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# INSTRUCTION MANUAL

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**FOTO/Analyst®**  
**LuminaryFX Workstation**  
LED Modules  
Cooled CCD camera  
Motorized Lens

**7-1720 series**  
Camera Model XL16 (FX/2.0)

**7-1740 series**  
Camera Model C8484 (FX/HiQE)

**WARNING**  
Read and understand this manual  
before using this product.



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# Instruction Manual for the FOTO/Analyst® LuminaryFX Workstation (LED modules, cooled CCD camera, motorized lens)

**7-1720 series**  
Camera Model XL16 (FX/2.0)

**7-1740 series**  
Camera Model C8484 (FX/HiQE)

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## Introduction

The FOTO/Analyst Luminary/FX Workstation is a multi-component system designed to simply and rapidly acquire images of a wide variety of specimens including gels, blots, and plates. Images are acquired by a CCD camera and transferred via a IEEE1394 (Firewire) board to a PC computer. Images can be archived in several file formats including TIF and BMP to preserve data integrity for downstream analysis.

The Luminary/FX system includes a Luminary/FX Benchtop Darkroom with visible LED sidelight panels, red, blue or green LED modules suitable for fluorescent applications, a cooled CCD camera with zoom lens, a IEEE1394 (Firewire) board, image acquisition software and all necessary cabling. The system is customized for your applications by the addition of a UV, white light or dual light transilluminator and filters. In addition, a thermal printer can be added for rapid acquisition of images.



**Figure 1**  
FOTO/Analyst® Luminary/FX Workstation includes: the Benchtop darkroom, and choice of several transilluminators with corresponding filters. Computer and thermal printer are optional.

## Introduction (cont.)

### IMPORTANT FEATURES OF YOUR FOTO/ANALYST® LUMINARY/FX WORKSTATION

#### 1. FOTO/Analyst Cooled CCD Cameras

The FOTO/Analyst CCD (Charge Coupled Device) Camera Model XL16 (FX/2.0) has a 7.4  $\mu\text{m}$  x 7.4  $\mu\text{m}$  pixel (picture element) photoreceptor array, and Camera Model C8484 (FX/HiQE) has a 6.45  $\mu\text{m}$  x 6.45  $\mu\text{m}$  pixel photoreceptor array. Each pixel in either camera can register up to 4096 grayscales (12-bits) allowing images to be acquired at high resolution and dynamic range. Light striking each element of the array results in a charge which is proportional to the intensity of that light. The cooling capabilities of both camera models increase the sensitivity of the photoreceptor array. This allows the user to maximize exposure times for low-light chemiluminescent samples.

The camera is equipped with a motorized zoom lens. Iris adjustment, parfocal zoom, and continuous focus are controlled using the PC Image software included with the system. The lens can sharply focus over a range of subject sizes from 7 cm to 28 cm in length.

- **Integration**

The CCD camera acquires and updates the live image every 1/30 of a second. The image is sent to the frame grabber in the computer which converts the analog signal to digital and stores the image. This sequence of exposures and updated displays goes on continuously in "LIVE" mode until interrupted by the operator.

Integration with the CCD camera is analogous to exposure time with a conventional film camera. The CCD camera creates live video at the rate of 30 images (frames) per second. In other words, a one frame exposure with the CCD camera is equivalent to 1/30 of a second. Since each video frame is 1/30 of a second, an integration of 30 frames would be equivalent to a 1 second exposure. With a conventional film the shutter stays open, the more light strikes the film. In a similar sense, the more frames that are accumulated during the integration period, the brighter the picture will be. Many other factors such as spectral sensitivity of the array and print parameters will influence the settings you need to acquire the best image.

Up to 24999 frames (13.8 min) may be integrated with the Luminary/FX. This permits the acquisition of low light images such as ethidium bromide-stained DNA gels and often allows the detection and analysis of bands too faint to be seen on conventional print film.

#### 2. Firewire Board (IEEE1394 bus)/PC Image Acquisition Software

Images from the CCD camera are acquired by the Firewire board which is to be installed into one of the PCI slots in your PC computer. The image acquisition process is driven by the FOTO/Analyst PC Image software package included with the system. From choosing the light source and filter to fine focussing and CCD camera integration time, this software gives complete hands-free control over acquiring images. Once an image is captured, PC Image can be used to manipulate image parameters such as brightness and contrast, import the image into your computer in a variety of file formats, and export the image to the thermal printer.

#### 3. Luminary/FX Benchtop Darkroom

The Darkroom provides a light-tight enclosure for documentation of low light images. Its non-reflective interior prevents interference by stray light. It has many features for safety, user convenience, and high quality results:

- **Front Access Door**

The front access door of the Luminary/FX Benchtop Darkroom opens with a push-button latch which provides easy access to the transilluminator inside. Pushing the button releases the latch and interrupts the safety interlock connection; this will cut the power to the transilluminator and direct lights preventing hazardous exposure to UV radiation. If the door is not completely closed, the transilluminator will only turn on if the "BYPASS" button is pressed.

- **LED Module Banks**

Each side of the Luminary/FX Benchtop Darkroom contains a three-position "bank" to secure the magnetic LED modules. The bank provides optimal positioning of the modules inside the darkroom.

- **Transilluminator Drawer**

The rectangular inset that sits in the center front of the drawer serves as the drawer's handle. Access to the drawer handle can be gained by pressing the inset on the left side. The drawer has been designed with detents which securely hold the drawer in the closed position. The enclosure's drawer is designed to accommodate the FOTO/UV® 15, 21, 26, FOTO/WL 26 White Light, FOTO/Convertible™ and FOTO/Flex transilluminators. A power cord in the lower left rear corner of the unit provides power to the transilluminator.

- **Slide-Out Tray**

The Luminary/FX Darkroom is equipped with a removable, adjustable slide-out tray. The tray is ideal for placing chemiluminescent samples as close to the camera as possible. The tray is stored neatly inside the darkroom.

## Introduction (cont.)

- **White LED Side Light Panels**  
These lights are useful for focusing or positioning the specimen on the transilluminator. Images of subjects requiring epi-illumination - such as photographs, line-drawings, Western blots, or TLC plates - can easily be acquired utilizing the direct lights.

- **Motorized Filter Wheel**  
The motorized filter wheel is contained inside the FX Darkroom. It is controlled by using either the button on the front of the darkroom or the PC Image software. The Luminary/FX Darkroom filter wheel can hold up to three filters. In addition to the filters, the wheel also contains a blank position for imaging chemiluminescent samples. Also included on the Luminary/FX Darkroom Filter Wheel is a close-up adapter for imaging samples on the Slide-Out Tray.

#### 4. LED Light Bank Sets

The Luminary Workstation comes with red, blue, or green LED light and filter packages call Bank Sets. The compact, magnetic LED light module easily connects to the workstation via the banks located on the interior sides of the darkroom. When not in use, modules can be disconnected and stored on the door of the darkroom.

Each LED module comes with a filter that has been chosen for use with that light. The filters are placed in the motorized filter wheel and controlled by using either the appropriate button on the darkroom or PC Image software.

- **Red Light Bank Set**  
The red LED module emits light in the 550-640 nm range and the red filter allows 650-710 nm light to pass through to the CCD camera. This set is suitable for use with Cy5.
- **Blue Light Bank Set**  
The blue LED module emits light in the 460-495 nm range and the blue filter allows 510-560 nm light to pass through to the CCD camera. This set is suitable for use with AF488.
- **Green Light Bank Set**  
The green LED module emits light in the 500-540 nm range and the green filter allows 565-625 nm light to pass through to the CCD camera. This set is suitable for use with Cy3.

#### 5. Transilluminators

- **UV Transilluminators**  
A variety of FOTODYNE Ultraviolet Transilluminators can be used with your FOTO/Analyst Luminary/FX Workstation. The FOTO/UV® line offers several models with filter glass sizes to fit your needs and dual intensity 312nm peak illumination. The FOTO/

Flex Dual Wavelength Transilluminator offers a large viewing surface and dual wavelength control. Combinations of 254, 312 and 366 nm UV bulbs allow viewing of a variety of fluorophores. All FOTODYNE transilluminators feature uniform illumination, a cooling fan to prevent sample degradation, and unsurpassed quality and reliability.

- **White Light Transilluminators**  
If your imaging needs include documentation of autoradiograms or coomassie blue-stained gels, then a FOTODYNE White Light Transilluminator is the perfect add-on to your Luminary/FX Workstation.
- **Dual Light Transilluminators**  
Both UV and White Light transillumination can be provided by a FOTODYNE Dual Light Transilluminator. The FOTO/Convertible™ offers ultraviolet and white light output in one small footprint by utilizing electroluminescent technology. Large format 312 nm peak illumination is complemented by a flip-down white light panel which provides unparalleled uniformity of illumination over its surface. The FOTO/Flex Convertible also offers both large format UV and electroluminescent white light output in one footprint. The addition of a dual wavelength combinations of 254, 312 and 366 nm UV bulbs allows for viewing a variety of fluorophores. Both dual light transilluminators give you performance and versatility without occupying excessive benchspace.

#### 6. Electronic Imaging Filters for Transilluminator Applications

Unlike conventional film, the array of the FOTO/Analyst CCD camera is sensitive to infrared radiation. If you try to use the standard cut-off type filters with your Luminary/FX Workstation, the bulbs from your UV transilluminator will be evident in the resulting image. To eliminate this effect, and to achieve increased sensitivity from longer exposures without interference from unacceptably high backgrounds, FOTODYNE offers a variety of bandpass filters to fit your applications. Filters for documentation of ethidium bromide, fluorescent green, fluorescent gold, Coomassie or Methylene blue-stained gels, and autoradiograms are available. Contact the FOTODYNE Technical Service Department to determine which filter will best fit your electronic imaging needs.

