Overview

NI 17xx Smart Cameras simplify machine vision by analyzing images directly on the camera with a powerful, embedded processor capable of running the entire suite of NI vision algorithms. You can use these cameras in a variety of applications including part location, defect detection, code reading, and assembly verification. The combination of the onboard processor with a charge-coupled device (CCD) image sensor provides an easily distributed, all-in-one vision system that transmits inspection results along with or in place of raw images. Housed in a rugged metal case designed for use in industrial applications, all NI Smart Cameras offer built-in I/O, multiple industrial protocols, built-in Web servers, and many other features. You can configure NI Smart Cameras with the included NI Vision Builder for Automated Inspection (AI) software or program the camera with LabVIEW Real-Time.

Flexible Industrial I/O

To communicate results to other industrial devices, NI Smart Cameras offer built-in digital I/O and support both Ethernet- and serial-based industrial protocols such as Modbus TCP. NI Smart Camera digital I/O lines are optoisolated for direct connectivity with industrial devices such as triggers and actuators. All NI Smart Cameras offer two optoisolated digital inputs and two optoisolated digital outputs.

To simplify Ethernet-based communication, NI Smart Cameras include two gigabit Ethernet ports. With one port connected to an industrial network to report inspection results, the other port can directly communicate with programmable automation controllers (PACs) such as NI CompactRIO or Compact FieldPoint, with industrial devices such as programmable logic controllers (PLCs), or with human machine interfaces (HMIs). All NI Smart Cameras include an RS232 serial port and 5 and 24 V lighting strobe outputs that you can use for synchronization with third-party lighting controllers.

NI Smart Cameras, with the exception of the NI 1722, include quadrature encoder support for synchronizing inspections with linear and rotary drive systems. This feature simplifies timing in complex applications where consistency is critical to system success.

Direct Drive Lighting

To directly illuminate objects under the camera, NI Smart Cameras feature direct drive lighting. Lighting controllers can be costly additions to machine vision applications. NI Smart Cameras have a built-in lighting controller so you can directly drive lights from the camera itself, lowering costs and simplifying wiring. The built-in direct drive lighting controller can provide a constant DC current of 500 mA or a strobed current of up to 1 A. With strobed lighting, you can increase the intensity produced by up to four times without harming the light head. Most current-driven LED light heads work with the NI Smart Camera’s direct-drive feature (this feature is not included on the NI 1722).

Recommended Software

- Vision Builder for Automated Inspection (included) or
- LabVIEW and the LabVIEW Real-Time Vision Development Bundle

Recommended Accessories

- C-mount lens
- Power and I/O cables
- Mounting bracket
Camera Comparisons

National Instruments offers a variety of smart cameras to meet a breadth of machine vision application needs.

All NI Smart Cameras process images using onboard PowerPC processors. In higher-performance models, a Texas Instruments digital signal processor (TI DSP) acts as a coprocessor to boost the performance of specific algorithms. The image sensors inside all NI Smart Cameras are charge-coupled devices (CCDs).

NI 1722 Smart Camera – Powered by a 400 MHz PowerPC processor; features a VGA (640x480) resolution CCD image sensor that can acquire images up to 60 fps.

NI 1742 Smart Camera – Powered by a 533 MHz PowerPC processor; acquires VGA resolution (640x480) monochrome images at up to 60 fps.

NI 1744 Smart Camera – Uses the same 533 MHz processor as the NI 1742 but features a higher-resolution CCD that acquires images of 1.3 megapixels (1280x1024); with higher resolution, you can inspect objects for smaller defects and make measurements with four times the resolution of previous NI Smart Cameras.

NI 1762 Smart Camera – Offers a 720 MHz TI DSP coprocessor alongside the 533 MHz PowerPC, making it possible to run specific algorithms up to four times faster with no changes to the application software (works well for engineers needing higher performance for pattern matching, optical character recognition, and datamatrix code reading); contains the same VGA resolution (640x480) image sensor found in the previous NI Smart Cameras.

