



INTELLIRAY 600

PN: UV0832

Microprocessor
Controlled Light
Curing System

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INTRODUCTION

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1.1 Purpose of Manual

The purpose of this manual is to provide installation, operation and troubleshooting instructions for the Uvitron International IntelliRay 600 Light Cure System. It is important the manual be read carefully before any attempt is made to install and operate the equipment.

1.2 Purpose of Equipment

The system is a bench top, machine, fixture or conveyor mountable light source, designed for the rapid light curing of photo-initiated adhesives, resins, coatings, inks or paints. The unit is suitable for laboratory use or volume industrial production applications.

1.3 Unpacking

Visually inspect the shipping carton for physical damage. Damaged shipping cartons should be reported to the carrier. Carefully open the carton and remove the equipment, being careful not to lose or damage any separately packed parts.

Check all parts against the parts list. Any damaged or missing parts should be reported to the carrier and to your UVITRON representative.

All packing material and the shipping carton should be saved in case the unit has to be returned at some future time.

1.4 List of Included Parts

1. One (UV0832) INTELLIRAY 600 microprocessor-controlled Lamp Head with integral shutter.
2. One (UV0834) 600-Watt UVA enhanced metal halide lamp (installed).
3. One (UV2128) glass filter plate (installed).
4. One (UV0495) pair of UV protective glasses.
5. One (UV0883) AC power cord, USA standard (type delivered country dependent)
6. One (UV0841) IntelliRay 600 owner's manual.

Optional Parts

1. One (UV1080) Rayven UV oven with adjustable shelf and DB15 interconnect cable.
2. One (UV0454) UV Flood Stand, consisting of post, base plate, & 2 screws with nuts.
3. One (UV0455) Wrap-around UV Flood Shield, Front.
4. One (UV1094) UV Flood Shield, Backside
5. One (UV0525) RS232 Remote Interface Cable.
6. One (UV0527) IntelliRay Remote Control Interface Software CD ROM.

INSTALLATION

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2.1 General

The IntelliRay 600 light cure system may be placed on any bench or shelf that has access to a 120/240V 50/60-cycle single-phase power source in a clean operation area. Since it is an air-cooled unit, dust or airborne particles can clog the internal cooling passages and cause overheating. Allow a 6-inch clearance on all sides for unrestricted airflow.

2.2 Mounting

The Lamp Housing Assembly should always be mounted on a stand or held away from any flammable surfaces. Never place the Lamp Housing Assembly directly on the work surface. The IntelliRay is designed to be stand mounted using the optional UV0454 Flood Stand. The unit's rear mounted clamping bracket allows the lamp's height to be slide adjusted on the Flood Stand for optimum curing distance (see fig. 1).

For machine or conveyor mounting applications, the lamp housing assembly can be optionally mounted using the threaded holes for the clamping bracket assembly (see fig. 2). Simply remove the clamping bracket and reuse its mounting holes and screws to attach to the desired mounting surface. If longer screws are required, care should be taken not to exceed the maximum mounting hole penetration depth of 1.25". (See fig. 3 for mounting hole pattern dimensions).



Fig. 1, IntelliRay with optional Stand & UV Shield

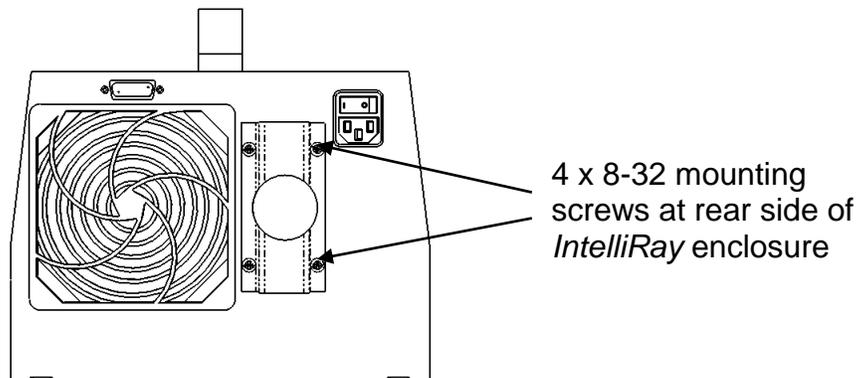


Fig. 2, mounting hole locations

INSTALLATION (CONTINUED)**2**

The lamp housing 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.

2.3 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 optional UV0455 Flood Shield and the UV1094 Backside Flood Shield can be used with the IntelliRay 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 IntelliRay 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.

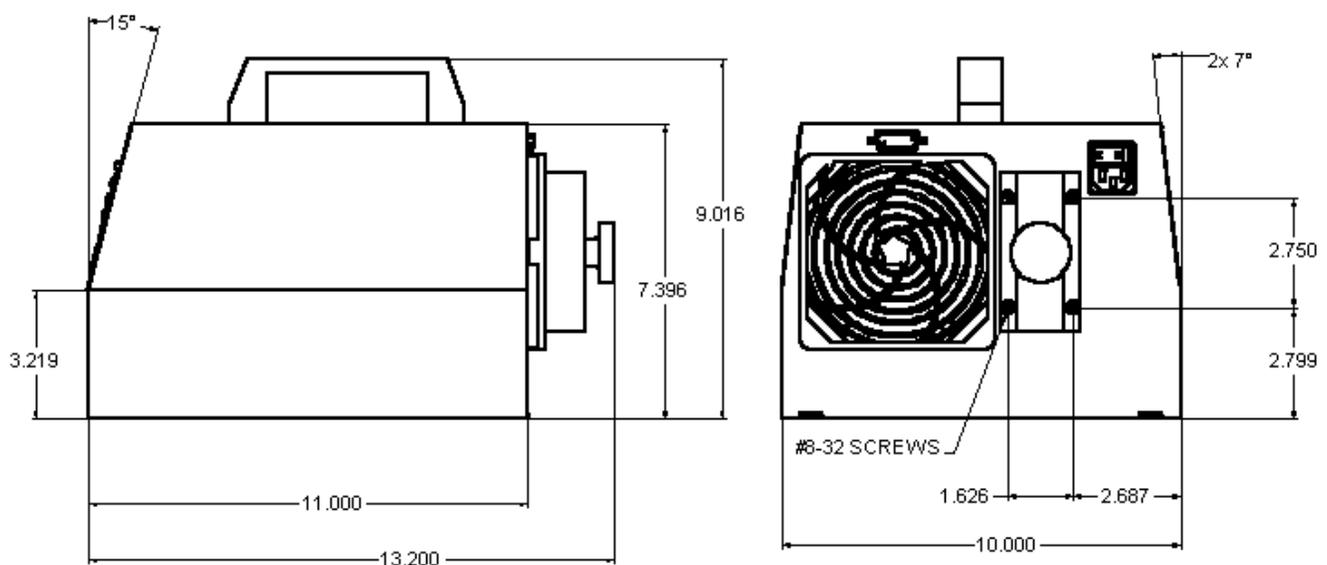
2.4 Dimensions

Fig. 3, IntelliRay overall dimensions

SAFETY CONSIDERATIONS

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3.1 UV Safety Warning



Ultraviolet radiation can cause severe burns to eyes and skin. Do not look at the light without protective eye shielding (UVITRON UV/IR safety glasses Part No. UV0495, UV2231 or equivalent).

While thermal burns are felt immediately, UV burns are not felt for several hours. Short exposure to UV lamp radiation can cause severe burning of skin and eyes. UV burn of eyes affects the cornea and burning takes several days to heal. UV burn is identical to “Welders Burn” and will feel like sand in the eyes that cannot be washed out. The discomfort is temporary and has no lasting effects. Some effects of UV radiation can cause permanent damage to the eyes. *Never look directly at the operating arc lamp, with or without UV protective glasses.*

Exposure to UV radiation of only limited time will cause erythema (redness) on normal skin. Remember that a few seconds of exposure to direct radiation of the lamp can cause burns equal to a day in the sun. Such redness is temporary and will not produce blistering, or tanning, as only a small amount of radiation penetrates deeply. Extended exposure to UV radiation can lead to skin cancer. *When operating the unit in production, the use of protective clothing and cotton gloves is required.*

3.2 Electrical Safety

HIGH VOLTAGE



High voltage and current energize the UV Lamp. A high voltage power supply and Starter combination are 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 remove the Lamp Access Panel or 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 only UVITRON service personnel.

3.3 High Temperatures



Due to the high output power of this system, high temperatures may be present on the surfaces of the Lamp, Reflector, and Lamp Housing Assembly. *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 Housing 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.

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

SAFETY CONSIDERATIONS (CONTINUED)**3****3.4 Ozone Safety**

High concentrations of ozone (O₃) can cause discomfort, or at sufficiently high levels can be dangerous. Arc lamps that are used in light curing systems may generate ozone when oxygen in the air is exposed to short wavelengths of light produced by the lamp (<210 nm). This ozone generation can be avoided by using arc lamps that are constructed with ozone-free quartz glass, which absorbs the ozone producing wavelengths. This type of glass is used in Uvitron's UVA and visible type lamps. Unfortunately, this ozone-free glass also can reduce the effectiveness of some curing processes that may require the absorbed short wavelengths (e.g. those for some inks and coatings). For this reason, Uvitron's UVB type lamps are not constructed with ozone-free glass and should be used only in well ventilated work areas. Another way to cope with the ozone is to exhaust the lamp air outdoors. Such exhausting involves no danger as the hot ozone containing gas is very unstable and breaks down to oxygen rapidly in ducting.

Although some IntelliRay system configurations generate ozone at a level that could barely be detected by odor and at a level well below the 0.1 parts per million allowable limit for continuous exposure (American Conference of Government Hygienists), it is recommended that all IntelliRay lamps systems be operated in well ventilated areas. For U.S. government recommended ozone exposure limits and additional ozone safety information, visit the following OSHA web page:

https://www.osha.gov/dts/chemicalsampling/data/CH_259300.html

3.5 Lamp Recycling

UV curing arc lamps (sometimes referred to as bulbs) all contain some level of mercury, and should be disposed of responsibly in accordance to local, state and federal laws. Excellent guidelines for mercury lamp recycling can be obtained at the following National Electrical Manufacturers Association website:

www.lamprecycle.org



Or call Uvitron customer service at (413) 731-7835 for more information.

THEORY OF OPERATION

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4.1 Light Curing

Ultraviolet Light (UV) exists around us as one of nature's phenomenon, an example of which is Ultraviolet (UV) rays produced by natural sunlight. Ultraviolet light can also be artificially produced by an electrical arc lamp enclosed in special glass to allow its passage (a UV arc lamp).