#### 7. Thermal Printer (optional)

The digital grayscale printer permits you to obtain hard copy thermal prints of your images. The printer plugs into a USB port on your PC computer. PC Image software drives the export of your image to the thermal printer to create an 896 x 612 pixel print measuring 10.0 x 6.9 cm. You can obtain as many as 260 prints from a single roll of thermal print paper, making this type of printing much more economical than conventional image film.

# Specifications

## FOTO/Analyst CCD Camera, 2.0 MegaPixel, Model XL16 (FX/2.0)

- 1600 x 1200 picture element array
- 4096 greyscales
- Pixel Size: 7.4  $\mu\text{m}$  x 7.4  $\mu\text{m}$
- Sensor size: 14.8 mm (effective diagonal dim)
- cooling to -32°C below ambient
- Power: +12 V DC ;  
<4.5 W power consumption
- Operating Temperature Range: 0° C to -40° C
- Dimensions (with zoom lens) :  
5.5 cm Wide x 5.5 cm Deep x 2.8 cm High

## FOTO/Analyst CCD Camera, 1.4 MegaPixel, Model C8484 (FX/HiQE)

- 1344 x 1024 picture element array
- 4096 greyscales
- Pixel Size: 6.45  $\mu\text{m}$  x 6.45  $\mu\text{m}$
- Sensor size: 8.67 mm x 6.60 mm
- -10°C two-stage Peltier cooling
- Power: +12 V DC (Range: 10.5 to 15 V);  
2.2 W power consumption
- Operating Temperature Range: 0° C to -40° C
- Dimensions (with zoom lens) :  
5.5 cm Wide x 5.5 cm Deep x 22.8 cm High

## Firewire Board

- 3 IEEE1394 (Firewire) ports
- Compliant with IEEE 1394-1995, P1394a (rev.1.1) and OHCI Interface specification 1.0
- Supports data transfer rates up to 400 Mbit/sec

## PC Image Acquisition Software

- Control of Acquisition Parameters: Integration (up to 24,999 frames), Brightness and Contrast adjustment
- Image Manipulation: Invert, Zoom, Mirror, Rotate, Annotate (date, time, text, circle, arrow)
- Control of Darkroom: Light source and filter choice
- Control of Motorized Zoom Lens:  
Iris (aperture), focus, and zoom
- Image Storage in User Choice of File Formats (including TIFF, JPEG, BMP)

## Luminary/FX Benchtop Darkroom with Sidelights

- Flat black interior to minimize stray light
- Two white LED sidelights
- LED Module Banks

### Red Light Bank Set (Figure 2a, page 5)

- Two red LED Modules, 60-7309
  - 550-640 nm emission
  - 3 watt LED
  - 5 x 5 x 2.5 cm block with magnet
  - 2.1 x 5.5 mm barrel connector
- One red filter, 26-2051
  - 650 - 710 nm bandpass

### Blue Light Bank Set (Figure 2b, page 5)

- Two blue LED Modules, 60-7310
  - 460-495 nm emission
  - 3 watt LED
  - 5 x 5 x 2.5 cm block with magnet
  - 2.1 x 5.5 mm barrel connector
- One blue filter, 26-2053
  - 51 - 560 nm bandpass

### Green Light Bank Set (Figure 2c, page 5)

- Two green LED Modules, 60-7311
  - 500-540 nm emission
  - 3 watt LED
  - 5 x 5 x 2.5 cm block with magnet
  - 2.1 x 5.5 mm barrel connector
- One green filter, 26-2050
  - 565 - 625 nm bandpass

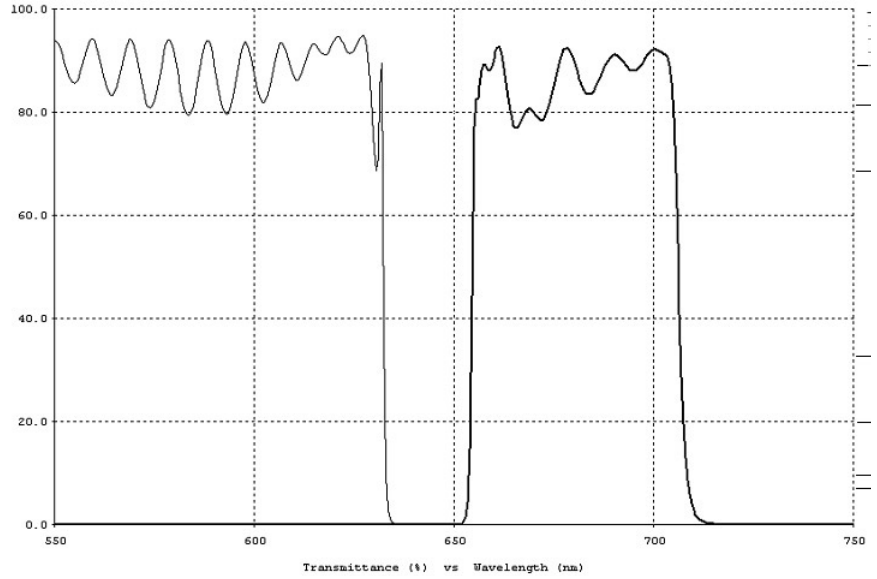
- Slide-out tray to bring chemiluminescent samples close to the camera
- Pull out drawer accommodates economy UV and WL, FOTO/Convertible and FOTO/Flex transilluminators
- Safety interlocked front door
- Motorized filter wheel
- Dimensions: 42.5 cm x 35 cm x 87 cm

# Specifications (cont.)

**Figure 2a**

**Red light bank set emission curves, 6-7309**

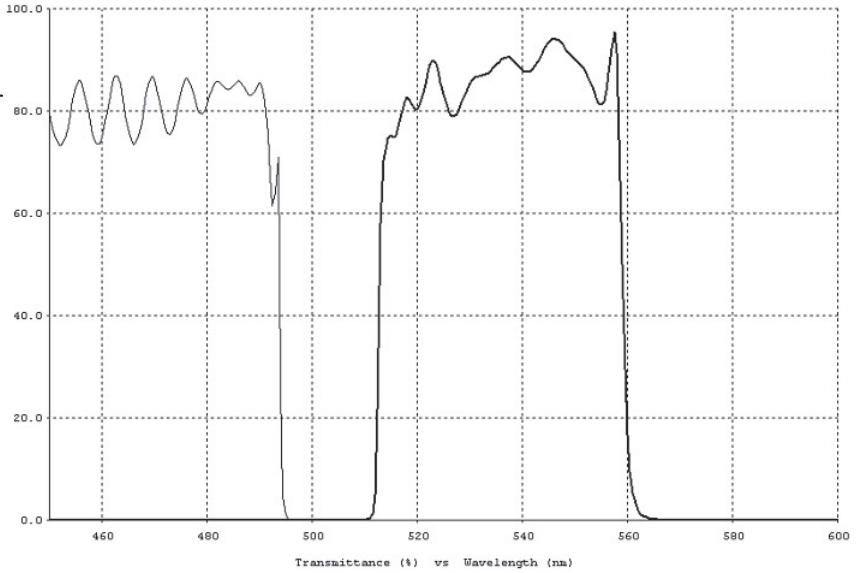
The first curve is the red LED emission curve (550-640 nm). The second curve is the red filter bandpass (650-710 nm).



**Figure 2b**

**Blue light bank set emission curves, 6-7310**

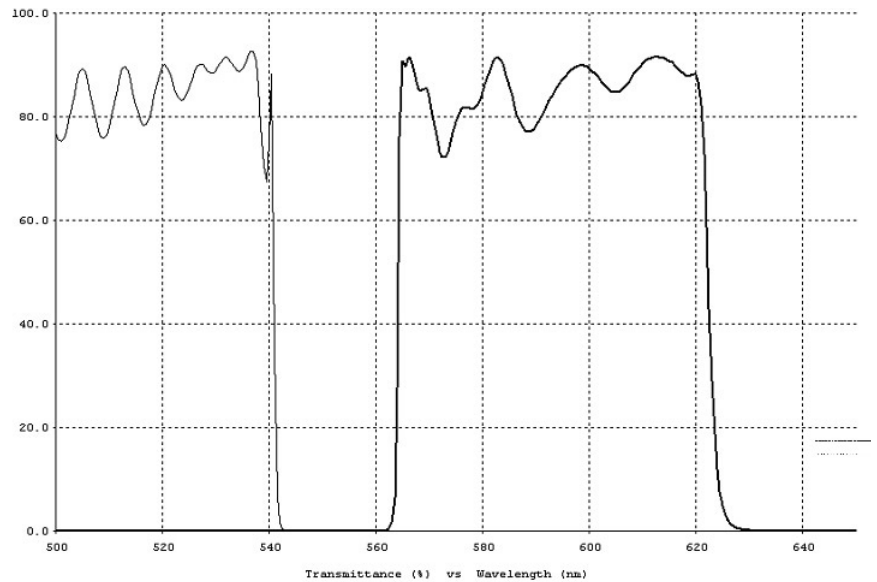
The first curve is the blue LED emission curve (460-495 nm). The second curve is the blue filter bandpass (510-560 nm).



**Figure 2c**

**Green light bank set emission curves, 6-7311**

The first curve is the green LED emission curve (500-540 nm). The second curve is the green filter bandpass (565-625 nm).



# Safety Information

## 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 short-wave 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. Unplug the electrical device before performing maintenance of ANY kind (including bulb replacement in transilluminators). 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. FOTO/UV Transilluminators are built with cooling fans to help alleviate this temperature problem.
4. **Care in 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. Avoid inhaling the powder exposed during the fracturing of the bulbs. Since the bulbs contain a very minimal amount of mercury, they do not have special disposal requirements.

