Getting Started with the NI CVS-1450 Series Compact Vision System

NI CVS-1450 Series compact vision system is an are easy-to-use, distributed, real-time imaging system that acquires, processes, and displays images from IEEE 1394 cameras conforming to the *IIDC 1394-based Digital Camera Specification, Version 1.30*. This document provides instructions for setting up the NI CVS-1450 Series hardware. This document includes instructions for installing software, configuring an IP address, and acquiring an initial image using LabVIEW and the NI Vision Development Module.

For information on setting up and configuring the NI CVS-1450 device and developing your applications using NI Vision Builder for Automated Inspection (Vision Builder AI), refer to the *NI Vision Builder for Automated Inspection Tutorial.*

What You Need to Get Started

You need the following items to set up and use the NI CVS-1450 device:

❑ NI CVS-1450 Series compact vision system

❑ Development computer running Windows Vista/XP/2000

❑ DCAM-compliant IEEE 1394 camera

❑ IEEE 1394 jackscrew-to-latch cable (part number 778796-01) or any standard IEEE 1394 cable. You can use a 4-pin to 6-pin converter cable with cameras that have their own external power supply and do not require power from the IEEE 1394 bus

❑ NI desktop power supply (part number 778794-01) or any 24 VDC ±10%, 50 W power supply
  – Power supply cord—Connects the NI desktop power supply to an outlet. Refer to `ni.com` for the part number specific to your region and ordering information
  – 4-position power connector—Required if you do not use the NI desktop power supply

❑ 10 m standard CAT 5 10/100Base-T Ethernet cable (part number 189174-10)

❑ NI Vision Acquisition Software 8.2.1 or later, which includes the NI-IMAQdx driver software

❑ Software for developing applications:
  – LabVIEW
  – LabVIEW Real-Time Module
  – NI Vision Development Module

Optional Equipment

National Instruments offers a variety of products for use with the NI CVS-1450 device, including the following:

• DCAM-compliant IEEE 1394 cameras

• Camera lenses

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- Ring and back lights
- NI Vision I/O Terminal Block and Prototyping Accessory (part number 779166-01)
- DIN rail/panel mount kit (part number 189154-01)
- Digital I/O cable and horizontal DIN rail terminal block (part number 778790-01)
- Digital I/O cable and vertical DIN rail terminal block (part number 778791-01)
- 75 Ω SMB 111 coaxial cable (part number 763422-01)—SMB to BNC cable for connecting to triggers and light sources

Visit ni.com or call the National Instruments office nearest you for more information about these products.

Related Documentation

The following documents contain additional information that you may find helpful:

- *NI CVS-1450 Series User Manual*—Contains information about programming options, hardware functionality, and signal connections.
- *NI Vision Acquisition Software Release Notes*—Outlines new functionality, system requirements, installation procedures, and descriptions of the documentation included with the NI-IMAQdx driver software.
- *Measurement & Automation Explorer Help for NI-IMAQdx*—Describes how to configure the NI-IMAQdx driver software, NI interface devices, and cameras using Measurement & Automation Explorer (MAX).
- *NI-IMAQdx Help*—Contains fundamental programming concepts for the NI-IMAQdx driver software and terminology for using NI image acquisition devices.

Safety Information

⚠ **Caution** The following paragraphs contain important safety information you *must* follow when installing and operating the device.

Do *not* operate the device in a manner not specified in the documentation. Misuse of the device may result in a hazard and may compromise the safety protection built into the device. If the device is damaged, turn it off and do *not* use it until service-trained personnel can check its safety. If necessary, return the device to National Instruments for repair.

Keep away from live circuits. Do *not* remove equipment covers or shields unless you are trained to do so. If signal wires are connected to the device, hazardous voltages can exist even when the equipment is turned off. To avoid a shock hazard, do *not* perform procedures involving cover or shield removal unless you are qualified to do so. Disconnect all field power prior to removing covers or shields.

If the device is rated for use with hazardous voltages (>30 V_{rms}, 42.4 V_{pk}, or 60 V_{dc}), it may require a safety earth-ground connection wire. Refer to the device specifications for maximum voltage ratings.

Because of the danger of introducing additional hazards, do *not* install unauthorized parts or modify the device. Use the device only with the chassis, modules, accessories, and cables specified in the installation instructions. All covers and filler panels *must* be installed while operating the device.

Do *not* operate the device in an explosive atmosphere or where flammable gases or fumes may be present. Operate the device only at or below the pollution degree stated in the specifications. Pollution consists of any foreign matter—solid, liquid, or gas—that may reduce dielectric strength or surface resistivity. The following is a description of pollution degrees.

- Pollution Degree 1—No pollution or only dry, nonconductive pollution occurs. The pollution has no effect.
- Pollution Degree 2—Normally only nonconductive pollution occurs. Occasionally, nonconductive pollution becomes conductive because of condensation.
- Pollution Degree 3—Conductive pollution or dry, nonconductive pollution occurs. Nonconductive pollution becomes conductive because of condensation.

