Digital Camera Image Acquisition

NI 1424

- RS-422, LVDS, or TTL area and line-scan camera compatibility
- Full 8, 10, 12, 14, 16, 24, and 32-bit resolution (grayscale or color)
- 50 MHz pixel clock rate with up to 200 Mbytes/s acquisition
- 4 external TTL triggers (digital I/O lines)

NI 1422

- RS-422 or LVDS area and line-scan camera compatibility
- Full 8, 10, 12, 14, 16-bit resolution (grayscale or color)
- 40 MHz pixel clock rate with up to 80 Mbytes/s acquisition
- 4 external TTL triggers (digital I/O lines)

Models

NI 1424
- NI PCI-1424

NI 1422
- NI PCI-1422
- NI PXI-1422

Operating Systems
- Windows 2000/NT/XP/Me/9x

Recommended Software
- LabVIEW
- Measurement Studio
- NI Vision Development Module
  - IMAQ Vision
  - NI Vision Builder

Other Compatible Software
- C/C++

Driver Software (included)
- NI-IMAQ

Overview and Applications

The NI 1424 is a digital camera image acquisition board for PCI designed to acquire color and grayscale images and to control digital cameras. Designed for high-speed, large-image, high-resolution digital image capture, the board can capture into onboard memory up to 32 bits of data at a clock speed of 50 MHz, for a total acquisition rate of 200 Mbytes/s. Onboard memory (16 to 80 MB) gives you the flexibility to buffer images on the board for large image capture and sustained real-time throughput. Two versions of the board exist – one compatible with digital cameras that use RS-422 and another compatible with digital cameras that use LVDS.

The NI 1422 Series boards, in both PCI and PXI formats, are designed to acquire images from a wide range of digital cameras. These boards perform high-speed, large-image, high-resolution digital image capture, and can capture up to 16 bits of data at a clock speed of 40 MHz for a total acquisition rate of 80 Mbytes/s. Onboard memory (16 MB) gives you the flexibility to buffer images on the board for large-image capture and sustained real-time throughput. There are two versions of the board – one compatible with digital cameras that use RS-422 signals and another compatible with digital cameras that use LVDS. The NI 1422 Series is ideal for both industrial and scientific applications.

Digital Cameras

Digital cameras have several advantages over analog cameras. During transmission, analog video is more susceptible to noise than digital video. Digitizing at the CCD camera, rather than at the image acquisition board, increases the signal-to-noise ratio, resulting in better accuracy. In addition, standard digital cameras now come with 10 to 12-bit gray levels of resolution. The higher resolution is often necessary in medical, machine vision, astronomy, and scientific imaging applications.

INFO CODES

For more information, or to order products online visit *ni.com/info* and enter:

pci1424
pci1422
pxi1422

BUY ONLINE!

Easy Camera Configuration

Configure digital image acquisition from your digital camera with National Instruments Measurement & Automation Explorer, which is delivered with the NI-IMAQ driver software. This configuration utility is an interactive tool for setting up region of interest and camera control. Plus, you can use Measurement & Automation Explorer to control the serial interface for communicating with the camera. Both the PCI 1422 and the 1424 use a 100-pin SCSI-type connector that you can easily cable to your specific camera. In addition, Measurement & Automation Explorer includes specific camera setup files, so you can quickly configure your camera for acquisition. For a list of applicable cameras, visit *ni.com/camera*

Digital Image Acquisition

The NI 1424 can acquire four channels of 8-bit data, two channels of 10, 12, 14, or 16-bit data, or one channel of 24 or 32-bit data. The NI 1422 devices can acquire two channels of 8-bit data or one channel of 10, 12, 14, or 16-bit data.

These boards have a serial interface and four TTL or differential digital control lines for camera control. You can also use the adjustable onboard ROI window to minimize the amount of data transferred to PC memory.