## 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 upon repeated exposure to 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.

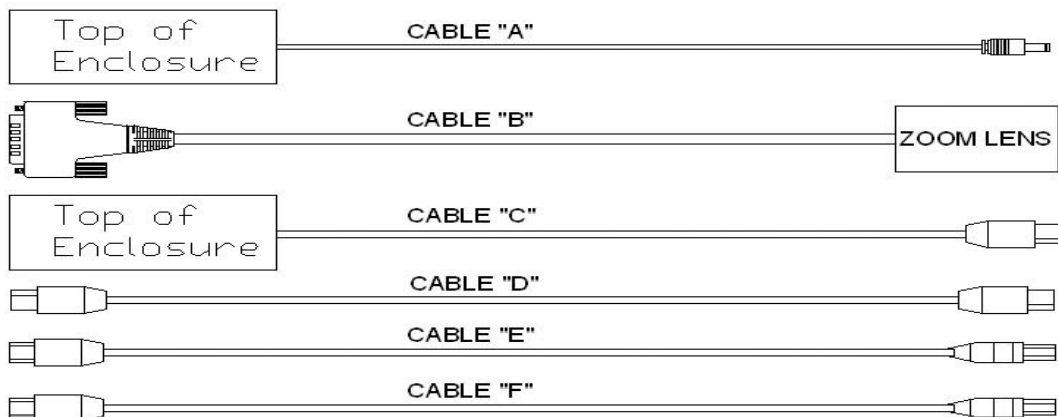
Although short-wave radiation below 242 nm from 15 watt or less fluorescent bulbs is nominal, the potential hazard does exist. It is recommended that adequate ventilation or air movement be provided. Ultraviolet bulbs should be turned on only for viewing and photographing and then immediately shut off.



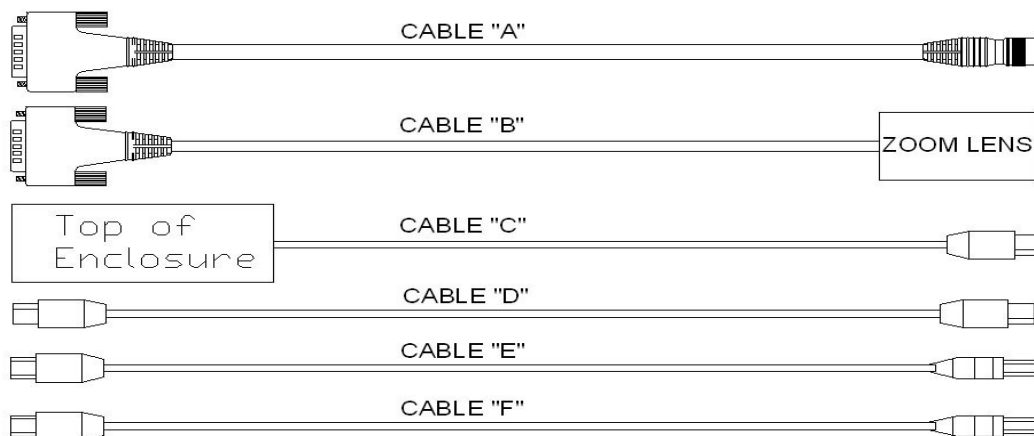
# Unpacking Instructions

## Check-out Procedure

1. Unpack and examine the FOTO/Analyst Luminary/FX Workstation 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/Analyst CCD Camera Assembly
    - CCD Camera & bracket
    - Zoom Lens with Cable B attached
  - b. Firewire Board
  - c. FX Benchtop Darkroom with Motorized Filter Wheel and cable(s) attached
    - Cable A & C - Camera Model XL16
    - Cable C - Camera Model C8484
  - d. PC Image Acquisition Software
  - e. Cable Package, Figure 3a *Camera Model XL16 (FX 2.0)*
    - Firewire Cable (Cable D)
    - USB Cable (Cable E)
  - OR**
  - e. Cable Package, Figure 3b *Camera Model C8484 (FX/HiQE)*
    - 15 pin to Barrel connector (Cable A)
    - Firewire Cable (Cable D)
    - USB Cable (Cable E)
  - f. LED Light Bank Set(s)
    - Two LED Modules
    - Filter
  - g. Transilluminator Package (*optional*)
    - Transilluminator  
(FOTO/UV 26, FOTO/Convertible, FOTO/Flex, or FOTO/WL 26)
    - UV Blocking Safety Glasses (for UV transilluminators only)
    - Power Cord
    - Instruction Manual
  - h. FOTO/Analyst Electronic Imaging Filter(s) (*optional*)
  - i. Thermal Printer-PC Package (*optional*)
    - Sony Thermal Printer
    - 1 Roll Thermal Print Paper
    - Power Cord
    - Instruction Manual
    - USB Cable (Cable F)



**Figure 3a**  
Cables supplied with Luminary/FX Workstation, Camera Model XL16 (FX/2.0)



**Figure 3b**  
Cables supplied with Luminary/FX Workstation, Camera Model C8484 (FX/HiQE)

# Set-up Instructions

## Firewire Board Installation

A Firewire board has been provided for your convenience. **Some computers are pre-equipped with a Firewire port. If you have a Firewire connector on your computer, skip to "CCD Camera Assembly" on the next page.**

You may install your board in any available full-height 32-bit PCI bus expansion slot in your computer. Because computer configurations vary greatly, detailed instructions can not be written specifically for each. Please follow the following general instructions for installation of your board:

1. **Turn Off Your Computer.** Make sure the power to your computer is completely off.
2. **Turn Off Accessories.** Make sure that power is completely off to any accessories (printer, modem, monitor, etc.) connected to your computer.
3. **Unplug Computer and Accessories.** Disconnect the power cords of the computer and all attached accessories from wall outlets.
4. **Remove Computer Cover.** Refer to your computer system's user manual for instructions to remove the cover from your computer.
5. **Select an Expansion Slot.** Referring to your computer system's user manual to determine which slots are bus masters, choose a 32-bit PCI bus master expansion slot for your Firewire board.  
  
**NOTE:** In most PC systems, any PCI slot can be a bus master.
6. **Remove Expansion Slot Cover.** Remove the cover from the selected expansion slot (if applicable, retain the screw that held it in place; it will be used later with the Firewire board).
7. **Remove Board from Protective Bag.** Before handling the board, discharge any static buildup on your body by touching the metal case of the computer. After you remove the board from its protective anti-static bag, hold it only by the edge and do not touch the components.
8. **Align Board with Expansion Slot.** Position the board so that the cable connectors are facing the rear of the computer.
9. **Insert Board into Slot.** Carefully position the board into the expansion slot using the card guide to properly align the board in the slot. When the bottom of the board contacts the bus connector, gently press the board into place.  
  
**CAUTION: Do NOT force the board into place. If you encounter resistance when inserting the board, remove it and try again. Do NOT wiggle the board from side to side during installation; this may damage the bus connector.**
10. **Secure Board in Place.** Secure the board in place at the rear panel of the system unit (if applicable, use the screw removed from the slot cover in Step 6).
11. **Replace Computer Cover.** Replace and secure the cover. Then reconnect the power cords to the computer and the accessories.

# Set-Up Instructions

## CCD Camera Assembly, Camera Model XL16 (FX/2.0) (Figure 4a, page 10)

1. **Attach the Camera Bracket to the FX Darkroom.**  
Position the camera so the lens is facing down. Insert the lens into the hole in the top of the FX Darkroom, taking care not to jar the lens. Place the camera bracket on the mounting bracket on the top of the Darkroom enclosure. The four thumbscrews on the camera bracket, when positioned correctly, will seat around the four holes on the darkroom mounting bracket. Press the thumbscrews down and begin to tighten in a clockwise direction. Do this for all four screws until thumb-tight. Tighten screws only until the unit is secure. Do not put undue pressure on the screws so as to avoid weakening their thread-life.
2. **Connect the Camera to the Luminary/FX Darkroom.**
  - a. **Attach the free end of cable “A” to the corresponding port on the top of the camera.**
  - b. **Attach the free end of cable “C” to the corresponding port on the top of the camera.**
3. **Connect the Motorized Lens to the Luminary/ FX Darkroom.** Attach the free end of cable “B”, the 15-pin connector, to the corresponding port on the top of the FX Darkroom.

## CCD Camera Assembly, Camera Model C8484 (FX/HiQE) (Figure 4b, page 10)

1. **Attach the Camera Bracket to the FX Darkroom.**  
Position the camera so the lens is facing down. Insert the lens into the hole in the top of the FX Darkroom, taking care not to jar the lens. Place the camera bracket on the mounting bracket on the top of the Darkroom enclosure. The four thumbscrews on the camera bracket, when positioned correctly, will seat around the four holes on the darkroom mounting bracket. Press the thumbscrews down and begin to tighten in a clockwise direction. Do this for all four screws until thumb-tight. Tighten screws only until the unit is secure. Do not put undue pressure on the screws so as to avoid weakening their thread-life.
2. **Connect the Camera to the Luminary/FX Darkroom.**
  - a. **Identify cable “A”.** A barrel connector on one end and a 15-pin connector on the other.
  - b. **Attach the barrel connector to its receptacle on the top of the CCD camera.**
  - c. **Attach the 15-pin connector to the corresponding port on the top of the FX Darkroom.**
  - d. **Attach the free end of cable “C” to the corresponding port on the top of the camera.**
3. **Connect the Motorized Lens to the Luminary/ FX Darkroom.** Attach the free end of cable “B”, the 15-pin connector, to the corresponding port on the top of the FX Darkroom.