Reactive materials called photoinitiators are added to resins for adhesive bonding, coating, sealing, and printing. Ultraviolet light will cure these adhesives by causing the liquid resin to polymerize, thus becoming a solid. This could be compared to two-part epoxies, which when mixed in the proper proportions, turn from a liquid to a solid. Light curing resins, on the other hand, are single component products ready to use as received without measuring or mixing, and cure on-demand when exposed to UV light.

The photoinitiators added to the adhesive chemistry react to a specific range of light wavelengths, and the speed of the reaction is governed primarily by the intensity (or irradiance) of the light source for those wavelengths and by the chemistry of the adhesive. Approximate adhesive cure time can be calculated as follows:

$$\text{Curing Time [seconds]} = \text{Light Energy [Joules/cm}^2\text{]} / \text{Light Intensity [Watts/cm}^2\text{]}$$

Adhesive manufacturers typically specify the energy required for curing, or the required intensity and time duration. For some adhesive types, the relationship between the speed of curing and lamp intensity is not linear (doubling the intensity does not offer half the cure time). The fastest and most complete reaction may occur at high peak intensity for a relatively short period of time. This may be a more effective type of curing as compared to a similar (or even a higher) dose of UV light, which is spread over a longer period of time.

NOTE: Various types of adhesives, inks and coatings from different manufacturers have different levels of reactivity which will require adjusting of exposure times for proper curing. Consult with the adhesive manufacturer for appropriate cure times for each type of material.

Light curable adhesives are typically cured using electromagnetic energy in the UV and visible ranges of 250 to 450 nanometers (nm). It should be noted that ultraviolet light is easily attenuated when attempting its transmission through any materials that are not extremely transparent or optically pure. Even window glass will have reduced transmission or block most UV wavelengths, and this attenuation is greater as wavelengths become shorter. For this reason, applications that call for deep curing through thick adhesive layers require the longer light wavelengths in the UV-A and visible ranges for maximum penetration. These longer wavelengths are also required for curing through more opaque or colored adhesives and substrate materials to reduce the effect of attenuation. Shorter wavelengths in the UV-B

THEORY OF OPERATION (CONTINUED)

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and UV-C regions have more energy and are effective for curing and removal of surface tack for thin layers of coatings, inks and paints.

To allow the IntelliRay curing system to adapt to these different types of curing applications, multiple replacement lamp types are available which are optimized for each of the visible, UVA and UVB wavelength ranges. See the Accessories list in section 10.2 for ordering part numbers of the optional lamp types.

Refer to the chart below for the wavelength ranges of the ultraviolet and visible light curing bands of the electromagnetic spectrum.

ELECTROMAGNETIC SPECTRUM										
	Short Waves	Gamma Rays	X-Rays	Ultraviolet Light	Visible Light	Infrared	Micro Waves	Radio Waves	Long Waves	
Range	Vacuum UV	UV-C	UV-B	UV-A	Violet	Blue	Green	Yellow	Orange	Red
Wavelength [nm]	100-200	200-280	280-315	315-400	400-440	440-490	490-570	570-585	585-620	620-780

4.2 System Information

The IntelliRay 600 has a very high-power density light output, which will result in rapid, high bond strength cures. The light intensity can be adjusted from 35 to 100% of total power using the unit's front panel keypad. The intensity can also be controlled somewhat by adjusting the distance of the lamp head to the substrate being cured (shorter distance results in increased light density and intensity). The lower intensity settings can be used for very reactive adhesives, or for temperature sensitive curing substrates.

The IntelliRay 600 utilizes a metal halide type arc lamp, which is powered by a tightly regulated switch-mode power supply. This combination provides high intensity and consistent light output, resulting in very fast and repeatable product curing. The system's timer-controlled shutter precisely regulates the duration of light exposure to the product being cured. A system block diagram is shown in Figure 9.

CONTROLS AND INDICATORS

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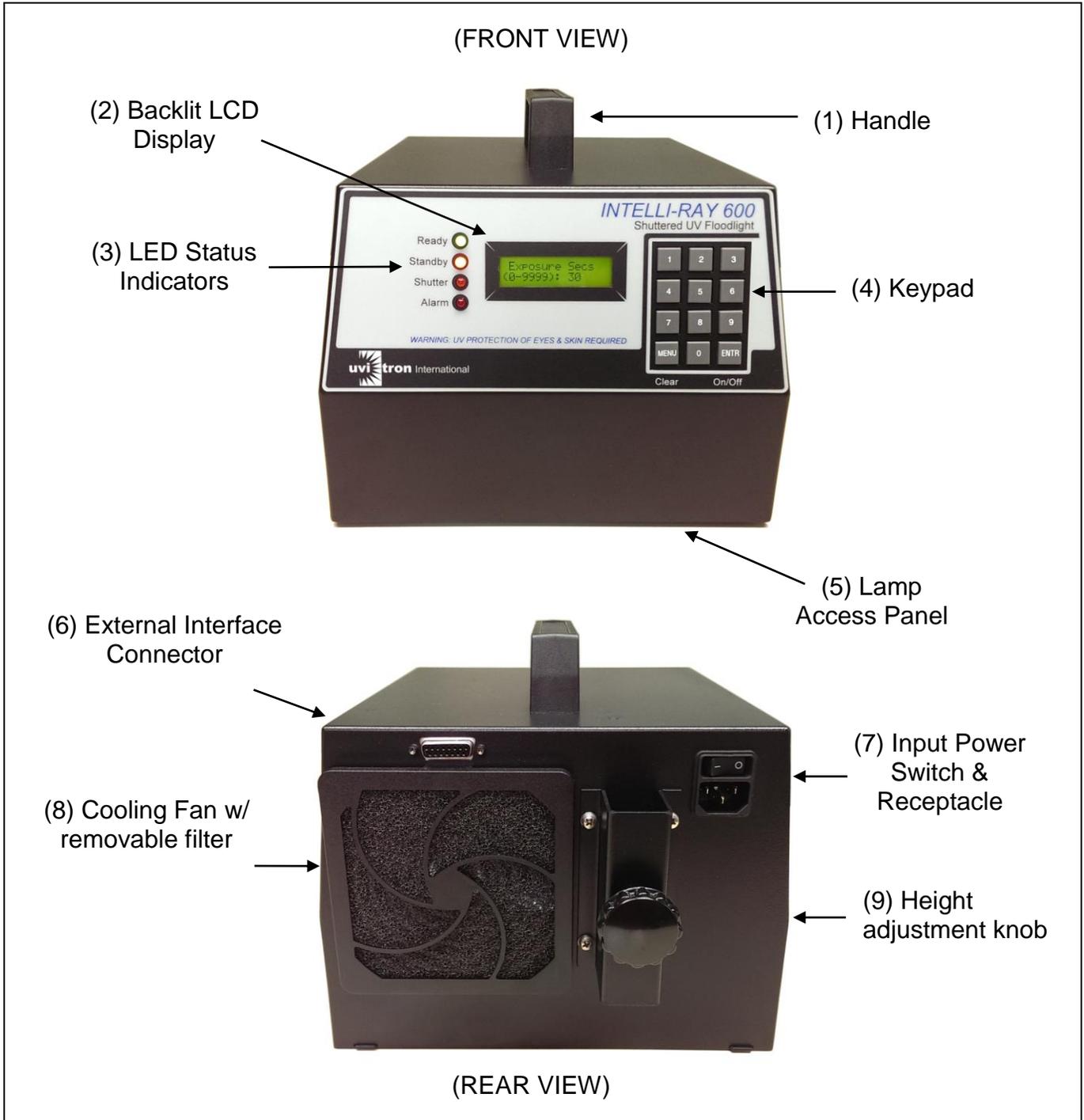


Fig. 4, Location of controls and indicators

CONTROLS AND INDICATORS (CONTINUED)**5**

Item	Description
1. Handle	The IntelliRay handle can be used to carry the lamp housing assembly, or to raise or lower the unit height. WARNING: The handle should never be used to lift or carry the IntelliRay when mounted to a stand or other supporting device.
2. Backlit LCD Display	The LCD display is used to convey messages to the operator. The display backlight can be turned on or off in the Setup menu.
3. LED Status Indicators	The 4 front panel LEDs display the following system status info: 1. READY: Lights when the lamp completes its power-on warm-up cycle and reaches stable output intensity. The Ready LED also flashes when the shutter is opened. 2. STANDBY: Lights when shutter is closed and output is reduced to low power, flashes when door/ext. interlock is active. 3. SHUTTER: Lights when shutter is opened. 4. ALARM: Lights when abnormal system condition detected.
4. Control Keypad	Keypad buttons are used to enter all system parameters and to navigate through system menus.
5. Lamp Access Panel	The Lamp Access Panel can be removed for inspection or replacement of the arc lamp. WARNING: High voltages and high temperatures are accessible with this panel removed. Always switch the Input Power Switch off, disconnect the input power cord, and wait for the unit to cool before removing this panel.
6. External Interface Connector	RS232/RS485 and logic control signal D-SUB connector. Optional or customer equipment may be interfaced here.
7. Input Power Switch & Receptacle	The Input Power switch is used to apply or remove main power to the IntelliRay system. Co-located with the switch is the universal IEC power cord receptacle.
8. Cooling Fan w/ removable filter	The system cooling fan has a foam filter element that can be removed for periodic cleaning (as required).
9. Height Adjustment Knob	When used with the optional Flood Stand, the rear mounted Height Adjustment Knob is used to set the optimum distance from the lamp to the substrate being cured.

SYSTEM OPERATION**6**

The following quick-start instructions give brief details on getting started with light curing. For more curing or setup details, see “System Operation (Continued)” on the following pages.

6.1 Start Up

A. Mount the IntelliRay at an appropriate distance from the target curing surface. Plug the IEC type connector of the AC Power Cord into the Power Input Receptacle at the rear of the Lamp Housing. Plug in the opposite end of the power cord into a nearby single-phase power outlet.

B. To start the system, turn on the Input Power Switch at the rear of the unit.

C. A 2 minute warm-up time is required for the lamp to reach full intensity. During the warm-up period, the system is automatically set to full power mode with the shutter closed, and the warm-up time remaining is counted down on the LCD display.

D. Once warm-up is complete, the Ready LED will light, and the following message will appear on the LCD display: Setup = ENTR, Cure Menu = MENU. Press MENU to proceed to curing. At the Lamp Intensity prompt, type in the desired value followed by ENTR. At the Exposure Time prompt, type in the desired number of seconds. Once the ENTR key is pressed, the shutter will open for the requested time duration. To stop exposure prematurely, press ENTR again.

WARNING: Bluish light will be projected from the unit once the shutter is opened. This ultra-violet light is 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 UV radiation (Refer to section 3.1 for critical UV safety information).

