OLITE **60Hz**

Printing Light
Service Manual

OLEC®

94MS20 Rev. B4

This manual is designed for technical personnel and should only be used by authorized dealer service personnel.

This manual is written to provide an understanding of the equipment, as well as a plan for troubleshooting.

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6 Check List for Troubleshooting and Service

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1. Introduction

This manual is designed for technical personnel and is written to provide an understanding of the equipment, as well as a plan for troubleshooting.

All OLEC lights respond to existing conditions. There are no fixed cycles or timers. This allows the unit to respond correctly to conditions that are not normal to operation, such as power failure or surges. Learning what conditions cause the various responses will guide you to the solutions.

This manual was written in several sections, each to provide information in a different manner or specialized locations. Here is a quick guide to the sections.

Features: A comparison between our lights and conventional light sources, with an explanation of each feature, is provided to demonstrate why we chose to design a light source so different from other sources.

Component Layout: Where to look for components referred to in the manual.

Note: The AL9 and AL13 units are very similar. The AL15, ALI15, AL19, AL20, AL23 (power supply only for the AL23) units are very similar but some have fewer parts. The AL23 (lamphead only for the AL23) AL25, AL25-2, AL35, AL50, AL53, AL54, AL54-480, AL55, AL55-480, AL56, AL56-480, AL83, AL84, AL84-480, AL85 and AL100 (power supply only for the AL100) units are very similar but some have fewer parts. The AL100 lamphead shares some of the same internal components with the other lampheads but the arrangement is quite different.

Troubleshooting: An outline of where to look for various symptoms. This guide refers to the more detailed information in the general information section that follows.

General: Contains specific information about the components in the light and the path of the signals and power. It can be used for information, or used with the troubleshooting guide.

Lamp Head Signals: Provides information about all the conductors to the lamp head, their functions, and the voltages present.

Light Function States: A chart of the different functions the board directs and the conditions that cause these functions. There is also a description of the states.

Printed Circuit Board Pins: Provides the pin-outs from the printed circuit board and an explanation of each.

Schematics: Full-unit schematics are provided. They are for the AL 9, AL 13, AL 15, ALI 15, AL19, AL20, AL23, AL35, AL50, AL53, AL54, AL54-480, AL55, AL55-480, AL56, AL56-480, AL83, AL84, AL84-480, AL85, AL100.

2. Safety

Questions have been raised regarding the possible danger of exposure to UV for equipment operators using high power lights. We address this issue in terms of overall safety of such lights. OLEC lights are UL approved and meet the strictest US electrical and safety standards, including all OSHA requirements. Users and dealers should insist on U.S. safety approval. It is required by law.

The Nature of UV

UV rays have been divided into three categories: UV“A” from 400-315nm, UV“B” from 315-280nm, UV“C” for the shorter waves. UV extends to about 10nm but air will filter out most rays shorter than 200 nm. To put this into perspective, the “near UV” or UV“A” is immediately adjoining the visible spectrum extending from the color violet. Violet extends to about 380 nm; red is at the opposite end of the visible spectrum at 700 nm (see Illustration: Electromagnetic Spectrum). Most light sources, including light bulbs, emit a certain amount of UV.

UV, Source of Health

Before one becomes unduly concerned with the harm UV can cause, it is important to understand the many beneficial effects connected with working outside and in bright areas with a certain amount of the “right” UV. The germicidal effect, for instance, can rid the air of bacteria and is used for that purpose extensively in hospitals. Exposure of the skin to UV produces Vitamin D, necessary for the formation of bones and teeth. Exposure to UV“A” is essential to life itself. Most life, human, animal and plant, depends on it for growth and health.

Bad UV

One must avoid UV“B” and UV“C” even in small doses. UV“A” is harmful only through overexposure. Never confuse the effects of UV with the great harm that can be caused by microwave and X-ray radiation, much of such damage being irreversible.

UV in Nature

Sunlight contains an abundance of UV, UV“A”, “B” and “C”, and the negative effects of overexposure to sunshine have become well known. These are primarily sunburn, sore eyes, headaches. Cataracts and skin cancer are caused by prolonged exposure. Very damaging is the erythematic energy, UV“B”, that penetrates the natural filter of ozone in the upper layers of the atmosphere.

Ozone, UV“B” and UV“C”

No UV“C” is generated by OLEC lamps. OLEC lights and lamps use “Ozone Free Quartz” for safety reasons to filter out most of the potentially harmful rays in the UV“B” region. Some manufacturers do not use “ozone free quartz.” Such lamps require greatly enhanced protection through safety glass, curtains, light tight housings, and special exhaust systems to rid the air of ozone. If you smell ozone in your workplace, speak to your supervisor or employer. DO NOT work under those conditions!

Safety Glass

Carefully selected safety glass is used on all OLITE UV lights under the reflector. It filters out nearly all the remaining UV“B” so effectively that any transmission is almost impossible to measure. This safety glass is equipped with an important electrical interlock to prevent use of the light if the glass is missing or installed improperly. Never use a light that does not have a protective safety glass.

Light Leaks

Light heads that leak light around the safety glass during idling periods should be avoided. Light above the safety glass always contains a certain amount of UV“B”, particularly when NON-ozone free lamps” are used. Poorly constructed light housings, with even small parts of the lighted area of the lamp or the reflector visible during standby, can be dangerous. Such lights are best used within an enclosure that is shut completely at all times, especially during extended idling time. According to NIOSH, UV“B” is quite different in its effect from UV“A.” It is cumulative and between 600 to 1000 times as destructive.

Being exposed to constant UV leakage during idling time can quickly exceed the daily maximum safe limit and eventually cause serious personal damage. Never use or have anyone else use a light with leaks past the safety glass (where you can see lamp or reflector from any direction)!

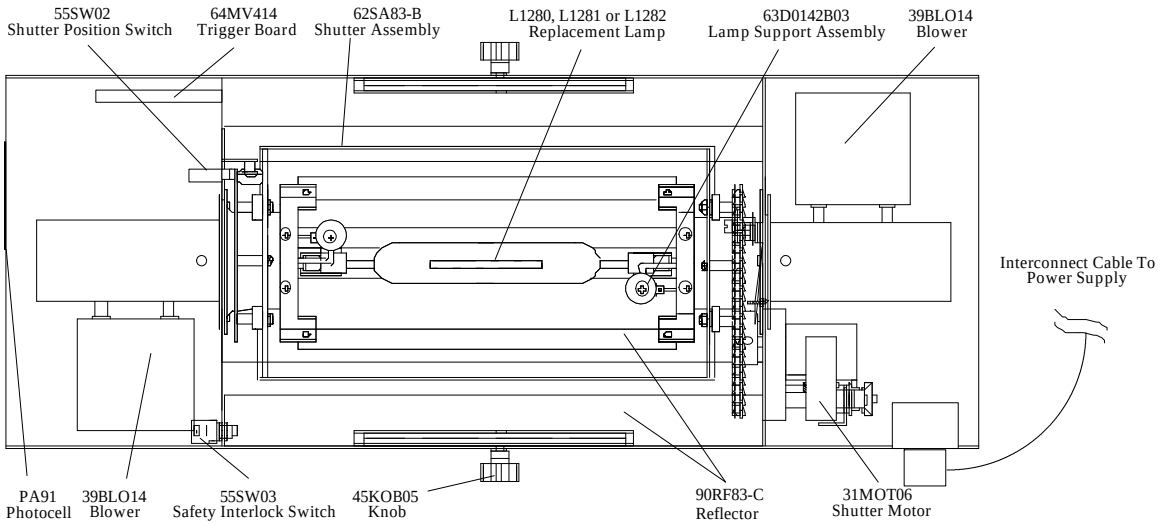
Overexposure to UV

What constitutes overexposure to UV“A” should be considered in terms of safe limits and the trade-off between documented health-promoting effects of UV and danger of overexposure. For the UV“A” region, the UV effecting exposure on film and plates, it is recommended that the total radiant incidence on unprotected skin and eyes should not exceed 1.0 mW per cm^2 for periods longer than 1000 seconds (16 minutes). This is the Standard, documented and recommended by the National Institute for Occupational Safety and Health, NIOSH, a basis for OSHA.

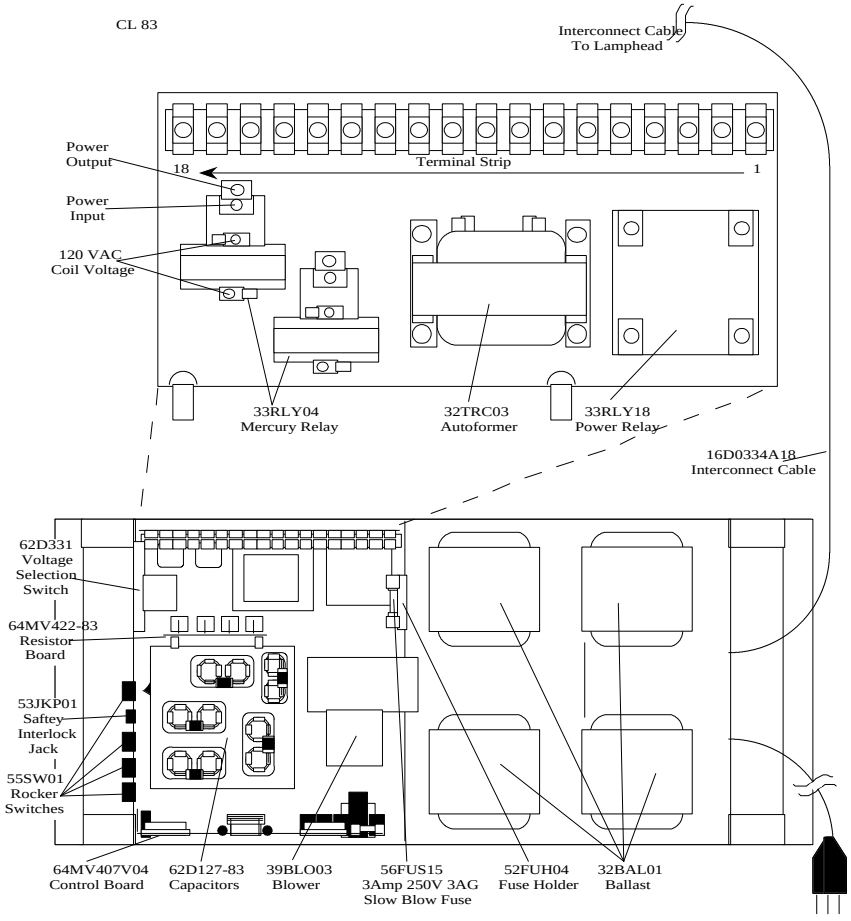
For UV intensity under 1.0 mW per cm^2 there is no time limit. With higher intensity the time should be reduced so that the total dose does not exceed 1000 mW-sec/cm^2 (1 mW/sec = 1 mJoule).

3. Component Layout

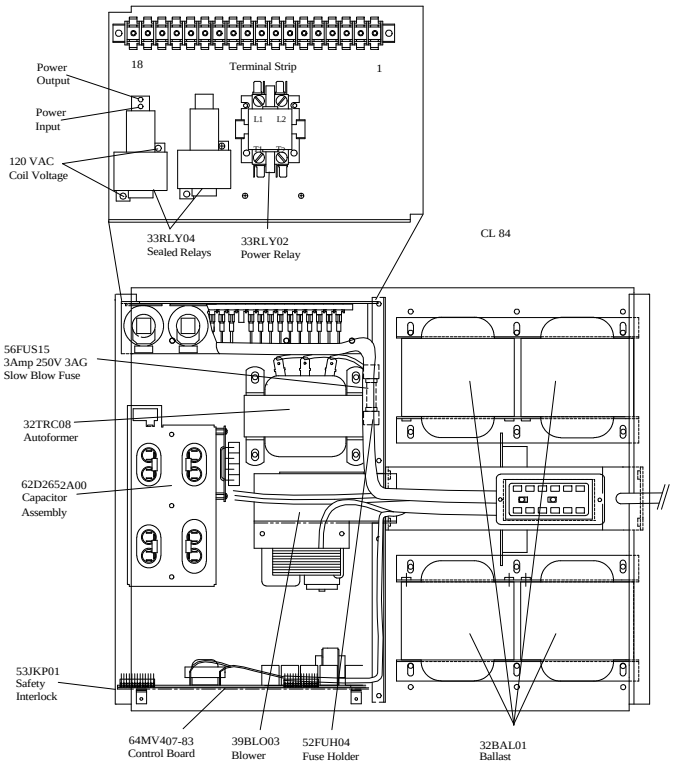
Lamphead for AL 83, 84, 84-480, 85, 56, 56-480



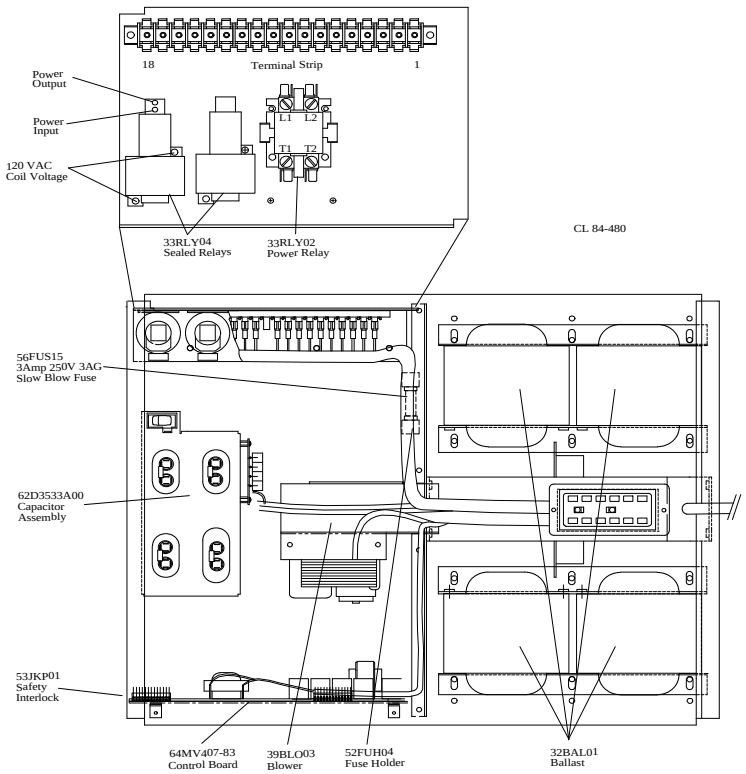
Power Supply for AL 83



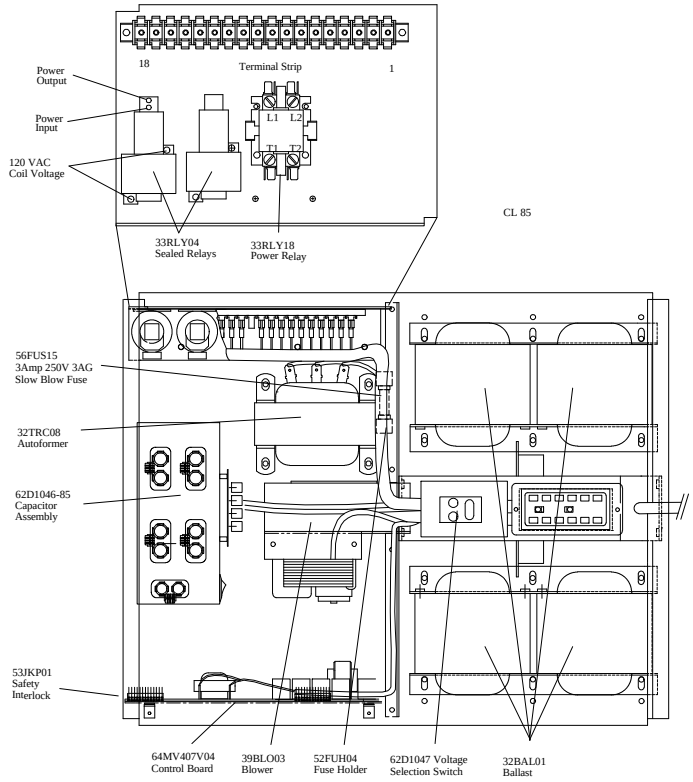
Power Supply for AL 84



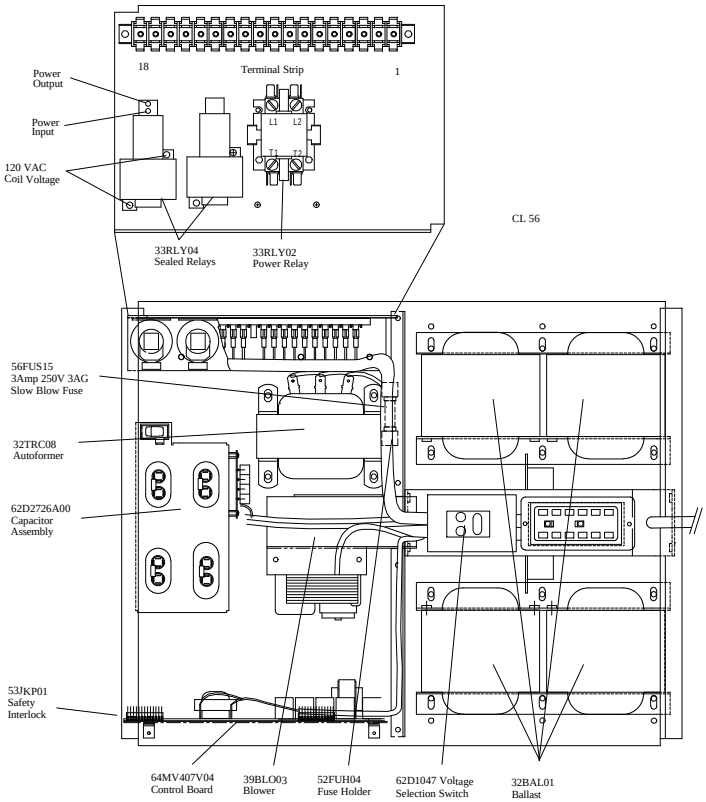
Power Supply for AL 84-480



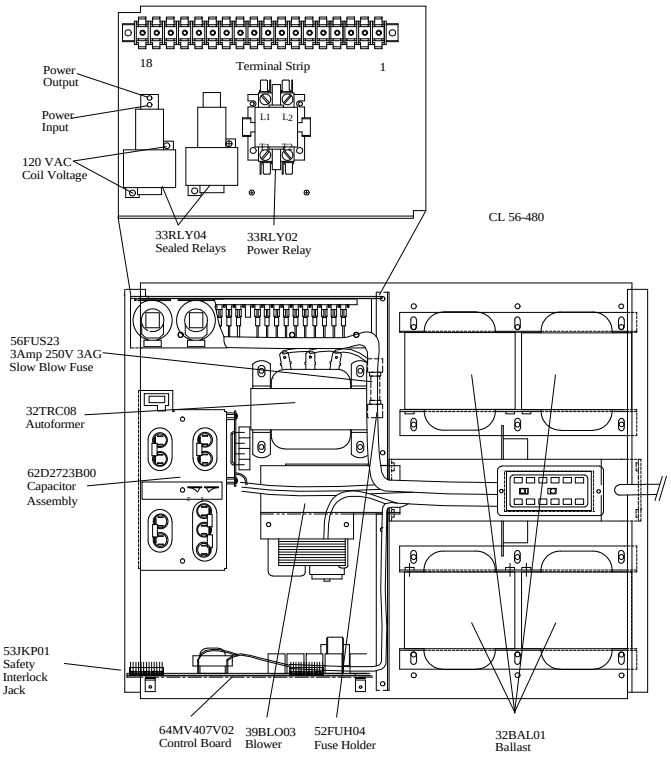
Power Supply for AL 85



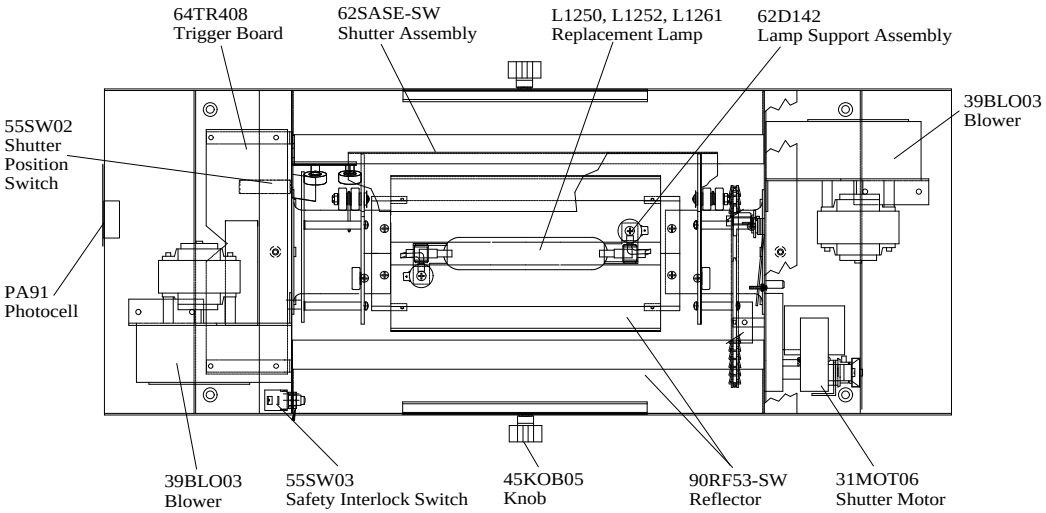
Power Supply for AL 56



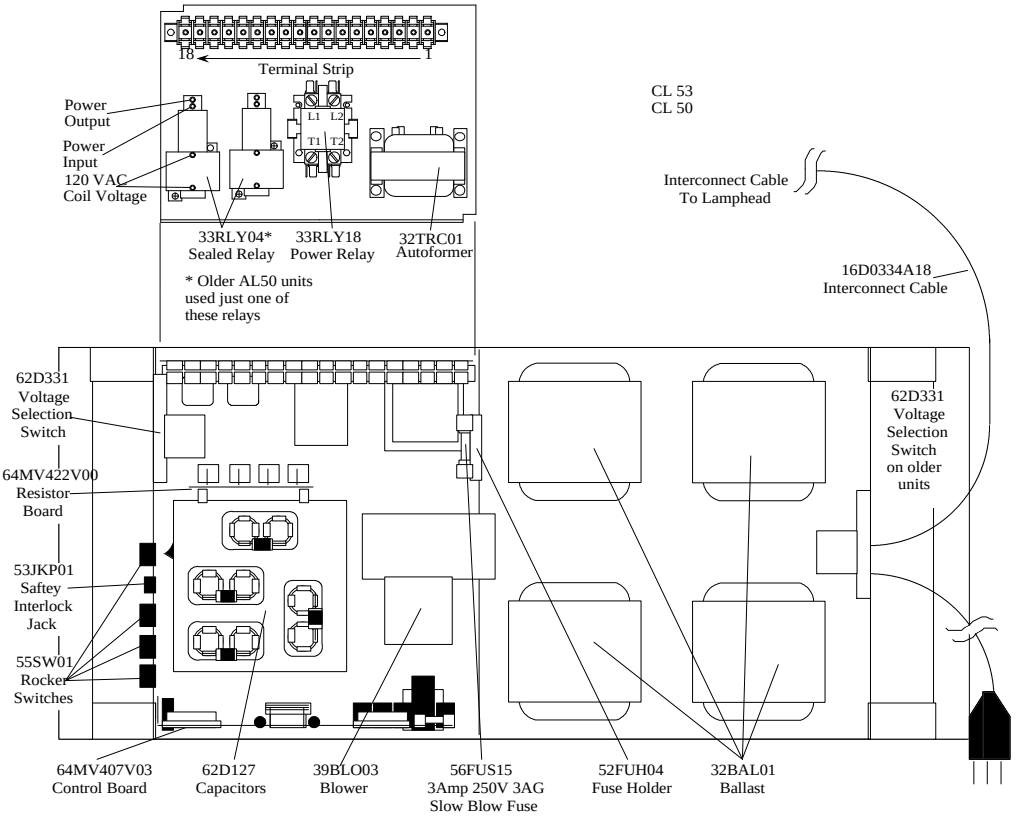
Power Supply for AL 56-480



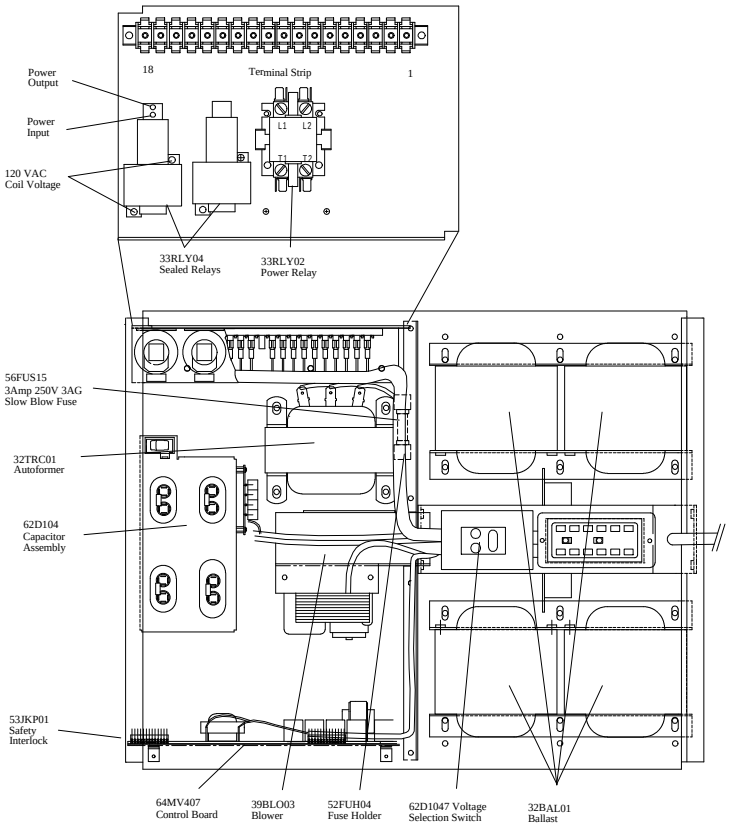
Lamphead for AL 53, 54, 54-480, 55, 55-480, 35, 25, 25-2, 23



