Basler ace

INSTALLATION AND SETUP GUIDE FOR CAMERA LINK CAMERAS

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BASLER
the power of sight

For customers in the USA

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

You are cautioned that any changes or modifications not expressly approved in this manual could void your authority to operate this equipment.

The shielded interface cable recommended in this manual must be used with this equipment in order to comply with the limits for a computing device pursuant to Subpart B of Part 15 of FCC Rules.

Export compliance

The pylon Camera Software Suite is not listed on the U.S. Commerce Control List (CCL) and does not require a license to be exported or re-exported. It does not have a specific export control classification number (ECCN) and is therefore designated as EAR99.

For customers in Canada

This apparatus complies with the Class A limits for radio noise emissions set out in Radio Interference Regulations.

Pour utilisateurs au Canada

Cet appareil est conforme aux normes Classe A pour bruits radioélectriques, spécifiées dans le Règlement sur le brouillage radioélectrique.

Life support applications

These products are not designed for use in life support appliances, devices, or systems where malfunction of these products can reasonably be expected to result in personal injury. Basler customers using or selling these products for use in such applications do so at their own risk and agree to fully indemnify Basler for any damages resulting from such improper use or sale.

Warranty note

Do not open the housing of the camera. The warranty becomes void if the housing is opened.

Contacting Basler Support Worldwide

Europe

Basler AG
An der Strusbek 60-62
22926 Ahrensburg
Germany

Tel. +49 4102 463 515
Fax +49 4102 463 599

support.europe@baslerweb.com

The Americas

Basler, Inc.
855 Springdale Drive, Suite 203
Exton, PA 19341
USA

Tel. +1 610 280 0171
Fax +1 610 280 7608

support.usa@baslerweb.com

Asia

Basler Asia Pte. Ltd.
35 Marsiling Industrial Road 3
#05-06
Singapore 739257

Tel. +65 6367 1355
Fax +65 6367 1255

support.asia@baslerweb.com

www.baslerweb.com

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1 Introduction

The procedures in this guide assume that you want to get your camera operational and begin capturing images as quickly and as simply as possible. Accordingly, the procedures describes the installation for one camera in a test setup on a desktop.

The procedures also assume that you will be using the Basler pylon Camera Software Suite to set the parameters on your camera and that you will only have Camera Link cameras connected to your computer.

1.1 General Preparations

Make sure that the following items are available before starting installation:

- A Basler ace Camera Link camera.
- The appropriate Camera Link cables. If you will be supplying power to the camera via Power over Camera Link (PoCL), make sure that the cables are specified for use with PoCL.
- If you are not using PoCL to supply power to the camera, obtain a power supply for the camera. Make sure that the power supply meets all of the requirements listed in the *Basler ace User's Manual for Camera Link Cameras* (AW000985).
- An appropriate C-mount lens.

  If you already know which lens you will be using in your application, use this lens. Otherwise, we suggest that you use a zoom lens for your initial testing and setup. If you need assistance in determining the best lens for your application, contact Basler technical support. The contact numbers appear in the title pages of this guide.
- A PC equipped with an appropriate Camera Link frame grabber.

  The PC must be equipped with a 32-bit or 64-bit Windows 7/8/8.1 operating system or Linux (from Kernel 2.6).

  The software installation procedures in this guide describe the installation of the pylon Camera Software Suite for Windows. For information about installing pylon for Linux, see the INSTALL text document that is included in the pylon for Linux installation packages.

  The frame grabber must support at least the base Camera Link configuration. It also should be able to handle a camera with an 82 MHz Camera Link pixel clock (see Section 1.2 on page 2).

You should perform the hardware installation first and the software installation second.

1.2 Frame Grabber Preparations

The camera installation procedures assume that you have already installed a Camera Link frame grabber in your PC, that you have properly installed all software included with the frame grabber, and that you understand how your frame grabber operates.

To correctly use a Camera Link camera, you must be thoroughly familiar with the operation of your frame grabber.

All ace Camera Link models have a default Camera Link clock speed of 82 MHz, however, not all frame grabbers are compatible with a clock speed this high. You should check the documentation for your frame grabber and make sure that it can operate at a 82 MHz pixel clock speed. If it cannot, the clock speed on the camera can be changed to 32.5 MHz, 48 MHz, or 65 MHz.

For more information about changing the Camera Link pixel clock speed, see the *Basler ace User's Manual for Camera Link Cameras* (AW000985).

