



LIGHTHOUSE[™] UV CURING SYSTEM

OPERATING INSTRUCTIONS

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DISCLAIMER

WARNING: 1.) When operating this unit, air flow must be fully unobstructed. 2.) User must provide appropriate shielding to protect against UV radiation exposure. 3.) Heat generated from the lamp must be effectively evacuated from within the lamp housing.

RECOMMENDATION: We recommend a minimum of 10 CFM of air flow within the lamp housing per 100 watts/inch energy supplied to the UV lamp. **IMPORTANT NOTE:** Excessive cooling will diminish lamp operating voltage and effectiveness.

If the shutter is activated (closed), switch lamp power to low (standby) power. Failure to do so will cause the lamp to overheat, and may cause electrical component (fans, wiring, etc.) failure.

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I. Overview

Maintaining a UV curing unit is critical as UV lamps must operate at their peak performance to provide a full cure. CON-TROL-CURE has designed and developed this irradiator system to provide ease of maintenance, flexibility, maximum efficiency and high UV output.

Using field research and state of the art technology, the LIGHTHOUSE[™] irradiator requires less effort to produce maximum output with minimal waste. With a maintenance-friendly design, the ability to replace the reflector quickly is a key design feature in our lamp system. The LIGHTHOUSE[™] system aims to achieve quick, easy and inexpensive reflector replacement by allowing the elliptical half-side reflectors to be removed and replaced within five minutes.

Since you can change the lamp's retrofitted components easily, and, therefore, frequently, you can be assured of maintaining consistent, high UV output. This cost-effective approach ultimately provides the highest level of assurance for effective UV curing.

II. Introduction

High intensity, medium pressure, mercury vapor lamps can generate extreme heat and corrosive temperatures. However, the LIGHTHOUSE's components (thin reflector sheets, gap for cooling and fans) are designed to withstand the harsh environment created within a UV curing chamber, and to provide optimum cooling.