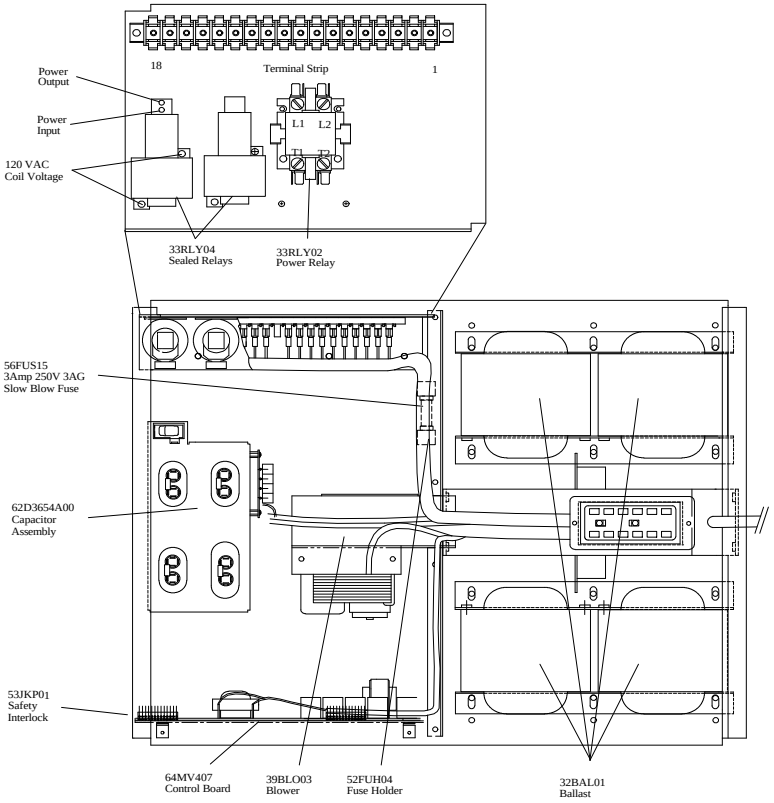
Power Supply for AL 53, AL 50



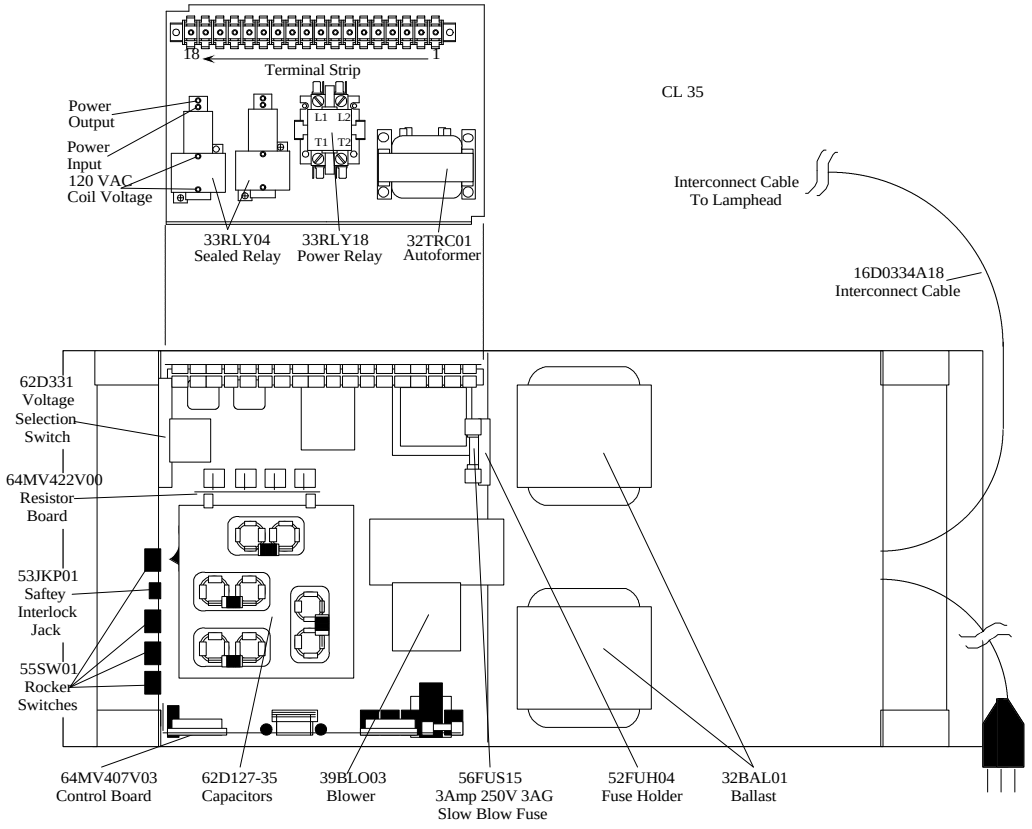
Power Supply for AL 54, 55



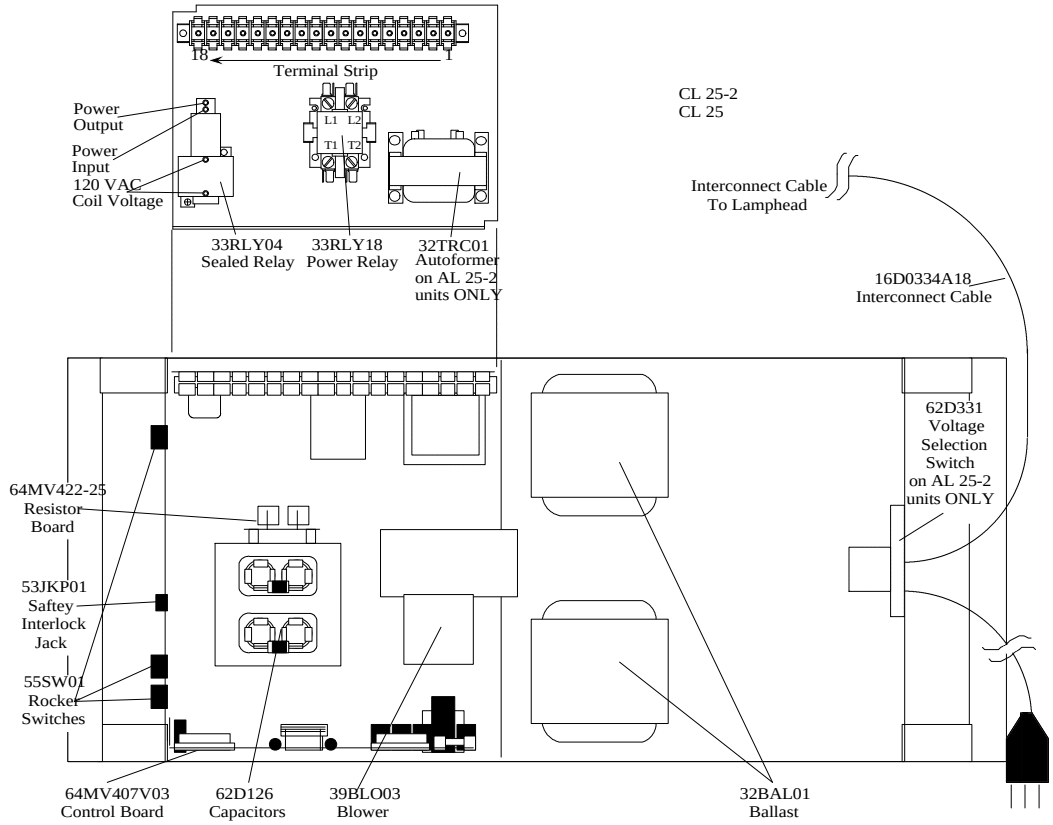
Power Supply for AL 54-480, 55-480



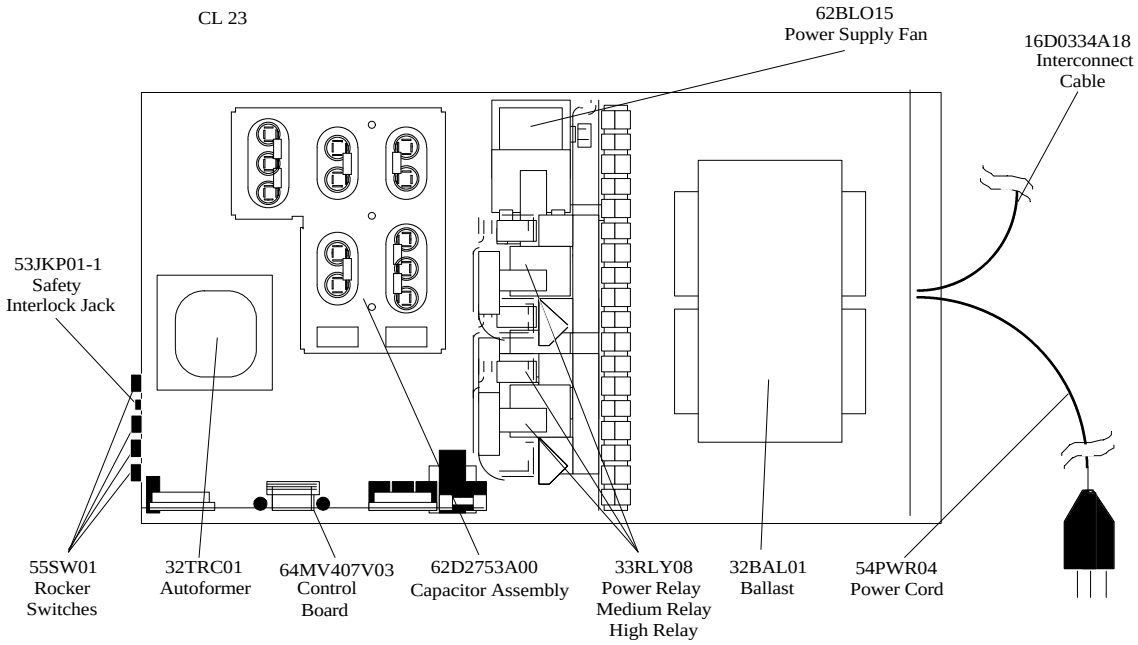
Power Supply for AL 35



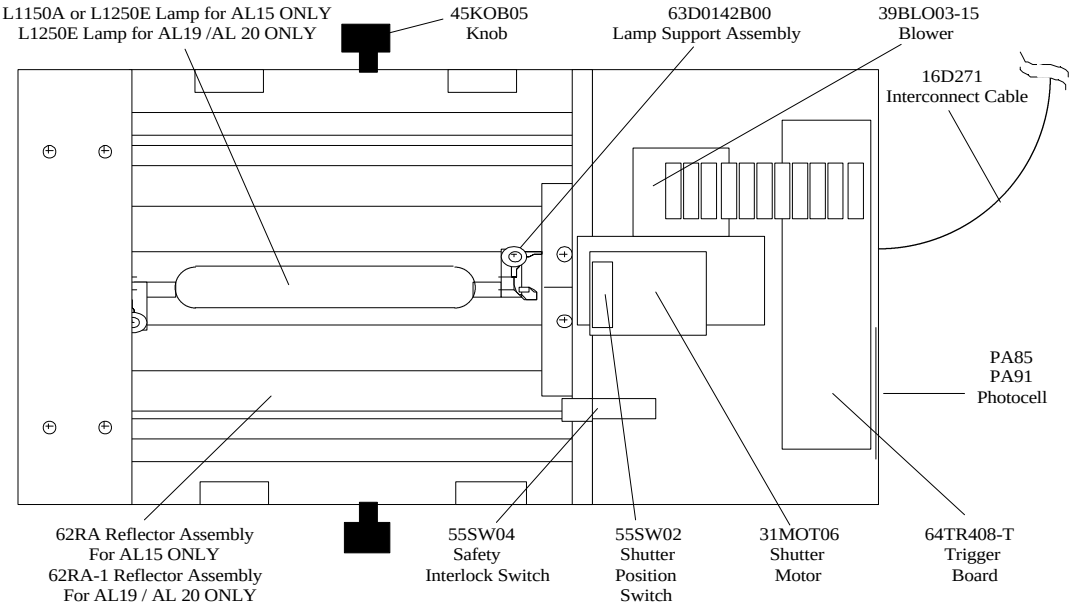
Power Supply for AL 25-2, AL 25



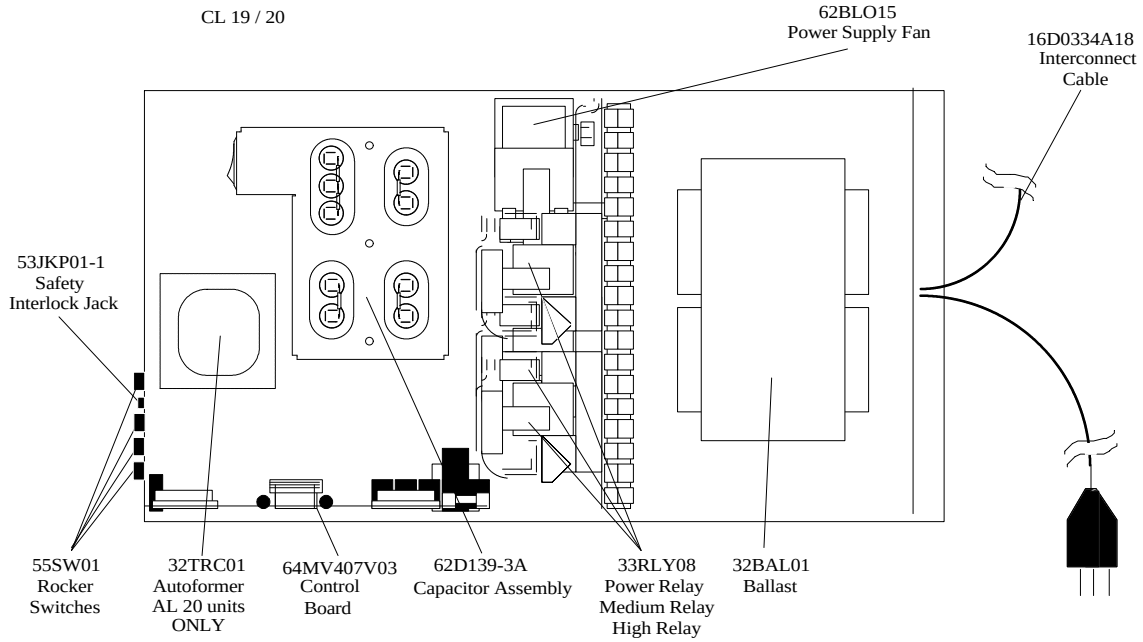
Power Supply for AL 23



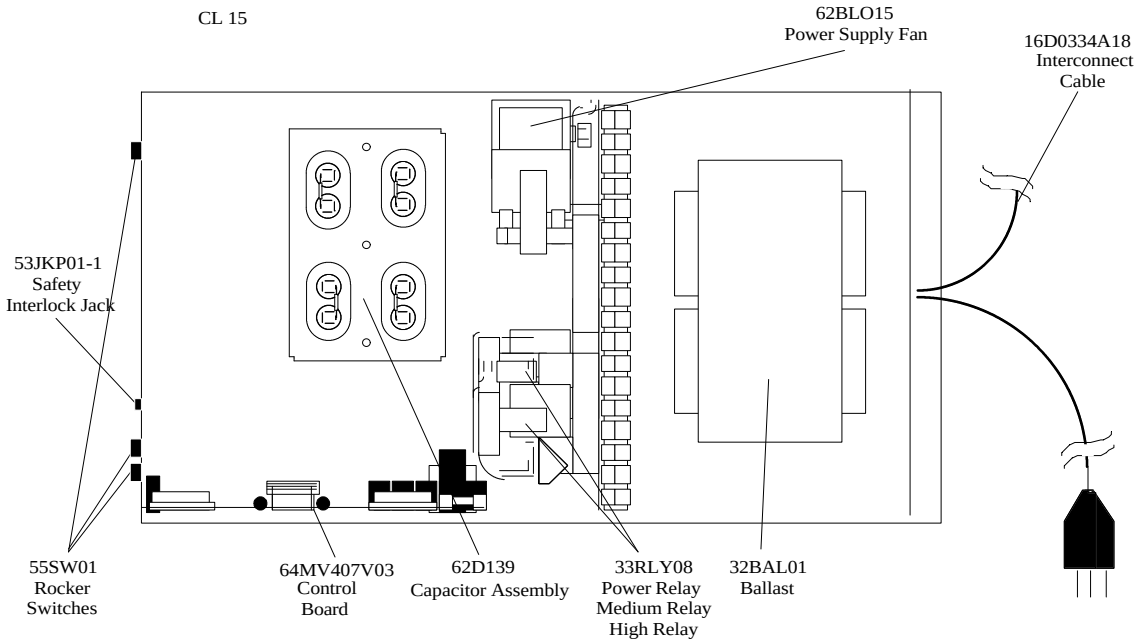
Lamphead for AL 15, 19, 20



Power Supply for AL 19, 20

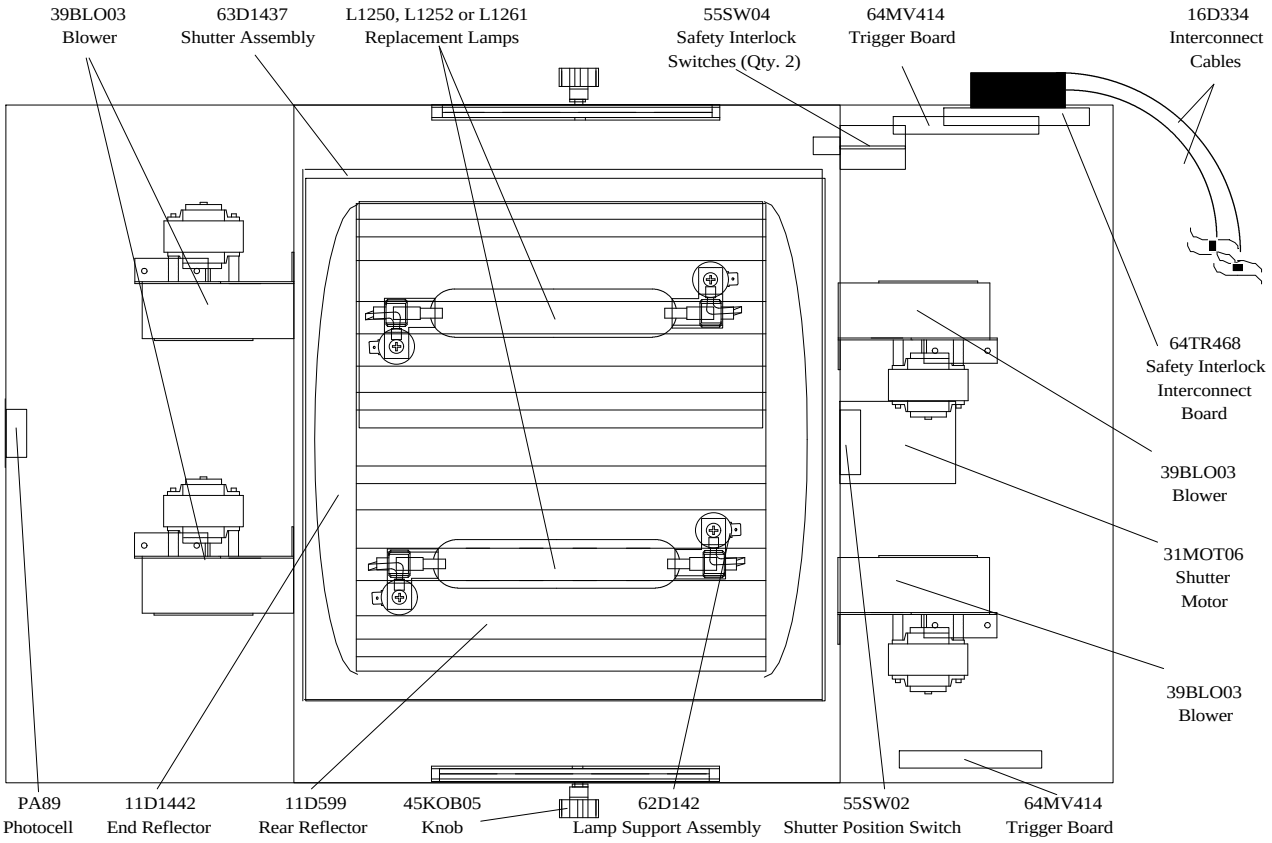


Power Supply for AL 15



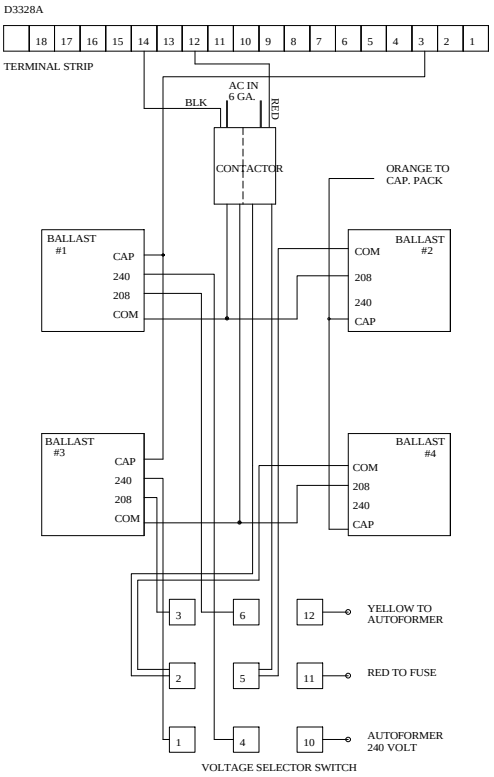
Lamphead for AL 100

Note: AL100 uses two AL53 power supplies

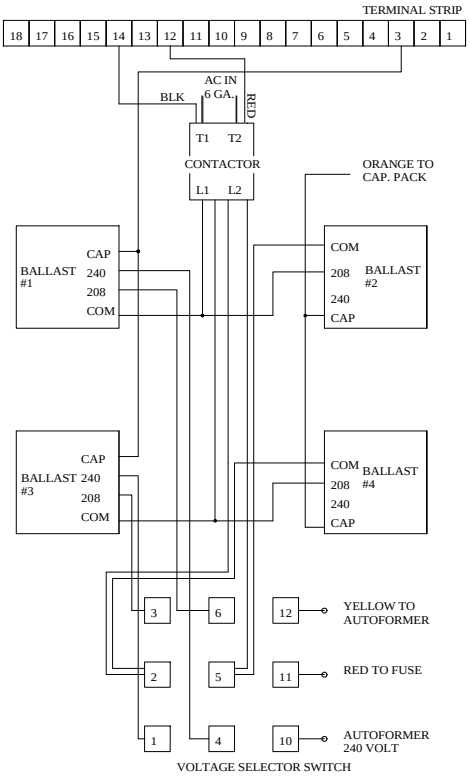


4. Ballast / Tap Switch Wiring

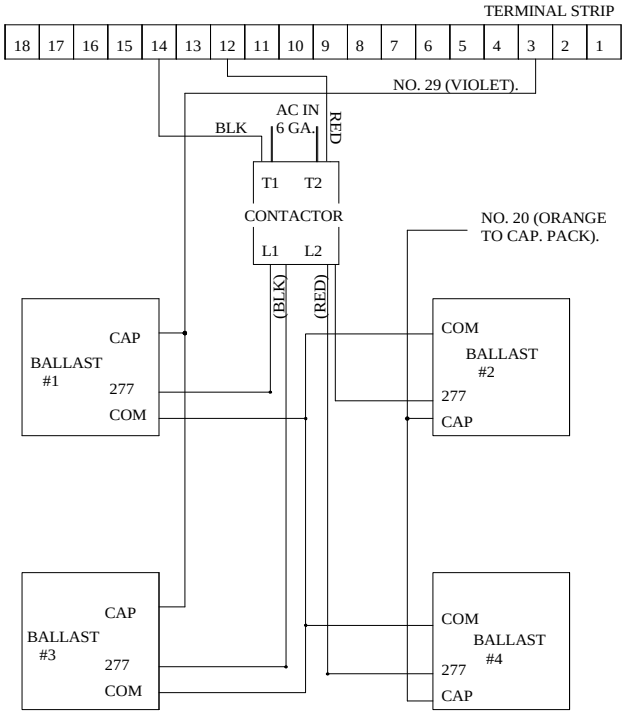
AL 83 Ballast / Tap Switch Wiring



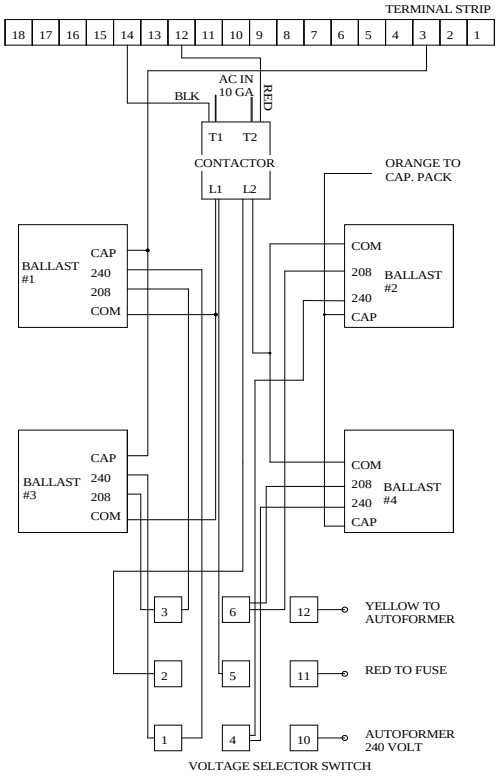
AL 84, 85 Ballast / Tap Switch Wiring



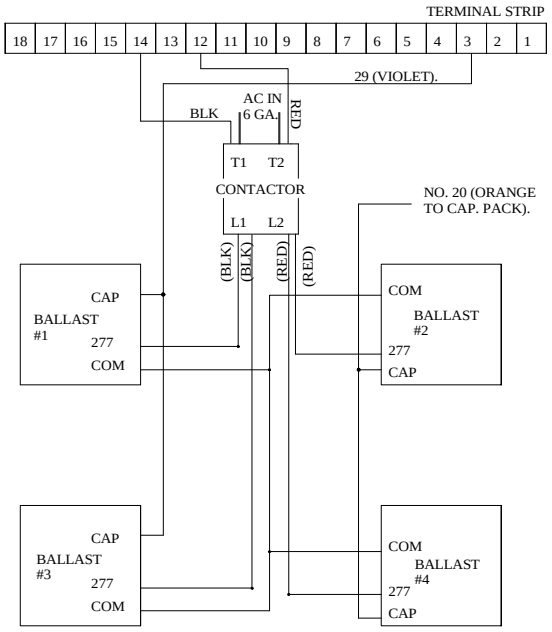
AL84-480 Ballast Wiring



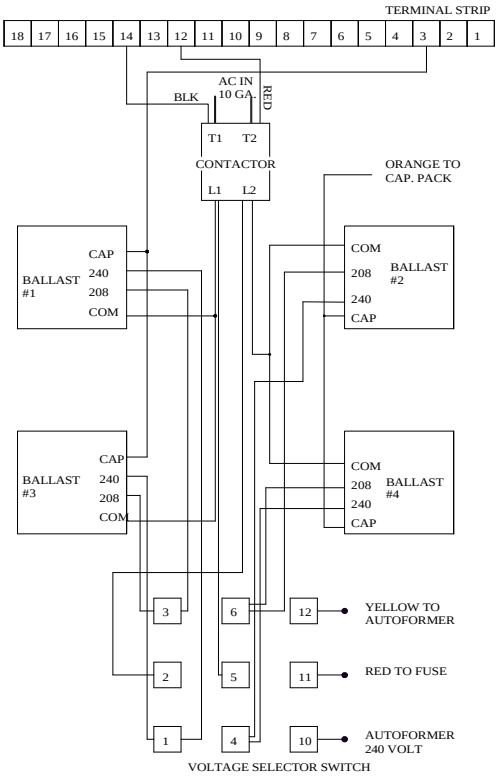
AL 56 Ballast / Tap Switch Wiring



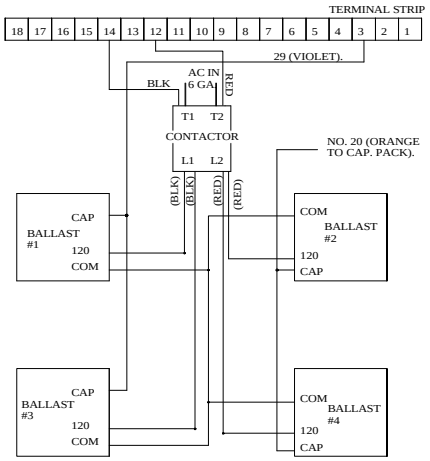
AL56-480 Ballast Wiring



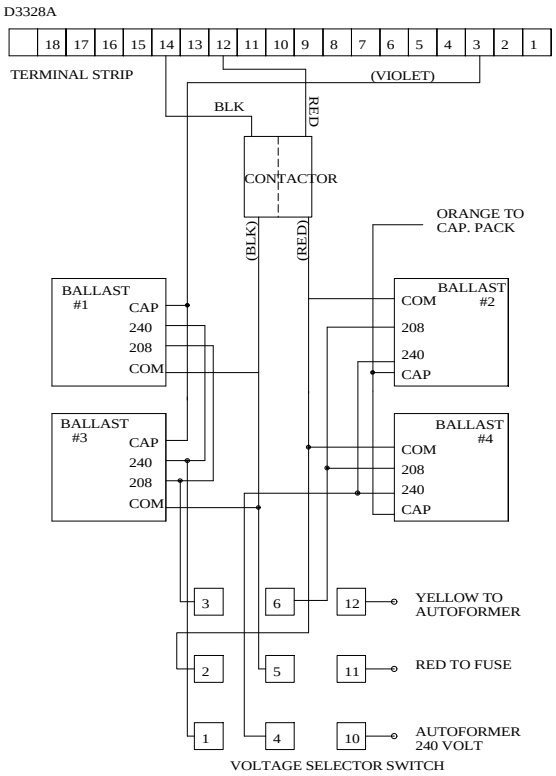
AL54 / AL55 Ballast / Tap Switch Wiring



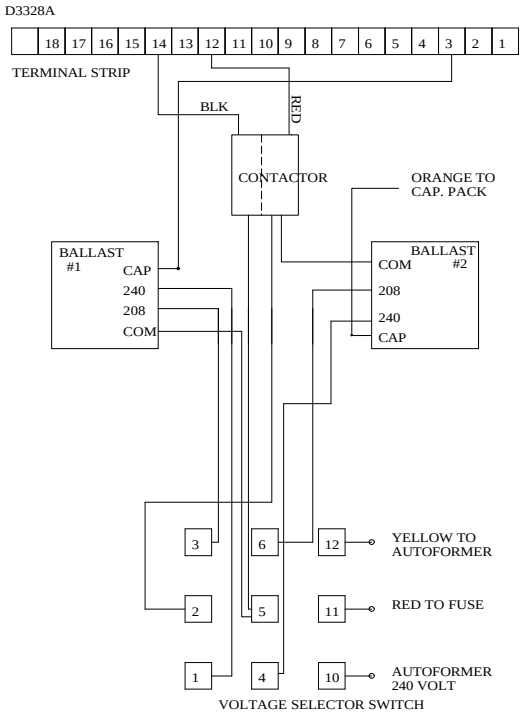
AL54-480 / AL55-480 Ballast Wiring



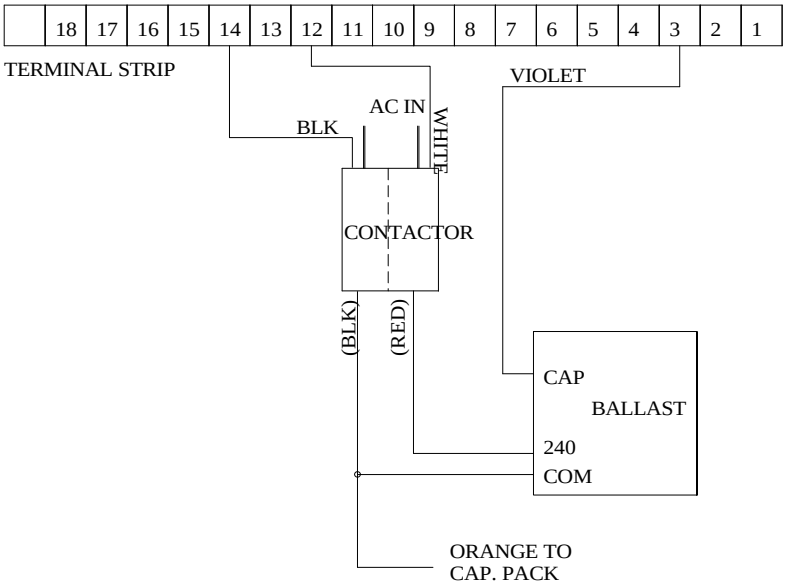
AL53/50 Ballast / Tap Switch Wiring



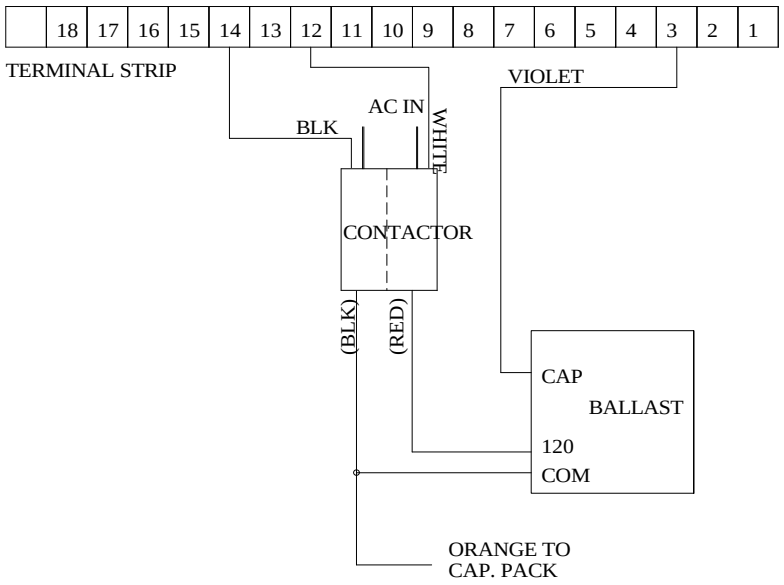
AL 35 Ballast / Tap Switch Wiring



AL23 and AL20 Ballast Wiring



AL 19 and AL15 Ballast Wiring



5. General

Path of Power to the PC Board

This section is useful when there is no power reaching the PC board (no LEDs lighted). Before tracing the power, check the fuse on the PC board and the incoming power.

The power cord enters the rear of the unit. The two hot conductors are connected by wire nuts to wires that are in turn connected to the front of a terminal strip. One of these two wires passes through a fuse and on 208/240V~ 60Hz units is then connected to a voltage selector switch, then is connected to taps on a step-down autotransformer. This transformer is located under the terminal strip on the component bracket near the dividing wall. The transformer tap marked 120V~ becomes the unit common and returns to the terminal strip. The other line wire is connected to the transformer common and becomes the hot 120V~ lead to the PC Board and also returns to the terminal strip. The power is distributed from the strip and a pair of wires goes to the PC board.

Interlock System

The internal interlock system serves two purposes. The first is for operator safety by insuring the safety glass is in place before operation. This glass filters short UV radiation and covers the high voltage lamp terminals. This interlock also protects from overheating by traveling through two thermostats in the lamp head. There is also an outlet on some equipment marked “interlock” and is not used in this equipment.

The internal interlock is a loop that travels through the light head, passing through the glass switch and two thermostats. This interlock is in series with the control circuit of the large relays in the power supply. When the interlock is opened, the relays will open and cut the power to the lamp terminals. The PC board senses the drop in voltage and closes the shutter.

The first place to check is the glass switch. The switch lever is located near the edge of the glass on the end of the lamp where the cable enters. By releasing the glass, the lever can be seen. If the lever can slip past the glass, it should be bent slightly toward the reflector. If the switch is closed, the loop can be traced. First measure the voltage between lamp wires (#4 V~ Common) and wire (#10 Interlock). The presence of voltage between these terminals indicates an open loop. This loop travels to the lamp head on wire (#10), then to the glass switch, the far end thermostat, the near end thermostat and terminates on wire (#4). The thermostats are mounted in the air tubes leading to the lamp. There are no splices in the air tubes.

Lamp Voltage

The lamp voltage measurement can provide useful information for lamp striking, lamp output, and level switching information. The meter used to measure can cause different results. We use caution when using digital meters in our factory, due to the trigger pulses on the lamp before striking. The waveforms are not sinusoidal, so different meters may produce different results. Here is a chart with typical measurements:

MODEL	IDLE	LOW	MED	HIGH	TRIG.	IDLE/LOW	MED.	HIGH	TRIG.
AL15 w/L1150A	180	180	----	230	500+	65-90	---	110-125	110-125
AL15 w/L1250	180	180	---	230	500+	65-90	---	110-125	110-125
AL19/20 w/L1150A	205	190	210	225	500+	65-90	80-95	110-125	110-125
AL19/20 w/L1250E	210	205	215	235	500+	65-80	70-90	80-95	110-125
AL23 w/L1250	205	190	210	225	500+	65-90	80-95	110-125	110-125
AL23 w/L1252	210	205	215	225	500+	65-80	70-90	80-95	110-125
AL23 w/L1261	215	210	215	220	500+	65-80	70-90	80-95	110-125
AL25/25-2 w/L1250	190	190	---	230	500+	45-80	---	100-125	110-125
AL35 w/L1250	190	190	205	235	500+	60-80	75-95	110-125	110-125
AL35 w/L1252	207	200	*195	235	500+	65-90	*60-85	100-125	110-125
AL35 w/L1261	200	195	*195	235	500+	65-90	*60-85	100-125	110-125
AL50 w/L1250	190	185	---	270	500+	60-90	---	110-125	110-125
AL50 w/L1252	207	200	---	270	500+	65-90	---	110-125	110-125
AL50 w/L1261	200	200	---	270	500+	65-90	---	110-125	110-125
AL53/54/54-480/55/ 55-480 w/L1250	190	185	225	270	500+	60-90	95-115	110-125	110-125
AL53/54/54-480/55/ 55-480 w/L1252	207	200	225	270	500+	65-90	85-125	110-125	110-125
AL53/54/54-480/55/ 55-480 w/L1261	200	200	225	270	500+	65-90	85-125	110-125	110-125
AL56/56-480 w/L1280	360-380	360-380	380-410	415-445	500+	80-95	90-120	115-125	115-125
AL56/56-480 w/L1281	400-430	400-430	420-490	440-510	500+	80-90	90-120	115-125	115-125
AL56/56-480 w/L1282	400-430	400-430	420-490	440-510	500+	80-90	90-120	115-125	115-125
AL83/84/84-480/85 w/L1280	370	360	390	425	700+	80-105	90-125	110-125	110-125
AL83/84/84-480/85 w/L1281	415	395	425	485	700+	80-115	90-125	110-125	110-125
AL83/84/84-480/85 w/L1282	422	395	430	510	700+	80-105	90-125	110-125	110-125

*When using the L1252 or L1261 the AL35 has only high and low power.

Lamp Power Path

The basic path that the power to the lamp takes is almost identical for all units. The basic path is incoming line, main power relay, ballasts, capacitors, trigger board, and then the lamp. See the point to point wiring diagrams for each light source in section 7.

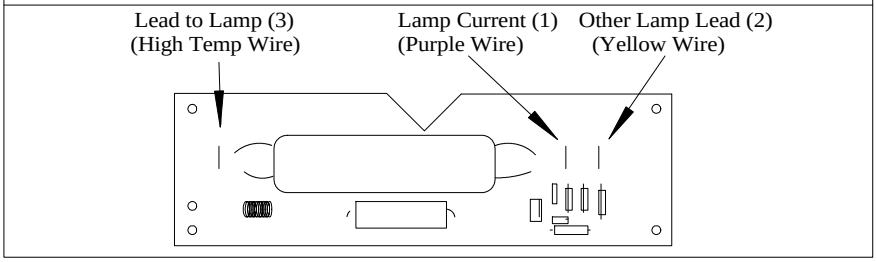
Trigger Board

A trigger board is provided in the light head to start the lamp. This board operates on demand by sensing the lamp voltage. This board can be heard when it is functioning, although the sound is faint. By turning the unit on and off, the sound can be compared during trigger and cool-down. In both situations, the fans are running full speed. The fans may be disabled by pulling the blue wire from terminal #5 to aid in determining if the trigger board is functioning.

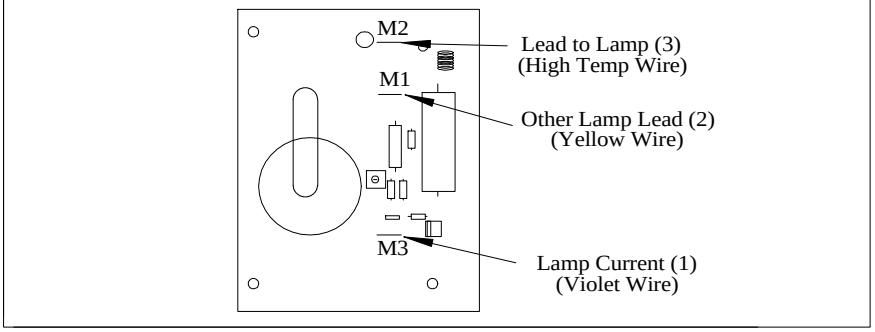
CAUTION Use caution that the lamp doesn't run without cooling.

The trigger board is located in the lamp head, in the end where the cable enters. It is located in the cool air path inside the air plenum. One lamp lead is in series with the trigger transformer [(1) input (3) output], the other lamp lead (2) is used to sense the lamp voltage. Outside the unit, the board can be tested by putting 350-750V~ between terminals [(1) and (3)], and causing an arc from terminal (3) to terminal (1). This arc should be .015" or greater.

TRIGGER BOARD #64TR408 for
AL 15, AL 19, AL 20, AL 23, AL 25, AL 25-2, AL 35, AL 50, and AL 53



TRIGGER BOARD #64MV414 FOR AL 83 and AL 100



Capacitors and Level Switching

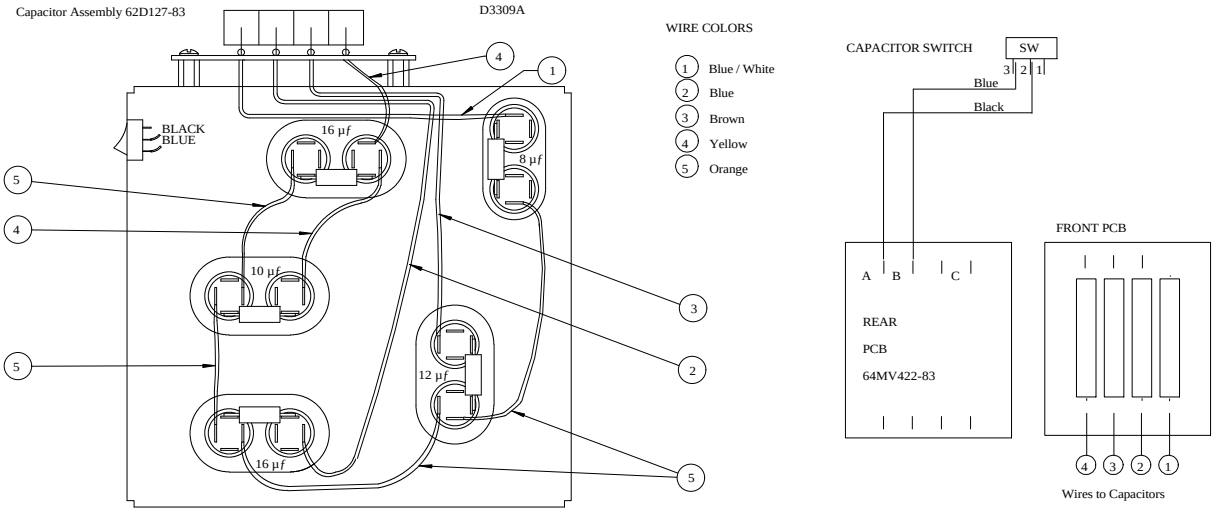
The capacitors pass all the current that flows through the lamp. They are also used to switch power levels.

The capacitors for the light sources are divided into two or three sections. All units have one or two idle capacitors, they are connected with a yellow wire. There are one or two medium power capacitors (in tri-level light sources only) connected with a brown wire. There are one or more high power capacitors connected with a blue wire. All capacitors have an orange wire which acts as a common.

The capacitors for high and medium levels are pulled in with relays during warm-up and exposures. The medium relay will pull in to select medium power. In all lights the medium relay will also always pull in for high power exposures.

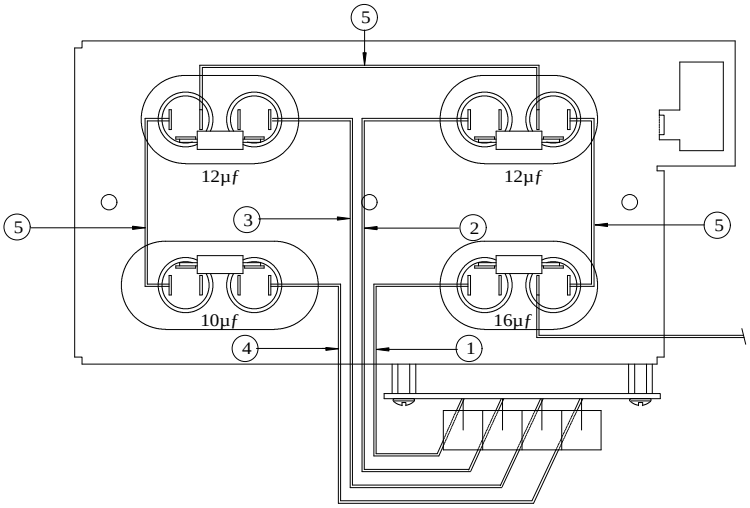
The capacitors set the operating current of the lamp. If the lamp output has changed rapidly, inspect the capacitors for swelling. The design of capacitor we use will burn open if it begins to short. A swollen capacitor should be replaced, and the unit should be tested to see that the capacitor did not damage the high or medium relay. To test the unit's ability to switch power levels, make a manual exposure, then switch between the power levels, noting the change in intensity. When switching down in power, allow the unit three seconds to respond.

AL 83 Capacitor Assembly



AL 84 Capacitor Assembly

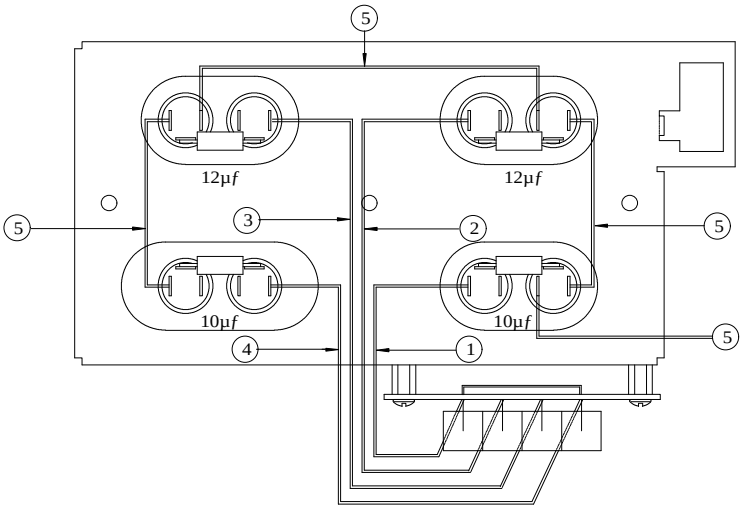
CAPACITOR ASSEMBLY PART # 62D2652A00



WIRE COLORS
1) YELLOW
2) BROWN
3) BLUE
4) BLUE WITH WHITE STRIPE
5) ORANGE

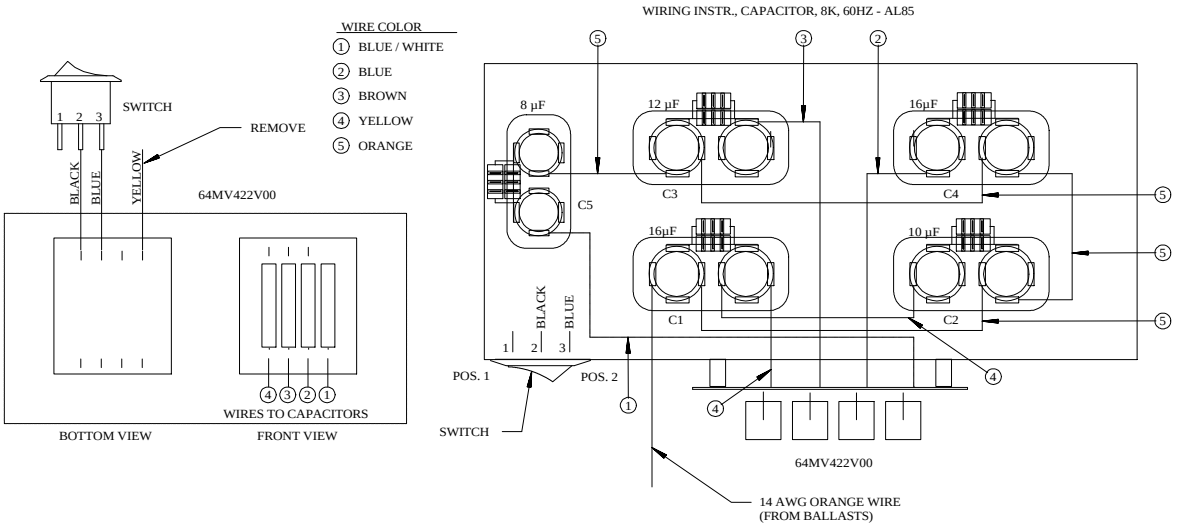
AL 84-480 Capacitor Assembly

CAPACITOR ASSEMBLY PART # 62D3533A00

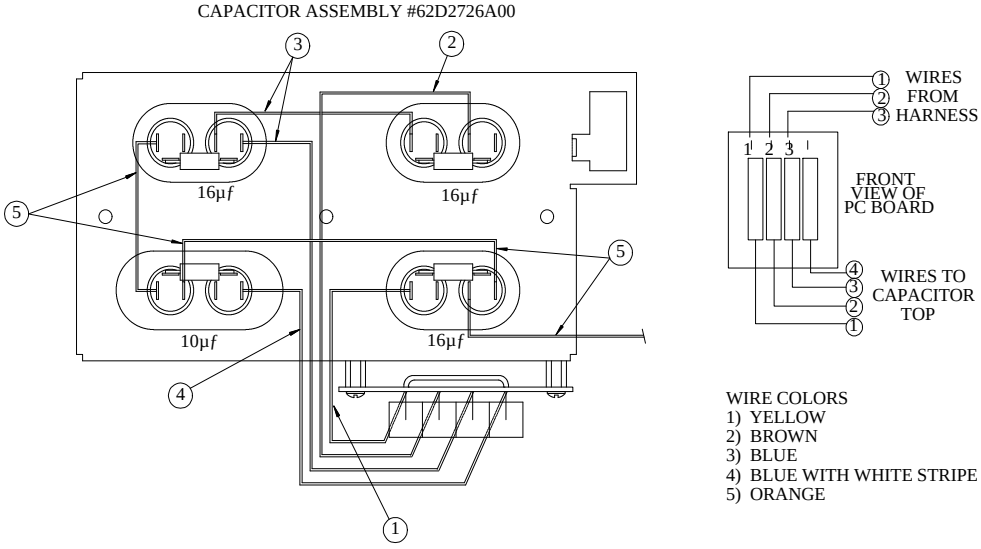


WIRE COLORS
1) YELLOW
2) BROWN
3) BLUE
4) BLUE WITH WHITE STRIPE
5) ORANGE

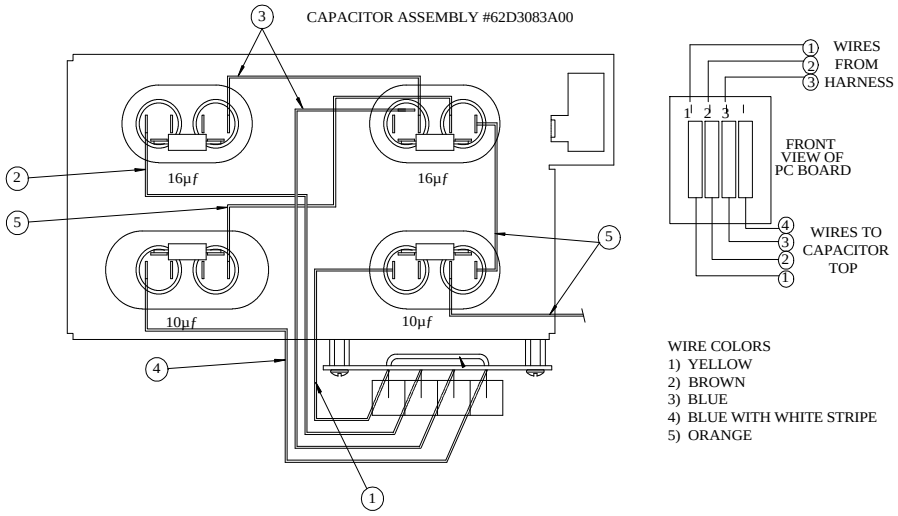
AL 85 Capacitor Assembly



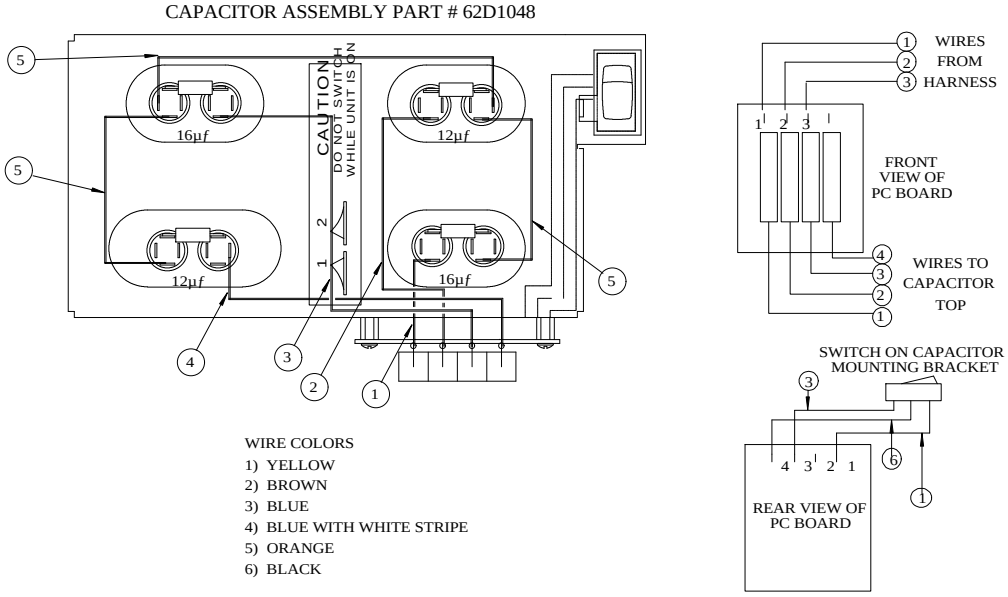
AL 56 Capacitor Assembly



AL 56-480 Capacitor Assembly

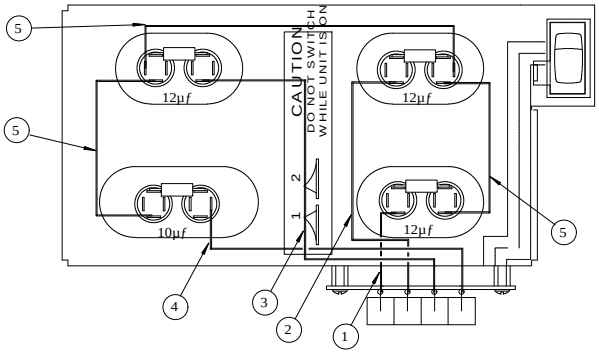


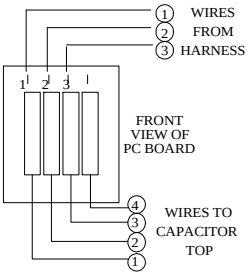
AL 54, AL 55 Capacitor Assembly

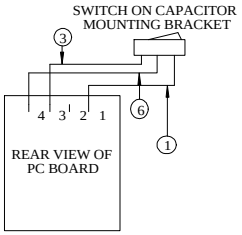


AL 54-480, AL 55-480 Capacitor Assembly

CAPACITOR ASSEMBLY PART # 62D3654A00



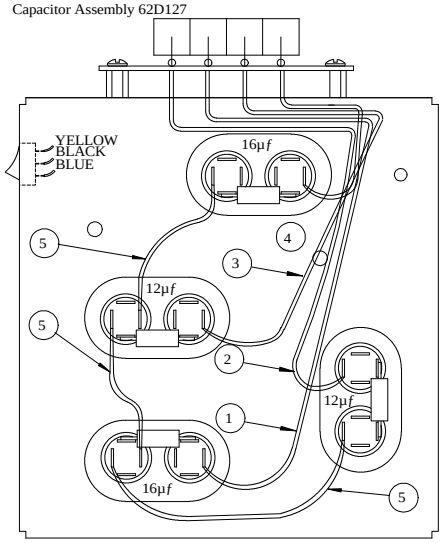




WIRE COLORS
1) YELLOW
2) BROWN
3) BLUE
4) BLUE WITH WHITE STRIPE
5) ORANGE
6) BLACK

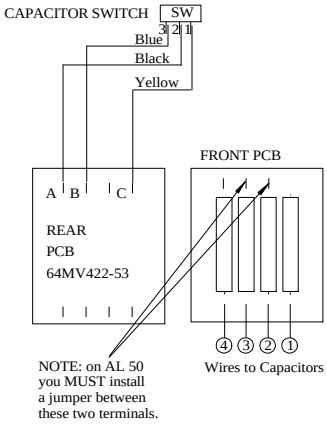
AL 53, AL 50 Capacitor Assembly

Capacitor Assembly 62D127

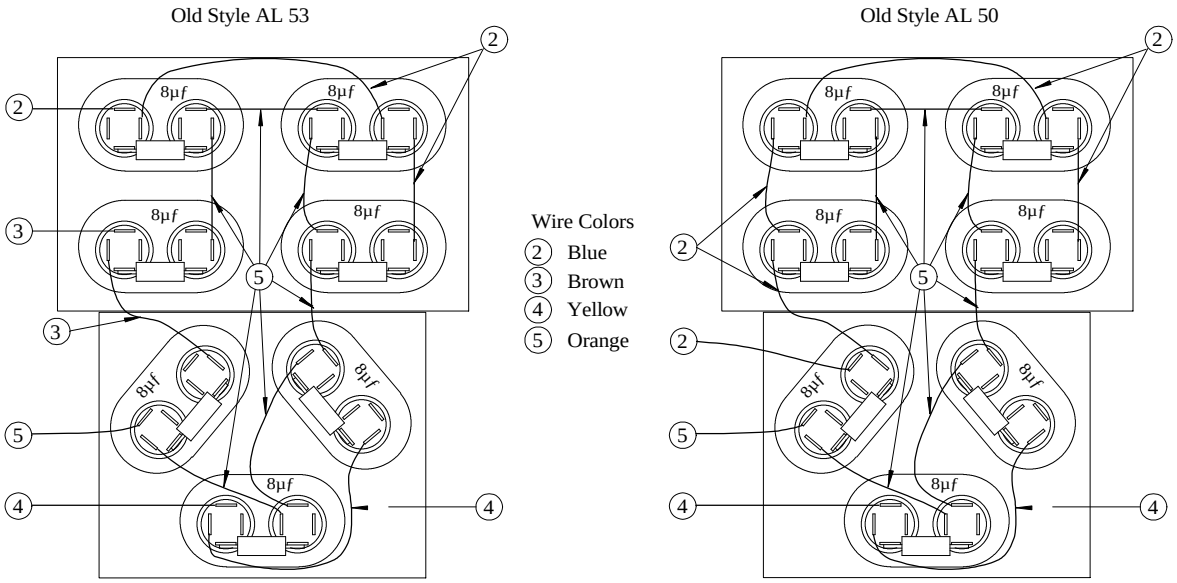


Wire Colors

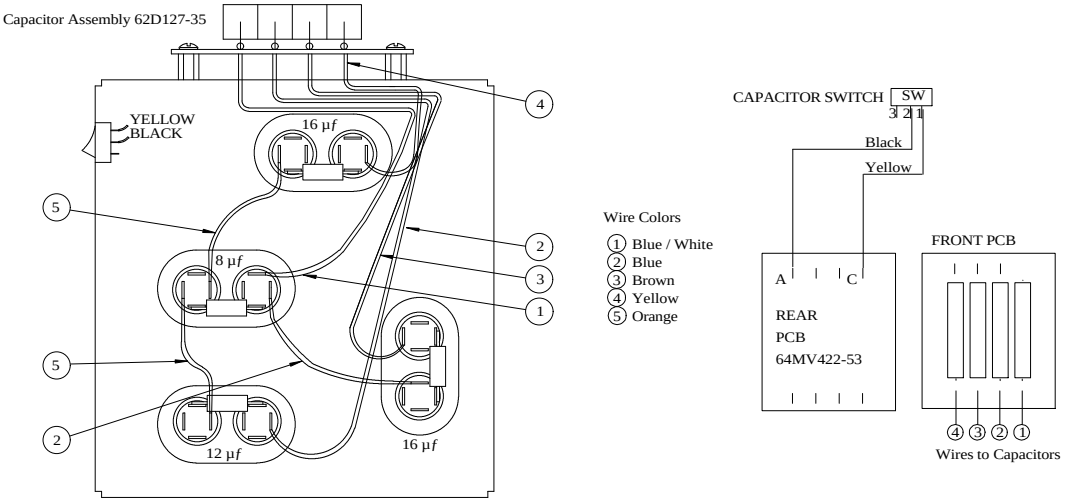
1. Blue / White
2. Blue
3. Brown
4. Yellow
5. Orange