NOTE: The IntelliRay 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 Mode for periods of non-use of less than thirty minutes. Since the lamp remains hot with the shutter closed, the unit will not require a re-warming period before the lamp returns to full intensity. Once the input power is switched off, the lamp may require up to 5 minutes of cooling time before restarting.

E. Setting lamp intensity from the menu prompt or by adjusting the lamp distance closer or farther from the substrate being cured will increase or decrease intensity and curing time accordingly. Refer to the adhesive manufacturer’s data sheet for appropriate exposure time and intensity levels. Optimum curing settings may need to be determined experimentally.

6.2 Shut Down

To shut down the light cure system, simply shut off the rear panel Input Power Switch.

SYSTEM OPERATION (CONTINUED)**6****6.3 Keypad Key Descriptions****Digit Keys, 0 – 9**

The digit keys are used to enter numerical values for control parameter settings (such as lamp intensity or exposure time). After the appropriate digit keys are pressed, the ENTR key must be pressed to input the value.

The MENU Key

The MENU key has two functions:

- The primary function of the MENU key is to select the parameter or system setting that is to be modified. Repeated pressing of the MENU key will allow the operator to step through menu items until the parameter of interest is found. Then the particular parameter can be modified using the Digit and ENTR keys.
- The second function of the MENU key is to clear incorrect or undesired values from the display that may have been inadvertently entered by the operator. For example, if the user intended to enter the value “15”, but by accident pressed the “1” key followed by the “4” key (instead of the “1” and “5”), then the MENU key could be used to clear the incorrect entry. This clearing action is only available before the ENTR key has been pressed to input the current value. After the MENU key has been pressed to clear digits, the current menu item will continue to be displayed to allow the operator to re-enter a new value.

The ENTR Key

The ENTR key also has two functions:

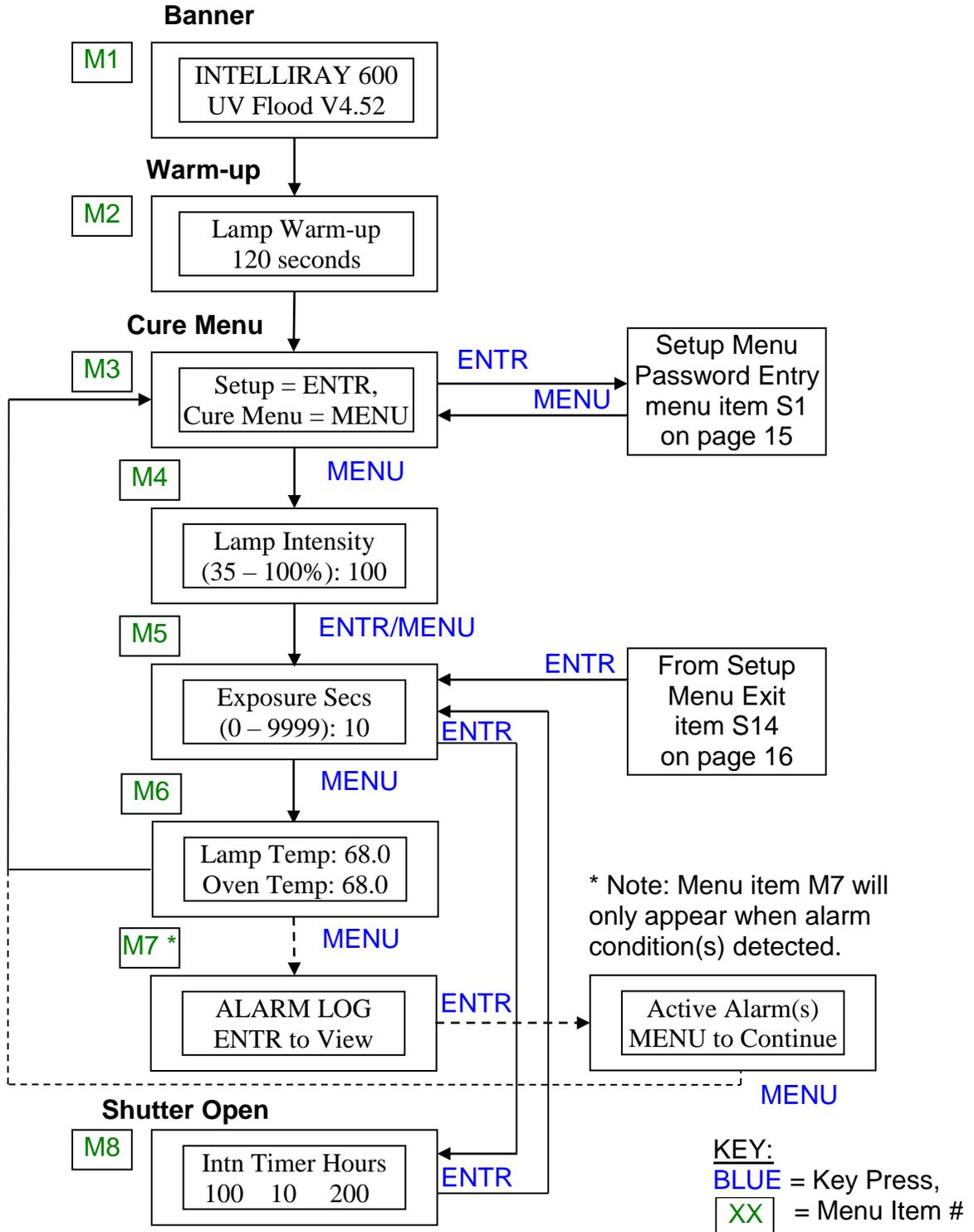
- The primary ENTR key function is to terminate the entry of numerical values, and to signal to the system software that the operator has completed entering a new value's digits. Once the appropriate digit keys are pressed, the ENTR key must be pressed for the new value to take effect.
- The ENTR key's second function is to select or toggle between menu choices, or to toggle settings ON or OFF. For instance, when in the Setup Menu's Beeper ON/OFF display, the ENTR key can be pressed to toggle the system audible beeper ON and OFF. Or if in the Exposure Time menu, the ENTR key can be used to toggle the light exposure ON and OFF.

6.4 Using Menus

The IntelliRay's operator interface is comprised of two circular type menu structures: The Cure Menu, and the Setup Menu. These menus can be stepped through by repeated pressing of the MENU key on the unit's front panel keypad. When the end of a particular menu is reached, the next press of the MENU key will cause a return back to the beginning of that same menu. To enter a new menu, or exit the current menu, the operator will be prompted to press the ENTR key. Any system parameters which are set at the various menu screens will be stored in non-volatile memory and recalled automatically after AC input power is cycled. Refer to Fig. 5 below for a map of the IntelliRay's menus.

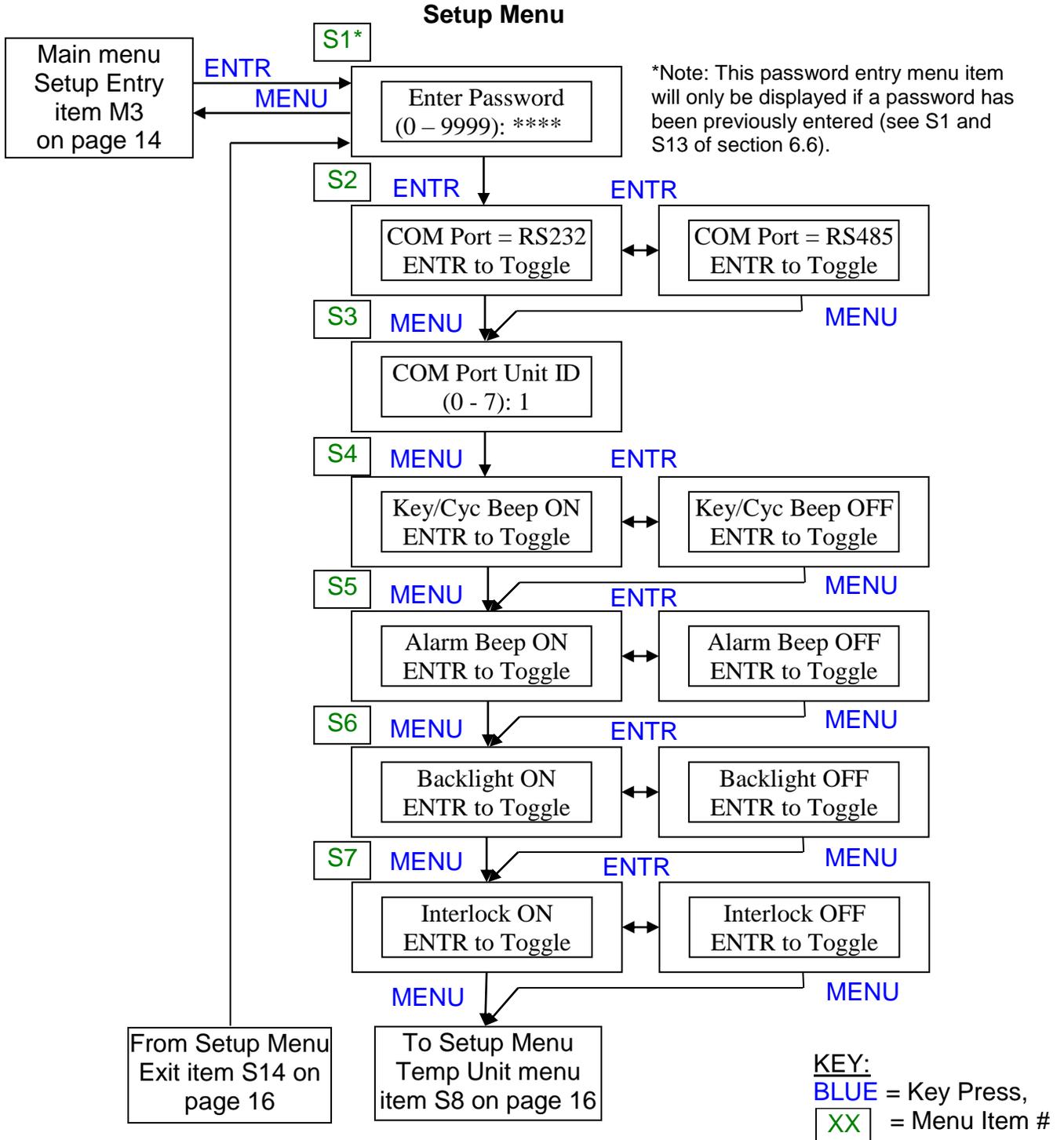
SYSTEM OPERATION (CONTINUED)

Fig. 5A, IntelliRay Main Menu Map: This diagram shows the display screens of the IntelliRay startup and curing menus, and the key presses (in uppercase) used to sequence through them. Refer to fig. 5B and 5C on the following pages for the Setup Menu Map.



