

Megapixel USB2.0 CMOS

# CAMERA

# U s e r   G u i d e

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SMX-150M USB2.0 Camera

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SMX-150M USB2.0 Camera User Guide

Revision 4.0

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# CONTENTS

|                  |  |           |
|------------------|--|-----------|
| <i>Chapter 1</i> | <b>Introduction</b> . . . . .                      | <b>7</b>  |
| <i>Chapter 2</i> | <b>Installation and Update</b> . . . . .           | <b>9</b>  |
|                  | System Requirements . . . . .                      | 9         |
|                  | Installation . . . . .                             | 9         |
|                  | Update . . . . .                                   | 15        |
|                  | Driver Update . . . . .                            | 15        |
|                  | Removal . . . . .                                  | 17        |
|                  | Troubleshooter . . . . .                           | 18        |
|                  | Camera Was Not Detected or Recognized . . . . .    | 18        |
|                  | Cannot Install the Hardware . . . . .              | 20        |
| <i>Chapter 3</i> | <b>Getting Started</b> . . . . .                   | <b>23</b> |
|                  | Recommendations on the Camera Connection . . . . . | 23        |
|                  | Plugging in the Camera . . . . .                   | 24        |
|                  | Installing Lens . . . . .                          | 24        |
|                  | Installing Driver Software . . . . .               | 26        |
|                  | Starting the Application . . . . .                 | 27        |
|                  | Switching Between Cameras . . . . .                | 30        |
|                  | Viewing Camera ID . . . . .                        | 30        |
|                  | Reducing CPU Load . . . . .                        | 31        |
| <i>Chapter 4</i> | <b>Tuning Guidelines</b> . . . . .                 | <b>33</b> |
|                  | Tuning Black Level and Column Balancing . . . . .  | 33        |
|                  | Manual Tuning of ADC Sample Delay . . . . .        | 34        |
|                  | Tuning Light in the Image . . . . .                | 37        |
|                  | Increasing Camera Speed . . . . .                  | 39        |
|                  | Reading Histogram . . . . .                        | 40        |
|                  | Sensor Controls . . . . .                          | 42        |
|                  | Exposure . . . . .                                 | 42        |
|                  | Gain . . . . .                                     | 42        |
|                  | Frequency . . . . .                                | 43        |
|                  | Decimation . . . . .                               | 43        |
|                  | Viewport . . . . .                                 | 43        |

|  |           |
|--|-----------|
| Image Correction .....                                 | 45        |
| Advanced Sensor Controls .....                         | 45        |
| Image Flip .....                                       | 45        |
| Increasing Image Quality .....                         | 46        |
| Exposure Mode .....                                    | 47        |
| Sensor Voltage .....                                   | 47        |
| Frame Rate .....                                       | 48        |
| Output Bits per Pixel .....                            | 49        |
| Filtering .....  | 49        |
| Saving and Loading Camera Profiles.....                | 50        |
| <i>Chapter 5</i> <b>Capturing</b> .....                | <b>53</b> |
| Capturing Images.....                                  | 53        |
| Capture Limits .....                                   | 53        |
| Recording Video.....                                   | 54        |
| Saving Video/Frames to Memory.....                     | 54        |
| Saving Options .....                                   | 55        |
| <i>Chapter 6</i> <b>Snapshots</b> .....                | <b>57</b> |
| Snapshots Basics .....                                 | 57        |
| Tuning Image for the Snapshot Mode .....               | 57        |
| Tuning Illumination.....                               | 58        |
| Adjusting Illumination on the Fly .....                | 59        |
| <b>Snapshot Controls</b> .....                         | <b>60</b> |
| Using Multiple Slope Exposure .....                    | 60        |
| Increasing Camera Speed .....                          | 62        |
| Taking Snapshots Using Software Trigger.....           | 62        |
| Taking Snapshots Using Hardware Trigger.....           | 63        |
| External Trigger Connector Pinout .....                | 64        |
| Setting External Trigger Polarity .....                | 64        |
| Snapshot Video.....                                    | 65        |
| Saving Snapshots.....                                  | 66        |
| <i>Chapter 7</i> <b>WIA</b> .....                      | <b>69</b> |
| Installation .....                                     | 69        |
| How It Works .....                                     | 69        |
| Location .....   | 69        |
| Getting Image with the Scanner and Camera Wizard ..... | 70        |
| Getting Image with Scan .....                          | 74        |
| Getting Image from Camera with Microsoft Paint .....   | 76        |

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|   |           |
|---|-----------|
| Removing .....                                    | 77        |
| <i>Chapter 8</i> <b>Trigger Connector</b> .....   | <b>79</b> |
| Connector Pinout.....                             | 79        |
| Soldering of Connector with Cable .....           | 80        |
| <i>Appendix 1</i> <b>Keyboard Shortcuts</b> ..... | <b>93</b> |
| <i>Appendix 2</i> <b>Toolbar Overview</b> .....   | <b>95</b> |
| <i>Appendix 3</i> <b>Figures</b> .....            | <b>97</b> |



# INTRODUCTION

The **SMX-150M Camera** is a 1.3 megapixel CMOS camera that provides capturing, streaming and storing high quality, digital images. The SMX-150M camera grants 1280 x 1024 pixel resolution with 27.5 fps (frames per second) frame rate.

Using the SMX-150M camera provides the following benefits:

- Less than 5 minutes to install
- Plug and play
- USB2.0 interface (480 Mbps)
- Requires no external power source

Programmable functions include **Viewport** settings window, adjustable **Exposure** time and **Gain**, selectable sensor clock **Frequency** and image **Decimation**, and horizontal and vertical image **Flip**.

The SMX-150M camera can be used in microscopy, video conferencing, webcasting, photo ID systems, surveillance and security systems, etc.

The camera is available in the monochrome mode - the SMX-150M. For special applications, the SMX-150M camera is available in three modifications:

- the SMX-150M-E camera with enhanced NIR response sensor
- the SMX-150M-W camera with a protection glass lid removed from the sensor
- the SMX-150M-E-W camera with enhanced NIR response and a protection glass lid removed.





## Chapter 2

# INSTALLATION AND UPDATE

Before installing the camera software, install a USB2.0 adapter if needed. Install all required drivers. Installation of the USB2.0 adapter is beyond the scope of this document.

## System Requirements

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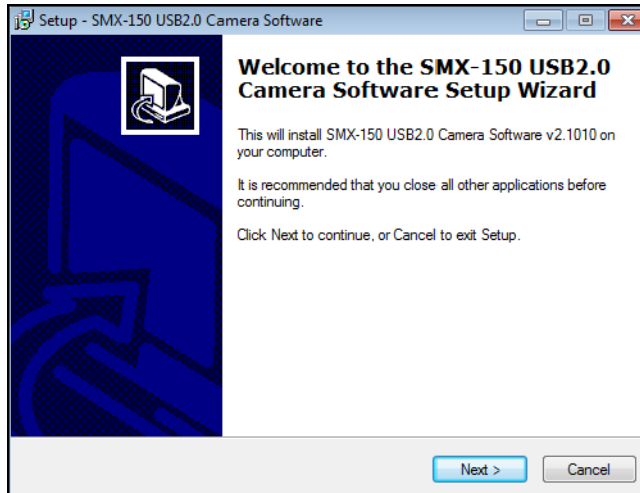
|                         |  |
|-------------------------|--|
| <b>Operating System</b> | XP SP1+/2003/Vista/2008/7, recommended: Windows 7 or XP SP1 and higher   |
| <b>Processor</b>        | Intel PIII or higher, recommended: Intel Core 2 Duo  |
| <b>Performance</b>      | Minimum 300 Mflops, recommended: 400 Mflops or higher  |
| <b>Memory</b>           | 256 MP for XP (512 MB for 2008/Vista/7), recommended: 512 MB (1024 MB)   |
| <b>USB 2.0</b>          | Recommended: Intel integrated Host Controller, not recommended: VIA-based<br>USB 3.0 Host Controller is also supported |
| <b>Video</b>            | 8 MB memory, recommended: GeForce 4xxx/Radeon 9xxx or higher   |

## Installation

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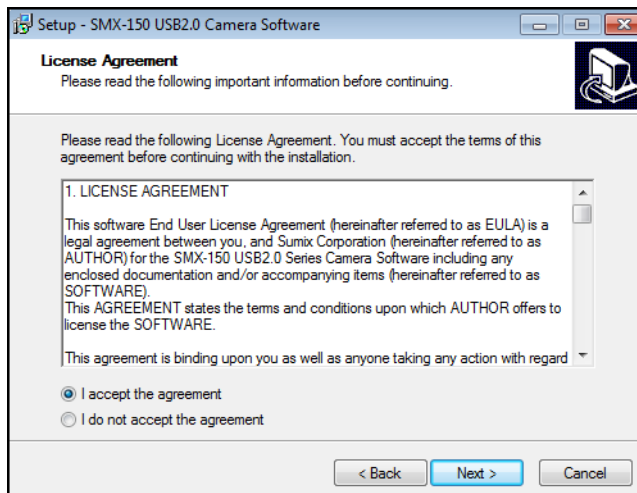
### To install the SMX-150M camera application software:

- 1 Run the **SMX150<version>.exe** file downloaded via the URL provided by Sumix Corporation.
- 2 **Welcome to the SMX-150 USB 2.0 Camera Software Setup Wizard** starts. The wizard will guide you through the software and hardware drivers installation. Close all other applications that are running on your computer and then click the **Next** button to continue the installation.



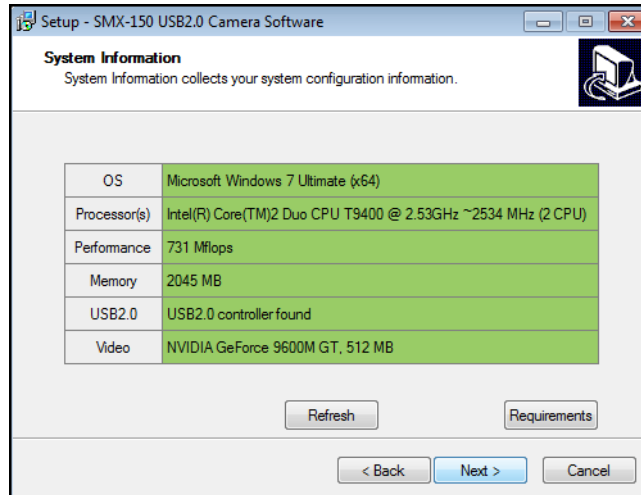
**Figure 2-1** Welcome to the SMX-150 Camera Setup Wizard

- 3 In the **License Agreement** box, read the license. Then select **I accept the agreement** and click **Next**.



**Figure 2-2** License Agreement dialog box

- 4 The wizard starts to check your system information. Upon completion, a table with check results is displayed in the **System Information** box.

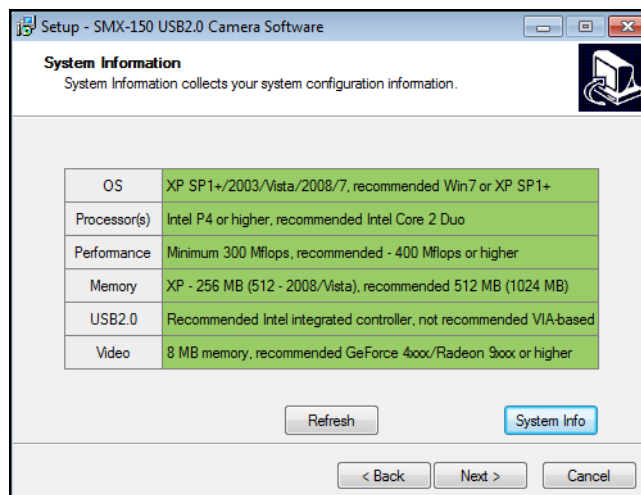


**Figure 2-3** System Information box

5 Do one of the following, depending on the results of the check:

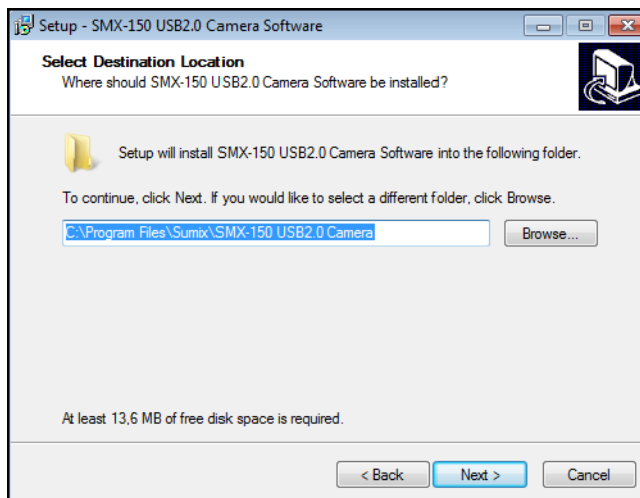
- click the **Next** button if all table cells with system parameters are green (the parameters satisfy the software requirements)
- update your system if at least one cell is red - such configuration is not recommended
- update your system if at least one cell is yellow, otherwise the technical characteristics declared for the camera will not be achieved.

To see the recommended system requirements, click the **Requirements** button in the **System Information** dialog box:



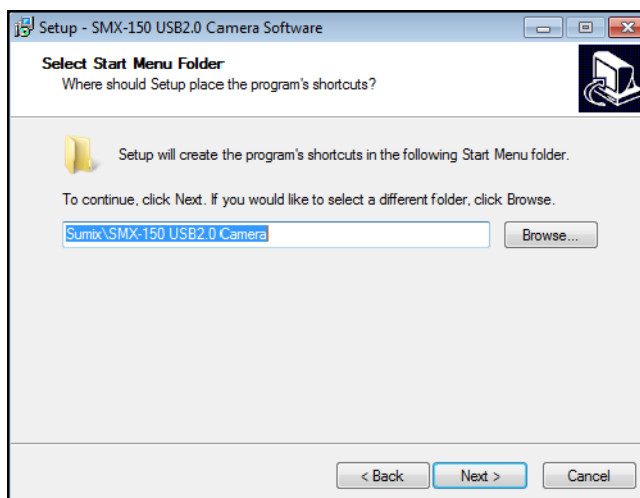
**Figure 2-4** Recommended system configuration

- 6 In the **Select Destination Location** box, click **Browse** to change the folder in which the SMX-150M camera software will be installed, or leave the one suggested by the wizard. Click **Next**.



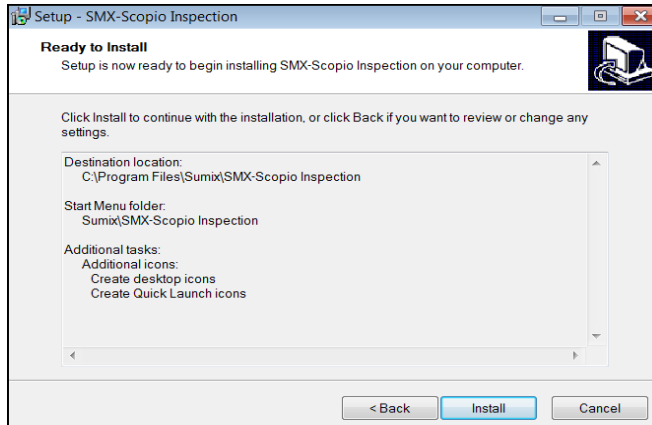
**Figure 2-5** *Select Destination location box*

- 7 In the same way, in the **Select Start Menu Folder** box, leave the suggested location or specify the folder you wish. Click **Next**.



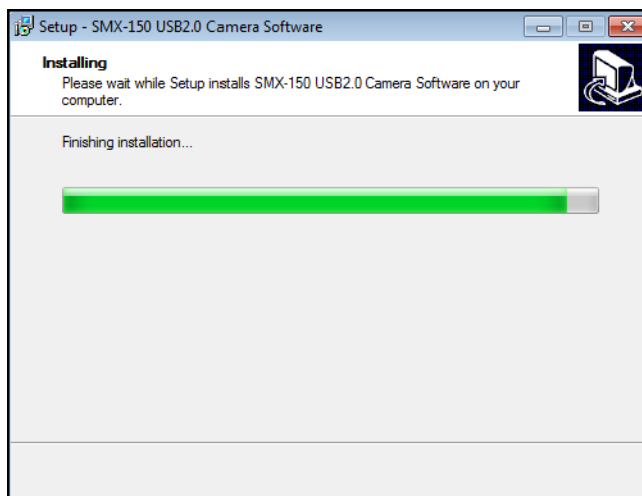
**Figure 2-6** *Select Start Menu Folder box*

- 8 In the **Ready to Install** step, view the options you selected and click **Install**.



**Figure 2-7** Ready to Install box

9 The wizard will start to install the application on your computer.



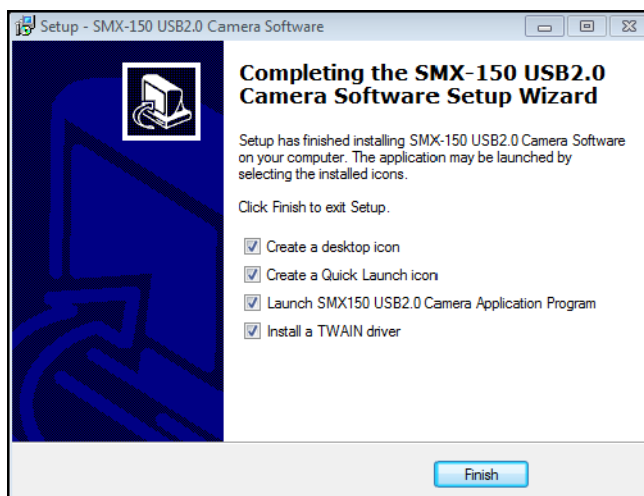
**Figure 2-8** Installing box

During the installation, the system will ask you whether you want to install the device software. Press **Install** to proceed.



**Figure 2-9** Windows Security box

- 10** On the last step, check the boxes for creating desktop and/or Quick Launch icons. If you want to install the TWAIN driver, check the box for it (see [“WIA” on page 69](#)). If you want to launch the camera application program right after finishing the installation, check the box for it.



**Figure 2-10** The last installation step

**Note:** TWAIN driver can be also installed separately, using the `\Sumix\SMX150 USB2.0 Camera\Drivers\TWAIN` folder. Browse to the Sumix folder that appears after the **SMX-150 USB2.0 Camera Software Setup Wizard** installation and run the TWAIN driver setup (see [“Installation” on page 69](#)).

- 11** When done, click **Finish**. The software has been successfully installed.

**Note:** If you face problems during the camera installation, see [“Troubleshooter” on page 18](#).

The installation of the camera driver will be completed when you first connect the camera to the computer’s USB port.

## Update

The camera application software is constantly developed and improved. When a new version is available, the customers are notified and a new installer file is sent to them.

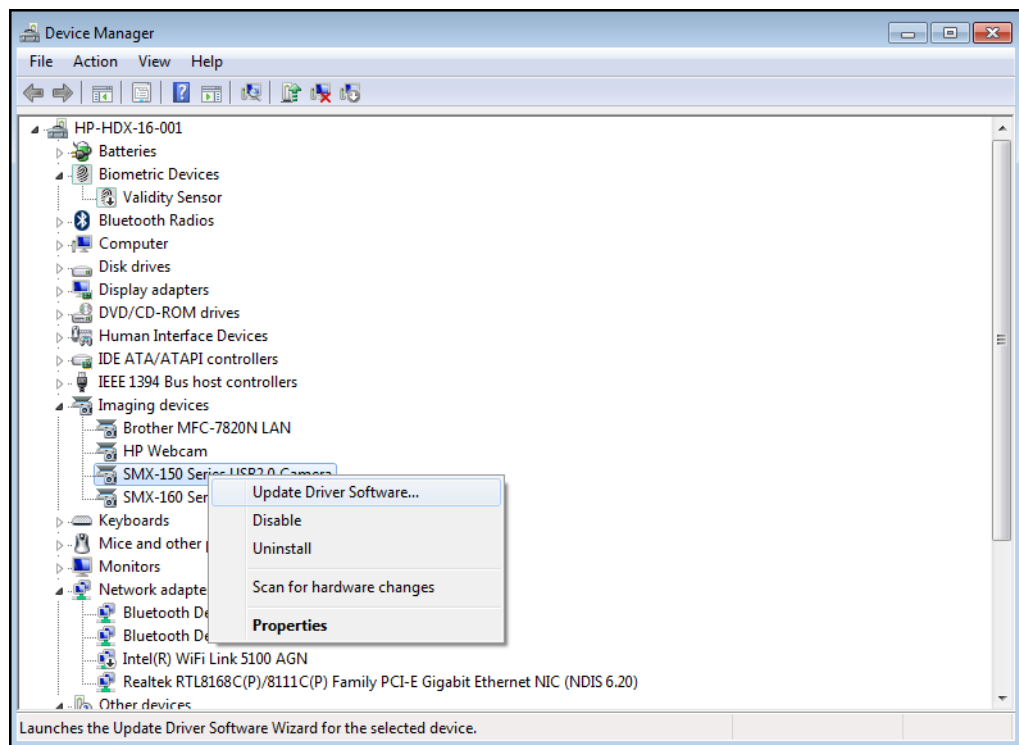
The update procedure is exactly the same as the installation described in the previous section. Simply run the new installer **SMX150<version>.exe** and follow the wizard (see [“Installation” on page 9](#)).