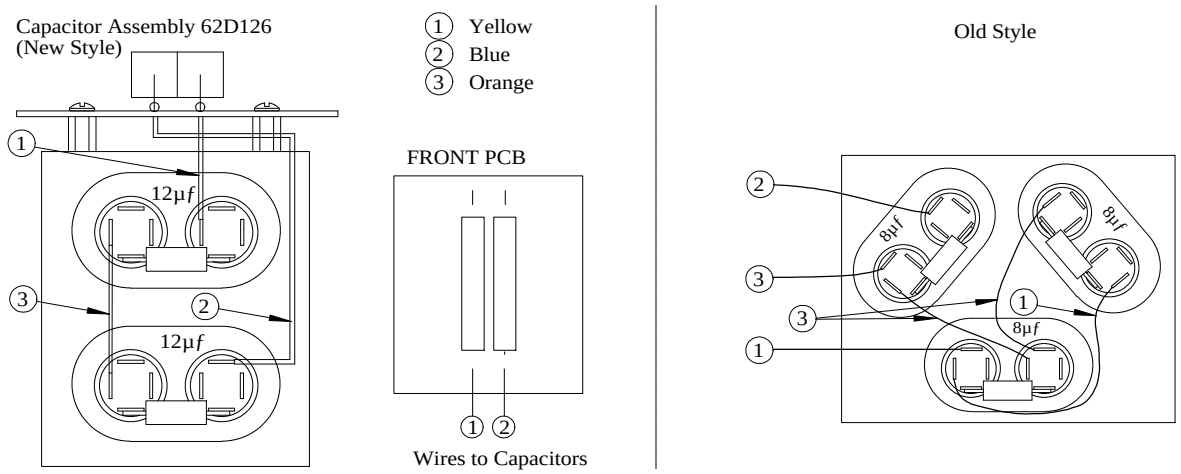
Old Style AL 53, AL 50 Capacitor Assembly



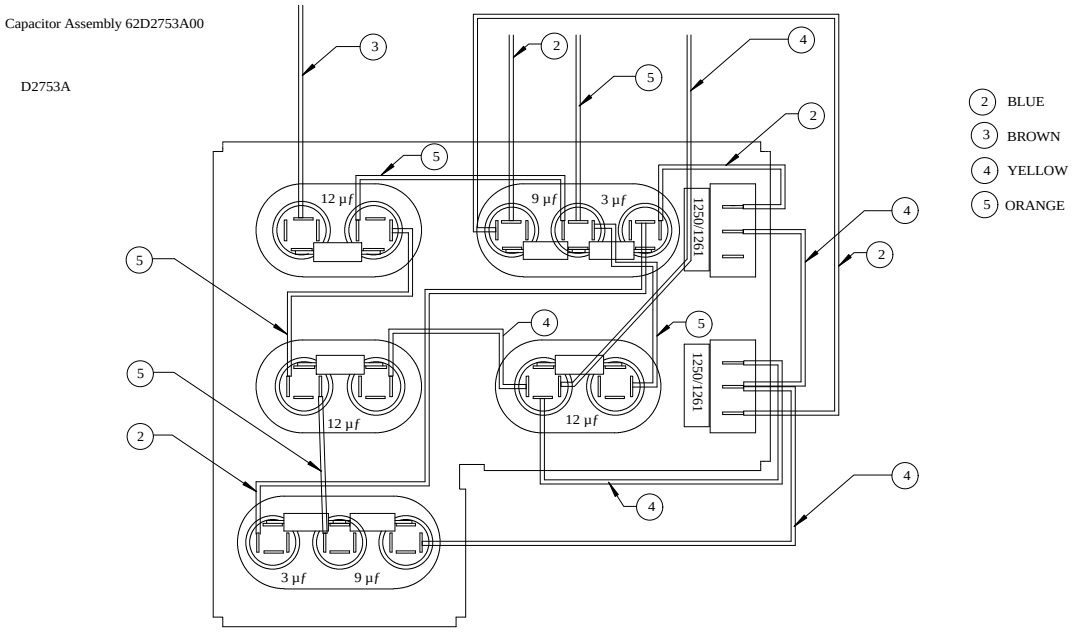
AL 35 Capacitor Assembly



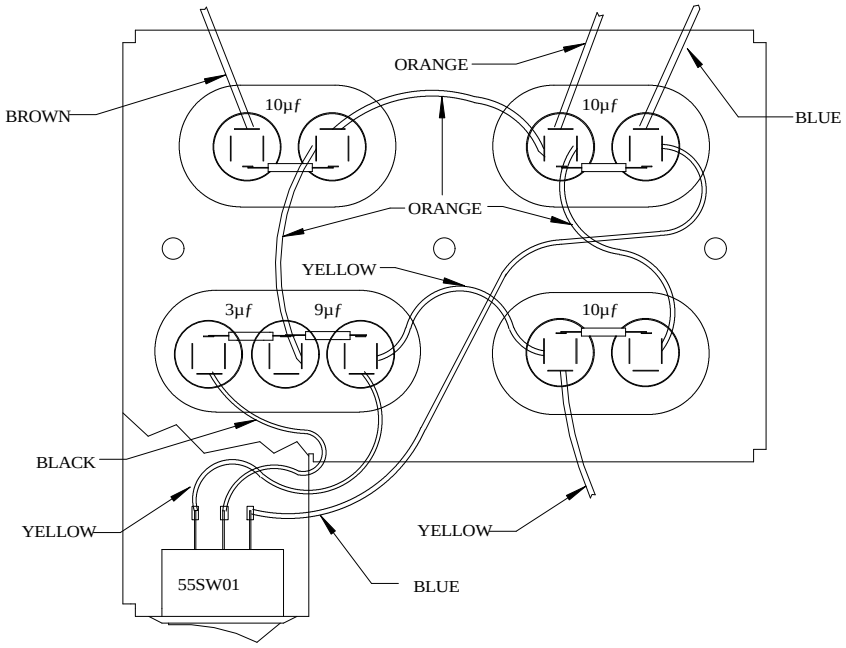
AL 25, AL 25-2 Capacitor Assembly



AL 23 Capacitor Assembly

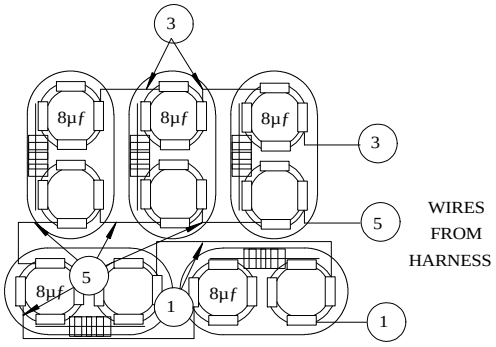


AL 20, AL 19 Capacitor Assembly

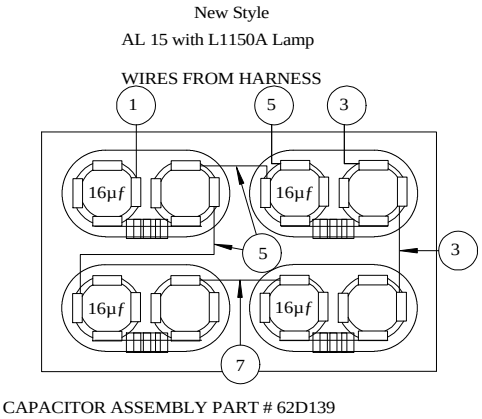


AL 15 Capacitor Assembly

Old Style
AL 15 with L1150A Lamp

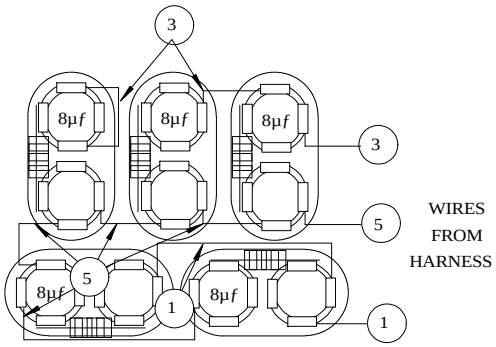


New Style
AL 15 with L1150A Lamp

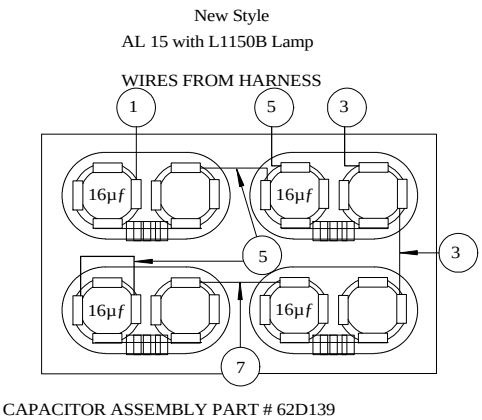


CAPACITOR ASSEMBLY PART # 62D139

Old Style
AL 15 with L1150B Lamp



New Style
AL 15 with L1150B Lamp

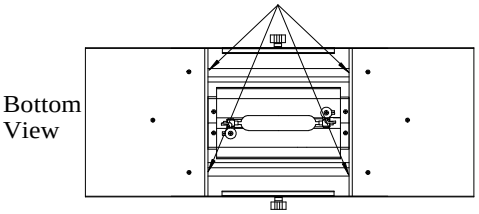


CAPACITOR ASSEMBLY PART # 62D139

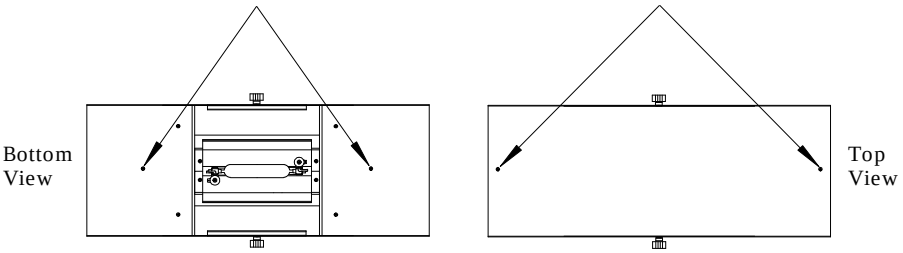
Opening the Lamp Head

- Unplug the unit.
- Remove the glass and the four screws attaching the large outer reflector section.

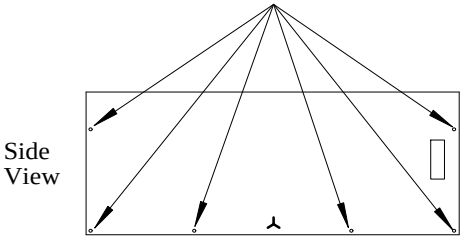
CAUTION **DO NOT TOUCH THE REFLECTOR SURFACE WITH YOUR HANDS.**



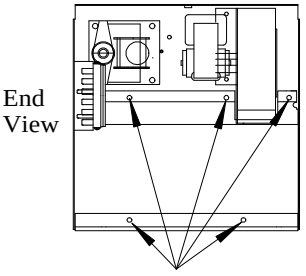
Remove the 2 center screws from the bottom side and the 2 screws from the top side of the lighthead.



Remove the 6 screws from each side of the lamphead and remove the two endcaps. On 8kW lampheads you can now access the trigger board and shutter position switch that are located at the opposite end from the shutter motor under the air plenum plate.



On 5kW lampheads remove the 5 screws from the air plenum plate to remove it. The trigger board and shutter position switch are located at the opposite end from the shutter motor under the air plenum plate.



Shutter

The shutter is controlled by the PC board, with information from a switch in the lamp head to provide position information. During cool-down and exposure, the shutter is open and during warm-up and idle, the shutter is closed.

The PC board compares the shutter position with the requested position. The shutter motor will run until the switch position matches. The shutter motor has a brake that is magnetically operated. Whenever the power is released from the motor, the brake falls into a slot. There is an LED on the PC board that lights whenever the shutter is being energized. (Look in the PC board pin section for a diagram of the LEDs).

Shutter Switch

The switch provides shutter position information to the PC board. This switch is in the lamp end where the cable enters, inside the manifold cover. The cam is in the chamber with the shutter. A failure of the switch can cause the shutter to rotate continuously or erratically. Similar problems may be due to the shutter motor brake, the idle setting, or the PC board.

The switch contacts close when the shutter is fully open and remain closed until the shutter closes. This level can be measured on the terminal strip from terminal 9 (+) to terminal 7 (-). The level is 12 VDC when the shutter is closed, and 0 V when the shutter opens. The switch is in the lamp head on the end where the cable enters inside the air manifold on older units. On newer units we use the normally open contacts, COM contact and the center contact. We use the normally closed contacts, the two outside leads, not the center contact. This switch is adjustable on older units. We recommend scribing a line around the switch and the bracket, if replacement is necessary, to return to the same position. The switch roller should be centered on the cam and closed when the cam pushes the wheel on the switch halfway.

Shutter Brake

The motor that drives the shutter has a brake that is magnetically operated. When the motor core magnetizes, it pulls a lever to release the brake. If the shutter coasts or rotates continuously, look at the shutter LED on the PC board. On early boards, where there are three LEDs in a row near the front of the power supply, it is the third from the front of the power supply. On the newer models, there are five in a row; it is the fourth from the front of the power supply. When this light goes out, the shutter brake should engage. If the shutter coasts, the brake may have failed. The shutter may coast to the point where the switch will switch again to cause the motor to energize. The LED on the board will flash if this occurs.

Shutter Motor

The shutter motor is located in the lamp head on the side with the shutter drive chain. We recommend checking the power and signals from the switch and to the motor coil, before entering the lamp head. These items are covered in the preceding sections. Changing the shutter motor requires a Phillips screw driver and a $^{3}/_{32}$" Allen wrench.

- Remove the glass and outer reflector from the light head.
- Open the end of the light head, where the drive chain and the sprocket are located.
- There are four screws that hold the motor; two of them require access through holes in the sprocket. The shutter can be turned counterclockwise to access these screws, by pushing the brake on the motor.

CAUTION Turn the shutter only counterclockwise (looking from the motor end) or you may damage the shutter switch on the other end of the light.

- Remove the chain from the sprocket with care to keep tension. The chain has shortened links and will separate if slackened. If the chain opens, attach an end to the sprocket with tape or wire and revolve the shutter.
- Remove the motor sprocket by loosening the set screw.
- Remove the two wire nuts from the motor coil wires.
- Remove the four motor screws.

Installing the Motor

- Mount the motor with four screws.
- Install the sprocket in line with the shutter sprocket and tighten.
- Install the chain on the sprockets.
- Set the chain to where it has $^{3}/_{8}$" side travel and tighten the two accessible motor screws lightly.

CAUTION Turn the shutter only counterclockwise (looking from the motor end) or you may damage the shutter switch on the other end of the light.

- Rotate the sprocket to tighten the other two screws and attach the wires.
- The shutter can be tested with the unit open by disconnecting one of the lamp leads and holding the interlock switch.

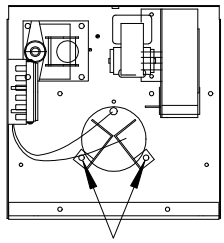
CAUTION **DO NOT light the lamp without the safety glass or when you are close to the bulb.**

Shutter Removal

LT1 lampheads

- Remove the 2 screws holding the air flow deflectors and remove them. Then reach through the air tube and remove the thermostat, then the high temp lamp lead (reaching through the bottom of the light a pair of needlenose pliers to remove it from the lamp support assembly makes this easier).

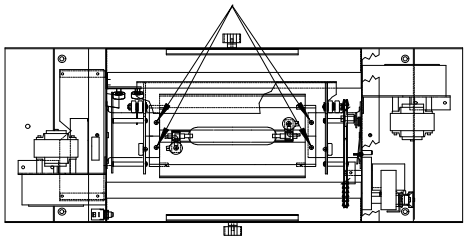
END VIEW



- Remove the 4 screws holding the rear reflector to the air tubes and remove the reflector and lamp from the lamphead.

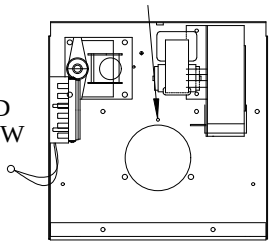
CAUTION **DO NOT TOUCH THE REFLECTOR SURFACE WITH YOUR HANDS.**

BOTTOM VIEW



- Remove the top screw from the cooling tube on both sides. Compress the air tubes into the shutter assembly, remove the chain from the motor sprocket, then remove the shutter assembly.

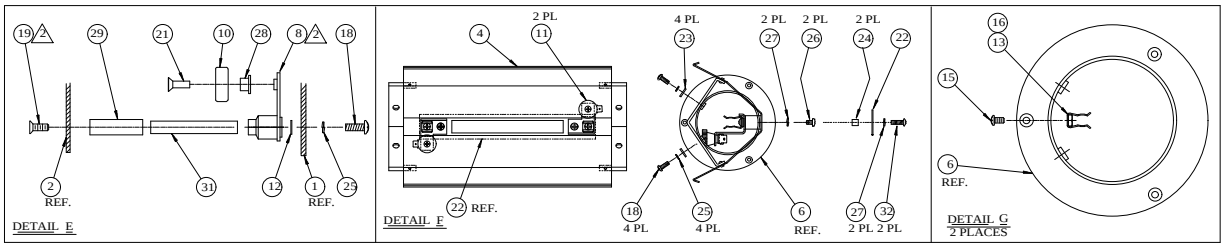
END VIEW

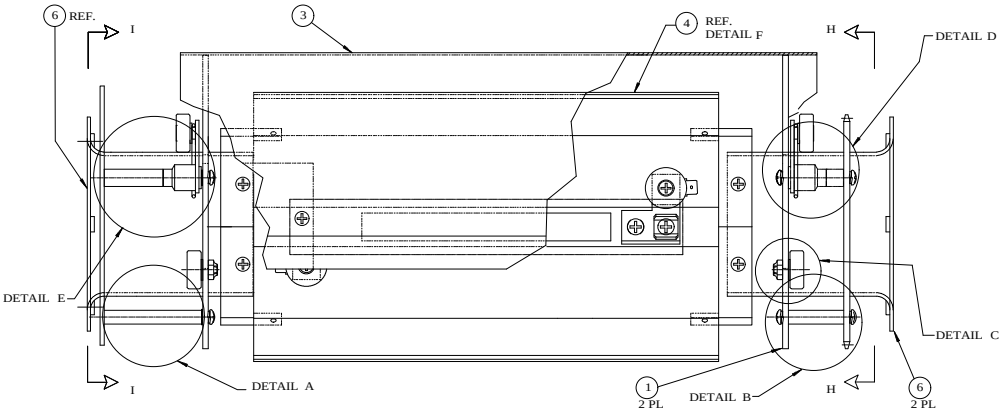


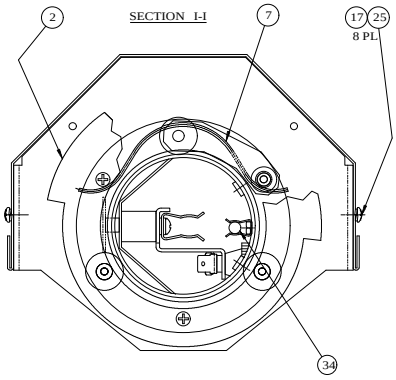
- Reassemble in reverse order.

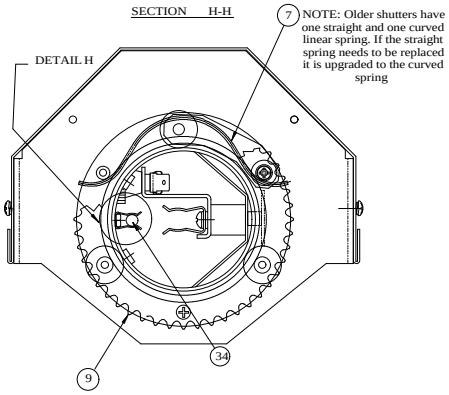
CAUTION **DO NOT TOUCH THE REFLECTOR SURFACE WITH YOUR HANDS.**

LT1 Shutter Assembly Drawing



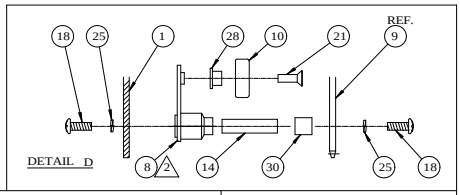


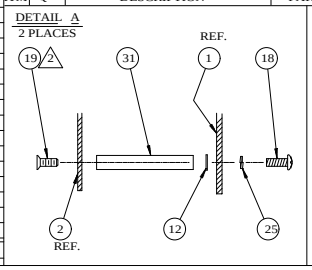


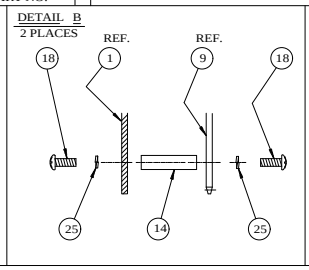


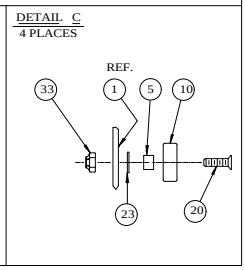
ITM	QTY	DESCRIPTION	PART NO.
27	4	#8 WASHER, SPLIT LOCK	41-08WLS
26	2	#8-32X.25 SCREW, PHIL,PN.HD.	41-08PPS.25
25	21	#6 WASHER, SPLIT LOCK	41-06WLS
24	2	#8 X .250 ROUND SPACER	42HHS8521
23	8	#6 FLAT WASHER	41-06WFR
22	1	BAFFLE, SHUTTER ASSEMBLY	11D878
21	2	6-32 X 7/16 SOC FLAT	41B06SHF.43
20	4	#6-32X.62 SCREW, 100° FLAT HD.	41B06SHF.62
19	3	#6-32X.37 SCREW, 100° FLAT HD.	41-06PF0.37
18	13	#6-32X.37 SCREW, PHIL.PN.HD.	41-06PPS.37
17	8	#6-32X.25 SCREW, PHIL PN.HD.	41B06PPS.25
16	2	#4-40 NUT HEX	41-04NHX
15	2	#4-40X3/16 PPMS ZINC	41-04PPS.18
14	3	#6-32X1.000 RD.THD SPACER	42HHS8347
13	2	FUSE CLIP	43CLP02
12	3	#6 WASHER, LOCK INTERNAL	41-06WLI
11	2	LAMP SUPPORT ASSEMBLY	63D0142B00
10	6	BALL, BEARING	12D3515A00
9	1	SPROCKET, DRIVE (MACHINED)	12D1998A99
8	2	IDLER ARM, SHUTTER	63D3530A62
7	2	SPRING, SHUTTER AL83	12D2060A07
6	2	AIR TUBE LT-1, AL25-53	12D0217A62
5	4	#6 X .180 ROUND SPACER	42HHS8500
4	1	REFLECTOR, INNER RF53	11D886
3	1	SHUTTER ASSEMBLY LT1	11D2206
2	1	TIMING DISC, LT-1	11D210A62
1	2	SHUTTER END	11D1949A71

ITM	QTY	DESCRIPTION	PART NO.
34	2	THERMOSTAT	56THM01
33	4	#6-32 NUT, FLEX LOCK	41-06NLM
32	2	#8-32 X 1/2 PPMS ZINC	41-08PPS.50
31	3	#6-32 X 1.7 STANDOFF	42HHS8761W
30	1	SPACER, TUBING (SHORT)	12D3588B07
29	1	SPACER, TUBING (LONG)	12D3588A07
28	2	BUSHING, IDLER ARM	12D3550A62



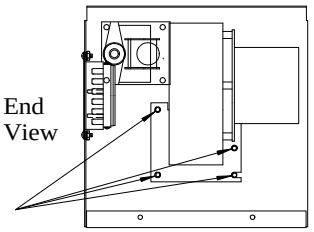






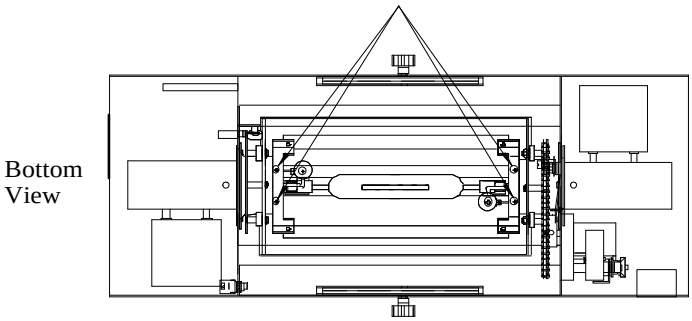
LT8 lampheads

- Remove the four hex nuts mounting the blowers, disconnect the blower and thermostat wires.

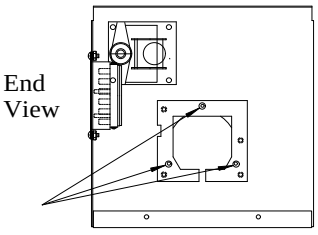


- Remove the four screws holding the rear reflector to the cooling tubes and remove the reflector and lamp from the lamp head.

CAUTION **DO NOT TOUCH THE REFLECTOR SURFACE WITH YOUR HANDS.**



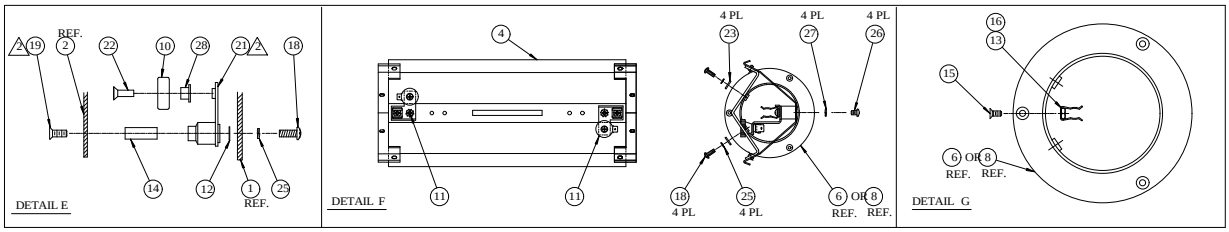
- Remove the three screws from the blower mounting plate to the cooling tubes on both sides. Compress the cooling tubes into the shutter assembly, remove the chain from the motor sprocket, then remove the shutter assembly.

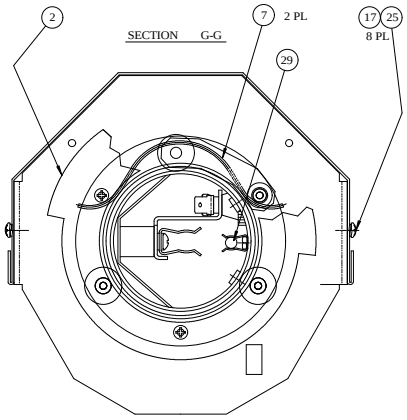


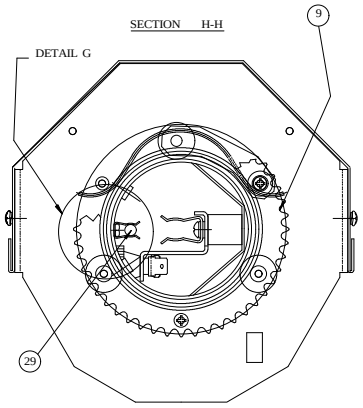
- Reassemble in reverse order.

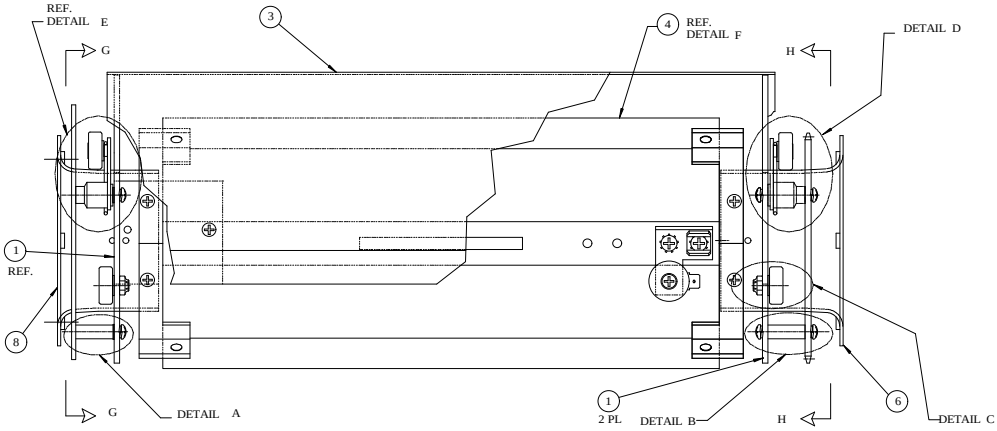
CAUTION **DO NOT TOUCH THE REFLECTOR SURFACE WITH YOUR HANDS.**

LT8 Shutter Assembly Drawing

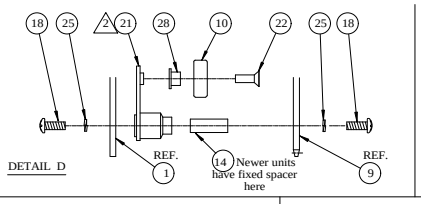




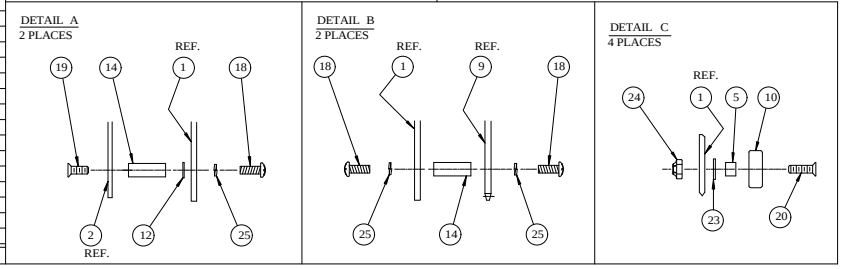




ITM	QTY	DESCRIPTION D4358A	PART NO.
29	2	THERMOSTAT	56THM01
28	2	BUSHING, IDLER ARM	12D3550A62
27	4	#8 WASHER, SPLIT LOCK	41 08WLS
26	4	#8-32X.25 SCREW, PHIL,PN.HD.	41 08PPS.25
25	21	#6 WASHER, SPLIT LOCK	41 06WLS
24	4	#6-32 NUT, FLEX LOCK	41 06NLM
23	4	#6 FLAT WASHER	41 06WFR
22	2	6-32 X 7/16 SOC FLAT	41B06SHF.43
21	2	IDLER ARM, SHUTTER	63D3530A62
20	4	#6-32X.62 SCREW, 100° FLAT HD.	41B06SHF.62
19	3	#6-32X.37 SCREW, 100° FLAT HD.	41 06PF0.37
18	13	#6-32X.37 SCREW, PHIL.PN.HD.	41B06PPS.37
17	8	#6-32X.25 SCREW, PHIL PN.HD.	41B06PPS.25
16	2	#4-40 NUT HEX	41 04NHX
15	2	#4-40X.25 SCREW, 100° FLAT HD.	41B04PF025
14	6	#6-32X.687 RD. SPACER	42HHS8779
13	2	FUSE CLIP	43CLP02
12	3	#6 WASHER, LOCK INTERNAL	41 06WLI
11	2	LAMP SUPPORT ASSEMBLY	63D0142B03
10	6	BEARING, BALL	SEE BOM
9	1	SPROCKET, DRIVE (MACHINED)	12D1998A99
8	1	AIR TUBE, FRONT	12D1874A62
7	2	SPRING, SHUTTER AL83	12D2060A07
6	1	AIR TUBE, DRIVE	12D1873A62
5	4	#6 X .187 ROUND SPACER	42HHS8500
4	1	REFLECTOR, INNER, RF83-SW-G	11D1876B99
3	1	LT8 SHUTTER-REFLECTOR ASS'Y	11D2216
2	1	TIMING DISC, LT-1	11D0210A62
1	2	SHUTTER END, PHOTOCELL, SLOT	11D3974A71



2 APPLY LOCTITE 242 TO THREADS WHERE INDICATED.



Idle Setting

The idle level occurs between exposures and low power exposures. The idle setting determines the power and temperature of the lamp, while at idle. It also allows for much lower idle power than was ever attainable before.

This lower power level provides a wider light output range, low power consumption, lower heat generation, and increased lamp life. At low power levels, the lamps normally become unstable. If over cooled, they begin to dissipate less energy, which causes them to cool more. This can continue until they extinguish. When lamps become hotter at idle, they become more efficient and dissipate more energy, making them hotter still. This becomes stable, and is commonly done in conventional light sources, but will shorten the life of the lamp and wastes energy. We have chosen to servo the cooling, by sensing the lamp condition and adjusting the cooling to regulate the idle temperature.

The idle setting is done at the factory and is rarely necessary in the field. Always check all other causes of problems before changing the setting.

If the lamp becomes too cool during operation, the board will sense this level and initiate a warm-up cycle. During warm-up, the shutter will close and will not open until the unit is sufficiently warm. A symptom of this is: after an exposure is started, the shutter will open, then close again for several seconds, before finishing the exposure. This should only happen if the unit is left in idle for a period of time. Successive rapid exposures would not fail, since it takes many minutes for the unit to over cool. This over cooling situation could also be due to a bad idle capacitor, which would not allow sufficient energy to the lamp to keep it warm.

After checking the capacitors, mark the factory setting of the trimpot that is located on the back side of the PC board. The trimpot sets the power level that the lamp idles at. Turning the trimpot counterclockwise will first slow the lamp blowers. As the lamp reaches the new idle setting, the blowers will speed up to hold the new level. Setting with a meter is done by measuring the lamp voltage on terminals 2 and 3. See Lamp Voltage for proper idle voltage setting. The voltage will increase with a counterclockwise and decrease with a clockwise direction. This voltage change is a secondary effect after the lamp has responded to the change in cooling. The changes should be done in small increments, waiting between adjustment for the voltage to stabilize the lamp temperature.

The idle setting affects the power that the lamp attains on warm-up cycle, before switching to idle and the idle temperature of the lamp. If the setting is too high (too far counterclockwise), the unit will run at high power, with no cooling until the thermostats switch the unit off. The idle temperature of the lamp affects its life and reliability. If the idle setting is too low (too far clockwise), the lamp will be slow to come to power for exposures, and the unit may close the shutter, after the unit has begun to expose to warm back to power. For these reasons, please take care when making this adjustment and check for other problems first.

Lamp Head Blowers

The lamp head blowers are controlled by the printed circuit board to provide the correct cooling to the lamp. During warm-up, the blowers are off or run very slowly. At idle and during low exposure, the blowers vary in speed. Both at high exposure and cool-down the blowers run at full speed.

A symptom of a defective blower would be: during high power exposure, after approximately 10 seconds, the lamp extinguishes and requires 2 to 4 minutes to restart. One blower will speed up to compensate for the defective blower or low power. When the unit switches to high power, the additional heat causes one of the lamp thermostats to open. (See also Interlock System for information on the thermostats.)

To test the blowers, turn the power supply main switch on then off. During the cool-down cycle, place a piece of paper over each intake vent located on the lamp end. The paper should be drawn to the lamp end. If one lamp end does not draw, that blower is suspect.

To replace the blower in the lamp head, see Opening Lamp Head.

Blown Fuse on PC Board

If the fuse blows on the printed circuit board, check if the fuse is a 5 amp fuse.

The printed circuit board drives five or six circuits: the lamp head blowers, shutter motor, power supply blower, and the relays. To find the cause:

- Unplug the unit and replace the fuse; then disconnect the wires to the lamp head on terminals 5 (blue wire) and 6 (red wire), and disconnect one of the wire nuts connecting the blower in the power supply. The relay coils rarely cause any problem.
- Plug in the unit and turn on the power switch for 10 seconds.
- If the fuse blows, the problem is either: the p.c.board or in one of the relay coils.
- If the fuse does not blow the problems is either: the power supply blower, lamphead blower or shutter motor.
- Unplug the unit and reconnect the red wire to the terminal strip #6.
- Plug in the unit and turn on, then off. The shutter should now turn. If the fuse blows, the problem is in the shutter motor or wiring to the motor.
- Unplug the unit and connect the blue wire to the terminal strip. Turn on the unit, then off for the cool-down cycle to test the lamphead blowers. If the fuse blows during this test, the problem could be with either of the two blowers in the lamp head. Normally, when the coil on a blower fails, the coil will become discolored. See section Opening Lamp Head.
- If the fuse has not blown throughout the test, the power supply blower is suspect.

Lamp Head Signals

Signals at the Terminal Strip (Cable to the Lamp Head)

A great deal of information about the operation of the lamp may be found at the terminal strip, in the power supply that connects to the lamp head. The terminals are counted number 1 at the end where the cable begins, and wire number 18 is the last wire. Terminal number 1 is closest to the dividing wall in the power supply.

Terminal#	Description
#1	Ground to lamp head
#2	Lamp
#3	Lamp
#4	V~ common
#5	Lamp fans
#6	Shutter motor
#7	Shutter position switch
#8	Not currently used
#9	Shutter position switch
#10	Interlock and thermostat switching
#11	Not currently used
#12	Incoming voltage
#13	Autoformer
#14	Incoming voltage

- #1 The ground terminal is for safety purposes and carries no current.
- #2#3 Lamp terminals 2 and 3 carry the power to the lamp. If the lamp is hot or fails to start, the voltage should be 600 to 950V~. During this time, there are voltage pulses that may damage a sensitive voltmeter. Immediately after the lamp strikes, the voltage will drop as low as 20V~, then rise as the lamp warms to the operating voltage, between 180 and 240V~.
- #4 V~ common terminal is the V~ return for the lamp fans, the shutter motor, and the interlock switch. On 120V~ equipment, this is the V~ common from the power line. This potential is generated on 208/240V~ equipment and may be 60V~ from the line common.
- #5 The voltage applied to the lamp fan varies as cooling is required. The voltage is measured referenced to terminal 4 and terminal 5. This voltage starts at 0V~ during unit warm-up and when the lamp temperature rises it increases. As the lamp reaches temperature, the fans speed increases to regulate the lamp. At idle, this voltage is typically 45 - 90V~

and depends on the lamp age and ambient temperature. When an exposure at high power is initiated, the lamp voltage rises to the maximum. The voltage remains there after the lamp returns to low power, until the lamp temperature again stabilizes.

