

# Operation Manual

## Porta-Ray 400

Model 39639/39640 – 120/230 Volt Metal Halide Lamp  
Model 39697/39713 – 120/230 Volt Mercury Lamp



## UV Curing Light Source Focused Beam Flood Lamp System



**DYMAX<sup>®</sup>**

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TM-060  
PN 39957  
Rev 08/15/07

TM-060 PN 39957 Porta-Ray 400 Focused Beam  
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The enclosed Dymax Porta-Ray 400 Focused Beam UV Curing Light Flood Lamp System was developed and manufactured by the DYMAX team, driven by a desire to best serve your needs. Before shipping, your Porta-Ray Curing Lamp was thoroughly checked and tested for trouble-free performance.

The proper set up and operation of this Flood Lamp System will maximize safety and user-friendly performance, providing optimum yield of your technological process.

**THEREFORE, WE ENCOURAGE YOU TO READ, UNDERSTAND, AND FOLLOW ALL SAFETY AND OPERATING INSTRUCTIONS AND RECOMMENDATIONS COMPILED IN THIS AND OTHER RELATED MANUALS** prior to setting up and operating this new Flood Lamp System or its individual components.

If you encounter a problem, have any questions, or would like to help us with your suggestions or recommendations, please contact our Technical or Customer Service Departments at 860-482-1010.

## 1. UNPACKING AND INSPECTION

Upon receipt of the unit, carefully remove the contents from the boxes and check for damage. **DYMAX® is not responsible for damage from shipping – all claims for shipping damage should be made with carrier.**

Check all boxes for contents and write down any serial numbers for further reference. You may wish to retain original shipping cartons in case you need to repackage any item for return.

If you observe or experience any problem with your equipment, notify DYMAX Customer Service, your authorized distributor, or your DYMAX Representative immediately.

**NOTE: REPORT ANY SHORTAGE TO DYMAX CORPORATION CUSTOMER SERVICE - Phone: (860) 626-6329 or 860- 482-1010, Fax: (860) 489-3232**

Before continuing with unpacking and installation, please read the following Chapters of this Manual for safety recommendations and installation, operation, and troubleshooting instructions.



### List of Parts Included

1. One *PORTA-RAY 400R* lamp head with attached bottom accessory compartment.
2. One 400-Watt UVA enhanced arc lamp (installed) - other spectral versions optional.
3. One lamp headrest / mini curing chamber with drawer.
4. One pair of UV/IR protective glasses.
5. One AC power cord.
6. One *PORTA-RAY 400R* owner's manual.
7. One Face Shield

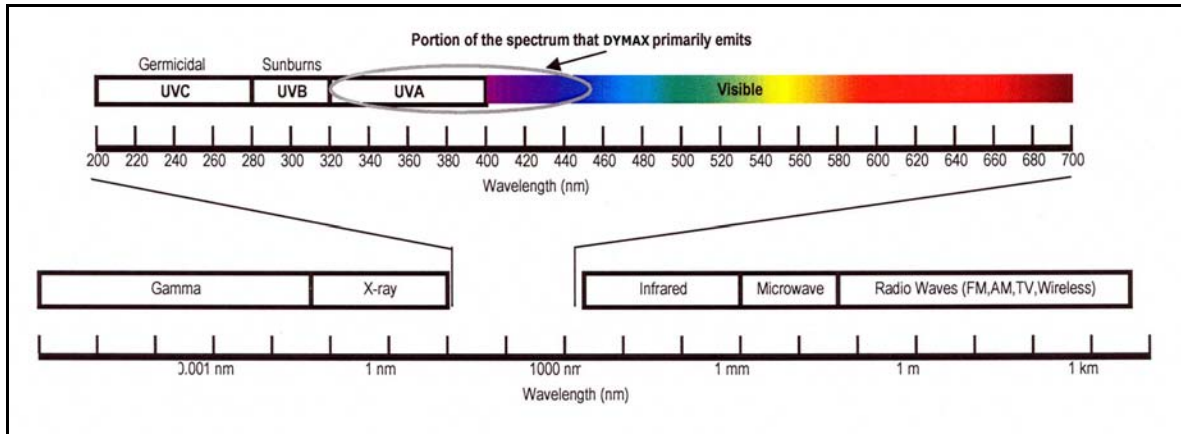
## 2. DYMAX UV CURING SYSTEM SAFETY CONSIDERATIONS

DYMAX ultraviolet curing technology has been used successfully for over 25 years. The fast cure, one component nature of our UV curing technology has made it the process of choice for many manufacturers requiring a Cure on Demand™ assembly process. The purpose of this document is to provide information relating to the use of DYMAX UV curing systems. There are four common questions/concerns related to UV curing systems: UV exposure, high temperature surfaces, ozone, and bright visible light.