### Driver Update

When a new camera driver version is available, you can update it via the Windows device manager.

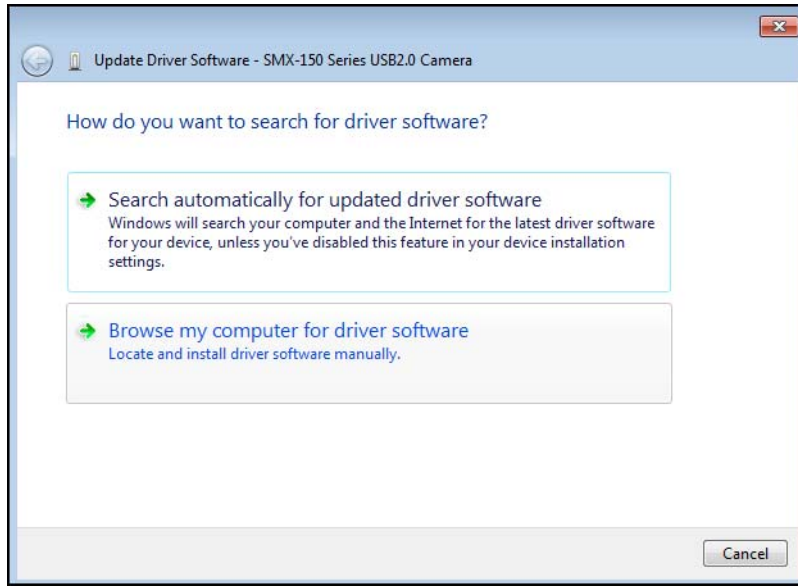
#### To update the camera driver:

- 1 Connect the camera to the computer.
- 2 Open the **Device Manager** window in the **Control panel** window.
- 3 Double-click **Imaging devices**.
- 4 Right-click **SMX-150 Series USB2.0 Camera** and select **Update Driver Software...**



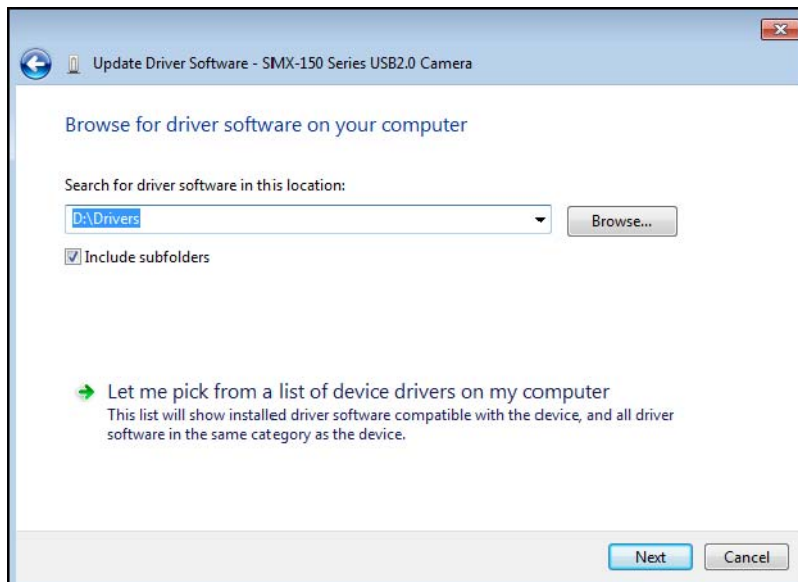
**Figure 2-11** Updating the camera driver

- 5 Follow the easy-on-screen instructions. On the first step, select **Browse my computer for driver software**.



**Figure 2-12** Updating the camera driver: step 1

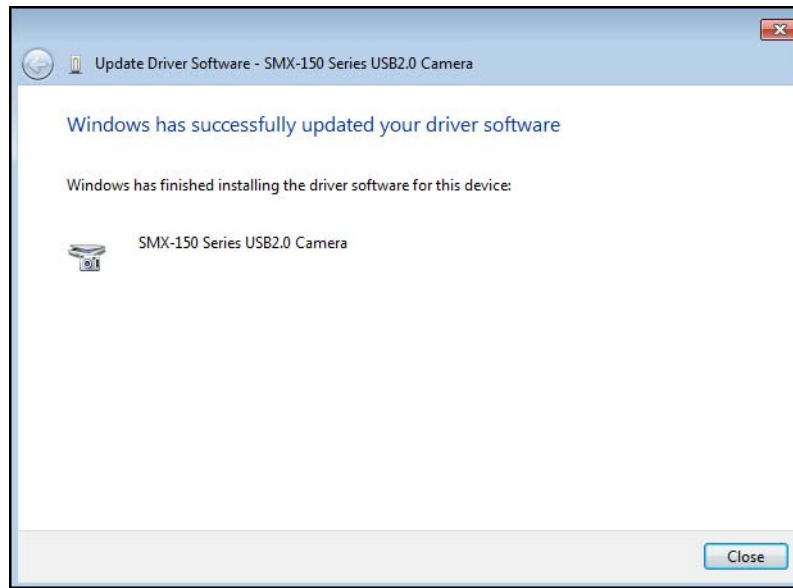
- 6 On the next step, browse for the location on your computer where the driver is saved and click **Next**.



**Figure 2-13** Updating the camera driver: step 2

- 7 The system will start installing the driver. In the end, a message that the installation is successful will appear:





**Figure 2-14** Updating the camera driver: step 3

- 8 Press **Close** to finish.

## Removal

To remove the camera application software, use the **Add/Remove Programs** section in the **Windows Control Panel**. Remove the application according to the general Windows application uninstallation rules.

Alternatively, you can click the uninstallation shortcut in the application folder (**Start > All Programs > Sumix > SMX-150 USB2.0 Camera > Uninstall SMX150 USB2.0 Camera Software**) and follow the uninstallation wizard.

After removing the software, you need also to remove the camera driver.

### To remove the camera driver:

- 1 Connect the camera to the computer.
- 2 Open the **Device Manager** window in the **Control panel** window.
- 3 Double-click **Imaging devices**.
- 4 Right-click **SMX-150 Series USB2.0 Camera** and select **Uninstall**.
- 5 Confirm removing the driver: check the **Delete the driver software for this device** and click **OK**.



**Figure 2-15** Driver removal confirmation


- 6 After the driver is uninstalled, the **SMX-150 Series USB2.0 Camera** will disappear from the **Imaging Devices** section of the **Device Manager**.

## Troubleshooter

If you face problems with installation and detection of the camera, use this Troubleshooter. If you face problems that are not described below, contact Sumix Technical Department.

*Note:* Tasks and problems in this section are demonstrated in Windows XP operating system.

### Camera Was Not Detected or Recognized

If after connecting the camera to your computer the system does not detect it: there is no icon  on the Taskbar or the camera was not recognized by the system:



Try doing the following:

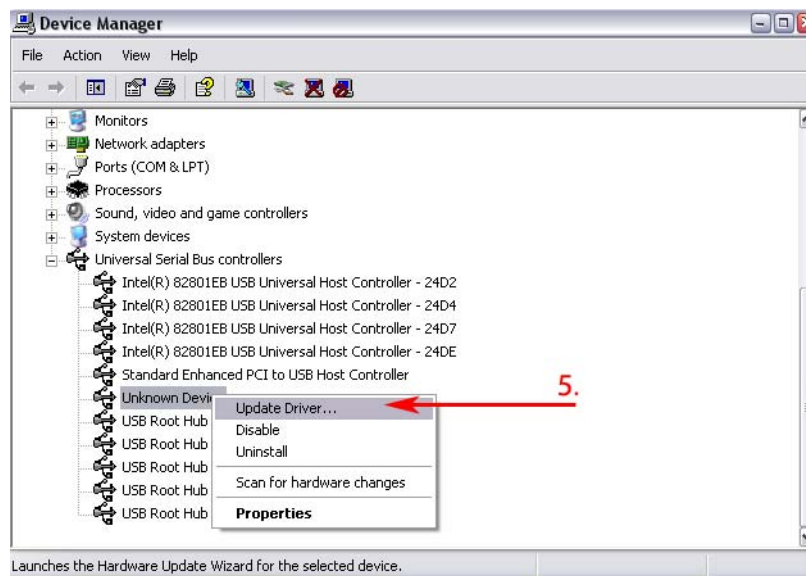
- Check if the device was installed successfully: open system folder `WINDOWS\system32\drivers` and check if there is the `SMX150A.sys` file (normally it is located on the C: hard disk). If not, run the Driver installation again. Be sure that no camera is connected during installation.
- If the problem still persists, manually save the `SMX150A.sys` file to the `\WINDOWS\system32\drivers` folder (the `SMX150A.sys` file is located in the `\Sumix\SMX150 USB2.0 Camera\Drivers` folder).

If the problem still persists, try one of the following:

- Reconnect the camera.
- Use other USB2.0 port of your computer - the problem might be due to the USB2.0 port malfunction.
- Use another USB2.0 cable - the problem might be due to the USB2.0 cable malfunction.
- Connect other SMX-150 camera (if any) to the same USB2.0 port - the problem might be due to the camera malfunction.
- Disconnect the camera and restart your computer.

If any of the above steps did not help and the device is not recognized yet, try the following:

- 1 Connect the problematical camera to the computer.
- 2 Open the **Device Manager** window (right-click **My Computer** desktop icon, select **Properties**, select **Hardware** tab, and then click **Device Manager**).
- 3 In **Device Manager**, double-click **Universal Serial Bus** controllers.
- 4 Right-click **Unknown Device**.
- 5 In the shortcut menu select **Update Driver...**



**Figure 2-16** Device Manager: the SMX-160 camera is detected as Unknown device

- 6 Run the **Hardware Update Wizard** the same way as the **Found New Hardware Wizard** by choosing the **Install the software automatically (Recommended)** option:

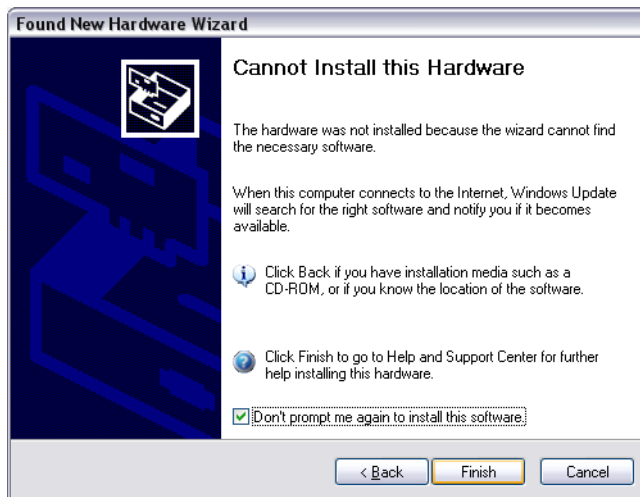


**Figure 2-17** *Hardware Update Wizard: the Welcome window*

If some problems occur during the manual hardware installation, read the next section of this Troubleshooter.

### Cannot Install the Hardware

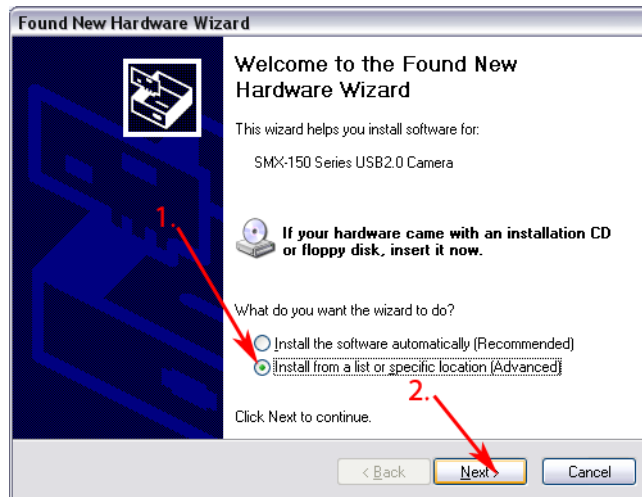
If the **Found New Hardware Wizard\Hardware Update Wizard** failed to install the hardware (the wizard that starts after the first connection of the camera or the **Wizard** that starts for updating the hardware; failure occurs after you browse to the files needed for the installing),



**Figure 2-18** *Found New Hardware Wizard: Cannot install this Hardware*

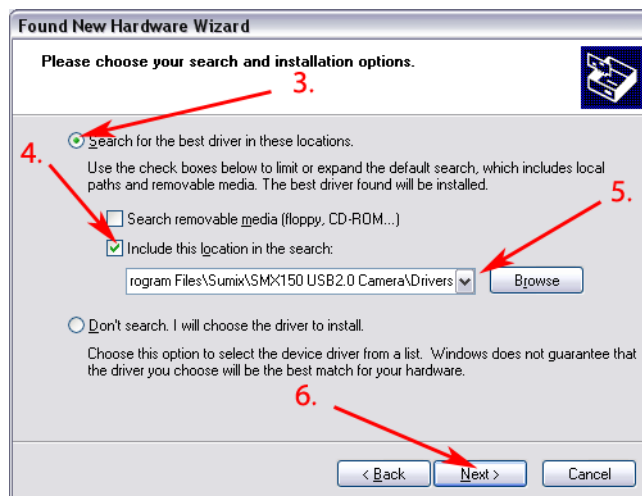
try doing the following:

- 1 Click **Back** in the **Found New Hardware Wizard** and select **Install from a list or specific location (Advanced)**.
- 2 Click **Next**.



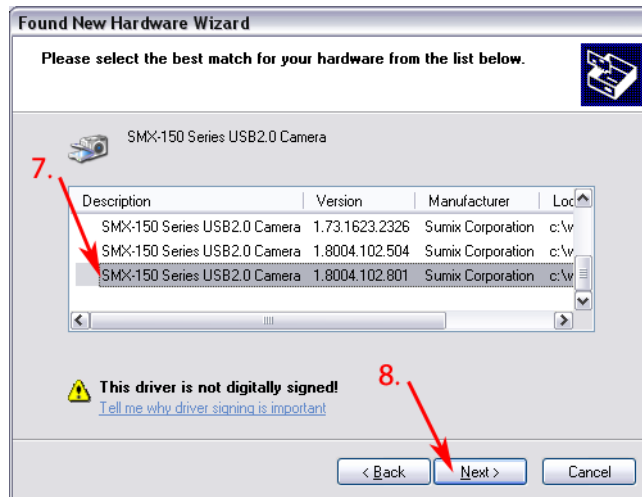
**Figure 2-19** Found New Hardware Wizard: Installing from a list or specific location (Advanced)

- 3** Select **Search for the best driver in these locations.**
- 4** Check the **Include this location in the search box.**
- 5** Browse to the Drivers folder - on the SMX-150 Camera CD or in the **Sumix\SMX150 USB2.0 Camera** folder (located on the hard disk where you installed the SMX-150 Camera Software, normally it is the **C:\Program Files\Sumix\SMX150 USB2.0 Camera**).
- 6** Click **Next.**



**Figure 2-20** Installing from a list or specific location (Advanced): specifying location

- 7** In the list, select the last item.
- 8** Click **Next.**



**Figure 2-21** *Install from a list or specific location (Advanced): selecting file among the Wizard's search results*

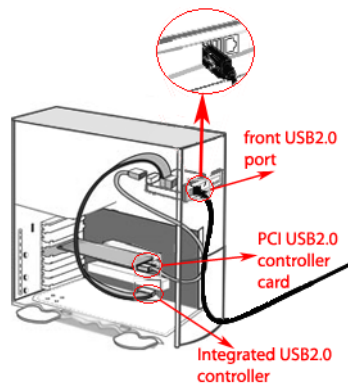
- 9 Wait till the wizard installs all files.
- 10 Click **Finish** if installation passed successfully.

## Chapter 3

# GETTING STARTED

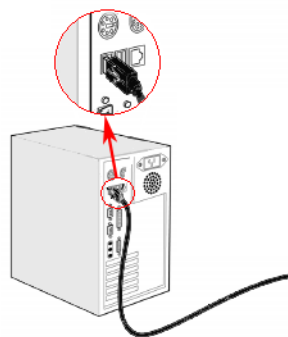
### Recommendations on the Camera Connection

Most computers have both front and back USB2.0 ports location. We do not recommend using the front USB2.0 port of your computer since it is not directly connected to the computer's USB Host Controller.



As shown on the picture above, the front USB2.0 port is connected to the USB Host Controller by long cables inside computer, meanwhile back USB2.0 port is connected directly to its controller at the back panel of computer.

So, when connecting the camera to the front USB2.0 port the device might not work properly. We recommend to use the back USB2.0 port to avoid problems with the camera work (see the picture below).

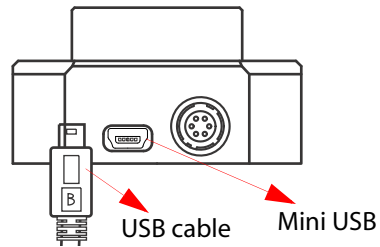


*Note:* Design and configuration of the front USB2.0 port location shown on the pictures above might differ from yours. The pictures' goal is only to show how the front USB2.0 port is connected to its controller

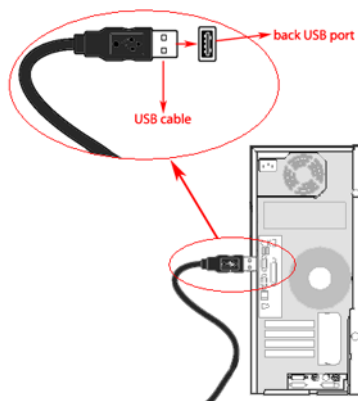
## Plugging in the Camera

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Connect SMX-150M camera with USB2.0 cable.



Connect the other end of the USB cable to the back USB2.0 port of your computer.



## Installing Lens

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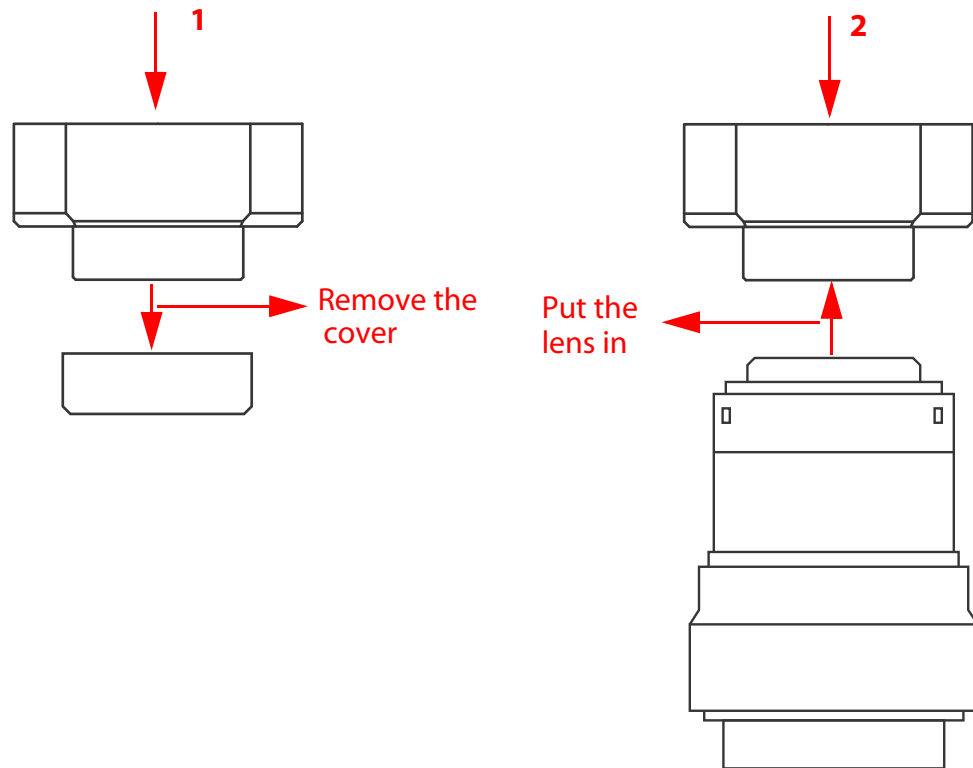
To use a lens with the camera, remove the cover from the camera and install a lens as described below.

It is recommended to remove the cover and install a lens (as well as remove a lens and put on the cover) when the camera is faced down, to prevent the sensor contamination.

