

# Four-Channel Monochrome Image Acquisition

## NI PCI-1410

- Up to 4 standard or nonstandard video sources
- 8 or 10-bit digitization
- Compatible with double-speed 60 frames/s progressive scan cameras
- Interlaced/noninterlaced acquisition
- Analog area and line-scan capabilities
- Unlimited acquisition window size with 16 MB of onboard memory
- 4 external triggers/digital I/O lines

### Operating Systems

- Windows 2000, NT, XP

### Recommended Software

- LabVIEW
- Measurement Studio
- LabWindows/CVI
- Vision Development Module
- Vision Builder AI

### Other Compatible Software

- C/C++
- Visual Basic

### Measurement Services Software (included)

- NI-IMAQ



## Overview and Applications

For acquiring high-resolution, measurement-quality images from standard and nonstandard analog cameras, the National Instruments PCI-1410 image acquisition board offers quick and easy configuration. NI PCI-1410 boards have high-resolution, 10-bit digitization for cameras that offer 60 dB dynamic range. In addition, you can easily configure the PCI-1410 to work with standard monochrome cameras (RS170 or CCIR), slow or variable-rate pixel-clock cameras, double-speed progressive-scan cameras, and analog line-scan cameras.

## Measurement-Quality Image Acquisition with Calibration

The PCI-1410 is gain-calibrated and delivered with a calibration certificate. Calibration ensures repeatable, consistent image acquisition for your machine vision and scientific imaging applications.

## Variable Scan and Nonstandard Video

With PCI-1410 boards, you can acquire images from nonstandard video, such as analog line-scan and variable-scan devices with pixel clocks that range from 2 to 40 MHz. The PCI-1410 device works with double-speed (60 frames/s) progressive-scan or noninterlaced monochrome cameras from vendors such as Sony and JAI PULNiX.

## 10-Bit Image Acquisition

Many high-resolution analog monochrome cameras have dynamic range greater than 48 dB, which means that the camera has resolution capabilities greater than 8 bits or 256 gray scales. For these high-resolution cameras, you should use an image acquisition board that offers comparable or greater resolution. The PCI-1410 works with the highest-quality monochrome cameras and delivers up to 60 dB of dynamic range, which corresponds to 10 bits or 1,024 gray scales. With the PCI-1410, you can acquire in 8-bit or 10-bit mode at very high rates, such as 60 frames/s with double-speed progressive-scan cameras.

## Quick and Easy Camera Configuration

You can easily configure standard and nonstandard video capture with NI Measurement & Automation Explorer, delivered with NI-IMAQ. This utility is an interactive tool for setting the camera type (RS170, CCIR, NTSC, and PAL), programmable ROI, aspect ratio, and antichrominance filter. Use this interactive utility to set up acquisition from noninterlaced progressive-scan cameras and to create your own camera configurations for nonstandard video.

## Image Acquisition Performance Gains with Partial Image Scanning

For improved throughput and processing bandwidth, the acquisition and ROI control circuitry monitors the incoming video signal and routes the active pixels to the FIFO. In addition to digitizing an entire frame, the PCI-1410 can perform pixel and line scaling (decimation) and ROI acquisition. With pixel and line scaling, you can transfer multiple (2, 4, or 8) pixels and/or lines to the PCI bus. Using ROI acquisition, you select an area in the acquisition window to transfer to the PCI bus.

# Four-Channel Monochrome Image Acquisition

## Hardware

### Scatter-Gather DMA Controllers

The PCI-1410 has three independent onboard DMA controllers. The DMA controllers can transfer data between the host memory and the onboard FIFO via the PCI bus. Each of these controllers performs scatter-gather DMA, which means the DMA controller can reconfigure on the fly, and thus perform continuous image transfers to either contiguous or fragmented buffers.

### Onboard Memory

The PCI-1410 has 16 MB of onboard memory used to temporarily store the image being transferred to the PCI bus. With 16 MB, you can buffer large images during image acquisition.

### DAQ Synchronization

The RTSI bus provides a flexible synchronization scheme between any National Instruments IMAQ, DAQ, or motion device and your PCI-1410.

### Trigger Control and Mapping Circuitry

The trigger control and mapping circuitry routes, monitors, and drives the external and RTSI trigger bus lines. You can configure each of these lines to start or stop acquisition on a rising or falling edge, or use each line as digital I/O. You also can map the lines to onboard status values (CSYNC, Acquisition in Progress, and Acquisition Complete).