### UV EXPOSURE

Standard DYMAX UV curing systems and bulbs have been designed to primarily emit UVA light<sup>3</sup> (as shown in Chart 1). UVA light is generally considered the safest of the three UV ranges: UVA, UVB, and UVC. Although OSHA does not currently regulate ultraviolet light exposure in the workplace, the American Conference of Governmental Industrial Hygienists (ACGIH) does recommend Threshold Limit Values (TLV's) for ultraviolet light. The strictest interpretation of the TLV (over the UVA range) for workers' eyes and skin is 1 mW/cm<sup>2</sup> (intensity), continuous exposure. Unless

workers are placing bare hands into the curing area, it is unusual to exceed these limits. To put 1 mW/cm<sup>2</sup> limit into perspective, cloudless summer days in Connecticut regularly exceed 3 mW/cm<sup>2</sup> of UVA light and also include the more dangerous UVB light (primarily responsible for sun tans, sun burns and skin cancer) as well.



The human eye can not detect “pure” UV light, only visible light. A radiometer should be used to measure stray UV light to confirm the safety of a UV curing process. A workstation that exposes an operator to more than 1 mW/cm<sup>2</sup> of UVA continuously should be redesigned.

UV adhesive curing can be a regulatory compliant, “worker-friendly” manufacturing process when the proper safety equipment and operator training is utilized. There are two ways to protect operators from UV exposure: shield the operator and/or shield the source.

**SHIELD THE OPERATOR**

- ❖ **UV-Blocking Eye Protection** – *UV-blocking eye protection is recommended when operating UV curing systems. Both clear and tinted UV-blocking eye protection is available from DYMAX (see Table 1).*
- ❖ **UV-Blocking Skin Protection** – *Where the potential exists for UV exposure upon skin, opaque, UV-blocking clothing, gloves, and full-face shields are recommended.*

**SHIELD THE SOURCE OF UV**

Any substrate that blocks UV light can be used as a shield to protect workers from stray UV light. The following materials can be used to create simple shielding structures or blind corners:

- ❖ **Sheet Metal** – *Aluminum, steel, stainless steel, etc. Sheet metal should be coated black or black anodized to minimize reflection of UV and visible light toward operators.*
- ❖ **Rigid Plastic Film** – *Transparent, UV-blocking plastics (typically polycarbonate or acrylic) are commonly used to create shielding where transparency is also desired. These rigid plastic films are available either water-clear or tinted.*
- ❖ **Flexible Film** – *UV-blocking, flexible urethane films can be used to quickly create workstation shielding. This UV-blocking, flexible urethane film is available from DYMAX (see Table 1).*

**HIGH TEMPERATURE SURFACES**

Surfaces exposed to high intensity curing lights will rise in temperature. The intensity, distance, exposure time, cooling fans, and the type/color of the surface can all affect the actual surface temperature. In some cases, exposed surfaces can reach temperatures capable of producing a burn or causing damage to a substrate. In these cases, care must be taken to ensure either a more moderate surface temperature or appropriate protection/training for operators.

**OZONE**






Standard DYMAX bulbs (UVA type) generate an insignificant amount of UVC and therefore essentially no ozone<sup>3</sup>. Some UV curing systems, like those used to cure UV inks, emit primarily “shortwave” (UVB and UVC) energy. Upon exposure to UVC light (specifically <240 nm), oxygen molecules (O<sub>2</sub>) split into oxygen atoms (O) and recombine with O<sub>2</sub> to create ozone O<sub>3</sub>. The current, long-term ozone concentration limit recommended by ACGIH, NIOSH, and OSHA is 0.1 ppm (0.2mg/m<sup>3</sup>).

**BRIGHT, VISIBLE LIGHT**

The bright visible light emitted by some UV curing systems can be objectionable to some workers and can cause eyestrain. Tinted eye protection and/or opaque/tinted shielding can be utilized to address this concern.

**SUMMARY**

UV light sources can be more “worker friendly” than many commonly accepted industrial processes, provided the potential concerns are addressed. Contact your DYMAX representative for information regarding the proper use of DYMAX UV curing systems.

TABLE 1. UV Blocking Eye Protection and Shielding		
 <p>Clear Spectacles* No tint <b>PN 35612</b></p>	 <p>Green Spectacles* Medium tint <b>PN 35614</b></p>	 <p>Dark Green Spectacles* Maximum tint <b>PN 38349</b></p>
 <p>Clear Goggles* No tint; for use over eye glasses <b>PN 35284</b></p>	 <p>Grey Goggles* Medium tint; for use over eye glasses <b>PN 35285</b></p>	 <p>Dark Green Goggles* Maximum tint; for use with eye glasses <b>PN 35286</b></p>
 <p>Clear Face Shield** No tint <b>PN 35186</b></p>	 <p>Dark Green Face Shield** Maximum tint <b>PN 38407</b></p>	 <p>Flexible Urethane Shielding 8” wide, per linear foot <b>PN 35531</b></p>

<sup>1</sup> Per manufacturer, 99.9+% UV blocking and meet ANSI Z87.1 and CSA Z94.3 requirements

<sup>2</sup> Meets ANSI X871.1

<sup>3</sup> DYMAX also provides special order “shortwave” bulbs that emit primarily UVB and UVC light. Contact DYMAX directly for information regarding the use of “shortwave” bulbs.

