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<https://www.teledynedalsa.com/en/products/imaging/cameras/falcon4-clhs/>

FA-ANHS01-v1: Falcon4-CLHS Application Note

Configuring Falcon4-CLHS and Teledyne DALSA Frame Grabbers

For Falcon4-CLHS models with P/N: FA-Hxxx-xxxxx

Overview

Falcon4-CLHS cameras require a connection to a frame grabber to acquire images. This application note describes how to configure a Falcon4-CLHS with a Teledyne DALSA CLHS frame grabber.

The Falcon4-CLHS supports the CLHS device discovery methodology providing plug-and-play capability. GenICam implementation allows compatibility with Teledyne DALSA or third-party CLHS frame grabbers that support the CLHS X-Protocol.

The Falcon4-CLHS series includes the following models:

- **Falcon4-CLHS M4480** (FA-HM00-M4485): 7 data lane output.
Supported by Teledyne DALSA Xtium2-CLHS PX8 frame grabber (OR-A8S0-PX870).
- **Falcon4-CLHS M4400** (FA-HM01-M4405): 4 data lane output.
Supported by Teledyne DALSA Xtium2-CLHS PX8 LC frame grabber (OR-A8S0-PX840).



The maximum sustained bandwidth from a Falcon4-CLHS camera to an Xtium2-CLHS PX8 is ~5.5GB (approximately 505 fps at full resolution); to obtain higher bandwidths two frame grabbers, using data forwarding, are required. Refer to the frame grabber documentation for more information.

Requirements & Installation

Prerequisites

The following table lists the recommended Falcon4-CLHS firmware and software for this camera model.

Falcon4-CLHS Firmware Design	Software SDK
Falcon4-CLHS_e2v_11M_STD_Firmware_256.83.cbf or higher	Sapera LT 8.50 (or higher)

Software

Sapera LT SDK (full version), the image acquisition and control software development kit (SDK) for Teledyne DALSA cameras is available for download from the Teledyne DALSA website:

<http://teledynedalsa.com/imaging/support/downloads/sdks/>

If the required version is not available, contact your Teledyne DALSA representative.

Sapera LT includes the CamExpert application which provide a graphical user interface to access camera features for configuration and setup.

Hardware

A frame grabber board such as the Teledyne DALSA Xtium2-CLHS PX8 / PX8 LC is the recommended computer interface.

Follow the installation instructions from the board's User Manual for the computer requirements, installation and updating the board driver.

The latest board drivers are available from the Teledyne DALSA website:

<https://www.teledynedalsa.com/en/support/downloads-center/device-drivers/>

Camera Link HS Cables Overview and Resources

In general, an SFP+ compliant cable assembly is acceptable for use as a CLHS interface cable. This cable assembly is primarily intended as a point-to-point interface of up to 100 meters.

A suitable manufactured SFP+ cable uses the SFF-8431 Specifications for Enhanced Small Form Factor Pluggable Module SFP+ Revision 4.1, rated for 10 Gbps.

Visit our web site for additional information on the CLHS interface:

<https://www.teledynedalsa.com/en/learn/knowledge-center/clhs/>

For additional information on cables and their specifications, visit the following web sites and search for "Camera Link HS" cables:

Components Express
FiberStore

<http://www.componentsexpress.com/>

<https://www.fs.com>



Warning:

SFP connectors and cables are considered a Class 1 laser product. Because invisible laser radiation can be emitted from the aperture of the port when no fiber is connected, avoid exposure to laser radiation and do not stare into open apertures. Laser radiation is present when the system is open and interlocks bypassed. Only trained and qualified personnel should be allowed to install, replace, or service this equipment.

Camera Power

Cameras with part number FA-HMxx-xxxxx support Power via the Auxiliary Connector (12 to 24 Volt DC). Refer to the [Falcon4-CLHS User Manual](#) for cable accessories or mating connector details.



The frame grabber PoCL (Power-over-Cable) powers the electronics in the Active Optical Cable (AOC) module, not the camera.

