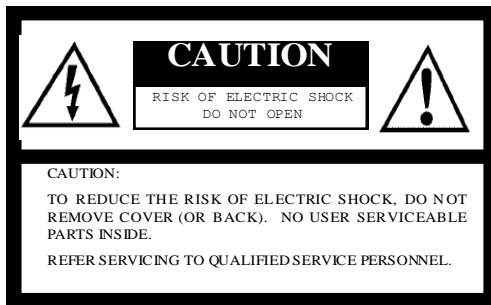




# **StStream User's Guide**

**Software Ver1.00.2525**

## Safety Precautions



For U.S.A.

**Warning:**

This equipment generates and uses radio frequency energy and if not installed and used properly, I.e., in strict accordance with the instruction manual, may cause harmful interference to radio communications. It has been tested and found to comply with the limits for a Class A computing device pursuant to Subpart J of Part 15 of FCC Rules, which are designed to provide reasonable protection against such interference when operated in a commercial environment.

For Canada

**Warning:**

This digital apparatus does not exceed the Class A limits for radio noise emissions from digital apparatus set out in the Radio Interference Regulations of the Canadian Department of Communications.



The lightning flash with arrowhead symbol, within an equilateral triangle, is intended to alert the user to the presence of uninsulated "dangerous voltage" within the product's enclosure that may be of sufficient magnitude to constitute a risk of electric shock to persons.



The exclamation point within an equilateral triangle is intended to alert the user to the presence of important operating and maintenance (servicing) instructions in the literature accompanying the appliance.

**WARNING:**

TO PREVENT FIRE OR SHOCK HAZARD, DO NOT EXPOSE THIS APPLIANCE TO RAIN OR MOISTURE.

## Product Precautions

- Handle the camera with care. Do not abuse the camera. Avoid striking or shaking it. Improper handling or storage could damage the camera.
- Do not pull or damage the camera cable.
- During camera use, do not wrap the unit in any material. This will cause the internal temperature of the unit to increase.
- Do not expose the camera to moisture, or do not try to operate it in wet areas.
- Do not operate the camera beyond its temperature, humidity and power source ratings.
- While the camera is not being used, keep the lens or lens cap on the camera to prevent dust or contamination from getting in the CCD or filter area and scratching or damaging this area.
- Do not keep the camera under the following conditions:
  - In wet, moist, and high humidity areas
  - Under hot direct sunlight
  - In high temperature areas
  - Near an object that releases a strong magnetic or electric field
  - Areas with strong vibrations

Use a soft cloth to clean the camera. Use pressured air spray to clean the surface of the glass. DO not scratch the surface of the glass.

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## Important Notes:

- This document details the instructions for installing StStream and the operation of Sentech camera within AMCAP software.
- This document details installation instruction for installing Direct-X driver for Windows Vista. Screen shots and instructed procedures in this document are from Windows Vista and may vary slightly in Windows 2000, Windows XP, and Windows 7.

## I. Installation Process

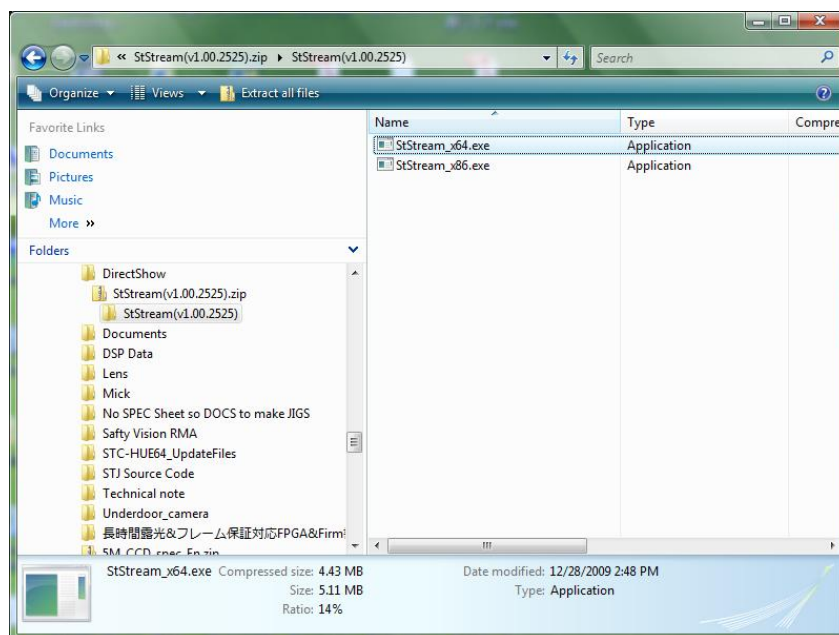
### A. Installing the Product for 64-bit Windows

#### 1. System Requirements

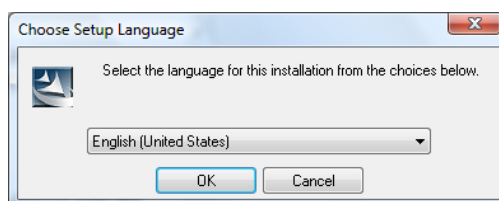
- Windows Vista (64bit)
- USB 2.0 Connection on PC

#### 2. Installing the Direct-X driver

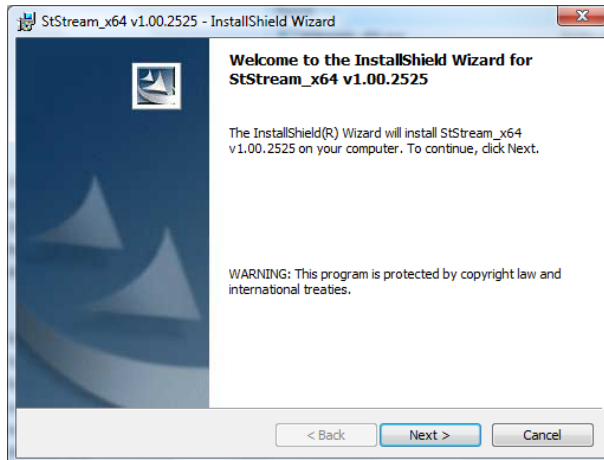
- a. Insert the disk into the CD-ROM drive.
- b. Double-click the 64bit executable StStream



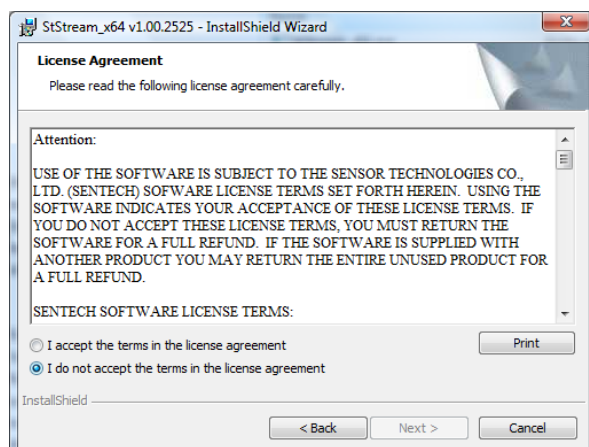
- c. With the drop down menu select a language for the installation process and then click "OK".



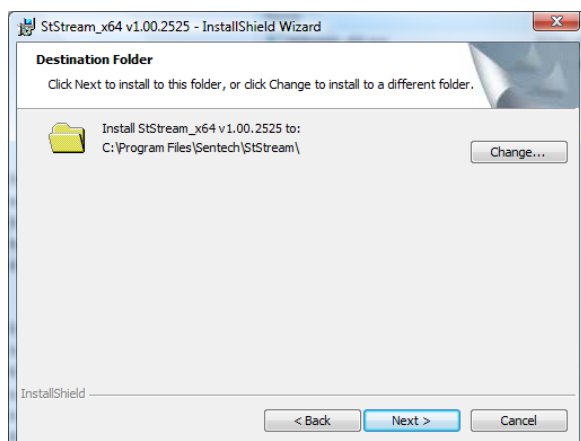
d. Click the “Next” button to continue.



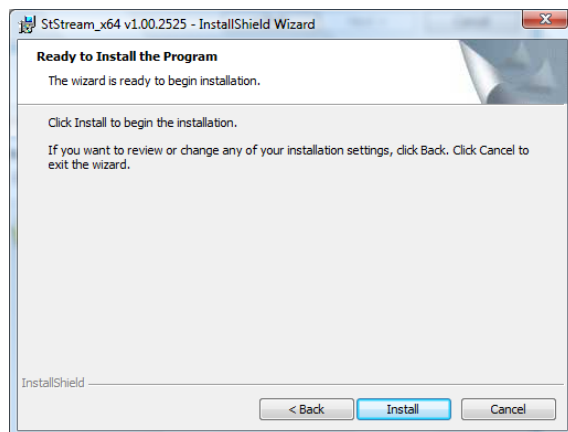
e. After reading over the license agreement, select “I accept the terms of the license agreement” and then select the “Next” button.



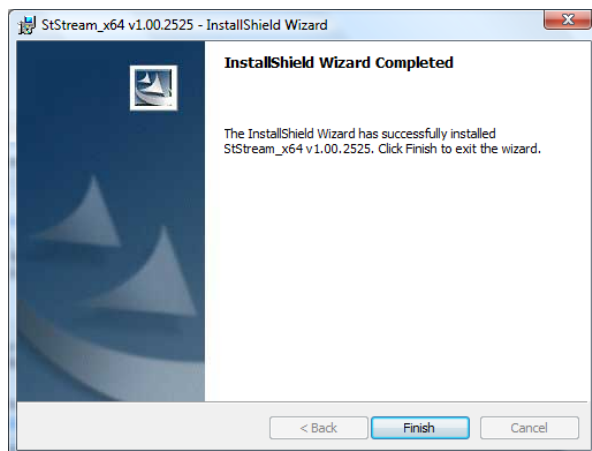
- f. Choose a folder to install the driver then click the “Next” button. It is recommended to use the default folder. Otherwise, click the “Change” button to select a different installation folder.



- g. Click the “Install” button to proceed to the next step.

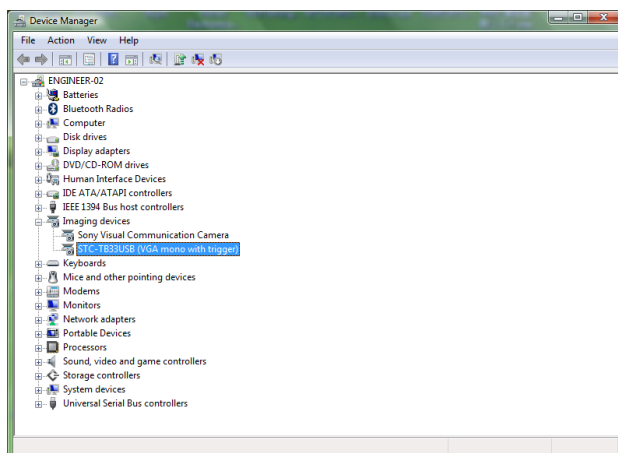


- h. Click the “Finish” button to close the Installer.

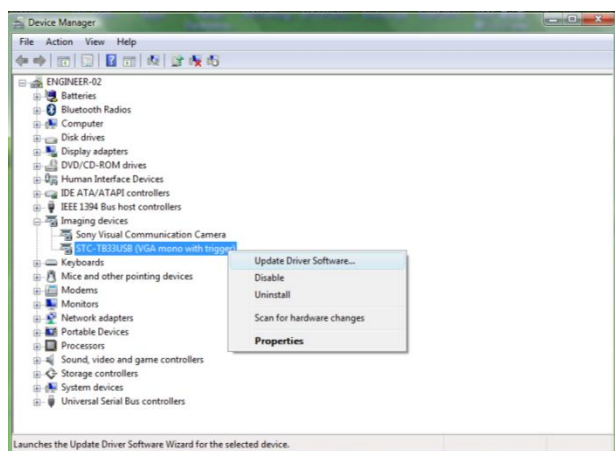


## II. Updating the Driver Software

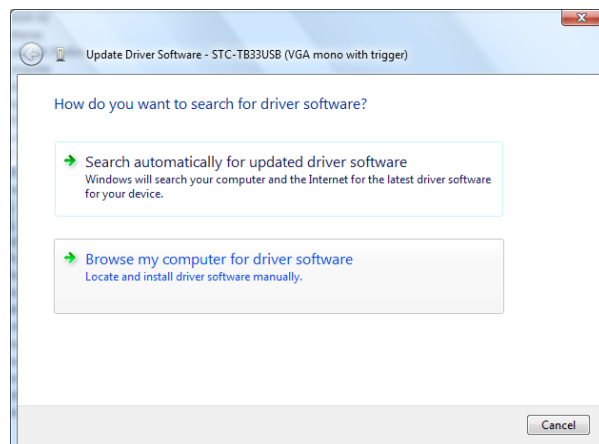
- A. Connect the camera to the PC with a USB cable.
- B. Go to the PC's Device Manager and under "Imaging Devices" and locate the Sentech Camera option.