### 3. GENERAL

The *PORTA-RAY 400R* light cure system may be placed on any bench or shelf that has access to an 115VAC 50/60-cycle single-phase power source in a clean operation area.

**CAUTION:** The Porta-Ray is available in 115 VAC and 230 VAC configurations. The unit's voltage configuration is clearly identified by a bright orange label, located adjacent to the unit's AC power input connector at the side of the lamp head. Operating with voltage outside the specified range may result in damage to the system.



Fig. 1, PortaRay lamp mounted on headrest

Since the PortaRay is an air-cooled unit, dust or airborne particles can clog the internal cooling passages and cause overheating. Allow a 4-inch clearance on all sides of the lamp head during operation for unrestricted airflow.

#### Mounting

The lamp head assembly should always be placed on the headrest, or held away from any flammable surfaces. Never place the lamp head directly on the work surface. The PortaRay is also designed to be fixture, machine or conveyor mounted using the two threaded holes in the top surface of the lamp head.

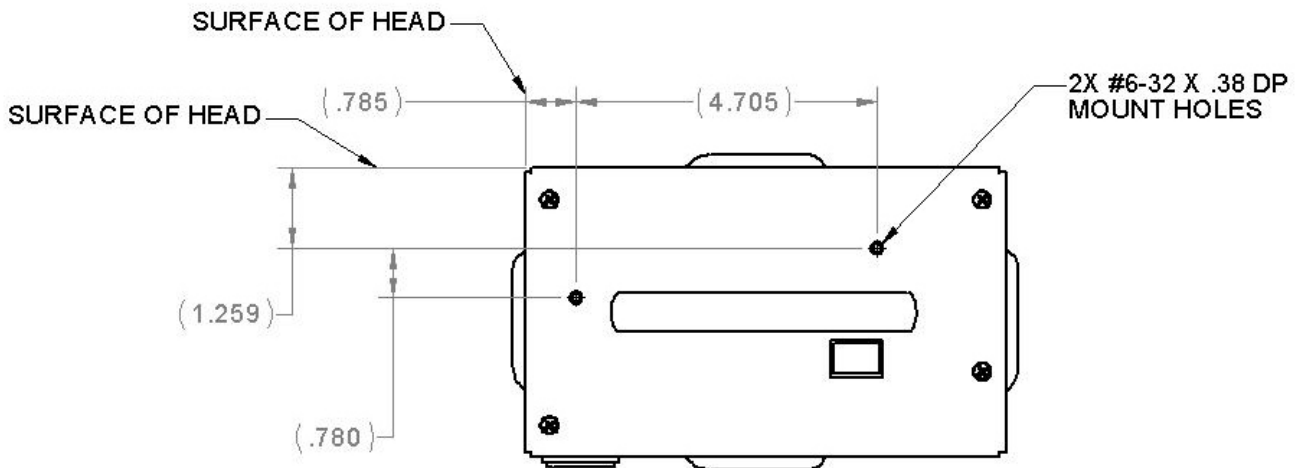


Fig. 2, PortaRay lamp head mounting hole dimensions (in inches).

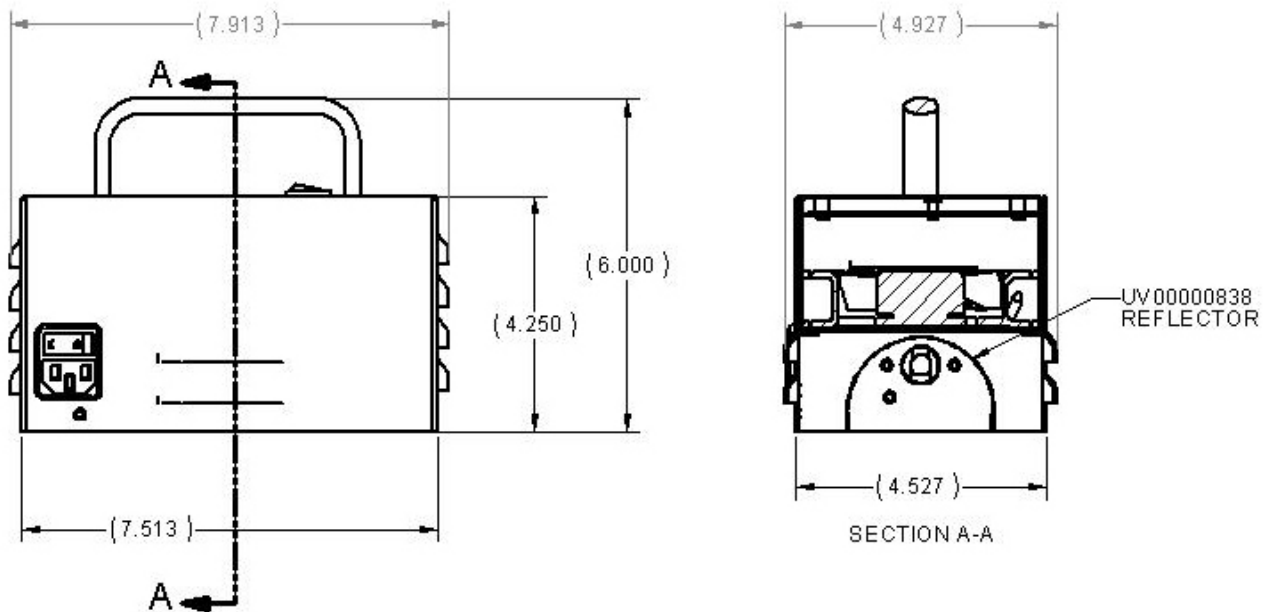
The lamp head assembly can also be placed on a shelf type structure, supporting the unit by its bottom outside edges. For this type of mounting, a windowed hole must be cut in the shelf, which would provide adequate clearance for the unit's bottom-side light exposure opening, and also for the cooling air exhaust holes.