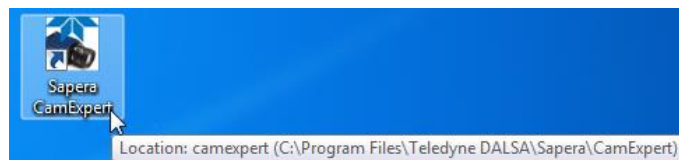
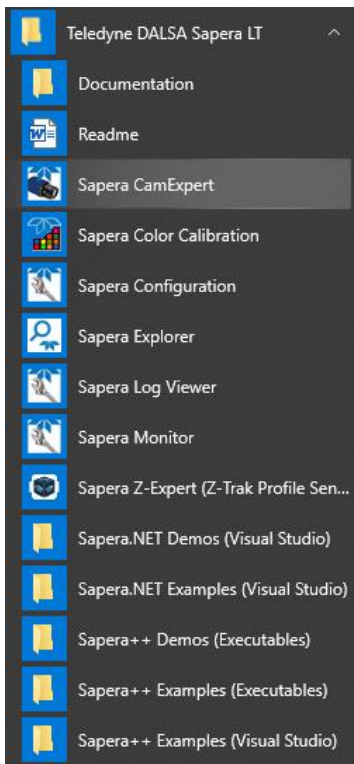
Installation Procedure

The following steps summarize the installation procedure:

- Install the Xtium2-CLHS PX8 (or Xtium2-CLHS PX8 LC) into an available PCI Express x8 Gen3 slot.
- Turn on the computer.
- [Download and install the Sapera LT Development Library](#) (**version 8.60 or later recommended**) or only its 'runtime library'.
- [Download and install the Xtium2-CLHS PX8 Sapera board driver](#) (**1.30 or later required**).
- Reboot the computer.
- Connect the Falcon4-CLHS with a CLHS camera cable to the CLHS frame grabber; power the camera using an appropriate power supply.
- The Falcon4-CLHS status Led will indicate power and the Device / Host connection with a steady green color when connected. Refer to the section "Camera Status LED Indicator" in the camera manual for a complete list of Status LED indicators.

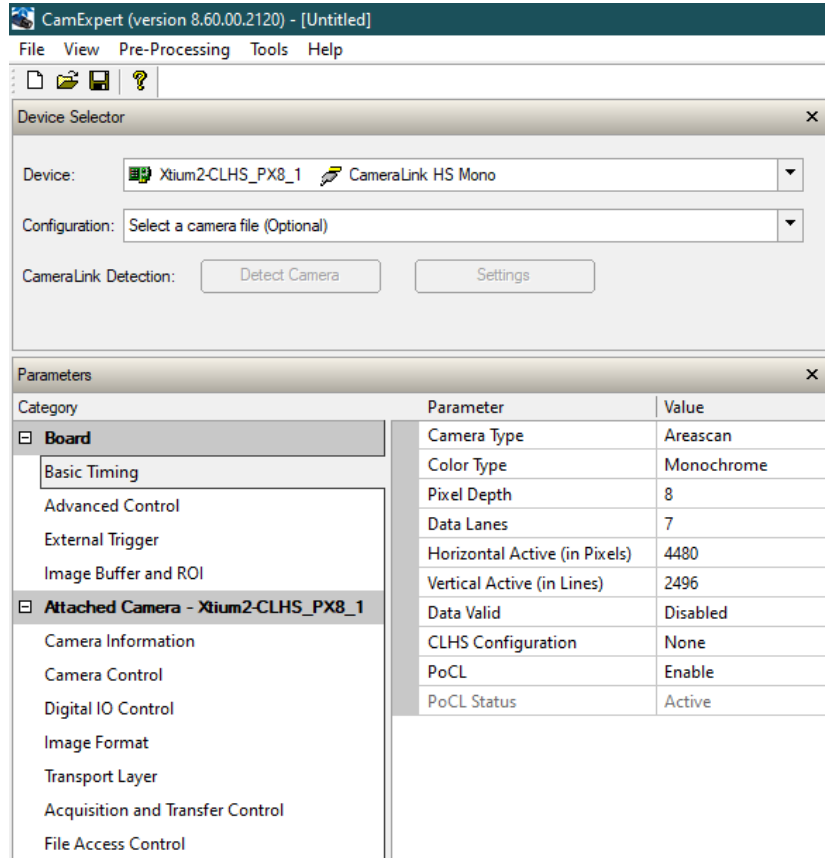
Start Sapera CamExpert

The Sapera CamExpert application is included as part of the Sapera LT SDK. It is Teledyne DALSA's camera and frame grabber interfacing tool that allows you to quickly validate hardware setup, change parameter settings, and test image acquisition. It is available from the Windows Start Menu or desktop shortcut.