- #6 The shutter voltage is present during the rotation of the shutter. The shutter motor runs on 120V~ measured to terminal 4.
- #7 Shutter position DC common (see terminal 9)
- #8 Not presently used
- #9 The shutter position switch reports the position of the shutter to the printed circuit board. This switch is open when the shutter is closed, and closes when the shutter opens. This signal is low voltage DC and can be measured (+) on terminal 9, (-) on terminal 7. The meter will read +12 VDC when the shutter is closed, and 0 VDC when the shutter is opened.
- #10 Interlock and thermostat switching. During normal operation, terminal 10 is shorted to terminal 4 (V~ common). An V~ voltage present would indicate the glass switch or one of the two thermostat switches open.
- #11 Not presently used.
- #12#14 Incoming voltage. To get load voltage, meter between terminals 12 & 14 while power is on. On 208/240V~ equipment set voltage selection switch accordingly, (low=219V~ or below, high=220V~ or above).
- #13 a. Autoformer

Light Function States

Model	Warm-Up	Idle	Low Exp.	Med Exp.	High Exp.	Cool Down	Trigger
Unit Fans	On / On	On / On	On / On	On / On	On / On	On / On	On / On
Power Relay	On / On	On / On	On / On	On / On	On / On	Off / Off	Off / Off
Shutter	Closed / Off	Closed / Off	Open / Off	Open / Off	Open / Off	Open / Off	* / Off
	Lamp Fans	Off / Off	Var.Slow / On	Slow/Med. / On	Med./Fast / On	Fast / On	Fast / On
Off / Off	High Relay	On / On	Off / Off	Off / Off	Off / Off	On / On	* / *
* / *	Medium Relay	On / On	Off / Off	Off / Off	On / On	On / On	* / *

Warm-Up - Occurs after the lamp ignites and ends when the lamp has warmed to operating temperatures. The lamp fans are held off and the unit goes to high power. Due to the technology of the power supply, the units do not draw large amounts of current during warm-up. Due to the restrictive cooling, the lamps warm up rapidly, without surge current. The shutter will not open until the unit reaches temperature.

Idle - Between exposures, the lamp is held in idle. During this period, the lamp fans vary in speed to maintain the proper lamp temperature. This allows the unit to consume less power on idle, and provides a wider range of exposure capabilities, since this same low power level is available for exposures. The lower idle saves power, generates less heat, and extends the lamp life.

Expose - The units allow exposures at three levels. At high power, the high and medium relays are activated. At medium power, the medium relay is activated.

Cool-Down - When the unit is switched off, all fans are turned on to cool the equipment. After the cooling period, the unit disables all of its functions until it is started again.

Trigger - If the lamp is turned on before the unit has fully cooled, the fans will run at full power and a trigger pulse is created. This mode will release itself when the lamp strikes. The unit is responding to conditions to provide these functions. It is therefore not possible to confuse the unit. If there is a momentary loss of power, the unit will cool the lamp until it strikes. It is recommended that the unit be shut off and allowed to cool, rather than turning off the power supplied to the unit.

Printed Circuit Board Layout

This is a description of the signals and voltages present on the pins of the printed circuit board.

64MV407V03 Control Board layout. Used on all **BUT** 8kW light sources

64MV407V04 Control Board layout. Used on all 8kW light sources

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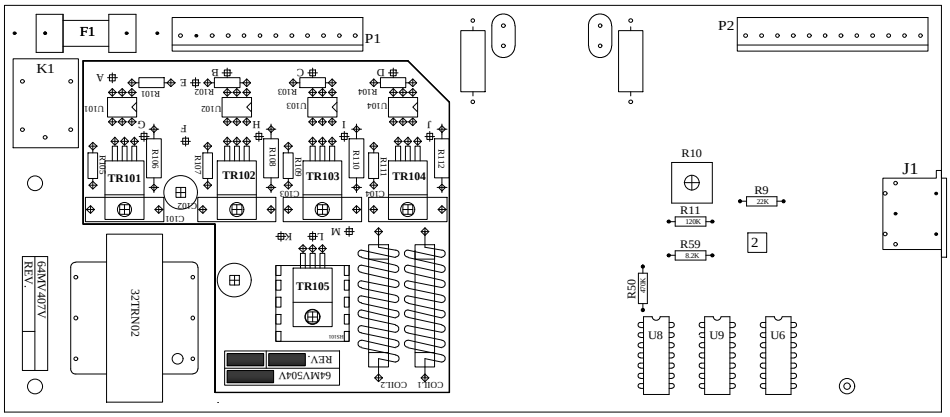
Note: Graphic of the new style p.c.board is shown. Relay style p.c.board has the same connector hookups and pin outs, however the LEDs are on the component side of the p.c.board not on the solder side as on the new style. The old style board is replaced by the new style and is interchangeable.



Front View of Control Board

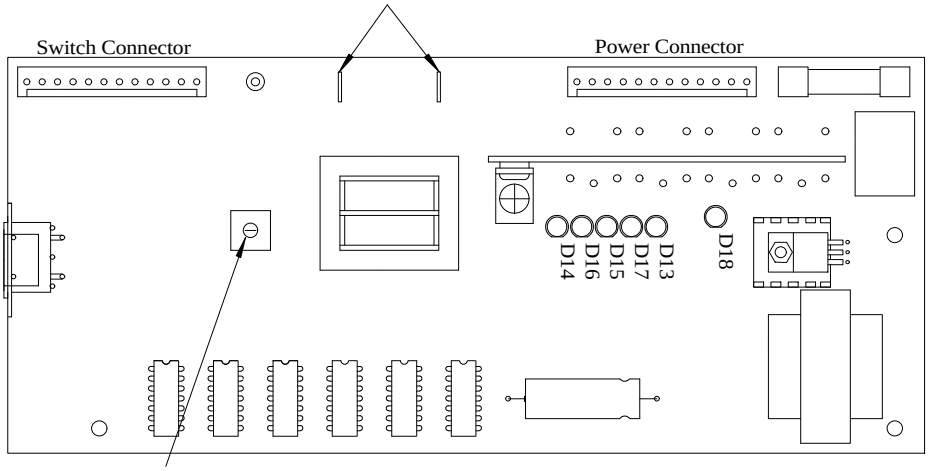
Triacs & Relay	
K1	Unit Power
TR101	Shutter Motor
TR102	High Relay
TR103	Medium Relay
TR104	Main Contactor
TR105	Lamp head fans

P1 Power Connector			
1	AC Hot	7	Unit Fan
2	AC Common	8	Power Relay
3	Lamp Fans	9	Not Connected
4	Shutter Motor	10	Aux Terminal
5	High Relay	11	DC Common
6	Medium Relay	12	Position

P2 Switch Connector			
1	AC Hot	7	High Switch
2	AC Common	8	Low/Med Switch
3	Not Connected	9	Manual Expose
4	Aux Terminal	10	Interlock
5	DC Com/Ground	11	Not Connected
6	Power Switch	12	+12 VDC

LED's	
D18	Lamp head fans
D13	Power Supply Fan
D17	Shutter Motor
D15	High Relay
D16	Medium Relay
D14	Power Relay

Check Idle Voltage on Board or on Terminal Strip Lugs #2 and #3



Back View of Control Board

Signal Description

Power Connector

P1)	V~ Hot: Supply to board approximately 125V~.
P2)	V~ Common: Common to board is the common also for relays, shutter fans, and the internal lamp head interlock. (This may not be at ground potential and should be measured with caution).
P3)	Lamp Fans: V~ proportional drive output for the blowers in the lamp head.
P4)	Shutter: V~ output to drive the shutter motor.
P5)	High: V~ Output to drive the high relay, which engages the high power capacitor bank during warm-up and high power exposures.
P6)	Medium: V~ Output to drive the medium relay which engages the medium capacitor bank during warm-up and both high and medium level exposures.
P7)	Unit Fan: V~ Output to drive the power supply blower or fans.
P8)	Power Relay: V~ Output to drive the main relay. This provides power to the lamp circuit.
P9)	Not currently used.
P10)	Aux: Terminal connects to the signal connector for accessories (Not used in most equipment).
P11)	DC Common: Circuit common for low voltage signals from the lamp (this may not be the same potential as V~ Common connection and should never be interchanged).
P12)	Position: Shutter switch active signal from the lamp head - Low voltage when the shutter is open and 12VDC when closed.

Switch Connection

S1)	V~ Hot: Output, V~ supply for internal accessories.
S2)	V~ Common: Output, V~ common for internal Accessories.
S3)	Not currently used.
S4)	Aux: Terminal connects to the power connector for accessories (Not used in most equipment).
S5)	DC common: DC circuit common for switches (Not the same as V~ Common).
S6)	Power Switch: Switch to turn on power. Low (0V) for power on. The power can also be turned on by the integrator through the outlet. (Only a signal ! Power is always present on the PC Board).

Continued on next page

S7)	High Switch: Switch to select high power level. Low (0V) for high.
S8)	Low/Med Switch: Switch to select power level when high switch is off. Low (0V) for medium power, High (12VDC) for low power.
S9)	Manual Switch: Manual expose switch. Low (0V) to cause exposure.
S10)	Interlock: External interlock outlet. Line must be connected to DC common to allow an exposure. (Outlet is normally shorted when plug in not inserted).
S11)	Not currently used.
S12)	+12V: Output for internal accessories (Not used in most equipment).

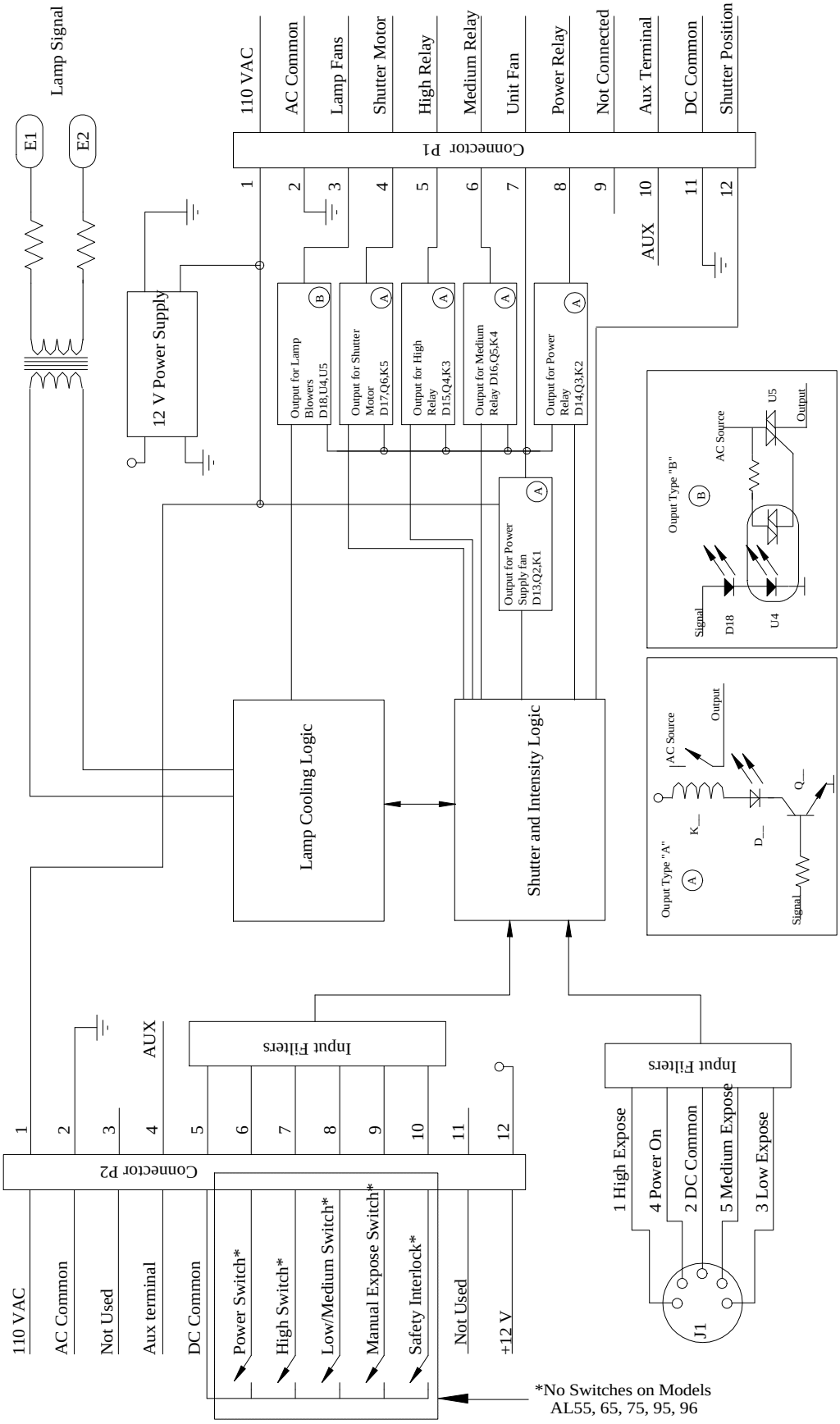
DIN Connection

D1)	Expose: High expose when connected to a compatible integrator. High / Medium / Low expose depending on the unit switches when connected to an older style integrator or other manufacturer's equipment.
D2)	DC Common: Common for all signals.
D3)	Low Exp: Low expose input.
D4)	Power: Signal from integrator to turn on the power.
D5)	Medium Exp: Medium expose input.

LEDs

The LEDs are an indicator of an acting command that you are asking the control board to do. For a list of which commands activate which LEDs, look at the chart above, labeled LED indicators. The LEDs light when they detect a ground or negative going pulse.

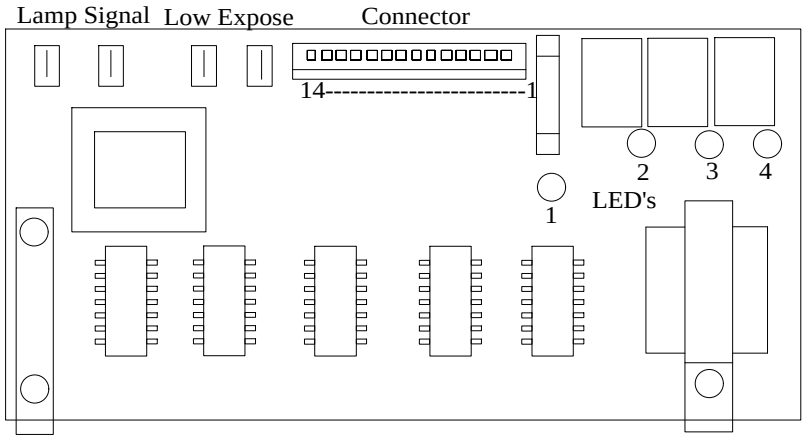
Circuit Diagram (64MV407 60Hz)



Old Style (64MV210A) Control Board Layout

Although there are very few old boards in the field, there are some, therefore we must address them also. To determine if you have an old board, look at the serial number. For the AL 25 the serial number is 2550 and below. For the AL 50, the serial number is 5400 and below. For the AL 53 the serial number is 7100 and below. If your control board has a serial number below those just stated, you have an older board.

Note: This pertains only to the models mentioned, and no others.



Control Board connector pins and pin signals.

14 Pin Power Connector			
1	AC Hot	8	Shutter Switch DC Common
2	AC Common	9	Optical Coupler
3	Lamp Fans	10	Shutter +12VDC
4	Shutter Motor	11	Power Supply Blower
5	High Relay	12	External Expose High/Low
6	Power Switch	13	External Expose Return
7	High/Low Switch	14	Manual Expose Switch

Control Board LEDs.

LED's	
1	Lamp Fans
2	Shutter Motor
3	High/Low Relay
4	Power Relay

Signal Description (64MV210A)

Lamp Signal: V~ going to lamp.

Low Expose: Input of 110V~ from timer/integrator activates a low powered exposure.

Power Connector

P1)	AC Hot: Supply to board. It is equal to the line voltage on 110V~ equipment, an approximately 130V~ on the 208/240V~ equipment.
P2)	AC Common: Common to board, also is common for relays, shutter fans, and the internal lamp head interlock. (This may not be at ground potential and should be measured with caution).
P3)	Lamp Fans: V~ proportional drive output for the blowers in the lamp head.
P4)	Shutter: V~ output to drive the shutter motor.
P5)	High: V~ Output to drive the high relay which engages the high power capacitor bank during warm-up and high power exposures.
P6)	Power: Switch 110V~ output to power on off switch.
P7)	High/Low: Switch 110V~ output to high/low intensity switch. Switch must be at high power to be controlled externally from an integrator.
P8)	Power Relay: V~ Output to drive the main relay. This provides power to the lamp circuit.
P9)	Optical Coupler: Not used.
P10)	Aux: Terminal connects to the signal connector for accessories (Not used in most equipment).
P11)	DC Common: Circuit common for low voltage signals from the lamp (This may not be the same potential as V~ Common connection and should never be interchanged).
P12)	Input: 110V~ from timer/integrator activates a low or high powered exposure (Intensity switch on power supply must be set on high power to get a high powered exposure).
P13)	Input: 110V~ from timer/integrator activates a low or high powered exposure (Intensity switch on power supply must be set on high power to get a high powered exposure).
P14)	Manual Expose: Switch 110V~ output to manual expose switch.

6. Check List for Printing Light Troubleshooting and Service

Check List for Printing Light Troubleshooting and Service

CAUTION In order for this check list to be effective it must be followed step by step.

1) Disconnect the integrator/timer from the power supply.

   This will make sure that a faulty integrator or QC15 cable are not responsible for the malfunction and also eliminate a bad DIN socket on the board.

2) Check the tap switch (208/240V~ power supplies only. If the top LED is lit, make sure the switch is in the UP position, and if the bottom LED is lit, make sure the switch is in the DOWN position (see Printing Light Installation Manual). Improper setting will most likely cause blower, capacitor, and/or PC board failure and will prematurely age the lamp.

   The LEDs next to the switch are not controlled by the switch, the LEDs tell you where to put the switch.

CAUTION You **MUST NOT** flip this switch with the power supply turned on! You will arc the contacts inside and this will damage the switch.

- If the tap switch is set for 240V~ and you have 208V~ coming in, the light source is going to draw excess amperage (as voltage goes down amperage draw has to go up). If when you open the power supply you notice right off burnt wires or connectors, one of the most likely causes is the tap switch in the wrong position. This condition usually take months and sometimes years (depending upon the degree of voltage discrepancy) to show up. When the burnt wire is on the tap switch itself or on the bottom side of the power relay it is very difficult to see the burnt wires without some disassembly of the power supply.
- If the tap switch is set for 208V~ and you have 240V~ coming in, the p.c.board and the blowers are usually the two items to get damaged. Over voltage to the blowers will burn them out and are usually the first to component damaged, the p.c.board will also be damaged under extended usage in an over voltage condition.
- If the voltage fluctuates there is a line that you can not cross 219V~ 220V~ the voltage must always stay 220V~ or above or always stay 219V~ or below.

  If the switch itself is bad with no external signs of burning make sure that the user is not flipping the switch with the power supply on. Flipping the switch with the light source turned on will cause damage to the switch that may take time to show up.

3) Check the safety glass for proper installation. The long dimension of the glass goes parallel with the long dimension of the lamphead. Improper installation can cause the glass to shatter and/or an 'open' in the safety interlock circuit.

- You must be able to reach up, place your fingers against the safety glass and there must be play front to back and side to side. Otherwise the glass does not have room for expansion and will more than likely shatter under use.

CAUTION **NEVER** operate the light source without the safety glass in place.

4) Check the beau plug at the lamphead. Make sure it is pushed in all the way. The most likely problem caused by a loose beau plug is an erratic shutter operation or an open safety interlock circuit.

   Just push in on the beau plug while rocking it up and down to make sure it is in all the way.

5) Check the lamphead interlock circuit. Remove or lower the safety glass. Turn the power supply on. Check for 120V~ from terminal 4 to terminal 10; when the glass is reinstalled, the voltage should go low. (See Interlock System for operation.)

   With the interlock open what should happen is the shutter should close and the power supply blower should come on, that's all. After you remove the glass and you turn on the power supply, if the light source comes on turn power off immediately and determine what is shorting out and bypassing the safety interlock circuit. If this does happen it is possible that the safety interlock circuit is shorting to ground. On older light sources this condition would burn up the autoformer. On newer light sources this condition will blow the 3A slow blow fuse on the dividing wall below the wiring harness.

6) Check input voltage with the power off at terminals 12 & 14. Then with power on, intensity level on high, and manual expose set on, check the voltage again. If the voltage drops more than 6 V~, the incoming power is most likely a problem.

   You can do checks 6 and 7 at the same time. Write down the voltage that you get before turning power on and after turning power on but before the light source completes the warm up cycle. This is maximum amperage draw so the voltage will show maximum drop.

   If the voltage in check 6 drops more than 6V~ the incoming power is a problem and it can not be corrected in the power supply (there is nothing you can do in the power supply to correct bad voltage from the wall).

7) Check input voltage to the PC board with the power off at pins 1 & 2 (see p.c.board layout for pin location). Then with power on, intensity level on high, and manual expose set on, check the voltage again. If the voltage drops more than 6 V~, the autoformer is most likely a problem.

- If and only if the voltage on 12 and 14 in step 6 is good can you say that

the autoformer is definitely bad, if the voltage on 12 and 14 in step 6 is bad you can not get a correct reading for step 7.

8) Check capacitors and relay circuit by:

   The capacitors and relays are checked by watching the voltage changes that take place at the different intensity levels. If a capacitor is not in the circuit the voltage readings on input and output will be the same. If the capacitor is pulled into the circuit the input and output voltages will be hundreds of volts apart. Now the tricky part, if a capacitor is pulled into the circuit the way it is supposed to be then we need to look at the voltage itself to see if we see an increase in the overall voltage to make sure that the capacitor is adding voltage to the circuit. If the capacitor is pulled into the circuit when it is supposed to be but the overall voltage does not increase then the capacitor is defective.

9) Check voltage from terminal 3 to the capacitor input (orange wire on top of the capacitors). The voltage should be 500+ V~. If voltage is lower, check the power path to the tap switch and ballasts. 500+V~ is typical for AL 19 through AL53 light sources, 450+ V~ for 1.5 kW light sources and 700+ V~ for the 8kW light sources. If the voltage on a 208/240V~ is low then not all the ballasts are being powered properly. This is usually caused by a bad tap switch or a burnt connector at the tap switch, however any of the wiring between ballast and tap switch is suspect. If the voltage is zero then a burnt wire at the power relay or a bad power relay is most likely the problem. There is a possibility that if there is zero V~ that you might have a grounded safety interlock circuit.

- At idle, check voltage from terminal 3 to the capacitor outputs (yellow, brown, and blue wires on top of the capacitors).

  On the chart following step 6.8.5 find the Wattage of the unit you are working on and then for the lamp installed into the unit, these are the general voltages you should read. These voltages are a ball park figure depending upon several factors and the actual voltage is not as important as to whether or not the voltages change on the capacitors according to intensity level. For instance on a 5kW light with an L1250 lamp at low intensity one capacitor will be about 200V~ and three capacitors will be over 500V~. Now when you go to medium intensity you should see two capacitors at about 230V~ and two capacitors at over 500V~. NOTE the number of capacitors at the lower voltage (i.e. in the circuit) and the voltage increase from the previous intensity 200V~ at low and 230V~ at medium.

- At low power, manual expose on, check voltage from terminal 3 to the capacitor outputs (yellow, brown, and blue wires on top of the capacitors).
- At medium power, manual expose on, check voltage from terminal 3 to the capacitor outputs (yellow, brown, and blue wires on top of the capacitors).
- At high power, manual expose on, check voltage from terminal 3 to the capacitor outputs (yellow, brown, and blue wires on top of the capacitors).

• SEE CHART FOR PROPER VOLTAGE READINGS (ALL VOLTAGES ARE READ TO TERMINAL 3).

1.5kW with L1150A or L1150B LAMP				
		ORANGE	YELLOW	BLUE
a.	IDLE/LOW	450+	180	450+
b.	HIGH	450+	230	230

1.5kW with L1250E LAMP				
		ORANGE	YELLOW	BLUE
a.	IDLE/LOW	450+	180	450+
b.	HIGH	450+	230	230

2kW (AL25 and AL25-2 only) with L1250 LAMP				
		ORANGE	YELLOW	BLUE
a.	IDLE/LOW	500+	190	500+
b.	HIGH	500+	230	230

1.9kW and 2kW (other than AL25 and AL25-2) with L1150A LAMP					
		ORANGE	YELLOW	BROWN	BLUE
a.	IDLE	500+	205	500+	500+
b.	LOW	500+	190	500+	500+
c.	MEDIUM	500+	210	210	500+
d.	HIGH	500+	225	225	225

1.9kW and 2kW with L1250E LAMP					
		ORANGE	YELLOW	BROWN	BLUE
a.	IDLE	500+	210	500+	500+
b.	LOW	500+	205	500+	500+
c.	MEDIUM	500+	215	215	500+
d.	HIGH	500+	235	235	235

2.3kW with L1250 LAMP					
		ORANGE	YELLOW	BROWN	BLUE
a.	IDLE/LOW	500+	190	500+	500+
b.	MEDIUM	500+	210	210	500+
c.	HIGH	500+	235	235	235

2.3kW with L1252 LAMP					
		ORANGE	YELLOW	BROWN	BLUE
a.	IDLE/LOW	500+	205	500+	500+
b.	MEDIUM	500+	215	215	500+
c.	HIGH	500+	225	225	225

2.3kW with L1261 LAMP					
		ORANGE	YELLOW	BROWN	BLUE
a.	IDLE/LOW	500+	210	500+	500+
b.	MEDIUM	500+	215	215	500+
c.	HIGH	500+	225	225	225

3.5kW with L1250 LAMP					
		ORANGE	YELLOW	BROWN	BLUE
a.	IDLE/LOW	500+	200	500+	500+
b.	MEDIUM	500+	215	215	500+
c.	HIGH	500+	240	240	240

3.5kW with L1252 or L1261 LAMP					
		ORANGE	YELLOW	BROWN	BLUE
a.	IDLE/LOW	500+	195	195	500+
b.	HIGH	500+	230	230	230

5kW with L1250 LAMP						
		ORANGE	YELLOW	BROWN	BLUE #1	BLUE #2
a.	IDLE/LOW	500+	200	500+	500+	500+
b.	MEDIUM	500+	225	225	500+	500+
c.	HIGH	500+	270	270	270	270

5kW with L1252 or L1261 LAMP						
		ORANGE	YELLOW	BROWN	BLUE #1	BLUE #2
a.	IDLE/LOW	500+	200	500+	500+	500+
b.	MEDIUM	500+	230	230	500+	500+
c.	HIGH	500+	270	270	270	270

6kW with L1280 LAMP						
		ORANGE	YELLOW	BROWN	BLUE #1	BLUE #2
a.	IDLE/LOW	500+	360-380	500+	500+	500+
b.	MEDIUM	500+	380-410	380-410	500+	500+
c.	HIGH	500+	415-445	415-445	415-445	415-445

6kW with L1281 or L1282 LAMP						
		ORANGE	YELLOW	BROWN	BLUE #1	BLUE #2
a.	IDLE/LOW	500+	200	500+	500+	500+
b.	MEDIUM	500+	230	230	500+	500+
c.	HIGH	500+	270	270	270	270

8kW with L1280 LAMP						
		ORANGE	YELLOW	BROWN	BLUE #1	BLUE #2
a.	IDLE	700+	360	700+	700+	700+
b.	LOW	700+	360	700+	700+	700+
c.	MEDIUM	700+	390	390	700+	700+
d.	HIGH	700+	425	425	425	425

8kW with L1281 LAMP						
		ORANGE	YELLOW	BROWN	BLUE #1	BLUE #2
a.	IDLE	700+	395	700+	700+	700+
b.	LOW	700+	395	700+	700+	700+
c.	MEDIUM	700+	425	425	700+	700+
d.	HIGH	700+	485	485	485	485

8kW with L 1282 LAMP						
		ORANGE	YELLOW	BROWN	BLUE #1	BLUE #2
a.	IDLE	700+	395	700+	700+	700+
b.	LOW	700+	395	700+	700+	700+
c.	MEDIUM	700+	430	430	700+	700+
d.	HIGH	700+	510	510	510	510

IF VOLTAGES CHECK GOOD, SKIP TO STEP 9, OTHERWISE CONTINUE.

‡ The voltage readings described in the following are typical of 5kW light

sources see voltage chart to find high and low values for others.

10) If a reading remains high (500V~ or more see note ‡) and it should be low (less than 300V~ see note ‡), the capacitor is not being pulled into the circuit. Check the respective relay, resistor, and wiring for an open.

11) If a reading remains low (less than 300V~ see note ‡) and it should be high (500V~ or more see note ‡), the capacitor is locked into the circuit. Check the respective relay, wiring, and PC board for a short.

12) If the readings show voltage changes from high to low and from low to high, but the overall low reading does not increase from the previous power level, then the capacitor being pulled into the circuit has failed.

13) Check the blowers using a piece of paper held up to the intakes at each of the lamphead during a cool-down cycle. The paper should get held up to each intake, if it doesn't, the blower is bad.

    Blowers speed can not be checked until this point because all previous checks affect the operation and can make them appear to be operating incorrectly. Also check blower voltage at terminals 4 & 5 for most lights this voltage should be a MINIMUM of 45V~ some lights this voltage will be higher depending on lamp used and lamp condition.

14) Check for cooling obstructions on intakes and exhausts. If any are found, remove them.

15) Check lamp idle voltage at terminals 2 & 3. This voltage should match the voltage chart above, if not, YOU MUST install a new lamp and recheck (see Idle Setting if adjustment is necessary).

    CAUTION DO NOT ADJUST idle voltage with a used lamp.

    Lamp voltage can be effected by all the checks in the check list to this point. So if this check list is used properly (followed step by step) if at this point the lamp voltage is out of specification it can now be adjusted if the lamp is less than two weeks old **AND "not or"** has no sign of deformation otherwise a new lamp must be installed before adjusting. Adjusting lamp idle voltage without first checking other causes of the lamp voltage deviation can damage the equipment.

16) If used, check the power supply safety interlock jack next to the power supply power on/off switch. A failure in this circuit will not allow the unit to do an exposure, the only time the shutter will rotate if this circuit is open, is when the power is turned on or off.

    If you suspect this circuit is faulty, turn the manual expose switch on, then short the blue and white wires on the jack together with a screwdriver (make sure you do not short to ground) and see if the shutter opens, if it opens the circuit is at fault.

17) Check for smooth shutter rotation. If the shutter rotates smoothly, skip to step 20, otherwise continue.

18) If the shutter does not rotate smoothly, it may not stop in the correct position and the bearings must be greased.

19) If the shutter fails to rotate at any time, then check the following:

20) When the shutter is supposed to be moving. Check for 120V~ between terminals 4 & 6. If there is voltage, go to the lamphead and check for voltage at the shutter motor then skip to step 22.

21) If there is no voltage between terminals 4 & 6, check the PC board output for voltage at pins 2 & 4 (see PC Board Layout for pin location).

22) Check to make sure the shutter stops immediately in the correct position.

23) If the shutter stops immediately, but in the wrong position, check the shutter position switch.

24) If the shutter coasts to a stop in the wrong position, check the shutter brake.

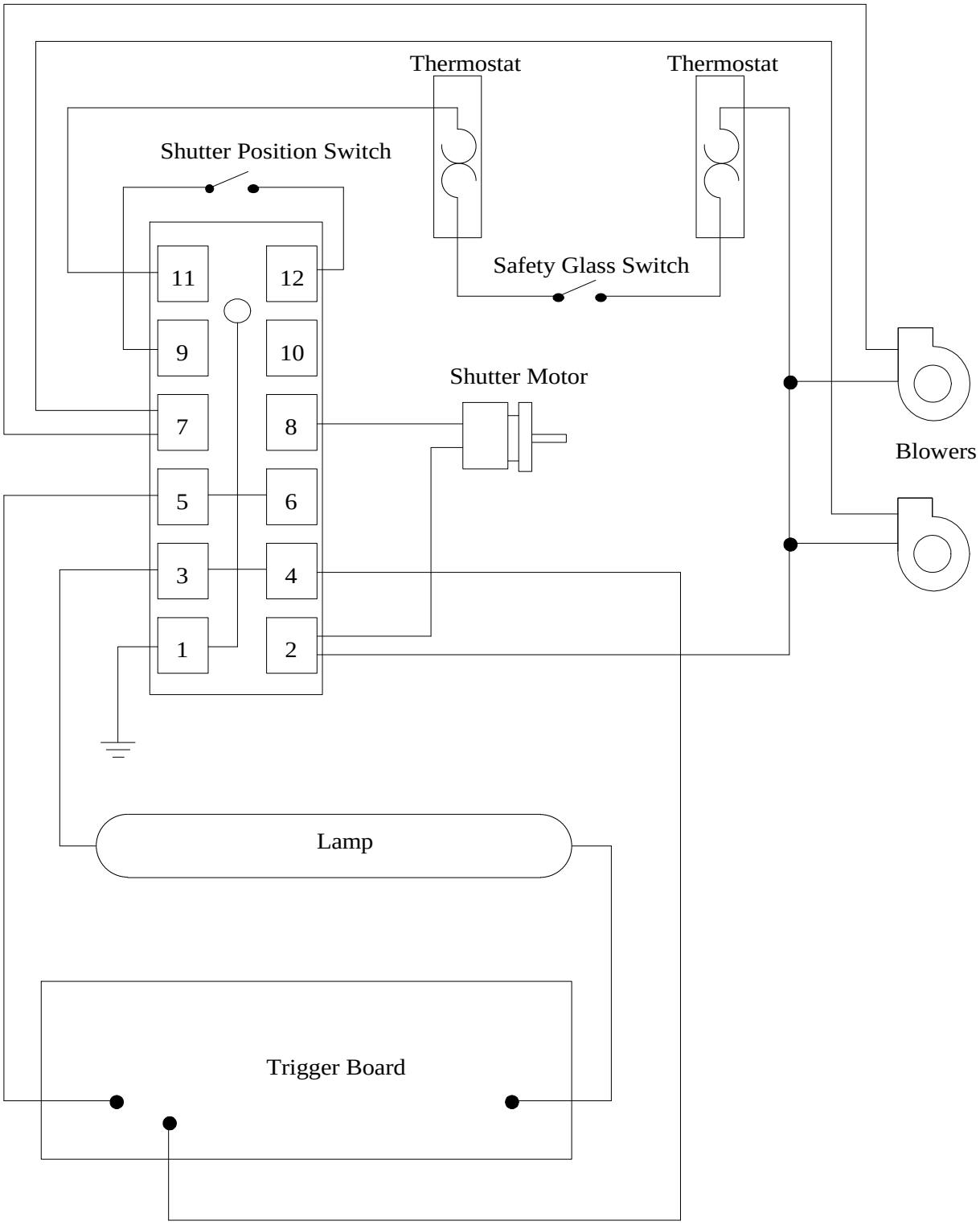
25) If you run into a situation were you are not getting voltage at the terminal strip, relay, blower, etc. make sure you go to the PC board itself and Double check the PC board outputs before replacing it.

26) Before you reassemble everything it is a real good idea to: Check the manual operations of the light source. Just to make sure everything is back together.

27) Reconnect all wires to the integrator and then: Check the remote operations of the light source from the integrator.

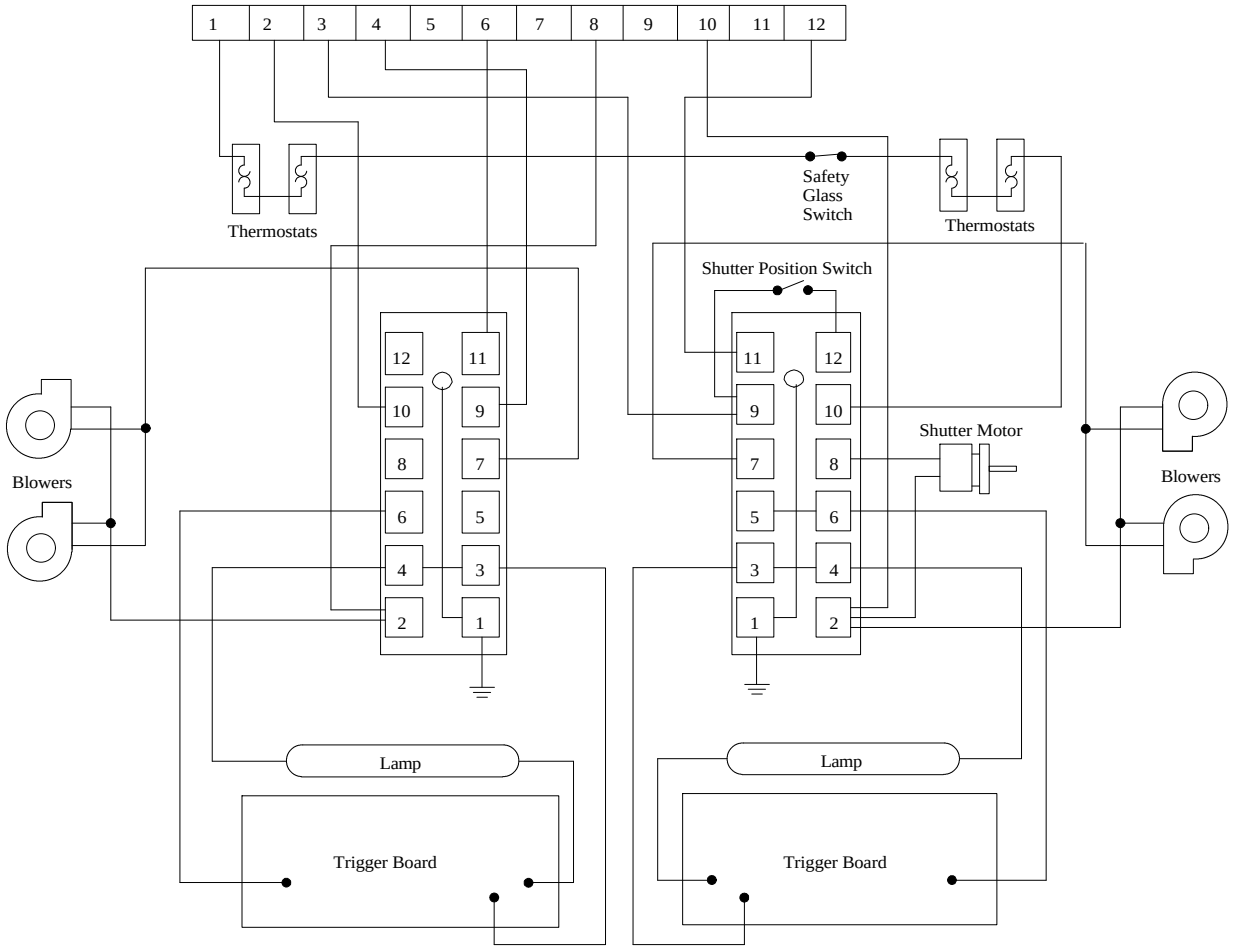
7. Wiring Diagrams

Lamphead for AL 83, 84, 84-480, 85, 56, 56-480, 53, 54, 54-480, 55, 55-480, 50, 35, 25, 25-2, 23

