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PC2-Comp Express™

User's Manual

Part number OC-P2EM-COMP0
Edition 2.10

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Introduction

Overview of the Manual

PC2-Comp Express Board

- **The PC2-Comp Express**
  Description of the PC2-Comp Express board, package contents, block diagrams, and a brief summary of its capabilities.

Installing the PC2-Comp Express

- **PC2-Comp Express**
  Describes how to install PC2-Comp Express, Sapera LT library and Sapera configuration information.
- **Troubleshooting**
  Offers suggestions for resolving PC2-Comp Express installation or usage problems.

Using the PC2-Comp Express

- **Theory of Operation**
  Detailing PC2-Comp Express features.

Technical Reference

- **Hardware**
  PC2-Comp Express specifications including connector pinout diagrams, jumper and LED descriptions.

Sapera LT

- **Sapera LT Server and Parameters**
  Lists the Sapera LT servers available plus describes the Sapera LT parameters and values supported by PC2-Comp Express board.
- **Sapera Software Example**
  Describes in detail the Sapera Grab Demo example and how to use it.
- **Using Sapera CamExpert with PC2-Comp Express**
  Describes the Sapera CamExpert tool and how to use it with PC2-Comp Express.

Support

- **Teledyne DALSA Contact Information**
  Phone numbers, important web site links and email addresses.

About the Manual

This manual exists in Adobe Acrobat® (PDF) format. The PDF format makes full use of hypertext cross-references and includes links to the Teledyne DALSA home page on the Internet, located at **http://www.teledynedalsa.com**, accessed using any web browser.

For PC2-Comp Express specific information, visit the Teledyne DALSA web site at http://www.teledynedalsa.com/mv/.

Using the Manual

File names, directories, and Internet sites will be in bold text
(for example, **image2.bmp**, **c:\Sapera**, **http://www.imaging.com**).

Text that must be entered using the keyboard will be in typewriter-style text
(for example, `c:\temp`).

Menu and dialog actions will be indicated in bold text in the order of the instructions to be executed, with each instruction separated by bullets. For example, going to the **File** menu and choosing **Save** would be written as **File•Save**.

PC2-Comp Express Board

Components & Part Numbers

PC2-Comp Express Board

Item	Product Number
PC2-Comp Express	Contact Sales

PC2-Comp Express Software

Item	Product Number
Sapera LT version 5.20 or later (required but sold separately) 1. Sapera LT: Provides everything you will need to build your imaging application 2. Current Sapera compliant board hardware drivers 3. Board and Sapera documentation (compiled HTML help, and Adobe Acrobat® (PDF) formats)	OC-SL00-0000000
(optional) Sapera Processing Imaging Development Library includes over 600 optimized image processing routines.	Contact Sales at Teledyne DALSA

PC2-Comp Express Cables & Accessories

Item	Product Number
PC2-Comp Express input cable	OR-B20C-4RGB0
4-Pin DIN to 2 BNC fan-out cable (Y/C video input)	OR-B20C-42000
8-Pin DIN to 4-pin DIN (Y/C out) plus 4 BNC fan-out cable (CV out & Trigger input)	OR-B20C-84400

PC2-Comp Express Overview

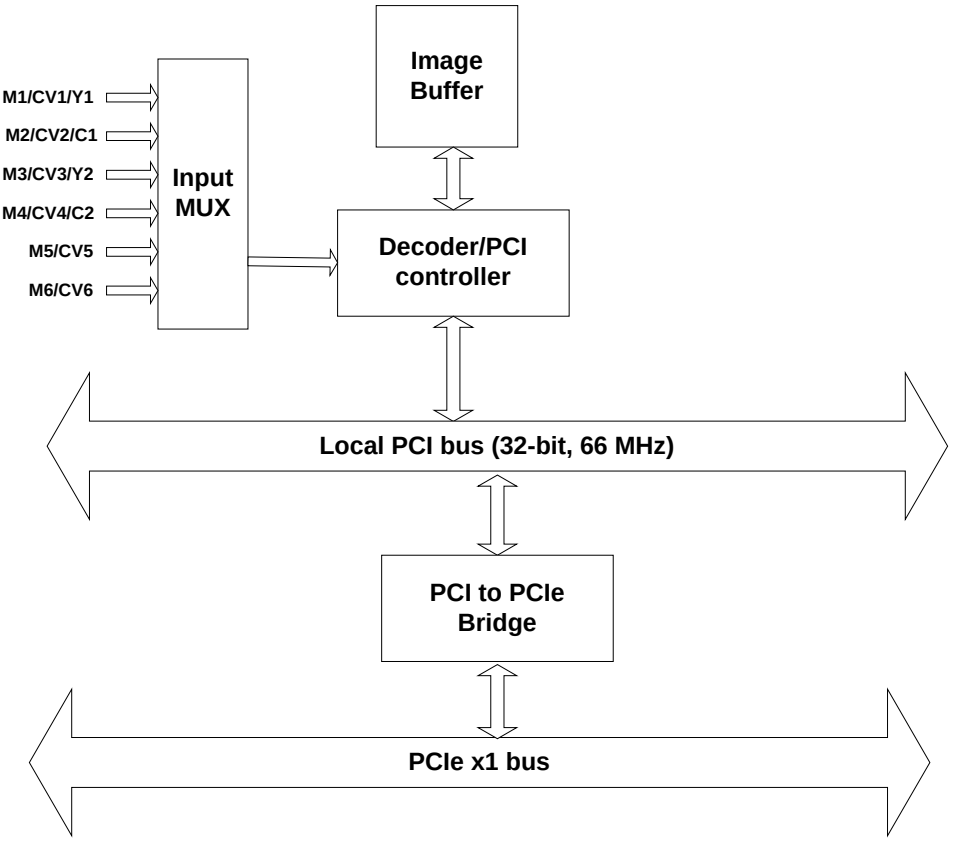
PC2-Comp Express is a PCIe x1 format board that provides image capture and transfer to the host.. The acquisition circuitry interfaces with standard (NTSC/RS-170 and PAL/CCIR) analog cameras.

PC2-Comp Express is supported by Sapera LT 5.20 (or later). It is also fully supported by the Sapera Image Processing library.

PC2-Comp Express Features

- Half size single slot PCIe x1 form factor.
- Six monochrome or composite video (CV) or 2 S-video inputs, AC coupled and 75Ω terminated.
- Acquires from color or monochrome cameras.
- Supports standard NTSC, RS-170, PAL, and CCIR camera formats.
- Video controls allow brightness, contrast, hue, and saturation adjustments .
- Supports YUV 4:2:2 (YUY2) and Mono 8 output pixel formats.
- Supports dual destination transfers, allowing transfers to both the video and host memory simultaneously.
- 8MB onboard frame buffer memory.
- External TTL trigger.
- Support for Windows XP, Vista & 7 (32/64 bit).

PC2-Comp Express Functional Block Diagram



PC2-Comp Express Block Diagram

Sapera LT Development Software Overview

Sapera LT Library

Sapera LT is a powerful development library for image acquisition and control. Sapera LT provides a single API across all current and future Teledyne DALSA hardware. Sapera LT delivers a comprehensive feature set including program portability, versatile camera controls, flexible display functionality and management, plus easy to use application development wizards.

Sapera LT comes bundled with CamExpert, an easy to use camera configuration utility to create new or modify existing camera configuration files. Information and screen shots in this manual correspond to Sapera LT 5.2.

Sapera Processing Library

Supplied optionally, Sapera Processing is a comprehensive set of C++ classes for image processing and analysis. Sapera Processing offers highly optimized tools for image processing, blob analysis, search (pattern matching), OCR, and barcode decoding.

Installing the PC2-Comp Express

Warning! (Grounding Instructions)

Static electricity can damage electronic components. Please discharge any static electrical charge by touching a grounded surface, such as the metal computer chassis, before performing any hardware installation.

If you do not feel comfortable performing the installation, please consult a qualified computer technician.



Never remove or install any hardware component with the computer power on. Disconnect the power cord from the computer to disable the power standby mode. This prevents the case where some computers unexpectedly power up when a board is installed.

Sapera LT Library Installation

Note: to install Sapera LT and the PC2-Comp Express device driver, log onto the workstation as an administrator or with an account that has administrator privileges.

The Sapera LT Development library (or 'runtime library' if application development is not being performed) must be installed prior to the PC2-Comp Express device driver.

- Insert the Teledyne DALSA Sapera LT CD-ROM into the CD-ROM drive. The Teledyne DALSA installation window appears if AUTORUN is enabled.
- If AUTORUN is not enabled, open Windows Explorer and browse to the root directory of the CD-ROM. Execute **launch.exe** to open the Teledyne DALSA installation window and install the required Sapera LT components.
- The installation program will prompt you to reboot the computer.

Refer to *Sapera LT User's Manual* for additional information concerning Sapera LT.

Installing the PC2-Comp Express Hardware and Driver

The PC2-Comp Express can be installed on any computer that meets the minimum requirements for operating Windows XP, Windows Vista or Windows 7 (32 or 64 bit) and that is equipped with a PCIe expansion slot.

Note: To install the PC2-Comp Express device driver, logon to the workstation as an administrator or with an account that has administrator privileges.

The PC2-Comp Express device driver is distributed on the Sapera LT CD-ROM, and is also available through the Teledyne DALSA web site from the "Service & Support" menu.

In a Windows XP/Vista/7 System

- Turn the computer off and open the computer chassis to allow access to the expansion slot area.
- Install the PC2-Comp Express into a free PCI Express x4 expansion slot. The PC2-Comp Express could also be installed in a PCI Express x8. Note that some computer's x16 slot may support the PC2-Comp Express. The user needs to test each computer to verify support of a x4 product.
- Close the computer chassis and turn the computer on. Driver installation requires administrator rights for the current user of the computer.
- Windows will find the PC2-Comp Express and start its **Found New Hardware Wizard**. Click on the **Cancel** button to close the Wizard.
- Insert the Teledyne DALSA Sapera CD-ROM. If **AUTORUN** is enabled on your computer, the installation menu is presented. Install the PC2-Comp Express driver.
- If **AUTORUN** is not enabled, use Windows Explorer and browse to the root directory of the CD-ROM. Execute **launch.exe** to start the installation menu. Click **Software Installation**, then **Install Hardware Device Driver**, **Frame Grabbers - Device Drivers,** and **PC2 Series**. Select the **PC2-Comp Express** board and install the PC2-Comp Express driver. Note, if you are using Windows Vista or Windows 7 with the User Account Control feature enabled, a dialog is displayed when you execute launch.exe; click **Allow** to continue with the driver installation.
- Choose the device driver setup type, full installation (required for application development) or runtime installation (supports application execution only).
- When using **Windows XP**, if a message stating that the PC2-Comp Express software has not passed **Windows Logo testing** is displayed, click on **Continue Anyway** to finish the PC2-Comp Express driver installation. Reboot the computer when prompted.
- When using **Windows Vista or Windows 7**, a message asking to install the Teledyne DALSA device software is displayed. Click **Install**.



- During the installation the PC2-Comp Express Device Manager firmware loader application starts. Click Update All. For more information on the Device Manager application, see "Device Manager Firmware Loader" on page 9.
- When the installation is complete, the following dialog box is displayed:



Device Manager Firmware Loader

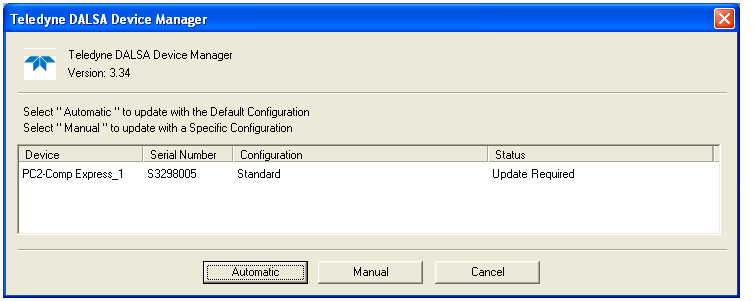
The Device Manager-Firmware Loader program determines if the PC2-Comp Express requires a firmware update. If firmware is required, the dialog displays and it also allows the user to load specific firmware for the PC2-Comp Express.

***Important*:** In the vary rare case of firmware loader errors please see "Recovering from a Firmware Update Error" on page 20.

Firmware Update: Automatic Mode

Click **Automatic** to update the PC2-Comp Express firmware.

If there are multiple PC2-Comp Express boards in the system, all will be updated with new firmware. If any installed PC2-Comp Express board installed in a system already has the correct firmware version, an update is not required. In the following screen shot, a single PC2-Comp Express Full board is installed in the system and the default configuration is ready to be programmed.



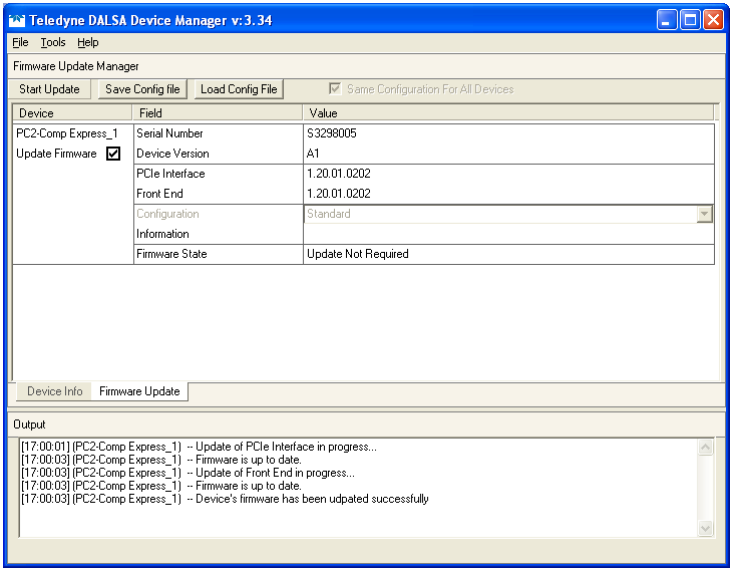
Firmware Update: Manual Mode

Select **Manual** mode to load firmware other then the default version or when, in the case of multiple PC2-Comp Express boards in the same system, each requires different firmware.

The figure below shows the Device Manager manual firmware screen. Information on all installed PC2-Comp Express boards, their serial numbers, and their firmware components are shown.

A manual firmware update is made as follows:

- Select the PC2-Comp Express to update via the board selection box (if there are multiple boards in the system)
- From the Configuration field drop menu select the firmware version required
- Click on the Start Update button
- Observe the firmware update progress in the message output window
- Close the Device Manager program when the device reset complete message is shown.