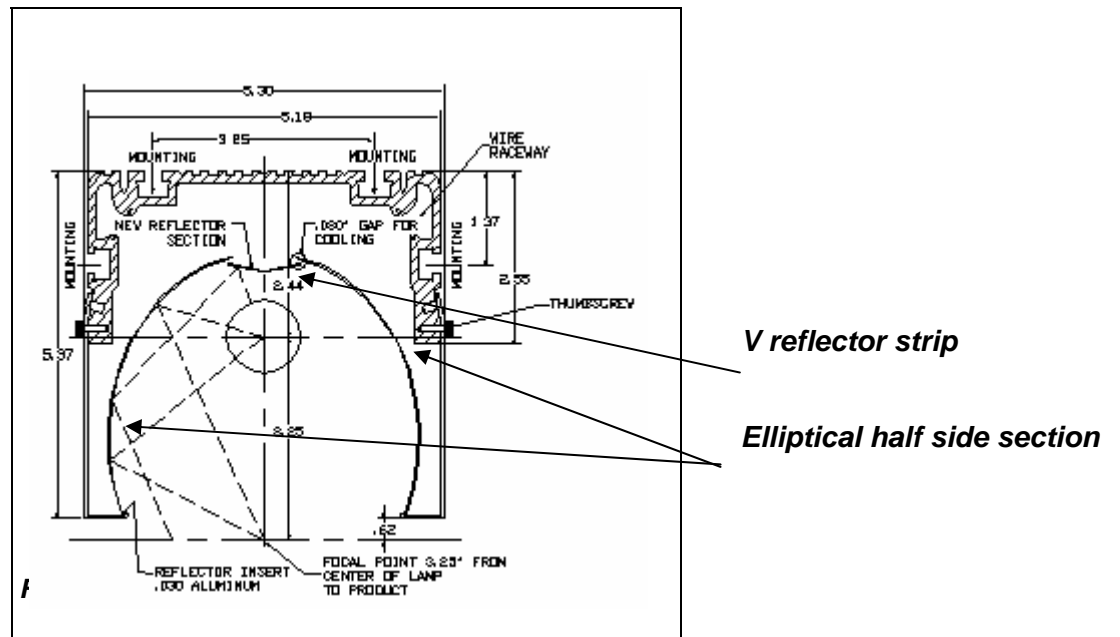
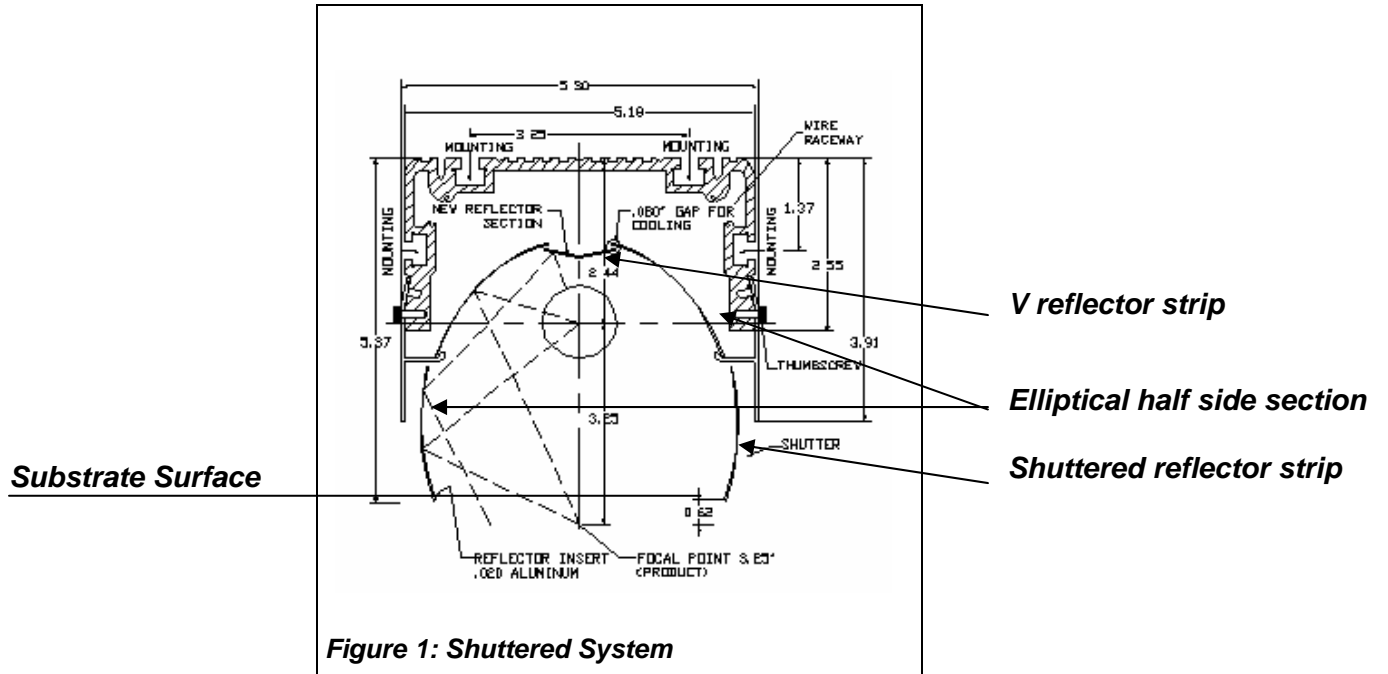
IMPORTANT: UV radiation can cause severe burns to eye and skin. Use protective materials (goggles, glasses), filter screens and curtains to ensure personnel safety. Proper maintenance procedures, including maintaining an inventory of spare lamps and reflectors, should also be practiced in order to prevent downtime.

This manual provides information regarding the different components (lamp, reflectors, power supplies and conveyor belts) for building your own irradiator system and/or upgrading existing system. It also includes directions and guidelines in operating the irradiator system including proper lamp mounting and focusing for utmost efficiency. In order to help prevent costly downtime and ensure maximum UV output, this manual contains important advice on proper clean-up and maintenance procedures.

