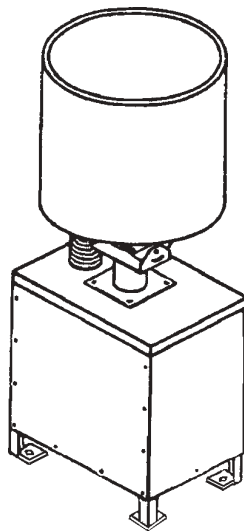


SKY-TRACKER PROMOTIONAL SEARCHLIGHTS NON-MOTORIZED SEARCHLIGHT SKY-LIGHT Model SLX-1 **INSTRUCTION MANUAL**

Rev. October 2003



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NOTICE

PATENT POSITION

The Sky-Light is a non-motorized, high-intensity, single head searchlight system, which was originated by Sky-Tracker of America, Inc. and is proprietary to Strong Entertainment Lighting/Ballantyne of Omaha, Inc.

Patents, owned by Sky-Tracker or Ballantyne of Omaha are either issued or pending in this and related concepts.

TRADEMARK

The name, "Sky-Light" is a trademark owned by Ballantyne of Omaha, and has been registered with the U.S. Patent Office.

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1.0 INTRODUCTION

The Sky-Light is an original proprietary lighting system developed specifically for the display advertising industry and related technologies. Each unit is designed with highly reliable mechanical, electrical and optical components to insure extended, trouble-free performance.

An outgrowth from space age and military advanced technology applications, the Sky-Light provides an easily transported base unit for the mounting and control of high intensity searchlight(s). The beams can be seen for miles in every direction, pinpointing the location of the attraction.

Each light combines a Xenon plasma arc light source with a precision electroformed metal reflector to produce a collimated beam of white light (virtually identical to sunlight; color temperature of 5600° Kelvin).

1.1 MODEL DESIGNATION

Sky-Lights are available in single-beam models in two intensity levels. Power requirements vary with model designation (also see section 3.1). The models available and performance characteristics are as follows:

2.0 SAFETY

The concept of achieving maximum safety through knowledge and understanding is basic to Sky-Tracker/Strong Entertainment Lighting. Whether applicable to its own personnel, those of the dealer, representative, operator, servicing agency or to any member of the general public who may be exposed to or associated with the operation of a Sky-Tracker/Strong Entertainment Lighting product.

| <u>MODEL</u> | <u>NUMBER OF BEAMS</u> | <u>WATTS PER LAMP</u> | <u>CANDLE POWER PER BEAM</u> |
|--------------|------------------------|-----------------------|------------------------------|
| SLX-1 – 2000 | 1 | 2000 | 208 MILLION |
| SLX-1 – 4000 | 1 | 4000 | 332 MILLION |

NOTE: The components that differ between the models are identified in the sections that follow.

Safety features and concepts are designed into every Sky-Tracker/Strong Entertainment Lighting product and component regardless of whether its function is mechanical, electrical, or optical. Since Sky-Tracker/Strong Entertainment Lighting has no control over the manner in which its products are installed, operated, maintained, or utilized after the product leaves the manufacturing facility, it can not be held responsible for any injuries resulting from improper installation, use, inadequate maintenance, or any other condition beyond its control.

It is the intent of this manual to call to the attention of the owner, operator, and service technician, any and all hazardous areas or conditions which could lead to operational problems or injury and to outline proper and recommended procedures to prevent any such occurrence.

Throughout this manual, the following nomenclature will be utilized to call to the attention of the reader any potential hazards related to operation or maintenance.

CAUTION

The word **CAUTION** is utilized (preceding certain sections in this manual) to call attention to an area of particular importance, where failure to follow the specified Sky-Tracker/Strong Entertainment Lighting procedure may result in improper operation of the device, impair the effectiveness or utility of the device, cause a shortened effective lifetime of components, or in any way lead to premature or ultimate failure of the device to perform to its original design standards and expectations.

The normal warranty will be voided in instances where it is determined that any component of the Sky-Light has been damaged or has failed due to failure to follow procedures or instructions contained in this manual.

DANGER

This designation is utilized preceding any section within this manual where the operations described could expose anyone to the possibility of physical danger or injury of any kind. It is the responsibility of the owner, operator, or service technician to become familiar with all such **DANGER** sections and/or situations, and to follow the specified procedures and instructions explicitly, and to otherwise use all prudent and responsible care to prevent injury.

The completely assembled and operational Sky-Light has all electrical and optical components contained within closed and secured housings. It is recommended that, if the unit is operated at ground level in areas where crowds may be present, a rope barrier or equivalent barricade be established to keep the general public away from the Sky-Light.

As is the case with all intense light sources, it is not advisable to look directly into the light source or into the light beam. It is the responsibility of the operator to see that the necessary rope barriers or other barricades are positioned suitably to prevent passers-by or any member of the crowd from looking directly into the light beams from a close distance.

3.0 OPERATION OF THE SKY-LIGHT

3.1 INPUT POWER REQUIREMENTS

CAUTION

Each Sky-Light model has been designed and factory tested to operate satisfactorily with an input power source as specified below. The DC lamp power supply incorporated within each Sky-Light base assembly can be adjusted to compensate for input voltages which are slightly lower or higher than nominal. Details of this adjustment procedure may be found in section 4.4.2 of this manual. It is the responsibility of the owner/operator to determine that proper input power is provided and to make adjustments or corrections as may be required to provide compliance with the requirements set forth below.

CAUTION

Polarity and Grounds must be checked before cable connections are made to the Sky-Light. Low voltage conditions (below the minimum levels specified) may cause damage to the Sky-Light.

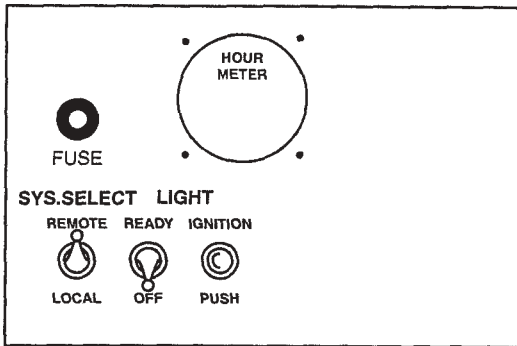
| MODEL | PHASE | VOLTAGE (±10%VAC,50/60 Hz) | CURRENT (CIRCUIT BREAKER) | POWER CABLES* |
|-------------|-------|-------------------------------|------------------------------|------------------|
| SLX1 – 2000 | 1 | 240 | (1 ea.) 20 AMP | #12 (3) |
| SLX1 – 2000 | 3 | 220 | (1 ea.) 20 AMP | #12 (4) |
| SLX1 – 4000 | 3 | 220 | (1 ea.) 30 AMP | #10 (4) |
| SXL1 - 2000 | 3 | 380 | (1 ea.) 15 AMP | #12 (5) |
| SXL1 - 4000 | 3 | 380 | (1 ea.) 20 AMP | #12 (5) |

Use 100' (30.5 m) or shorter cables. For cables longer than 100' (30.5 m), go to larger wire sizes.

* Recommended wire sizes; *comply with local codes*

3.2 STARTUP AND SHUTDOWN

The operation of the Sky-Light controls will be explained in this section. The Sky-Light control panel (see Figure 1) is protected from weather, vandalism, and unauthorized access by means of a control panel enclosed by a screw cover.



SLX-1 CONTROL PANEL (Figure 1)

NOTE: It is not detrimental to the Sky-Light units to leave the input power connected (with the pilot lights lit) when the unit is not being used

3.2.1 LIGHTS “ON”

To turn the light on, move the “Master” switch to the “READY” position (up), and the “Mode” switch to “LOCAL” (down). The lamp will automatically ignite within 3 to 4 seconds. In the event that the “autostrike” feature of the Sky-Light does not function properly (as evidenced by the lamp failing to light within a few seconds); the lamp can be manually lit by momentarily pressing the manual “IGNITION” button located on the control panel.

CAUTION

If the light still fails to light, there is a malfunction, which must be corrected. DO NOT hold the IGNITION button in for more than a fraction of a second. A momentary push is all that is required. Holding the manual start button in for a prolonged period is not necessary for lamp ignition, and can result in failure of the igniter components.

3.2.2 SHUTDOWN

To turn the Sky-Light off, reverse the procedures noted in the previous sections. It is desirable, however, for prolonged bulb life, that power continue to be supplied for *at least* 10 minutes after the lamp has been turned off to provide required cooling air for optimum cool down of the bulbs after operation. SLX-1 systems have a built-in timer that operates the cooling system for 30 minutes after shutdown.

3.3 HOUR METER

An hour meter, located on the control panel, is provided to maintain a running record of operational hours. The total hours shown on the meter provide a guide to service intervals as well as recording operational lamp hours (required for lamp warranties).

3.4 ELECTRICAL PROTECTION

A circuit breaker is provided for protection of the auxiliary circuit. The auxiliary circuit breaker protects the cooling blowers and the control circuits. Each xenon lamp power supply is internally fused. SLX-1 units are provided with a single circuit breaker for all auxiliary circuits.

In the event that any of the above described functions (cooling, lights) do not operate, the related circuit breaker should be checked (see Troubleshooting). Re-setting the circuit breaker may resolve the problem. Since circuit breakers or fuses are protective devices, failure of a circuit breaker or fuse could indicate an overload or other malfunction. If the circuit breaker or fuse blows again, it is a sign that such a malfunction exists and the cause should be determined and remedied.

CAUTION

UNDER NO CIRCUMSTANCES SHOULD A CIRCUIT BREAKER OR FUSE OF A HIGHER CURRENT RATING BE SUBSTITUTED IN AN EFFORT TO CORRECT A "CIRCUIT BREAKER / FUSE BLOWING PROBLEM". TO DO SO MAY NEGATE THE PROTECTION ORIGINALLY INTENDED, CAUSING SERIOUS COMPONENT FAILURE AND VOIDING THE WARRANTY.