Executing the Firmware Loader from the Start Menu

If required, the PC2-Comp Express Firmware Loader program is executed via the Windows Start Menu shortcut **Start • All Programs • Teledyne DALSA • PC2-Comp Express Driver • Firmware Update**.

Requirements for a Silent Install

Both Sapera LT and the PC2-Comp Express driver installations share the same installer technology. When the installations of Teledyne DALSA products are embedded within a third party's product installation, the mode can either have user interaction or be completely silent. The following installation mode descriptions apply to both Sapera and the hardware driver.



Note: You must reboot after the installation of Sapera LT. However, to streamline the installation process, Sapera LT can be installed without rebooting before installing the board hardware device drivers. The installations then complete with a single final system reboot.

Perform Teledyne DALSA embedded installations in either of these two ways:

- **Normal Mode**
  The default mode is interactive. This is identical to running the setup.exe program manually from Windows (either run from Windows Explorer or the Windows command line).
- **Silent Mode**
  This mode requires no user interaction. A preconfigured "response" file provides the user input. The installer displays nothing.

Silent Mode Installation

A Silent Mode installation is recommended when integrating Teledyne DALSA products into your software installation. The silent installation mode allows the device driver installation to proceed without the need for mouse clicks or other input from a user.

Preparing a Silent Mode Installation requires two steps:

- Prepare the response file, which emulates a user.
- Invoke the device driver installer with command options to use the prepared response file.

Creating a Response File

Create the installer response file by performing a device driver installation with a command line switch "-r". The response file is automatically named **`setup.iss`** and is saved in the \windows folder. If a specific directory is desired, the switch –f1 is used.

As an example, to save a response file in the same directory as the installation executable of the PC2-Comp Express, the command line would be:

```
PC2-Comp.exe –r –f1".\setup.iss"
```

Running a Silent Mode Installation

A device driver silent installation, whether done alone or within a larger software installation requires the device driver executable and the generated response file **`setup.iss`**.

Execute the device driver installer with the following command line:

```
PC2-Comp.exe -s -f1".\setup.iss"
```

Where the **–s** switch specifies the silent mode and the **–f1** switch specifies the location of the response file. In this example, the switch –f1".\setup.iss" specifies that the **`setup.iss`** file be in the same folder as the device driver installer.



Note: On Windows Vista and 7, the Windows Security dialog box will appear unless one has already notified Windows to 'Always trust software from "DALSA Corp." during a previous installation of a driver.

Silent Mode Uninstall

Similar to a silent installation, a response file must be prepared first as follows.

Creating a Response File

The installer response file is created by performing a device driver un-installation with a command line switch "-r". The response file is automatically named **`setup_uninstall.iss`** which is saved in the \windows folder. If a specific directory is desired, the switch "–f1" is used.

As an example, to save a response file in the same directory as the installation executable of the PC2-Comp Express, the command line would be:

```
PC2-Comp.exe –r –f1".\setup_uninstall.iss"
```

Running a Silent Mode Uninstall

Similar to the device driver silent mode installation, the un-installation requires the device driver executable and the generated response file **`setup.iss`**.

Execute the device driver installer with the following command line:

```
PC2-Comp.exe -s -f1".\setup_uninstall.iss"
```

Where the **–s** switch specifies the silent mode and the **–f1** switch specifies the location of the response file. In this example, the switch –f1".\setup_uninstall.iss" specifies that the **`setup_uninstall.iss`** file be in the same folder as the device driver installer.

Silent Mode Installation Return Code

A silent mode installation creates a file “corinstall.ini” in the Windows directory. A section called [SetupResult] contains the ‘status’ of the installation. A value of 1 indicates that the installation has started and a value of 2 indicates that the installation has terminated.

A silent mode installation also creates a log file “setup.log” which by default is created in the same directory and with the same name (except for the extension) as the response file. The /f2 option enables you to specify an alternative log file location and file name, as in Setup.exe /s /f2"C:\Setup.log".

The “setup.log” file contains three sections. The first section, [InstallShield Silent], identifies the version of InstallShield used in the silent installation. It also identifies the file as a log file. The second section, [Application], identifies the installed application name, version, and the company name. The third section, [ResponseResult], contains the ‘ResultCode’ indicating whether the silent installation succeeded. A value of 0 means the installation was successful.

Installation Setup with CorAppLauncher.exe

The installation setup can be run with the CorAppLauncher.exe tool provided with the driver.

- Install the board driver and get CorAppLauncher.exe from the \bin directory of the installation.
- When running the installation, CorAppLauncher.exe will return only when the installation is finished.
- When run from within a batch file, obtain the installation exit code from the ERRORLEVEL value.
- The arguments to CorAppLauncher.exe are
  -l: Launch application
  -f: Application to launch. Specify a fully qualified path.

As an example:

- CorAppLauncher –l –f”c:\driver_install\PC2-Comp.exe”
- IF %ERRORLEVEL% NEQ 0 goto launch error

Note: There is a 32-bit and 64-bit version of CorAppLauncher.exe. When installing the driver, only the version related to the OS is installed. However, the 32-bit version is usable on either 32-bit or 64-bit Windows.

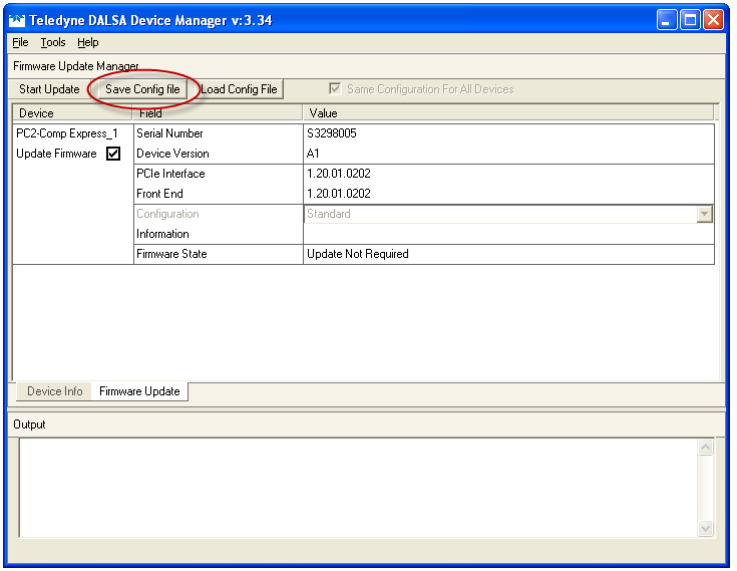
Custom Driver Installation using install.ini

Customize the driver installation by parameters defined in the file “install.ini”.
By using this file, the user can:

- Select the user default configuration.
- Select different configurations for systems with multiple boards.
- Assign a standard Serial COM port to the board.

Creating the install.ini File

- Install the driver in the target computer. All PC2-Comp Express boards required in the system must be installed.
- Configure each board's acquisition firmware using the Teledyne DALSA Device Manager tool (see Firmware Update: Manual Mode).
- When each board setup is complete, using the Teledyne DALSA Device Manager tool, click on the Save Config File button. This will create the "install.ini" file.



Create an install.ini File

Run the Installation using install.ini

Copy the install.ini file into the same directory as the setup installation file. Run the setup installation as normal. The installation will automatically check for an install.ini file and if found, use the configuration defined in it.

Upgrading Sapera LT or any Teledyne DALSA Device Driver

When installing a new version of Sapera LT or a Teledyne DALSA device driver into a computer with a previous installation, the current version must be first uninstalled! Upgrade scenarios are described below.

Device Driver Upgrade Only

Minor device driver upgrades may be distributed as ZIP files available on the Teledyne DALSA web site (http://www.teledynedalsa.com/mv/support/driverSDKlist.aspx). Device driver upgrades are also available on the next Sapera LT CD-ROM release.

Minor device driver upgrades often do not require a successive Sapera LT upgrade. To confirm that the current Sapera LT version you are using will work correctly with a new device driver:

- Open and review the new device driver's **ReadMe** file before installing to verify the minimum Sapera LT version required.
- If the **ReadMe** file does not specify a Sapera LT version, contact Teledyne DALSA Technical Support (see "Technical Support" on page 68).

To upgrade the device driver only:

- Log on to the computer as an administrator or with an account that has administrator privileges.
- From the Windows start menu select **Start • Control Panel • Add or Remove Programs**.
- Select the Teledyne DALSA PC2-Comp Device Driver, click **Remove**, and then in the InstallShield dialog click on **Remove** to uninstall the board driver.
- When the driver uninstall is complete, reboot the computer.
- Log on to the computer as an administrator once again.
- Install the new device driver:
  - Run **Setup.exe** if installing manually from a driver file you download from the Teledyne DALSA web site).
  - If the new driver is on a Sapera CD-ROM, follow the installation procedure described in the section “Installaing PC2-Comp Express Hardware and Driver”.

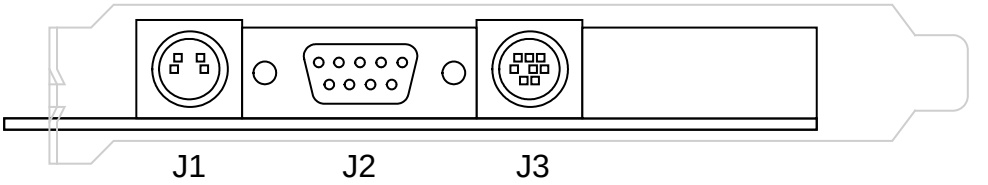
Important: Sapera LT must be installed on your computer in order to install a Teledyne DALSA device driver.

Sapera LT and Device Driver Upgrades

Follow the procedure described below when both Sapera LT and the Teledyne DALSA device driver are upgraded.

- Log on to the computer as an administrator or with an account that has administrator privileges.
- From the Windows start menu select **Start • Control Panel • Add or Remove Programs**.
- Select the Teledyne DALSA PC2-Comp Device Driver, click **Remove**, and then in the InstallShield dialog click on **Remove** to uninstall the board driver.
- From the Windows start menu select **Start • Control Panel • Add or Remove Programs**.
- Select the Sapera LT, click **Remove**, and then in the InstallShield dialog click on **Remove** to uninstall the board driver.
- Reboot the computer and log on to the computer as an administrator once again.
- Install the new versions of both Sapera LT and the device driver as if it is a first-time installation.

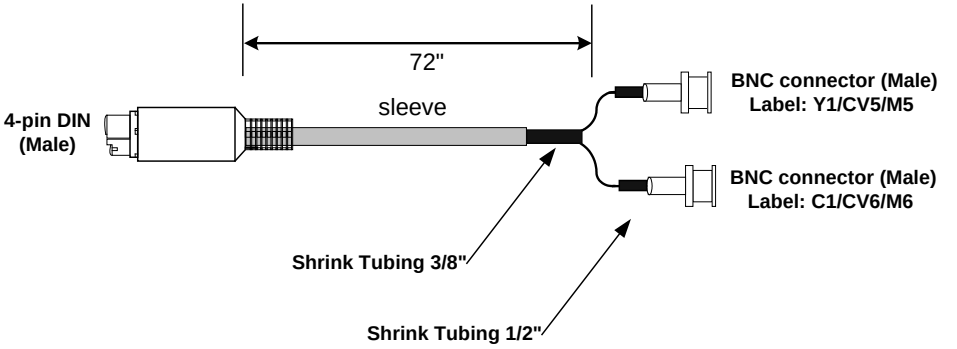
Connecting Cameras



PC2-Comp Express Connector Bracket

J1 - Y/C Input

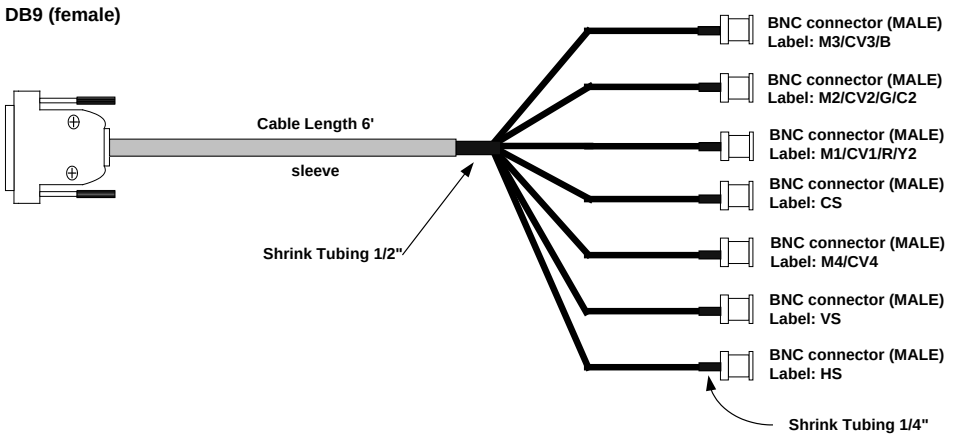
Connect cable assembly OR-B20C-42000 to J1 and to your Y/C video source. Refer to "J1: DIN 4 Pin, Y/C Video Input" on page 41 for a description of J1.



PC2-Comp Express Cable Assembly (OR-B20C-42000)

J2 - Composite Video Input

Connect cable assembly OR-B20C-4RGB0 to J2. Connect the BNC connector labeled CV1 to your color or monochrome video source. Connect additional cameras to CV2, CV3, and CV4 if required. Refer to "J2: DB9, General Video Input" on page 42 for a list of inputs possible on J2.

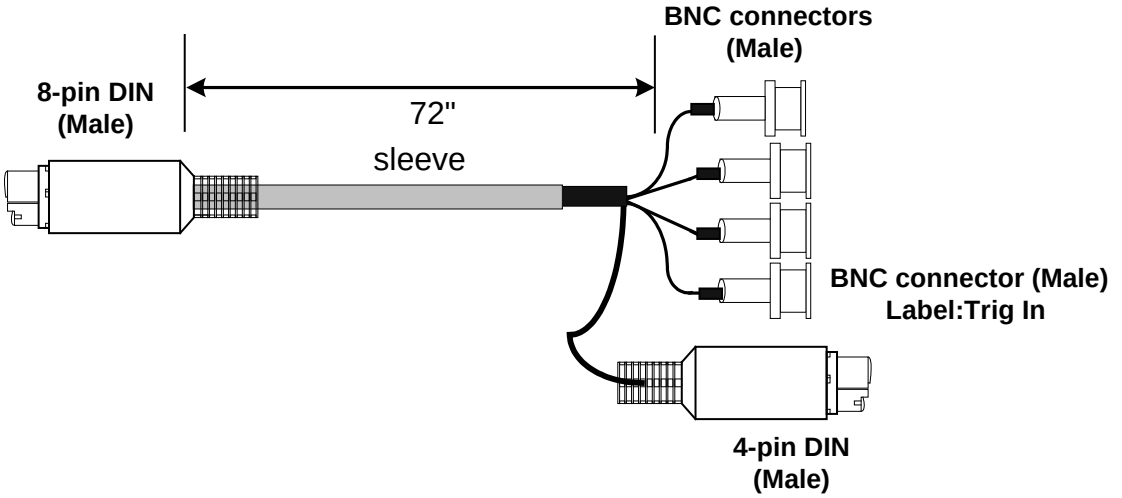


PC2-Comp Express Cable Assembly (OR-B20C-4RGB0)

J3 – External Trigger Input

When an external trigger is required, connect cable assembly OR-B20C-84400 to J3 and to your external trigger.