**Shielding**

All installations should incorporate adequate shielding of radiated UV light, in order to prevent eye and skin burn of the operator or others passing through the work area (refer to UV Safety Warning in the following Safety Considerations section of the manual). The supplied headrest / curing chamber can be used with the *PortaRay* to minimize the amount of stray UV light scattering in the work area. Custom shielding may be constructed using sheet metal, UV blocking acrylic or polycarbonate to prevent operator exposure to UV radiation.

**WARNING:** To prevent risk of eye or skin burn, all personnel must be protected from direct or indirect exposure to the UV light produced by the *PortaRay* curing system. Extreme care should be used when designing custom UV shielding to insure personnel will not be exposed to harmful UV radiation. Additionally, UV protective glasses and protective clothing should be used at all times while working in the vicinity of the UV curing system.

**Dimensions**



*PortaRay* lamp head overall dimensions (in inches).

**Electrical Safety**

High voltage and current energize the UV Lamp. A high voltage power supply and igniter combination is designed to provide lamp-starting voltages, to limit current, and subsequently provide a uniform output of energy. *To avoid the risk of electrical shock, do not attempt to replace the lamp before turning off the power input switch, and disconnecting the input power cord.*

The electrical system of this unit should be serviced by qualified service personnel.

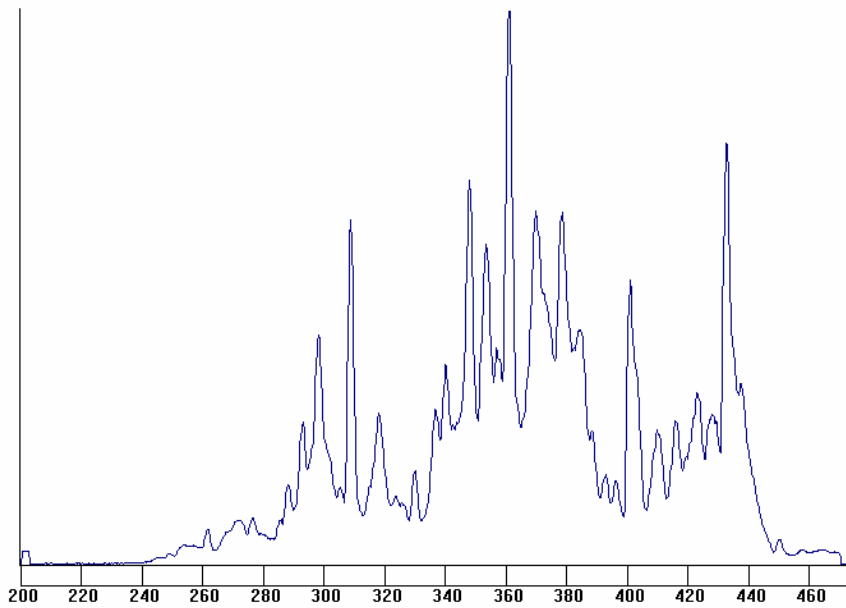
**High Temperatures**

Due to the high output power of this system, high temperatures may be present on the surfaces of the lamp, reflector, lamp head and headrest. *Extreme care should be taken to prevent touching any of these surfaces before allowing sufficient time for all temperatures to drop to safely back to room temperature after power has been removed.* Also, the lamp head assembly should never be placed on or near any flammable surface while the lamp is on, or before its temperature has cooled back to room temperature. Never place the lamp head or parts to be cured on a heat sensitive surface. Always cure parts on a metallic or non-flammable surface. When the unit is not in use, place the lamp head on the headrest, and switch the standby switch to the low power position to minimize temperature rise.

