

Configurable Machine Vision Software

NI Vision Builder for Automated Inspection

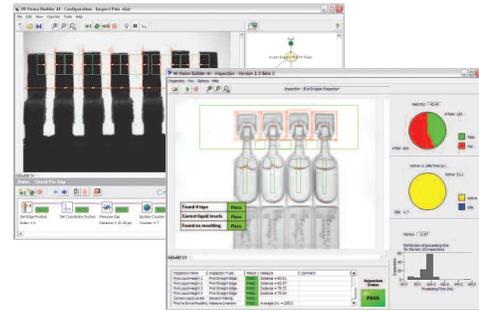
- Configure and deploy complete machine vision applications without programming
- Communicate with PLCs and other industrial devices
- Run as a stand-alone application or use ActiveX to embed into an application
- Extend functionality using NI LabVIEW

NI Vision Acquisition (included)

- Acquires from all NI vision hardware
- Acquires from IEEE 1394 cameras
- Acquires from GigE cameras
- Reads and writes image files

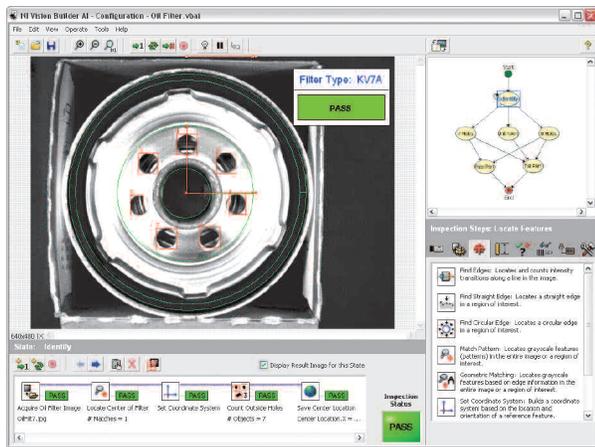
Operating Systems

- Windows XP/2000/NT
- LabVIEW Real-Time



Overview

National Instruments Vision Builder for Automated Inspection (Vision Builder AI) is configurable software for building, benchmarking, and deploying machine vision applications. NI Vision Builder AI does not require programming. A built-in deployment interface is included so you can quickly deploy your inspection, guidance, and identification applications. Also it includes the ability to set up complex pass/fail decisions to control digital I/O devices and communicate with serial or Ethernet devices such as PLCs, PACs, and HMIs.



A Better Way to Configure Vision Systems

For inspections that require conditional branches or iterative loops, Vision Builder AI provides an innovative state-diagram-process model. In this model, you configure each state to perform a certain action, from acquiring images to reading text to communicating with PLCs. The results of these steps determine which transition path is taken to the next state. By using state diagrams, you can create seemingly complex machine vision applications that provide the flexibility of a programming language with the ease of use of a configuration environment. Not only are state diagrams an intuitive way to represent machine vision applications, but also they are self-documenting and easy to share among colleagues.

Run as a Stand-Alone Vision System

Vision Builder AI includes a built-in deployment interface with which you can quickly deploy your application once you have finished configuring and benchmarking.

Integrate into a Larger Application

Use the Vision Builder AI ActiveX component to embed Vision Builder AI inspections into your NI TestStand, LabVIEW, or Visual Basic programs. Use the ActiveX control to develop an operator interface that (remotely) views images and retrieves the results of each run.

Image Acquisition

Choose from several different hardware options within Vision Builder AI for deploying your machine vision application. Whether you prefer low-cost analog cameras; high-speed, high-resolution digital cameras; or easy-to-use IEEE 1394 and GigE Vision cameras; NI has an image acquisition device for your needs. In addition, you can deploy your machine vision system using PCI or PCI Express boards, or upgrade to more rugged PXI and Compact Vision System options.

Machine Vision Tools

Vision Builder AI includes all the machine vision tools necessary to build quality control, assembly verification, and industrial inspection applications. Use Vision Builder AI to enhance images, locate features, measure objects, check for presence, and read text and bar codes.

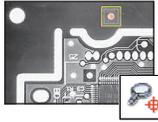
Advanced Decision Making

With the decision-making interface, you can define pass/fail criteria and classify parts. You can set limits for each inspection step and also use the intuitive decision-making interface to create complex decision expressions for the entire system. You can route the results of these decisions to digital lines, the user interface, or a serial port.