Note, only the BNC connector labeled Trig In is used; other BNC and the 4-pin DIN connectors can be removed from the cable assembly.



Testing Acquisitions

The simplest way to test a PC2-Comp Express installation is to connect a standard composite video source and run Sapera CamExpert. Camera brand is not important—only the video standard needs to be known. Standard video formats are RS170 (monochrome) or NTSC (color) and CCIR (monochrome) or PAL (color) cameras. See "Using CamExpert with PC2-Comp Express" on page 54 for a CamExpert quick-start procedure.

Troubleshooting Installation Problems

PC2-Comp Express has been tested by Teledyne DALSA with a variety of computers. Although unlikely, installation problems may occur due to the constant and changing nature of computer equipment and operating systems. This section describes what the user can verify to determine the problem or the inspection checks to do prior to contacting the Teledyne DALSA Technical Support department.

If you require help and need to contact Teledyne DALSA Technical Support, make detailed notes of your installation and/or test results for Technical Support to review. See "Technical Support" on page 68 for contact information.

Recovering from a Firmware Update Error

This procedure is required if any failure occurred while updating the PC2-Comp Express firmware on installation or during a manual firmware upgrade. On the rare occasion the board has corrupted firmware, any Sapera application such as CamExpert or the grab demo program will not find an installed board to control.

Possible reasons for firmware loading errors or corruption are:

- Computer system mains power failure or deep brown-out.
- PCI bus or checksum errors.
- PCI bus timeout conditions due to other devices.
- User forcing a partial firmware upload using an invalid firmware source file.

When the PC2-Comp Express firmware is corrupted, executing a manual firmware upload will not work because the firmware loader can not communicate with the board. In an extreme case, corrupted firmware may even prevent Windows from booting.

***Solution*:** The user manually forces the board to initialize from write protected firmware designed only to allow driver firmware uploads. When the firmware upload is complete, the board is then rebooted to initialize in its normal operational mode.

- Note that this procedure may require removing the PC2-Comp Express board several times from the computer.

- ***Important*:** Referring to the board's user manual (in the connectors and jumpers reference section), identify the configuration switch location. The Boot Recovery Mode jumper for the PC2-Comp Express is J19 (see "J19: Boot Recovery Mode" on page 45).
- Shut down Windows and power OFF the computer.
- Remove jumper J19 for the boot recovery mode position.
- Power on the computer. Windows will boot normally.
- When Windows has started, do a manual firmware update procedure to update the firmware again (see "Executing the Firmware Loader from the Start Menu" on page 11).
- When the update is complete, shut down Windows and power off the computer.
- Replace the jumper on J19 (i.e. default position) and power on the computer once again.
- Verify that the frame grabber is functioning by running a Sapera application such as CamExpert. The Sapera application will now be able to communicate with the PC2-Comp Express board.

Windows Event Viewer

Windows Event Viewer (**Computer Management • System Tools • Event Viewer**) lists various events that have taken place during the OS boot sequence. If a driver generates an error it will normally log an entry in the event list. The Computer Management utility is available by right-clicking **My Computer** in the Explorer window (or desktop icon) and selecting **Manage** in the pop-up menu.

Teledyne DALSA Device Manager Program

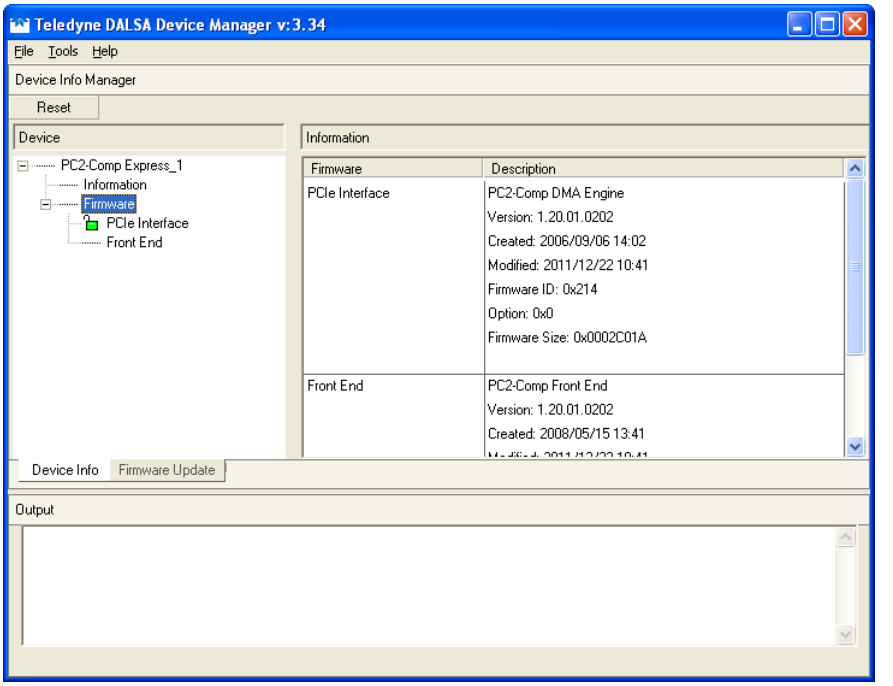
The Teledyne DALSA Device Manager program provides a convenient method of collecting information about the installed PC2-Comp Express. System information, such as operating system, computer CPU, system memory, PCI configuration space, as well as PC2-Comp Express firmware information can be written to a text file (default file name: **BoardInfo.txt**).

Execute the program using the Windows Start Menu shortcut **Start • All Programs • Teledyne DALSA • PC2-Comp Express Device Driver • Device Manager**. If the Teledyne DALSA Device Manager program does not run, it will exit with a message that the board was not found. Since the PC2-Comp Express board must have been in the system to install the board driver, possible reasons for an error are:

- Board was removed
- Board driver did not start or was terminated
- PCI conflict after some other device was installed

Information Window

The following figure shows the Teledyne DALSA Device Manager information screen. Click to highlight one of the board components and the information for that item will be displayed on the right-hand window, as shown below.

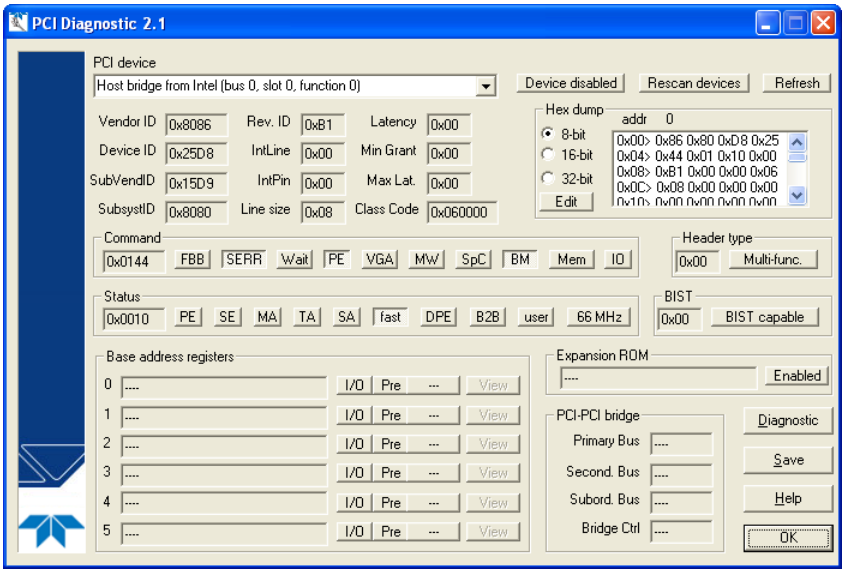


Click on **File • Save Device Info** to save all information to a text file. Email this file when requested by Teledyne DALSA Technical Support.

PCI Configuration

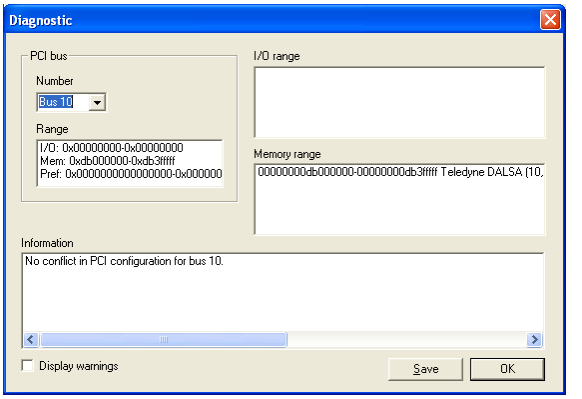
One of the first items to check when there is a problem with any PCI board is to examine the system PCI configuration and ensure that there are no conflicts with other PCI or system devices. The *Teledyne DALSA PCI Diagnostic* program (**cpcidiag.exe**) allows for examination of the PCI configuration registers and can save this information to a text file. Run the program via the Windows Start Menu shortcut **Start • All Programs •** Teledyne **DALSA • Sapera LT • Tools • PCI Diagnostics**.

As shown in the following screen image, use the first drop-down menu to select the PCI device to examine. Select the device 'PC2-Comp Express from Teledyne DALSA '. Note the bus and slot number of the installed board (this will be unique for each system unless systems are setup identically). Click on the **Diagnostic** button to view an analysis of the system PCI configuration space.



Clicking on the **Diagnostic** button opens a new window with the diagnostic report. From the PCI Bus Number drop down menu, select the bus number that the PC2-Comp Express is installed in. In this example the computer PCI expansion slots are identified as bus 2.

The window now displays the I/O and memory ranges used by each device on the selected PCI bus. The information display box will detail any PCI conflicts. If there is a problem, click on the **Save** button. A file named '**pcidiag.txt'** is created (in the Sapera\bin directory) with a full dump of the PCI configuration registers. Email this file when requested by the Teledyne DALSA Technical Support group along with a full description of your computer.

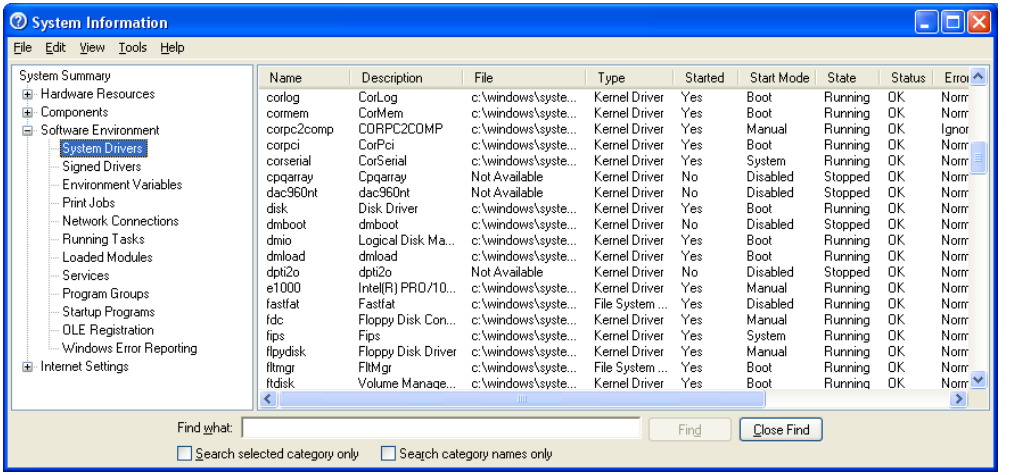


Sapera and Hardware Windows Drivers

The next step is to make certain that the appropriate Teledyne DALSA drivers have started successfully during the boot sequence. For example, click **Start • All Programs • Accessories • System Tools • System Information • Software Environment**. Click on '**System Drivers**'. Make certain that the following device drivers have started to support the PC2-Comp Express driver.

Device Drivers	Description
corpc2comp	*PC2-Comp Express messaging*
corlog	*Sapera Log viewer*
cormem	*Sapera Memory manager*
corpci	*Sapera PCI configuration*
corserial	*Sapera Serial Port manager*

The **Drivers** dialog box should be similar to the following screenshot. All other drivers may differ depending on individual systems.



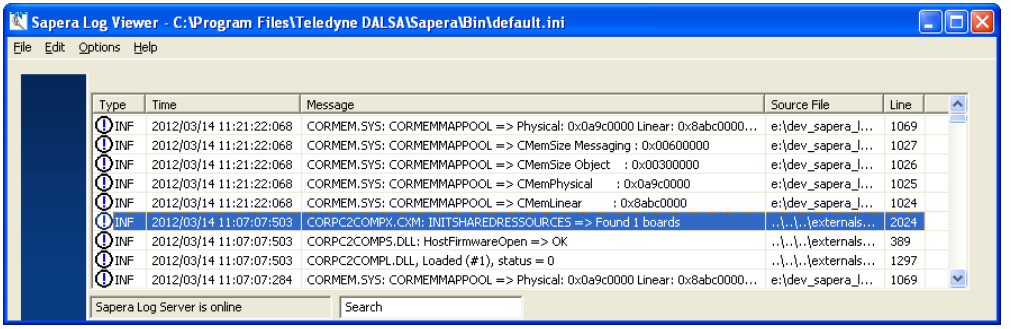
Teledyne DALSA Technical Support may request that you check the status of these Teledyne DALSA drivers as part of the troubleshooting process.