## Cable Connections

1. **Connect the FX Darkroom to the Computer.**
  - a. **Identify cable “D”.** A firewire cable.
  - b. **Connect one end of the firewire cable to the Firewire port on the back of the FX Darkroom.**
  - c. **Connect the other end of the firewire cable to one of the three firewire ports on the board installed in your computer.**
  - d. **Identify cable “E”.** A USB cable.
  - e. **Connect the corresponding end of Cable E to the port on the back of the FX Darkroom.**
  - f. **Connect the other end of Cable E to a free USB port on the back of your computer.**

**CAUTION:** Do not disconnect the firewire cables while the LuminaryFX workstation is turned on. Doing so can fatally damage the camera. If the camera must be disconnected for any reason, **TURN OFF both the LuminaryFX and computer before disconnecting any firewire cable connections.**

2. **Connect Power Cord.** Connect the power cord to the back of the FX Darkroom. Then plug the cord into a properly grounded surge protector or outlet.

# Set-Up Instructions (cont.)

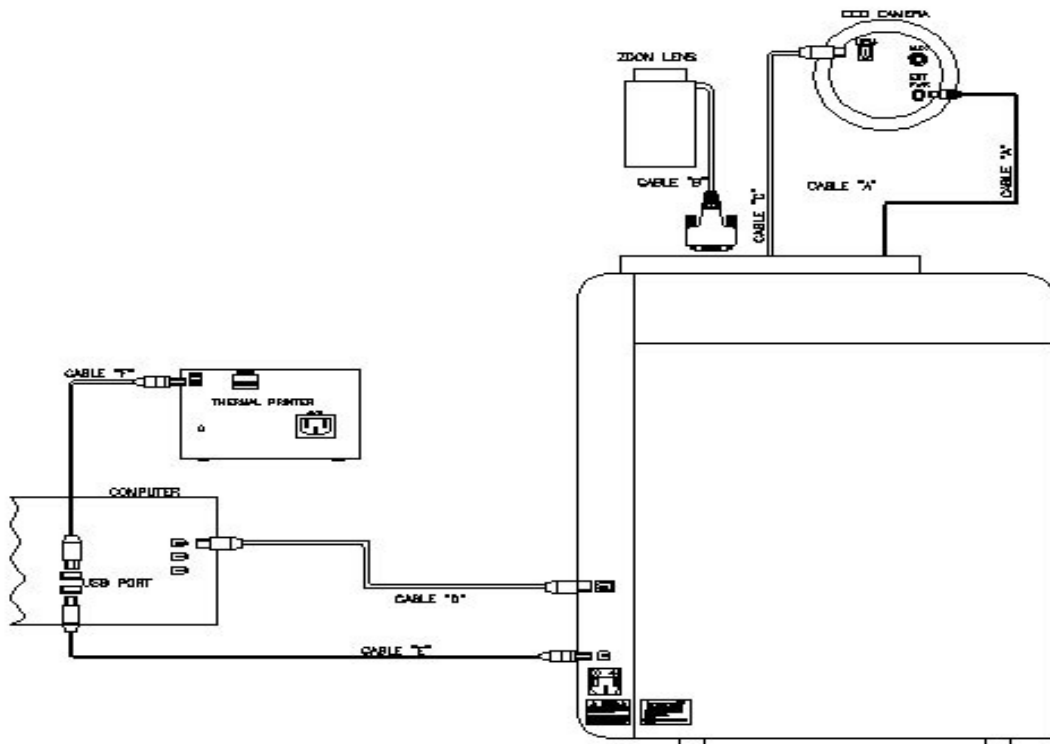


Figure 4a FOTO/Analyst Luminary/FX Workstation Cable Connections for Camera Model XL16 (FX/2.0)

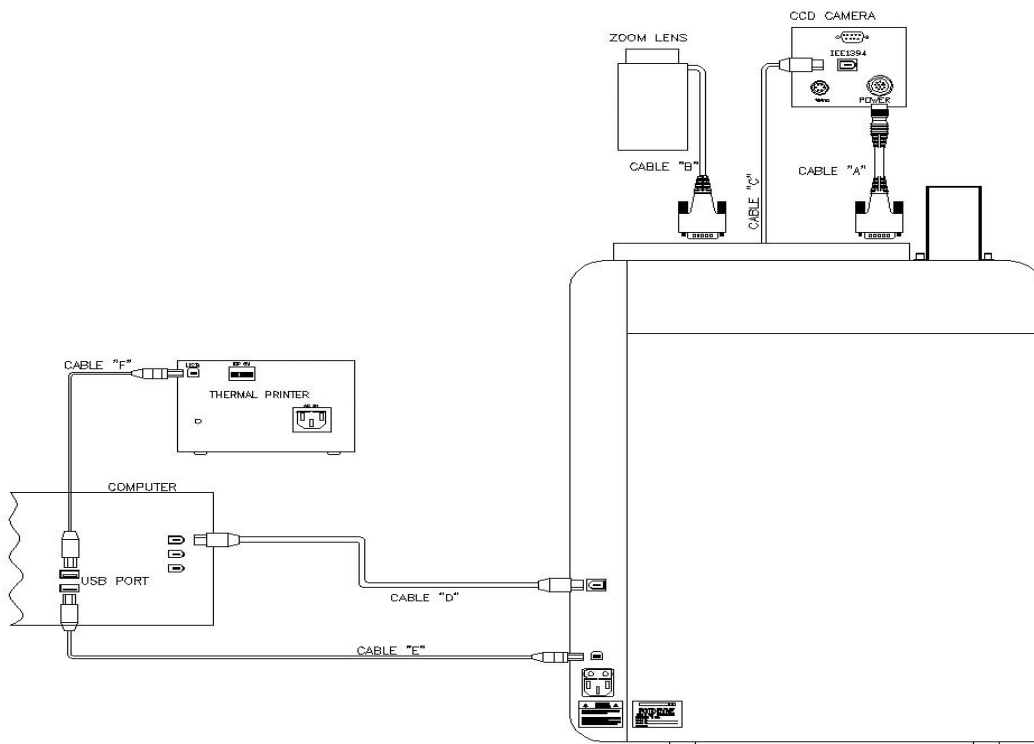


Figure 4b FOTO/Analyst Luminary/FX Workstation Cable Connections for Camera Model C8484 (FX/HiQE)

## Set-Up Instructions (cont.)

### LED Light Module Connections

1. **Locate the LED Module Banks (Figure 5a).** On the interior sides of the darkroom locate the LED Module Banks under the white LED sidelights. The banks each have three labeled positions, “Direct 2”, “Direct 3”, and “Direct 4”. These labels correspond to the buttons on the front of the darkroom and in PC Image.
2. **Connect a pair of LED Modules to the Darkroom (Figure 5b).** Attach the first of a matching pair of LED modules (red, blue, or green) to the “Direct 2” position in the left bank using the magnet on the back of the module. Be sure that the barrel connector is on the top. Connect the barrel connector to its corresponding port under the “Direct 2” label. Repeat with other module on the right side of the darkroom. The “Direct 2” position on the right will be diagonally across from the “Direct 2” position on the left.
3. **Repeat Step 2 above with other pairs of LED modules.** If more than one pair of LED modules has been purchased they may be connected to the module banks in the “Direct 3” and “Direct 4” positions at this time. A total of three pairs of LED modules may be connected to the darkroom.

**NOTE: Make note of where each LED module pair has been connected to ensure proper results.**

**Figure 5a**  
Interior left side of Luminary/FX darkroom with empty LED module bank



**Figure 5b**  
Interior left side of Luminary/FX darkroom with full LED module bank



### Transilluminator Installation

**Warning: Always wear UV blocking eyeglasses whenever setting up or operating a UV transilluminator to prevent accidental exposure of the eyes to ultraviolet radiation.**

1. **Prepare Transilluminator for Installation.** If necessary, unplug the power cord from the back of your transilluminator. Turn the power switch on the transilluminator to the ON position.
2. **Position Transilluminator in the Darkroom.** Using the drawer handle, pull the drawer out of the Darkroom. Set the transilluminator in the center of the drawer.
3. **Attach Power Cord.** A short power cord is located on the back left corner of the drawer. Plug it into the power cord connector on the transilluminator.
4. **Enclose Transilluminator.** Return drawer to fully retracted position in the Darkroom. Fold drawer handle back into its receptacle and close the front access door.

**NOTE: The front access 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 with the front door open by using the Bypass feature.**

# Set-Up Instructions (cont.)

## Thermal Printer Set-Up (optional)

1. **DIP Switches.** In the rear of the Thermal Printer there are a series of switches which control many of the printing parameters. They have been factory-set at FOTODYNE for the optimal performance for your application. Do not change any of the settings on these switches.
2. **Connect Thermal Printer to Computer.** A USB cable (cable "F" in Figure 3, page 7) is packed with the printer. Connect one end of this cable to the corresponding port on the back of the thermal printer marked "USB". Connect the other end to a free USB port on the back of your computer.
3. **Connect Power Cord.** Connect the power cord to the "AC IN" receptacle on the thermal printer. Plug the power cord into a properly grounded surge protector or outlet.
4. **Load Thermal Print Paper.** Press the POWER ON/OFF switch to turn the printer on. Press the OPEN/CLOSE button to open the paper lid. Handling the paper by its edges, place the roll of thermal print paper into the printer with the thermosensitive (outer) printing side up. The paper should be rolling over the top of the roll. Remove any slack in the roll. Push the lid closed.