- C. Right-click the Sentech Camera and select "Update Device Software..."

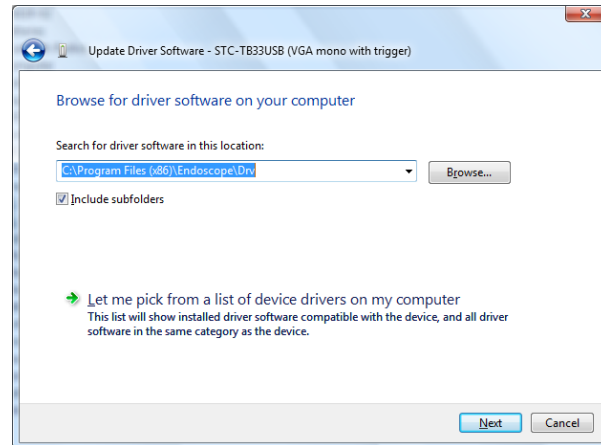


- D. Select "Browse my computer for driver software"





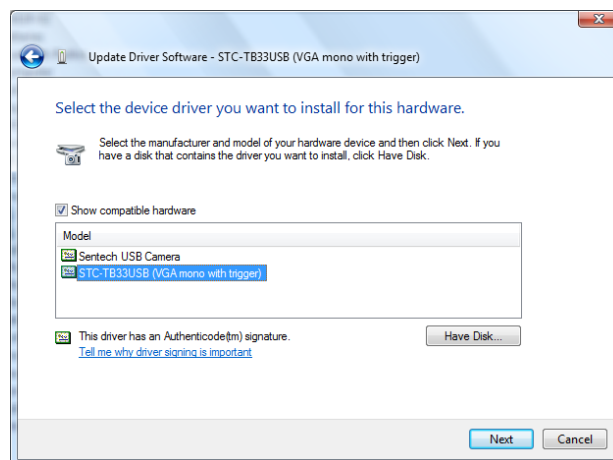
E. Select “Let me pick from a list of device drivers on my computer” at the bottom of the window. Then select the “Next” button.



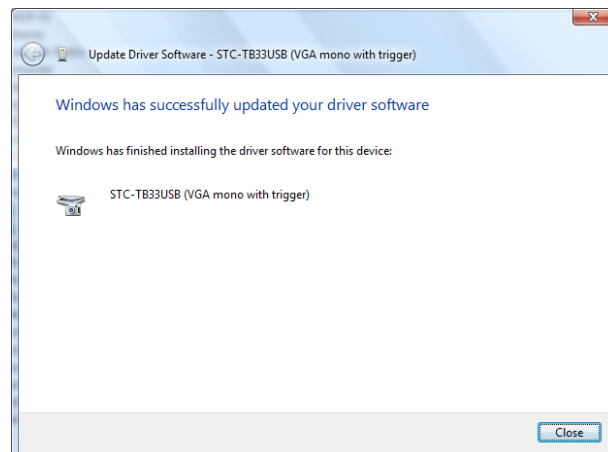
F. The following window has the available drivers listed in the model box.

By selecting “Sentech USB Camera”, the user (fill this out).

By selecting the camera’s model name, the user is selecting the Direct-X driver (fill this out).



G. Select “Close” to finish the drive software update process.



### III. Starting and Operating Sentech Camera in AMCAP

#### A. Starting the AMCAP Software

(Make certain that the software driver is correctly installed and the USB camera is connected to a mapped USB 2.0 port before continuing forward with the instructions)

1. Double-click the shortcut icon of AMCAP software to start the program. Please wait a few moments until the system recognizes the camera.
2. When the software and drivers are correctly installed and the USB camera is connected properly through the driver to the PC, the live image appears.

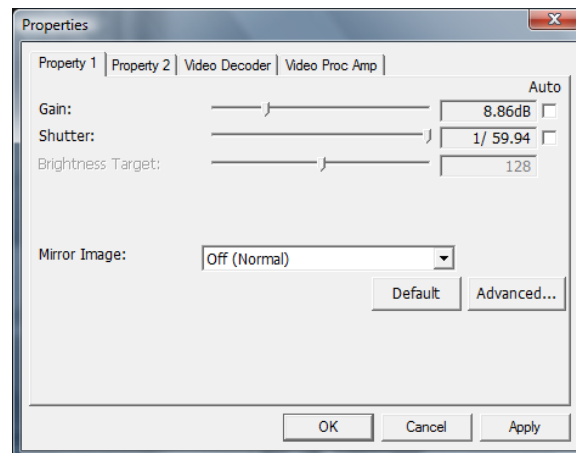
#### B. Operating the Camera Functionality within AMCAP Software

**Important Note:** In the “Properties” function there are two levels of operation control. There is a “Simple Menu” and an “Advanced Menu”. The “Simple Menu” is geared towards an end-user type level, whereas the “Advanced Menu” is geared towards an engineering level. In this section, we will review both Simple and Advanced menus, as well as the menu bars associated with these operations.

Click the “Options” on the main menu bar and select “Video Capture Filter”. By selecting Video Capture Filter, the following “Simple Menu” window appears and can be used to modify the camera settings.

As shown in the following screen shot, there are four tabs available for selection in the Properties Window. Property 1 tab and Property 2 tab are Sentech-based tabs; whereas, the Video Decoder tab and Video Proc Amp tab are AMCAP-based. The following section will explain the functionality within the Sentech-based tabs, Property 1 and Property 2. Both of these tabs have basic “end user” level control setups for the camera operation.

##### 1. Property 1 Tab settings on the Simple Menu



##### a. Gain

Note: Noise levels become more prominent when the gain level becomes higher. Proper lens aperture and shutter speed adjustments are required to reduce the gain level (i.e. opening lens aperture more and extending shutter speed longer, etc.)

There are two selectable gain modes:

i. AGC (Automatic Gain Control)

To activate the AGC check the “Auto” box.

Note: When AGC is selected the “Brightness Target” slide bar is activated. Adjust the target brightness level with the slide bar for the optimum brightness level desired for the application. This adjustment sets the upper range limit for the AGC and/or Auto Shutter.

In this AGC mode, the gain level changes automatically according to the changes of light intensity on the object.

ii. Fixed Gain

The camera works in the Fixed Gain mode by un-checking the “Auto” box at the right end of the “Gain” slide bar. In the Fixed Gain mode, the gain level can be adjusted with the “Gain” slide bar.

b. Shutter

Two shutter modes are selectable:

i. Auto Shutter control

The camera works with the auto shutter control by checking the “Auto” box at the right end of the “Shutter” slide bar.

Note: “Brightness Target” is activated and can be adjusted for the target brightness level with the slide bar when the auto shutter control is activated.

ii. Fixed Shutter control

The camera works with the fixed shutter control by un-checking the “Auto” box at the right end of “Shutter” slide bar. The shutter speed can be adjusted and set to the desired setting with the slide bar when the camera is in fixed shutter control mode.

c. Brightness Target

The “Brightness Target” is activated when the camera is set to AGC or the auto shutter control. While activated the target brightness level can be adjusted with the slide bar.

d. White Balance

Two white balance modes are selectable:

i. Auto White Balance

The camera works with the auto white balance by checking the “Auto” box at the right end of the “Manual White Balance R” and “Manual White Balance B” slide bar.

ii. Manual White Balance

The camera works with the manual white balance by un-checking the “Auto” box at the right end of “Manual White Balance R” and “Manual White Balance B” slide bars. Manual White Balance R” and “Manual White Balance B” can be adjusted with the slide bars to determine the desired value of white when the camera is in the manual white balance mode.

e. Mirror Image\*

The following four Mirror Image modes are selectable through this drop down menu:

i. OFF (Normal)

A normal image is displayed by selecting this mode.

ii. Horizontal

A mirror image (Horizontal reversed image or right/left converted image) is displayed by selecting this mode.

iii. Vertical

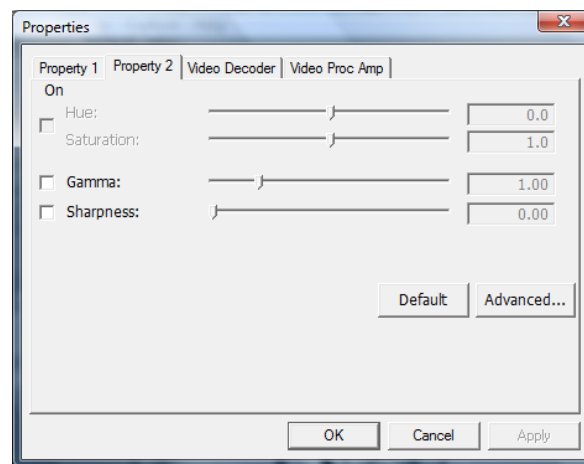
A vertically flipped image is displayed by selecting this mode.

iv. Horizontal/Vertical

Both a horizontally and vertically reversed image (180 degree rotated image from the original image) is displayed by selecting this mode.

**\*Important Note:** The frame rate may be reduced when this function is used because the processing is done in the PC. If this function is unnecessary for the system application, please use the camera without this function.

## 2. Property 2 Tab settings on the Simple Menu



a. Hue\*

The color hue can be adjusted by checking the “On” box at the left end of “Hue” and “Saturation”. The hue is adjustable with the slide bar. If the “On” box is left unchecked the camera default value of the hue is used.

b. Saturation\*

The saturation can be adjusted by checking the “On” box at the left end of “Hue” and “Saturation”. The saturation is adjustable with the slide bar. If the “On” box is left unchecked the default value of the saturation is used.

c. Gamma\*

The default value of the gamma is 1.0. The gamma can be adjusted to other values by checking the “On” box at the left end of the “Gamma”. The gamma is adjustable with the slide bar.

Note: Gamma correction or adjustment is setting the linearity of gray scale representation. Gamma value 1.0 represents linear transmission. In the case of this camera, when you set the gamma value below 1.0 the gray scale of the brighter side is expanded and the gray scale of the darker side is suppressed. On the other hand, when you set the gamma value above 1.0, the gray scale of the brighter side is suppressed and the gray scale of the darker side is expanded.

d. Sharpness\*

The sharpness can be adjustable by checking “On” at the left end of the “Sharpness”. The sharpness is adjustable with the slide bar. If the “On” box is left unchecked, the camera default value of the sharpness is used.

Note: By increasing the sharpness, the noise in the image becomes more prominent. If required, adjust the shutter speed, gain and lens aperture to reduce the noise.

\*Important Note: The frame rate may be reduced when these functions are used because the processing is done in the PC. IF this function is unnecessary for the system/application, please use the camera without this function.

### 3. Menu Bar

#### a. "OK" Button

By clicking the "OK" button, the "Properties" window will close and the current settings will temporarily remain in the software, as long as the software remains open. However, these settings have NOT been saved by clicking the "OK" button. Therefore, when the camera is powered down and re-started, it will reboot with the original or last saved settings.

#### b. "Cancel" Button

By selecting the "Cancel" button, the camera settings will reset to the default or last saved settings.

#### c. "Apply" Button

This button is similar to the "OK" button in that it will have the current settings temporarily remain in the software, as long as it remains open. The difference, however, is that with this button the properties window will remain open, for further setting adjustments. The setting made with the "Apply" button, will not remain once the camera is powered down and restarted.

#### d. "Default" Button

Finish writing this section.

