

CamSetup Software

Ver. 5.0

User Manual

Ref. 1846-SU-09

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What does...

CamSetup is a software tool, that can be used together with the Optronis CL600x2 and CL300x2 CameraLink cameras.

CamSetup is an easy interface that allows to parametrize the functions of the camera.



The command Log window can be used to analyse the RS232 commands that are sent to and received from the camera.

CamSetup works with CameraLink frame grabbers from different frame grabber suppliers. Please refer to the Appendix for frame grabber examples.

System Requirements

The Optronis CamSetup software is designed to work with

Windows XP (32 bit, 64 bit),

Windows Vista (32 bit, 64 bit) and

Windows 7 (32 bit, 64 bit),

allows to setup Optronis CamRecord CL600x2 and CL300x2 CameraLink cameras and works together with CameraLink frame grabbers of different frame grabber manufacturers. Please refer to frame grabber examples in the Appendix.

Install

The software is delivered on a CD-ROM and contains all informations for installation.

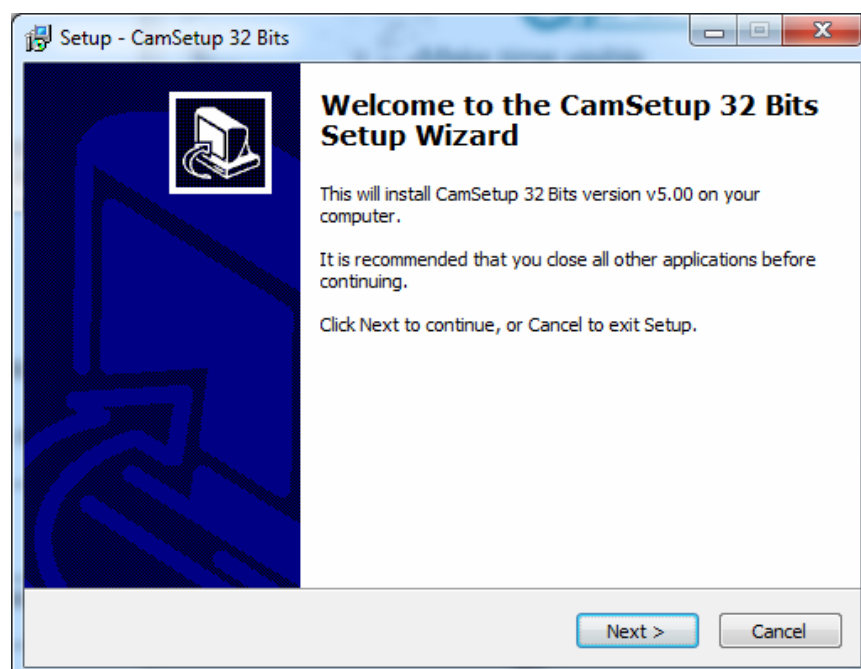
To install the software please follow the instructions below.

1. Start up your computer
2. Insert the CD-ROM OPTRONIS CamSetup in your CD-ROM drive.

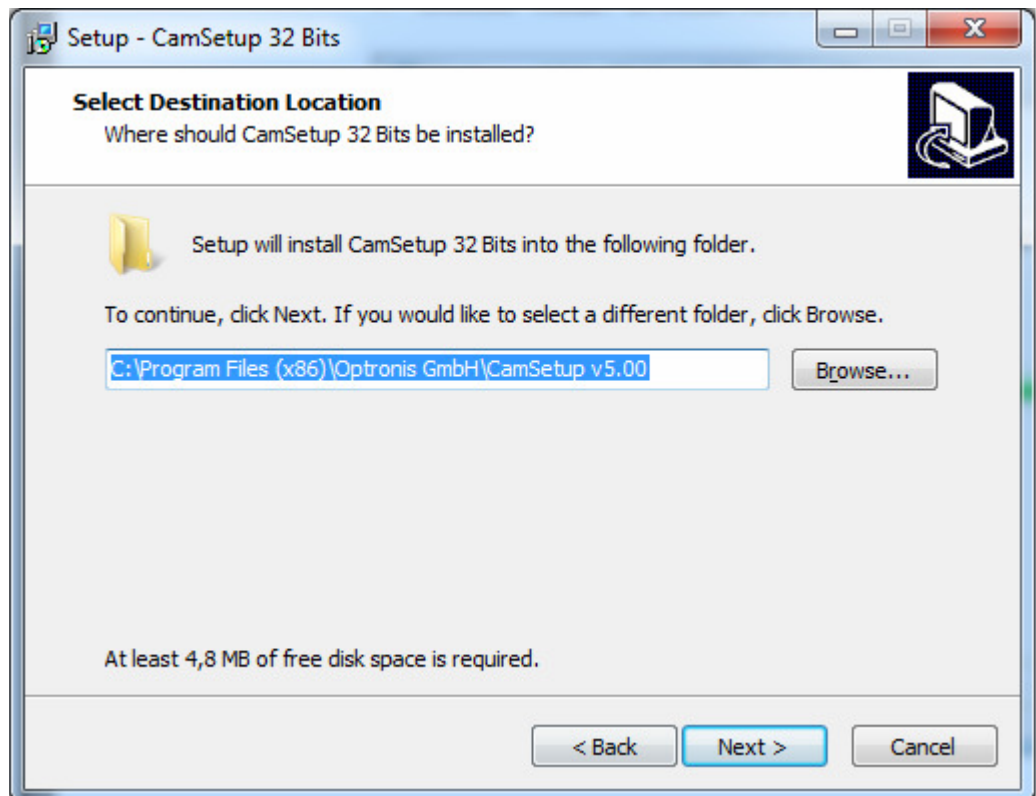
3. If the Software Setup doesn't start automatically, please execute the "setup" file from the CD-Rom and follow the instructions as indicated in the figures below.