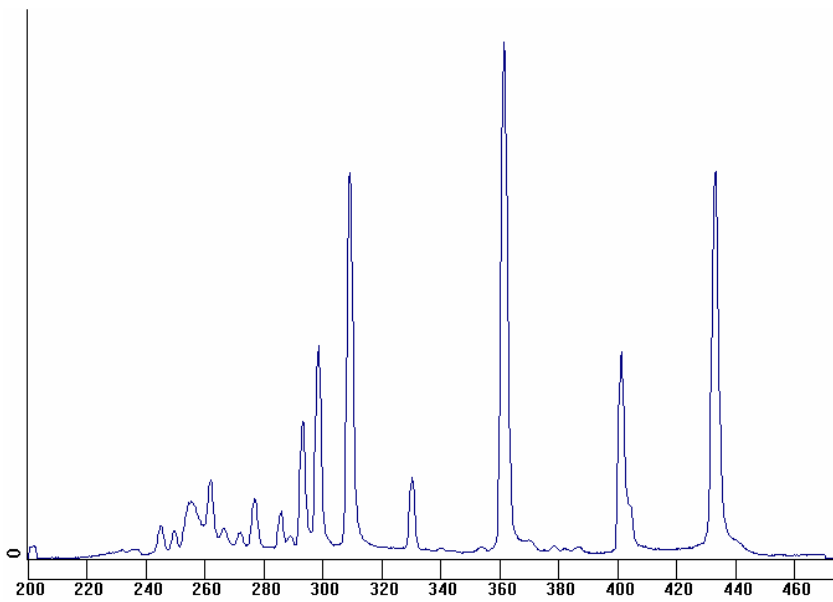
**WARNING: Placing the Lamp Housing Assembly on or near flammable surfaces while the lamp is on, or still hot could result in fire.**

#### 4. SPECIFICATIONS

Category	Parameter	Value	Conditions/Notes
<b>General</b>	Model	PORTA-RAY 400R	
	Part Number	PN 39639 (120VAC Metal Halide Bulb)	PN 39640 (240VAC Metal Halide Bulb)
		PN39697(120VAC Mercury Bulb)	PN 39713 (240VAC Mercury Bulb)
<b>Power Supply</b>	Input Voltage	100-120VAC +-10%	200-240VAC +-10%
	Input Current (max)	7 Amperes	3.5 Amperes
	Source Input Frequency	47 Hz to 63 Hz	47 Hz to 63 Hz
	Lamp Power Regulation	± 1%	
	Protection	Inrush current limit, Line voltage surge, Short circuit, Open circuit, Hot re-strike, Over temperature, Ignition retry timeout	5 minute
<b>Lamp</b>	Lamp Type	400 Watt Metal Halide	Quartz, ozone-free
	Lamp Voltage	135 ± 15V	
	Arc Length	32 mm	
	Burning Position	Horizontal	
	Radiation Flux	72 Watts	315 - 400 nm
	Warm-up Time	1 to 2 minutes	
	Cooling Time Before Restart	5 minutes typical	Lamp protection prevents restart of hot lamp
	Lamp Peak Irradiance	500mW/cm2 UVA	2" from base of lamp head
	Curing Area	5 x 3" minimum	Affected by lamp height
	Lamp Life	1000 hours typical	Affected by # of on/off cycles
<b>Environmental</b>	Operating Temperature	+10 °C to +40 °C (+50 °F to +104 °F)	
	Storage Temperature	0 °C to +60 °C (+32 °F to +140 °F)	
	Relative Humidity	30 to 75% operating, 10 to 100% storage	Non-condensing
	Cooling	Forced air	
	Over-temp Shutdown	67 °C (internal)	
<b>Dimensions</b>	L x W x H (inches)	8" x 5" x 16.5"	Including bottom enclosure
	Weight (lbs.)	6 lbs. w bottom box	3.5 lbs. lamp head only
	Max Chamber Part Size	4.25" x 4.25" x 2"	For curing in headrest



**Spectral Output of Standard Metal Halide Bulb**



**Spectral Output of Mercury Bulb**

**Output Intensities (Typical)**

WAVELENGTH	INTENSITY (mW/cm <sup>2</sup> )
UV-A * (365 nm)	400

\* Intensity with the beam focused, measured with an Accu-Cal 50 UV radiometer calibrated and traceable to NIST.