Configurable Machine Vision Software

Vision Software Capabilities

National Instruments vision software includes hundreds of image processing and analysis functions. A subset of the tools available in the Vision Development Module and Vision Builder AI are shown below.



Pattern and Geometric Matching

Learn and locate objects and patterns in your images. National Instruments patented matching algorithms locate patterns fast with very high accuracy.



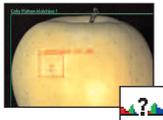
Optical Character Recognition/Verification

NI OCR functions use a trainable OCR algorithm specifically designed to identify and verify all types of fonts, characters, and symbols despite poor and inconsistent image quality.



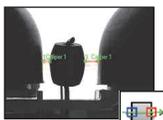
Particle Analysis

Use particle analysis to detect connected regions or groupings of pixels in an image and make selected measurements of those regions. Choose from more than 80 unique measurements that return data in both real-world and pixel values.



Color Inspection

Color matching quantifies which colors and how much of each color exist in a region of an image and uses this information to check if another image contains the same colors in the same ratio.



Edge Detection

Use the edge detection tools to identify and locate discontinuities in the pixel intensities of an image. Find edges in order to align, measure, or detect features in the image.



Object Classification

Classification is a tool for identifying an unknown object by comparing its significant features to a set of features that represent known samples.



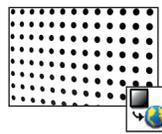
Gauging

You can use dimensional measurement or gauging tools to obtain quantifiable, critical distance measurements – such as distances, angles, areas, line fits, circular fits, and counts.



Bar Code Reader and Grader

Read 1D bar codes as well as 2D codes like Data Matrix and PDF 417. You can decipher codes applied through ink jets, thermal transfer, laser etching, or dot peen.



Spatial Calibration

Using spatial calibration functions, you can calibrate your image to take accurate, real-world measurements from images, regardless of camera perspective or lens distortion.

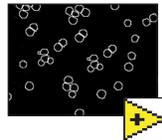
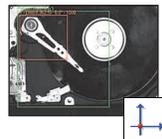


Image Arithmetic and Logic Functions

Operators perform basic arithmetic and logical operations on images. Use operators to add, subtract, multiply, and divide an image with other images or constants.



Coordinate Systems

Set up coordinate systems to ensure that all your measurements move with the object within the field of view.

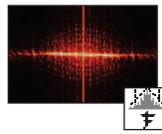


Image Filters and Frequency Analysis

Frequency filters, such as the fast Fourier transform (FFT), alter pixel values with respect to the periodicity and spatial distribution of the variations in light intensity in the image.



Image Segmentation

NI vision software comes with several options to segment and partition images into related components. Segmentation is an important part of many imaging applications that need to extract certain features or objects in order to process them further.



Golden Template Comparison

Find defects in an image by comparing a perfect (golden) sample to all subsequent samples. Golden template comparison detects surface defects, label misprints, and overall quality issues.

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Signal Input and Output

From Vision Builder AI, you can control the industrial digital I/O lines on the NI Compact Vision System, PCI-8254R, NI PCIe-8255R, and any NI-DAQmx data acquisition device to communicate inspection results to other industrial devices such as PLCs. Beyond simple digital I/O, Vision Builder AI can also output precise timing signals through pulse generation and single-shot signals directly to actuators. Moreover, you can acquire and transmit analog values on any M Series device from Vision Builder AI in order to integrate data measurements with your machine vision or generate analog values based on inspection results.

Industrial Communication

From Vision Builder AI, you can also communicate with devices using industrial protocols over serial or Ethernet ports and send inspection data, inspection results, or customized data to PLCs, touch screens, or industrial PCs.

Benchmark Your Inspections

Use the performance meter to see how fast the application will run. A detailed view of the performance meter helps you identify time-consuming individual steps.

Customize Inspections

Vision Builder AI is one of the most flexible menu-based vision software packages and it includes several features with which end users can expand and extend the environment to handle most machine vision applications.

- You can use the Run LabVIEW VI step to call any LabVIEW VI from Vision Builder AI to expand its capabilities. Examples include report generation tools, custom algorithms, communication routines, or virtually any other LabVIEW VI. You do not need LabVIEW installed to use this step.
- You can extend the capabilities of your system by converting your Vision Builder AI script to LabVIEW. Use this code to build a customized user interface or to add more measurement or automation functionality such as motion control and data acquisition.

