



# ***Eyeppearance*** **(V4.0)**



**Model 820  
Video  
Photometer**



**Model 810A  
Appearance  
Measurement  
System**



**Model 810B  
Reference Manual**



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Alternate (1) \_\_\_\_\_

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Note: Superscript 810B indicates the control is used only with the 810A chamber.



## **INTRODUCTION**

Congratulations, you now own the most powerful, easy to use, affordable video photometric system ever. EYEPPEARANCE is used in several different products for different uses. This is the major reason TRICOR can offer this package at such a low cost. EYEPPEARANCE can be used by the novice yet flexible and power enough to meet the demanding requirements of the most demanding engineers.

This manual is written for owners of both Model 810A, Model 810B and Model 820. Throughout this manual any reference containing the superscript 810 refers to owner of the Model 810A and/or 810B only.

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# SECTION 1

## Button Descriptions

### 1.1 Main Panel



Figure 1.1.1 Main Panel with sample image

**File** – A collection of functions allowing the user to load and save image and other data. The user can also print the current image header.

**File – Load** – A collection of functions allowing retrieval of information stored on disk storage.

**File – Load - Image** – Retrieves an image from disk storage. The program will retrieve two binary files. One file contains the image itself (.bmp or .tif). The other file contains the header information regarding the image (.hd1). If *both* files are not found the image will not load.

**File - Load - ROI** – Retrieves a Region Of Interest (ROI) file from disk storage. The program will retrieve two files. One file (binary) contains the image itself (.bmp or .tif). The other file (ASCII text) contains the header information regarding the region of interest (.ri1). If *both* files are not found the image will not load.

**File - Load - Production Configuration (PRODUCTION UPGRADE)** – Retrieves a Production configuration file (.pr1) from disk storage. The file (binary) contains the production specs for each of the Quick Test buttons.





## Button Descriptions (cont'd)

### 1.1 Main Panel (cont'd)

**File – Save** – A collection of functions allowing storage of information to disk storage for later retrieval.

**File – Save - Image** – Writes an image to disk storage for later retrieval. Two files are saved. (for more information on the file types see “File - Load Image”).

**File – Save - Production Configuration (PRODUCTION UPGRADE)** – Writes the production configuration for later retrieval (for more information on file types see "File - Load - Production")

**File – Save - ROI** – Writes image ROI to disk storage for later retrieval.. Two files are saved. (for more information on the file types see “File - Load - Image” or “File – Load - ROI”).

**File – Export** – A collection of data export functions.

**File – Export - Current Region Pixel Values (ANALYSIS UPGRADE)** – Exports absolute pixel values for the currently selected region. The export data file is ASCII text (.txt).

**File – Print Image Header** – Prints out the currently selected image header data.

**File – Exit** – Exit the application.

**View – Configurations** – Initiates a small panel that contains the current Hardware and Software configuration file names. Selecting this item will toggle the panel on and off.

**Locator! (LOCATOR UPGRADE)** – Initiates a panel used to control all aspects of the Locator capabilities.

**Calibration** – A collection of functions used for calibration purposes.



## Button Descriptions (cont'd)

### 1.1 Main Panel (cont'd)

**Calibration – System<sup>810B</sup>** – Initiates a panel used to calibrate the chamber to current conditions.

**Calibration – Falloff** – Not Implemented.

**Calibration – Assistant (CALIBRATION UPGRADE)** – Initiates a panel used to assist in the creation of a new calibration file.

**Acquire!** – Initiates a panel used for general image acquisition.

**Tools** – A collection of functions used for direct manipulation of an image.

**Tools – Filters** – Initiates a panel containing a collection of kernels used to filter the currently displayed image.

**Tools – Region of Interest** – Initiates a panel containing the region of interest group names. The user can enable/disable any regions for exclusive processing.

**Tools – Toolbox** – Initiates a panel containing drawing tools for ROI specification.

**Tools – Histogram** – A collection of functions which include display and/or manipulation of histogram data.

**Tools – Histogram – Classification** – Initiates a panel containing statistical classification tools. This panel allows printouts, pseudo color enhancements, multi-image analysis and graphical histogram representation

**Tools – Histogram – WindowGrouping** – Initiates a panel containing statistical calculations, histogram, and histogram summary of the data within the currently defined ROI or entire frame. This panel also allows printouts and pseudo color enhancements.



## Button Descriptions (cont'd)

### 1.1 Main Panel (cont'd)

**Tools – Falloff Correction** – Initiates a panel used to specify the type of falloff correction.

**Analysis (ANALYSIS UPGRADE)** – A collection of additional analysis functions.

**Analysis – Difference** – Generates an absolute difference image between two specified image channels.

**Analysis – Profile** – Generates a profile graph of a selected image section.

**Analysis – Contour 3D** – Initiates a panel used to show a 3 dimensional graph/plot of a small selected area within an image.

**Production (PRODUCTION UPGRADE)** – A collection of functions used for the production environment. This is only available with the optional upgrade package.

**Production – Quick Test** – Initiates a panel used to quick production testing.

**About** – Initiates a panel containing Version information, a legal statement and the current operational codes. The codes are listed below. Each code is binary. See figure 1.1.2.

#### Operational Codes

- |    |                               |                            |
|----|-------------------------------|----------------------------|
| 1. | Demonstration Software Only   | (1 = Enabled 0 = Disabled) |
| 2. | Production Upgrade            | (1 = Enabled 0 = Disabled) |
| 3. | Additional Analysis Upgrade   | (1 = Enabled 0 = Disabled) |
| 4. | Calibration Assistant Upgrade | (1 = Enabled 0 = Disabled) |
| 5. | Automatic Shutter Control     | (1 = Enabled 0 = Disabled) |
| 6. | Locator Upgrade               | (1 = Enabled 0 = Disabled) |
| 7. | Reserved                      |                            |
| 8. | Reserved                      |                            |



## Button Descriptions (cont'd)

### 1.1 Main Panel (cont'd)

**EYEPPEARANCE** (label) – double click to see the current software version #, copyright warning, and operational codes.



Figure 1.1.2 Version Dialog Box

**Hardware** (button) – Initiates a panel containing a number of tabs representing specific hardware configuration parameters. Loading, Saving & Printing are also capabilities of this panel.

**Software** (button) – Initiates a panel containing a number of tabs representing specific software configuration parameters. Loading, Saving & Printing are also capabilities of this panel.

**Image** (button) – Initiates a panel containing a number of tabs representing specific header information about the currently displayed image.

**Live / No Live** (button) – Allows the user to toggle between live and no image on the panel display.

**Channel button** – Allows the user to “change channels” or view different displayed images.

**Power** (button) – Allows the user to exit the program. A green color indicates the program is actively running.

**Filename** (text) – This text is centered immediately above the displayed image. It contains drive, path and filename with extension.

**Status and ROI** (text) – This text is centered immediately below the displayed image. It will give general messages such as # of active Regions Of Interests (ROI).



## Button Descriptions (cont'd)

### 1.2 Acquire Panel

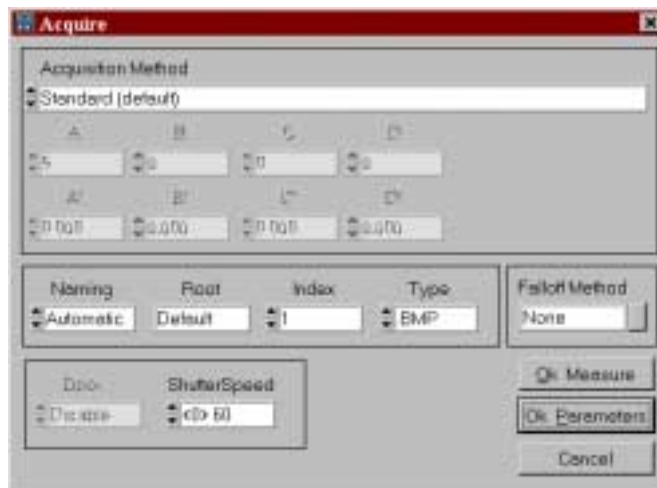


Figure 1.2.1 Acquire Panel

**Acquisition Method** – Specifies the method in which a final image is to be obtained.

1. **Standard (default)** – A basic image acquisition from a video source.
2. **Build #1** – Specify the number of individual acquisitions needed to build a final image. The acquisitions are done in the center of the field of view. If the scales are set properly A' will instruct the user how far to move the scene for each image.
3. **Build #2** – This build algorithm allows the user to specify the number of individual acquisitions required to build a final image. Parameters B & C specify the starting and ending row #'s to extract from each individual iteration.
4. **Build-By-Rows** – Do not use this option.

**Naming** – Allows the user to enable/disable the ability to automatically name the files with a "Root" name followed by an index with a file extension type defined in "Type". Example: Root="Default", Index=1, Type=".bmp", results in a filename of "Default1.bmp" for the first image and will increment the index on each subsequent measurement. The names will be coded with the date and time of the measurement when this feature is turned off.



## Button Descriptions (cont'd)

### 1.2 Acquire Panel (cont'd)

**Root** – Allows the user to specify the root portion of the naming feature.

**Index** – Allows the user to specify an index counter used in the naming feature.

**Type** – Allows the user to specify a file type used in the naming feature.

**Door<sup>810A</sup>** – Allows the user to specify the state in which the door is to be left *after* the measurement is completed. There is also a selection to disable the door in which the door is *not* opened or closed during the measurement sequence.

**ShutterSpeed** – Allows the user to specify a specific shutter speed to use or auto mode instructs the system to determine the proper shutter speed. Auto mode only works with 810A or Model 820 with the Automatic shutter controller option.

**Falloff – Method** – Displays the falloff correction method to be used during the next acquisition.

**Falloff – Method (button)** – Initiates a panel which allows the user to specify the falloff correction desired.

**OK – Measure** – Initiates an image acquisition and returns control back to the main panel and saves configuration information for later use.

**OK – Parameters (button)** – Returns control back to the main panel *and* saves any configuration changes for later use.

**Cancel (button)** – Returns control back to the main panel *without* saving any configuration changes.



## Button Descriptions (cont'd)

### 1.3 Filter / Convolutions Panel<sup>810A</sup>

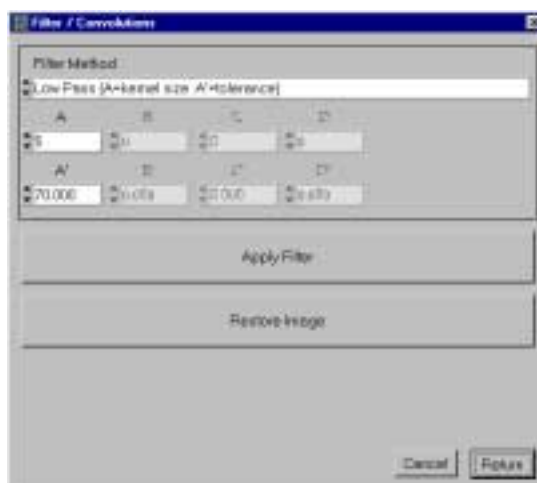


Figure 1.3.1 Filter / Convolutions Panel

**Filter Method** – Selection of the type of kernel or filter to use.

**A, B, C, D** – Generic integer parameters used for specifying characteristics of filters.

**A', B', C', D'** – Generic floating point parameters used for specifying characteristics of filters.

**Apply Filter** (button) – Used to perform the filtering operation on the currently displayed image.

**Restore Image** (button) – Used to restore the image to the state at which is was when entering the panel.

**Cancel** (button) – Returns control back to the main panel *without* saving any configuration changes.

**Return** (button) – Returns control back to the main panel *and* saves any configuration changes.



## Button Descriptions (cont'd)

### 1.4 Window Grouping Panel

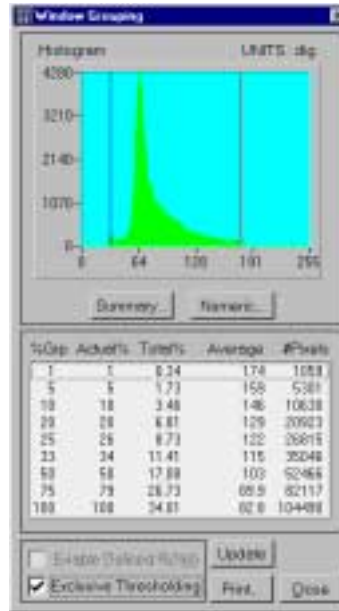


Figure 1.4.1 Window Grouping Panel

**Histogram** (graph) – This displays the histogram in graphical form. The blue & red vertical lines represent the Minimum & Maximum threshold values respectively. By grabbing these bars and moving them will allow you to coarsely adjust these threshold values. The vertical axis represents numbers of pixels. The horizontal axis represents the brightness scale in the currently selected units.





## Button Descriptions (cont'd)

### 1.4 Window Grouping Panel (cont'd)

**Profile** (listbox) – The listbox contains the 9 group sizes and the average pixel value within each of the user defined groups.

- % Grp - User defined % group sizes (% of the brightest pixels within the threshold limits (exclusively))
- Actual % - The closest % group size Attainable
- Total % - The group size based off the Total region of interest within the threshold limits (inclusive).  
(Count/Total # of pixels) x 100.
- Average - The average pixel value within each group in the currently selected brightness units within the threshold limits (inclusively).
- # Pixels - The # of pixels between the threshold values (inclusively).

**Enable Defined ROI(s)** (checkbox) – Enables exclusive Region of Interest, false coloring calculations, and exclusive histogram draws.

**Exclusive Thresholding** (checkbox) – Enables the histogram to be drawn exclusively between the lower and upper threshold limit bars.

**Update** (button) – Used to update the contents in the panel to any new draws. If there is no new draws than this button should not be pressed or you will lose the coordinate of the last ROI drawn.

**Print** (button) – Generate a hardcopy printout of the measurement results.

**Close** (button) – Return control back to main panel.



## Button Descriptions (cont'd)

### 1.4 Window Grouping Panel (cont'd)

**Numeric . . .** (button) – This will display a new panel (figure 1.4.2) contains the exact numerical histogram values. A histogram is the number of samples at every individual digital value.



Figure 1.4.2 Numeric Histogram Display

**Numeric . . . – Histogram Values** (listbox) – The listbox contains three columns of data. Column #1 represents the index (0-255) or digital level. The center column represents the brightness at every digital level in currently selected brightness units. The rightmost column represents the actual number of pixels present at every digital level. By left clicking on any row within this list box will identify the actual pixels by enhancing them green. If the “Enable Defined ROI(s)” checkbox is enabled then the histogram of the active ROI’s will be exclusively displayed in list.

**Summary . . .** (button) – This will display a new panel (figure 1.4.3) which contains a summary of the current histogram.



Figure 1.4.3 Histogram Summary



## Button Descriptions (cont'd)

### 1.4 Window Grouping Panel (cont'd)

**Summary . . .** (button) – **Histo Report** (text box) – A summary of the histogram, within the threshold limits (inclusively), for a full display as well as a selected ROI (Region Of Interest). The actual terms are described below...

Min = Minimum pixel value

Max = Maximum pixel value

Start = Starting histogram value (x-axis)

Int = Interval between each histogram bar

Mean = Statistical average

Sdev = Standard deviation of the histogram data

#Pix = Total number of pixels within the histogram

Tool = The last selected tool used in the image

Up- Left is the X & Y coordinate of the upper left corner of the ROI

Low – Rt is the X & Y coordinate of the lower right corner of the ROI



## Button Descriptions (cont'd)

### 1.5 Histogram Classification Panel

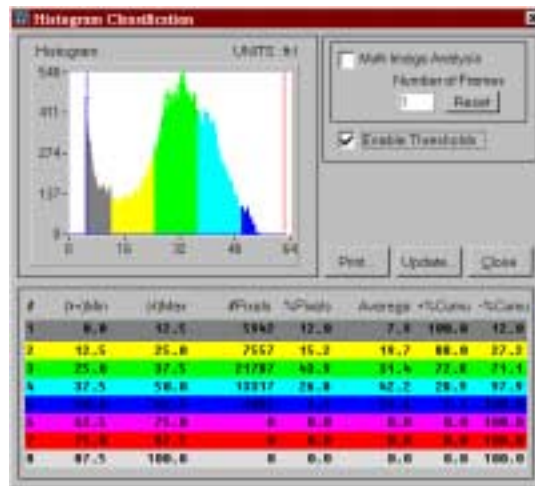


Figure 1.5.1 Histogram Classification Panel

**Histogram** (graph) – Graphical display of the image or region of interest histogram. The vertical axis represents numbers of pixels. The horizontal axis represents the brightness scale in currently selected units.