### Antichrominance and Lowpass Filter

The PCI-1410 has an antichrominance filter, which can remove chrominance information from a color video signal. There are two software selectable antichrominance filters – one for NTSC color-coded signals (a 3.58 MHz notch filter), and another for PAL color-coded signals (a 4.43 MHz notch filter). Use the lowpass filter at 9 MHz to remove unwanted noise.

### 10-Bit A/D and Look-Up Table (LUT)

An A/D converter performs the image digitization, the result of which passes to a 1,024 by 10 RAM LUT. You can configure the LUT to implement simple imaging operations, such as gamma manipulation, contrast enhancement, data inversion, or any nonlinear transfer function.

### Programmable Gain and Offset

The PCI-1410 has programmable gain and offset circuitry for optimizing the input signal range.

## Digital I/O

The PCI-1410 includes four general-purpose digital input/output lines for general-purpose triggering and pulse generation. In addition, each PCI-1410 includes four digital output lines for lighting, shutter, camera control, and pulse generation.

### BNC Connector

The BNC connector supplies an immediate connection to the VIDEO0 input of the PCI-1410. Use the 2 m BNC cable shipped with a PCI-1410 to connect a camera to VIDEO0. You can configure the BNC connector only for RSE mode.

### Cable Accessories

The IMAQ-A6822 cable provides 22 BNC connectors to all video signals (VIDEO0, VIDEO1, VIDEO2, and VIDEO3), the external digital I/O lines and triggers, and external signals. The IMAQ-A6804 provides four bus connectors to three video signals and one trigger line. The IMAQ SCB-68 provides access to all of the signals on a PCI-1410 device 68-pin connector.

## Warranty and Support Services

As a complement to your image acquisition product, consider FREE technical support through worldwide applications engineers, Web resources, and Premier Support at [ni.com/support](http://ni.com/support).

## Ordering Information

NI PCI-1410 .....779209-01  
Includes hardware, NI-IMAQ software,  
and a 2 m NI-BNC cable

### Cables

IMAQ-A6822 (1 m) .....778135-01  
IMAQ-A6804 .....187805-01  
IMAQ-BNC-1 (2 m) .....183882-02  
IMAQ SCB-68 .....778410-01

### RTSI Bus Cables

2 boards.....776249-02  
3 boards.....776249-03  
4 boards.....776249-04  
5 boards.....776249-05

# Four-Channel Monochrome Image Acquisition

## Specifications

Typical for 25 °C unless otherwise stated

### Available Formats

RS170/NTSC.....	30 frames/s interlaced
CCIR-601/PAL.....	25 frames/s interlaced
Progressive scan.....	60 frames/s noninterlaced maximum
Variable scan.....	2 to 40 MHz pixel clock

### Video Input

Quantity.....	4 monochrome
Video 0.....	Single-ended (BNC)
Video (0:3).....	Single-ended or differential (D-Sub)
Input impedance.....	75 $\Omega$ $\pm$ 1%
Bandwidth.....	Typical 30 MHz (-3 dB)
Input range (black and white).....	700 mV (calibrated) or 50 mV to 1.4V (variable gain)
Antichrominance filter.....	Programmable 3.58 MHz notch filter (<-25 dB) 4.43 MHz notch filter (<-25 dB)

### A/D Conversion

Gray levels.....	256 (8 bits) or 1,024 (10 bits)
DNL.....	$\pm$ 1 LSB maximum
RMS noise.....	< 0.5 LSB rms
SNR.....	Typical 56 dB
Sampling rate.....	2 to 40 MHz

### External Synchronization and Trigger Signals

Trigger lines.....	4
Trigger sense.....	TTL
Trigger polarity.....	Programmable (rising or falling)
PCLKIN sense.....	Selectable (TTL or RS422)
PCLKIN polarity.....	Programmable (direct or invert)
HSYNCIN sense.....	Selectable (TTL or RS422)

HSYNCIN polarity.....	Programmable (rising or falling)
VSYNIN sense.....	Selectable (TTL or RS422)
VSYNIN polarity.....	Programmable (rising or falling)
CSYNIN sense.....	Selectable (TTL or RS422)
CSYNIN level.....	Programmable (rising or falling)
Pulse width.....	20 ns minimum detectable
VIH (TTL).....	2 V
VIL (TTL).....	0.8 V