 Acquire with IEEE 1394 and GigE cameras	 Find circular edges	 Measure intensity
 Find and match patterns	 Find and measure straight edges	 Communicate with external devices such as PLCs
 Set up coordinate systems	 Perform advanced geometric analysis	 Read text (OCR)
 Detect and measure objects	 Make caliper distance measurements	 Read 1D and 2D bar codes
 Find any number of edges	 Calibrate measurements to real-world units	 Make pass/fail decisions

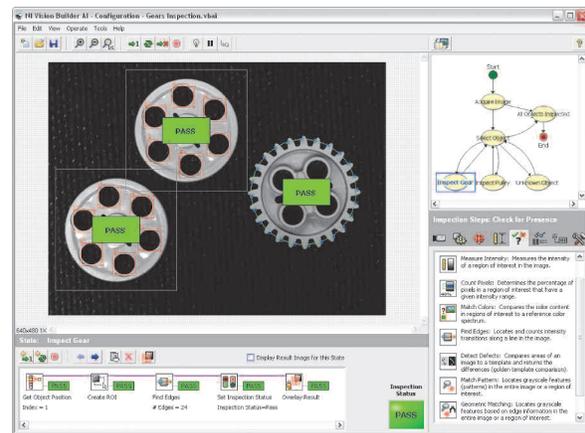
Figure 1. Examples of the Many Functions Available in Vision Builder AI

Vision Builder AI Development Toolkit

Machine builders, integrators, and advanced users can use the Vision Builder AI Development Toolkit to develop professional-looking custom steps that provide functionality not already included in Vision Builder AI. For example, you can develop a custom step that drives a camera or other hardware not currently compatible with Vision Builder AI. You also can create a custom step to include a customized image-processing algorithm. You can distribute custom steps in addition to the released version of Vision Builder AI, providing your end users with a customized Vision Builder AI package.

Deploying Inspections

To deploy your application, use a Vision Builder AI Run-Time license. The run-time license is a low-cost way to replicate your inspection while still allowing your operators and engineers to interact with the software to view images, update parameters, and gather statistics. Each NI Compact Vision System already comes with a Vision Builder AI Run-Time license.



Ordering Information

NI Vision Builder for Automated Inspection	778649-01
NI Vision Builder for Automated Inspection Development Toolkit.....	779343-03
Run-Time License	779799-03

NI Vision Builder for Automated Inspection Bundles

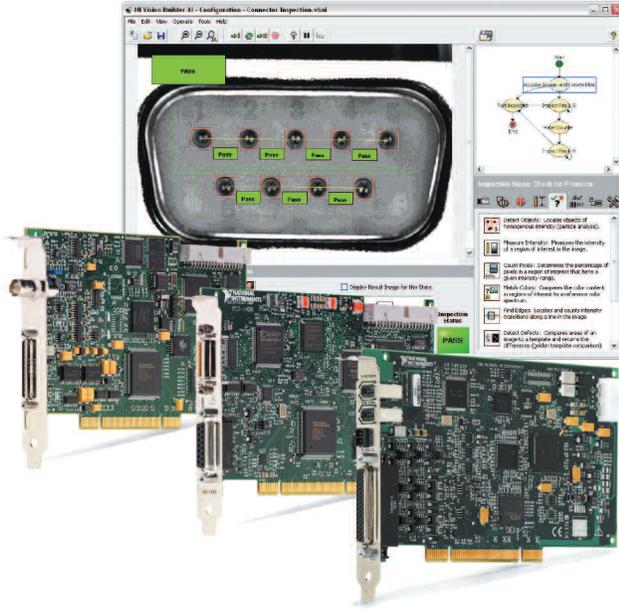
NI Vision Builder for Automated Inspection with:	
PCI-8254R	779493-01
PCI-1426	779495-01
PCI-1410	779494-01

BUY NOW!

For complete product specifications, pricing, and accessory information, call 800 813 3693 (U.S.) or go to ni.com/vision.

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Save up to 25 Percent with Vision Builder AI Hardware Bundles



For significant savings, you can purchase Vision Builder AI bundled with one of three frame grabber options. With these bundles, you can acquire images from analog, IEEE 1394, and Camera Link cameras. The hardware in each bundle is described below.