### To install a lens:

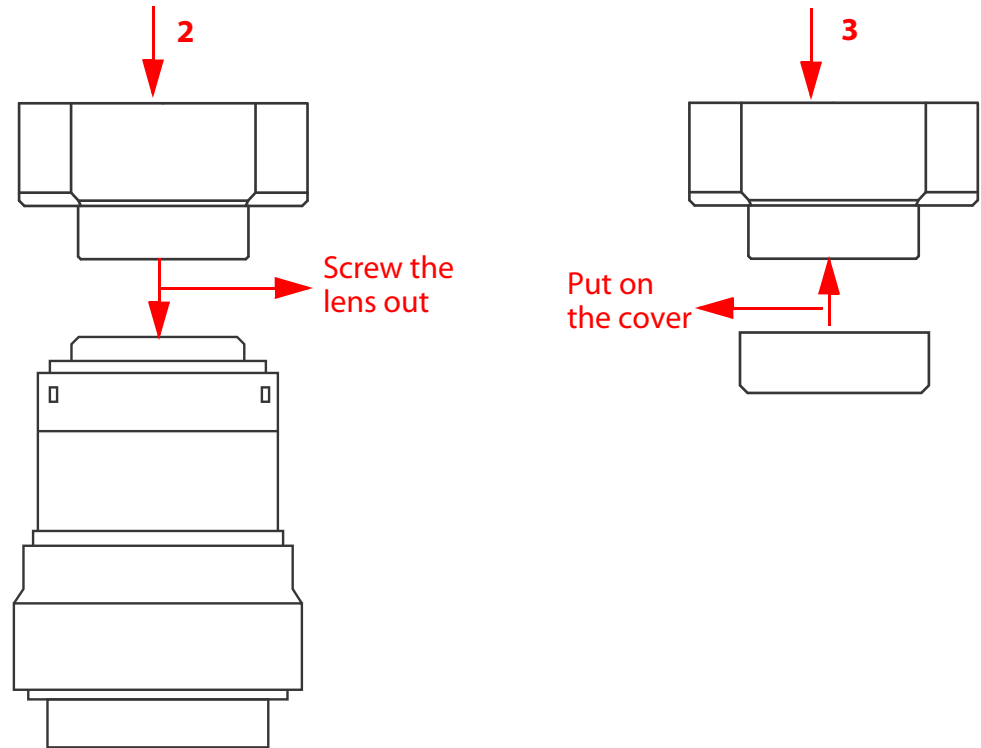
- 1 Face the camera down.
- 2 Remove the camera cover.
- 3 Screw the lens in (see the picture below):





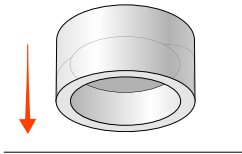
### To remove the lens

- 1 Face the camera down.
- 2 Screw the lens out.
- 3 Put on the cover (see the picture below):



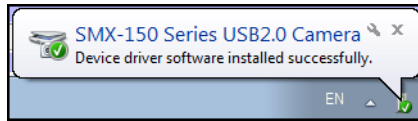
*Note:* Before screwing the lens in or putting on the cover, make sure that the surfaces are free from dust

When you remove the cover, put it facing down to keep dust out



## Installing Driver Software

After you connect the camera to the USB port of your computer, a **Found New Hardware** message will appear in the notification area of the task bar, and Windows will install the hardware driver. When the installation is finished, a message will appear in the notification area:



**Figure 3-1** Notification about successful camera installation

*Note* If you experience problems during the driver software installation, refer to the *Installation Troubleshooter* and learn how to fix such problems (see [“Troubleshooter” on page 18](#)).

## Starting the Application

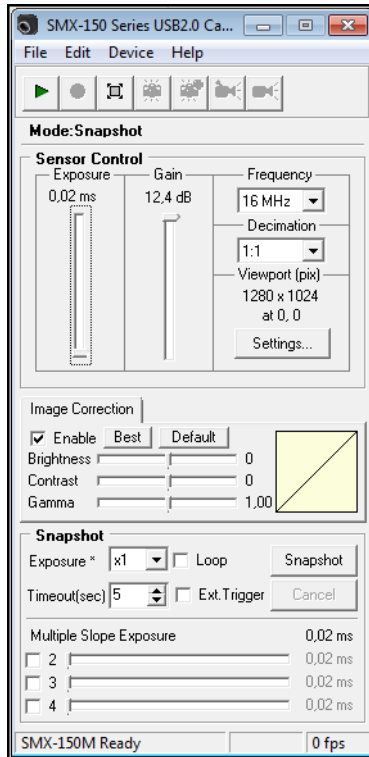
After the camera hardware has been installed, you can start the application.

### To start the camera application:

Click **Start > All Programs > Sumix > SMX-150 USB2.0 Camera > SMX150 USB2.0 Camera Application Program**. If during the installation you chose to install a desktop icon and/or a quick launch icon, you can also click the icon to launch the application. The SMX-150M application will start with its main window.

The SMX-150M application consists of the following parts:

- Main window which contains the main functions. On the top of the main window, there is an application toolbar:

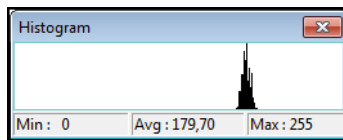


**Figure 3-2** SMX-150M application main window

- **Histogram** which reflects all color settings of the camera.

**To open the histogram:**

Press the **h** button on the keyboard or select **Histogram** from the **Device** menu.



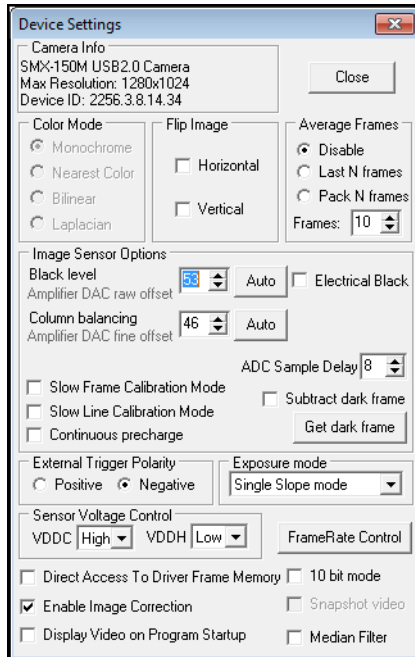
**Figure 3-3** Camera histogram

*Note:* The histogram window is empty when the video is not started.

- **Device Settings** window contains the camera settings.

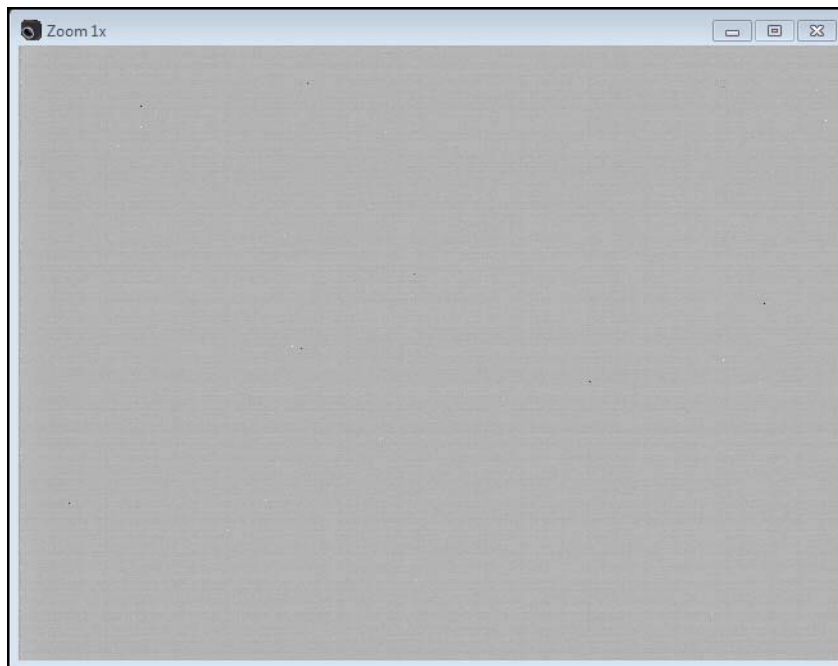
**To open the Device Settings window:**

Select **Settings** from the **Device** menu or press **Alt+s** on the keyboard.



**Figure 3-4** *Device Settings window*

- **Video mode** window which shows a live view from the camera and reflects all settings of the image



**Figure 3-5** *Video mode window*

### To start video from the camera:

Click the **Start Video** button in the toolbar:



### OR

Select **Start Video** from the **Device** menu.

*Note:* To display video right after you enter the application, select the **Display Video on Program Startup** check box in the **Device Settings** window. Then you will not need to click the **Start Video** button.

If the **Start Video** button is not active, in the **SMX150 USB2.0 Camera Software** main window, click **Device** menu, select **Switch Multiple...** and select the connected camera.

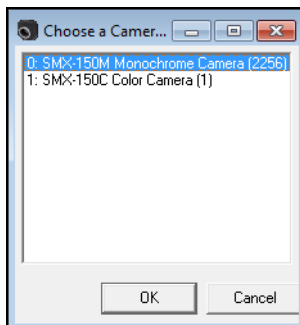
## Switching Between Cameras

---

If you have more than one SMX-150 camera connected to your PC, the camera application allows you to switch between them.

### To switch between multiple cameras:

- 1 In the **Device** menu of the application's main window, select the **Switch Multiple** command.
- 2 The **Choose a Camera** window will appear.



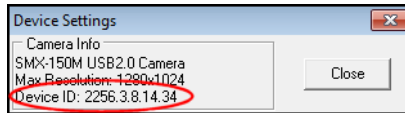
**Figure 3-6** Switching between cameras

- 3 In the list of the present cameras, select the desired one and click **OK**.

## Viewing Camera ID

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The camera ID is shown on the top of the **Device Settings** window.



**Figure 3-7** Camera ID

## Reducing CPU Load

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You can reduce CPU load by enabling the **Direct Access to Driver Frame Memory** option at the bottom of **Device Settings** window. See API documentation for the details on how to provide direct pointer to the driver frame memory instead of copying the frame to the user buffer.





## Chapter 4

## TUNING GUIDELINES

## Tuning Black Level and Column Balancing


Before you start working with SMX-150M camera, it is necessary to perform some initial tuning of the image. You need to tune the **Black Level** and **Column Balancing** parameters because quality of the image directly depends on them. For this purpose, the camera can be used without a lens.

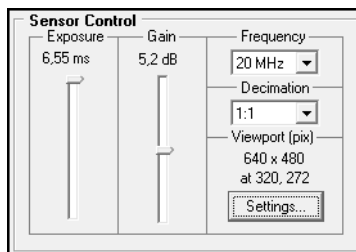
- **Black Level (Amplifier DAC raw offset)** - specifies a black level offset for the camera.
- **Column Balancing (Amplifier DAC fine offset)** - levels even columns to compensate their non-uniformity with odd columns

*Note* The Black Level and Column Balancing options are available for the Video mode only.

*Note* Adjusting of Black Level and Column Balancing depends on lighting conditions. The less light the camera receives, the more exact the values are. You may receive wrong values when the camera receives more light; recommended settings for adjustments: maximal exposure, gain about 5 dB, minimum light for the camera.

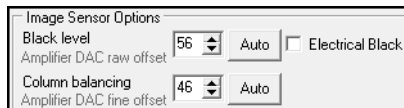
## To adjust Black level and Column balancing:

- 1 Start video by pressing the **Start Video**  button in the toolbar.
- 2 Open the **Device Settings** window by pressing **Alt+s** on the keyboard.
- 3 Go to the **Sensor Control** section of the main window and set:
  - a. frequency to 20MHz
  - b. exposure to its maximal value
  - c. gain to its middle value



**Figure 4-1** Setting sensor controls

- 4 Put the camera to a dark place (cover by hand or put into a dark box).
- 5 In the **Image Sensor Options** of the **Device Settings** window, click the **Auto** button near the **Black level** field to adjust the level of black for the camera.



**Figure 4-2** Adjusting Black level and Column balancing

Check the **Electrical Black** box if you want the sensor to output its electrical black level. Use this check box to get the hardware-generated electrical black image for calibrating the black level offset. The option is useful for various sensor parameters calibration. It does not depend on lighting conditions and provides stable and reliable way to tune these parameters.

**6** After the auto search of black level is finished, click the **Auto** button near the **Column balancing** field to balance the columns.

*Note:* During Black level and Column balancing adjustment do not expose the camera to extra light as this may cause an interruption. Leave the camera untouched until these processes are completed.

*Note:* You need to adjust the Black level and Column balancing each time you start using the camera and/or change the Frequency and Viewport parameters.

## Manual Tuning of ADC Sample Delay

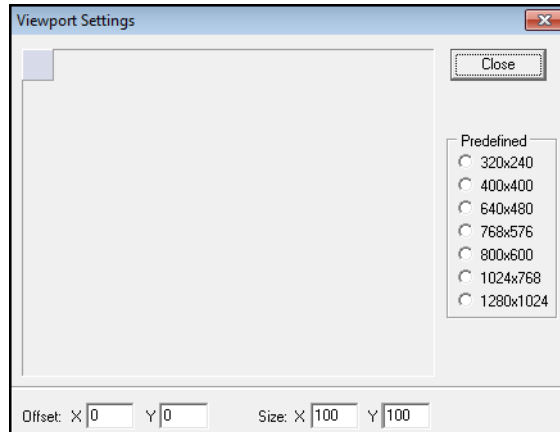
**ADC Sample Delay** is a phase shift between the ADC clock and the system clock. Usually, this parameters is set correctly but in some rare cases if you notice significant distortions in the image, you need to tune it manually.

ADC Sample Delay can be set to a value from **0** to **15**. For each camera, it is possible to choose the value that will help to make the image from the camera clearer by reducing its noise.

*Note* The ADC Sample Delay value may vary for different frequencies.

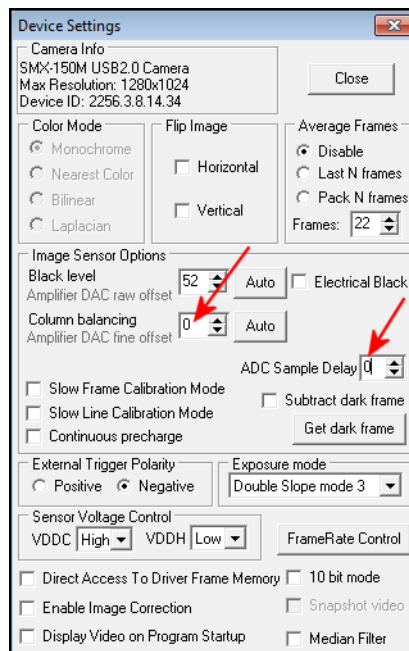
The initial settings for tuning the ADC Sample Delay for the camera are as follows:

- 1** Frequency is set to 20MHz.
- 2** Video is started.
- 3** Viewport size is set to 100x100 with Offset X and Y set to 0.



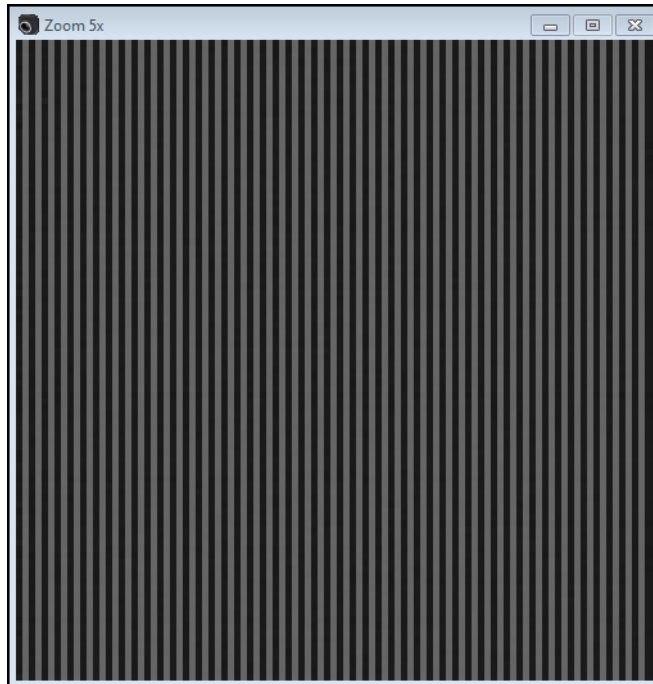
**Figure 4-3** Setting viewport

- 4 Increase zoom by pressing 'Numpad +' on your keyboard
- 5 Open the **Device Settings** window and enter 0 in the **Column balancing** and **ADC Sample Delay** fields:



**Figure 4-4** Setting Column balancing and ADC Sample Delay to 0

- 6 As a result, in the **Video mode** window you will see dark and light columns as shown on the picture below.



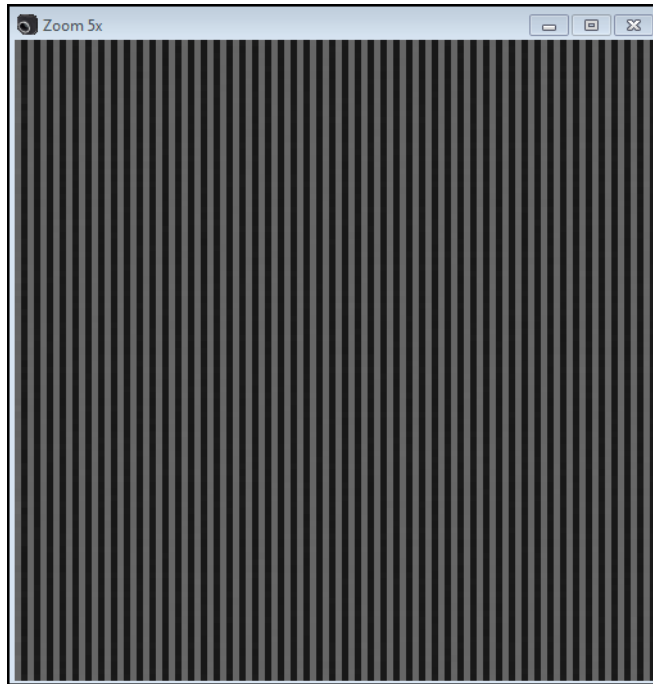
**Figure 4-5** Video mode window

- 7 To adjust the ADC value, use the spin buttons of the **ADC Sample Delay** field in the **Device Settings** window.



**Figure 4-6** ADC Sample Delay field

- 8 Increase the ADC value until the columns shift. As a rule, the shift will occur when the ADC value is 7 (+ 1-2).



**Figure 4-7** Video mode window with shifted columns

- 9 The value, which results in the shift, will be the desired **ADC Sample Delay** value for your camera.

Once the ADC value is set, the Black level and Column balancing should be adjusted.

*Note:* With the manually adjusted ADC value, the Snapshot Loop view might not be reflected completely with the defined frequencies. If Snapshot Loop view is not satisfactory, simply increase or decrease ADC value by 1-2.

You can set ADC Sample Delay only for the current camera application session. When the application is reset, the parameter returns its default value.

## Tuning Light in the Image

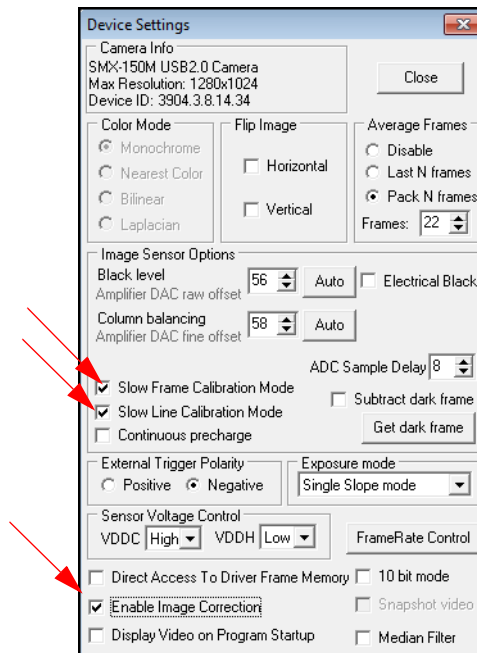
To tune illumination, install a lens (see [“Installing Lens”](#) on page 24).

Illumination of image from the camera depends on the **Frequency**, **Exposure**, **Gain**, image **Viewport** (resolution), and **Decimation** values, which you can control using the main application's window, and on the lighting conditions of your environment.

### Recommended initial settings:

- Black level, Column balancing, ADC Sample Delay and Sensor Voltage Control are tuned
- Gain and Exposure sliders are in low position

- Decimation is 1:1
- Viewport size is 800x600
- **Slow Frame Calibration Mode** and **Slow Line Calibration Mode** boxes are checked (Device Settings window)

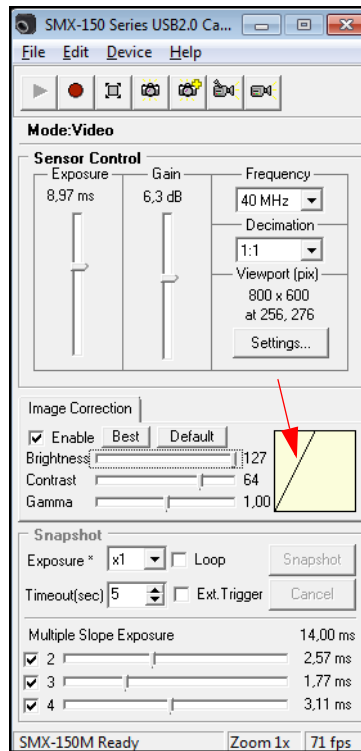


**Figure 4-8** Initial settings for tuning light

- Histogram is active
- Image correction is enabled

#### To tune light in the image:

- 1 For light tuning in the image, use maximum diaphragm aperture of your lens. Try to get enough light using the **Exposure** slider. If the slider is at maximum but the image is not bright enough, decrease frequency (it enlarges the exposure interval) and/or increase gain.
- 2 The **Image Correction** tab can also be used. Double-click its graphic area, **Brightness**, **Contrast** and **Gamma** will take the values that are assumed as the maximal recommended; this will also increase the illumination of the image.