### NOTE:

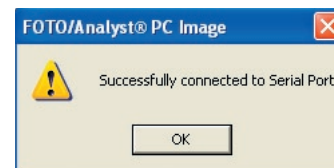
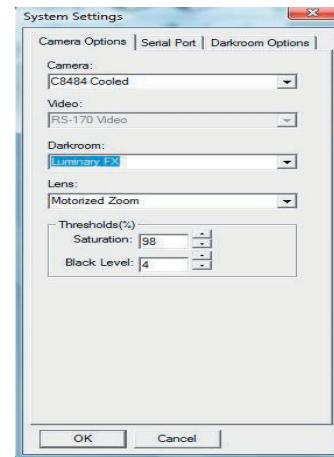
- Do NOT fold the paper or touch the printing surface.
- Moisture, fingerprints or dust on the paper surface may cause deterioration in print quality.
- Store thermal print paper out of direct sunlight in a place which remains below 30°C (86°F) and between 20-80% relative humidity.
- Do NOT allow any volatile organic solvent or vinyl chloride to come into contact with the thermal print paper. Alcohol, plastic tape, or film will fade the print-out. To attach a thermal print to another piece of paper, use double-sided adhesive tape or water-based or solid glue.
- Do NOT touch the cutting blade of the printer.
- Do NOT turn the power off while the printer is printing; this may damage the thermal head.

## Software Installation

Refer to installation instructions included with your software CD.

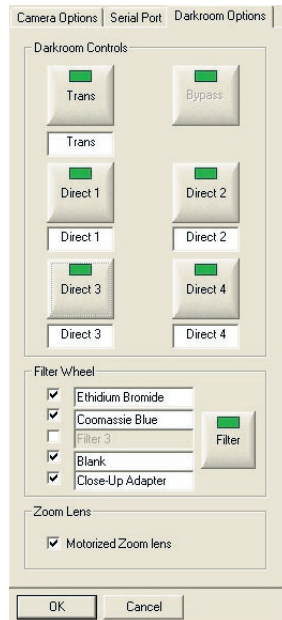
## System Set-Up

1. **Open PC Image.**
2. Click on the **File** menu, choose **System Options**. The System Settings dialog box will appear.
3. **Set Camera Options.**
  - a. Under the Camera options tab, choose the camera model number (XL16 cooled or C8484 cooled) from the pull-down menu that matches the camera in your system.
  - b. Choose Luminary/FX from the Darkroom pull-down menu
  - c. Choose Motorized Zoom from the Lens pull-down menu.
4. **Set up the Serial port.**
  - a. Click the Serial Port tab in the **System Settings** dialog box.
  - b. Choose a serial port number.
  - c. Click **Test**. A dialog box will appear to confirm the correct choice. If the dialog box indicates that it can not initialize, click **OK**, then select another serial port number and click the **Test** button. Continue to test until the correct serial port has been found.



## Set-Up Instructions (cont.)

### 5. Set Darkroom Options.



- a. Click the **Darkroom Options** tab. This tab allows customization of the darkroom controls.
  - b. If desired, click and highlight the button names to customize for your applications. For example, "Direct 2" could be changed to "red". Check label in FX darkroom to determine actual settings for "Direct" lights.
  - c. If a light source is not active it can be removed from the list by clicking on it's button. The green indicator light will turn to grey and this light source will not be part of the Darkroom Controls during image acquisition.
  - d. If desired, click and highlight Filter Wheel filter names to customize for your system. Check boxes to remove or add filters.
6. Click **OK** to finish.

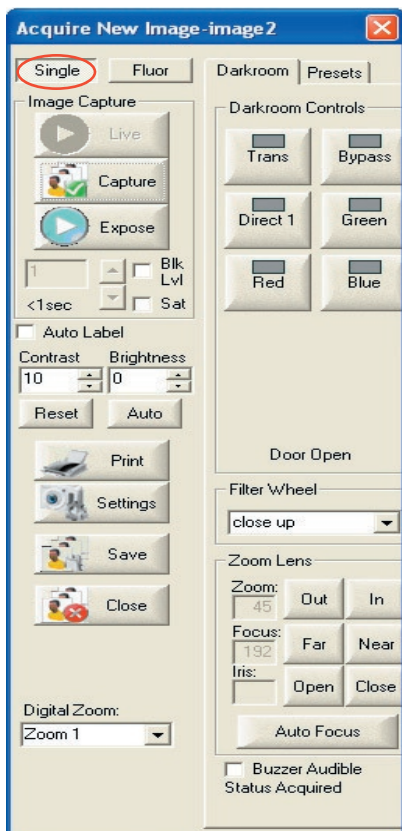
# Operating Instructions

## Basic Gel Imaging

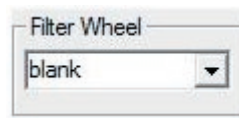
**CAUTION:** Ethidium bromide is a known mutagen and a possible carcinogen. Use vinyl or latex gloves when handling gels treated with this stain. All spent buffers and other materials containing ethidium bromide should be disposed of properly.

**WARNING:** Always wear UV blocking eyeglasses as well as either a UV blocking faceshield or a UV blocking cover. Cover skin to avoid sunburn.

1. **Place Subject on Transilluminator.** Open the front access door to the FX Darkroom. Pull the drawer at the bottom of the enclosure all the way forward. Place subject in the center of the transilluminator filter glass. Slide the drawer back into position. Close the front access door.
2. **Turn on Power.** Depress the top half of the power switch on the front of the FX Darkroom. The power to the thermal printer may be turned on at this time.
3. **Open PC Image Software.** Select the **PC Image** icon and open the application program.
4. **Click on the “Acquire New Image” icon located in the PC Image tool bar.** The **Video Capture** box will appear and live video display will begin. For most UV/WL transillumination use the “Single” tab in the Video Capture box.



5. **Select Proper Filter.** Choose the appropriate filter by clicking the “^” button to the right of the filter choices in the filter wheel box.

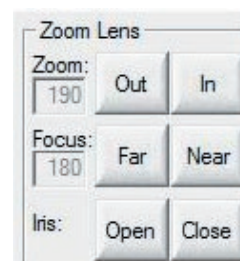


6. **Turn on white lights.** Click the “Direct 1” button in the Darkroom Controls tab in the Video Capture box. The indicator light on the darkroom will illuminate and the LED side and overhead lights inside the Darkroom will turn on.



7. **Frame and Focus the Subject.**
  - a. **Adjust the iris.** Use the “Open” and “Close” buttons next to “Iris” in the Zoom Lens box to adjust the amount of light entering the camera.
  - b. **Frame the Subject.** Use the “Out” and “In” buttons in the Zoom Lens box to zoom in or out. Adjust the zoom until your subject is framed properly.
  - c. **Focus the Subject.** Adjust the fine focus using “Far” or “Near” buttons next to “Focus” in the Zoom Lens box.

**NOTE:** The reference numbers under “Zoom” and “Focus” help to duplicate settings from image to image. Fluctuation while the system is on is normal.



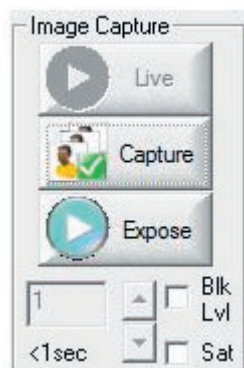
8. **Turn off Direct 1 (white lights).**
9. **Turn on Transilluminator.** Click the “Trans” button in the Darkroom Controls box.



## Operating Instructions (cont.)

### 10. Expose the image.

- a. Click the button marked “Expose” in “Video Capture” box to start the integration.



- b. **Adjust Integration.** In the box under the **Expose** button, type the desired number of frames of integration. Alternatively, use the up or down buttons to find the optimal integration time.

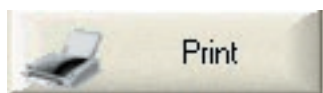
**NOTE:** For better contrast, decrease the amount of light coming through the iris by clicking on the “Close” button next to “Iris” in the Zoom Lens box. Then increase the integration time.

**NOTE:** Long integration periods will take longer to be displayed. For example, 300 frames of integration will take 10 seconds to be acquired and displayed on the computer monitor.

- c. **Capture Image.** Click on the button marked **Capture** to stop integration. The transilluminator can now be turned off.

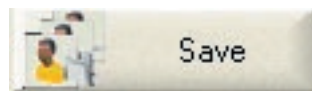
**NOTE:** If bands appear out of focus, a fluorescent ruler can be used to focus the camera. Turn off your transilluminator and place a ruler next to your gel. Turn the transilluminator on. Focus on ruler. Remove the ruler after focusing if necessary

- d. **Brightness and Contrast (optional).** If desired, brightness and contrast can be adjusted using the buttons in the **Video Capture** box.
- e. **Print the Image (optional).** Click the **Print** button in **Video Capture** box.



### 11. Save the Image.

- a. Click on the **Save** button in the Video Capture box.



- b. **Type in the file name.**

- c. **Choose file type.** Images acquired by PC Image may be saved in any of nine file types including BMP and JPEG. TIF type is recommended if the image is going to be analyzed using TL100 image analysis software.

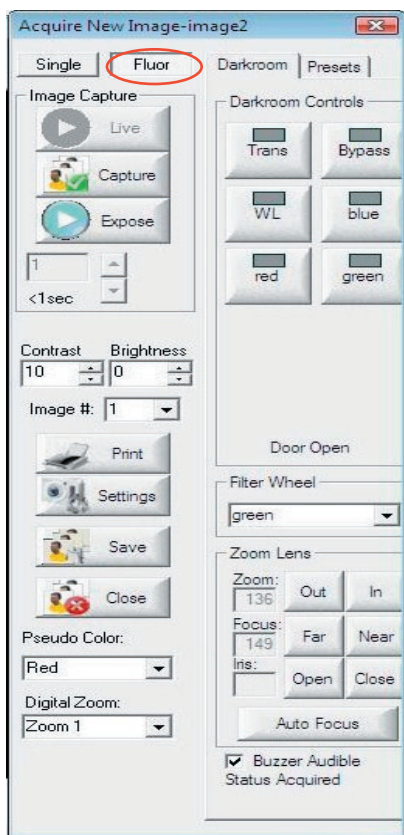
12. **Remove Subject from Transilluminator.** Turn off the transilluminator by clicking the “Trans” button in the Video Capture box. Open the FX Darkroom and remove subject. Rinse surface of transilluminator with distilled water and wipe dry with a non-abrasive wipe.