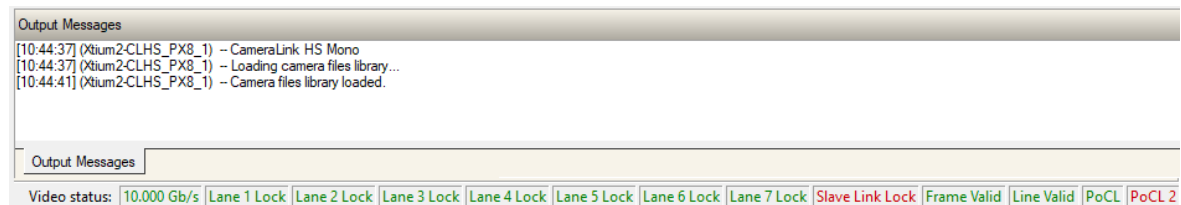


Select the Frame Grabber & Camera

If there is only one Teledyne DALSA frame grabber the Device Selector drop-down menu automatically has the Xtium2-CLHS PX8 selected and the connected Falcon4-CLHS is also automatically detected as shown in the image below.



CamExpert indicates the status of the data connections and signal integrity between the camera and frame grabber. The CamExpert lower-right area, below the Output Message window, displays the connection status flags in green (OK) or red (error). The following screen capture shows that the Data Lane signals are correct and Frame Valid and Line Valid signals are active.

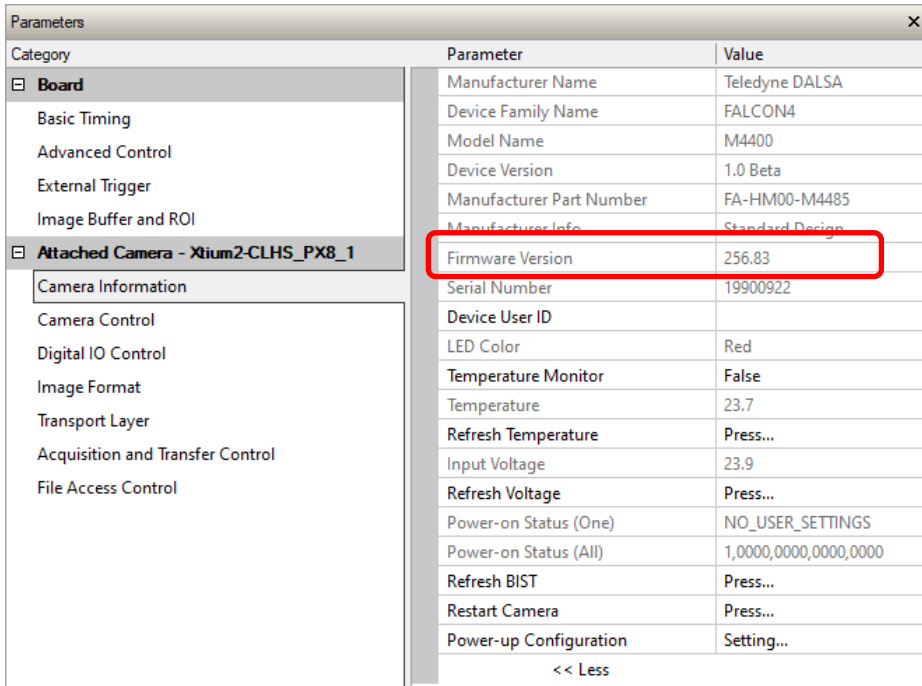


If the Camera is Not Automatically Detected

Verify that the camera is properly powered and the fiber optic cable is connected with the appropriate connectors to the frame grabber and camera; cables are uni-directional and connectors are labelled "Camera" and "F G" (frame grabber).