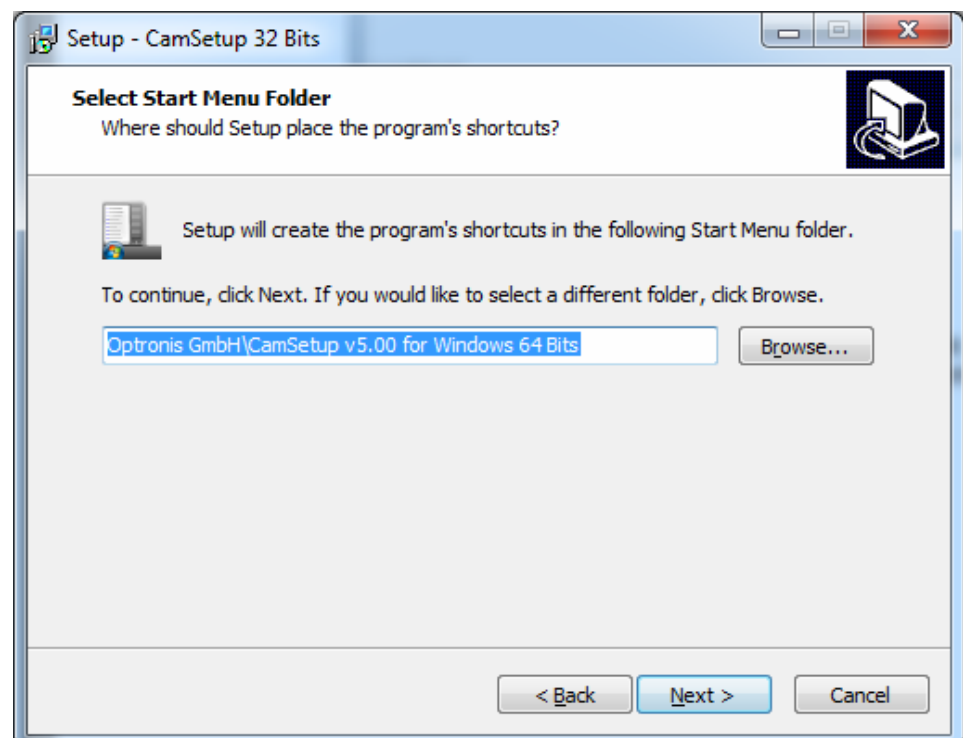
4. Choose CamSetup for Windows 32 bits or Windows 64 bits



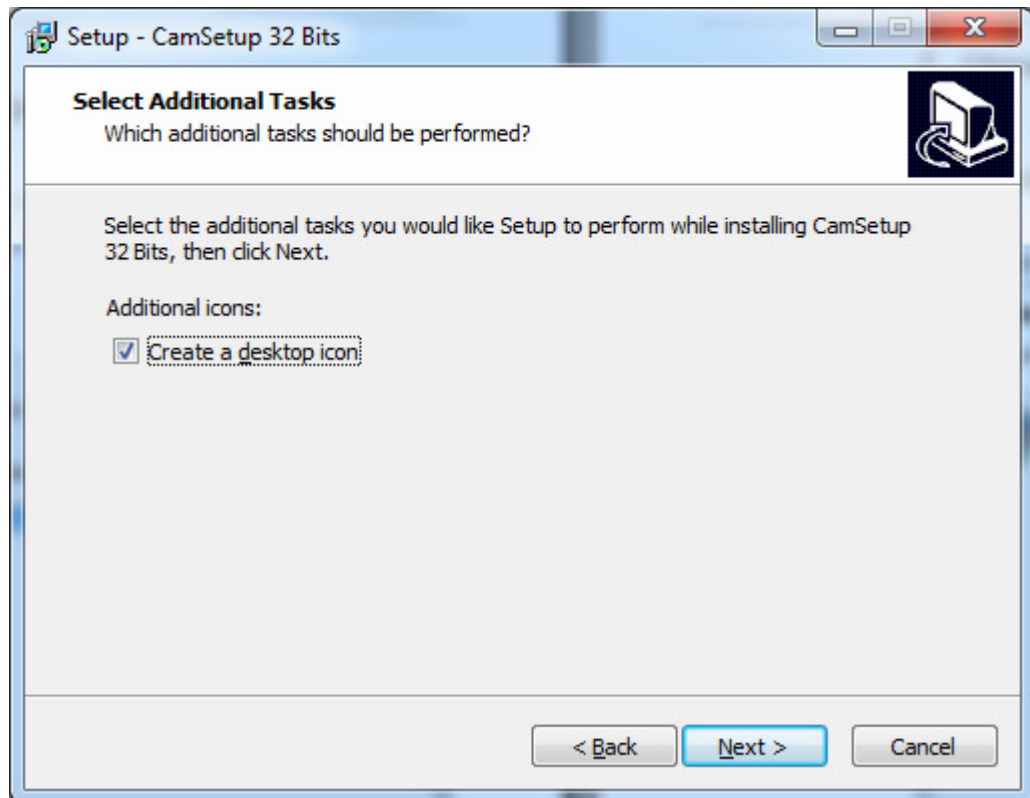
5. Choose "Next" if you would like to proceed or "Cancel" to stop the installation procedure.