#### e. "Advanced" Button

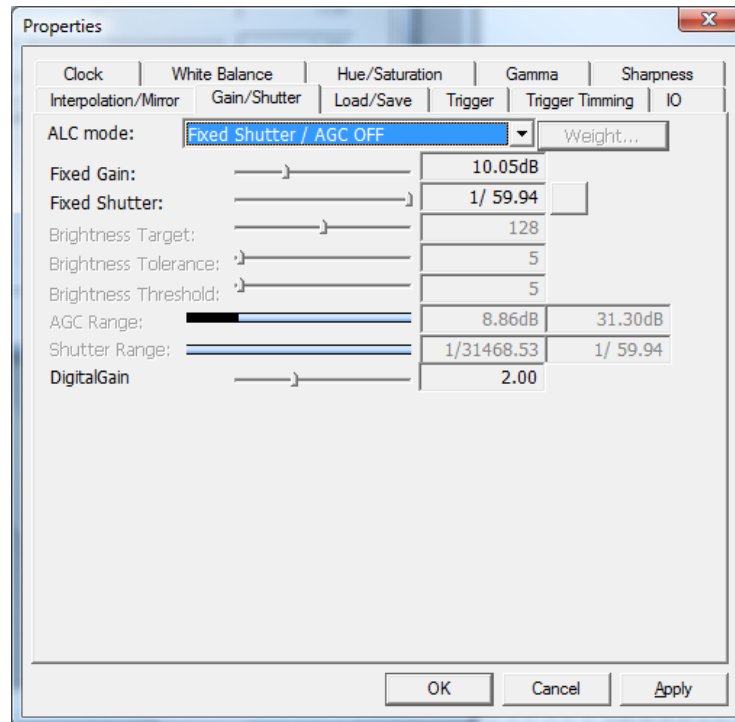
This button allows controls similar to those explained for the "Simple" menu settings, except the level of control is significantly deeper and more powerful. In order to support the continuity of the explanation of the Menu Bar on the image screen, a detailed explanation of the "Advanced" menu will be provided in the following section "Advanced Menu Instructions".

## IV. Advanced Menu Instructions

Click the “Options” on the main menu bar and select “Video Capture Filter”. The Properties window will open and then select the “Advanced” button. By selecting this button, the Advanced settings window appears for more detailed settings of the camera.

In the Advanced window there are **XX** tabular sections (**XX** in the case of non-trigger) that can be observed at the top of the window. The following section of the manual will explain the settings for each of these **XX** Advanced window tabs.

### A. Gain / Shutter Tab



#### 1. ALC Mode Selection:

The following seven ALC (Automatic Light Compensation) modes are selectable through the drop down menu. As these various modes are selected, the control options on the control option screen will change.

**Note:** In the case in which at least one of auto modes is selected (b, c, and d on the following [page](#)) it is possible that a constant flickering or brightness fluctuation may occur in environments with fluorescent lighting. This happens because the internal feedback time is too long for the photometric detection for the ALC function since this decision is executed on the computer over the USB port.

**Note:** The Sentech USB cameras offer two kinds of gain; Analog Gain and Digital Gain. Analog Gain is gain that is generated off of the CCD before signal passes to the A/D convertor after which the signal is processed digitally. As Analog Gain is increased, video noise is also increased. Digital Gain is gain that is applied digitally after the signal has passed the A/D convertor and is being processed digitally. Unlike Analog Gain, Digital Gain can be increased without increasing or adding noise to the image.

## a. Fixed Shutter / AGC OFF

In this mode, the camera works with a fixed shutter speed and a fixed gain value.

This mode is suitable for applications which have consistent light conditions or when absolute video level measurements are required. Since there is no automatic gain or shutter function at this setting, the picture may be too dark or saturated depending on the adjustments of the shutter speed, fixed gain and/or lens aperture. Adjust these three for optimum brightness of the image.

The available control functions for this mode are:

- Fixed Gain
- Fixed Shutter
- Preset Shutter Speeds
- Digital Gain

## b. Auto Shutter ON / AGC ON

In this mode, the camera works in the auto shutter mode and AGC (automatic gain control). This mode is suitable for applications in which lighting conditions change gradually (i.e. applications with natural outdoor lighting).

In this mode, the shutter speed and gain change automatically to maintain the video output level at optimum brightness, despite light intensity changes on the object. The Target Brightness slide bar is activated when this mode is selected and this "Brightness Target" level defines the targeted brightness level desired to be maintained automatically.

The available control functions for this mode are:

- Weight
- Brightness Target
- Brightness Tolerance
- Brightness Threshold
- AGC Range
- Shutter Range
- Digital Gain

## c. Auto Shutter ON / AGC OFF

In this mode, the camera works with the auto shutter mode and fixed gain control. This mode is suitable for applications in which the lighting conditions change gradually, yet a certain fixed gain value is required.

The available control functions for this mode are:

- Weight
- Fixed Gain
- Brightness Target
- Brightness Tolerance
- Brightness Threshold
- Shutter Range
- Digital Gain

## d. Fixed Shutter / AGC ON

In this mode, the camera works with a fixed shutter speed and the AGC (auto gain control). This mode is suitable for applications in which lighting conditions change gradually yet a certain fixed shutter speed is required.

The available control functions for this mode are:

- Weight
- Fixed Shutter
- Preset Shutter Speeds
- Brightness Target
- Brightness Tolerance
- Brightness Threshold
- AGC Range
- Digital Gain

## e. Auto Shutter / AGC OneShot

Auto Shutter / AGC “One Shot” allows the user to set the shutter and gain values to a desired temporary fixed setting. If the camera is powered down, these temporary values will be lost.

This is a fast convenient mode to set the fixed shutter speed and fixed gain value with one action, for a given environment with set lighting and lensing. First, set the “Target Brightness” at the desired or optimum brightness level needed for the application and click “Auto Shutter / AGC OneShot”. By doing this the fixed shutter speed and fixed gain values are set automatically to maintain the “Target Brightness” setting. Once this action is taken, the shutter and gain values are fixed on a temporary basis. These values will be held until they are either reset or until the camera is powered off.

In this mode, the “Target Brightness” slide bar is activated and can be adjusted. To change the brightness level, set a different value with the “Target Brightness” slide bar and select “Auto Shutter/AGC OneShot” again.

There are two ways to set the “Auto Shutter / AGC OneShot” brightness level:

- 1) Go to “Auto Shutter / AGC On” and adjust the Target Brightness Bar to the desired level. Next, select “Auto Shutter / AGC OneShot”. This will set the Fixed Shutter and Fixed Gain values to that brightness level.
- 2) Select “Auto Shutter /AGC OneShot” and adjust the Target Brightness slide bar to the desired value, then go back to the ALC Mode drop down menu and again click on “ALC/AGC One Shot” again. This will reset the shutter and gain values according to the new “Brightness Target” value.

The available control functions for this mode are:

- Weight
- Brightness Target
- Brightness Tolerance
- Brightness Threshold
- AGC Range
- Shutter Range
- Digital Gain



## f. Auto Shutter OneShot / AGC OFF

This mode is very similar to the previous mode “Auto Shutter/AGC OneShot” above. The difference is that in this mode the gain is set at a fixed value by the operator and the “OneShot” process is used to set only the shutter speed. After the shutter speed has been set, the gain value can be further adjusted by either the “Fixed Gain” or “Digital Gain” slide bars. This mode is used to set the gain at a certain fixed value and to find optimum shutter speed. Set the fixed gain value first then click the “Auto Shutter OneShot / AGC OFF” selection.

The available control functions for this mode are:

- Weight
- Fixed Gain
- Brightness Target
- Brightness Tolerance
- Brightness Threshold
- Shutter Range
- Digital Gain

## g. Fixed Shutter / AGC OneShot

This mode is also very similar to the previous mode “Auto Shutter/AGC OneShot” above. The difference is that in this mode the shutter speed is set at a fixed value by the operator and the “OneShot” process is used to set only the gain value. After the gain value has been set, the shutter speed can be further adjusted by either the “Fixed Shutter” slide bar or the “Preset Shutter Speed Buttons”. This mode is used to set the shutter speed at a certain fixed value and to find optimum gain value. Set the fixed gain value first then click the “Auto Shutter OneShot / AGC OFF” selection.

The available control functions for this mode are:

- Weight
- Fixed Shutter
- Preset Shutter Speeds
- Brightness Target
- Brightness Tolerance
- Brightness Threshold
- AGC Range
- Digital Gain

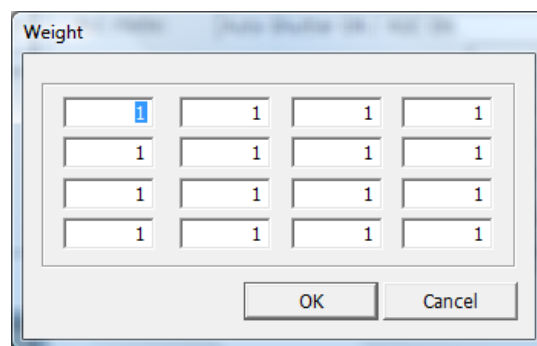
## 2. Weight

This function allows the user to define the importance or “weight” of physical areas on the image sensor (or image) during the calculation of the Automatic Values for Auto Gain or Auto Shutter.

This function can be activated and accessed in the following ALC Mode Selections:

- Auto Shutter ON / AGC ON
- Auto Shutter ON / AGC OFF
- Fixed Shutter / AGC ON
- Auto Shutter / AGC OneShot
- Auto Shutter OneShot / AGC OFF
- Fixed Shutter / AGC OneShot

By clicking the “Weight” button, the following “ALC Weight” window will appear:



The number placed in each area signifies/determines the value of the “weight” given in relationship to the weight value of the other areas in calculating the effect of the auto function (i.e. the Automatic Light Compensation factor for the “Auto Shutter” and the “AGC”). Simply type in the desired weight factor to adjust the numbers. The larger the number, the more effect that area of the image has on the ALC adjustment. The range of the weight factor is from 1 to 255.

## 3. Fixed Gain

**Note:** The Sentech USB cameras offer two kinds of gain; Analog Gain and Digital Gain. Analog Gain is gain that is generated off of the CCD before the signal passes to the A/D convertor after which the signal is processed digitally. As Analog Gain is increased, video noise is also increased. Digital Gain is gain that is applied digitally after the signal has passed the A/D convertor and is being processed digitally. Unlike Analog Gain, Digital Gain can be increased without increasing or adding noise to the image.

This control is used to set the desired level of analog gain, when the gain has a fixed value. This function is activated and can be accessed in the following ALC Mode Selections:

- Fixed Shutter / AGC OFF
- Auto Shutter / AGC OFF
- Auto Shutter OneShot / AGC OFF

Once the “Fixed Gain” is activated, the “Fixed Gain” slide bar can be used to adjust the desired level of the analog gain.

**Note:** When fine adjustments are needed for the fixed gain, select the “Fixed Gain” slide bar and hit the right or left arrow key on the keypad. This is applicable on all other slide bars as well.

## 4. Fixed Shutter

This control is used to set the desired shutter speed, when the shutter speed has a fixed value. This function is activated and can be accessed in the following ALC Mode Selections:

- Fixed Shutter / AGC OFF
- Fixed Shutter / AGC ON
- Fixed Shutter / AGC OneShot

Once the “Fixed Shutter” is activated the “Fixed Shutter” slide bar can be used to adjust the shutter speed to the desired level.

**Note:** Maximum shutter speed can be obtained by setting the slide bar to the far right end position. As the slide bar is moved towards the left, the shutter speed will gradually become shorter. Please note that at the far left position, the shutter speed goes back to the maximum speed.

**Note:** When fine adjustments are needed for the shutter speed, select the “Fixed Shutter” slide bar and hit the right or left arrow key. This is applicable on all other slide bars as well.

## 5. Shutter Speed Buttons

This control is used to set the shutter speed at traditional preset values. This function is activated and can be accessed in the following ALC Mode Selections:

- Fixed Shutter / AGC OFF
- Fixed Shutter / AGC ON
- Fixed Shutter / AGC OneShot

The values for the preset shutter speed buttons for fixed shutter speeds vary by different camera types. The preset shutter speeds are listed below by sensor size:

	<u>VGA</u>	<u>XGA</u>	<u>SXGA</u>	<u>UXGA</u>
a.	1/120	1/120	1/120	1/120
b.	1/100	1/100	1/100	1/100
c.	1/60	1/60	1/60	1/60
d.	1/50	1/50	1/50	1/50

**Note:** By clicking “Reset”, the shutter speed will be reset to the original value which is the longest shutter speed available at the selected mode.

## 6. Brightness Target

This control is used to set the desired brightness level for all ALC automatic controls.

An example of where this might be used is on a microscope. Usually a microscope will have a light source and the optics of the scope will serve as the lens train. By hooking up the camera to the microscopes coupler and putting the ALC Mode in any of the selections below, the desired brightness level of the image can be targeted by adjusting the “Target Brightness” slide bar. This “Brightness Target” level defines the brightness level you would like to maintain automatically with the automatic modes. The target brightness can be adjusted with this slide bar.