Upload New Camera Firmware

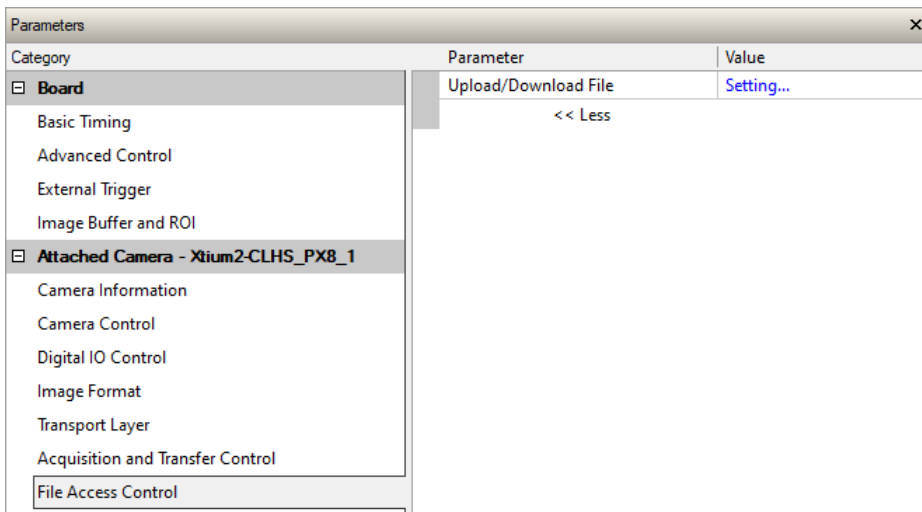
With the Falcon4-CLHS detected the user should upload new firmware if available. Using CamExpert, verify the current camera firmware by selecting the "Camera Information" category and checking the "Firmware Version" feature.



Category	Parameter	Value
Board	Manufacturer Name	Teledyne DALSA
	Device Family Name	FALCON4
	Model Name	M4400
	Device Version	1.0 Beta
	Manufacturer Part Number	FA-HM00-M4485
	Manufacturer Info	Standard Design
	Firmware Version	256.83
	Serial Number	19900922
	Device User ID	
	LED Color	Red
Attached Camera - Xtium2-CLHS_PX8_1	Temperature Monitor	False
	Temperature	23.7
	Refresh Temperature	Press...
	Input Voltage	23.9
	Refresh Voltage	Press...
	Power-on Status (One)	NO_USER_SETTINGS
	Power-on Status (All)	1,0000,0000,0000,0000
	Refresh BIST	Press...
	Restart Camera	Press...
	Power-up Configuration	Setting...

New firmware versions are available in the [file download area of the Teledyne DALSA web site](#). Download the latest release to the computer used with the Falcon 4.

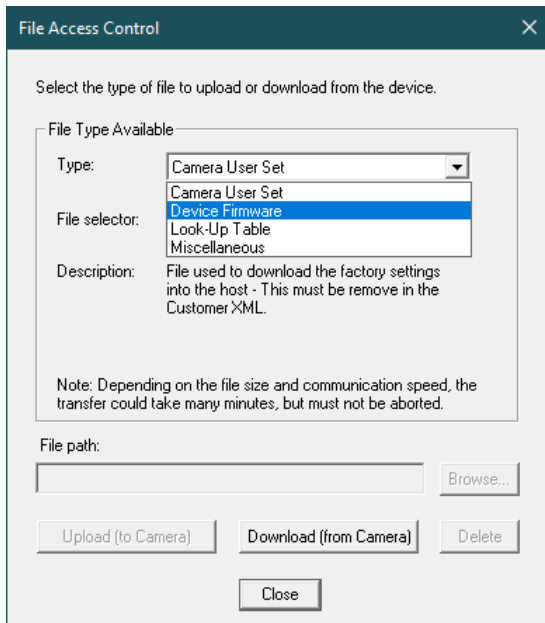
Upload New Firmware



Category	Parameter	Value	
Board	Upload/Download File	Setting...	
	<< Less		
	Attached Camera - Xtium2-CLHS_PX8_1	Camera Information	
		Camera Control	
		Digital IO Control	
		Image Format	
		Transport Layer	
		Acquisition and Transfer Control	
		File Access Control	

- Select the File Access Control category and click **Setting**.