13. **Turn off all Components.** To ensure a long life for your Luminary/FX turn the Darkroom and printer **OFF** when not in use.

## Operating Instructions (cont.)

### Fluorescent Imaging

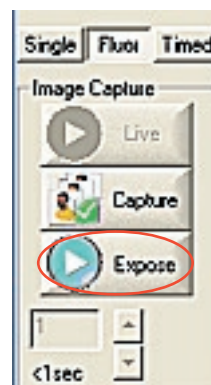
1. **Position sample.** Open the front access door to the FOTO/Luminary Darkroom. Place subject in the center of the transilluminator surface.
2. **Turn on power.** Press the top half of the power switch on the front of the FOTO/Luminary Darkroom; the switch is found in the upper right of the unit. Turn on the power to the camera control box, your computer, the thermal printer, and all required accessories.
3. **Open PC Image software.** Select the PC Image icon and open the application.
4. **Click on the “Acquire New Image” icon on the PC Image toolbar.** The Acquire New Image box will appear and live video will begin.
5. **Select “Fluor” tab in the Video Capture box.**
6. **Turn on white lights.** Click the “Direct 1” button in the Darkroom Controls tab in the Video Capture box. The indicator light on the darkroom will illuminate and the LED side and overhead lights inside the Darkroom will turn on.



*The Fluor Capture dialog box allows you to control the motorized zoom lens and FX darkroom interior lighting.*

7. **Frame and Focus the Subject.**
  - a. **Adjust the iris.** Use the “Open” and “Close” buttons next to “Iris” in the Zoom Lens box to adjust the amount of light entering the camera.
  - b. **Frame the Subject.** Use the “Out” and “In” buttons in the Zoom Lens box to zoom in or out. Adjust the zoom until your subject is framed properly.
  - c. **Focus the Subject.** Adjust the fine focus using “Far” or “Near” buttons next to “Focus” in the Zoom Lens box.

NOTE: The reference numbers under “Zoom” and “Focus” help to duplicate settings from image to image. Fluctuation while the system is on is normal.
8. **Open the Aperture.** Using the “Open Iris” button open the aperture as far as it will go. Your image will probably appear all white.
9. **Turn off Direct 1 (white lights).** Cover the white LED sidelights with black light covers to avoid reflections.
10. **Choose desired light source.** Click on the “Direct” LED light source (red, blue, or green) appropriate for your application.
11. **Choose desired filter.** Select the correct filter for the LED light source you are using. Click on the “V” button in the Filter Wheel box to select the appropriate filter.
12. **Expose the image.**
  - a. **Click the button marked “Expose” in the Acquire New Image box to start the integration.**



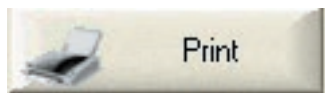
## Operating Instructions (cont.)

- b. **Adjust Integration.** In the box under the **Expose** button, type the desired number of frames of integration. Alternatively, use the up or down buttons to find the optimal integration time.

**NOTE:** For better contrast, decrease the amount of light coming through the iris by clicking on the "Close" button next to "Iris" in the Zoom Lens box. Then increase the integration time.

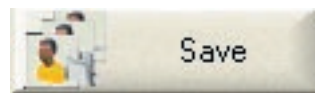
**NOTE:** Long integration periods will take longer to be displayed. For example, 300 frames of integration will take 10 seconds to be acquired and displayed on the computer monitor.

- c. **Capture Image.** Click on the button marked **Capture** to stop integration. The transilluminator can now be turned off.
- d. **Brightness and Contrast (optional).** If desired, brightness and contrast can be adjusted using the buttons in the **Video Capture** box.
- e. **Print the Image (optional).** Click the **Print** button in **Video Capture** box.



13. **Optional: Select the Settings button.** This will bring up a dialog box in which you can adjust binning settings for the exposure. "No binning" will result in a picture that is displayed exactly as it is received from the camera (i.e. full resolution) "2x2" causes the software to view 2 pixels of the camera in each direction as a single pixel, increasing the pixel size and therefore the light sensitivity. Similarly "4x4" treats sixteen pixels as one and "8x8" view a grid of 64 pixels as a single pixel. Keep in mind that resolution is decreased as binning settings are increased. This also produces a decrease in resolution.
14. **Optional: Pseudo Color.** This will apply a pseudo coloring to your image. From the drop-down menu, you can choose between several colors.
15. **Optional: Digital Zoom.** This will zoom in to your image. Choose Zoom from the drop-down menu.

16. **Save the Image.**
- a. Click on the **Save** button in the Video Capture box.



- b. **Type in the file name.**
- c. **Choose file type.** Images acquired by PC Image may be saved in any of nine file types including BMP and JPEG. TIF type is recommended if the image is going to be analyzed using TL100 image analysis software.
17. **Remove Subject from Surface of Transilluminator.** Open the FX Darkroom and remove subject. Rinse surface of transilluminator with distilled water and wipe dry with a non-abrasive wipe.

# Operating Instructions (cont.)

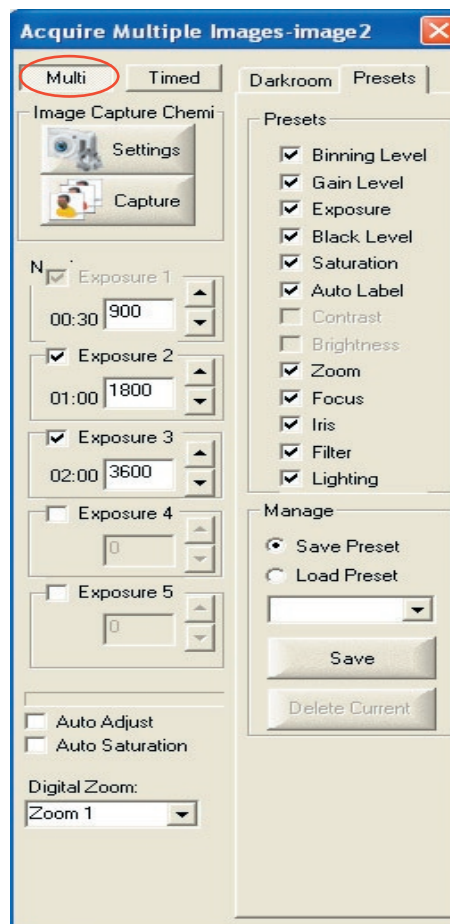
## Chemiluminescent Imaging: Acquiring Images Using “Multi” Feature

1. **Position sample.** Open the front access door to the FOTO/Luminary Darkroom. Remove the Lumi/Tray from its storage place on the inside of the door. Place subject in the center of the sample tray. Fit the tray into the track near the top of the enclosure, above the darkroom unit's sidelights. Slide the tray to the fully retracted position. Close the front access door. *Samples that are too large for this tray can be placed on the UV surface of the transilluminator.*



Sample Tray Storage Location

2. **Turn on power.** Press the top half of the power switch on the front of the FOTO/Luminary Darkroom; the switch is found in the upper right of the unit. Turn on the power to the camera control box, your computer, the thermal printer, and all required accessories.
3. **Open PC Image software.** Select the PC Image icon and open the application.
4. **Choose Acquire “Multiple Exposures”** (the second icon from the left) **on the PC Image toolbar.**
5. **Select the “Multi” tab.**
6. **Select proper filter.** If you placed your sample on the Lumi/Tray in the last step, choose the Close-Up Adapter. If you placed your sample on the transilluminator, use the Blank filter.
7. **Turn on white lights.** Click the “Direct 1” button in the Darkroom Controls tab in the Video Capture box. The indicator light on the darkroom will illuminate and the LED side and overhead lights inside the Darkroom will turn on.

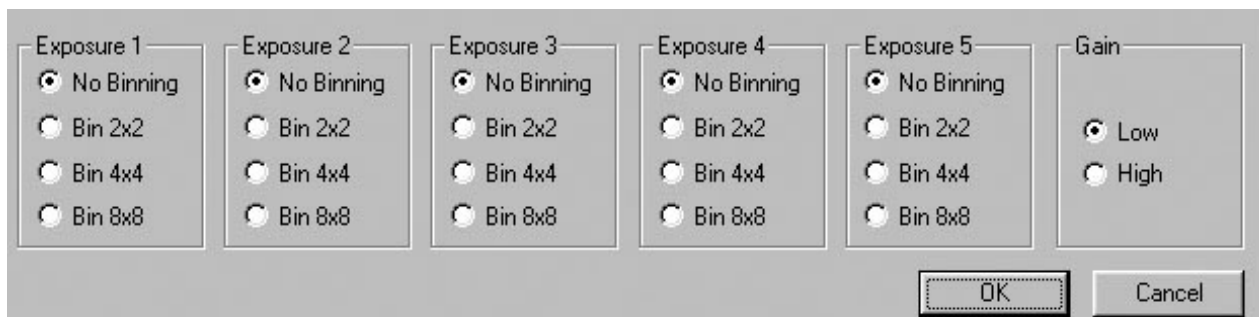


*The Multi tab in the Acquire Multiple Images dialog box allows you to set up to five different exposure times. It also allows you to control the motorized zoom lens and FX darkroom interior lighting.*

8. **Frame and Focus the Subject.**
    - a. **Adjust the iris.** Use the “Open” and “Close” buttons next to “Iris” in the Zoom Lens box to adjust the amount of light entering the camera.
    - b. **Frame the Subject.** Use the “Out” and “In” buttons in the Zoom Lens box to zoom in or out. Adjust the zoom until your subject is framed properly.
    - c. **Focus the Subject.** Adjust the fine focus using “Far” or “Near” buttons next to “Focus” in the Zoom Lens box.
- NOTE: The reference numbers under “Zoom” and “Focus” help to duplicate settings from image to image. Fluctuation while the system is on is normal.
9. **Open the Aperture.** Using the “Open Iris” button open the aperture as far as it will go. Your image will probably appear all white.

