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INSTRUCTION MANUAL

FOTO/Convertible Dual Transilluminator

Cat. No. 3-3450 (a.c.: 120 V, 60 Hz)
Cat. No. 3-3452 (a.c.: 220 V, 50 Hz)
Cat. No. 3-3454 (a.c.: 240 V, 50 Hz)

WARNING
Read and understand this manual before using this product.

FOTODYNE INCORPORATED

950 Walnut Ridge Drive • Hartland, WI 53029-9388 • USA
Website: www.fotodyne.com • E-mail: info@fotodyne.com

Research Products Division
Technical Service: 262-369-7000
Phone Orders: 1-800-DNA-FOTO (1-800-362-3686)
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Instruction Manual for the FOTO/Convertible Dual Transilluminator

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Introduction

The FOTO/Convertible™ Dual Transilluminator is a unique concept in dual function lighting systems. FOTODYNE's use of an electroluminescent (EL) panel as a white light overlay (patent pending) virtually doubles the utility of the transilluminator while retaining its small footprint. You no longer need to occupy vast amounts of valuable bench space with a dual transilluminator having lighted surfaces too small to meet your needs. The FOTO/Convertible™ provides large 21 cm x 26 cm areas of illumination for both ultraviolet and white light.

The ultraviolet transilluminator base is designed for the viewing of nucleic acids in agarose and polyacrylamide gels stained with fluorescent dyes such as ethidium bromide and SYBR™ Green nucleic acid gel stain. It employs four 312 nm peak emission bulbs and features a special internal reflector design to provide even illumination at the solarization-resistant filter glass surface. The bulbs are rated for over 1,000 hours of visualization with negligible intensity loss of emitted UV after as many as 100 hours of continuous operation. Like the related FOTO/UV® 15, 21, and 26 family of ultraviolet transilluminators, the FOTO/Convertible™ provides two intensity modes for sub-nanogram analytical (100% intensity) detection or reduced photodamage preparative (40% intensity) work. The UV filter glass surface of the FOTO/Convertible™ is fitted with a UV transparent filter glass protector to minimize damage from the sharp implements commonly used in preparative work or from dropping small objects onto the glass surface. For user safety, a convenient UV blocking cover can be added to the FOTO/Convertible™ to protect you from harmful ultraviolet radiation.

The white light surface, mounted in a thin, water-tight panel, conveniently swings down to occupy the same area as the UV filter glass. When the panel is lowered into position, a safety interlock automatically extinguishes the UV bulbs (if they have been left on). The EL panel provides unsurpassed uniformity of illumination and has a continuously variable light output (100-40%). It exhibits substantially less intensity variation over the entire viewing area than fluorescent bulb-based units. When the output of the EL panel begins to degrade, simply replace it - no bulb changes, no filter changes.

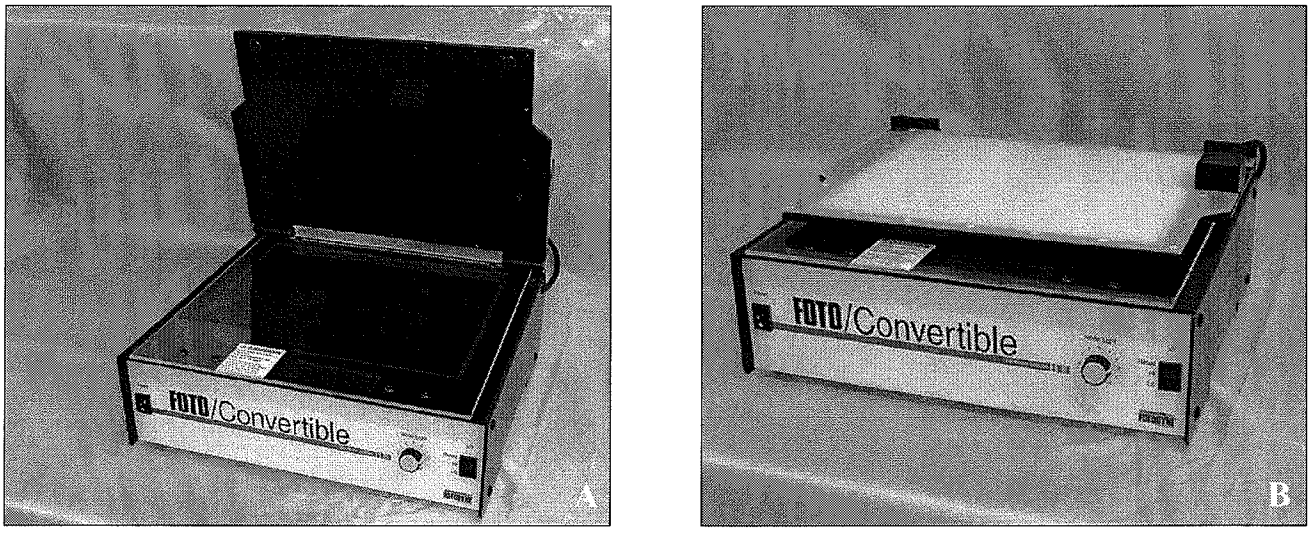


Figure 1. The FOTO/Convertible™ Dual Transilluminator.
A: White Light Panel Up for UV Transillumination
B: White Light Panel Down for White Light Transillumination.