III. Mounting

The Lighthouse[™] incorporates parallel channels along three sides of the housing which accept 1/4" bolts for mounting into any existing production system. To ensure proper focus of the UV light to the product surface, the Lighthouse[™] must be mounted providing a space of 5/8" from the housing's lowest point (open shutter for shuttered unit) to the top of product, or with a measurement of 3 1/4" from the 1/8" (3 mm) Focus Reference Hole to the top of product (see Figure 1 and 2).

When mounting the UV lamp assembly, compensate for thermal expansion (38" lamp irradiator will expand approximately 1/16" during an operation; 77" lamp irradiator will expand up to 1/8" or more).



IV. Cooling of Lamp

Cooling of Irradiator assembly

Cooling is accomplished by a series of fans positioned over the reflector and secured to the top-side of the housing. These fans are properly balanced to provide the right amount of air flow throughout the housing. Reducing air flow in any manner may cause the system to overheat and may cause the reflector to melt.

With Lighthouse's 3-part reflector, gaps permit air flow over both sides of the reflector. As the fans blow air down around the reflector sheet, it is deflected away from the lamp to maximize lamp efficiency. With minimal use of support extrusions and the incorporation of Lighthouse's reflector strip (which deflects light from behind the lamp, thus diminishing heat build-up around the lamp), additional heat is dissipated.

Fan-generated airflow can be reversed, thus allowing the fans to draw air up towards the reflector and lamp. To accomplish this, disconnect the fans and mount them upside down (see arrow on the side of the fan for flow direction). By redirecting air flow in this manner, though, you may increase lamp or reflector contamination due to outgassing of some coatings. This may also reduce lamp efficiency as air will be drawn over the quartz sleeve, thus reducing lamp temperature.

Keeping the fans off at startup will reduce warm-up period. Caution should be exercised since overheating and meltdown of the reflector can occur while the fans are off.

Cooling of product

Cooling the product is separate from cooling the lamp. Heat generated by the UV lamp can shrink or distort heat sensitive substrates during curing. Air Knives can help prevent such distortion when attached to the outside of the housing. Each Air Knife acts as high velocity air delivery system that effectively cools the substrate as it exits the curing chamber.

The Air Knife (6" - #A005-009) (12" - #A005-010) (18" - #A005-011) (24" - #A005-012) (30" - #A005-013) (36" - A005-014) blows a continuous and narrow stream of air over the substrate to quickly dissipate potentially damaging heat build-up.

V. Shielding

UV radiation can cause severe burns to eye and skin. Looking directly at an operating UV light should be avoided at all times. Wearing sufficient shielding and following safety practices are your most effective protective measures.

OSHA requires employers to make available and require employees to wear suitable eye and face protection where eye injuries may occur. In order to help comply with OSHA requirements



and to provide safety for your personnel, we offer an array of safety glasses and filter materials which were carefully selected for the needs of UV applications.

Protect the eyes by wearing safety glasses or goggles. They provide the best protection from large amounts of UV and visible light. UV Filter Safety Glasses protect the eyes by absorbing short-wave UV radiation to 400nm (yellow - # I005-018) (green - # I005-020) (clear - # I005-021) (gray - # I005-022). Disposable UV Filter Glasses (# I005-023) are offered at a very low cost to encourage safety even for people visiting your production shop. UV Viewing Goggles' glass filter offers maximum eye protection from UV light (# I005 - 016).

UV Filter Screens and Blackout Curtains can also be used to shroud the UV curing area and to help protect personnel from over-exposure to UV radiation. However, this is not intended as a substitute for using approved eye protection when direct and close range viewing is required.

The Portable UV Filter Screen (# F007-010) blocks ultraviolet light emitting from UV curing equipment. These self-standing screens absorb and filter light waves to 600nm. UV Blackout Curtains (30" x 40" - # F007-018), (37" x 48" - # F007-019), (40" x 50" - # F007-020), (40" x 60" - # F007-021) block out UV light, eliminate light leakage, and allow optimum light penetration.