NI 1764 Smart Camera – Provides the 1.3 megapixel image sensor found in the NI 1744, and the 720 MHz TI DSP coprocessor found in the NI 1762; ideal for high-speed manufacturing.

<table>
<thead>
<tr>
<th>Hardware Comparison</th>
<th>NI 1722</th>
<th>NI 1742</th>
<th>NI 1744</th>
<th>NI 1762</th>
<th>NI 1764</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Processor Configuration</strong></td>
<td>Processor</td>
<td>400 MHz PowerPC</td>
<td>533 MHz PowerPC</td>
<td>533 MHz PowerPC</td>
<td>533 MHz PowerPC</td>
</tr>
<tr>
<td></td>
<td>Coprocessor</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>720 MHz DSP</td>
</tr>
<tr>
<td><strong>Memory</strong></td>
<td>System memory</td>
<td>128 MB</td>
<td>128 MB</td>
<td>128 MB</td>
<td>128 MB</td>
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<tr>
<td></td>
<td>Resolution</td>
<td>640x480</td>
<td>640x480</td>
<td>1280x1024</td>
<td>640x480</td>
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<tr>
<td></td>
<td>Image size</td>
<td>1/3 in. CCD</td>
<td>1/3 in. CCD</td>
<td>1/2 in. CCD</td>
<td>1/3 in. CCD</td>
</tr>
<tr>
<td><strong>Image Sensor</strong></td>
<td>Pixel depth</td>
<td>8-bit</td>
<td>8-bit</td>
<td>8-bit</td>
<td>8-bit</td>
</tr>
<tr>
<td></td>
<td>Color</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td></td>
<td>Acquisition rate (frames per second)</td>
<td>60 fps</td>
<td>60 fps</td>
<td>13 fps</td>
<td>60 fps</td>
</tr>
<tr>
<td></td>
<td>Partial image acquisition</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
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<tr>
<td><strong>Display</strong></td>
<td>TTL I/O</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Isolated digital input</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Isolated digital output</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Encoder input</td>
<td>–</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>I/O breakout</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td><strong>Communication Options</strong></td>
<td>Ethernet</td>
<td>2X 10/100/1000</td>
<td>2X 10/100/1000</td>
<td>2X 10/100/1000</td>
<td>2X 10/100/1000</td>
</tr>
<tr>
<td></td>
<td>RS232</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td><strong>Lighting</strong></td>
<td>External light control</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>Integrated light control and power</td>
<td>–</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td><strong>Application Development</strong></td>
<td>Included configuration software</td>
<td>Vision Builder AI</td>
<td>Vision Builder AI</td>
<td>Vision Builder AI</td>
<td>Vision Builder AI</td>
</tr>
<tr>
<td></td>
<td>Programmable software option</td>
<td>LabVIEW</td>
<td>LabVIEW</td>
<td>LabVIEW</td>
<td>LabVIEW</td>
</tr>
<tr>
<td><strong>Operation</strong></td>
<td>Camera</td>
<td>0 to 45 °C</td>
<td>0 to 45 °C</td>
<td>0 to 45 °C</td>
<td>0 to 45 °C</td>
</tr>
<tr>
<td><strong>Temperature Range</strong></td>
<td>Housing Material</td>
<td>Metal</td>
<td>Metal</td>
<td>Metal</td>
<td>Metal</td>
</tr>
</tbody>
</table>

Table 1. NI Smart Camera Hardware Comparison

BUY ONLINE at ni.com or CALL 800 813 3693 (U.S.)
Software
Unmatched Scalability
All NI Smart Cameras include the NI Vision Builder for Automated Inspection (AI) configurable vision application development environment so you can build and deploy complete machine vision applications quickly and easily. Vision Builder AI applications are based on an easy-to-use state diagram model. With this model, you can configure sophisticated inspections that include loops and branches without programming. Vision Builder AI also features all of the steps you need to develop complete machine vision systems, including advanced triggering, acquisition from data acquisition devices, communication with HMIs and PLCs, and control of digital I/O lines.

