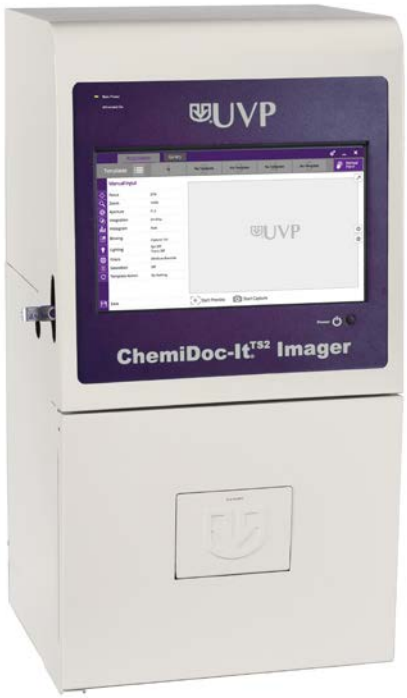
GelDoc-It®TS2 & ChemiDoc-It®TS2 Imagers

Installation and User Instructions



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Introduction

The **GelDoc-It^{TS2} Imager** is a high resolution imaging system capable of capturing and documenting fluorescent gel images.

In addition to gel documentation capabilities, the **ChemiDoc-It^{TS2} Imager** is equipped with a cooled, scientific-grade CCD camera allowing users to capture and document chemiluminescent blot images, including Western blots.

The TS2 Imagers are self-contained, light-tight imaging systems with a built-in 15.6” touch screen and computer and TS2 Software for image acquisition.

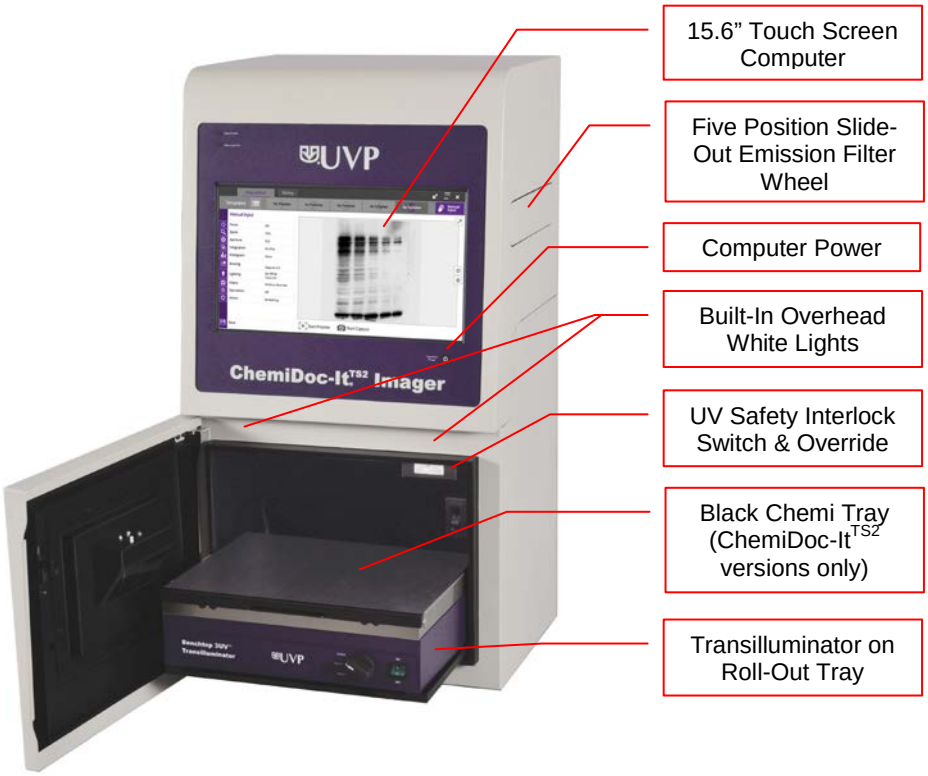
The darkroom has a UV-blocking gel viewer window, built-in overhead epi white lighting, a UV transilluminator and a five-position slide-out emission filter wheel with an ethidium bromide (EtBr) emission filter included as standard. Save images to the internal hard drive, to an external USB storage device or to a network drive for later quantitative analysis or enhancement for publication.

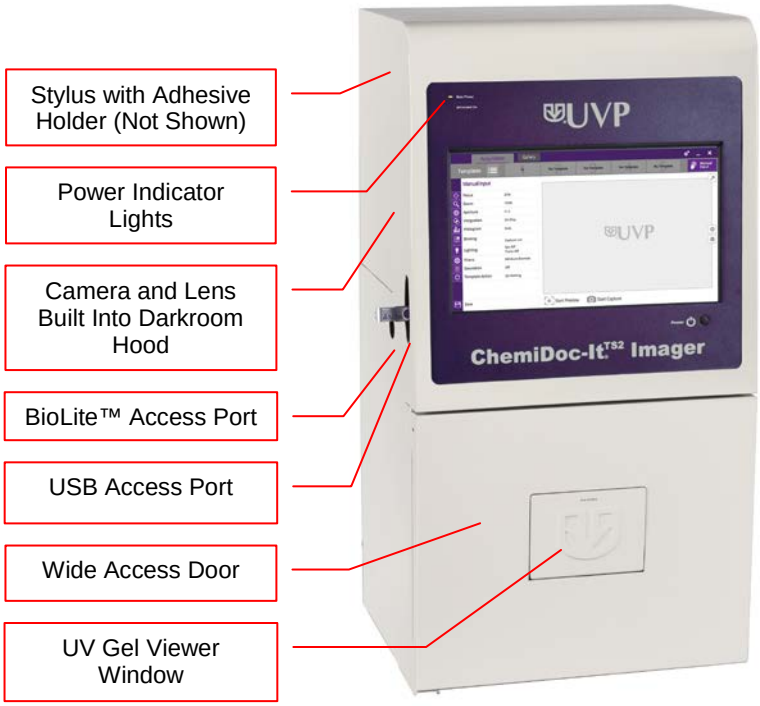
UVP’s VisionWorks®LS Analysis software is included* with all TS2 Imagers for analysis of gels, blots and colony plates. VisionWorksLS requires an external computer and cannot be operated directly on the TS2’s integrated computer.

**System/software configurations may vary by country. Contact UVP or authorized distributor for details.*

System Components

Refer to the packing slip and pictured components for specific parts and components included with the system.





Specifications

Power Requirements:	100/115V, 50/60Hz; 3.1 Amps at 120 Volts
	230V, 50/60Hz; 1.55 Amps at 230 Volts
	Mains supply voltage fluctuations are not to exceed 10 percent of the nominal supply voltage
Pollution Degree:	2
Installation Category:	II
Altitude:	Up to 2000m
Ambient Temperature:	5°C to 40°C
Humidity:	Maximum relative humidity of 80% for temperatures up to 31°C, decreasing linearly to 50% maximum relative humidity at 40°C

Built-In Touch Screen Computer

Operating System:	Windows® 8.1, 64-Bit
Connectivity Ports:	1 USB (side of system)
	6 USB, VGA and Ethernet (rear of system)
Wireless Networking Capability:	802.11 b/g/n
USB Flash Drive Capacity:	2 GB (minimum)
Internal Hard Drive:	320 GB (minimum)
Software:	TS (Touch Screen) Software

Cameras and Lenses

GelDoc-It^{TS2}: The GelDoc-It^{TS2} is equipped with the **GelCam 310** camera, a scientific-grade monochrome CCD camera with a resolution of 2.0MP (1600x1200). The GelCam 310 is equipped with a 12.5-75mm f/1.2 optical zoom lens.