**Statistics Summary** (listbox) –

- (>=) min - Starting group brightness value (inclusive).
- (<) max - Ending group brightness value (exclusive).
- # pixels - # of pixels within a group
- % pixels - % of pixels within the group compared to all groups.
- Average - The average brightness of pixels within a group.
- +% Cumu. - The % pixels with this group and all groups brighter than this group compared to all groups.
- % Cumu. - The % pixels with this group and all groups darker than this group compared to all groups.

**Print** (button) – Generates a hardcopy output of these statistics.

**Update . . .** (button) – Forces an update to the current statistics. While in Multi-Image analysis mode update will increase the amount of data by another image worth.



## Button Descriptions (cont'd)

### 1.5 Histogram Classification Panel (Cont'd)

**Close** (button) – Return control back to main panel.

**Enable Thresholds** (checkbox) – Enables the current thresholds to be used which disregards all data outside the threshold limits.

**Multi Image Analysis** (checkbox) – Enable Multi Image Analysis. MIA is the ability of this function to accumulate data from multiple image(s) and summarize the calculated data. Every time the update button is pressed new data is added to the MIA.

**Number of Frames** (text) – Display the number of frames that have been accumulated into the summary results.

**Reset** (button) – Resets MIA to 0 frames.



## Button Descriptions (cont'd)

### 1.6 Falloff Correction

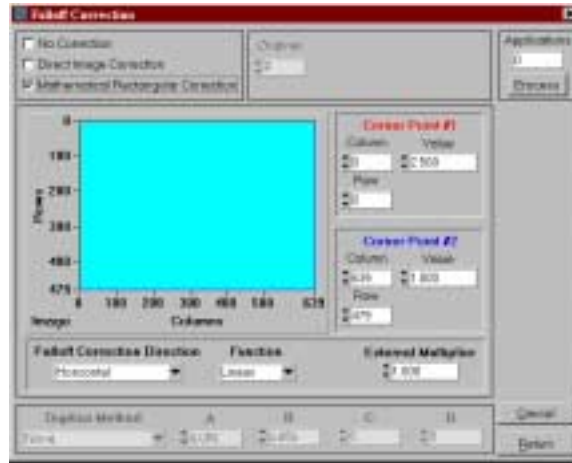


Figure 1.6.1 Falloff Correction Panel

**No Correction** (checkbox) – Disables image falloff correction.

**Direct Image Correction** (checkbox) – Uses an image as a direct pixel to pixel correction. When this option is enabled, a Channel must be specified to the location of the falloff image.

**Mathematical Rectangular Correction** (checkbox) – This allows a linear falloff correction to be applied according to the specifications shown below.

**Applications** (text) – Displays the number of times the current image has been corrected.

**Process** (button) – Apply the current falloff method to the active image channel.

**Graph** (graph) – Represents the image plane. Left clicking inside allows placement of corners 1 and 2.

**Falloff Correction Direction** (pulldown menu) – This specifies the correction direction. Horizontal, Vertical or Both.

**Function** (pulldown menu) – This specifies the type of Mathematical correction to be applied.



## Button Descriptions (cont'd)

### 1.6 Falloff Correction (Cont'd)

**External Multiplier** (numeric) – Specifies the multiplication factor applied to the image outside the selected region of correction.

**Digitize Method** (pulldown menu) – Not implemented.

**A** (numeric) – Not implemented.

**B** (numeric) – Not implemented.

**C** (numeric) – Not implemented.

**D** (numeric) – Not implemented.

**Corner Point #1** – Represented by the red graphical crosshairs. This is one of the 2 points required to define a rectangular region of correction.

**Column #1** (numeric) – Column location of red crosshair.

**Row #1** (numeric) – Row location of red crosshair.

**Column – Value** (numeric) – Multiplication factor applied at that end of the image column (horizontal correction only).

**Row – Value** (numeric) – Multiplication factor applied at the end of the image row (vertical correction only).

**Corner Point #2** – Represented by the blue graphical crosshairs. This is one of the 2 points required to define a rectangular region of correction.

**Column #2** (numeric) – Column location of blue crosshair.

**Row #2** (numeric) – Row location of blue crosshair.

**Column – Value** (numeric) – Multiplication factor applied at that end of the image column (horizontal correction only).

**Row – Value** (numeric) – Multiplication factor applied at the end of the image row (vertical correction only).

Note: The multiplication value factors will always normalize the smaller value to 1.0.



## **Button Descriptions (cont'd)**

### **1.7 Hardware Panel**

**Status** (text) – The hardware data structure's version number. The current data status is also displayed.

**Current Configuration** (text) – The hardware configuration file name.

**Load . . .** (button) – Used to load a specific hardware configuration file from disk storage.

**Save . . .** (button) – Used to save the current hardware configuration to disk storage.

**Print . . .** (button) – Generate a hardcopy printout of the current hardware configuration.

**Active Camera** – Selects which camera number to use. Each camera number contains its own set of hardware parameters. Users with one camera can only use camera #0.

**Cancel** (button) – Do not accept any changes made in the hardware configuration and return to main panel.

**Ok** (button) – Accept all changes made in the hardware configuration and return to main panel.





## Button Descriptions (cont'd)

### 1.7 Hardware Panel (Cont'd)

**Illumination** (tab) – This tab contains all hardware specifications regarding the illumination hardware configuration.

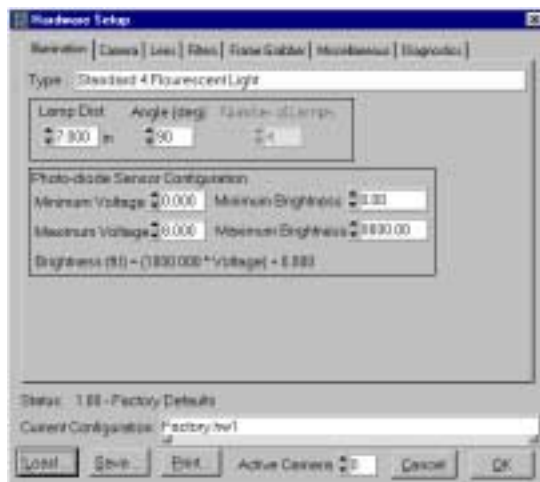


Figure 1.7.1 Hardware Setup Panel w/Illumination Tab Active

**Illumination – Type** – A description of the light source.

**Illumination – Lamp Dist.** – The distance of the lamp to the center of the field of view.

**Illumination – Angle** – The angle of the light source to the sample surface.

**Illumination – Number of Lamps** – The number of individual lamps.

**Illumination – Minimum Voltage**<sup>810B</sup> – A minimum voltage reading from a lamp.

**Illumination – Maximum Voltage**<sup>810B</sup> – A maximum voltage reading from a lamp.

**Illumination – Minimum Brightness**<sup>810B</sup> – A minimum brightness at the minimum voltage for a lamp. This describes the linear relationship of voltage to brightness. Brightness units MUST ALWAYS BE FOOT-LAMBERTS!



## Button Descriptions (cont'd)

### 1.7 Hardware Panel (cont'd)

**Illumination – Maximum Brightness<sup>810B</sup>** – A maximum brightness at the maximum voltage for a lamp. This describes the linear relationship of voltage to brightness. Brightness units MUST ALWAYS BE FOOT-LAMBERTS!

**Camera (tab)** – This tab contains all hardware specifications regarding the camera hardware configuration.

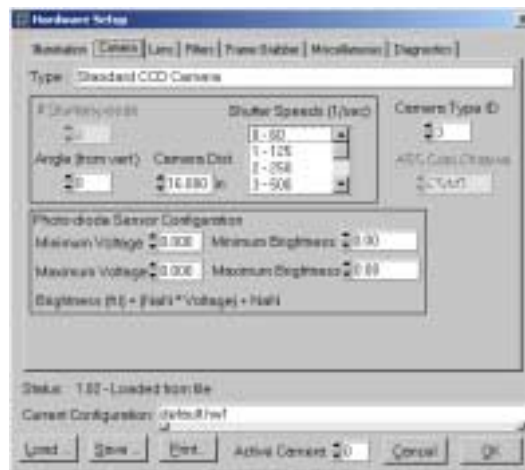


Figure 1.7.2 Hardware Setup Panel w/Camera Tab Active

**Camera – Type (Read Only)** – A description of the camera.

**Camera – # Shutter speeds (Read Only)** – The number of programmable shutter speeds of the camera.

**Camera – Angle** – The angle of the camera measured from the vertical direction.

**Camera – Camera Dist.** – The distance of the camera to the center of the field of view.

**Camera – Shutter Speeds (listbox)** – The available shutter speeds. Double click will temporarily set the camera to the selected shutter speed.



## Button Descriptions (cont'd)

### 1.7 Hardware Panel (cont'd)

**Camera – Minimum Voltage<sup>810B</sup>** – A minimum voltage reading from the cal photodiode.

**Camera – Minimum Brightness<sup>810B</sup>** – A maximum voltage reading from the cal photodiode.

**Camera – Minimum Brightness<sup>810B</sup>** – A minimum brightness at the minimum voltage for the cal photodiode. This will describe the linear relationship of voltage to brightness. Brightness units MUST ALWAYS BE FOOT-LAMBERTS!

**Camera – Maximum Brightness<sup>810B</sup>** – A maximum brightness at the maximum voltage for the cal photodiode. This will describe the linear relationship of voltage to brightness. Brightness units MUST ALWAYS BE FOOT-LAMBERTS!

**Camera – Camera Type ID** – Identifies a specific type of camera. Changing this parameter will automatically load the proper shutterspeeds and number of shutterspeeds available with that camera.

Standard CCD Camera . . . . . ID # 3

Standard Progressive CCD Camera . . . . . ID # 4

**Camera – ASC Com Channel** – Identifies the Com port to be used with the optional Automatic Shutter Control.



## Button Descriptions (cont'd)

### 1.7 Hardware Panel (cont'd)

**Lens** (tab) – This tab contains all hardware specifications regarding the lens hardware configuration.



Figure 1.7.3 Hardware Setup Panel w/Lens Tab Active

**Lens – Type** – A description of the lens.

**Lens – Focal Length** – The focal length of the lens in millimeters.

**Lens – F-Stop** – F-Stop setting on the lens. Changing this value will affect absolute calibration values for new image acquires.



## Button Descriptions (cont'd)

### 1.7 Hardware Panel (cont'd)

**Filters** (tab) – This tab contains all hardware specifications regarding the filters hardware configuration.



Figure 1.7.4 Hardware Setup Panel w/Filters Tab Active

**Filters – Number of Color Filters** – The number of spectral filters being used. This does not include any neutral density filters.

**Filters – Type of Color Filters** – A description of each of the spectral filters being used.

**Filters – Replace Text String** - (button) - This button is used to replace a currently selected description with the text contained in the lower text box.

**Filters – Neutral Density (% Transmission)** – The transmission value of the neutral density filters being used. This will changed the current calibration curves according to the changes in the neutral density filter.

**Photopic Filter ID #** – This identifies the specific photopic filter currently being used. This filter is located at the front end of the lens. This must be correct in order to assure the proper spectral response curve.



## Button Descriptions (cont'd)

### 1.7 Hardware Panel (cont'd)

**Frame Grabber** (tab) – This tab contains all hardware specifications regarding the frame grabber hardware configuration. Only experienced users should changed the values from the factory default. Consult the factory when changing these values.



Figure 1.7.5 Hardware Setup Panel w/Frame Grabber Tab Active

**Frame Grabber – Type** – A description of the frame grabber.

**Frame Grabber – # Columns** – Number of columns available in the frame grabber.

**Frame Grabber – # Rows** – Number of rows available in the frame grabber.

**Frame Grabber – Left** – The leftmost column to use in the image acquisition.

**Frame Grabber – Top** – The topmost column to use in the image acquisition.

**Frame Grabber – Total Gain** – The frame grabber gain value. This will alter absolute calibration data.

**Frame Grabber – Offset** – The frame grabber offset value. This will alter absolute calibration data and should not be changed.



## Button Descriptions (cont'd)

### 1.7 Hardware Panel (cont'd)

**Frame Grabber – Trigger Enable (checkbox)** – Enables the trigger input to be used when acquiring an image. Do not enable unless a trigger is connected.

**Miscellaneous (tab)** – This tab contains all hardware specifications regarding miscellaneous hardware configuration.

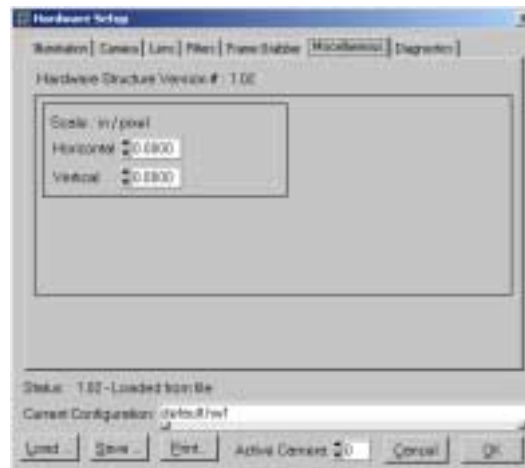


Figure 1.7.6 Hardware Panel w/Miscellaneous Tab Active

**Miscellaneous – Hardware Structure Version #** - The version number of the hardware configuration data structure.

**Miscellaneous – Scale** – The units of the following scale terms.

**Horizontal** – Represents the flat horizontal pixel size. This scale is assumed to be consistent across the field.

**Vertical** – Represents the flat vertical pixel size. This scale is assumed to be consistent across the field.



## Button Descriptions (cont'd)

### 1.7 Hardware Panel (cont'd)

**Diagnostics** (tab) – This tab contains a means to test the hardware directly for diagnostic purposes.

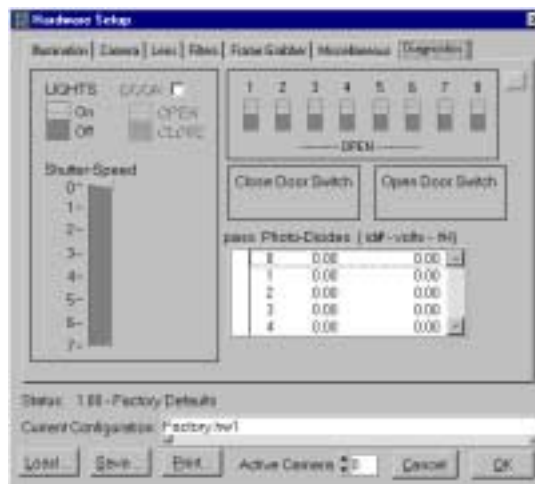


Figure 1.7.7 Hardware Setup w/Diagnostics Tab Active

**Diagnostics – Lights<sup>810B</sup>** (switch) – Used to turn the lights on and off.

**Diagnostics – Door<sup>810B</sup>** (switch) – Used to open and close the chamber door.

**Diagnostic – Door<sup>810B</sup>** (checkbox) – Enables use of the motorized chamber door (optional hardware).

**Diagnostics – Shutter-Speed** (slide switch)– Used to temporarily change the current shutter speed of the camera.

**Diagnostics – Dip Switch<sup>810B</sup>** (buttons) – Indicator only showing the current setting of the dip switches on the chamber interface board.

**Diagnostics – Close Door Switch<sup>810B</sup>** (text) – Used to describe the state of the closed door limit switch. If open indicates the door is NOT fully closed.

**Diagnostics – Open Door Switch<sup>810B</sup>** (text) – Used to describe the state of the open door limit switch. If open indicates the door is NOT fully opened.





## Button Descriptions (cont'd)

### 1.7 Hardware Panel (cont'd)

**Diagnostics – Photo Diodes<sup>810B</sup>** (listbox) – This listbox contains the current voltage and equivalent brightness values being read by the photodiodes. Identification numbers 0 thru 3. Identification # 4 is the calibration photo-diode.

**Diagnostics – Red LED** (indicator) – Red indicates when the hardware is being polled.



## **Button Descriptions (cont'd)**

### **1.8 Software Panel**

**Status** (text) – The software data structure's version number. The current data status is also displayed.

**Current Configuration** (text) – The software configuration file name.

**Load . . .** (button) – Used to load a specific software configuration file from disk storage.

**Save . . .** (button) – Used to save the current software configuration to disk storage.

**Print . . .** (button) – Generate a hardcopy printout of the current software configuration.

**Active Camera ID#** – Selects which camera number to use. Each camera number contains its own set of software parameters. Users with one camera can only use camera #0.