## Operating Instructions (cont.)

10. **Turn off Direct 1 (white lights).**
11. **Expose the image.**
  - a. Set the number of frames of exposure in the "Exposure 1" box.
  - b. **Optional:** Check the boxes next to "Exposure 2", "Exposure 3, etc." if you want multiple pictures of the same sample. This allows you to experiment with different exposure settings. Set the number of frames of integration for each box you checked.
12. **Select the Settings button.** (Figure 7, below) This will bring up a dialog box in which you can adjust binning settings for each of the exposures. "No binning" will result in a picture that is displayed exactly as it is received from the camera (i.e. full resolution) "2x2" causes the software to view 2 pixels of the camera in each direction as a single pixel, increasing the pixel size and therefore the light sensitivity. Similarly "4x4" treats sixteen pixels as one and "8x8" view a grid of 64 pixels as a single pixel. *Keep in mind that resolution is decreased as binning settings are increased.* This also produces a decrease in resolution.
13. **Optional: Set other parameters.**
  - a. "Auto" will produce pictures with automatic brightness and contrast optimization.
  - b. "Auto Label" will put a date, time, and exposures stamp on the bottom of the image.
  - c. "Show Saturation" will indicate any areas of your image that have been overexposed.
14. **Select "Expose Series".** This will start the exposures.
15. **Choose and Save the image.**
  - a. Pick an image from the multiple exposures. Click on the image.
  - b. Choose Save from the File pull-down menu. Alternatively, click the Save icon in the PC Image toolbar.
  - c. Type in the file name.
  - d. Choose file type. Images acquired by PC Image may be saved in any of nine file types including BMP and JPEG. TIF file type is recommended if the image will be analyzed using image analysis software.
16. **Make a Thermal Print of the image (optional).** Click the Print button in the tool bar or select Print from the File pull-down menu. The image will be sent the thermal printer and printed in a few seconds.



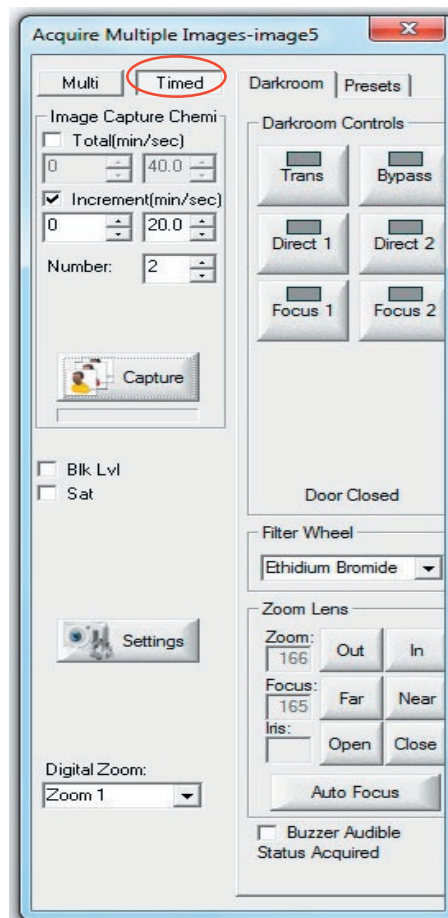
**Figure 7**  
The Chemi Settings box allows you to set different binning for each exposure. It also allows the control of the camera gain for additional sensitivity

# Operating Instructions (cont.)

## Chemiluminescent Imaging:

### Acquiring Multiple Images Using “Timed” Feature

- Position sample.** Open the front access door to the FOTO/Luminary Darkroom. Remove the Lumi/Tray from its storage place on the inside of the door. Place subject in the center of the sample tray (refer to Page 14). Fit the tray into the track near the top of the enclosure, above the darkroom unit’s sidelights. Slide the tray to the fully retracted position. Close the front access door. *Samples that are too large for this tray can be placed on the UV surface of the transilluminator.*
- Turn on power.** Press the top half of the power switch on the front of the FOTO/Luminary Darkroom; the switch is found in the upper right of the unit. Turn on the power to the camera control box, your computer, the thermal printer, and all required accessories.
- Open PC Image software.** Select the PC Image icon and open the application.
- Choose Acquire “Multiple Exposures”** (the second icon from the left) **on the PC Image toolbar.**
- Select the “Timed” tab.** It is located in the Acquire Multiple Images window.
- Select proper filter.** If you placed your sample on the Lumi/Tray in the last step, choose the Close-Up Adapter. If you placed your sample on the transilluminator, use the Blank filter.
- Turn on white lights.** Click the “Direct 1” button in the Darkroom Controls tab in the Video Capture box. The indicator light on the darkroom will illuminate and the LED side and overhead lights inside the Darkroom will turn on.



*The Timed tab in the Acquire Multiple Images dialog box allows you to accumulate multiple images over a selected number of time increments. It also allows you to control the motorized zoom lens and FX darkroom interior lighting.*

- Frame and Focus the Subject.**
  - Adjust the iris.** Use the “Open” and “Close” buttons next to “Iris” in the Zoom Lens box to adjust the amount of light entering the camera.
  - Frame the Subject.** Use the “Out” and “In” buttons in the Zoom Lens box to zoom in or out. Adjust the zoom until your subject is framed properly.
  - Focus the Subject.** Adjust the fine focus using “Far” or “Near” buttons next to “Focus” in the Zoom Lens box.

NOTE: The reference numbers under “Zoom” and “Focus” help to duplicate settings from image to image. Fluctuation while the system is on is normal.

- Open the Aperture.** Using the “Open Iris” button, open the aperture as far as it will go. Your image will probably appear all white.
- Turn off Direct 1 (white lights).**

# Operating Instructions (cont.)

## 11. Select the Settings button.

Adjustment of these settings may not be necessary before each use. If the settings achieve optimal image quality for a routine experiment, please go to Step 12.

- a. Binning:
 

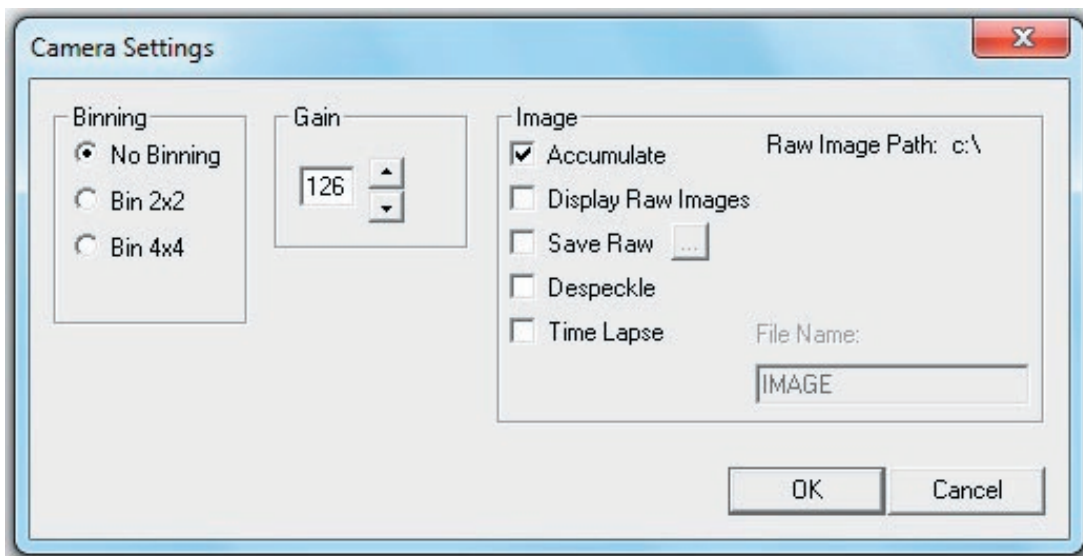
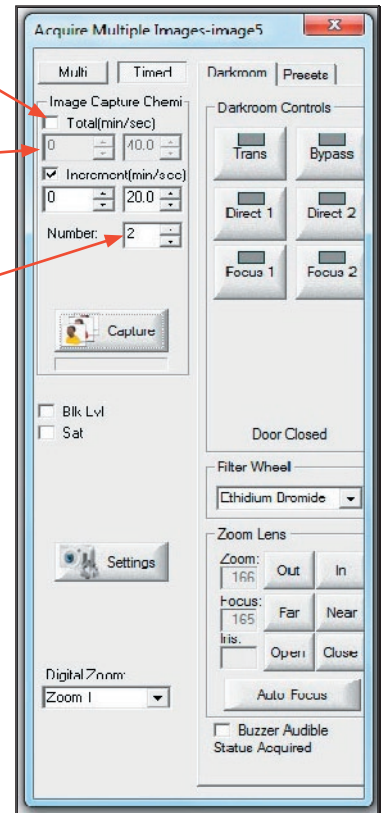
“No binning” will result in a picture that is displayed exactly as it is received from the camera (i.e. full resolution) “2x2” causes the software to view 2 pixels of the camera in each direction as a single pixel, increasing the pixel size and therefore the light sensitivity. Similarly “4x4” treats sixteen pixels as one and “8x8” treats a grid of 64 pixels as a single pixel. *Keep in mind that resolution is decreased as binning settings are increased.*
- b. Gain:
 

This setting is related to sensitivity. Higher Gain values correspond to increased sensitivity.
- c. Accumulate: This option will give you the sum of all the captured images at the end of the image collection.
- d. Display Raw Images: This option will show captured images for all the selected increments.
- e. Save Raw: This option will automatically save the captured images as they are taken. A window will appear where you can name the images.
- f. Despeckle: This option will remove background spots.
- g. Time Lapse: Selecting Time Lapse will open a new box within the Acquire Multiple Images window. Enter the time desired between capturing images in h:m:s format.