ChemiDoc-It^{TS2}: The ChemiDoc-It^{TS2} is equipped with either the **MegaCam 810** or **BioChemi™ 510** scientific-grade monochrome CCD camera. Both cameras are Peltier cooled and offer full 16-bit file bit depth:

The **BioChemi 510** camera is a 2.1MP unit with Peltier cooling to 35°C below ambient. The BioChemi 510 has a peak quantum efficiency of 50% and is capable of binning from 1x1 to 8x8. This camera is equipped with a 12.5-75mm f/1.2 optical zoom lens.

The **MegaCam 810** camera is an 8.1MP camera (3296x2472) with Peltier cooling to 35°C below ambient. The MegaCam 810 has a peak quantum efficiency of 50% and is also capable of binning from 1x1 to 8x8. This camera is equipped with either a 50mm f/1.2 lens or a 30mm f/1.4 lens, both of which have a fixed focal length (non-optical zoom capable).

All camera settings are factory pre-set for optimum performance when viewing gels, films or membranes under low light level conditions. Contact UVP Technical Support prior to making any adjustments to internal camera settings.

Ethidium Bromide (EtBr) Emission Filter

The ethidium bromide (50mm^2) UV-blocking bandpass interference filter blocks UV and IR radiation emitted from the transilluminator. The filter is placed in the slide-out filter wheel assembly on the side of the Imager. The filter allows visualization of fluorophores from 580-630nm, targeting the ethidium bromide emission peak of 605nm.

Additional filters are available for other specific fluorophores, including custom filters. Filters can also be removed when imaging non-fluorescent media (including chemiluminescent blots, protein gels, colony plates, etc.) in order to produce brighter images. Contact UVP for ordering information.

Darkroom

The darkroom is light tight to provide optimal imaging conditions. Darkroom features include:

- Epi (overhead) LED white light
- Roll-out transilluminator tray
- UV-safe gel viewer window built into the darkroom door
- Five position emission filter wheel
- Brackets and built-in power ports for installing optional epi UV modules
- Brackets for installing optional high-intensity halogen or xenon BioLite™ epi light guides
- Built-in power jumper cable for transilluminator
- Power cord for optional LED White Light Plate
- UV safety interlock switch with manual override to disable UV transillumination and optional UV epi illumination when darkroom door is opened

Transilluminator

The GelDoc-It^{TS2} and ChemiDoc-It^{TS2} Imagers can accommodate UVP's Benchtop and FirstLight® transilluminator models. UVP offers a variety of transilluminator configurations, including Benchtop models with multiple wavelengths and variable intensities, as well as the highly uniform, patented FirstLight transilluminator.

Note: For UV protection and to extend the life of the UV transilluminator, the system incorporates a customizable transilluminator shutoff timer built into the software. For additional information, refer to the **Lighting** section of this manual.

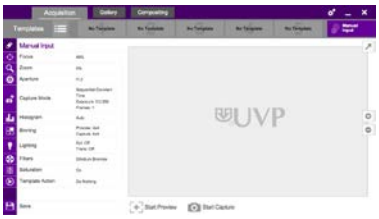
LCD Touch Screen

The GelDoc-It^{TS2} and ChemiDoc-It^{TS2} Imagers contain a fully integrated 15.6-inch color touch screen computer. The touch screen allows the user to perform a variety of tasks, including previewing, capturing, saving and printing images, as well as selecting preference options, without the use of an external mouse or keyboard. The screen can be pressed by finger or with the included stylus.

For users who prefer not to use the touch screen interface, an external keyboard and mouse are included as standard. These components can be plugged into any available system USB ports.

TS2 Software

Image acquisition and hardware functions for the GelDoc-It^{TS2} and ChemiDoc-It^{TS2} Imagers are controlled by the TS2 (Touch Screen) Software interface. In addition to image preview, capture and save functions, the TS2 Software controls camera and lens functions (exposure, aperture, focus and zoom, where applicable), image printing, lighting and filter selection, and other user settings.



TS2 Software Screen

Fluorescent Focus Target

The UVP Fluorescent Focus Target fluoresces when placed on a UV transilluminator or when exposed to overhead UV. The Target provides sharp fluorescent images to aid in adjusting the lens and camera settings for ideal imaging results.

Fluorescent Focus Target

Optional Equipment

UVP offers a variety of optional equipment to support the needs of varying laboratory environments. Refer to **Replacement Parts and Accessories** at the end of this manual for optional equipment part numbers.

BioLite MultiSpectral Light Source

The BioLite™ MultiSpectral Light Source utilizes high intensity xenon or halogen lighting in conjunction with fiber optic guides to a supply powerful, directed illumination to a variety of fluorescent stained samples. A wide range of excitation and emission filters enable a wide spectral range of wavelengths, including red, green, blue and NIR.

BioLite MultiSpectral Light Source

Thermal Printer

The thermal printer provides archive quality, 256 grayscale prints and five optional cost-effective print sizes.

Thermal Printer

UV Modules for Epi (Overhead) Lighting

A set of two 4-watt ultraviolet modules can be connected inside the darkroom to provide epi UV illumination. These modules can be switched on or off in the **Lighting** menu within the TS2 Software and can also be removed from the darkroom and used as standalone handheld lamps (as seen in the image to the right).

Epi UV Module

LED White Light Plate

The LED White Light Plate emits high uniformity with less than 5% coefficient of variance (CV). Plug the LED White Light Plate directly into the power supply within the darkroom and select “White Light Plate” under the **Lighting** menu within the TS2 Software.

LED White Light Plate

Converter Plates

An alternate to the LED White Light Plate, the **UV/White Converter Plate** allows imaging of non-fluorescent stained media with an ultraviolet transilluminator. The converter plate is specially coated to convert 302nm UV to white light rather than using a separate white light box.

The **Visi-Blue™ Converter Plate** (not shown) converts UV to a safe 460-470nm wavelength designed for use with blue excitation samples and SYBR Green, SYPRO Orange and GFP stains.

UV/White Converter Plate

VisionWorks®LS Analysis Software

All TS2 systems include* a copy of VisionWorksLS Software for analysis of gels, plates and membranes. The software features image enhancement, complete analysis tools and reporting capabilities, and is ideal for users who require image analysis functions in addition to the standard image acquisition capabilities of the TS2 software.

NOTE: Software must be installed and operated on an external computer.

**System/software configurations may vary by country. Contact UVP or authorized distributor for details.*

Setup Instructions

Components

When unpacking the GelDoc-It^{TS2} and ChemiDoc-It^{TS2}, the following items will be included:

1. GelDoc-It^{TS2} or ChemiDoc-It^{TS2} system
2. Ethidium bromide (EtBr) emission filter
3. Transilluminator
4. Power cable
5. USB flash drive (8 GB minimum)
6. Keyboard and mouse
7. VisionWorksLS Software (if included; varies by country)
8. Supporting documentation

When unpacking and setting up the darkroom, two people are required to move the darkroom.