This function is activated and can be accessed in the following ALC Mode Selections:

- Auto Shutter ON / AGC ON
- Auto Shutter ON / AGC OFF
- Fixed Shutter / AGC ON
- Auto Shutter / AGC OneShot
- Auto Shutter OneShot / AGC OFF
- Fixed Shutter / AGC OneShot

## 7. Brightness Tolerance

This control is used to set the “Brightness Tolerance” level referencing to the “Brightness Target” value mentioned above. This control allows the upper and lower limit values of the brightness range to be set. By setting the upper and lower values of the range, the automatic gain control or automatic shutter control (collectively called ALC) is activated when actual video level exceeds the range set here. The “Brightness Tolerance” for ALC operations can be adjusted with this slide bar.

This function is activated and can be accessed in the following ALC Mode Selections:

- Auto Shutter ON / AGC ON
- Auto Shutter ON / AGC OFF
- Fixed Shutter / AGC On
- Auto Shutter / AGC OneShot
- Auto Shutter OneShot / AGC OFF
- Fixed Shutter / AGC OneShot

## 8. Brightness Threshold

This control is used to set the “Brightness Threshold” level. This value supports or is related to the “Brightness Target” value. This function allows the upper and lower limit values of the brightness level to be set for additional control of the “Automatic Gain Control” and/or “Automatic Shutter Control” (collectively called ALC). In other words, when ALC is in operation, the automatic adjustments will halt when the brightness level reaches to this value set for the “Brightness Threshold”.

**Note:** To insure a stable ALC operation, choose a smaller value for the “Brightness Threshold” level than the “Brightness Tolerance” setting.

This function is activated and can be accessed in the following ALC Mode Selections:

- Auto Shutter ON / AGC ON
- Auto Shutter ON / AGC OFF
- Fixed Shutter / AGC On
- Auto Shutter / AGC OneShot
- Auto Shutter OneShot / AGC OFF
- Fixed Shutter / AGC OneShot

## 9. AGC Range

This control is used to set the AGC range. This defines the range of gain values for the AGC operation. When the gain value mode selected uses Auto Gain (AGC ON), the active range will be limited to the upper and lower values shown where the slide bar is highlighted. The active AGC range (lower and upper) can be adjusted with this slide bar.

This function is activated and can be accessed in the following ALC Mode Selections:

- Auto Shutter / AGC ON
- Fixed Shutter / AGC ON
- Auto Shutter / AGC OneShot
- Fixed Shutter / AGC OneShot

## 10. Shutter Range

The active shutter speed range (upper and lower) can be adjusted with this slide bar. When the upper and lower shutter speed values are set, the auto shutter speed will be limited only to the range shown where the slide bar is highlighted. This function is activated and can be accessed in the following ALC Mode Selections:

- ALC FullAuto / AGC ON
- ALC / AGC OneShot
- ALC OneShot / AGC OFF

## 11. Digital Gain

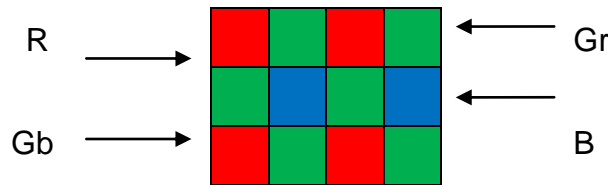
**Note:** The Sentech USB cameras offer two kinds of gain; Analog Gain and Digital Gain. Analog Gain this gain that is generated off of the CCD before the signal is processed digitally. As Analog Gain is increased, video noise is also increased. Digital Gain is gain that is applied digitally after the signal has started to be processed. Unlike Analog Gain, Digital Gain can be increased without increasing or adding noise to the image.

This control allows the “Digital Gain” value to be set. The “Digital Gain” for ALC operations can be adjusted with this slide bar.

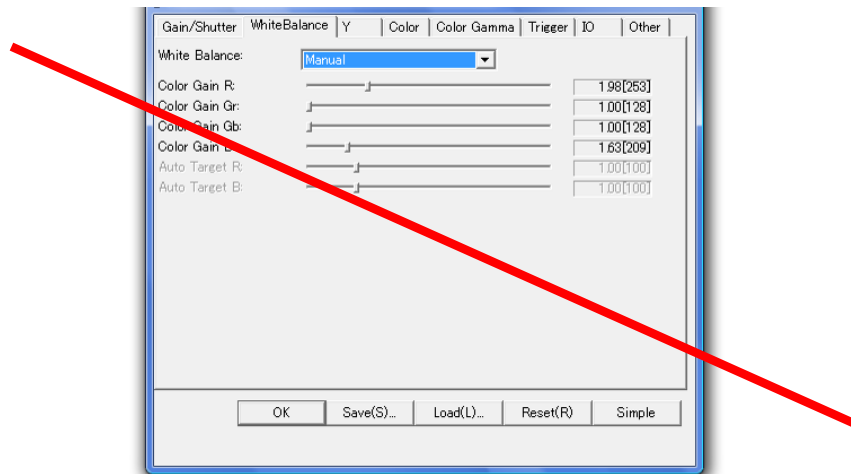
## B. White Balance Tab

**Important Note:** The frame rate may be reduced when either the “FullAuto” or “One Shot” White Balance modes are used because these functions are processed in the PC. If these modes are unnecessary for the application, please do not use them.

**Note:** This camera utilizes an RGB Bayer Mosaic filter and the arrangement of R (red), G (green) and B (blue) is shown in the figure below. This filter is placed over the CCD so that each pixel has an R, G or B filter over it. Color interpolation is done in the PC and a full color image is created. As you see in the drawing below, there are more green pixels than red or blue pixels. For convenience purposes, we differentiate green pixels in the red rows from the ones in the blue rows as Gr and Gb respectively.



### 1. White Balance – Mode Selection



Through the White Balance drop down menu, the following four White Balance modes are selectable:

#### a. OFF

By selecting this mode, the camera works without white balance processing. This mode would be utilized in those cases where raw data is desired.

Due to the Bayer color filter, the picture becomes green tinted as there are more pixels on the CCD that have green filters on them than there are with red or blue filters on them. (See illustration above.)

## b. Manual

By selecting this mode, the camera works with manual white balance. This mode is highly recommended in applications in which the color temperature of the light is constant.

By adjusting “Color Gain R”, “Color Gain Gr”, “Color Gain Gb” and “Color Gain B”, the desired level of White can be set to define the manual white balance.

The meaning of each of the four slide bars that are activated in this mode are as follows:

- Color Gain R: Color gain for all red pixels.
- Color Gain Gr: Color gain for all green pixels in the red rows.
- Color Gain Gb: Color gain for all green pixels in the blue rows.
- Color Gain B: Color gain for all blue pixels.

## c. Full Auto

By selecting this mode, the camera activates Auto White Balance (AWB). In AWB the camera constantly calculates what it “thinks” is white based on the scene it is currently processing. This mode is recommended in applications in which the camera is constantly exposed to different color temperatures of light.

The following slide bars are activated in the AWB mode:

- Color Gain Gr
- Color Gain Gb
- Target R
- Target B

By adjusting “Color Gain Gr”, “Color Gain Gb”, “Auto Target R” and “Auto Target B”, the desired level of White can be set to help define the Automatic White Balance processing.

## d. OneShot

By selecting this mode, the camera works with “OneShot Auto White Balance” (also referred to as “Push to Set White Balance”). This mode is highly recommended for applications in which the color temperature of the light is constant during a session but may vary from session to session. This is a temporary White Balance setting and will be lost when the camera is powered down. Therefore, the “OneShot Auto White Balance” settings will need to be reset for every session.

Follow the procedures below to use this “OneShot” White Balance feature and to set the white balance for this session:

- Under the proper lighting source, place a white object in front of the camera so that the whole screen is covered by the white target.
- Click “OneShot” white balance and keep the white object for a few seconds until the screen becomes pure white or gray (no color tint). At this moment, the white balance is properly set for the particular light source and lens currently being used. The camera will retain this white balance setting until the process is executed again or until the camera is powered-down.
- If or when the color temperature of the light source changes, repeat this process to reset the white balance value.

The following slide bars are activated in the “OneShot” mode:

- Color Gain Gr
- Color Gain Gb
- Target R
- Target B

## 2. Color Gain R

This slide bar is used to adjust the red color level of the white balance.

## 3. Color Gain Gr

This slide bar is used to adjust the green in the red rows. This setting must be equal to setting or value of “Color Gain Gb”. Lines may appear on the image when “Color Gain Bg” and “Color Gain Gr” are not equal.

## 4. Color Gain Gb

This slide bar is used to adjust the green in the blue rows. This setting must be equal to the setting or value of “Color Gain Gr”. Lines may appear on the image when “Color Gain Gb” and “Color Gain Gr” are not equal.

## 5. Color Gain B

This slide bar is used to adjust the blue color level of the white balance.

## 6. Target R

This slide bar is used to adjust the red color level of the white balance in “Full Auto” or “One Shot” modes.

## 7. Target B

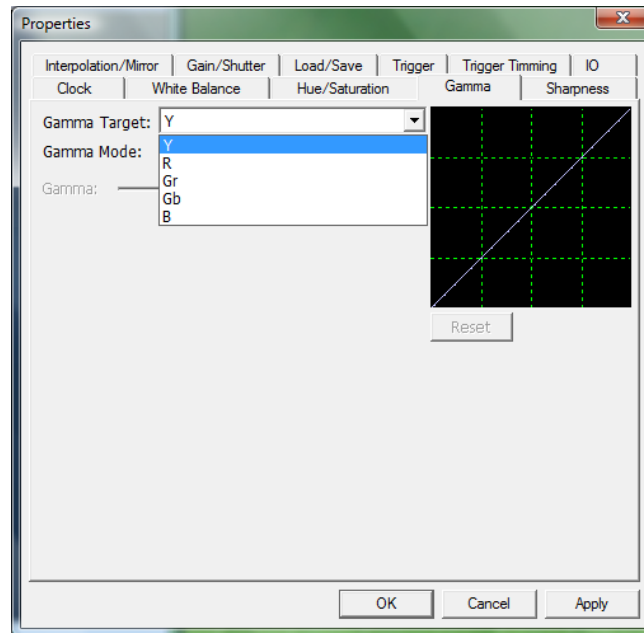
This slide bar is used to adjust the blue color level of the white balance in “Full Auto” or “One Shot” modes.



## C. Gamma Tab

Through this tab the color gamma correction factors can individually be set on R, Gr, Gb and B.

**Note:** Gamma correction or adjustment is setting linearity of gray scale representation as mentioned before. With the adjustments below, the grayscale can be set rendering on individual color segments. Gamma value “1” represents linear transmission. With this camera, if the gamma value is set below “1”, the gray scale of brighter side is expanded and the gray scale of darker side is suppressed. On the other hand, when the gamma value is set above “q”, the gray scale of brighter side is suppressed and the gray scale of darker side is expanded.

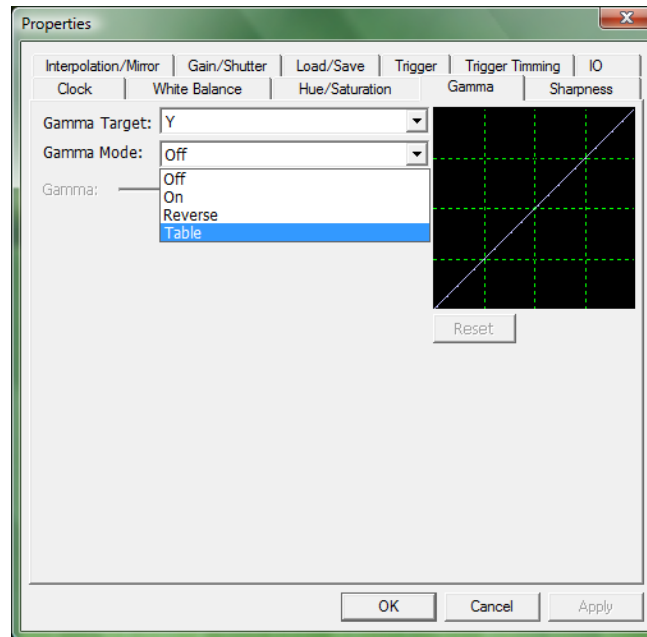


### 1. Gamma Target

Use this section to select the individual gamma factor that is to be changed in the Gamma Mode section. The following five gamma correction factors can be selected:

- a. Y  
This mode is for adjusting the **Fill this section out.**
- b. R  
This mode is for adjusting the red color level.
- c. Gr  
This mode is for adjusting the green color level in the red rows.
- d. Gb  
This mode is for adjusting the green color level in the blue rows.
- e. B  
This mode is for adjusting the blue color level.

**Important Note:** The frame rate may be reduced when Gamma Mode is used because the function is processed in the PC. If this function is unnecessary for the application/system, please do not use it.