- In the File Access Control dialog, select the file type Device Firmware and click Browse to select the required firmware file.



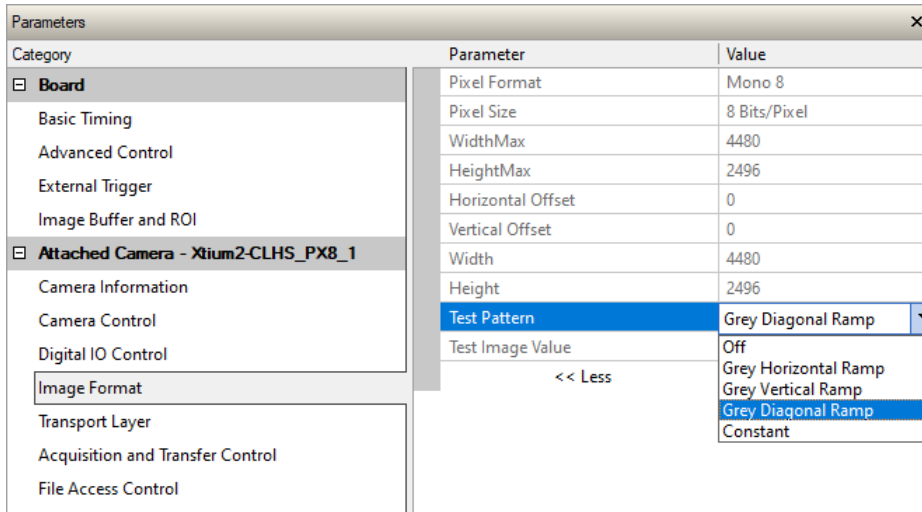
- Click **Upload (to Camera)** and restart the camera when prompted.

	<p>Important: File upload rates are fixed (as per the CLHS standard) at 20Mbits/s. As an example, a firmware file upload process will take about 2½ minutes.</p>
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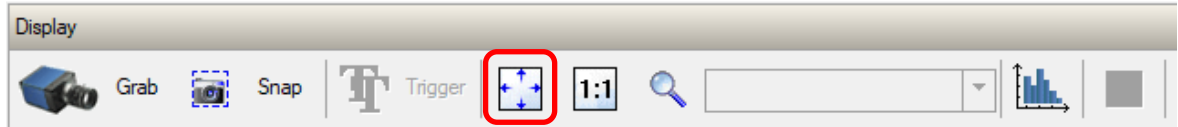
Verify Basic Acquisition

To verify basic acquisition the camera can output a test pattern to validate that parameter settings are correctly configured between the camera and frame grabber.