Place the darkroom on a flat surface which can provide adequate support for up to 100 pounds.

WARNING: Do not attempt to perform any setup procedures while the system is plugged in or powered on unless otherwise instructed.

CAUTION: Do not install the system in areas with high moisture, dust or high temperatures. Keep the equipment away from motors or any other large magnetic equipment. This system is designed for indoor use only.

Connecting the Power Cables

1. Plug the main power cable into the back of the darkroom and the other end into a surge-protected power outlet.

   Note: It is recommended to leave the power switch on the back of the system in the **ON** position except when the system will not be used for an extended period of time (one day or longer).

   Note: Do not position the system so that it is difficult to access the power cable and operate the main power switch at the back of the unit.

2. Inside the darkroom, place the transilluminator on the roll-out tray. Connect the transilluminator to the internal power jumper cable. Ensure that the green power switch on the front of the transilluminator unit is in the **ON** position and that the desired wavelength or intensity is selected.

   Note: For UV protection and to extend the life of the UV transilluminator, the system incorporates a customizable transilluminator shutoff timer built into the software. For additional information, refer to **Touch Screen Interface** in this manual.

3. If installing the LED White Light Plate, place the plate on top of the UV transilluminator and connect the power cord coming from inside the darkroom to the back of the Plate.

4. If installing epi UV modules, place the modules in the brackets located at the top of the darkroom. Plug the modules into the outlets provided inside the darkroom. Place the power switches located on the modules in the **ON** position.

Installing Emission Filters

To install the 50mm^2 ethidium bromide (EtBr) filter and any other emission filters:

1. Carefully remove the filter from the protective plastic case, holding the filter at the edges to prevent placing fingerprints on the glass surface.
2. The filter wheel is located on the user's right side of the darkroom. Press in on the slide-out filter wheel door and the door will pop out slightly. Pull the filter wheel assembly out until it stops.
3. Manually rotate the filter wheel to the desired position. Place the ethidium bromide filter in Position #1.

   NOTE: Before placing the filter in the filter wheel, ensure that the text on the edge of the filter is positioned so it is right side up when facing the installer.
4. Note the position of all installed filters for entry into the **Filters** menu in the TS2 Software.
5. Once all filters have been loaded, slide the filter wheel assembly back into the system until it locks into place.

   NOTE: In order for the system to accurately determine the position of the emission filter wheel, press the **Reset Wheel** button in the **Filters** menu after the wheel has been moved by hand to load, change or remove filters. This will recalibrate the emission filter wheel alignment. Refer to the **Filters** section in this manual for more information.

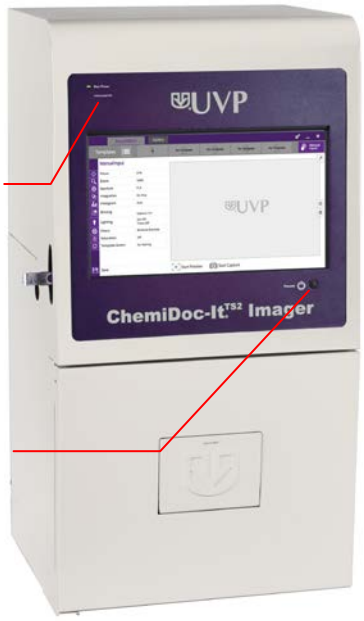
   Additional and replacement emission filters are available through UVP. Refer to the **Replacement Parts and Accessories** section of this manual for ordering information.

Using the System

Powering Up the System

Set the black power switch on the back of the system to the **ON** (**I**) position. Once plugged in to a wall outlet and the black power switch on the back of the system is placed in the **ON** (**I**) position, the GelDoc-It^{TS2} and ChemiDoc-It^{TS2} systems are always powered on.

Press the **POWER** button on the front of the system to power on the internal computer/touch screen. Once the computer completely boots, the TS2 software will load automatically.



The **POWER** button will illuminate blue when the internal computer and touch screen are on. (**Note**: The black main power switch on the back of the unit must be in the **ON** (**I**) position in order for the internal computer and touch screen to function.)

The **Power Indicator Lights** on the front of the unit indicate when the system's main power and ultraviolet illumination are on. **Main Power** will illuminate green when the black main power switch on the back of the unit is in the **ON** (**I**) position (this does not indicate that the internal computer or touch screen are on). **Ultraviolet On** will illuminate red when ultraviolet illumination is active within the darkroom.

Note: It is recommended to leave the power switch on the back of the system in the **ON** position except when the system will not be used for an extended period of time (one day or longer).

Preparing the Transilluminator for Use

1. Open the darkroom door and turn on the main power switch located on the front of the transilluminator. Place this switch in the **ON** (**I**) position. (Note: It is recommended to always leave this power switch on the **ON** (**I**) position.)

2. Use the rotary knob on the front of the transilluminator to select from the available lighting wavelengths or intensities (transilluminator settings vary by model).

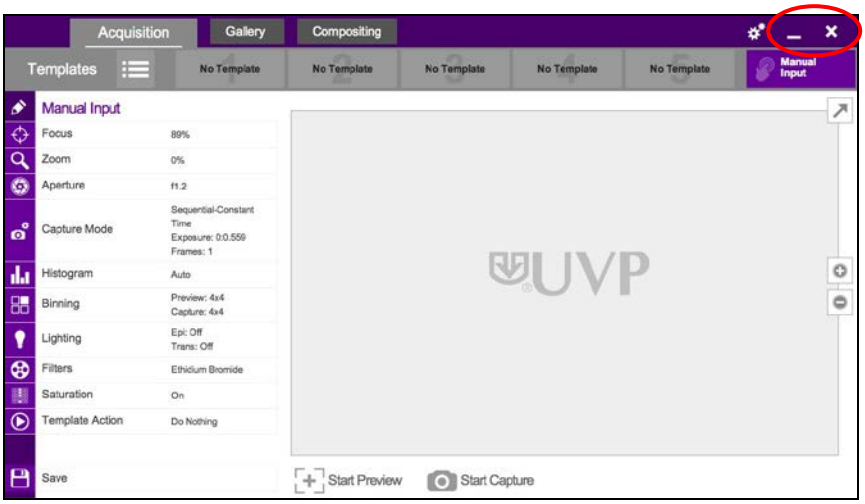
Note: The GelDoc-It^{TS2} and ChemiDoc-It^{TS2} systems integrate a UV interlock switch which will inactivate all UV when the darkroom door is open. This switch is located on the upper right corner of the darkroom door opening and is only accessible when the door is open. To override the UV interlock, pull out on the switch. The switch will automatically reset after the darkroom door is closed.

Caution: UV Transilluminators are powerful sources of UV radiation which will cause damage to unprotected eyes and skin. Before overriding the UV interlock, be sure all personnel in the area are properly protected, including proctective eyewear and clothing.

Refer to the transilluminator manual for additional instructions on using the transilluminator.

