UV Crosslinker

Installation and User Instructions

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Introduction

The UV Crosslinker provides researchers an instrument to quickly, safely and efficiently expose samples to a controlled amount of ultraviolet radiation. Exposure of samples to UV provides for the following:

- Crosslinking of DNA or RNA to nitrocellulose, nylon or reinforced nitrocellulose.
- PCR sample contamination control.
- Photonicking of DNA
- Testing RecA function
- Rapid site mapping
- UV sterilization and sanitization
- UV curing

The Crosslinkers are designed to measure and control the ultraviolet (UV) radiation within the exposure chamber. A unique UV sensor continually measures the UV energy and automatically adjusts to variations in UV intensity that occurs as the UV tubes age. This same UV sensor feedback measurement system allows you to set UV sample exposure, which automatically deactivates the UV sources when the set UV energy dose has been achieved.

Important Safety Information

Ultraviolet Crosslinkers are a powerful source of ultraviolet radiation. Even though they are not easily accessible, do not attempt to disengage or override the internal safety interlocks. Exposure to the UV radiation may result. If the UV sources remain on when the door is open, the unit is malfunctioning and use should be discontinued until the unit is serviced. Do not expose unprotected eyes or skin to UV radiation. Always disconnect the UV Crosslinker from its electrical supply before servicing.

Description and Specifications

Configurations

Part No.	Description	Nominal Voltage/Hertz/Amp
89131-484	UV Crosslinker	115V/60Hz/0.7A
89131-486	UV Crosslinker	230V/50Hz/0.7A

Dimensions

External:	15D x 17.5W x 9.75H in. (381 x 445 x 248 mm)
Internal Chamber:	11.3D x 11.4W x 3.6H in. (287 x 290 x 91 mm)

Features

- Microprocessor controlled/UV sensor feedback system
- Multiple set functions:
  - preset UV energy exposure
  - preset UV time exposure
  - user set UV energy exposure
  - user set UV time exposure
- Maximum UV energy exposure setting of 999,900 microjoules per cm2
- Maximum UV time exposure setting of 999.9 minutes

- Internal safety interlock
- Large LED readout
- Tactile membrane switch keypad
- UV blocking viewing window
- Large interior UV exposure chamber
- Dual safety fused
- Removable power cord
- Pull-out drawer

Electrical

Part No.	Nominal Voltage/Hertz/Amp
89131-484	115V/60Hz/0.7A
89131-486	230V/50Hz/0.7A

Operation

Set-Up the Crosslinker

- Place the Crosslinker on a level work surface. Be sure there is enough room in front to open the door.
- Plug the female end of the power cord into the Crosslinker.
- Plug the male end of the power cord into a properly grounded electrical outlet. The proper operating voltage of the Crosslinker is found on the product information label. Note: For 230V models, or those requiring special power cord connectors, ensure that the proper configuration of the male connector or the plug has been has been properly connected to the power cord.
- Turn the On/Off switch to the ON position. Note: WHEN TURNED ON THE CROSSLINKER DEFAULTS TO THE LAST USED UV EXPOSURE SETTING.
- The last UV exposure setting will now be displayed on the LED. The last function setting will be noted by glowing red spot(s) on the display panel. Place your sample requiring exposure into the chamber.

Using the PRESET Ultraviolet energy exposure setting

The UV Crosslinker can be operated on the following settings:

- Push the PRESET and then ENERGY on the tactile touch pad. The red light at each position should now be lit and the preprogrammed UV exposure setting of 120,000 microjoules per cm² is displayed in the LED as 1200. This value must be multiplied by 100 to obtain actual exposure.
- Push START. After a slight delay to energize the UV tubes, the LED will begin to count down. The unit automatically stops at the end of the exposure cycle and will beep FIVE times. Exposure is now complete.

To change PRESET value for the ultraviolet energy exposure setting:

- Push and hold the PRESET on the tactile touch pad until an audible signal is heard, then push ENERGY also on the touch pad.

- Set the new user-defined PRESET UV exposure by pushing the numbers on the touch pad. The LED display must be multiplied by 100 to obtain the proper exposure setting.