3.5 TRANSPORTING

Certain precautions should be taken before moving a Sky-Light. Before moving a unit, the lamphead should be brought straight up and secured.

The Sky-Light can be moved by the use of "optional" casters. It can then be fork-lifted or winch-loaded onto a trailer or easily placed or relocated at point of use.

CAUTION

When traveling short distances (such as for rental situations within a city or local area) the bulb may be left in place *IF* the transport vehicle (trailer or small truck) has a soft-riding suspension, as prevent any sudden jars. For long distance transportation, or in any instance when possibility of severe jarring, shock or excessive vibration exists, AND IN ALL INSTANCES OF TRANSPORT VIA COMMON CARRIER, the bulbs *must* be removed from the lampheads. The bulbs should be carefully packed in their original containers and transported vertically.

Damage to a xenon bulb during transportation, whether in place in a lamphead or separately packed, is not covered under warranty, nor is consequential damage.

4.0 BASE ASSEMBLY – ELECTRICAL COMPONENTS (see Figure 2)

To aid in understanding the function of each electrical component, the system is described below in the approximate order as related to the “flow” of electricity starting from the input power connection through the entire system.

Access to the electrical components for servicing can be accomplished by the removal of the side panels. The access panels can be removed by unscrewing the fasteners located along the outside edge of the panels.

4.1 CONTROL PANEL

The control panel (see Figure 1) is mounted in a recessed compartment or rain-tight box. Access to the control panel components is provided by the removal of four (4) corner screws and then swinging the panel forward and down. If desired, it may be removed by unplugging indexed plugs, which connect it to the individual power supplies and internal components.

The various input power cord receptacles, switches, circuit breakers, and hour meter are mounted to the panel and all electrical connections are accessible from the rear of the panel. Details of operation are covered in section 3.2.

4.2 MAIN WIRE HARNESS ASSEMBLY

The Wire Harness Assembly provides interconnection between the Control Panel and all electrical components within the base assembly. Each component may be individually disconnected for testing or removal for servicing, by unplugging the indexed connectors from the Wire Harness Assembly.

4.3 COOLING SYSTEM

Blower(s) draw clean air through the bottom filtered inlet, pressurizing the base cabinet. The air then passes over the power supplies, cooling them, and continues through the flexible ducts to the lamphood. For systems that separate the lamphood from the power supply base, exhaust for the power supply is vented from the side panel of the base. With the aid of supplemental blowers in the lamphood, the air continues through the base plenum, cooling the bulbs. Finally, the air exits out the bottom of the lamphood through screened outlets.

CAUTION

Each lamphood is protected from overheating by a Thermal Switch. DO NOT override this protection device as premature failure of the bulb may result. The Flexible Cooling ducts must be in good condition, securely mounted on both ends and with no visible holes in the duct's materials. The base cabinet should also be without holes and with all side panels in place to insure sufficient cooling to each lamphood.

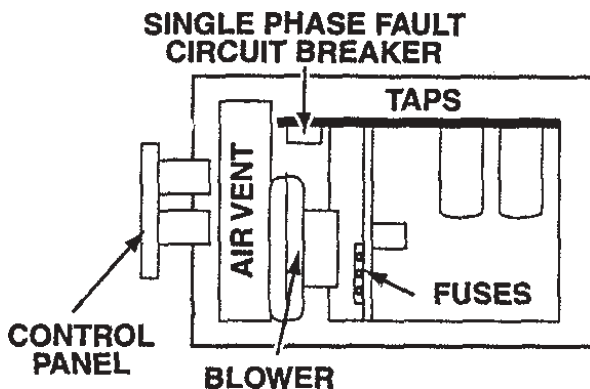
4.4 D.C. POWER SUPPLIES

The DC power supplies are modular units. They consist of large transformers that lower the input voltage down to a range of 25 to 45 volts to operate xenon bulbs. They also provide for a higher (125 to 150 volts) level required during the ignition phase. The output from the transformer is converted to the direct current (DC) required to operate xenon bulbs by Power Diodes (see section 4.5.3). Additional power condition and filtering is provided by capacitors mounted inside the power supply modules.

4.4.1 POWER SUPPLY CONTACTOR

The Power Supply Contactors (mounted on the top of each power supply) serve as the main power switch to turn each power supply on and off. They are actuated when the "Master" switch on the main control panel is turned to the "ON" position and the individual "Lamp OFF" switch is in the "ON" position. However, if the lamphed thermal switch or power supply thermal switch is opened due to a "high temp" condition, the contactor for that particular head will not engage.

FIGURE 2



The Base Assembly contains:

1. Control Panel
2. Main Wire Harness Assembly
3. Cooling System Blower(s)
4. DC Power Supply

4.4.2 VOLTAGE ADJUSTMENT TERMINAL BOARD

The power supplies within each Sky-Light are provided with variable taps for adjusting the power delivered to each xenon bulb. This feature is helpful if the input voltage (from either regional power service or portable generator) is either higher or lower than "normal" rated input voltage of the Sky-Light.

The taps are set at the factory for optimum performance with normal input voltages (see section 3.1). For optimum Sky-Light performance consistent with long bulb life, the input should be measured while the Sky-Light is in operation. If the input voltages vary below or above the levels specified in section 3.1, the taps should be reset.

If input voltages are found to be lower than normal, a HIGHER tap setting will result in normal rated lamp intensity. If input voltages are found to be higher than normal, a LOWER tap setting will reduce the lamp intensity to normal levels and prolong bulb life.

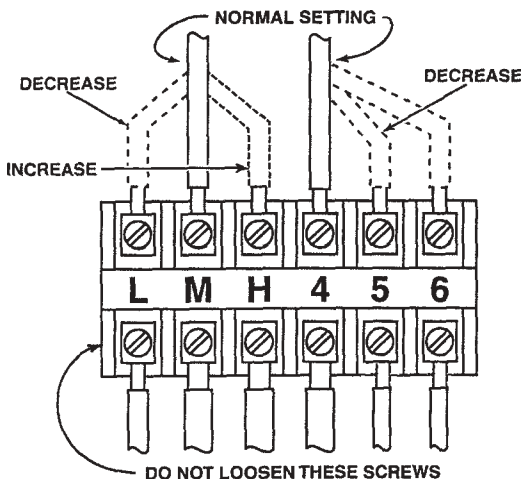
CAUTION

If input voltages (measured with the Sky-Light in full operation) are found to be BELOW the minimum levels specified in section 3.1, damage to components may result and in particular the motion motor may burn out. If voltages are found to be below the minimum levels, DO NOT OPERATE THE SKY-LIGHT. Components damaged from low voltage operation will NOT be replaced under warranty. Similarly, if any other components fail (including the xenon bulb) from over-voltage operation, they will NOT be replaced under warranty.

NOTE: In certain areas 208 volts AC (rather than 220/240 volts) is the “normal” input voltage. Although Sky-Lights will operate on 208 volt input, the brightness and overall performance will be less than normal unless the input voltage adjustment taps are changed to compensate for this normal 10% reduction in input voltage. Also, in some instances where current draw of the Sky-Tracker is causing input circuit breakers to “trip,” or if portable generators are “lugging down” and causing them to deliver less than normal input voltage, a downward adjustment of the taps to lower the lamp output will sometimes cure the problem.

SINGLE PHASE ADJUSTMENT: 2kW (240V)

A Voltage Adjustment Terminal Board is located on the top of each power supply and the various taps, or wire positions, are shown in Figure 3. The taps are identified as Low (L), Medium (M), High (H), 4, 5, and 6.



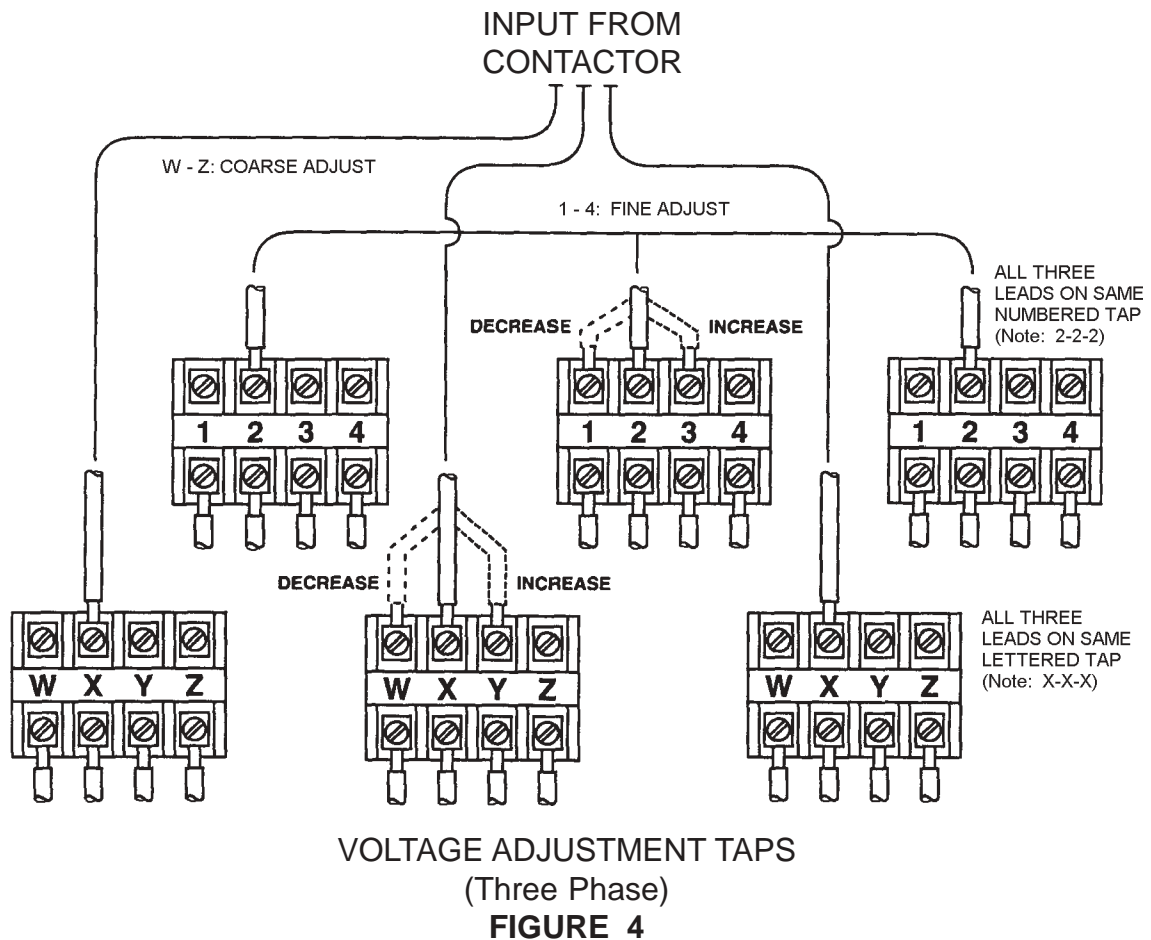
VOLTAGE ADJUSTMENT TAPS
(Single Phase)
FIGURE 3