Operating the TS2 Software Interface

Upon startup, the internal computer will proceed through the boot-up process. When complete, the Windows desktop will appear. The TS2 Software screen, similar to the one below, will open automatically shortly thereafter.



To exit the TS2 Software interface, press either the close (**X**) or minimize (_) buttons at the top right corner of the software (see red circle above). To power down the system, press the **POWER** button located on the front of the TS2. Once the **POWER** button light is extinguished, set the power switch on the back of the system to the **OFF (O)** position if the system will not be used for an extended period of time.

Refer to the **Touch Screen Interface** section in this manual for further instructions on using the software.

Using the UV Gel Viewer Window

The **UV Gel Viewer Window**, built into the darkroom door, allows users to view the interior of the darkroom without opening the main door.

To open the Window, press firmly on the top of the Window cover to release the pressure-sensitive clasp and open the viewer. The Window glass is UV blocking while providing a clear view to the transilluminator surface for sample viewing.

NOTE: Close the UV Gel Viewer Window prior to capturing a light-sensitive image such as a chemiluminescent blot.

Image Focusing

Prior to capturing an image, prepare the image focus as follows:

1. Remove the blue protective film from the **Fluorescent Focus Target** (see the “Fluorescent Focus Target” section of this manual for more information).

2. Turn on the transilluminator and place the Target on the transilluminator surface.

   NOTE: The darkroom has a UV safety switch that turns off the transilluminator and optional epi UV modules when the door is open.

3. Using the TS2 Software, press **Start Preview** to begin viewing the sample within the system. Adjust the exposure, focus, zoom (if applicable) and aperture controls using the **Focus**, **Zoom** and **Aperture** menus in the TS2 Software screen until an ideal image is visible.

   Refer to **Touch Screen Interface** in this manual for further instructions on using the software.

Image Zooming

Both the GelDoc-It^{TS2} with the GelCam 310 camera and the ChiemiDoc-It^{TS2} with the BioChemi 510 camera are equipped with optical zoom lenses, meaning that the system uses the lens' optics to make the sample appear closer/larger on the screen. Optical zoom is adjusted using the vertical slider in the **Zoom** menu on the TS2 Software screen.

The ChemiDoc-It^{TS2} with the MegaCam 810 camera utilizes a fixed focal length lens, meaning that optical zoom is not available. However, given the camera's high megapixel resolution, digital zooming can be used to move in closer on the image. Digital zoom enlarges a portion of the image, simulating optical zoom. Thus, the camera crops a portion of the image and enlarges the cropped portion to fill the imaging area on the screen.

To use digital zoom functionality:

1. With a preview or captured image on the screen, use the **"+"** and **"–"** buttons located on the right side of the image.
2. Tap and drag to move around on the zoomed-in image.

Notes regarding digital zoom operation:

- The software's digital zoom feature utilizes WYSIWYG, or "what you see is what you get," meaning that a zoomed preview image will result in a zoomed capture image.
- A zoomed capture image will save and print as shown on the screen (WYSIWYG).

Note: Digital zoom is available on all TS2 systems, regardless of camera configuration. However, it is only recommended to use digital zoom with the MegaCam 810 due to the camera's high megapixel resolution.

Refer to the **Zoom** section of **Touch Screen Interface** in this manual for further information.

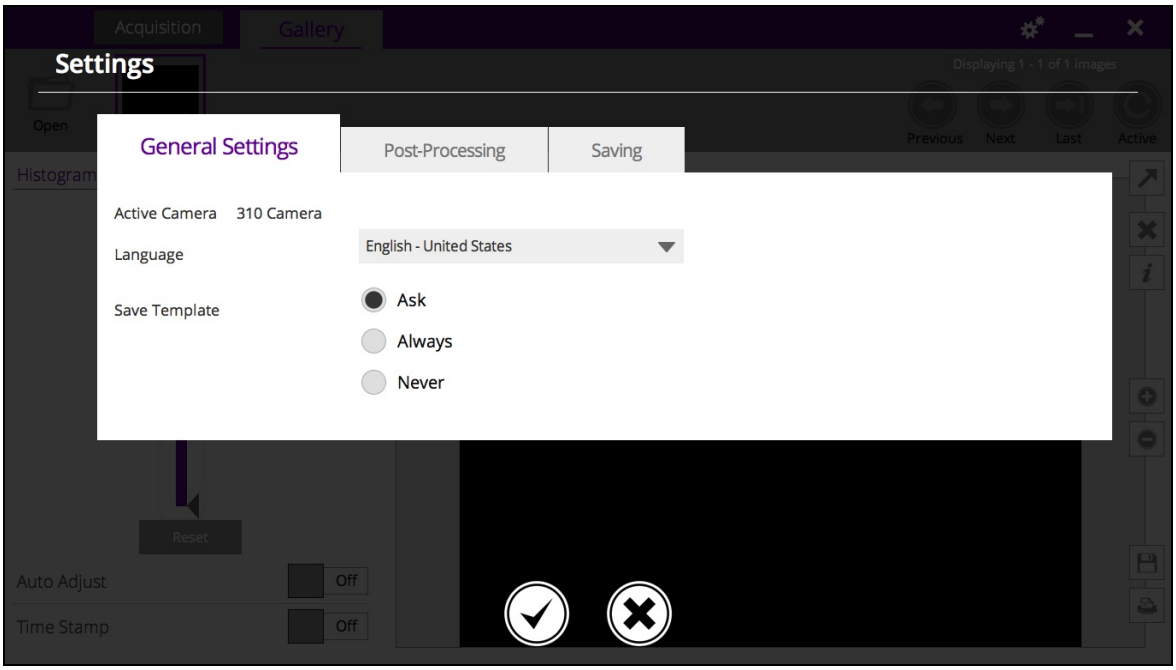
Touch Screen Interface

Setting User Preferences

The **Settings** portion of the TS2 Software allows the user to select preferences which are normally set once and rarely changed. Such settings include image save format and image save location. Access the user preferences by pressing the **Settings** button in the upper-right corner of the main TS2 screen and selecting from the following tabs:

- **General Settings**
- **Post-Processing**
- **Saving**

The following pop-up screen will appear:



General Settings Tab

Language: Use the drop-down arrow to select the desired language for the TS2 software interface. Multiple language options are available including English (US), Chinese (simplified), Turkish, Japanese, Korean, Russian, Portuguese, Spanish and German.

Save Template: Select from **Ask**, **Always** or **Never** to choose whether the software should ask to save any changes to a template, always save the changes automatically without asking, or never save the changes automatically.

Post-Processing Tab

Auto Rotate: Set Auto Rotate to **ON** to automatically rotate the image to the desired degree upon image capture. *Note: "Auto Rotate" must be set to **ON** in order to rotate images during image capture, as images cannot be rotated after capture using the TS2 software.*

To select the degree of image rotation, press the down arrow from the drop-down menu and choose to rotate the image 90 degrees clockwise, 90 degrees counterclockwise, or 180 degrees (upside down). *Note: "Auto Rotate" must first be turned **ON** before selecting a rotation setting.*

Auto Invert Image: Set Auto Invert Image to **ON** to automatically invert the image upon image capture. *Note: "Auto Invert Image" must be set to **ON** in order to invert images during image capture; captured images can also be inverted in the Gallery view.*

Noise Subtraction: Set Noise Subtraction to **ON** to reduce the amount of background and ambient ("white") noise within the image. In most circumstances, this setting should be left **ON**. *Note: "Noise Subtraction" must be set to **ON** in order to subtract noise from images during image capture, as noise cannot be subtracted from images after capture using the TS2 software.*

Saving Tab

Save Format: Press the down arrow to select the desired file save format from the drop-down menu. Save images in **JPEG**, **TIFF**, **BMP** or **PNG** file formats.