The slide bar is activated and or accessible by setting any of the Gamma Mode selections to “ON” or “Reverse”. Adjust the Color Gamma volumes with the slide bars.

**Note:** Gamma correction or adjustment is referring to the linearity of the gray scale representation. Gamma value “1.0” represents a linear transmission. In the case of the Sentech USB cameras, when the gamma value is set below “1.0”, the gray scale of the brighter side is expanded and the gray scale of the darker side is suppressed. On the other hand, when the gamma value is set above “1.0”, the gray scale of the brighter side is suppressed and the gray scale of the darker side is expanded.

## 2. Gamma Mode

After selecting the desired Gamma Target (see previous [page](#)), the following three “Gamma” modes are selectable through the Gamma Mode drop down menu:

### a. OFF

In this mode, the gamma value is set at 1.0. This mode also prohibits the gamma value from being changed.

### b. ON

By selecting this mode, the gamma value can be changed. In this mode the gamma value can be adjusted with the “Gamma” slide bar.

### c. Reverse

This mode creates a “gray scale-reversed-image” and provides gamma correction at the same time. In this mode, pixels which would normally be bright are represented as dark and dark as bright. In this mode the gamma value can be adjusted with the “Gamma” slide bar.

### d. Table

This mode utilizes the grid table adjacent to the setting. Select the gamma curve within the table and position the curve into the desired level of gamma. This mode provides more flexibility when adjusting the gamma.

## D. Sharpness Tab

### 1. Sharpness Mode

Through this drop down menu, the following two “Sharpness” modes are selectable.

#### a. OFF

The sharpness setting cannot be adjusted in this mode.

The camera works with minimum sharpness gain and minimum sharpness coring settings in this mode.

#### b. ON

The sharpness setting can be adjusted in this mode. This adjustment is also known as “aperture correction”.

The available control functions for the “ON” mode are:

##### 1) Gain

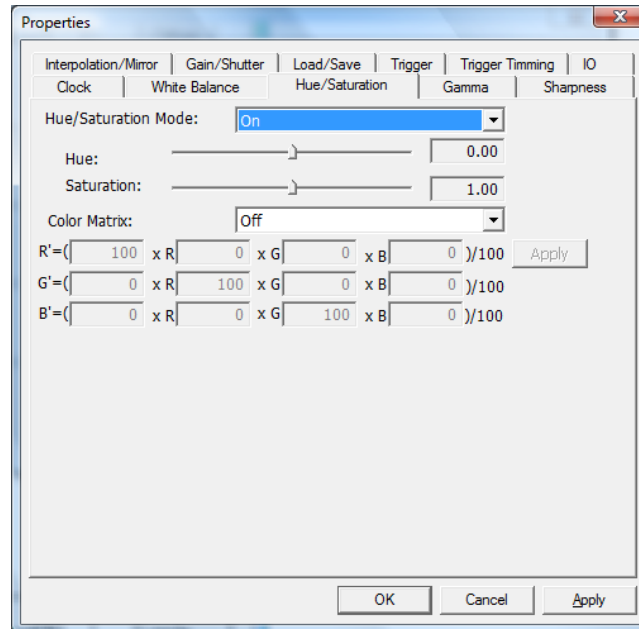
This function is activated and can be accessible when the sharpness mode is set to “ON”. The sharpness setting can be adjusted with the slide bar.

##### 2) Coring

This function is activated and can be accessible when the sharpness mode is set to “ON”. The detection range of sharpness enhancement can be adjusted with the slide bar.

**Note:** This adjustment is also called ‘aperture correction’ or ‘edge enhancement’. The principal of this correction is adding edge enhancement information based on the gray scale signal level difference and image sharpness is increased significantly. However, as a nature of this principle, as the “Sharpness Gain” increases, the background noise becomes more noticeable. In such a case, the “Sharpness Coring” can be increased and the background noise will reduce significantly. Please note, however, that if the “Sharpness Coring” is increased too much, eventually the effect of “Sharpness Gain” will also become null.

## E. Hue / Saturation Tab



### 1. Hue / Saturation Mode

Through the drop down menu, the following two “Hue / Saturation” modes are selectable:

#### a. OFF

In this mode the color saturation and hue settings cannot be changed. The camera operates with factory default Hue and Saturation settings in this mode.

#### b. ON

In this mode the color saturation and hue settings can be changed by adjusting the respective slide bars.

##### 1) Hue

This function is activated when the Hue/Saturation Mode is set to “ON”. The hue setting can be adjusted with the slide bar.

##### 2) Saturation

This function is activated when the Hue/Saturation Mode is set to “ON”. The saturation setting can be adjusted with the slide bar.

## 2. Color Matrix

This section is for detailed color adjustment. Do not adjust these settings if the default color is satisfactory for the application. Through the drop down menu, the following two “Color Matrix” modes are selectable:

### a. OFF

In this mode the color matrix cannot be changed. The camera operates with factory default color settings in this mode.

### b. ON

In this mode the color matrix settings can be changed by adjusting the respective R, G, and B fields.

Color Matrix: Off

R'=(  x R  x G  x B  )/100

G'=(  x R  x G  x B  )/100

B'=(  x R  x G  x B  )/100

Apply

The 4x3 Matrix above allows for 12 parameters to be used to set the Color Matrix of the image. Any changes made to the parameters are only reflected to the image after the “APPLY” button to the right of the matrix is selected.

- R', G' and B' are the result of the formulas where the R color, G color, and B color have been revised by the formula.
- If the standard core color values are not acceptable, this matrix may be used to adjust those core values. If no adjustments or additional processing for the core color values is needed, then R is Red, G is Green, and B is Blue without any processing by this matrix. The values shown in this matrix before any adjustments are made are the “Factory Default” values.
- The active value range which may be put into the matrix is from -32,767 to 32,767.

**Note:** Luminance is primarily carried in the Green channel. Therefore, if for example the three default values are each changed from 100 to 1,000, the image will become quite saturated. If the lens is closed down to reduce the amount of light that is allowed onto the CCD, a more natural image color will be regained. This might be useful for very low light applications. Please note that this will also increase the noise in the image.

### a. APPLY (button to the right of the matrix)

By selecting the “APPLY” button (to the right), all changes to the Color Matrix will be reflected in the image and the color Matrix window will stay open, allowing further adjustments.

**Note:** The Apply button at the bottom of the window is VOID. Selecting it will NOT apply the setting changes of the Color Matrix. Make sure to only select the Apply button to the right of the matrix.

### b. OK

This will simply close the window. No setting changes will be reflected if the “Apply” button is not selected prior to clicking the “OK” button.

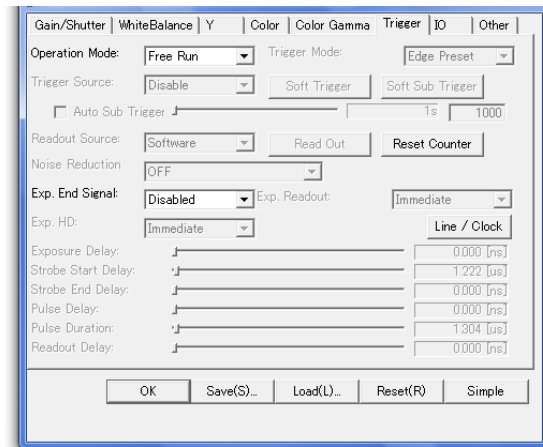
### c. CANCEL

By selecting the “CANCEL” button, the values will be set at the last saved setting and the window will close.

## F. Trigger Tab

The set up and control features for the “Trigger” functions of the Sentech USB cameras are provided on this tab.

**Note:** If the current display of the StCamSWare Viewing Software does not have the “Trigger” and “IO” tabs displayed and the trigger function is needed, please refer to [Page 47](#) of this manual. If a “Trigger” function is not needed please proceed to [Page 78-82](#) to review the “Other” tab.



### 1. Trigger Type

Through the “Operation Mode” drop down menu, the following three modes are selectable:

#### a. Free Run

In this mode, the camera outputs video continuously as in a non-trigger operation.

#### b. Trigger

In this mode, the camera waits for a trigger input signal. When a trigger signal is received, the camera exposes and sends one frame of video. The image generated by supplying a trigger is displayed on the monitor until the next image is generated upon receipt of the next trigger.

#### c. Trigger Read Out

In this mode, the camera waits for the trigger input signal. The camera exposes when the trigger signal is received, however, the video output signal is held on the CCD until the readout signal is applied. As a result, this function allows the user to control the readout timing from the CCD.

### 2. Trigger Source

This function can be activated and accessed in the following “Trigger Type” settings:

- Trigger
- Trigger w/ Readout

The “Trigger Source” has three setting selections:

#### a. Disable

This setup disables the trigger input.

#### b. Software

By selecting this mode, the camera will accept a trigger signal through the software over the USB cable. By selecting the software mode, the “Trigger” button to the right will be activated.

c. Hardware

By selecting this mode, the camera accepts trigger signals through the hardware. A “Hard Trigger” signal should be supplied to the camera via one of the I/O ports provided on the camera. Please refer to the explanation in the next “IO” tab. (Page XX).

3. Exposure Time

The general trigger function is enabled when “Trigger” or “Trigger with ReadOut” is selected in the operation mode. The following are the selectable exposure times:

a. Edge Preset Trigger

The duration of exposure is determined by the preset “Fixed Shutter” speed (which is set under the “Gain/Shutter” tab, see Page 51). This type of trigger is activated when either “Software” or “Hardware” is selected in the Trigger Source field.

b. Pulse Width Trigger

This mode only works in conjunction with “Hardware” trigger, in the “Trigger Source”. With this mode, the duration of camera exposure will synchronize with the input pulse width.

c. Start / Stop Trigger

In Start/Stop trigger mode, first select “Software” as the trigger source. The exposure time is determined by the following two methods:

- i. First is the time between pressing “Trigger” and “Sub Trigger”, which is done manually.
- ii. Second is by checking the Auto Sub Trigger setting box, where the user can set the timer via software clock scroll bar. The range is from 500ms to 10 minutes.

If “Hardware” is selected as the “Trigger Source”, it is exactly the same as in the software mode, except, the hardware signal is assigned to the IO pins, which can then be configured under the IO tab. Assign trigger input and sub trigger to either IO0 or IO1. Camera starts exposure when trigger input is applied. The exposure stops when the sub trigger \signal is applied.

4. Read Out Source

This function can ONLY be activated and accessed in the following Trigger Type mode:

- Trigger w/ Read Out

The “Readout Source” has two setting selections:

- a. Software
- b. Hardware

Under the “Trigger w/ readout” mode, the video output signal is held on the CCD as a charge until a “Readout” signal is applied. This selection determines the type of signal which will be supplied, whether it is a software based or hardware based signal. If “Software” is selected, the signal must be supplied from the software via the USB cable. If “Hardware” is selected, the signal should be supplied through one of the I/O ports provided on the camera. Please refer to the explanation provided in the section “IO Tab” (Page 37).

## 5. Noise Reduction

This function is applicable only when the "Start/Stop" mode is selected. By utilizing this function, the user can reduce the noise of the image, since long exposure with the "Start/Stop" mode tends to create more noise in general. There are two methods to implement this function: "Easy" and "Complex". The operations and operational principles are explained below:

### a. OFF

In this selection, no adjustments can be made to the noise reduction.

### b. Easy

#### 1) Operational Procedures

This method does not require any calibration process. Simply choose "Easy" from the drop-down menu and capture an image with the "Start/Stop" mode.

#### 2) Operational Principal

The system analyzes the image captured automatically and recognizes noise segments in the image. The system executes the averaging manipulation on the subject pixel with neighboring pixel information and masks the noise.

### c. Complex & Calibration

#### 1) Operational Procedures

This method requires calibration process before capturing a final image. The calibration can be done by selecting "Calibration" from the drop-down menu. Follow the procedures below:

- a) Make sure that all parameters are set the same as the setting you are intending to use when the final image is captured (i.e. exposure time, gain, etc.).
- b) Cover the lens completely so that there is no light going through the lens.
- c) Execute the calibration by selecting "Calibration" from the drop down menu.
- d) Capture one image.
- e) Select "Complex" and remove the cover from the lens.
- f) Capture the final image.

#### 2) Operational Principal

The system recognizes noise information based on the captured image taken in the calibration process while the lens is covered. The final image will have the corresponding correction factor and cancel these noises in the image.

**Note:** Due to the operational principal in the system, the "Easy" method is effective to not only the pixel blemishes but also some of random noises. Normally, this process softens the image causing some of edge information may be lost.