For more advanced applications, NI Smart Cameras are also full-featured NI LabVIEW Real-Time targets. This adds the power of LabVIEW and the world-class algorithms in the NI Vision Development Module to this new platform. Other modules supported in LabVIEW Real-Time, such as the LabVIEW Control Design and Simulation Module, also work with NI Smart Cameras.

NI vision software makes it easy to move between a configurable environment and a programming environment. With Vision Builder AI, you can create an inspection and easily convert it to LabVIEW code. If you want to use Vision Builder AI but need a bit more flexibility than it offers, you can also create custom steps for Vision Builder AI using LabVIEW.

Hardware Scalability
The NI vision hardware platform ranges from PCI- and PXI-based systems to compact vision systems to the sensor itself with NI Smart Cameras. This entire range of hardware works with both LabVIEW and Vision Builder AI. This means you can design and prototype your machine vision algorithms using an off-the-shelf machine vision camera connected to an NI frame grabber and deploy that same application to an NI Smart Camera with minimal changes to your LabVIEW code or Vision Builder AI inspection.

Software – Configure or Program
Vision Builder for Automated Inspection
Vision Builder (AI) is a configurable machine vision development environment that requires no programming. With the Vision Builder AI, you can:

- Build, benchmark, and deploy complete machine vision applications without programming
- Configure more than 40 powerful machine vision tools including pattern matching, OCR, and particle analysis
- Create custom user interfaces for display and control purposes
- Host user interfaces on a built-in Web server
- Communicate with industrial protocols over serial and Ethernet

LabVIEW Real-Time Vision Development Bundle
The NI LabVIEW Real-Time Vision Development Bundle includes all the software you need to program a real-time machine vision application with LabVIEW. You must purchase LabVIEW separately.

The bundle includes:
- LabVIEW Real-Time Module
- LabVIEW Application Builder
- NI Vision Development Module

The Vision Development Module, a library of image processing and machine vision functions, includes the Vision Assistant, an interactive prototyping environment that generates ready-to-run code. The Vision Development Module delivers:

- Hundreds of image processing functions including pattern and geometric matching, OCR, bar code readers, object classification, and particle analysis
- Tools to enhance images, check for presence, locate features, identify objects, and gauge parts
- Fast application prototyping and code generation with the Vision Assistant
- Subpixel accuracy down to 1/10 of a pixel and 1/10 of a degree

Figure 1. With the scalability of NI vision software, you can develop your code on a PC, prototype on an NI Compact Vision System, and deploy to an NI Smart Camera without ever changing your application development environment.
Smart Cameras for Embedded Machine Vision

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. The 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 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**
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.

**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.
Smart Camera Accessories

Lighting
All NI Smart Cameras except for the NI 1722 provide direct connectivity to many current-controlled LED light heads, including those below. Additional lighting is available from Advanced Illumination (www.advill.com).

- Back light (red) ................................................................. 780221-01
- Ring light (red) ................................................................. 780222-01
- Linear array (red) ............................................................. 780223-01
- Spot light (red) ................................................................. 780224-01

Lenses
NI Smart Cameras work with any standard C-mount lens, including the lenses below supplied by Computar.

- 8 mm, F1.4, megapixel, Computar ....................................... 780024-01
- 12 mm, F1.4, megapixel, Computar ..................................... 780025-01
- 16 mm, F1.4, megapixel, Computar ..................................... 780026-01
- 25 mm, F1.4, megapixel, Computar ..................................... 780027-01

Cables and Power Supplies
NI 17xx unshielded screw terminal
- breakout with 2 m cable .................................................. 780261-01
- NI Smart Camera I/O accessory ......................................... 780443-01
- Desktop power supply, 24 V, 63 W .................................. 780237-01
- DIN-rail mount power supply ............................................. 778805-90
- 15-pin high-density D-Sub male to flying leads, 5 m ........... 197818-05
- Ethernet cables, twisted pair
  - 1 m .............................................................................. 182219-01
  - 5 m .............................................................................. 182219-05
  - 10 m ............................................................................. 182219-10

Smart Camera Mounting
- ⅛ in.-20 tripod adapter ...................................................... 780239-01
- Mounting bracket .............................................................. 780240-01