1.2.1 Location of the Serial Port File

All Camera Link compliant frame grabbers must be supplied with a DLL file which describes the characteristics of a serial port that is built into the frame grabber. This serial port is used for communication between your PC and your camera via the Camera Link interface.

The name of the file supplied by the frame grabber manufacturer will have the form **clser***.dll.

For 32-bit and 64-bit versions of your frame grabber's DLL, *** is determined by the manufacturer of the grabber and usually represents the manufacturer's name. For example, a frame grabber made by the "Acme" company may supply a file called **clseracm.dll**.

In the standard case, your frame grabber's DLL will be located at the following path: **%Program Files%\CameraLink\Serial**

The frame grabber software should take care that the DLL file is located correctly for the PC-to-camera communication via the serial port. If no communication can be established, check whether the DLL file is located at the path specified by the Windows registry key **HKEY_LOCAL_MACHINE\SOFTWARE\CameraLink\CLSerialPath**. If the DLL file is not at this location, contact the frame grabber vendor.

1.2.2 Frame Grabber "Camera Files"

For your camera to operate properly with your frame grabber, you must install the correct frame grabber "camera file". In essence, the camera file informs the frame grabber about how the pixel information coming from the camera will be ordered and about the bit depth of the pixel data. Depending on the frame grabber supplier, there can be a separate camera file for each combination of camera model and pixel data format or a camera file may cover several different camera models.

Typically, each frame grabber supplier has a different naming scheme for their camera files. For example, Matrox refers to the camera files for their grabbers as "Digital Configuration Files" or DCF files and National Instruments refers to theirs as "Interface Camera Descriptors" or ICD files. Camera files appropriate for the ace must be supplied by your frame grabber manufacturer. If you don't have the camera files for your frame grabber, you can usually find them at the supplier's web site.

Once you have the camera files, there are three things you must keep in mind:

- The camera file you obtain and install must be appropriate for the pixel data format setting and Camera Link tap geometry setting that you will be using on your camera. Refer to the *Basler ace User's Manual for Camera Link Cameras* (AW000985) for information about available pixel data formats and tap geometries.
- The camera file must be installed in the correct location on your PC. This location varies depending on your frame grabber supplier. Consult the documentation for your frame grabber to determine where the camera files should be installed.
- The camera must be set for your desired pixel data format and tap geometry. You can set the camera's pixel data format and tap geometry using the pylon software you will be installing later in this guide.

2 Hardware Installation

2.1 Avoiding EMI and ESD Problems

The cameras are frequently installed in industrial environments. These environments often include devices that generate electromagnetic interference (EMI) and they are prone to electrostatic discharge (ESD). Excessive EMI and ESD can cause problems with your camera such as false triggering or can cause the camera to suddenly stop capturing images. EMI and ESD can also have a negative impact on the quality of the image data transmitted by the camera.

To avoid problems with EMI and ESD, you should follow these general guidelines:

- Always use high quality shielded cables. The use of high quality cables is one of the best defenses against EMI and ESD.
- Try to use camera cables that are the correct length and try to run the camera cables and power cables parallel to each other. Avoid coiling camera cables. If the cables are too long, use a meandering path rather then coiling the cables.
- Avoid placing camera cables parallel to wires carrying high-current, switching voltages such as wires supplying stepper motors or electrical devices that employ switching technology. **Placing camera cables near to these types of devices may cause problems with the camera.**
- Attempt to connect all grounds to a single point, e.g., use a single power outlet for the entire system and connect all grounds to the single outlet. This will help to avoid large ground loops. Large ground loops can be a primary cause of EMI problems.
- Use a line filter on the main power supply.
- Install the camera and camera cables as far as possible from devices generating sparks. If necessary, use additional shielding.
- Decrease the risk of electrostatic discharge by taking the following measures:
  - Use conductive materials at the point of installation (e.g., floor, workplace).
  - Use suitable clothing (cotton) and shoes.
  - Control the humidity in your environment. Low humidity can cause ESD problems.

The Basler application note called *Avoiding EMI and ESD in Basler Camera Installations* provides much more detail about avoiding EMI and ESD.
The application note can be downloaded from the Basler website:
www.baslerweb.com

2.2 Hardware Installation Procedure

2.2.1 Precautions

NOTICE

Avoid dust on the sensor.