**Cancel** (button) – Do not accept any changes made in the software configuration and return to main panel.

**Ok** (button) – Accept all changes made in the software configuration and return to main panel.



## Button Descriptions (cont'd)

### 1.8 Software Panel (cont'd)

**Calibration** (tab) – This tab contains all software specifications regarding calibration configuration.



Figure 1.8.1 Software Setup Panel w/Calibration Tab Active

**Calibration – Calibration File...** (button) – This allows the user to load a predefined calibration curve.

**Calibration – Falloff** (button) – (not implemented)

**Calibration – Falloff** (checkbox) – (not implemented)

**Calibration – Speed** – Camera speed used at calibration time.

**Calibration – FStop** – Lens F-Stop at calibration time.

**Calibration – ND** – Neutral Density transmission value used at calibration time.



## Button Descriptions (cont'd)

### 1.8 Software Panel (cont'd)

**Calibration – Gain** – The total gain setting on the frame grabber at calibration time.

**Calibration – Offset** – The offset setting on the frame grabber at calibration time.

**Calibration – Lamp<sup>810B</sup>** (button) – Used to display the lamp specification panel.



Figure 1.8.2 Lamp Performance Panel

**Calibration – Absolute<sup>810B</sup>** (button) – This will display a panel that shows the current absolute calibration value. This is the result of changing a neutral density filter and/or lens f-stop and/or camera shutter speed and/or frame grabber gain and offset and/or Color Correction Factor and/or Color Correction Offset.

Digital	#f	Relative
0	0.00	0
1	1.00	0
2	2.00	0
3	3.00	0
4	4.00	0
5	5.00	1
6	6.00	1
7	7.00	1
8	8.00	1
9	9.00	2

Figure 1.8.3 Current Absolute Calibration List Panel



## Button Descriptions (cont'd)

### 1.8 Software Panel (cont'd)

**Calibration – Calibration** (listbox) – This listbox contains the current calibration transform from digital level to absolute brightness to relative values.

**Calibration – NFrames**<sup>810A</sup> – The number of frames to average at acquisition time for calibration.

**Calibration – Flare ACO** – Flare Light Absolute Compensation Offset allows the user to offset the calibration curve with a constant in order to compensate for extraneous flare light. Most cases this value should be 0.

**Calibration – CCF** – Color Correction Factor allows the user to multiply the calibration curve by a factor. Generally, this is used to correct for non-ideal system photopic response. It can also be used to correlate calibrate to another device.

**Calibration – CCF** (button) – Color Correction Factor Assistant is used to assist the user in determining the color correction factor based off many factors.

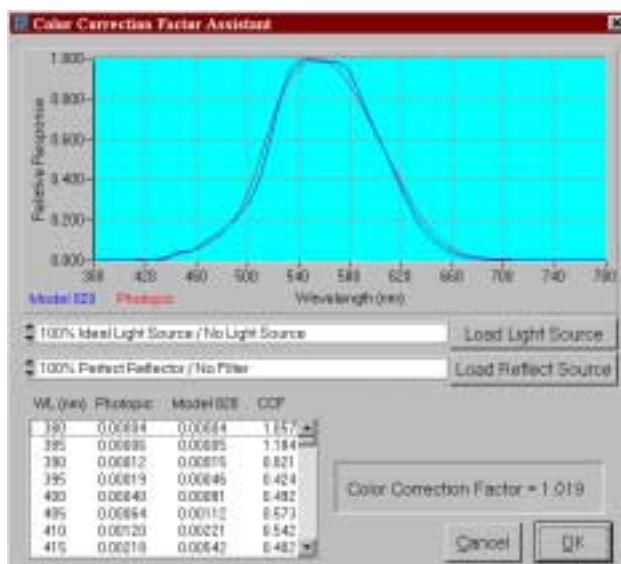


Figure 1.8.4 Color Correction Factors Assistant Panel



## Button Descriptions (cont'd)

### 1.8 Software Panel (cont'd)

**Color Correction Assistant – Relative Response** (graph) – This graph represents the systems spectral response characteristics. The 'Blue' graph represents the Model 820 system. The 'Red' graph represents the ideal photopic curve.

**Color Correction Assistant – Illuminant** (pulldown) – Allows the user to select the type of illuminant being used. There is a number of standard sources to choose from. The user can also select a user specific file that is loaded using the "Load Light Source" button.

**Color Correction Assistant – Load Light Source** (button) – Allows the user to load user supplied/created spectral curves representing the illuminant/source. (See Appendix C for file format details).

**Color Correction Assistant – Reflector/Filter** (pulldown) – Allows the user to select the type of reflectance or illuminant filtering spectral curves. (See Appendix C for file format details).

**Color Correction Assistant – Load Reflect Source** (button) – Allows the user to load user supplied/created spectral curves representing the reflectance spectral curves. (See Appendix C for file format details).

**Color Correction Assistant – Response Curve** (listbox) – This listbox contains 5nm wavelength bands across the photic region. It contains the photopic response, the Model 820 response and the CCF for every 5nm band.

**Color Correction Assistant – Color Correction Factor** (text) – Contains the Color Correction Factor (CCF) for the conditions chosen with the illuminant type, reflectance type and the filter id (found in the Hardware - Filter section).

**Color Correction Assistant – Cancel** (button) – This closes the window and returns control back to the Software Calibration window without accepting the proposed Color Correction.



## Button Descriptions (cont'd)

### 1.8 Software Panel (cont'd)

**Color Correction Assistant – OK** (button) – This closes the window and returns control back to the Software - Calibration window after accepting the current CCF. This new value should be updated in the Software - Calibration window.

**Calibration – Left** – The leftmost column used to define a ROI to calibrate within. Consult factory before changing this value.

**Calibration – Top** – The topmost row used to define a ROI to calibrate within. Consult factory before changing this value.

**Calibration – Width** – The width of the rectangular ROI to calibrate within. Consult factory before changing this value.

**Calibration – Height** – The height of the rectangular ROI to calibrate within. Consult factory before changing this value.

**Calibration – InLUT** (listbox)– The input Look Up Table to the frame grabber.

**Calibration – Camera ID#** – The camera id # of the currently selected camera.



## Button Descriptions (cont'd)

### 1.8 Software Panel (cont'd)

**Units** (tab) – This tab contains all software specifications regarding the operating units.



Figure 1.8.5 Software Setup Panel w/Units Tab Active

**Units – Linear Units** – The linear units to use throughout the application.

**Units – Brightness Units** – The brightness units to use throughout the application. DIGITAL units is simply the digital value ranging from 0 to 255 for an 8 bit image. Relative is a scale based on the shutter speed of the camera. If a shutter speed of 1/500 seconds shutter speed is used than the scale range is from 0 to 500. Ft-Lambert and Candle/sq. meter are absolute brightness scales.





## Button Descriptions (cont'd)

### 1.8 Software Panel (cont'd)

**Image** (tab) – This tab contains all software specifications regarding the image generation and threshold values.



Figure 1.8.6 Software Setup Panel w/Image Tab Active

**Image – Lower Threshold – Absolute Level** – This is the lower threshold value (inclusive) used in any measurement routines. This is used if NOT using digital units. Any pixels darker than this value are NOT included in any calculations.

**Image – Upper Threshold – Absolute Level** – This is the upper threshold value (inclusive) used in any measurement routines. This is used if NOT using digital units. Any pixels brighter than this value are NOT included in any calculations.

**Image – Lower Threshold – Digital Level** – This is the lower threshold value (inclusive) used in any measurement routines. This is used if using digital units. Any pixels darker than this value are NOT included in any calculations.

**Image – Upper Threshold – Digital Level** – This is the upper threshold value (inclusive) used in any measurement routines. This is used if using digital units. Any pixels brighter than this value are NOT included in any calculations.



## **Button Descriptions (cont'd)**

### **1.8 Software Panel (cont'd)**

**Image – Falloff Method** – The type of falloff method currently being used.

**Image – Falloff Method – Channel** – The channel number containing the falloff image when using "Direct Image Correction" method.

**Image – Falloff Method – Details** – Initiates a panel which allows the user to specify the falloff correction desired.

**Image – Height** – The final image height (rows). Consult factory before changing this value.

**Image – Width** – The final image width (columns). Consult factory before changing this value.

**Image – Border** – The border around the image for filter processing only (pixels). Consult factory before changing this value.

**Image – NFrames** – The number of frames to average in order to create a final image.

**Image – Sat. Pixels** – The number of acceptable saturated pixels when using the automatic shutterspeed option.

**Image – Camera ID#** - The active camera number.



## Button Descriptions (cont'd)

### 1.8 Software Panel (cont'd)

**Misc. (tab)** – This tab contains miscellaneous software specifications.

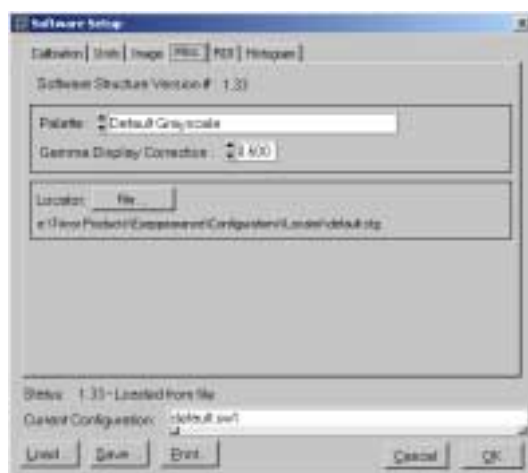


Figure 1.8.7 Software Setup Panel w/Misc. Tab Active

**Misc. – Software Structure Version #** - The version of the software data structure.



## Button Descriptions (cont'd)

### 1.8 Software Panel (cont'd)

**Misc. – Palette** – This allows the user to select the type of display palette.

1. Default Grayscale – Normal grayscale display with gamma correction.
2. Negative Grayscale – Negative "Default Grayscale".
3. Blue – Green – Red ( $\leq$   $\geq$  Threshold Values) – Pixels less than the lower threshold are Blue. Pixels greater than the upper threshold are Red. All other pixels are green.
4. Six Color ( $\geq$   $\leq$  Threshold Values) – Grayscale between the lower and upper thresholds are divided into six equal division. Each division is given a unique color (violet, blue, cyan, green, yellow, red). Grayscale above and below the upper and lower thresholds is maintained.
5. Six Color + BBW ( $\geq$   $\leq$  Threshold Values) – Grayscale between the lower and upper thresholds are divided into six equal division. Each division is given a unique color (violet, blue, cyan, green, yellow, red). In addition pixels less than lower threshold are black. Pixels greater than upper threshold are white.
6. Rainbow – Full scale color from blue to red.
7. Gradient – Full scale color from dark red to light blue.
8. Red Grayscale – Full scale red from dark to light.
9. Green Grayscale – Full scale green from dark to light.
10. Blue Grayscale – Full scale blue from dark to light.
11. Histogram Classification Colors – Colors will match the histogram classification specifications.
12. Custom Palette – Allows custom specification of up to 9 color bands for each of the Brightness Units.

**Misc – Gamma Display Correction** – Used to gamma correct the display image in order to see more details on the display. This DOES NOT affect the actual value, but only the presentation of the grayscale. If no correction is desired then a value of 1.00 is required.

**Misc – Locator – File (button) (LOCATOR UPGRADE)** – Used to specify the default locator configuration file.



## Button Descriptions (cont'd)

### 1.8 Software Panel (cont'd)

**ROI (tab)** – This tab contains settings regarding the use of Regions of Interest.

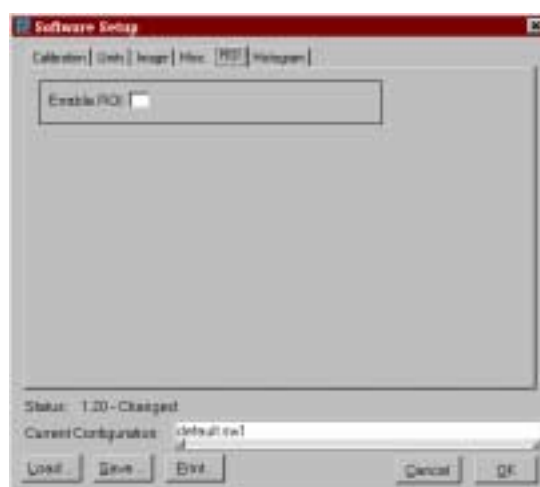


Figure 1.8.8 Software Setup Panel w/ROI Tab Active

**ROI – Enable ROI** – This checkbox enables use of the Region of Interest file groups.



## Button Descriptions (cont'd)

### 1.8 Software Panel (cont'd)

**Histogram** (tab) – This tab contains settings regarding the use of the histogram tools.

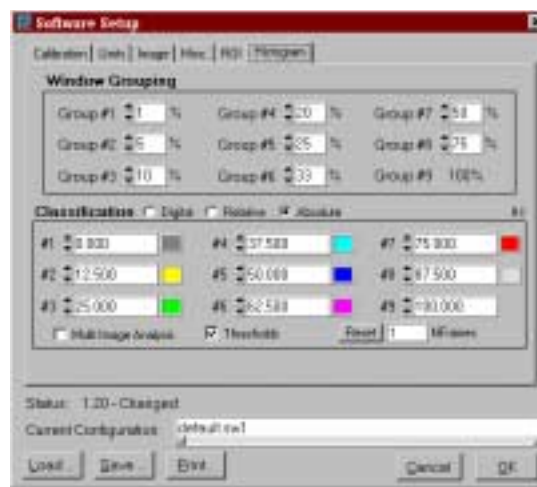


Figure 1.8.9 Software Setup Panel w/Histogram Tab Active

**Histogram – Group #1** – Group size of group number 1. For group processing routines. This values must be in ascending order only.

**Histogram – Group #2** – Group size of group number 2. For group processing routines. . This values must be in ascending order only.

**Histogram – Group #3** – Group size of group number 3. For group processing routines. . This values must be in ascending order only.

**Histogram – Group #4** – Group size of group number 4. For group processing routines. . This values must be in ascending order only.

**Histogram – Group #5** – Group size of group number 5. For group processing routines. . This values must be in ascending order only.

**Histogram – Group #6** – Group size of group number 6. For group processing routines. . This values must be in ascending order only.



## Button Descriptions (cont'd)

### 1.8 Software Panel (cont'd)

**Histogram – Group #7** – Group size of group number 7. For group processing routines. . This values must be in ascending order only.

**Histogram – Group #8** – Group size of group number 8. For group processing routines. . This values must be in ascending order only.

**Histogram – Group #9** – Group size of group number 9. For group processing routines. This value cannot be changed from 100%.

**Histogram – Classification – Units** – "Digital", "Relative" and "Absolute" will allow the user to specify different group boundaries based on the type of units selected.

**Histogram – Classification #1 thru #9** – This describes the start and end points for each of the classification groups. For example, #1 and #2 represent the minimum and maximum classification group #1 respectively. #2 and #3 represent the minimum and maximum classification group #2 respectively etc.

**Histogram – Classification – #1 thru #9 (colors)** – Allows colors to the specified for each group. This color will be seen on the histogram and the image alike.

**Histogram – Classification – Multi Image Analysis (checkbox)** – Selects histogram classification multi image capability. "NFrames" describe the # of image(s) used to generate the current statistics.

**Histogram – Classification – Threshold (checkbox)** – Enables/Disables use of threshold limits.

**Histogram – Classification – Reset (button)** – Resets the classification statistics. This is used when using Multi Image Analysis.



## Button Descriptions (cont'd)

### 1.8.1 Custom Palette Panel

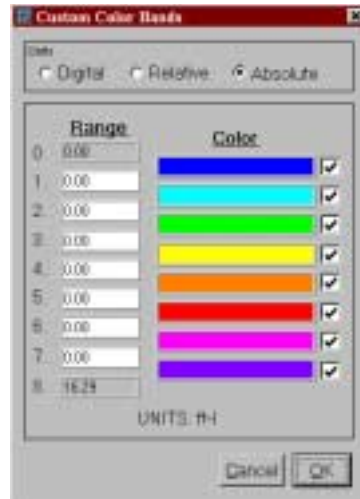


Figure 1.8.10 Palette

**Units (Radio Buttons)** – These radio buttons allows the user to select the different brightness units in order to specify range values and palette color each range.

**Enable (Check boxes)** – Enables false coloring of the range immediately to the left of the box.

**Range Values (Text Boxes)** – The user will type in the start and stop (or min and max) of each of the ranges. The false coloring will be done from the top range down to the bottom range. Therefore if there is an overlap of range values the lower range will "overwrite" to upper ranges. The range values are determined by the Units Radio Buttons. The software actually stores range values for all unit types.