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Specifications

Key Features

- UV Filter Glass Size: 21 cm x 26 cm
- Four 8 watt midrange (312 nm peak intensity) bulbs
- Analytical UV Intensity: ~3000μW/cm² at 312 nm ±15 nm at the surface of the filter glass
  Preparative UV Intensity: ~1200μW/cm² at 312 nm ±15 nm at the surface of the filter glass
- Three position mode selection switch (Low - High - Reset) for UV operation
- Safety interlocked: UV bulbs extinguish when EL panel lowered
- UV Transparent Filter Glass Protective Sheet
- White Light Electroluminescent (EL) Panel
  - Illuminated Area: 21 cm x 26 cm
  - White Acrylic Cover for Protection and Diffusion
  - Friction Hinged for Flexible Positioning
  - Adjustable Intensity Control (100 - 40%)
- Cooling Fan
- UV Blocking Eyeglasses
- Optional UV Blocking Cover

Dimensions

- 30.6 cm Wide x 34 cm Long x 10.2 cm High (11.6 in W x 13.25 in L x 4.25 in H)

Weight

- approximately 44 kg (20 lbs)

Operating Temperature

- Operating Temperature Range: 0 to 40°C

Power Requirements

- a. c.: 120V, 60 Hz at 0.85 Amps, 1.25 Amp time delay fuse
- a. c.: 220V, 50 Hz at 0.3 Amps, 0.4 Amp time delay fuse
- a. c.: 240V, 50 Hz at 0.3 Amps, 0.4 Amp time delay fuse

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Safety Information

UV WARNING

CAUTION: Ultraviolet (UV) radiation can cause severe eye and skin damage! Do not view the UV light source with unprotected eyes.

For maximum protection from skin damage, wear protective clothing and a UV blocking face shield over UV blocking eyeglasses. UV blocking eyeglasses are necessary with a face shield to prevent accidental exposure when the shield is raised or removed.

Always turn off midrange and shortwave ultraviolet light sources when setting up a system or setting up objects to be photographed. The ultraviolet lights should be activated only when observing or photographing objects.

SAFETY PRECAUTIONS

Electrical Instruments
Use the same precautions as with any electrical device. Do not operate without the sides and chassis fully assembled. Do not operate in a damp, humid atmosphere or where condensed moisture may short circuit internal electrical components. Make sure the transilluminator is unplugged before performing maintenance of any kind, including bulb replacement. When moving the unit from a normal room temperature condition into a cold room or vice versa, allow at least eight hours for the temperature of the unit to equilibrate before use.

Ultraviolet Fluorescent Bulbs
There are several hazards associated with using ultraviolet bulbs. Among them are:

1. **The radiation itself:** All radiation below 350 nm wavelength and especially below 280 nm must be considered dangerous. Thus, ultraviolet blocking eyeglasses and a face shield must be worn, along with protective gloves and clothing to cover exposed skin.

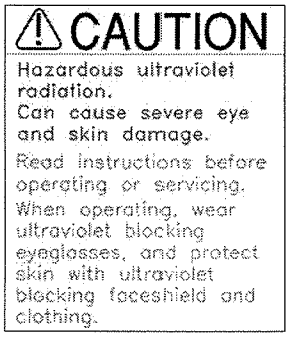
2. **Secondary or reflected radiation:** The above personal safety considerations are also important in protection from ultraviolet radiation that is reflected from surrounding working surface areas such as metal and glass.

3. **The bulbs themselves:** An ultraviolet absorbing film develops on the interior walls of the bulb as it is used, reducing its useful life and sometimes causing the temperature to rise above normal operating levels. The FOTO/Convertible™ Transilluminator is built with a cooling fan to help alleviate this temperature problem.

4. **Care of handling:** Ultraviolet bulbs contain small amounts of mercury, therefore special care in handling them is advised. When replacing ultraviolet fluorescent bulbs, never hold them in the center. Instead, hold both ends of the bulb and gently twist it free from the socket to prevent breakage. In the event of a broken bulb, wear protective gloves during clean-up. Since the bulbs contain a very minimal amount of mercury, they do not have special disposal requirements.

SAFETY LABELS AND PLACEMENT

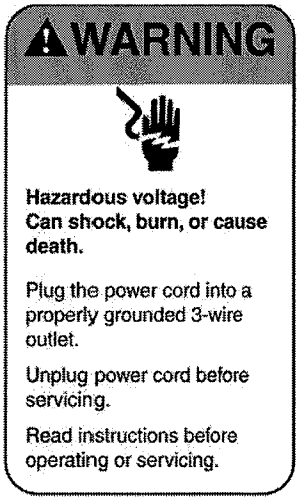
Hazardous ultraviolet radiation safety label:



Placement of hazardous ultraviolet radiation label:

Located on the top of the cover, directly to the left of the intensity selection toggle switch.

Hazardous voltage safety label:



Placement of hazardous voltage label:
Located on the back of the unit, next to the power receptacle.

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Safety Information (cont.)

HEALTH HAZARDS ASSOCIATED WITH UV LIGHT

Eyes
Exposure of the eyes to UV radiation (including 312 nm) can result in inflammation of the cornea and of the conjunctiva. A combination of these conditions is referred to medically as "Kerato-conjunctivitis," more commonly known as "snow blindness." Symptoms include irritation, sensation of dirt in the eye, excessive watering, sensitivity to bright lights, and sometimes eyelid spasms. These symptoms appear after exposure, when it is too late to avoid their cause. Wearing ultraviolet blocking eyeglasses is a must and never should be circumvented, even for "just a few seconds."

It is important to realize that the eye does not build up tolerances to repeated ultraviolet radiation as does the skin. Even though the symptoms described above usually disappear within two or three days, medical attention should be sought in all ultraviolet eye burn situations to help prevent more serious complications.

Skin
Excessive exposure of the skin to UV radiation can cause "sunburn-like" symptoms. Wear protective clothing, giving special attention to the chin and neck areas. A UV blocking face shield is recommended. Exercise care when performing preparative techniques, or any other manipulations that require working in close proximity to a UV light source for extended periods of time.

Ozone
Another potential hazard associated with the use of short-wave ultraviolet light in the research lab is ozone. Short-wave ultraviolet radiation below 242 nm reacts with molecular oxygen to form ozone. Ozone above the threshold level of 0.1 ppm causes eye irritation and discomfort of the respiratory tract. Because of its toxicity, ozone can cause serious medical problems at higher concentrations.

