

# **SOLAR SYSTEM IMAGER**

# **USER MANUAL**

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## Technical Specifications of SOLAR SYSTEM IMAGER

### Technical Specifications:

#### Sensor:

- Sensor Chip: 1/4" High Sensitivity Low Noise CMOS Sensor Chip
- Format: VGA 640x480
- Sensor Size: 3.84 mm x 2.88mm (4.8 mm diagonal)
- Pixel Size: 6.0 micron x6.0 micron
- Sensitivity: 0.01 lux at 25 degree C
- Scan Mode: Progressive Scan

#### Camera:

- Control Modes: Auto/Manual Modes
- Exposure Time: 0.065msec to 4293msec
- Gain: 1X to 123.5X
- Frame Rate: 0.23 fps to 30 fps
- Computer Compatibility: Windows 7 32/64bit, Widows Vista 32/64 bit, Windows XP

\* The driver has been certified for Microsoft Windows operation systems.

(The driver has passed tests of Microsoft Windows logo programs.)

(Submission number: 1454695 & 1454534)

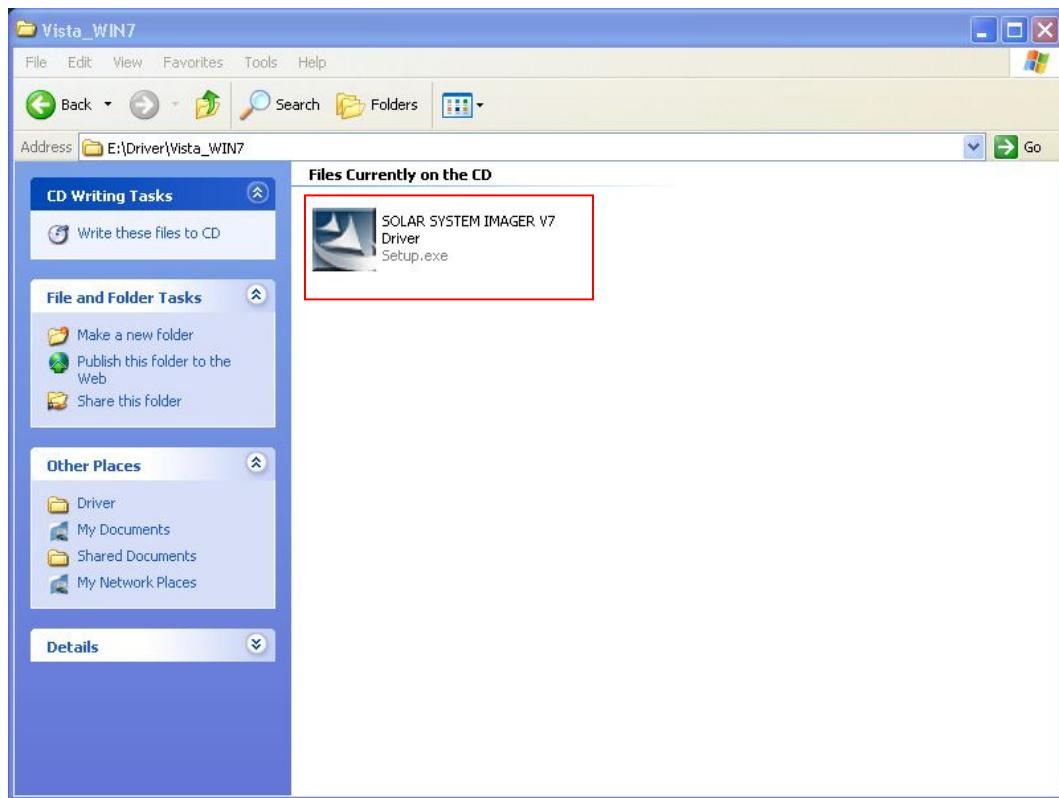
#### Miscellaneous:

- Computer connection: USB2.0, USB cable length: 2 meters
- Weight: 70 grams
- Dimensions: 9.1mm (height) x 3.2cm (width) x 2.4 cm (thickness)
- Comes with: Optical disc with driver software, user manual, and image processing software

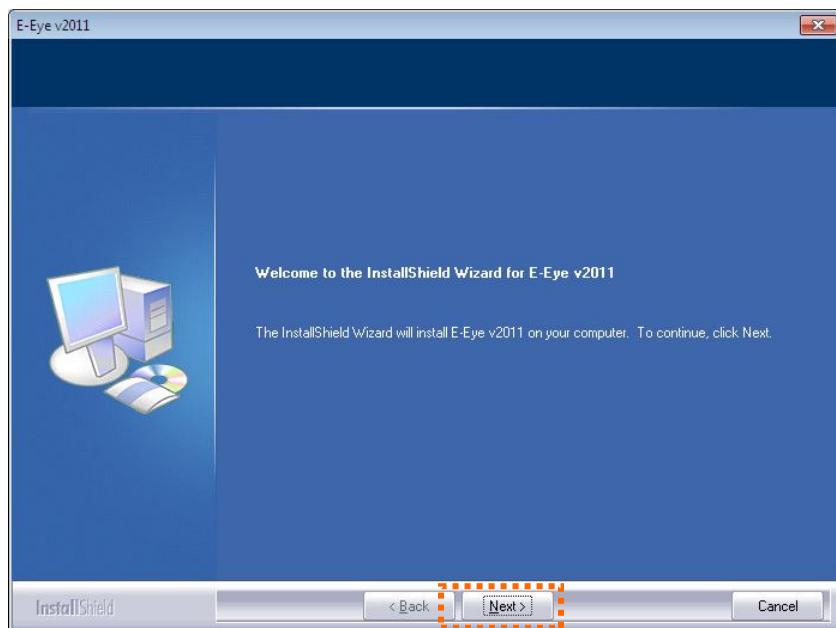
## Installing the SOLAR SYSTEM IMAGER Driver

### A. On Vista and Windows 7 Computers

**A-1.** Insert the SOLAR SYSTEM IMAGER (referred to as SS Imager below) installation CD, choose **Driver > Vista\_Win7**.  
Double-click **SOLAR SYSTEM IMAGER V7 Driver**.

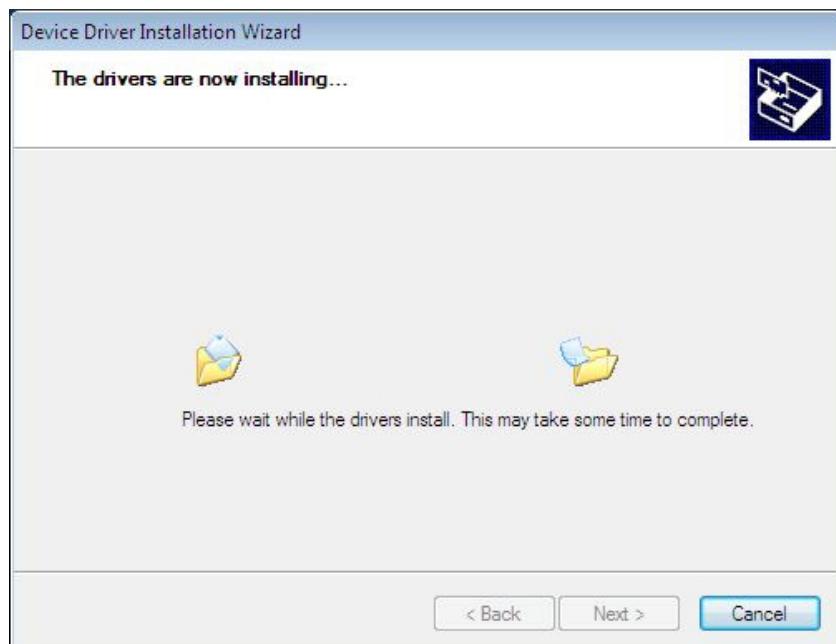


**A-2.** Click **Next** on the following interface:



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**A-3.** Click **Next** to start:

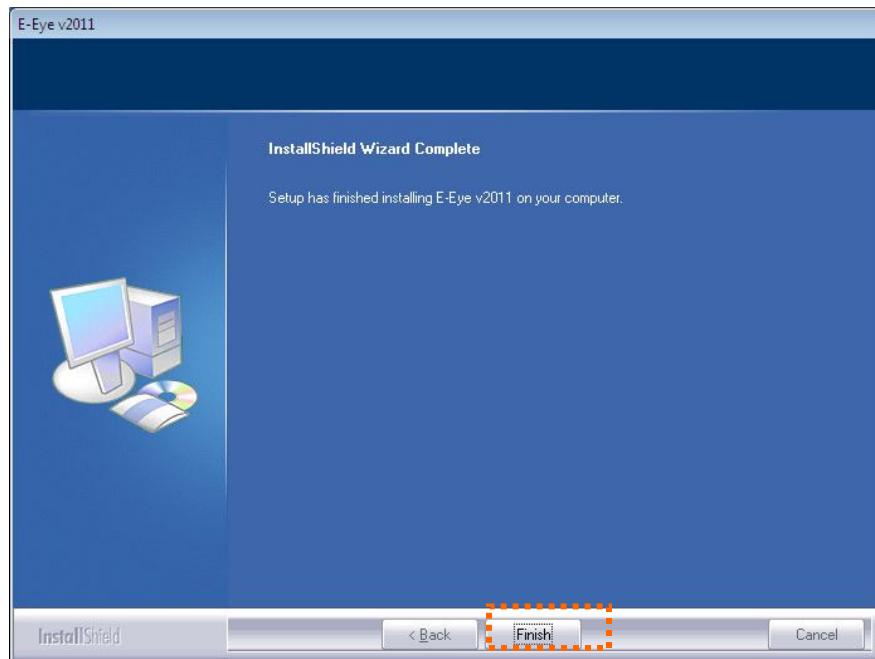


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**A-4.** Click **Finish** on the following:

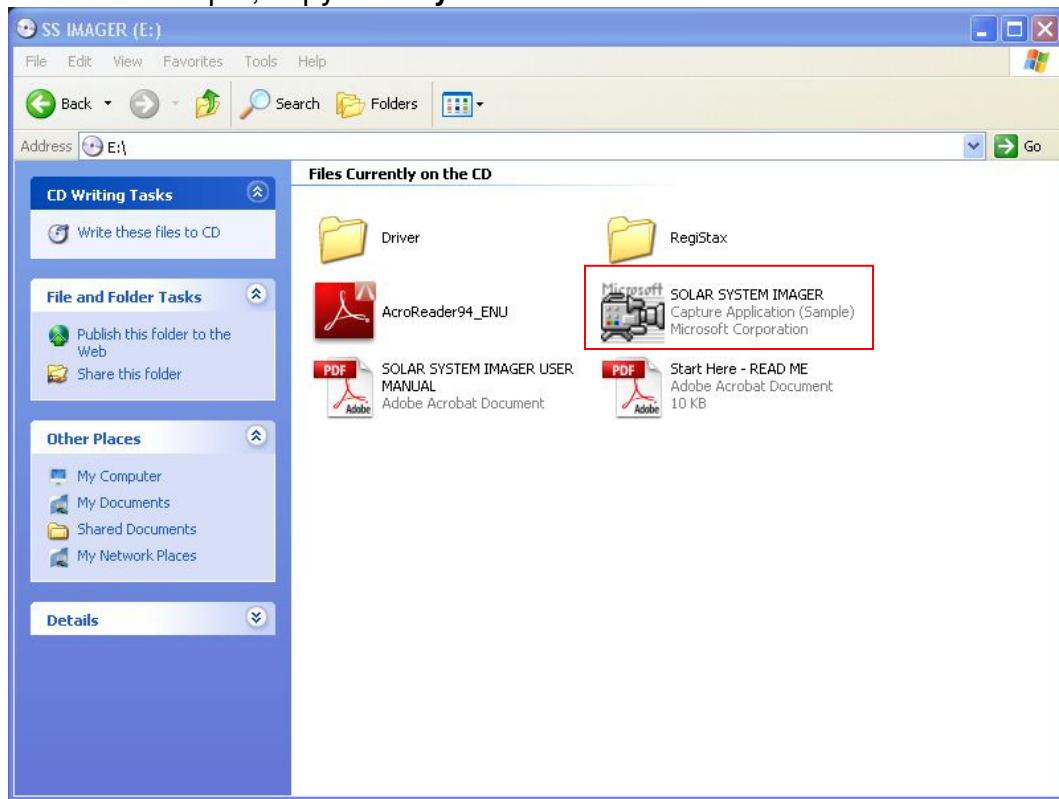


**A-5.** Click **Finish** again:

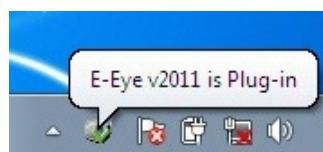
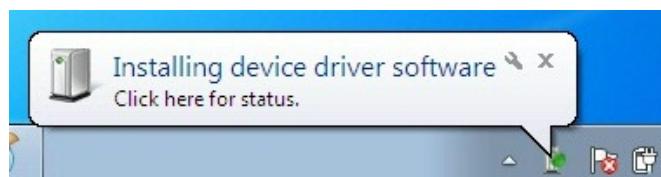


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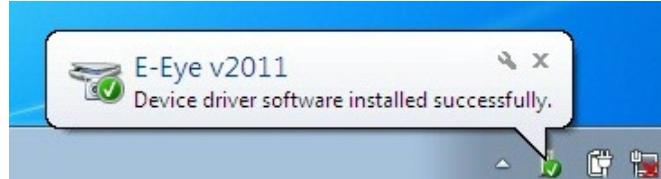
**A-6.** Copy **SOLAR SYSTEM IMAGER** to your computer.  
For example, copy it to **My Pictures**.



**A-7.** Plug in the USB of your **SS IMAGER** to the computer now, the following messages will appear and the device driver will be installed automatically.