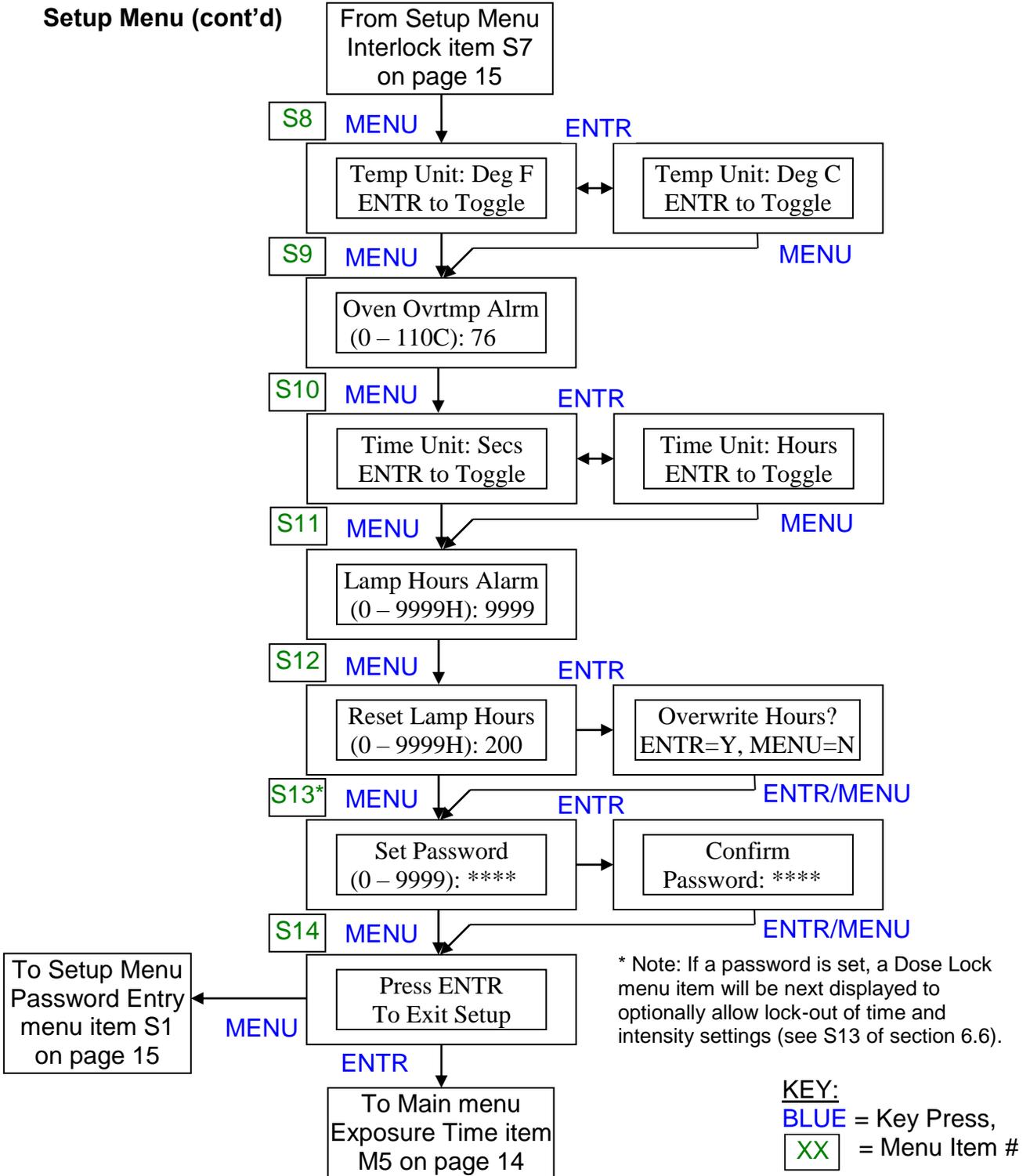
SYSTEM OPERATION (CONTINUED)

Fig. 5B, IntelliRay Setup Menu Map: This diagram and the one on the following page show the display screens of the IntelliRay Setup menus, and the key presses (in uppercase) used to sequence through them. Refer to fig. 5A on the previous page for the Main Menu Map.



SYSTEM OPERATION (CONTINUED)

Fig. 5C, IntelliRay Setup Menu Map (continued from previous page)



SYSTEM OPERATION (CONTINUED)**6****6.5 Descriptions of Main Menu Items****M1 IntelliRay Banner**

At power-up, this screen displays the system model name, description, and firmware version. The firmware (or internal system software) version may be requested by Uvitron customer service personnel when responding to technical support calls. The screen will clear itself after a few seconds have elapsed.

M2 Lamp Warm-up

This screen is displayed during the 120 second lamp warm-up period which is run automatically each time the unit is first powered on. During warm-up, the lamp is automatically set to full power, the shutter is held closed, and the time remaining counts down on the LCD display. When the warm-up period has completed, the system will notify the operator with two short beeps. To bypass the warm-up, press the MENU/Clear key after the banner has dismissed.

M3 Setup/Cure Menu Select

This screen is displayed after completion of the lamp warm-up period. The operator is prompted to choose between entering the Setup Menu by pressing the ENTR key and entering the Curing Menu by pressing the MENU key. Since all system setup parameters are stored in non-volatile memory, the Setup Menu parameters will only have to be set once, unless changes to the current values are desired.

M4 Lamp Intensity

When the Cure Menu is first entered, the Lamp Intensity screen will be displayed to allow the operator to set the appropriate intensity level before curing begins. A new intensity may be set by entering a value between 35 to 100%, followed by a press of the ENTR key. If the no change of the displayed intensity is required, the MENU or ENTR key can be pressed to continue. Once entry is completed, the menu display will auto advance to the Exposure Time prompt.

M5 Exposure Time

The Exposure Time setting is used to adjust the length of time the shutter will remain open, to allow light to pass through to the substrate being cured. The time can be entered and displayed in either seconds or hours (as selected in the Setup Menu Timer Units item S10).

If the currently displayed Exposure Time value is correct, the exposure can be turned ON by simply pressing the ENTR key. If a new exposure time is desired, a value in the range of 1 to 9999 seconds (or hours) may be entered. In either case, once the ENTR key is pressed, timed exposure will begin, and the Run Screen timer will count down to indicate time remaining. When the timer expires, the shutter will automatically close, and the operator will be notified by two short beeps. To terminate timed exposure before the timer has expired, press the ENTR key a second time and the shutter will close.

SYSTEM OPERATION (CONTINUED)**6**

If a value of 0 is entered for exposure time, then Manual Exposure will begin. This will result in the shutter remaining open indefinitely, until a subsequent press of the ENTR key occurs to end the exposure. During Manual Exposure, the Run Screen timer will count up, indicating the total time that has elapsed.

NOTE: Any time the shutter is open, it can be closed immediately (exposure turned OFF) by pressing the ENTR key.

If the MENU key is pressed twice while exposure is in progress, the Exposure Time screen will be displayed, allowing the time setting to be changed without closing the shutter. If in either Timed or Manual Exposure mode, the amount of time already elapsed will be subtracted from the newly entered value, so that the total time of exposure will be equal to the new value entered. If the time elapsed is greater or equal to the new value entered, the exposure will terminate, and the shutter will close.

M6 Lamp/Oven Temperatures

This screen will display the internal temperature of the IntelliRay lamp head. If the IntelliRay is being used with a Rayven Oven, then the Rayven internal temperature will also be displayed. Note that in order for the oven temperature to be displayed, the DSUB interface cable must be connected between the rear connectors of the IntelliRay and Rayven, and the door interlock must be enabled in the Setup menu (Interlock ON/OFF item S7). If the interlock is not enabled or if the Oven Over-temperature alarm is disabled by a setting of less or equal to 0°C (32°F) in the Setup menu, then the word OFF will be displayed for oven temperature. The units for the temperature display can be selected as degrees F or C in the Temp Unit Setup menu item S8.

M7 Alarm Log (Appears Only When Alarm(s) Active)

When the IntelliRay control system detects an alarm condition has occurred, an audible beeping will sound and a pop-up “ALARM PRESENT, ENTR to View” message will be sent to the LCD display. To view & acknowledge the active alarm and silence its’ beeping, press the ENTR key. As long as this or any other previously detected alarm condition persists, an extra Alarm Log menu item M7 will be present at the end of the main menu that will identify the existing problem(s) with appropriate messages on the LCD display. See System Alarms in section 9.2 for more information.

M8 Shutter Open (Run Screen)

When timed or manual exposure has been started from the Exposure Time screen, then the run screen is automatically displayed, showing the following system parameters:

Intn = Current lamp intensity

Timer = Current value of Exposure Timer

Hours = Age of arc lamp in hours (not displayed when exposure timer set for Hours)

SYSTEM OPERATION (CONTINUED)**6**

While the Run Screen is displayed, the MENU key may be pressed to switch to the Intensity or Exposure Time screens, allowing values to be changed “on the fly” (without closing the shutter). When the exposure timer expires, the Run Screen is cleared, and the Exposure Timer screen is again displayed.

6.6 Descriptions of Setup Menu Items**S1 Enter Password**

The Setup menu can be protected by a password to prevent changing of critical system parameters by unauthorized users. If the setup password is enabled (see Set Password below), then the correct password must be entered before access to the Setup menu is allowed. Passwords are in the range of 0 to 9999. If the operator doesn't know the password, or does not wish to enter it, then he may press the MENU button to back-out of the Setup menu and return to Curing. If the password value is forgotten or lost, then the Uvitron customer service department may be contacted to obtain a temporary password.

S2 COM Port Type

The IntelliRay may be controlled remotely via a RS232 or RS485 serial port connection to a Personal Computer. RS232 can be used to communicate over short distances (< 25 feet) with a single IntelliRay, while RS485 can be used to network multiple units over longer distances (up to eight IntelliRay systems may be controlled from a single computer). At the COM Port Selection screen, the port type can be alternately toggled by pressing the ENTR key.

S3 COM Port Unit ID

Because multiple IntelliRay units can be networked over a single serial cable, each unit must have the ability to be assigned a unique unit identifier to allow each to be addressed separately. Therefore, the COM Port Unit ID of each networked IntelliRay should be set to a different value, and the ID setting at the computer should match the unit ID of the IntelliRay that is to be controlled. Each IntelliRay's Unit ID can be set from the COM Port Unit ID screen by entering a unique value from 0 to 7.