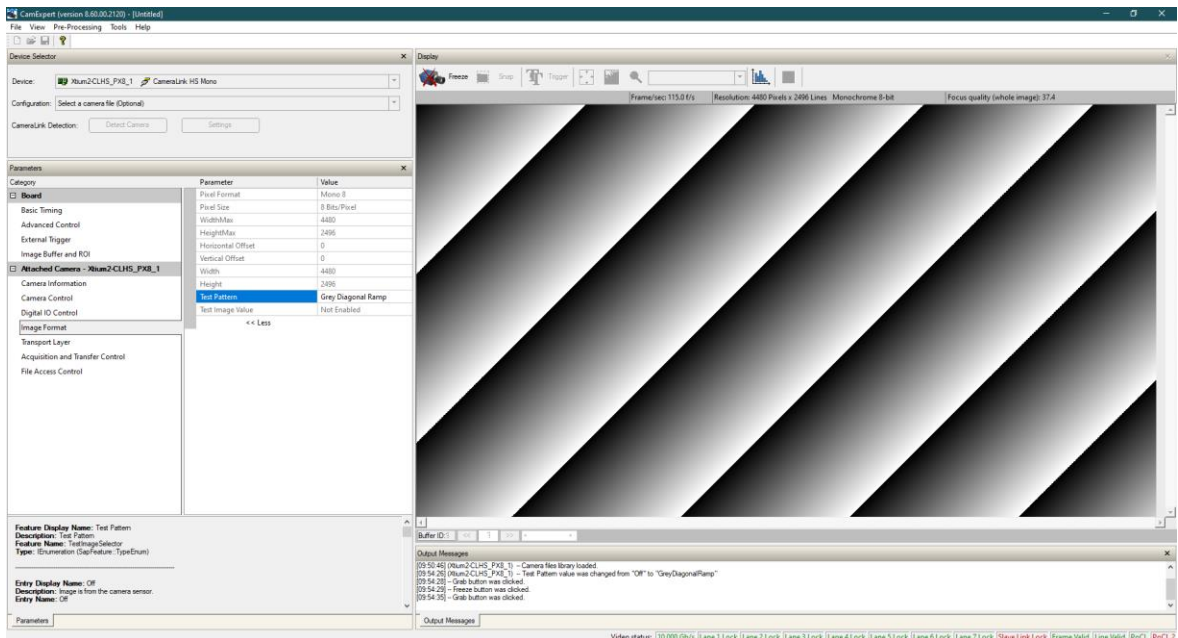
- In the Image Format category, select the Test Pattern output – Grey Diagonal Ramp.



- In CamExpert, click the **Fit to Screen** button to view the complete acquisition in the display window (the actual acquisition data is unmodified).



- Click on the CamExpert "Grab" button to view the diagonal ramp acquisition.



Key features to verify include:

- Data Lanes
- Image Format (pixel depth, pixel format, image height and width)

For example, for frame grabbers, the Basic Timing category includes the Data Lanes and Pixel Depth parameters:

The screenshot shows a 'Parameters' dialog box with the 'Basic Timing' category selected. The table below represents the data shown in the dialog:

Category	Parameter	Value
Board	Camera Type	Areascan
	Color Type	Monochrome
	Pixel Depth	8
	Data Lanes	8
	Horizontal Active (in Pixels)	10
	Vertical Active (in Lines)	12
		14
	Data Valid	16

The Image Buffer and ROI categories include the Image Width, Image Height and Image Buffer format parameters.

The screenshot shows a 'Parameters' dialog box with the 'Image Buffer and ROI' category selected. The table below represents the data shown in the dialog:

Category	Parameter	Value
Board	Image Width (in Pixels)	4480
	Image Height (in Lines)	2496
	Image Left Offset (in Pixels)	0
	Image Top Offset (in Lines)	0
	Image Buffer Format	Monochrome 8-bits
	Image Flip	Monochrome 8-bits

For the Falcon4-CLHS, the Image Format category provides the required feature settings.

The screenshot shows a 'Parameters' dialog box with the 'Image Format' category selected. The table below represents the data shown in the dialog:

Category	Parameter	Value
Board	Pixel Format	Mono 8
	Pixel Size	8 Bits/Pixel
	WidthMax	4480
	HeightMax	2496
	Horizontal Offset	0
	Vertical Offset	0
	Width	4480
	Height	2496
	Test Pattern	Off
	Test Image Value	Not Enabled

The Transport Layer includes the Next CLHS Device Configuration feature which describes the camera cable and data lanes.

The screenshot shows a 'Parameters' dialog box with a tree view on the left and a table on the right. The tree view is expanded to 'Attached Camera - Xtium2-CLHS_...' and then to 'Transport Layer'. The table on the right lists parameters and their values.

Category	Parameter	Value
Board	XML Major Version	100
	XML Minor Version	0
	CLHS Discovery	Discovery Enabled
	Next CLHS Device Configuration	One Cable Seven Lanes
	Refresh GenCP Status	Press...
	Last GenCP Status	Good
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When the imaging setup is validated and working correctly:

- Use CamExpert to explore the Falcon 4 camera feature set and the Xtium-CLHS PX8 / PX8 LC parameter set.
- Use the individual product's User Manuals to explore the capabilities of this imaging system pair.
- Develop your custom imaging application with the Sapera LT API.