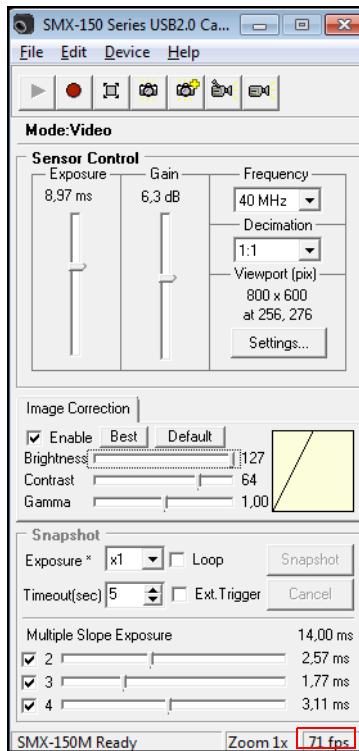
**Figure 4-9** Using image correction

- 3 Use **Exposure mode** to increase the sensitivity of the camera's sensor to the light: in the **Device Settings** window, change the **Exposure mode** using the drop-down menu (see ["Exposure Mode" on page 47](#)).
- 4 The **Sensor Voltage Control** can also be used. For Video mode try different combinations, except when **VDDC = High** and **VDDH = High**.

## Increasing Camera Speed

The speed work of the camera depends on the camera's frequency, viewport and decimation, and on your computer and its system configuration.

The speed of the camera is measured in fps (frames per second). This value shows the number of frames (images) produced by the camera per second. In the SMX-150M camera software its option is called frame fate. The frame rate is displayed at the bottom right corner of the main application window.



**Figure 4-10** Viewing frame rate at the bottom of main application

High camera speed (frame rate) is especially important when you shoot moving objects.

### To increase the camera speed:

You can try the following:

- Decrease viewport size (the smaller viewport, the higher frame rate is)
- Set 1:2 decimation (the lower decimation, the higher frame rate is)
- Increase the camera's frequency (the higher frequency, the higher frame rate is).

## Reading Histogram

Most of the image distortions are reflected in the histogram.

### To load camera histogram:

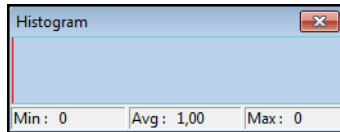
Press **h** on the keyboard.

**OR**

Select **Histogram** in the **Device** menu.

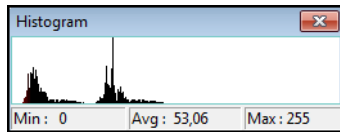
- When the Black level is distorted the histogram looks like this:





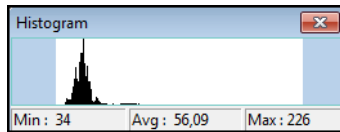
The histogram is close to the left or right sides.

- When the Column balancing is distorted the histogram looks like this:



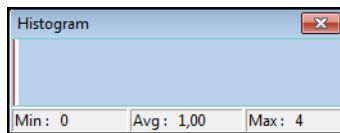
The histogram is divided into two parts.

- When level of the black is tuned, columns are balanced, the histogram looks like this:



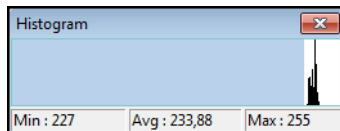
The histogram is close to the middle of the window or in its middle.

- When illumination for camera is poor or Black level is close to 0, the Histogram looks like this:



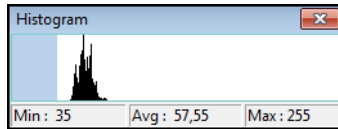
The histogram is close to the left side of the window or over its left side.

- When illumination is too bright or the Black level is close to 127 (maximal value), the histogram looks like this:

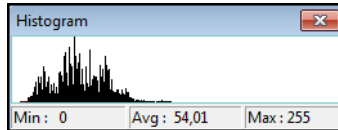


The histogram is close to or over the right side of the window.

- When the dynamic range is poor, the histogram is thin. Increasing of the dynamic range may be done by clicking the **Best** button on the **Image Correction** tab in the main application's window.



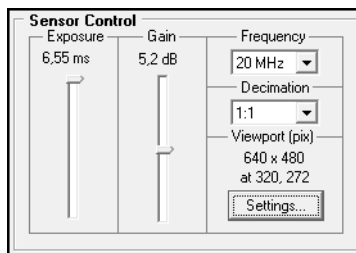
The image above shows the histogram before the **Best** button is pressed.



The image above shows the same histogram after the **Best** button is pressed.

## Sensor Controls

The sensor control options are located in the **Sensor Control** section of the application main window. They are as follows.



**Figure 4-11** Sensor controls

### Exposure

The exposure parameter defines time during which the sensor will consume light energy before starting to record data.

Use the **Exposure** slider to adjust the camera exposure time manually. The current exposure time in milliseconds is displayed above the control. This value depends on viewport height, decimation and sensor frequency.

#### To tune exposure automatically:

In the **Device** menu select the **Auto Exposure** command, or press **E** on the keyboard.

### Gain

Use the **Gain** slider to change the signal gain of the sensor. Increasing the gain is reasonable in case when the light condition is poor and increasing the exposure time does not help.

*Note:* Increasing the Gain parameter adds noise to the video from the camera

## Frequency

The **Frequency** drop-down box provides values for the pixel clock frequency of the sensor. The lower the frequency, the higher the maximum possible exposure time and the less the frame rate is. This control defines the frequency of polling the camera for its image stream.

## Decimation

Use the **Decimation** drop-down box to decimate (sub-sample) the picture by 2. The decimation means excluding pixels and rows from the scan process (every second pixel and second row for the 1:2 decimation). This mode thus allows viewing the picture at the higher frame rate.

The higher decimation can be used for preview, when the full 1280 x 1024 image is displayed as 640 x 512 with the frame rate two times higher.

## Viewport

Viewport is a rectangular area of the sensor on which the image is scanned. It can have variable size: from the full sensor field of view to the small area of 8 x 8 pixels. The smaller vertical size (in lines) of the viewport, the faster the scan process and the higher the frame rate is.

### To change the viewport:

1 Press **Alt+v** on the keyboard

**OR**

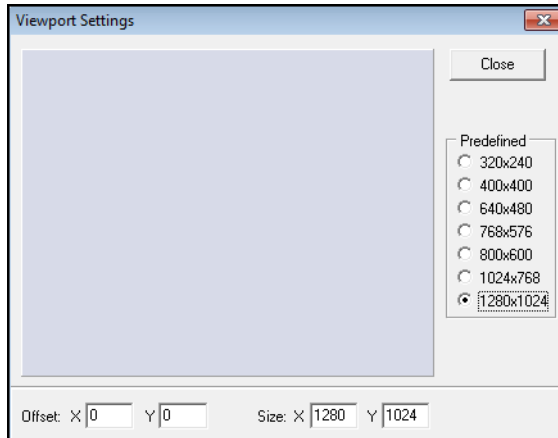
Click the **Settings...** button below **Viewport (pix)**

**OR**

Click the **Viewport Settings** button on the toolbar:

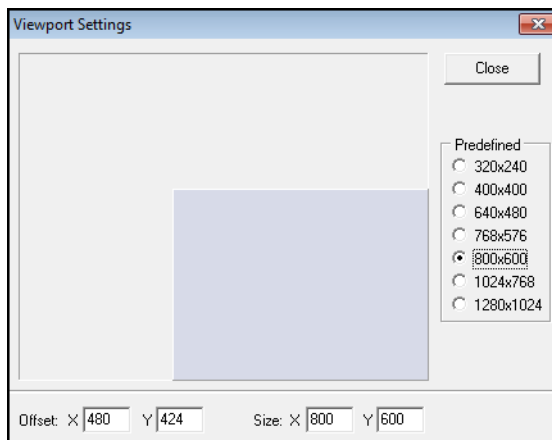


2 The **Viewport Settings** window will open.



**Figure 4-12** Viewport Settings window

- 3 You can select one of the predefined viewport options and then drag the rectangle across the full viewport resolution area for the viewport window. You will notice how the image in the **View Mode** window changes with the movement.



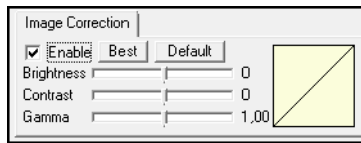
**Figure 4-13** Changing the viewport

- 4 Alternatively, you can change values in the following fields:
  - **Offset X, Y** fields with coordinates of the top left corner of the rectangle
  - **Size X, Y** fields with coordinates of the bottom right corner of the rectangle

If the viewport size is smaller than 1200x1024, you can also change it by dragging the video image in the **Video mode** window.

## Image Correction

The **Image Correction** controls are designed for setting up the camera brightness, contrast and gamma. These corrections are programmable with the conversion (lookup) table of the values. They do not affect any electrical settings of the camera.



**Figure 4-14** Image correction controls

To use these controls, check the **Enable** box - the **Brightness**, **Contrast** and **Gamma** sliders become editable. By default, the values of **Brightness**, **Contrast** and **Gamma** are set to **0; 0; 1, 00**, respectively.

You can restore the default values at any step, just click the **Default** button on the **Image Correction** tab.

Click the **Best** button to automatically achieve the optimal combination of brightness, contrast and gamma instead of setting them manually. As the result, the application will transform the look-up table of 8 and 10 bit to increase the dynamic range.

*Note:* The SMX-150 camera software does not display changes of the Image Correction look-up table when the **Best** button is pressed.

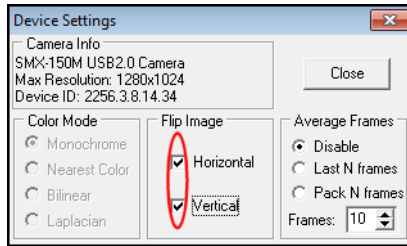
With every change of any **Image Correction** control, you can view a graphical interpretation of dependence of the image's changes from the changes of the **Image Correction** controls.

## Advanced Sensor Controls

Apart of the controls in the main application window, you can also use controls available in the **Device Settings** window. To access the **Device Settings** window, press **Alt+s** on the keyboard or select **Settings** from the **Device** menu.

### Image Flip

You can flip the image in the **Video** mode window horizontally and vertically. Check the corresponding boxes in the **Flip Image** section of the **Device Settings** window.



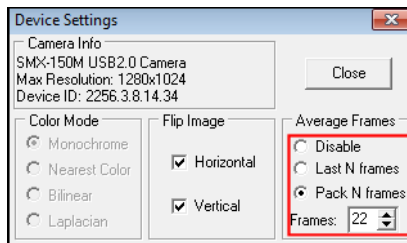
**Figure 4-15** Flipping image

Using the flip controls, you can rotate the image without changing the camera position itself.

*Note:* Flipping the image horizontally and/or vertically can cause distortions - horizontal lines can periodically appear on the image.

## Increasing Image Quality

You can increase the image quality by compensating the random noise of the sensor. For this purpose, use the **Average Frames** controls in the **Device Settings** window.



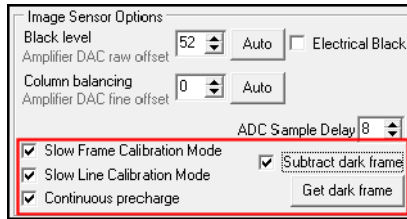
**Figure 4-16** Averaging frames

There are two averaging modes:

- **Last N frames:** the currently displayed frame is the average of the last N frames set in the **Frames** box. The picture is updating every frame
- **Pack N Frames:** the currently displayed frame is the average of the last N frames set in the **Frames** box. The picture is updating every N-th frame.

*Note:* Use the averaging only for static pictures. Displaying moving objects in the average mode will lead to the image blurring.

To increase the image quality, you can also try enabling the following controls in the **Image Sensor Options** section of the **Device Settings** window:

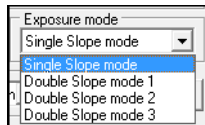


**Figure 4-17** Increasing image quality

- **Continuous precharge** - checking this box this disables reset of the image sensor making it to continuously accumulate light from frame to frame
- **Slow Frame Calibration Mode** and **Slow Line Calibration Mode** - check these boxes to reduce the image noise
- **Subtract Dark Frame** - this option is available for the Video mode to reduce the fixed pattern noise by subtracting the static dark frame from the picture. The dark frame is obtained by clicking the **Get Dark Frame** button and is stored in a temporary buffer.

## Exposure Mode

This option sets reset voltage for multiple slope operation when running the camera in Video mode. It is available for Video mode only. The level (mode) of the multiple slope pulse can be set in the **Device Settings** dialog by changing the **Exposure Modes** in the drop-down menu.



**Figure 4-18** Exposure mode section

Exposure modes are as follows:

- **Single Slope mode**
- **Double Slope Mode 1**
- **Double Slope Mode 2**
- **Double Slope Mode 3**

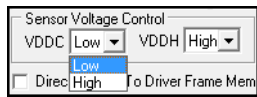
By default, **Single Slope Mode** is used.

## Sensor Voltage

The image sensor has several supply voltages that can be set as **High** or **Low**:

- **VDDH** is the voltage that controls the sample switches and should always be the highest voltage that is applied to the chip

- **VDDC** is the supply of the pixel core



**Figure 4-19** *Sensor voltage controls*

For the Video mode the most suitable values are: **VDDC = High, VDDH = Low**. Normally, there is no need to change the values for the Video mode.

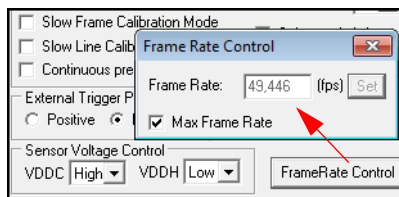
For the Snapshot mode they are: **VDDC = Low, VDDH = High**.

## Frame Rate

You can change the frame rate for the current sensor parameters (for example, frequency or viewport) using the **FrameRate Control** button in the lower part of the **Device Settings** window.

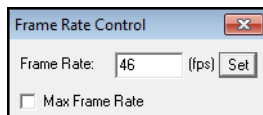
### To change frame rate:

- 1 Open the **Device Settings** window by pressing **Alt+s** on the keyboard.
- 2 Press the **FrameRate Control** button.



**Figure 4-20** *The Frame Rate Control window*

- 3 The **Frame Rate Control** box opens. By default, it shows the maximum value for the current sensor parameters (the **Max Frame Rate** box is checked).
- 4 Uncheck the **Max Frame Rate** box and type in the new value in the **Frame Rate** field, then press **Set**.



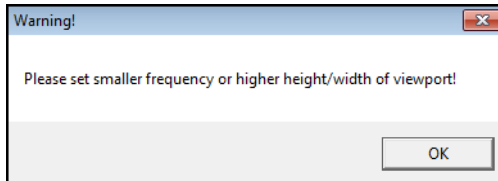
**Figure 4-21** *Decreasing frame rate*

As a result, the **Frame Rate** value will not be greater than the one you entered in the **Frame Rate Control** window. Check it when running video: frame rate value will be displayed at the bottom-right corner of the status bar in the application's main window.

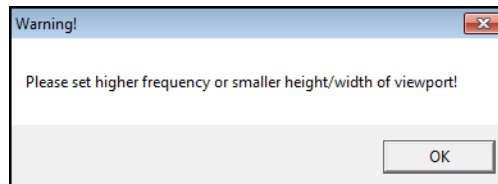


**Note** When running the camera on a system that does not meet the minimal requirements (see “[System Requirements](#)” on page 9), the frame rate value can be less than it is set with the **Frame Rate Control** option, especially when running with full viewport and with high frequencies.

When changing the frame rate value manually, a warning message can appear. Usually it will appear when the entered value is lower (see [Figure 4-22 Warning message: entered frame rate value is lower than allowed](#)) or higher (see [Figure 4-23 Warning message: entered frame rate value is higher than allowed](#)) than it is allowed. In this case, follow the instructions in the warning message



**Figure 4-22** Warning message: entered frame rate value is lower than allowed



**Figure 4-23** Warning message: entered frame rate value is higher than allowed

## Output Bits per Pixel

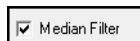
If the **10 bit mode** box is checked, it enables the software to transmit **10 bit** images from the camera as opposed to regular **8 bit**.



**Figure 4-24** 10 bit mode check box

## Filtering

The **Median Filter** option turns on pixel averaging. The brightness of every single pixel becomes affected by the brightness of its neighbor pixels and the whole image becomes smoother.



**Figure 4-25** Median Filter check box

## Saving and Loading Camera Profiles

The SMX-150M camera application automatically stores most of the camera settings on exit and restores them on startup.

You can also store current settings in profile files (\*.pro) and load them whenever you need. Profiles store frequency, gain, exposure, viewport, flip, black level and column balancing, and other settings.

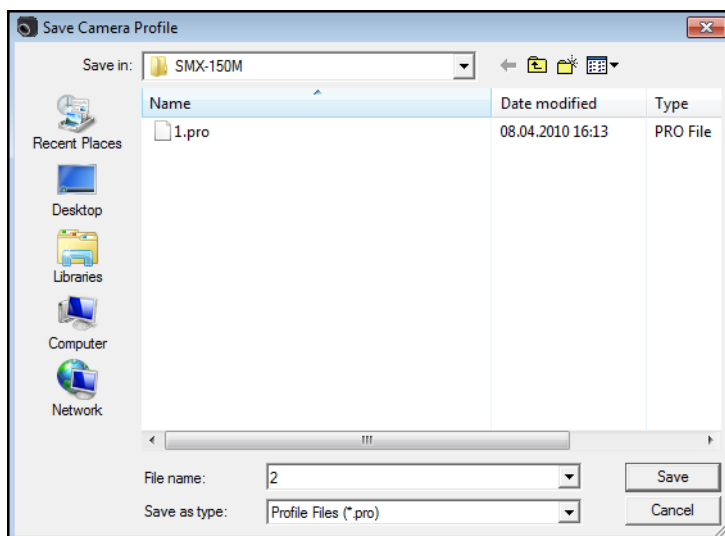
### To save current camera settings into a profile:

1 Press **Ctrl+s**.

**OR**

In the **File** menu select the **Save Profile** command.

2 **Save Camera Profile** box appears. Type in profile title and select a folder where you want to save the file.



**Figure 4-26** Saving camera profile

3 Press **Save**.

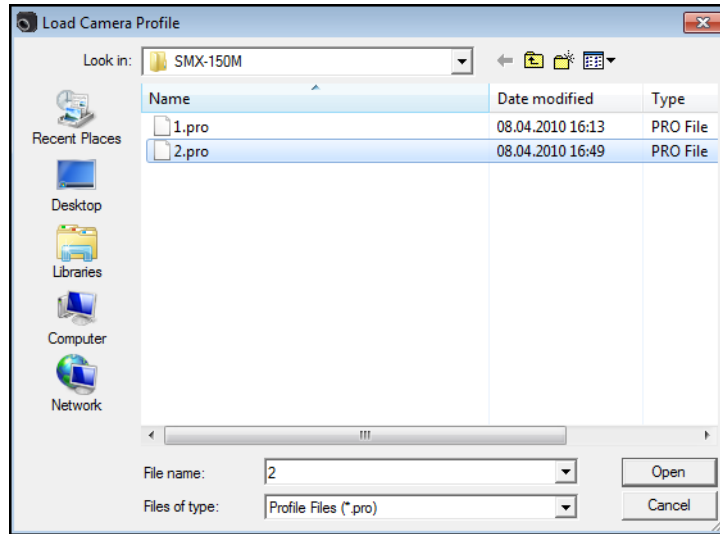
### To load a profile:

1 Press **Ctrl+o**.

**OR**

In the **File** menu select the **Open Profile** command.

2 **Load Camera Profile** box appears. Browse to a folder with profile files and select one you want to load.



**Figure 4-27** Loading camera profile

**3** Press **Open**.






## Chapter 5

# CAPTURING

The SMX-150M camera application enables you to capture images from the camera and to store them in BMP or TIFF format files. You can also save files with video that you record.

## Capturing Images

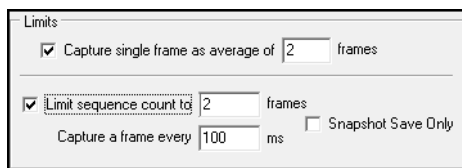
### To capture frames:

- 1 Start video (press **F5** or the button  **Start Video** in the toolbar).
- 2 You can capture a single frame or a frame sequence:
  - For a single frame press **F2** or the button  in the toolbar
  - For a sequence press **F3** or the button  in the toolbar.
- 3 The frame/frame sequence is captured immediately and saved in the folder specified in **Capture Options** (see [“Saving Options” on page 55](#)).

### Capture Limits

The **Limits** section in the **Capture Options** dialog box allows controlling the capture parameters. To open the dialog box, press **Alt+c** on the keyboard.

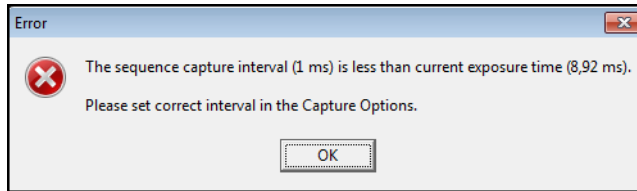
You can lower the noise level in the frame being captured using the **Capture single frame as average** of box. Check the box and type in the number of frame you want to average.