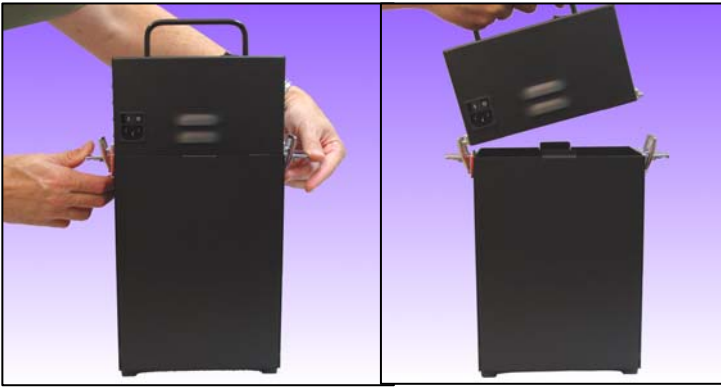
## 5. Components Description



<b>Item</b>	<b>Description</b>
1. Handle	The <i>PortaRay</i> handle can be used to carry the curing system when the lamp head is latched to bottom accessory compartment, or to hold the lamp head during manual curing operations.
2. Mounting Holes	These two threaded holes can be used for fastening the lamp head to a fixture, machine or conveyor.
3. Lamp Power Select Switch	The Lamp Power rocker switch selects either the “full” or “standby” lamp power setting. When curing or warming-up the lamp, the switch should be set to full power. Between curing operations, the switch can be set to the half power standby setting, which reduces the amount of heat and stray UV light radiated by the unit. The switch should always be set to “standby” when the lamp is idling on the headrest. When switching back to full power, the lamp will be ready for curing again after a brief 10 second re-warming period.
4. Input Power Switch & Receptacle	The Input Power switch is used to apply or remove main power to the <i>PortaRay</i> system. Co-located with the switch is the IEC type power cord socket where the input line cord is inserted.
5. Input/output Cooling Air Louvers	The input & output air louvers channel cooling air from the fan, in and out of the lamp head. These must remain unobstructed.
6. Accessories Storage Compartment	This bottom box can be used to store and transport curing accessories (e.g. headrest, glasses, power cord & adhesive).
7. Cooling Fan	The lamp head fan cools the lamp, reflector and internal power supply circuit board assembly.
8. Lamp head latches	These latches are used to secure the lamp head to the bottom accessories compartment during transport & storage.
9. Arc Lamp	Medium pressure arc lamp which produces UV & visible light.
10. Reflector	Lamp reflector which collects and concentrates light from all sides of the arc lamp. This surface should be kept clean to insure maximum light output.

## **6. OPERATION**

The *PortaRay* is designed to be an extremely user-friendly system, which has a minimum of controls, and is easy to operate. Therefore, the following operating instructions are brief.



Unlatching and removing lamp head

- A. Open the latches on the side of the unit, and remove the lamp from the bottom enclosure by lifting it by the handle.
- B. Place the lamp head on the headrest with the drawer closed.



Lamp head on headrest

- C. Plug the IEC type connector of the AC Power Cord, into the power input receptacle in the side of the lamp head. Plug in the opposite end of the line cord into a nearby single phase power outlet.
- D. To start the system, turn on the Input Power Switch at the side of the unit. The lamp should turn on.
- E. During the warm-up period, the switch on the top of the lamp should be set to full power mode. A one to two minute warm-up time is required for the lamp to reach full intensity.

**WARNING:** Bluish light is projected from the unit becoming brighter as the unit warms up. This ultra-violet light can be harmful to the eyes and skin. UV protective glasses and clothing are required to prevent burns of eyes and skin. Care should also be taken to protect other personnel in the area from unintentional exposure to the UV light (see section 2 for additional UV safety information).

- F. To change to the standby power mode, switch the lamp power rocker switch to the half power position (rocker paddle pressed toward the closest handle stem). The lamp intensity will visibly dim when the unit is in this low power mode.

**NOTE:** The *PortaRay* system is designed for continuous operation. It is suggested that the lamp remain on during work breaks. Frequent stopping and starting of the lamp will reduce lamp life. In general, leave the unit in standby power mode for periods of non-use of less than thirty minutes. The unit will require only a brief 10 second rewarming period before the lamp returns to full intensity. Once the input power is switched off, the lamp will require a minimum of 5 minutes of cooling time before restarting.

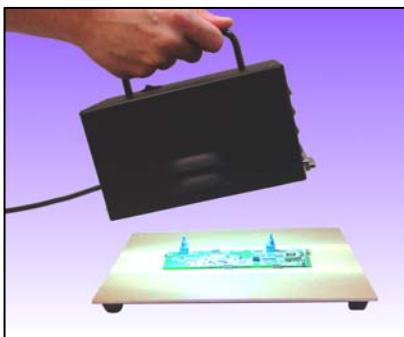


Curing in headrest

G. The headrest can be used as a curing chamber for small parts. To cure parts in the head rest, pull the drawer open using the black pull knob, and load components onto the center of the tray. Close the drawer, set the power mode switch to the full power position and wait the appropriate amount of time for curing to complete.

**WARNING:** While the drawer is in the fully open position, the back side of the drawer will block most of the UV light and prevent it from scattering into the work area. However, UV glasses and skin protection should still be worn during curing to insure safe operation.

H. When curing is complete, set the power mode switch to the standby position to minimize temperature rise of the lamp head and headrest. Open the drawer and remove the cured parts.



Handheld curing

I. To perform handheld curing, lift the lamp head from the headrest using the handle, switch to full power mode and hold the lamp 2 to 6 inches from the target substrate.

**NOTE:** The height of the Lamp can be adjusted up or down to control the intensity of light reaching the substrate being cured. Refer to the adhesive manufacturer's data sheet for appropriate exposure time and intensity levels. The optimum height and exposure time required to provide proper curing may need to be adjusted experimentally.

J. When curing is complete, place the lamp head back on the headrest, and set the power mode switch back to the standby position.