Although shortwave radiation below 242 nm from 15 watt or less fluorescent bulbs is nominal, the potential hazard does exist. It is recommended that adequate ventilation or air movement be provided. Ultraviolet bulbs should be turned on only for viewing and photographing and then immediately shut off.

Unpacking Instructions

Check-out Procedure

1. Unpack and examine the FOTO/Convertible™ Transilluminator carefully. Immediately report any damage to the transporting carrier and to FOTODYNE Incorporated. Be sure to save all cartons for claim purposes if damage is found.

2. Identify the following components:

   a. FOTO/Convertible™ Transilluminator

   b. UV blocking eyeglasses

   c. Power cord

   d. Instruction manual

   e. Warranty card

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Operating Instructions

Set-up

CAUTION: It is recommended that UV blocking eyeglasses be worn when setting up a UV transilluminator to prevent accidental exposure of the eyes to ultraviolet radiation.

For Standard Operation:

1. **Position the transilluminator.** Place the FOTO/Convertible™ Transilluminator on a flat, solid surface. Leave several inches of space on the sides of the instrument to prevent blockage of vents.

2. **Ensure that power is off.** The power switch on the left side of the front panel of the transilluminator should be in the OFF (**O**) position (bottom half depressed).

3. **Connect power cord.** Plug the power cord into the outlet on the back of the unit. Plug the other end of the power cord into a properly grounded three-conductor outlet. ***Please note: This is a three-wire ground style cord and should not be used with a conversion plug inserted in a two-wire receptacle.***

   For 220V or 240V, 50 Hz models, the power cord will arrive with one end open. The appropriate plug for your specific receptacle will need to be attached.

For Use inside a FOTO/Eclipse® Enclosure:

1. **Prepare Transilluminator for Installation.** Press the power switch on the front of the unplugged transilluminator to the ON position (top half depressed).

2. **Position Transilluminator in the FOTO/Eclipse®.** Open door on the front of the FOTO/Eclipse. Pull the drawer at the bottom of the enclosure all of the way forward. Place the FOTO/Convertible™ Transilluminator, facing forward, fully into the drawer, centering it on the platform.

3. **Attach Power Cord.** Plug the internal power cord which extends from the bottom of the drawer into the outlet on the back of the FOTO/Convertible™ Transilluminator.

4. **Enclose Transilluminator.** Slide the drawer closed and close the door of the FOTO/Eclipse.

   NOTE: The door is equipped with a safety interlock such that neither the transilluminator nor the internal direct lights will illuminate continuously unless the door is completely closed. However, both the transilluminator and direct lights can be illuminated momentarily with the door open as long as their switches remain depressed. The safety interlock may be bypassed with FOTO/Analyst systems.

Operation

Standard Operation:

Ultraviolet Transillumination

CAUTION: Always wear UV blocking eyeglasses whenever operating a transilluminator. When working with UV light for more than a minute, or when working at short distances from the filter glass, wear a UV blocking face shield in addition to UV blocking glasses. Cover skin to avoid sunburn.

1. **Place the Gel on the UV Transilluminator.** Raise the white EL panel fully and place the gel on the purple filter glass surface of the transilluminator. Position the gel for optimal viewing and photography. A gel that has been cast and run in a UV-transparent gel tray may be viewed and photographed while still in the gel tray.

CAUTION: Ethidium bromide is a known mutagen and a possible carcinogen. Use vinyl or latex gloves when handling gels treated with this stain. All spent buffers and other materials containing ethidium bromide should be disposed of properly.

2. **Select UV Light Intensity.** Push the switch located on the right portion of the front of the unit to the desired intensity setting. Low intensity, roughly 40% that of high intensity, is produced when the switch is pushed down (**LO**); high intensity, the standard output of most transilluminators, is produced when the switch is in the center position (**HI**). The purpose of the up switch position (**RESET**) will be described below.

3. **Turn on the FOTO/Convertible™** Transilluminator. Press the top half of the power switch on the left side of the front panel of the transilluminator to the ON position. The switch and the UV bulbs will illuminate.

   Note: It is not unusual for the transilluminator bulbs to flicker when the unit is first turned on. The lamps should burn continuously within a few seconds following start-up. If **LO** *intensity has been selected, the bulbs will turn on in high intensity, then immediately switch automatically to low intensity output.*

4. **View/Photograph the Gel.** The gel may be viewed safely through UV blocking eyeglasses, however, it is recommended that for longer viewing periods (over 1 minute), a UV blocking face shield be worn in addition to UV blocking eyeglasses. An optional hinged UV Blocking Cover (Catalog Number 3-4484) may be attached to your FOTO/Convertible™ for convenient increased protection from harmful radiation.
   Optimal photodocumentation of gels is achieved by raising

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the UV Blocking Cover completely and photographing the gels directly. The quality of photodocumentation is dependent on several factors. To achieve the best results, consult your camera instruction manual. When using a FOTODYNE MP-ST™ or FCR-10 Camera System equipped with an ethidium bromide or SYBR™ Green nucleic acid gel stain photographic filter and Polaroid Type 667 film, a good initial setting is f/5.6 at 1/2 second exposure. Your results may vary depending on DNA concentration, staining/destaining conditions, film type, photographic filter, etc. and your camera settings should be adjusted accordingly. FOTODYNE Electronic Imaging systems require the proper interference filter for the CCD camera and the optimal length of integration will depend on the same factors listed above.

NOTE:

a. The UV intensity may be switched from high to low or vice versa while the bulbs are illuminated by simply flipping the switch to the desired setting. You do not need to turn off the power to change the output intensity.

b. The FOTO/Convertible™ may be switched from UV to white light operation without turning off the power to the unit. After removing your sample from the UV filter glass, just carefully lower the white EL panel to horizontal. The UV bulbs will automatically extinguish and the EL panel will illuminate.

c. You may also convert your FOTO/Convertible™ from white light to ultraviolet transillumination without turning off the power. After removing your sample from atop the illuminated EL panel, raise the panel fully. The white light will automatically turn off. Note, however, that the safety interlock does **not** permit the UV lights to automatically turn on when this is done. To activate the ultraviolet bulbs, push the right switch to the up, **RESET**, position. The switch will return to the center, **HIGH**, position. You may then select the **LO** setting if desired.