- The camera is shipped with a protective plastic cap on the lens mount. To avoid collecting dust on the camera's IR cut filter (color cameras) or sensor (mono cameras), make sure that you always put the protective cap in place when there is no lens mounted on the camera.
- Every time you remove or replace the plastic cap, a lens, or lens adapter, make sure that the camera is pointing down.
- Never apply compressed air to the camera. This can easily contaminate optical components, particularly the sensor.

NOTICE

On all cameras, the lens thread length is limited.

All cameras (mono and color) are equipped with a plastic filter holder located in the lens mount. The location of the filter holder limits the length of the threads on any lens you use with the camera. If a lens with a very long thread length is used, the filter holder or the lens mount will be damaged or destroyed and the camera will no longer operate properly.

NOTICE

If you are supplying power to the camera via Power over Camera Link (PoCL), you must use a PoCL compliant frame grabber and you must use Camera Link cables that are specifically designed for PoCL as specified in the Camera Link standard. Failure to use a PoCL compliant frame grabber or the correct cables can result in severe damage to the camera.

If you are supplying power to the camera via the 4-pin M5 connector, the voltage of the power to the camera must be between +10.8 VDC and +13.2 VDC.

- If the voltage is greater than +13.2 VDC, severe damage to the camera can result.
- If the voltage is less than +10.8 VDC, the camera may operate erratically.

Applying power with the wrong polarity can result in severe damage to the camera.

NOTICE

Making or breaking Camera Link connections incorrectly can severely damage the camera.

- If you are supplying power to the camera via the Camera Link connection (PoCL), be sure that the power to the frame grabber is switched off before you connect or disconnect the Camera Link cables.
- If you are supplying power to the camera via the 4-pin M5 connector, switch off the power to the connector before you connect or disconnect the Camera Link cables.

NOTICE

The camera's GPIO line can be set to operate as an input or as an output. Applying incorrect electrical signals to the camera's GPIO line can severely damage the camera.

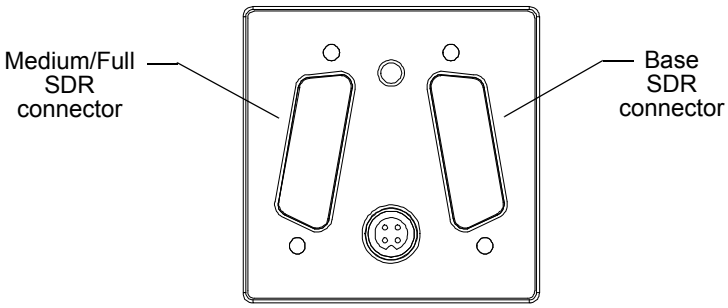
- Before you connect any external circuitry to the GPIO line, we strongly recommend that you set the GPIO line to operate as an input or as an output (according to your needs).
- Once the line is set, make sure that you only apply electrical signals to the line that are appropriate for the line's current setting.

2.2.2 Hardware Installation Steps When Powering the Camera Via Power Over Camera Link (PoCL)

To install the camera hardware using a PoCL cable:

1. **Make sure the power to the host PC that contains your frame grabber is switched off.**
2. Remove the plastic cap from the lens mount on the camera and mount a lens on the camera.
3. Mount the camera in your test setup.
4. Plug one end of a Camera Link cable into the base SDR connector on the camera and the other end of the Camera Link cable into the base configuration connector on your frame grabber.
5. Plug one end of a Camera Link cable into the medium/full SDR connector on the camera and the other end of the Camera Link cable into the medium/full configuration connector on your frame grabber.

   If you will be operating the camera in a fashion that only requires the base Camera Link configuration, it is not necessary to attach a cable to the medium/full connector. For more information about which camera uses which configuration, see the *Basler ace User's Manual for Camera Link Cameras* (AW000985).



6. Use the locking screws built into the Camera Link cable connectors to securely fasten the connectors to the camera and to the frame grabber. **If the connectors are loose, they will cause problems with your images and may cause electrical problems that can damage the camera.**
7. Switch on the power to your host PC and let the PC boot up.

Hardware installation is complete. Go to the software installation procedure that starts on page 9.

2.2.3 Hardware Installation Steps When Powering the Camera with a Separate Power Supply

To install the camera hardware using a separate power supply:

1. **Make sure the power to the host PC that contains your frame grabber is switched off.**
2. Remove the plastic cap from the lens mount on the camera and mount a lens on the camera.
3. Mount the camera in your test setup.
4. If you obtained the power supply for your camera directly from Basler:
   a. Make sure that the power supply **is not** plugged into an AC outlet. (The power supply must not have AC power applied to it at this point.)
   b. Connect the plug on the power supply's output cable to the 4-pin power connector on the camera. Make sure that the screw lock on the connector is securely fastened to the camera.
   c. Go on to step 5.