**Note:** Accordingly, the "Complex" method has no effect on the random noise and maintains a sharp image. On the other hand, if there is significant random noise during the calibration process, they may overcompensate and create undesirable noise in the image.

**Note:** We recommend executing "Calibration" every time before capturing the final image as temperature and any other changes to the parameter may affect the overall image quality.



## 6. Exposure End

The Sentechn USB cameras have the ability to send out “cue” or notification signals through the software as soon as the camera exposure is completed and this set up enables or disables that function.

The “Exp. End Signal” has two set up selections:

- a. Disabled
- b. Enabled

This signal may be extremely convenient if the application requires notification of exposure completion, in order to generate some downstream action. For example, if a certain actuator process in the system must be activated only after the completion of an exposure, this feature would allow that to be achieved.

## 7. Wait HD

This function provides two drop down selections for exposure control as related to the trigger timing:

- a. OFF – With this setting the exposure starts at the arrival of the trigger signal.
- b. ON – With this selection, the exposure on the CCD holds until the next HD (Horizontal Drive Pulse) occurs. This eliminates the picture noise created by Vsub signal when the consecutive trigger is applied before the completion of previous video readout.

## 8. Wait Read Out

This function provides two drop down selections for exposure control as related to the readout timing:

- a. OFF – For normal operations, please use this selection.
- b. ON– With this setting, the camera automatically delays the timing of the start of the next exposure so that the end (timing) of this (next) exposure matches the end of the readout of the prior exposure. In the event that a trigger is received with a timing that would result in the end of the (next) exposure occurring before the end of the readout of the prior exposure, this will delay the start of the (next) exposure until these timings will match.

## 9. Camera Memory

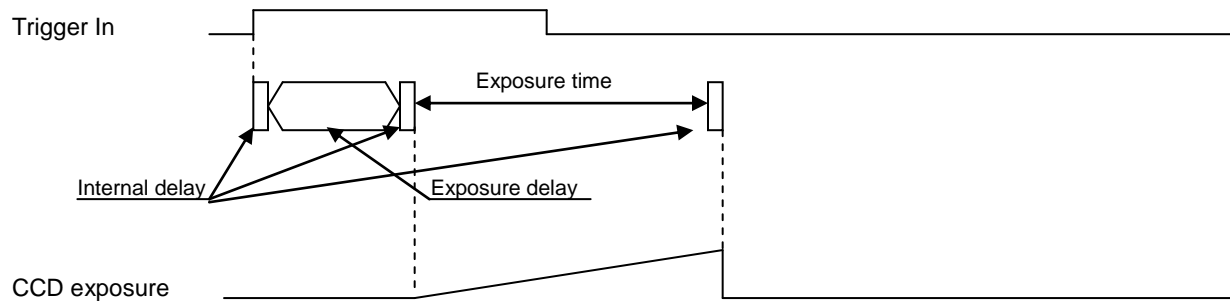
This button relates to the AMCAP software

## G. Trigger Timing Tab

There are six timing control slide bars. By utilizing these controls, you can set certain timing parameters (fixed delay time, duration time, etc.) for the I/O signals (described under the “G. I/O” tab).

### 1. Exposure Delay

When the “Exposure Delay” control is set at “0 nsec”, the camera exposure starts immediately after the trigger signal arrives at the camera. By adjusting this control to an “X nsec” value greater than 0 that value of X is the additional delay time added onto the actual start of the exposure time. See the below:



### 2. Strobe Start Delay

When the “Strobe out (programmable)” output signal is utilized, this sets the delay time of “Strobe out (programmable)” output signal. (See ③ in the IO Signal Timing Chart on the following page)

### 3. Strobe End Delay

This adjustment defines when the “Strobe out (programmable)” output signal should end referencing to the end of the CCD exposure. (See ④ in the IO Signal Timing Chart on the following page)

### 4. Output Pulse Delay

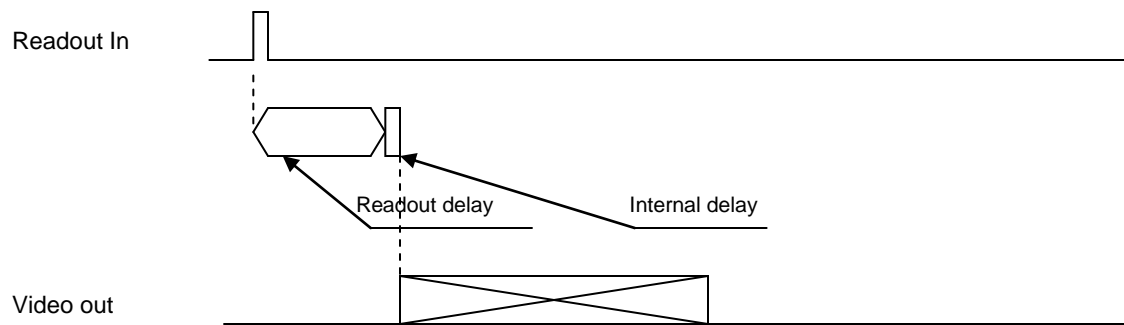
This adjustment is used to set the delay time for various output signals (Trigger output [Programmable], Exposure end and CCD readout end). (See ⑤ in the IO Signal Timing Chart on the following page)

### 5. Output Pulse Duration

This adjustment is used to set the time duration for various output signals (Trigger output [Programmable], Exposure end and CCD readout end). (See ⑥ in the IO Signal Timing Chart on the following page)

### 6. Read Out Delay

When this control value is set at “0 ns”, the video output signal is output immediately after the readout input signal arrives to the camera. By adjusting this value to an “X ns” value greater than 0, the value of X is the additional delay time added to the output time for the video output signal. See the figure below:



Readout Delay Timing Chart

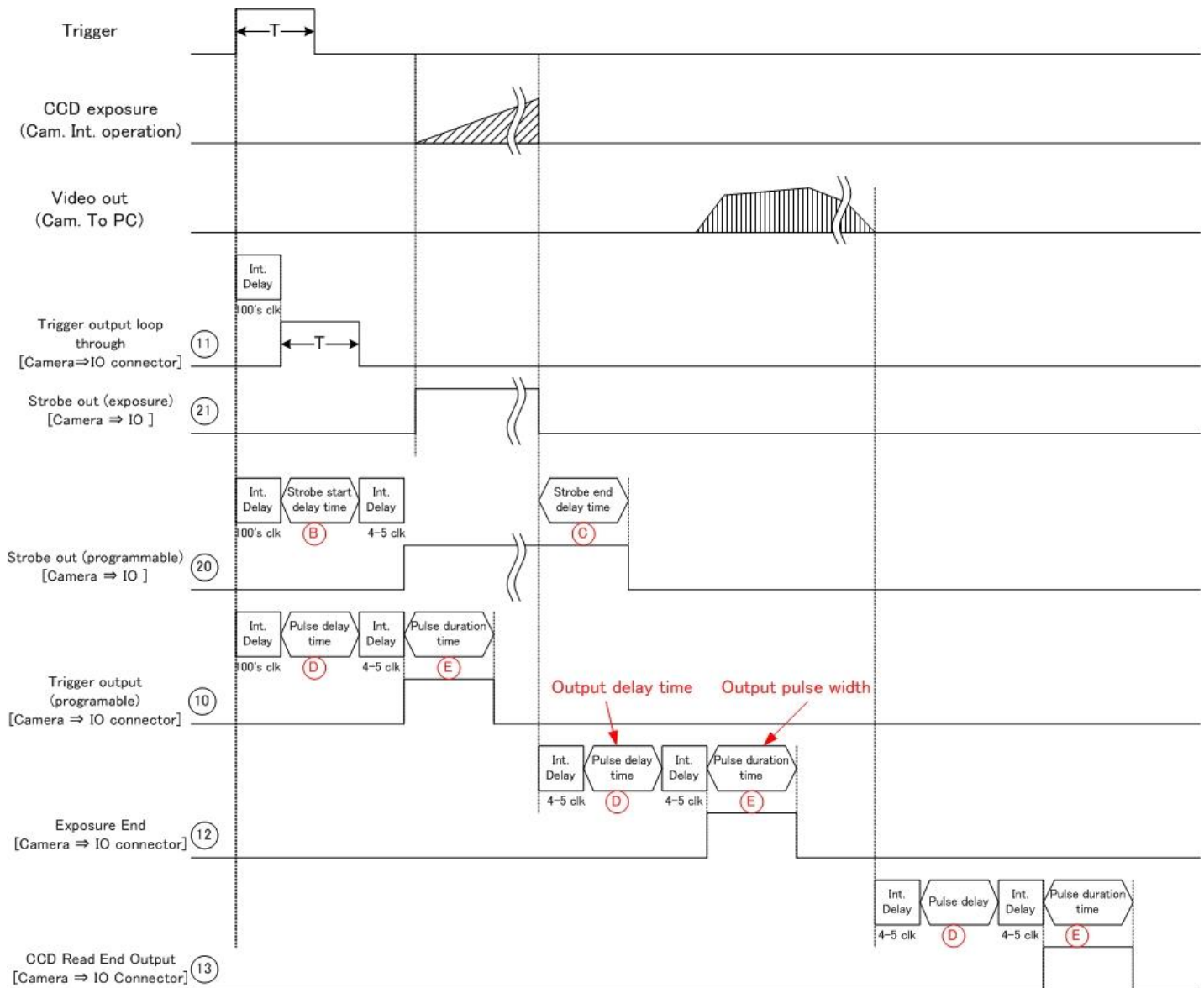
## 7. "Line/Clock" & "Second" Button

At the right hand side of the "Trigger Tab Timing Control Slide Bars" is an information box which displays the timing setting values of the "Timing Control Slide Bars". These values can be displayed in two different value formats. The desired display format can be seen simply by clicking on the "Line/Clock" and "Second" button. By clicking on this button, the two formats are toggled back and forth from on to the other. The two data formats are:

- "Line/Clock" displays the unit of measure in nanoseconds (ns).
- "Second" displays the unit of measure in "clocks" and "line". In this case, clock represents each pixel clock duration time and line represents each horizontal duration time.

## 8. IO Signal Timing Chart

The chart below illustrates the various IO Timing features and their functions for the Sentech USB cameras.



**Note:** This data is applicable for both the Soft and Hard Trigger type Sentech USB cameras. If a hardware trigger is being used, this data is applicable for both the "Edge Preset" and "Pulse Width" type triggers.

## 9. CAUTIONS

### a. Trigger input signal cycle time

Set the trigger signal input cycle time to be more than (the exposure time + video output), otherwise the following phenomenon may occur.

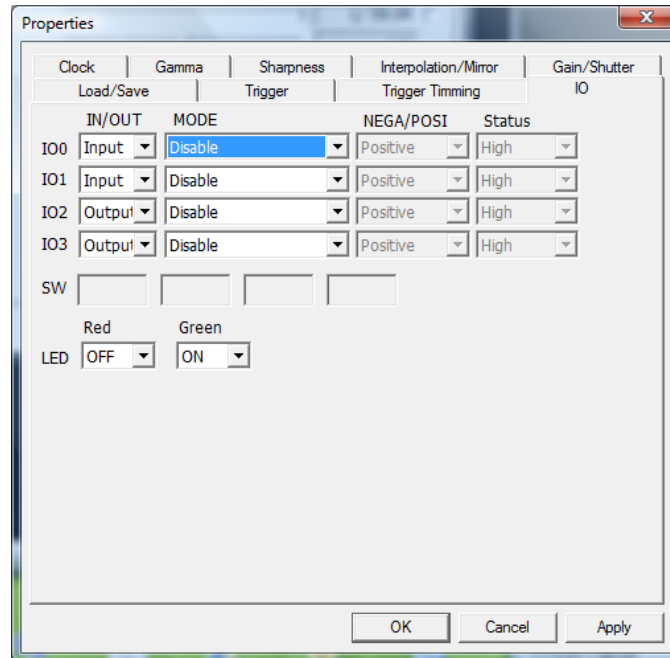
- Double images
- Excess or abnormal noise
- No video image.

### b. The status of the input signal pins at power up

All input pins must be set at “low” status when power is turned on. Otherwise the camera may not operate properly.

## H. IO Tab

**Note:** The selections and functionality on this “IO” tab are only available for use with Sentech’s USB “hard trigger” type cameras. These cameras will have a suffix designator at the end of the model number: “ASH”. An example of this would be STC-TC33USB-ASH or STC-TB202USB-ASH. If the camera does not have this ASH at the end of the model number, that unit is unable to use “hard triggers” and the “Trigger” and “IO” tabs will NOT appear when the camera is plugged in.