5. **Turn off the Power.** When done viewing, turn off your FOTO/Convertible™ Transilluminator to help maintain optimal performance of the bulbs and filter glass. The intensity of the UV bulbs may decrease slightly with time, as can the UV transmission of the filter glass (see "Solarization" below). This phenomenon is much more pronounced with shortwave (254 nm) ultraviolet radiation.

6. **Remove the Subject from the Transilluminator.** Remove the gel by lifting or sliding it, and wipe the surface of the UV transparent filter glass protector with a soft, non-abrasive cloth or tissue.

7. **Rinse the Acrylic Surface.** Rinse the surface of the UV transparent filter glass protector with distilled water. Wipe the surface dry with a soft, non-abrasive cloth or tissue.

NOTE:
All acrylics are oil-based resins and are not resistant to organic solvents or alcohols. Ethanol should not be used to clean acrylic surfaces. Such treatment removes important oils from acrylic, Plexiglas®, and Lucite® and may damage the UV transparent filter glass protector. Continued ethanol abuse results in "crazing" in which fine cracks develop in the acrylic over time. We suggest that the acrylic UV transparent filter glass protector be cleaned with nonorganic, nonalcohol cleaners. In most cases, mild detergents and water (followed by a thorough distilled water rinse) should adequately clean your system. If you have any questions or problems, please feel free to contact FOTODYNE immediately.

White Light Transillumination

1. **Place the Subject on the EL Panel.** Lower the white EL panel fully to the horizontal position. Place the subject to be viewed or photographed on the white plastic surface.

2. **Turn on the Power.** Press the top half of the power switch on the left side of the front panel of the transilluminator to the ON position. The switch and the EL panel will illuminate. NOTE: There is no intensity control for EL panel output; only a single intensity is possible. The center toggle switch has no effect.

3. **View/Photograph the Subject.** The quality of photodocumentation is dependent on several factors. To achieve the best results, consult your camera instruction manual. When using a FOTODYNE MP-ST™ or FCR-10 Camera System equipped with an Coomassie/Methylene Blue photographic filter and Polaroid Type 667 film, a good initial setting is f/16 at 1/8 second exposure. Your results may vary depending on sample concentration, staining/destaining conditions, film type, photographic filter, etc. and your camera settings should be adjusted accordingly. FOTODYNE Electronic Imaging systems require the proper filter for the CCD camera and the optimal length of integration will depend on the same factors listed above.

NOTE:

a. You may convert your FOTO/Convertible™ from white light to ultraviolet transillumination without turning off the power. After removing your sample from atop the illuminated EL panel, raise the panel fully. The white light will automatically turn off. Note, however, that, to prevent accidental exposure, the safety interlock does **not** permit the UV lights to automatically turn on when this is done. To activate

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the ultraviolet bulbs, push the center toggle switch to the right, **RESET**, position. The switch will return to the center, **HIGH**, position. You may then select the **LO** setting if desired.

b. The FOTO/Convertible™ may also be switched from UV to white light operation without turning off the power to the unit. After removing your sample from the UV filter glass, carefully lower the white EL panel to its horizontal position. The UV bulbs will automatically extinguish and the EL panel will illuminate.

4. **Turn off the Power.** When done viewing, turn off your FOTO/Convertible™ Transilluminator to help maintain optimal performance of the electroluminescent panel. An inherent characteristic of this type of panel is that its intensity will gradually decrease over its lifetime. After approximately 1000 hours of use, the intensity of the EL panel will be roughly half that of a brand new one. Turning off the EL panel when it is not needed will help prolong its useful lifetime. The panels may easily be replaced after their output has degraded below the user's preference (see Servicing Information, page 16).

5. **Remove the Subject from the Transilluminator.** Remove a gel by lifting or sliding it, and wipe the acrylic diffuser panel surface with a soft, non-abrasive cloth or tissue.

6. **Rinse the Acrylic Diffuser Panel Surface.** Rinse the surface of the white acrylic diffuser panel with distilled water. Wipe the surface dry with a soft, non-abrasive cloth or tissue.

NOTE:
All acrylics are oil-based resins and are not resistant to organic solvents or alcohols. Ethanol should not be used to clean acrylic surfaces. Such treatment removes important oils from acrylic, Plexiglas®, and Lucite® and may damage the diffuser panel. Continued ethanol abuse results in "crazing" in which fine cracks develop in the acrylic over time. We suggest that the acrylic diffuser panel be cleaned with nonorganic, nonalcohol cleaners. In most cases, mild detergents and water (followed by a thorough distilled water rinse) should adequately clean your system. If you have any questions or problems, please feel free to contact FOTODYNE immediately.

FOTO/Eclipse® Benchtop Darkroom Operation:

Ultraviolet Transillumination

CAUTION: Always wear UV blocking eyeglasses whenever operating a transilluminator. When working with UV light for more than a minute, or when working at short distances from the filter glass, wear a UV blocking face shield in addition to UV blocking glasses. Cover skin to avoid sunburn.

1. **Place the Gel on the UV Transilluminator.** Open the door of the FOTO/Eclipse. Raise the white EL panel fully until it touches the back wall of the enclosure. Place the gel on the purple filter glass surface of the transilluminator. Position the gel for optimal viewing and imaging. A gel that has been cast and run in a UV-transparent gel tray may be viewed and photodocumented while still in the gel tray.

   CAUTION: Ethidium bromide is a known mutagen and a possible carcinogen. Use vinyl or latex gloves when handling gels treated with this stain. All spent buffers and other materials containing ethidium bromide should be disposed of properly.