Digital Camera Image Acquisition

Digital Transfer Rates

The base memory configuration for the NI 1424 is 16 MB for the board. You can use onboard memory to buffer large images before transferring them to PC memory, which increases the overall throughput. The 1422 can acquire data into onboard memory at a rate of up to 80 Mbytes/s and transfer data to PC memory at a rate of 100 Mbytes/s. The PCI-1424 can acquire data at 200 Mbytes/s into onboard memory.

Onboard Image Preparation

The 1424 has four 8-bit or two 16-bit LUTs for mapping the data from one value to another in real time. The 1422 has two 8-bit or one 16-bit LUT(s) for mapping the data from one value to another in real time.

In addition, setting a rectangular ROI window reduces the overall data across the PCI bus because the pixels outside the ROI are not transferred. You can reduce the amount of data transferred across the PCI bus by scaling or decimating the data in hardware. You can scale the image by keeping every second, fourth, or eighth pixel.

Digital I/O

Four general-purpose, bidirectional TTL digital I/O lines are available for triggering image acquisition.

NI 1424 Signaling

The RS-422/TTL version of the PCI-1424 can drive and receive either TTL or RS-422 level signals. The driver software can control these signal levels independently for data, control, and enable lines on the 100-pin connector. The LVDS (also known as EIA-644) version can drive and receive LVDS and TTL signals. Benefits of LVDS include less power consumption, longer cable lengths, less noise, and higher clock rates.

NI 1422 Signaling

One version of the NI 1422 can receive RS-422 data signals. It can also drive and receive RS-422 or TTL control and enable signals. NI-IMAQ can control these signal levels independently for data, control, and enable lines on the 100-pin connector. Another version of the NI 422 device is capable of receiving data from LVDS cameras. LVDS, also known as EIA-644, is a low-voltage differential signal protocol similar to RS-422 but with lower voltage levels.

Multiple-Channel Data Formatter

The multiple-channel data formatting circuitry is fully programmable, so you can simultaneously acquire from multiple channels to build up to the complete image.

Advanced Clock Generation

The PCI-1424 has two clock outputs for generating a frequency from 500 kHz up to 50 MHz for digital cameras that require an external clock. The NI 1422 has two clock outputs for generating a frequency from 500 kHz up to 40 MHz.

RS-232 Serial Interface

RS-232 serial lines are available on the 100-pin connector to control digital cameras that have a serial interface.

Camera Cables

National Instruments offers 2 m cables for digital cameras, including models by Balser, Dalsa, Hamamatsu, Roper Scientific, Pulnix, and others. Extension cables are also available (see the cable section). Contact National Instruments for additional cabling options or visit ***ni.com/camera***

Advanced Triggering to Work with DAQ and Motion

IMAQ products are designed to work with National Instruments DAQ and motion products. The RTSI bus on the PCI-1422 and PCI-1424 routes timing and triggering signals between boards. The PXI-1422 uses the PXI trigger bus similarly. The buses can synchronize video acquisition between several IMAQ devices or between IMAQ, DAQ, and motion control devices.

I/O Connector Signals

The 100-pin SCSI connector connects to all digital video data inputs, digital enable inputs, camera control outputs, RS-232 serial interface, and the external trigger signals.

Digital Trigger Accessory

The IMAQ D2504-1, which has four BNC connectors for digital trigger lines, is for use with National Instruments digital camera cables.

Digital Camera Image Acquisition

Ordering Information

PCI-1424 RS-422/TTL 777662-01
PCI-1424 LVDS/TTL 777662-02
Includes NI 1424 board and NI-IMAQ software for Windows 2000/NT/XP/Me/9x

Cables

See page 609 for 2 m cables to connect the NI 1424 to different cameras.