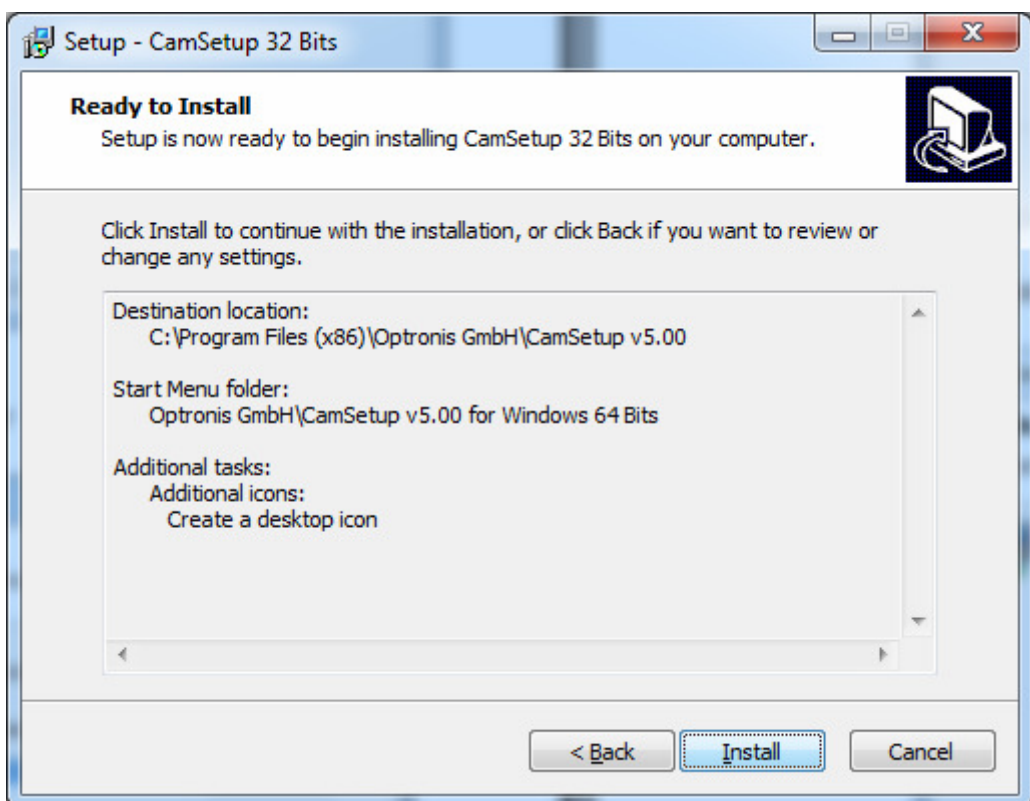
6. Choose software destination folder



7. Choose "Start Menu" destination folder



8. Choose if you want to create a desktop icon

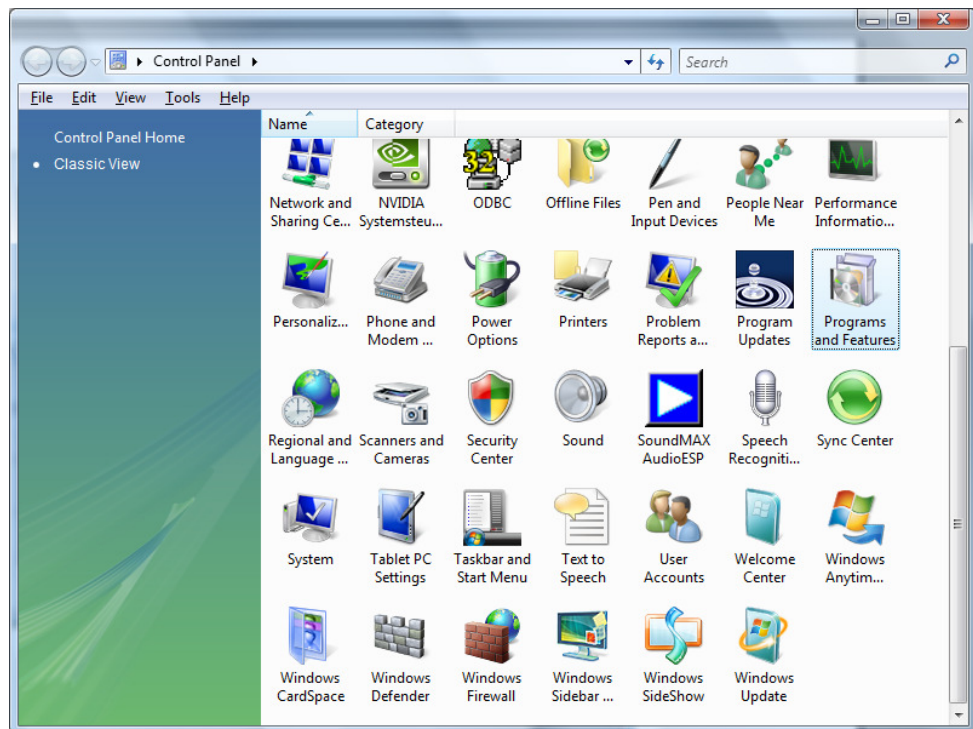


9. Software will be installed

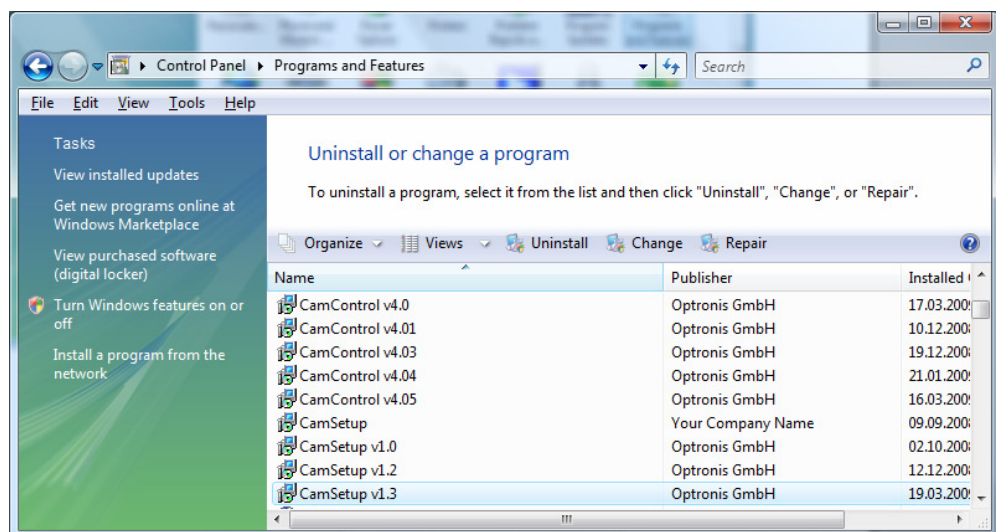
Uninstall

To uninstall the software please

1. Click on “Start/Settings/Control Panel” on the Windows desktop.
2. Double click the ‘Software’ icon (Programs and Features) in the system manager.

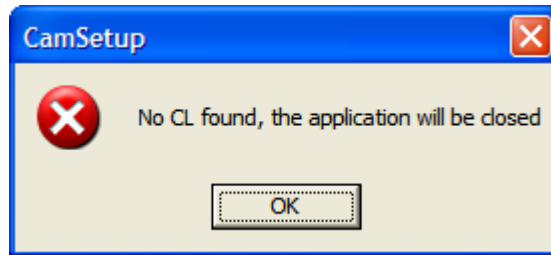


3. Select the ‘CamSetup 5.0’ software and remove it.



Starting the software

When starting the CamSetup Software, it will first be checked, if a CL600x2 or CL300x2 CameraLink camera is connected to the Personal Computer. When the software doesn't find a camera, a message will appear that no camera was found:



When a camera was found, the CamSetup application window will open.

As indicated in **Figure 1** the CamSetup application window consist of

1. a Title Bar,
2. a Slider Bar,
3. a Control Panel,
4. a Command Log,
5. and an Information Display.

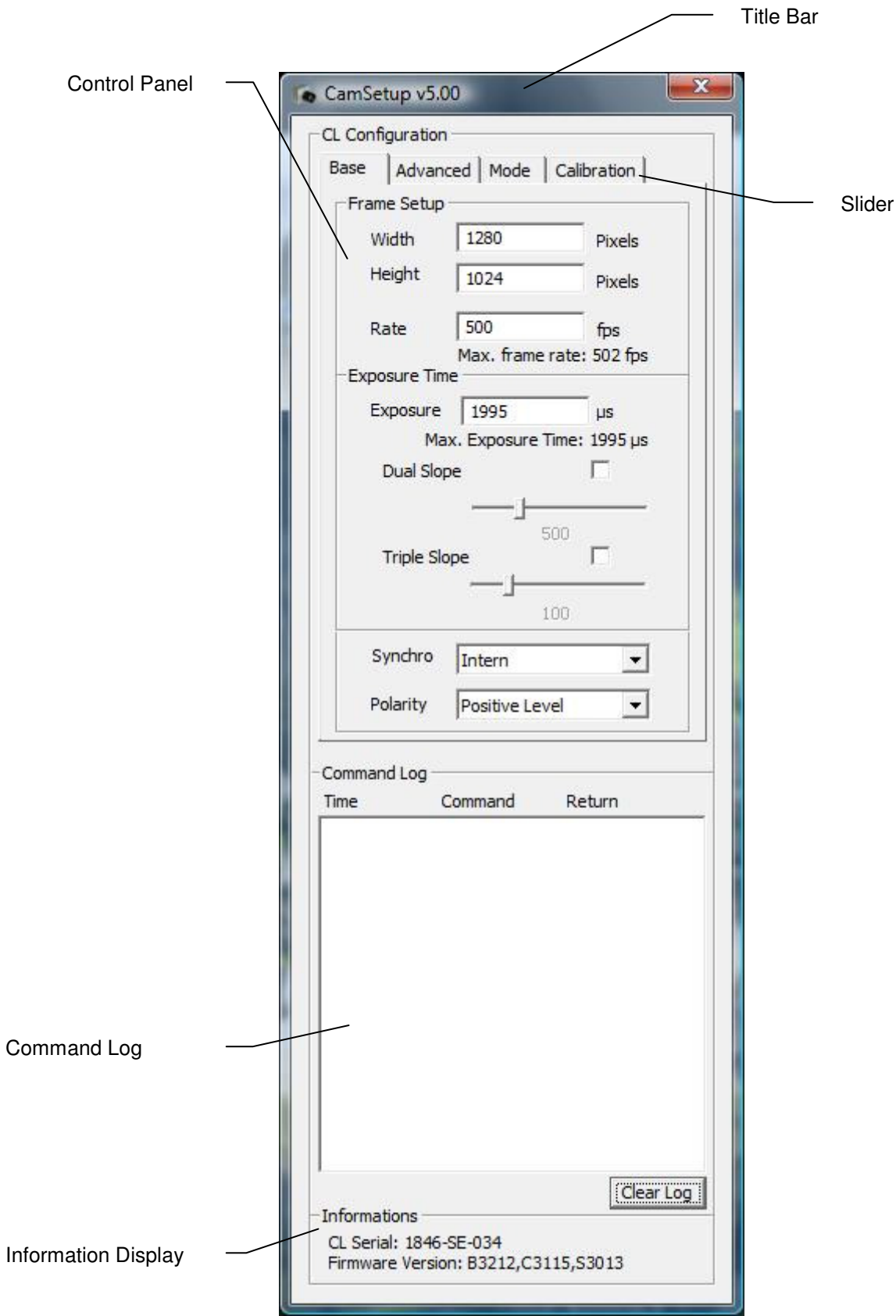
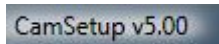


Figure 1: CamSetup Application Window

Title Bar



Name and Version of the Software



Closes the Application

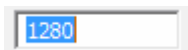
Right Click on the CamSetup v5.00 name opens a small dialog that allows to move and close the application, to show information on the Application and to move the application always on top of the screen.