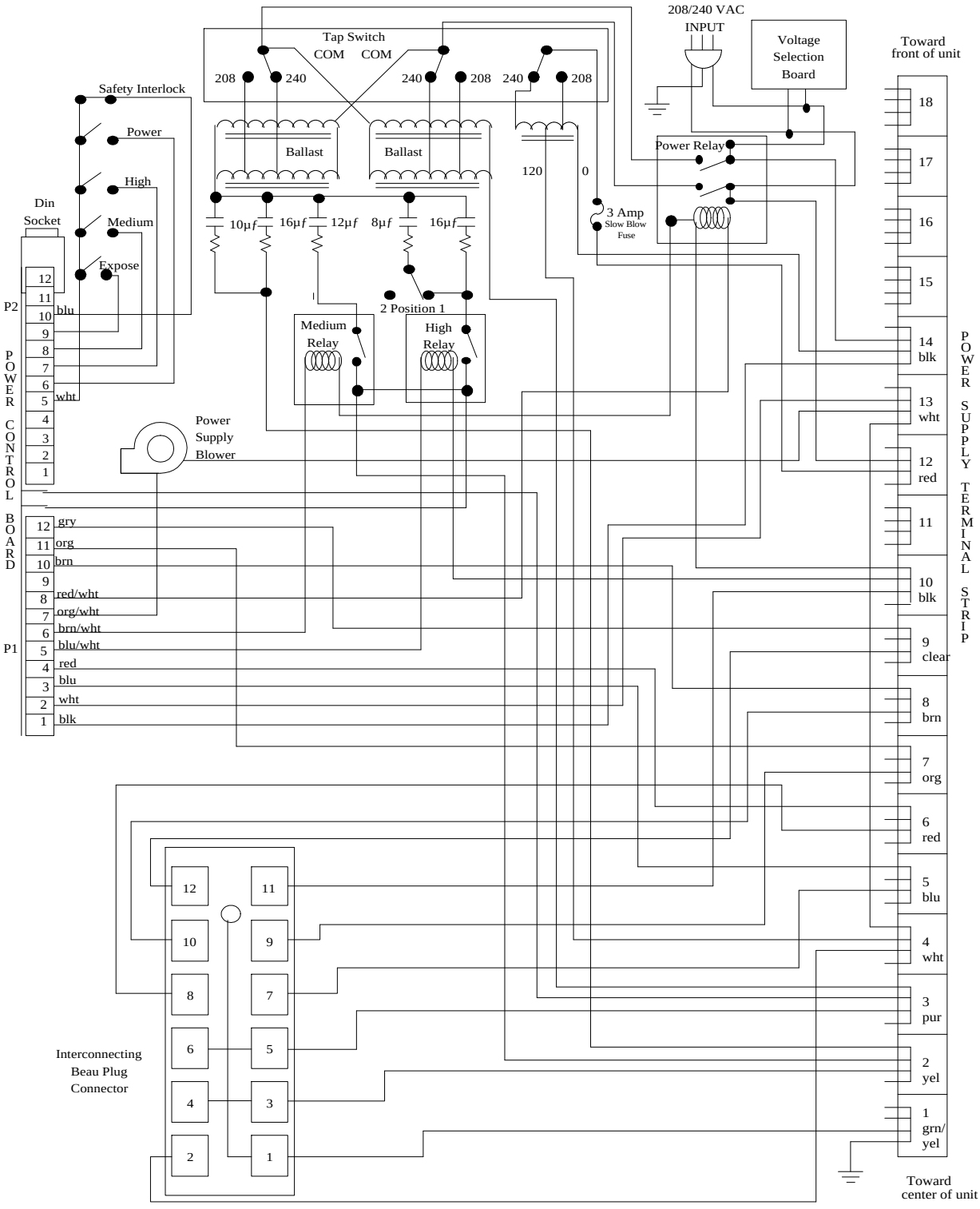


Lamphead for AL 100

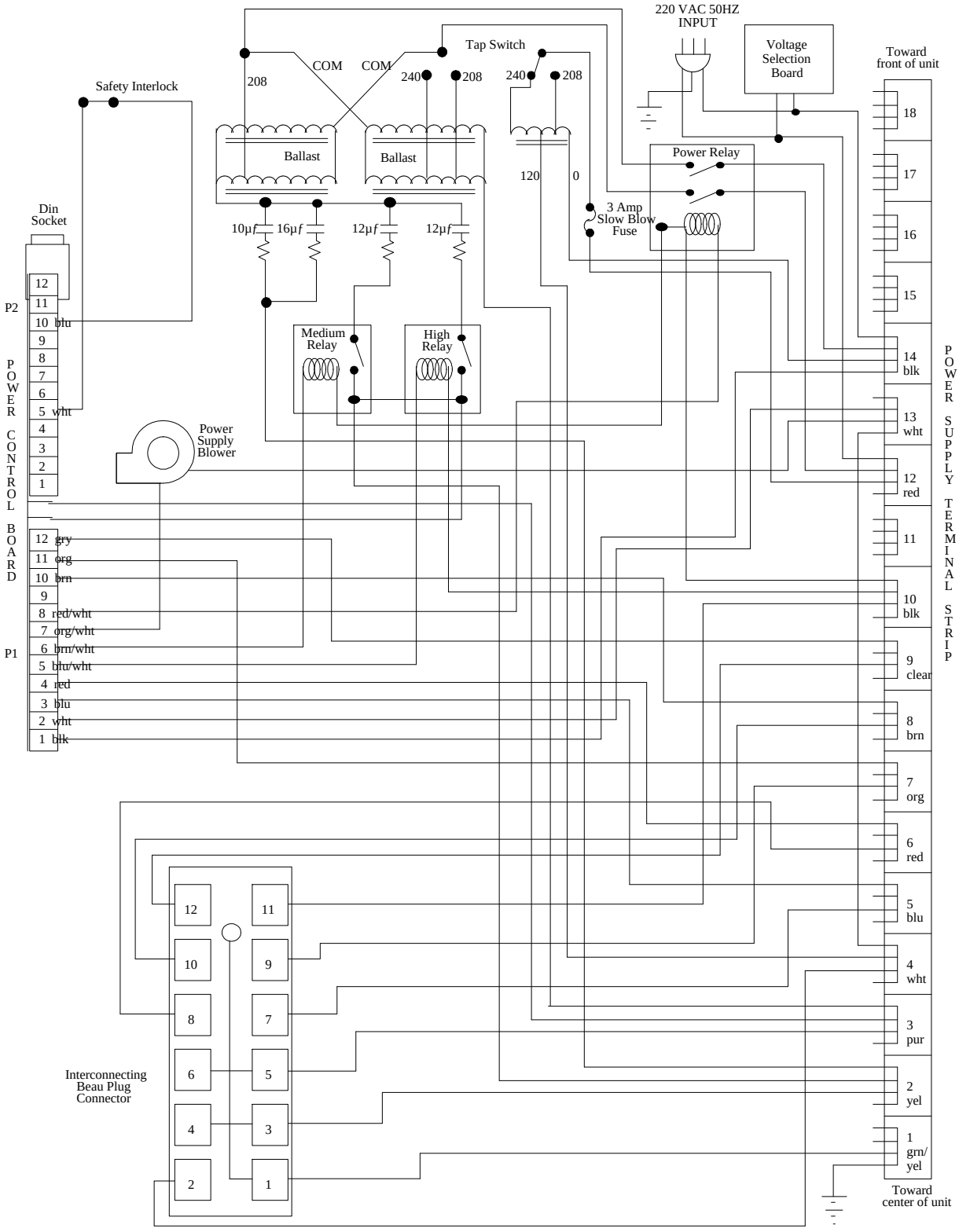
Note: AL100 uses two AL 53 power supplies



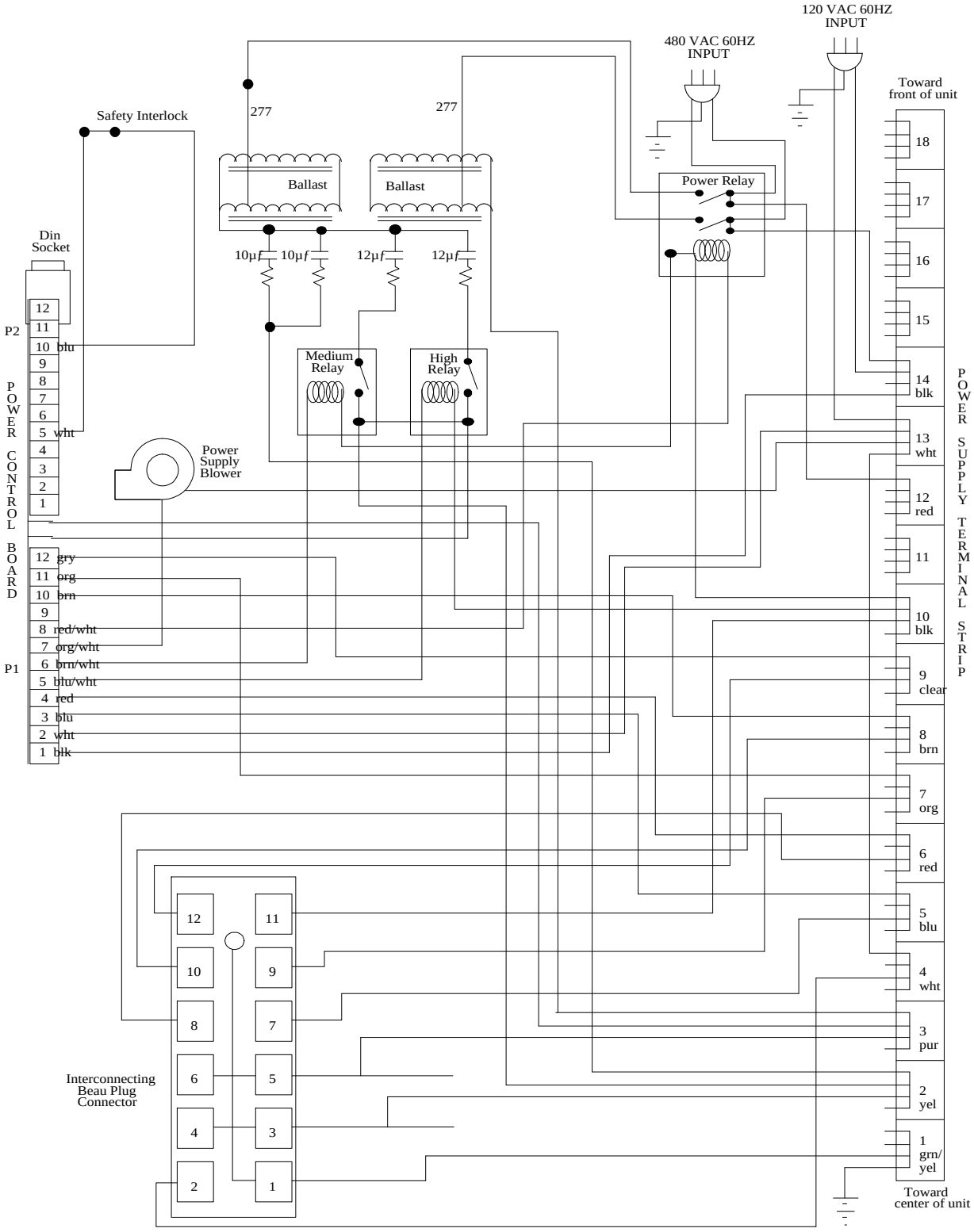
AL 83 Power Supply



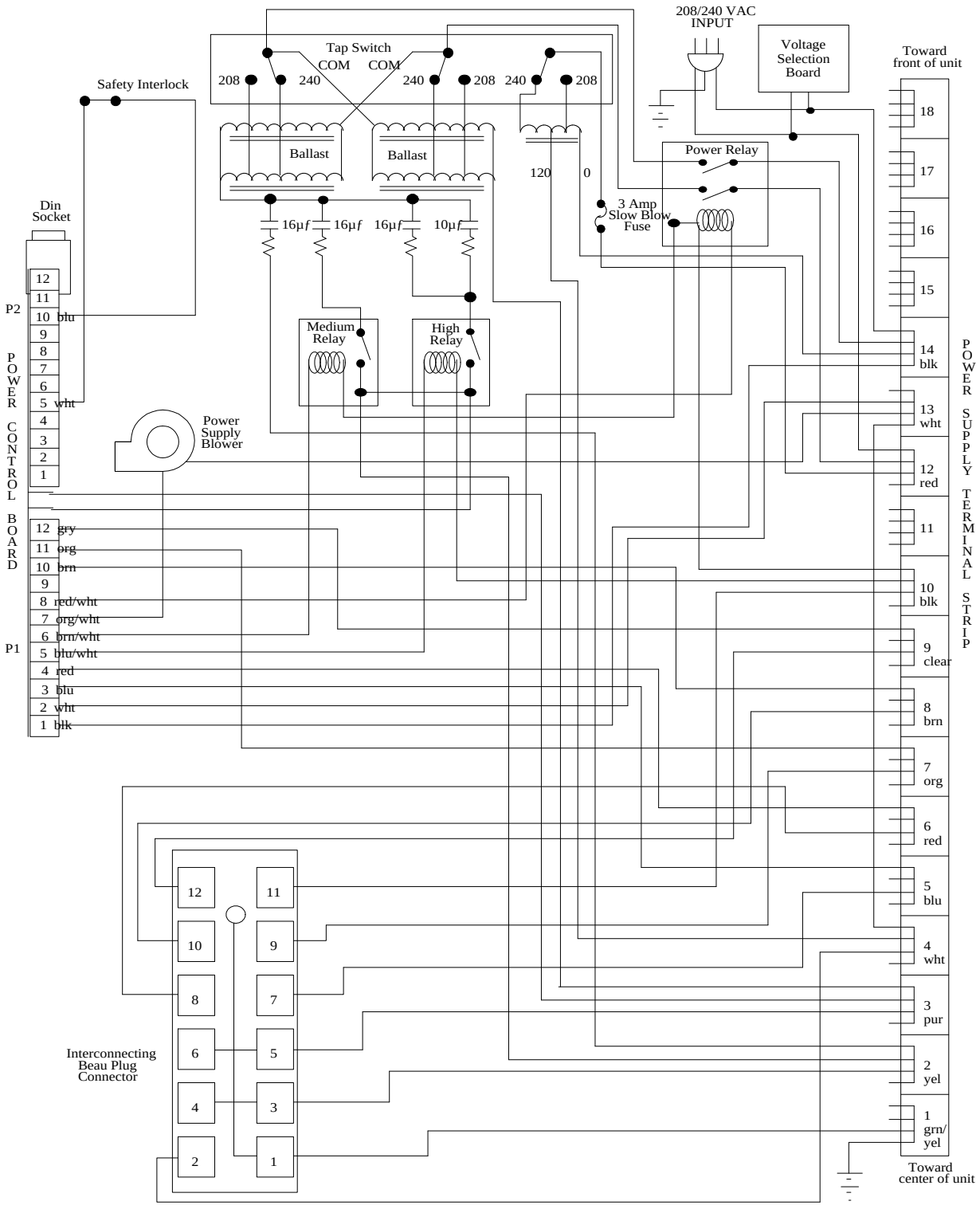
AL 84,85 Power Supply



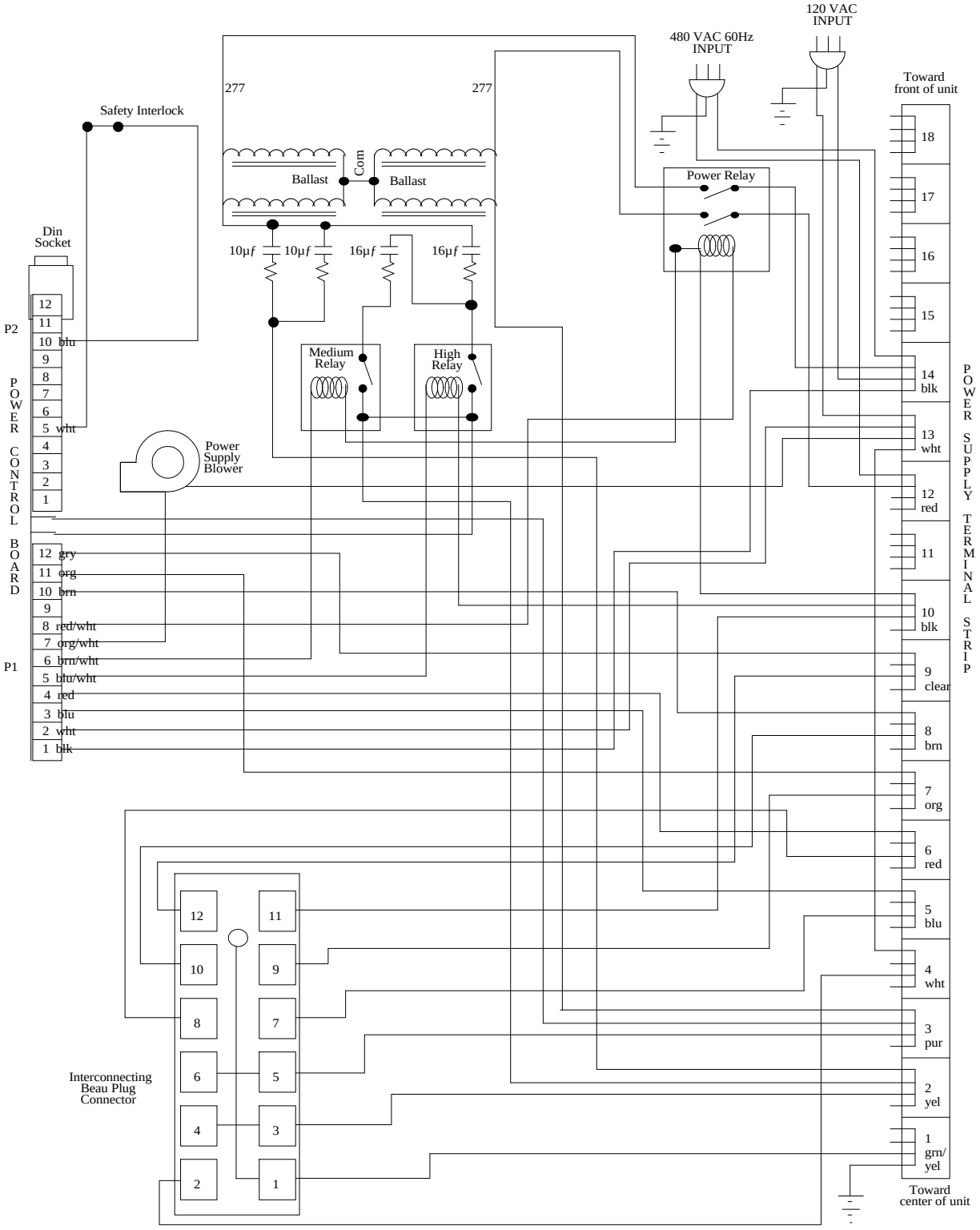
AL 84-480 Power Supply



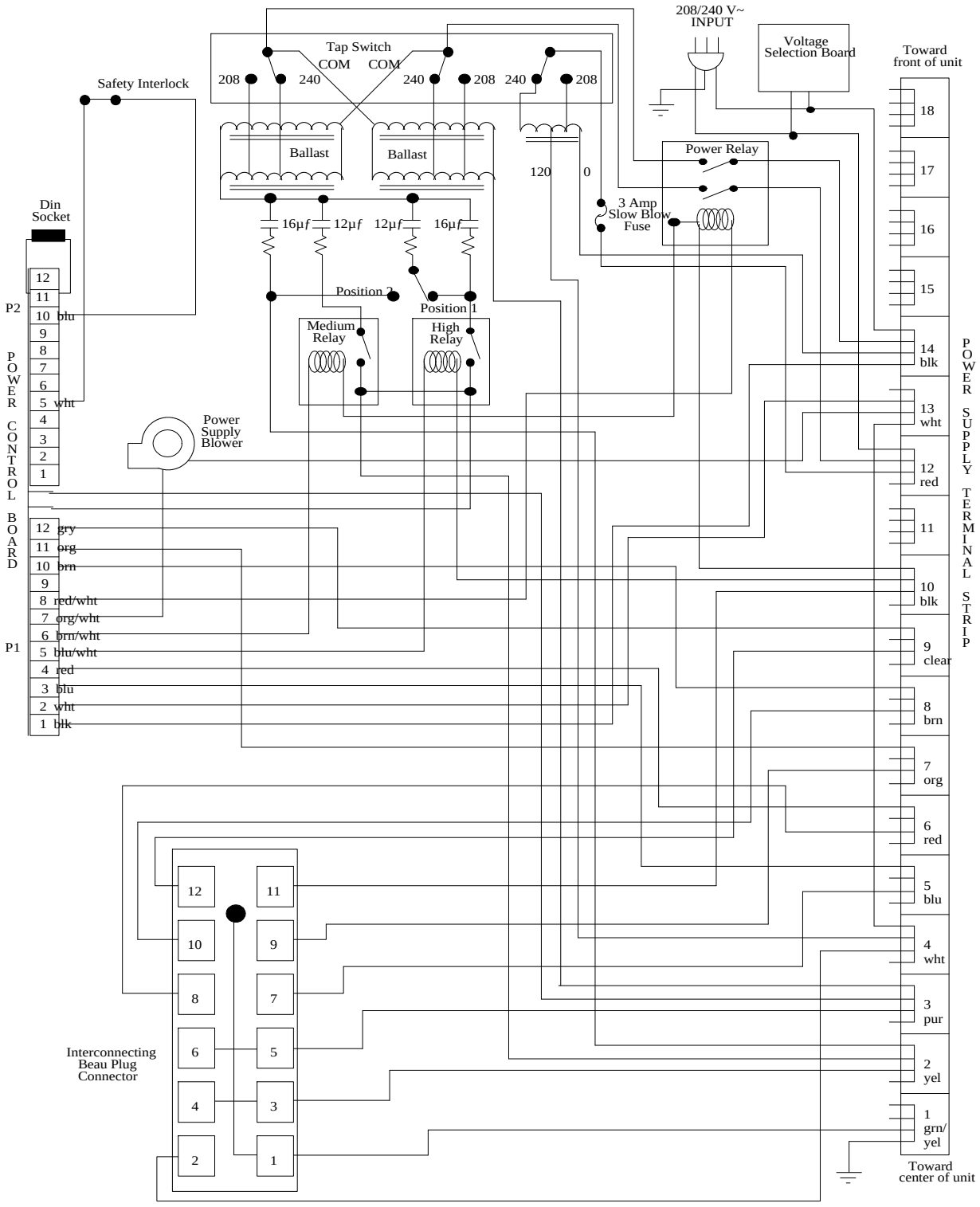
AL 56 Power Supply



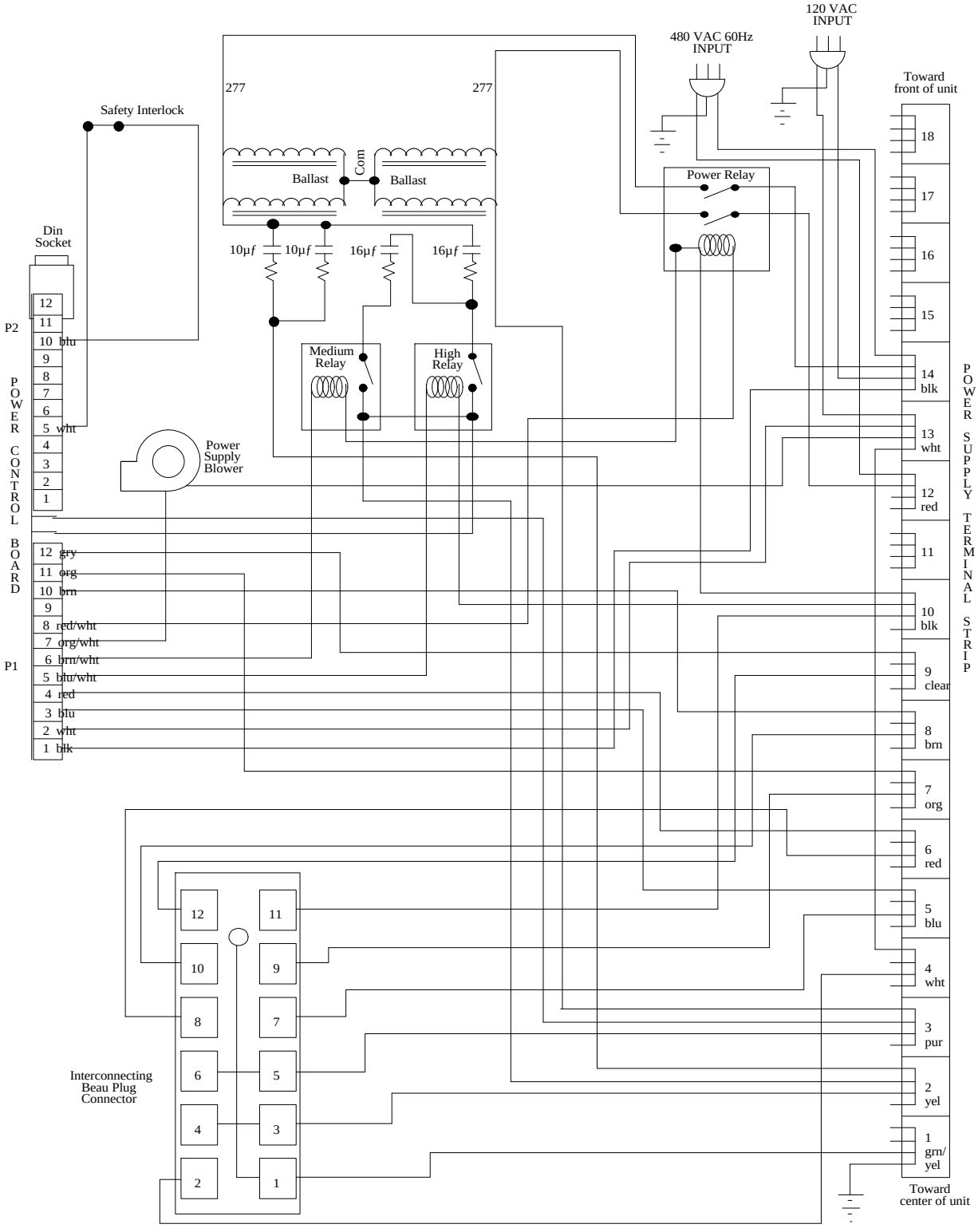
AL 56-480 Power Supply



AL 54,55 Power Supply

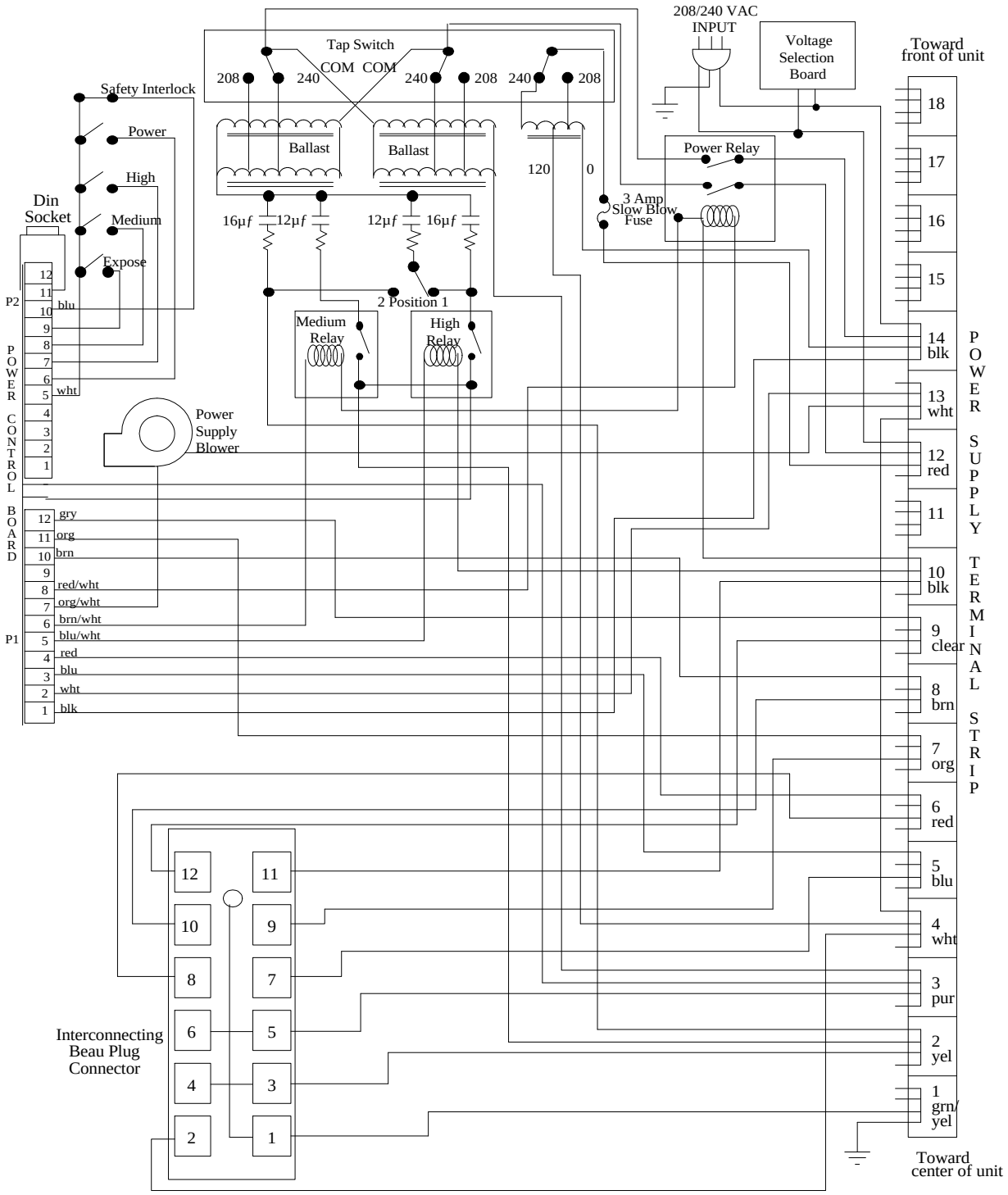


AL 54-480,55-480 Power Supply

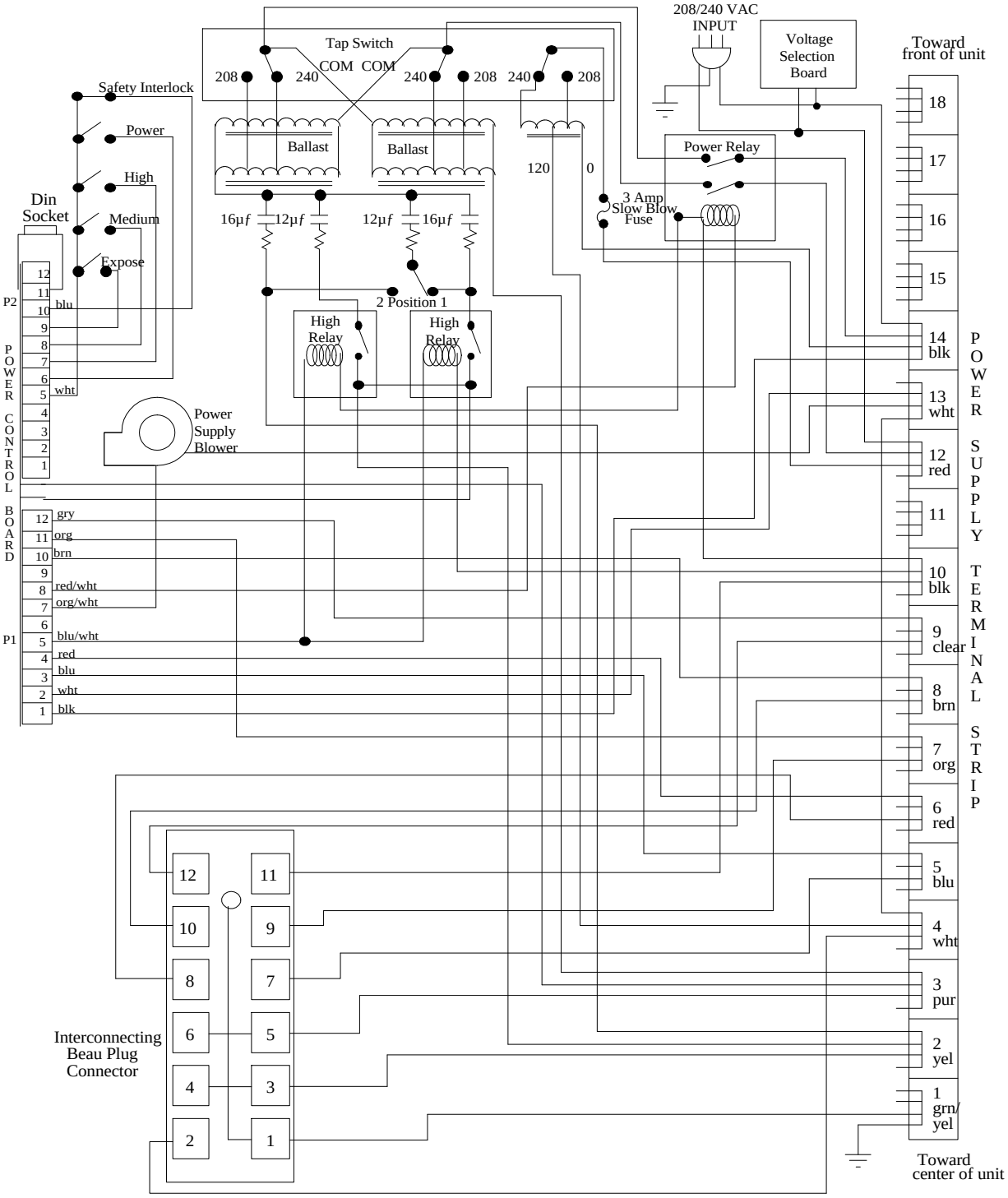


AL 53 Power Supply

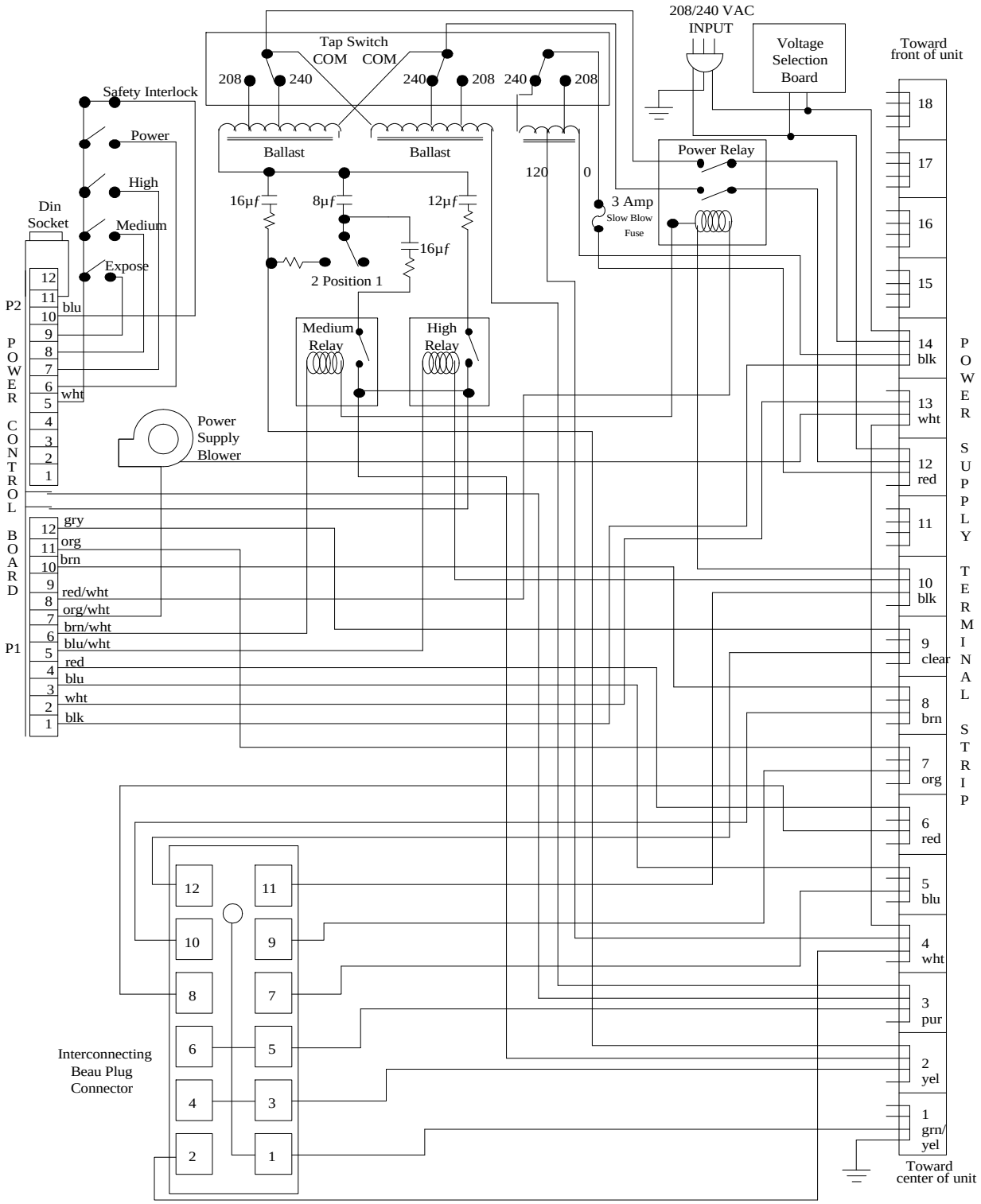
Note: AL100 uses two AL53 power supplies