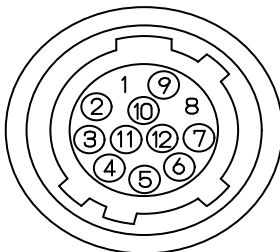


“ASH” hardware trigger type cameras provide four hardware I/O’s for various purposes. These features are provided and can be configured for the various purposes of many machine vision and other applications requiring trigger functions.

The I/O points are available at both the Hirose 12p connector and the pin jack on the rear panel of the camera. Hirose 12P connector provides four I/O points (2 inputs and 2 outputs) and the pin jack provides two I/O points (1 input and 1 output). See the connector drawings below for the signal assignments.

**Note:** Any combination of these I/O points may be used and configured for up to a total of four I/Os, with a maximum of two Input I/Os and two Output I/Os.

12 pin Hirose Connector  
HR10A-10R-12P

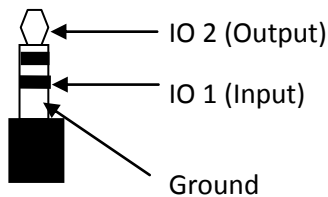


Hirose Connector Drawing

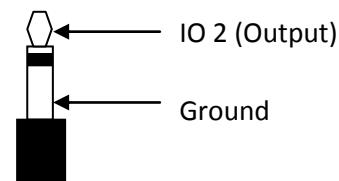
Pin No.	Signal type	In/Out
1	GND	
2	+5V DC	
3	USB D-	
4	USB D+	
5	IO0 GND	
6	IO0	In
7	IO3	Out
8	IO3 GND	
9	IO1 GND	
10	IO1	In
11	IO2	Out
12	IO2 GND	

Hirose Connector Pin Out

Stereo Pin Jack



Mono Pin Jack



For both the Hirose and the Pin Jacks, these I/O points are user configurable and can be configured through this “IO” tab. IO0 and IO1 are assigned for input signals only and IO2 and IO3 are assigned for output signals only.

Assigning signals to each I/O is very simple.

1. Click the down arrow key provided for each I/O then a popup window appears and it shows all available signals for that I/O. Simply choose desired signal.
2. After that set up enable polarity of that signal by selecting “Positive” or “Negative”.

The camera provides four hardware I/O connections for the various signals. These features are provided for the purposes of many machine vision applications as well as other applications. Read this section along with the “I/O Signal Timing Chart” on [Page 71](#).

## 1. Input I/O's (IO0 and IO1)

By clicking on either IO0 or IO1, the input configuration of the input signals can be set up. These functions are user configurable and can be set up to provide the following input functions on either of the input points:

### a. Mode

There are four modes that can be assigned to an Input signal.

#### 1) Disable [00]

This mode disables the “Input” pin for which it is assigned.

#### 2) General Input [01]

This input may be used for auxiliary purpose. The status of this input can be obtained by using Sentech SDK.

#### 3) Trigger Input [10]

This provides an input path for a “Hardware Trigger” input, into the camera. By applying a “Trigger Pulse” to the camera, one frame of image can be obtained. As the camera provides both hardware and software triggers, “Hardware Trigger” must be selected to utilize this feature on the “Trigger tab”.

#### 4) Readout Input [30]

This provides an input path for a “Readout Signal” into the camera. This function instructs the camera to release the video output signal, when the “Operation Mode” is set to “Trigger w/ readout”. As this camera can be configured for either a hardware and software readout, in order to configure this output pin, the “ReadOut Source” must be set to the “Hardware” mode.

#### 5) Sub Trigger [40]

This is a hardware replication of the software sub trigger, which is explained on [Page 69](#). When the hardware start/stop mode is selected, the camera integration finishes when the sub trigger input is enabled.

### b. Polarity

This setting allows the “Polarity” of the “Input Signal” to be set at either “Positive” or “Negative” for those signals where this is applicable.

### c. Status

This allows the signal to be set at either a “High” or “Low” status, when it is appropriate to do so.

## 2. Output I/O's (IO2 and IO3)

By clicking on either IO2 or IO3, the output configuration of the output signals can be set up. These functions are user configurable and can be set up to provide the following input functions on either of the output points:

### a. Mode

There are seven modes which can be assigned to an output signal.

#### 1) Disable [00]

This mode disables the "Input" pin for which it is assigned.

#### 2) General Output [01]

By assigning "General output" to one of the output pins, some logical signals in a system can be extracted as a hardware signal to this IO point. In the system designed with the SDK, this is convenient way to obtain a signal as hardware output signal. Through this viewing software, for a demonstration purpose, the status of this signal can be set to either "High" or "Low".

#### 3) Trigger Output (Programmable) [10]

This "output signal" is produced from a "Trigger Input" signal applied to the camera and may be used to trigger another downstream camera. By referencing the beginning of the "External Trigger Input" signal to the camera, the beginning of this trigger output timing may be programmed or delayed by adjusting "Pulse delay time" under the "Trigger tab".

#### 4) Trigger Output (Loop through) [11]

This function is very similar to the "Trigger Output (Programmable)" listed above. The only difference is that in this mode the timing of the "Trigger Output" is not programmable (cannot be delayed). This mode is used to pass through the "Trigger Input" as an output signal for various purposes including triggering other cameras. Please note there is a fixed time delay of several hundred pixel clocks associated with this process.

#### 5) Exposure End [12]

This "notification" output signal is sent out following the end (or completion) of an exposure. By utilizing this "Exposure End" output signal, the system can be ensured that the exposure has been completed. For example, this could be useful to move objects via an actuator to a next position/stage after confirming the end of exposure, etc.

#### 6) CCD Read End Output [13]

This "notification" output signal is sent out following to the end (or completion) of each video output transmission from the camera. By utilizing this "CCD Read End Output" signal, the system can ensure the camera has completed transferring the previous video output signal.

#### 7) Strobe Output (Programmable) [20]

This "Strobe Output (Programmable)" output signal may be used to drive an external strobe device. In this mode, the beginning of the strobe output signal can be defined (programmed) referencing the beginning of the "Trigger Input" signal with a delay timing, and the end (duration) of the "Strobe" signal can also be set.

#### 8) Strobe Output (Exposure) [21]

With this selection, the strobe output signal synchronizes with actual exposure timing.

### b. Polarity

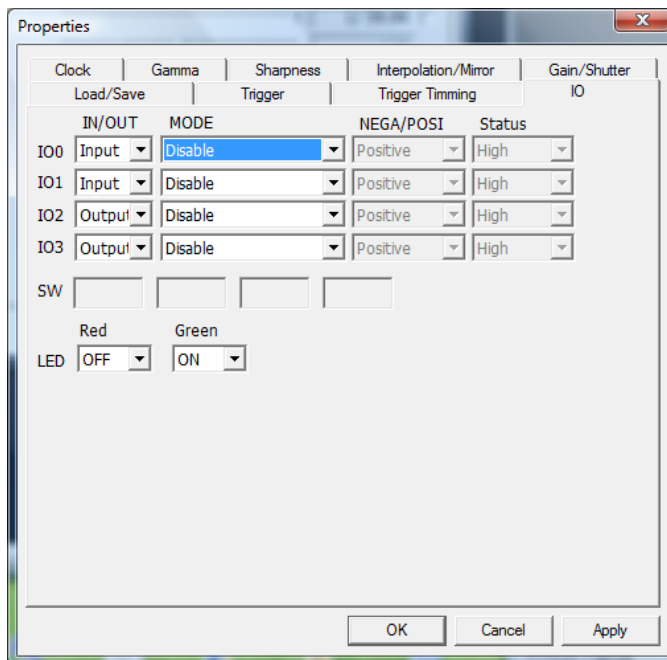
This setting allows the "Polarity" of the "Output Signal" to be set at either "Positive" or "Negative" for those signals where this is applicable.

### c. Status

This setting allows the signal to be set at either a "High" or "Low" status, when applicable.

### 3. SW 1-4 Status

Under the “trap door” cover on the top of the camera are four “status hardware switches”. These switches have no operational impact on the camera performance. They may be set to an “ON” or “OFF” position. The “ON” or “OFF” position setting will be reflected as shown on Figure 72 below. This status data may be used by the user or the system to make something happen in the system. For example, different systems may have different or multiple software settings and the “OFF” status of switch 1 would result in software set A being downloaded into the camera whereas the “ON” status of switch 1 would result in software set B being downloaded into the camera.



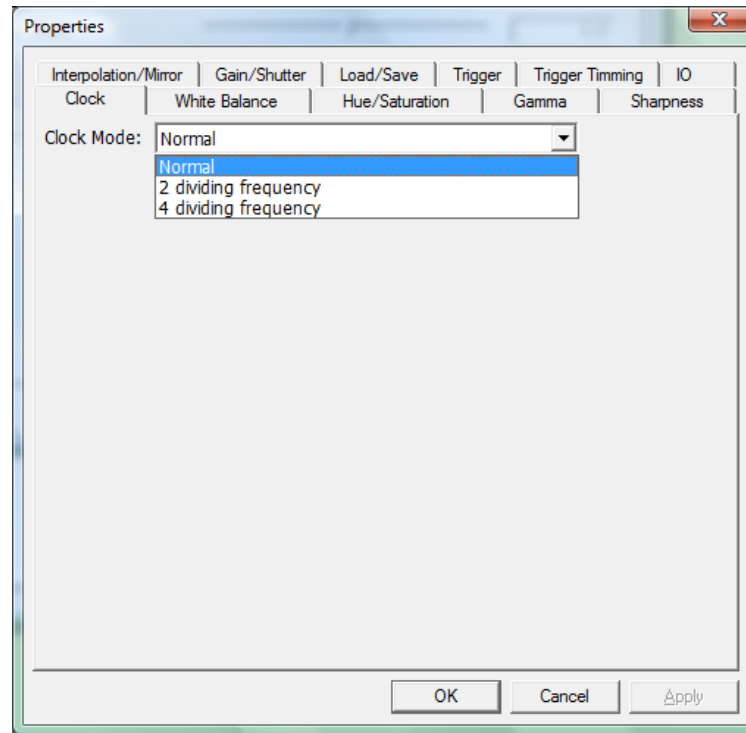
### 4. Update

If one of the input pins is set to “General Input”, by clicking this button, the status of the signal over that input pin is updated to the current status and displayed.



## I. Clock Mode Tab

This function allows the “Clock Speed” of the camera readout to be set. The following three “Pixel Clock Speeds” are selectable through this drop down menu:



### 1. Normal

By selecting this mode, the pixel clock speed is set to normal. If the PC has enough performance and it is not occupied with other tasks, the following scan rates can be achieved on the Sentech USB cameras:

- VGA = 59.94 frames per second,
- XGA = 29.18 frames per second
- QVGA = 22.40 frames per second
- SXGA = 19.26 frames per second
- UXGA = 15.32 frames per second

### 2. 2 Dividing Frequency

By selecting this mode, the pixel clock speed is 1/2 of the normal pixel clock speed (half speed of Normal).

### 3. 4 Dividing Frequency

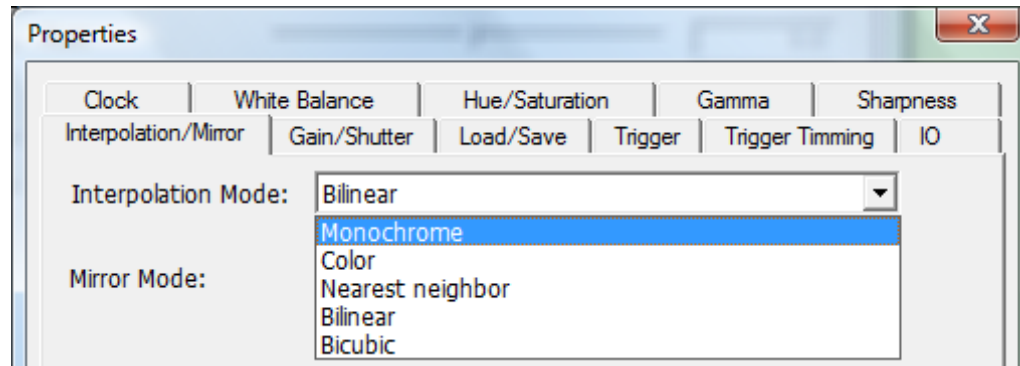
By selecting this mode, the pixel clock speed is 1/4 of the normal pixel clock speed (quarter speed of Normal).

**Note:** As the pixel clock speed slows down, the frame rate will also slow down accordingly. As the frame rate slows down, the light sensitivity of the camera increases due to the longer exposure time. Hence, for low light applications, which require higher sensitivity, selecting either the 1/2 or 1/4 “Clock Speed”, may be effective in helping increase the brightness of the image. Additionally, this setting may help improve the S/N ratio.