Changing the letter taps (L, M, H) has a smaller, “fine tuning” effect. Changing the number taps (4, 5, 6) has a greater effect. The highest setting (H-4) gives the highest lamp output. The lowest setting (L-6) gives the lowest lamp output.

THREE PHASE VOLTAGE ADJUSTMENTS: 2kW and 4kW

Six Voltage Adjustment Terminal Boards are located on the side of each power supply. The various taps, or wire positions are shown in Figure 4. The taps are identified as “W, X, Y, Z” on the three (3) terminal boards, and “1, 2, 3, 4” on the remaining boards.

Changing the letter taps (W, X, Y, Z) has a greater effect on voltage. Also, changing the number taps (1, 2, 3, 4) has a small “fine tuning” effect. The highest setting (Z-4) gives the highest lamp output and the lowest setting (W-1) gives the lowest lamp output. Taps on the (6) terminal boards MUST be changed in unison (i.e. three terminal boards set on #2 taps and three terminal boards set on “X” taps. See Figure 4).



4.4.3 POWER DIODES

Solid state diodes, located on large heat sinks, are attached to each power supply. The diodes convert the AC to DC, which is necessary for operation of the xenon bulbs. While diodes are very reliable, they sometimes fail due to voltage surges or “spikes” which sometimes occur, particularly with improperly regulated generators.

4.4.4 AUTO STRIKE ASSEMBLY

The Auto Strike Assembly is a module consisting of a printed circuit board and related components located near each power supply. Functionally, this circuit activates the igniter circuit when it senses that the light has been turned on, but the bulb is not drawing any current. It provides igniter bursts to the lamp and then locks itself out to prevent overloading and potential burn-out of the primary transformer. The auto strike can be re-activated by flipping the “Master” switch off and then back on again.

4.4.5 TIMER PBC ASSEMBLY

SLX-1 units are supplied with a printed circuit board assembly that controls Auto Strike action as described above, and a 30 minute cool down timer for units operated by remote or unattended operation.

4.5 D.C. POWER AND IGNITION CABLES

Three cables connect the DC power supply and the control system to each lamphouse. In each group the two large, single-conductor cables supply DC current to the lamps, while the center multiconductor cable supplies control voltage, igniter operation and fan power.

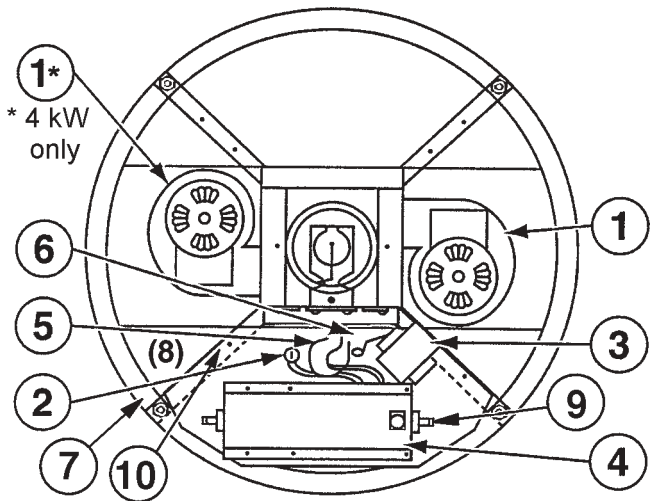
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Three cables connect the DC power supply and the control system to each lamphouse. In each group the two large, single-conductor cables supply DC current to the lamps, while the center multiconductor cable supplies control voltage, igniter operation and fan power.

(Section 5 applies *only* to searchlights with motorized lampheads and is deleted.)

6.0 LAMPHOUSE ELECTRICAL COMPONENTS

All high voltage igniter components, cooling blower(s), thermal switch, and D.C. power connectors to the xenon bulb are located in the lamphead (see Figures 5 & 6). The functions of the various components are as follows:



1. Blower*
 2. Spark Gap
 3. Primary Transformer
 4. R.F. Igniter Transformer
 5. Doorknob Capacitor
 6. R.F. Trap
 7. Cable/Conduit Entry
 8. Control Terminal Strip **
 9. Connection Point, DC- **
 10. Connection Point, DC+ **
- * (2) req'd. with 4 kW
** Type "C" Units only

LAMPHOUSE BASE PLATE ELECTRICAL COMPONENTS
FIGURE 5

6.1 IGNITER SYSTEM

The complete high voltage igniter circuitry is located on the lamphead base plate. To gain access to the internal electrical components, it is only necessary to unlatch the two draw-down latches located at the bottom of the housing. Then, slide the fiberglass housing upward and away from the tubular frame assembly. With the components exposed, the following items that make up the igniter system can be accessed.

DANGER

Before opening the lamphead, disconnect all input power to the Sky-Light so that the igniter cannot be accidentally operated. Severe electrical shock can result if the igniter is accidentally operated when these parts are exposed.

6.1.1 PRIMARY TRANSFORMER

The Primary Transformer receives an input pulse when either the autostrike assembly or the manual start button is actuated, and raises this voltage to approximately 6,000 V.AC, 50/60 Hz. If replacement is required, it may be easily removed by unplugging the two (2) pin input connector, disconnecting the single output wire from the capacitor and removing the two (2) screws which hold it to the right hand Plenum Support Bracket.

CAUTION

This transformer is wound with a large number of very fine windings and is subject to "burn-out" if, for any reason, the input power is supplied for longer than two seconds.

6.1.2 R.F. "IGNITER" TRANSFORMER

The R.F. (Radio Frequency) Igniter Transformer is specially constructed transformer that provides an ignition pulse of 40,000 volts when the output of the Primary Transformer is fed through its primary winding to a grounded spark gap. The negative (-) DC power from the power supply is fed through the secondary winding of the R.F. transformer to the lower (or cathode) end of the xenon bulb.

6.1.3 SPARK GAP AND RELATED COMPONENTS

Other components of the Igniter System include a spark gap, a "door knob" capacitor, and various smaller capacitors and "R.F. Traps". Figure 5 indicates the location of these components.

6.2 DC POWER CABLES

The flexible cables that carry the DC power from the Base Assembly to the lamphead enter through the baseplate. The positive (+) input cable is attached at an interconnect point to a similar cable within the lamphead connected to the upper bulb support spider. The spider in turn carries the DC positive (+) power through jumper cables then to the upper bulb adapter which is attached to the front or anode (+) end of the xenon bulb.

The negative (-) DC input cable is attached directly to one end of the R.F. transformer. A short, flexible cable then connects the other end of the R.F. transformer to the end of the bulb, which is the cathode (-) end of the xenon bulb. This cable and all components between the output side of the R.F. transformer and the xenon bulb must be well insulated and maintained at least one inch from any “ground” or conductive components of the lamphead, in order to prevent shorting and/or loss of ignition energy to the bulb.

6.3 COOLING BLOWERS

One or two cooling blowers, depending on the lamphead model, are attached to a square plenum, which distributes air to the lamp and rear of the reflector and also provides support for the base (cathode end) of the lamp. Access to this plenum and the base end of the bulb is achieved through removal of four screws securing a cover plate to one side of the plenum.

6.4 THERMAL SWITCH

Each lamphead is equipped with a Thermal Switch that will detect “High Temperature” conditions. The switch is located on the upper bulb support spider (Figure 6, Item 7). When the temperature in a lamphead reaches a level that may be harmful to the system, the Thermal Switch will open, turning the lamp off.

