Phoenix Selection Guide

Camera Link Frame Grabbers

Description

This selection guide helps you choose which of the Phoenix Camera Link frame grabbers is most suitable for your application. There are many variants of the boards, with a variety of bus formats and form factors, as well as different Camera Link options.

The decisions to make are:

- Standard PC or Industrial Form Factor?
- PCI Express or PCI?
- Bus Bandwidth Needed?
- D24, D48 or D64 Camera Link?
- Power over Camera Link (PoCL)?

Standard PC or Industrial Form Factor?

Standard PC boards plug into a normal desktop PC, whereas industrial form factors are designed for embedded systems, particularly in harsh environments, where a rugged form factor and extended temperature operation may be needed.

Active Silicon offers frame grabbers in the following industrial form factors:

Form Factor	Options / Notes
PC/104-Plus	-
PMC	-
CompactPCI	3U or 6U height

PC/104-Plus is generally the lowest cost of these three to implement, and has a good selection of low power processors available. PMC and CompactPCI are used where ruggedness and reliability are most critical, but tend to be more expensive.

PCI Express or PCI?

For standard PC boards Active Silicon generally recommends that PCI Express is used for new designs. However motherboards with standard 32 bit PCI slots are still readily available, and may continue to be available for several years, so these may still be an option for new designs. Note that 64 bit PCI slots are now quite hard to find in new PCs, so are not recommended for new designs.

With industrial form factors, proven reliability is critical, so the market is quite conservative and PCI is still dominant.

Bus Bandwidth Needed?

Some Camera Link cameras can be very fast, with data rates as high as 850 Mbytes a second for *Full* cameras. The frame grabber and computer need to be chosen to reliably keep up with the data rate from your chosen camera. This is quite a complex topic …

The key thing to understand is the data rate from the camera. This may not be clear from the camera's data sheet, but depends on the pixel clock frequency, the number of taps the camera outputs, and the bit depth of the data. This is why one of the first questions that *Active Silicon Sales* will ask is details of your camera.

Having established the data rate from the camera, you next have to consider if you plan to use the hardware image format conversions that Phoenix can perform. If say the data from an 8 bit monochrome camera is converted into an "RGBx" type format – possibly for ease of display – the data rate over the bus goes up by a factor of four.

Next you need to choose the appropriate bus interface for the Phoenix frame grabber. 32 bit PCI is slowest, x4 PCI Express is fastest – but more expensive both in terms of the frame grabber and the motherboard. Therefore volume OEM customers in particular need to carefully consider bandwidth when they are trying to optimize system cost.

Finally you need to choose a computer that will accept this bus interface. Note here that not all motherboards are equal in how well they cope with lots of data from a camera. Low power embedded motherboards in particular may achieve relatively low *average* data transfer rates, even if the peak data rate quoted in the specification is good.

This description is only an overview. Customers should contact *Active Silicon Sales* for advice.

D24, D48 or D64 Camera Link?

Active Silicon's naming of all Phoenix Frame Grabbers is based on the data width in bits, which corresponds in Camera Link products to *Base*, *Medium* or *Full* configuration:

Phoenix	Camera Link	Notes
D24	Base	-
D48	Medium	Also supports *Base* and *dual Base*
D64	Full	Also supports *Base* and *Medium*

The decision here mainly depends on the camera. A *Full* camera needs a *Full* frame grabber. A *Base* camera will work with any of the frame grabbers, but the D24 is most cost effective. *Dual Base*, as supported on the D48 frame grabbers, allows two *Base* cameras to be connected simultaneously.

Power over Camera Link (PoCL)?

Some of the latest Camera Link cameras can be powered from the Camera Link cable, resulting in a neat system with few cables.

Currently Phoenix PCI Express boards support PoCL. These boards also support *SafePower*, a Camera Link protocol originated by Active Silicon, which allows PoCL cameras to be safely disconnected and reconnected, even when running live.

Note that Phoenix frame grabbers supporting PoCL also work with conventional cameras.

Migration

All Phoenix boards, and all operating systems, use a common software API. Therefore it is simple to migrate from one Phoenix frame grabber to another if your requirements change. Similarly, it is easy to migrate from one operating system to another.

Identifying PCI Express Connectors

If you plan to use a PCI Express x4 framegrabber in your PC, the only reliable way of identifying which PCI Express connectors in your PC will accept x4 boards is to check the computer's documentation, or to contact the computer manufacturer.

Alternatively, a simple and quick way of checking the width of PCI Express supported is by the length of the connector on the motherboard. For safety, power off the computer, and use a plastic ruler, to measure the connector!

PCI Express Width	Length in mm (inches)
x1	25.0 (0.984)
x4	39.0 (1.535)
x8	56.0 (2.205)
x16	89.0 (3.504)

Note that any PCI Express connector should support a x1 board.

Most x8 and x16 connectors will support a x4 board, but this is not always the case – in some computers these connectors will only work at x1 speed, which is of little use if you plan to use a x4 board. Also some x16 slots are dedicated for graphics use and will not work with any other board. This is why we recommend checking the computer's documentation.

To confuse things further, all Apple Mac Pros use x16 connectors regardless of the PCI Express width supported. However all PCI Express Apple Macs (to date – rev 3,1) support both x1 and x4 boards, although some earlier models need the width set using an Apple configuration program, as described in Phoenix Technical Note 009.

What Next?

This guide gives an overview of the issues to consider when specifying a Camera Link frame grabber. Now contact *Active Silicon Sales* to discuss your application.

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