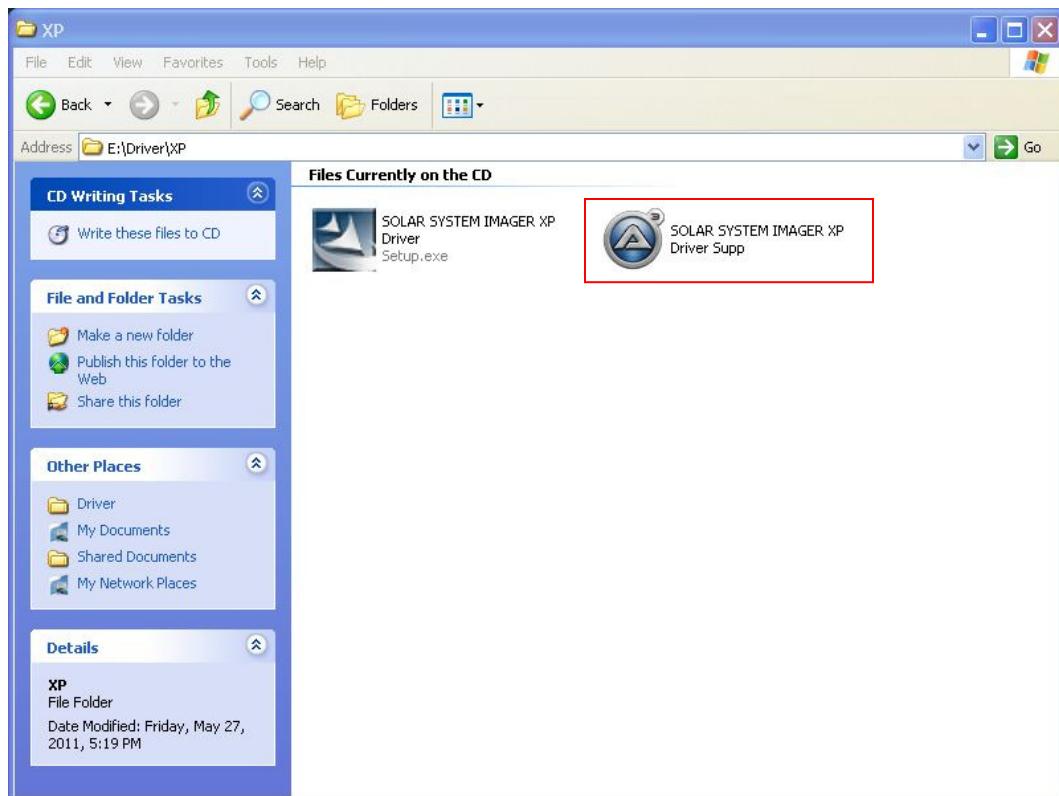
**Installation is complete** when you see this:



## B. On Windows XP Computers

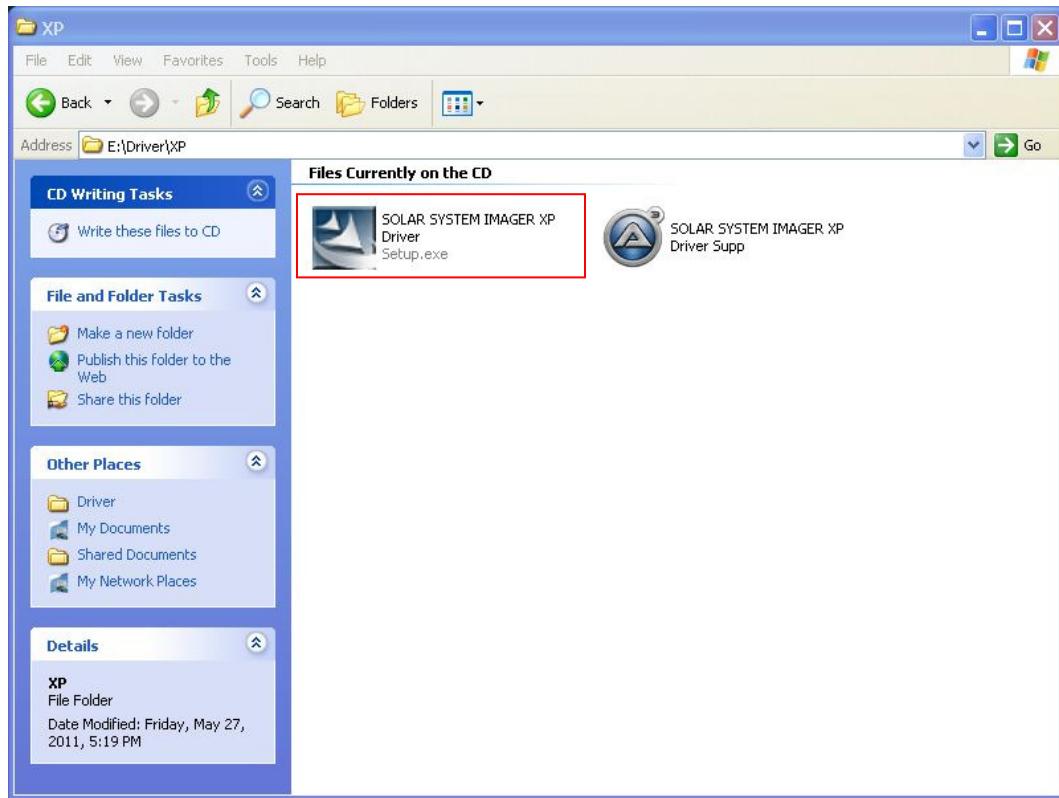
**B-1.** Insert SS IMAGER installation CD, choose **Driver > XP**.

Double-click **SOLAR SYSTEM IMAGER XP Driver Supp** for computer configuration.

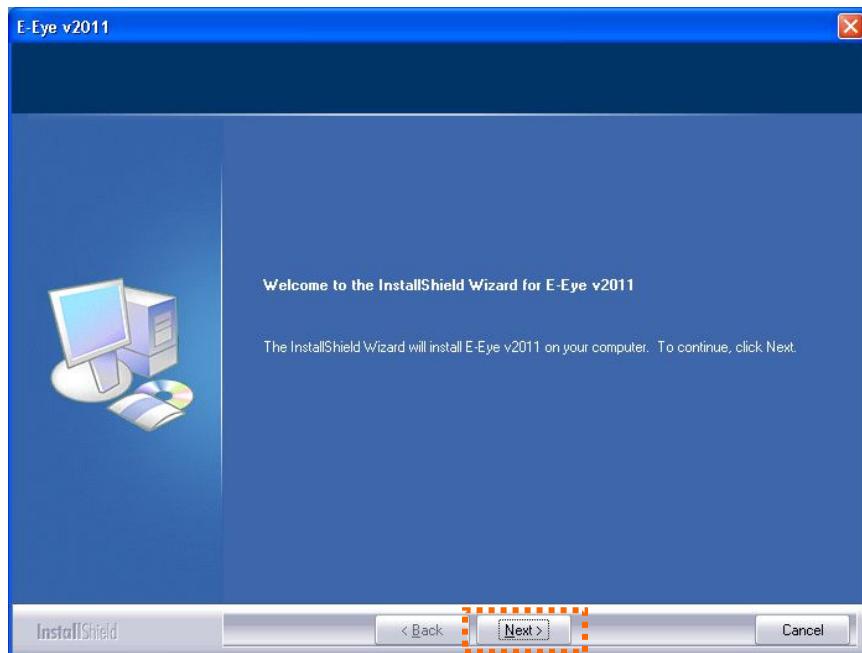


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**B-2.** Double-click **SOLAR SYSTEM IMAGER XP Driver** in the same folder to start installation.



**B-3.** Click **Next** on the following interface:



**B-4.** Click **Next** to start:

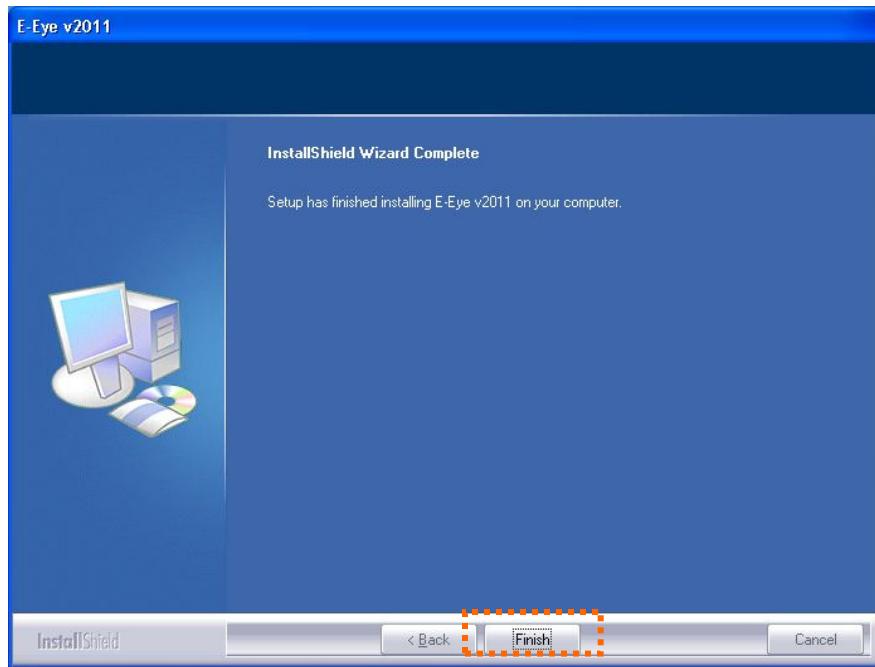


**B-5.** Click **Finish** on the following:

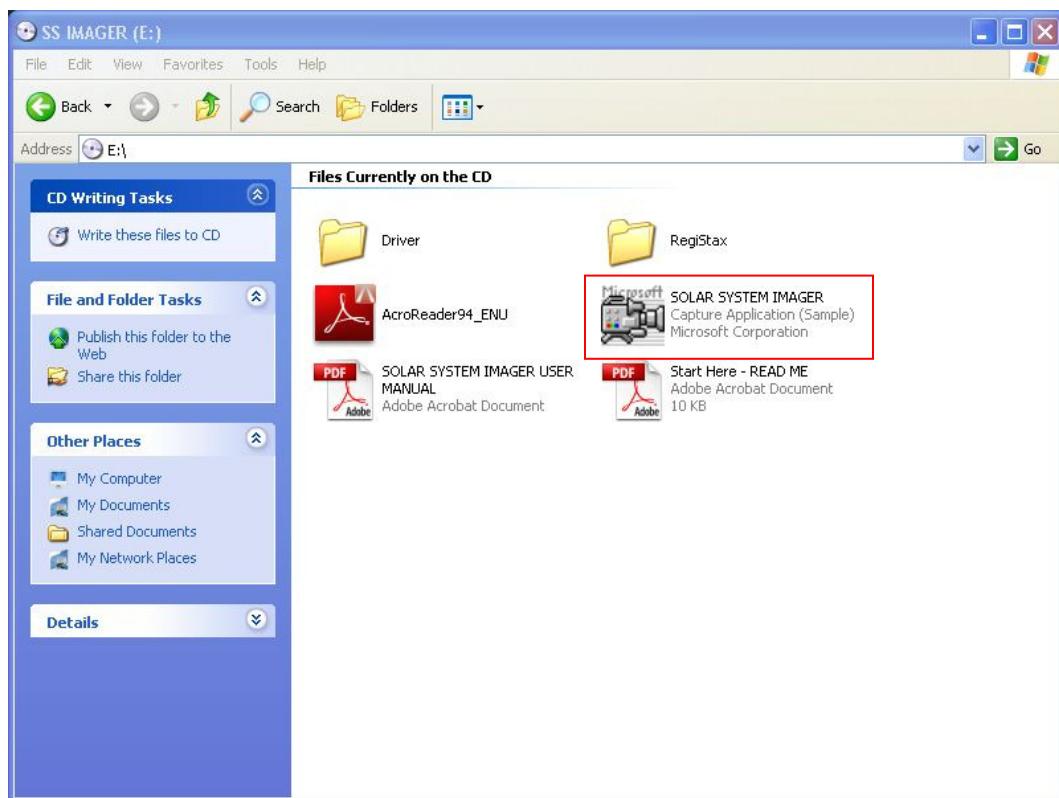


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**B-6.** Click **Finish** again:



**B-7.** Copy **SOLAR SYSTEM IMAGER** to your computer.  
For example, copy it to **My Pictures**.



**B-8.** Plug in the USB of your **SS IMAGER** now and **Found New Hardware Wizard** will pop-up. Select **Install the software automatically (Recommended)**, and click **Next** to start installation.



**B-9.** Click **Finish** to complete the installation.



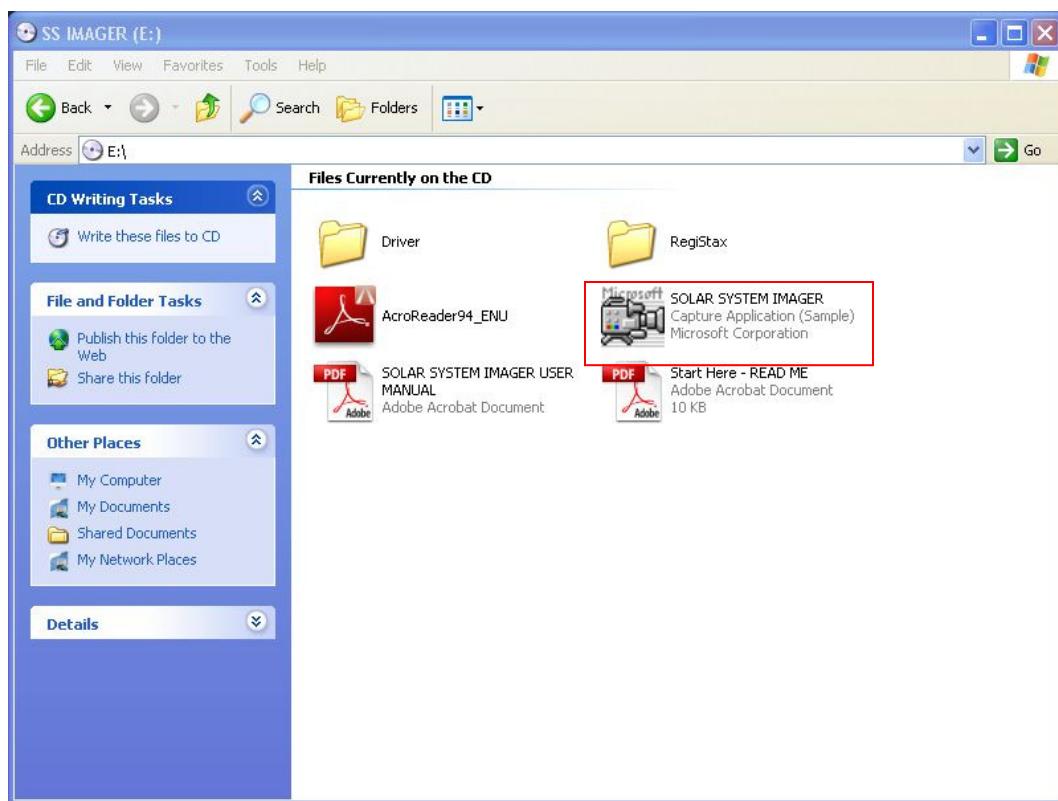
## Using the SOLAR SYSTEM IMAGER Software

With the **SOLAR SYSTEM IMAGER** software, you can:

- 1) Viewing
- 2) Control Image Properties
- 3) Capture Images
- 4) Recording/Reviewing Video
- 5) Display Time
- 6) Select Image Format

### (1) Viewing

To start seeing images on the computer, double click to open **SOLAR SYSTEM IMAGER** as shown below. Image will appear.