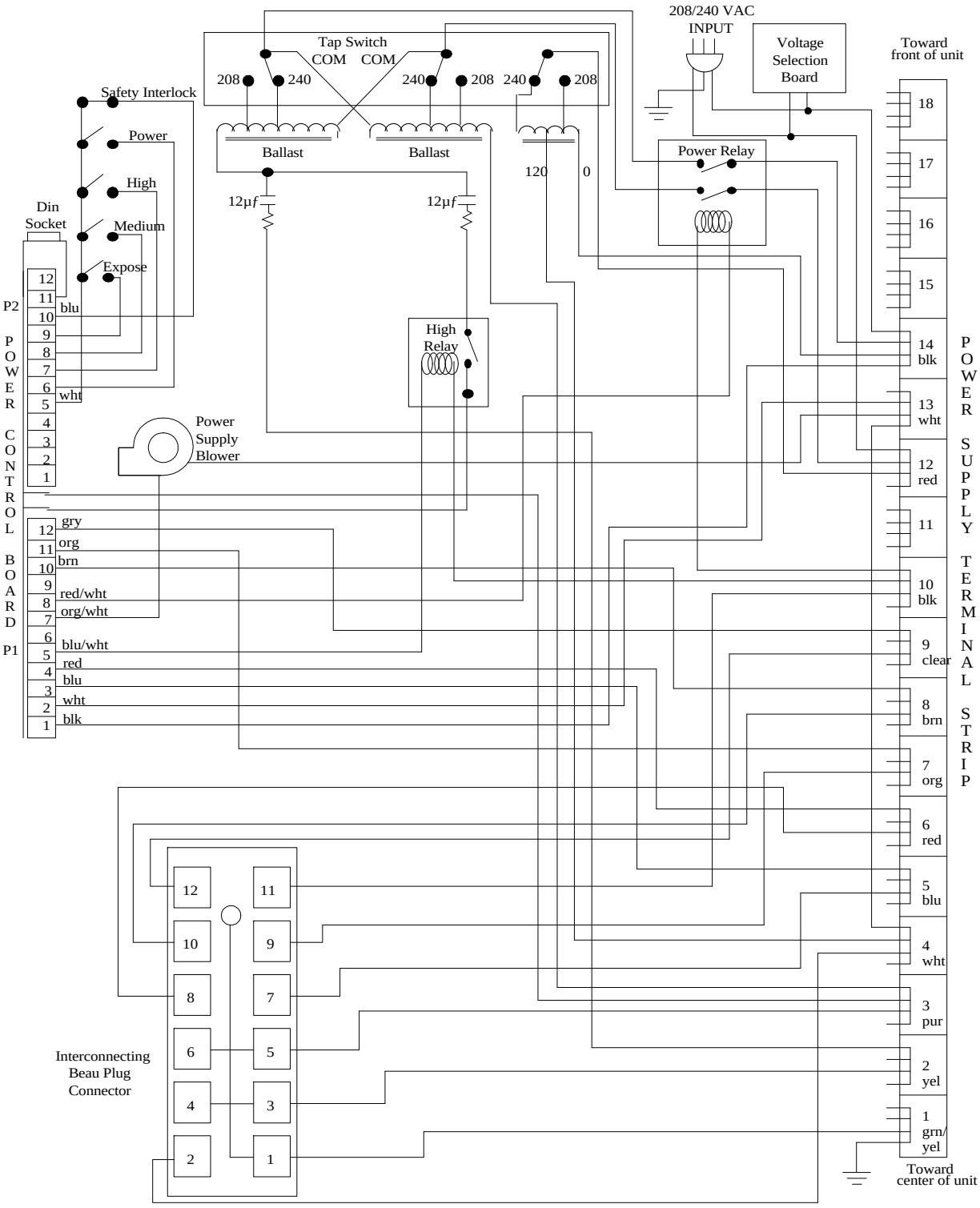
AL 50 Power Supply



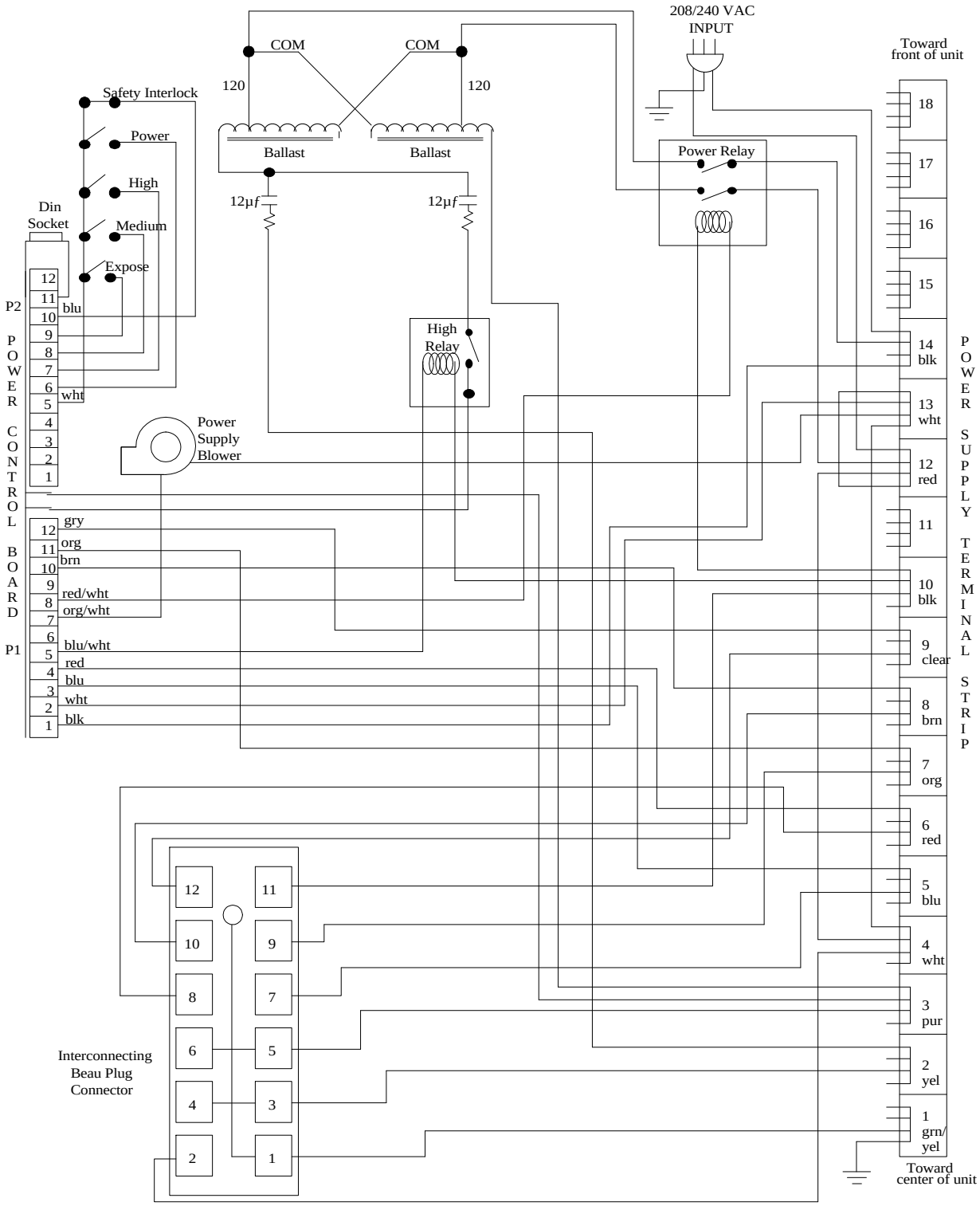
AL 35 Power Supply



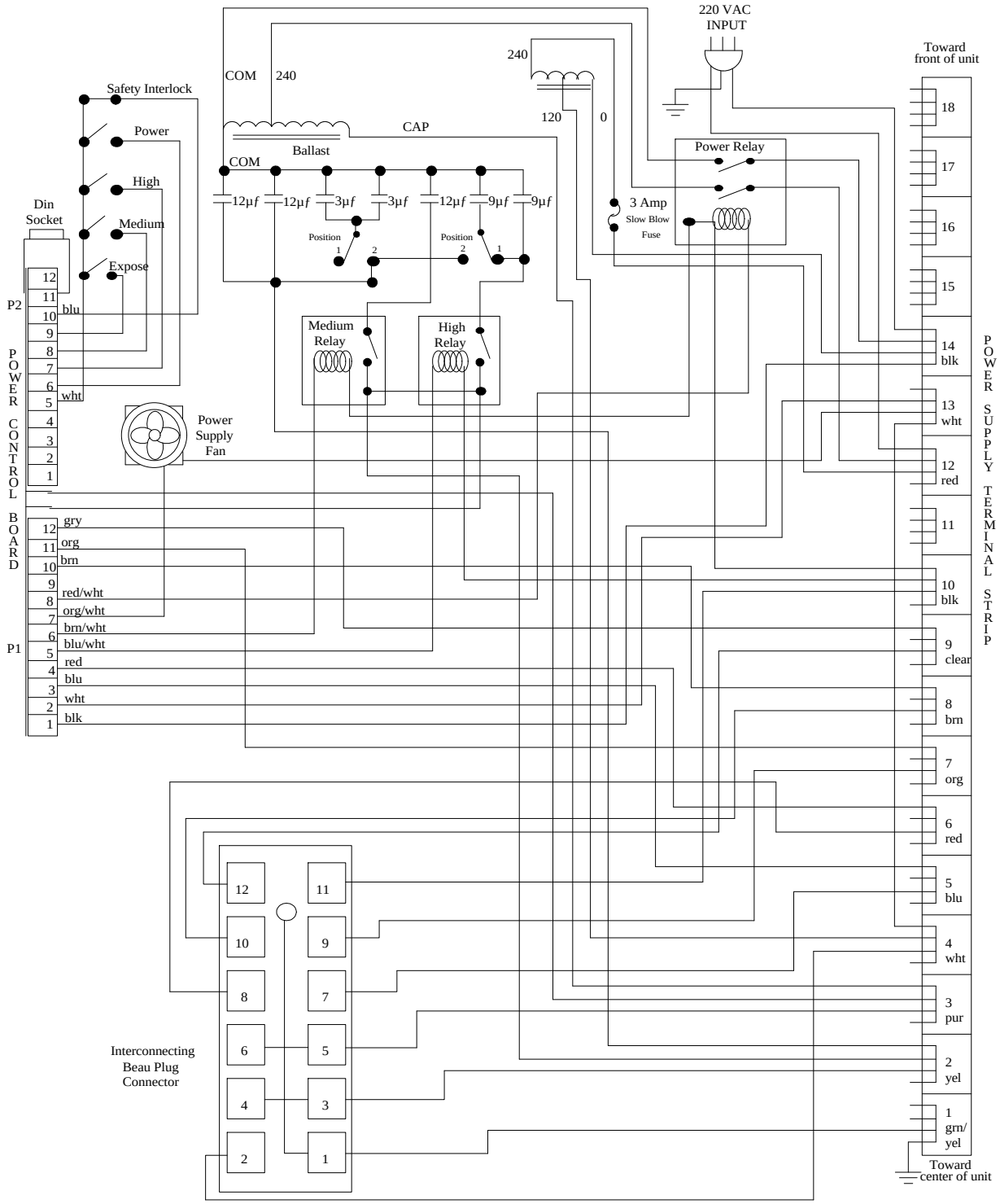
AL 25-2 Power Supply



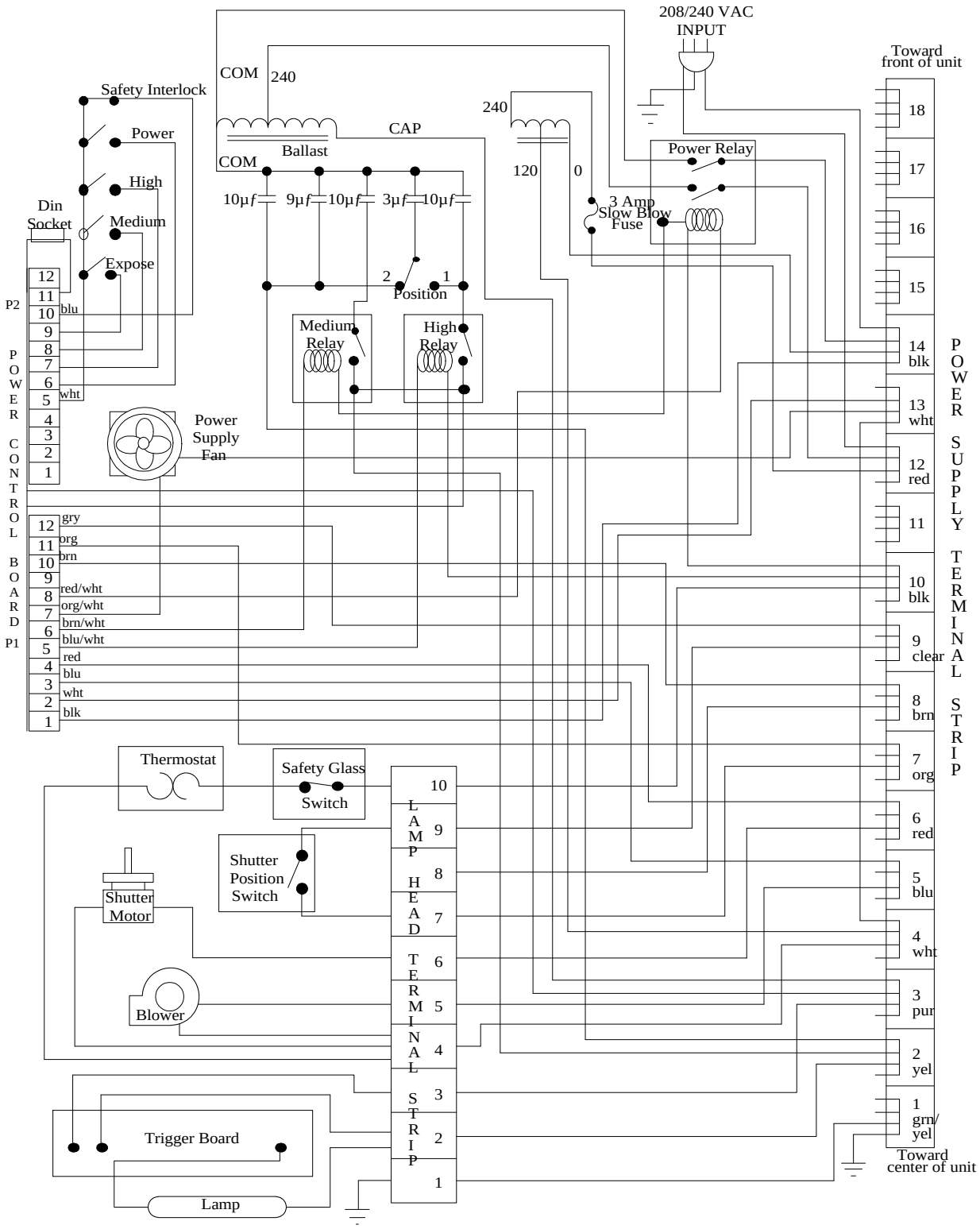
AL 25 Power Supply



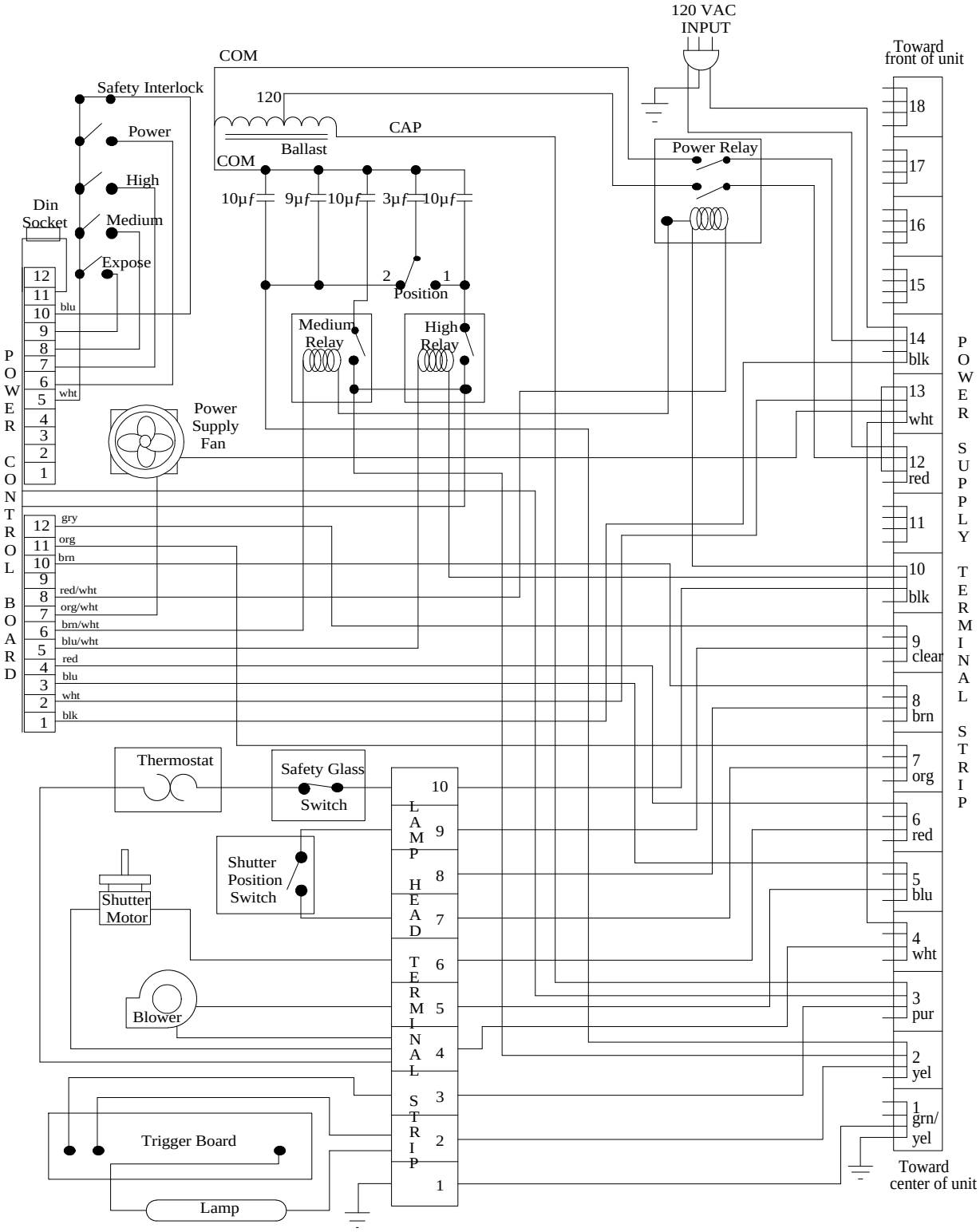
AL 23 Power Supply



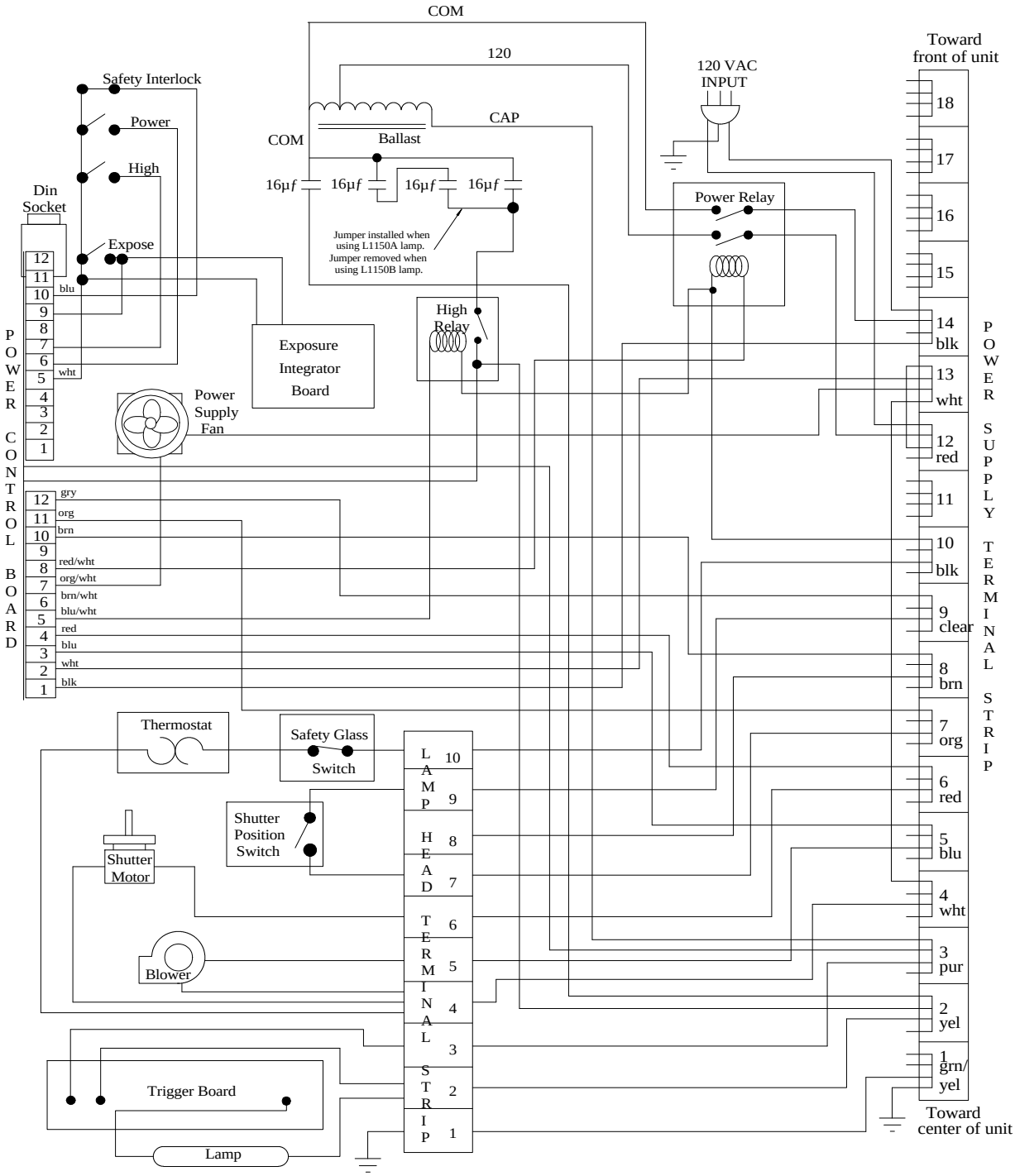
AL 20 Power Supply



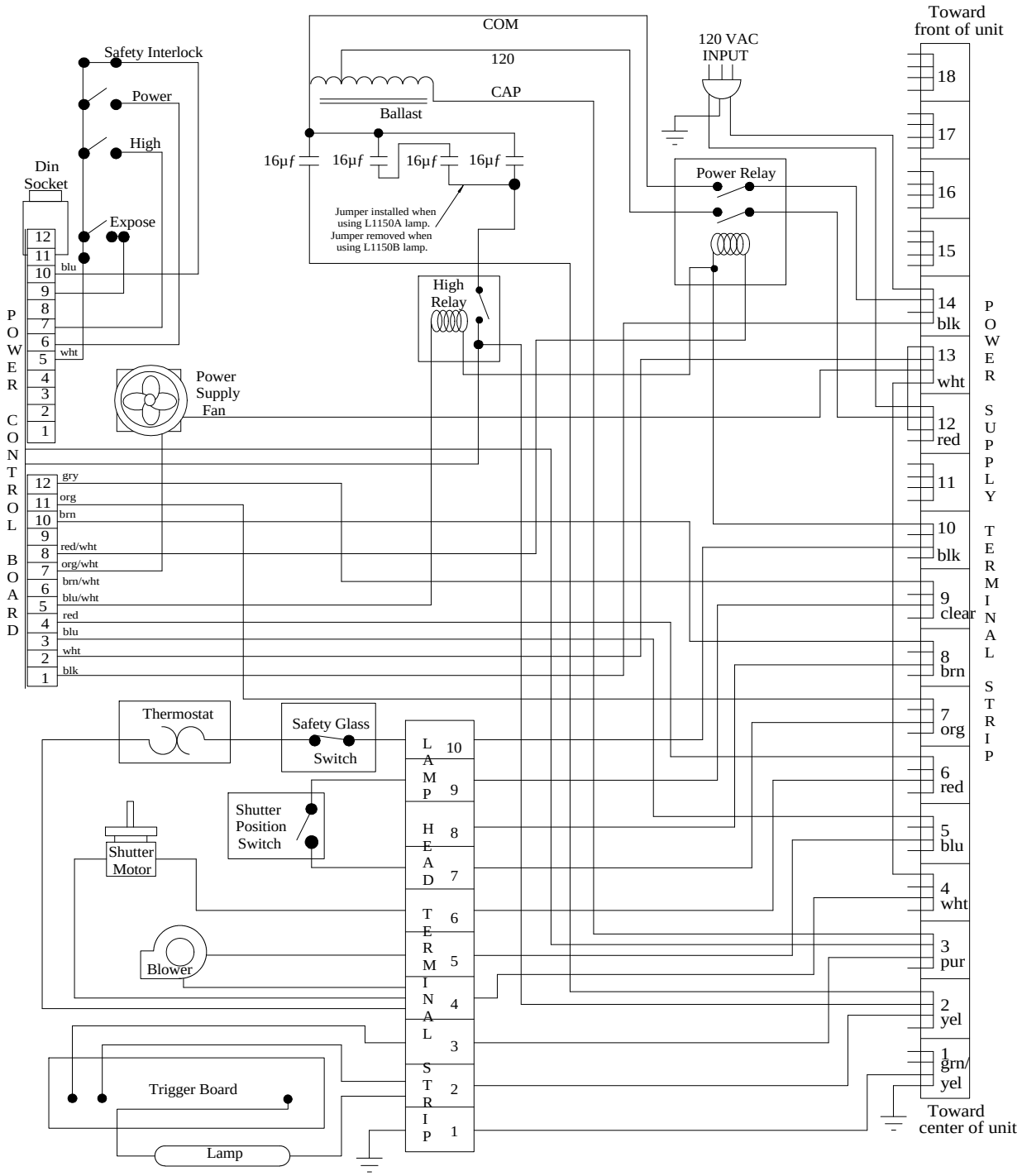
AL 19 Power Supply

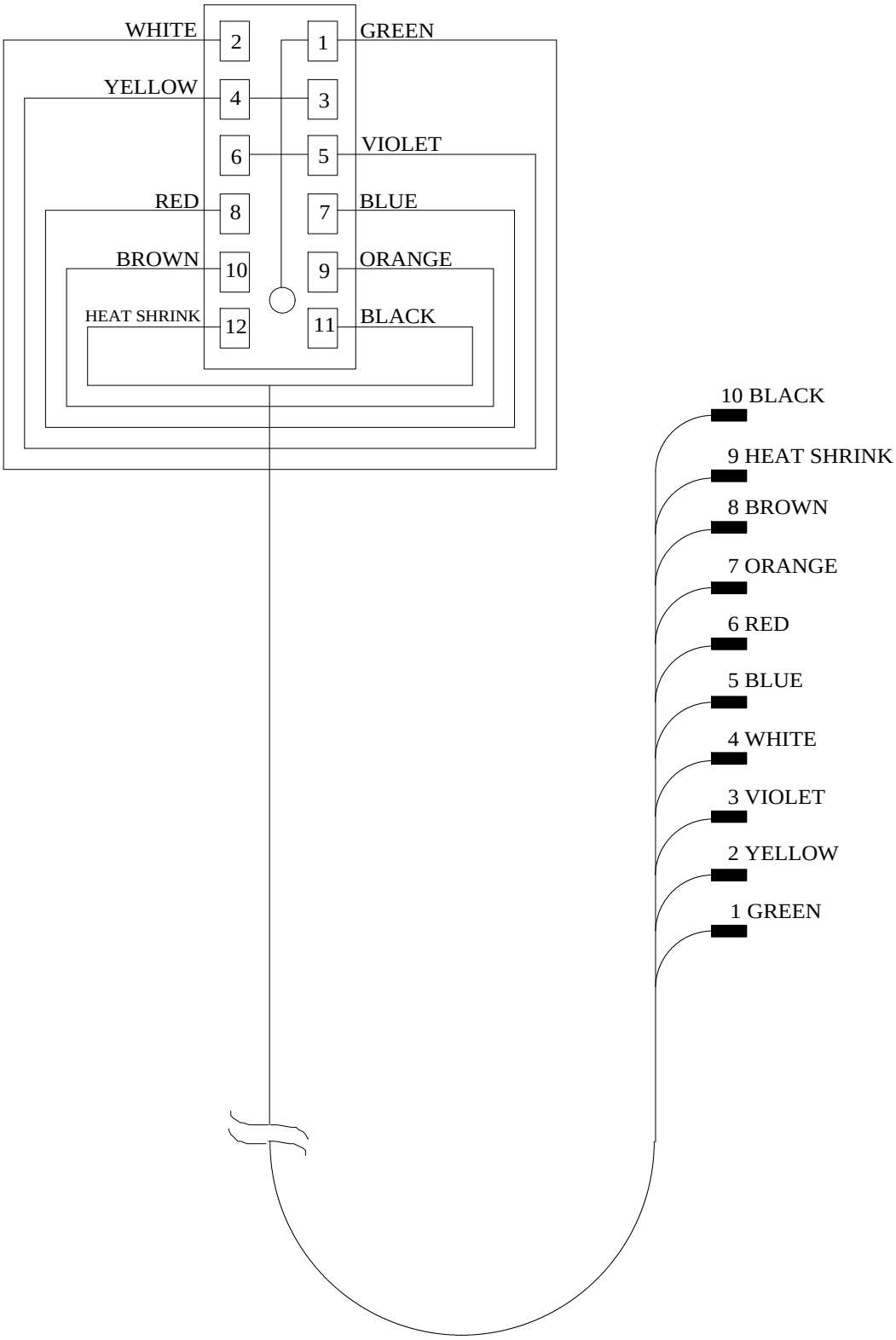


ALI 15 Power Supply

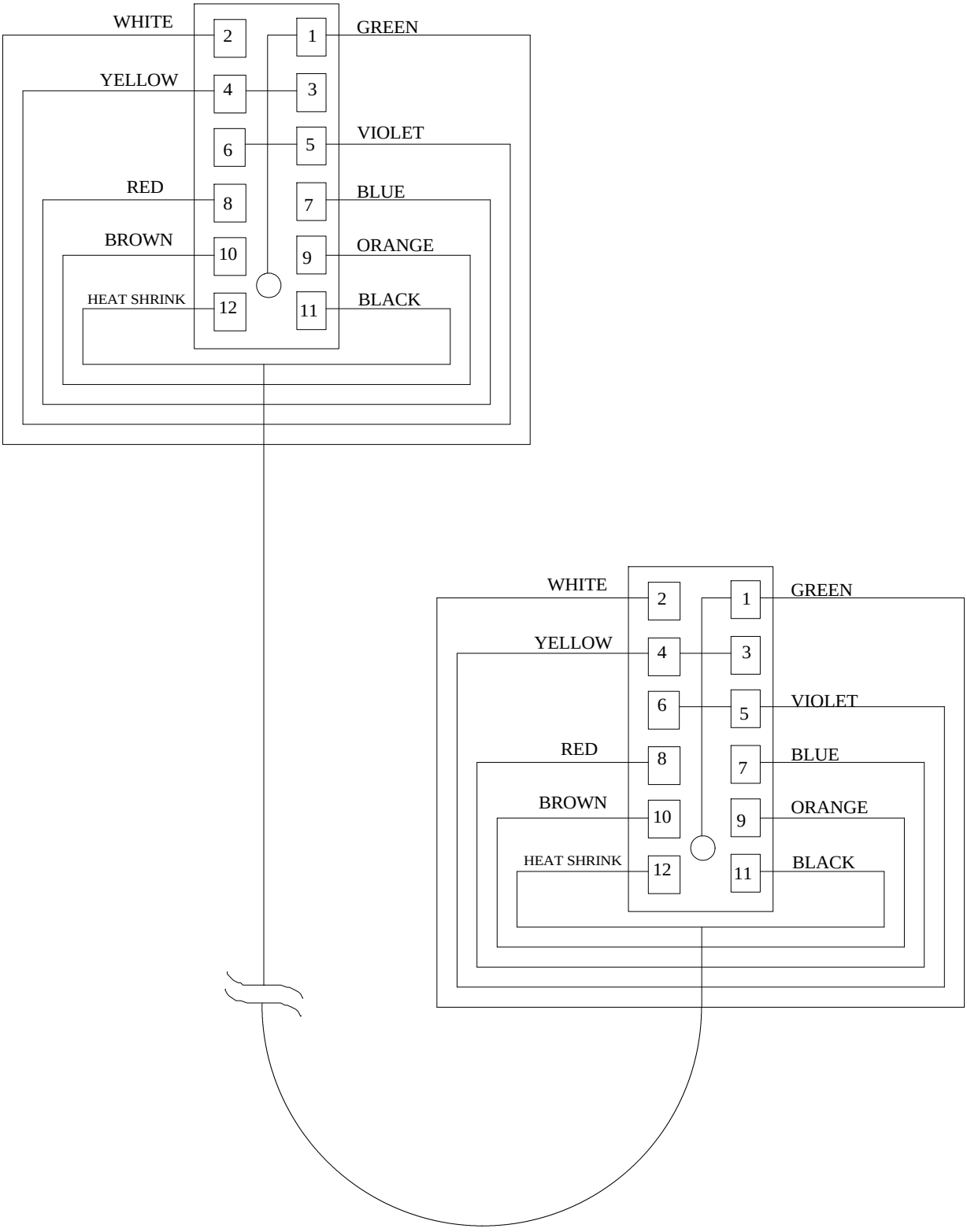


AL 15 Power Supply



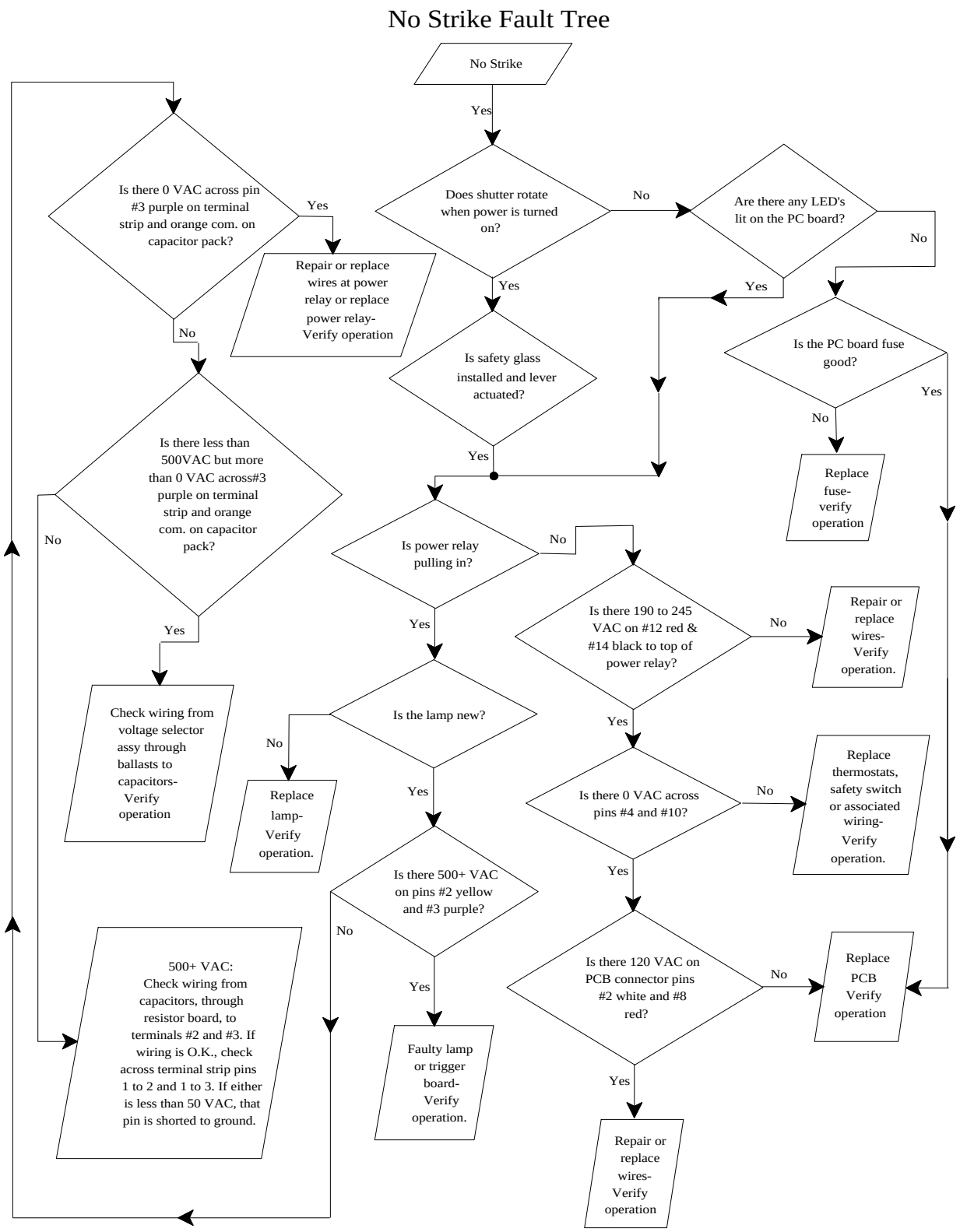

WHITE
2
1
GREEN
YELLOW
4
3
6
5
VIOLET
RED
8
7
BLUE
BROWN
10
9
ORANGE
HEAT SHRINK
12
11
BLACK
10 BLACK
9 HEAT SHRINK
8 BROWN
7 ORANGE
6 RED
5 BLUE
4 WHITE
3 VIOLET
2 YELLOW
1 GREEN

Interconnect Cable for AL85, AL84, AL84-480, AL56, AL56-480, AL55, AL55-480, AL54, AL54-480

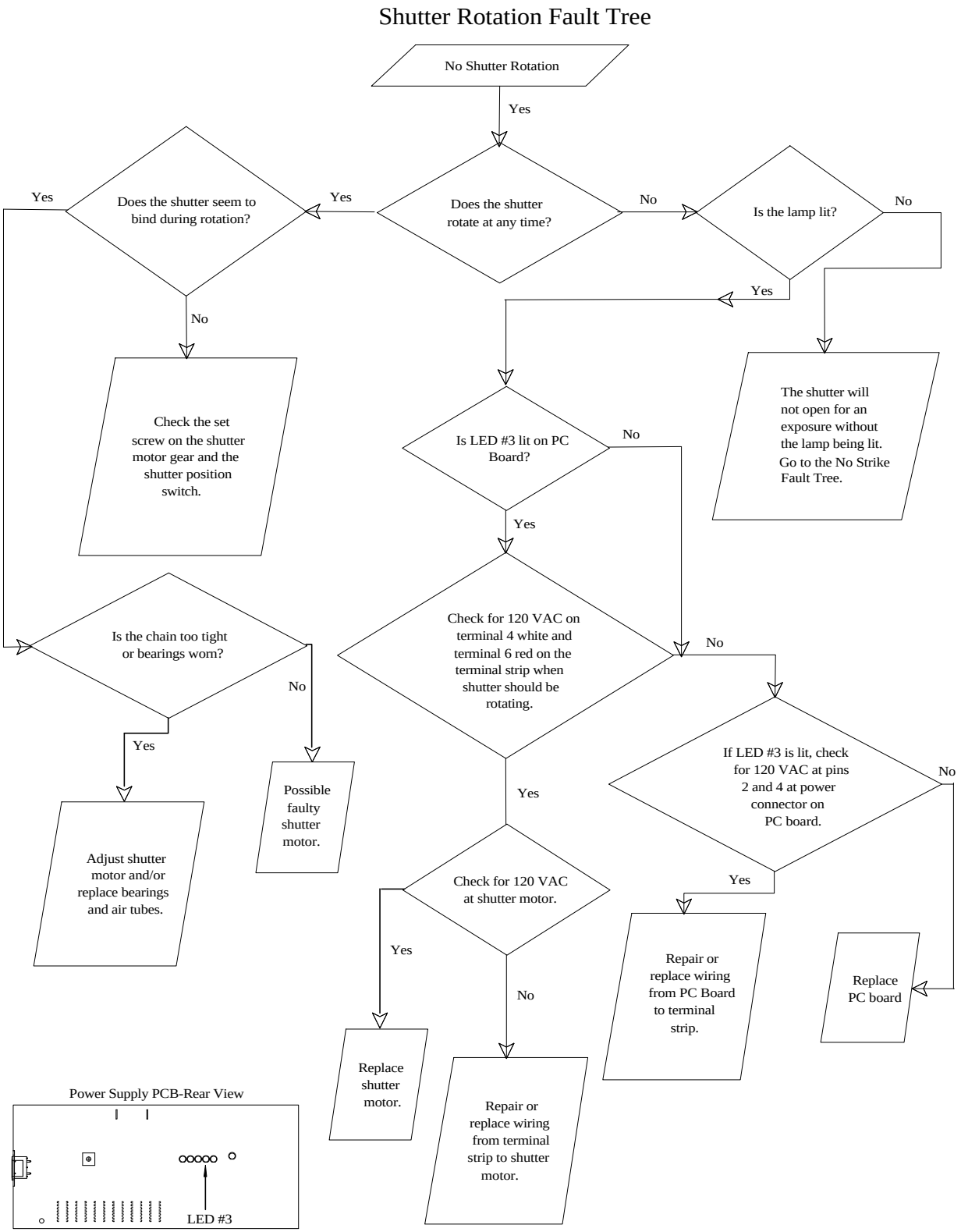


8. Fault Trees

No Strike Fault Tree



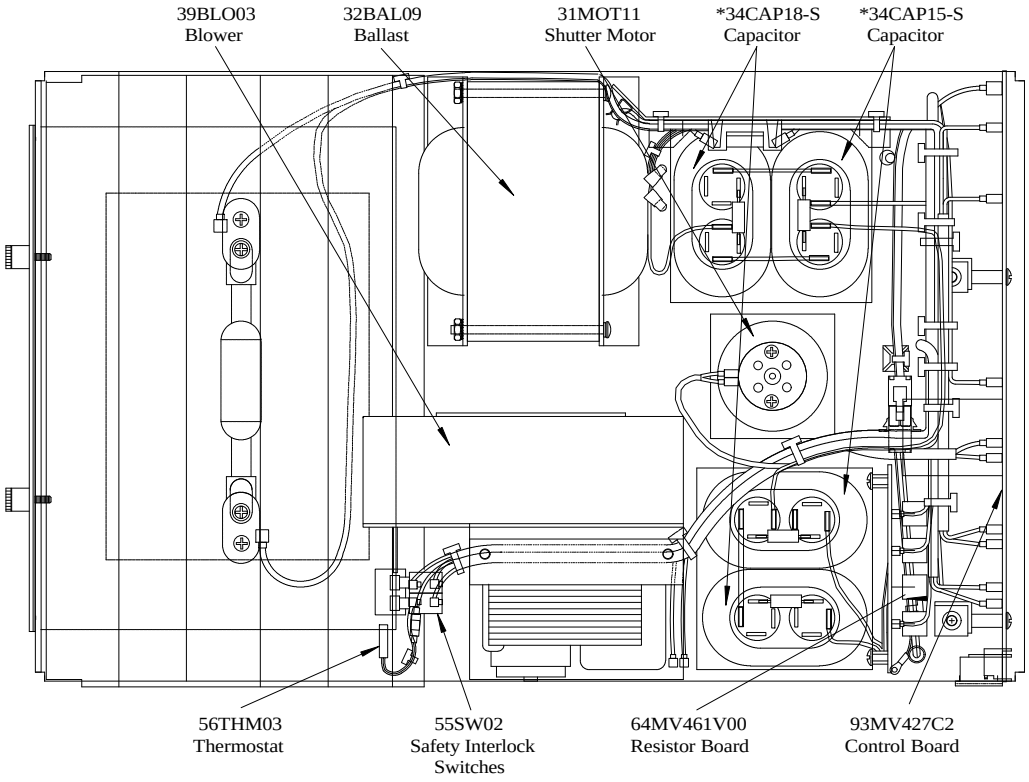
Shutter Rotation Fault Tree

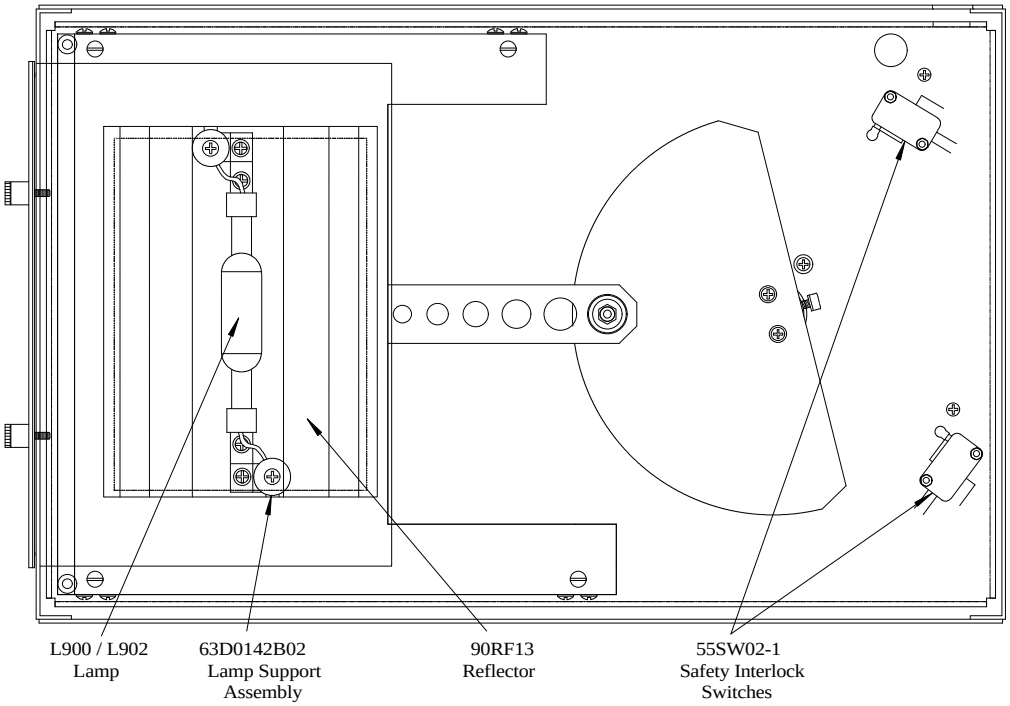


9. AL 13 / AL 9

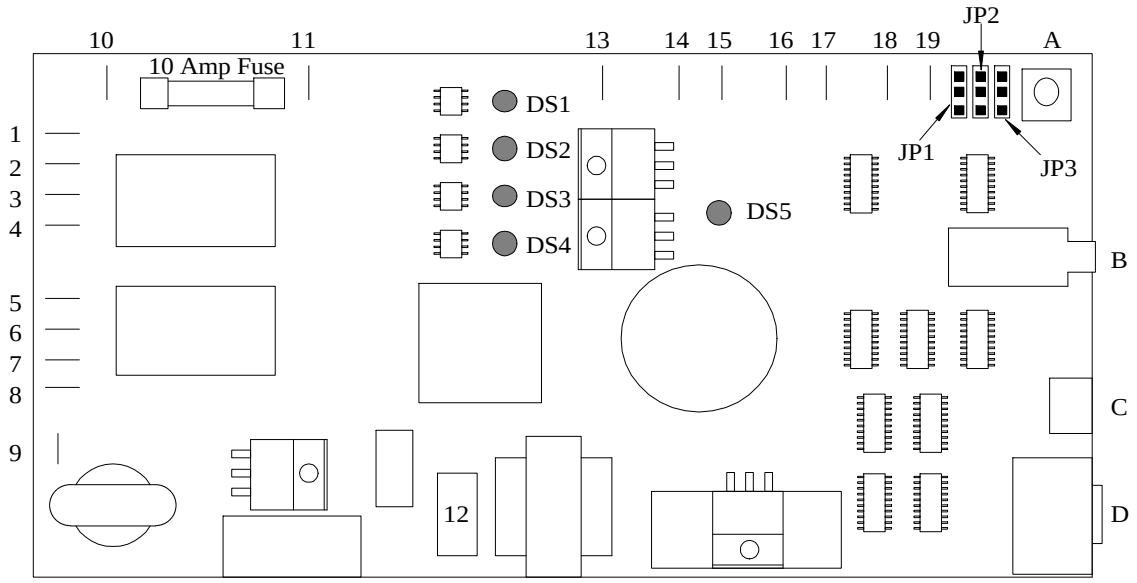
AL 13 Component Layout

*Capacitors for 220~ units are different values see AL 13 (220~) Wiring Diagram for values.