### Pixel Clock

Internally generated	
Frequency range.....	11.0 to 25.8 MHz
Adjustable pixel aspect ratio	
RS-170/NTSC.....	$\pm$ 5%
CCIR/PAL.....	$\pm$ 5%
Pixel jitter.....	<5 ns
Lock time.....	<1 frame
External PCLK frequency range.....	2 to 40 MHz

### Power Requirements

+5 VDC ( $\pm$ 5%).....	1.25 A
+12 VDC ( $\pm$ 5%).....	<100 mA
-12 VDC ( $\pm$ 5%).....	<100 mA

### Physical

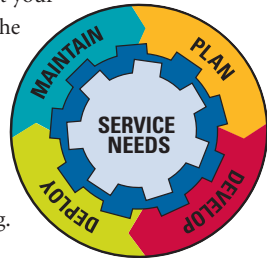
Dimensions	
PCI.....	10.7 by 17.5 cm (4.2 by 6.9 in.)
PXI.....	10 by 16 cm (3.9 by 6.3 in.)

### Environment

Operating temperature.....	0 to 55 °C
Storage temperature.....	-20 to 70 °C
Relative humidity.....	5 to 90%, noncondensing

# NI Services and Support

NI has the services and support to meet your needs around the globe and through the application life cycle – from planning and development through deployment and ongoing maintenance. We offer services and service levels to meet customer requirements in research, design, validation, and manufacturing. Visit [ni.com/services](http://ni.com/services).



## Training and Certification

NI training is the fastest, most certain route to productivity with our products. NI training can shorten your learning curve, save development time, and reduce maintenance costs over the application life cycle. We schedule instructor-led courses in cities worldwide, or we can hold a course at your facility. We also offer a professional certification program that identifies individuals who have high levels of skill and knowledge on using NI products. Visit [ni.com/training](http://ni.com/training).

## Professional Services

Our Professional Services Team is comprised of NI applications engineers, NI Consulting Services, and a worldwide NI Alliance Partner Program of more than 600 independent consultants and integrators. Services range from start-up assistance to turnkey system integration. Visit [ni.com/alliance](http://ni.com/alliance).



## OEM Support

We offer design-in consulting and product integration assistance if you want to use our products for OEM applications. For information about special pricing and services for OEM customers, visit [ni.com/oem](http://ni.com/oem).

## Local Sales and Technical Support

In offices worldwide, our staff is local to the country, giving you access to engineers who speak your language. NI delivers industry-leading technical support through online knowledge bases, our applications engineers, and access to 14,000 measurement and automation professionals within NI Developer Exchange forums. Find immediate answers to your questions at [ni.com/support](http://ni.com/support).

We also offer service programs that provide automatic upgrades to your application development environment and higher levels of technical support. Visit [ni.com/ssp](http://ni.com/ssp).

## Hardware Services

### NI Factory Installation Services

NI Factory Installation Services (FIS) is the fastest and easiest way to use your PXI or PXI/SCXI combination systems right out of the box. Trained NI technicians install the software and hardware and configure the system to your specifications. NI extends the standard warranty by one year on hardware components (controllers, chassis, modules) purchased with FIS. To use FIS, simply configure your system online with [ni.com/pxiadvisor](http://ni.com/pxiadvisor).

### Calibration Services

NI recognizes the need to maintain properly calibrated devices for high-accuracy measurements. We provide manual calibration procedures, services to recalibrate your products, and automated calibration software specifically designed for use by metrology laboratories. Visit [ni.com/calibration](http://ni.com/calibration).

### Repair and Extended Warranty

NI provides complete repair services for our products. Express repair and advance replacement services are also available. We offer extended warranties to help you meet project life-cycle requirements. Visit [ni.com/services](http://ni.com/services).



[ni.com](http://ni.com) • (800) 813 3693

National Instruments • [info@ni.com](mailto:info@ni.com)

© 2005 National Instruments Corporation. All rights reserved. CVI, LabVIEW, Measurement Studio, National Instruments, National Instruments Alliance Partner, NI, ni.com, NI-IMAQ, and SCXI are trademarks of National Instruments. Other product and company names listed are trademarks or trade names of their respective companies.

A National Instruments Alliance Partner is a business entity independent from NI and has no agency, partnership, or joint-venture relationship with NI.