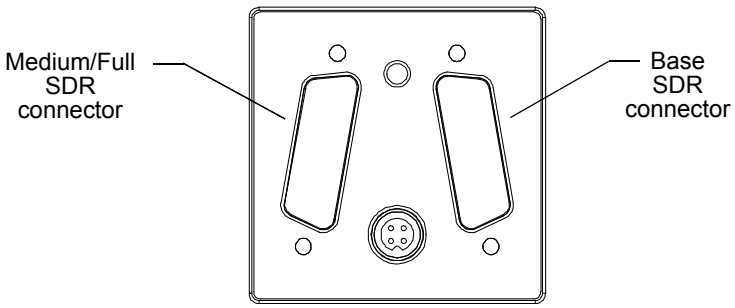
   If you are using a power supply that was not obtained from Basler:
   a. Refer to the Interface chapter in the *Basler ace User's Manual for Camera Link Cameras* (AW000985) and locate the following information:
      - Camera input power information. Make sure that your power supply can meet the input power requirements.
      - Power connector information. Make sure that the output cable on your power supply is correctly wired and that the cable is terminated with the proper type of plug. **If the cable is miswired or the incorrect plug is used, severe damage to the camera can result.**
   b. Make sure that the power supply **is not** connected to an AC outlet.

c. Connect the plug on the power supply's output cable to the 4-pin power connector on the camera. Make sure that the screw lock on the connector is securely fastened to the camera.

d. Go on to step 5.

5. Plug one end of a Camera Link cable into the base SDR connector on the camera and the other end of the Camera Link cable into the base configuration connector on your frame grabber.
6. Plug one end of a Camera Link cable into the medium/full SDR connector on the camera and the other end of the Camera Link cable into the medium/full configuration connector on your frame grabber.

   If you will be operating the camera in a fashion that only requires the base Camera Link configuration, it is not necessary to attach a cable to the medium/full connector. For more information about which camera uses which configuration, see the *Basler ace User's Manual for Camera Link Cameras* (AW000985).



7. Use the locking screws built into the Camera Link cable connectors to securely fasten the connectors to the camera and to the frame grabber. **If the connectors are loose, they will cause problems with your images and may cause electrical problems that can damage the camera.**
8. Switch on the power to your host PC and let the PC boot up.
9. Apply AC power to the camera power supply.

Hardware installation is complete. Go to the software installation procedure that starts on page 9.

3 Software Installation

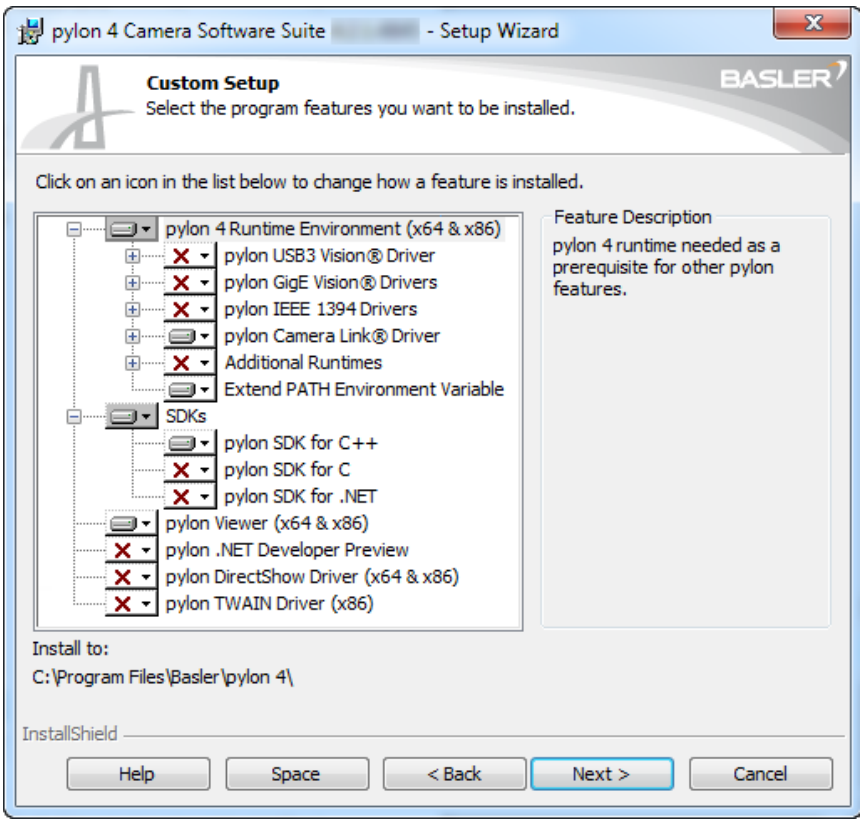
3.1 Installing the Basler pylon Camera Software Suite