Log Viewer

This step in the verification process saves a text file with the report obtained when the Teledyne DALSA Log Viewer is run. Run the program via the Windows Start menu shortcut **Start • All Programs • Teledyne DALSA • Sapera LT • Tools • Log Viewer.**

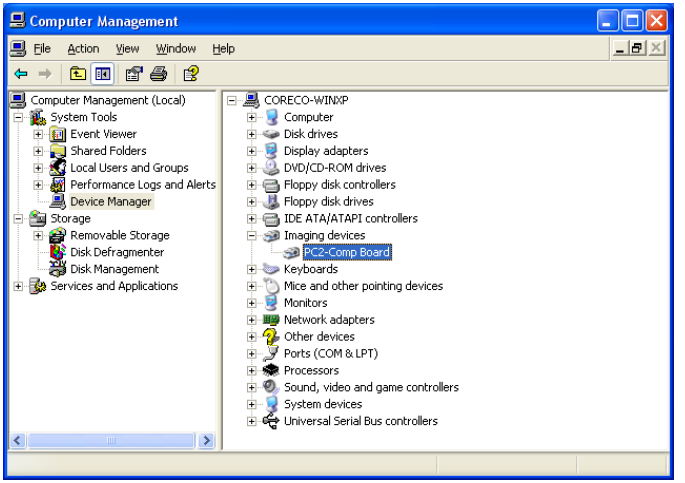
The Teledyne DALSA Log Viewer lists information about installed Teledyne DALSA drivers. Click **File • Save**. You will be prompted for a text file name in which to save the Log Viewer contents. Email this text file to Teledyne DALSA Technical Support when requested or as part of your initial contact email.

Although the information collected by the Log Viewer seems complicated, you can make some initial diagnostics by checking the status of the Teledyne DALSA driver. In the screen shot below, note the highlighted lines [... Found 1 PC2-Comp Board (s) ...]. This confirms that the driver can communicate with the PC2-Comp Express.


Sapera Log Viewer - C:\Program Files\Teledyne DALSA\Sapera\Bin\default.ini
File Edit Options Help
Type Time Message Source File Line
INF 2012/03/14 11:21:22:068 CORMEM.SYS: CORMEMMAPPOOL => Physical: 0x0a9c0000 Linear: 0x8abc0000... e:\dev_sapera_l... 1069
INF 2012/03/14 11:21:22:068 CORMEM.SYS: CORMEMMAPPOOL => CMemSize Messaging : 0x00600000 e:\dev_sapera_l... 1027
INF 2012/03/14 11:21:22:068 CORMEM.SYS: CORMEMMAPPOOL => CMemSize Object : 0x00300000 e:\dev_sapera_l... 1026
INF 2012/03/14 11:21:22:068 CORMEM.SYS: CORMEMMAPPOOL => CMemPhysical : 0x0a9c0000 e:\dev_sapera_l... 1025
INF 2012/03/14 11:21:22:068 CORMEM.SYS: CORMEMMAPPOOL => CMemLinear : 0x8abc0000 e:\dev_sapera_l... 1024
INF 2012/03/14 11:07:07:503 CORPC2COMPX.CXM: INITSHAREDRESSOURCES => Found 1 boards ..\..\..\externals... 2024
INF 2012/03/14 11:07:07:503 CORPC2COMPS.DLL: HostFirmwareOpen => OK ..\..\..\externals... 389
INF 2012/03/14 11:07:07:503 CORPC2COMPL.DLL, Loaded (#1), status = 0 ..\..\..\externals... 1297
INF 2012/03/14 11:07:07:284 CORMEM.SYS: CORMEMMAPPOOL => Physical: 0x0a9c0000 Linear: 0x8abc0000... e:\dev_sapera_l... 1069
Sapera Log Server is online
Search

Windows Device Manager

Use the Start Menu shortcut **Start • Control Panel • System • Hardware • Device Manager**. As shown in the following screen images, look for the PC2-Comp Express board under 'Imaging Devices'. Double-click and look at the device status. You should see 'This device is working properly' Go to the 'Resources' tab and make certain that the device is mapped and has an interrupt assigned to it without any conflicts.



Symptoms: CamExpert Detects No Boards

- **Using Sapera version 5.20 or later:**
  When starting CamExpert, if no Teledyne DALSA board is detected, CamExpert will start in offline mode. There is no error message produced and CamExpert remains functional for creating or modifying camera configuration files. If CamExpert should have but did not detect the installed board, troubleshoot the installation problem as described below.

Troubleshooting Procedure

When CamExpert detects no installed Teledyne DALSA board, there could be a hardware problem, a PnP problem, a PCI problem, a kernel driver problem, or a software installation problem.

- Make certain that the board is properly seated in the PCIe slot.
- Perform all installation checks described in this section before contacting Technical Support.
- Try the board in a different PCIe slot if possible.

Symptoms: Board does not grab

You are able to start Sapera CamExpert but you do not see an image and the frame rate displayed is 0.

- Verify the camera's external power supply.
- Make certain that you provide an external trigger if the camera configuration file requires one. You can try generating a software trigger if you do not have a trigger source.
- Make certain that the camera cable input is the input selected in CamExpert.
- Make certain that the camera is configured for the proper mode of operation (RS170, CCIR, NTSC, PAL). This must match the camera configuration file. Refer to your camera datasheet.
- Try to snap one frame from the CamExpert instead of continuous grab.
- Verify the board properties in "Windows Device Manager" on page 27 as described.

Symptoms: Board Grabs Black

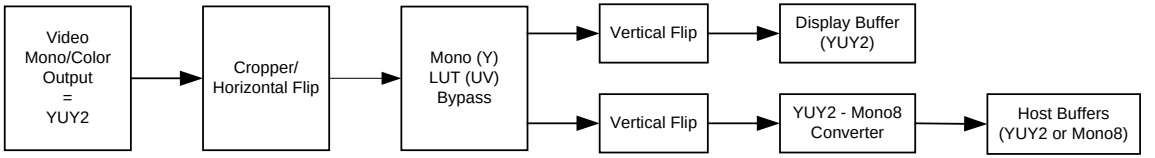
You are able to use Sapera CamExpert and the displayed frame rate is as expected, but the display remains black.

- Try changing Contrast/Brightness settings.
- Try changing the clamping setting (DC restoration).
- Make certain that the input LUT is not filled with ‘0’s.
- Make certain that the iris of the lens on your camera is opened.
- This problem is sometimes caused by a PCIe transfer issue. No PCIe transfer takes place, so the frame rate is above 0 but nevertheless an image is not displayed in CamExpert.
- Make certain that the BUS MASTER bit in the PCI configuration space is activated. Run the Sapera PCI Diagnostics tool, select the PC2-Comp Express PCI device, and check that the **BM** button under 'Command' group is depressed.

Theory of Operation

Acquisition Process

The PC2-Comp Express supports dual destination transfers, enabling the transfer of acquired images to both the video display buffer and the host buffer simultaneously. The acquisition process data flow is illustrated below.



Analog Front End

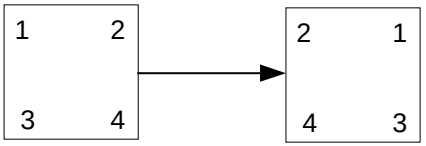
The Analog Front End handles all details related to pixel format conversion. It can output data using 2 pixel formats. It can also flip the image horizontally:

- Monochrome 8-bit (for monochrome or color video input)

pixel 4	pixel 3	pixel 2	pixel 1
31 24	23 16	15 8	7 0

- YUY2 (4:2:2) (for monochrome or color video input).

Y	U	Y	V
31 24	23 16	15 8	7 0



Horizontal Image Flip

On-board Memory

On-board memory behaves as a temporary buffer between the camera interface and the host PCIe system. The onboard memory for image frame buffers is 8MB. Maximum captured frame size is limited by on-board memory: one incoming frame must fit into onboard memory. On-board memory allows capture from cameras requiring a bandwidth exceeding the PCIe x1 practical maximum of 200MB/second. It also compensates for latencies introduced by any other PCI bus master within the host system.

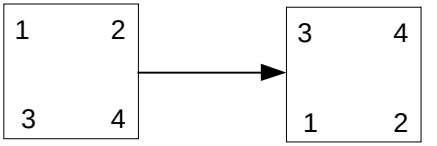
DMA Controller

The DMA controller reads data from on-board memory and sends this data to the PCIe bus. It uses scatter-gather support to reduce CPU usage to a minimum and retrieves the buffer descriptor list from host memory. Generally host system memory allocated for frame buffers is virtually contiguous but physically scattered throughout all available memory.

The DMA controller is also responsible for other image manipulation functions as described below.

Image Flip Operations

The PC2-Comp Express DMA controller performs image flip operations vertically.



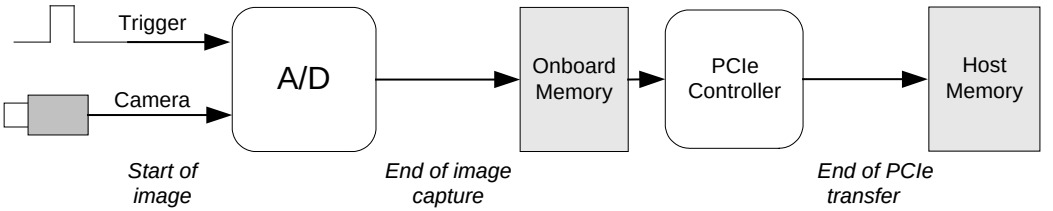
Vertical Image Flip

Events and Status

The PC2-Comp Express frame grabber provides acquisition and transfer events that allow an application to accurately monitor acquisition/transfer status, one of the many elements that make up the "trigger-to-image reliability" model supported by the *Acquisition and Control Unit* (ACU). See "Event-Related Definitions" on page 31. The events are grouped into two families:

1. Acquisition Events
2. Transfer Events

Acquisition events are related to the acquisition module. They provide feedback on the image digitization phase. The following block diagram illustrates the acquisition process.



Acquisition/Transfer Interrupts

Event-Related Definitions

Interrupt An interrupt is a signal sent by the PC2-Comp Express board to the computer CPU that indicates an event on the frame grabber. The PC2-Comp Express device driver has excellent event reaction time since interrupts are processed inside an interrupt service routine (ISR) at kernel level.

Event An event is a WIN32 object that can take two states: signaled and non-signaled. It is used for thread synchronization. In this context, an event is associated with an interrupt so that a WIN32 thread can be unblocked when the event it is waiting for gets signaled. For example, when an interrupt is received, the corresponding event is signaled and the thread waiting for this event resumes execution.

Acquisition Events

External Trigger (Used or Ignored)

The External Trigger event is generated when the external trigger pin is asserted, usually indicating the start of the acquisition process. There are two types of external trigger events: ‘Used’ or ‘Ignored’. Following an external trigger, if the event generates a captured image, an External Trigger Used event will be generated (CORACQ_VAL_EVENT_TYPE_EXTERNAL_TRIGGER).

If there is no image captured, an External Trigger Ignored event will be generated (CORACQ_VAL_EVENT_TYPE_EXTERNAL_TRIGGER_IGNORED). An external trigger event will be ignored if the rate at which the events are received are higher than the possible frame rates of the camera.

For more information, see "External Trigger" on page 35.

Vertical Sync from Camera

The Vertical Sync event indicates a vertical sync has been detected. Note that this does not necessarily mean the image will be captured. For instance, if you have a free-running camera at 30fps with external trigger enabled, you will get thirty events per second even though the PC2-Comp Express waits for an external trigger to actually capture the next image. This allows the application program to independently count frames coming from the camera. The Sapera event value is CORACQ_VAL_EVENT_TYPE_VERTICAL_SYNC.

Frame Lost

The Frame Lost event indicates that an acquired image could not be transferred to onboard memory. An example would be if there were no free onboard buffers available for the new image. This will usually be the case if the image transfer from onboard buffers to host PC memory cannot be sustained due to PCI bus bandwidth. If multiple PCI bus master devices are active simultaneously, it is possible that the PC2-Comp Express PCI controller cannot transfer onboard buffers in time for the next acquired frame. The Sapera event value is CORACQ_VAL_EVENT_TYPE_FRAME_LOST.

Start of Frame

The Start of Frame event represents the beginning of a full frame transfer from front end to onboard memory. For interlaced video, there is one Start of Frame event for each pair of fields. The Sapera event value is CORACQ_VAL_EVENT_TYPE_START_OF_FRAME.

Start of Field

The Start of Field event is only available for interlaced scan cameras. There is a Start of Field event at the beginning of each field transferred from front end to onboard memory (two per frame). The Sapera event value is CORACQ_VAL_EVENT_TYPE_START_OF_FIELD.

Start of Odd Field

The Start of Odd Field event is only available for interlaced scan cameras. There is a Start of Odd Field event at the beginning of each incoming odd field transferred from front end to onboard memory. The Sapera event value is CORACQ_VAL_EVENT_TYPE_START_OF_ODD.

Start of Even Field

The Start of Even Field event is only available for interlaced scan cameras. There is a Start of Even Field event at the beginning of each incoming even field transferred from front end to onboard memory. The Sapera event value is CORACQ_VAL_EVENT_TYPE_START_OF_EVEN.

End of Frame

The End of Frame event is generated when the last image pixel is transferred from front end to onboard memory. The Sapera event value is CORACQ_VAL_EVENT_TYPE_END_OF_FRAME.

End of Field

The End of Field event is only available for interlaced scan cameras. There is an End of Field event when the last field has been transferred from front end to onboard memory. The Sapera event value is CORACQ_VAL_EVENT_TYPE_END_OF_FIELD.

End of Odd Field

The End of Odd Field event is only available for interlaced scan cameras. There is an End of Odd Field event when the odd field has been transferred from front end to onboard memory. The Sapera event value is CORACQ_VAL_EVENT_TYPE_END_OF_ODD.

End of Even Field

The End of Even Field event is only available for interlaced scan cameras. There is an End of Even Field event when the even field has been transferred from front end to onboard memory. The Sapera event value is CORACQ_VAL_EVENT_TYPE_END_OF_EVEN.

Acquisition Status

Chroma Present

The Chroma Present status indicates the presence of the color component in the input video signal. When connecting a monochrome video source, this status will be FALSE.

The Sapera status value is CORACQ_VAL_SIGNAL_CHROMA_PRESENT.

Horizontal Sync Lock

The Horizontal Sync (HS) Lock status indicates the state of the ADC'sphase-locked loop (PLL) with respect to the incoming horizontal sync. In order to digitize accurately, the PLL must be synchronized (that is, be locked) to the incoming video HS. Typically, the application first verifies the HS lock condition before starting an acquisition sequence.

The Sapera status value is CORACQ_VAL_SIGNAL_HSYNC_LOCK.

Vertical Sync Lock

The Vertical Sync (VS) Lock status indicates the state of the ADC's PLL with respect to the incoming vertical sync. In order to digitize accurately, the PLL must be synchronized (that is, be locked) to the incoming video VS. Typically, the application first verifies the VS lock condition before starting an acquisition sequence.

The Sapera status value is CORACQ_VAL_SIGNAL_VSYNC_LOCK.

Transfer Events

Transfer events are the events related to the transfer module. Transfer events provide feedback on image transfer from onboard memory frame buffers to PC memory frame buffers.