S4 Key Click / Exposure Cycle Beeper ON/OFF

The system's audible beeper can be toggled ON or OFF from this screen by alternate pressing of the ENTR key. Setting the beeper to OFF will prevent keypad key-clicks, as well as beeping at the end of timed exposure cycles.

S5 System Alarm Beeper ON/OFF

The system's audible alarm beeper can be toggled ON or OFF from this screen by alternate pressing of the ENTR key. Setting the alarm beeper to OFF will prevent audible alert beeping when any system alarm conditions occur (such as over-temperature conditions).

SYSTEM OPERATION (CONTINUED)**6****S6 Backlight ON/OFF**

The LCD display's backlight can be toggled ON or OFF from this screen by alternate pressing of the ENTR key.

S7 Interlock ON/OFF

The IntelliRay has a shutter safety interlock signal which is available on the unit's rear panel DSUB connector (see Fig. 6). This signal may be used to force the shutter closed when the door is opened on the optional UV1080 Rayven Oven, or it may be used in a similar fashion with customer designed enclosures, fixtures or machinery. The interlock signal can be toggled ON or OFF from this Setup Menu screen by alternate pressing of the ENTR key. When the interlock signal is ON and the signal is activated (signal has open connection), the shutter will close if it is open, and the unit will ignore any command to open the shutter. During this condition, the front panel Standby light will flash to signal the operator that an interlock opening has occurred, and the current timer count will be held on the LCD display. Once the interlock is closed, timing from the last exposure value can be continued by pressing the ENTR key, or cleared to the previously set starting value by pressing the MENU key.

S8 Temperature Units, Degrees F/C

This menu item will allow the user to select whether the Lamp head and Oven temperatures will be displayed in units of degrees Fahrenheit or Celsius. At the Temp Unit selection screen, the timer units can be alternately toggled by pressing the ENTR key.

S9 Oven Over-Temperature Alarm Setting

The value set in this menu item will determine the temperature in the curing chamber at which an alarm will be triggered to warn the operator that temperature has risen to an unacceptable level. The alarm will also reduce lamp power to its minimum level to prevent further heating. The over-temperature setting is adjustable because some applications are more sensitive than others with respect to chamber temperature rise. Possible reasons for elevated temperature may be high system room ambient temperature, obstructed cooling air inlets or outlets, or blocked rear panel air filter. Note that if the IntelliRay is not connected to an oven temperature sensor (such as is present in the Rayven curing chamber), then an over-temperature alarm setting equal to zero Celsius (32 Fahrenheit) can be entered to disable this alarm.

S10 Exposure Timer Units, Seconds/Hours

Most curing applications require short exposure times that are best displayed in seconds. However, some conveyor curing and artificial aging applications require long exposures which are best displayed with timer units in hours. This menu item will allow the user to select whether the exposure time will be entered and displayed in units of seconds or hours. At the Timer Unit selection screen, the timer units can be alternately toggled by pressing the ENTR key.

SYSTEM OPERATION (CONTINUED)**6****S11 Lamp Hours Alarm Setting**

The value set in this menu item will determine the number of elapsed operating hours at which an alarm will be triggered to notify the operator to replace the currently installed arc lamp. The value is adjustable because some applications are more sensitive than others with respect to allowable lamp intensity decay before curing or exposure level is no longer acceptable. If a value of zero hours is entered, the lamp hours alarm will be disabled.

S12 Reset Lamp Hours

From this screen, the lamp age timer can be reset after replacing an arc lamp. When the screen is first entered, the current lamp age will be displayed. If a new lamp is installed, then a value of zero should be entered for Lamp Hours. If a previously used lamp is installed, then the current age of the lamp should be entered. After entering the new value, the operator will be prompted to confirm overwriting of the current hours (to insure the current value isn't changed inadvertently). If the age of the lamp had exceeded the lamp hours alarm setting in Setup Menu S11 (resulting in the Alarm light being activated), the alarm light will turn off when a new age of less than the current lamp hours alarm setting is entered.

S13A Set Password

This screen is used to enable or change the Setup Security Password. When the system is delivered from the factory, the password is disabled by default, allowing all operators access to the setup menu. To enable the password, enter a value from 0 to 9999. Once entered, the new password must be confirmed by entering it a second time. If the two passwords do not match, then an error message will be displayed, and the operator will be prompted to press "ENTR to Retry". If the passwords match, then the operator will be prompted to "Press ENTR to Exit Setup".

NOTE: Care should be taken not to lose or forget the Setup password. If the password is lost, contact the Uvitron customer support department to obtain a temporary password.

To disable the setup password, press ENTR for the new password, and ENTR for the confirmation password. This will prevent the "Enter Password" prompt from being displayed when the Setup Menu is entered.

S13B Dose Lock

If a password was entered, then the next menu item displayed will be a dose lock screen for preventing unauthorized changes to Main Menu exposure time and intensity. The lock can be toggled ON/OFF by pressing ENTR. When enabled, a Dose Locked message will be displayed for time or intensity change attempts. The lock will be auto-disabled if the password is removed.

S14 Exit Setup

Exit Setup is the last screen of the Setup Menu. To exit the Setup Menu and return to the Cure Menu, press the ENTR key. To go back to the top of the Setup Menu, press the MENU key.

EXTERNAL INTERFACE

7.1 External Interface Wiring

External monitoring and control of the IntelliRay is possible by wiring to the unit's rear panel 15 pin connector, using the optional Remote Interface Cable (Uvitron P/N UV0526). See fig. 6 below for wiring schematics of typical configurations.

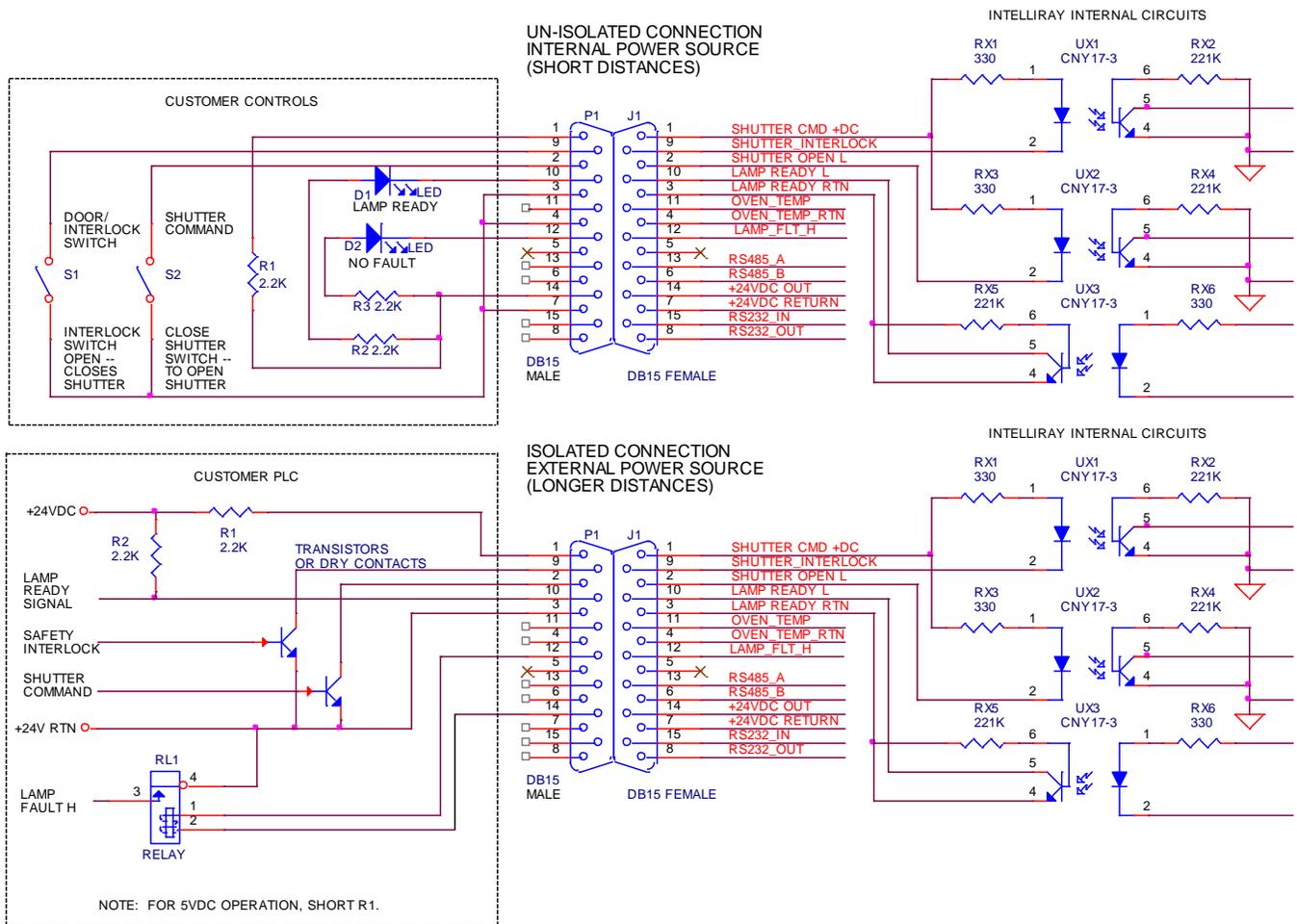


Fig. 6, Signal interface wiring diagram

EXTERNAL INTERFACE (CONTINUED)**7**

The DSUB interface connector pin descriptions are listed in the table below. For applications utilizing the optional UV0526 Interface Cable, wire names and colors are also included.

Pin Number	Signal Description	Interface Cable Wire Name	Interface Cable Wire Color
1	Shutter command input DC power	SHUTTER_CMD_+DC	BLACK
2	Shutter command input (LO=open, HI=close)	SHUTTER_OPEN_L	BROWN
3	Lamp Ready/Shutter Open signal return	LAMP_READY_RTN	RED
4	Oven temperature signal return	OVEN_TEMP_RTN	ORANGE
6	RS485B serial port signal	RS485B	GREEN
7	+24VDC return	+24VDC_RETURN	BLUE
8	RS232 out serial port signal	RS232_OUT	VIOLET
9	Shutter Interlock signal, LO=normal, HI=interlock active (shutter closes)	SHUTTER_INTRLK	GRAY
10	Lamp Ready/Shutter Open signal, LO=lamp ready, HI=lamp warming up or shutter open	LAMP_READY_L	WHITE
11	Oven temperature input signal (0-2.4VDC = 0-240°F @ 10mV/°F)	OVEN_TEMP	PINK
12	Alarm signal output (fault detected)	LAMP_FLT_H	LIGHT GREEN
13	RS485 A serial port signal	RS485A	BLACK/WHITE
14	+24VDC output, 1 Amp max	+24VDC_OUT	BROWN/WHITE
15	RS232 in serial port signal	RS232_IN	RED/WHITE

7.2 Logic Signal Descriptions

The *Lamp Ready/Shutter Open signal* is a dual function status output from the curing system. During the warm-up period, the signal remains in a high (no conduction) state, and will drop low to signal the warm-up interval is complete. Once the shutter is commanded to open (either by the keypad or external interface connector signal), the Lamp Ready/Shutter Open signal will again return to a high (no conduction state) as soon as the shutter has reached its fully open position. When the shutter is commanded to shut, the signal will drop back low again once the shutter has reached its fully closed position. The toggling of this signal with shutter position allows an external PLC or controller to confirm the shutter has reached its newly commanded position.