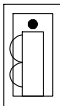
AL 13 Control Board (64MV427C2)



1) AC COM
2) Ballast COM
3) Lamp COM
4) Blower COM
5) Blower HOT
6) Medium Cap Input
7) High Cap Input
8) Low Cap Input
9) Lamp Lead HOT
10) Ballast AC HOT
11) Incoming AC HOT
12) **Voltage Selection Jumpers** see NOTE A
13) Ground
14) Shutter Motor +
15) Shutter Motor -
16) Shutter Switch 2 +
17) Shutter Switch 2 -
18) Shutter Switch 1 +
19) Shutter Switch 1 -

DS1) POWER
DS2) BLOWER
DS3) MED POWER
DS4) HIGH POWER
DS5) SHUTTER MOTOR
A) Idle Adjustment
B) External Interlock
C) **External Operation Switches** see NOTE B
D) Control Din (to integrator)

NOTE A: TERMINAL 12 Voltage Selection Switch

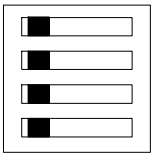


Connector must be in this position for 120V

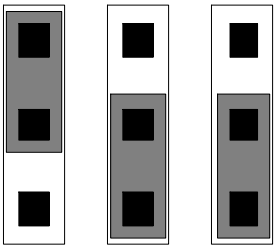
Connector must be in this position for 220V

NOTE B Test Switches OFF ON

1 Power ON/OFF
2 High Expose
3 Medium Expose
4 Low Expose



JP1 JP2 JP3

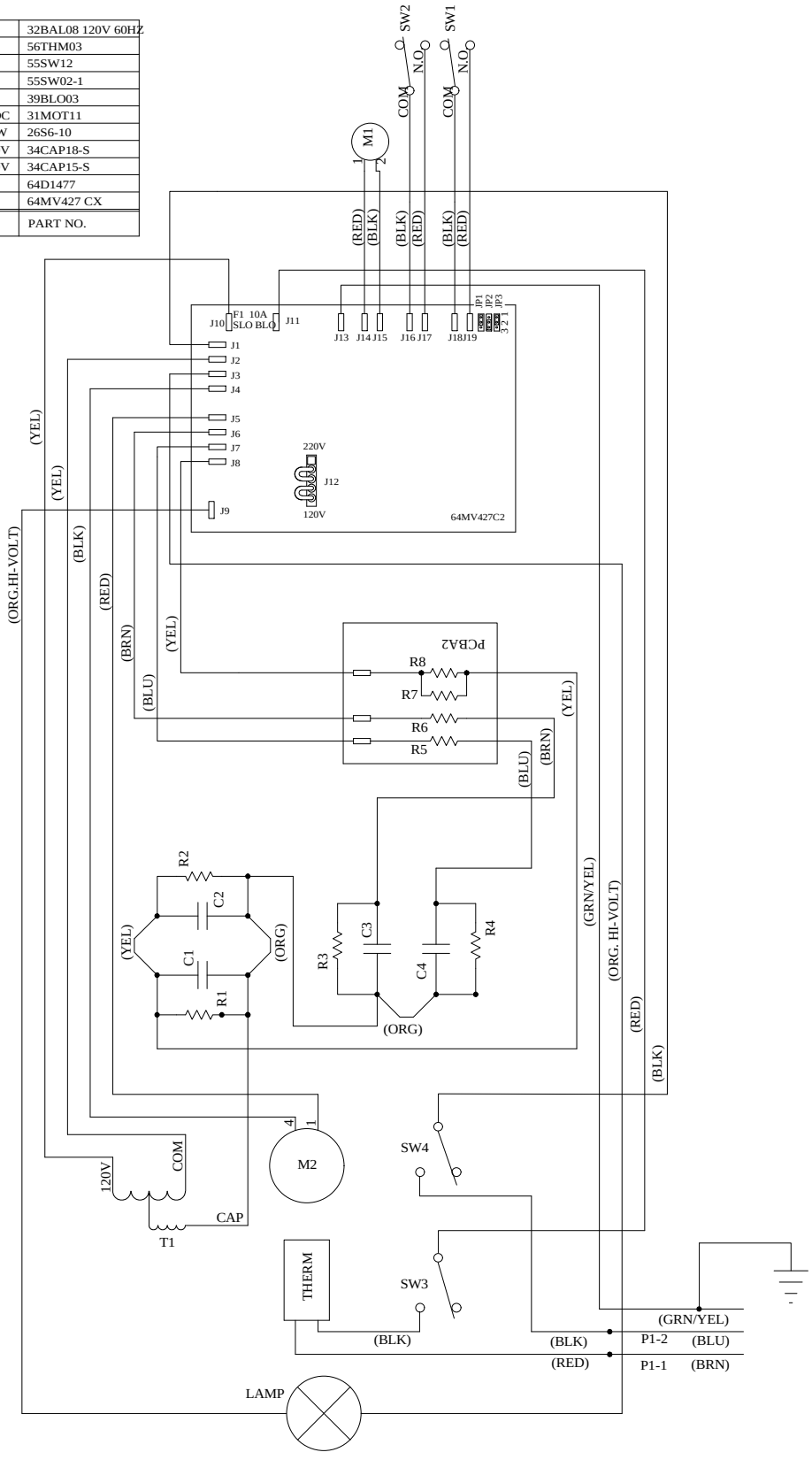


JUMPER SETTING

JP1	UP	Duel Shutter Switch Operation
	DOWN	Single Shutter Switch Operation
JP2	UP	Not Using External Interlock
	DOWN	Using External Interlock
JP3	UP	50Hz Operation
	DOWN	60Hz Operation

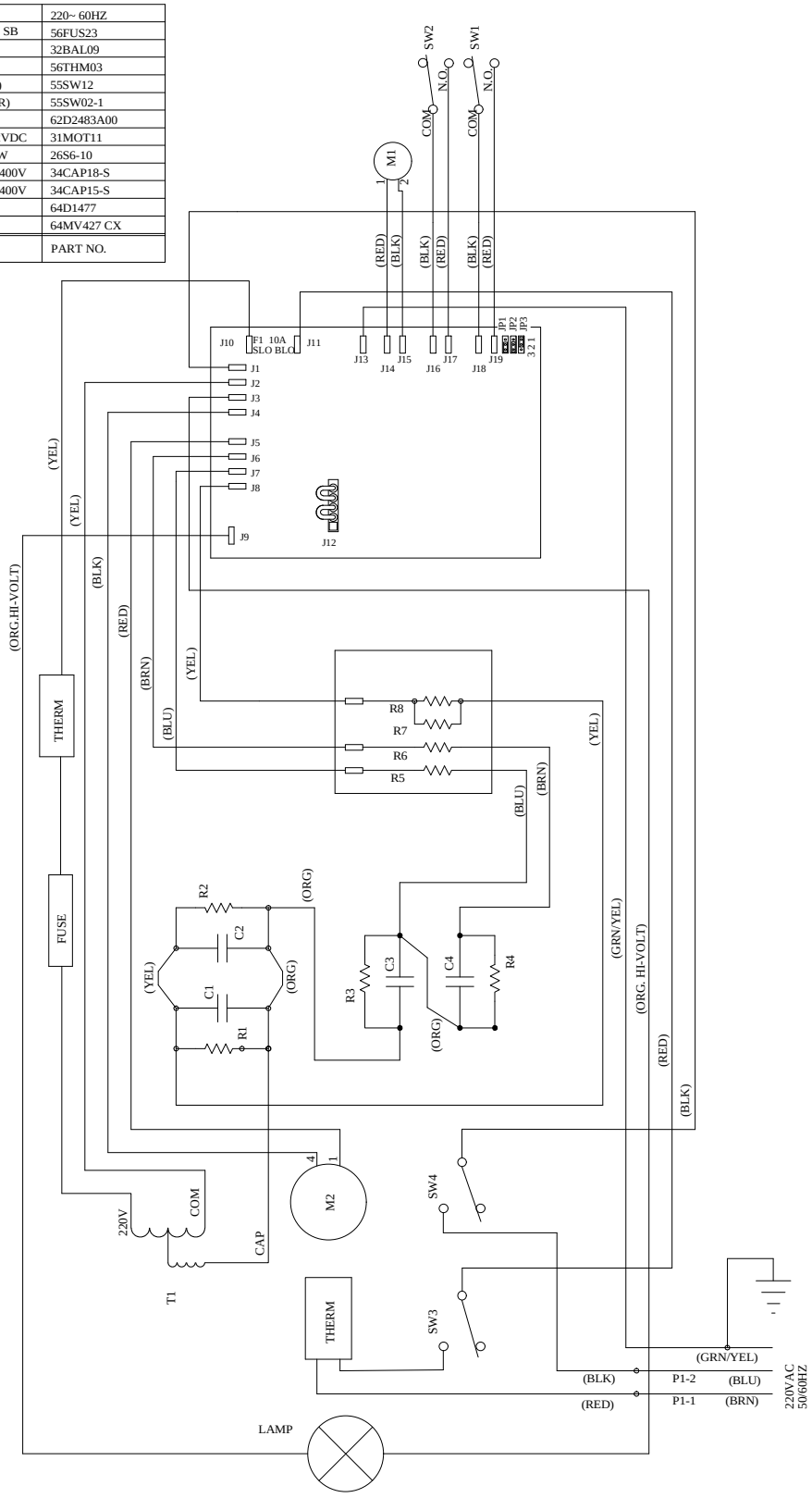
AL 13 (120V~) Wiring Diagram

REF. DESIGNATIONS	DESCRIPTION	PART NO.
T1	BALLAST	32BAL08 120V 60HZ
THERM	THERMOSTAT	56THM03
SW3-SW4	SWITCH,(SAFETY)	55SW12
SW1-SW2	SWITCH,(SHUTTER)	55SW02-1
M2	MOTOR, BLOWER	39BLO03
M1	MOTOR, DRIVE 12VDC	31MOT11
R1-R4	RESISTOR 1M Ohm 1W	26S6-10
C2,C4	CAPACITOR 20µƒ 400V	34CAP18-S
C1,C3	CAPACITOR 15µƒ 400V	34CAP15-S
PCBA2	RESISTOR BOARD	64D1477
PCBA1	CONTROL BOARD	64MV427 CX

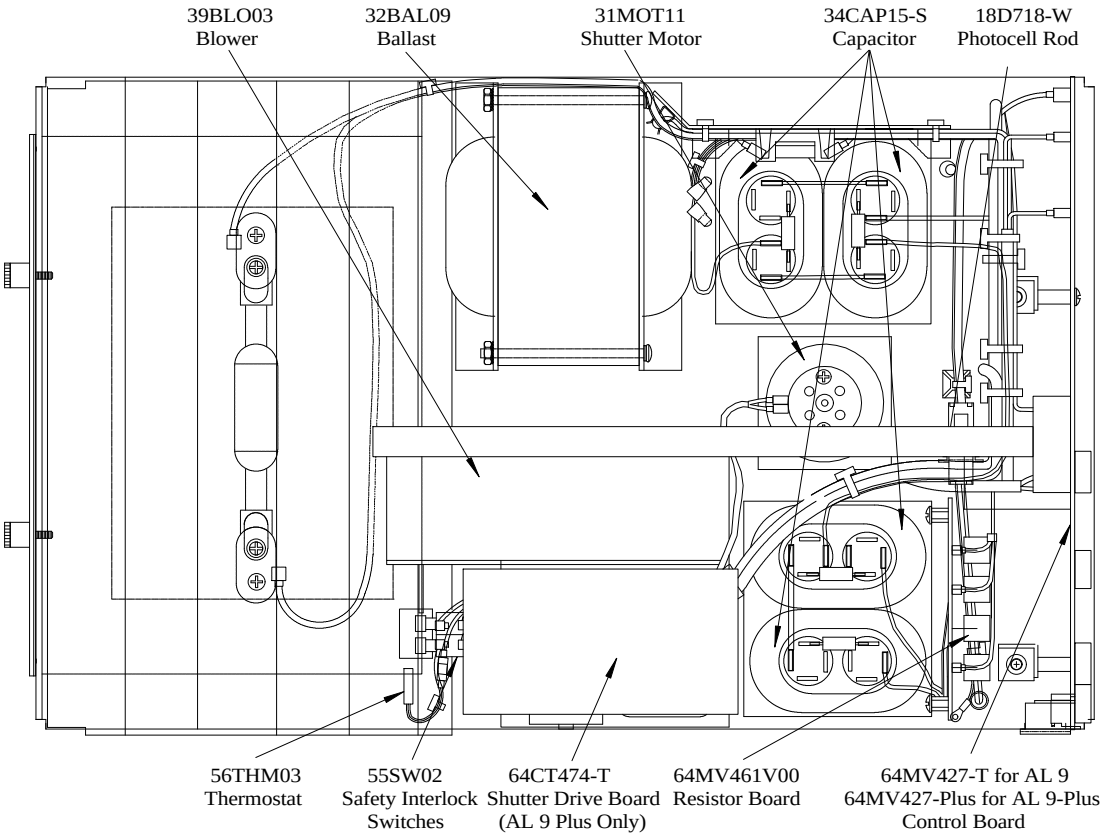


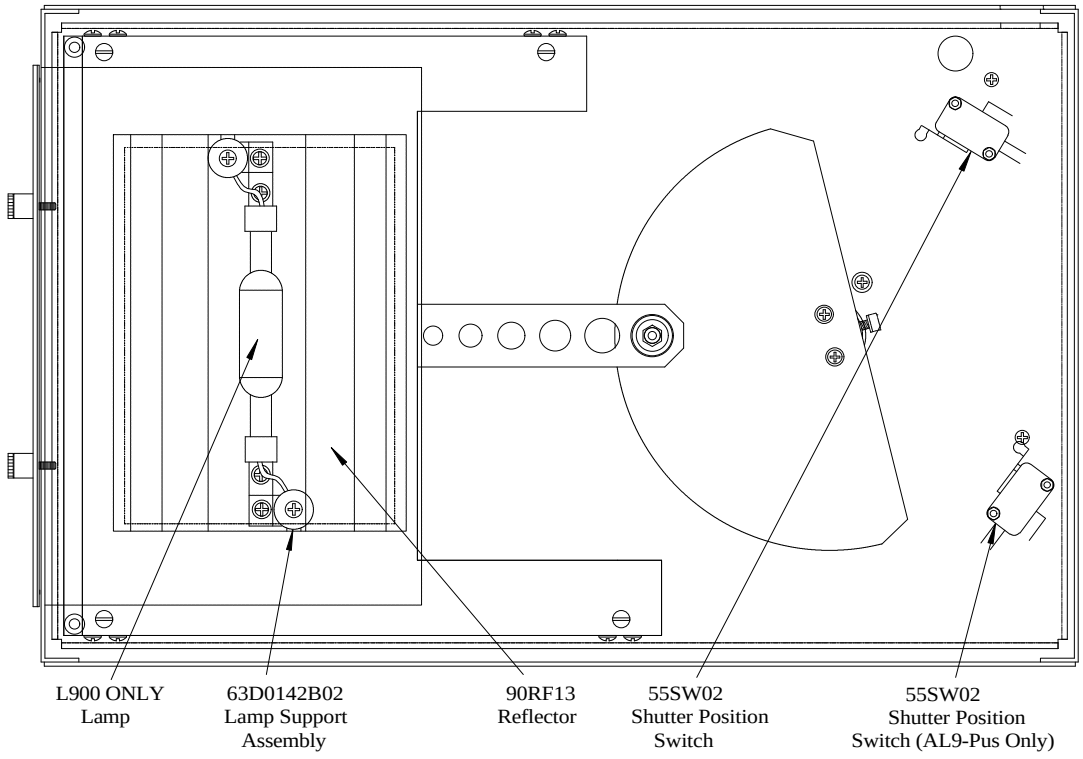
AL 13 (220V~) Wiring Diagram

		220~ 60HZ
FUSE	FUSE, 4 AMP 250V SB	56FUS23
T1	BALLAST	32BAL09
THERM	THERMOSTAT	56THM03
SW3-SW4	SWITCH,(SAFETY)	55SW12
SW1-SW2	SWITCH,(SHUTTER)	55SW02-1
M2	MOTOR, BLOWER	62D2483A00
M1	MOTOR, DRIVE 12VDC	31MOT11
R1-R4	RESISTOR 1Meg 1W	26S6-10
C2, C3, C4	CAPACITOR 20µF 400V	34CAP18-S
C1	CAPACITOR 15µF 400V	34CAP15-S
PCBA2	RESISTOR BOARD	64D1477
PCBA1	CONTROL BOARD	64MV427 CX
REF. DESIGNATIONS	DESCRIPTION	PART NO.

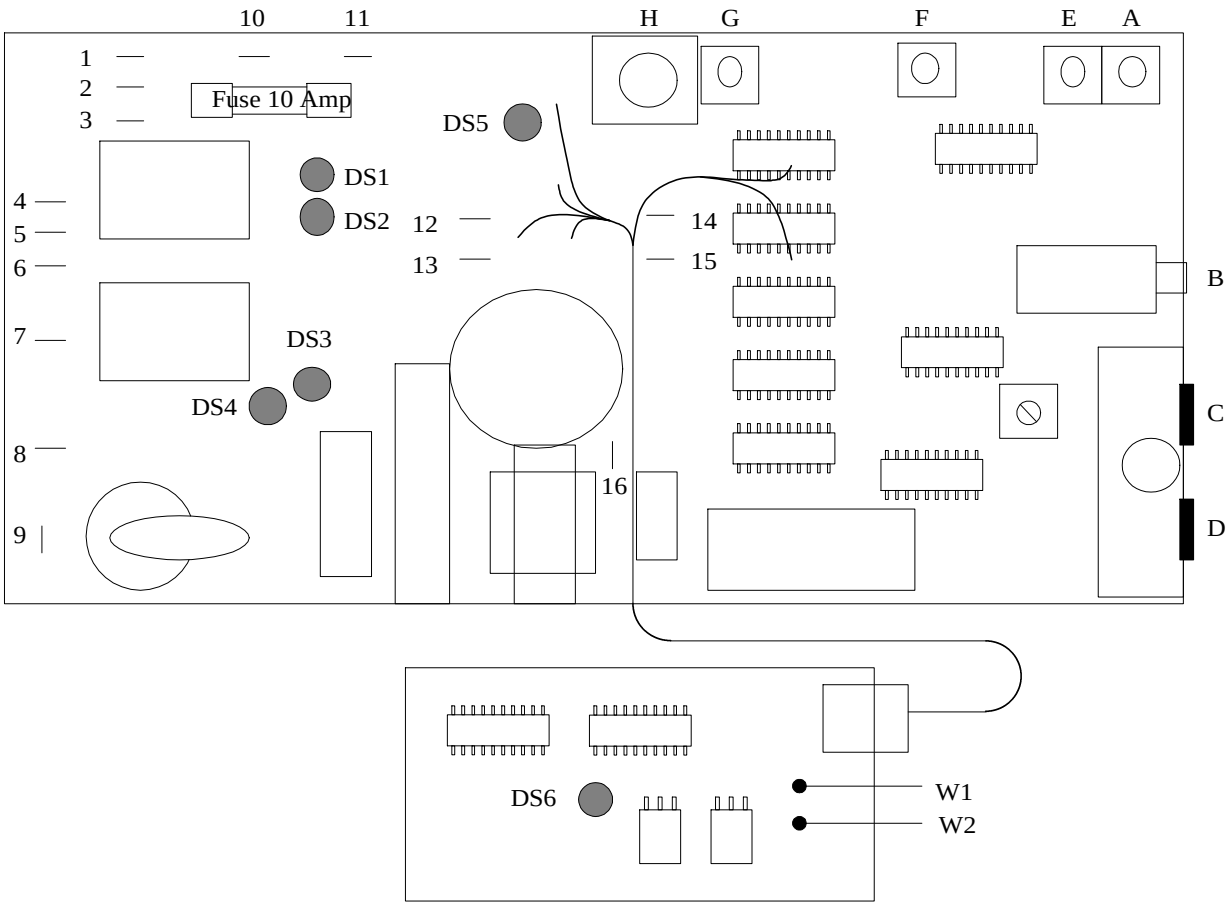


AL 9, AL 9-PLUS Component Layout



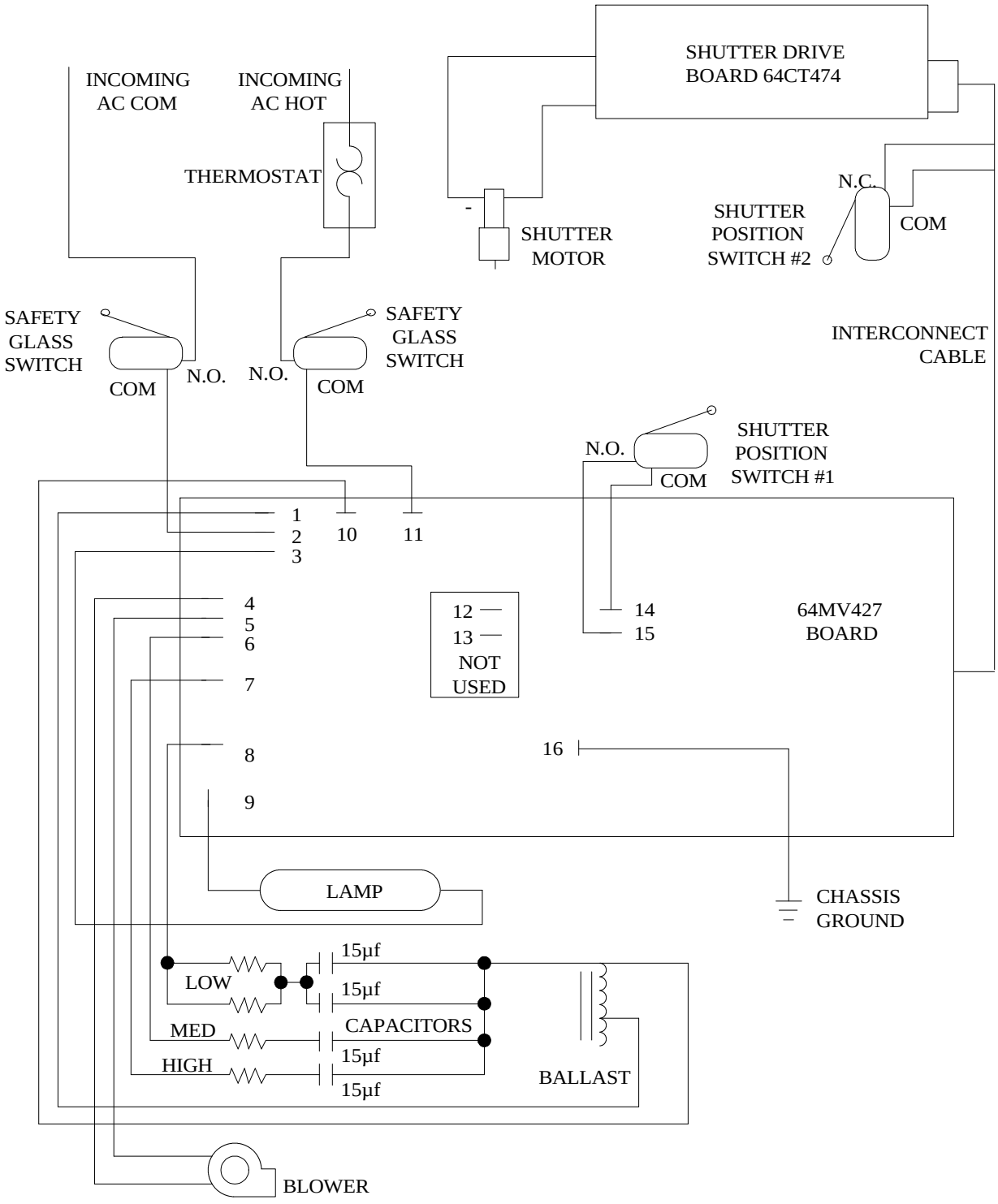


64MV427-Plus Board Layout for AL 9-Plus

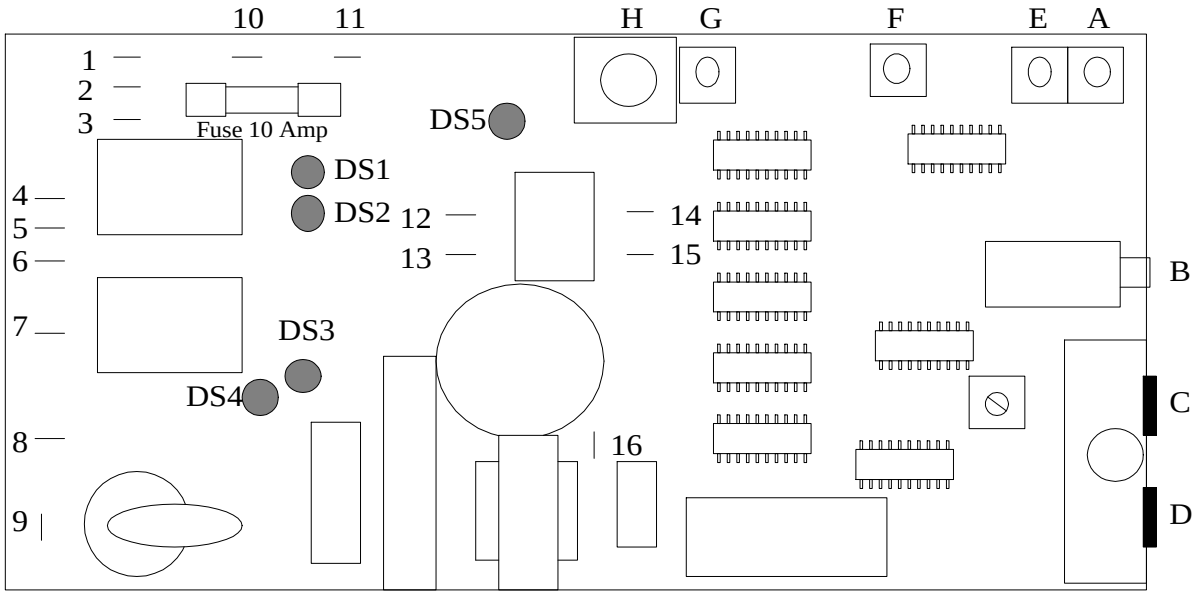


1) Ballast COM
2) AC COM
3) Lamp COM
4) Blower COM
5) Blower HOT
6) Medium Cap Input, brown
7) High Cap Input, blue
8) Low Cap Input, yellow
9) Lamp Lead HOT
10) Ballast AC HOT
11) Incoming AC HOT
12) Not Used
13) Not Used
14) Shutter Switch -
15) Shutter Switch +
16) Ground
A) Idle Adjustment
B) External Interlock
C) Photocell Din (to integrator)
D) Control Din (to integrator)
E) Overall Photocell adjust
F) Photocell A(high) adjust
G) Photocell B(low) adjust
H) Photocell
DS1) Power
DS2) Blower
DS3) MED Power
DS4) HIGH Power
DS5) Not Used
DS6) Shutter Motor
W1) Shutter Motor (-)
W2) Shutter Motor (+)

AL 9-Plus Wiring Diagram

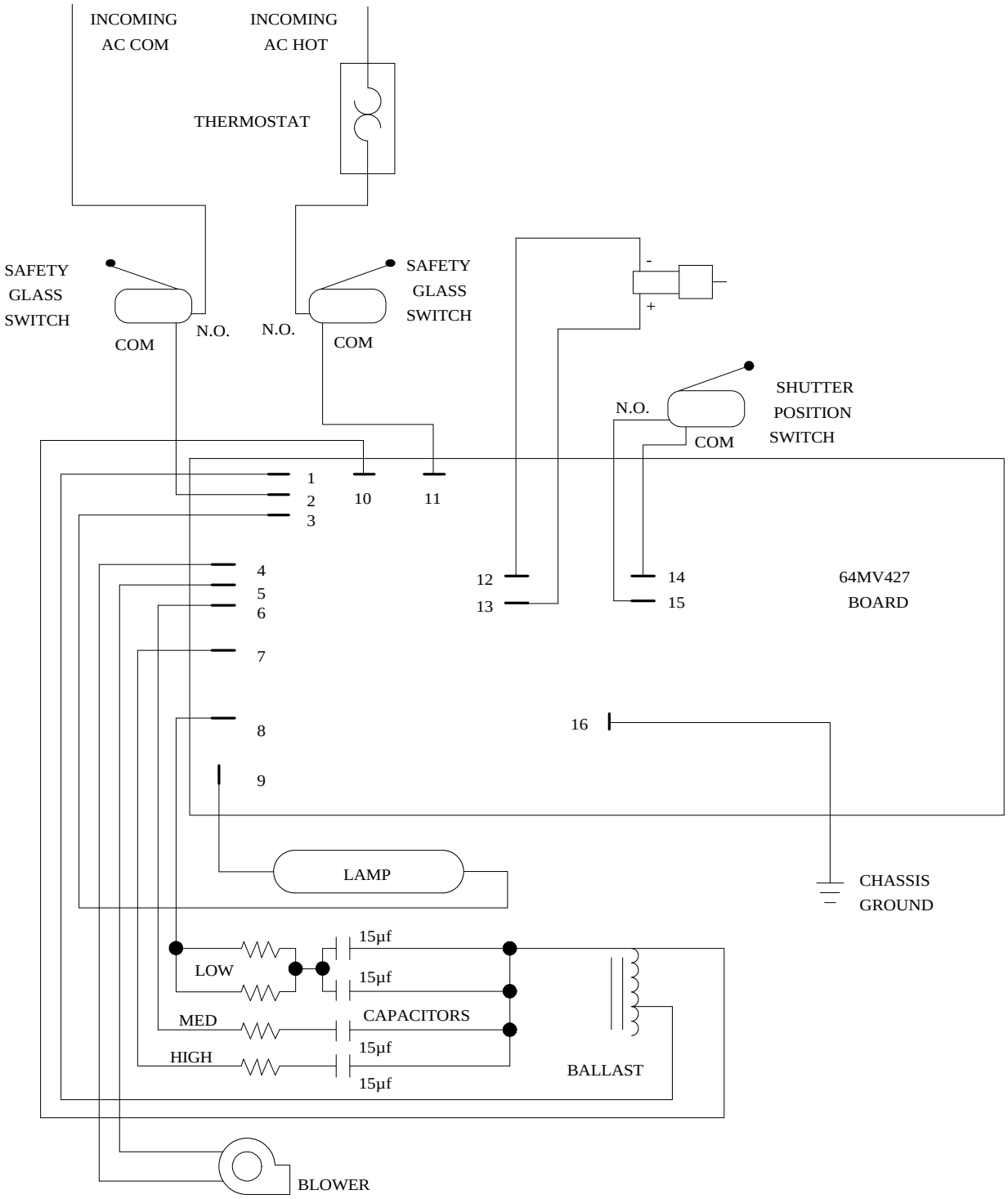


64MV247 Board Layout for AL 9



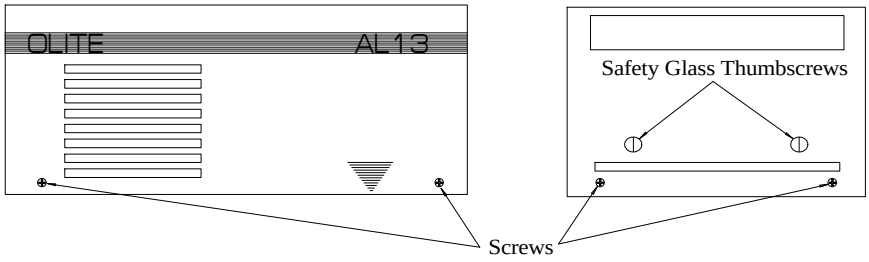
1) Ballast COM
2) AC COM
3) Lamp COM
4) Blower COM
5) Blower HOT
6) Medium Cap Input, brown
7) High Cap Input, blue
8) Low Cap Input, yellow
9) Lamp Lead HOT
10) Ballast AC HOT
11) Incoming AC HOT
12) Shutter Motor -
13) Shutter Motor +
14) Shutter Switch -
15) Shutter Switch +
16) Ground
A) Idle Adjustment
B) External Interlock
C) Photocell Din (to integrator)
D) Control Din (to integrator)
E) Overall Photocell adjust
F) Photocell A(high) adjust
G) Photocell B(low) adjust
H) Photocell
DS1) POWER
DS2) BLOWER
DS3) MED POWER
DS4) HIGH POWER
DS5) SHUTTER MOTOR

AL 9 Wiring Diagram



AL 9, AL 13 Cover Removal

- Place the light on its top and remove the hood and filter assembly.
- Place the light on a table with the shutter flat against the table and remove the safety glass. Then remove the two screws from each of the four sides and remove the cover.



Path of Power to the P.C.Board

The power circuit can be easily traced from where the power cord enters the corner of the unit and immediately connects with 2 (two) wire nuts to black (V~ hot) and white (V~ common). The circuit travels through the black wire to the thermostat, then through the safety glass switch and returns as a brown wire to the P.C. Board as incoming V~ (HOT). The V~ common circuit travels through the white wire to the other safety glass switch and returns as a yellow wire to the P.C. Board as incoming V~ common.

Interlock Systems

The internal interlock system serves two purposes. The first is for operator safety by protecting the safety glass. This glass filters short UV radiation and covers the high voltage lamp terminals. This interlock also protects from overheating, by traveling through the thermostat by the reflector. There is also an outlet on the side marked “INTERLOCK”. This external interlock inhibits exposures when installed. It is not, however, related to the internal interlock.

The internal interlock is a loop that travels through the light, passing through two safety glass switches and a thermostat. This interlock is in series with the input power to the P.C. Board. When this interlock is open all power is cut to the P.C. Board.

The first place to check for an opening in the circuit is the glass switches (see Component Layout Diagram for location). If both switches check good, then check the thermostat. This is a closed loop and can be traced with an Ohmmeter with the AL9/AL14 unplugged.

Lamp Voltage

The lamp voltage measurement can provide useful information for lamp striking, lamp output and switching information. The meter used to measure can cause different results. The waveforms are not sinusoidal, so different meters may produce different results.

Here is a chart with typical measurements, (see P.C. Board Layout Diagrams for the location of the test points).

See Shrouding The Lamp before continuing.

Lamp voltage measured from lamp lead common to:				
	Low	Med.	High	Trigger
Low (Yellow)	130	140	150	270
Medium (Brown)	270	140	150	270
High (Blue)	270	270	150	270

Path Of Power To The Lamp

The basic path is incoming line, safety interlock, P.C. Board, ballasts, capacitors, back to the P.C. Board, then to the lamp.

In detail first see Path of Power to the P.C. Board.

Then see P.C. Board Layout, showing ballast power (yellow 120V) and ballast common (yellow COM).

This is the feed to the ballast and should be 120 V~. The ballast then feeds the capacitors with the wire labeled "CAP" (see Capacitors and Level Switching for detailed wiring).

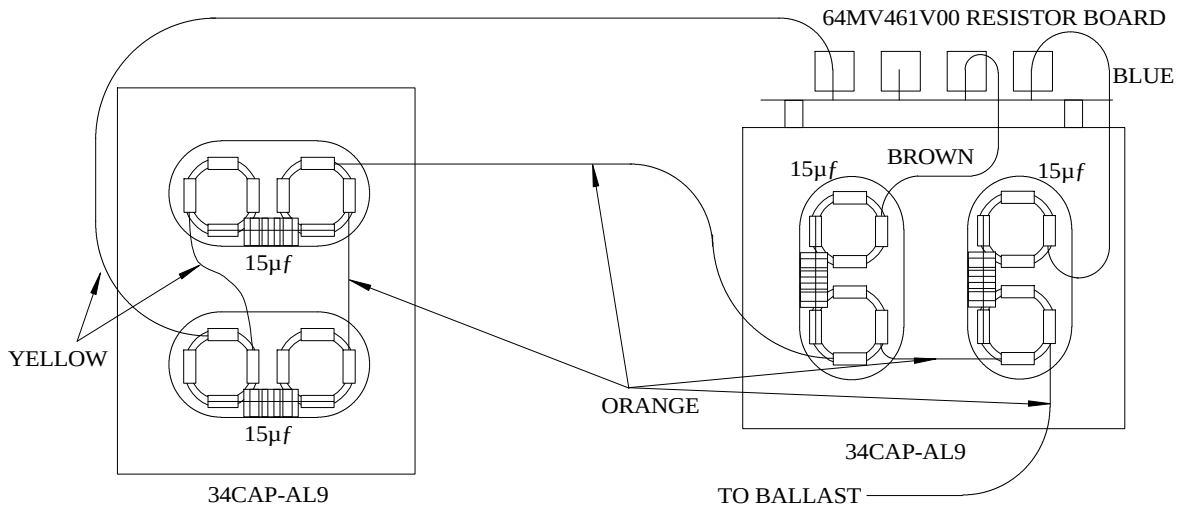
From the capacitors the power feeds back to the P.C. Board on the yellow, brown, and blue wires. The P.C. Board does the electronic switching of the capacitors and sends the power to the lamp.

Capacitors and Level Switching

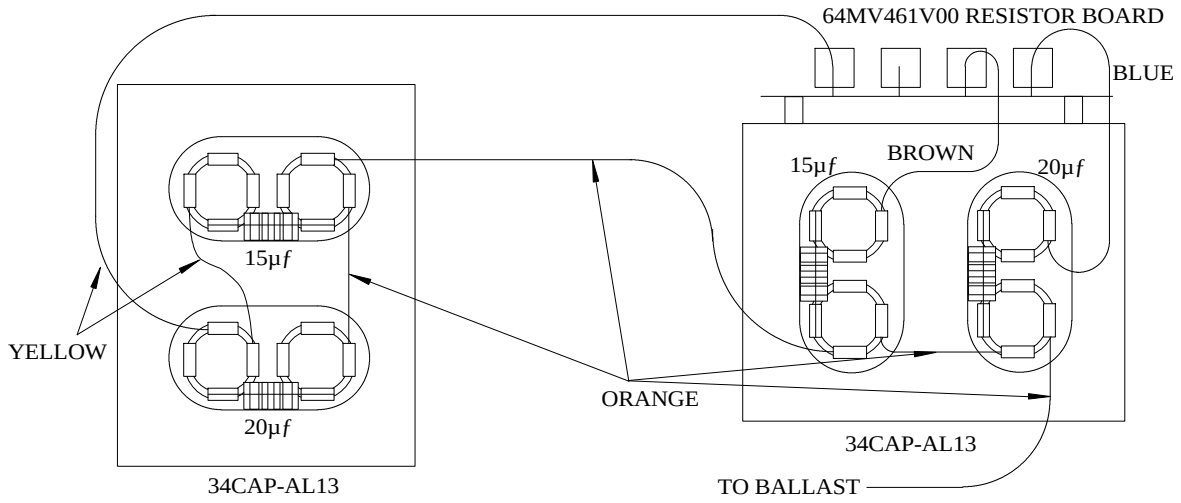
The capacitors pass all the current that flows through the lamp. They are also used to switch power levels. The capacitors are divided into three sections. The unit has two low power (idle) capacitors connected with a yellow wire. There is one medium power capacitor connected with a brown wire. There is one high power capacitor connected with a blue wire. All capacitors have an orange feed wire coming from the ballast.

The low power (idle) capacitors are always in the circuit. The medium power capacitor gets pulled into the circuit for warm-up, medium power exposures, and high power exposures. The high power capacitor gets pulled into the circuit for warm-up and high power exposures.

AL 9, AL 9 Plus Capacitor Wiring



AL 13 Capacitor Wiring



CAUTION See Shrouding The Lamp before continuing.

The capacitors set the operating current of the lamp. If the lamp output has changed rapidly, inspect the capacitors for swelling. The design of the capacitors we use will burn open if it begins to short. A swollen capacitor should be replaced and the unit should be tested to see that the capacitor did not damage the P.C. Board.

To test the unit's ability to switch power levels, make a manual exposure at low power, note the voltage between the lamp lead common and the low yellow (about 130V~, see diagram). Then switch to medium brown (about 140V~, see diagram). Then switch to high power and note the

voltage between the lamp lead common and the high blue (about 150V~, see diagram).

Should one or more of these voltages be about 270V~, the respective capacitor is not being pulled into the circuit and the P.C. Board is most likely at fault. Should the voltage be unchanged from the previous power level, a bad capacitor or bad connection between the capacitor and the P.C. Board is most likely at fault.

Shutter

The shutter is controlled by the P.C. Board with information from a switch below the component chassis to provide position information. During cool-down and exposure, the shutter is open and during warm-up and idle, the shutter is closed. The P.C. Board compares the shutter position with the requested position. The shutter motor will run until the switch position matches. The shutter motor brakes magnetically when it is in the correct position. There is an led on the P.C. Board that lights whenever the shutter motor is being energized (see P.C. BOARD LAYOUT).

Shutter Switch

The switch provides shutter position information to the P.C. Board. This switch is below the component chassis. A failure of the switch can cause the shutter to rotate continuously or erratically. Similar problems may be due to the shutter brake, the idle setting, or the P.C. Board.

The switch contacts close when the shutter is fully open and remains closed until the shutter fully closes. This can be measured on the P.C. Board (see P.C. BOARD LAYOUT). The switch is wired to the normally open contacts and is adjustable. We recommend scribing a line around the switch if replacement is necessary to return to the same position. The switch roller should be centered on the cam and close when the cam pushes the wheel on the switch halfway.

Shutter Motor

The shutter motor is located between the two sets of capacitors. We recommend checking the power and signals from the switch and to the motor coil before removing the motor. The motor operates from 9VDC which comes from the P.C. Board. Should the motor want to travel past its desired location and the shutter switch is operating properly the motor brushes are most likely to be at fault and are replaced as follows.

Changing Shutter Motor Brushes

Should the shutter motor ever need replacement you will need a Phillips screwdriver and a 5/32" Allen wrench.

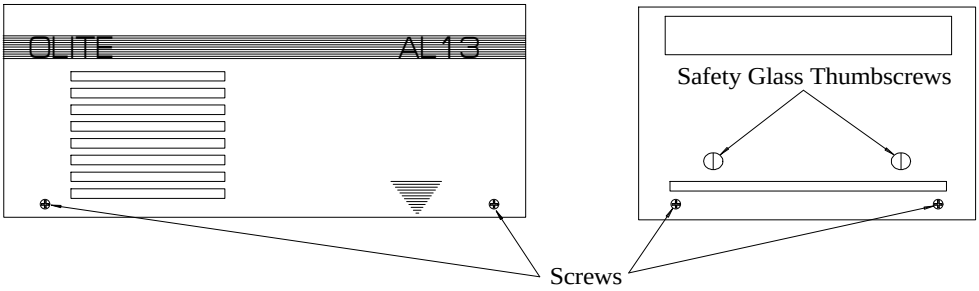
- Remove the safety glass and the cover (see AL 9/AL 13 COVER REMOVAL).
- Remove the two Phillips screws holding the shutter timing cam onto the

motor assembly from underneath the component chassis, swing the timing cam out of the way.