**Figure 5-1** Limits section of Capture Options

By default, two frames are captured in a sequence. You can increase this value:

- 1 Check the **Limit sequence count to** box.
- 2 Type in the new value in the field near the checkbox.
- 3 Change the time period for capturing frames in the **Capture a frame every** field. The sequence capture interval cannot be less than current frame exposure time. If it is less, an error message will be displayed when you try to perform a sequence capture:






**Figure 5-2** Message about incorrect sequence capture interval

- 4 Press **OK**.


## Recording Video

### To record a video:

- 1 Start video (press **F5** or the button  **Start Video** in the toolbar).
- 2 To start video recording, press **F4** or the button  in the toolbar.
- 3 Press **Shift+F5** to stop the video stream or click the  **Stop Video** button in the toolbar.
- 4 The video is recorded and saved in the folder specified in **Capture Options** (see [“Saving Options” on page 55](#)) as an **.avi** file.

## Saving Video/Frames to Memory

You can save video or frames to the core memory. This is done without a delay between frames. Do the following:

- Press the  **Save Video to Memory** button in the toolbar or press **Shift+F4** on the keyboard.
- Select **Save Frames to Memory** command from the **File** menu.

The number of single frames or frames in the video is set via the **Capture Options** box. Type in the required number in the **Capture Limit** field:



**Figure 5-3** Save Video to Memory section

When you use the Save to Memory option, frames will be saved as image files similarly to the simple saving (see [“Saving Options” on page 55](#)). Video will be saved as a **.smx** file which can be replayed and converted to the **.avi** file with the **SMXView** utility that goes with the standard SMX-150 software package.

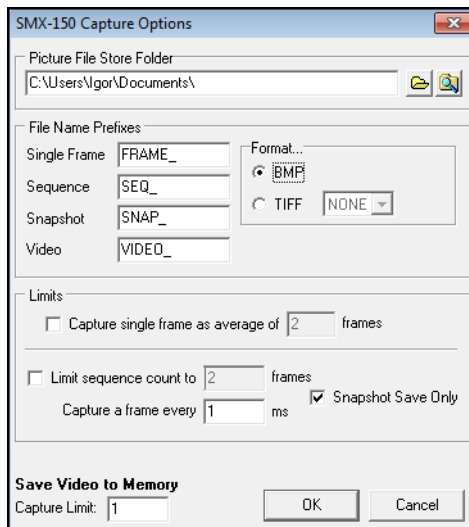
Saving video directly to memory can slow down the camera’s output visualization, but this method insures that no frames are missing in the saved file.

## Saving Options

When you capture frames or record a video, they are saved in directory and with file prefix specified in **Capture Options**.

### To change options for saving frames/video:

- 1 Open the **Capture Options** dialog by pressing **Alt+c** on the keyboard or go to the **File** menu and select **Capture Options**.



**Figure 5-4** Capture Options box

- 2 Set the options:

- a. In the **Picture File Store Folder** box, change the directory in which you want to save frames/video or leave the default C:\Users\

*Note:* This folder will also store snapshots (see “[Snapshots](#)” on page 57).

- b. Change the prefix that will be assigned to all frame/frame sequence and video files or leave the default ones. Use the **Single Frame**, **Sequence** and **Video** fields. The files are named automatically by combining the corresponding **File Name Prefix** and numerical value that is calculated by the number of last captured file + 1.
- c. Select image file format for frames:
  - **BMP** - saves any 8 bit or 10 bit image as 8 bit BMP image.
  - **TIFF** - saves 8 bit image as 8 bit TIFF image and 10 bit image as 10 bit TIFF image. Select also compression type: **NONE** (without compression) or **LZW** (Lemple-Zif-Welch - lossless type of compression).

*Note:* The selected image format will also be used for snapshots.

3 Press **OK**.



## Chapter 6

# SNAPSHOTS

### Snapshots Basics

---

The SMX-150M camera can work in one of the two modes: data stream (video) or snapshot. The data stream mode is normal mode when the camera is giving out the image data. The mode is on when the video is started and the **Video** window is open.

The snapshot mode forces the camera to give out an instant view from the sensor. You can take a snapshot using a software (pressing a button in the application) or a hardware trigger.

Taking snapshots is similar to capturing frames. The differences are the following:

- capture is always manual, while snapshots can be triggered by some external hardware
- snapshots are made with global shutter (all pixels are exposed to light at the same), capture - rolling shutter

### Tuning Image for the Snapshot Mode

---

Some of the adjustments that should be done when you start working with the camera are available only for the Video mode and disabled when using the Snapshot mode, but they affect the snapshot view anyway.

If necessary, these settings should be adjusted in the Video mode before making snapshots.

For the Snapshot mode the following options are not available:

- Average Frames (Device Settings window)
- Black level Auto (Device Settings window)
- Column balancing Auto (Device Settings window)
- Subtract dark frame (Device Settings window)
- Exposure mode (Device Settings window)
- Continuous precharge (Device Settings window)
- The Best button (Image Correction tab of the main window)

Before you start using the Snapshot mode, activate video and adjust the main image settings:

1. Black level (see [“Tuning Black Level and Column Balancing” on page 33](#))
2. Column balancing (see [“Tuning Black Level and Column Balancing” on page 33](#))

### 3. ADC Sample Delay (see [“Manual Tuning of ADC Sample Delay”](#) on page 34)

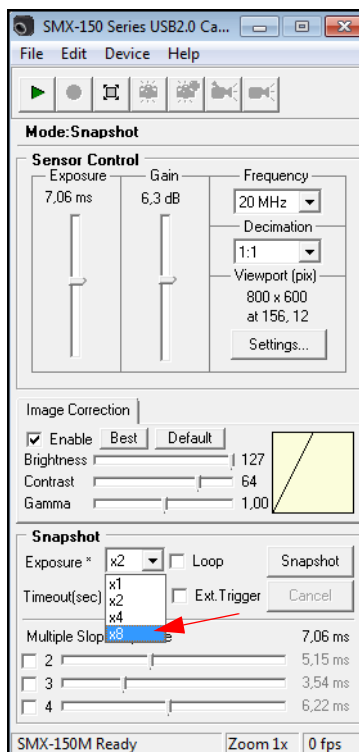
## Tuning Illumination

Use the **Loop** option to adjust the illumination of the Snapshot view. When this option is enabled, you will be able to see changes you make to improve the illumination in the **Snapshot** window (see [“Adjusting Illumination on the Fly”](#) on page 59).

In the Snapshot mode, the illumination will be lower compared to the Video mode with the same settings. When capturing in the normal light conditions (day light), this difference is not much visible.

To avoid the 'strong' illumination reduction do the following:

- Use the **Exposure\*** option (the **Snapshot** section of the main application window) by setting it to **x8**:



**Figure 6-1** Setting exposure for Snapshot mode

This will 8 times increase the current **Exposure** range and step and will make the image lighter.

*Note:* To change the **Exposure\*** parameter, you need to stop the Snapshot Loop mode first otherwise it will not take effect.

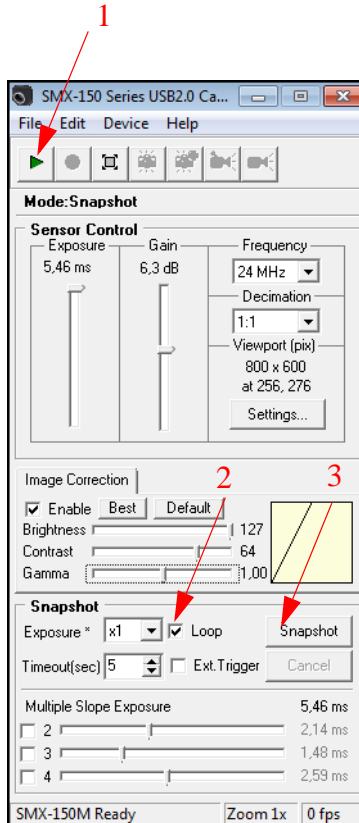
- Change the **Sensor Voltage Control** in the **Device Settings** window - try all the combinations with High and Low values for the VDDC and VDDH parameters
- **Image Correction** tab: increase exposure, gain and brightness and try decreasing gamma
- Increase decimation and/or viewport.

### Adjusting Illumination on the Fly

To get the continuous sequence of snapshots, use the **Loop** option. This option allows adjusting the illumination of snapshots on the fly, so it is possible to see all changes done with snapshot's view immediately.

#### To use the Loop option:

- 1 Stop the Video mode, if it is running.
- 2 Select the **Loop** checkbox in the main window.
- 3 Press the **Snapshot** button.



**Figure 6-2** Adjusting illumination of the fly for Snapshot mode

- 4 Tune illumination and see immediate changes in the **Snapshot** window.
- 5 To stop the continuous sequence of snapshots, click **Cancel**.

## Snapshot Controls

In the snapshot mode, the following controls are available:

**Exposure\*** - select a multiplier (2, 4 or 8) from the drop-down box to increase the exposure value.

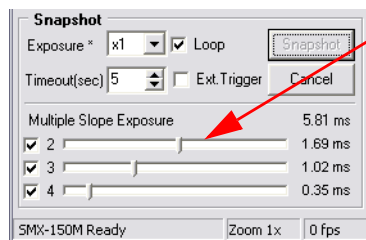
**Timeout** - defines the time for the software to wait before making a snapshot.

**Multiple Slope Exposure** is used to increase the dynamic range to balance the image exposure. This function specifies the values of the parts of the total exposure period before the voltage resetting takes place.

By defining up to three points in the exposure time, you can reduce overexposure of the bright areas while increasing the level of visible details in the dark areas. This does not cause losing data in the image.

### To use Multi Slope Exposure:

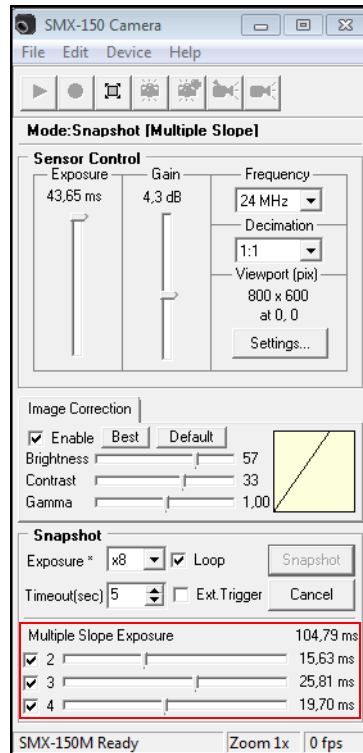
- 1 Make sure that video is not running.
- 2 Check the needed boxes for 2, 3 or 4.
- 3 Drag the sliders.



**Figure 6-3** Using the Multi Slope Exposure for Snapshot mode

## Using Multiple Slope Exposure

If some areas of the image are completely or mostly white or black and have no image details, use the **Multiple Slope Exposure** option in the main window of the application.



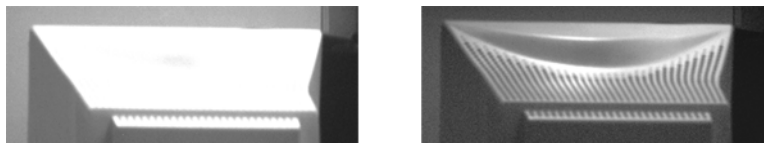
**Figure 6-4** Multiple Slope Exposure section

### To use the Multiple Slope Exposure:

- 1 Turn on the **Snapshot Loop** mode by checking the **Loop**, then click the **Snapshot** button.
- 2 Check 2, 3, and 4 checkboxes. Move the **Multiple Slope Exposure** sliders (if needed uncheck some of these checkboxes) until you get a satisfactory image.

The **Exposure** of the **Sensor Control** can be also used during the **Multiple Slope** tuning.

The pictures below show the image from the camera with highlights in **Snapshot mode** before using **Multiple Slope Exposure** (left) and the same image after using **Multiple Slope Exposure** function (right).



*Note:* These images show the Multiple Slope Exposure effect only.

## Increasing Camera Speed

The camera speed in the **Snapshot mode** is lower than that in the **Video mode** with the same settings (see [“Increasing Camera Speed”](#) on page 39).

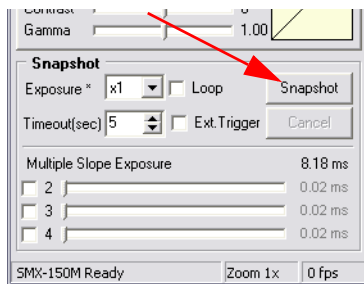
To avoid the 'strong' fps reduction, try doing the following:

- Decrease exposure
- Decrease viewport, decimation
- Increase frequency

## Taking Snapshots Using Software Trigger

**To make a snapshot using the software trigger:**

- 1 Turn the video mode on (press **F5** or the **Start Video** button in the toolbar).
- 2 Set **Exposure**, **Gain**, **Viewport**, etc.
- 3 Turn the video mode off (press **Shift+F5** or the **Stop Video** button in the toolbar).
- 4 Click the **Snapshot** button in the **Snapshot** section of the main window.



**Figure 6-5** Making a snapshot using software trigger

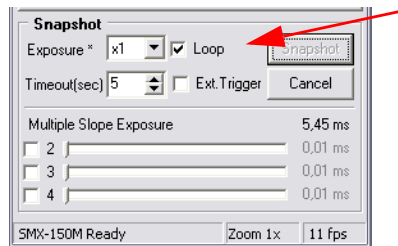
- 5 The **Snapshot mode** window will open.

*Note:* In the **Video mode**, the **Exposure** slider controls exposure time for the video. When the video is stopped, the **Exposure** slider controls exposure time of the snapshot.

For continuous sequence of snapshots, use the **Loop** option.

**To make a continuous sequence of snapshots:**

- 1 Turn off the video.
- 2 Check the **Loop** box in the **Snapshot** section of the main window.
- 3 Click the **Snapshot** button. Snapshots will continuously appear in the **Snapshot** window.



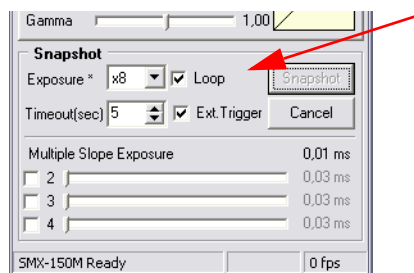
**Figure 6-6** Using the Loop option

- 4 To stop taking snapshots, press **Cancel**.

## Taking Snapshots Using Hardware Trigger

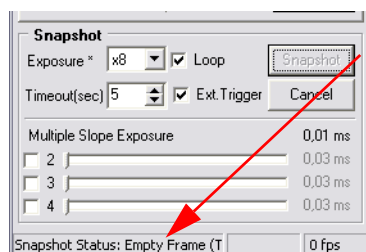
To take a snapshot using a hardware trigger:

- 1 Turn the video mode off (press **Shift+F5** or the **Stop Video** button in the toolbar).
- 2 Set **Exposure, Gain, Viewport**, etc.
- 3 Set **Timeout** (seconds to wait for external triggering pulse).
- 4 Check the **External Trigger** box.
- 5 Click the **Snapshot** button.



**Figure 6-7** Taking a snapshot using the hardware trigger

- 6 Apply triggering pulse (see [“External Trigger Connector Pinout”](#) on page 64).
- 7 As a result, the **Snapshot mode** window will open if the camera has detected the external triggering pulse.
- 8 If it failed to detect the external triggering pulse, the **Snapshot mode** window will not open and a timeout message will be displayed in the application status bar).



**Figure 6-8** Timeout message in the application status bar

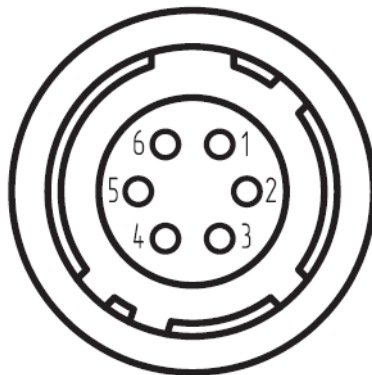
## External Trigger Connector Pinout

The **External Trigger Connector** pinout is described in the table below.

| Pin# | Direction | Signal                            | Polarity |
|------|-----------|-----------------------------------|----------|
| 1    | Input     | External trigger input            | Positive |
| 2    | Output    | Delayed synchronous shutter start | Positive |
| 3    | Output    | User programmed output            | -        |
| 4    | Input     | External trigger input            | Negative |
| 5    | Output    | Synchronous shutter start         | Positive |
| 6    | -         | Common (ground)                   | -        |

- **External trigger input (#1)** - an input used to trigger a snapshot by applying a positive pulse (3.3V TTL, duration is not less than one period of the clock frequency).
- **Delayed synchronous shutter start (#2)** - same as Pin # 5, but delayed by the time specified in application program. Can be used to activate a flash.
- **User programmed output (#3)** - user programmed output
- **External trigger input (#4)** - same as Pin # 1, but for negative triggering pulse
- **Synchronous shutter start (#5)** - a pulse occurs at this output when the camera is in snapshot mode and snapshot control sequence begins. It can be used to trigger another camera for synchronous operation or to activate a flash.

*Note:* For the cameras with firmware **1.3.7.11.34** (**1.4.7.11.34** - for the color models) or lower **Pin# 3** of the **External Trigger Connector pinout** (User programmed output) is not available.

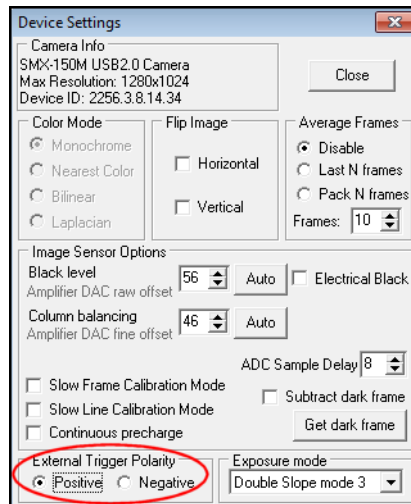


**Figure 6-9** Camera Connector View, as mounted on the camera

## Setting External Trigger Polarity

The polarity of external trigger is set via the **Device Setting** window (press **Alt+s** on the keyboard).





**Figure 6-10** Setting the external trigger polarity

The following options are available:

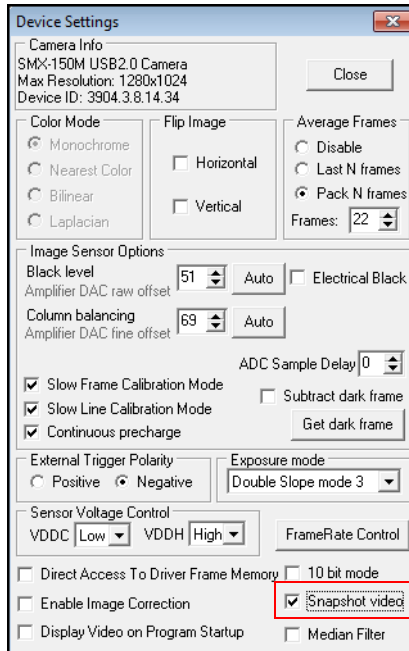
- **Positive** - the **External Trigger Input 1** will be enabled
- **Negative** - the **External Trigger Input 2** will be enabled.

## Snapshot Video

The selected **Snapshot Video** option enables receiving snapshots at the hardware level. The camera gives out a continuous sequence of instant views from the sensor. This does not influence any snapshot settings (actually, snapshot options are disabled in this situation).

### To start the snapshot video:

- 1 Make sure that the camera is stopped.
- 2 In the **Device Settings** window, check the **Snapshot Video** box:



**Figure 6-11** Snapshot video checkbox

- 3** Click the **Start Video** button, or press **F5**.
- 4** To save the video, press **F4**.

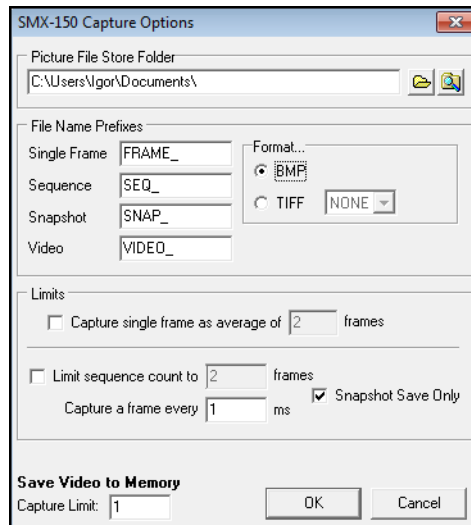
*Note:* When running Snapshot Video, the checkbox in the **Device Settings** window is disabled. To uncheck the box, stop streaming with the **Stop Video** button, or press **Shift+F5** on the keyboard.

## Saving Snapshots

When you take snapshots or record a snapshot video, they are saved in directory and with file prefix specified in **Capture Options**.

### To change options for saving snapshots:

- 1** Open the **Capture Options** dialog by pressing **Alt+c** on the keyboard or go to the **File** menu and select **Capture Options**.



**Figure 6-12** Snapshot saving options

**2** Set the options:

- a. In the **Picture File Store Folder** box, change the directory in which you want to save snapshots or leave the default `C:\Users\\Documents\`.

*Note:* This folder will also store captured videos and frames.

- b. Change the prefix that will be assigned to all snapshot files or leave the default one. Use the **Snapshot** field. The files are named automatically by combining the corresponding **File Name Prefix** and numerical value that is calculated by the number of last captured file + 1.
- c. Select image file format:
  - **BMP** - saves any 8 bit or 10 bit image as 8 bit BMP image.
  - **TIFF** - saves 8 bit image as 8 bit TIFF image and 10 bit image as 10 bit TIFF image. Select also compression type: **NONE** (without compression) or **LZW** (Lemple-Zif-Welch - lossless type of compression).