Control Panel

Buttons

Insert Values



Insert Values and validate with "Return" button

Show / Hide



Activate / Hide Functions

Slide Bar



Shift left or right to change value

Open Combo Box



Open list of predefined values

Add Values



Add new values or Files

Command Log Panel

Allows to analyse the last 1000 Serial commands, sent to and received from the camera.

Clear Log

Clears the Log buffer.

Information Display

Shows the Serial Number of the CameraLink camera and its Firmware Version.

CL Serial: 1846-ST-063 Firmware Version: B3212,C3114,S3012

Base Control Panel

The screenshot shows a software window titled 'Base Control Panel' with the following settings:

- Frame Setup:**
 - Width: 1280 Pixels
 - Height: 1024 Pixels
 - Rate: 500 fps
 - Max. frame rate: 502 fps
- Exposure Time:**
 - Exposure: 1995 μ s
 - Max. Exposure Time: 1995 μ s
 - Dual Slope: ☐ (slider at 500)
 - Triple Slope: ☐ (slider at 100)
- Synchro:** Intern
- Polarity:** Positive Level

Frame Format

The CL600x2 and CL300x2 CameraLink camera allows to select horizontal frame format (width) in steps of 24 Pixel and vertical frame format (height) in steps of 2 Pixel. A special case is the value of 1280 Pixel (Modulo 16) in horizontal direction that adds 8 Pixel to the 1272 Pixel (Modulo 24).

Please respect also the specification of the frame grabber that allows perhaps only a Modulo 16 in horizontal direction.

Example:

Camera horizontal direction: Modulo 24 (24, 48, 72, 96 ...1272)

Special Case 1280 (Modulo 16)

Frame grabber horizontal direction: Modulo 16 (16, 32, 48, 64, ...1280)


Resulting possible horizontal frame format with camera and framegrabber: 48, 96, 144, ... 1248 (Special case: 1280 for the CR600x2 sensor)

Frame Rate

Allows to select free selectable frame rates (internal synchronisation). The frame rate is given in frames per second [fps].

The Frame Rate can be set from 20 fps (frames per second) to Max. frame rate that is indicated below the Frame Rate Value box.





The precision of the free running internal oscillator is 1 microsecond and determines the precision and absolute value of the free running Frame Rate. This leads –mainly at very high frame rates- to discrete frame rate steps:

Examples:

...

1/10 microseconds: 100000 fps

1/11 microseconds: 90909 fps

1/12 microseconds: 83333 fps

...

Please note, that with internal free running oscillator, only these discrete frame rates can be reached. Frame rates in between have to be generated in external synchronisation mode.

Frame Rates higher than the maximum rate are not accepted.

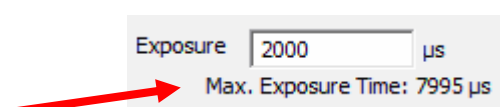
Exposure

Allows to select exposure times in microseconds [us].

Please note that in

- “external synchronisation” the dual slope feature of the sensor will be inactive.
- “external synchronisation” and “level detection mode” the exposure time is controlled by the external control signal.

The Exposure Time can be set from 1 microsecond (us) to Max. Exposure Time that is indicated below the Exposure Value box.



Exposure times higher than the maximum rate are not accepted.

Exposure Dual Slope

Allows to select the dual slope feature to increase the dynamic range of the sensor. The dual slope value can be selected between 1us and Exposure Time. This means, that after the dual slope time, the charge of the Pixels will be reset to about 60% of its maximum value.

Please note that in

- “external synchronisation” the dual and triple slope features of the sensor will be inactive.

Exposure Tripple Slope

Allows to select the tripple slope feature to increase the dynamic range of the sensor. The tripple slope value can be selected between 1us and the dual slope Time. This means, that after the tripple slope time, the charge of the Pixels will be reset to about 30% of its maximum value.

Please note that in

- “external synchronisation” the dual and triple slope features of the sensor will be inactive.

Synchronisation

Allows to change between internal and external synchronisation of the camera.

Internal synchronisation uses a camera internal time base for frame rate and exposure time.

External synchronisation uses a TTL signal on the Synchronisation Input of the Power connector to synchronise the camera to external frame rates and -detection mode dependent- to external exposure times.

Please read the External Synchronisation chapter in the CL600x2, CL300x2 cameralink camera manual for detailed external timing information.

Polarity (only for external Sync)

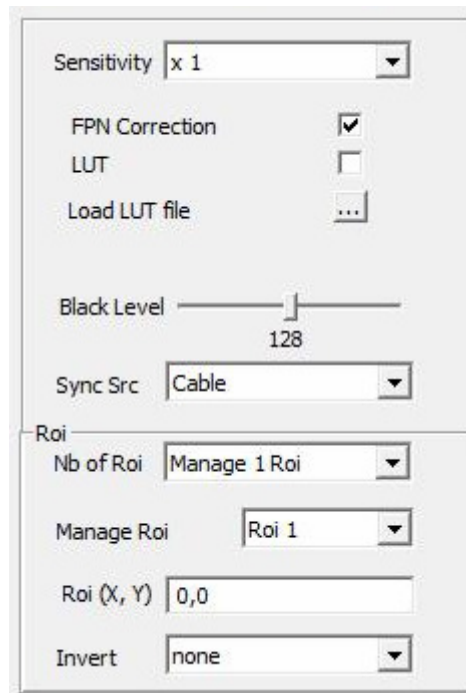
Allows to change between

- Positive Level
- Negative Level
- Positive Edge
- Negative Edge

Sync on edge uses the internal exposure time (Positive edge means that the exposure time starts with positive edge of the external Sync signal), Sync on level uses the TTL level state to determine the exposure time

(Positive level means that the exposure time starts and holds during positive level of the Sync signal).