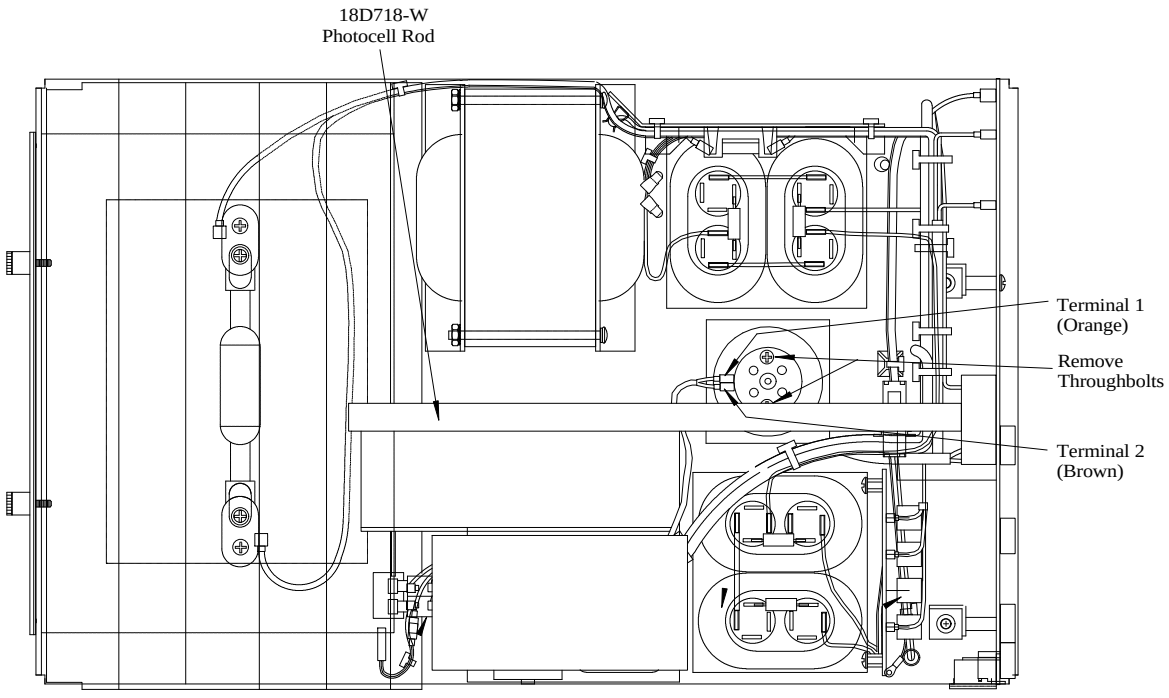
- Remove the four Phillips screws holding the motor to the chassis and pull the motor out.
- Remove the orange and brown wires from the motor (orange from terminal #1 and brown from terminal #2).
- Remove the cam mount from the motor using the 5/32 Allen wrench.
- Install in reverse order.

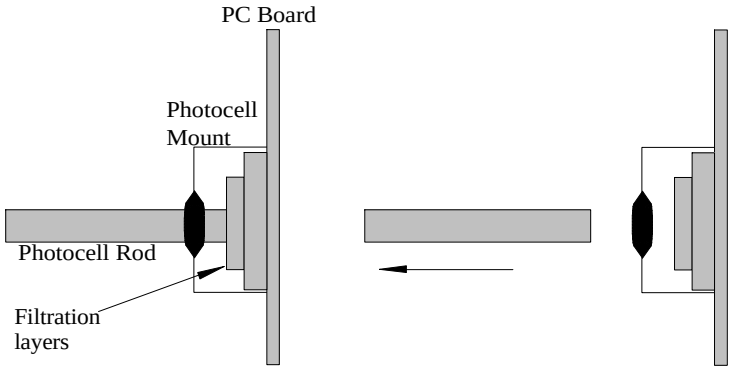
Steps to change shutter motor brushes.

- Place the light on its top and remove the hood and filter assembly.
- Place the light on a table with the shutter flat against the table and remove the two screws from each of the four sides and remove the cover.

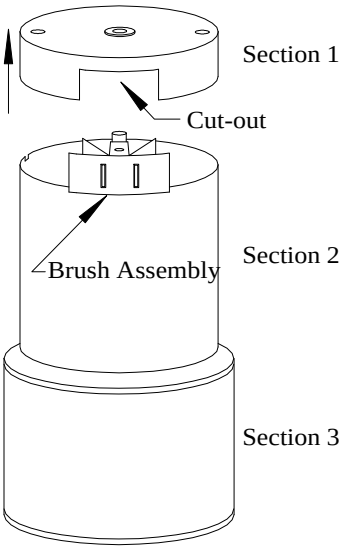


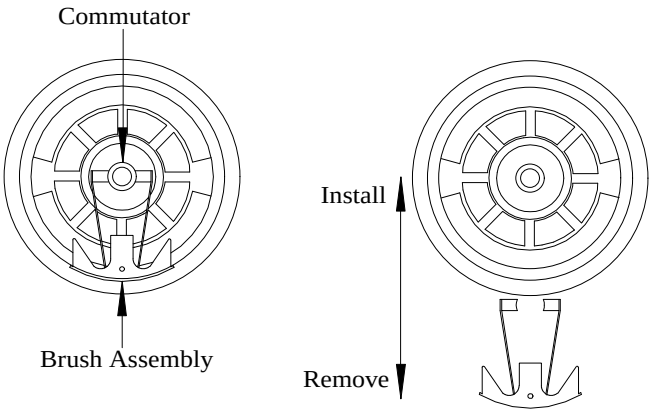
- **(AL 9 and AL 9+ ONLY)** Carefully remove the photocell rod by first pulling the rod away from the printed circuit board until it clears the mounting bracket. Lift the end to clear the top of the printed circuit board and slide the rod out of the reflector. Set the rod in a safe place.





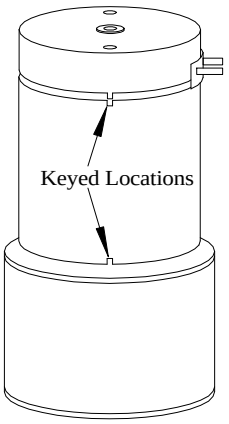
- Locate the shutter motor and remove the orange wire from terminal No. 1 and the brown wire from terminal No. 2. Remove the two Phillips screws from the top section of the motor. Use a knife or razor blade to cut any tape or labels holding section 1 to section 2. Usually they are just terminal labels marked 1 and 2.

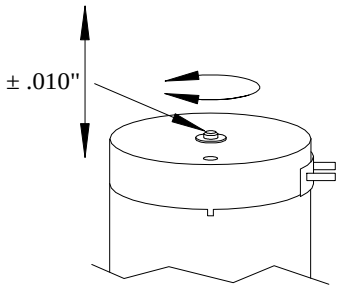




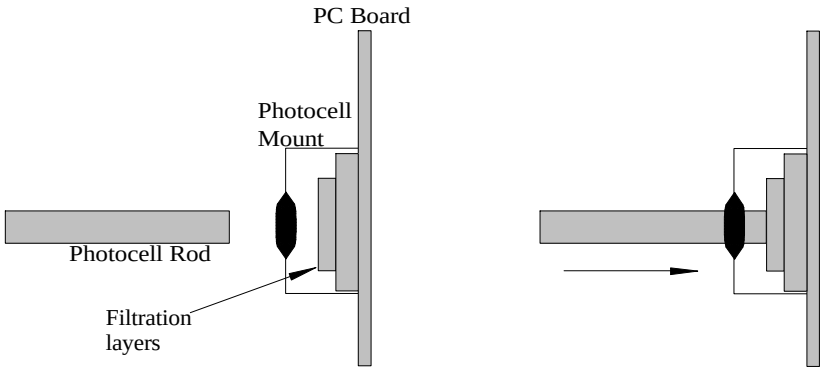
- Apply a downward pressure with your thumbnail on the brush assembly. While keeping the brush assembly on section 2 of the motor, lift off section 1 with a rocking motion.

- Slide brushes off the commutator. Slide new brush assembly onto commutator. Note: Center hole on brush assembly must face up.
- The brush assembly has a shoulder that rests on the motor housing (section 2). The brush assembly is in position when the brushes center over the farthest outside edges of the commutator. Use your thumbnail to keep the brush assembly in place.
- Install section 1 by tilting the cut-out so that it fits in behind the brush assembly. Drop down the rest of the section 1 till it meets section two. Align the key and slots between sections 1 and 2, and 2 and 3. Apply Loctite Threadlock #242 on the first quarter inch of the through bolt threads. Use sparingly. Secure motor assembly using both throughbolts at a torque rate of 5-7 inch pounds.





- Once the through bolts are installed make sure the armature has about .010" of play up and down. Using a pair of needle nose pliers, take hold of the armature, move up and down and turn shaft both directions to be sure it is and the armature moves freely.
- Reconnect the orange wire to terminal No. 1 and the brown wire to terminal No. 2.
- Reinstall photocell rod (AL9 & AL9 PLUS ONLY).



- Reinstall cover on AL9/AL13

Idle Setting

The idle level occurs when the unit is between exposures and when the unit is at low power exposures. The idle setting determines the power and temperature of the lamp while at idle. It also allows for much lower idle power than was ever attainable before.

This lower power level provides a wider light output range, low power consumption, lower heat generation, and increased lamp life. At low power levels, the lamps normally become unstable; if over cooled, they begin to dissipate less energy, which causes them to cool more. This can continue until they extinguish. When lamps become hotter at idle, they become more efficient and dissipate more energy, making them hotter still. This becomes stable, and is commonly done in conventional light sources, but will shorten the life of the lamp and waste energy. We have chosen to servo the cooling, by sensing the lamp condition and adjusting the cooling to regulate the idle temperature.

The idle setting is done at the factory and is rarely necessary in the field. Always check all other causes of problems before changing the setting.

If the lamp becomes too cool during operation, the P.C. Board will sense this level and initiate a warm-up cycle. During warm-up, the shutter will close and will not open until the unit is sufficiently warm. A symptom of this is after an exposure is started, the shutter will open then close again for several seconds before finishing the exposure. This should only happen if the unit is left for a period of time. Successive rapid exposures would not fail, since it takes many minutes for the unit to over cool. The most likely cause of this problem is a defective lamp. This over cooling situation could also be due to a bad idle capacitor, which would not allow sufficient energy to the lamp to keep it warm.

CAUTION See Shrouding The Lamp before continuing.

After checking the capacitors, mark the factory setting of the trimpot that is located on the back side of the P.C. Board, in the upper left hand corner (see P.C. Board Layout). The trimpot sets the lamp idle power level. Turning the trimpot counterclockwise will first slow the lamp blower. As the lamp reaches the new idle setting, the blower will speed up to hold the new level. Setting with a meter is done be measuring the lamp voltage on the P.C. Board lamp lead hot and lamp lead common (see P.C. Board Layout). The idle setting is 130V~. The voltage will increase with a counterclockwise adjustment and decrease with a clockwise adjustment. This voltage change is a secondary effect, after the lamp has responded to the change in cooling. The changes should be done in small increments, waiting 60 seconds between each adjustment before taking the next reading.

The idle setting affects the power that the lamp attains on warm-up cycle, before switching to idle and the idle temperature of the lamp. If the setting is too high (too far counterclockwise), the unit will run at high power with no cooling, until the thermostat switches the unit off. The

idle temperature of the lamp affects its life and reliability. If the idle setting is too low (too far clockwise), the lamp will be slow to come to power for exposures, and the unit may initiate a warm-up cycle. For these reasons, please take care when making this adjustment and check all other problems first.

Blower

The lamp blower is controlled by the P.C. board to provide the correct cooling to the lamp. During warm-up the blower is off. At idle and during low and medium power exposures the blower will vary in speed. At high power exposure and during cool-down, the blower runs at full speed.

A symptom of a defective blower would be: after the light is on for a short period of time, the lamp extinguishes and requires 2 to 4 minutes to restart. The heat causes the thermostat to open (see Interlock System).

To test the blower, turn the light on and then off. This will put the light source into a forced cool-down cycle. During the cool-down cycle, place a piece of paper over the intake vent located on the opposite side of the light from where the control cables enter. If the paper does not get pulled to the vent the blower is suspect.

To replace the blower see COVER REMOVAL.

Blown Fuse

The P.C. board drives several circuits: THE BLOWER, SHUTTER MOTOR, and the SHUTTER POSITION SWITCH. To find the cause of a blown fuse unplug the light and remove the cover (see Cover Removal). Disconnect the blower, shutter motor, and the shutter position switch (see P.C. Board Layout).

Plug the unit in and turn on the power for 10 seconds. If the fuse blows, the problem is the P.C. board. If not, unplug the light and reconnect the shutter motor wires. Plug in the unit and turn it on, the shutter should now operate. If the fuse blows, the problem is in the shutter motor or wiring to the motor. Repeat these steps with the shutter position switch and the blower.

Photocell

The photocell is located on the P.C. board. Light is transmitted to the photocell by a glass rod that travels the length of the unit from the reflector. This rod is covered to keep dust from accumulating on it. If it becomes necessary to remove the rod, do so carefully. If the rod gets broken, light will not transmit properly and the photocell will not get enough light in order to operate properly.

There are three adjustments for the photocell, overall photocell, photocell A(high), and photocell B(low)(see P.C. Board Layout). The overall photocell calibration is adjusted at the factory and is rarely necessary in the field. The photocell A and photocell B are coarse adjustments, fine adjustments should be made at the integrator.

Photocell Rod Removal (AL9 Only)

(See Changing Shutter Motor Brushes)

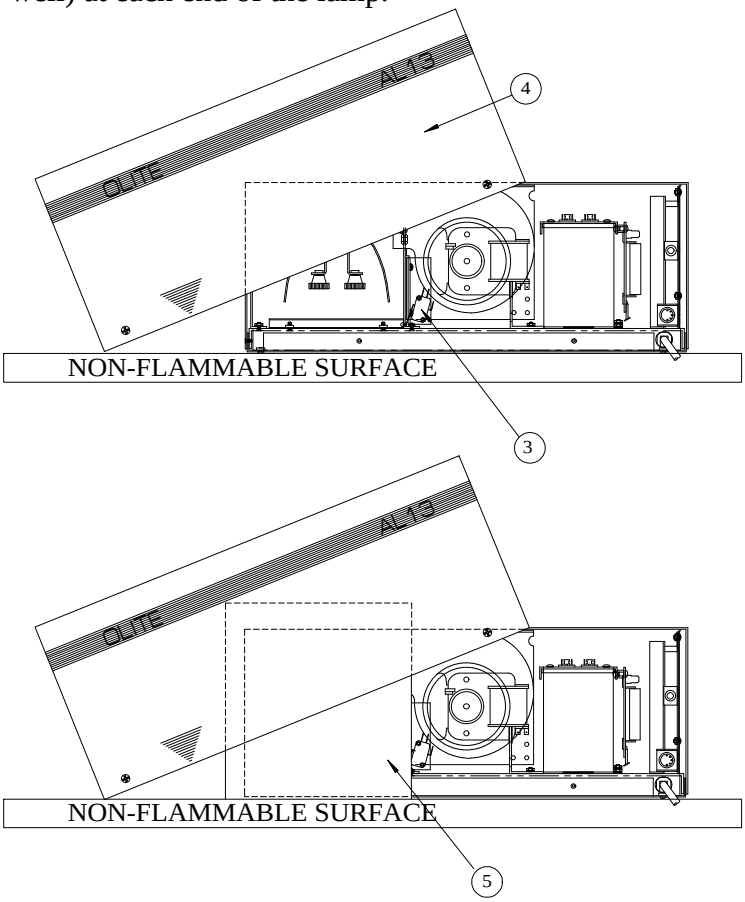
Shrouding The Lamp

CAUTION **YOU MUST SHROUD THE LAMP WHENEVER YOU OPERATE THE AL 9 / AL 13 WITHOUT THE COVER INSTALLED.** Shrouding the lamp will keep you from being exposed to the harmful unfiltered UV, and will also make sure the cooling of the lamp is not effected. Shrouding is done as follows:

- Remove the safety glass and the cover (see COVER REMOVAL).
- Place the AL 9 / AL 13 on a non-flammable surface.

CAUTION **DO NOT PLACE ON WOOD, CARPET, OR ANY SURFACE AFFECTED BY HEAT.**

- Bypass the glass switches by wedging a small screwdriver between the switches and the internal dividing wall.
- Place the cover over the AL 9 / AL 13 about half way from end to end.
- Place a small piece of non-flammable material (a piece of plate material works well) at each end of the lamp.



10. Parts Lists

8kW LAMPHEAD		
62LH83SE-SW	Lamphead 8kW Stdrd Rev SE	1
63D0142B03	8kW Lamp Support Bracket	2
90RF83-C	Reflector Assembly AL 83	1
12D1361	Ladder Chain, # 18-49	1
12D1577	Spring, Idler, Shutter	1
16D0180A00	Harness, Lamphead	1
18D319	Glass, Frosted Diffusion Glass (photocell opening)	1
31MOT06	Motor, V~ Gear Positive Shutter	1
39BLO14	Blower, 50/60 Hz (8kW)	2
55SW02	Shutter Position Switch	1
55SW03	Switch, Glass	1
56THM01	Thermostat, model K	2
63D3669A00	Idler, Arms Assy LT8	1
64MV414-T	Trigger Bd 8kW/10kW	1
62SA83-B	Shutter ass'y 8kW SE	1
11D0210A62	Timing disc LT-1	1
12D1873A62	Air Tube, Drive(Rear)	1
12D1874A62	Air Tube, Front	1
12D2060A07	Spring, shutter AL 83	2
12D3515A00	Ball, bearing	6
12D3550A62	Bushing, Idler Arm	2
43CLP02	NSI Fuse Clip (for thermostat)	2
63D3530A62	Idler Arm, Shutter	2
90GEARKIT	Motor and shutter sprokets	1
AL 85 POWER SUPPLY 8kW 208/240V~		
62CL85	CL85 Power Supply	
16D1045A00	Harness, Beau Plug OEM	1
16D1585	Interlock Harness	1
16D2617B00	POWER CABLE, AL85	1
16D2629A00	HARNESS, 8K-B P/S - MAIN	1
32BAL01	Ballast, AL 15-53	4
32TRC08	Autoformer 208/225/240 V~	1
33RLY04	Relay, Sealed	2
33RLY18	Contactors Relay 50 Amp	1
39BLO03	Blower,Model Ball Bearing	1
52FUH04	Fuse Holder, 3AG/3AB	1
56FUS15	Fuse, 3A 250V 3AG Slow Blow	1
62D1046-85	Capacitor Assembly CL85	1
34CAP02	Cap, 8µƒ 850V~ 60Hz	1
34CAP10-HV	Cap, 10µƒ 1200 V~	1
34CAP12-HV	Cap, 12uF 1200 V~	1
34CAP16-HV	Cap, 16µƒ 1200 V~	2
55SW01	Switch, CW	1
64MV422V00	Resistor board AL53/50,50	1
62D1047	Voltage Selector 60 Hz	1
64MV407V04	Assy UV Lt Ctrl 8K 60Hz	1
AL 84 POWER SUPPLY 8kW 208/240V~		
62CL84	CL84 Power Supply	
16D1045A00	Harness, Beau Plug OEM	1
16D1585	Interlock Harness	1
16D2617A00	POWER CABLE, AL54-8K P/S	1
16D2629A00	HARNESS, 8K-B P/S - MAIN	1

(AL 84 POWER SUPPLY 8kW 208/240V~ Cont.)

32BAL01	Ballast, AL 15-53	4
32TRC08	Autoformer 208/225/240V~	1
33RLY02	Contactor, 2 pole,NO,30A	1
33RLY04	Relay, Sealed	2
39BLO03	Blower,Model Ball Bearing	1
52FUH04	Fuse Holder, 3AG/3AB	1
56FUS15	Fuse, 3A 250V 3AG Slow Blow	1
62D1047	Voltage Selector 60 Hz	1
55SW26	Switch, 3PDT, 250V, 10A	1
64VS409-HA	Voltage Selection Board	1
62D2652A00	ASSEMBLY, CAPACITOR PACK	1
34CAP10-HV	CAPACITOR 10µƒ 1200V~	1
34CAP12-HV	Capacitor 12µƒ 1200V~	2
34CAP16-HV	Capacitor 16µƒ 1200V~	1
64MV422-84	Resistor PCBA, AL 84	1
64MV407V04	Assy UV Lt Ctrl 8K 60Hz	1
AL 84 POWER SUPPLY 8kW 480V~		
62CL84-480	CL84 480V~ Power Supply	
16D1045A00	Harness, Beau Plug OEM	1
16D1585	Interlock Harness	1
16D2617A00	POWER CABLE, AL54-8K P/S	1
16D2629A00	HARNESS, 8K-B P/S - MAIN	1
32BAL01	Ballast, AL 15-53	4
33RLY02	Contactor, 2 pole,NO,30A	1
33RLY04	Relay, Sealed	2
39BLO03	Blower,Model Ball Bearing	1
52FUH04	Fuse Holder, 3AG/3AB	1
54PWR05	Pwr Crd 18/3 SJT 12' 5-15	1
56FUS15	Fuse, 3A 250V 3AG Slow Blow	1
62D3533A00	Assy, Capacitor 60H,480V~	1
34CAP10-HV	CAPACITOR 10µƒ 1200 V~	2
34CAP12-HV	Capacitor 12µƒ 1200 V~	2
64MV422-84	Resistor PCBA, AL 84	1
64MV407V04	Assy UV Lt Ctrl 8K 60Hz	1
AL 83 POWER SUPPLY 8kW 208/240V~		
62CL83-BASE	CL83 Power Supply Base Kit	1
16D0278A00	Harness, 2kW/5kW Switch	1
16D0334A18	Cable, Interconnect, Plug	1
16D2142A06	Harness AL 83 Power 6 feet	1
32BAL01	Ballast, AL 15-53	4
39BLO03	Blower,Model Ball Bearing	1
44LEG03	Leveling Glide, Non-Skid-	4
52FUH04	Fuse Holder, 3AG/3AB	1
55SW01	Switch, CW	4
56FUS15	Fuse, 3A 250V~ 3AG Slow Blow	1
62D127-83	AL 83 Capacitor Assembly	1
34CAP02	Capacitor 8µƒ 850V~	1
34CAP10-HV	Capacitor 10µƒ 1200 V~	1
34CAP12-HV	Capacitor 12µƒ 1200 V~	1
34CAP16-HV	Capacitor 16µƒ 1200 V~	2
55SW01	Switch, CW	1
64MV422-83	Resistor Board AL 83	1
62D331A	Voltage Selector Assembly	1
64VS409	PCB, Voltage Selection Board	1
55SW26	Switch, 3PDT, 250V~, 10A	1

(AL 83 POWER SUPPLY 8kW 208/240V~ Cont.)

62D503-83	AL 83 Component Bracket Assembly	1
16D2636A00	HARNESS, 8kW P/S - MAIN	1
32TRC08	Autoformer 208/225/240 V~	1
33RLY04	Relay, Sealed	2
33RLY18	Contactors Relay 50 Amp	1
52TS18	Terminal Strip 18 position	1
64MV407V04	Assy UV Lt Ctrl 8kW 60Hz	1
6kW LAMPHEAD		
62LH83SE-SW	Lamphead 8kW Stdrd Rev SE	1
63D0142B03	8kW Lamp Support Bracket	2
90RF83-C	Reflector Assembly AL 83	1
12D1361	Ladder Chain, # 18-49	1
12D1577	Spring, Idler, Shutter	1
16D0180A00	Harness, Lamphead	1
18D319	Glass, Frosted Diffusion Glass (photocell opening)	1
31MOT06	Motor, V~ Gear Positive Shutter	1
39BLO14	Blower, 50/60 Hz (8kW)	2
55SW02	Shutter Position Switch	1
55SW03	Switch, Glass	1
56THM01	Thermostat, model K	2
63D3669A00	Idler, Arms Assy LT8	1
64MV414-T	Trigger Bd 8kW/10kW	1
62SA83-B	Shutter ass'y 8kW SE	1
11D0210A62	Timing disc LT-1	1
12D1873A62	Air Tube, Drive(Rear)	1
12D1874A62	Air Tube, Front	1
12D2060A07	Spring, shutter AL 83	2
12D3515A00	Ball, bearing	6
12D3550A62	Bushing, Idler Arm	2
43CLP02	NSI Fuse Clip (for thermostat)	2
63D3530A62	Idler Arm, Shutter	2
90GEARKIT	Motor and shutter sprokets	1
AL56 POWER SUPPLY 6kW 208/240V~		
62CL56	CL56 Power Supply	1
16D0277A00	Harness, 5K Power Supply	1
16D1045A00	Harness, Beau Plug OEM	1
16D1585	Interlock Harness	1
32BAL01	Ballast, AL 15-53	4
32TRC08	Autoformer 208/225/240V~	1
33RLY02	Contactor, 2 pole,NO,30A	1
33RLY04	Relay, Sealed	2
39BLO03	Blower,Model Ball Bearing	1
52FUH04	Fuse Holder, 3AG/3AB	1
54PWR01	Power Cable for AL50/53	1
55SW01	Switch, CW	4
56FUS15	Fuse, 3A 250V~ 3AG Slow Blow	1
62D1047	Voltage Selector 60 Hz	1
55SW26	Switch, 3PDT, 250V, 10A	1
64VS409-HA	Voltage Selection Board	1
62D2726A00	Assembly, Capacitor Pack	1
34CAP10-HV	CAPACITOR 10µƒ 1200V~	1
34CAP16-HV	Capacitor 16µƒ 1200V~	3
64MV422V02	Resistor board AL 84	1
64MV407V04	Assy UV Lt Ctrl 8K 60Hz	1

AL56 POWER SUPPLY 6kW 480V~

16D0277A00	Harness, 5K Power Supply	1
16D1045A00	Harness, Beau Plug OEM	1
16D1585	Interlock Harness	1
32BAL01	Ballast, AL 15-53	4
33RLY02	Contactor, 2 pole,NO,30A	1
33RLY04	Relay, Sealed	2
39BLO03	Blower,Model Ball Bearing	1
54PWR01	Power Cable for AL50/53	1
54PWR05	Pwr Crd 18/3 SJT 12' 5-15	1
62D3083A00	Assy, Capacitor Pack-6K/480V~	1
34CAP10-HV	CAPACITOR 10µƒ 1200V~	2
34CAP16-HV	Capacitor 16µƒ 1200V~	2
64MV422-84	Resistor PCBA, AL 84	1
64MV407V04	Assy UV Lt Ctrl 8K 60Hz	1

5kW, 3.5kW, 2.3kW and old style (AL25, AL25-2) 2kW LAMPHEAD

62LHSE-5K	2.3kW, 3.5kW, 5kW and old style 2kW Lamp Head	1
12D1361	Ladder Chain, # 18-49	1
12D1577	Spring, Idler-5kW Shutter	1
16D0180A00	Harness, Lamphead 5kW	1
18D319	Glass, 5kW Frosted Diffusion Glass (photocell opening)	1
31MOT06	Motor, V~ Gear Positive Shutter	1
39BLO03	Blower,Model Ball Bearing	2
55SW02	Shutter Position Switch	1
55SW03	Switch, Glass, 2 Pos Blk	1
56THM01	Thermostat, model K	2
62SASE	Shutter ass'y 5kW SE	1
11D0210A62	Timing disc LT-1	1
12D2060A07	Spring, shutter AL 83	2
12D3515A00	Ball, bearing	6
12D3550A62	Bushing, Idler Arm	2
12D3950A62	AL 25-53 Air tube LT-1	2
43CLP02	NSI Fuse Clip (for thermostat)	2
63D3530A62	Idler Arm, Shutter	2.
63D3669B00	Idler arm ass'y LT 1	1
64TR408	Assembled Trigger PCB	1
90GEARKIT	Motor and shutter sprokets	1

AL 54/55 POWER SUPPLY 5kW 208/240V~

16D0277A00	Harness, 5K Power Supply	1
16D1045A00	Harness, Beau Plug OEM	1
16D1585	Interlock Harness	1
32BAL01	Ballast, AL 15-53	4
32TRC01	Autoformer 208-240 V~	1
33RLY02	Contactor, 2 pole,NO,30A	1
33RLY04	Relay, Sealed	2
39BLO03	Blower,Model Ball Bearing	1
56FUS15	Fuse, 3A 250V 3AG Slow Blow	1
62D1047	Voltage Selector 60 Hz	1
55SW26	Switch, 3PDT, 250V, 10A	1
64VS409-HA	Voltage Selection Board	1
62D1048	Capacitor Assembly 60 Hz	1
34CAP12-HV	Capacitor 12µƒ 1200 V~	2
34CAP16-HV	Capacitor 162µƒ 1200 V~	2
55SW01	Switch, CW	1
64MV422V00	Resistor board AL53/50	1
64MV407V03	Assy UV Lt Ctrl 5K 60Hz	1

AL 54-480/55-480 POWER SUPPLY 5kW 480V~

16D0277A00	Harness, 5K Power Supply	1
16D1045A00	Harness, Beau Plug OEM	1
16D1585	Interlock Harness	1
32BAL01	Ballast, AL 15-53	4
33RLY02	Contactor, 2 pole,NO,30A	1
33RLY04	Relay, Sealed	2
39BLO03	Blower,Model Ball Bearing	1
54PWR01	Power Cable for AL50/53	1
54PWR05	Pwr Crd 18/3 SJT 12' 5-15	1
62D3654A00	Assy, Capacitor AL54-480V~	1
34CAP10-HV	CAPACITOR 10µƒ 1200 V~	1
34CAP12-HV	Capacitor 12µƒ 1200 V~	3
64MV422-84	Resistor PCBA, AL 84	1
64MV407V03	Assy UV Lt Ctrl 5K 60Hz	1

AL 53 POWER SUPPLY 5kW 208/240V~

62CL53-BASE	CL53 Power Supply	1
16D0278A00	Harness, 2kW/5kW Switch	1
16D0334A18	Cable, Interconnect, Plug	1
32BAL01	Ballast, AL 15-53	4
39BLO03	Blower,Model Ball Bearing	1
52FUH04	Fuse Holder, 3AG/3AB	1
54PWR01	Power Cable for AL 50/53	1
55SW01	Switch, CW	4
56FUS15	Fuse, 3A 250V~ 3AG Slow Bl	1
62D127	Capacitor Assy AL 50/53	1
34CAP12-HV	Capacitor 12µƒ 1200 V~	2
34CAP16-HV	Capacitor 16µƒ 1200 V~	2
55SW01	Switch, CW	1
64MV422V00	Resistor board AL 53/50,50	1
62D331A	Voltage Selector Assembly	1
64VS409	PCB, Voltage Selection Board	1
55SW26	Switch, 3PDT, 250V~, 10A	1
62D503	Component Brkt AL 53/AL 5	1
32TRC01	Autoformer 208-240 V~	1
33RLY02	Contactor, 2 pole,NO,30	1
33RLY04	Relay, Sealed	2
52TS18	Terminal Strip 18 position	1
64MV407V03	Assy UV Lt Ctrl 5kW 60Hz	1

AL 35 POWER SUPPLY 3.5kW 208/240V~

62CL35-BASE	CL35 Power Supply	1
16D0278A00	Harness, 2kW/5kW Switch	1
16D0334A18	Cable, Interconnect, Plug	1
32BAL01	Ballast, AL 15-53	2
39BLO03	Blower,Model Ball Bearing	1
44LEG03	Leveling Glide, Non-Skid	4
52FUH04	Fuse Holder, 3AG/3AB	1
54PWR01	Power Cable for AL 50/53	1
55SW01	Switch, CW	4
56FUS15	Fuse, 3A 250V~ 3AG Slow Blow	1
62D127-35	AL 35 Capacitor Assembly	1
34CAP02	Cap, 8µƒ 850V~ 60Hz	1
34CAP12-HV	Capacitor 12µƒ 1200 V~	1
34CAP16-HV	Capacitor 16µƒ 1200 V~	2
55SW01	Switch, CW	1
64MV422V00	Resistor board AL 53/50,50	1

62D331A	Voltage Selector Assembly	1
64VS409	PCB, Voltage Selection Board	1
55SW26	Switch, 3PDT, 250V~, 10A	1
62D536	Component Brkt 2kW & 5kW	1
16D3171A00	Harness, Power Supply Main	1
32TRC01	Autoformer 208-240 V~	1
33RLY02	Contactor, 2 pole,NO,30A	1
33RLY04	Relay, Sealed	2
64MV407V03	Assy UV Lt Ctrl 5kW 60Hz	1

AL 25-2 POWER SUPPLY 2kW 208/240V~

62CL25-2

16D0278A00	Harness, 2kW/5kW Switch	1
16D0334A18	Cable, Interconnect, Plug	1
32BAL01	Ballast, AL 15-53	2
39BLO03	Blower,Model Ball Bearing	1
54PWR04	Power Cable for AL 25	1
55SW01	Switch, CW	4
62D126	Capacitor Assy AL 50/53	1
34CAP12-HV	Capacitor 12µƒ 1200 V~	2
64MV422-25	Resistor board AL 53/50,50	1
62D331A	Voltage Selector Assembly	1
64VS409	PCB, Voltage Selection Board	1
55SW26	Switch, 3PDT, 250V~, 10A	1
32TRC01	Autoformer 208-240 V~	1
33RLY02	Contactor, 2 pole,NO,30	1
33RLY04	Relay, Sealed	1
52TS18	Terminal Strip 18 position	1
64MV407V03	Assy UV Lt Ctrl 5kW 60Hz	1

AL 25 POWER SUPPLY 2kW 120V~

62CL25

16D0278A00	Harness, 2kW/5kW Switch	1
16D0334A18	Cable, Interconnect, Plug	1
32BAL01	Ballast, AL 15-53	2
39BLO03	Blower,Model Ball Bearing	1
54PWR02	Power Cable for AL 25	1
55SW01	Switch, CW	4
62D126	Capacitor Assy AL 50/53	1
34CAP12-HV	Capacitor 12µƒ 1200 V~	2
64MV422-25	Resistor board AL 25	1
62D331A	Voltage Selector Assembly	1
64VS409	PCB, Voltage Selection Board	1
55SW26	Switch, 3PDT, 250V~, 10A	1
33RLY02	Contactor, 2 pole,NO,30A	1
33RLY04	Relay, Sealed	1
52TS18	Terminal Strip 18 position	1
64MV407V03	Assy UV Lt Ctrl 5kW 60Hz	1

AL 23 POWER SUPPLY 2.3kW 208/240V~

62CL23

16D0334A18	Cable, Interconnect, Plug	1
32BAL01	Ballast, AL 15-53	1
32TRC01	Autoformer 208-240 V~	1
44LEG03	Leveling Glide, Non-Skid	4
54PWR04	Pwr Crd 14/3 SJT 6' 6-15P	1
62D137-1	Center Bracket AL 18/19	1
16D1723A00	Assy, Harness, CL19 Main	1

(AL 35 POWER SUPPLY 3.5kW 208/240V~ Cont.)

33RLY08	Relay, Power DPST-NO	3
62BLO15	Fan, Power Supply	1
62D138-6	Front Panel AL 23	1
16D1724	Assy, Harness, CL19	1
53JKP01-1	Washer Phono Jack 5kW	1
55SW01	Switch, CW	4
62D2753A00	Assembly, Capacitor Pack	1
34CAP12-P	Cap, 12µƒ 660 V~	3
34CAP20	Capacitor, Dual 9+3µƒ,660	2
64MV407V03	Assy UV Lt Ctrl 5kW 60Hz	1

AL 20, AL 19, AL 15 LAMPHEAD

62LH19K	AL 20, AL 19 Lamp Head	1
12D614	Shutter Motor Coupling, AL 15/19	1
16D0271A16	Cable, Interconnect, AL 15	1
18D319	Glass, 5kW Frosted Diffusion Glass (photocell opening)	1
31MOT06	Motor, V~ Gear Positive Shutter	1
39BLO03	Blower,Model Ball Bearing	2
52TS10	Terminal Strip 10 position	1
55SW02	Switch, Timing - Roller	1
55SW04	Switch,Micro, 1.2" Lever	1
62RA-1	Reflector Assembley AL 18	1
63B2282A00	Shutter Assembly for AL 15	1
64TR408	Assembled Trigger PCB	1

AL 20 POWER SUPPLY 2kW 208/240V~

62CL20	AL 20 2kW Power Supply	1
32BAL01	Ballast, AL 15-53	1
32TRC01	Autoformer 208-240 V~	1
44LEG03	Leveling Glide, Non-Skid	4
54PWR04	Pwr Crd 14/3 SJT 6' 6-15P	1
62D137-1	Center Bracket AL 18/19	1
16D1723A00	Assy, Harness, CL19 Main	1
33RLY08	Relay, Power DPST-NO	3
62BLO15	Fan, Power Supply	1
62D138-4	Front Panel Assy AL 20	1
16D1724	Assy, Harness, CL19	1
53JKP01-1	Washer Phono Jack 5kW	1
55SW01	Switch, CW	4
62D139-3A	Assembly,Capcitor AL 19 60	1
34CAP10-P	Cap,10µƒ 660 V~	3
34CAP20	Capacitor, Dual 9+3µƒ,660	1
55SW01	Switch, CW	1
64MV407V03	Assy UV Lt Ctrl 5kW 60Hz	1

AL 19 POWER SUPPLY 1.9kW 120V~

62CL19	AL 19 1.9kW Power Supply	1
16D1767A00	Assembly, Line Cord OL 19	1
32BAL01	Ballast, AL 15-53	1
44LEG03	Leveling Glide, Non-Skid	4
62D137-1	Center Bracket AL 18/19	1
16D1723A00	Assy, Harness, CL19 Main	1
33RLY08	Relay, Power DPST-NO	3
62BLO15	Fan, Power Supply	1
62D139-3A	Assembly,Capcitor AL 19 60	1
34CAP10-P	Cap,10µƒ 660 V~	3
34CAP20	Capacitor, Dual 9+3µƒ,660	1
55SW01	Switch, CW	1
64MV407V03	Assy UV Lt Ctrl 5kW 60Hz	1

AL 15 POWER SUPPLY 1.5kW 120V~

62CL15	AL 15 1.5kW Power Supply	1
32BAL01	Ballast, AL 15-53	1
44LEG03	Leveling Glide, Non-Skid	4
54PWR06	Pwr Crd 16/3 SJT 6' 5-15P	1
62D137	Center Bracket Assy AL 15	1
16D0633A00	Harness, Pwr AL 15	1
33RLY08	Relay, Power DPST-NO	2
62BLO15	Fan, Power Supply	1
62D138	Front pannel assmb, AL 15	1
53JKP01-1	Washer Phono Jack 5kW	1
55SW01	Switch, CW	4
62D139	AL 15 Capacitor Assy 4 Pk	1
34CAP17	Cap,16µƒ 550V~ 60 Hz	4
64MV407V03	Assy UV Lt Ctrl 5kW 60Hz	1

AL 13 LAMPHEAD/POWER SUPPLY 1kW 120V~

62D2089A02	AL 13 Base Assy.	1
16D1492A12	Assembly, Power Cord	1
16D2110A00	Wire, Harness AL 13	1
31MOT11	Motor,AL13/14	1
32BAL08	Ballast for AL9/13	1
34CAP15-S	Cap, 15µƒ 400V~	2
34CAP18-S	Cap, V~, 20µƒ 400V~	2
39BLO03	Blower,Model Ball Bearing	1
43CLP02	NSI Fuse Clip	2
55SW02	Switch, Timing - Roller	2
55SW12	Switch, AL 9	2
56THM03	Thermostat, 90^C	1
62D969	AL 13/14 Link Assembly	1
63D0142B02	AL 13/14 Lamp Support Assy.	2
64MV427C2-T	AL 13/15 PCBA	1
64MV461V00	Assy,Resistor PCB AL13/14	1

AL 13 LAMPHEAD/POWER SUPPLY 1kW 220V~

62D2089A05	AL 13-2 Base Assy.	1
16D2110B00	Wire Harness, AL 13-2	1
31MOT11	Motor,AL13/14	1
32BAL09	Ballast 60 Hz for AL13-2	1
34CAP15-S	Cap, 15µƒ +-6% 400V~	1
34CAP18-S	Cap, V~, 20µƒ +-6%, 400V~	3
54CAB12	Cable,International -16/3	6ft.
55SW02	Switch, Timing - Roller	2
55SW12	Switch, AL 13-2	2
56FUS04	Fuse, 5A/250V~ Slow Blow 3AG	1
56THM03	Thermostat, 90^C (+/-) 10	2
62D2483A00	Blower, 220V~	1
63D0142B02	AL 13/14 Lamp Support Assy.	2
64MV427C2-50	AL13-2 PCB	1
64MV461V00	Assy,Resistor PCB AL13/14	1

AL 9 LAMPHEAD/POWER SUPPLY .9kW 120V~

AL 9/13	AL 9/13 900W Power Supply/Lamphead	
11D0750A03	AL13/14 Glass Tray	1
16D2172A00	Harness, Swtch, AL9	1
31MOT11	Motor,AL13/14	1
39BLO03	Blower,Model Ball Bearing	1
55SW02	Switch, Timing - Roller	1
64MV427-PLUS	AL 9-PLUS Control Board	1
64MV461V00	Assy,Resistor PCB AL13/14	1

11. Warranty

OLEC

Limited Warranty

OLEC equipment is warranted against defects in material for ONE (1) Year from date of purchase. Faulty parts will be repaired, replaced, or purchase price refunded at OLEC's option, for the original Buyer, provided the parts have been replaced by authorized personnel and are returned prepaid to the OLEC factory in Irvine, CA. Shipment must be accompanied by proof of purchase and the Dealer/Distributor name.

This Warranty applies only to equipment which was installed and used according to instructions and in the way it was intended to be used by the manufacturer. Unauthorized repairs, use of non-OLEC parts and lamps, modification, or Serial Numbers that have been removed or defaced, void this Warranty. Glass parts are not included in this Warranty. Lamps are covered according to the Warranty below.

The OLEC Corporation and/or the Seller shall not be liable for any loss, damage or injury arising out of the improper use of, the failure of, or the inability to use the equipment. It is the Buyer's responsibility to ascertain the suitability of the equipment for the application. The Buyer assumes all risk and responsibility for the proper installation, for reading the Instruction Manual and retaining it with the equipment for the safe use of the OLEC product. All operators must be made familiar with the proper use and safe operation upon installation and periodically thereafter.

No one is authorized to assume any obligation, either on behalf of the OLEC Corporation or the Seller, which is not in accordance with the above.

Lamp Warranty

Should any original OLITE Lamp fail prematurely when used in OLEC lights, it should be returned promptly to OLEC, prepaid. It should be accompanied by proof of purchase, explanation of the type of failure incurred, and the approximate useful life of the lamp prior to failure. If it is determined by OLEC that the failure or shortened life has been caused by faulty material or workmanship, full or partial replacement will be extended to the Buyer.

IMPORTANT: The use of any lamp, other than those purchased or approved by OLEC will void this Warranty.

All Warranty Service should be handled through the Distributor through whom the equipment was purchased.

Corporation

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