Expansion I/O and HMI
If your applications need more I/O than NI Smart Cameras provide, you can easily connect expansion I/O over standard Ethernet. Compact FieldPoint and CompactRIO are two popular NI platforms for expansion I/O. Both of these platforms are built on real-time architectures, ensuring the determinism needed for many industrial applications. CompactRIO also features a built-in field-programmable gate array (FPGA) for precise timing and synchronization. Communication to both of these platforms is simplified with the use of shared variables in LabVIEW or Vision Builder AI. For more information on these platforms, visit ni.com/compactfieldpoint or ni.com/compactrio.

For interfacing options, NI offers a full suite of touch panel HMIs. With the LabVIEW Touch Panel Module, you can develop custom HMI applications for Windows CE touch panel devices. Other options include Windows XP HMI devices that can run the entire LabVIEW development environment. Or simply target NI Smart Cameras and other PAC devices through a Web browser with the Web server technology available on these hardware platforms. For more information on HMI options from NI, visit ni.com/hmi.

Ordering Information

NI 1722 Smart Camera with Vision Builder AI ..................... 780146-01
NI 1742 Smart Camera with Vision Builder AI ..................... 780147-01
NI 1744 Smart Camera with Vision Builder AI ..................... 780403-01
NI 1762 Smart Camera with Vision Builder AI ..................... 780306-01
NI 1764 Smart Camera with Vision Builder AI ..................... 780402-01

Additional Software
NI LabVIEW ......................................................................... 776670-09
NI LabVIEW Real-Time Vision Development Bundle .......... 779324-03

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

>> For complete specifications, see the NI 17xx Smart Camera User Manual at ni.com/manuals.

Image Sensor

<table>
<thead>
<tr>
<th>Sensor</th>
<th>Sony CCD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resolution</td>
<td>VGA (640 x 480), SXGA (1280 x 1024)</td>
</tr>
<tr>
<td>Max frame rate</td>
<td>60 fps (VGA), 13 fps (SXGA)</td>
</tr>
<tr>
<td>Sensor size</td>
<td>1/3 in. (VGA), 1/2 in. (SXGA)</td>
</tr>
<tr>
<td>Pixel size</td>
<td>7.4 x 7.4 µm (VGA), 4.65 x 4.65 µm (SXGA)</td>
</tr>
<tr>
<td>Sensor readout</td>
<td>Progressive scan</td>
</tr>
<tr>
<td>Bits per pixel</td>
<td>8 bits, 256 gray levels</td>
</tr>
<tr>
<td>Scanning mode (VGA)</td>
<td>1/2 scan – 640 x 240</td>
</tr>
<tr>
<td></td>
<td>1/4 scan – 640 x 120</td>
</tr>
<tr>
<td>Scanning mode (SXGA)</td>
<td>1/2 scan – 1280 x 512</td>
</tr>
<tr>
<td></td>
<td>1/4 scan – 1280 x 256</td>
</tr>
<tr>
<td>Binning</td>
<td>1x2 – 540 x 240 (VGA), 1280 x 512 (SXGA)</td>
</tr>
<tr>
<td>Min exposure time</td>
<td>36.3 µs (VGA), 76.7 µs (SXGA)</td>
</tr>
<tr>
<td>Exposure time increment</td>
<td>31.2 µs (VGA), 71.6 µs (SXGA)</td>
</tr>
</tbody>
</table>

Processor Characteristics

<table>
<thead>
<tr>
<th>Processor</th>
<th>NI 1722................................. 400 MHz Freescale PowerPC</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>NI 1742/1744................................ 533 MHz Freescale PowerPC</td>
</tr>
<tr>
<td></td>
<td>NI 1762/1764................................ 533 MHz Freescale PowerPC and 720 MHz Texas Instruments DSP</td>
</tr>
<tr>
<td>Memory</td>
<td>128 MB</td>
</tr>
<tr>
<td>Nonvolatile program storage</td>
<td>128 MB</td>
</tr>
<tr>
<td>Image/data storage</td>
<td>Unlimited through FTP or Ethernet hard drive</td>
</tr>
</tbody>
</table>