## 12. Expose the image.

- a. Choose the total length of time the sample is to be photographed.

- Select the “Total (min/sec)” option.
- Input the desired exposure time.
- Set the desired number of images (increments) to be captured during that time in the “Number” box.
- The program will automatically calculate the length of the increments.

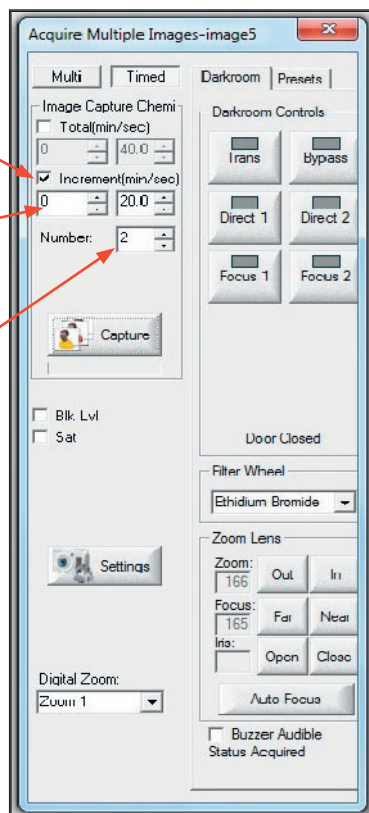


**Figure 5**  
The Camera Settings box allows you to select from several binning options. It also allows the control of the camera gain for additional sensitivity

## Operating Instructions (cont.)

b. Choose the number of increments and their durations.

- Select the “Increment (min/sec)” option.
- Input the desired length of time for each captured photo.
- Set the desired number of increments in the “Number” box.
- The program will automatically calculate the total length of time.



13. **Optional: Set other parameters.**

- Select **Blk Lvl** to indicate saturation of black subjects (ex: bands).
- Select **Sat** to indicate any white areas of your image that have been overexposed.

14. **Select “Capture”**. This will start the exposures.

15. **If you did not select Save Raw in the Settings box, choose and Save the image.**

- Pick an image from the multiple exposures. Click on the image.
- Choose Save from the File pull-down menu. Alternatively, click the Save icon in the PC Image toolbar.
- Type in the file name.
- Choose file type. Images acquired by PC Image may be saved in any of nine file types including BMP and JPEG. TIF file type is recommended if the image will be analyzed using image analysis software.

16. **Make a Thermal Print of the image (optional)**. Click the Print button in the tool bar or select Print from the File pull-down menu. The image will be sent the thermal printer and printed in a few seconds.



## Additional Information

### Helpful Hints

Obtaining the best possible print from your FOTO/Analyst Luminary/FX Workstation sometimes requires a bit of trial and error. Knowing how to analyze a print will usually help to change the proper parameters to improve upon it.

### Exposure/Integration

Image exposure is determined by the size of the lens opening (iris) and the length of time that light is stored on the CCD photoreceptor array before sending it to the frame grabber (integration time). The lightness or darkness of a gel image may be adjusted by changing these two parameters in your Luminary/FX system. If a gel image is too light, either reduce the integration time (fewer frames) or make the lens iris smaller. Conversely, if the image is too dark, the exposure should be increased by using a longer integration time (more frames) or a larger lens iris. Refer to Figure 4 for recommended exposure settings.

### Depth of Field

Blurry or hazy photographs can result from improper selection of exposure settings. This is especially true in low-light photography, such as that for ethidium bromide-stained DNA in agarose electrophoresis gels. These low-light situations require the lens iris to be open very wide to allow as much light as possible into the camera. The open lens iris results in a very shallow depth of focus. Because the 5mm or greater gel thickness often used in this application can exceed this depth of focus, some of the gel may lie outside the focal plane. To correct such a problem, it is necessary to close down the lens iris. While this increases the depth of focus, the integration time must be lengthened to compensate for the reduction of light through the lens.

### Filtration

If transilluminator bulbs are visible in photographs, then the correct photographic filter is not being used or it is missing. For high quality photodocumentation, check to make sure that the filter is in place, that it is the correct filter and that it is in good condition .

### Recommended Exposure Settings

<u>Stain</u>	<u>Transillumination</u>	<u># Frames</u>
Ethidium Bromide	Ultraviolet	5 - 10
Fluorescent Green	Ultraviolet	10 - 15
Fluorescent Gold	Ultraviolet	10 - 15
Coomassie Blue	White Light	(Live)

**Figure 9**

The above settings represent suggested starting points for standard gels using proper filtration. A variety of factors (gel thickness, stain concentration, staining time, destaining, etc.) may cause your gel to require different settings for optimal documentation.

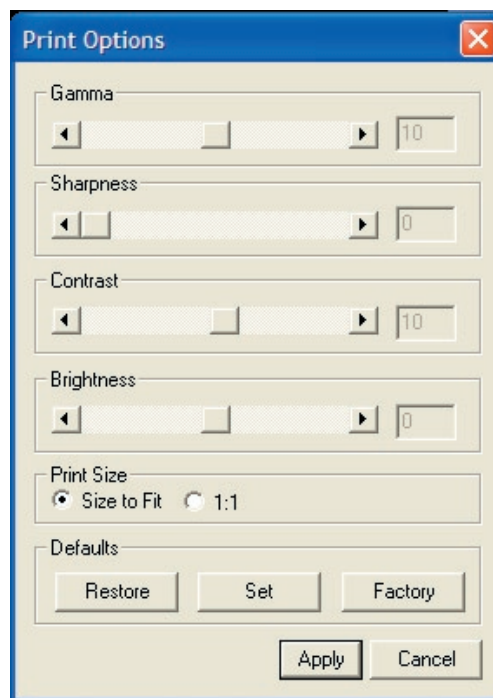
### Recommended Exposure Settings

To obtain the best images, the proper filter should be in place. For ethidium bromide, fluorescent green, or fluorescent gold-stained gels a band-pass (interference) filter should be used. For Coomassie blue stained gels, a cut-off filter should be in place. For the filtration needs of other stains, contact Technical Service at FOTODYNE, 1-800-362-3686. Refer to Figure 4 for recommended exposure settings for use with popular gel stains.

For images such as autorads, blots, or petri plates, a neutral density filter (FOTODYNE Catalog Number 60-2032) may be added in order to achieve more control over exposure settings. The amount of light reaching the camera array through such a filter will be attenuated over the entire visible spectrum.

### Print Options (File menu)

Images sent to the printer can be optimized to match the image on the screen by adjusting "Print Options". When you choose the Print Options command, you will be presented with the dialog box shown below. These settings only affect how the image appears when printed without affecting how the image is displayed on the monitor or saved to file. Click "Set" to save settings. These are saved and reused every time PC Image prints out an image. Click "Factory" to restore the factory settings.



**Image Rounding Correction.** Under normal imaging settings images of your round subjects (i.e. petri plates) may appear "oval". To correct for this you can change the video format to RS-170, Image Rounding Correction. This compensates for the non-square pixels of the camera.

## Additional Information (cont.)



**Acquire**



**Acquire Multiple Exp**



**Arrow**

---



**Auto Level**



**Black Level**



**Brightness/Contrast**

---



**Cascade Windows**



**Crop (Select)**



**Double Arrow**

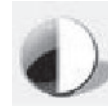
---



**Edit Drawing**



**Ellipse**



**Invert**

---



**Line**



**Mirror Horizontal**



**Mirror Vertical**

---



**New Window**



**Open Image**



**Print**

---



**Rectangle**



**Rotate**



**Saturate**

---



**Save**



**Text**



**Tool Color**

---



**Tile Window\_Horizontal**



**Tile Window\_Vertical**

---



**Undo**



**Zoom In**



**Zoom Out**

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## *Servicing Information*

### **Adding or Replacing Filters**

If it becomes necessary to add or replace a filter in the motorized filter wheel, please contact FOTODYNE Incorporated for technical assistance at 1-800-362-3686.

## ***Ordering Information / Technical Assistance***

### ORDERING INFORMATION

Call or Fax Toll-Free:

#### **Educational Products Division**

Technical Service: 262-369-7000

Phone Orders: 1-800-362-4657

Fax Orders: 1-800-362-3642

#### **Research Products Division**

Technical Service: 262-369-7000

Phone Orders: 1-800-DNA-FOTO

1-800-362-3686

Fax Orders: 1-800-362-3642

Mail to:



950 Walnut Ridge Drive  
Hartland, WI 53029-9388  
USA

Web-site: [www.fotodyne.com](http://www.fotodyne.com) • E-mail: [technical.service@fotodyne.com](mailto:technical.service@fotodyne.com)

### TECHNICAL ASSISTANCE

Technical questions regarding the operation and safe use of this instrument should be directed to FOTODYNE Incorporated.

Call 1-262-369-7000.