Advanced Control Panel



Sensitivity x 1

FPN Correction ☒

LUT ☐

Load LUT file ...

Black Level 128

Sync Src Cable

Roi

Nb of Roi Manage 1 Roi

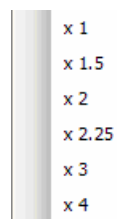
Manage Roi Roi 1

Roi (X, Y) 0,0

Invert none


Sensitivity

Allows to select the gain of the image sensor from factor 1x (lowest gain) to 4x (highest gain). Please note, that lowest gain (lowest sensitivity) generates images with best image quality and lowest noise. Highest gain (highest sensitivity) generates images with lower image quality and higher noise.



FPN Correction

Allows to switch Fixed Pattern Noise (FPN) correction on or off . Standard selection is FPN on. FPN on generates images with higher image quality.



FPN correction may switch off automatically when changing Frame

Format or Frame Rate. Please reactivate FPN correction if necessary.

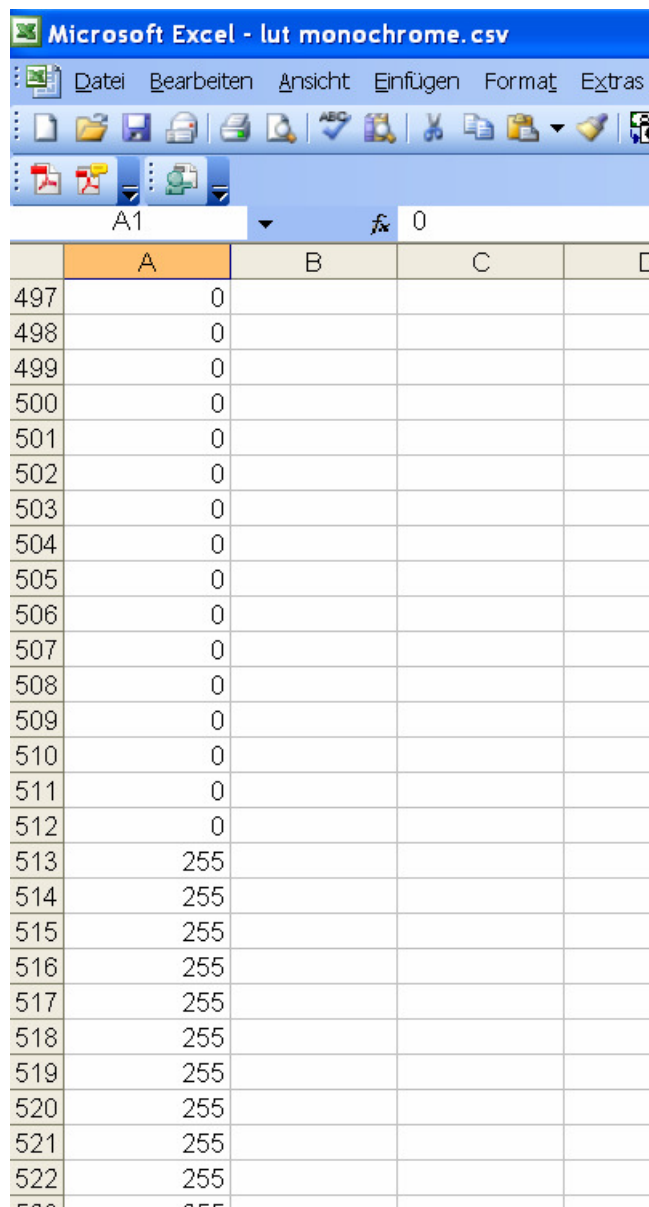
Please refer to following Application Note for more information about image quality:

AN Image Quality Noise CL600x2 english.pdf

LUT

LUT allows to load a 10bit to 8bit LUT into the camera. To do this, a generated Excel or Text file has to be opened and the LUT has to be set "on". To desactivate the LUT please set LUT to "off".

Excel example:



	A	B	C	D
497	0			
498	0			
499	0			
500	0			
501	0			
502	0			
503	0			
504	0			
505	0			
506	0			
507	0			
508	0			
509	0			
510	0			
511	0			
512	0			
513	255			
514	255			
515	255			
516	255			
517	255			
518	255			
519	255			
520	255			
521	255			
522	255			

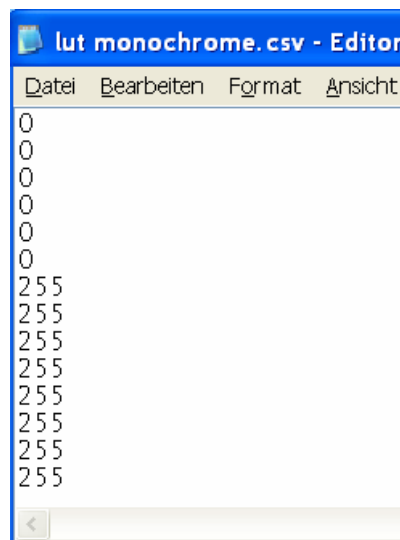
The image above shows an Excel example for a simple binarisation LUT. All intensity values from 0 to 511 (Excel: 1 to 512) are converted to a new intensity value of 0, all intensity values from 512 to 1023 (Excel: 513 to 1024) are converted to the maximum 8bit value of 255.