**Color Swatch (Color select)** – Allows visual selection of colors for each range.

**Cancel (button)** – Returns control back to the software panel without saving any settings.

**OK (button)** – Returns control back to the software panel after saving all settings.





## Button Descriptions (cont'd)

### 1.9 Image Panel

**Image** (tab) – This tab contains all the calibration, hardware & software settings of the system at calibration time.

**Image – Width** – see Software Image Panel Definition.

**Image – Height** - see Software Image Panel Definition.

**Image – Border** - see Software Image Panel Definition.

**Image – NFrames** - see Software Image Panel Definition.

**Image – SatPixels** - see Software Image Panel Definition.

**Image – Override Image Calibration . . . (button)** - Load an absolute calibration file in order to override the images absolute values.

**Camera** (tab) – This tab contains the camera specifications regarding the currently displayed image.

**Camera – Type** – see Hardware Camera Panel Definition.

**Camera – ShutterSpeed** - see Hardware Camera Panel Definition.

**Camera – Diode Slope** - see Hardware Camera Panel Definition.

**Camera – Diode Y-Intercept** - see Hardware Camera Panel Definition.

**Camera – Angle** - see Hardware Camera Panel Definition.

**Camera – Camera Distance** - see Hardware Camera Panel Definition.

**Frame Grabber** (tab) – This tab contains the image specifications regarding the currently displayed image.

**Frame Grabber – Type** – see Hardware Frame Grabber Panel Definition.



## **Button Descriptions (cont'd)**

### **1.9 Image Panel (cont'd)**

**Frame Grabber – Left** - see Hardware Frame Grabber Panel Definition.

**Frame Grabber – Top** - see Hardware Frame Grabber Panel Definition.

**Frame Grabber – Total Gain** - see Software Frame Calibration Definition.

**Frame Grabber – Offset** - see Software Frame Calibration Definition.

**Filters** (tab) – This tab contains the spectral filter specifications regarding the currently displayed image.

**Filters – Type of Color Filters** (listbox) – see Hardware Filters Panel Definition.

**Filters – Number of Filters** – see Hardware Filters Panel Definition.

**Filters – Neutral Density Transmission** - see Hardware Filters Panel Definition.

**Illumination** (tab) – This tab contains the illumination specifications regarding the currently displayed image.

**Illumination – Type** – see Hardware Illumination Panel Definition

**Illumination – Lamp Distance** - see Hardware Illumination Panel Definition

**Illumination – Angle** - see Hardware Illumination Panel Definition

**Illumination – Number of Lamps** - see Hardware Illumination Panel Definition

**Illumination – Diode Values** - see Hardware Illumination Panel Definition

**Illumination – Diode Slope** - see Hardware Illumination Panel Definition



## Button Descriptions (cont'd)

### 1.9 Image Panel (cont'd)

**Illumination – Diode Y Intercept** - see Hardware Illumination Panel Definition

**Illumination – Mask Code** – (not implemented) always 0.

**Lens** (tab) – This tab contains the lens specifications regarding the currently displayed image.

**Lens – Type** – see Hardware Lens Panel Definition

**Lens – Focal Length** – see Hardware Lens Panel Definition

**Lens – F Stop** – see Hardware Lens Panel Definition

**Miscellaneous** (tab) – This tab contains miscellaneous information regarding the currently displayed image.

**Miscellaneous – Version** – Image header data structure version #.

**Miscellaneous – Hardware Structure Version #** – see Hardware Panel Definitions

**Miscellaneous – Software Structure Version #** – see Software Panel Definitions

**Miscellaneous – Image Structure Version #** – file image header structure version #.

**Miscellaneous – Date** – Date of acquisition

**Miscellaneous – Time** – Time of acquisition.

**Miscellaneous – Scale** – see Hardware Miscellaneous Panel Definition



## Button Descriptions (cont'd)

### 1.10 Region Of Interest Panel

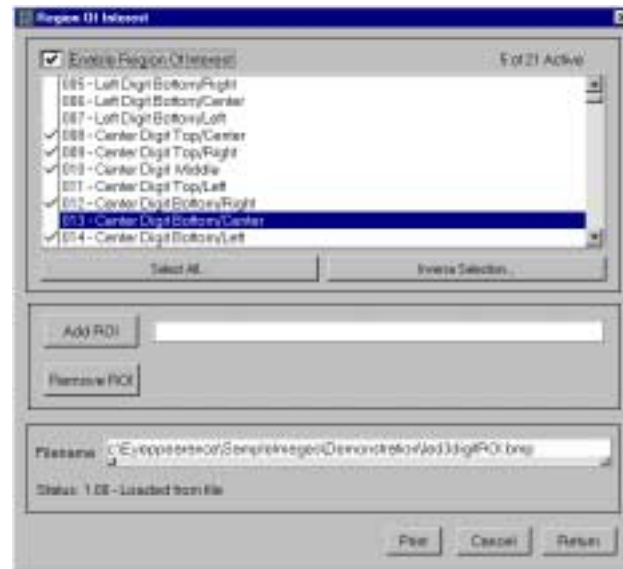


Figure 1.10.1 Region of Interest Panel

**Enable Region Of Interest** (checkbox) – Enables Region of interest processing.

**Region Of Interest List** (listbox) – This listbox contains a list of all defined region of interests. The region of interests are loaded by using the main menu File-Load-ROI selection. Any combination of regions can be enabled by clicking on the row/region of interest. The upper right corner above the listbox will always show the current number of active and total regions.

**Select All . . .** (button) – Automatically enables all regions.

**Inverse Selection . . .** (button) – Automatically reverses the enable flag on every region.

**Add ROI** (button) – Will add an ROI into the region of interest list at the point where the listbox selection bar is located. If there is already an ROI defined at the location then the text will be overwritten with the new text. Prior to pressing this button, the region of interest description text should be entered. The text field is located immediately to the right of this button.



## Button Descriptions (cont'd)

### 1.10 Region Of Interest Panel (cont'd)

**Remove ROI** (button) – Removes the ROI that is currently selected in the Region Of Interest listbox.

**Filename** (textbox) – Displays the name (with path and extension) of the currently loaded ROI.

**Status** (text) – Text describes the ROI version number. This text also describes the current status of the ROI file.

**Print** (button) – Print a list of the current ROI list as well as each regions status. (See HARDCOPY PRINTOUT section).

**Cancel** (button) – Cancels this panel without implementing any changes done within this panel.

**Return** (button) – Returns control back to the main panel after implementing all changes initiated in this panel.



## Button Descriptions (cont'd)

### 1.11 Tools Panel



Figure 1.11.1 Tools Panel

**Line Tool** (Row 1, Column 1) – Allows the user to select a line region by left clicking on the image and hold down and drag to size the line. Releasing the button, will complete the selection process.

**Rectangle Tool** (Row 1, Column 2) – Allows the user to select a rectangular region by left clicking on the image and hold down and drag to size the rectangle. Releasing the button, will complete the selection process.

**Ellipse Tool** (Row 1, Column 3) – Allows the user to select a elliptical region of interest by left clicking on the image and hold down and drag to size the ellipse. Releasing the button, will complete the selection process.

**Polygon Tool** (Row 2, Column 1) – Allows a user to select a region with a closed polygon shape. A polygon is closed curve made up of line segments. Drawing is completed by clicking back on the first point drawn.

**Freehand Tool** (Row 2, Column 2) – Allows a user to select a region with a freehand drawing tool. A region is drawn by left clicking and holding down in order to draw. Release the button when the region is drawn. Keep in mind that the start point is connected to the end point with a straight line.

**Magnifying Tool** (Row 2, Column 3) – This allows the user to perform a digital zoom. Left click on the point of interest in the image to zoom in on that point. Each click will zoom in 2x. Hold the shift button on the keyboard while clicking will allow the user to unzoom the image.



## Button Descriptions (cont'd)

### 1.11 Tools Panel (cont'd)

**Eyedropper** (Row 3) – This row describes the pixel value at the location of the cursor point. This value is an integer and may lack the precision that you require.

**X: Y:** (Row 4 & 5) – These two rows describe the current location of the cursor over the image. The upper left corner has the coordinates of  $X = 0$ ,  $Y = 0$ .

**Anchor X: Y:** (Row 6 & 7) – These rows only exist during actual drawing of the regions. These values describe the location of the first point dropped during basic region selection on the last point dropped during complex region selection.

**Relative X: Y:** (Row 8 & 9) – These rows only exist during actual drawing of the regions. These values describe the pixel offset from the previously selected location. Positive X is in the right direction while Positive Y is in the downward direction.

Note: Any loaded ROI file must be disabled for these drawing tools to work.



## Button Descriptions (cont'd)

### 1.12 Production (Production Upgrade)



Figure 1.12.1 Production Panel

#### 1.12.1 Quick Test

This allows the Eyeppearance software to be configured in up to a different configuration by simply pressing a button. Also, after pressing the button a measurement is automatically made and results updated in a window. This is ideal for a production/test mode.





## Button Descriptions (cont'd)

### 1.12.2 Button Configuration



Figure 1.12.2 Production Switch Parameters Panel

Configuration of the appearance or looks of a button as well as its functionality is done by right clicking on each of the buttons. Figure 1.10.2 is the parameter entry panel.

**Panel Header** – Text description displayed at the top of the production panel.

**Switch Label** – Text description displayed within each button.

**Color** – Color selection and displayed allows color selection of a button.

**HW File** – Loads the appropriate hardware configuration file to be used when this button is pressed.

**SW File** – Loads the appropriate software configuration file to be used when this button is pressed.

**Cancel** – Cancel all changes and exit.

**OK** – Accept all changes and exit.

After completing all the button configuration(s) you must save this configuration. Select File - Save - Production to save the production configuration file for later retrieval.

This panel can now be used to quickly, easily and repeatedly measure parts in a production environment.



## Button Descriptions (cont'd)

### 1.13 Analysis (Analysis Upgrade)

A group of functions allowing a user additional analysis tools. This is available as an optional software upgrade.

#### 1.13.1 Difference

Calculates a difference image. A difference image is simply 1 image subtracted from another. The values in the resultant image represents the absolute value of the difference between each pair of pixels at a given location. The units generated are in the currently selected brightness units.

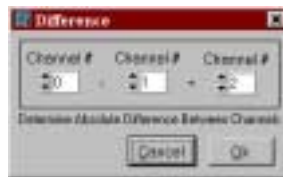


Figure 1.13.1 Difference Panel

**Channel #** – Specify the locations of the images to be used in the subtraction. The final channel # located at the right is the location of the resultant image.

**Cancel** – Aborts any operations and returns to the main panel.

**OK** – Accepts inputs and proceeds with the operation. The current channel will change to the location of the resultant image. Control will be transferred back to the main menu.



## Button Descriptions (cont'd)

### 1.13.2 Profile

Provides graphical and tabular data for pixel values along a linear line. The preferred tool for this operation is a "line", however, any drawing tool can be used. The line used will ALWAYS be from the upper left corner to the lower right corner of a bounding rectangle when a linear line tool is NOT used. If no tools are used then the line is from the upper left corner to the lower right corner of the entire image. Graph is immediately update after as drawing event to the image. This function only works with the drawing tools.

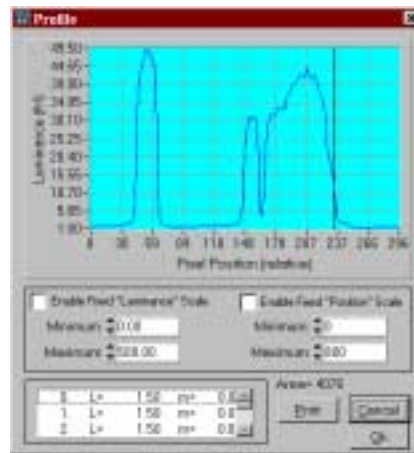


Figure 1.13.2 Profile Panel

**Graph** – A graphical representation of the pixel data long the line. The X axis is the position data. The Y axis is the Luminance axis in the currently selected brightness units.

**Enable Fixed "Luminance" Scale** – The checkbox enables/disables direct control of the luminance axis. When checked, it uses the minimum and maximum values found directly below this control.

**Minimum** – Sets the minimum luminance value in the graph.

**Maximum** – Sets the maximum luminance value in the graph.

**Enable Fixed "Position" Scale** – This checkbox enables/disables direct control of the position axis. When checked, it uses the minimum and maximum values found directly below this control.



## **Button Descriptions (cont'd)**

### **1.13.2 Profile (cont'd)**

**Minimum** – Sets the minimum position value in the graph.

**Maximum** – Sets the maximum position value in the graph.

**Listbox** – Displays the tabular data of the graph starting with position 0. "L" represents the luminance value at that pixel position. "M" represents the slope of the curve at that pixel position based on the immediate neighbors of that pixel. Selecting a list item will highlight that row in the listbox and identify that position in the graph by moving a vertical line cursor at that position.

**Area** – This is a relative measure of the area under the graph.

**Print** – Prints a hardcopy of the graph and tabular data.

**Cancel** – Return to the main menu.

**OK** – Return to main menu.



## Button Descriptions (cont'd)

### 1.13.3 Contour 3D

This graph image data in a 3-dimensional contour plot. The limit of this control varies. The control is capable of handling large datasets; however, it seems impractical for sizes over 200 pixels in length or height, since the computer processor becomes quite taxed. The data that is analyzed is contained within the bounding rectangle around a selected region of interest. This function only works with the drawing tools.

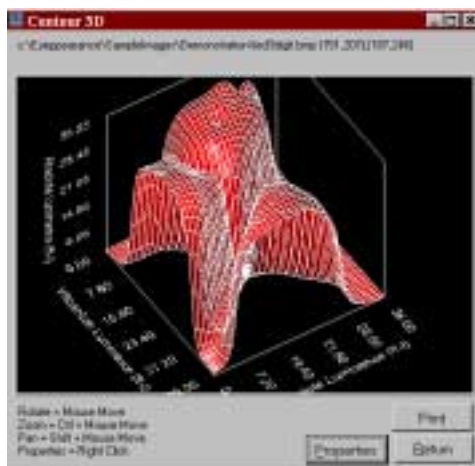


Figure 1.13.2 Profile Panel

**Graph** – Represent the 3-dimensional plot of the selected data.

**Title** – Located above the graph is the name and path of the filename. Two coordinates represent the upper left and lower right coordinates of the bounding rectangle of the selected area.

**Properties** – A popup panel used to control the "look" of the 3-dimensional plot.

**Print** – Prints a hardcopy of the panel.

**Return** – Close panel.



## Button Descriptions (cont'd)

### 1.14 Calibration Assistant (Calibration Upgrade)

This optional upgrade is used to help generate new calibration files for the Model 820 Video Photometer. There are a number of factors that must be taken into account when generating calibration files. This assistant does most of the work for you. The user just needs to adjust the integrating sphere to the target brightness and read the value from their calibrated NIST luminance device and enter the value through the user interface. The following is a list of quick reference explanations of each of the buttons located on this panel. Following the brief descriptions is a procedure explaining a typical calibration process.



Figure 1.14.1 Calibration Assistant Panel

**Avg Frames** – Command button initiates the acquisition of n frames ( $n = \text{"# Avg Frames"}$ ) and determines the average digital value found within the currently defined region of interest (ROI). This can only be used while “Live” video is active.

**Average Digital** – This text contains the results of the “Avg Frames” command button. During acquisition, the value is temporarily set to –1 to indicate acquisition in process and filled with the digital average when complete.



## Button Descriptions (cont'd)

**Pause** – Command button pauses “Live” video. This allows the user to enter the NIST calibrated luminance device output for this given digital level.

**Absolute** – The user must enter the value of the NIST calibrated luminance device. This is the absolute luminance value (in currently selected “Absolute Units”) of the integrating sphere during the current acquisition.

**Enter Data** – Command button enters both the “Average Digital” and “Absolute” values into the calibration curve. The software will linearly interpolate from the last calibration point to this current point.

**Current Calibration Curve** – List box contains the current 256 calibration curve values. The information in the list box is digital value versus absolute luminance.

**New File** – Command button activates all the necessary buttons and initializes all 256 calibration curve values to –1. This is the first step in creating a new calibration file.

**Save File** – Command button allows the user to save the current calibration data to the specified filename. If the calibration curve is not completely filled then the software will extrapolate the remaining calibration values from the last two entries. When creating the calibration curve, many of the hardware/software settings in Eyeppearance are used. Therefore, make sure all your settings are set up properly before starting.

**Absolute CCF** – This text entry contains the Color Correction Factor (CCF) of the NIST luminance device with the integrating sphere being used.

**FG Offset** – This text contains the frame grabber’s black level offset value. This should be adjusted to assure that a capped video photometer reads as close to 0 as possible. Care should be taken when adjusting this value in order to prevent over correction. Adjustment should approach 0 without actually achieving it.