*Note:* The selected image format will also be used for captured frames.

- d. Check the **Snapshot Save Only** to save snapshots without showing them on the screen.

**3** Press **OK**.



## Chapter 7

# WIA

It is possible to use the SMX-150M camera to get images using the **Scanners and Cameras** option - standard **Windows Administrative Tool** (in the **Control Panel**, open **Scanners and Cameras**).

You can use almost any of the image editing programs to get images from the SMX-150M camera. This option is available in most image editing programs. We will use an image editing program that is always available in Windows XP - Microsoft Paint.

*Note:* WIA operation with the camera is demonstrated in Windows XP operating system.

## Installation

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To use the SMX-150M camera for getting images, you should first install the required software - TWAIN driver. Installing and using the TWAIN driver require that the needed hardware for the camera is already installed (see ["Installation" on page 9](#)).

If the TWAIN driver was installed during the SMX-150M USB2.0 camera Software Package installation, it is ready to be used. If not, browse to the *Sumix* folder, to which the camera was installed, and open the *SMX150 USB2.0 Camera\Drivers\TWAIN* folder. To install the TWAIN driver, run the *SMX15WIA.exe* application file. Wait awhile for completing the driver installation.

The TWAIN driver is installed and ready to be used now.

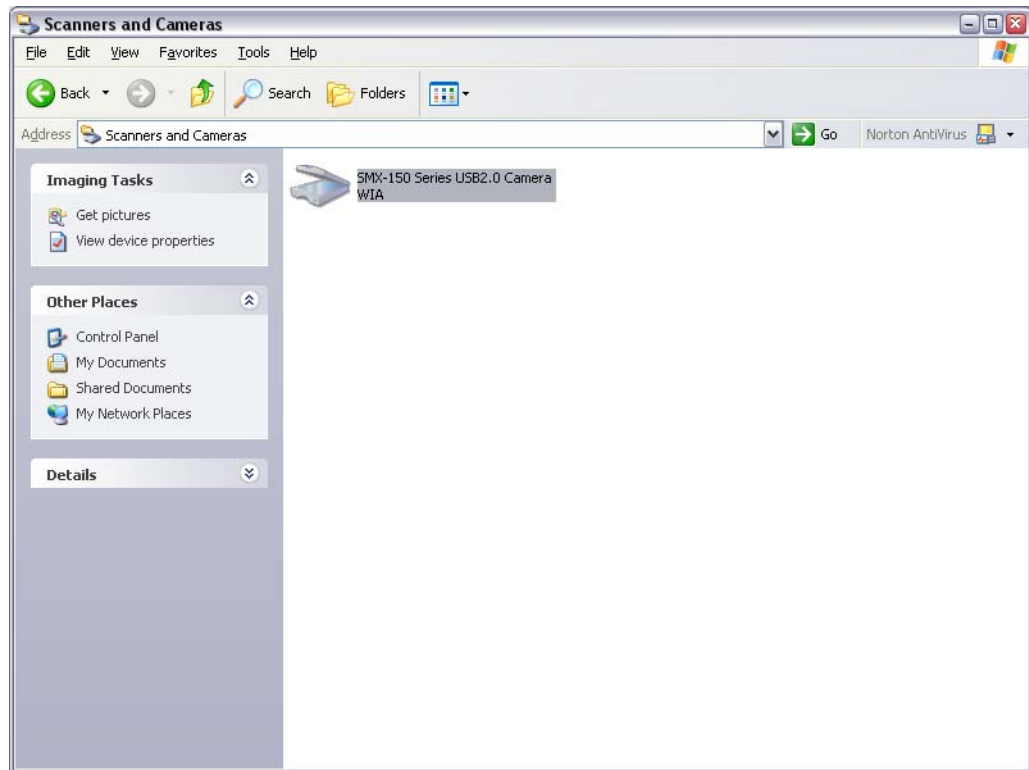
*Note:* The TWAIN driver is not available yet for 64 bit Windows.

## How It Works

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### Location

Open the **Control Panel** window (from the **Start** menu), then open **Scanners and Cameras**. Since the TWAIN driver is already installed, **SMX-150 USB2.0 Camera WIA** will be available:

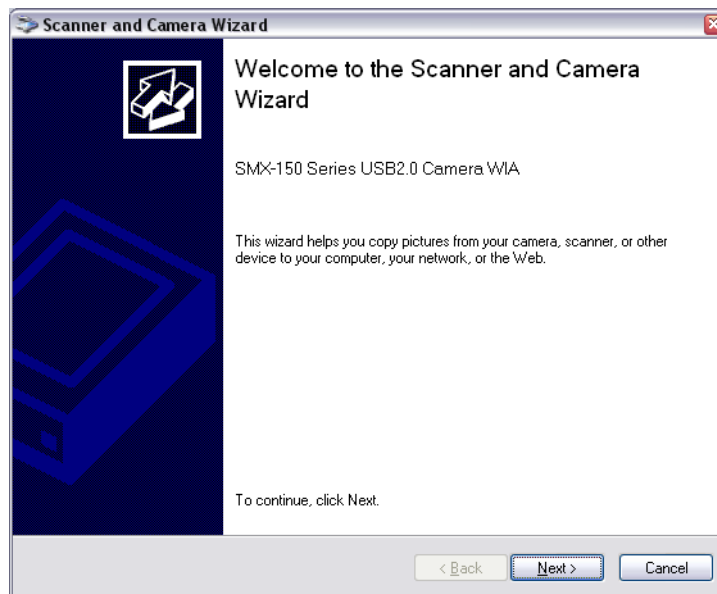


**Figure 7-1** *The Scanners and Cameras window*

### Getting Image with the Scanner and Camera Wizard

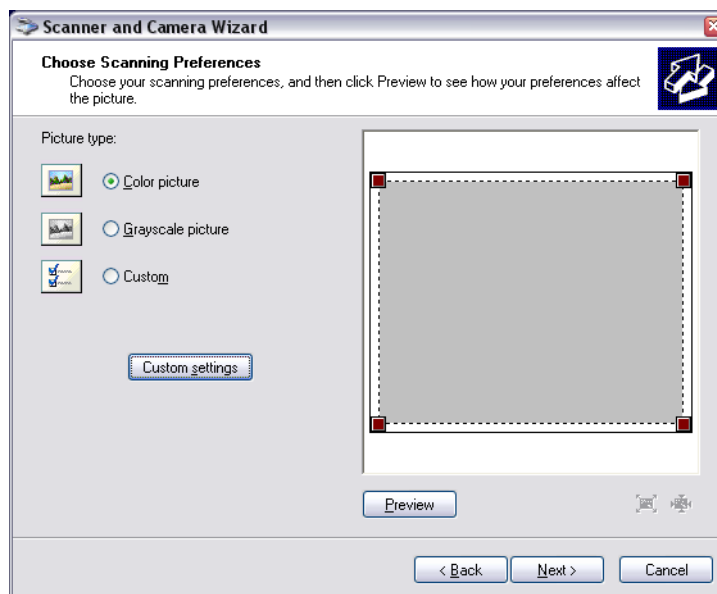
#### To get an image with the Scanner Wizard:

- 1 Connect the **SMX-150M Camera** to your computer.
- 2 Open the **Scanners and Cameras** window.
- 3 Double-click **SMX-150 USB2.0 Camera WIA** or right-click the item and select **Get picture using Scanner Wizard**.
- 4 **Welcome to the Scanner and Camera Wizard** will start. Press **Next** to proceed.



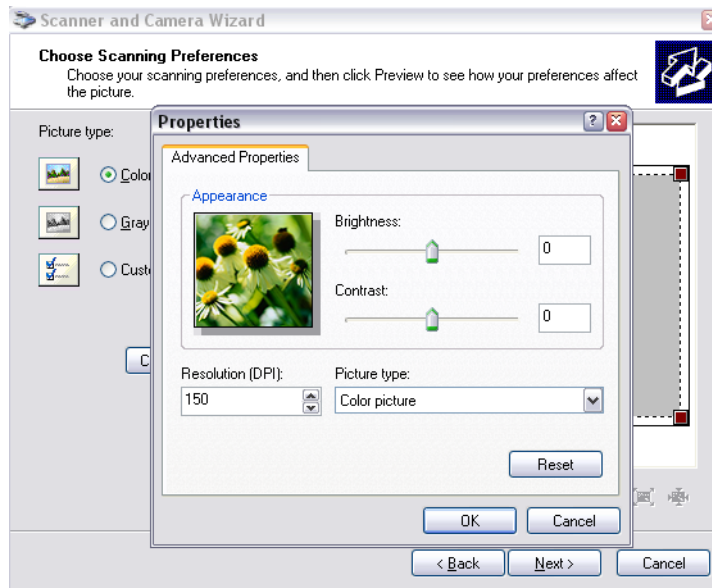
**Figure 7-2** Welcome to Scanners and Camera Wizard

**5** Select **Grayscale picture** option below **Picture Type** and adjust image settings:



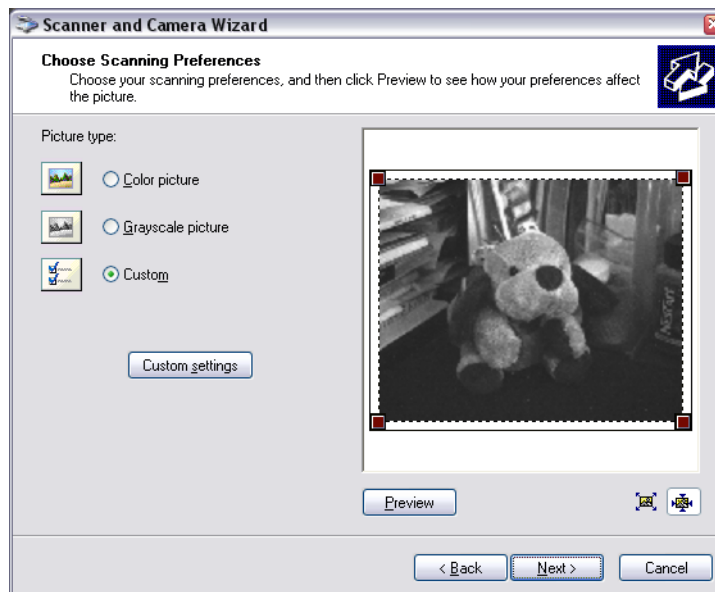
**Figure 7-3** Scanner and Camera Wizard: choosing the Scanning Properties

**6** Click the **Custom Settings** button to adjust the properties of the image.



**Figure 7-4** Scanner and Camera Wizard: Advanced Properties window

**7** Click the **Preview** button to preview the image.

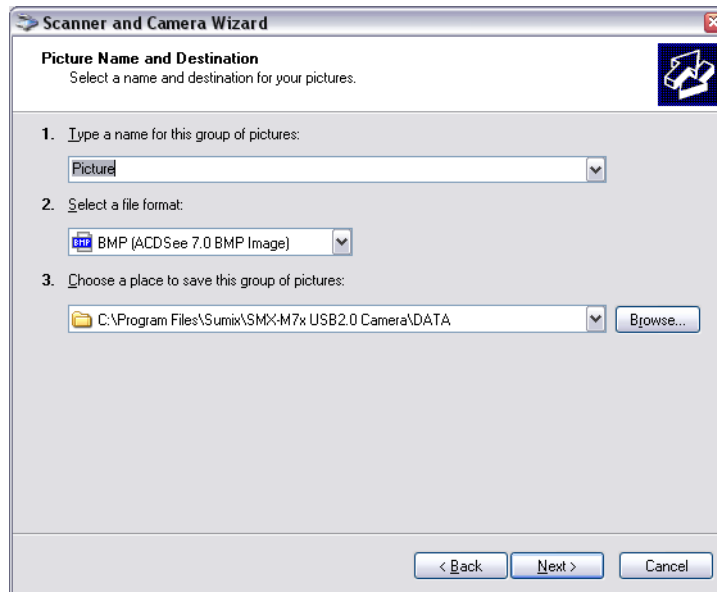


**Figure 7-5** Scanner and Camera Wizard: Preview

**8** Resize the image if needed and click the **Next** button to go to the next step of the **Scanner and Camera Wizard**.

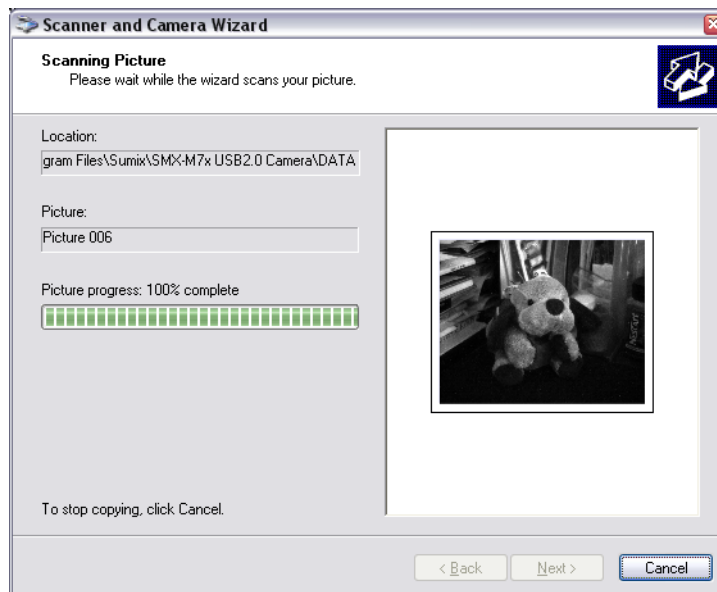
**9** Enter the name, select file format and location, to which you want to save your image. Then press **Next**.





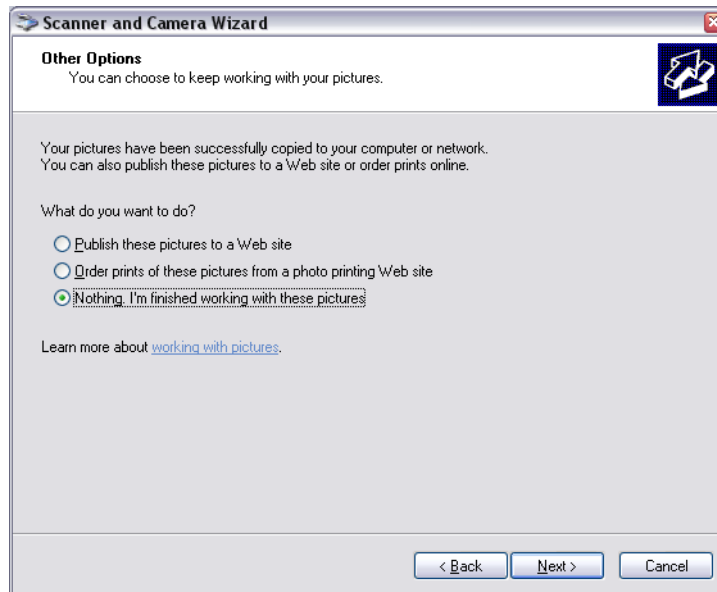
**Figure 7-6** *Scanner and Camera Wizard: Picture Name and Location window*

**10** The **Scanner and Camera Wizard** will start to scan your picture.



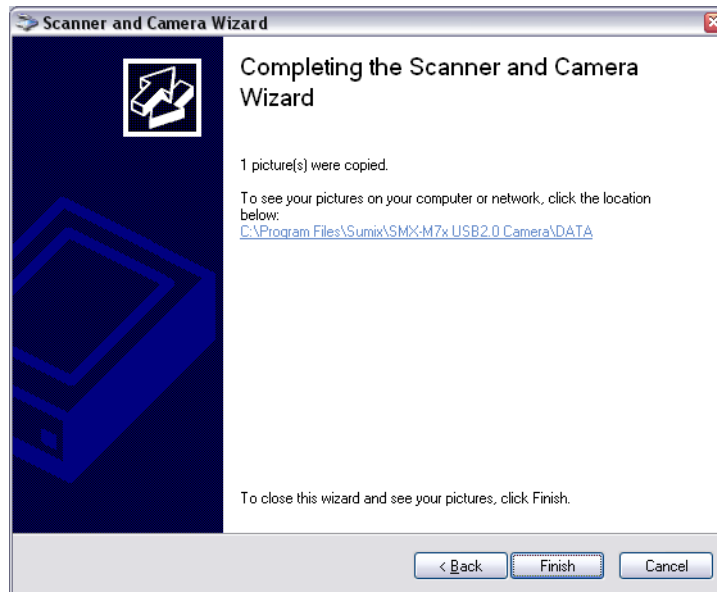
**Figure 7-7** *Scanner and Camera Wizard: Scanning Picture window*

**11** After the wizard finishes, you will be asked to select other options. Choose **Nothing. I'm finished working with these pictures** and press **Next**.



**Figure 7-8** *Scanner and Camera Wizard: Other Options window*

8. In the final window, press **Finish**.



**Figure 7-9** *Completing the Scanner and Camera Wizard window*

Microsoft Windows will open the folder, where you saved your picture. Now you can view your scanned image.

## Getting Image with Scan

### To get an image using the Scan feature:

1 Connect the **SMX-150M** or **SMX-150C USB2.0** Camera to your computer

- 2 Open the **Scanners and Cameras** window.
- 3 Right-click **SMX-150 USB2.0 Camera WIA** and select **Scan**. A window with a list of programs available for the image scanning will appear.

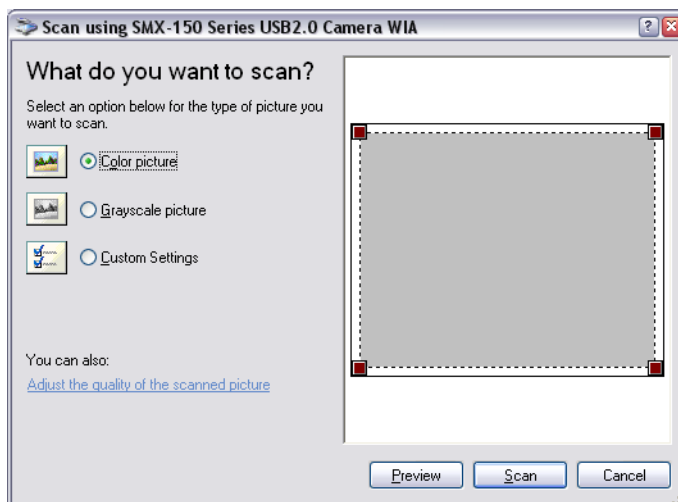


**Figure 7-10** Select the program to launch for Scanning window

*Note* Some image editing programs that can be also used for scanning images might not be present in the list (see [Figure 7-10 Select the program to launch for Scanning window](#)). It might be due to the current operating system's settings or the image editing program configuration. For more information, see **Scanners and Cameras Help Topic** of Microsoft Windows, or **Help Topics** of your image editing program

*Note* The list of image editing programs that is shown on the image above (see [Figure 7-10 Select the program to launch for Scanning window](#)) may vary depending on your operating system and programs that are installed on your computer

- 4 Select the suitable program and click **OK**. The selected program will start and **Scan Using SMX-150 USB2.0 Camera WIA** will open.



**Figure 7-11** Scan using SMX-150 USB2.0 Camera WIA window

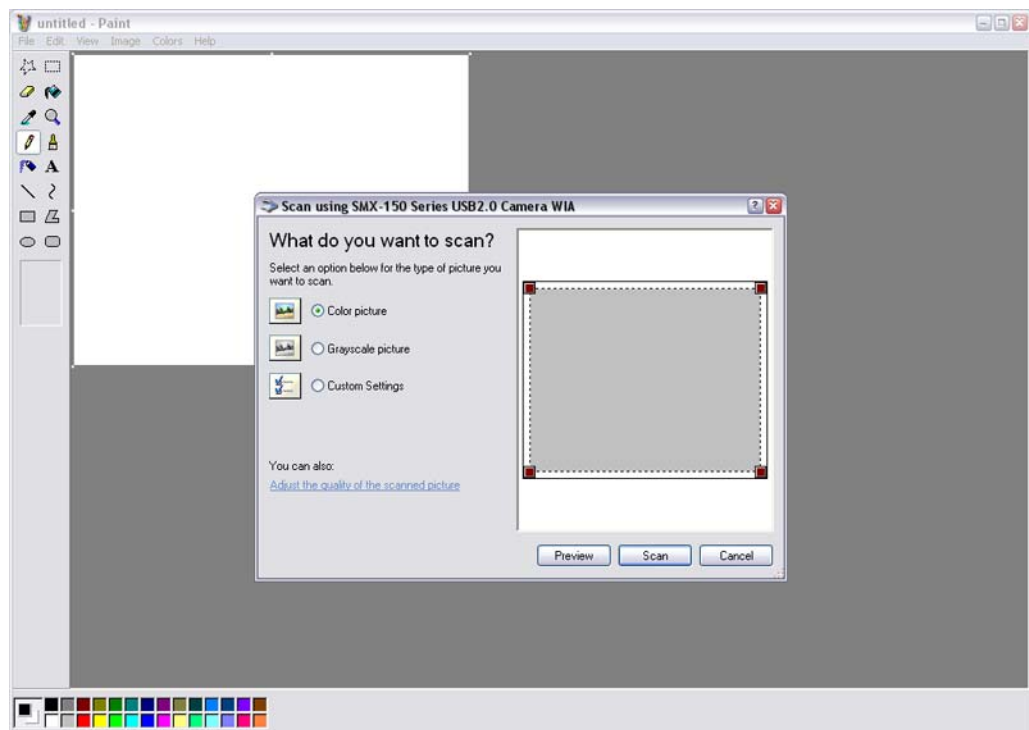
**Note:** Not all image editing programs open the **Scan Using SMX-150 USB2.0 Camera WIA** window (see [Figure 7-11 Scan using SMX-150 USB2.0 Camera WIA window](#)) automatically - some of them just open the program's main window. It depends on the image editing program configuration. For more information, see **Help Topic** of the program.