End of Frame

The End of Frame event is generated when the last image pixel is transferred from onboard memory into PC memory. The Sapera event value is CORXFER_VAL_EVENT_TYPE_END_OF_FRAME.

End of Field

The End of Field event is only available for interlaced scan cameras. There is an End of Field event when the last field has been transferred from onboard memory into PC memory. The Sapera event value is CORXFER_VAL_EVENT_TYPE_END_OF_FIELD.

End of Odd Field

The End of Odd Field event is only available for interlaced scan cameras. There is an End of Odd Field event when the odd field has been transferred from onboard into PC memory. The Sapera event value is CORXFER_VAL_EVENT_TYPE_END_OF_ODD.

End of Even Field

The End of Even Field event is only available for interlaced scan cameras. There is an End of Even Field event when the even field has been transferred from onboard memory into PCI memory. The Sapera event value is CORXFER_VAL_EVENT_TYPE_END_OF_EVEN.

End of Transfer

The End of Transfer event is generated at the completion of the last image being transferred from onboard memory into PC memory. To complete a transfer, a stop must be issued to the transfer module (if transfers are already in progress). If a transfer of a fixed number of frames was requested, the transfer module will stop transfers automatically. The Sapera event value is CORXFER_VAL_EVENT_TYPE_END_OF_TRANSFER.

External Trigger

An external trigger allows image acquisitions to be synchronized to external events. With this mode enabled, when the PC2-Comp Express receives a trigger signal, the acquisition begins with the next valid frame.

PC2-Comp Express provides one TTL external trigger input. It is possible to emulate an external trigger using a software trigger generated by a function call from an application.

The incoming trigger pulse passes through a debouncing circuit to ensure that no voltage glitch would be detected as a valid trigger pulse. The time constant can be programmed from 0µs (off) to 255µs. Any pulse smaller than the programmed value is blocked and therefore not seen by the acquisition circuitry. A minimum pulse of 100 nsec is recommended for proper operation.

Note: Teledyne DALSA recommends that a debouncing value always be used (even a minimal 1µs delay) to avoid the effects of any undefined electrical state when passing from TTL low voltage (0.8V) to TTL high voltage (2.0V).

TTL external trigger is available on J3 pin 2 (see "J3: DIN 8 Pin, Trigger Input" on page 43). and can be directly connected to a TTL voltage source. The following table defines the electrical specification.

Electrical parameters	Description	Value
$V_{IL\ max}$	Maximum voltage for low	0.8 V
$V_{IH\ min}$	Minimum voltage for high	2 V

Sapera parameters for External Trigger:

CORACQ_PRM_EXT_TRIGGER_ENABLE = CORACQ_VAL_EXT_TRIGGER_ON

CORACQ_PRM_EXT_TRIGGER_SOURCE = Sets the external trigger source. Currently, only 0 (External Trigger #1) is supported

CORACQ_PRM_EXT_TRIGGER_SOURCE_STR = string representing the external trigger source

CORACQ_PRM_EXT_TRIGGER_DETECTION = {CORACQ_VAL_RISING_EDGE, CORACQ_VAL_FALLING_EDGE, CORACQ_VAL_ACTIVE_HIGH, CORACQ_VAL_ACTIVE_LOW}

CORACQ_PRM_EXT_TRIGGER_DURATION: Debouncing duration

CORACQ_PRM_EXT_TRIGGER_FRAME_COUNT: Number of frames to acquire per trigger
In CamExpert, these parameters are located under the ‘External Trigger Parameters’ tab.

Trigger-To-Image Reliability

Trigger-to-image reliability incorporates all stages of image acquisition inside an integrated controller to increase reliability and simplify error recovery. The trigger to image reliability model brings together all the requirements for image acquisition to a central management unit. These include onboard frame buffer memory to compensate for PCI bus latency and comprehensive error notification. Whenever PC2-Comp Express detects a problem, the user application is immediately informed and can take appropriate action to return to normal operation.

The PC2-Comp Express is designed with a robust ACU (Acquisition and Control Unit), which manages all six inputs. The ACU monitors in real-time, the acquisition state of each input. In general these management processes are transparent to end-user applications. With the PC2-Comp Express, applications ensure trigger-to-image reliability by following the rules defined below:

Trigger Signal Validity

External trigger signal noise or glitches are easily ignored by the ACU with its programmable debouncing control. A parameter is programmed for the minimum pulse duration considered as a valid external trigger pulse. For further information, refer to "External Trigger (Used or Ignored)" on page 31.

Acquisition or Transfer Status

For each frame or field, a number of events are generated. An application can monitor these events to track the image acquisition or to take appropriate action if there is a problem. The following events are described in:

Acquisition Events:

- "External Trigger (Used or Ignored)" on page 31
- "Vertical Sync from Camera" on page 31
- "Frame Lost" on page 32
- "Start of Frame" on page 32
- "Start of Odd Field" on page 32
- "Start of Odd Field" on page 32
- "Start of Even Field" on page 32
- "End of Frame" on page 32
- "End of Field" on page 32
- "Start of Odd Field" on page 32
- "End of Even Field" on page 33

Transfer Events:

- "End of Frame" on page 34
- "End of Field" on page 34
- "End of Odd Field" on page 34
- "End of Even Field" on page 34
- "End of Transfer" on page 34

Supported Transfer Cycling Methods

The PC2-Comp Express supports the following transfer cycle modes which are either synchronous or asynchronous. These definitions are from the Sapera Basic Reference manual.

- **CORXFER_VAL_CYCLE_MODE_SYNCHRONOUS_WITH_TRASH**
  Before cycling to the next buffer in the list, the transfer device will check the next buffer's state. If its state is full, the transfer will be done in the trash buffer which is defined as the last buffer in the list; otherwise, it will occur in the next buffer. After a transfer to the trash buffer is done, the transfer device will check again the state of the next buffer. If it is empty, it will transfer to this buffer otherwise it will transfer again to the trash buffer.
- **CORXFER_VAL_CYCLE_MODE_SYNCHRONOUS_NEXT_EMPTY_WITH_TRASH**
  Before cycling to the next buffer in the list, the transfer device will check the next buffer's state. If its state is full, the next buffer will be skipped, and the transfer will be done in the trash buffer, which is defined as the last buffer in the list; otherwise it will occur in the next buffer. After a transfer to the trash is done, the transfer device will check the next buffer in the list, if its state is empty, it will transfer to this buffer otherwise it will skip it, and transfer again to the trash buffer.
- **CORXFER_VAL_CYCLE_MODE_SYNCHRONOUS**
  If next buffer is empty, then transfer to next buffer, otherwise, transfer to current buffer.
- **CORXFER_VAL_CYCLE_MODE_NEXT_EMPTY**
  If next buffer is empty, then transfer to next buffer, otherwise, transfer to next empty buffer in the list. If all buffers are full, then transfer to current buffer.
- **CORXFER_VAL_CYCLE_MODE_ASYNCHRONOUS**
  The transfer device cycles through all buffers in the list without concern about the buffer state.
- **CORXFER_VAL_CYCLE_MODE_OFF**
  Always transfer to the current buffer.

Technical Reference

Hardware Specifications

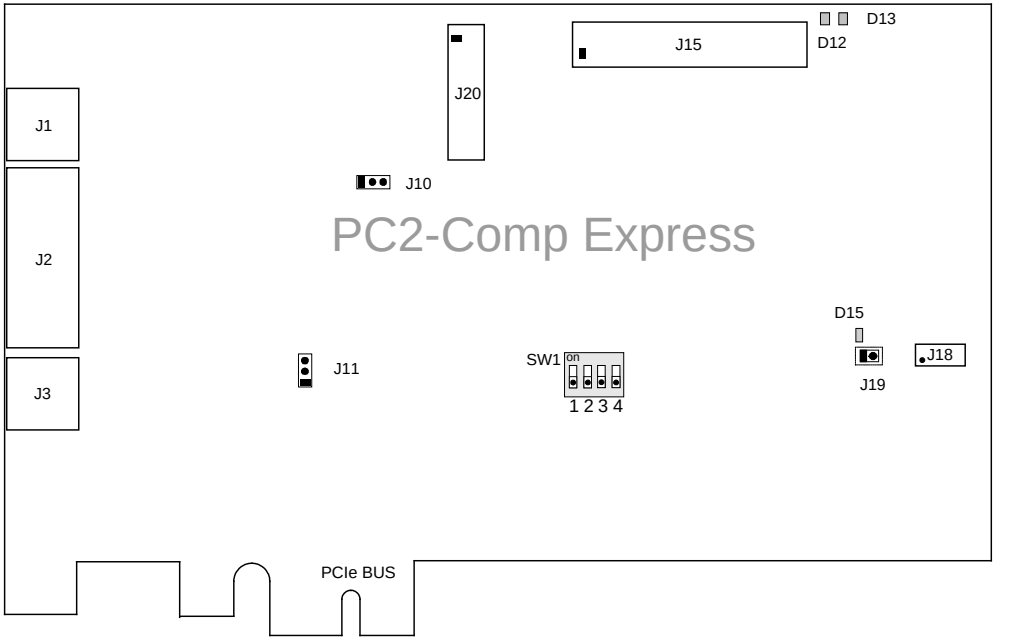
Board	PCIe x1 – half-length rev. 1.0a compliant.
Acquisition	Connect up to 6 monochrome or 2 Y/C (4 CV and 1 YC or 2 CV and 2 YC) cameras. Standard RS-170, NTSC, CCIR, and PAL formats. Composite video 75Ω terminated. Image mirroring and vertical flip. Adaptive 2/4 line comb filter for high accuracy chrominance and luminance separation. Brightness, contrast, hue, saturation, and sharpness controls.
Noise and Pixel Jitter	+/- 1 LSB with +/- 1 nsec jitter.
Controls	One TTL trigger input feeding through a programmable debouncing circuit.
Data Formatting	One 8-bit in/8-bit out LUT. Acquisition cropper to define region of interest (ROI). Horizontal and Vertical image flip.
Image Buffer	8 MB
Pixel Format	8-bit monochrome (MONO8), 16-bit YUV (YUY2).
Transfer	Up to 200MB/second for PCIe x1
Connectors	PCI bracket: DB9 (cameras), DIN-8 (trigger input), DIN-4 (Y/C input).
Software	Supported by Sapera LT and Sapera++. Multi-board support. Microsoft Windows® XP, Windows® Vista and Windows® 7 compatible. Application development using Microsoft® Visual C/C++ DLLs or Visual Basic ActiveX® controls.
Requirements	PC class computer with a free PCIe x1 slot and 80MB free hard drive space for Sapera LT and drivers.

PC2-Comp Express Connector and Jumper Locations

This section describes the PC2-Comp Express connectors, jumpers, and configuration switches. Any item defined as *Reserved* must not be connected to, or in the case of a shorting jumper or switch, must not be changed from the default factory position.

PC2-Comp Express Board Component View

The following figure shows locations and identification numbers. Reserved pin connectors typically are not installed. See "Connector, Jumper, & Status LED Summary" on page 41 for a short overview.



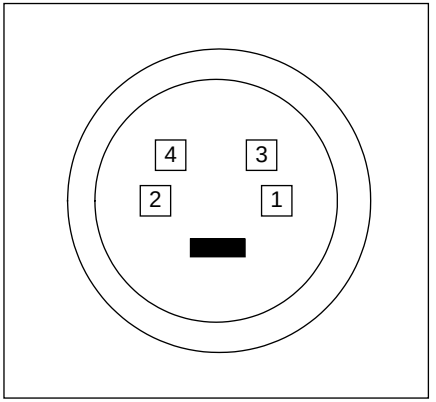
PC2-Comp Express PCIe Board Component View

Connector, Jumper, & Status LED Summary

Details for connectors, status LEDs, and jumpers follow the summary table.

Connector	Description	Connector	Description
J1	DIN 4 Pin, Y/C Video Input	D12, D13	Acquisition status LEDs
J2	General 4 Video Input	D15	Board firmware status LED
J3	Video Output, Trig In	J19	Boot Recovery Mode

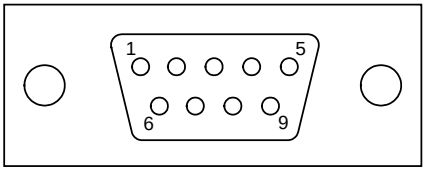
J1: DIN 4 Pin, Y/C Video Input



View looking at J1 (female) on the PC2-Comp Express.

Pin Number	Description
1	Gnd
2	Gnd
3	M5 /CV5 / Y1
4	M6 / CV6 / C1

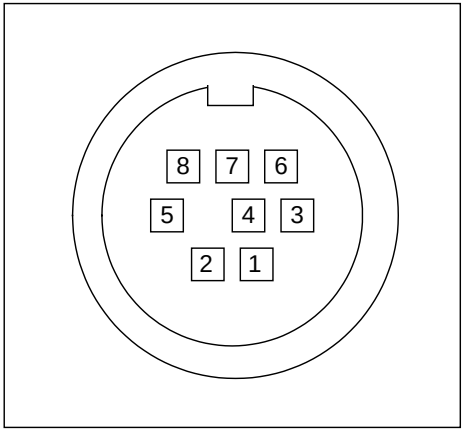
J2: DB9, General Video Input



View looking at J2 (male) on the PC2-Comp Express.

Pin Number	Description
1	M3 / CV3
2	Gnd
3	M2 / CV2 / C2
4	Gnd
5	M1 /CV1 / Y2
6	CS
7	M4 / CV4
8	Reserved
9	Reserved

J3: DIN 8 Pin, Trigger Input



View looking at J3 (male) on the PC2-Comp Express.

Pin Number	Description
1	Reserved
2	Trigger
3	Gnd
4	Reserved
5	Reserved
6	Reserved
7	Reserved
8	Reserved

D12, D13: Acquisition and Trigger Status LEDs

Two LEDs, located on the top edge of the PC2-Comp Express board, provide visual feedback for the acquisition and trigger status. It is necessary to open the host system case to see the LED states (this is typical when doing system setup and verification).

D12: LED State	Acquisition State
OFF	PC2-Comp Express firmware is not loaded
Static Red	Cannot synchronize to input, (that is, no video or an unstable HS)
Static Green	Board ready
Blinking Green Slow (2 Hz)	HS and VS are present and stable
Blinking Green Fast (15 Hz)	Acquisition is in progress

D13: LED State	Trigger State
OFF	No trigger detected
Blinking Green	Triggers operating at a slow rate detected (one blink per trigger)
Static Green	Triggers at a fast rate detected
Blinking or Static Red	Error detected by PC2-Comp Express driver

D15: Firmware State

This LED provides visual feedback as to which firmware is selected to execute on the PC2-Comp Express. Normally firmware is loaded or updated by the driver installation procedure. If there is an error condition with a driver installation, a safe mode firmware can be forced to execute so as to re-attempt the driver installation. See "J19: Boot Recovery Mode" on page 45.