- The new setting will appear on the LED display. Push ENTER on the touch pad. The new setting is now installed.

- To test the new setting, push START on the touch pad. After a slight delay to energize the UV tubes, the LED will begin to countdown. The unit will stop automatically at the end of the exposure cycle and will beep five times. Exposure is now complete.

Using the PRESET Ultraviolet Time Exposure

- Push PRESET and then TIME on the tactile touch pad. The red light at each position should now be lit and the preprogrammed UV exposure time of 2 minutes should be displayed in the LED.

- Push START on the touch pad. After a slight delay to energize the UV tubes, the LED will begin to count down. Note: The time exposure is set in minutes and tenths of a minute.

- The unit will automatically stop at the end of the exposure cycle and will beep FIVE times. Exposure is now complete.

To change PRESET value for the ultraviolet time exposure setting:

- Push and hold the PRESET on the touch pad until an audible signal is heard, then push TIME.

- Set the new user-defined PRESET UV TIME EXPOSURE by pushing the numbers on the tactile touch pad. The new setting will appear on the LED display.

- Push ENTER and the new setting will be installed.

- To test the new settings, push START. After a slight delay to energize the UV tubes, the LED will begin to countdown. The unit will stop automatically at the end of the exposure cycle and will beep five times. Exposure is now complete.

Operational Notes

- To abort an exposure, press STOP on the tactile touch pad. The LED will display the remaining exposure.

- To restart an aborted exposure, press START on the touch pad. The exposure will continue from the point at which the exposure was aborted.

- To reset an aborted exposure, press the RESET. The LED and touch pad will return to the used last setting.

- The unit will not operate with the door open. Opening the door during a cycle aborts the cycle. Reclosing the door will reset the cycle to the last entered cycle used. To restart, press the START key.

Applications

The Crosslinker is a multi-purpose ultraviolet exposure instrument for use in the laboratory. A wide variety of applications for ultraviolet radiation exist in the laboratory.

- UV crosslinking of DNA and RNA by covalently binding nucleic acids to transfer membranes nitrocellulose, nylon or nylon-reinforced nitrocellulose membranes after Northern, Southern, slot or dot blotting.

Note: The Preset UV exposure setting is factory set to a UV dose of 120,000 microjoules per cm^2 for this laboratory purpose. This setting has been found to be the optimal dose for DNA retention and hybridization-signal sensitivity.

- Nicking ethidium-bromide stained DNA in Agarose Gels
- Gene Mapping for creating cleavage-inhibiting thymine dimers
- Testing RecA function
- Ultraviolet Sterilization
- Elimination of PCR contamination
- UV Curing
- Fluorescence of materials

Note: Further Applications can be achieved with the Crosslinkers by changing the ultraviolet wavelength (see Section Changing the UV Wavelength).

Calibration Procedures

Crosslinker Calibration Procedure

Equipment necessary:

- Chart recorder
- Two probes with banana plug adapters
- One radiometer with UVX-25 calibrated sensor
- Cable with banana plug and jack adaptor to connect radiometer to chart-recorder
- Power source (100V, 115V or 230V)

Procedure:

1. Connect the Crosslinker to the power source. Do not turn on the unit at this time.

2. Connect the testing probes to the chart recorder and to the Crosslinkers PCB as follows:
   PEN 1 (red) to the right side of R7
   PEN 2 (blue) to the right side of R6
   Ground both pens at the lower part of R2

   Note: While connecting these probes, the switches for both pens on the chart recorder should be on **ZERO** position to avoid possible damage to the recorder.

3. Place the UVX-25 sensor inside the Crosslinker at the center and slide the sensor cable through the upper hole of the inner chassis. Plug the sensor cable into the PCB's jack.

4. Select 5V scale for both pens. Turn the chart recorder on.

5. Select a speed of 15mm/min.

6. Switch both pens to **MEASURE** and **DOWN** positions so they can touch the chart paper.

7. Adjust the **ZERO** position for both pens.

8. Press the **CHART DRIVE** switch.

9. Run the Crosslinker in calibration mode by depressing the **STOP/RESET** button and turning the power switch on at the same time. At this point, both pens should start recording information on paper. Sometimes either pen will record zero information regardless of the lights in the Crosslinker being on, if this is the case, check for bad connections.