VI. Wiring

When wiring the Lighthouse™ irradiator to the power supply, use appropriate high voltage and high-temperature, UL-approved wire (#A005-004). As electrical codes vary from region to region, we recommend reviewing those specifications before beginning any installation. We also strongly recommend the use of a certified electrician when installing and/or wiring this unit. Refer to the power supply schematic diagram to ensure proper installation.

The terminal box should be located where no high heat will be felt. Lamp wiring should be paired in a separate conduit from the terminal box to the power supply. Proper labeling should be posted (i.e. "WARNING: HIGH VOLTAGE").

Integrate the cooling fans by connecting two high temperature, UL-approved 20 gauge wires (# A005-003) to the terminal block (refer to schematic diagram). See fan voltage rating for power source and schematic diagram for appropriate wiring connections.

Electrical connections and wires should be examined on regular basis. UV curing environments produce tremendous amounts of heat, UV light and (usually) ozone. Exposure to harsh UV can deteriorate the integrity of internal components. However, parts of the Lighthouse™ irradiator (thin reflector sheets, gap for cooling and lamp housing fans) are designed to withstand such harmful effects.

VII. Lamp mounting



Figure 4: Focus Reference Hole

A. Focus

IMPORTANT: Before installing or focusing a lamp, disconnect this unit from its power supply to ensure complete safety.

The reflector is designed to focus all rays for the lamp in front of the reflector opening. Therefore, an exact focal point is needed for effective UV curing and centering the lamp within the housing provides maximum effectiveness. As different lamp ends and lamp diameters can change lamp focus, it is necessary to understand how to readjust lamp position to maintain proper focus should your lamp dimensions change. As mentioned earlier, the center of the lamp should be positioned exactly 3 ¼" from the Focus Reference Hole to the product surface.

By using the Focus Reference Hole found on each end plate, the user can adjust the position of the lamp on the universal lamp holder. Centering the lamp's focus (see Figure 6) is found to be more critical than we expected. Mounting the lamp ¼ of an inch upwards (see Figure 7), downwards (see Figure 8) or to the left (see Figure 9) will greatly affect the efficiency and intensity of the lamp's ultraviolet energy.

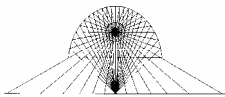


Figure 6: CON-TROL-CURE 3/4 Elliptical Reflector with adjustable lamp positioning

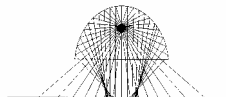


Figure 7: Typical Reflector Lamp 1/4" too high

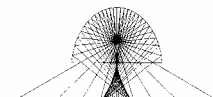


Figure 8: Typical Reflector 1/4" too low

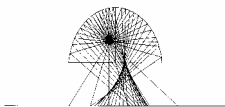


Figure 9: Typical Reflector 1/4" to the left

To focus a lamp before installing, string a wire through the Reference Holes located at each end of the reflector. Note the wire's position in relation to lamp holders. As mentioned previously, the center of lamp should be 3.25" from the product surface. If the holder appears at variance with this measurement, raise or lower the lamp holder by adjusting the nuts beneath the lamp holders to raise or lower the bracket as necessary.

To ensure the lamp is properly centered, ensure that the lamp is positioned 2.75" from outside of the lamp housing. Use the V-shaped reflector strip as a visual reference when making this adjustment. If corrections are required, loosen lamp holder and pivot the brackets until the holder is aligned with the reference wire.

Once all corrections have been made, retighten the holder hardware to prepare for lamp mounting.

A. Lamp Mounting

When focus is complete, and with the end caps removed, the Lighthouse's lamp holder mounts are exposed. Loosen and remove one wing nut per side and swing the lock-down clamp away from the reflector. Place the lamp's ceramic or metal ends into the v-notched universal holders, and swing the lock-down back into place. Lightly tighten the lamp holders so that some play is allowed to compensate for thermal expansion during operation. If the lamp is over-tightened, and does not allow for this expansion, it may break.