To install the Basler pylon Camera Software Suite:

1. If you have old Basler pylon software installed on your system, make sure to uninstall the software. For more information about uninstalling Basler pylon software, see Section 4 on page 11.
2. Close all open Windows based applications on your computer. **We most strongly recommend that you close all open applications now.**
3. Download the installer from the Basler website (www.baslerweb.com) to a local directory on your computer. For possible installer names, see Section 3.2 on page 6.
4. Close all open applications.
5. Launch the downloaded installer.
6. In the **Setup Wizard**, on the **Welcome** page, click **Next**.
7. On the **License Agreement** page, accept the agreement and click the **Next** button.
8. On the **Customer Information** page, enter the appropriate information and click the **Next** button.
9. On the **Destination Folder** page, determine the directory where you want to install the software to and click the **Next** button.
10. On the **Custom Setup** page, a list of program features is displayed.
    a. Deselect the features of the pylon software that you do not want to install.
    b. Only select those features of the pylon software you want to install.

    The example shown below assumes that you install the 64-bit version of the Basler pylon software, that you will only use Camera Link cameras, and that your applications and software development only use C++.

    See Section 3.3 on page 7 for information about the software features and recommendations about combining software features for installation.



	The deselected software features will not be installed. However, if you want, you can easily install them later. For more information, see Section 9.1 on page 93.

11. Click the **Next** button.
12. On the **Ready to Install the Program** page, click the **Install** button.
13. On the **Setup Wizard Completed** page, click the **Finish** button.

    The installation program has added a shortcut on the desktop for the **pylon Viewer**.
14. Check the installed software features:
    - Windows 7: Click **Start** > **All Programs** > **Basler** > **pylon 4 Camera Software Suite**.
    - Windows 8 or 8.1: Right-click on the bottom-left corner of the screen, then click **Search** to open the Apps view. You can find the installed software features in the **Basler** group.

The Basler pylon software installation is complete.

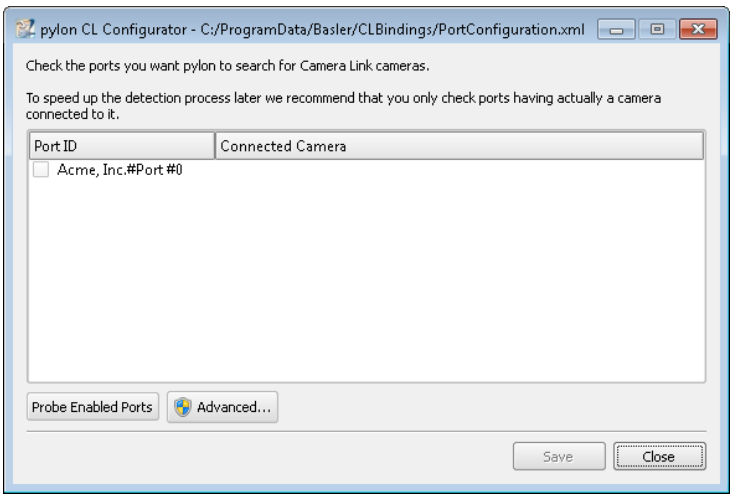
3.2 Configuring the Camera Link Serial Port

To communicate with the camera, the pylon Camera Software Suite uses a serial port that is built into the Camera Link interface on your frame grabber. Before the pylon software can communicate with the camera, you must configure the serial port.

To configure the Camera Link serial port:

1. Open the pylon CL Configurator:
   - Windows 7: Double-click the **pylon CL Configurator** icon on your desktop.
   - Windows 8 or 8.1: Click the **pylon CL Configurator** icon on the Start screen.
2. A **pylon CL Configurator** window will open as shown below. The following figure shows the **pylon CL Configurator** window for the 64-bit version of the Basler pylon software as an example.

   A list of ports that are supported by the Camera Link interface will be displayed in the window.