The *Shutter Command Input* can be used to externally control exposure time of the curing system. When controlling the shutter from the shutter command input, the exposure timer should first be set to manual by entering a value of zero at the front panel keypad (refer to Exposure Time in section 6.5). This setting will only have to be made once, since it will be stored in non-volatile memory and recalled after power is cycled. When the shutter input is

EXTERNAL INTERFACE (CONTINUED)

pulled low, the shutter will open, and when the signal returns to a high level (non-conduction state), the shutter will close. If it is desirable for the external signal to only initiate shutter opening, with the IntelliRay performing exposure timing, then the exposure time setting can be set to a non-zero value at the unit's front panel keypad. In this case when the signal goes low, the system will open the shutter for the exposure time interval set at the keypad, and then the shutter will close automatically.

Timing for the control signals is shown below in fig. 7:

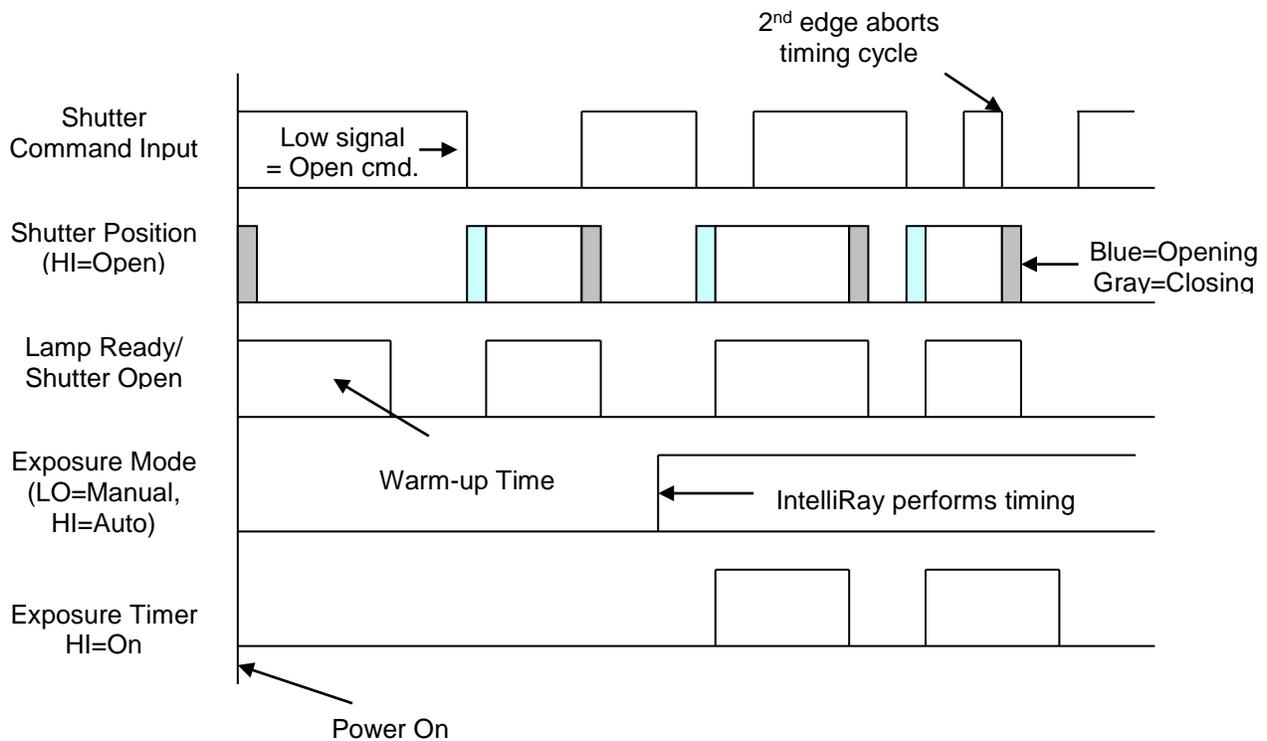


Fig. 7, Signal interface timing

The *Shutter Interlock signal* provides a way to interrupt the system's exposure cycle for cases where a safety switch on a door or access panel is opened on customer equipment, or when the IntelliRay is used in conjunction with the optional UV1080 Rayven curing oven. This signal only becomes active once it is enabled in the Setup Menu (see Interlock ON/OFF menu item **S7** in section 6.6). In order for the shutter to operate normally while the interlock is set to on, the interlock signal must be shorted to its respective return signal. If the interlock signal transitions high (no conduction) state during exposure, the shutter will immediately close, the current timer count will be held on the LCD display, and the Standby light will flash to signal the user that the interlock has opened. At new exposure attempts, "Interlock Active" will be displayed on the LCD.

EXTERNAL INTERFACE (CONTINUED)**7**

The *Alarm signal output* can be used to signal an external system, PLC or audible/visible alarm device if the any IntelliRay fault condition has been detected. The output is an un-isolated open collector type capable of sinking up to 0.33 amps of current, that will turn off (go high) when a fault occurs or if the signal connection is broken. The alarm signal can be used in conjunction with the +24VDC output to activate external loads such as solenoids or relays. The system will also display an alarm message on the unit's LCD display when a fault occurs (refer to Alarm Troubleshooting in section 9.2).

7.3 Foot Pedal Control

The system's shutter can also be controlled using an optional foot pedal (Uvitron P/N UV0725), allowing for hands-free operation. The foot pedal connects to the IntelliRay's rear panel DSUB connector. When the exposure is set to timed mode, a momentary press of the foot pedal will cause the shutter to open for a duration specified by the exposure time setting. After the requested time has elapsed, the shutter will automatically close. To prematurely terminate exposure before the timer has expired, the foot pedal can be pressed a second time, and the shutter will close.

When the exposure time is set to zero (manual timer mode), the shutter will be held open as long as the foot pedal is pressed down. As soon as the pedal is released, the shutter will close. If it is desirable to have manual pedal control of the shutter position without having to continuously hold down the pedal, the exposure timer can be set to a higher value than what is desired, and the pedal can be alternately pressed to open and close the shutter.

7.4 Serial Port Control

The system can be controlled remotely via a PC serial port using the optional Microsoft Windows™ compatible IntelliRay Curing System Control program (Uvitron P/N UV0527). To connect the curing system to the PC's serial port, either the RS232 Interface Cable (Uvitron P/N UV0525) or the RS485 Remote Interface Cable (Uvitron P/N UV0526) may be used. The IntelliRay software allows for complete monitor and control of all system functions from an easy to use graphical user interface. The program also allows multiple curing systems to be networked using the individual addressing capability of the RS485 communications protocol. (Refer to the IntelliRay Software instruction sheet provided with the program CD for more information on serial port control.)

The IntelliRay can also be serial port controlled using custom designed application specific software. Uvitron has documented the IntelliRay serial protocol and command set and will supply it upon request for customers who would like to write their own software device driver. Contact Uvitron Customer Support to request a copy of the IntelliRay Serial Communication Protocol Description.

MAINTENANCE**8****8.1 Maintenance Considerations**

During the production process, various deposits of foreign matter may accumulate on the Lamp, Reflector, and Filter Glass surfaces. Product vapors can also condense on these surfaces over time, causing poor reflectance/transmission of UV light, and reduced curing efficiency. To insure maximum light output of the curing system, these surfaces should be inspected and cleaned every two months (or 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 every 7,000 to 10,000 hours.

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 IntelliRay UV Lamp: *Turn off the Input Power Switch at the rear of the Lamp Housing and unplug the power cord from the Input Power Receptacle. Wait a minimum of 15 minutes for the lamp and other hot components to cool back to room temperature and for internal power supply electrical storage capacitors to discharge before proceeding with any maintenance operations.*

8.2 Cleaning of Optics and Lamp Replacement

1. Before power is removed, enter an exposure time to open the shutter. Once the shutter is open, turn off the unit's Input Power Switch to allow for access past the shutter shade.
2. Remove the power cord from the rear panel IEC receptacle. Remove the Lamp Housing Assembly from its stand or fixture and place it upside-down on a soft clean surface.
3. Remove the two thumbscrews from the front edge of the Lamp Access Panel, and carefully slide the panel forward, out of the slots in the rear of the Lamp Housing. Place the Lamp Access Panel and glass on a soft clean surface.

CAUTION: It is extremely important to avoid touching (with your hand) the filter glass, 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. Cotton gloves or a soft cloth should be used when handling or cleaning the Filter Glass, Reflector, and Lamp.

4. 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

MAINTENANCE (CONTINUED)**8**

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.

5. Using a clean soft cloth dampened with isopropyl alcohol, clean the surfaces of the aluminum reflector, and both sides of the Lamp Access Panel Filter Glass.

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.

6. Wipe the lamp lightly with a clean isopropyl dampened cloth. If the lamp shows signs of bulging, shape distortion or un-removable surface contamination, or if the lamp is excessively aged, then replace it. Otherwise, dry and polish the lamp with a clean dry cloth.
7. 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.
8. Re-install the Lamp Access Panel and tighten both thumbscrews.
9. Mount the Lamp Housing back on its stand or fixture and reconnect the input power cord.
10. Turn power on to the unit, and zero the Setup Menu lamp hour meter (Refer to sections 6.4-6.6).
11. Re-test the unit to insure satisfactory light intensity and cure time is achieved.

8.3 Fan Filter

The unit's rear mounted fan has a removable foam filter, which should be cleaned frequently to avoid restriction of adequate cooling airflow. The filter can be removed by unsnapping its plastic retainer from the fan guard. The filter element should be washed using a mild detergent solution.

8.4 Cleaning of Optional UV Shield or Rayven Oven Door Window

If the system was purchased with the optional UV shield (UV0455) or the Rayven UV oven with window (UV1080-WIN), the tinted acrylic should be cleaned using a mild dish detergent solution, and a clean soft cloth.