Clean the device and accessories by brushing off light dust with a soft, nonmetallic brush. Remove other contaminants with a stiff, nonmetallic brush. The unit *must* be completely dry and free from contaminants before returning it to service.

You *must* insulate signal connections for the maximum voltage for which the device is rated. Do *not* exceed the maximum ratings for the device. Remove power from signal lines before connection to or disconnection from the device.

⚠ **Caution** National Instruments measurement products may be classified as either Measurement Category I or II. Operate products at or below the Measurement Category level specified in the hardware specifications.

Measurement Category[1]: Measurement circuits are subjected to working voltages[2] and transient stresses (overvoltage) from the circuit to which they are connected during measurement or test. Measurement Category establishes standardized impulse withstand voltage levels that commonly occur in electrical distribution systems. The following is a description of Measurement (Installation[3]) Categories:

- Measurement Category I is for measurements performed on circuits *not* directly connected to the electrical distribution system referred to as MAINS[4] voltage. This category is for measurements of voltages from specially protected secondary circuits. Such voltage measurements include signal levels, special equipment, limited-energy parts of equipment, circuits powered by regulated low-voltage sources, and electronics.
- Measurement Category II is for measurements performed on circuits directly connected to the electrical distribution system. This category refers to local-level electrical distribution, such as that provided by a standard wall outlet (e.g., 115 V for U.S. or 230 V for Europe). Examples of Measurement Category II are measurements performed on household appliances, portable tools, and similar products.
- Measurement Category III is for measurements performed in the building installation at the distribution level. This category refers to measurements on hard-wired equipment such as equipment in fixed installations, distribution boards, and circuit breakers. Other examples are wiring, including cables, bus-bars, junction boxes, switches, socket-outlets in the fixed installation, and stationary motors with permanent connections to fixed installations.
- Measurement Category IV is for measurements performed at the primary electrical supply installation (<1,000 V). Examples include electricity meters and measurements on primary overcurrent protection devices and on ripple control units.

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[1] Measurement Categories as defined in electrical safety standard IEC 61010-1.

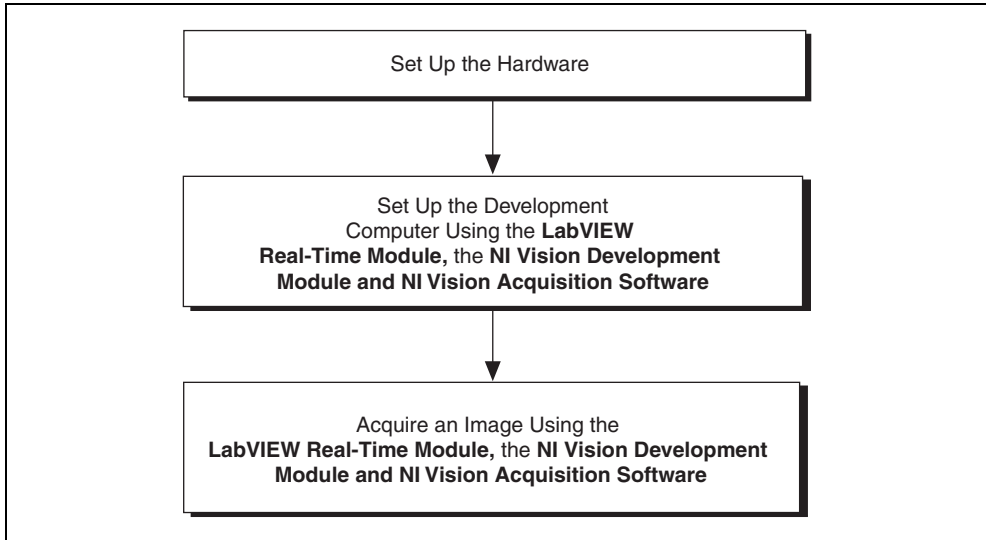[2] Working voltage is the highest rms value of an AC or DC voltage that can occur across any particular insulation.

[3] Measurement Category is also referred to as Installation Category.

[4] MAINS is defined as the (hazardous live) electrical supply system to which equipment is designed to be connected for the purpose of powering the equipment. Suitably rated measuring circuits may be connected to the MAINS for measuring purposes.

Hardware Installation

Figure 1 illustrates the sequence for setting up the NI CVS-1450 device.