## J. Interpolation/Mirror Tab

### 1. Interpolation

Each pixel on the CCD has a “Red”, “Green” or “Blue” filter over it. This means each pixel does not have color information for two of the three primary colors (i.e. green pixels are missing blue and red). The process of “filling in” the absent color information is called “Color Interpolation”. The section provides five different algorithms for color interpolation. (Color Interpolation is only applicable with color cameras.)



The following “Color Interpolation” algorithms are selectable through the drop down menu:

#### a. Monochrome

By selecting this mode, the image is generated without any color information. If this mode is selected while using a color camera, a monochrome image will be generated, but the image will have geometric patterns due to the primary color filter. This mode is not recommended for color cameras.

#### b. Color

By selecting this mode, the image appears with no color interpolation. The image generated is comprised of the raw color information (Red, Green and Blue) due to the Bayer filter.

#### c. Nearest Neighbor

By selecting this mode, the color of the image is generated with the simplest color interpolation algorithm. In the case that red is needed on a green pixel, the algorithm simply copies the color from the nearest red pixel and uses that value for the missing red color information on the green pixel. The execution of the “Nearest Neighbor Replication” algorithm requires very limited resource from the PC, however some “pixelization” effect may be visible especially along sharp contrasting edges. The color reproduction will also be less accurate than either the Bilinear or Bi-Cubic algorithms.

#### d. Bilinear

By selecting this mode, the camera works with the “Bilinear” algorithm, which is a more complex color interpolation algorithm. This generates a more accurate color reproduction and smoother edge renderings than the “Nearest Neighbor” method, but requires more computational power from the PC. The algorithm is as follows:

Interpolation of green pixels: the average of the upper, lower, left and right pixel values is assigned as the G value of the interpolated pixel. For example:  $G8 = (G3 + G7 + G9 + G13) / 4$

Interpolation of red/blue pixels:

Interpolation of a red/blue pixel at a green position: the average of two adjacent pixel values in corresponding color is assigned to the interpolated pixel. For example:  $B7 = (B6 + B8) / 2$ ;  $R7 = (R2 + R12) / 2$

Interpolation of a red/blue pixel at a blue/red position: the average of four adjacent diagonal pixel values is assigned to the interpolated pixel. For example:  $R8 = (R2 + R4 + R12 + R14) / 4$ ;  $B12 = (B6 + B8 + B16 + B18) / 4$

## e. Bicubic

By selecting this mode, the image appears with the most sophisticated color interpolation algorithm in this software. Each interpolated color value is defined based on a certain equation factored by the distances and color values of the surrounding pixels. This creates very smooth edge rendering and excellent color reproduction; however, this method also requires most computational power from the PC.

This interpolation algorithm is generally described as the next formula:

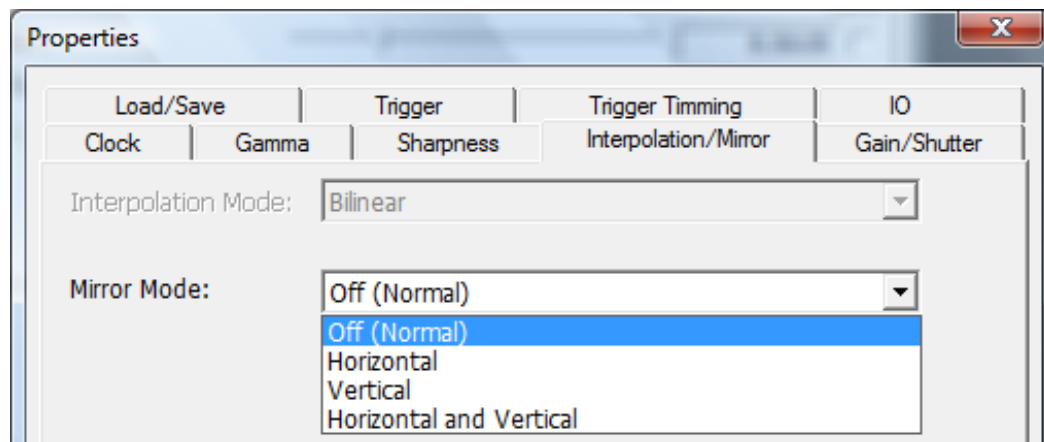
$$C(x,y) = \sum_{K=1}^{\infty} \sum_{k=1}^{\infty} c(x_k, y_k) \cdot h(|x-x_k|) \cdot h(|y-y_k|)$$

In this software, we utilize the method called “One-Variable Cubic” interpolation in which the pixels up to two pixels away from the subject pixel may be the object for this color interpolation. (See figure to the right.)

G1	R2	G3	R4	G5
B6	G7	B8	G9	B10
G11	R12	G13	R14	G15
B16	G17	B18	G19	B20
G21	R22	G23	R24	G25

One Variable Cubic Interpolation

## 2. Mirror

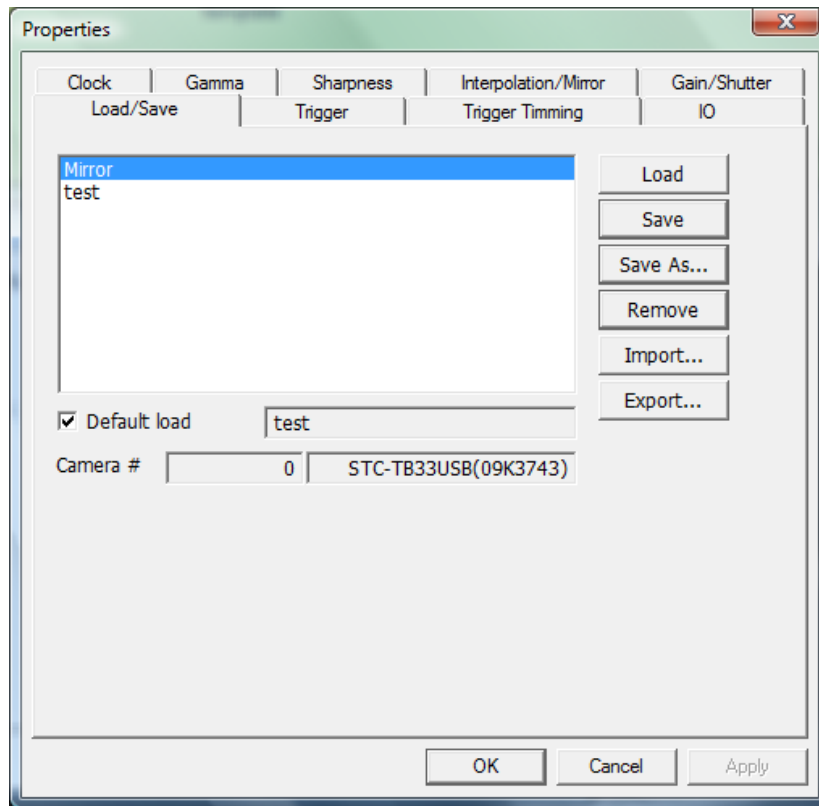


“Mirror Mode” allows the orientation for the image to be changed digitally. Through this drop down menu, the following four mirror modes are selectable:

- Normal**  
By selecting this mode, a normal image is displayed.
- Horizontal**  
By selecting this mode, a so-called “mirror image” (horizontally reversed image or right/left converted image) is displayed.
- Vertical**  
By selecting this mode, a vertically reversed (top / bottom flip) image is displayed.
- Horizontal and Vertical**  
By selecting this mode, both a vertically and a horizontally reversed image (180 degree rotated image from the original image) is displayed.

## K. Load / Save Tab (This section is incomplete)

The section allows user to save and load previously saved camera settings.

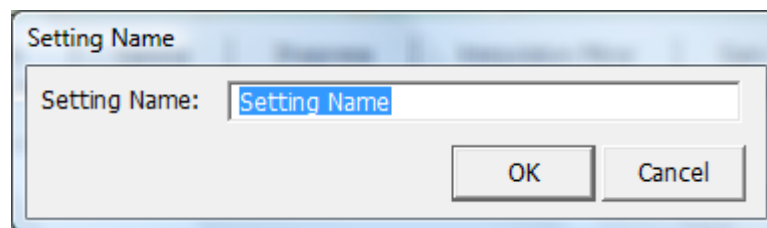


### 1. Load

This allows the user to select a previously saved camera set-up profile which is to be loaded for the camera's operation; follow the standard Windows procedure to open the previously saved file.

### 2. Save

Select the "Save" button and the following window will appear:

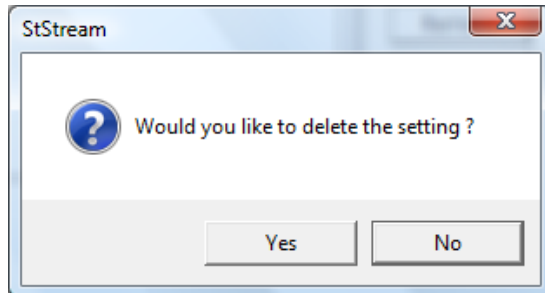


This prompted window allows users to name file that is to be saved in the repository. Once a setting name is assigned, click the "OK" button to close the "Setting Name" window. Click the "Cancel" button to stop the process of saving the file settings.

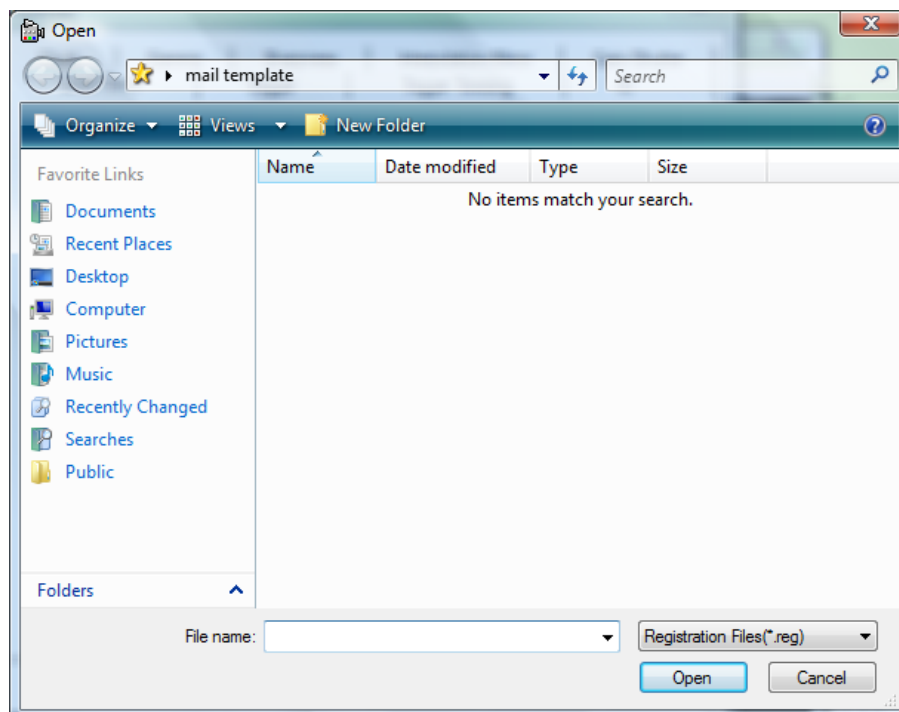
Note:

### 3. Save As...

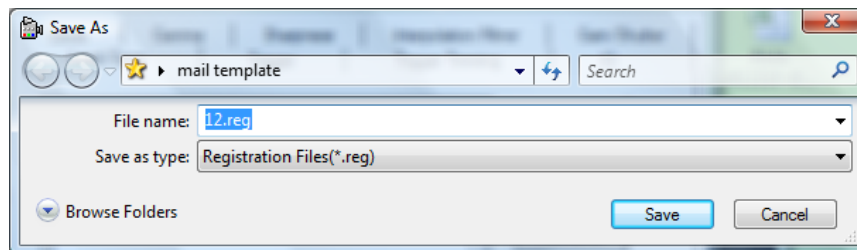
#### 4. Remove



#### 5. Import...



#### 6. Export...



#### 7. Default Load

This section allows users to set a previously saved file as the default file whenever the camera is restarted. Highlight the desired saved file in the repository and then select the Default check box. Please make sure that the correct file is selected by confirming that the file name is in the field adjacent to the Default check box.

#### 8. Camera #

## Revision

Rev	Date	Changes	Notes
1.0	2/2/2010	New Document	

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