2. **Select UV Light Intensity.** Push the switch located on the right portion of the front of the FOTO/Convertible™ Transilluminator to the desired intensity setting. Low intensity, roughly 40% that of high intensity, is produced when the switch is pushed down (**LO**); high intensity, the standard output of most transilluminators, is produced when the switch is in the center position (**HI**). The purpose of the upmost switch position (**RESET**) will be described below.

3. **Turn on the FOTO/Convertible™ Transilluminator.** Close the sliding door of the FOTO/Eclipse® completely. Press the "Trans" button on the front of the controller. The green indicator above the button will illuminate and the transilluminator will turn on.

   NOTE: The door of the FOTO/Eclipse® is safety interlocked such that, if the door is not completely closed, then the transilluminator will only turn on with *momentary* actuation of the "**Trans**" switch. That is, the transilluminator will only light when the "**Trans**" button is depressed and will turn off when the button is not being depressed. Similarly, if the door is opened when the transilluminator is on, it is immediately turned off unless operating in momentary mode ("**Trans**" button depressed). Note also that, when operating in momentary mode, closing the door will cause the transilluminator to turn off. This safety interlock system may be overridden in FOTO/Analyst® systems; please consult the instruction manuals systems for procedures to implement the Safety Interlock Bypass feature.

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4. **View/Photograph the Gel.** Focus and frame the gel image on the video or computer monitor by standard procedures using the internal direct white lights of the FOTO/Eclipse®. Optimize the camera settings and number of frames of integration and then capture the image. The exact procedure may vary depending on the system that you are using; please consult the appropriate instruction manual.

   NOTE:
   a. The FOTO/Convertible™ may be switched from UV to white light operation in the FOTO/Eclipse® momentary mode ("**Trans**" button depressed). After removing your sample from the UV filter glass, just carefully lower the white EL panel to horizontal. The UV bulbs will automatically extinguish and the EL panel will illuminate.

   b. You may also convert your FOTO/Convertible™ from white light to ultraviolet transillumination in the FOTO/Eclipse® *momentary* mode ("**Trans**" button depressed). After removing your sample from atop the illuminated EL panel, raise the panel fully. The white light will automatically turn off. Note, however, that the safety interlock does **not** permit the UV lights to automatically turn on when this is done. To activate the ultraviolet bulbs, push the **Hi/Low** switch to the up, **RESET**, position. The switch will return to the center, **HIGH**, position. You may then select the **LO** setting if desired.

   c. Conversion of the FOTO/Convertible™ from white light to ultraviolet transillumination without the "**Trans**" button depressed does not require pushing the toggle switch to **RESET**. After removing your sample from the white EL panel, simply raise it fully until it touches the back wall of the enclosure, then proceed with standard operation.

5. **Remove the Gel from the Transilluminator.** Turn off the FOTO/Convertible™ transilluminator by pressing the "**Trans**" button; the LED indicator above it will turn off. Open the door of the FOTO/Eclipse. Remove the gel by lifting or sliding it, and wipe the surface of the UV transparent filter glass protector with a soft, non-abrasive cloth or tissue.

6. **Rinse the Acrylic Surface.** Rinse the surface of the UV transparent filter glass protector with distilled water. Wipe the surface dry with a soft, non-abrasive cloth or tissue.

   NOTE:
   All acrylics are oil-based resins and are not resistant to organic solvents or alcohols. Ethanol should not be used to clean acrylic surfaces. Such treatment removes important oils from acrylic, Plexiglas®, and Lucite® and may damage the UV transparent filter glass protector. Continued ethanol abuse results in "crazing" in which fine cracks develop in the acrylic over time. We suggest that the acrylic UV transparent filter glass protector be cleaned with nonorganic, nonalcohol cleaners. In most cases, mild detergents and water (followed by a thorough distilled water rinse) should adequately clean your system. If you have any questions or problems, please feel free to contact FOTODYNE immediately.

White Light Transillumination

1. **Place the Subject on the EL Panel.** Open door of the FOTO/Eclipse. Lower the white EL panel fully to the horizontal position. Place the subject to be viewed or photographed on the white plastic surface. NOTE: There is no intensity control for EL panel output; only a single intensity is possible. The **Hi/Low** switch has no effect.

2. **Turn on the FOTO/Convertible™ Transilluminator.** Close door of the FOTO/Eclipse completely. Press the "**Trans**" button on the front of the controller. The green indicator above the button will illuminate and the transilluminator will turn on.

   NOTE: The door of the FOTO/Eclipse® is safety interlocked such that, if the door is not completely closed, then the transilluminator will only turn on with momentary actuation of the "**Trans**" switch. That is, the transilluminator will only light when the "**Trans**" button is depressed and will turn off when the button is not being depressed. Similarly if the door is opened when the transilluminator is on, it is immediately turned off unless operating in *momentary* mode ("**Trans**" button depressed). Note also that, when operating in *momentary* mode, closing the door will cause the transilluminator to turn off. This safety interlock system may be overridden in FOTO/Analyst® systems; please consult the instruction manuals for those systems for procedures to implement the Safety Interlock Bypass feature.

3. **View/Photograph the Subject.** Focus and frame the image on the video or computer monitor by standard procedures. Optimize the camera settings and number of frames of integration and then capture the image. The exact procedure may vary depending on the system that you are using; please consult the appropriate instruction manual.

   NOTE:
   a. You may convert your FOTO/Convertible™ from white light to ultraviolet transillumination in the FOTO/Eclipse® momentary mode ("**Trans**" button depressed). After removing your sample from atop the

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illuminated EL panel, raise the panel fully. The white light will automatically turn off. Note, however, that the safety interlock does **not** permit the UV lights to automatically turn on when this is done. To activate the ultraviolet bulbs, push the **Hi/Low** switch to the up, **RESET**, position. The switch will return to the center, **HIGH**, position. You may then select the **LO** setting if desired.

b. Conversion of the FOTO/Convertible™ from white light to ultraviolet transillumination without the "**Trans**" button depressed does *not* require pushing the toggle switch to **RESET**. After removing your sample from the white EL panel, simply raise it fully until it touches the back wall of the enclosure, then proceed with standard operation.

c. The FOTO/Convertible™ may be switched from UV to white light operation in the FOTO/Eclipse® *momentary* mode ("**Trans**" button depressed). After removing your sample from the UV filter glass, just carefully lower the white EL panel to horizontal. The UV bulbs will automatically extinguish and the EL panel will illuminate.