10. During calibration, check the voltage levels on both pens. By adjusting the potentiometers R21 and R29 on the PCB, adjust the values of R6 and R7. Depending on the voltage used, from past units it has been found that the optimum values for these levels are:

VOLTAGE	**RANGE FOR R6**	**RANGE FOR R7**
115V	3.3-3.5V	2.1-2.3V
220V	3.5-3.7V	1.7-2.0V
100V	2.5-2.7V	2.6-2.9V

11. When the calibration cycle is finished, move both pens to **UP** and **ZERO** positions.

12. Unplug the UVX-25 sensor and disconnect the probe for **PEN 2**.

13. At this point, it is necessary to check the energy levels of the Crosslinker to see if the unit was calibrated properly. Slide the UVX-25's cable through the lower hole of the inner chassis and plug it into the radiometer.

14. Set the radiometer scale to 20mW/cm^2.

15. Connect the radiometer to **PEN 2** of the chart recorder.

16. Select 1V scale for **PEN 2** and a speed of 60mm/min.

17. Lower both pens, turn the **CHART DRIVE** switch on, change the pens' switches to **MEASURE** position and adjust for zero level.

18. Select an energy level of 600 Joules on the Crosslinker and press the **START** button.

19. When the cycle is completed, repeat for 1,200 and 2,000 Joules levels.

20. Obtain the actual amount of energy in Joule/m^2 by calculating the area encompassed by the recorded data curve and zero baseline times 100. Compare it with the energy selected. They should be within a range of +/- 10%. If this is not the case, adjustments of potentiometers R21 and R29 should be made during a repeat calibration. Repeat all the above procedures until the actual levels are within range.

21. When the three levels of energy are acceptable, disconnect the sensor and the chart recorder from the Crosslinker. At this point, the unit is ready to be tested.

UV Wavelength Calibration Procedure

Changing the UV Wavelength

A UV Crosslinker is purchased with shortwave, longwave or midrange tubes. However, if user requirements and applications change, the Crosslinkers allows the user the option to change the ultraviolet wavelength and recalibrate the UV sensor and microprocessor to the new UV wavelength. This is accomplished by purchasing **FIVE** tubes of the **NEW UV** wavelength and the proper UVP calibration sensor.

TUBE P/N	WAVELENGTH	UVP CALIBRATION SENSOR P/N	
21474-921	365 nm Longwave	97-0016-02	UVX-36 Longwave
21474-965	302 nm Midrange	97-0016-04	UVX-31 Midrange
21474-943	254 nm Shortwave	97-0016-01	UVX-25 Shortwave

1. After disconnecting the unit from the electrical supply, install the **FIVE NEW WAVELENGTH** Tubes as directed. (Section - Changing tubes).
2. Plug the corresponding UV calibration sensor into the **TOP HOLE** just inside of the door at the upper right.
3. Place the UV calibration sensor in the middle of the floor of the exposure chamber.
4. Close the Crosslinker door.
5. Invoke the calibration mode of the Crosslinker by pushing/holding down **STOP** on the tactile touch pad and turning the power to the unit **ON**.
6. A sequence of tones will be heard from the Crosslinker and a 180-second count will display on the **LED** when the calibration procedure has started.
7. No calibration occurs during this 180-second period. This period allows a UV tube warm-up and stabilization period.
8. Upon completion of the 180-second period, measurements are automatically made with the UV calibration sensor and the Crosslinker sensor. These measurements are compared to limits of acceptability and/or if sensor operation is within range.
9. If sensor readings are unacceptable, an error code (01, 02, 03 or 04) will flash on the **LED** Press any key to stop.
10. Check all connections and redo calibration. If the same error message appears, call UVP Customer Service.
11. The previous calibrated operation of the Crosslinker will continue following any unsuccessful recalibration. Replace the new UV wavelength tubes with the previously removed old wavelength tubes.
12. Successful recalibration to the **NEW** UV wavelength changes the values in the microprocessor and numeric setting value is displayed on the **LED**. To return to original or another wavelength the proper UV calibration sensor is needed.