- 5 Choose **Grayscale**, then the **Adjust the quality of the scanned picture** link to change the image settings. Click the **Preview** button to preview the image to be scanned
- 6 When ready, click the **Scan** button. Your image editor will start scanning and will show the scanned image in the current program's windows

## Getting Image from Camera with Microsoft Paint

### To get an image from the camera using Microsoft Paint:

- 1 Open **Microsoft Paint** (in **All Programs**, from the **Accessories** program group select **Paint**).
- 2 Connect the SMX-150M camera to your computer.
- 3 In **Microsoft Paint**, open the **File** menu and select **From Scanner or Camera**. The **Scan Using SMX-150 USB2.0 Camera WIA** dialog box will appear.



**Figure 7-12** Getting image from camera using Microsoft Paint program

- 4 Adjust image settings (see ["How It Works" on page 69](#)), click **Preview** to view the image that will be scanned.
- 5 When ready, click the **Scan** button.

- 6 When finished, save the scanned image.



**Figure 7-13** Microsoft Paint: Viewing of scanned image (maximal resolution)

*Note:* To get more information about **Scanners and Cameras** operation, see **Windows XP Help Topics**.

## Removing

### To remove the SMX-150 USB2.0 Camera WIA:

- 1 In the **Control Panel**, open **Scanners and Cameras** window
- 2 Right-click **SMX-150 USB2.0 Camera WIA**
- 3 Select the **Delete** command.
- 4 Click **Yes** in the confirmation message.

The SMX-150 USB2.0 camera WIA will be removed from your computer.

*Note:* Before every new installation of the TWAIN driver it is necessary to remove the old version of the SMX-150 USB2.0 camera WIA.



## Chapter 8

# TRIGGER CONNECTOR

This chapter describes how to use a Hirose trigger connector and cable with a SMX-150 Series camera. Hirose trigger connector is included in the standard camera kit. Since a cable is not included in the standard connector package, this document will guide on how to use the connector with a cable.

## Connector Pinout

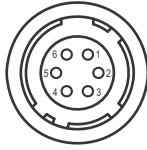
A cable should be soldered to the connector according to the pin layout, which is described in the table below.

| Pin# | Direction | Signal                            | Polarity |
|------|-----------|-----------------------------------|----------|
| 1    | Input     | External trigger input            | Positive |
| 2    | Output    | Delayed synchronous shutter start | Positive |
| 3    | Output    | User programmed output            | -        |
| 4    | Input     | External trigger input            | Negative |
| 5    | Output    | Synchronous shutter start         | Positive |
| 6    | -         | Common (ground)                   | -        |

*Note:* When soldering, any combination of pins can be used according to one's specific needs.

- **External trigger input (#1)** - an input used to trigger a snapshot by applying a positive pulse (3.3V TTL, duration is not less than one period of clock frequency).
- **Delayed synchronous shutter start (#2)** - the same as Pin# 5 but delayed by the time specified in the application program. Can be used to activate a flash.
- **User programmed output (#3)** - a user programmed output.
- **External trigger input (#4)** - the same as Pin# 1 but for negative triggering pulse.
- **Synchronous shutter start (#5)** - a pulse occurs at this output when camera is in snapshot mode and snapshot control sequence begins. It can be used to trigger another camera for synchronous operation or to activate a flash.

*Note* For the **SMX-150M** camera, **Pin#3** of the **External Trigger Connector pinout** (User programmed output) is available only for cameras with firmware **1.3.8.14.34** or higher. For previous versions of the cameras (with lower firmware version) it is not used.

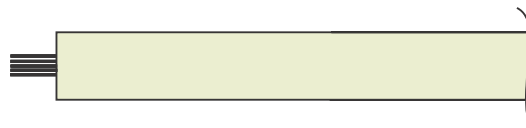


**Figure 8-1** Camera Connector View, as mounted on the camera

## Soldering of Connector with Cable

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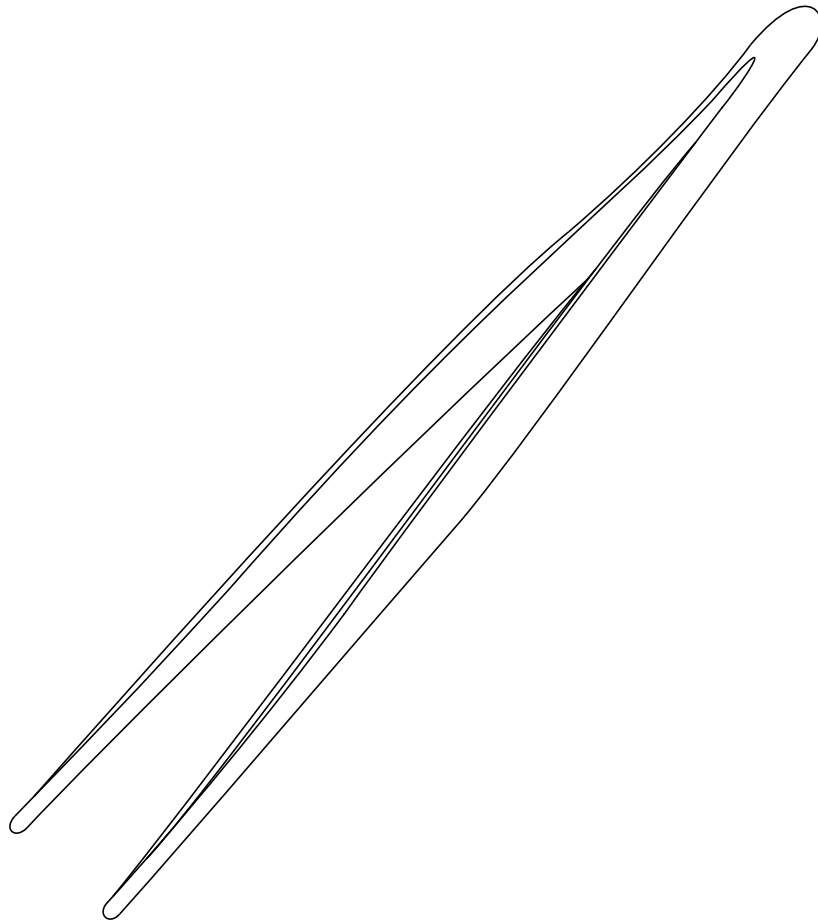
Prepare a standard (6-core) cable with already opened contacts for soldering with the connector.



**Figure 8-2** A cable for soldering with the connector

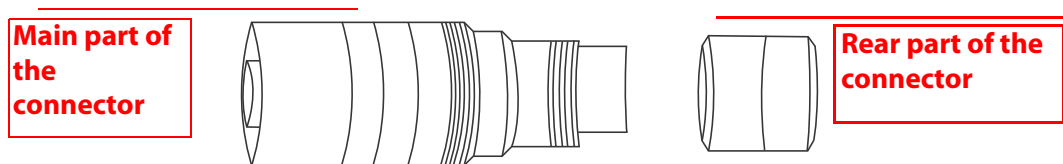
Prepare a tweezers-like tool for the connector assembling.





**Figure 8-3** Tweezers tool for the connector modifying

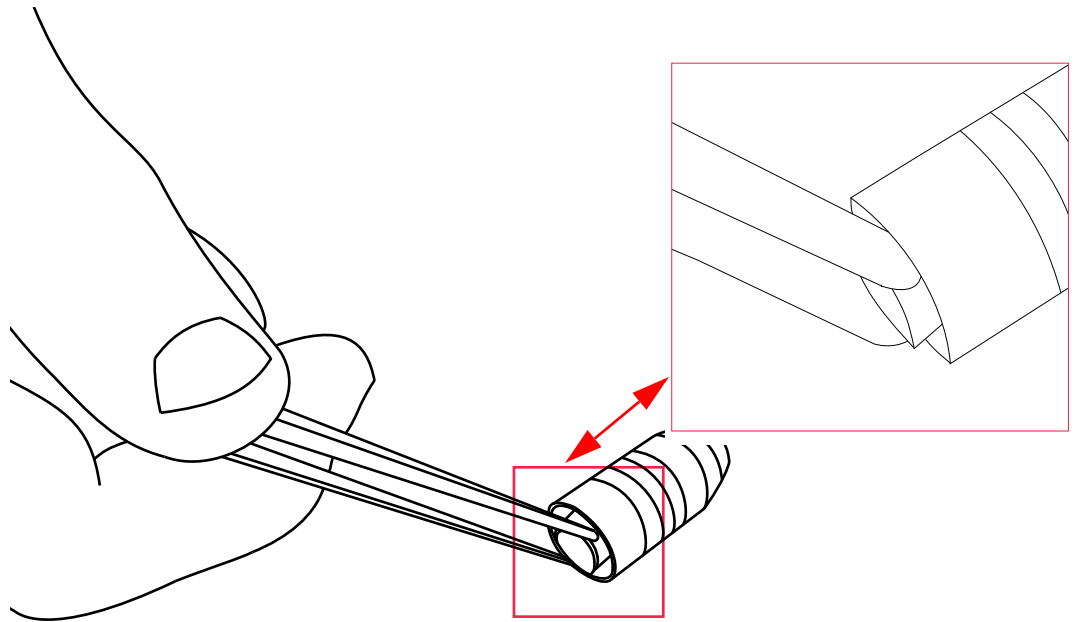
Unscrew the rear part of the connector.



**Figure 8-4** The rear part and the main part of the connector

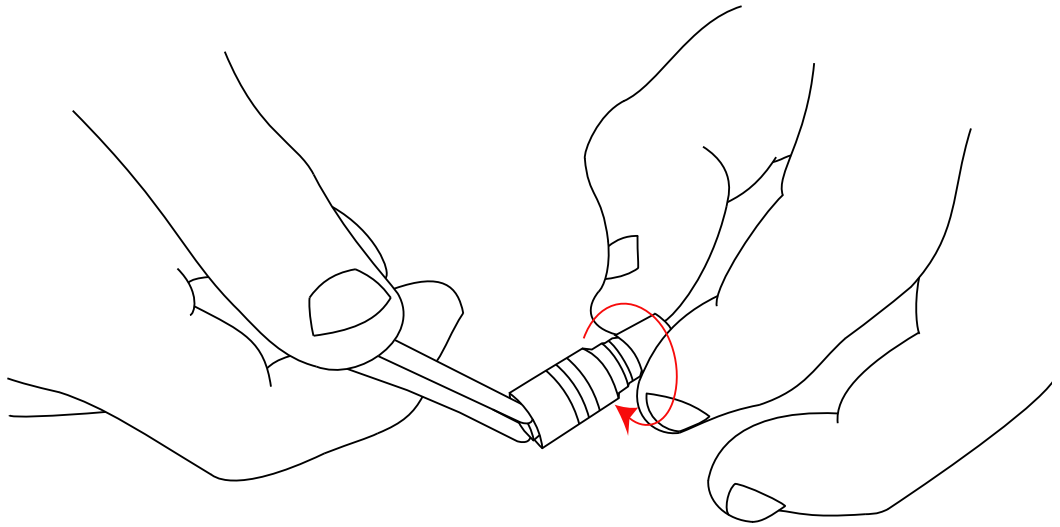
Use tweezers and remove it from the main part in the following way:

- 1 Fix the inner part of the connector with tweezers.



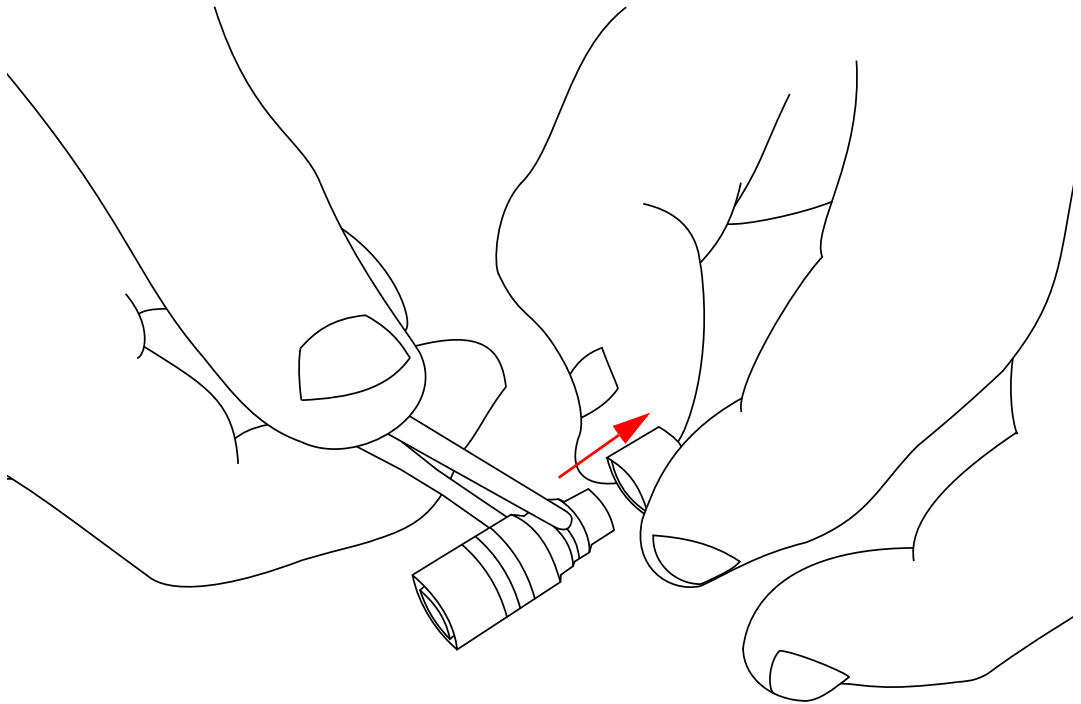
**Figure 8-5** Fixing of the inner part of the connector with tweezers

- 2 Unscrew the rear part of the connector with fingers clockwise.



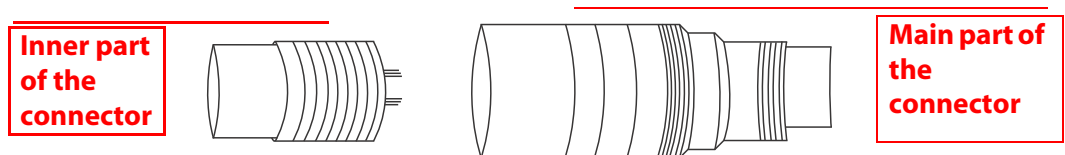
**Figure 8-6** *Unscrewing of the rear part of the connector*

- 3 Remove the rear part of the connector from the main part.



**Figure 8-7** Removing of the rear part of the connector from the main part

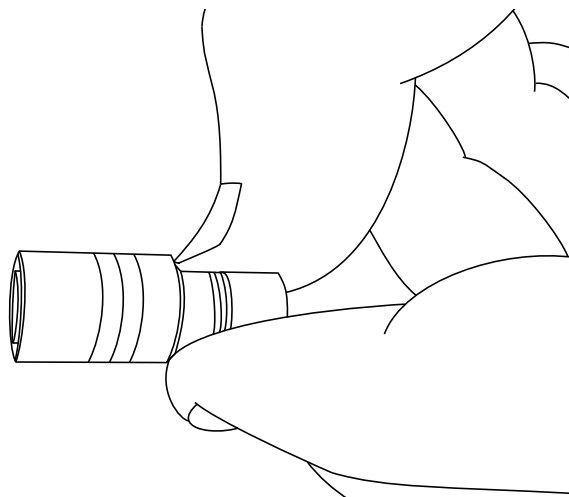
Unscrew the inner part of the connector:



**Figure 8-8** The inner part and the main part of the connector

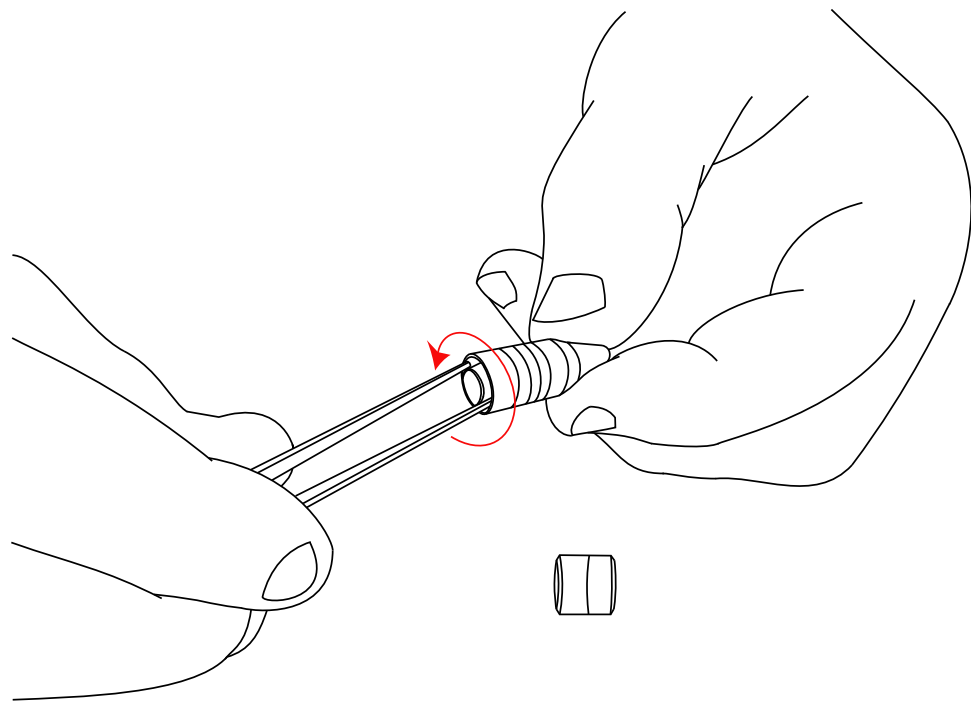
To unscrew, perform the following steps:

- 1 Hold the main part of the connector with your fingers.



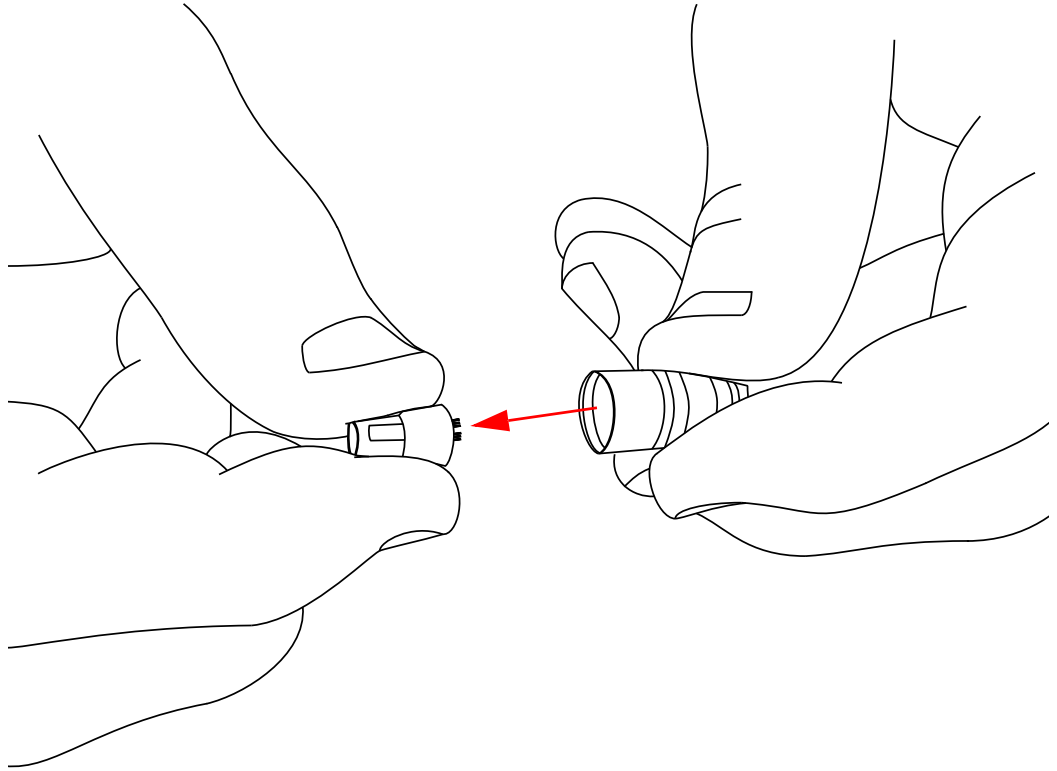
**Figure 8-9** *Gripping the main part of the connector with fingers*

- 2** Fix the inner part of the connector with tweezers ([see Figure 8-5 Fixing of the inner part of the connector with tweezers](#)).
- 3** Rotate tweezers counterclockwise.