4. **Remove the Subject from the Transilluminator.** Turn off the FOTO/Convertible™ transilluminator by pressing the "**Trans**" button; the LED indicator above it will turn off. Open the door of the FOTO/Eclipse. Remove the subject by lifting or sliding it, and wipe the surface of the acrylic diffuser panel with a soft, non-abrasive cloth or tissue.

5. **Rinse the Acrylic Diffuser Panel Surface.** Rinse the surface of the acrylic diffuser panel with distilled water. Wipe the surface dry with a soft, non-abrasive cloth or tissue.

NOTE:
All acrylics are oil-based resins and are not resistant to organic solvents or alcohols. Ethanol should not be used to clean acrylic surfaces. Such treatment removes important oils from acrylic, Plexiglas®, and Lucite® and may damage the diffuser panel. Continued ethanol abuse results in "crazing" in which fine cracks develop in the acrylic over time. We suggest that the acrylic diffuser panel be cleaned with nonorganic, nonalcohol cleaners. In most cases, mild detergents and water (followed by a thorough distilled water rinse) should adequately clean your system. If you have any questions or problems, please feel free to contact FOTODYNE immediately.

Additional Information

WHY 312 nm UV LIGHT?

There are several reasons why ultraviolet transilluminators equipped with mid-range (312nm peak intensity) bulbs are preferable to those containing shortwave (254 nm peak intensity) for the detection of DNA in ethidium bromide stained gels. In addition to causing less damage to the DNA, 312 nm bulbs provide better sensitivity, more efficient illumination, and reduced solarization to the UV filter glass of the transilluminator. The FOTO/Convertible™ Transilluminator utilizes 312 nm ultraviolet light in **both** its "**HI**" and "**LO**" intensity modes, simply reducing the bulb intensity to approximately 40% when switching from the former to the latter.

Sensitivity

The optimal wavelength for exciting fluorescence from an ethidium bromide-DNA complex is in the 312 nm range. Excitation at 312 nm produces 3 times more fluorescence at 590 nm than excitation at 254 nm, and 7 times more fluorescence than excitation at 366 nm.

Photonicking

Photodamage to the DNA is greatly reduced with 312 nm UV light. Exposure to ultraviolet radiation can actually break the phosphodiester linkage of the DNA backbone. This phenomenon, called photonicking, can induce single strand nicks and even double strand breakage if enough UV energy is absorbed. Using a 254 nm short-wave UV light source to visualize ethidium bromide stained DNA on agarose gels can cause severe photodamage in a very short time. For example, using a 2700 base pair supercoiled plasmid, every molecule takes at least one hit in less than 5 minutes of exposure to 254 nm radiation. Reduction of photodamage is further achieved with the FOTO/Convertible™ Transilluminator by reducing the intensity of 312 nm radiation in the "**LO**" intensity mode.

Photobleaching

Photobleaching of the ethidium bromide-DNA complex is much less rapid with 312 nm excitation than with 254 nm excitation. Photobleaching is the loss of fluorescence caused by exposure to UV radiation, presumably due to dissociation of the ethidium bromide-DNA complexes. This phenomenon is quite rapid using 254 nm UV; the fluorescent DNA band can fade almost completely after less than a minute of exposure. However, using the 312 nm FOTO/Convertible™ Transilluminator to visualize DNA bands on agarose gels under otherwise identical circumstances causes no noticeable loss of sensitivity after ten minutes of exposure.

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Additional Information (cont.)

Illumination
The FOTO/Convertible™ Transilluminator has an ultraviolet (UV) filter glass. The UV filter glass transmits 89% of the UV energy in the 312 nm range, which is the wavelength optimum for ethidium bromide-DNA complexes. About 70% of the short-wave UV radiation at 254 nm is transmitted, while 80% of long wave UV (366 nm) is passed by this filter.

Solarization
It is the inherent nature of UV glass filters that, over a period of time and use, solarization occurs within the filter material and the light transmitted decreases dramatically. Shortwave ultraviolet light solarizes UV filter glass more rapidly than does mid-range ultraviolet light. The transmission of 312 nm light by the UV filter glass is reduced by only 3% after 500 hours of exposure to mid-range illumination. The transmission of 254 nm light is reduced by 20% after just 100 hours exposure to shortwave illumination. Plastic protective covers and photographic filters are similarly affected.

UV CROSSLINKING
The FOTO/Convertible™ Transilluminator can be used to rapidly crosslink DNA to nylon membranes. After blotting, the wet nylon membrane is placed - DNA side down - directly on the filter glass surface of the transilluminator (remember to remove the UviClear or any other protective cover first). The membrane is then exposed to UV light for 5-10 minutes, depending on the application. Keep in mind that it is the transmitted 254 nm light, rather than 312 nm light, which acts to crosslink the DNA to the membrane.

Servicing Information

The 312 nm bulbs, ballasts, fuse, electroluminescent panel assembly, and UV filter glass may require periodic replacement. With the exception of these components, the FOTO/Convertible™ Transilluminator has no user serviceable parts. If the unit fails to operate as instructed, or if there are any questions regarding its correct use, please contact FOTODYNE Incorporated for technical assistance at 1-800-362-3686.