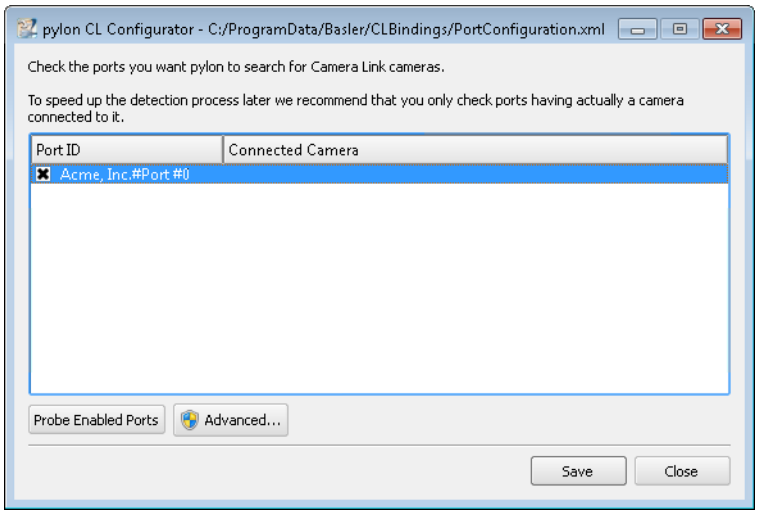


	If you use a 64-bit operating system: The CL Configurator and pylon Viewer in use and the **clser***.dll** files must match. Otherwise the ports will not be displayed: - You must run the 32-bit versions of the CL Configurator and Viewer if 32-bit versions of your frame grabber's **clser***.dll** files are installed. - You must run the 64-bit versions of the CL Configurator and Viewer if 64-bit versions of your frame grabber's **clser***.dll** files are installed. If, for example, you are running the 32-bit version of the CL Configurator and the ports are not displayed, run the 64-bit version of the CL Installer to display ports that are related to 64-bit versions of **clser***.dll** files.

3. Determine which port will be used for communication between the PC and the camera. Usually, this will be the port that is built into the frame grabber. For the port on the frame grabber, you will typically see the name of the frame grabber manufacturer included as part of

the port name. In the example shown below, we are using a frame grabber from the "Acme" company, and "Acme" is included as part of the port name.

Select the port that you want to use as shown below.



	In the following step, you will be probing ports to see if cameras are attached. We suggest that you only probe the ports that you will be using to communicate with a Camera Link camera running with Basler pylon software. Probing a port that has a device other than a Camera Link camera running with Basler pylon connected to it may change the configuration of the port and may cause the device to stop operating correctly.

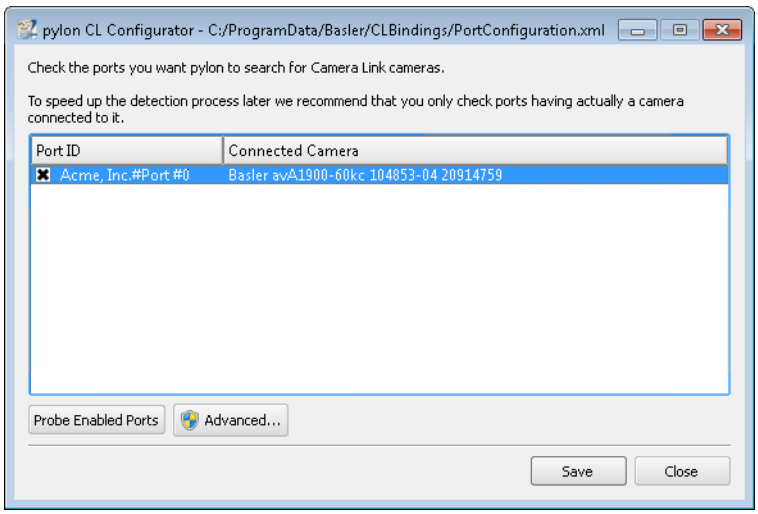
4. Click the **Probe Enabled Ports** to probe the selected port(s).
This will probe the selected port(s) to see if a camera is connected to the port. When the port is probed, the port configuration will be changed as required and the CL Configurator will attempt to establish communication with any camera connected to the port.

	You can also probe an individual port by right clicking on a port ID in the list and clicking on **Probe this port** from the menu that appears.