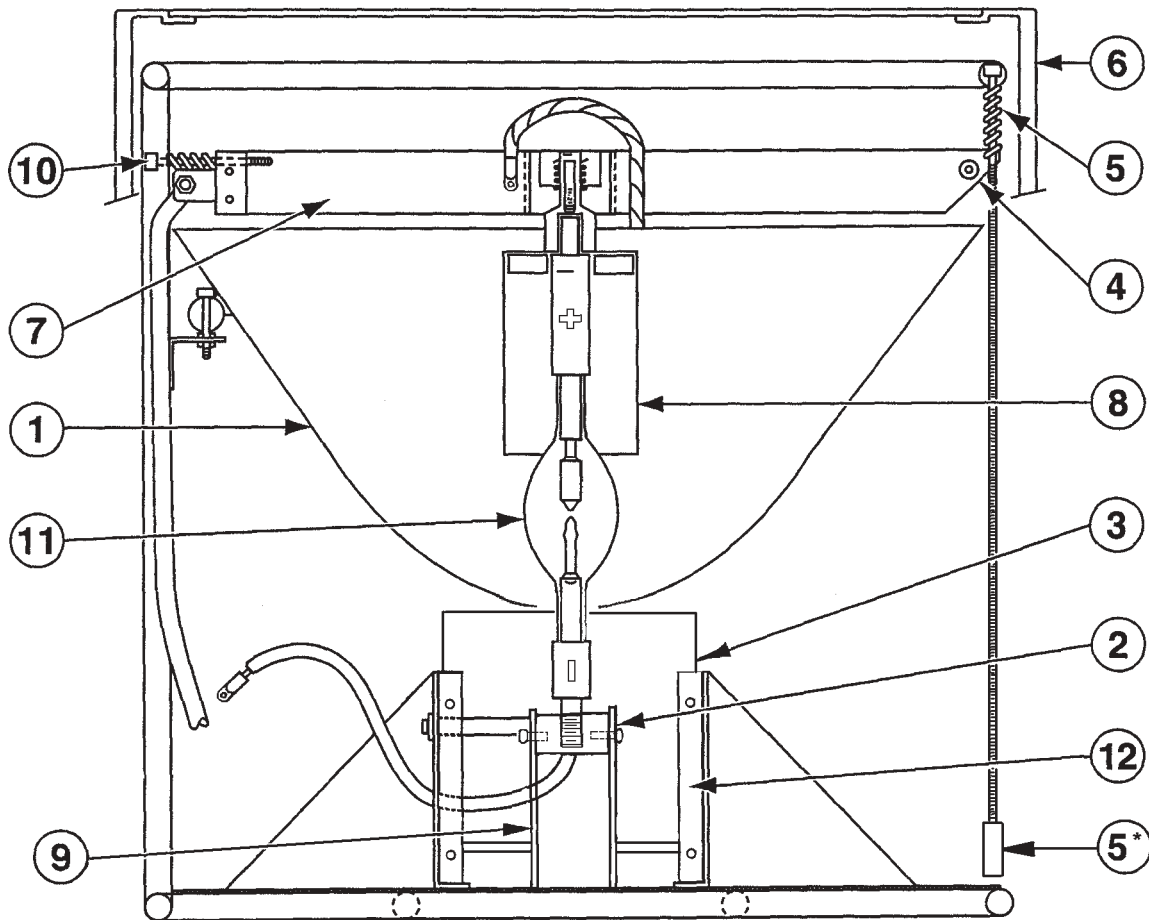
6.5 XENON BULB (LIGHT SOURCE)

The light source is supplied through the use of a high quality xenon bulb (see Figure 6). The bulb is securely attached to the circuit to minimize mechanical and thermal stresses. Instructions to install and remove the bulb are detailed in sections 8.0 and 9.0.

7.0 LAMPHEAD MECHANICAL COMPONENTS

The xenon lamphead has been designed and constructed for ease of operation and serviceability in extreme weather conditions and operates satisfactorily in rain or snow. In operation, the lamphead is slightly pressurized as a result of the cooling air inflow, thus aiding in the exclusion of dust or moisture. The basic components are shown in Figure 6.

The two primary components of the lamphead are the deep dish electroformed parabolic reflector and the xenon bulb (light source). To function efficiently, these components must be mounted in such a manner that the bulb can be carefully positioned with its radiant energy source precisely located at the focal point of the reflector. The bulb must be capable of adjustment as to its relationship with the reflector to optimize the projected beam characteristics. All electrical connections to the bulb must be of low resistance and capable of carrying relatively high currents (50 to approximately 150 amperes) and cooling must be constant and effective to maximize bulb life and minimize electrical conductivity problems that can result from overheating. The components, which accomplish these functions, are noted below.



* after March, 2001

- | | |
|-------------------------|---|
| 1. Reflector Assembly | 7. Anode Support Spider |
| 2. Cathode Pin Receiver | 8. Anode Adapter |
| 3. Air Plenum | 9. Lower Bulb Support |
| 4. Thermal Switch | 10. "X" and "Y" Focus Adjustment |
| 5. "Z" Focus Adjustment | 11. Xenon Bulb |
| 6. Housing Assembly | 12. Insulator Cover Plate (removed for clarity) |

FIGURE 6

7.1 REFLECTOR ASSEMBLY

The electroformed parabolic reflector is precision bonded to a circular support ring, which in turn bolts to the lamphouse tubular frame. If replacement is required, first, remove the lamp as noted in section 9.0. Next, detach the upper support spider and associated components. Finally, unbolt the reflector from the lamphouse tubular frame.

7.2 CATHODE SUPPORT

The rear, or cathode (-) end of the xenon bulb is supported by slotted bulb guides, which are bolted to the bottom of the air plenum. This allows the bulb to move freely in the vertical axis for beam adjustment and to eliminate strain on the quartz envelope of the bulb.

7.3 AIR PLENUM/DUCT

The air plenum is attached to the base center support baffle and provides a means of ducting and directing the airflow around and over the xenon bulb to the front, or anode (+) end of the bulb.

NOTE: It is crucial that heat be properly removed from the anode end of the bulb to avoid damage to its internal seal.

7.4 ANODE ADAPTER

The upper bulb adapter, which is a tubular section surrounding the front portion of the bulb and attaches to the anode (+) end of the bulb, serves a dual purpose. The point of attachment to the bulb and also provides a means of removing heat from the bulb by direct conduction. As the heat is conducted outward from the bulb into the front bulb adapter, it spreads outward into the tubular section of the adapter by conduction. It is then removed by convection to the air stream, which has been directed over the bulb by the air duct.

7.5 ANODE SUPPORT – SPIDER AND ADJUSTMENT ASSEMBLY

The upper bulb support also serves a dual purpose. Its construction of highly conductive aluminum permits D.C. power to be carried from the input cable to the anode end of the bulb with very little loss due to electrical resistance. Additionally, it provides a pivot point, which allows the xenon bulb to be adjusted in the X or Y axis without developing any undesirable bending forces that could stress the quartz envelope of the xenon bulb. Movement of the bulb along the Z axis during focusing is also readily accomplished by the pivoting motion of the upper bulb support.

7.6 HOUSING ASSEMBLY

The housing assembly provides a front closure to the lamphead. A tempered glass window is attached to the housing by means of silicone rubber sealant to provide a watertight seal. The tempered glass window is not affected by temperature shock, (such as rain or snow suddenly applied to the window) even when it is operating at elevated temperatures. The high strength tempered glass also resists accidental breakage resulting from foreign objects.

8.0 BULB INSTALLATION

Upon original delivery or subsequent common carrier transportation of the Sky-Light, the customer will be required to install the xenon bulb into the lampheads. The procedure is as follows:

DANGER

The handling of a xenon bulb may expose the operator or technician to hazards resulting from bursting of the quartz envelope, because of the high internal pressure of the xenon gas.

Bursting may occur if the bulb is dropped or mishandled. The hazard is substantially increased if the bulb is hot from operation, as the gas pressure increases in a manner directly proportional to the increased temperature. Whenever the xenon bulb is removed from its protective cover, and until the installation or removal is complete and the lamphouse window assembly is secured, the operator or technician MUST wear protective clothing, including Kelvar™ gloves, acetate face shield, and quilted ballistic nylon jacket or equivalent. (These items are available from Sky-Tracker/Strong Entertainment Lighting.) Instructions regarding protective clothing are subject to change by any local or federal agency that may have authority over such matters, dependent on area or point of use of the Sky-Tracker equipment.

It should be noted that xenon bulbs do not “explode” in the normal sense, in that there is no combustible energy releasing reaction occurring. They merely “burst” like a balloon or a pressure vessel. The hazard is related to the flying particles of glass-like quartz, which are propelled with sufficient force to penetrate normal clothing, eyes, and skin. It can not be over-emphasized that protective clothing, gloves, and eye protection be worn when handling xenon bulbs.

BULB INSTALLATION STEPS

1. Place and secure the lamphood in the upright vertical position.
2. Remove the housing and set aside.
3. Remove the two bolts that secure the power jumper cables to the upper lamp adaptor (Figure 6, Item 8). Remove the central bolt, washer and spring assembly that secures the front bulb adaptor to the anode support “spider.”
4. Inspect reflector for cleanliness; clean if necessary.
5. Carefully remove xenon bulb from shipping container and remove protective cover. (Save the container and packing for future shipping purposes.) Use caution to handle the bulb only from the metal end fixtures, not allowing finger contact with the quartz envelope. Finger oils or other foreign material on the quartz envelope can lead to rapid, premature failure. If accidentally touched and contaminated, carefully clean the quartz envelope with tissue moistened with alcohol and then wipe dry with a clean, dry, lint-free tissue.
6. Inspect the upper bulb adapter and end pins of the lamp to make sure that these contact areas are clean and free of corrosion or any contaminant which could cause a high resistance electrical joint. Make sure that the clamp screws on the upper bulb adapter are loosened and that the upper bulb adapter will slide freely over the front anode (+) end of the lamp.

7. After sliding the top bulb adapter onto the anode (+) end of the bulb, carefully turn the two components upside down and hold the adapter with the bulb vertically. Then, while tighten the clamp screws. This will insure that no bending force is applied to the bulb body, which could cause an accidental and dangerous bursting if stressed. Tighten the screws carefully, a little at a time, alternating back and forth between each clamp screw until they are completely tight, alternating back and forth between each clamp screw until they are completely tight and no further screw rotation is possible using moderate force. Carefully check to be sure that the bulb end is not loose within the top bulb adapter clamp.
8. Hold the bulb and upper bulb adapter subassembly carefully by the adapter (continue using caution not to touch or contaminate the quartz lamp envelope). Lower the lamp carefully through the hole in the center of the reflector, using caution not to nick or damage the reflector or bump any portion of the bulb. Carefully insert the cathode end of the bulb into the lower bulb receiver. Rotate the bulb so that all three leads of the threaded bulb ferrule start. Tighten until the spring pins of the receiver engage the bulb. Apply one-quarter turn to the bulb. Do not overtighten the bulb. Insert the upper bulb adapter pivot bolt/washer/spring assembly into the center of the "spider" and engage the bolt a few turns into the upper bulb adapter.