The file has to be saved as a “.csv” text file.

The corresponding text file will contain 1024 values in the order that the first value corresponds to 10bit “0” and the last value corresponds to 10bit “1023”. The values are separated by a carriage return.

Please note, that with a 10/8 bit LUT that has to be loaded into the camera the initialisation time period of the camera will increase.

Text file example:



In this example line 1 up to line 512 are covered by 0 values, line 513 up to line 1024 are covered by 255.

Black Level

Allows to fine adjust the black level of the camera. Allowed CamSetup black level values are selected between 0 and 255 whereas typical value is around 128.

The CamSetup black level value is an arbitrary value and is not directly related to the black level value of the image:

Increasing the CamSetup black level value increases black level value of the image. Reducing this value reduces black level to a certain minimum. Below this minimum level strong Fixed Pattern noise will appear.

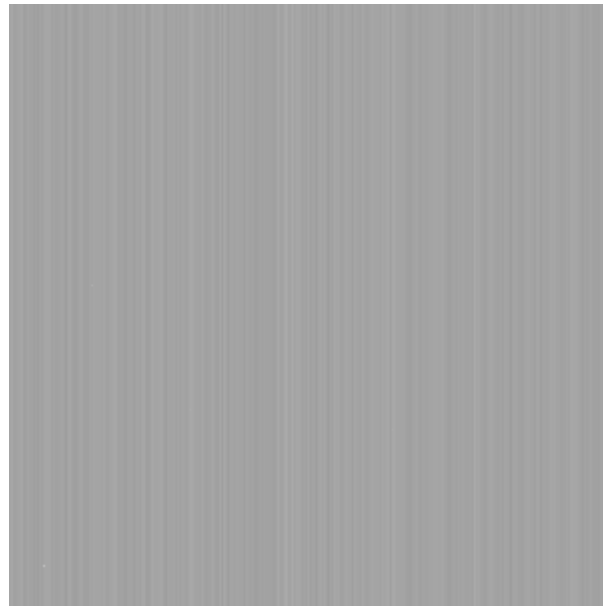


Figure: Strong Fixed Pattern Noise at Minimum of Black Level value

To avoid Fixed Pattern Noise as shown above, a higher black level value has to be selected.

When black level value has to be selected to lower values as limited by the Fixed Pattern Noise level (e.g. around 0), the 10 to 8 bit LUT has to be used:

Typical LUT function is the Original function (see red line on the figure below). Input grey levels from 0 to 1023 LSB are converted to 0 to 255 LSB at the output.

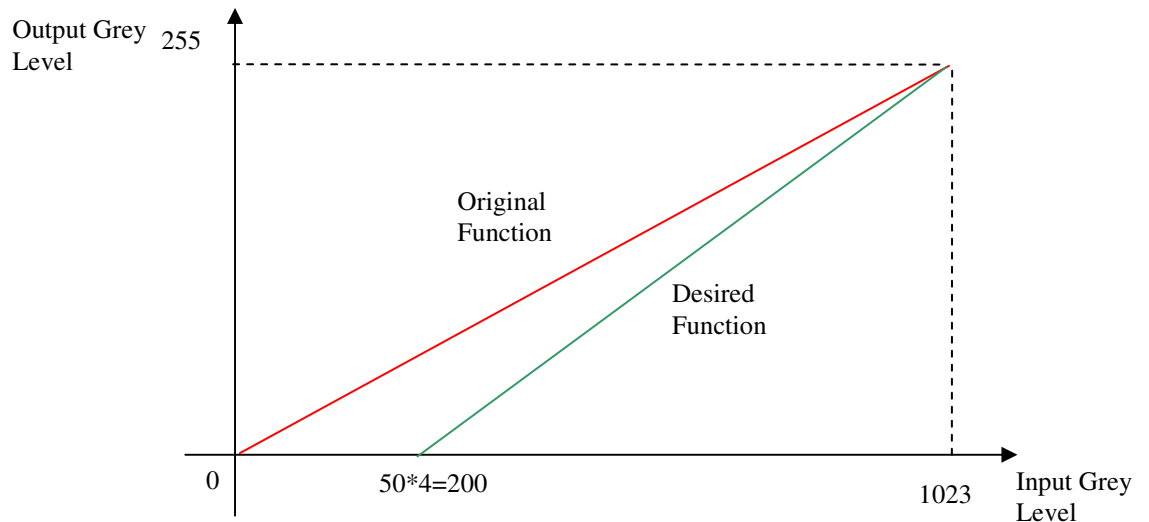
When e.g. input black level is around 200 LSB at 10 bits input level (equals 50 LSB at 8 bits output level), and the desired black level has to be 0, the desired function (green line on the figure below) has to be programmed into the camera: An input value of 200 LSB at 10 bits leads to an output value of 0 LSB. From 200 LSB to 1023 LSB the function is linear.



Black level changes the dark voltage reference of the image sensor. Best black level values range between 120 and 170 depending on Gain (Sensitivity) settings. Low values (typically below ~120) tend to saturate some Pixel to 0 LSB, High values (typically above 170) tend to saturate some Pixel to 1023 LSB. In both situations, FPN correction may fail and may add vertical stripes to the image.

Black Level for Gain 1 is mostly uncritical and ranges at typically 128. Black level for higher Gain up to 4 becomes more critical and has to be

analysed in detail. Here typically higher values (> 128) are suggested to avoid Pixel saturation below 0. But as higher values may lead to Fixed Pattern in the upper saturation range, it is suggested to use then the Look up table to fit the output range to usefull range of the sensor.