## Button Descriptions (cont'd)

**# Avg Frames** – This text contains the number of frames to average during an acquisition.

**Target Step** – This text contains the automatic increment value of the target after each data entry.

**Absolute Units** – Select the absolute luminance units of choice.

**Average** – This text indicator contains the average pixel value found within the current Region of Interest (ROI) of the last single frame acquired.

**Difference** – This text indicator contains the difference between the “Target” and “Average” values of the last single frame acquired.

**Target** – This text contains the current target digital level. This is an aid for a target value for adjustment of the integrating sphere.

**+/-** – This is the acceptable adjustment range. The user will adjust the sphere until it is within this average digital range from the target value. The LED immediately located to the right of this entry will indicate acceptability by its color. Blue will indicate below acceptable limits. Red will indicate above acceptable limits and green is within acceptable limits.

**Minimum** – This text is the lowest sampled average seen during the sampling interval.

**Maximum** – This text is the largest sampled average seen during the sampling interval.

**Reset** – This command button will reset the “Minimum” and “Maximum” sampled values and begin a new sampling session.

**Return** – This command button will return control back to the main panel. All data will be lost.





## Button Descriptions (cont'd)

### 1.14.1 Calibration Procedure

1. Calibration should be done in a dark room.
2. The Model 820 Video Photometer to be calibrated is positioned at a distance consistent with typical testing and should be focused on the exit port of the sphere.
3. The Model 820 Video Photometer and Eyeppearance software should be set up to your current calibration settings.
4. A NIST traceable luminance device (i.e. spot photometer) should be positioned behind the Model 820 and in the line of site from the system to the integrating sphere. Of course, it needs to be positioned slightly off center in order to “see” the exit port of the integrating sphere.
5. The appropriate shutter speed should be selected in order to allow operation of the integrating sphere within its luminance limits.
6. Start the Eyeppearance software.
7. Select Calibration → Assistant to initiate the “Calibration Assistant” as well as drawing tools. Position all these windows allowing you to view all of them at one time.
8. Press the “Live” button to activate the live display.
9. Use the drawing tools to identify the Region of Interest (ROI) on the center area of the exit port of the sphere. Note: The smaller the ROI the faster the update rate.
10. The NIST traceable device's CCF (color correction factor) with the integrating sphere should be entered at “Absolute CCF” data entry area.
11. The “# Avg Frames” is recommended to be set to 20.
12. The “Target Step” is recommended to be 10.
13. The “+/-” is recommended to be .25 for more accurate results.
14. The “FG Offset” is determined by capping the camera lens of the Model 820 Video Photometer. Adjust the “FG Offset” until the “Average” value found in the upper right corner *approaches* 0. DO NOT FORCE to 0! We recommend that you adjust it in order to get a positive value and then keep reducing the FG Offset value until a small positive number results (i.e. .100).



## **Button Descriptions (cont'd)**

15. Remove the cap from the Model 820 Video Photometer.
16. Press "New File" to activate all the file generation buttons and initializes the calibration curve to -1.
17. Adjust the integrating sphere to achieve the target value. As an aid use the LED color as a guide.
18. Once the absolute luminance level is achieved press "Avg Frames" to acquire n frames and determine the average digital value. This digital level is displayed in the "Average Digital" field.
19. Press "Pause" to pause the live video mode.
20. Fill in the "Absolute" value with the number that was read using the NIST device.
21. Press "Enter Data" to enter the NIST device and the average digital level pair of values. The software will linearly interpolate from the last calibration point to the current point.
22. Repeat steps 17 thru 21 for each of the 255 values. Note: you do not need to calibrate ALL 255 values, because the "Save File" function will complete the curve by extrapolating from the last two points in the file. We suggest stopping at digital level 250.
23. Press "Save File" to complete the curve and save the file. Refer to factory file names for file convention. The filename contains Serial Number, f-stop and shutter speed (1/seconds).

Suggested Naming Convention:

Filter NNN\_FF\_SSS.ca1

where:

NNN is the Model 820 Serial Number

FF is the lens fstop without the decimal point

SSS is the shutter speed (1/seconds)



## Button Descriptions (cont'd)

### 1.15 Locator (Locator Upgrade)

This optional upgrade is used to perform automatic measurements in accordance with MIL-P-7788E and SAE AS7788 three point method. This package allows the user to create models of graphics (for example: characters, symbols, etc.), search for them and measure and average the luminance levels at of the three specific locations specified by the user. The sample being tested does not need to be fixtured. The software will automatically locate the character and report back its luminance levels. The following is a list of quick reference explanations of each of the control located on this panel. Following the brief descriptions is a procedure explaining a typical model creation and use of a model.

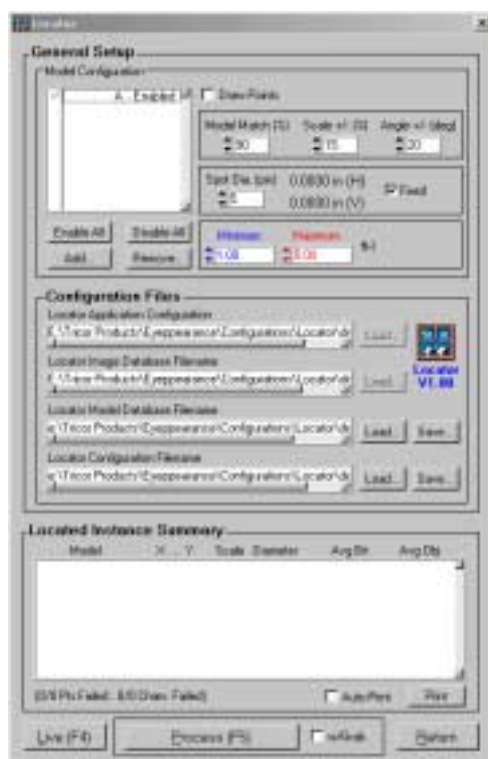


Figure 1.15.1 Locator Panel



## Button Descriptions (cont'd)

### 1.15 Locator (Locator Upgrade) (cont'd)

**Draw Points (checkbox)** – Used to enable automatic drawing of reference point sizes and locations immediately following subsequent "Process" commands.

**Model Match** – Used to specify the percentage of perimeter exposed for a match to be establish.

**Scale** – Is an allowable scale tolerance. Any graphics larger than the specified scale variable will not be found. This term is a approximate value. Large scale variations may result in decreased system performance.

**Angle** – Is an allowable rotation angle tolerance in degrees. The system will search for characters whose rotation angle is within this given tolerance and exclude characters rotated outside this tolerance. Large angle variations may result in decreased system performance.

**Spot Dia** – Specifies the size (in pixels) of the square area whose center is located at the location of the models reference points. The terms located immediately to the right are representative of the real world size of this square.

**Fixed (checkbox)** – Enables a fixed square size regardless of the determined scale. Disabling this term insures that the sampling square will shrink or grow along with the located graphic and its determined scale.

**Minimum/Maximum** – Specified the lower and upper ends of the acceptable luminance range. Any reading of reference points and averages measured to be above the upper or below the lower luminance range will be a failure, and flagged as such.

**Model (listbox)** – Lists all the models available for locating. Clicking on a model in the list will toggle the enable/disable flag for each specific Model. Rt - Clicking on a Model will invoke the model editor. See Mode, Editor for further details.



## Button Descriptions (cont'd)

### 1.15 Locator (Locator Upgrade) (cont'd)

**Enable All** – Will enable all models for locating.

**Disable All** – Will disable all models for locating.

**Add . . .** – Allows the user to create the name of a new model. After creating a new model name the user must create one by right-clicking on the specific model in the list.

**Remove . . .** – Allows the user to remove a model from the database list. To permanently remove item resave the "Locator Model Database" to file.

#### Configuration Files

**"Locator Application Configuration"** – Specifies the file containing the locator configuration. This file is read only.

**"Locator Image Database Filename"** – Specifies the file containing the image database used. This file is read only.

**"Locator Model Database Filename"** – Specifies the file containing the models to be used for locating. This file will vary depending on the application and samples being measured.

**"Locator Configuration Filename"** – Specifies the file containing all specifications found in this panel.

#### Located Instance Summary

(listbox) – Used to display the results of each reference point at each instance of a model found. Red indicates luminance values exceed Maximum. Blue indicates luminance values below Minimum. Double clicking on any item will allow the reference point spot to be toggled between visible and not visible within the image.



## **Button Descriptions (cont'd)**

### **1.15 Locator (Locator Upgrade) (cont'd)**

**Auto-Print (checkbox)** – Enable an automatic hardcopy the be printed out for each and every locate process.

**Print** – Prints out a hardcopy results of the currently listed results.

**Live (F4)** – Toggle between a live image and no image. Used to position a sample in the scene, of the camera.

**Process (F5)** – Process the current image. If the w/Grab checkbox is checked then a new image will be acquired and results updated.

**Return** – Used to return to the Main Panel.

#### **1.15.1 Locator Model Creation**

1. Start Eyeppearance application using Windows NT or Windows 2000 only.
2. Select Locator! from the main menu. If "Locator!" is not active then your software does not contain the Locator Upgrade. Consult factory.
3. First thing is to create a new Locator Model file. Press "Locator Model Database Filename" - Save. . . Button. We suggest saving it in the . . .Eyeppearance\Configurations\Locator folder. Give the file a new unique name and press Save.
4. Press "Locator Configuration Filename" - Save. . . Button. We suggest saving it in the . . .Eyeppearance\Configurations\Locator folder. Give the file a new unique name and press Save.
5. Press "Live (F4)" to display a live image. Place the sample containing the items graphic to be modeled. Make sure lens is focussed and the proper shutter speed is selected.



## Button Descriptions (cont'd)

### 1.15.1 Locator Model Creation (cont'd)

6. Set the "w/Grab" checkbox. Press "Process (F5)" button to acquire the image.
7. Press the "Add. . ." button to create a new Model name.
8. Highlight the new model found at the end of the list. Right click in order to invoke the model editor.
9. Set the Model Creation terms as follows:  
  
Automatic Levels - uncheck  
Outline Level - 2  
Detail Level - 1  
  
Contrast Level - n/a  
"Adaptive Normal Sensitivity"  
Tracking Inertia - 0  
Feature Selection - Normal
10. Set Miscellaneous terms as follows:  
  
Show - checked  
Normal - checked  
Bars - checked
11. Select Area of Interest by sizing and moving the green box over the specific area of interest. You must leave at least a ten pixel "cushion" around the model area.
12. Position and align the coordinate system with the sample part. We suggest using a sample edge or straight line (if available). Press center to move the coordinate system to the center of the selected area. You may need to magnify the image for a more accurate positioning.



## **Button Descriptions (cont'd)**

### **1.15.1 Locator Model Creation (cont'd)**

13. Press "Build Model" to create the model. The purple areas represent the models features.
14. Select "Reference Points" tab. Click Add to add a single reference point. Do this three times. Position each of the reference points at the luminance sampling point. Keep in mind each of the reference points the location of the three sampling point centers. You MUST ALWAYS create exactly 3 reference points.
15. Press "Crop Model" to reduce the size of the model image.
16. Press "Ok" to leave editor and return to the Locator panel.

Note: The specific settings may vary with each model. The settings for a given scenario will only be apparent with experience. You may need to consult with the factory for additional assistance.

17. Press "Process" to re-acquire an image to locate the enabled model(s).
18. Don't forget to save any configurations that you want to keep.





## SECTION 2

### System Interconnect

#### 2.1 Model 810A and 810B Appearance Measurement System

##### 2.1.1 General

The Model 810A Appearance Measurement System requires four power cords and eight cables to interconnect the system. The Model 810B Appearance Measurement System required 1 power cord and 1 video cable.

##### 2.1.2 System Interconnect

**\*\*CONNECT CABLES WITH POWER OFF\*\***

All cables have one connector connected to the computer. All connectors for the equipment are labeled and located on the back. Connect the cables in ascending order (refer to figure 2.1.1 and 2.1.2) and be sure the cables are tightly secured.

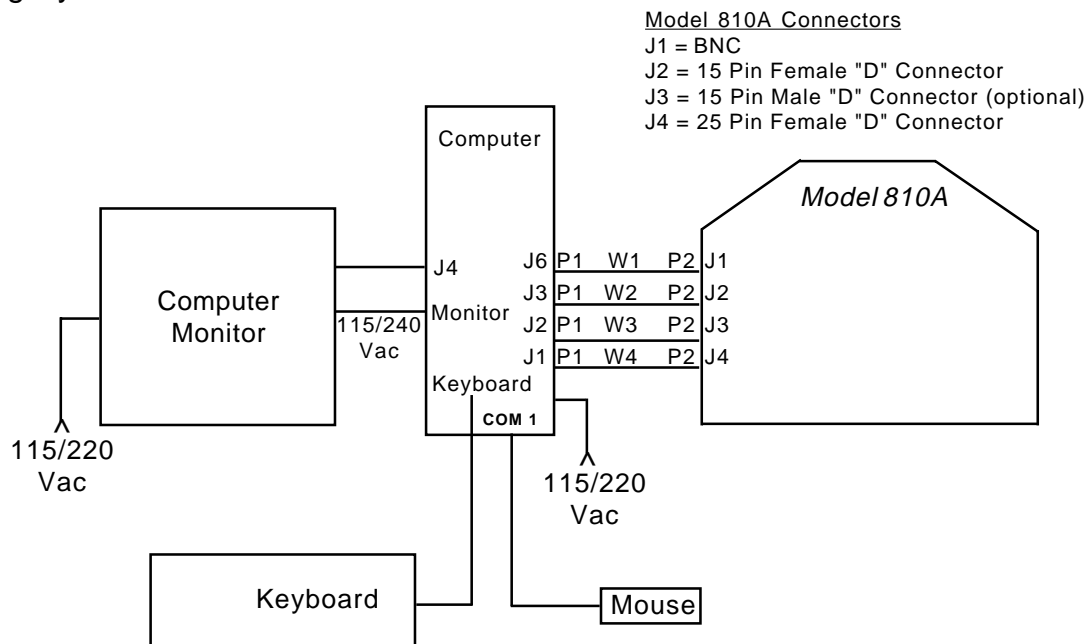


Figure 2.1.1 Model 810A Appearance Measurement System Interconnect



## System Interconnect (cont'd)

### 2.1.2 System Interconnect (Cont'd)

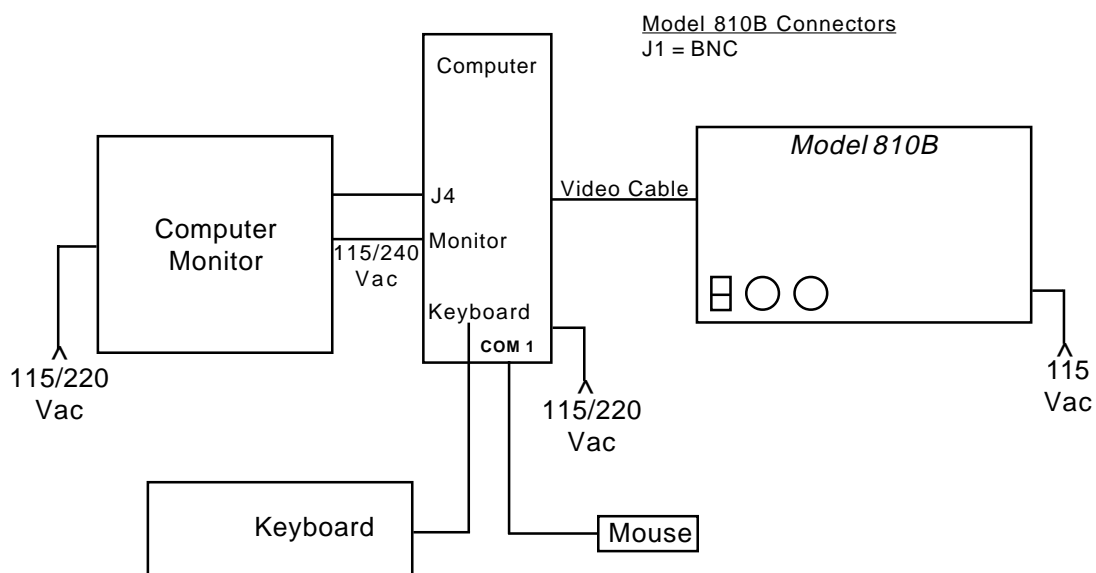


Figure 2.1.2 Model 810B Appearance Measurement System Interconnect



## System Interconnect (cont'd)

### 2.2 Model 820 Video Photometer

#### 2.2.1 General

The Model 820 Video Photometer requires a calibrated CCD camera, lens, photopic filter, BNC cable, 12V Power Supply, Shutterspeed Select Switch, Frame Grabber, Computer and Eyeppearance Software.