Figure 12: Hold-down bracket unlocked for lamp placement.



Figure 13: Lamp locked in place; hold-down bracket secured.

If you are installing a wire end lamp, connect the wire ends to the appropriate grounding posts (see Electrical Schematic). If the lamp requires refocusing (see "Focus" above), wait until the lamp is properly focused before securing any wire ends.

When installing any lamp, do not touch the quartz envelope directly. Always wear cotton inspection gloves when handling the lamp. Do not allow fingers or hands to touch the lamp body after cleaning or during lamp mounting. Dirt and foreign particles can reduce a lamp's effectiveness, cause a lamp to fail prematurely, or create an obstruction of the UV light.

When placing the lamp in the lamp holders, be sure it sits square so pressure is evenly distributed. Once the lamp is installed, reattach and secure the end caps covering the lamp holders and reflector.

VIII. Electrical/Start-up

With the lamp and reflector secured in place, and all shields locked down, you are ready to power up the unit.

With the reflector and lamp shielded against harmful exposure, turn the power supply On.

Refer to your lamp manufacturer's specifications indicating the length of time required for the lamp to reach stabilization (may vary from 5 to 15 minutes). After the warm-up period is complete, the lamp is ready to use for your curing application.

IMPORTANT: Remember to wear UV protective eye-wear and clothing when operating this system. Also protect from heat exposure as unit temperature may exceed 125°F.

POWER SUPPLY CONTROL PANEL



Main Power ON/OFF: Shuts off electrical connected to power supply. Includes safety lock which prevents power supply cabinet from opening while power is ON.

Start/Stop w/indicator light: Two-position pushbutton switches power ON (Start/green) or OFF (Stop/red) to end source (irradiator). When red indicator light is ON, power is ON to the irradiator. Power must be turned ON at the Main Power ON/OFF switch for this secondary switch to work.

Ammeter: Meter indicates real-time amperage draw being used by the power supply.

Lamp Voltage Interface: LED displays numerical level of electrical current. Interface permits input of high and low presets to warn user is lamp is drawing energy in excess or below levels required to produce the desired cure.

[The Lamp Voltage Interface is integrated parallel to your curing equipment's power supply and irradiator to provide continuous feedback of voltage level during operation. Interfaced with a high impedance panel-mount volt meter, the LVI provides a numerical power reading of lamp energy draw. The operator can use this numerical value to determine when a lamp stabilizes and is ready for use. This numerical value is critical in establishing an initial baseline after installing a new lamp.

As the lamp degrades over time, or if air flow (cooling) within the housing inadvertently lowers lamp temperature, the lamp will draw less energy. As a result, the LVI's numerical reading will be less than its initial baseline. This indicates the lamp is drawing less power and may be performing at less than peak efficiency.

By noting this change in numerical values, you can quickly cross-check this variance through physical cure evaluation before under-cured product is generated. If the tested product fails to cure at this numerical value, you can eliminate the inefficiency by cleaning or changing the



lamp, by cleaning or changing the reflector, by increasing power, or by changing air flow characteristics.]

Hour Meter: Counter displays number of hours the power supply has been in operation.

Power Level Settings: 8 different power level settings to suit your specific application. Choose from 40 to 100% maximum power level. To adjust power level, position the three power toggle switches as described on the Main Control Panel to achieve the require setting. **IMPORTANT NOTE FOR SHUTTERED LAMP HOUSINGS:** When the shutter is closed, lamp power must be reduced to low power (100 watts/inch). For timed shutter mechanisms, the time delay for switching to low power must be set at 120 seconds or less. If not, the shutter may overheat and warp.