NOTE: If space appears inadequate to accomplish this joining of the spherical pivot points, more space can be provided by adjusting the Z focus screw in a clockwise direction, which moves the spider away from the reflector.

9. The top adapter may have to be carefully rotated, so that the two tapped holes on the adapter are symmetrically located with respect to the two spider legs, which are located at a right angle (90 degrees apart). Loosen the two clamp screw if required. This is necessary so that the front power jumper cables can be properly attached. When this positioning has been achieved, the upper bulb adapter attachment bolt and spring assembly may be tightened. *The shoulder bolt should be tightened until it bottoms.* The clamp screws should be tightened if necessary.
10. The front power jumper cables, which conduct power from the spider to the upper bulb adapter, can now be attached. Make sure that the cables are properly positioned within the protected area of the upper bulb adapter, so that they do not protrude into the light beam (which will cause some loss of light and overheating of the cables). Make sure all connections are tight.

11. Carefully replace the fiberglass lamphead cover assembly. Make certain that the adjustment holes in the housing align to the frame. Make sure that the window is clean, both inside and out.

The lamphouse is now ready for operation, pending final focusing and adjustment during nighttime conditions.

8.1 FINAL FOCUS AND BEAM ALIGNMENT

Final focusing and beam alignment can only be properly accomplished outdoors during nighttime operation.

After the lamphead has been placed into operation and allowed to warm up for approximately five minutes, the beam can be adjusted and aligned as follows:

LAMP FOCUS PROCEDURE

1. Loosen the lamphead swing and position the lamphead extended in the outermost position. This provides easier access to the focus adjustments.

The two bulb centering movements (normally described as X and Y adjustments, see Figure 6) are located in the sides of the lamphead. They are approximately three inches down from the top, or window end, of the lamphead and immediately adjacent to the ends of the two spider legs, which are located at right angles to each other (90 degrees apart). The adjustment holes are closed with plugs to prevent entrance of moisture and dirt. Carefully remove the plugs and insert the appropriate adjustment tool (5/32" allen wrench).

2. With the light operating, the operator should position himself adjacent to either one of the X or Y adjustments so that he can view the beam from that angle, while adjusting the other adjustment. In other words, if he positions himself adjacent to the X adjustment and views the beam from that position, he will be able to visually assess the results of his adjustment of the Y adjustment. The operator should alternately turn the opposite adjustment first clockwise and then counterclockwise to observe the movements of the apparent center of the beam and try to obtain symmetry.

The operator should then move and reposition his body adjacent to the other adjustment, 90 degrees removed, and then adjust the other beam centering adjustment. The combination of movements of these X and Y adjustments should result in a completely symmetrical beam shape when viewed from any position.

3. Focus adjustment (see Figure 6): The focus adjustment is performed on the third leg of the spider assembly and is accessible by removal of the plug located on the front rim of the fiberglass housing assembly adjacent to the window. Clockwise rotation of this adjustment will move the bulb forward, or away from the reflector, causing the beam to converge to a narrower appearing beam. Counterclockwise will cause the bulb to be moved deeper into the reflector, causing a divergence or spread of the beam. The operator will have to judge which type of beam is most suitable for the intended application or use.
4. After adjustment is complete, be sure to replace all plugs to prevent entrance of undesirable moisture and dirt into the lamphousing.

Since all of the above noted adjustments are spring loaded, there should be little or no free movement or “backlash,” nor drifting of the adjustments due to vibration associated with transport. The bulb should remain reasonably well focused for long periods of time. However, as the lamp ages and the cathode tip burns back, some refocusing may be required to maximize performance and appearance.

9.0 BULB REMOVAL

DANGER

Wear all required protective clothing and follow prescribed steps carefully.

1. If the xenon bulb has been in operation, wait *at least* 15 minutes after Lamp shutdown, (with blowers operating) before opening the lamphood. This will allow the internal lamp pressure to reduce to a level that is permissible for handling, provided that the specified protective clothing is worn.
2. Reverse the steps of the Lamp Installation Procedure in section 8.0.

10.0 ROUTINE SERVICE AND MAINTENANCE

10.1 PERIODIC MAINTENANCE

Except for unusual conditions of use (dirty environment, flooding, non-passive bulb failure, etc.) the frequency of service and replacement of certain parts and components because of normal wear is directly related to hours of use.

Inspection and preventive maintenance should be performed approximately every 250 hours of use or every 3 months (whichever occurs first). The period can be adjusted according to actual circumstances. The following items are to be included at the time of each periodic servicing:

10.1.1 BASE

1. Remove and replace the intake air filter.
2. Remove, lubricate, and reinstall blower motors.
3. Inspect and tighten, as required, all electrical connections.
4. Tighten all mounting bolts.
5. Inspect all of the flexible cooling ducts.

10.1.2 XENON LAMPHEAD ASSEMBLIES

NOTE: See Section 8.0 for safe handling instructions of xenon bulbs.

1. Remove lamphousings and the xenon bulbs (Section 9.0).
2. Inspect and tighten all electrical connections.
3. Inspect all focus mechanisms. Lubricate focus screws.
4. Clean reflectors and windows.
5. Clean bulb ends. Clean inside contact area of Upper Bulb Adapters, clean contact points on upper bulb support spider.
6. Tighten DC cables.
7. Inspect blower motors for proper air flow.
8. Reinstall bulbs and replace housings.

Operate the system – Check automatic ignition, thermal switch operation, and pilot lights.

Any parts (such as flexible air ducts, switches, etc.) which are found to be worn or in questionable condition, should be replaced to insure trouble-free operation. Xenon bulbs should also be replaced as required.

CAUTION

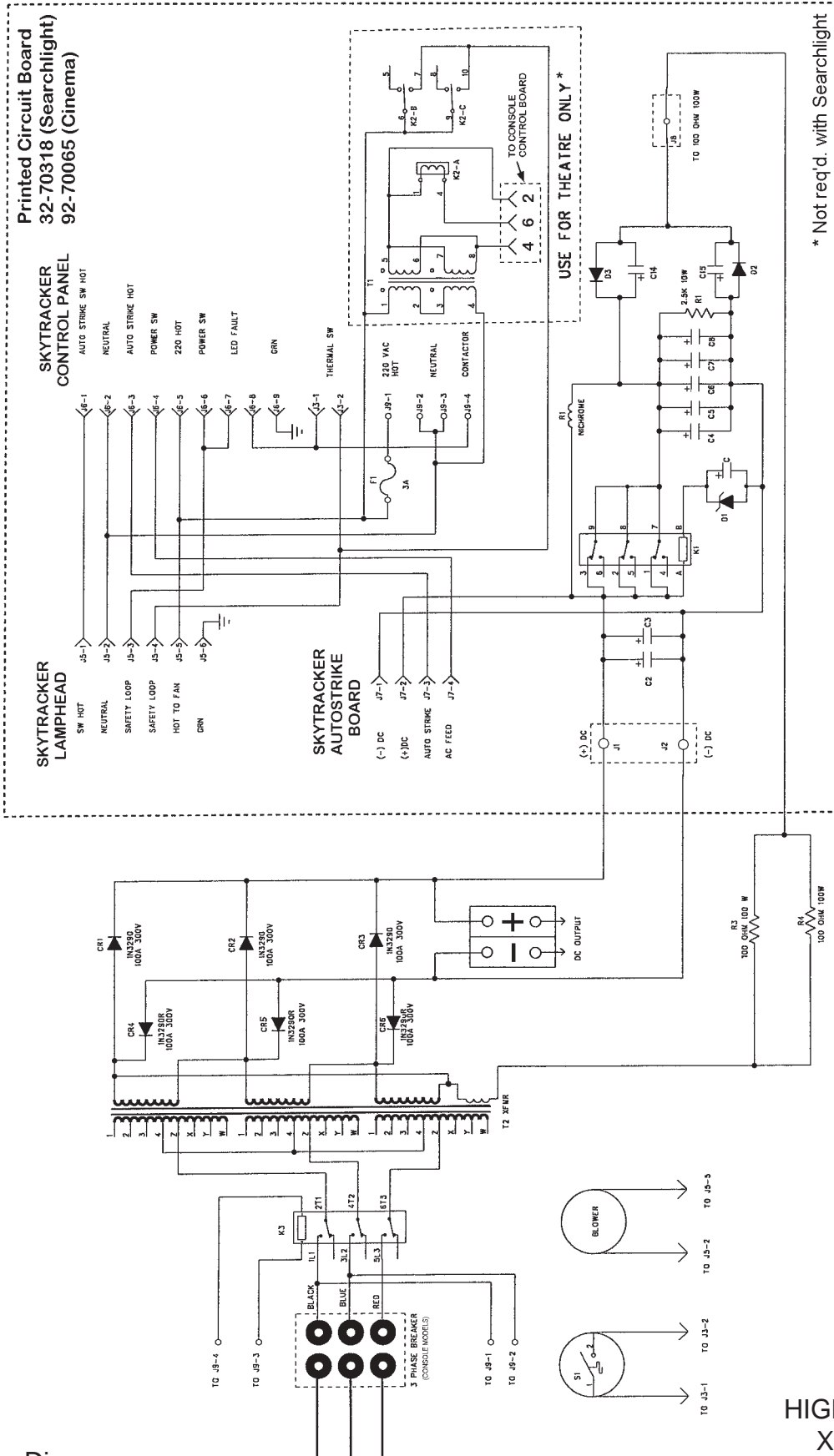
Upon expiration of the bulb warranty (see warranty information packaged with bulb), the possibility of the bulb bursting increases, particularly if the quartz envelope shows signs of excessive darkening.