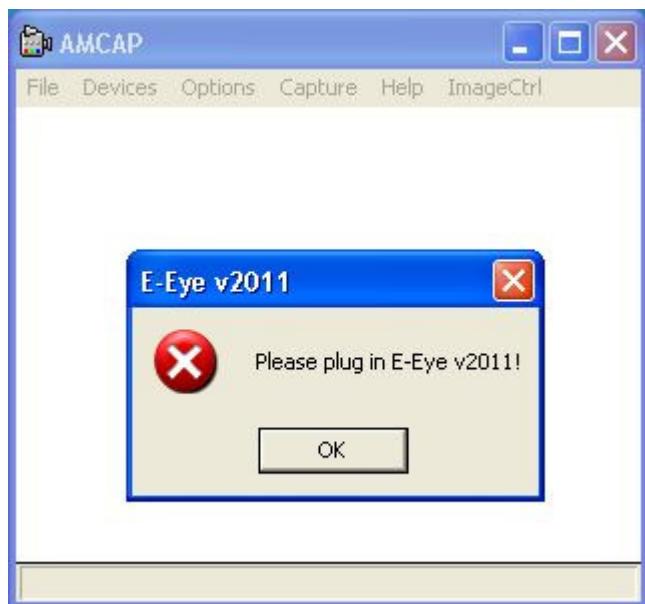
## SOLAR SYSTEM IMAGER USER MANUAL



## NO IMAGE?

### POSSIBLE ERROR 1: Not Connected

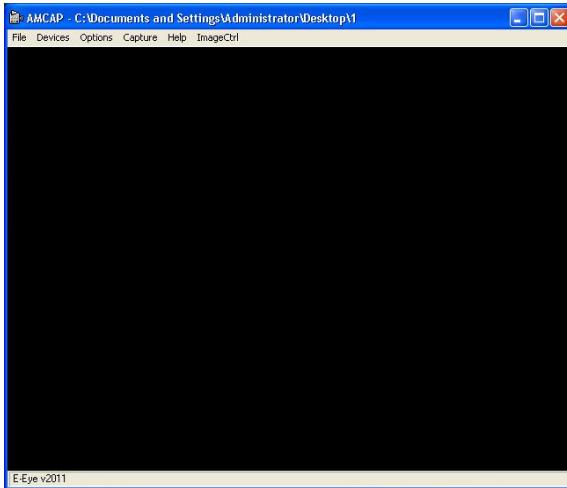
When you see the message below, the SS IMAGER is not connected to the computer, please plug the SS IMAGER to the USB port of the computer, and open the software again. It is also possible that USB plug connection is loose, then you need to unplug and plug again.



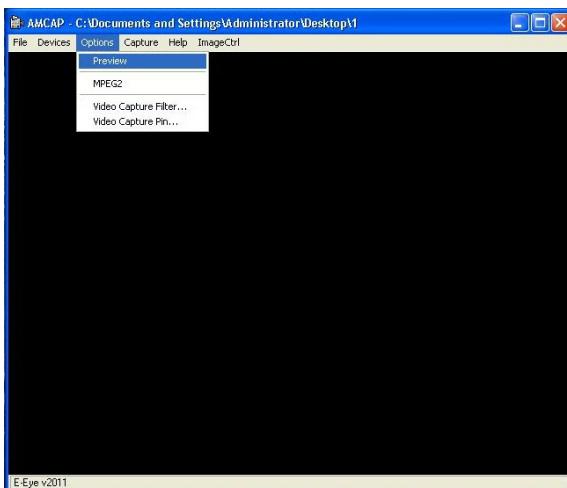
Note: If you want to use another USB port on your computer, the software will hint you to finish installation again (similar to installing the SOLAR SYSTEM IMAGER Driver A or B above) to enable using a different port.

## POSSIBLE ERROR 2: Wrong Hardware Selected

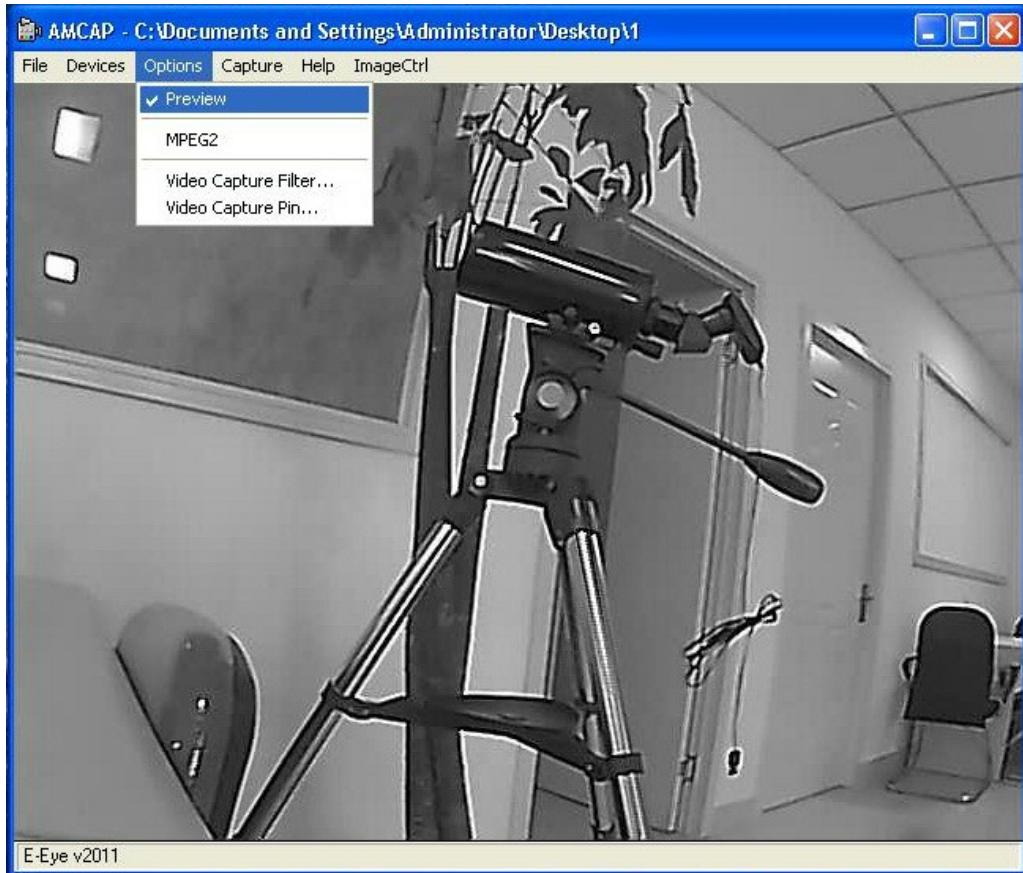
If the Amcap window is blank (as below), SS IMAGER is not selected as the hardware. (Although our software automatically selects SS IMAGER by default.)



Open “Option” and select “Preview” as shown below, you should now see the image as below.



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## (2) Imaging Control

To change imaging settings, choose **ImageCtrl > Property Control**.



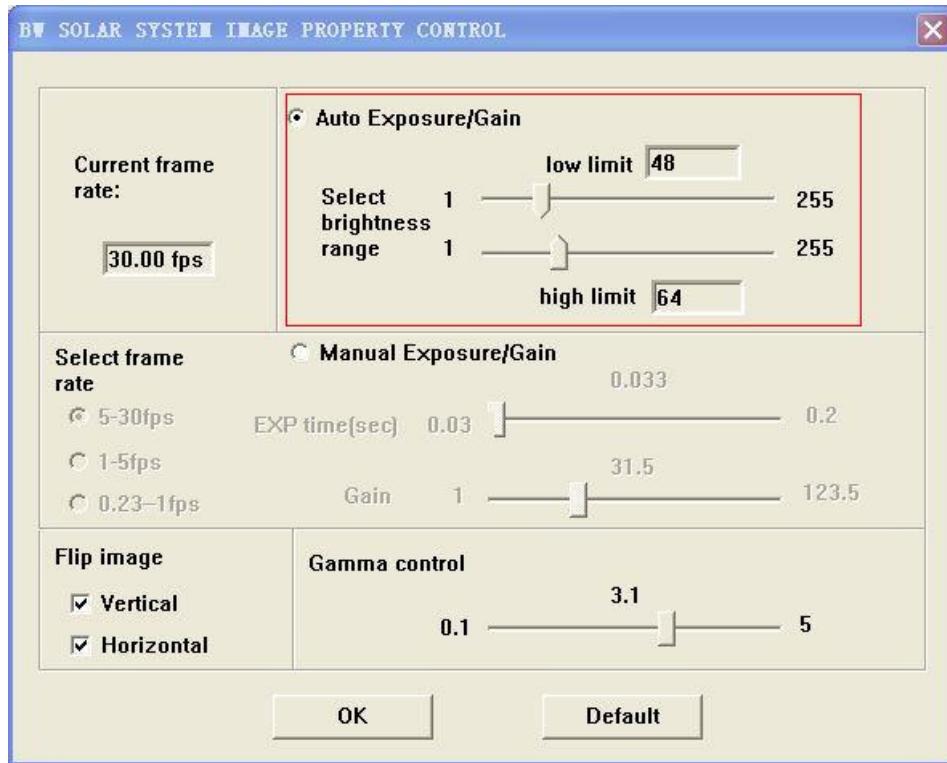
### (2)a. Auto Exposure/Gain

- At default, the camera operates under the auto mode.
  - Each time SS Imager is open/reopen, the camera is under **Auto Exposure/Gain**.
  - Anytime when the **Default** icon is clicked, the camera will automatically switch to **Auto Exposure/Gain**.)
- Under automatic operation, the camera optimizes its performance by self-adjusting gain (between 1.0 and 8.0) and exposure time (0.065 msecound to 0.263 second).
- Since “best brightness” is different for each person, the user can choose the preferred “brightness range” to guide auto adjustment.

**Select brightness range** according to the environment:

Hi limit from 2 to 255, Lo limit from 1 to 254.

The default range is 48 to 64.



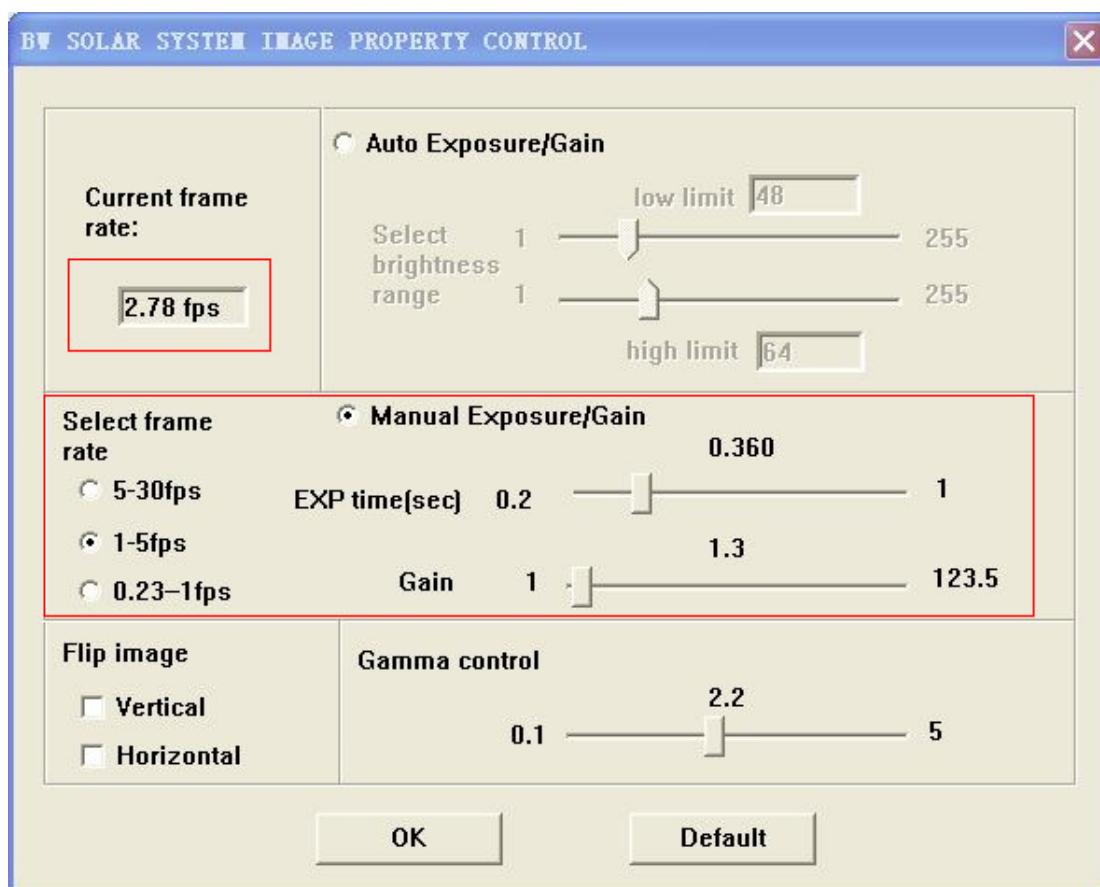
- Ultra-bright Scene:  
When the scene is ultra-bright, under AUTO Mode operation, the camera will automatically select an ultra-short exposure time beyond the normal range to achieve better imaging results. The shortest possible exposure time is 0.068 msec.

## (2)b. Manual Exposure/Gain

- When auto operation does not provide satisfactory image quality, the user should switch to Manual Exposure/Gain mode. For example, you may need to increase the exposure time or gain when the picture taken under the auto mode seems too dark.
- For exposure control, first select “frame rate”. The selectable Exposure Time range is different for each frame rate range:

<u>Frame Rate (set)</u>	<u>Exposure Time (selectable range)</u>
5-30 fps	0.033 to 0.2 seconds
1-5 fps	0.2 to 1.0 seconds
0.23-1fps	1.0 to 4.3 seconds

Note that much longer exposure time is obtainable with manual control.



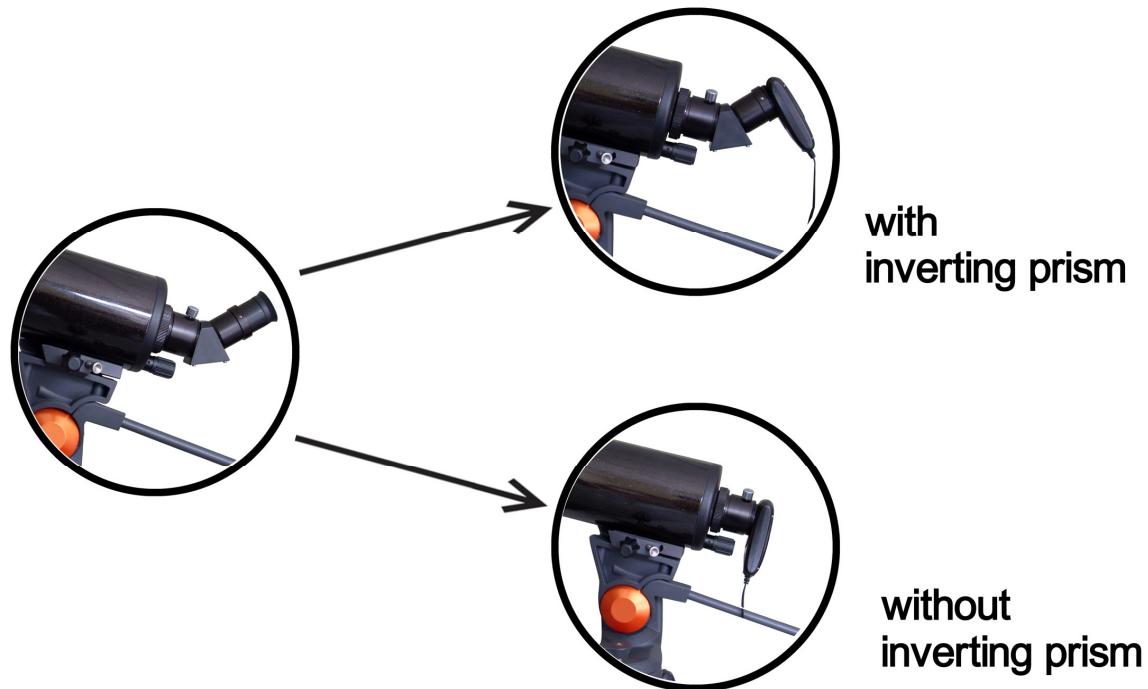
- Gain** is selectable from 1 to 123.5. Note that the maximum obtainable gain is much higher than that from auto operation.