Lighting Connectivity

<table>
<thead>
<tr>
<th>NI 1722</th>
<th>5 and 24 V external strobe ........... Programmable duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>NI 1742, 1744, 1762, 1764</td>
<td>5 and 24 V external strobe ........... Programmable duration</td>
</tr>
<tr>
<td>Direct drive lighting ..........</td>
<td>500 mA DC, 1 A strobed</td>
</tr>
</tbody>
</table>

I/O Connectivity

| Digital input | 2 channels optoisolated 24 V |
| Digital output| 2 channels optoisolated 24 V |
| Ethernet      | 2 ports (10/100/1000 Mb/s) |
| RS232 serial  | Up to 230.4 kb/s |
| Quadrature encoder | Phase A/Phase B, no index |

(not available on NI 1722)

Power Requirements

| Main supply voltage | 24 VDC, +20%, -15% (IEC 1311) |
| Max current         | NI 1722................................. 450 mA |
|                     | NI 1742, 1744, 1762, 1764........... 800 mA (with direct drive lighting) |

Physical Specifications

| Lens mount          | C-mount |
| Dimensions          | 11.765 by 8.58 by 5.06 cm |
| Weight              | 525 g |

Safety and Compliance

Safety

This product is designed to meet the requirements of the following standards of safety for electrical equipment for measurement, control, and laboratory use:

- IEC 61010-1, EN 61010-1
- UL 61010-1, CSA 61010-1

Note: For UL and other safety certifications, refer to the product label or visit ni.com/certification, search by model number or product line, and click the appropriate link in the Certification column.

Electromagnetic Compatibility

This product meets the requirements of the following EMC standards for electrical equipment for measurement, control, and laboratory use:

- EN 61326 (IEC 61326): Class A emissions; Basic immunity
- EN 55011 (CISPR 11): Group 1, Class A emissions
- AS/NZS CISPR 11: Group 1, Class A emissions
- FCC 47 CFR Part 15B: Class A emissions
- ICES-001: Class A emissions

Note: For EMC compliance, operate this product according to the documentation.

CE Compliance

This product meets the essential requirements of applicable European Directives, as amended for CE marking, as follows:

- 2006/95/EC; Low-Voltage Directive (safety)
- 2004/108/EC; Electromagnetic Compatibility Directive (EMC)

Note: Refer to the Declaration of Conformity (DoC) for this product for any additional regulatory compliance information. To obtain the DoC for this product, visit ni.com/certification, search by model number or product line, and click the appropriate link in the Certification column.

Waste Electrical and Electronic Equipment (WEEE)

EU Customers: At the end of their life cycle, all products must be sent to a WEEE recycling center. For more information about WEEE recycling centers and National Instruments WEEE initiatives, visit ni.com/environment/weee.htm.
Smart Cameras for Embedded Machine Vision

Mechanical Drawings

Figure 2. Camera Front

Figure 3. Camera Back

Figure 4. Camera Side

Figure 5. Camera Bottom
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.

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.

Professional Services

Our NI Professional Services team is composed of NI applications and systems engineers 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.

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.

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.

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

Hardware Services

System Assurance Programs

NI system assurance programs are designed to make it even easier for you to own an NI system. These programs include configuration and deployment services for your NI PXI, CompactRIO, or Compact FieldPoint system. The NI Basic System Assurance Program provides a simple integration test and ensures that your system is delivered completely assembled in one box. When you configure your system with the NI Standard System Assurance Program, you can select from available NI system driver sets and application development environments to create customized, reorderable software configurations. Your system arrives fully assembled and tested in one box with your software preinstalled. When you order your system with the standard program, you also receive system-specific documentation including a bill of materials, an integration test report, a recommended maintenance plan, and frequently asked question documents. Finally, the standard program reduces the total cost of owning an NI system by providing three years of warranty coverage and calibration service. Use the online product advisors at ni.com/advisor to find a system assurance program to meet your needs.

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.

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.