Indicator LED D15	Indicator State
OFF	(default) using driver uploaded firmware
ON	Using safe mode firmware

J19: Boot Recovery Mode

- **Default Mode**: Shunt jumper is installed. PC2-Comp Express boots normally on system power-up and is ready to execute image capture applications.
- **Boot Recovery Mode**: Shunt jumper is removed if any problems occur while updating the PC2-Comp Express firmware. With the jumper off, reboot the computer and update the firmware again. When the update is complete, install the jumper and reboot the computer once again.

J10, J11, J15, J18, J20, SW1: Reserved

Computer Requirements for the PC2-Comp Express

The host computer requirement for using PC2-Comp Express is an Intel or compatible computer system with a free PCI Express x1 bus slot. Using an unused PCI Express x4, x8 or x16 slot is allowed by the PCI Express specification.

Operating System Support

Windows® XP, Windows® Vista, and Windows® 7.

PC2-Comp Express Physical Dimensions

Approximately 6.675" W×4.2" H (16.95 cm W×10.67 cm H)

Power Requirements

The PC2-Comp Express is compliant with the PCI Express specification power requirements.

	Typical	Maximum
+3.3 Volts	1.72 A	1.8 A
+12 Volts	160 mA	170 mA

Environment

Ambient Temperature:	0° to 55° C (operation) -40° to 125° C (storage)
Relative Humidity:	5% to 95% non-condensing (operating) 0% to 95% (storage)

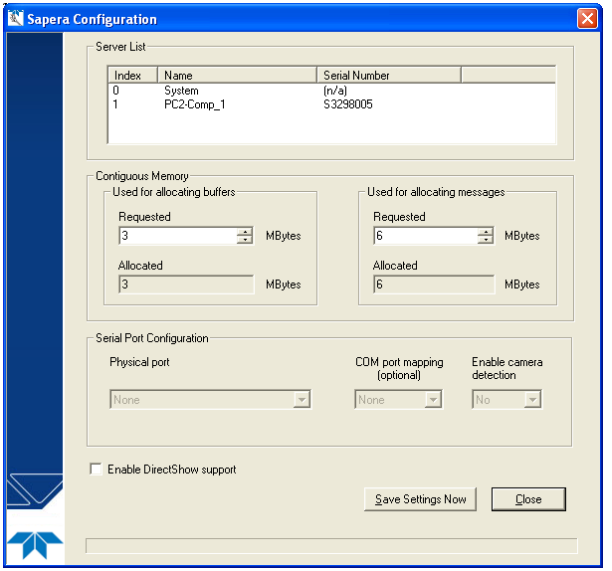
Sapera LT

Configuring Sapera

Viewing Installed Sapera Servers

The Sapera Configuration program (**Start • Programs •** Teledyne **DALSA • Sapera LT • Sapera Configuration**) allows the user to see all available Sapera servers for the installed Sapera-compatible boards.

The **System** entry represents the system server. It corresponds to the host machine (your computer) and is the only server that should be present at all times. As shown in the following screen image, server index 1 is the installed PC2-Comp Express board itself. If required, update the server list by clicking the **Refresh** button.



Increasing Contiguous Memory for Sapera Resources

The **Contiguous Memory** section lets the user specify the total amount of contiguous memory (a block of physical memory occupying consecutive addresses) reserved for the resources required for **Sapera buffers** allocation and **Sapera messaging**. For both items, the **Requested** value dialog box shows the

driver default memory setting while the **Allocated** value displays the amount of contiguous memory that has been allocated successfully. The default values will generally satisfy the needs of most applications.

The **Sapera buffers** value determines the total amount of contiguous memory reserved at boot time for the allocation of dynamic resources used for host frame buffer management, such as DMA descriptor tables as well as other kernel needs. Adjust this value to a higher level if your application generates any 'out of memory' errors while allocating host frame buffers. You can approximate the amount of contiguous memory required as follows:

- Calculate the total amount of host memory used for frame buffers (number of frame buffers • number of pixels per line • number of lines • [2 - if buffer is 10 or 12-bits]).
- Provide 1MB for every 256MB of host frame buffer memory required.
- Add an additional 1MB if the frame buffers have a short line length, for example, 1k or less (increased number of individual frame buffers requires more resources).

Add an additional 2MB for various static and dynamic resources:

- Sapera resources.
- Test for any memory errors when allocating host buffers. Click the **Buffer** button in the 'General Options' section in the Grab Demo program to allocate the number of host buffers required for your acquisition source. Feel free to test the maximum host buffer limit possible on your host system—the Sapera Grab Demo will not crash when the requested number of host frame buffers cannot be allocated.

Host Computer Frame Buffer Memory Limitations

When planning a Sapera application and the number of host frame buffers to use, as well as other Sapera memory resources, be aware of Windows OS memory needs. Window® XP, for example, should always have a minimum of 128MB for its own needs.

A Sapera application using scatter-gather buffers could consume most of the remaining system memory. When using frame buffers allocated as a single contiguous memory block, typical limitations are one third of the total system memory with a maximum limit of approximately 100MB. Click the **Buffer** button in the 'General Options' section within the Grab Demo program for information concerning selecting the type of host buffer memory allocation.

Contiguous Memory for Sapera Messaging

The current value for **Sapera messaging** determines the total amount of contiguous memory reserved at boot time for message allocation. This memory space is used to store arguments when a Sapera function is called. Increase this value if you are using functions with large arguments, such as arrays, and when experiencing any memory errors.

Sapera Server and Parameters

The following table lists the Sapera server available for PC2-Comp Express. Note that a single server supports both monochrome, color, and Y/C cameras.

Servers		Resources			
Name	**Description**	**Type**	**Name**	**Index**	**Description**
PC2-Comp	PC2-Comp Express	Acquisition	Standard Composite Video & Y/C	0	Composite Video (color/mono) and Y/C video channel

The following table describes the Sapera parameters and values supported by PC2-Comp Express. Refer to *Sapera Acquisition Parameters Reference manual* for a thorough description of each parameter.

CAMERA PARAMETERS	Values
CORACQ_PRM_CHANNEL	CORACQ_VAL_CHANNEL_SINGLE
CORACQ_PRM_CHANNELS_ORDER	CORACQ_VAL_CHANNELS_ORDER_NORMAL
CORACQ_PRM_COUPLING	CORACQ_VAL_COUPLING_AC
CORACQ_PRM_FIELD_ORDER	CORACQ_VAL_FIELD_ORDER_NEXT_FIELD CORACQ_VAL_FIELD_ORDER_EVEN_ODD CORACQ_VAL_FIELD_ORDER_ODD_EVEN
CORACQ_PRM_FRAME	CORACQ_VAL_FRAME_INTERLACED
CORACQ_PRM_HACTIVE	Min: 16 Max: 4096 Step: 4
CORACQ_PRM_HBACK_PORCH	Min: 0 Max: 4092 Step: 1
CORACQ_PRM_HFRONT_PORCH	Min: 0 Max: 4092 Step: 1
CORACQ_PRM_HSYNC	Min: 1 Max: 4092 Step: 1
CORACQ_PRM_HSYNC_POLARITY	CORACQ_VAL_ACTIVE_LOW
CORACQ_PRM_INTERFACE	CORACQ_VAL_INTERFACE_ANALOG
CORACQ_PRM_PIXEL_CLK_INT	Min: 1000000 Max: 40000000 Step: 1
CORACQ_PRM_PIXEL_CLK_SRC	CORACQ_VAL_PIXEL_CLK_SRC_INT

CORACQ_PRM_PIXEL_DEPTH	8 bits, # LUT = 1, LUT Format = CORDATA_FORMAT_MONO8
CORACQ_PRM_SCAN	CORACQ_VAL_SCAN_AREA
CORACQ_PRM_SIGNAL	CORACQ_VAL_SIGNAL_SINGLE_ENDED
CORACQ_PRM_SYNC	CORACQ_VAL_SYNC_COMP_VIDEO
CORACQ_PRM_TAP_1_DIRECTION	CORACQ_VAL_TAP_DIRECTION_FROM_TOP CORACQ_VAL_TAP_DIRECTION_UD CORACQ_VAL_TAP_DIRECTION_LR
CORACQ_PRM_TAP_OUTPUT	CORACQ_VAL_TAP_OUTPUT_SEGMENTED
CORACQ_PRM_TAPS	1
CORACQ_PRM_VACTIVE	Min: 16 Max: 4096 Step: 1
CORACQ_PRM_VBACK_PORCH	Min: 0 Max: 4095 Step: 1
CORACQ_PRM_VFRONT_PORCH	Min: 0 Max: 4095 Step: 1
CORACQ_PRM_VIDEO	CORACQ_VAL_VIDEO_MONO CORACQ_VAL_VIDEO_COLOR CORACQ_VAL_VIDEO_YC
CORACQ_PRM_VIDEO_STD	CORACQ_VAL_VIDEO_STD_RS170_NTSC CORACQ_VAL_VIDEO_STD_CCIR_PAL CORACQ_VAL_VIDEO_STD_SECAM
CORACQ_PRM_VSYNC	Min: 1 Max: 4095 Step: 1
CORACQ_PRM_VSYNC_POLARITY	CORACQ_VAL_ACTIVE_LOW

VIC PARAMETERS	Values
CORACQ_PRM_BRIGHTNESS	Min: -47360 (-47%) Max: 46990 (46%) Step: 370 (0.37%)
CORACQ_PRM_CAMSEL	Monochrome Min: 0 Max: 5 Step: 1 Color Min: 0 Max: 5 Step: 1 YC Min: 0 Max: 1 Step: 1
CORACQ_PRM_CONTRAST	Min: 78112 (78%) Max: 114688 (114%) Step: 288 (0.288%)
CORACQ_PRM_CROP_HEIGHT	Min: **16** Max: 4095 Step: **1**
CORACQ_PRM_CROP_LEFT	Min: 0 Max: 4080 Step: 1
CORACQ_PRM_CROP_TOP	Min: **0** Max: 4080 Step: **1**
CORACQ_PRM_CROP_WIDTH	Min: 16 Max: 4095 Step: 4
CORACQ_PRM_DC_REST_MODE	CORACQ_VAL_DC_REST_MODE_AUTO
CORACQ_PRM_DECIMATE_METHOD	CORACQ_VAL_DECIMATE_DISABLE CORACQ_VAL_DECIMATE_ODD CORACQ_VAL_DECIMATE_EVEN
CORACQ_PRM_EXT_TRIGGER_DETECTION	CORACQ_VAL_RISING_EDGE CORACQ_VAL_FALLING_EDGE CORACQ_VAL_ACTIVE_HIGH CORACQ_VAL_ACTIVE_LOW
CORACQ_PRM_EXT_TRIGGER_DURATION	Min: 0 Max: 255 Step: 1
CORACQ_PRM_EXT_TRIGGER_ENABLE	CORACQ_VAL_EXT_TRIGGER_OFF CORACQ_VAL_EXT_TRIGGER_ON
CORACQ_PRM_EXT_TRIGGER_FRAME_COUNT	Min: 1 Max: 65535 Step: 1
CORACQ_PRM_EXT_TRIGGER_LEVEL	CORACQ_VAL_LEVEL_TTL

CORACQ_PRM_EXT_TRIGGER_SOURCE	[0] = External Trigger #1
CORACQ_PRM_EXT_TRIGGER_SOURCE_STR	[0] = External Trigger #1
CORACQ_PRM_FLIP	CORACQ_VAL_FLIP_HORZ
CORACQ_PRM_HUE	Min: -180000 Max: 178600 Step: 1
CORACQ_PRM_INT_FRAME_TRIGGER_ENABLE	TRUE FALSE
CORACQ_PRM_INT_FRAME_TRIGGER_FREQ	Min: 1 Max: 1000000000 Step: 1
CORACQ_PRM_LUT_ENABLE	TRUE
CORACQ_PRM_LUT_FORMAT	CORLUT_VAL_FORMAT_MONO8
CORACQ_PRM_LUT_MAX	1
CORACQ_PRM_LUT_NENTRIES	256
CORACQ_PRM_LUT_NUMBER	0
CORACQ_PRM_OUTPUT_FORMAT	CORACQ_VAL_OUTPUT_FORMAT_MONO8 CORACQ_VAL_OUTPUT_FORMAT_YUY2
CORACQ_PRM_SATURATION	Min: 0 Max: 198400 Step: 1
CORACQ_PRM_SCALE_HORZ	Min: 0 Max: 4095 Step: 2
CORACQ_PRM_SCALE_HORZ_METHOD	CORACQ_VAL_SCALE_METHOD_DISABLE CORACQ_VAL_SCALE_METHOD_INTERPOLATION
CORACQ_PRM_SCALE_VERT	Min: 0 Max: 4095 Step: 1
CORACQ_PRM_SCALE_VERT_METHOD	CORACQ_VAL_SCALE_METHOD_DISABLE CORACQ_VAL_SCALE_METHOD_INTERPOLATION
CORACQ_PRM_SHARPNESS	Min: -7 Max: 8 Step: 1

ACQUISITION PARAMETERS	**Values**

CORACQ_PRM_EVENT_TYPE	CORACQ_VAL_EVENT_TYPE_EXTERNAL_TRIGGER CORACQ_VAL_EVENT_TYPE_EXTERNAL_TRIGGER_IGNORED CORACQ_VAL_EVENT_TYPE_FRAME_LOST CORACQ_VAL_EVENT_TYPE_VERTICAL_SYNC CORACQ_VAL_EVENT_TYPE_START_OF_FIELD CORACQ_VAL_EVENT_TYPE_START_OF_ODD CORACQ_VAL_EVENT_TYPE_START_OF_EVEN CORACQ_VAL_EVENT_TYPE_START_OF_FRAME CORACQ_VAL_EVENT_TYPE_END_OF_FIELD CORACQ_VAL_EVENT_TYPE_END_OF_ODD CORACQ_VAL_EVENT_TYPE_END_OF_EVEN CORACQ_VAL_EVENT_TYPE_END_OF_FRAME
CORACQ_PRM_SIGNAL_STATUS	CORACQ_VAL_SIGNAL_HSYNC_PRESENT CORACQ_VAL_SIGNAL_VSYNC_LOCK CORACQ_VAL_SIGNAL_CHROMA_PRESENT