From the drop-down menu to the right of the chosen file format, choose **Save Selected Format** to save the image only in the chosen format. Or, select **Save Selected & Original Formats** to save in both the selected format as well as in an uncompressed TIFF format (note: two separate files will be saved using this method).

*Note: If the TIFF file format is selected and **Save Selected & Original Formats** is also selected, both compressed and uncompressed TIFF files will be saved.*

Save Images To: Select the location where images are to be saved. The black dot within the radio button indicates which selection is activated.

1. Select **USB** to save the file to the USB drive if one is currently inserted. If a USB device is not present, the user will be notified that a USB drive is not present when attempting to save an image.

2. Select **Prompt for Location** to prompt the user to select a file save location when attempting to save an image. This setting will also allow the user to save using a custom file name.

3. Choose **Select Folder** to define where the file will be saved when attempting to save an image. Select from any local or network drive by pressing the folder icon to the right of the file path display. *Note: The **Select Folder** radio icon must first be selected prior to defining the save location.*

Auto Save After Capture: Set **Auto Save After Capture** to **ON** to automatically save the image after capture. The image will automatically save to the location selected in **Save Images To** and in the format selected in **Save Format**, as described above.

NOTE: If the **Auto Save After Capture** function is set to **OFF**, press the **Save** button in the Gallery view to manually save an image.

Auto Print After Capture: Select **ON** to automatically send the captured image to the default printer after an image is captured. If a default printer is not installed, the Windows "Printers and Faxes" dialog will automatically appear after the image is captured. Select the desired printer in the "Printers and Faxes" dialog box and press **OK** on the dialog box to print the image.

Accept or Cancel Settings

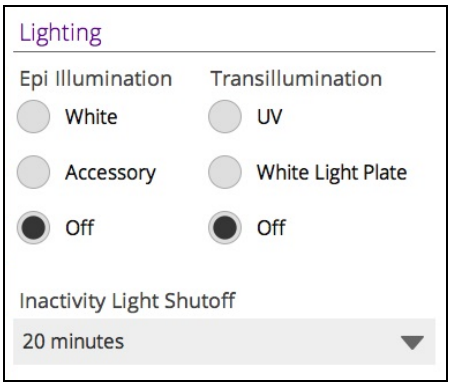
Once all Preferences settings have been made, press the **Checkmark** button at the bottom of the Preferences screen to save all preferences and go back to the main TS2 screen. Or, press the **"X"** button to go back to the main TS2 screen without saving changes.

Changing Lighting and Filter Settings

Before previewing or capturing images, choose the appropriate lighting and emission filter settings.

Lighting

Press the **Lighting** button on the main TS2 screen to access the lighting selection menu. The following options will appear:



Epi Illumination: Press the desired radio button to select from the following epi illumination sources: **White**, **Accessory** or **Off**.

1. **White** lighting produces a glow of white light from overhead.
2. **Accessory** lighting is only functional when optional epi UV modules are installed in the system darkroom.
3. **Off** will disable all overhead lighting.

Transillumination: Press the desired radio button to select from the following transillumination sources: **UV**, **White Light Plate** or **Off**.

1. **UV** will activate the ultraviolet transilluminator within the system darkroom, providing ultraviolet base lighting of variable wavelengths or intensities (depending upon system configuration).
2. **White Light Plate** base lighting is only functional when the optional LED white light plate is installed in the darkroom.
3. **Off** will disable all transillumination.

Inactivity Light Shutoff: The Inactivity Light Shutoff will automatically turn off the transilluminator within the darkroom after a selected period of time. From the drop down menu, select from 1, 5, 10, 15, 20 or 25 minutes of inactivity time prior to shutoff. To re-enable lighting after the inactivity light shutoff period, access the **Lighting** button from the main screen and turn the lighting on again.

Filters

Press the **Filters** button on the main TS2 screen to access the filter selection menu.

Filter Selection: Select the desired emission filter by pressing the appropriate radio button. Select from one of five filter positions on the built-in filter wheel.

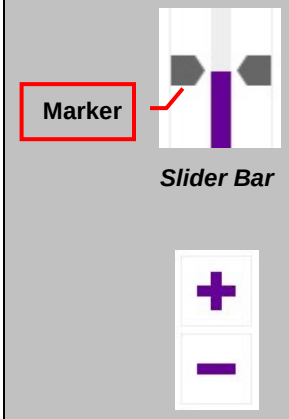
Reset Wheel: Press the **Reset Wheel** button to recalibrate the emission filter wheel alignment after the wheel has been moved by hand to load, change or remove filters. **NOTE:** If **Reset Wheel** is not pressed after the filter wheel has been manually rotated, the system will not be able to accurately determine the position of the emission filter wheel.

Edit: To change a filter name, press the desired radio button to select the emission filter and then press the **Edit** button. A screen will appear allowing the user to type in a new filter name. Press the **Checkmark** button to accept the new name or the **"X"** button to cancel the filter name change.

Identifying the Touch Screen Buttons and Functions

Using the TS2 System's built-in touch screen monitor allows for convenient selection of all system functions, including image capture, save and print. Following is a list of buttons on the touch screen and their individual functions.

TS2 Button	Function
 ***"Off"*** *and* ***"On"*** *Sliders*	Throughout the TS2 interface, the **"Off" and "On" Sliders** are used to turn settings either off or on. To toggle between off and on, tap the Slider; the Slider will autmatically move between the "X" (off) and the checkmark (on).
 ***"Acquisition" Tab***	To access system acquisition settings, press to select the **Acquisition** tab.
 ***Settings***	Access user preferences by pressing the **Settings** button in the upper-right corner of the main TS2 screen. The **Settings** screen allows the user to select settings which are normally chosen once and rarely changed, such as interface language and image save format. See the **Setting User Preferences** section of this manual for further information.
 ***Templates***	Press the **Templates** button to access the list of templates. Press again to close the list of templates. For more information on templates, see the **Using Templates** section of this manual.
	To view a preview of the image prior to capturing, press the **Start Preview** button. This function is active when the button's text and pictogram are shown in purple and read "Stop Preview". When active, press the button again to deactivate live preview.
 ***Maximize***  ***Minimize***	When an image preview is open, press the **Maximize** button to show the image in full-screen mode. Press the **Minimize** button to close full-screen.
	To capture an image with user-defined settings, press the **Start Capture** button. For longer exposures, the amount of time remaining for the capture to complete will appear to the right of the "Start Capture" button. This function is active when the button reads "Stop Capture" in purple lettering. **NOTE**: When using the Start Capture button, if the **Auto**