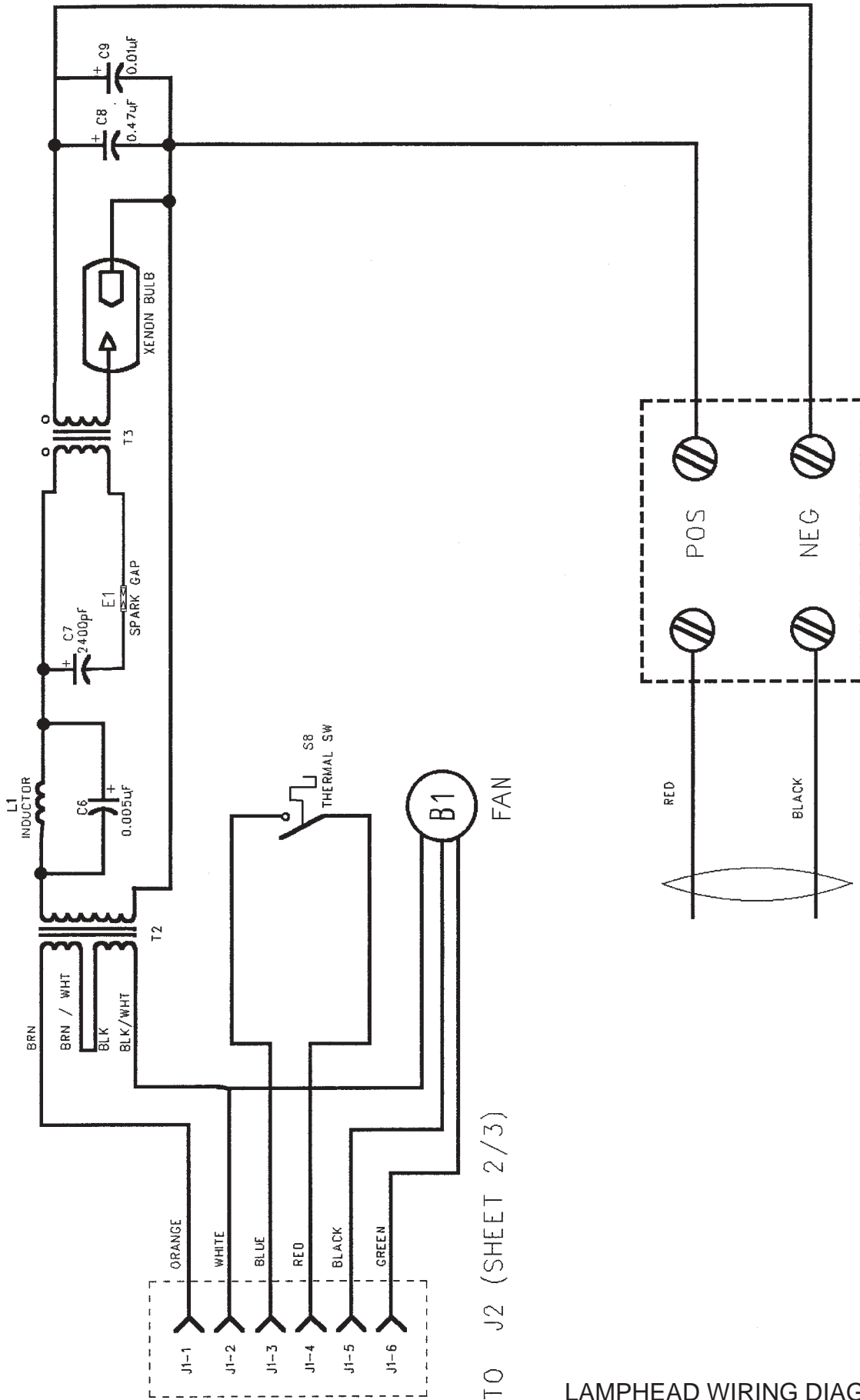
If bursting occurs, the tempered window may also break and the reflector may become scratched, resulting in a degradation of the lamp's performance.

For this reason, it is recommended that the xenon bulbs be replaced once the specified warranted life span has been reached.

TROUBLESHOOTING GUIDE

| <u>PROBLEM</u> | <u>PROBABLE CAUSE</u> | <u>WHAT TO CHECK</u> |
|------------------------|---|--|
| LAMP IS OUT | Auto Strike is non-operational. | Try manual "Ignition" switch. |
| | Igniter Circuit is out. | Try manual "Ignition" and listen for arcing sound. |
| | Bulb has failed. | Inspect bulb for damage. |
| | AC Input power is out or AC power cord is out. | Check indicator light on panel; check voltage with meter. |
| | Cooling Blower(s) in the lamphead is out, causing the Thermal Switch to open. | Check Aux. circuit breaker. |
| | Power Supply is out. | Check Aux. circuit breaker. Also check DC output (should be 125/165 V.DC prior to ignition). |





TO J2 (SHEET 2/3)

LAMPHEAD WIRING DIAGRAM

EQUIPMENT WARRANTY

Sky-Tracker/Strong Entertainment Lighting agrees that its products shall be free from defects in materials and workmanship for a period of one year, from the date of original shipment from its factory. This warranty is nontransferable and applies to the original purchaser only. Said warranty will not apply if equipment is used in conditions of service for which it is not specifically intended. The manufacturer is not responsible for damage to its apparatus through improper installation, physical damage or poor operating practice.

If any device is found to be defective under the warranty, the buyer should notify the manufacturer. Such equipment will be repaired or replaced, at manufacturer's option, free of all charge except transportation, F. O. B. its factory. Any such repair or replacement by the manufacturer shall constitute fulfillment of all obligations to the purchaser. This warranty does not include troubleshooting expense, labor charges associated with service calls, and disassembly or reassembly of the lamp system. Should such a repair or replacement require an on-site service call, the Purchaser shall bear the responsibility for all costs and associated expenses. The manufacturer does not assume responsibility for any unauthorized repairs to its products, even though defective, and unauthorized parts or repairs shall void this warranty.

This warranty is the only warranty given with the manufacturer's products. There are no warranties of merchantability of fitness for a particular purpose or other warranties or representations of any kind, express or implied, which are made with respect to these products.

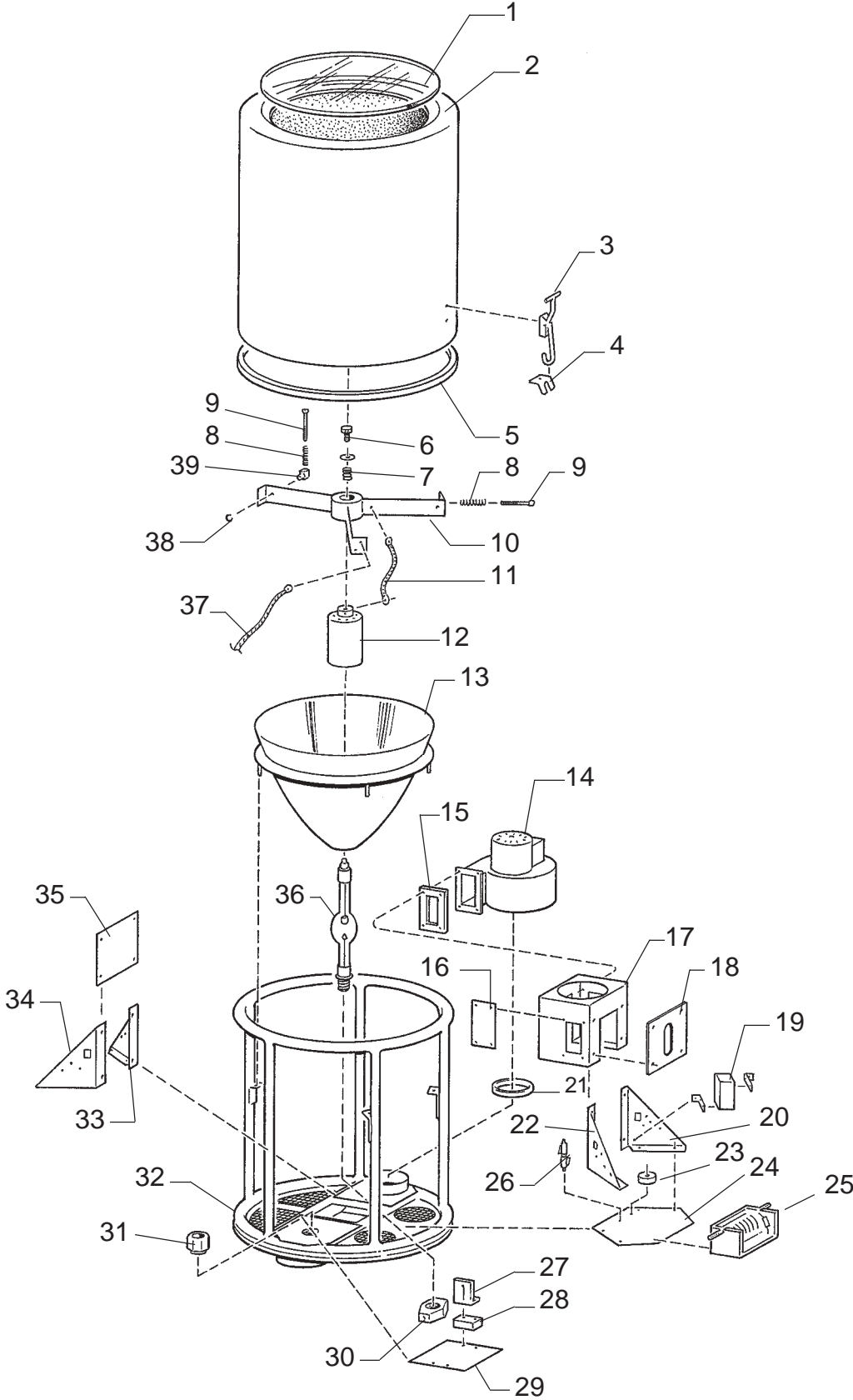
The remedies of the Owner set forth in this warranty are exclusive. In no event shall the buyer be entitled to recover for incidental, special or consequential damages, arising from the sale or use of these products, including but not limited to loss of profits or revenue, other commercial losses, inconvenience, delay, labor, repairs, or other cost of rental or replacement equipment.