CAUTION: The UV shields should never be cleaned using any ammonia-based cleaners. Such harsh cleaners can cause cracking or crazing of the acrylic and may cause permanent damage to the surface of the shield.

TROUBLESHOOTING**9**

The IntelliRay system is designed for industrial use, and if configured correctly, little or no problems should be encountered during its operation. If, however, problems do occur, the following checklist may help to isolate the cause and suggest a solution.

Problem	Probable Cause	Solution
1. Lamp operates but has low output, or slow curing.	A. Lamp intensity set too low.	A. Increase lamp intensity to full power and retest.
	B. Lamp too far from substrate being cured.	B. Adjust lamp height to within 2 to 4 inches of surface being cured.
	C. Defective or excessively aged lamp.	C. Replace lamp (see lamp replacement procedure in maintenance section).
	D. Reflector or Filter Glass requires cleaning, or filter attenuating UVB	D. Clean reflector and glass as per maintenance procedure. Filter glass can be removed for increased UVB output.
	E. Adhesive not compatible with lamp type.	E. Compare the adhesive's light spectral requirements with the Lamp's spectral chart in the specs section. Visit Uvitron website for optional lamp type charts if required.
2. Lamp does not light, but fan and display running.	A. Arc lamp too hot.	A. Wait 5 minutes and retry.
	B. Lamp not properly installed.	B. Disconnect power and verify both lamp electrodes are properly centered in sockets.
	C. Defective or excessively aged lamp.	C. Replace lamp (see replacement procedure in maintenance section).
	D. Over-temperature protection activated	D. Allow unit to cool. Clean fan filter or operate unit in cooler environment.
3. Lamp does not light, fan and display <u>not</u> 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.
4. Shutter does not operate and Standby light is flashing.	Shutter interlock open (see section 7.2 for Interlock signal info).	If using Rayven oven, check rear DSUB cable connections - if external interlock, check wiring. Otherwise turn off interlock.
5. Alarm light on.	Alarm due to detection of abnormal condition.	See section 9.2 below for descriptions of alarm messages and solutions.

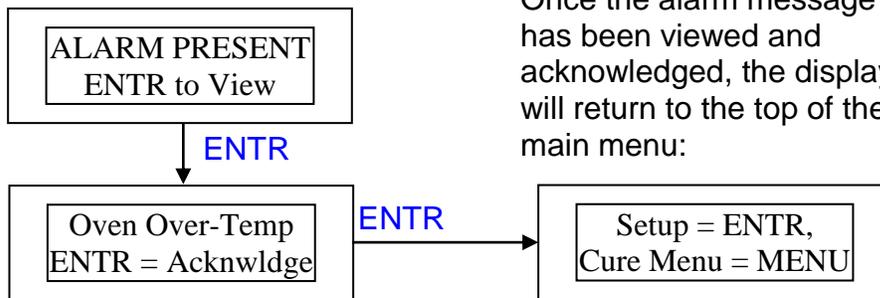
TROUBLESHOOTING (CONTINUED)

9.2 System Alarms

The IntelliRay control system has the ability to monitor the lamp’s subsystems for abnormal conditions, and to warn the operator by triggering an alarm. In such a case, an audible warning beep will sound and an appropriate pop-up message will be displayed on the system LCD display. All active alarms will be subsequently displayed in an Alarm Log which will appear at the bottom of the main menu. Refer to the chart below for the sequence of alarm menu items:

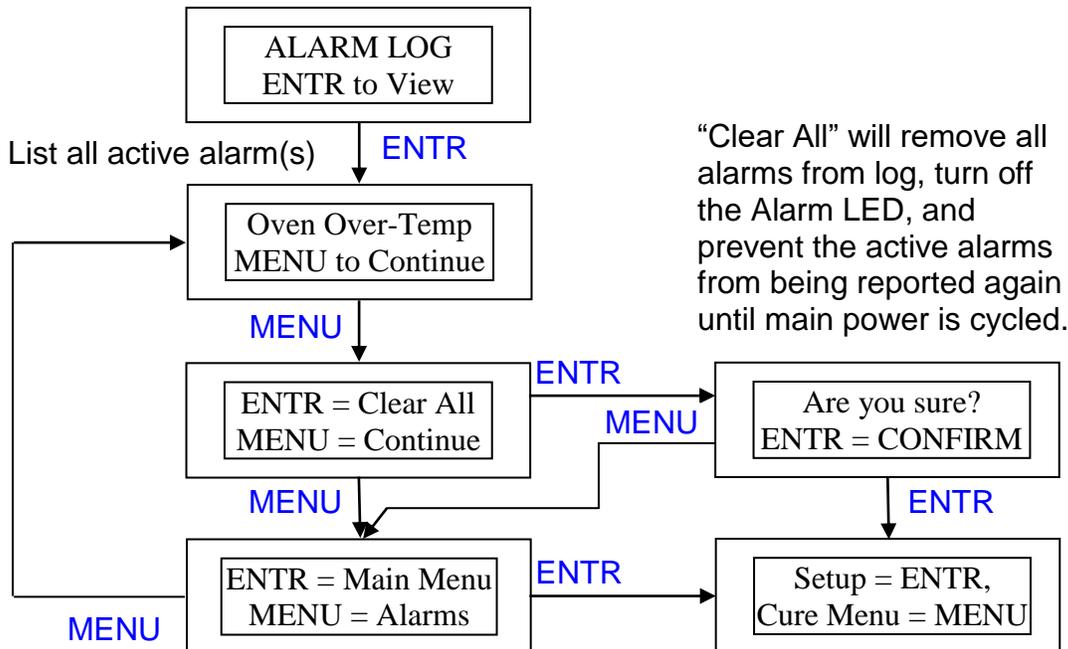
Alarm Pop-up

Alarm Pop-Up will be displayed when a system alarm condition is detected:



Alarm Log

After alarm acknowledged, a new Alarm Log item appears at the bottom of Main Menu:



TROUBLESHOOTING (CONTINUED)**9**

The table below lists possible alarm conditions, descriptions and causes. Some of these alarms (identified in last column) will cause the system to automatically abort exposure, to close the shutter and to reduce the lamp power to minimum in order to protect the system, parts being exposed or the operator.

Msg #	Alarm Message	Description	Cause/Solution	Aborts Exposure
1	Replace Lamp	Lamp age exceeded max hours value set in Setup menu.	If hours warning threshold appropriate, replace lamp to ensure required intensity. Otherwise adjust warning threshold in lamp alarm setup menu item.	NO
2	Shutr Stuck Open	Exposure shutter stuck in open position or not fully closed.	Check shutter for obstruction or excess friction and check corresponding position limit switch for proper operation. Return system to Uvitron for servicing if required.	NO
3	Shutr Stuck Clsd	Exposure shutter stuck in closed position or not fully open.		YES
4	Shutr Swtch Brkn	Both open and closed shutter position detecting switches activated simultaneously.	Since it is not possible for the shutter to hit both position limit switches simultaneously, one switch must be broken. Return system to Uvitron for servicing if required.	YES
5	Internl Connectr	Internal controller main signal connector not fully inserted.	Unit's internal 64 pin signal connector is not fully seated. Return system to Uvitron for servicing if required.	NO
6	Lamp Over-Temp	Lamp head internal temperature exceeded limit.	Cooling air inlet/outlet restricted or ambient temperature high. Verify no air obstructions, clean rear air filter and verify room temperature to specifications table. For oven over-temp, DSUB cable may be disconnected, or setup menu limit may be set too low (adjust or disable in setup as required, refer to section 6.6).	YES
7	Oven Over-Temp	Curing chamber internal temperature exceeded limit value set in Setup menu.		YES

Alarm table continued on following page...

TROUBLESHOOTING (CONTINUED)**9**

Msg #	Alarm Message	Description	Cause/Solution	Aborts Exposure
8	A to D Voltage	System control board analog to digital converter test failed.	This error may result in incorrect lamp and chamber temperature sensing. Return system to Uvitron for servicing if required.	NO
9	Interlock Active	Curing chamber door open or shutter interlock signal open.	Shutter interlock signal open or not connected at rear panel DSUB connector. Close chamber door or disable interlock in setup menu if interlock not used.	YES

REPLACEMENT PARTS AND ACCESSORIES**10****10.1 Ordering Information**

To order replacement parts or accessories, or to obtain further information, please contact Uvitron Customer Service:

Uvitron International, Inc.
150 Front Street, Unit 4
West Springfield, MA, USA 01089

Tel. (413) 731-7835
Fax (413) 731-7767
Web site: www.uvitron.com
Email: info@uvitron.com

10.2 Replacement & Accessories

Item Description	Part Number
UVA Enhanced Metal Halide Lamp, 600W	UV0834
UVB Enhanced Metal Halide Lamp, 600W	UV1884
Visible Light Enhanced (420nm) Metal Halide Lamp, 600W	UV1074
Filter Glass	UV2128
Lamp Access Panel Thumb Screws	UV0499
Replacement Shutter Shade	UV0331
Lamp Height Adjustment Knob	UV0290
Power Cord, 7'6" U.S. version (other types also available)	UV0883
RS232 Remote Interface Cable	UV0525
RS485/Logic Remote Interface Cable	UV0526
IntelliRay Remote Control Interface Software	UV0527
Foot Pedal, Shutter Control	UV0725
Replacement Fan Filter Elements	UV0498
Adjustable Height Flood Stand	UV0454
Wrap-around UV Flood Shield, Front	UV0455
Rayven UV Oven Curing Chamber	UV1080
UV Safety Glasses, OTG (fit over prescription eyewear), 3.0 Shade	UV0495
IntelliRay 600 Instruction Manual	UV0841
UVICure Plus II Radiometer, UVA, B or C, 10mW-10W/cm ²	UV1450-XX

TECHNICAL SPECIFICATIONS**11**

Category	Parameter	Value	Conditions/Notes
General	Model	INTELLI-RAY 600	
	Part Number	UV0832	
Power Supply	Type	Electronic, Switch Mode	Constant power regulated
	Input Voltage	90–132/180-265VAC	Auto-Ranging AC line input
	Input Current, 120/240V	10A/5.0A maximum	
	Source Input Frequency	47 Hz to 63 Hz	
	Lamp Power Regulation	± 1%	Line & lamp
	Fan / Auxiliary Voltage	24V ± 10%	1 Amp max from DSUB
	Protection	Inrush current limit, Line voltage surge, Short circuit, Open circuit, Hot re-strike, Over temperature	
Lamp	Lamp Type, Standard	600 Watt Metal Halide	Quartz, ozone-free
	Lamp Voltage	140 ± 10V	
	Arc Length	32 mm	
	Burning Position	Horizontal	
	Radiation Flux	110 Watts	315 - 400 nm
	Warm-up Time	2 minutes	
	Cooling Time Before Restart	5 minutes typical	Lamp protection prevents restart of hot lamp
	Peak Irradiance, Typical (Initial)	175 mW/cm ² UVA	3" from bottom face of lamp head
	Curing Area	8 x 6" minimum	Affected by lamp height
	Reflector type	Parabolic flood	Collimated light output
	Lamp Life	10,000 hours typical	Affected by number of on/off & shutter cycles
Environmental	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	Quiet DC fan
	Over-temp shutdown	60 °C (internal)	
Dimensions	L x W x H (inches)	11" x 10" x 9"	Including handle
	Weight (Pounds)	13 lbs.	