TRANSFER PARAMETERS	Values
CORXFER_PRM_EVENT_TYPE	CORXFER_VAL_EVENT_TYPE_END_OF_FIELD CORXFER_VAL_EVENT_TYPE_END_OF_ODD CORXFER_VAL_EVENT_TYPE_END_OF_EVEN CORXFER_VAL_EVENT_TYPE_END_OF_FRAME CORXFER_VAL_EVENT_TYPE_END_OF_TRANSFER

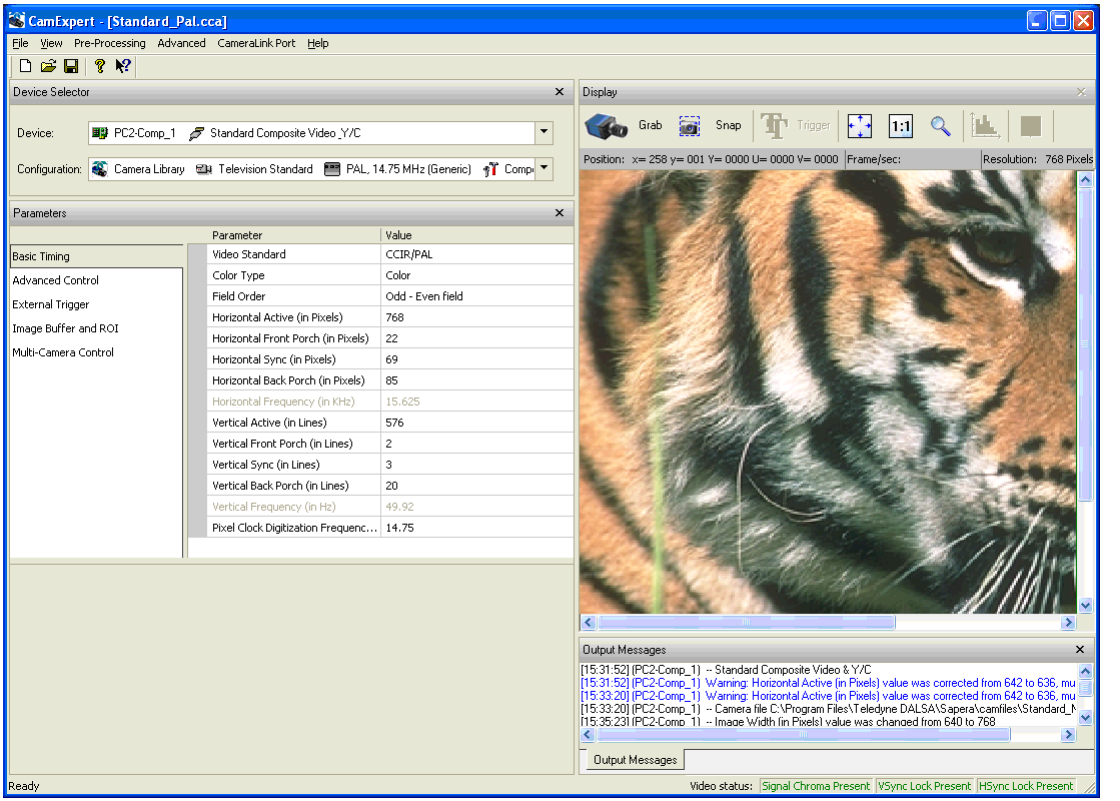
Using CamExpert with PC2-Comp Express

CamExpert is the camera interfacing tool for frame grabber boards supported by the Sapera library. CamExpert generates the Sapera camera configuration file (*your_camera.ccf*) based on timing and control parameters entered. For backward compatibility with previous versions of Sapera, CamExpert also reads and writes the *.cca and *.cvi camera parameter files.

Every Sapera demo program starts by a dialog window to select a camera configuration file. Even when using the PC2-Comp Express with standard video signals, a camera file is required. Therefore CamExpert is typically the first Sapera application run after an installation. Obviously existing .ccf files can be copied to the new installation when similar cameras are used.

CamExpert Example with a PAL Camera

The image below shows CamExpert with the PC2-Comp Express. The camera outputs standard PAL composite video. After selecting the camera or video standard, the timing parameters are displayed and the user can test by clicking on *Grab*. Descriptions of the CamExpert windows follows the image.



The CamExpert sections are:

- **Device:** Select which acquisition device to control and configure a camera file for. Required in cases where there are multiple boards in a system and also when one board supports multiple acquisition types.
- **Configuration:** Select the timing for a specific camera model included with the Sapera installation or a standard video standard. In this example the selection is PAL standard. Standard monochrome video would be either CCIR or RS170. The *User's* subsection is where created camera files are stored.
- **Parameters:** The central section of CamExpert provides access to the various Sapera parameters supported by PC2-Comp Express. It is divided into five tabs:

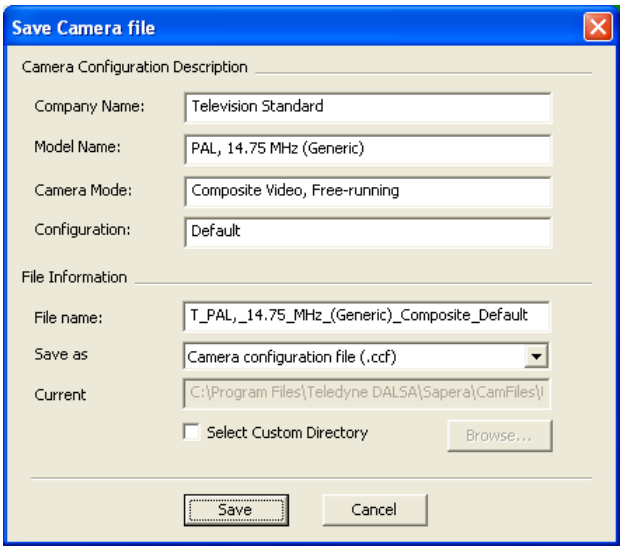
Basic Timing Parameters	Basic parameters used to define the timing of the camera. This includes the vertical, horizontal, and pixel clock frequency. This tab is sufficient to configure a free-running camera.
Advanced Control Parameters	Advanced parameters used to configure camera control mode and strobe output. Also provides analog signal conditioning (brightness, contrast, DC restoration, and so forth)
External Trigger Parameters	Parameters to configure the external trigger characteristics.
Image Buffer and AOI Parameters	Control of the host buffer dimension and format.
Multi-Camera Control Parameters	Provides camera selection. Includes planar transfer.

- **Display:** An important component of CamExpert is its live acquisition display window which allows immediate verification of timing or control parameters without the need to run a separate acquisition program. **Grab** starts continuous acquisition (button then toggles to **Freeze** to stop). **Snap** is a single frame grab. **Trigger** is a software trigger to emulate an external source.
- **Output Messages:** Events and errors are logged for review.

For context sensitive help, click on the  button then click on a camera configuration parameter. A short description of the configuration parameter will be shown in a popup. Click on the  button to open the help file for more descriptive information on CamExpert.

Saving a Camera Configuration File

Click on **File•Save** to create the camera configuration file. The following image shows the save menu with the PAL camera default timing from the previous example.



Camera Files Distributed with Sapera

The Sapera distribution CD-ROM includes camera files that are compatible to PC2-Comp Express supported cameras. When using the Sapera CamExpert program, you may use the camera files (CCA) provided to generate a camera configuration file (CCF) that describes the desired camera and frame grabber configuration.

Camera files are ASCII text and can be read with Windows Notepad on any computer without having Sapera installed.

Overview of Sapera Acquisition Parameter Files (*.ccf or *.cca/*.cvi)

Concepts and Differences between the Parameter Files

There are two components to the legacy Sapera acquisition parameter file set: CCA files (also called cam files) and CVI files (also called VIC files, that is, video input conditioning). The files store video-signal parameters (CCA) and video conditioning parameters (CVI), which in turn simplifies programming the frame grabber acquisition hardware for the camera in use. **Sapera LT 5.0** introduces a new camera configuration file (**CCF**) that combines the CCA and CVI files into one file.

Typically, a camera application will use a CCF file per camera operating mode (or one CCA file in conjunction with several CVI files, where each CVI file defines a specific camera operating mode). An application can also have multiple CCF files so as to support different image format modes supported by the camera or sensor (such as image binning or variable ROI).

CCF File Details

Files using the ".CCF" extension (CORECO Camera Configuration file) are essentially the camera (CCA) and frame grabber (CVI) parameters grouped into one file for easier configuration file management. This is the default Camera Configuration file used with Sapera LT 5.0 (and later) and the CamExpert utility.

CCA File Details

Teledyne DALSA distributes camera files using the ".CCA" extension (CORECO CAMERA files) that contains all parameters describing the camera video signal characteristics and operation modes (that is, what the camera outputs). The Sapera parameter groups located within the file are:

- Video format and pixel definitions.
- Video resolution (pixel rate, pixels per line, and lines per frame).
- Synchronization source and timings.
- Channels/Taps configuration.
- Supported camera modes and related parameters.
- I/O hardware signal assignment.

CVI File Details

Legacy files using the ".CVI" extension (CORECO VIDEO files) contain all operating parameters related to the frame grabber board, that is, what the frame grabber can actually do with camera controls or incoming video. The Sapera parameter groups located within the file:

- Activates and sets any supported camera control mode or control variable.
- Defines the integration mode and duration.
- Defines the strobe output control.
- Allocates the frame grabber transfer ROI, the host video buffer size and buffer type (RGB888, RGB101010, MONO8, MONO16).

- Configuration of line/frame trigger parameters such as source (internal via the frame grabber /external via some outside event), electrical format (TTL, LVDS, OPTO-isolated), and signal active edge or level characterization.

Camera Interfacing Check List

Before undertaking the task of interfacing a camera from scratch using CamExpert:

- Confirm that Sapera does not already have a .cca file for your camera installed on your hard disk. If there is a .cca file supplied with Sapera, then use CamExpert to automatically generate the .ccf file with default parameter values matching the frame grabber capabilities.
- Check if the Sapera installation has a similar type of camera file. A similar .cca file can be loaded into CamExpert where it is modified to match timing and operating parameters for your camera and then save them as Camera Configuration files (.ccf), or as a new .cca & .cvi camera file pair for applications built with Sapera 4.2 or earlier.
- Finally, if your camera type has never been interfaced, run CamExpert after installing Sapera and the acquisition device driver, select the board acquisition server, and enter the camera parameters.

A Note about Cameras

Many cameras have jumpers or a serial port to control their internal configuration. Make certain that they match your camera configuration file.

A Note on Analog Camera Timing Relationships

For analog cameras, the following formulas show the relationship between the PCLK parameter and the Horizontal and Vertical total. These values must be accurate if the acquisition board drives the synchronization signals to the camera (board is in Master Mode).

- The HS and VS signal frequencies are:

$$\frac{1}{HS_{freq}} = \frac{1}{PCLK_{freq}} * H_{total} \qquad \frac{1}{VS_{freq}} = \frac{1}{HS_{freq}} * V_{total}$$

Overview of Video Bandwidth and System Limitations

Some high resolution/high frame rate cameras can output more data than can be transferred through the host computer PCI bus. A successful imaging application must account for the camera data bandwidth and possibly control frame rate or image resolution to bring the bandwidth requirements to within the system's limitations.

Bandwidth is defined in two different ways. Peak bandwidth is the highest data rate occurring at any time during the data transfer. The average bandwidth is the amount of data per unit of time being transferred.

Each is calculated as follows:

- Peak Bandwidth (MBps) = Pixel Clock Frequency *Bpp *nb channels
- Average Bandwidth (MBps) = Frame Width *Frame Height *Frame Rate *Bpp
- where:
- MBps = Megabytes per second
- Bpp = Bytes per pixel
- nb = number of …

When the bandwidth required by the frame grabber exceeds the capacity of the PCIe bus, the following techniques can reduce and optimize the average bandwidth.

Bandwidth Reduction Techniques

- A linear relationship exists between the average bandwidth required and the acquisition image height. For example, if four cameras of 1K x 1K, at some frame rate, need to transfer 160MB per second of data, those four cameras at a 512 x 1K resolution will only need a bandwidth of 80MB per second.
- Using the Planar Transfer mode, where each color plane is sent to its own host buffer, can reduce PCI traffic by 25% 羊 3 bytes to transfer (RGB) instead of 4 (xRGB).

Bandwidth Optimization Techniques

The following techniques are suggestions for applications that require all possible optimizations from the host system. Implementing these suggestions require a thorough understanding of your computer system setup and its BIOS controls.

- Allocate a separate IRQ for the frame grabber. BIOS settings can be used to manually assign the IRQ number to a particular PCI slot. As an alternative, the Window Device Manager can be used to force a specific IRQ to a specific PCI slot.
- Minimize the PCI latency timer in the BIOS setting; the value is given in CLK cycles.
- Avoid any hard drive write/read operations and network access through PCI LAN interfaces during intensive image transfers by the frame grabber.

Important: Some computer systems do not provide the BIOS controls described. Review your system manual.

Sapera Grab Demo

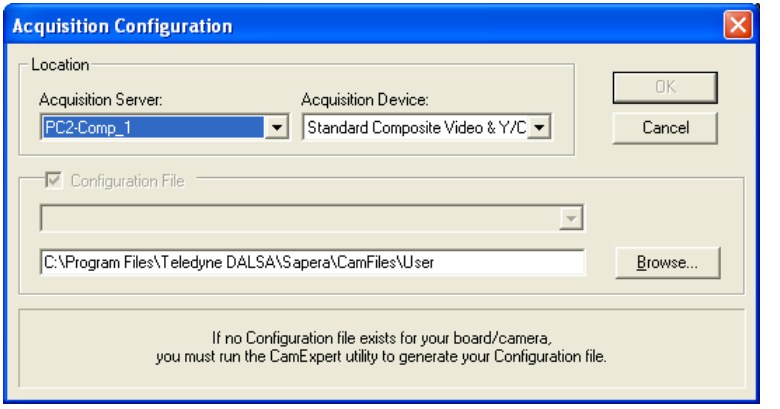
Overview

Program	**Start•All Programs• Teledyne DALSA •Sapera LT•Demos•Grab Demo**
Program file	**\Teledyne DALSA\Sapera\Demos\Classes\vc\GrabDemo\Release\GrabDemo.exe**
Workspace	**\Teledyne DALSA\Sapera\Demos\Classes\vc\SapDemos.dsw**
.NET Solution	**\Teledyne DALSA\Sapera\Demos\Classes\vc\SapDemos_2003.sln**
Description	This program demonstrates the basic acquisition functions included in the Sapera library. The program allows you to acquire images, either in continuous or in one-shot mode, while adjusting acquisition parameters. The program code can be extracted for use within your own application.
Remarks	Grab Demo was built using Visual C++ 6.0 by means of the MFC library and is based on the Sapera standard API and Sapera C++ classes. See the Sapera User's and Reference manuals for further information.