#### 2.2.2 System Interconnect

\*\*\* CONNECT CABLES WITH POWER OFF \*\*\*

Connect hardware in accordance to the diagram below.

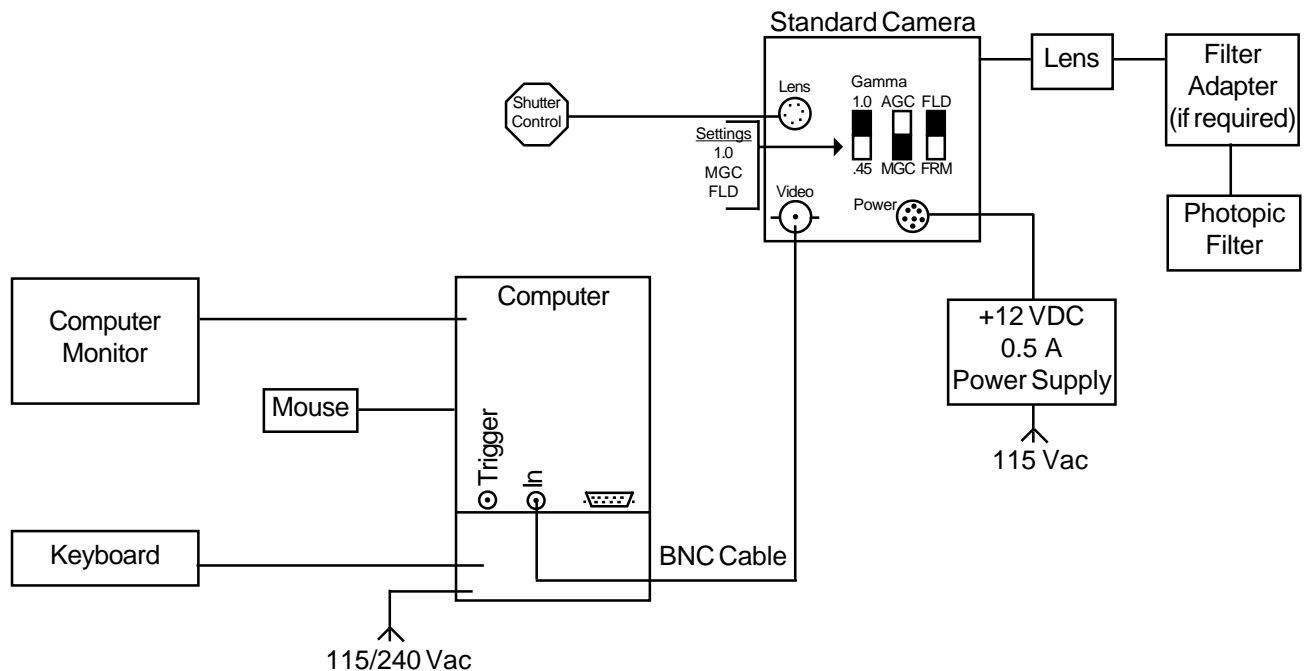


Figure 2.2.1 Model 820 Video Photometer System Interconnect



## **SECTION 3**

### **System Requirements, Installation And Start Up**

#### **3.1 Description**

The Eyeppearance is delivered with all software preinstalled on the computer's hard drive (if computer was also purchased). A floppy is provided in case reinstallation is required. Eyeppearance is required to be run under Windows 95 or greater. We recommend windows by running at a resolution of 1024 x 768 or greater, however, this resolution is NOT necessary.

This section is dedicated to installation procedures of Eyeppearance. It lists the system requirements, and provides a step by step guide to program installation.

#### **3.2 System Requirements**

To use Eyeppearance (32 bit application), you'll need:

- A computer running with Microsoft Windows 98 or higher (Note: Windows 2000 or greater must be used when using LOCATOR UPGRADE).
- A mouse.
- A hard drive. When installed, the program files may require up to 10 Megabytes of space.
- At least 32 MB RAM, 64 MB recommended as minimum. (128 MB recommended when using the LOCATOR upgrade.)
- A VGA or higher monitor (1024 x 768 w/16 bit color or greater).
- A printer.



## **System Requirements, Installation And Start Up (cont'd)**

### **3.3 Installation**

The installation program decompresses and copies the program directory on your hard disk. To install the program:

1. Place "Eyeppearance Installation Disk" into floppy drive and select setup.exe and follow the prompts replacing old files with new.
2. Install hardware drivers by placing "Frame Grabber Drivers" into floppy drive and selection setup.exe.
3. Shutdown computer. Install the frame grabber into the computer. Make sure to unplug computer and follow all antistatic practices. Before you remove board from its antistatic pouch, ground yourself by touching the computer's metal back panel. Replace cover and close computer chassis.
4. Connect system as specified in Section 2.



## **SECTION 4**

### **Calibration**

#### **4.1 Calibration Of The 810A Chamber**

##### **4.1.1 Description**

Calibration is used to establish a transform array converting digital levels to absolute brightness values. Calibration could be done with any flat white plate. The plate should be at least 8 inches square and centered in the opening. The camera and a calibrated photodiode are viewing this white plate. The photodiode is what determines the absolute level for the current lens, shutter speed, light level, filters, gain and offset. This step may be avoided by loading your own calibration file or absolute levels are not required for your application.

##### **4.1.2 Procedure**

1. Turn on the system and allow it to stabilize. The stabilization time varies with environmental temperature. The cooler the temperature the longer the stabilization time. In general, the time is approximately 20-30 minutes for normal 70 degree Fahrenheit conditions. This time will allow the lamps to stabilize and reach their normal operating brightness.
2. Place your calibration reference standard in the center of the measurement opening beneath the chamber.
3. Set all hardware and software configuration parameters properly in order to best represent your current configuration.
4. Select Calibration from the main pull down menu. Follow system prompts to properly complete the calibration process.



## **Calibration (cont'd)**

### **4.2 Calibration Of The 810B Chamber**

#### **4.2.1 Description**

Calibration is used to insure the lamp output does not vary or degrade over time. To do this the brightness of the center of the light source is measured and recorded.

The camera and frame grabber must also be calibrated. For details refer to Section 4.3.

#### **4.2.2 Procedure for Calibration of Light Source**

1. Turn on the system and allow it to stabilize. The stabilization time varies with environmental temperature. The cooler the temperature the longer the stabilization time. In general, it is approximately a few minutes and is verified with a yellow illuminator located on the front left bottom corner of the Model 810B chamber.
2. Use a spot photometer and record the absolute brightness of the light source at the center. The device should be held perpendicular to the table (i.e. light source). The brightness of the lamp is recorded. The lamp is adjusted in order to achieve the calibration brightness.



## **Calibration (cont'd)**

### **4.3 Calibration Of The Video Photometer**

#### **4.3.1 Description**

Calibration is used to establish a transform array converting digital levels to absolute brightness values. The Model 820 Video Photometer comes with 1 set of calibration curves. The set of curves are good a specific lens at 1 fstop. This set consists of 7 individual calibration curves. One curve or file for each shutter speed, lens, fnumber combination.

Increased accuracy can be achieved by loading the appropriate file for the appropriate hardware configuration. For example, a situation arises which requires a lens fstop for 5.6 and shutterspeed of 1/100 second. You must first set the hardware configuration values. Now you can load any of the calibration files and the system will work properly. However, accuracy is increased if you load the calibration file which represents the exact current hardware configuration. The Eyeppearance software makes adjustments to the calibration curve based on changing hardware conditions. This adjusted calibration is only as good as the hardware is represented values. These values have some error and therefore the resulting curve will also have some error.

It is difficult to predict the error for all hardware configuration possibilities. The set of calibration curves should be chosen to best represent your application(s).





## **Calibration (cont'd)**

### **4.3.2 Procedure**

1. Turn on the system and start the Eyeppearance application.
2. Select - Software - Calibration - Calibration/File . . . In order to load the appropriate calibration file.
3. Select - OK to accept changes.
4. In order for the calibration file and system to work properly (on an absolute basis) your hardware setting must match your hardware software settings exactly.

See appendix for calibration files format. You may create your own files if desired.



# SECTION 5

## Hardcopy Printout

### 5.1 Hardware

#### EYEPEARANCE HARDWARE CONFIGURATION (V1.02)

Filename: default.hwl

File Configuration Version #: 1.02

#### Illumination Description: Standard Light Source

Number of Lamps: 4

Diode Min/Max Voltage (volts) & Brightness (ft.l): 0.000/0.000 0.000/0.000

Diode Configuration: Brightness(ft.l) = (NaN \* voltage) + NaN

Angle (degrees): 0

Distance (in): 0.00

Mask Code: 0

#### Camera Description (0): Standard CCD Camera

Camera Type ID#: 3

Diode Min/Max Voltage & Brightness (ft.l): 0.000/0.000 0.000/0.000

Diode Configuration: Brightness(ft.l) = (NaN \* voltage) + NaN

Shutter Speeds: 8

#0 Shutter Speed (1/sec): 60

#1 Shutter Speed (1/sec): 125

#2 Shutter Speed (1/sec): 250

#3 Shutter Speed (1/sec): 500

#4 Shutter Speed (1/sec): 984

#5 Shutter Speed (1/sec): 1969

#6 Shutter Speed (1/sec): 3937

#7 Shutter Speed (1/sec): 10499

Angle (degrees): 0

Distance (in): 16.00

#### Lens Description: HF35A\_2\_Fujinon\_TV\_1:1.7/35

Focal Length (mm): 35

F-Stop: 2.0

#### Color Filter Description: None

Photopic Filter SN: 131

Number of Color Filters: 0

Neutral Density Transmission: 100%

#### Frame Grabber Description: Standard Frame Grabber

Width (pixels): 640 Height (pixels): 480 Left: 0 Right: 0

Gain: 3.000 Offset: -16 Trigger: 0

#### Image Scale (in/pixel):

Xtop/Xbottom (horizontal): 0.0000/0.0000 0.0000/0.0000 0.0000/0.0000

Ytop/Ybottom (vertical) : 0.0000/0.0000 0.0000/0.0000 0.0000/0.0000

#### Chamber

Door: NO



## Hardcopy Printout (cont'd)

### 5.2 Software (Page 1)

#### EYEPPEARANCE SOFTWARE CONFIGURATION (V1.33)

Fname: default.sw1

File Configuration Version #: 1.33

Camera #0 Channel #0

#### Units Specification:

Linear: in Brightness: ft-1

#### Calibration Specification:

Date/Time (yyyy/mm/dd hh:mm:ss): 2001/12/13 10:17:24

Cal. Fname: e:\Tricor Products\Eyeppearance\Configurations\Calibration\Model820\Sn131\Filte  
rl31\_1.98\_0.cal

Falloff Fname: Factory.fol

Absolute Calibration Range Min / Max (ft-1): 0.00 / 2.12

Relative Calibration Range Min / Max (rel.): 0 / 59

Input LUT Min / Max (dig.): 0 / 255

Camera Speed (1/sec): 60

Lens Type: HF35A\_2\_Fujinon\_TV\_1:1.7/35 Lens F-Stop: 2.0

Neutral Density Transmission: 100%

Frame Grabber Total Gain / Offset: 2.99 -16

Calibration Correction Factor / Flare ACO: 1.000 0.000

Falloff Correction: NO

Lamp Values (volts): 6.00 6.00 6.00 6.00

Acceptable Lamp %Variation, Min(volts), Max(volts): 1.000% 5.40 6.60

Use Lamp Variation: NO

Number of Averaged Frames: 15

Window Leftmost Column #:270 Uppermost Row #:190 Width:100 Height:100

#### Image Related Specification:

Absolute Threshold Lower / Upper (ft-1): 0.000 / 10000.000

Digital Threshold Lower / Upper: 0 / 255

Image Size W x H x Border (pixels): 640 x 480 x 2

Number of Averaged Frames: 5 Number of Allowable Saturated Pixels: 100

#### Miscellaneous Specifications:

Group Size(s) (%): 1 5 10 20 25 33 50 75 100

Gamma Display Correction: 0.600

Palette Type Code : 0

Locator Fname: e:\Tricor Products\Eyeppearance\Configurations\Locator\default.vis

#### Region Of Interest (ROI) Specifications:

State: OFF

#### Acquire Specifications:

Method: 0 A,B,C,D: 5 0 0 0 A'B'C'D': 0.00 0.00 0.00 0.00

Name Method: 0 Type: 0 Index: 1 RootName: Default

Door Method: 4 ShutterMethod: 0

Falloff Method: 0 Channel: 3 Filename:

Direction: 2 Function: 0 Digital Method: 0 Multiplier: 1.000

A: 0.000 B: 0.000 C: 0 D: 0

Pt #1: Col/Row:V/V 0/0: 1.000/1.000 Pt #2: 0/0: 1.000/1.000

#### Filter/Convolution Specifications:

Method: 1 A,B,C,D: 5 0 0 0 A'B'C'D': 70.00 0.00 0.00 0.00

#### Analysis Specifications:

Profile: Enable Fixed Luminance: 0 Min: 0.000 Max: 0.000

Enable Fixed Position: 0 Min: 0 Max: 0

Difference: Frame #0 - Frame #1 = Frame #2



## Hardcopy Printout (cont'd)

### 5.2 Software (Page 2)

EYEPEARANCE Calibration Data: Factory.cal

Brightness Units: dig.

0	1	2	3	4	5	6	7	8	9
0	0	1	2	3	4	5	6	7	8
10	10	11	12	13	14	15	16	17	18
20	20	21	22	23	24	25	26	27	28
30	30	31	32	33	34	35	36	37	38
40	40	41	42	43	44	45	46	47	48
50	50	51	52	53	54	55	56	57	58
60	60	61	62	63	64	65	66	67	68
70	70	71	72	73	74	75	76	77	78
80	80	81	82	83	84	85	86	87	88
90	90	91	92	93	94	95	96	97	98
100	100	101	102	103	104	105	106	107	108
110	110	111	112	113	114	115	116	117	118
120	120	121	122	123	124	125	126	127	128
130	130	131	132	133	134	135	136	137	138
140	140	141	142	143	144	145	146	147	148
150	150	151	152	153	154	155	156	157	158
160	160	161	162	163	164	165	166	167	168
170	170	171	172	173	174	175	176	177	178
180	180	181	182	183	184	185	186	187	188
190	190	191	192	193	194	195	196	197	198
200	200	201	202	203	204	205	206	207	208
210	210	211	212	213	214	215	216	217	218
220	220	221	222	223	224	225	226	227	228
230	230	231	232	233	234	235	236	237	238
240	240	241	242	243	244	245	246	247	248
250	250	251	252	253	254	255			

Brightness Units: rel.

0	1	2	3	4	5	6	7	8	9
0	0	0	0	0	1	1	1	1	2
10	2	2	2	3	3	3	4	4	4
20	4	4	5	5	5	6	6	6	6
30	7	7	7	7	8	8	8	8	9
40	9	9	9	10	10	10	11	11	11
50	11	12	12	12	12	13	13	13	13
60	14	14	14	14	15	15	15	16	16
70	16	16	16	17	17	17	18	18	18
80	18	19	19	19	19	20	20	20	20
90	21	21	21	21	22	22	22	23	23
100	23	23	24	24	24	24	25	25	25
110	25	26	26	26	26	27	27	27	28
120	28	28	28	28	29	29	29	30	30
130	30	30	31	31	31	31	32	32	32
140	32	33	33	33	33	34	34	34	35
150	35	35	35	36	36	36	36	37	37
160	37	37	38	38	38	38	39	39	39
170	40	40	40	40	40	41	41	41	42
180	42	42	42	43	43	43	44	44	44
190	44	44	45	45	45	46	46	46	46
200	47	47	47	47	48	48	48	48	49
210	49	49	49	50	50	50	51	51	51
220	51	52	52	52	52	53	53	53	53
230	54	54	54	54	55	55	55	56	56
240	56	56	56	57	57	57	58	58	58
250	58	59	59	59	59	60			



## Hardcopy Printout (cont'd)

### 5.2 Software (Page 3)

EYEPPEARANCE Absolute Data: Factory.cal  
Brightness Units: dig.