This warranty excludes any and all incidental damage that may be caused by xenon bulb explosions. The bulbs used in manufacturer's products are not included in this warranty, however, they are covered by the bulb manufacturer's warranty.

LAMP POLICY

1. To avoid unnecessary down time because of bulb failure, it is suggested that all owners keep at least one spare bulb, of each type required, on hand.
2. To return a bulb, the owner must first obtain a Returned Materials Authorization Number (RMA) from Sky-Tracker/Strong Entertainment Lighting's Customer Service Department in Omaha, Nebraska.
3. All returned bulbs must be accompanied by the manufacturer's warranty form, properly completed, and must be shipped in the original manufacturer's shipping container with proper cushioning inserts.
4. It is not Strong Entertainment Lighting's policy to supply "replacement bulbs" for bulbs returned with a warranty claim form. If a replacement bulb is requested, it must be ordered from the sales department, and it will be shipped and invoiced as a sale.
5. All bulb invoices are to be paid within the established terms, without regard to any warranty claim.
6. Failure to remit invoices under the established terms will result in the owner being placed on COD status.
7. Bulbs returned to Strong that are re-workable by the manufacturer will be reworked and returned to the owner.
8. Bulbs returned to Strong that the manufacturer determines test satisfactorily will be returned to the owner.
9. Bulbs returned to Strong that are defective and are covered under warranty and that are not re-workable will result in a credit being issued to the owners account in accordance to policy #10.
10. Bulbs covered by warranty, which have failed within the first 50 operating hours, will be credited in full. Credit for bulbs failing after more than 50 operating hours will be pro-rated as per the average life span of the bulb type (see #15).
11. Bulbs that have been overheated are not covered by warranty.
12. Bulbs that suffer any unusual damage not caused by normal wear are not covered by warranty.
13. Bulbs received at Strong broken and not in their original container, with proper cushioning packing, are not covered by warranty.
14. The return authorization number must be written on the shipping label to be properly recognized and accepted by our Receiving Department.
15. Average Bulb Life Span:
 - 2 kW Lamps are warranted for 2000 hours.
 - 4 kW Lamps are warranted for 1000 hours.
 - 7 kW Lamps are warranted for 500 hours.

Sky-Light Lamphood Assembly,
2000, 4000 Watt



PARTS LIST

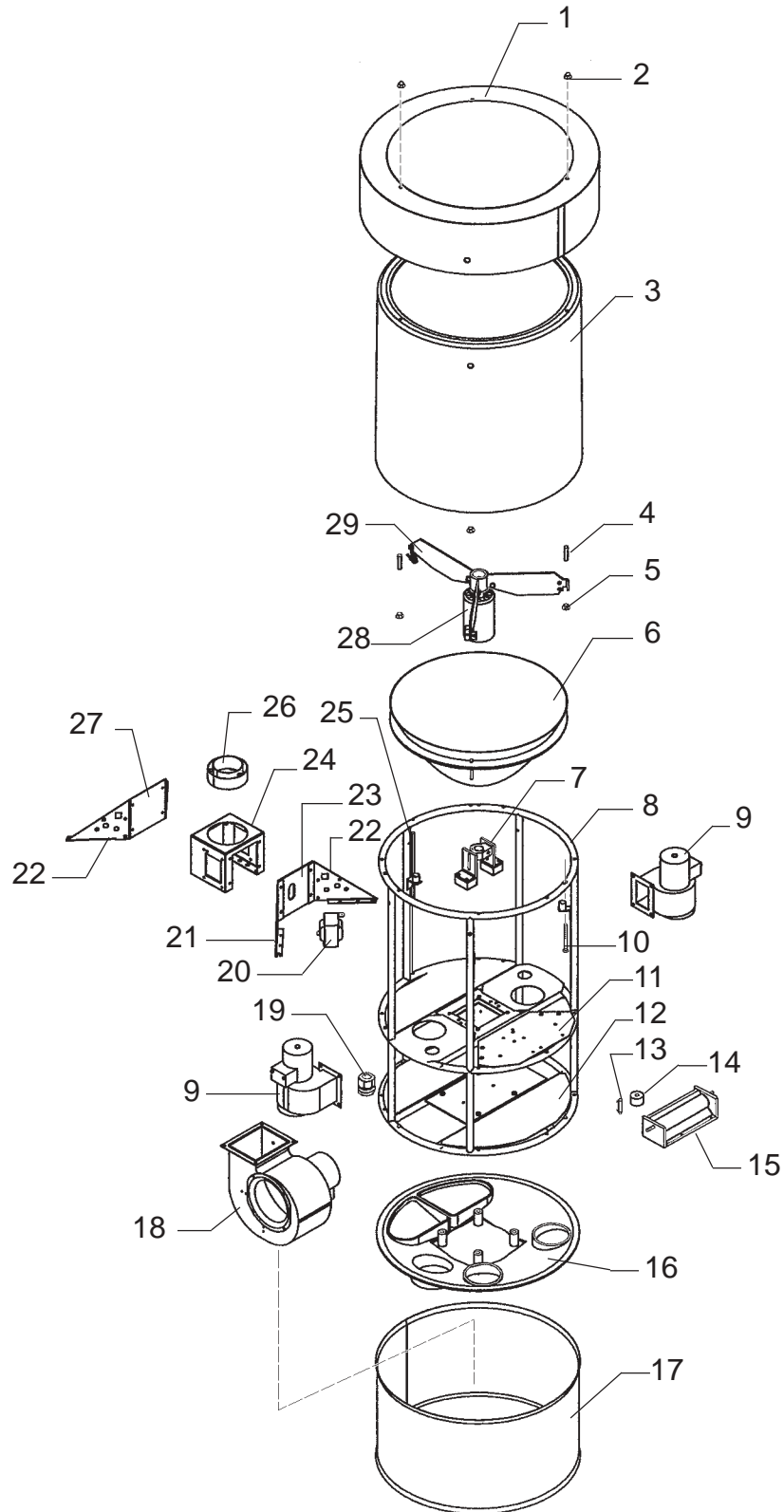
2 - 4 kW Lamphead Assembly

| <u>Item</u> | <u>Part No.</u> | <u>Description</u> |
|-------------|-----------------|---|
| 1 | 31-98097 | Cover Lens, Glass |
| - | 11-98062 | RTV Silicone Sealant (3 oz. Tube) |
| 2 | 32-50024 | Lamphead Housing, Fiberglass |
| 3 | 31-18035 | Latch (2 req'd.) |
| - | 32-40463 | Nut Plate, Latch (not shown) |
| 4 | 23-40462 | Catch (mounts to Item 33; 2 req'd.) |
| 5 | 31-98098 | Lower Gasket, Trimlock |
| 6 | 41-51767 | Shoulder Bolt, 5/16 x 3/4" 1/4-20 Thrd. |
| - | 41-70005 | Flatwasher, 5/16" |
| 7 | 31-58005 | Compression Spring, .720 x .75" |
| 8 | 31-58006 | Compression Spring, .300 x 2.0" |
| 9 | 41-51216 | Screw, 10-32 x 2" Socket Head |
| 10 | 32-50013 | Bulb Support Spider |
| - | 31-61007 | Thermal Switch |
| 11 | 32-50244 | Positive Lead (2 req'd.) |
| 12 | 32-50177 | Radiation Shield & Anode Clamp |
| 13 | 32-50435 | Reflector Assembly, Parabolic |
| 14 | 32-50055 | Blower, 220 V.AC, 50/60 Hz. (2 req'd. for 4 kW) |
| 15 | 31-9813 | Gasket, Blower Outlet |
| 16 | 32-40090 | Cover Plate |
| 17 | 32-40088 | Blower Box |
| 18 | 32-20031 | Insulator Plate |
| 19 | 32-50032 | Transformer (2 kW) |
| 19 | 32-50033 | Transformer (4 kW) |
| 20 | 32-40084 | Support Bracket, Right |
| 21 | 32-20030 | Ring, Blower Coupling |
| 22 | 31-40083 | Support Bracket, Left |
| 23 | 39110000 | Capacitor |
| 24 | 32-40089 | Base Plate, Lower Bulb Support |
| 25 | 32-50036 | RF Coil Assembly (2 kW) |
| 25 | 32-50053 | RF Coil Assembly (4 kW) |
| 26 | 81-61018 | Spark Gap |
| 27 | 31-98076 | Mounting Bracket, Cathode Receiver (2 req'd.) |
| 28 | 32-20029 | Spacer Block, Bracket (2 req'd.) |
| 29 | (ref.) | Plate (welded to Item 32 Frame) |
| 30 | 31-98078 | Cathode Receiver, Threaded |
| 31 | 31-98163 | Strain Relief Bushing |
| 32 | 32-40098 | Frame, Welded Assembly |
| 33 | 32-40084 | Support Bracket, Right |

PARTS LIST, 2 - 4 kW Lamphead (continued)

| <u>Item</u> | <u>Part No.</u> | <u>Description</u> |
|-------------|-----------------|--|
| 34 | 31-40083 | Support Bracket, Left |
| 35 | 32-40092 | Blower Input Cover |
| - | 32-40091 | Blower Port Cover (not shown), 2 kW only |
| 36 | 31-30095 | Xenon Bulb, 2 kW |
| 36 | 31-30052 | Xenon Bulb, 4 kW |
| 37 | | Positive Lead |
| - | 31-98078 | Negative Lead (to Power Supply; not shown) |
| 38 | 31-98075 | Snap Ring |
| 39 | 32-20003 | Focus Block |