	Save After Capture function is enabled in Preferences, the image will automatically be saved to the preset location (see "Saving Tab" under **Setting User Preferences** in this manual).
 ***Slider Bar***	Use the **slider bar** to adjust various settings, including **Exposure**, **Aperture**, **Histogram**, **Focus** and **Zoom** (if applicable). To adjust the settings, do one of the following: • Press and drag the marker (small triangle) to the desired position; • Touch anywhere along the gray slider bar and the marker will automatically "snap" to that position (not applicable to Histogram); or • Press the **"+"** and **"–"** buttons to make fine adjustments to the settings (not applicable to Histogram).
Focus	Press the **Focus** button to access lens focus adjustment. Use the vertical **slider bar** and/or the **"+"** and **"–"** buttons below the slider to make adjustments to this setting. The current focus setting will be indicated above the **slider bar**.
 ***Zoom***  ***Digital Zoom Buttons***	Press the **Zoom** button to access lens optical zoom adjustment (if available). Use the vertical **slider bar** and/or the **"+"** and **"–"** buttons below the slider to make adjustments to this setting. Note that the higher the zoom percentage is, the larger the image will appear. The current zoom setting will be indicated above the **slider bar**. **NOTE:** Optical zoom functionality is not available on all systems. To digitally zoom in on previewed or captured images, use the **Digital Zoom Buttons** (**"+"** and **"–"**) located to the right of the active image. Tap and drag to move around on the zoomed-in image.
 ***Aperture***	Press the **Aperture** button to access lens aperture adjustment. Use the vertical **slider bar** and/or the **"+"** and **"–"** buttons to make adjustments to this setting. Note that the lower the aperture setting (the lower the f-number), the more light will pass through to the camera's sensor. The current aperture setting will be indicated above the **slider bar**.
 ***Capture Mode***	Press the **Capture Mode** button to access exposure time adjustment for live image preview and capture, as well as to select modes for image capture. Use the vertical **slider bars** and/or the **"+"** and **"–"** buttons to make adjustments to the desired portion of the exposure time (**min**, **sec**, **ms** or **microseconds**). To adjust capture modes, select the desired mode from the drop-down menu. Capture modes include:

- **Manual Exposure:** Captures one (or more) images with a pre-selected exposure time.
- **Auto Exposure:** Captures an image with an ideal exposure time determined automatically by the system prior to image capture. (**NOTE**: When using the Auto Exposure function, any exposure time settings made by the user prior to image capture will be changed.)

  After selecting **Auto Exposure**, select from one of the following image acquisition settings:

  1. **Best (Longer Exposure)** exposes the image to the maximum value of the histogram (65,000 gray levels).
  2. **Better** exposes to fill the histogram 50% so the brightest portion of the image is at 32,000 gray levels.
  3. **Good** exposes to fill the histogram to 25% or 16,000 gray levels.
  4. **Minimum (Fast Exposure)** exposes to fill the histogram to 10% over background. Minimum and Good settings are particularly useful for chemiluminescent imaging applications and allow for quicker image capture overall.
- **Sequential – Constant Time:** Select the number of frames to be captured as well as the total image capture time, and the software will automatically capture the desired number of frames with evenly divided exposure times.
- **Sequential – Variable Time:** Captures sequential images with user-selectable exposure times per image. For example, capture one image at 300ms exposure, immediately followed by another image captured at 200ms exposure, and so forth.

  Click **"+"** to add a new interval. Tap to edit each time block (Min, Sec, Ms and Micro) as needed, then use the on-screen keyboard to make edits. Or, use the dropdown menu to select from several pre-defined interval sets for specific applications.
- **Image Integration – Continuous:** Captures multiple images at a desired exposure time and continually "stacks" the images, compensating for low-light limitations. *Image Integration - Continuous* will continue image acquisition and "stacking" until the user stops the image capture.
- **Image Integration – Automatic:** Similar to *Image Integration - Continuous*, except the software automatically stops image capture and "stacking" when the ideal level of saturation has been achieved.

Select the **Number of Frames** to be captured during *Manual Exposure* and *Sequential – Constant Time* image capture modes. Use the **"+"** and **"–"** buttons to select the desired number of frames.

 ***Histogram***	Press the **Histogram** button to access image histogram adjustment. Use the pointers on the vertical **slider bar** to make adjustments to this setting. Slide the top marker down to darken the image, or slide the bottom marker up to lighten the image. Push the "Reset" button to reset the markers to the top and bottom of the slider bar, showing the image's full histogram range. Turn **Auto Adjust** on to automatically adjust the image histogram for ideal imaging results. **Note:** When a color image is present, the histogram menu will show three separate slider bars, allowing histogram settings for red, green and blue channels. **NOTE:** Histogram settings also apply to the Gallery view, discussed later in this manual.
 ***Binning/Interpolation***	Press the **Binning/Interpolation** button to access image binning and interpolation adjustment options. Binning is the process of combining multiple image pixels into one larger pixel. For example, 2x2 binning combines a two-by-two area of pixels (four pixels all together) into one large pixel, 4x4 binning combines a four-by-four area of pixels (sixteen pixels all together) into one large pixel, and so forth. This process shortens the image preview and capture process when increased sensitivity is needed, and also aids the camera's sensor in capturing and displaying more image signal in low-light situations (such as in chemiluminescence applications). The disadvantage of binning is an overall reduction of resolution, as the effective image pixel area is exponentially reduced as binning is increased. Select a higher **Preview Binning** to increase the preview frame rate and make sample previewing faster. Preview binning will not affect the captured image. (**Note**: Preview binning is only available on chemi-capable systems.) Select a higher **Capture Binning** to decrease image capture time or to acquire more image signal in the same amount of time, especially in low light situations. Note that increased capture binning will decrease the overall pixel resolution of the captured image. (**Note**: Capture binning is set to 1x1, thus no binning, by default.) Depending upon system model, image **Interpolation** settings may also be found in the **Capture Binning** dropdown menu. By utilizing advanced algorithms integrated into the TS2 software, Interpolation effectively increases an image's resolution beyond the camera's native resolution. To activate image interpolation, select the desired interpolated resolution from the **Capture Binning** dropdown menu.

 ***Saturation Warning***	Turn on **Saturation Warning** to provide a bright yellow or red image overlay on oversaturated areas of the image during Live Preview. Yellow indicates mild overexposure while red indicates extreme overexposure. To capture an ideally exposed image, decrease the aperture or exposure time until the yellow or red overlay disappears. To activate saturation warning, press the **Saturation Warning** slider until the check mark appears.
 ***Action***	Press the **Template Action** button to select which action the TS2 Imager will take when a template is selected. Available actions include: • **Start Capture:** When a template includes this Action, all system settings will be adjusted according to the template and then the image will automatically be captured. • **Start Preview:** When a template includes this Action, all system settings will be adjusted according to the template and an image preview will automatically be shown. • **Do Nothing:** When a template includes this Action, all system settings will be adjusted according to the template; no image preview or capture will occur.
 ***Done*** and ***Save***	After all template settings have been made, press the **Done** (checkmark) button. Then, to save the selected settings as a template for future use, press the **Save** (disk) icon. A window will appear prompting the user to enter a template name using the on-screen keyboard. After the name has been entered, press the **Checkmark** button to accept the name or the **"X"** button to cancel.
 ***"Gallery" Tab***	To access the photo gallery, press to select the **Gallery** tab. Once active, select the desired image from the top of the Gallery screen.
 ***Open Image***	To open a previously-saved image, press the **Open Image** button. Pressing this button will open the Windows file/folder navigation screen. Select the desired file and press **Open**.