### (2)c. Frame Rate

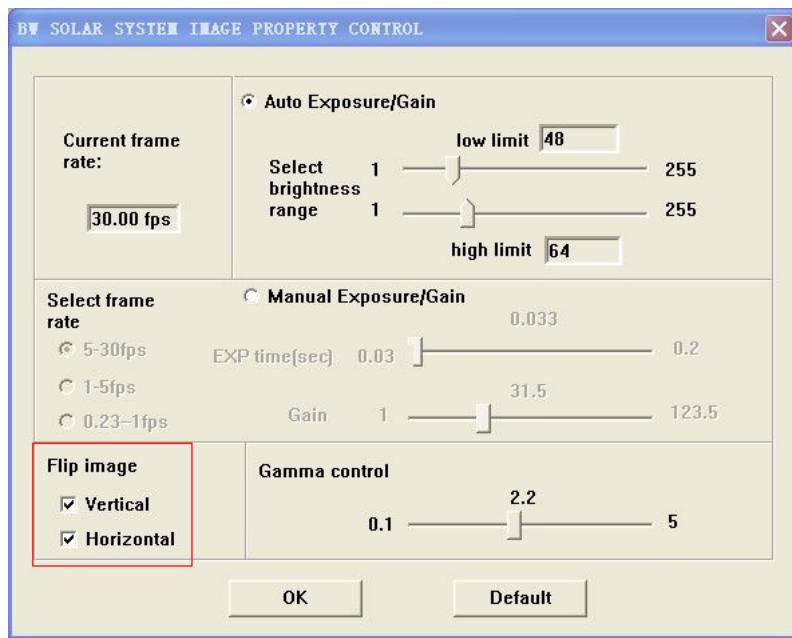
The current frame rate is automatically selected by the camera to match the exposure time required for the preferred brightness and displayed as illustrated above.

### (2)d. Flip Image

Depending on the orientation of the camera, the image appear on the screen may be rotated vertically or horizontally. To obtain a correctly oriented image, you can flip the image by checking the appropriate box. For example, when the inverting prism is used (see illustration below), the image will be inverted. The user has to click the “Vertical” icon to make another inversion to compensate.

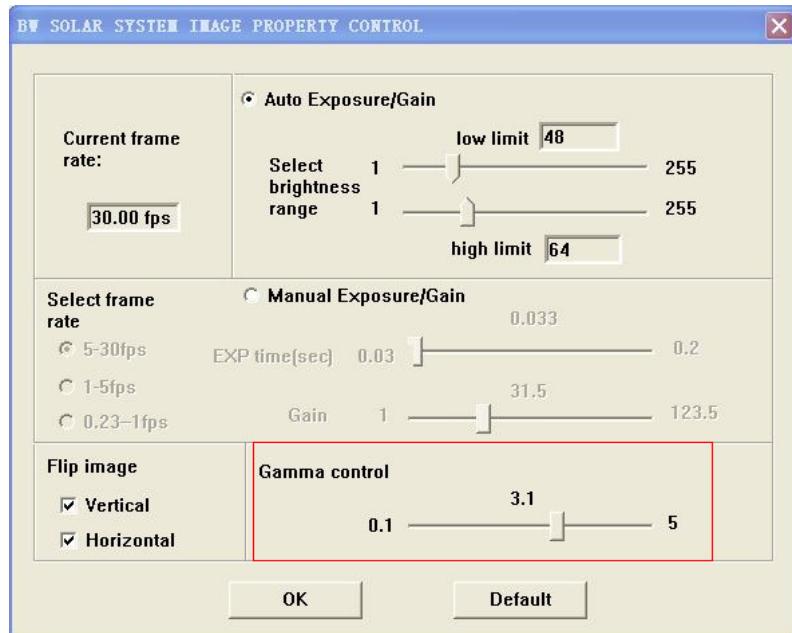


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### (2)e. Gamma Control

- The default value of Gamma for the **SOLAR SYSTEM IMAGER** is 2.2, you may need to adjust the Gamma value to improve the contrast of the image.



## (2)f. Return to Default Settings

After changing the image properties you may either click **OK** to confirm, or click **Default** to adopt the **default settings**:

### Default Settings:

- **Auto Exposure/Gain Mode**
- **Brightness Range: low 48, high 64.**
- **Gamma value: 2.2.**

In fact you can return to these settings anytime by clicking default.

## (3) Capturing Still Images

Select **ImageCtrl > StillCap** to capture still images, one at a time.



The captured images will be saved at the same location where **SOLAR SYSTEM IMAGER** software is.

For example, if **SOLAR SYSTEM IMAGER** is located in **My Pictures**, all pictures taken by **SOLAR SYSTEM IMAGER** will be saved in **My Pictures**.

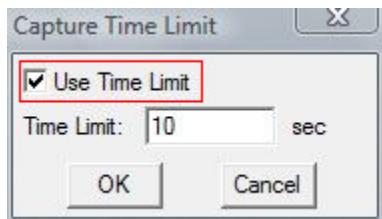
## (4) Recording/Reviewing Video

- To record video for a specific period of time

1. Choose **Capture > Set Time Limit.**



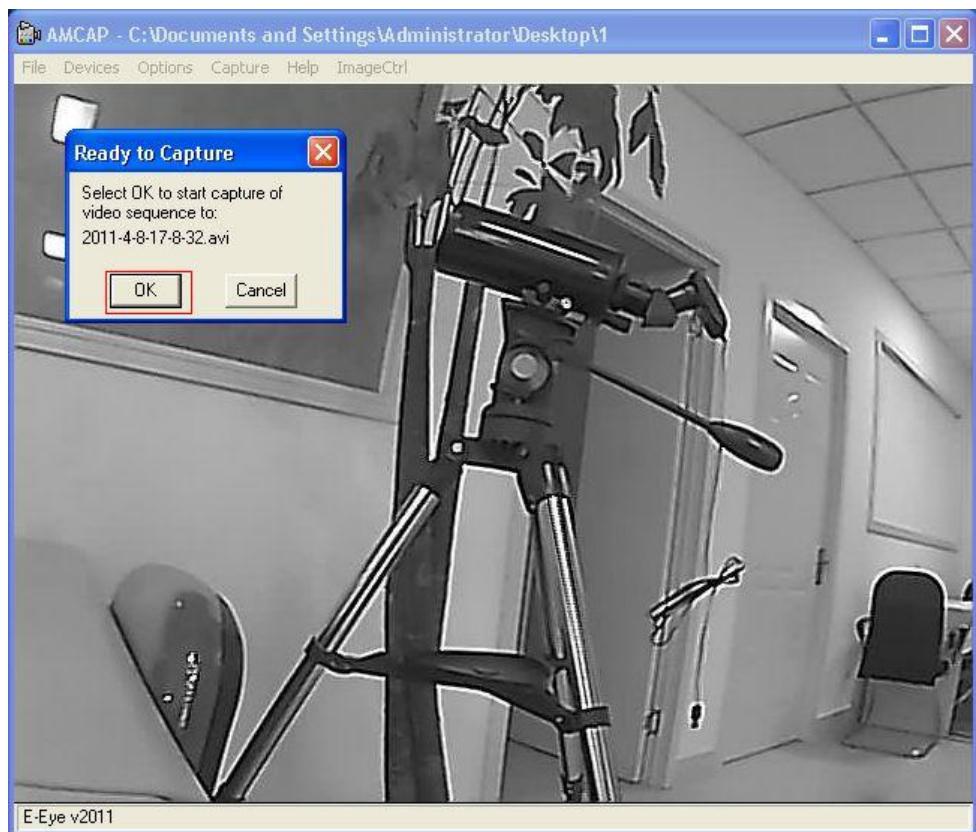
2. Select **Use Time Limit** > key in desired time duration> **OK**



3. Choose **Capture** > **Start Capture**, and click **OK** to start recording.



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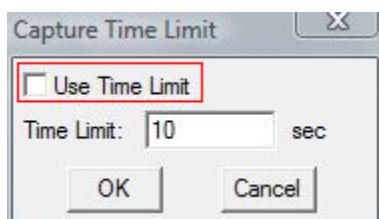


- **To start recording video for an indefinite time duration**

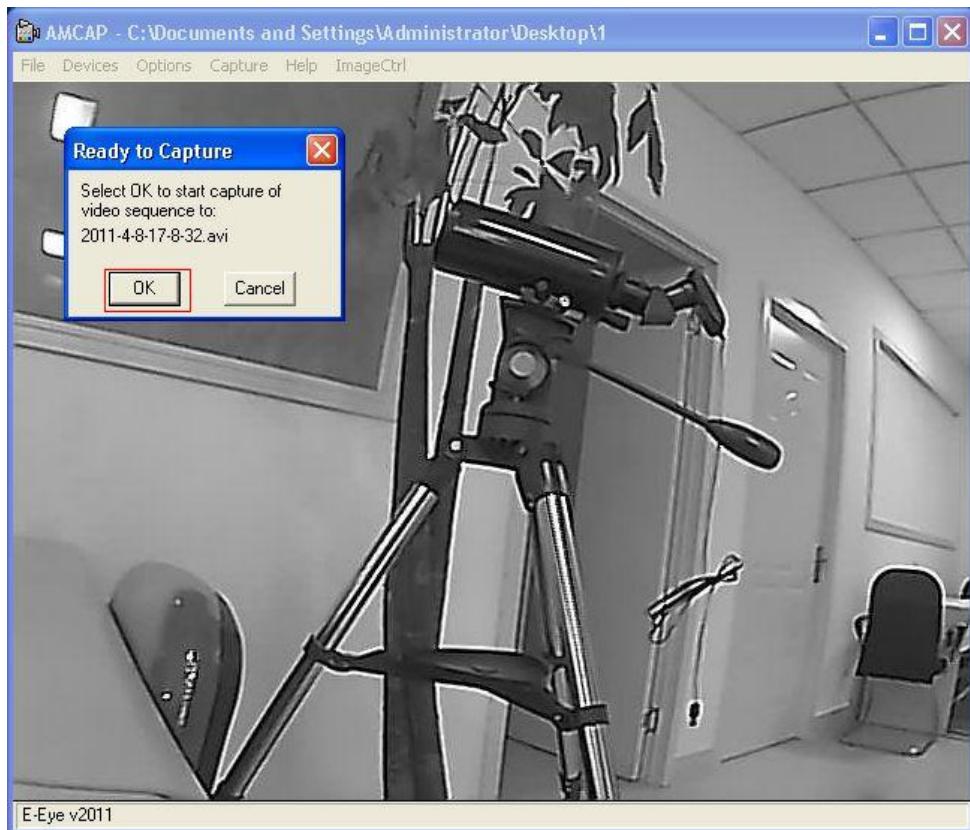
1. Choose **Capture > Set Time Limit.**



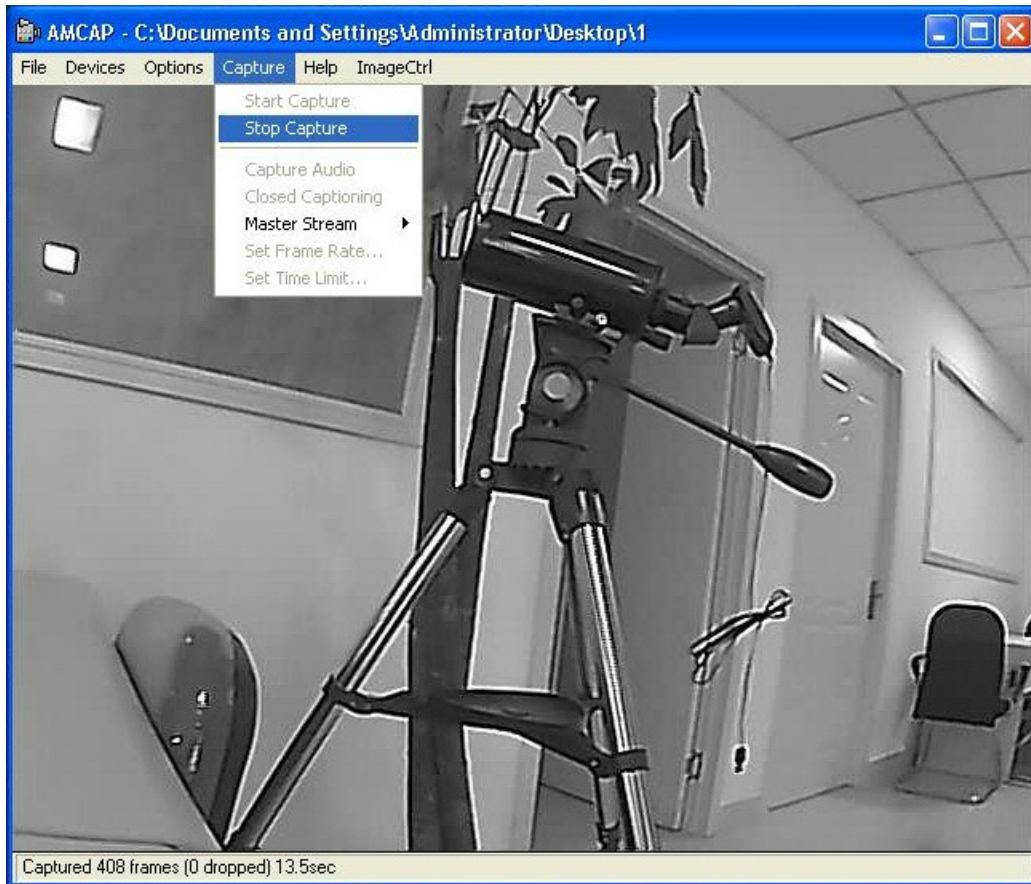
2. Make sure Use Time Limit is not chosen > OK



3. Choose **Capture > Start Capture**, and click **OK** to start recording.



4. To stop, choose **Capture > Stop Capture.**



- **To Review Recorded Video**

The captured videos will be saved at the same location where the **SOLAR SYSTEM IMAGER** software is.

For example, if **SOLAR SYSTEM IMAGER** is located in **My Pictures**, all videos captured by **SOLAR SYSTEM IMAGER** will be saved in **My Pictures**.