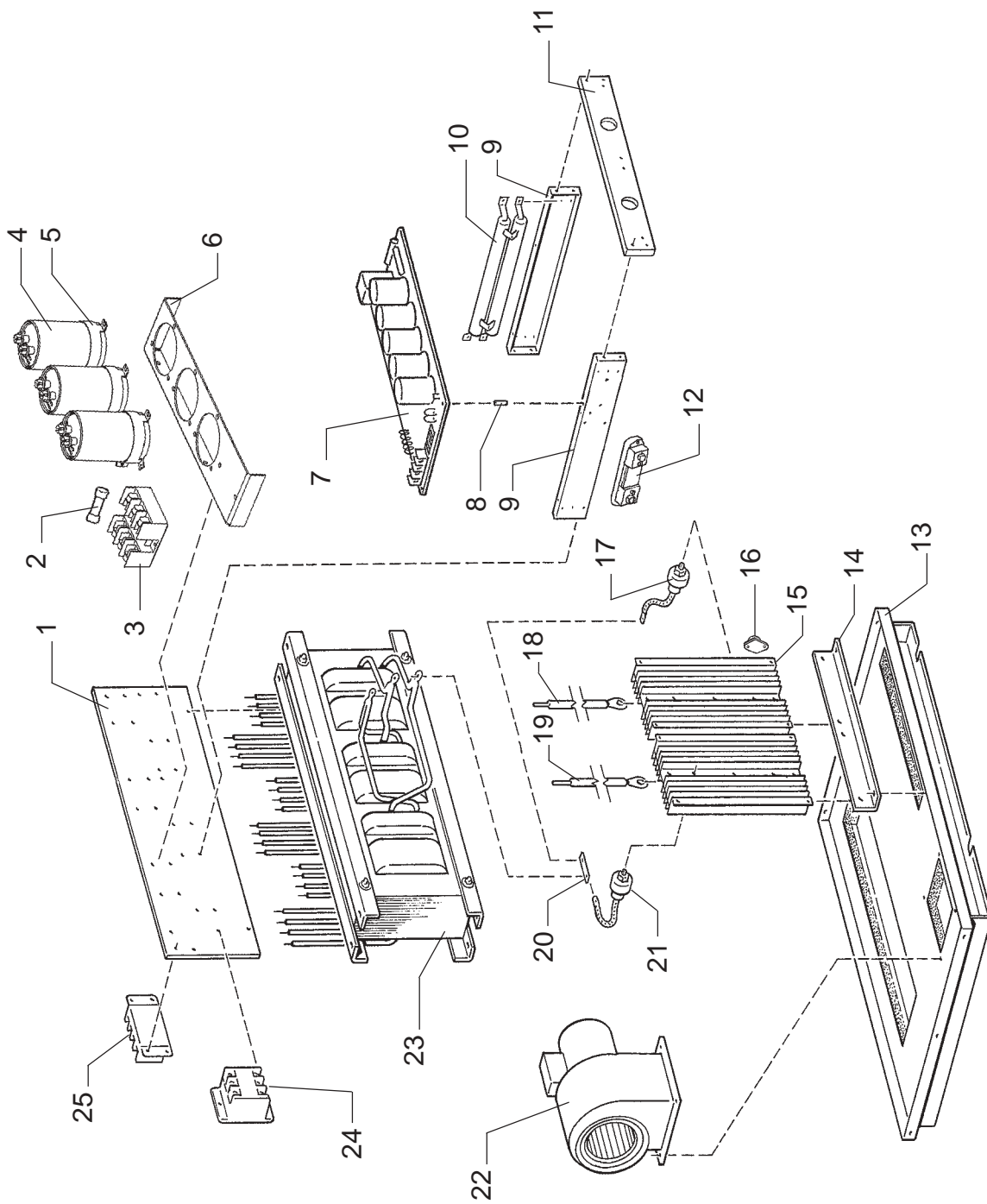
Sky-Light Lamphood Assembly,
7000 Watt



PARTS LIST
7 kW Lamphead Assembly

| <u>Item</u> | <u>Part No.</u> | <u>Description</u> |
|-------------|-----------------|--|
| 1 | 32-00303 | Cowl Assembly, 7 kW Lamphead |
| - | 32-00251 | Cowl, Welded Assembly |
| - | 31-98097 | Cover Lens, Glass |
| - | 11-98062 | RTV Silicone Sealant (3 oz. Tube) |
| 2 | 4258008 | Acorn Nut, 1/4-20 (3 req'd.); to Item 10 |
| - | 4257106 | Washer, 1/4" Weatherseal (3 req'd.) |
| 3 | 31-98096 | Lamphead Housing, Fiberglass |
| 4 | 32-00287 | Cowl Spacer (3 req'd.); with Item 10 |
| 5 | 4257104 | Washer, 1/4" (3 req'd.); with Item 10 |
| 6 | 32-50435 | Reflector & Ring Assembly |
| 7 | 32-50014 | Bulb Receiver Assembly (see Figure 1, Items 27-30) |
| 8 | 32-00169 | Lamphead Frame, Welded Assembly |
| 9 | 32-50055 | Blower, 240 V.AC, 50/60 Hz. |
| 10 | 4253500 | Cowl Mounting Screw, 1/4-20 x 3-1/2" (3 req'd.) |
| 11 | 32-40089 | Igniter Base Plate |
| 12 | 32-00269 | Mid-Frame Cover Plate (3 req'd.) |
| 13 | 31-61018 | Spark Gap |
| 14 | 39110000 | Capacitor, High Voltage |
| 15 | 32-50053 | RF Transformer |
| 16 | 31-29221 | Lamphead Base, Molded |
| 17 | 32-00182 | Lamphead Extension Cover |
| 18 | 32-00274 | Blower, 240 V.AC, 50/60 Hz. |
| 19 | 31-98163 | Cord Grip Bushing |
| 20 | 32-50032 | High Voltage Transformer |
| 21 | 32-40083 | Igniter Base Support, Left (2 req'd.) |
| 22 | 32-40084 | Igniter Base Support, Right (2 req'd.) |
| 23 | 32-00031 | Insulator Plate |
| 24 | 32-00188 | Blower Mounting Box |
| 25 | 32-00027 | Focus Rod |
| - | 32-00265 | Focus Rod Spacer |
| - | 4250620 | Screw, 1/4-20 x 5/8" Socket Head |
| - | 51-48004 | Retaining Ring, External |
| 26 | 32-00224 | Ring Assembly, Blower Box |
| 27 | 32-40090 | Access Cover Plate |
| 28 | 32-50117 | Lamp Holder |
| - | 41-51767 | Shoulder Bolt, 5/16 x 3/4" 1/4-20 Thrd. |
| - | 41-70005 | Flatwasher, 5/16" |
| - | 31-58005 | Compression Spring, .720 x .75" |
| 29 | 32-50013 | Bulb Support Spider, Welded Assembly |

Xenon Power Supply



PARTS LIST
Xenon Power Supply

| <u>Item</u> | <u>Part No.</u> | <u>Description</u> |
|--|-----------------|--|
| 1 | 82-40047 | Terminal Board Mounting Plate, Phenolic |
| 2 | 31-21005 | Fuse, 20 A. 250 V. (replace with same rated fuse) |
| 2 | 31-21038 | Fuse, 30 A. 250 V. (replace with same rated fuse) |
| 3 | 31-21054 | Fuse Block |
| 4 | 31-08133 | Power Factor Capacitor (3 req'd.) |
| 5 | 31-10001 | Capacitor Clamp (3 req'd.) |
| 6 | 32-40538 | Capacitor Mounting Bracket |
| 7 | 32-70318 | Printed Circuit Board Assembly |
| 8 | 41-56002 | Spacer, PC Board (4 req'd.) |
| 9 | 82-40040 | Support Bracket, Rectifier Heat Sinks |
| 10 | 81-46026 | Ceramic Resistor (R1,2), 100 Ohm, 100 W. |
| 11 | 82-40254 | Heat Sink Mounting Plate, Phenolic |
| 12 | 81247000 | Shunt, 200 A. |
| 13 | 32-40006 | Chassis Plate, Welded Assembly |
| 14 | 82-40255 | Heat Sink Mounting Plate |
| 15 | 82-20032 | Heat Sink (2 req'd.) |
| 16 | 81-61010 | Thermal Switch |
| 17 | 81-47004 | Forward Diode (CR1,2,3), 150 A. 300 V. (1N3290A) |
| 18* | 61-71010 | Positive Lead (Red) |
| 19* | 61-71009 | Negative Lead (Black) |
| - | 94129000 | Ring Terminal (2 per lead req'd.) |
| 20 | 91-98031 | Buss Bar (3 req'd.) |
| 21 | 81-47001 | Reverse Diode (CR4,5,6), 150 A. 300 V. (1N3290A-R) |
| 22 | 81-33026 | Squirrelcage Blower, 230 V.AC, 50/60 Hz. |
| 23 | 91-64008 | Power Transformer, 2000 Watt; 208/230 V.AC Input |
| 23 | 91-64009 | Power Transformer, 2000 Watt; 380/440 V.AC Input |
| 23 | 91-64012 | Power Transformer, 4000 Watt; 208/230 V.AC Input |
| 23 | 91-64001 | Power Transformer, 4000 Watt; 380/440 V.AC Input |
| 23 | 91-64011 | Power Transformer, 7000 Watt; 208/230 V.AC Input |
| 23 | 91-64007 | Power Transformer, 7000 Watt; 380/440 V.AC Input |
| <i>Item 23 Transformer includes Item 1 Mounting Plate & (6) Item 25 Terminal Blocks.</i> | | |
| 24 | 81-14003 | Contactator |
| 25 | 81-62001 | Tap Terminal Block (6 req'd.) |

* Order by *foot*