 ***Gallery Navigation***	Use the **Gallery Navigation** buttons to navigate through the image gallery. When multiple "pages" of images appear in the gallery: • Press **Previous** to go to the previous page. • Press **Next** to go to the next page. • Press **Last** to go to the newest picture in the Gallery. • Press **Active** to go to the active image shown on the main image screen.
  ***Maximize*** ***Minimize***	When an image is open in the Gallery, press the **Maximize** button to show the image in full-screen mode. Press the **Minimize** button to close full-screen mode.
 ***Close***	Press the **Close** button to the right of the image to close the active image. If the image is unsaved, the user will be prompted to save the image before closing.
 ***Information***	Press the "**i**" **(Information**) button to view information pertaining to the open image. Information includes exposure time, illumination, focus and aperture settings. Press the "**i**" button again to close the image information screen. **NOTE:** Image information is only available for images captured using the TS2 Imager.
 ***Digital Zoom Buttons***	Use the **"+"** and **"–"** buttons located to the right of the active image to digitally zoom in or out on Gallery images. Tap and drag to move around on the zoomed-in image.

 ***Save Burned***  ***Save***	Press the **Save Burned** button to save the image with all modifications (such as time stamp and histogram modifications) embedded in the image. Or, press the **Save** button to save the raw image without any modifications embedded. Images will be saved to the location specified in **Preferences**. The file name is automatically assigned by the software as **yyyy-mm-dd_hh-mm-ss**, with "yyyy-mm-dd" being the date of image capture and "hh-mm-ss" being the time of image capture. **NOTE**: To manually change the file name when saving an image, select **Prompt for Location** under the **Saving** tab in **Settings** prior to saving. Then, each time the a save button is pressed, the user will be prompted to select a file save location and can enter a custom file name. **NOTE:** If **Save Selected & Original Formats** is selected in the **Settings** menu (described earlier in this manual) and the **Save** button is pressed, both the Selected & Original formats will be saved. However, if the **Save Burned** button is pressed, only the selected format will be saved.
 ***Print***	Press the **Print** button to print the current image on the default printer. If a default printer is not installed, pressing the **Print** button will place the print request in queue.
 ***Histogram***	See the **Histogram** section in the **Acquisition** portion of this manual for information on using the histogram in Gallery view.
 ***Time Stamp***	To add a date stamp to the captured image, press the **Time Stamp** button, then press the slider until the check mark appears. This will add **mmm/dd/yyyy hh:mm:ss** to the bottom right corner of the image. **NOTE:** The time stamp is not saved to the image unless **Save Burned** is selected (as described earlier in this manual).
 ***Pseudocolor*** *and* ***Invert***	Press the **Pseudocolor** button to access a variety of Pseudocolor options for captured images. Pseudocolor options include **in vivo**, **oversaturation** (shows yellow to indicate mild overexposure and red to indicate extreme overexposure), **yellow**, **red**, **green** and **blue**. Press the appropriate radio button to select the desired pseudocolor. Press the **Invert** button to access image inversion selection. Under **Invert**, touch the slider until the check mark appears to activate image inversion. **NOTE:** Pseudocolors and image inversion are not saved to the image unless **Save Burned** is selected (as described earlier in this manual).

 ***"Compositing" Tab***	To access image compositing tools, press to select the **Compositing** tab. Copositing tools include Fluorescent, Merge and Chemiluminescent. Press to select the desired compositing tool once the **Compositing** tab has been selected.
 ***Fluorescent Compositing Tool***	The **Fluorescent Compositing Tool** is used to merge various fluorescently-colored channels into one image. To use this tool, first open two or three images in the gray area (gallery bar) below the "Compositing" tab. Drag the base/primary image from the gallery bar to the "Drag image here" Base Image area. Then, drag one or two overlay images to the second and third "Drag image here" boxes. The base and overlay images' histogram, pseudocolor and inversion attributes can be adjusted to create the ideal composited image. To do so, select the desired image to be adjusted by pressing it. A black outline will surround the selected image. Then, use the **Histogram**, **Pseudocolor** and **Invert** tools on the left side of the screen to modify the image(s) and Preview composited image as desired. Use the percentage tool to the right of the overlay image(s) to determine the intensity of the overlay image(s) in the final composited image. Note that the percentage shown pertains to the saturation levels in the overlay image(s). Therefore, as higher percentages are selected, only pixels with higher saturation levels will be shown in the final composited image. For example, if 65% is selected, only pixels with over 65% saturation in the overlay image will be shown in the final composited image. Once the ideal composited image has been created, press the **Checkmark** button below the Preview composited image to complete fluorescent compositing.
 ***Merge Compositing Tool***	The **Merge Compositing Tool** is used to merge up to three different images, pulling a specific color channel (red, green or blue) from each image. This tool is useful for multiplexing applications. The **Merge Compositing Tool** consists of three gray rectangles where images can be placed (each rectangle states "Drag image here"). The color channel to be pulled from the image in each box is shown in the colored bar below the gray box (red on top, green in the middle, and blue on the bottom). To use this tool, first open two or three images in the gray area (gallery bar) below the "Compositing" tab. Depending upon the desired color to be composited, drag an image from the gallery bar to the "Drag image here" area. Each image's histogram, pseudocolor and inversion attributes can be adjusted to create the ideal composited image. To do so, select the desired image to be adjusted by pressing it. A black outline will surround the selected image. Then, use the **Histogram**, **Pseudocolor** and **Invert** tools on the left side of the screen to modify the image(s) and the Preview composited image as desired.

	Once the ideal composited image has been created, press the **Checkmark** button below the Preview composited image to complete fluorescent compositing.
 ***Chemiluminescent Compositing Tool***	The **Chemiluminescent Compositing Tool** is used to merge various image channels for chemiluminescent imaging. This tool functions exactly the same as the **Fluorescent Compositing Tool** described earlier, except that the middle overlay image will always automatically be inverted. This is ideal for chemiluminescent white light overlays. For more information on using this tool, see the **Fluorescent Compositing Tool** as described earlier in this manual.
 ***Minimize*** and ***Close***	Press the **Minimize** ("_") button in the upper-right corner of the screen to minimize the TS2 Software. Press the **Close** ("**X**") button in the upper-right corner of the screen to close the TS2 Software. If any unsaved images are open prior to closing the TS2 software, the user will be prompted to choose one of the following: 1. Save the current image 2. Not save the current image 3. Cancel closing the software 4. Save none of the images 5. Save all images The user will also be prompted to **Save Selected Format** or **Save Selected & Original Formats**. See the "Preferences" section of this manual for more information.

Using Templates

The TS2 Imagers are capable of utilizing templates to recall pre-saved systems settings for repeat experiments. An unlimited number of templates can be saved in the system, with up to five quick-access templates available at the top of the main system screen for easy access.