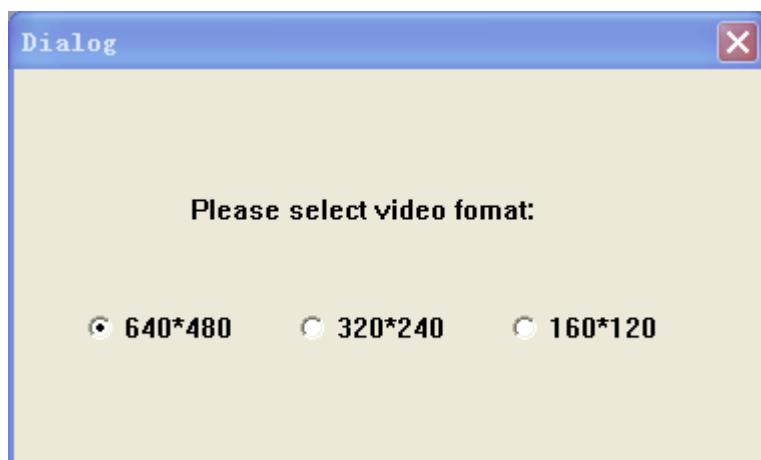
## (5) Displaying Time

To display time and date on the images or videos recorded:  
Choose **ImageCtrl > Show time**.



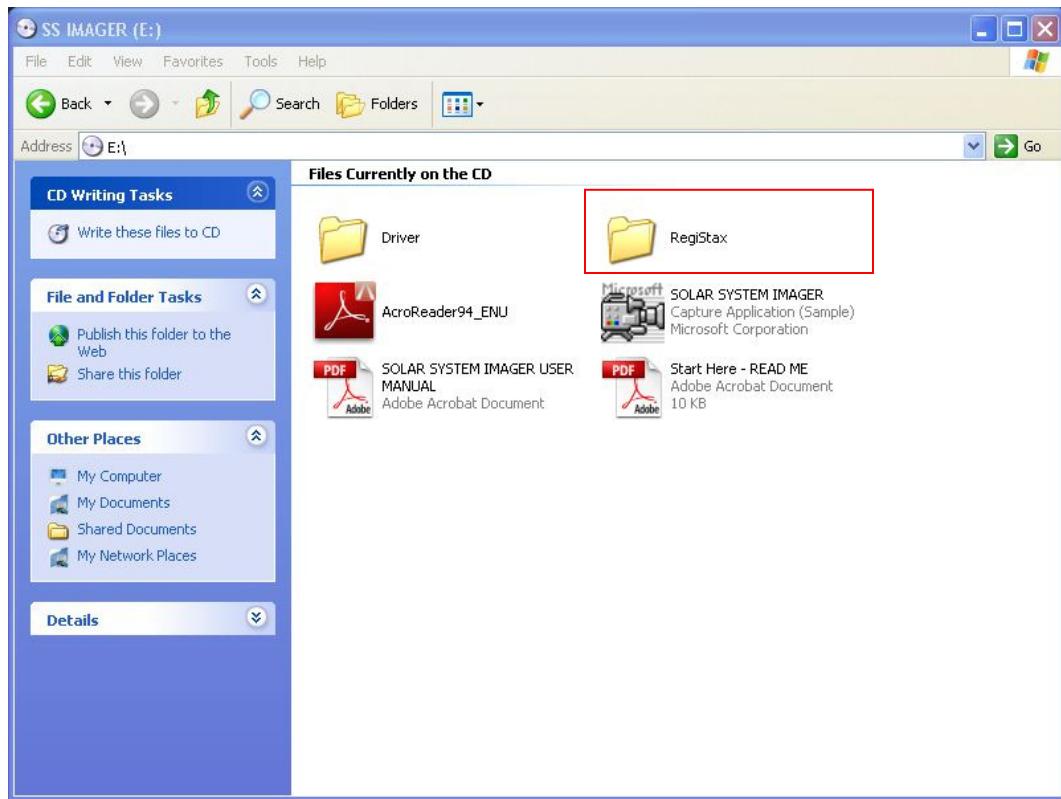
## (6) Selecting Image Format

- The default image size (for both still image and video) is: 640 \* 480.
- To change the size of the image if needed: choose **ImageCtrl > Video Format**.

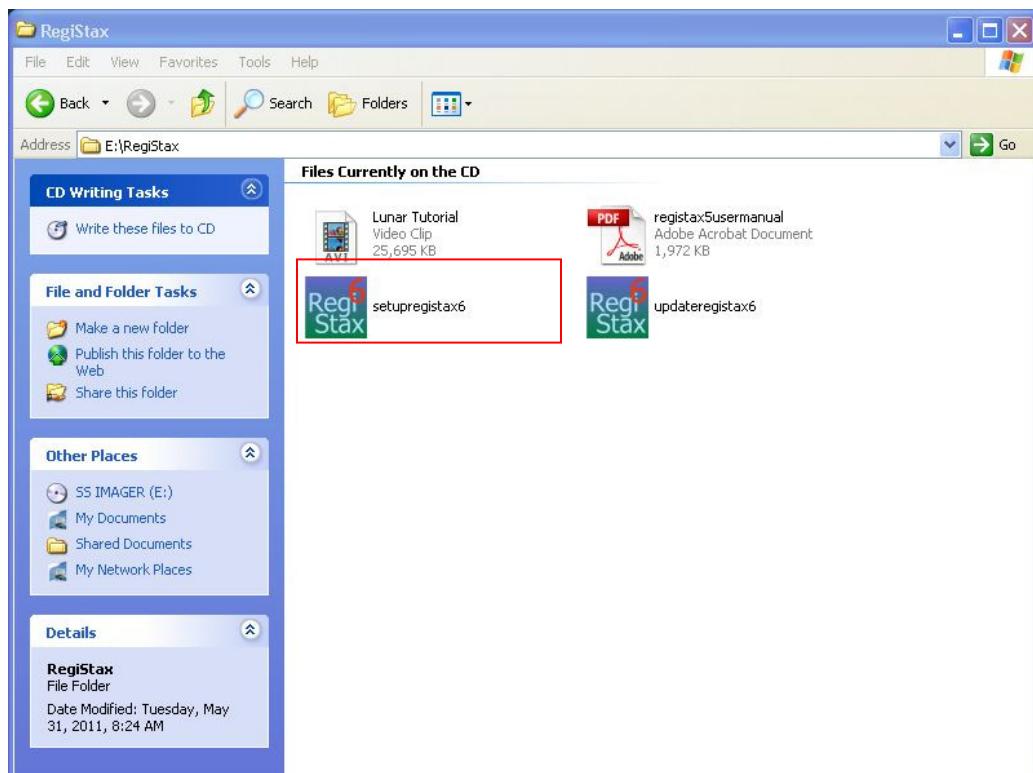


## Image Enhancement with RegiStax

RegiStax version 6.0 is included in the installation CD.



Please open the software (**RegiStax > setupregistax6**) and follow instructions.

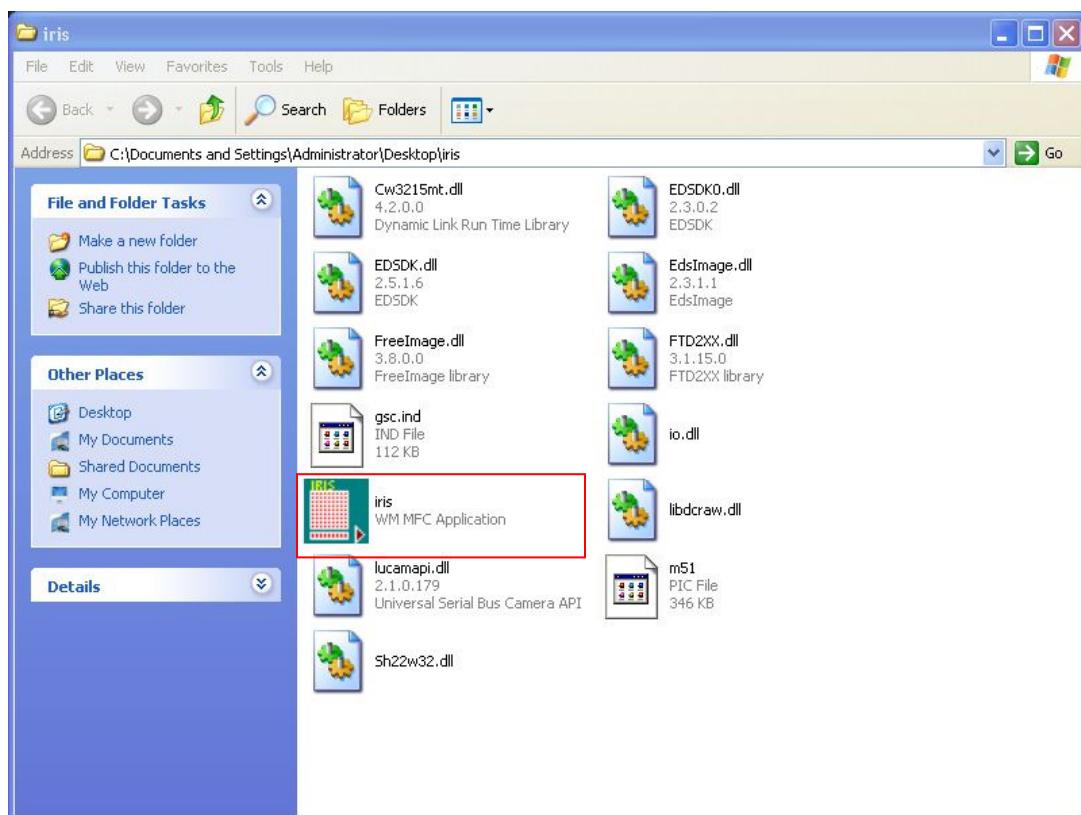


## Using Other Software to Control SOLAR SYSTEM IMAGER

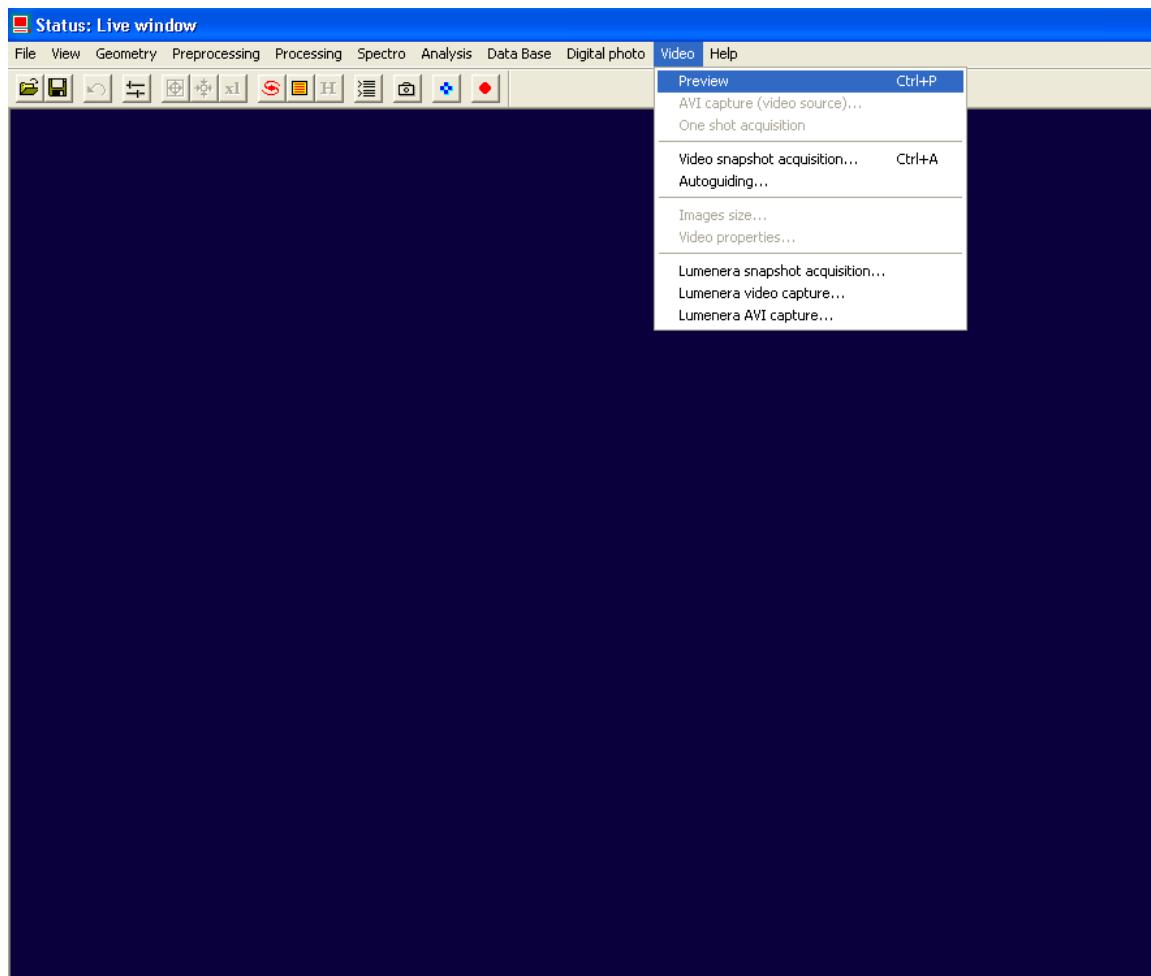
For various reasons the user may want to use his/her own software to control Solar System Imager. For example, he/she may want to use the imager as a “guide cam” to keep their telescope pointing at a selected deep sky object for long exposure. Most of the Microsoft compatible imaging software may be used. We have used Iris, a popular astronomy software, as well as Amcap, Microsoft’s standard image software, to illustrate “how”,