The NI PCI-1410 four-channel analog frame grabber is suitable for standard and nonstandard cameras. The PCI-1410 is recommended for megapixel analog cameras (JAI CV-A1/A2, Sony XC-HR70, and more) or standard resolution cameras (RS-170, NTSC, CCIR, PAL, and more) when image quality is paramount.

The NI PCI-1426 low-cost Camera Link image acquisition board works with any base-configuration Camera Link camera. The PCI-1426 has isolated digital I/O accessible through a 15-pin D-Sub connector for integrating triggers, encoders, and pulse generation into your application.

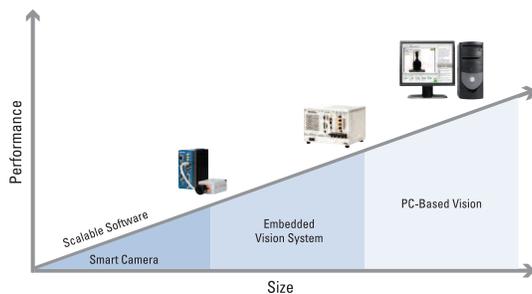
The NI PCI-8254R has multiple IEEE 1394 ports and 29 digital I/O lines, and is reconfigurable with LabVIEW FPGA. You can access the digital I/O lines for synchronizing vision components such as cameras, triggers, and lights. You also can use quadrature encoder inputs, product selection lines,

pulse generation, and general-purpose digital I/O for communicating with the other industrial components such as actuators, pneumatics, and PLCs.

National Instruments vision software includes hundreds of image processing and analysis functions. A subset of the tools available in the Vision Development Module and Vision Builder AI is shown below.

	NI Vision Acquisition Software	Vision Builder for Automated Inspection Configurable software	Vision Development Module Programming libraries
Continuous acquisition	✓	✓	✓
Triggered acquisition	✓	✓	✓
Camera configuration	✓	✓	✓
Trigger output	✓	✓	✓
Full frame-rate display with overlays	✓	✓	✓
Write and read image files	✓	✓	✓
Write and read AVI files	✓	–	✓
Image manipulation tools	–	✓	✓
Image filters	–	✓	✓
Image arithmetic	–	✓	✓
Image logic functions	–	✓	✓
Morphology	–	✓	✓
Region-of-interest tools	–	✓	✓
Particle analysis	–	✓	✓
Object classification	–	✓	✓
Gauging	–	✓	✓
Pattern matching	–	✓	✓
Geometric matching	–	✓	✓
Distortion calibration	–	✓	✓
Real-world measurements	–	✓	✓
1D and 2D bar code readers	–	✓	✓
Coordinate systems	–	✓	✓
Complex and fourier analysis	–	✓	✓
Optical character recognition	–	✓	✓
Color matching	–	✓	✓
Color pattern matching	–	✓	✓
Instrument reader	–	–	✓
Performance benchmarking	–	✓	✓
LabVIEW VI generation	–	✓	✓
C code generation	–	–	✓
VB code generation	–	–	✓
Customizable user interface	–	–	✓
Integration with motion control	–	–	✓
Integration with data acquisition	–	–	✓
Industrial communication protocols	–	✓	✓

Table 1. NI Vision Software Products



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.

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.

Training and Certification

NI training is the fastest, most certain route to productivity with our tools. 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.



Professional Services

Our Professional Services Team is composed of NI applications engineers, NI Consulting Services, and a worldwide National Instruments 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.

Software Service Programs

NI offers service programs that provide automatic upgrades to your application development environment and higher levels of technical support. Our service programs ensure that you always have the latest advances in productivity and receive live, on-demand access to NI applications engineers through phone and e-mail to assist in developing your solutions. Service programs are cost effective and simplify software purchasing as an annual, fixed cost, making it easier to plan and budget than intermittent individual upgrades. You also receive discounts for our training courses and materials. For details, visit ni.com/ssp.

Basic Service Level

- Upgrades purchased separately
- Support by NI applications engineers, R&D engineers, partners, and community members through online Developer Exchange
- Access to Knowledgebase, example code, troubleshooting wizards, solutions, and white papers

Standard Service Level

- Automatic upgrades included
- All the benefits of Basic Service
- Support by NI applications engineers through direct phone or e-mail access
- Exclusive access to on-demand training through Services Resource Center

Premier Service Level

- All the benefits of Standard Service
- Support by NI senior applications engineers through direct phone or e-mail access with extended hours of operation



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