Service Procedures

Maintenance, Care, and Cleaning

The UV Crosslinker is built to provide trouble-free operation. To ensure correct service:

Note: ALWAYS UNPLUG UNIT FROM ELECTRICAL SUPPLY BEFORE CLEANING OR DRYING.

- Wipe ANY water from inside and outside the unit with a soft cloth or sponge.
- Use soap and water with a soft cloth or sponge to clean the unit.
- Do not allow chemicals to remain on unit surfaces.
- Never clean unit with abrasive pads or cleaners.
- Never clean unit with acetone or chloroform.
- Clean the UV sensor regularly with a soft cloth and alcohol.

Replacement Parts

Operations without removing the top cover

	Qty / Part Number
Tubes	5 x 21474-943

Operations with top cover removed

	Qty / Part Number
Tube holders	10 x 36-0003-01
Starters	5 x 53-0001-02
	or 53-0132-01
Starter holders	5 x 36-0005-01
Fuse holders	2 x 56-0023-02
Main connector	55-0105-01
Main switch	53-0134-01
UV sensor	39-0006-01
PCB	57-0014-01
Membrane panel	53-0133-01

Operations with the internal chassis assembly removed

	Qty / Part Number
Reflector	16-0095-01

Operations with reflector removed

	Qty / Part Number
Micro-switch	53-0072-01
Ballasts	5 x 42-0005-03 100V
	5 x 42-0005-04 230V
	5 x 42-0005-01 115V
Magnetic door holders	2 x 67-0019-01

General items

	Qty / Part Number
Fuses	2 x 56-0022-02
Plastic feet	4 x 72-0004-01

TUBE P/N	WAVELENGTH	UVP CALIBRATION SENSOR P/N	
21474-921	365 nm Longwave	97-0016-02	UVX-36 Longwave
21474-965	302 nm Midrange	97-0016-04	UVX-31 Midrange
21474-943	254 nm Shortwave	97-0016-01	UVX-25 Shortwave

Process to Replacement Parts

Operations without Removing the Top Cover

Changing the tubes

It is recommended to change all **FIVE** 8-Watt 254nm UV tubes at the same time. The unit does not require recalibration if you are replacing the old sources with new sources of the same wavelength.

1. Purchase five tubes from UVP.
2. Unplug the unit from the electrical supply.
3. Reach up to the inside top of unit and carefully rotate each UV tube a 1/4 to 1/3 turn and pull gently downward.
4. After removing all five old tubes, carefully install the five new tubes.
5. Dispose of the old UV tubes properly.

Operations with Top Cover Removed

Removal of top cover

Remove the four screws located on the two sides of the unit (2 each side).
Remove the cover, moving in an upward direction and store safely.

All of the operations below are described as taking place within the unit unless otherwise stated.

Replacement of tube holders

1. Open front door on unit.
2. Locate tube holders to be changed. (These will be seen at the front and back of the internal chassis assembly - 5 at the front and 5 at the back).
3. Loosen and remove screw on the tube holder(s). This screw is located in the main chamber-at the top and just in front of the tube holder(s).
4. The tube should now be loose.
5. Cut all of the cable ties coming from the tube holder following the two wires from the tube holder to where it terminates. Note: There will be two different termination points for each tube holder. Once this has been located, cut the wires (marking them to ensure easy replacement).
6. The tube holder(s) can now be removed by pushing the holder into the main chamber and feeding the wires through the cut out.
7. Replace tube holder(s). (Part number 36-0003-01)
8. In order to refit the tube holder, reverse the above procedure using butt crimps to reconnect the wires.

   Note: If more than one tube holder is to be replaced, the wiring schematic diagram may be of assistance.

Replacement of starters

1. Locate the starter to be changed. These are positioned in a vertical row on the right hand side of the internal chassis assembly.
2. Turn starter(s) 30 degrees anti-clockwise and then pull out of the holder.