	0	1	2	3	4	5	6	7	8	9
0	0	1	2	3	4	5	6	7	8	9
10	10	11	12	13	14	15	16	17	18	19
20	20	21	22	23	24	25	26	27	28	29
30	30	31	32	33	34	35	36	37	38	39
40	40	41	42	43	44	45	46	47	48	49
50	50	51	52	53	54	55	56	57	58	59
60	60	61	62	63	64	65	66	67	68	69
70	70	71	72	73	74	75	76	77	78	79
80	80	81	82	83	84	85	86	87	88	89
90	90	91	92	93	94	95	96	97	98	99
100	100	101	102	103	104	105	106	107	108	109
110	110	111	112	113	114	115	116	117	118	119
120	120	121	122	123	124	125	126	127	128	129
130	130	131	132	133	134	135	136	137	138	139
140	140	141	142	143	144	145	146	147	148	149
150	150	151	152	153	154	155	156	157	158	159
160	160	161	162	163	164	165	166	167	168	169
170	170	171	172	173	174	175	176	177	178	179
180	180	181	182	183	184	185	186	187	188	189
190	190	191	192	193	194	195	196	197	198	199
200	200	201	202	203	204	205	206	207	208	209
210	210	211	212	213	214	215	216	217	218	219
220	220	221	222	223	224	225	226	227	228	229
230	230	231	232	233	234	235	236	237	238	239
240	240	241	242	243	244	245	246	247	248	249
250	250	251	252	253	254	255				

Brightness Units: rel.

	0	1	2	3	4	5	6	7	8	9
0	0	0	0	0	0	1	1	1	1	2
10	2	2	2	3	3	3	3	4	4	4
20	4	4	5	5	5	5	6	6	6	6
30	7	7	7	7	8	8	8	8	8	9
40	9	9	9	10	10	10	10	11	11	11
50	11	12	12	12	12	12	13	13	13	13
60	14	14	14	14	15	15	15	15	16	16
70	16	16	16	17	17	17	17	18	18	18
80	18	19	19	19	19	20	20	20	20	20
90	21	21	21	21	22	22	22	22	23	23
100	23	23	24	24	24	24	24	25	25	25
110	25	26	26	26	26	27	27	27	27	28
120	28	28	28	28	29	29	29	29	30	30
130	30	30	31	31	31	31	32	32	32	32
140	32	33	33	33	33	34	34	34	34	35
150	35	35	35	36	36	36	36	36	37	37
160	37	37	38	38	38	38	39	39	39	39
170	40	40	40	40	40	41	41	41	41	42
180	42	42	42	43	43	43	43	44	44	44
190	44	44	45	45	45	45	46	46	46	46
200	47	47	47	47	48	48	48	48	48	49
210	49	49	49	50	50	50	50	51	51	51
220	51	52	52	52	52	52	53	53	53	53
230	54	54	54	54	55	55	55	55	56	56
240	56	56	56	57	57	57	57	58	58	58
250	58	59	59	59	59	60				



## Hardcopy Printout (cont'd)

### 5.3 Window Grouping (Page 1)

#### EYEPPEARANCE Group Window Data

Filename: c:\Eyeppearance\SampleImages\Demonstration\led3digit.bmp  
Acquisition Time (yyyy/mm/dd hh:mm:ss): 1998/07/15 07:25:44  
Version #'s (Master,Software Cfg,Hardware Cfg,Image Hdr): 3.00 1.00 1.00 1.00  
ROI Filename: c:\Eyeppearance\SampleImages\Demonstration\led3digitROI.bmp

Grp	Act/Tot	Average (dig.)	Count	Histogram Summary (ROI, Full)
1	1/ 1.15	214	124	Max : 220.000 220.000
5	5/ 5.34	208	576	Start: 0.000 0.000
10	10/ 10.26	202	1106	Int : 256.000 256.000
20	21/ 20.62	192	2223	Mean : 136.904 24.911
25	26/ 25.50	188	2749	SDev : 42.107 45.978
33	34/ 33.97	181	3662	#Pix : 10779 307198
50	50/ 50.49	170	5443	
75	75/ 75.46	155	8135	Threshold :15 224
100	100/ 99.99	137	10779	

Active ROI's (5 of 21): 8 10 12 13 14

#### Histogram Details:

	0	1	2	3	4	5	6	7	8	9
0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	1	0	0	1	5	8
20	7	3	11	4	7	11	4	10	12	2
30	8	6	8	10	9	11	15	15	15	11
40	21	17	19	20	17	22	23	29	24	20
50	27	22	28	19	20	25	27	21	23	16
60	10	17	20	12	22	23	21	20	21	20
70	18	27	18	25	25	30	32	33	21	35
80	25	32	34	33	27	33	49	35	47	40
90	33	41	61	56	58	39	49	47	63	43
100	54	64	40	62	63	68	60	63	79	76
110	87	66	76	88	91	103	77	97	75	84
120	91	77	80	78	93	106	96	88	83	100
130	118	113	116	103	104	122	123	121	123	116
140	96	112	121	96	116	107	117	93	90	82
150	94	87	80	87	97	95	95	112	97	101
160	95	81	80	88	91	83	85	65	87	71
170	86	71	76	70	79	64	62	57	67	62
180	59	61	64	62	54	58	59	76	66	62
190	49	56	63	63	60	57	44	39	49	39
200	64	52	58	50	45	50	48	39	48	34
210	39	41	29	25	24	23	7	3	7	4
220	2	0	0	0	0	0	0	0	0	0
230	0	0	0	0	0	0	0	0	0	0
240	0	0	0	0	0	0	0	0	0	0
250	0	0	0	0	0	0				



## Hardcopy Printout (cont'd)

### 5.3 Window Grouping (Page 2)

EYEPPEARANCE Image Absolute Data: c:\Eyeppearance\SampleImages\Demonstration\led3digit.bmp

Brightness Units: ft-l

	0	1	2	3	4	5	6	7	8	9
0	0.0	0.2	0.5	0.8	1.0	1.2	1.5	1.8	2.0	2.2
10	2.5	2.8	3.0	3.2	3.5	3.8	4.0	4.2	4.5	4.8
20	5.0	5.2	5.5	5.8	6.0	6.2	6.5	6.8	7.0	7.2
30	7.5	7.8	8.0	8.2	8.5	8.8	9.0	9.2	9.5	9.8
40	10.0	10.2	10.5	10.8	11.0	11.2	11.5	11.8	12.0	12.2
50	12.5	12.8	13.0	13.2	13.5	13.8	14.0	14.2	14.5	14.8
60	15.0	15.2	15.5	15.8	16.0	16.2	16.5	16.8	17.0	17.2
70	17.5	17.8	18.0	18.2	18.5	18.8	19.0	19.2	19.5	19.8
80	20.0	20.2	20.5	20.8	21.0	21.2	21.5	21.8	22.0	22.2
90	22.5	22.8	23.0	23.2	23.5	23.8	24.0	24.2	24.5	24.8
100	25.0	25.2	25.5	25.8	26.0	26.2	26.5	26.8	27.0	27.2
110	27.5	27.8	28.0	28.2	28.5	28.8	29.0	29.2	29.5	29.8
120	30.0	30.2	30.5	30.8	31.0	31.2	31.5	31.8	32.0	32.2
130	32.5	32.8	33.0	33.2	33.5	33.8	34.0	34.2	34.5	34.8
140	35.0	35.2	35.5	35.8	36.0	36.2	36.5	36.8	37.0	37.2
150	37.5	37.8	38.0	38.2	38.5	38.8	39.0	39.2	39.5	39.8
160	40.0	40.2	40.5	40.8	41.0	41.2	41.5	41.8	42.0	42.2
170	42.5	42.8	43.0	43.2	43.5	43.8	44.0	44.2	44.5	44.8
180	45.0	45.2	45.5	45.8	46.0	46.2	46.5	46.8	47.0	47.2
190	47.5	47.8	48.0	48.2	48.5	48.8	49.0	49.2	49.5	49.8
200	50.0	50.2	50.5	50.8	51.0	51.2	51.5	51.8	52.0	52.2
210	52.5	52.8	53.0	53.2	53.5	53.8	54.0	54.2	54.5	54.8
220	55.0	55.2	55.5	55.8	56.0	56.2	56.5	56.8	57.0	57.2
230	57.5	57.8	58.0	58.2	58.5	58.8	59.0	59.2	59.5	59.8
240	60.0	60.2	60.5	60.8	61.0	61.2	61.5	61.8	62.0	62.2
250	62.5	62.8	63.0	63.2	63.5	63.8				

Brightness Units: rel.

	0	1	2	3	4	5	6	7	8	9
0	0	0	0	0	0	0	0	0	0	1
10	1	1	1	1	1	1	1	1	1	1
20	1	1	1	1	1	1	2	2	2	2
30	2	2	2	2	2	2	2	2	2	2
40	2	2	2	3	3	3	3	3	3	3
50	3	3	3	3	3	3	3	3	3	3
60	4	4	4	4	4	4	4	4	4	4
70	4	4	4	4	4	4	4	5	5	5
80	5	5	5	5	5	5	5	5	5	5
90	5	5	5	5	6	6	6	6	6	6
100	6	6	6	6	6	6	6	6	6	6
110	6	7	7	7	7	7	7	7	7	7
120	7	7	7	7	7	7	7	7	8	8
130	8	8	8	8	8	8	8	8	8	8
140	8	8	8	8	8	9	9	9	9	9
150	9	9	9	9	9	9	9	9	9	9
160	9	9	10	10	10	10	10	10	10	10
170	10	10	10	10	10	10	10	10	10	11
180	11	11	11	11	11	11	11	11	11	11
190	11	11	11	11	11	11	12	12	12	12
200	12	12	12	12	12	12	12	12	12	12
210	12	12	12	13	13	13	13	13	13	13
220	13	13	13	13	13	13	13	13	13	13
230	14	14	14	14	14	14	14	14	14	14
240	14	14	14	14	14	14	14	15	15	15
250	15	15	15	15	15	15				



## Hardcopy Printout (cont'd)

### 5.3 Window Grouping (Page 3)

EYEPPEARANCE ROI Summary Data (Page 1)

Filename: c:\Eyeppearance\SampleImages\Demonstration\led3digitROI.bmp

ITEM	STATUS	ID	DESCRIPTION
----	-----	--	-----
001.	Not Active	001	Background
002.	Not Active	002	Left Digit Top/Right
003.	Not Active	003	Left Digit Middle
004.	Not Active	004	Left Digit Top/Left
005.	Not Active	005	Left Digit Bottom/Right
006.	Not Active	006	Left Digit Bottom/Center
007.	Not Active	007	Left Digit Bottom/Left
008.	Active	008	Center Digit Top/Center
009.	Not Active	009	Center Digit Top/Right
010.	Active	010	Center Digit Middle
011.	Not Active	011	Center Digit Top/Left
012.	Active	012	Center Digit Bottom/Right
013.	Active	013	Center Digit Bottom/Center
014.	Active	014	Center Digit Bottom/Left
015.	Not Active	015	Right Digit Top/Center
016.	Not Active	016	Right Digit Top/Right
017.	Not Active	017	Right Digit Middle
018.	Not Active	018	Right Digit Top/Left
019.	Not Active	019	Right Digit Bottom/Right
020.	Not Active	020	Right Digit Bottom/Center
021.	Not Active	021	Right Digit Bottom/Left





## Hardcopy Printout (cont'd)

### 5.4 File - Print (Page 1)

EYEPPEARANCE IMAGE HEADER (V1.20)

Filename: c:\Eyeppearance\SampleImages\Demonstration\cockpit1.bmp

Acquisition Time (yyyy/mm/dd hh:mm:ss): 1998/12/31 11:22:00

Version (Master,Software cfg,Hardware cfg,Image hdr): 3.10 1.00 1.00 1.00

Calibration Filename: c:\Eyeppearance\Configurations\Calibration\SN104\Filter4\_198\_60.cal

Absolute Calibration Range Min / Max (ft-l): 0.00 / 8.99

Relative Calibration Range Min / Max (rel.): 0 / 60

Illumination Description: No Light Source

Diode Configuration: Brightness(ft.l) = (NaN \* voltage) + NaN

Angle (degrees): 0

Distance (in): 0.00

Mask Code: 0

4 Lamp Values (volts): 0.00 0.00 0.00 0.00

Camera Description: Standard CCD Camera

Diode Configuration: Brightness(ft.l) = (NaN \* voltage) + NaN

Shutter Speed (1/seconds): 60

Angle (degrees): 0

Distance (in): 0.00

Lens Description: HF35A-2 Fujinon TV 1:1.7/35

Focal Length (mm): 35

F-Stop: 2.0

Filter Description: None

Number of Filters: 0

Neutral Density Transmission: 100%

Frame Grabber Description: Standard Frame Grabber

Leftmost Column #: 0 Uppermost Row #: 0

Gain/Offset: 1.00 -8

Image Scale (in/pixel)

Xtop/Xbottom (horizontal): 1.000/1.000 1.000/1.000 1.000/1.000

Ytop/Ybottom (vertical) : 1.000/1.000 1.000/1.000 1.000/1.000

Image Size W x H x Border (pixels): 640 x 480 x 2

Number of Averaged Frames: 5

Number of Allowable Saturated Pixels: 100

Number of Falloff Corrections: 0



## Hardcopy Printout (cont'd)

### 5.4 File - Print (Page 2)

EYEPPEARANCE Image Absolute Data: c:\Eyeppearance\SampleImages\Demonstration\led3digit.bmp

Brightness Units: ft-l

	0	1	2	3	4	5	6	7	8	9
0	0.0	0.2	0.5	0.8	1.0	1.2	1.5	1.8	2.0	2.2
10	2.5	2.8	3.0	3.2	3.5	3.8	4.0	4.2	4.5	4.8
20	5.0	5.2	5.5	5.8	6.0	6.2	6.5	6.8	7.0	7.2
30	7.5	7.8	8.0	8.2	8.5	8.8	9.0	9.2	9.5	9.8
40	10.0	10.2	10.5	10.8	11.0	11.2	11.5	11.8	12.0	12.2
50	12.5	12.8	13.0	13.2	13.5	13.8	14.0	14.2	14.5	14.8
60	15.0	15.2	15.5	15.8	16.0	16.2	16.5	16.8	17.0	17.2
70	17.5	17.8	18.0	18.2	18.5	18.8	19.0	19.2	19.5	19.8
80	20.0	20.2	20.5	20.8	21.0	21.2	21.5	21.8	22.0	22.2
90	22.5	22.8	23.0	23.2	23.5	23.8	24.0	24.2	24.5	24.8
100	25.0	25.2	25.5	25.8	26.0	26.2	26.5	26.8	27.0	27.2
110	27.5	27.8	28.0	28.2	28.5	28.8	29.0	29.2	29.5	29.8
120	30.0	30.2	30.5	30.8	31.0	31.2	31.5	31.8	32.0	32.2
130	32.5	32.8	33.0	33.2	33.5	33.8	34.0	34.2	34.5	34.8
140	35.0	35.2	35.5	35.8	36.0	36.2	36.5	36.8	37.0	37.2
150	37.5	37.8	38.0	38.2	38.5	38.8	39.0	39.2	39.5	39.8
160	40.0	40.2	40.5	40.8	41.0	41.2	41.5	41.8	42.0	42.2
170	42.5	42.8	43.0	43.2	43.5	43.8	44.0	44.2	44.5	44.8
180	45.0	45.2	45.5	45.8	46.0	46.2	46.5	46.8	47.0	47.2
190	47.5	47.8	48.0	48.2	48.5	48.8	49.0	49.2	49.5	49.8
200	50.0	50.2	50.5	50.8	51.0	51.2	51.5	51.8	52.0	52.2
210	52.5	52.8	53.0	53.2	53.5	53.8	54.0	54.2	54.5	54.8
220	55.0	55.2	55.5	55.8	56.0	56.2	56.5	56.8	57.0	57.2
230	57.5	57.8	58.0	58.2	58.5	58.8	59.0	59.2	59.5	59.8
240	60.0	60.2	60.5	60.8	61.0	61.2	61.5	61.8	62.0	62.2
250	62.5	62.8	63.0	63.2	63.5	63.8				

Brightness Units: rel.