**Shut Down**

To shut down the light cure system, place the lamp head back on the headrest, and shut off the input power switch. Allow the lamp and surrounding components time to cool before placing the head close to temperature sensitive materials or before re-packaging the system for transportation.

**7. MAINTENANCE****Maintenance Considerations**

During the production process, various deposits of foreign matter may accumulate on the lamp and reflector surfaces. Product vapors can also condense on these surfaces over time, causing poor transmittance/reflectance of UV light, and reduced curing efficiency. To insure maximum light output of the curing system, these surfaces should be inspected and cleaned at regular intervals as required.

The lamp will also need to be replaced periodically as its UV output drops sufficiently enough to prevent complete product curing. A radiometer should be used to monitor system UV light output over time. If a radiometer is not available, the quality of the product's curing should be checked regularly as a less direct indicator of lamp performance. If a radiometer is not used to track lamp performance, then the lamp should be replaced after approximately every 1000 hours of operation.

**Cleaning of Optics and Lamp Replacement**

The following procedure should be followed carefully for optics cleaning & lamp replacement:

**WARNING:** To avoid coming in contact with dangerous high voltages or high temperatures, the following power down & cooling procedure must be completed before attempting any maintenance operations on the *PortaRay 400R UV Lamp*: *Turn off the input power switch at the side of the lamp head, and unplug the power cord from the input power receptacle. Wait 15 minutes or until the lamp and other hot components cool back to room temperature before proceeding with any maintenance operations.*

1. Remove the lamp head from its headrest or fixture, and place it upside-down on a soft clean surface.

**CAUTION:** It is extremely important to avoid touching (with your hand) the aluminum reflector, and the glass portion of the lamp. Contaminants from your skin will cause oxidation of the reflector, and unwanted refraction of light through the contaminated portion of the filter glass and lamp. These contaminants may also cause localized hot spots on the quartz envelope of the lamp, which could result in premature lamp failure. Clean cotton gloves or a clean soft cloth should be used when handling or cleaning the lamp and reflector.

2. Using cotton gloves or a clean soft cloth, remove the lamp by holding it near one end, and pushing into the adjacent spring loaded socket. Once the other end of the lamp has cleared the walls of its socket, tilt the cleared end of the lamp up slightly, and remove the lamp from the other socket that is still engaged.
3. Using a clean soft cloth dampened with isopropyl alcohol, clean the surfaces of the aluminum reflector.

**CAUTION:** Do not use abrasive cleaning compounds or steel wool for cleaning the reflector. These harsh products will remove the finish and reduce the reflector efficiency.

4. Wipe the lamp lightly with a clean isopropyl dampened cloth. If the lamp shows signs of bulging or shape distortion, then replace it. Otherwise, dry and polish the lamp with a clean dry cloth.
5. Re-insert the cleaned or new lamp between the lamp sockets, with the filler nipple facing the reflector. Be sure to center each lamp electrode in its socket to insure proper electrical connection and to avoid arcing (which could damage the lamp or socket). The lamp is non-polarized so it does not matter which electrode is placed in which socket.

6. Mount the lamp head back on its headrest or fixture, and reconnect the input power cord.
7. Re-test the unit to insure satisfactory light intensity and cure time is achieved.

**Accessories Storage, Packaging and Carrying**

Once the lamp has cooled sufficiently, the system can be re-packaged and transported. The bottom portion of the PortaRay can be used for storing related curing accessories (such as the headrest, power cord, UV glasses and adhesive. After accessories have been inserted, the lamp head can be latched onto the bottom enclosure for system storage or transportation to another location.



## 8. TROUBLESHOOTING

**ONLY QUALIFIED MAINTENANCE PERSONNEL SHOULD ATTEMPT THE FOLLOWING PROCEDURES:**

<b><u>Problem</u></b>	<b>Probable Cause</b>	<b>Solution</b>
1. Lamp operates but has low output, or slow curing.	A. Lamp Power switch is in half power position.	A. Place switch in the full power position during curing.
	B. Lamp too far from substrate being cured.	B. Adjust lamp height to within 2 to 4 inches of surface being cured.
	C. Adhesive not compatible with lamp type.	C. Compare the adhesive's light spectral requirements with the Lamp's spectral chart in the Specifications section. Contact factory for optional lamp types if required.
	D. Reflector or lamp requires cleaning.	D. Clean reflector and lamp as per maintenance procedure.
	E. Defective or excessively aged lamp.	E. Replace lamp (see lamp replacement procedure in maintenance section)
2. Lamp does not light, but fan running.	A. Lamp not properly installed.	A. Disconnect power, and verify both lamp electrodes are properly centered in sockets.
	B. Over-temperature protection activated	B. Allow unit to cool and operate unit in cooler environment (see Specifications section for operating temperature range).
	C. Defective or excessively aged lamp.	C. Replace lamp (see lamp replacement procedure)
3. Lamp does not start, fan not running.	A. Power cord not properly connected or defective.	A. Verify both ends of the power cord are fully inserted into their sockets, or replace power cord.
	B. No power at outlet.	B. Test for power at wall outlet.