IX. Cleaning

Dust and dirt on the lamp should be removed prior to installation to assure that they do not contaminate the quartz envelope. Dirt on the lamp and reflector can cut curability dramatically. Accumulation of deposits during production will prevent uniform delivery of light, reduce UV intensity and lessen cure efficiency. The lamp will absorb the UV energy and turn it into unwanted infrared.

Avert equipment failure by performing regular, proper maintenance. Keeping a log will define future operating procedures and maintenance programs. Prevent costly downtime and ensure maximum UV output by having a routine clean up of the irradiator system.

C.1 Cleaning the lamp

Lamp and Reflector Cleaning solution (Part # - A002-019) will prevent a thin film of foreign matter from accumulating on the lamp. Use this cleaning solution to clean lamps and reflectors so no organic materials can affect optimum light transmission.

Dampen the lint-free wiping towel (Part # - A002-021) with the lamp cleaning solution. Wipe the UV lamp directly with the dampened cloth. Dry and polish lamp with a clean wiper that contains no chemical binds nor any particles that can scratch.

Always wear cotton inspection gloves (Men's - #1004-022) (Ladies' - #1004-031) when handling the UV lamps. Do not allow fingers or hands to touch the lamp body after cleaning or during lamp mounting.

The CON-TROL-CURE UV Lamp and Reflector Maintenance Kit contains everything you need to clean UV lamps and reflectors thoroughly: cleaning solution, soft, lint-free wiping towel and cotton inspection gloves.

X. Changing Reflectors

The reflector is a vital component in the irradiator system since it affects the amount of light focused on the curing surface. During production, various deposits accumulate on reflector surfaces to greatly lessen cure efficiency. Depending on condition, reflectors can be replaced rather than cleaned. It is advisable to change the reflectors if they are contaminated, scratched or have lost their reflective quality.



Our entire design system aims to achieve quick, easy and cheap reflector replacement. The ability to easily replace the reflector is a key design and important feature in our lamp system. You can change the reflector as frequently as necessary.

The lamp housing reflector kit consists of “V” reflector strip and elliptical half sides, and shuttered reflector strips for shuttered units (see Figures 1 and 2). Because of the Lighthouse’s special design, changing the reflector is simple. Replace the V reflector strip (SHUTTERED - #U004-006) (NONSHUTTERED - #U004-007) found on the center of the lamp housing by alternately twisting it behind the hooks of the rib. Make sure the hooks are alternately opposite each other. If the first hook on the first rib is on the right side, the second hook on the second rib must be on the left side of the lamp housing.

The ends of the lamp are critical because you lose light output first as the lamp ages. The reflector end (SHUTTERED #U004-008) (NONSHUTTERED -#U004-009) is a unique design feature in the LIGHTHOUSE™ because it reflects more light at the end of the lamp. By removing the side shield on the lamp, the elliptical half side reflectors pop out for replacement.

Ultimately, changing reflectors frequently is a cost-effective measure. It also provides the highest level of assurance for effective UV curing. When cleaning reflectors, use same cleaning procedures as cleaning lamps. Never use abrasive cleaning compounds or steel wool for cleaning reflectors. These harsh products will remove its protective finish and reduce the reflector’s capability.

XI. Conveyor Belts and Drive Assemblies

Using heat-dissipating conveyors can withstand the high levels of radiation in a UV curing system. Conveyor belts (Part # - B002-002) must be tracked properly, be set at the correct tension and be checked for rips, tears and frays.

Repair and replace them with products that can sustain long term exposure to UV light or ozone (Replacement Belt - # B002-001). Look for our conveyor belts made of Teflon and Kevlar. To make emergency repair, use our Conveyor Belt Repair Kit.

XII. Maintenance of shutter mechanisms

Check shutter mechanisms and grippers monthly for proper operation. Replacement for all wearing parts should be on hand at all times. Treat them with UV Grease, which contains rust and oxidation inhibitors; color compounding, lubricity additives and synthetic oil base. UV Grease (Part # - U000-000) is useful for mechanical areas around UV lamps such as grippers or shutters.

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