	0	1	2	3	4	5	6	7	8	9
0	0	0	0	0	0	0	0	0	0	1
10	1	1	1	1	1	1	1	1	1	1
20	1	1	1	1	1	1	2	2	2	2
30	2	2	2	2	2	2	2	2	2	2
40	2	2	2	3	3	3	3	3	3	3
50	3	3	3	3	3	3	3	3	3	3
60	4	4	4	4	4	4	4	4	4	4
70	4	4	4	4	4	4	4	5	5	5
80	5	5	5	5	5	5	5	5	5	5
90	5	5	5	5	6	6	6	6	6	6
100	6	6	6	6	6	6	6	6	6	6
110	6	7	7	7	7	7	7	7	7	7
120	7	7	7	7	7	7	7	7	8	8
130	8	8	8	8	8	8	8	8	8	8
140	8	8	8	8	8	9	9	9	9	9
150	9	9	9	9	9	9	9	9	9	9
160	9	9	10	10	10	10	10	10	10	10
170	10	10	10	10	10	10	10	10	10	11
180	11	11	11	11	11	11	11	11	11	11
190	11	11	11	11	11	11	12	12	12	12
200	12	12	12	12	12	12	12	12	12	12
210	12	12	12	13	13	13	13	13	13	13
220	13	13	13	13	13	13	13	13	13	13
230	14	14	14	14	14	14	14	14	14	14
240	14	14	14	14	14	14	14	15	15	15
250	15	15	15	15	15	15				



## Hardcopy Printout (cont'd)

### 5.5 ROI

EYEPPEARANCE ROI Summary Data (Page 1)

Filename: C:\Eyeppearance\SampleImages\12voltMask.bmp

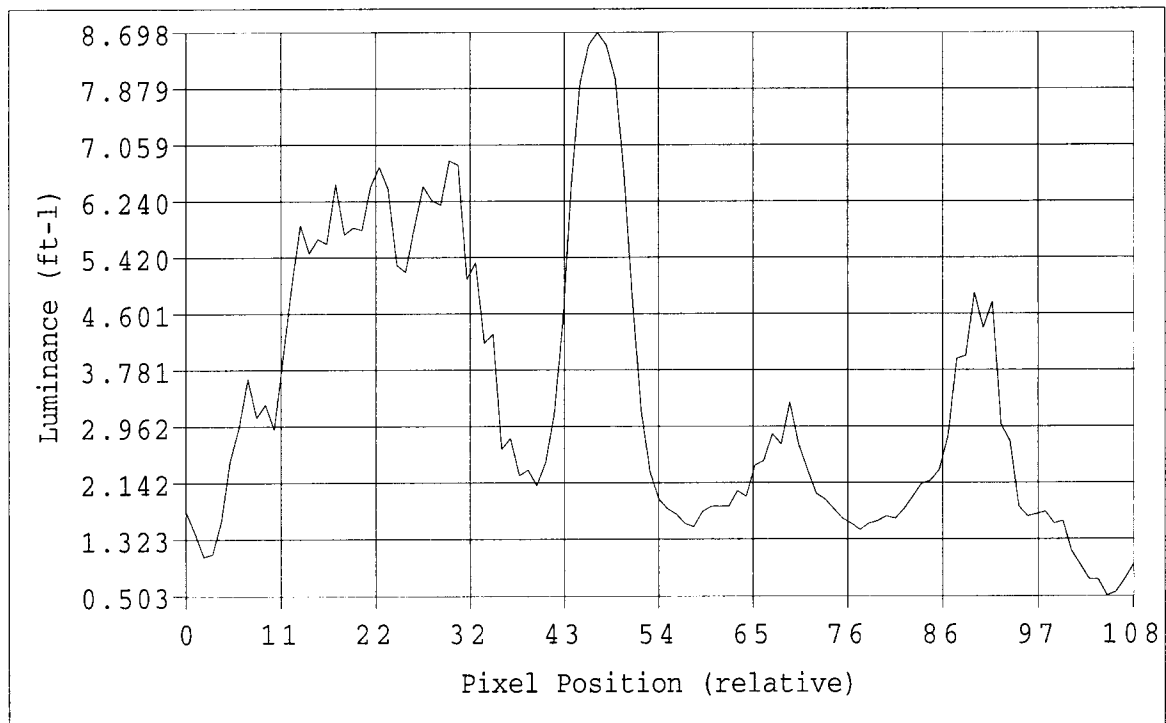
ITEM	STATUS	ID	DESCRIPTION
----	-----	--	-----
001.	Active	101	Fan
002.	Active	102	Small Vertical Line
003.	Active	103	Medium Vertical Line
004.	Not Active	104	Medium++ Vertical Line
005.	Active	105	Large Vertical Line
006.	Active	106	LO
007.	Active	107	HI
008.	Active	108	High Guy
009.	Not Active	109	Low Guy
010.	Active	110	Right Arrow



## Hardcopy Printout (cont'd)

### 5.6 Profile

EYEPPEARANCE (V1.30) Image Profile: c:\Eyeppearance\SampleImages\Demonstration\cockpit1.bmp



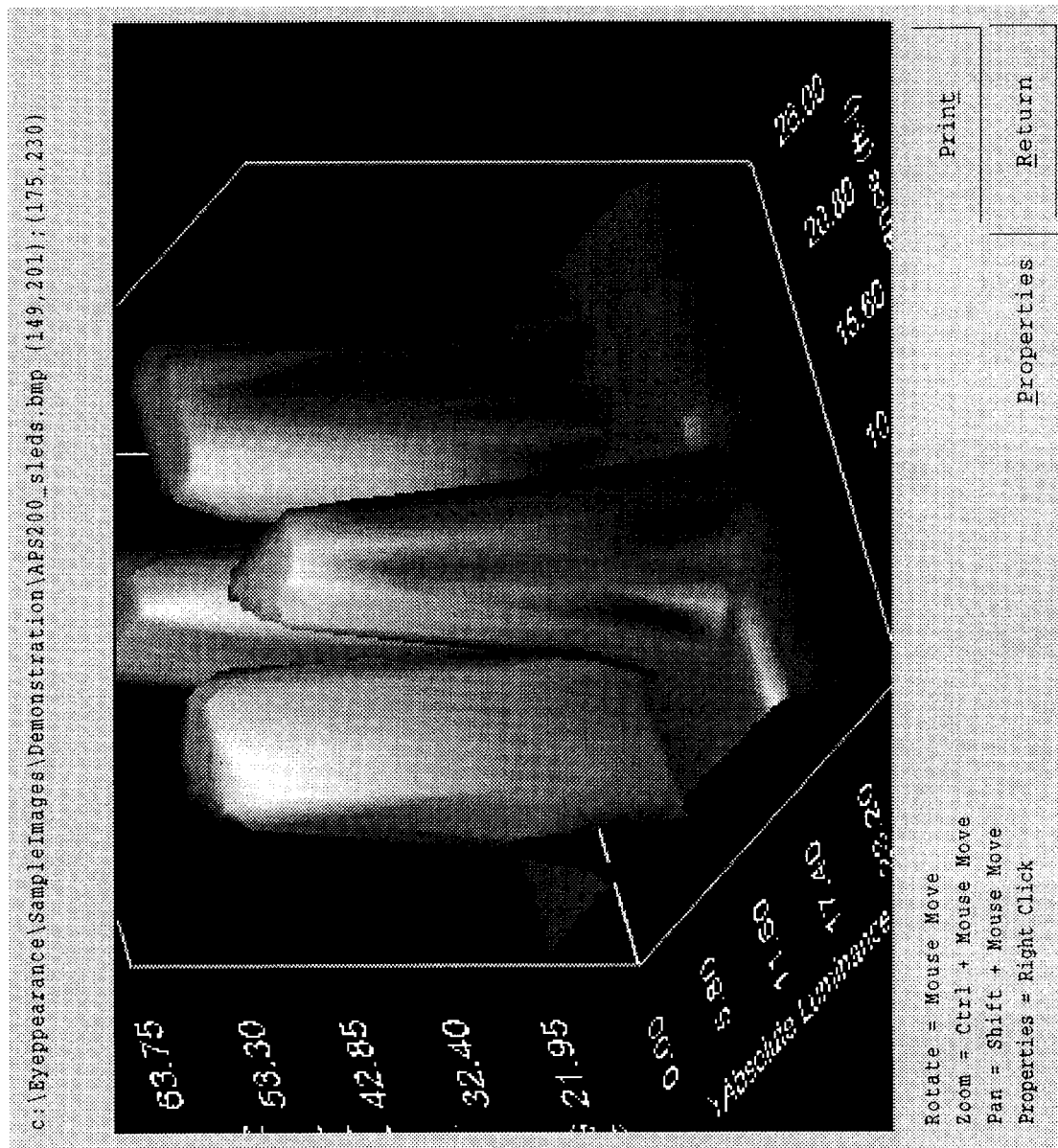
Brightness Units: ft-l

	0	1	2	3	4	5	6	7	8	9
0	1.7	1.4	1.1	1.1	1.6	2.5	3.0	3.6	3.1	3.3
10	2.9	3.9	5.0	5.9	5.5	5.7	5.6	6.5	5.8	5.9
20	5.8	6.5	6.7	6.4	5.3	5.2	5.9	6.5	6.3	6.2
30	6.8	6.8	5.1	5.3	4.2	4.3	2.6	2.8	2.2	2.3
40	2.1	2.4	3.1	4.5	6.5	8.0	8.5	8.7	8.5	8.0
50	6.7	4.7	3.2	2.3	1.9	1.8	1.7	1.6	1.5	1.7
60	1.8	1.8	1.8	2.0	1.9	2.4	2.5	2.9	2.7	3.3
70	2.7	2.3	2.0	1.9	1.8	1.6	1.6	1.5	1.6	1.6
80	1.7	1.6	1.8	1.9	2.1	2.2	2.3	2.8	3.9	4.0
90	4.9	4.4	4.8	3.0	2.7	1.8	1.7	1.7	1.7	1.6
100	1.6	1.1	0.9	0.7	0.7	0.5	0.6	0.7	0.9	0.0



## Hardcopy Printout (cont'd)

### 5.7 Contour 3D





## SECTION 6

### Maintenance

#### 6.1 Model 810A System Chamber

##### 6.1.1 General

Routine maintenance of the Model 810A consists primarily of cleaning. The interval between maintenance periods depends on the environment in which the Model 810A is operated. The user should initially check the Model 810A monthly for any required routine maintenance and adjust that period accordingly.

#### WARNING

***Power must be removed*** for all maintenance. Unplug the 115/220 Vac power.

##### 6.1.2 Air Filter

Remove power from Model 810A. Check air filter for dust/dirt accumulation. If dust/dirt is visible, remove filter. Clean with pressurized air by blowing through entire filter. Note: Do ***NOT*** blow air by Model 810A. If filter will not come clean, replace with new air filter.

Located behind the air filter is the fan, check for dust/dirt accumulation before replacing air filter. If cleaning is needed. Clean by using a small vacuum cleaner, this will minimize dust/dirt entering the test chamber. Continue until there is no dust/dirt visible.



## **Maintenance (cont'd)**

### **6.2 Video Photometer**

#### **6.2.1 General**

Routine maintenance of the Model 820 Video Photometer consists primarily of cleaning. The interval between maintenance periods depends on the environment in which the video photometer is operated. The user should initially check the Model 820 Video Photometer monthly for any required routine maintenance and adjust that period accordingly.

#### **6.2.2 Photopic Filter And Lens Cleaning**

Carefully remove the photopic filter and clean the filter and lens with optical tissue and cleaner. Use photographic compressed air to blow off any dust from the camera sensor front window. Photopic filters should not be interchanged between lens or cameras.



# SECTION 7

## Parts List

### Customer Replaceable

<u>Part Number</u>	<u>Description</u>
SAF-1043	Air Filter
PL-24W/41	Lamps (Light Source)
313002	Fuse, 2 amp, 250V, Slow Blow
190-237	Cable W1
190-239	Cable W2
190-240	Cable W3
190-241	Cable W4
190-238	Cable W5





## **Appendix A**



## **Video Photometer Calibration**

### **Introduction:**

The Model 820 Video Photometer can be calibrated by sending the camera, lens and photopic filter to TRICOR Systems Inc. We have also included a procedure for those who decide to calibrate the system themselves. Calibration should be done at least once a year. The following describes the procedure for calibrating and creating calibration files (.ca1).

### **Equipment Required:**

- Integrating Sphere with known spectral content.
- Calibrated photometer with known spectral response.
- Video Photometer System
- Darkroom

### **Data Required:**

- Determine the CCF (Color Correction Factor) for the photometer being used with the illuminant of the sphere.

### **Procedure:**

- Setup Video Photometer system so the integrating sphere's exit port is pointed directly at the camera. The distance of the sphere to the photometer lens should be set as close to the actual operating test distance as possible to insure maximum accuracy. The exit port should be approximately 100 pixels in diameter and located in the center of the frame.
- Set the desired fstop, focus and shutter speed. Start with shutter speed 0 (i.e. 1/60 second).
- Setup the Photometer immediately next to the camera and pointed and focused at the center of the exit port.



- Turn on the computer and start the "Eyeppearance" application.
- Set Software - Units to digital.
- Set Software - Misc. - Palette to Blue/Green/Red.
- Turn off all lights.
- Now you must repeat the following steps until every digital level has been calibrated.
  - Set Software - Image - Upper Digital Threshold to the level being tested +1.
  - Set Software - Image - Lower Digital Threshold to the level being tested -1.
  - Press the LIVE button in order to see a live image on the main panel.
  - The digital level being tested will be green while areas less than it will be blue and areas greater than it will be red.
  - Adjust the sphere until the area colored green is maximized within the image center.
  - Now record both the digital level being tested, and the absolute level from the photometer multiplied by the CCF for the photometer.
  - Repeat for digital values from 1 to 254
- When completed, you have a list of digital levels (1 to 254) and absolute brightness values. Set digital level 0 to absolute level 0.0. Digital level 255 must be extrapolated using the absolute brightness measurements found at digital levels 253 and 254.
- Correct the absolute brightness numbers using the CCF of the Model 820 video photometer. This number can be found using the CCF assistant. Each absolute value should be divided by this CCF.
- This list must be put in a file along with some header information. Below is the header information along with its description.

```
1.0          // calibration file version (decimal)
60           // 1/seconds shutter speed (integer)
1.0          // frame grabber gain (decimal)
-8           // frame grabber offset (integer)
HF35A-2_Fujinon // lens description (up to 40 characters (no spaces))
5.6          // lens f-stop / f.number (decimal)
100          // transmission % of neutral density filter (integer)
1.000        // default CCF (float)
0            // CCO Color Correction Offset (integer)
0 0 12 16 7 1998 // seconds (0-59), minutes (0-59), hours (0-23), day (1-31), month (1-12), year (1998-XXXX) represents
                // the creation time and date of calibration. Each term
                // must be separated by a space.
```



- The calibration list/curve has 3 columns to it. The leftmost column (#1) represents digital level (integer value), column (#2) represents absolute brightness (decimal value), and column (#3) represents relative. Relative values vary from 0 to shutter speed (linear).

0	0.0	0
1	0.0573	0
2	0.1146	0
3	0.1719	1
4	0.2292	1
5	0.2732	1
6	0.6006	1
7	0.9253	2
8	1.2053	2
9	1.4746	2
10	1.7527	2
.	.	.
.	.	.
.	.	.
.	.	.
.	.	.
.	.	.
250	46.1012	59
251	46.3206	59
252	46.5399	59
253	46.7393	60
254	46.9787	60
255	48.5411	60



## **Appendix B**



## Spectral Data

Spectral data is the response of a device over a frequency (or wavelength) range. Eyeppearance gives the ability for users to load their own generated files. Below is the format of a typical spectral file (.spc)

Description Line (no more than 80 characters)

380	0.000
385	0.115
390	0.253
400	0.157
405	0.685
410	3.125
415	8.631
420	10.321
⋮	
780	0.379

Example of Spectral Text File (.spc)

- First column term represents the center wavelength (nm). It must start at 380nm and end with 780nm. There should be 81 rows of data (5nm steps).
- Second term represents the spectral response (floating point). These values are positive floating point values.



## **Appendix C**



## Creating Region Of Interest (ROI) Files

1. Digitize or Acquire an image with Eyeppearance. This image should represent following image to be used with the Region of Interest files.
2. Save this file as a .bmp or .tif file.
3. Load this file into an application that will allow you to repaint this image. We recommend Adobe Photoshop. The greyscale "color" (values 1-255) can represent region of interests 1 thru 255. This file is going to be repainted; therefore, make a backup copy if you don't want to lose. Simply paint the parts of the image with the color that represents a given region. Any part of the image of no interest should be painted 0.
4. Save this file as a .bmp or .tif (whichever you have used). It is going to be the Region Of Interest (ROI) image file.
5. You now need to create a simple text file that gives each ROI value a name. Use your favorite text editor. . . . Line #1 should contain the version number (1.00). Line #2, etc. should contain a list of ROI # followed by a description of the Region separated by a space. The description cannot be longer than 75 characters. The following is an example. When done, save this file with the same name as above with the .R11 extension. Copy the two files to proper directory.
6. The only reason for this type of Region of Interest file is quality control or testing. This is not intended to be done often.

```
1.00
1   This is a description of ROI   1
10  This is a description of ROI  10
11  This is a description of ROI  11
12  This is a description of ROI  12
```

Example of Region of Interest Text File