TECHNICAL SPECIFICATIONS (CONTINUED)

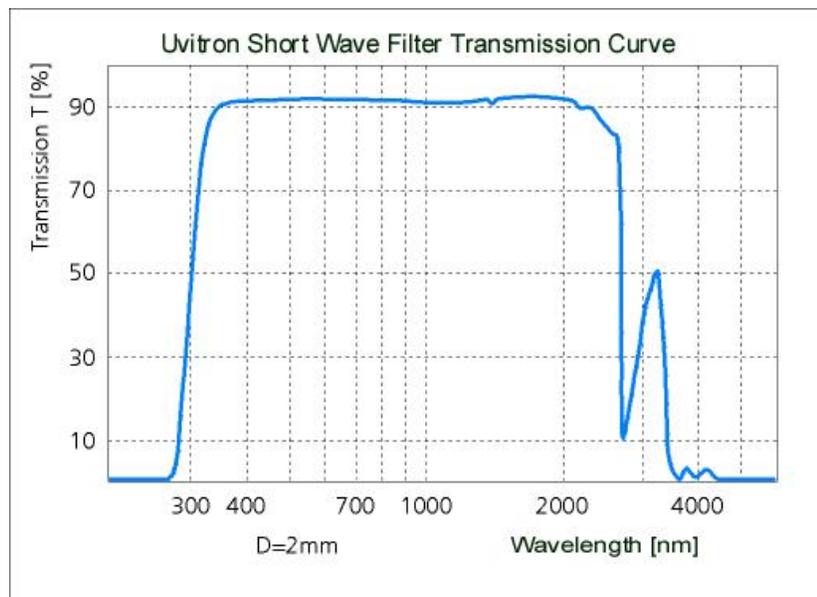
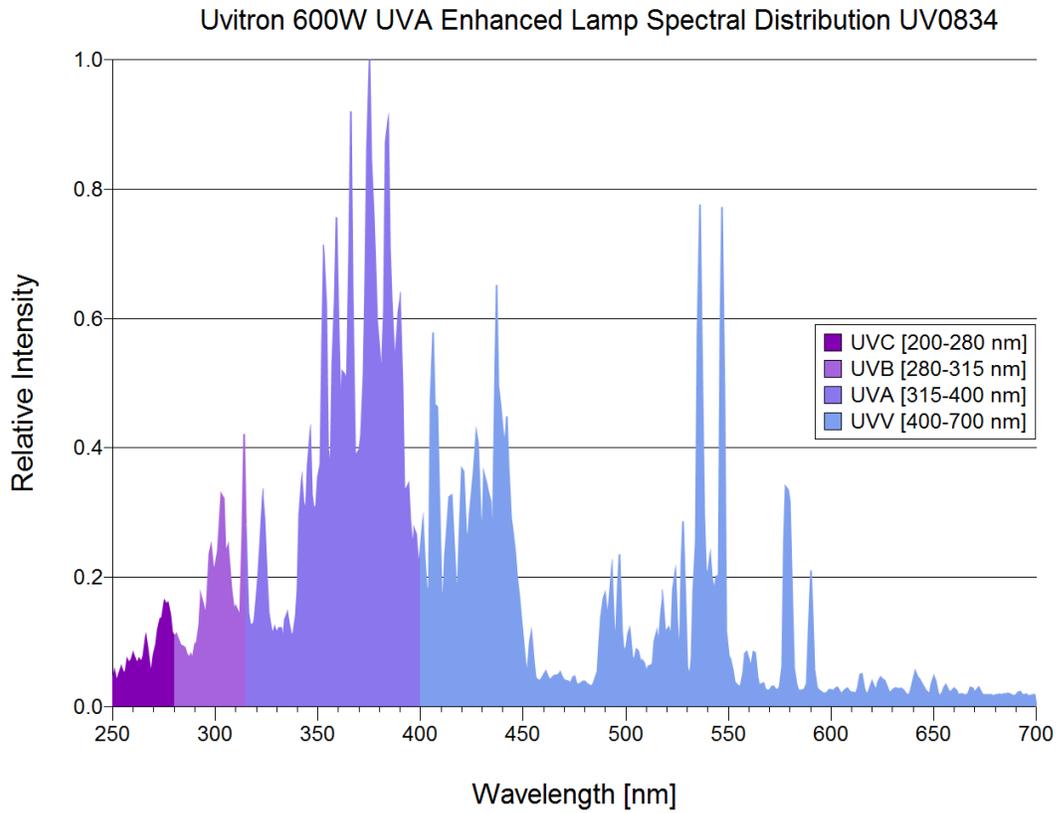


Fig. 8, Standard Lamp Intensity & Filter Glass Transmission vs. Wavelength

INTELLI-RAY 600 BLOCK DIAGRAM

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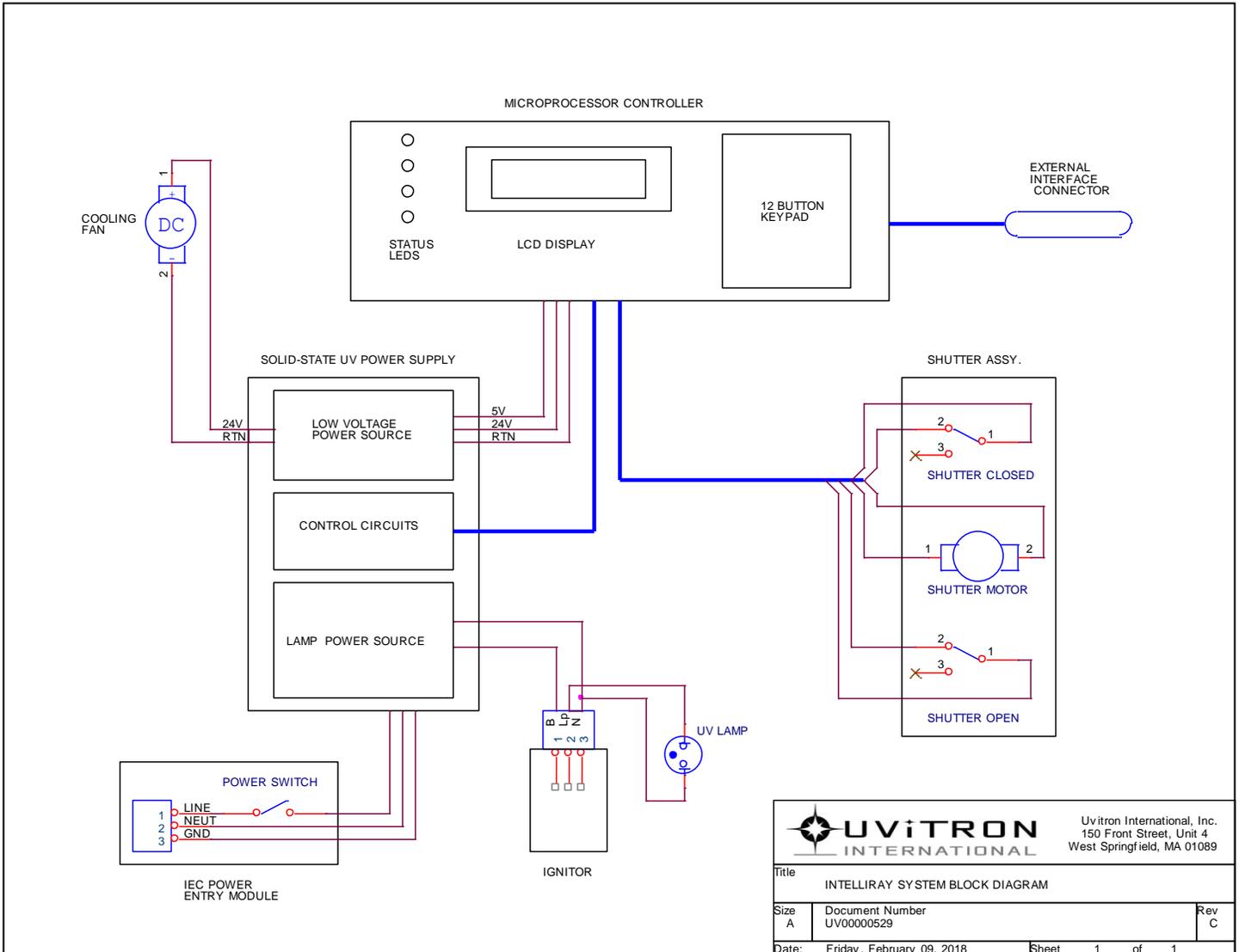


Fig. 9, System Block Diagram

WARRANTY INFORMATION**13****UVITRON INTERNATIONAL WARRANTY**

UVITRON International, Inc. warrants its products against defective material and workmanship under normal use for a period of 2 (two) years from the date of shipment to our customer. This warranty does not apply to any product that has been subjected to misuse, accident, improper installation, improper application or improper operation, nor does it apply to any product that has been repaired or altered by other than a factory authorized representative. Any tamper-proof seals that are broken will void the warranty. There are no warranties that extend beyond those herein specifically stated.

SERVICING POLICY**WARRANTY REPAIR**

All products will be repaired at the factory or replaced at no charge throughout the warranty period. If a unit is returned for an approved repair, the warranty will be extended for the length of time required to complete the repair or to replace the unit.

OUT OF WARRANTY REPAIR

Products requiring repair that are beyond the warranty period, will be subject to a fee depending on the degree of repairs. Please consult the factory for details.

SERVICE WARRANTY

UVITRON International, Inc. warrants all repair work for a period of 1 (one) year from date of repair. This warranty applies only to the repair for which the unit was returned.

RETURN MATERIALS AUTHORIZATION

A Return Material Authorization (RMA) number must be obtained so that we may process your returned equipment. Please call the factory service department to obtain a RMA Number.

SHIPPING INSTRUCTIONS

Products that are shipped to the factory for repair will be shipped at the customer's expense and will be returned to the customer at no charge by UVITRON International, Inc., via normal shipping method for said product. Products that are shipped to the factory on a freight collect basis will not be accepted.