### A. Example 1: IRIS

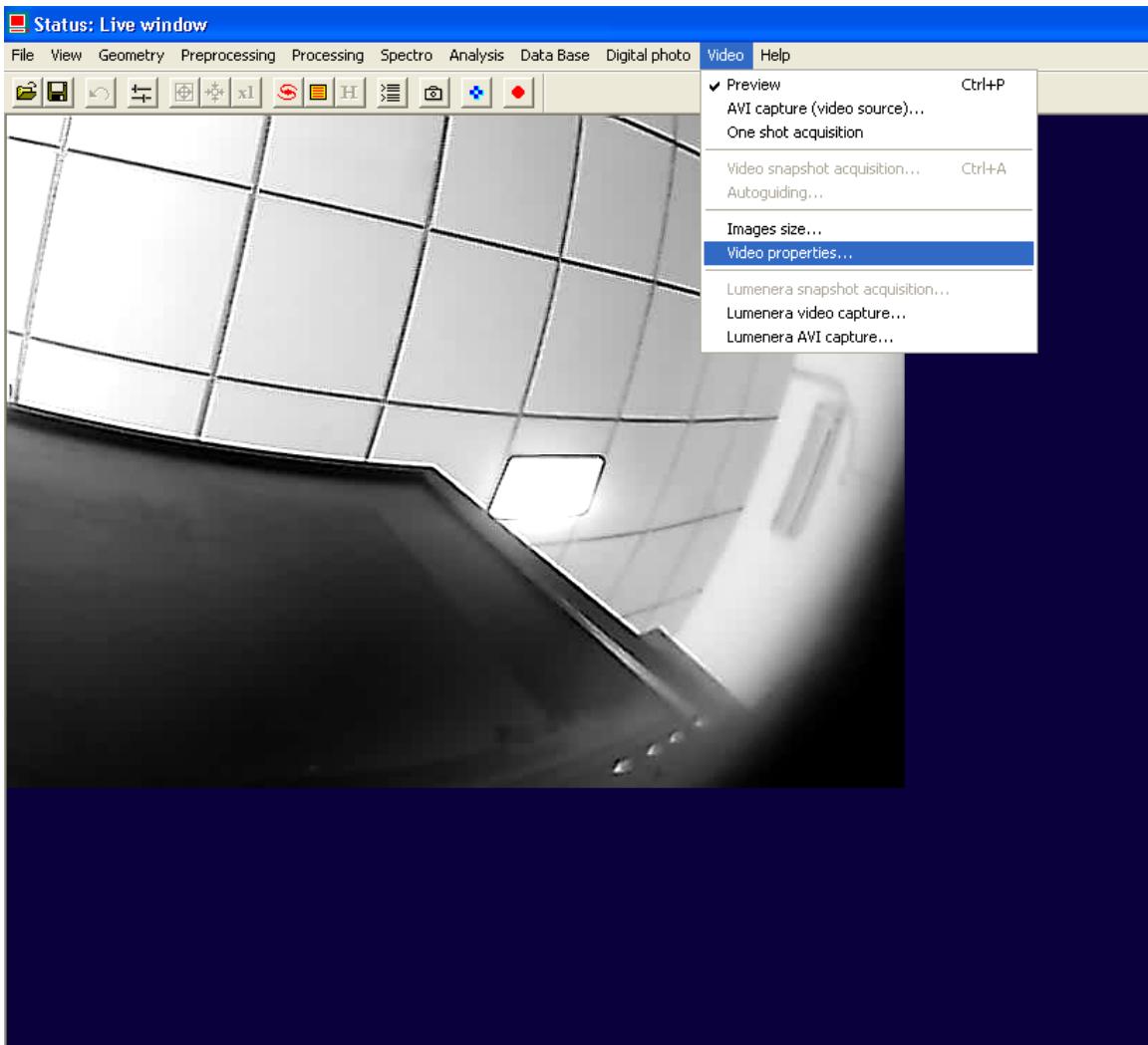
- A-1.** If you do not already have IRIS, go to this website to download **IRIS ZIP file:** <http://www.astrosurf.com/buil/us/iris/iris.htm>
- A-2.** Decompress the IRIS.ZIP in a directory of your choice.
- A-3.** Copy the icon of the program **IRIS.EXE** to your desktop (optional).
- A-4.** To run the program, double click on **IRIS.EXE**.



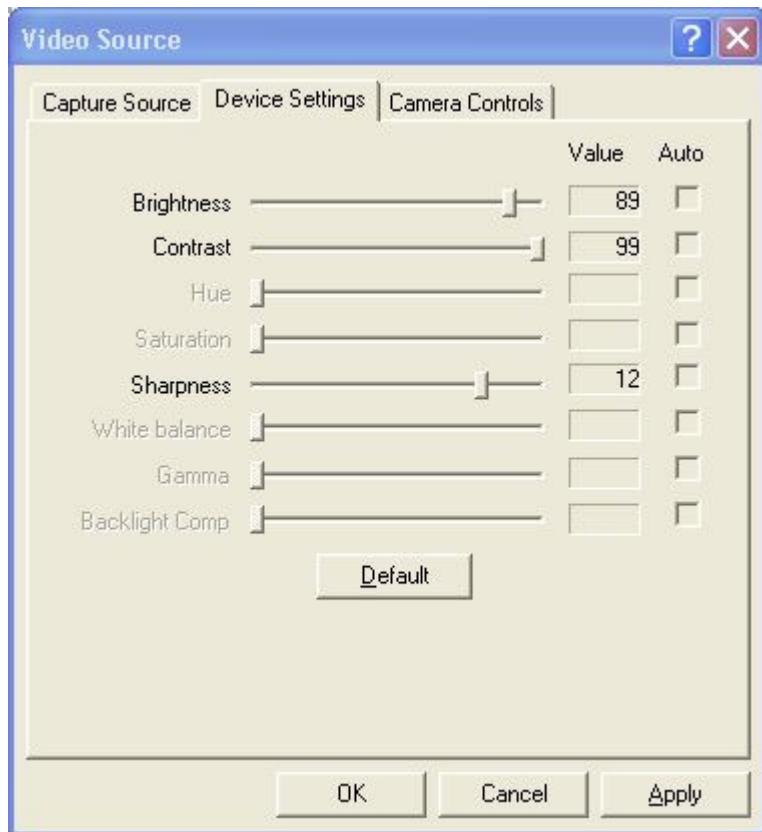
**A-5. Choose Video > Preview.**



**A-6. Choose Video > Video properties.**

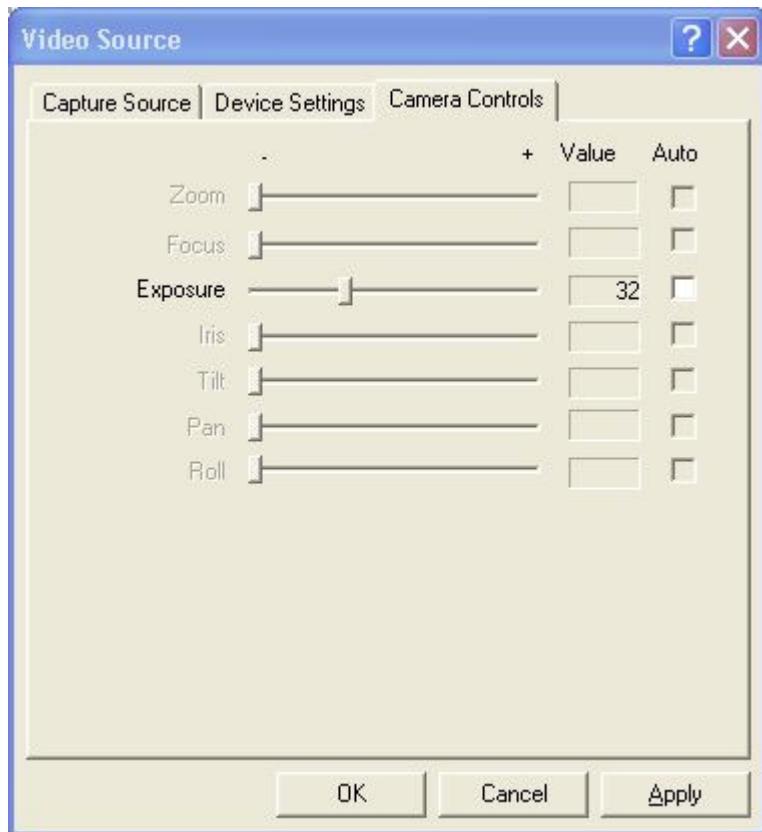


**A-7.** The **Video Source** window as below will pop up. Click **Device Settings**.

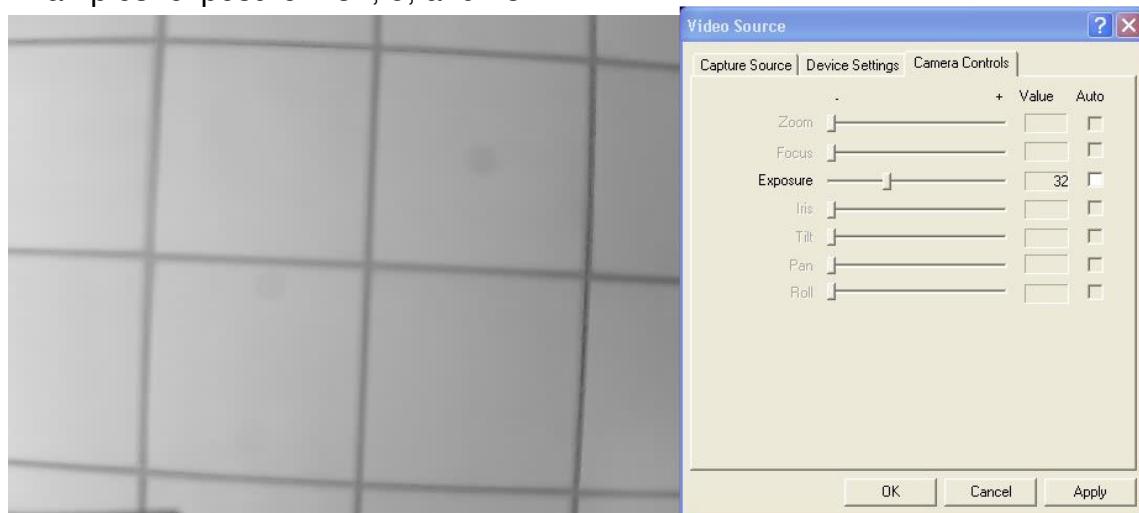


Now you can adjust **Brightness** (0-99, default 50), **Contrast** (0-99, default 50), and **Sharpness** (0-15, default 12) levels on the Video Source window.

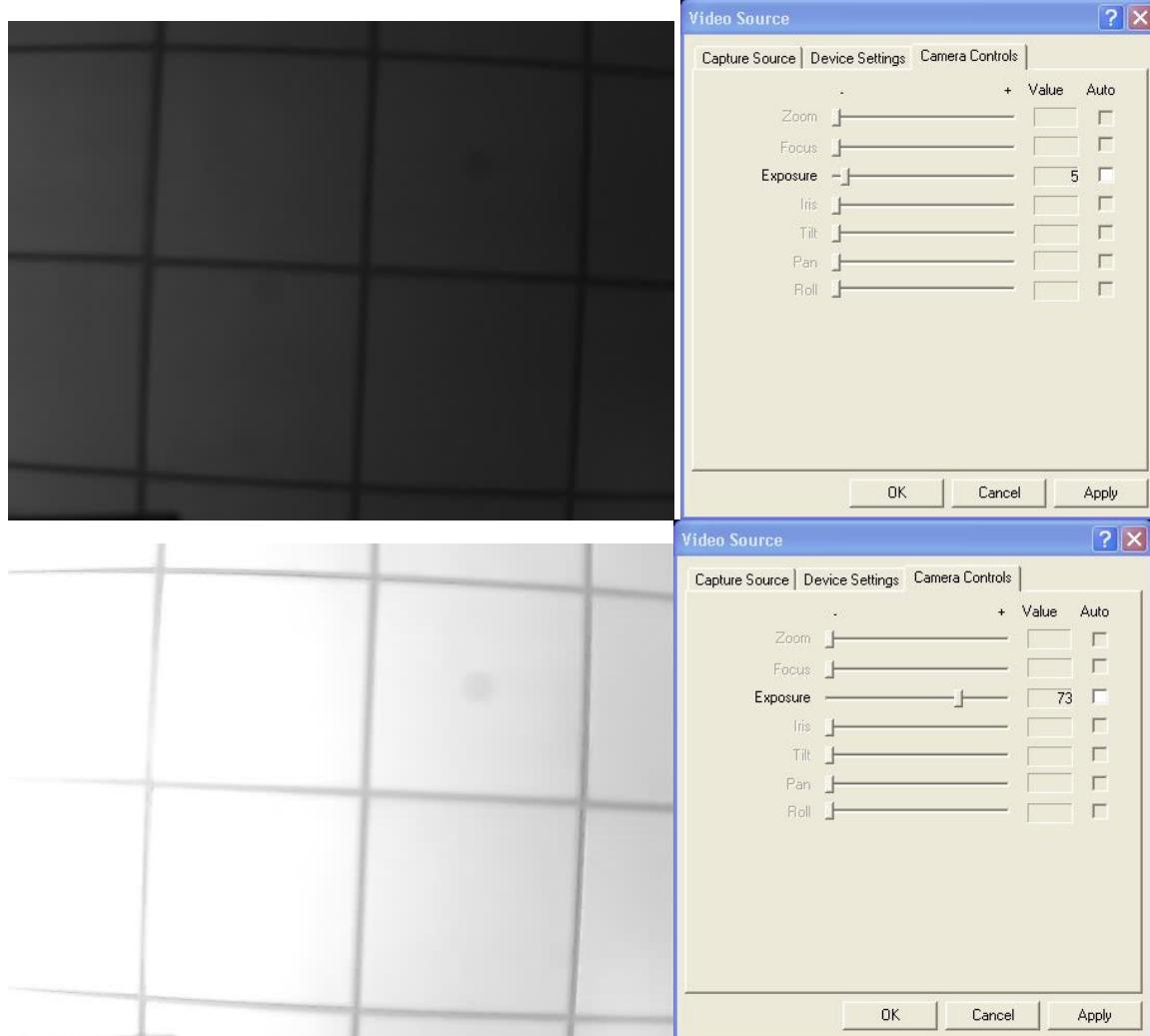
**A-8.** Click **Camera Controls** to change exposure (0-99, default 32, 1 = 0.325 msec, 32 = 10.4 msec, max 32.175 msec).



Examples: exposure = 32, 5, and 73.