CAUTION: Before opening the FOTO/Convertible™ Dual Transilluminator for service or repairs, unplug the electrical cord. Do this even when checking or replacing bulbs, etc. This insures that power to the instrument is off, avoiding ignition of the bulbs and the possibility of shock hazard while servicing. If your FOTO/Convertible™ Transilluminator has been installed inside of a FOTO/Eclipse® Benchtop Darkroom, unplug the electrical cord from the FOTO/Eclipse® before disconnecting the FOTO/Convertible™ from its internal power connection inside the enclosure. Take the transilluminator out of the FOTO/Eclipse™ for servicing. Always wear protective UV blocking eyeglasses when servicing the transilluminator.

Fuses

Unplug the transilluminator and locate the fuse compartment above the power cord receptacle on the back of the unit. Open the fuse cartridge by lifting the tab on the lower edge of the cartridge. It may then be pulled directly out of the unit. Remove the fuse and visually inspect it for burn-out. Replace the bad fuse with the appropriate replacement (see "Specifications", page 3)

Filter Glass/Frame Removal

Before accessing the inside of the FOTO/Convertible™ Transilluminator for servicing, the EL panel must be tilted back as far as possible. The FOTO/Convertible™ Transilluminator is then entered by removing the 8 screws on the right and left sides of the unit (4 screws per side) and the 6 top screws (4 in front and 2 in back) labelled B in Figure 2 on page 12. Once the screws are removed, the filter frame (UV filter glass in metal frame) can be carefully lifted straight up and off the transilluminator base. Note, however, that it is still attached to the base by a grounding wire on the left side and the safety interlock connection on the right. You may carefully disconnect the safety interlock at the plastic connector found under the right front corner of the frame. Then, carefully place the cover next to the base such that the grounding wire remains attached and is not pulled tightly. **DO NOT HANG THE COVER BY THE CONNECTING WIRE!** If you have equipped your FOTO/Convertible™ with an optional UV Blocking Cover, care should be taken that it not be damaged as the frame to which it is hinged is removed. Remove it completely when the screws which attach it to the frame and transilluminator base are removed.

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Bulbs and Ballasts

To save time and money, it is important to determine whether a bulb that doesn't light has burned out, or whether a ballast is defective. First, the filter frame must be removed as instructed above. Be sure to unplug the transilluminator before beginning and raise the EL panel before fully removing the filter glass. Next, the bulb that doesn't light should be switched with a good bulb from a properly functioning ballast (a ballast in which both bulbs light). If the bulb in question does not light in the good ballast, then a bulb replacement is in order. If, on the other hand, the bulb does light, then a ballast needs to be replaced.

Bulb replacement

Warning: Broken fluorescent bulbs present a hazard of skin laceration and exposure to toxic mercury vapor. Wear protective gloves when removing bulbs. Do not breathe the mercury vapor or touch the mercury droplets if the bulb should break.

Grasp the metal collar on each end of the bulb with the thumb and first finger. Gently rotate the bulb, and pull it out of its socket. Do not force. Do not use excessive pressure, and do not hold the bulb in the center. Replace the old bulb with a new one in the reverse order.

Ballast replacement

To replace a defective ballast call FOTODYNE for assistance (see page 18)

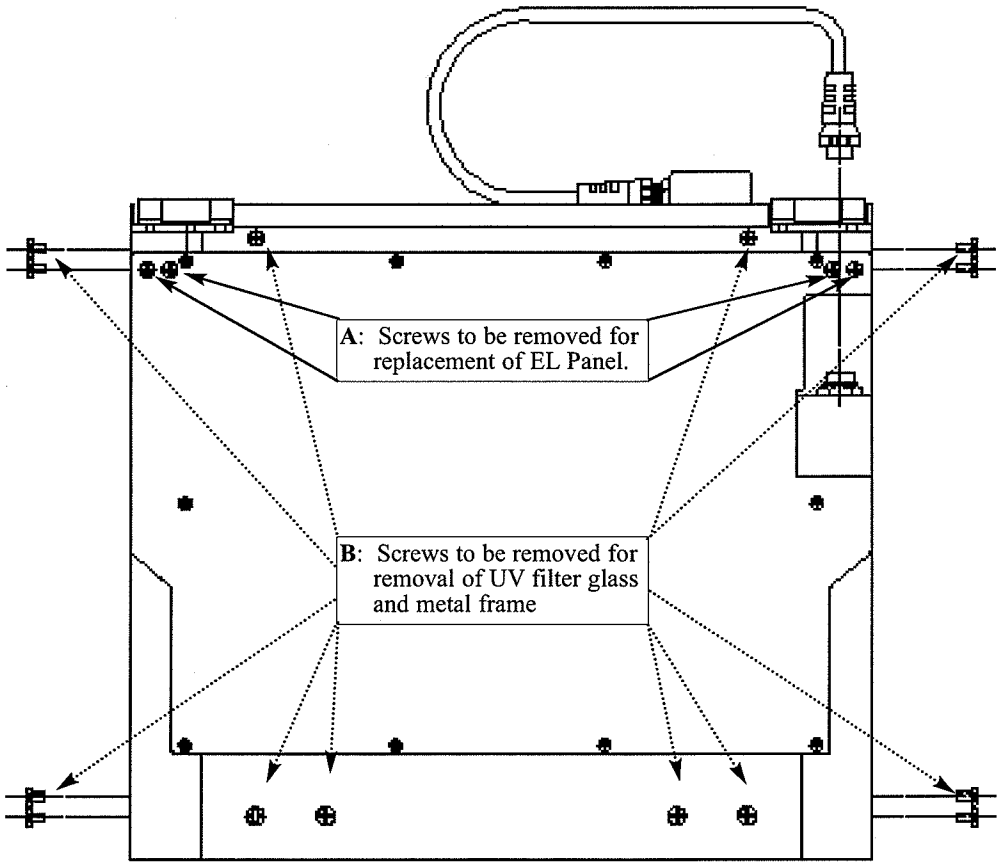


Figure 2. Top View of FOTO/Convertible™ (EL Panel Down and Disconnected from Base)

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UV Filter Glass

Maintenance

The UV filter glass is the single most costly component of the transilluminator, and therefore requires special care. Residue from the gels, in combination with UV light, may leave a film on the surface of the glass. It may be difficult or impossible to remove this film. Also, the filter glass is quite hygroscopic and water taken up by the glass may result in "clouding" and loss of transmittance. Ethidium bromide can also stain the glass, resulting in high background and reduced resolution. For these reasons, it is important to keep the filter glass clean. After every use, it should be rinsed thoroughly with distilled or deionized water and dried with a soft, non-abrasive cloth or tissue.