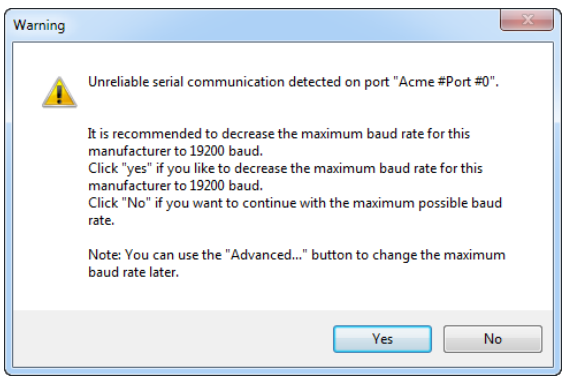
The selected port(s) will be probed. This may take up to approximately one minute for each port.

During the probing, the CL Configurator will test whether data can be reliably transmitted from the camera at the maximum possible baud rate supported by the frame grabber.

If a camera is detected, it will be indicated in the **pylon CL Configurator** window.



If an error is detected, the test will be repeated at successively lower baud rates until a maximum baud rate is found where all data are reliably transmitted. When this is achieved, a warning message will open informing that data is not reliably transmitted at the maximum possible baud rate:



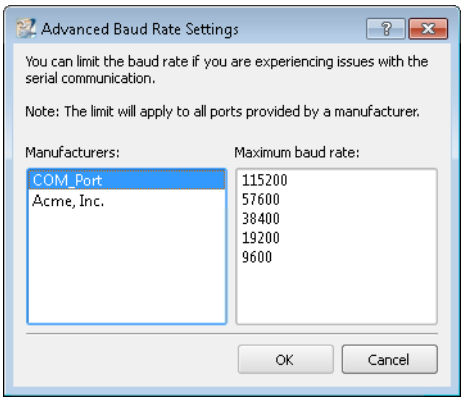
5. If the warning message opens, take the following steps to ensure the most efficient data transmission:
   a. Check connectors and cable of the serial connection.
   b. Obtain, if available, an updated **clser***.dll** file from the frame grabber manufacturer.

	You need administrative privileges to change the baud rate in the next step.

   c. Click **Yes**. This will automatically set a maximum baud rate for the port where reliable data transmission is ensured. If you click **No**, the maximum possible baud rate supported by the frame grabber will be used but reliable data transmission is not ensured.
   d. If you want to set the baud rate manually, click the **Advanced...** button in the **pylon CL Configurator** window.

	You need administrative privileges to use the Advanced Baud Rate Settings window.

The **Advanced Baud Rate Settings** window opens.



Select a frame grabber manufacturer in the left pane and set a maximum baud rate in the right pane. The set maximum baud rate will apply for all ports related to the selected manufacturer.

e. Click **OK** to save the settings and close the window.

6. Click the **Save** button to save the port configuration and click the **Close** button to close the CL Configurator.

4 Next Steps

4.1 Accessing Information about Acquiring Images and Configuring Your Camera

To acquire your first images and to configure your camera, we suggest that you use the **pylon Viewer** software.

	For Camera Link cameras, the pylon Viewer can only be used for camera configuration. Images will not be displayed.

Information about

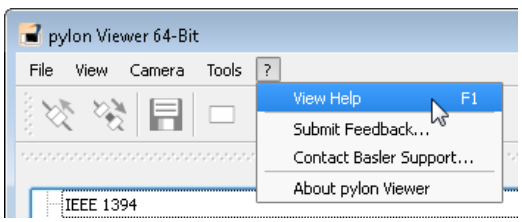
- how to acquire images,
- how to make camera settings more suitable for your specific application, and
- how to optimize your image quality,

can be found in the **online help** of the pylon Viewer.