3. Reverse above procedure with recommended starter.

Replacement of starter holder

1. Locate the starter holder to be changed. It is located on the right hand side of the internal chassis assembly.

2. Lever off the starter holder using a flat bladed screwdriver. The holder should now be loose.

3. Replace unit (part number 36-0005-01). This is achieved by first loosening the internal reflector which is held in place with eight screws. The screws can be located in the chamber of the Crosslinker - two on the left, two on the right and four on the top of the chamber.

4. To replace the starter holder first push the center of the two black spigots, which hold the starter holder (x2) away from you i.e. toward the Crosslinker chamber. As the reflector has been loosened, this should be done fairly easily with a small, flat-bladed screwdriver.

5. The starter can now be relocated.

6. To secure the starter holder, place the holder in your right hand and with your left hand in the chamber, press the now loosened reflector adjacent to the holder inwards. This will push the black spigots inwards thereby securing the starter holder.

7. Re-fit reflector.

Replacement of fuse holders

These are located at the back of the unit just above the main connector. There are two fuses in separate holders. Replacement is the same for both.

1. Cut back the heat shrink on the two wires.

2. Unsolder both connections and pull from the holder.

3. Unscrew the nylon nut and push the holder out through the back of the unit.

4. To replace, reverse the above procedure.

Replacement of main connector

This is located at the back of the unit below the fuse holders.

1. Cut back the heat shrink on the three wires.

2. Unsolder the three connections and pull from connector.

3. Release main connector by holding the nuts with a spanner and then on the outside back of the unit, release the two screws one at a time (using a screwdriver). The main connector should now be loose.

4. To replace, reverse the above procedure.

Replacement of main switch

This is located on the front panel below the membrane pad.

1. Remove the wires noting their position.

2. Remove the switch by pushing it out from the back towards the rear of the front panel.

3. Push in the new switch and re-connect.

Replacement of UV sensor

UVP recommends returning the Crosslinker to the UVP factory for service. The UV sensors are located on the right hand side of the internal chassis assembly at the back near the base.

1. Unplug the sensor connector from the PCB board marked J2.

2. Release the sensor by removing the location screw with a screwdriver and holding the nut inside the main chamber with a spanner. Pull sensor clear.

3. For replacement, reverse the above procedure.

Note: The Crosslinker will now need recalibration-see section 8.

Replacement of PCB

UVP recommends returning the Crosslinker to the UVP factory for service.

The main PCB is located on the right of the unit directly behind the front membrane panel.

1. Disconnect the ribbon connector J4. See wiring diagram for position.

2. Unscrew the four screws located at the top and bottom. **Note:** If the membrane panel needs to be replaced, it should be replaced now. See next paragraph.

3. For replacement, reverse the above procedure.

Replacement of membrane panel

Located on the front panel.

1. Carry out the above procedure-replacement of PCB.

2. Peel off membrane after first marking the position with a pencil, and feed out the ribbon cable.

3. Replace membrane pad.

Note: Marking the position of the membrane will ensure that the new part will be in the exact position as fitted from the factory.

Operations with the Internal Chassis Assembly Removed

Removal of the assembly

1. Release the wire to the micro switch located on the bottom left internal chassis assembly.

2. Release the main power cable to ballasts - black wire with connector (color red).

3. Release all eight nuts positioned four on top of the unit, two sets on either side of the unit. See diagram for positions.

4. Slide unit out from the main frame.

Replacement of reflector

The reflector is located inside of the internal chassis assembly.

1. Release the eight screws-four on the top and two on either side of the unit.

2. Pull the reflector out towards the front of the unit. **Note:** For cleaning the reflector, refer to Section 6 for maintenance/care/cleaning of the Crosslinker.

3. For replacement, reverse the above procedure.

Operations with the Reflector Removed

Replacement of ballasts

The ballasts are fitted to the right hand side of the internal chassis assembly.

1. Select the ballast(s) which need to be replaced.
2. Cut the tie wraps to locate the ballast electrical connectors.
3. Cut these wires and mark positions.
4. Re-fit new ballasts using M4 posidrive screws with shake proof and plain washers with a nut as fitted on the diagram.