Whenever your FOTO/Convertible™ Transilluminator is not being used, turn it off to help maintain optimal performance of the bulbs and filter glass. As described above, the intensity of the bulbs may decrease with time, as can the UV transmission of the filter glass. This phenomenon is much more pronounced with shortwave UV.

Replacement

Replacement of the UV filter glass may be necessary due to solarization that has occurred over time or to physical damage. The FOTO/Convertible filter glass is easily replaceable since each filter is already equipped with a metal frame (Catalog Number 3-9835). To change the filter, you must first remove the filter glass and frame and disconnect the safety interlock as described above. Remove the nut which attaches the grounding wire to the metal frame with a 5/16" wrench or nutdriver. Attach the grounding wire to the new frame with the same nut, tightening it securely. Before completely lowering the frame onto the transilluminator base, connect the safety interlock at the plastic connector found under the right front corner of the frame, clicking it firmly into place. Lower the frame completely onto the base and tighten the 8 screws on the right and left sides of the unit (4 screws per side) and the 6 top screws (4 in front and 2 in back) labelled B in Figure 2 on page 12.

EL Panel

Maintenance

An inherent characteristic of electroluminescent panels is that their intensity will gradually decrease over time. After approximately 1000 hours of use, the intensity of the EL panel will be roughly half that of a brand new one. Turning off the EL panel when it is not needed will help prolong its useful lifetime.

The EL panel has been encased in a water-tight acrylic cover in order to protect it. It is important to keep the surface of the white diffuser panel clean so that the intensity of the EL Panel output is not attenuated. After every use, it should be rinsed thoroughly with distilled or deionized water and dried with a soft, non-abrasive cloth or tissue. Because it is an integral part of the EL Panel Assembly, a damaged acrylic diffuser panel must be replaced by a complete EL Panel Assembly; you can not replace only the diffuser itself.

Replacement

EL panel or acrylic diffuser screen replacement is an easy process because each is completely replaced by a new, sealed assembly (Catalog Number 3-4111). Make sure that the power cord for your FOTO/Convertible™ Transilluminator has been unplugged before proceeding with servicing. You must first disconnect the EL panel from the transilluminator base. Facing the unit from the rear, find the connector where the wire from the transilluminator enters the small black box on top of the EL Panel Assembly. Turn the plastic collar on the connector about 1/4 of a turn counterclockwise (still facing it from the rear). Pull the connector straight out to fully disconnect it. Remove the 4 screws at the back of the panel (labelled A in Figure 2, page 12) which attach the EL Panel Assembly to the bracket which holds it.

Attach the new EL Panel Assembly to the bracket by fully tightening the same 4 screws. Plug the connector wire into the rear of the small black box on top of the EL Panel Assembly. Tighten the plastic collar on the connector by pushing it completely onto the connector and twisting it about 1/4 of a turn clockwise (facing it from the rear).

UV Transparent Filter Glass Protector

Exposure to ultraviolet light causes eventual solarization of the UviClear Transparent Protector which reduces light intensity. Replacement of the UviClear is recommended after approximately 50 hours of use. To replace a worn or degraded UviClear for a FOTO/Convertible™ Transilluminator, simply order Catalog Number 3-4473. Remove the six screws (4 in front and 2 in the rear) which attach it to the top of the UV transilluminator. Align the new UviClear with the screw holes and tighten all six screws completely.

Optional UV Blocking Cover

An optional UV Blocking Cover (Catalog Number 3-4484) can be added to your FOTO/Convertible™ Transilluminator. Simply remove the 4 frontmost screws on top of the transilluminator and use them to attach the hinges of the UV Blocking Cover. The tension on the hinges holding the UV Blocking Cover may require periodic adjustment. If the cover will not stay up in some positions, turn the central adjusting screw on each hinge clockwise until the cover can still move freely, but will also stay up in all positions.

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Related Equipment

Product	Cat. No.
FOTO/Analyst® Investigator Electronic Documentation & Analysis System (FOTO/Eclipse® Configuration)-Mac, 120V	6-1500M
FOTO/Analyst® Investigator Electronic Documentation & Analysis System (FOTO/Eclipse® Configuration)-PC, 120V	6-1500P
FOTO/Analyst® Archiver Electronic Documentation System (FOTO/Eclipse® Configuration)	6-4500
FOTO/Analyst® MiniVisionary Benchtop Electronic Documentation System	6-2310
FCR-10 Camera	5-5330
Replacement 8 Watt 312 nm UV Bulbs	3-4406
Replacement EL Panel Assembly	3-4111
Replacement UV DNA Filter with Metal Frame	3-9835
Replacement UviClear UV Transparent Glass Protector	3-4473
Optional UV Blocking Cover	3-4484
UV Blocking Eyeglasses	3-4240
UV Blocking Face Shield	3-4245

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Phone Orders: 1-800-DNA-FOTO
1-800-362-3686
Fax Orders: 1-800-362-3642

Educational Products Division
Technical Service: 262-369-7000
Phone Orders: 1-800-362-4657
Fax Orders: 1-800-362-3642

Mail to:

FOTODYNE INCORPORATED
950 Walnut Ridge Drive
Hartland, WI 53029-9388
USA

TECHNICAL ASSISTANCE

Technical questions regarding the operation and safe use of this instrument should be directed to FOTODYNE Incorporated. Call 1-262-369-7000.

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