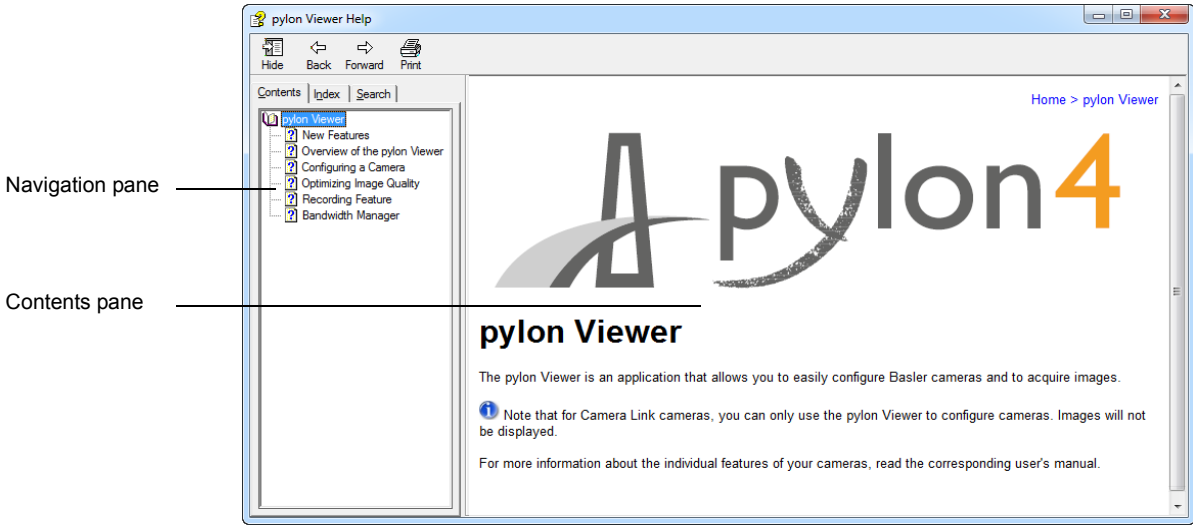
To access the online help of the pylon Viewer:.

1. Open the pylon Viewer:
   - Windows 7: Double-click the **pylon Viewer** icon on your desktop.
   - Windows 8 or 8.1: Click the **pylon Viewer** icon on the Start screen.

   The pylon Viewer window opens.
2. Click **?** > **View Help** in the menu bar of the pylon Viewer. For quick access, press the **F1** key.



The online help window opens.



3. Click on an entry in the navigation pane to display a specific topic.

For information about

- how to acquire images and to make camera settings more suitable for your specific application, read the **Configuring a Camera** topic.
- how to optimize your image quality, read the **Optimizing Image Quality** topic.

4.2 Additional Camera Settings

We assume that you have succeeded in acquiring images and setting the camera's basic parameters using the pylon Viewer and that you were able to optimize the image quality.

To meet the requirements of your application, you will likely need to change additional camera settings and to modify earlier camera settings.

Refer to the Features chapter in the *Basler ace User's Manual for Camera Link Cameras* (AW000985) for details about additional camera settings.

Contact Basler technical support if you need more assistance. The contact numbers appear in the title pages of this manual.

If you have not already done so, implement the typical conditions of operation as required by your application before proceeding with the next steps. In particular, choose the lens and the illumination required by your application.

Before making the additional camera settings, you must know the requirements for your application regarding depth of field, image acquisition rate, size of the AOI, and contrast. And you must know what the priority of the requirements are since some of the settings depend on each other or have opposite effects.

Your next steps will involve some or all of the following:

- Selecting the pixel data format.
- Selecting a triggering scheme and an exposure control mode.
- Fine tuning the exposure time.
- Defining an AOI.
- Enabling and parameterizing other features available on your specific camera model.
- Configuring the camera from within your application program using the pylon API or using direct register access.

Revision History

Doc. ID Number	Date	Changes
AW00099601000	6 Jun 2011	Initial release of this document.
AW00099602000	2 Mar 2015	Minor corrections and modifications throughout the manual. Added document identification number in the headers. Updated e-mail addresses for technical support. Updated Basler contact address for Asia. Added export compliance information. Updated pylon 4-related language conventions. Removed Microsoft Windows XP and Vista as supported operating systems. Added Microsoft Windows 8 and 8.1 as supported operating systems. Added a notice on installing pylon for Linux in Section 1.1 on page 1. Updated the precautions in Section 2.2.1 on page 5 to match the precautions in the *Basler ace User's Manual for Camera Link Cameras*. Modified the hardware installation instructions in Section 2.2.2 on page 6 and Section 2.2.3 on page 7 to indicate that the ace Camera Link cameras are now equipped with a plastic cap instead of a plastic seal. Updated instructions and screen shots related to the software installation in Section 3.1 on page 9. Updated instructions and screen shots related to the pylon CL Configurator in Section 3.2 on page 11. Removed Chapter 4 ("Acquiring Your First Images") and Chapter 5 ("Adjusting Image Quality"). Content of these sections can now be found in the online help of the pylon software. Added instructions on how to access the online help of the pylon software in Section 4.1 on page 15. Moved Chapter 6 ("Next Steps") to Section 4.2 on page 16 ("Additional Camera Settings").