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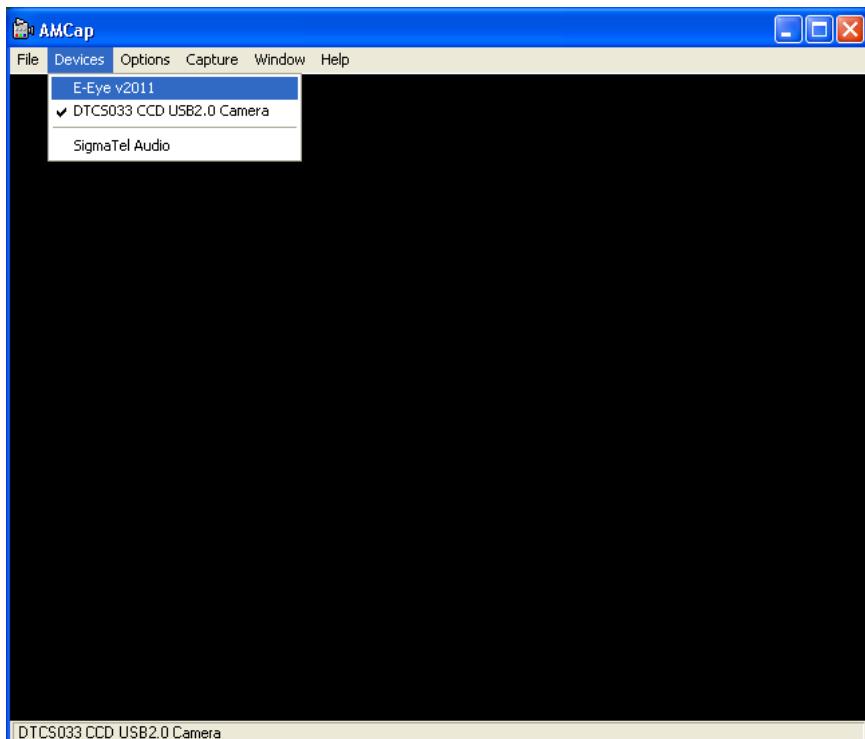
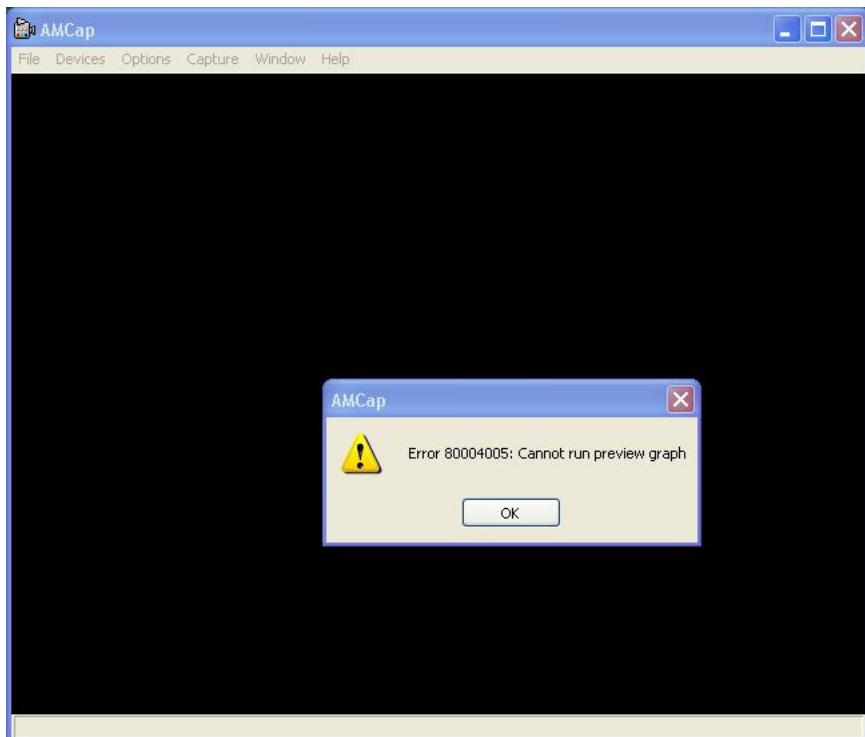
## B. Example 2: Amcap

**B-1.** Open **AMCAP** of the Microsoft operation system to see images on the computer.



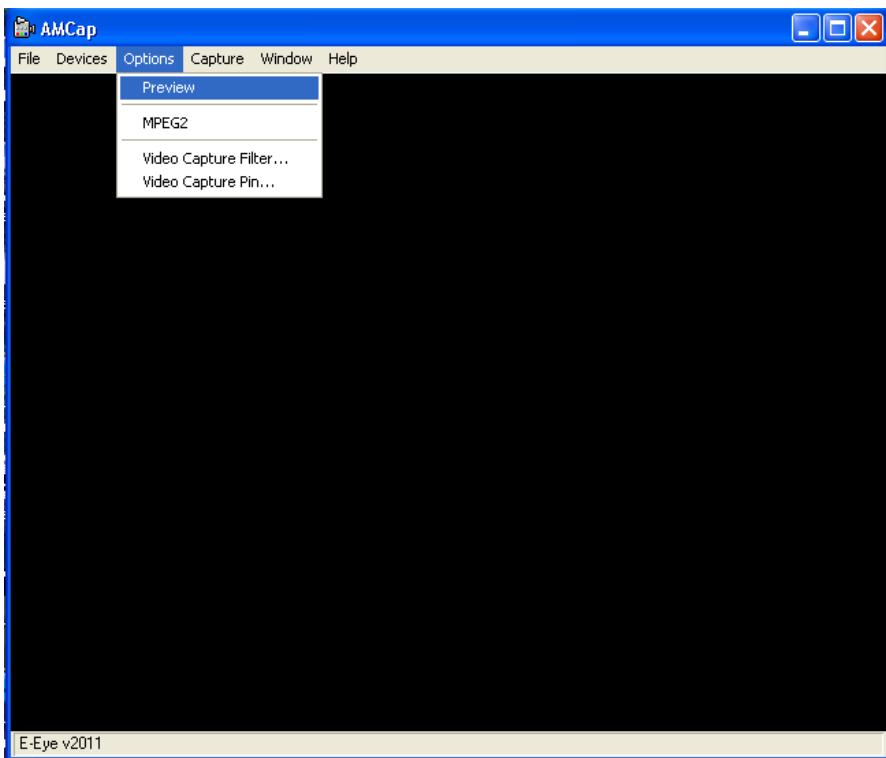
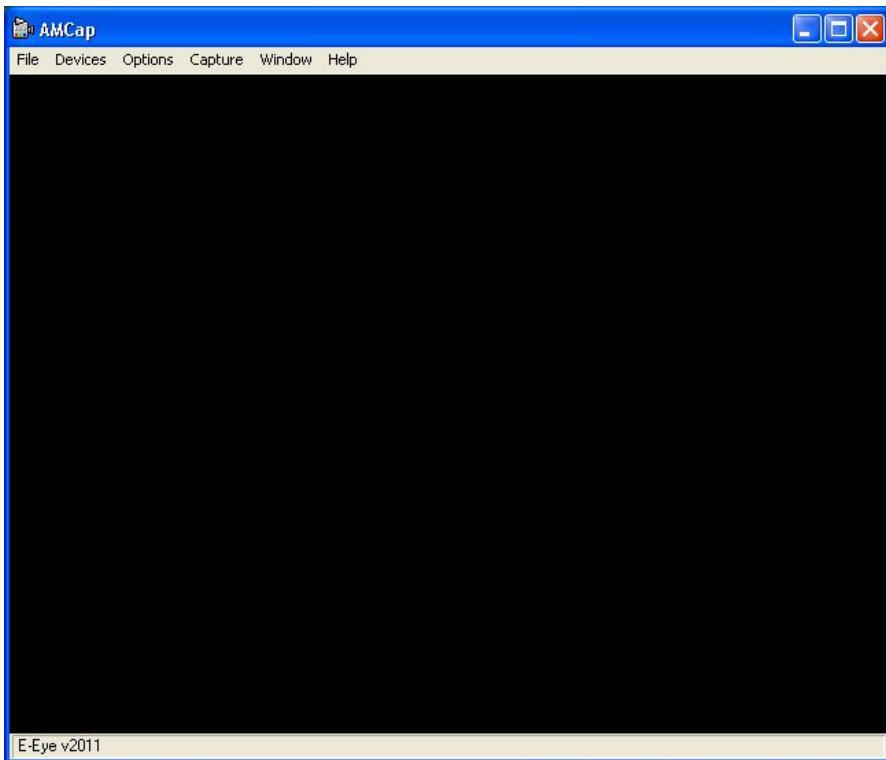
## NO IMAGE?

1. If the error message below pops up, it is because the computer has been using another camera before. Select **Devices > E-Eye v2011**.

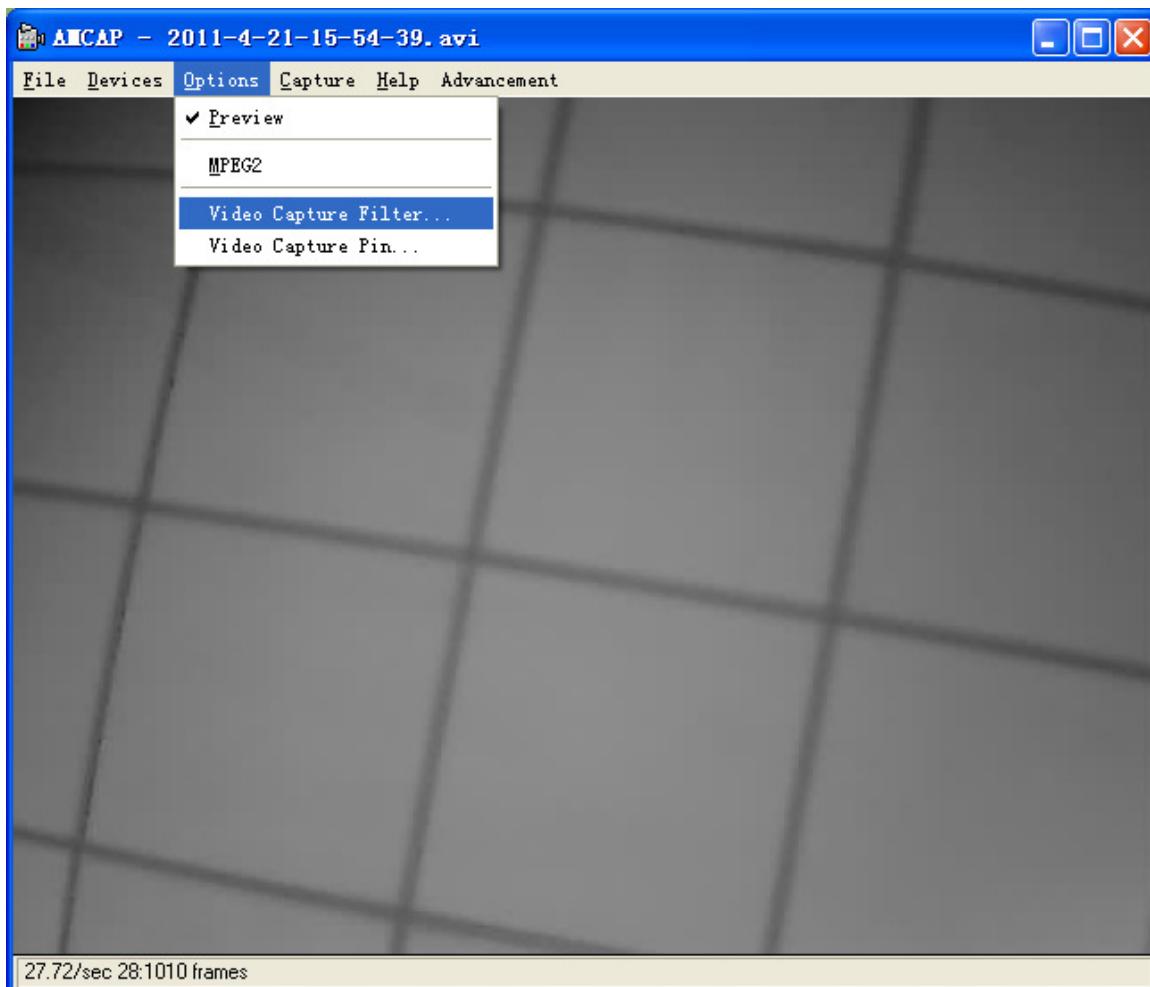


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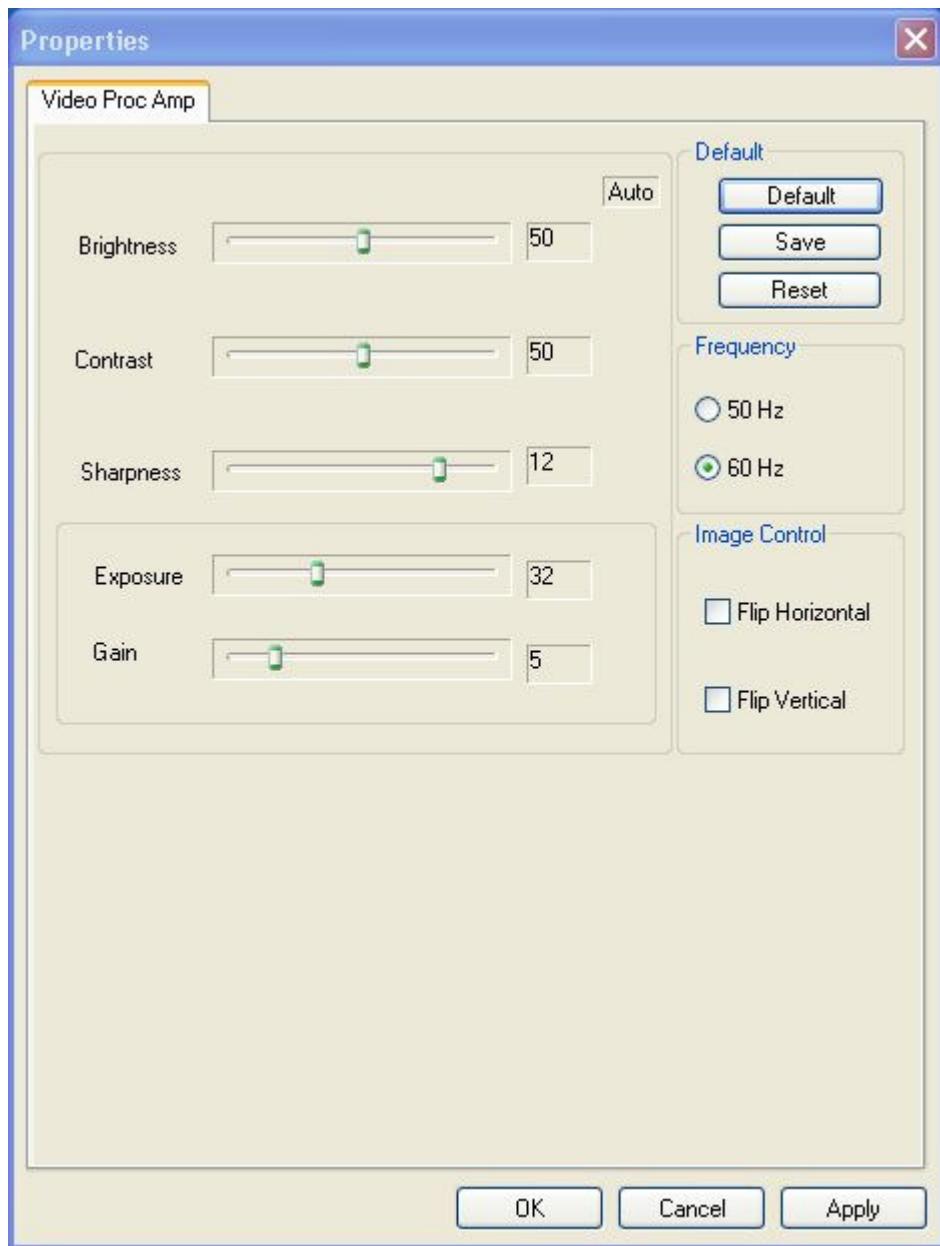
2. If the Amcap window is blank (as below), select **Options > Preview**.