General Items

Changing fuses

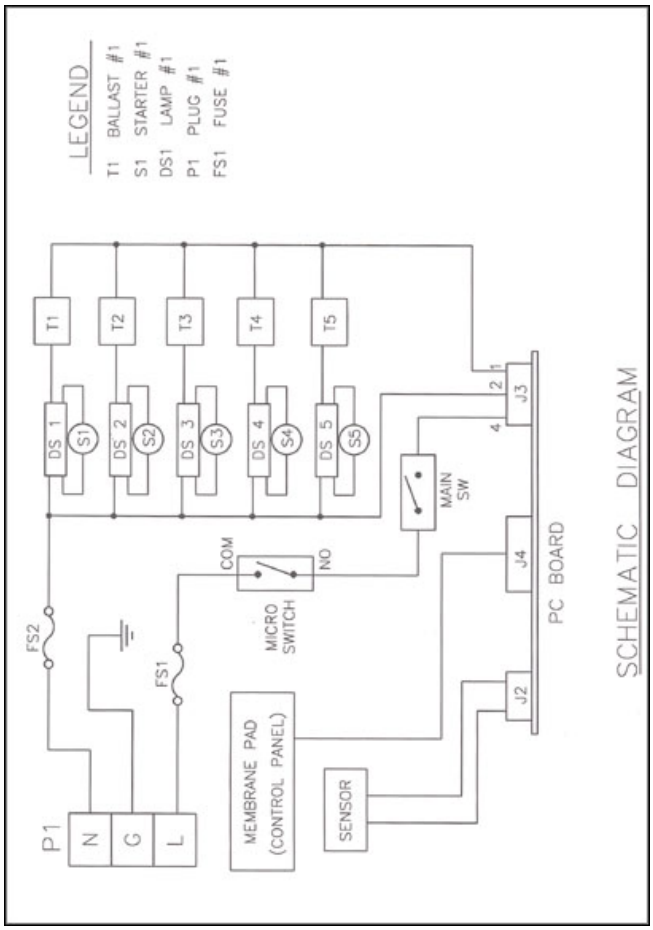
The fuses are located on the back panel and are marked with a self-adhesive sticker.

1. Turn fuse cap 15 degrees anti-clockwise.
2. Pull fuse and cap from the holder.
3. Pull fuse from the cap.
4. Replace the fuse.
5. Replace fuse cap and fuse into holder and turn 15 degrees clockwise.

Changing plastic feet

The feet are fitted to the bottom of the cabinet. They are removed by unscrewing the screw mounted inside each foot.

Schematic Diagram



Technical Support

VWR's Technical Resource Center is committed to providing you with real-time response and proven industry solutions. Contact them at 1-888-VWR-LINE (1-888-897-5463) or Equipment_Instruments@vwr.com.

Warranty

UVP's quality instruments are guaranteed to be free of defects in materials, workmanship, and manufacture for one (1) year from date of purchase. Transilluminators are similarly warranted for two (2) years from the date of purchase. Consumable and disposable products, including, but not limited to lamps or light tubes, filters, or rechargeable batteries are guaranteed to be free from defects in manufacture and materials for ninety (90) days from date of purchase. If equipment failure or malfunction occurs during the warranty period, UVP shall examine the inoperative equipment and have the option of repairing or replacing any part(s) which, in the sole and absolute discretion of UVP, were originally defective or became so under conditions of normal usage and service. No warranty shall apply to any instrument, or part thereof, that has been subject to accident, negligence, alteration, abuse or misuse by the end user. Moreover, UVP makes no warranties whatsoever with respect to parts not supplied by UVP or that have been installed, used and/or serviced other than in strict compliance with the instructions appearing in this installation and instruction manual. In no event shall UVP be responsible to the end-user for any incidental or consequential damages, whether foreseeable or not, including but not limited to property damage, inability to use equipment, loss of business, loss of profits, or inconvenience arising out of or connected with the use of instruments produced by UVP. Nor is UVP liable or responsible for any personal injuries occurring as a result of the use, misuse, installation and/or servicing of equipment. Representations and warranties made by any person, including dealers and representatives of UVP which are inconsistent or in conflict with the terms of this warranty (including but not

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