Using the Grab Demo

Server Selection

Run Grab Demo: **Start•All Programs•** Teledyne **DALSA •Sapera LT•Demos•Grab Demo**.



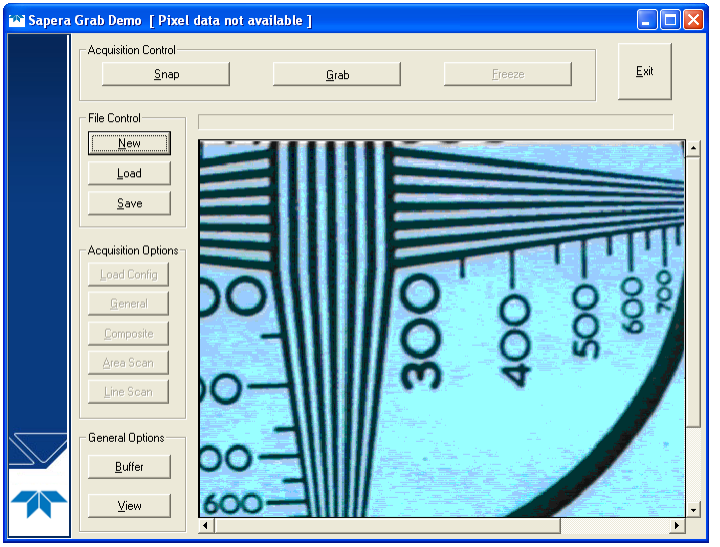
When executed, Grab Demo first displays the "Acquisition Configuration" window. The first drop-down menu allows you to select any installed Sapera acquisition server (that is, installed Teledyne DALSA acquisition hardware using Sapera drivers). The second drop-down menu allows you to select the available input devices present on the selected server.

CCF File Selection

The 'Acquisition Configuration' window is also used to select the camera configuration file required for the connected camera. Sapera camera files contain timing parameters and video conditioning parameters. The default folder used for camera configuration files is also used by the CamExpert utility to save user generated or modified camera files.

Grab Demo Main Window

The main window provides control buttons and a central region where the grabbed image is displayed. Developers can use the source code supplied with the demo as a foundation to quickly create and test the desired imaging application. The various functions are described below.



Acquisition Control

- **Grab:** Displays live digitized video from your video source. If your source is a camera, focus and adjust the lens aperture for the best exposure. Use a video generator as a video source to acquire reference images.
- **Freeze:** Stops live grab mode. The grabbed image can be saved to disk via the **File Control•Save** control.
- **Snap:** A single video frame is grabbed.

File Control

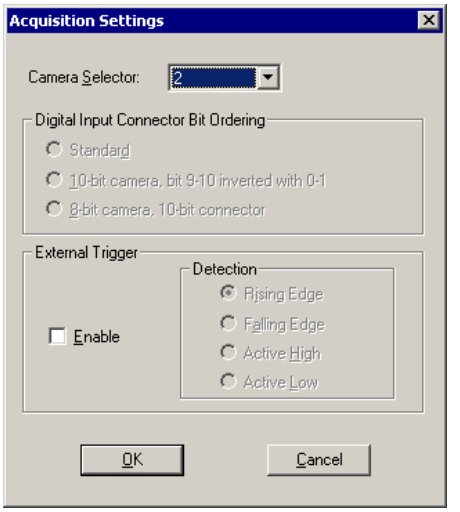
Three controls are provided for image file transfers

- **New:** Clears the current image frame buffer.
- **Load:** Retrieves images in BMP, TIF, CRC, JPG, and RAW formats.
- **Save:** Prompts for a file name, file save location, and image format.

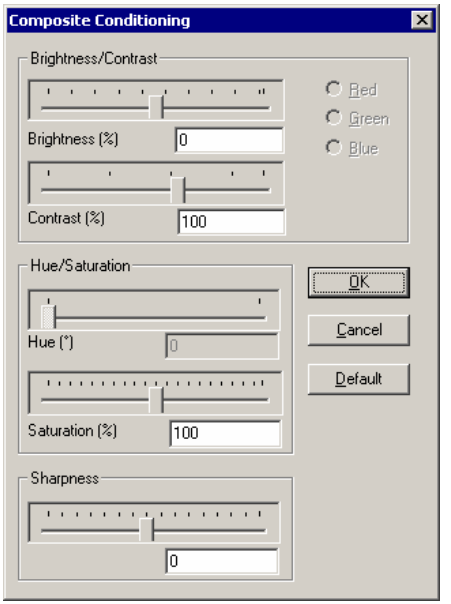
Acquisition Options

Note: Unsupported functions are grayed out and not selectable. Function support is dependent on the acquisition hardware in use.

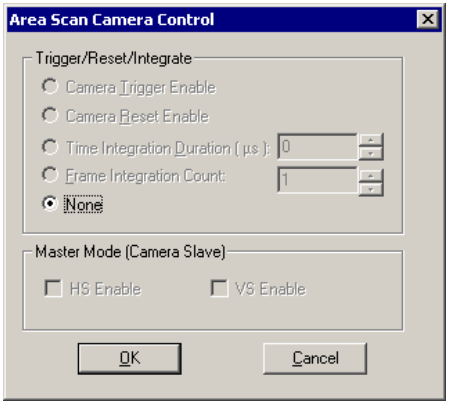
- **Load Config:** Opens the dialog window Acquisition Parameters allowing the user to load a new set of camera files. This is the same window displayed when the Sapera Acquisition Demo is first started
- **General:** Allows for PC2-Comp Express camera input selection and external trigger mode enabling.



- **Composite - Conditioning:** Offers Brightness, Saturation, and Sharpness controls.



- **Area Scan – Camera Control:** Provides trigger, reset, and integrate controls when supported by the current hardware and driver. Also offers master HS and VS output.



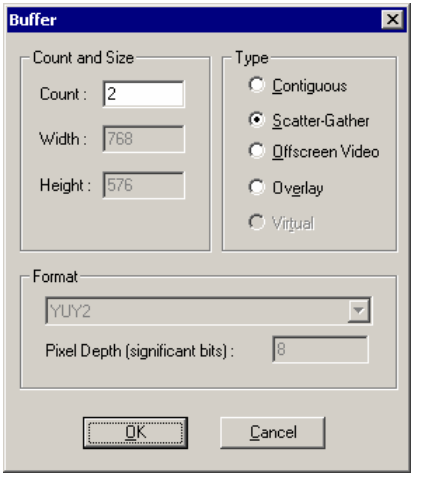
- **Line Scan – Camera Control:** This dialog is not applicable to the area scan frame grabber.

.

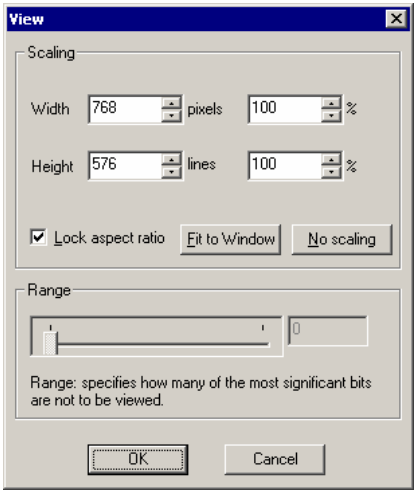
General Options

Note: functions grayed out are not supported by acquisition hardware.

- Buffer: Provides buffer count and size, type, and format controls.



- **Count and Size**: Select the number of frame buffers of the configured image size.
- Type – **Contiguous**: Frame buffers are allocated in contiguous system memory (single memory block - no segmentation).
- Type – **Scatter-Gather**: Frame buffers are allocated throughout system memory in noncontiguous memory (paged pool). Pages are locked in physical memory so a scatter-gather list can be constructed. This type allows for the allocation of very large size buffers or large buffer counts.
- Type – **Off-screen Video**: The buffer is allocated in off-screen video memory and uses the display adapter hardware to perform a fast copy from video memory to video memory.
- Type – **Overlay**: The frame buffer is allocated in video memory where the display adapter overlay hardware uses color-keying to view the overlay buffer.
- **Format**: Shows frame buffer pixel formats as supported by the hardware and camera files used.
- **View**: Provides image scaling and range controls.


View
Scaling
Width
768
pixels
100
%
Height
576
lines
100
%
Lock aspect ratio
Fit to Window
No scaling
Range
0
Range: specifies how many of the most significant bits are not to be viewed.
OK
Cancel

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Declare under sole legal responsibility that the following products conform to the protection requirements of council directive 2004/108/EC on the approximation of the laws of member states relating to electromagnetic compatibility:

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EN55022:2006, A1:2007
EN55024:1998, A1:2001, A2:2003
ENV50204:1995

Further declare under our sole legal responsibility that the product listed conforms to the code of federal regulations CFR 47 part 15 (2008), subpart B, for a class A product.

St. Laurent, Canada — Location
2012-04-09 — Date

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Technical support form via our web page: Support requests for imaging product installations, Support requests for imaging applications	http://www.teledynedalsa.com/mv/support
Driver updates	http://www.teledynedalsa.com/mv/support/driverSDKlist.aspx

When encountering hardware or software problems, please have the following documents included in your support request:

- The Teledyne DALSA Log Viewer .txt file
- The PCI Diagnostic PciDump.txt file
- The Teledyne DALSA Device Manager BoardInfo.txt file

Note, all these tools are available from the Windows start menu shortcut **Start•All Programs•Teledyne DALSA •Sapera LT•Tools**.

Glossary of Terms

ADC

Analog-to-Digital conversion is an electronic process in which a continuously variable (analog) signal is changed, without altering its essential content, into digital data.

Back Porch

The portion of the video waveform between the end of horizontal sync and the start of active video.

Bandwidth

Describes the measure of data transfer capacity. A computer system's PCI expansion bus is rated for a maximum peak data bandwidth of 132 MB/s. PCI devices must share the maximum PCI bus bandwidth when transferring data to and from system memory or other devices.

Blanking

The part of the video signal where the CRT scanning beam is blanked so that it can track back to the starting point without drawing diagonal lines across the screen. Horizontal blanking occurs when the signal is blanked to track back horizontally from right to left. Vertical blanking retraces the beam from the bottom to the starting point (top).

Bus

A common pathway, or channel, between multiple devices. Besides the computer's internal bus to memory and system components, peripheral buses such as PCI and AGP, allow adding or changing devices that make up the computer system.

Clamper Circuit

A circuit that establishes a fixed level for the video signal at the beginning of each scanning line. Also know as "DC restoration".

Composite Video

A video signal that is composed of the luminance and color information plus the synchronization signals together. Common composite video formats are NTSC and PAL.

Contiguous Memory

A block of physical memory occupying consecutive addresses.

DDC

Display Data Channel. A data channel used by newer monitor which communicates monitor properties (such as maximum resolution and refresh rate) to the associated video adapter.

Driver

Also called a device driver, a program routine that links a peripheral device to the operating system.

Frame

One complete image data set or its equivalent storage space.

Frame buffer

An area of memory used to hold a frame of image data. A frame buffer may exist on the acquisition hardware or be allocated by the acquisition hardware device driver in host system memory.

Front Porch

This is the area of the video waveform that sits between the start of horizontal blanking and the start of horizontal sync.

Genlock

When two cameras are genlocked, their internal sync circuits are driven by a common external source. These cameras output video frames synchronous to each other.

Grab

Acquiring an image frame by means of a frame grabber.

Grayscale

In image processing, the range of available brightness levels, displayed in shades of gray. In an 8-bit system, the gray scale contains values from 0 to 255.

Host

Refers to the computer system that supports the installed frame grabber.

Interlaced

Describing the standard television method of raster scanning in which the image is the product of two fields, each of which is made up of the image's alternate lines (that is, one field is comprised of lines 1, 3, 5, and so forth, and the other is comprised of lines 2, 4, 6, and so forth)

Look-up Table

A table that is used to convert values into related values from the table.

Low Pass Filter

A filter that blocks high frequencies and allows lower frequencies to pass through. Used to limit undesirable analog information (such as high frequency video noise) before converting to digital data.

NTSC

National Television Systems Committee. Color TV standard used in North America and other countries. The interlaced video signal is composed of a total of 525 video lines at a frame rate of 30 Hz.

Opto-Coupler

An electronics device that couples an electrical connection by a light beam. It prevents damage caused from inherent electrical signal problems, like power surges.

PAL

Phase Alteration by Line. Color TV standard used in most of Europe and other countries. The interlaced video signal is composed of a total of 625 video lines at a frame rate of 25 Hz.

PCI

Peripheral Component Interconnect. The PCI local bus is a 32-bit high performance expansion bus intended for interconnecting add-in boards, controllers, and processor/memory systems.

PCIe

PCI Express. PCI Express provides a high-speed, switched architecture. Each PCI Express link is a serial communications channel made up of two differential wire pairs that provide 2.5 Gbits/sec in each direction. Up to 32 of these "lanes" may be combined in x2, x4, x8, x16 and x32 configurations, creating a parallel interface of independently controlled serial links.

Pixel

A contraction of "picture element". The number of pixels describes the number of digital samples taken of the analog video signal. The number of pixels per video line by the number of active video lines describes the acquisition image resolution. The binary size of each pixel (for example, 8-bits, 15-bits, 24-bits) defines the number of gray levels or colors possible for each pixel.

PLL

Short for phase-locked loop. A PLL ensures that a signal is locked on a specific frequency.

Progressive Scan Camera

The progressive scan format outputs data from the camera (the signal) in sequential order as it is scanned. The scan format produces a full frame of video in a continuous stream, rather than half the image per output sequence in standard interlaced cameras.

RS-232

A standard serial communication port.

RS-422

RS-422 is a serial communications standard that provides a much longer transmission distance (but fewer signal lines) than to RS-232.

Scatter Gather

Host system memory allocated for frame buffers is virtually contiguous but physically scattered throughout all available memory.

Trigger

A mechanism that initiates an action when an event occurs such as synchronizing an image acquisition to an external event. A trigger generally causes a program routine to be executed such as the resetting of camera exposure and/or the firing of a strobe light.

TTL

Transistor-Transistor Logic. Acceptable TTL gate input signal voltage levels are:

LOW: lower than 0.8V

HIGH: higher than 2.0V

Any voltage between 0.8V and 2.0V is uncertain and will not be reliably interpreted by the TTL device.

UART

A UART (Universal Asynchronous Receiver/Transmitter) is the microchip with programming that controls an interface to its attached serial devices.

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