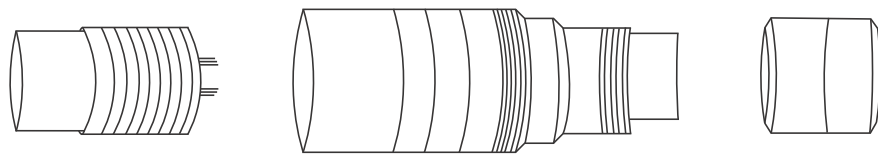
**Figure 8-10** *Unscrewing the inner part of the Connector from the main part*

- 4** Remove the inner part of the connector from the main part.



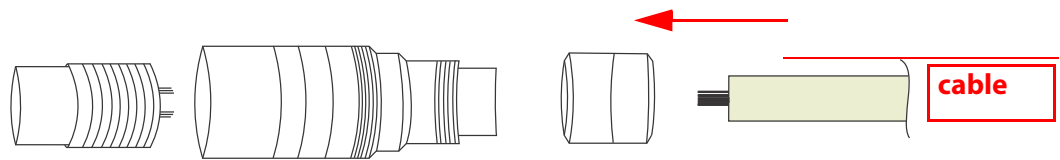
**Figure 8-11** Removing the inner part of the connector from the main part

As a result, all connector parts will be disassembled:



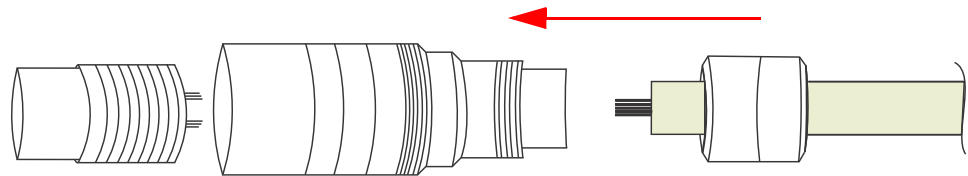
**Figure 8-12** All parts of the connector are disassembled

Insert a cable into the rear part of the connector.



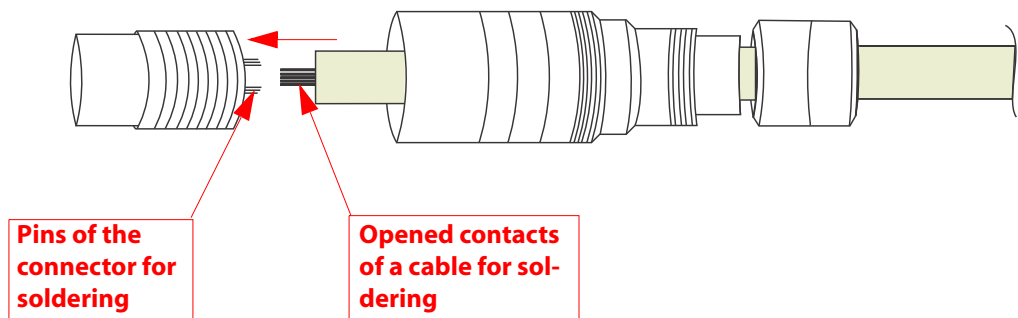
**Figure 8-13** Inserting of a cable in the rear part of the connector

Then insert it into the main part.



**Figure 8-14** Inserting of a cable in the main part of the connector

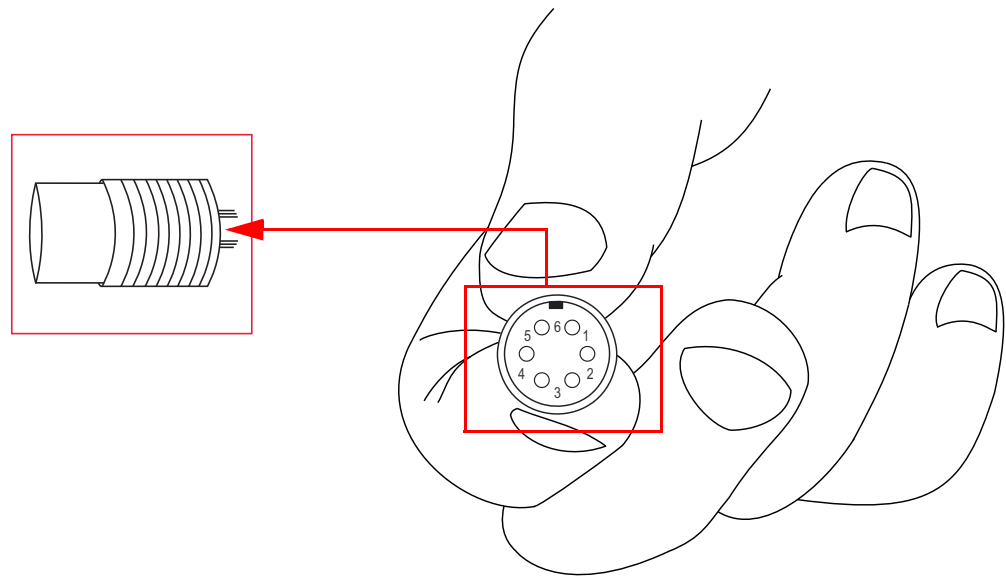
When a cable is inserted into the rear part and the main part correspondingly, solder each pin of the connector with opened contacts of a cable according to the layout (see [“Connector Pinout” on page 79](#)) and your specific needs:



**Figure 8-15** Inserting and soldering of a cable to the inner part of the connector

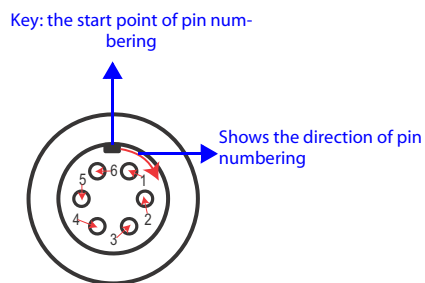


Please note that each pin is marked with a number according to the pin layout (see [“Connector Pinout” on page 79](#)). The pins numbering is located at the internal side of the inner part of the connector.



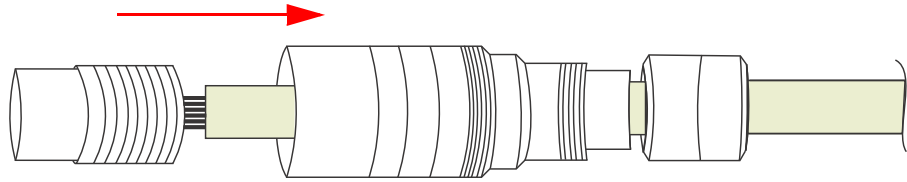
**Figure 8-16** Connector pinout outlook

Note also that direction of pin numbering is done clockwise starting from the key at the upper edge of the inner part of the connector.



**Figure 8-17** The pin numbering direction

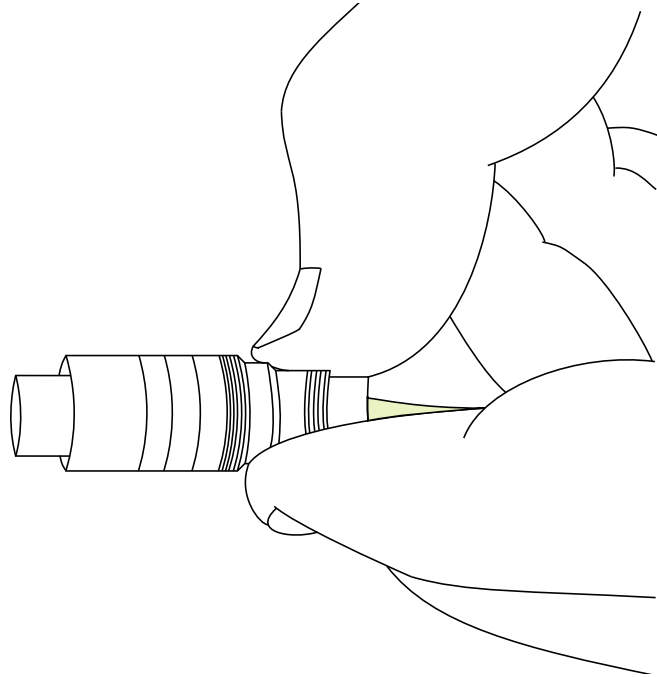
When the soldering is done, insert the inner part of the connector in the main part.



**Figure 8-18** Inserting of the inner part of the connector in the main part

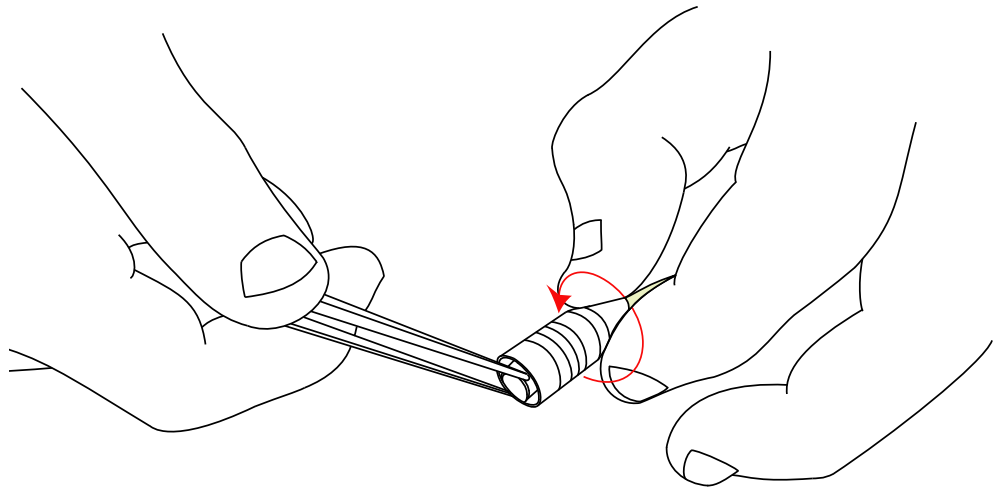
Screw in the inner part of the connector in the following way:

- 1 Fix the inner part of the connector with tweezers ([see Figure 8-5 Fixing of the inner part of the connector with tweezers](#)).
- 2 Hold the main part of the connector with fingers.



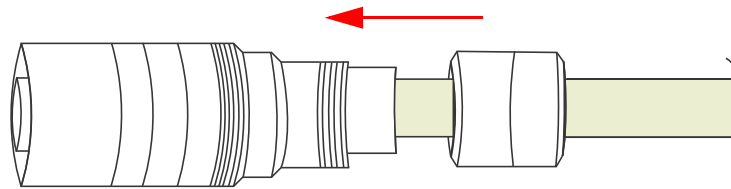
**Figure 8-19** Gripping of the main part of the connector with fingers

- 3 Screw the main part of the connector in counterclockwise.



**Figure 8-20** *Screwing the inner part of the connector in*

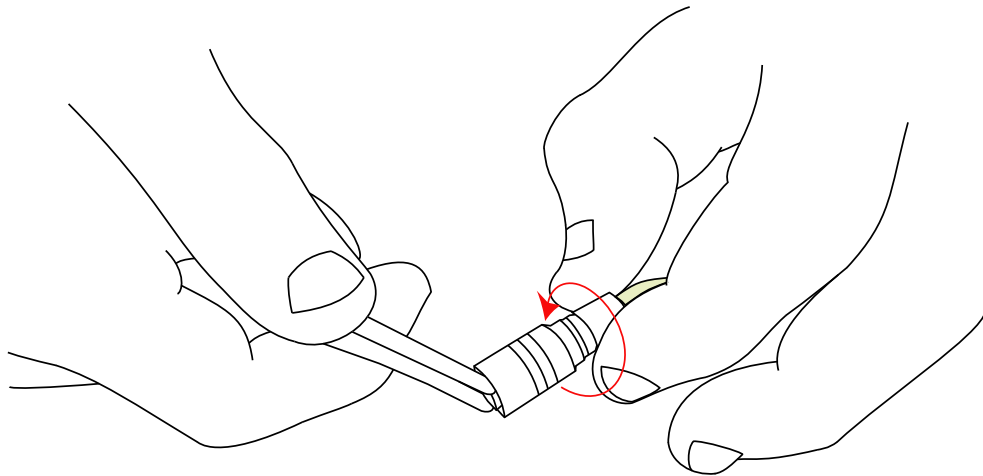
Insert the main part of the connector into the rear part.



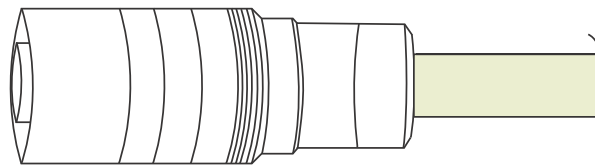
**Figure 8-21** *Inserting of the main part of the connector into the rear*

Screw the rear part in using tweezers in the following way:

- 1 Fix the inner part of the connector with tweezers ([see Figure 8-5 Fixing of the inner part of the connector with tweezers](#)).
- 2 Screw the rear part of the connector in with your fingers counterclockwise.



**Figure 8-22** *Screwing of the rear part of the connector in to the main part*  
Connector is ready to be used.



**Figure 8-23** *Soldered connector with a cable*

# Appendix 1

## KEYBOARD SHORTCUTS








| Keyboard shortcut | Description  |
|-------------------|--|
| F2                | Captures Frame into bitmap file                          |
| F3                | Captures a Sequence frames into bitmap files             |
| F4                | Captures a sequence of frames into AVI file              |
| F5                | Starts live video display in the View window             |
| Shift+F5          | Stops live video display and close the View window       |
| F12               | Activates the main window when displaying the live video |
| Shift+F4          | Saves Video to Memory                                    |
| Ctrl+o            | Opens Camera Profile                                     |
| Ctrl + s          | Stores Camera Profile                                    |
| Ctrl+c            | Copies an image from the camera to buffer                |
| Alt + c           | Brings up a Capture Options Dialog                       |
| Alt + s           | Brings up a Device Settings Dialog                       |
| Alt+v             | Opens Viewport Settings... window                        |
| e                 | Performs Auto Exposure                                   |
| w                 | Performs White Balance                                   |
| h                 | Opens a Histogram  |
| F                 | Fine   |
| Num+/-            | Zooming In/Out   |
| Num*              | Returns original Size                                    |
| F9                | Makes a Snapshot   |
| F1                | Opens a Help window                                      |
| Esc               | Exit   |



## Appendix 2

# TOOLBAR OVERVIEW

The most commonly used menu commands are duplicated on the application toolbar:

| Buttons   | Description   |
|---|---|
|    | Starts live video in the View window. Disabled when Video is running or no camera is connected                    |
|    | Stops live video and closes the View window. Disabled when Video is stopped or no camera is connected             |
|    | Opens a Viewport Setup dialog. Disabled when no camera is connected   |
|    | Captures a frame into BMP/TIFF file format. Disabled when no camera is connected or video is stopped              |
|  | Captures a sequence of frames into BMP/TIFF file format. Disabled when no camera is connected or video is stopped |
|  | Saves Video to AVI file. Disabled when no camera is connected or video is stopped                                 |
|  | Saves Video to Memory. Disabled when no camera is detected or video is stopped                                    |





## Appendix 3

# FIGURES

|  |    |
|--|----|
| Welcome to the SMX-150 Camera Setup Wizard .....   | 10 |
| License Agreement dialog box .....   | 10 |
| System Information box .....   | 11 |
| Recommended system configuration .....   | 11 |
| Select Destination location box .....  | 12 |
| Select Start Menu Folder box .....   | 12 |
| Ready to Install box .....   | 13 |
| Installing box .....   | 13 |
| Windows Security box .....   | 14 |
| The last installation step .....   | 14 |
| Updating the camera driver .....   | 15 |
| Updating the camera driver: step1 .....  | 16 |
| Updating the camera driver: step 2 .....   | 16 |
| Updating the camera driver: step 3 .....   | 17 |
| Driver removal confirmation .....  | 18 |
| Device Manager: the SMX-160 camera is detected as Unknown device .....                           | 19 |
| Hardware Update Wizard: the Welcome window .....   | 20 |
| Found New Hardware Wizard: Cannot install this Hardware .....                                    | 20 |
| Found New Hardware Wizard: Installing from a list or specific location (Advanced) .....          | 21 |
| Installing from a list or specific location (Advanced): specifying location .....                | 21 |
| Install from a list or specific location: selecting file among the Wizard's search results ..... | 22 |
| Notification about successful camera installation .....  | 27 |
| SMX-150M application main window .....   | 28 |
| Camera histogram .....   | 28 |
| Device Settings window .....   | 29 |
| Video mode window .....  | 29 |
| Switching between cameras .....  | 30 |
| Camera ID .....  | 31 |

|  |    |
|--|----|
| Setting sensor controls .....  | 33 |
| Adjusting Black level and Column balancing .....                       | 34 |
| Setting viewport .....   | 35 |
| Setting Column balancing and ADC Sample Delay to 0 .....               | 35 |
| Video mode window .....  | 36 |
| ADC Sample Delay field .....   | 36 |
| Video mode window with shifted columns .....                           | 37 |
| Initial settings for tuning light .....                                | 38 |
| Using image correction .....   | 39 |
| Viewing frame rate at the bottom of main application .....             | 40 |
| Sensor controls .....  | 42 |
| Viewport Settings window .....   | 44 |
| Changing the viewport .....  | 44 |
| Image correction controls .....  | 45 |
| Flipping image .....   | 46 |
| Averaging frames .....   | 46 |
| Increasing image quality .....   | 47 |
| Exposure mode section .....  | 47 |
| Sensor voltage controls .....  | 48 |
| The Frame Rate Control window .....                                    | 48 |
| Decreasing frame rate .....  | 48 |
| Warning message: entered frame rate value is lower than allowed .....  | 49 |
| Warning message: entered frame rate value is higher than allowed ..... | 49 |
| 10 bit mode check box .....  | 49 |
| Median Filter check box .....  | 49 |
| Saving camera profile .....  | 50 |
| Loading camera profile .....   | 51 |
| Limits section of Capture Options .....                                | 53 |
| Message about incorrect sequence capture interval .....                | 54 |
| Save Video to Memory section .....                                     | 54 |
| Capture Options box .....  | 55 |
| Setting exposure for Snapshot mode .....                               | 58 |

|  |    |
|--|----|
| Adjusting illumination of the fly for Snapshot mode .....            | 59 |
| Using the Multi Slope Exposure for Snapshot mode .....               | 60 |
| Multiple Slope Exposure section .....                                | 61 |
| Making a snapshot using software trigger .....                       | 62 |
| Using the Loop option .....  | 63 |
| Taking a snapshot using the hardware trigger .....                   | 63 |
| Timeout message in the application status bar .....                  | 63 |
| Camera Connector View, as mounted on the camera .....                | 64 |
| Setting the external trigger polarity .....                          | 65 |
| Snapshot video checkbox .....  | 66 |
| Snapshot saving options .....  | 67 |
| The Scanners and Cameras window .....                                | 70 |
| Welcome to Scanners and Camera Wizard .....                          | 71 |
| Scanner and Camera Wizard: choosing the Scanning Properties .....    | 71 |
| Scanner and Camera Wizard: Advanced Properties window .....          | 72 |
| Scanner and Camera Wizard: Preview .....                             | 72 |
| Scanner and Camera Wizard: Picture Name and Location window .....    | 73 |
| Scanner and Camera Wizard: Scanning Picture window .....             | 73 |
| Scanner and Camera Wizard: Other Options window .....                | 74 |
| Completing the Scanner and Camera Wizard window .....                | 74 |
| Select the program to launch for Scanning window .....               | 75 |
| Scan using SMX-150 USB2.0 Camera WIA window .....                    | 75 |
| Getting image from camera using Microsoft Paint program .....        | 76 |
| Microsoft Paint: Viewing of scanned image (maximal resolution) ..... | 77 |
| Camera Connector View, as mounted on the camera .....                | 80 |
| A cable for soldering with the connector .....                       | 80 |
| Tweezers tool for the connector modifying .....                      | 81 |
| The rear part and the main part of the connector .....               | 81 |
| Fixing of the inner part of the connector with tweezers .....        | 82 |
| Unscrewing of the rear part of the connector .....                   | 83 |
| Removing of the rear part of the connector from the main part .....  | 84 |
| The inner part and the main part of the connector .....              | 84 |

|   |    |
|---|----|
| Gripping the main part of the connector with fingers .....                  | 85 |
| Unscrewing the inner part of the Connector from the main part .....         | 86 |
| Removing the inner part of the connector from the main part .....           | 87 |
| All parts of the connector are disassembled .....                           | 87 |
| Inserting of a cable in the rear part of the connector .....                | 88 |
| Inserting of a cable in the main part of the connector .....                | 88 |
| Inserting and soldering of a cable to the inner part of the connector ..... | 88 |
| Connector pinout outlook .....  | 89 |
| The pin numbering direction .....   | 89 |
| Inserting of the inner part of the connector in the main part .....         | 90 |
| Gripping of the main part of the connector with fingers .....               | 90 |
| Screwing the inner part of the connector in .....                           | 91 |
| Inserting of the main part of the connector into the rear .....             | 91 |
| Screwing of the rear part of the connector in to the main part .....        | 92 |
| Soldered connector with a cable .....                                       | 92 |