To create a template:

1. Set the various system settings (lens settings, lighting, filters, etc.) as desired following the instructions shown in the **Identifying the Touch Screen Buttons and Functions** section of this manual.

2. Once all desired settings have been selected, press **Done** at the bottom left of the screen. A summary of all settings will be shown. Then, press **Save** to save the template:

    a. For new templates, a popup will appear requesting for the template to be assigned a name.

    b. For existing templates, the keyboard will appear with the template name shown. The user can then accept the current name by pressing the **Checkmark** button, enter a new template name then press the **Checkmark** button, or press the **"X"** button to cancel saving.

3. To access saved templates, press the **Templates** button as shown: 

4. To select the quick-access templates to be shown at the top of the TS2 screen, press the **Templates** button until the list of saved templates is shown. Then, drag the template to the desired quick-access position.

To run a template, either:

1. Select the desired template from the **Templates** menu by pressing the gray check box icon to the right of the template name, or

2. Select the template from the quick-access area.

Once the template is selected, all template settings and actions will automatically be performed on the system.

A template is active when the template button shows white letters on a purple background. A template is inactive when black letters are shown on a gray background.

To edit a template name, press the gray pencil icon to the right of the template name in the list of saved templates. The template settings will be shown. Press the pencil icon in the upper-left corner of the screen to the left of the template name. An on-screen keyboard will appear. Use the keyboard to enter the desired template name. Press the **Checkmark** button to accept the revised name, or press the **"X"** button to cancel.

To delete a template, press the gray trash can icon to the right of the template name.

To disregard a template and enter settings and actions manually, press the **Manual Input** button located at the top right of the software:

Connecting to a Network

The TS2 Imagers have built-in network capability, both wired and wireless. While it is fairly simple to connect the system to a network, it is highly recommend to obtain assistance from a network administrator to ensure that the process is completed properly.

Follow Microsoft or local standard network protocols for network configuration. To minimize the TS2 Software interface and access Microsoft Windows for network configuration, press the **Minimize** ("_") button in the upper-right corner of the software.

Installing Drivers or Additional Software

In the event that additional drivers or software must be installed on the system, exit the TS2 Software interface and access Microsoft Windows by pressing the **Close** ("**X**") button located in the upper-right corner of the main TS2 screen.

To install drivers or additional software, copy the software to an external storage device, open Windows Explorer, navigate to the appropriate folder and run the desired program.

Service Procedures

Return Procedure

A **Returned Goods Authorization (RGA)** number must be obtained from UVP Customer Service before returning any product.

Replacement Parts and Accessories

To order accessories or replacement parts for the GelDoc-It^{TS2} and ChemiDoc-It^{TS2} Imagers, contact UVP's offices.

Part Description	Part Number
Epi UV Modules:	
UV Module, 254/365nm, 4 watt (115V)	95-0021-12 (Qty. 2 Recommended)
UV Module, 254/365nm, 4 watt (230V)	95-0021-10 (Qty. 2 Recommended)
Fuses:	
Fuse, 3.15A (for Darkroom)	56-0022-04 (Qty. 2 Required)
Fuse, 2A (for Transilluminators)	56-0002-01 (Qty. 2 Required)
Emission Filters:	
Filter, Ethidium Bromide, 50mm Square	38-0220-01
Filter, SYBR Green, 50mm Square	38-0219-01
Filter, SYBR Gold, 50mm Square	38-0221-01
Transillumination Accessories:	
LED White Light Plate	95-0476-01
White Light Converter Plate, 21x26cm	38-0191-01
Visi-Blue Converter Plate, 21x26cm	38-0200-01
Gel Accessories:	
Gel-Cutter	85-0002-01
Gel-Ruler	85-0003-01
Gel-Scooper	85-0006-01
Gel-Tray, small	85-0007-01
Gel-Sentry DNA Preparation Plate	97-0076-01
Fluorescent Standard Step Tablet	33-0014-02
Protective Equipment:	
Spectacles, UV Blocking (UVC-303)	98-0002-01
Goggles, UV Blocking (UVC-503)	98-0002-02
Faceshield, UV Blocking (UVC-803)	98-0002-04

Troubleshooting

No Power to the Darkroom or Transilluminator

1. Recheck the main power cord connection to the GelDoc-It^{TS2}/ChemiDoc-It^{TS2} darkroom as well as the power cables between the darkroom and transilluminator, LED White Light Plate or optional epi UV modules.
2. Check the fuses located at the back of the unit next to the power port. A small flat-head screwdriver or similar tool is required. Push the bottom tab of the fuseholder up until the bottom of the fuseholder pops out. Then, push the top tab down until the top pops out. The entire fuseholder can now be removed.

Inspect the thin wire within each glass fuse to see if there is a break in the wire. If so, replace the fuse(s). If fuses are blowing repeatedly, contact UVP Technical Support for additional troubleshooting.

Transilluminator Will Not Turn On

1. In addition to turning on "UV transillumination" in the **Lighting** menu within the TS2 Software, the transilluminator itself has a power switch. Make sure that the green transilluminator power switch, located on the front of the transilluminator, is in the **ON** position.
2. For UV protection and to extend the life of the UV transilluminator, the system incorporates a customizable transilluminator shutoff timer built into the software. For additional information, refer to the **Lighting** section of this manual.

Error Messages Appear on the Screen

1. An error message that is related to the TS2 software interface or Microsoft Windows may appear on the screen. If the message is related to Microsoft Windows, such as a reminder to activate or update the copy of Windows, please contact your system administrator for assistance.
2. If an error message appears repeatedly and your system administrator does not recognize it as a Microsoft Windows error, contact UVP Technical Support for further assistance.

Care and Cleaning

Use only mild soap or detergent solution for cleaning the GelDoc-It^{TS2}/ChemiDoc-It^{TS2}. Do NOT use oil- or petroleum-based cleaners for the cabinet. Ensure that the system is turned **OFF** and unplugged during cleaning.

When cleaning the transilluminator surface, use a damp soft cloth or sponge. Never use abrasive cleaners which can damage the UV filter surface.

Technical Support

UVP offers free lifetime technical support on all of its products and software. Should you have any questions regarding the product's use, operation or repair, contact UVP's offices at the locations below, or visit www.uvp.com.

If you are in North America, South America, East Asia or Australia:	**If you are in Europe, Africa, the Middle East of Western Asia:**
Call (800) 452-6788 or (909) 946-3197, and ask for **Customer Service** during regular business days, between 7:00 am and 5:00 pm, PST.	**Call +44(0) 1223-420022**, and ask for **Customer Service** during regular business days between 9:00 am and 5:30 pm.
E-mail your message to: info@uvp.com	**E-mail** your message to: uvp@uvp.co.uk
Fax Customer Service, and send it to **(909) 946-3597**	**Fax** Customer Service, and send it to: **+44(0) 1223-420561**
Write to: UVP, LLC 2066 W. 11th Street, Upland, CA 91786 USA	**Write to**: **Ultra-Violet Products Ltd** Unit 1, Trinity Hall Farm Estate, Nuffield Road, Cambridge CB4 1TG UK