**NOTE:** WHEN CONTACTING DYMAX CORPORATION, AN AUTHORIZED DYMAX DISTRIBUTOR, OR MANUFACTURER'S REPRESENTATIVE, BE SURE TO KNOW AND PROVIDE THE FOLLOWING:

- MODEL NUMBER OF LIGHT SOURCE IN QUESTION.
- SERIAL NUMBER OF LIGHT SOURCE IN QUESTION.
- PRODUCT NUMBER OF ADHESIVE IN QUESTION (IF APPLICABLE).
- LOT NUMBER OF ADHESIVE IN QUESTION (IF APPLICABLE).

ALL RETURNS TO DYMAX CORPORATION MUST BE ACCOMPANIED BY A RETURN AUTHORIZATION NUMBER (RAN). THIS NUMBER MUST BE OBTAINED FROM THE DYMAX CUSTOMER SERVICE CENTER.

## 9 SPARE PARTS

ITEM	PART#
Lamp, Metal Halide 400 Watt UV (Standard)*	38560
Lamp, Mercury Vapor 400 Watt UV (Optional)	36970
Face Shield	35186
Safety Glasses	35285

\* Recommended spare parts

## 10. DEFINITION OF TERMS

**Flood Lamp System** - Set of components arranged to generate, collect, condition and direct UV radiant energy to perform curing of engineering adhesives, coatings, and inks within a safe and controlled process. It includes a Lamp Housing and Power Supply and may also include a Shutter, and Workstation, UV Enclosure, or Dymax® Lightshield, and accessories.

**Lamp** - Light source (bulb or burner) generating Ultraviolet, Visible, and Infrared radiant energy from burning matter stimulated by electrical power conditioned by a proper power supply which is an integral part of a Lamp. A light source is usually placed into a reflector (of various geometry) to increase light source efficiency by collecting and directing radiant energy of selected spectra (for a given curing process).

**Intensity** - a measure of light energy over the unit of surface area (usually surface at the specified working distance from the bottom of a reflector housing) in  $W/cm^2$  or  $mW/cm^2$ . For the UV portion of light, this measure is often called in literature "irradiance", i.e. radiant energy arriving at a point on a surface per unit area.

**Brightness**, also known as **Luminance** - description of energy in the visible region of the spectrum (approximately from 400 to 700 nm) and recorded in photometric units. "**Intensity**" (see below) of visible light energy is called Illuminance.

**Illuminance** - luminous flux (energy of visible light) incident per unit area, and measured in **Lx** (lux) or **Lumen/cm<sup>2</sup>**.

**Ultraviolet (UV)** - The invisible region of the spectrum just beyond the violet end of the visible region. Wavelength ranges in general from 1.0 to 400 nm. Dymax® bulbs (burners) do not radiate energy in deep Ultraviolet; there are very minute amounts below 220 nm and practically nothing can be sensed below 200 nm. This is due to the use of an ozone blocking quartz bulb envelope (See Ozone).

Ultraviolet is used beneficially in various fields of industry and medicine. In order to standardize Light Sources used in medicine, in Copenhagen in 1932, The International Congress on Light recommended dividing the ultraviolet spectrum into three spectral parts:

1. **Ultraviolet A (UV-A)** - UV of long wavelength from within approximately 400 to 320nm of the spectral band (4000 to 3200⊕) - predominately produced by Dymax Flood Lamps.
2. **Ultraviolet B (UV-B)** - UV of medium wavelength from within approximately 320 to 280nm - Dymax Flood Lamps produce some amount of their energy within this bandwidth.
3. **Ultraviolet C (UV-C)** - UV of short wavelength below 280nm (we say from 280 to 200nm) – a large amount of this energy is present in the Sunlight.

**Dose** - is irradiance integrated over time, or Irradiance ( $W/cm^2$ ) x Time (s) = Dose (Joules/cm<sup>2</sup>). Note: Watt is the power that gives rise to the production of energy at the rate of 1-joule (J) per second (s).

**Ozone** - oxidizing agent (O<sub>3</sub>) produced by the action of Ultraviolet radiant energy (below 185 nm) or electrical corona discharge of oxygen on air.

**OSHA** 1910.145: "Regulation of Accident prevention Signs and Tags" defines the following headers as:

**WARNING** – is used when there is a hazardous situation that has some probability of severe injury.

**CAUTION** - is used to indicate a hazardous situation that may result in minor or moderate injury.

**NOTICE** - is used to convey a message related directly or indirectly to the safety of personnel, or protection of property.

## 11. WARRANTY

### CAUTION!

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**WARRANTY CARD MUST BE RETURNED OR WARRANTY WILL BE VOID.**

Dymax<sup>®</sup> offers a one-year warranty against defects in material and workmanship on all system components *with proof of purchase date*. Unauthorized repair, modification, or improper use of equipment may void warranty. The use of aftermarket replacement parts not supplied or approved by Dymax<sup>®</sup> Corporation, will void any effective warranties and may result in damage to the equipment.

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