**B-2.** To change imaging settings, choose **Options > Video Capture Filter**.



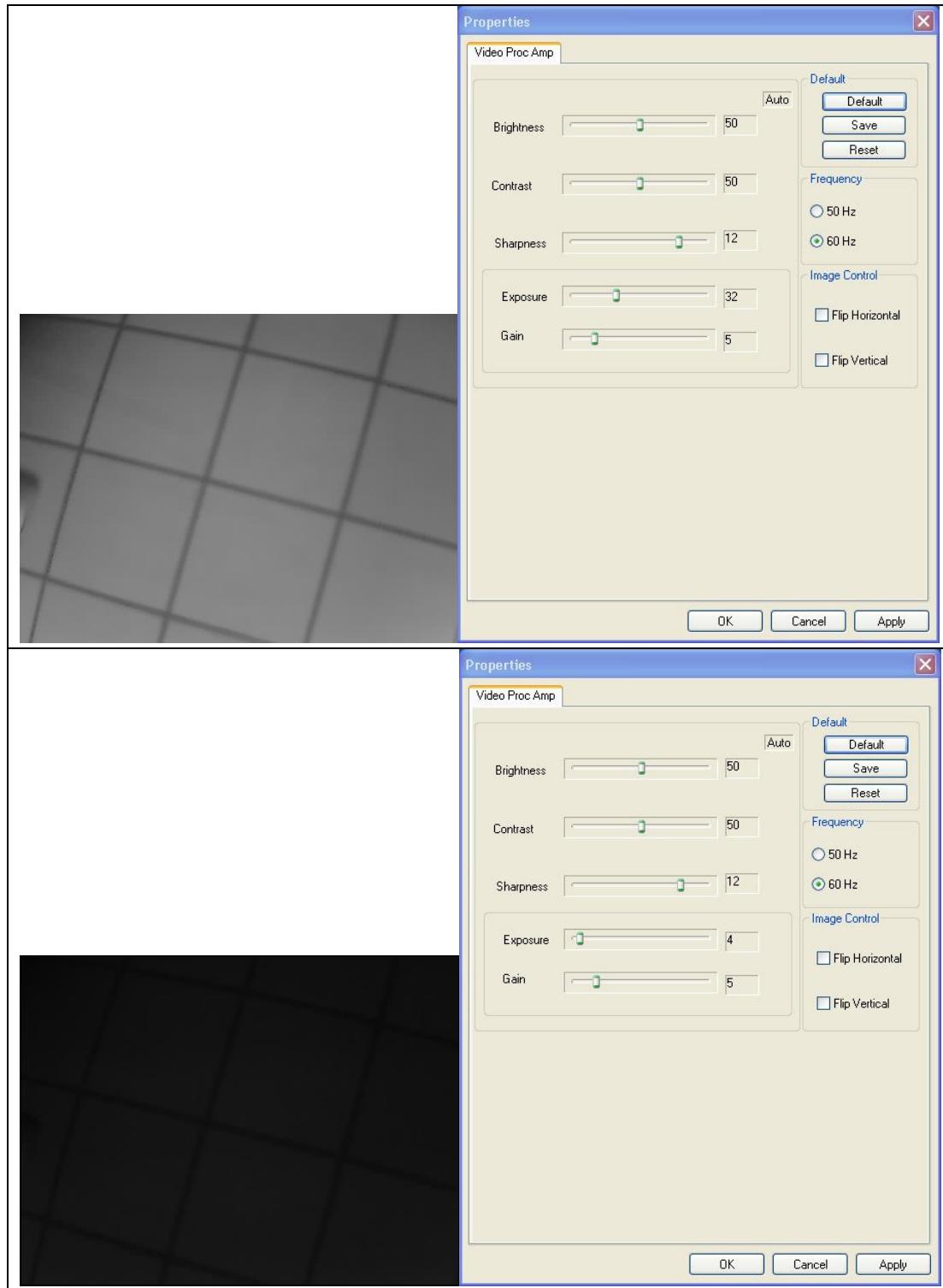
**B-3.** The **Properties** widow (as below) will pop up.

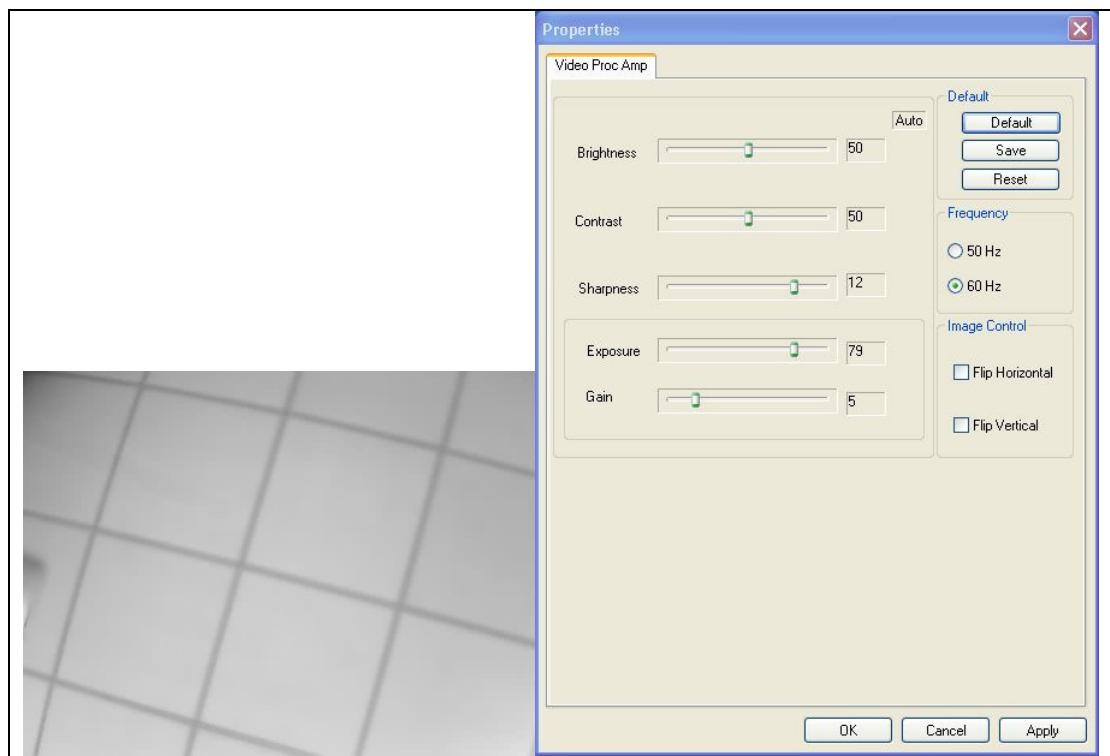


Now you can adjust **Brightness** (0-99, default 50), **Contrast** (0-99, default 50), and **Sharpness** (0-15, default 12) levels on the Properties window.

**B-4.** On the Properties window you can also change exposure (0-99, default 32, 1 = 0.325 msec, 32 = 10.4 msec, max 32.175 msec).

The results of setting exposure at 32, 4, and 79 are shown below.





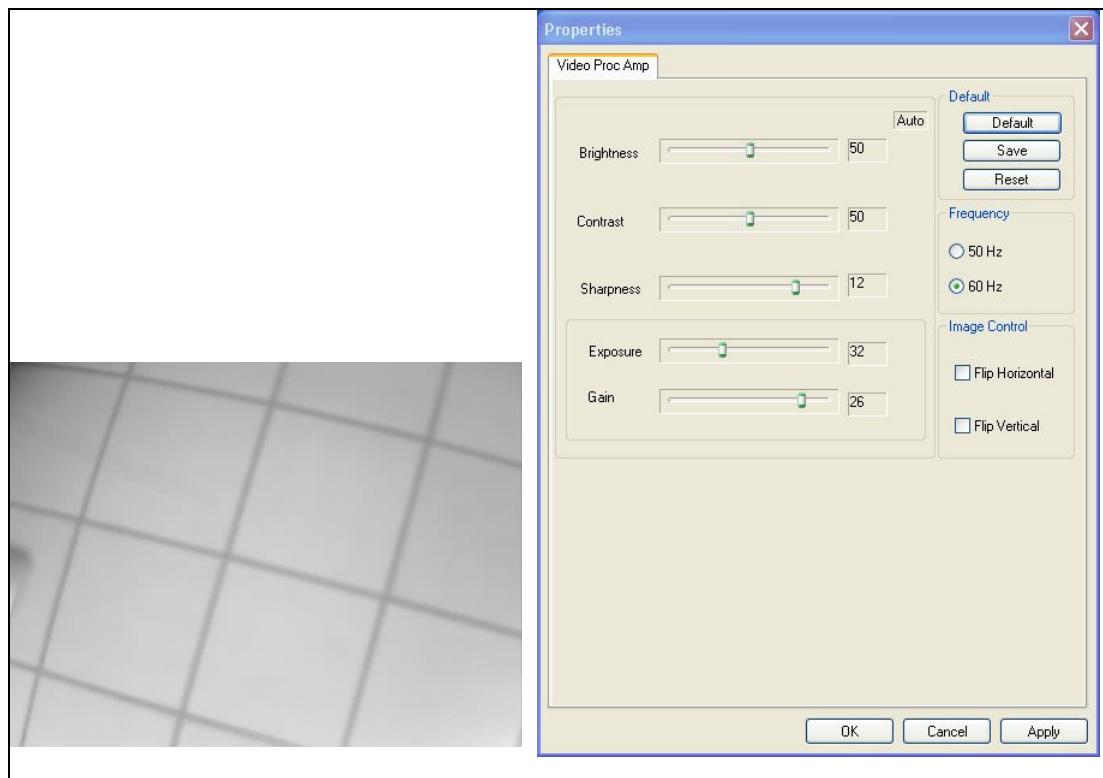
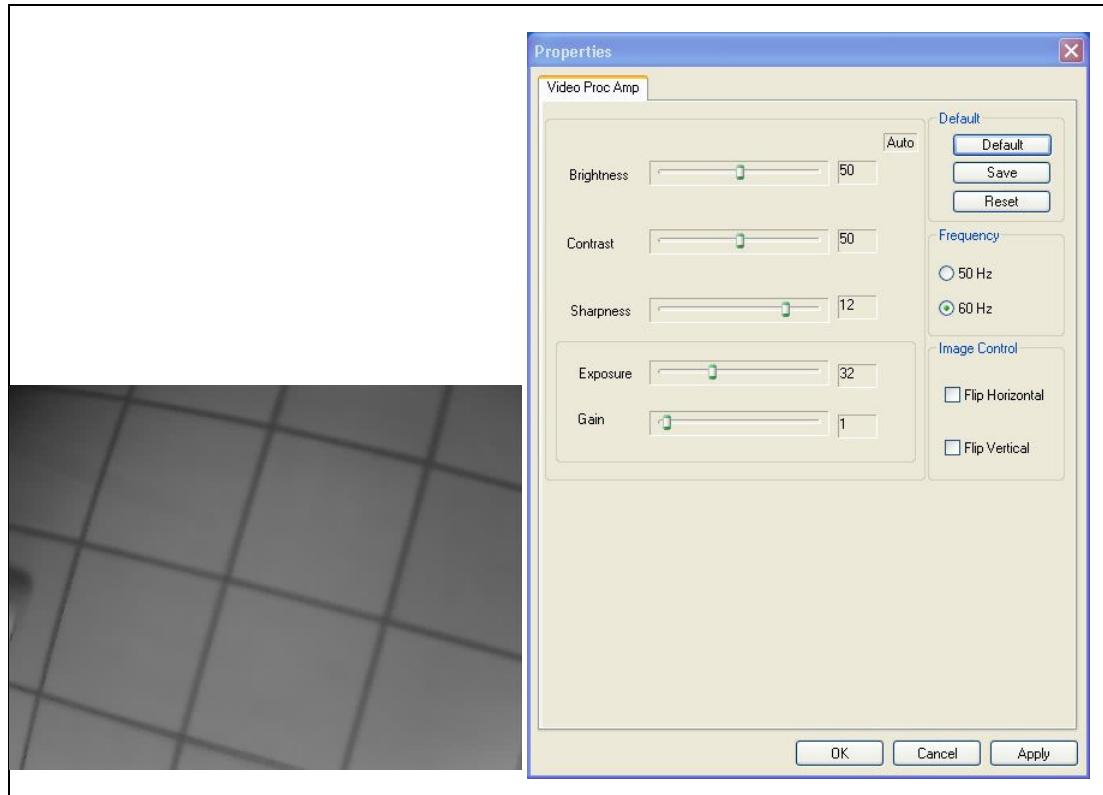
Gain can also be set 0 to 31, default is 5.

The following table shows the actual gain corresponding to each number.

Indicated Gain	Actual Gain	Indicated Gain	Actual Gain	Indicated Gain	Actual Gain
0	1.0000	11	1.6875	22	2.7500
1	1.0625	12	1.7500	23	2.8750
2	1.1250	13	1.8125	24	3.0000
3	1.1875	14	1.8750	25	3.1250
4	1.2500	15	1.9375	26	3.2500
5	1.3125	16	2.0000	27	3.3750
6	1.3750	17	2.1250	28	3.5000
7	1.4375	18	2.2500	29	3.6250
8	1.5000	19	2.3750	30	3.7500
9	1.5625	20	2.5000	31	3.8750
10	1.6250	21	2.6250		

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Here are the results for gain = 1 and gain = 26 at default exposure.

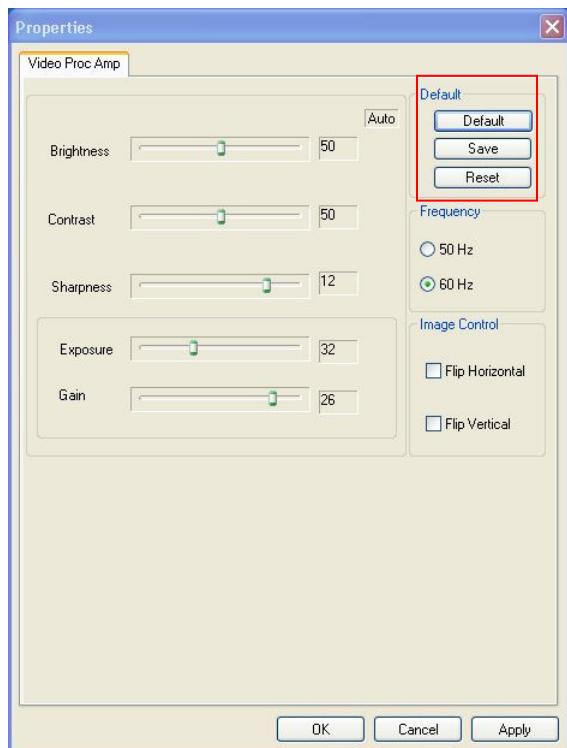


**Note:**

**Default** → all parameters return to default settings.

**SAVE** → change default to current settings.

**Reset** → recover parameters to values before the last time when OK is clicked.



## C. Why Use the SOLAR SYSTEM IMAGER Software

With Amcap or similar standard softwares for general applications, the adjustable ranges for exposure and gain are very small. Therefore, if you can, we strongly suggest that use the specialized SOLAR SYSTEM IMAGER.exe to control the camera, not other softwares.

Here is a comparison:

	Exposure Time	Gain	Frame Rate
<b>SOLAR SYSTEM IMAGER software</b>	0.065ms-4293ms	1-123.5 X	0.23-30fps
<b>AMCAP</b>	0.325ms-32.175ms	1-3.875 X	30fps