The LUT Excel file is generated corresponding to the mathematical function: $y = m \cdot x - c$ whereas

m : corresponds to the slope of the desired function.

x : corresponds to the input grey level

y : corresponds to the output grey level

c : corresponds to the output grey level offset at $x = 0$

The mathematical formula for the Excel sheet is as follows:

$y = 0$ for input values from 0 to 200 and

$y = (255 / (1024 - 200)) \cdot \text{cell}() - 61,893$ for the linear function from 201 to 1023

	A	B
1	0	
2	0	
3	0	
4	0	
5	0	
6	0	
7	0	
8	0	
9	0	
10	0	
11	0	
12	0	
13	0	
14	0	
15	0	
16	0	
17	0	
18	0	
19	0	

	A	B
193	0	
194	0	
195	0	
196	0	
197	0	
198	0	
199	0	
200	0	
201	0	
202	1	
203	1	
204	1	
205	2	
206	2	
207	2	
208	2	
209	3	
210	3	
211	3	
212	4	
213	4	
214	4	
215	5	
216	5	
217	5	
218	6	
219	6	
220	6	
221	6	

Sync Source

Perform external Sync by CC1 pin of the frame grabber or by the Sync External Pin of the camera connector.

ROI

It can be selected up to 4 ROIs, that are readout sequentially. Please refer to the frame grabber user manual, to readout and store ROIs sequentially.

Invert

Images that are readout by the sensor can be mirrored or flipped in X and Y direction.

Mode Control Panel

CameraLink Mode

CameraLink Mode allows to configure the CameraLink interface of the CL600x2 camera. CameraLink Mode allows to select Base, Medium and Full CameraLink with 8bits data format or 10 bits data format.

- base : 2 x 8 bits
- base : 2 x 10 bits
- medium : 4 x 10 bits
- full : 8 x 8 bits

Please note, that CameraLink interface selection of both, the CL600x2 camera and the frame grabber have to be identical.

Factory Mode

The Factory Mode allows to select predefined camera setups, that are stored inside the CL600x2, CL300x2 CameraLink cameras. 8 factory modes are predefined (a .. h).

User Mode

Allows to select one out of 8 individual User Modes (Mode 0..7).

Set Current Mode as Startup

Allows to store the actual Factory or User Mode as Startup Mode

Reload Startup Mode

Restores the Startup Mode (Set all parameters of Startup Mode)

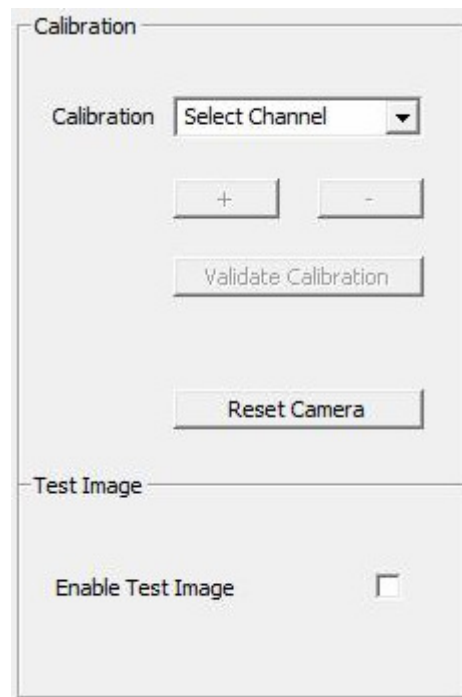
Record Mode

Stores the actual parameter set to one of the User Modes 0..7.

Data Frequency

Sets the Clock frequency of the CameraLink data to 66, 75 or 85 MHz.
Please note, that maximum performance is achieved at 85MHz.

Calibration Control Panel



The Calibration Control Panel is a software interface for camera calibration. It is divided into two main sections: 'Calibration' and 'Test Image'. The 'Calibration' section contains a 'Select Channel' dropdown menu, two buttons labeled '+' and '-', a 'Validate Calibration' button, and a 'Reset Camera' button. The 'Test Image' section contains a checkbox labeled 'Enable Test Image' which is currently unchecked.

Enable Test Image

Test Image allows to generate a grey-scale pattern to check the CameraLink Interface. When the test image is switched on, the image sensor is disactivated and a pattern image is generated. When the Test Image is disactivated (off), the image sensor is activated. This mode is the normal operation mode.

Enable Test Image allows to check data communication of the CameraLink communication channel (See Calibration)

Calibration

Fine Adjust the Clock signal of channel 2 and channel 3 of the CameraLink communication channels. This should be done, if salt and pepper noise appears in the image (See Enable Test Image).

Appendix

Customer Service

For any questions or problems, please do not hesitate to ask our customer service:

Optronis GmbH
Honsellstrasse 8
77694 Kehl
Tel: +49 (0) 7851 9126 0
Fax: +49 (0) 7851 9126 10
e-mail: info@optronis.com

In case of problems please prepare the following informations:

- Name of the device:
(e.g. CamRecord CL600x2, CL300x2)
- Serial-Number:
(back side of the camera)
- Operating System:
 Windows XP
 Windows Vista
 Windows 7
 32 bits or 64 bits
- Software Version:
(See Principal Bar on the CamSetup Software)
- Frame Grabber
- Short description of the problem

Frame Grabber Examples

Dalsa (example: Xcelera-CL PX4)

National Instruments (example: NI PCIe - 1429)

Silicon Software (example: MicroEnable IV AD4CL, VD4CL)

Bitflow (example: Karbon KBN-PCE-CL4-F-IP4)