Digital Trigger Accessory

IMAQ D2504-01 (1 m).....185298-01

Accessories

100-pin to 100-pin extension cable
- 2 m 184743-02
- 4 m 184743-04

Memory upgrades
- 32 MB 920130-32
- 64 MB 920130-64

Ordering Information

NI 1422 for RS-422 Digital Cameras
- PCI-1422 RS-422 777959-01
- PXI-1422 RS-422 777933-01

NI 1422 for LVDS Digital Cameras
- PCI-1422 LVDS 777959-02
- PXI-1422 LVDS.....777933-02

Includes NI 1422 device and NI-IMAQ driver software for Windows 2000/NT/XP/Me/9x.

Digital Trigger Accessory

IMAQ D2504-1 (1 m).....185298-01

Cables

Refer to Camera Advisor at ***ni.com/camera*** for the proper camera configuration.

Extension Cables

100-pin to 100-pin extension cable
- 2 m 184743-02
- 4 m 184743-04

Tech Tip

How do I use IMAQ hardware onboard memory?

Onboard memory buffers continue to acquire resources even if there is a delay associated with the PCI bus, operating system, or image processing. Use onboard memory for high-speed burst acquisitions up to 200 Mbytes/s. Learn more about NI-IMAQ and the acquisition modes (grab, ring, and sequence) designed for display and processing of high-speed images by visiting ***zone.ni.com***

For more information, visit ***ni.com/info*** and enter: ex9kr5.

Digital Camera Image Acquisition

Specifications
NI 1424

External Connections

Trigger sense	TTL
Trigger level	Programmable (rising or falling)
Pixel clock sense	LVDS or RS-422 selectable (TTL or differential)
Pixel clock level	Programmable (rising or falling)
Enable sense	LVDS or RS-422 selectable (TTL or differential)
Enable level	Programmable (rising or falling)
Master clock drive	LVDS or RS-422 selectable (TTL or differential)
Master clock level	Rising edge
Control signal drive	LVDS or RS-422 selectable (TTL or differential)
Control signal level	Programmable (rising or falling)
Video data sense	LVDS or RS-422 selectable (TTL or differential)

Clocks

Master clock frequency range	500 kHz to 50 MHz
Pixel clock frequency range	500 kHz to 50 MHz

PCI Master Performance

Ideal	133 Mbytes/s
Sustained	100 Mbytes/s

Power Requirements

+5 VDC (±5%)	2.135 A
+12 VDC (±5%)	25 mA
-12 VDC (±5%)	20 mA

Physical

Dimensions

PCI	11.4 by 33.6 cm (4.5 by 13.2 in.)
PXI	10 by 16 cm (3.9 by 6.3 in.)

Environment

Operating temperature	0 to 50 °C
Storage temperature	-25 to 70 °C
Relative humidity	10 to 40% noncondensing

Specifications
NI 1422

External Connections

Trigger sense	TTL
Trigger level	Programmable (rising or falling)
Pixel clock sense	LVDS or RS-422 selectable (TTL or differential)
Pixel clock level	Programmable (rising or falling)
Enable sense	LVDS or RS-422 selectable (TTL or differential)
Enable level	Programmable (rising or falling)
Master clock drive	LVDS or RS-422 selectable (TTL or differential)
Master clock level	Rising edge
Control signal drive	LVDS or RS-422 selectable (TTL or differential)
Control signal level	Programmable (rising or falling)
Video data sense	LVDS or RS-422

Clocks

Master clock frequency range	500 kHz to 40 MHz
Pixel clock frequency range	500 kHz to 40 MHz

PCI Master Performance

Ideal	133 Mbytes/s
Sustained	100 Mbytes/s

Power Requirements

+5 VDC (±5%)	2.135 A
+12 VDC (±5%)	25 mA
-12 VDC (±5%)	20 mA

Physical

Dimensions

PCI	11.4 by 33.6 cm (4.5 by 13.2 in.)
PXI	10 by 16 cm (3.9 by 6.3 in.)

Environment

Operating temperature	0 to 50 °C
Storage temperature	-25 to 70 °C
Relative humidity	10 to 40% noncondensing