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┌─────────────────────────────────────────────────────────┐
│                                                           │
│         ┌─────────────────────────────────────┐           │
│         │        Set Up the Hardware          │           │
│         └─────────────────────────────────────┘           │
│                          │                                │
│                          ▼                                │
│         ┌─────────────────────────────────────┐           │
│         │        Set Up the Development        │           │
│         │     Computer Using the LabVIEW       │           │
│         │  Real-Time Module, the NI Vision     │           │
│         │        Development Module and        │           │
│         │    NI Vision Acquisition Software    │           │
│         └─────────────────────────────────────┘           │
│                          │                                │
│                          ▼                                │
│         ┌─────────────────────────────────────┐           │
│         │       Acquire an Image Using the     │           │
│         │  LabVIEW Real-Time Module, the NI    │           │
│         │    Vision Development Module and     │           │
│         │    NI Vision Acquisition Software    │           │
│         └─────────────────────────────────────┘           │
│                                                           │
└─────────────────────────────────────────────────────────┘
```

Figure 1. Setup Sequence

The following instructions are for general installation. Refer to the documentation provided by your computer manufacturer for specific instructions and warnings. Refer to the *Specifications* section for typical power requirements for the NI CVS-1450 device.

Connecting a Camera and Monitor to the NI CVS-1450 Device

Before connecting a camera and monitor to the NI CVS-1450 device, make sure that all NI CVS-1450 device DIP switches are in the **OFF** position.

To connect an IEEE 1394 camera and a monitor to the NI CVS-1450 device, refer to Figure 2 while completing the following steps:

1. Connect the VGA cable from the monitor to the VGA port on the NI CVS-1450 device.

2. Plug the IEEE 1394 cable into one of the IEEE 1394a ports on the NI CVS-1450 device. Plug the other end of the cable into the IEEE 1394 port on the camera.

   If your camera requires an external power supply, connect it to the camera, and verify that the camera is powered on.

   Note To maintain signal integrity, the IEEE 1394 cable length must be no longer than 4.5 m.

3. Plug in and power on the monitor.

| 1 | VGA Cable | 2 | IEEE 1394 Cable |
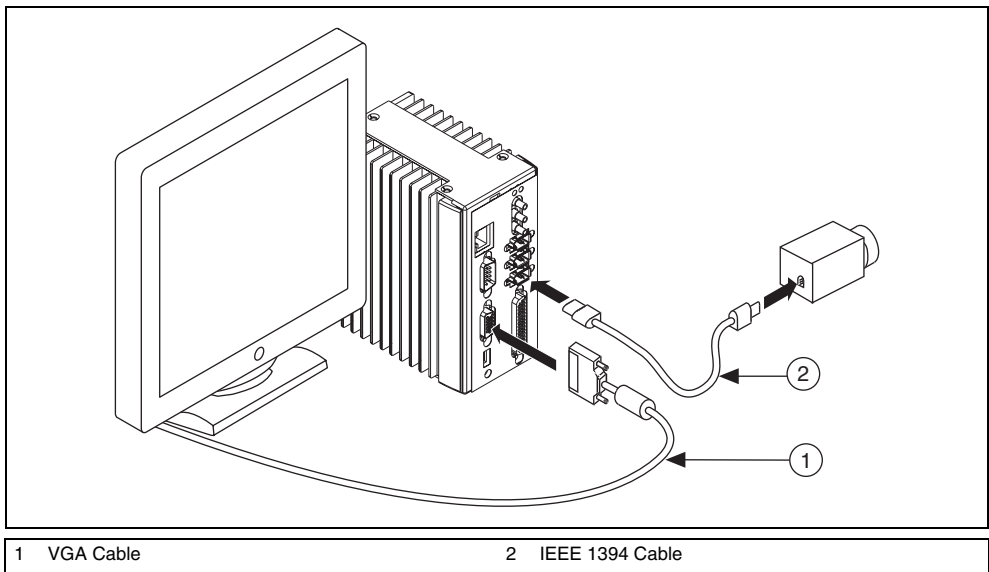
Figure 2. Basic Hardware Setup

Wiring Power to the NI CVS-1450 Device

This section describes how to connect the NI desktop power supply. For instructions on how to connect a separate main supply, refer to the *Connecting to a Separate Main Supply* section.

⚠️ **Caution** Do *not* connect the NI CVS-1450 device main power to a source other than 24 VDC ±10%. Do *not* connect the NI CVS-1450 device isolated power to a source less than 5 VDC or greater than 30 VDC. Doing so could damage the NI CVS-1450 device.

To connect power to the NI CVS-1450 device, refer to Figure 3 while completing the following steps:

1. Plug the 4-position connector from the power supply into the power receptacle on the NI CVS-1450 device.
2. Plug the power cord into the power supply.
3. Plug the power cord into an outlet.

The NI CVS-1450 device ships with a factory-installed startup program that, when the NI CVS-1450 device is connected to a camera and powered on, acquires images and displays them on the monitor. If the images from the camera display on the monitor, continue to the *Connecting the NI CVS-1450 Device to a Network* section. If the images from the camera are not displayed on the monitor, refer to the *NI CVS-1450 Series User Manual* for troubleshooting information.
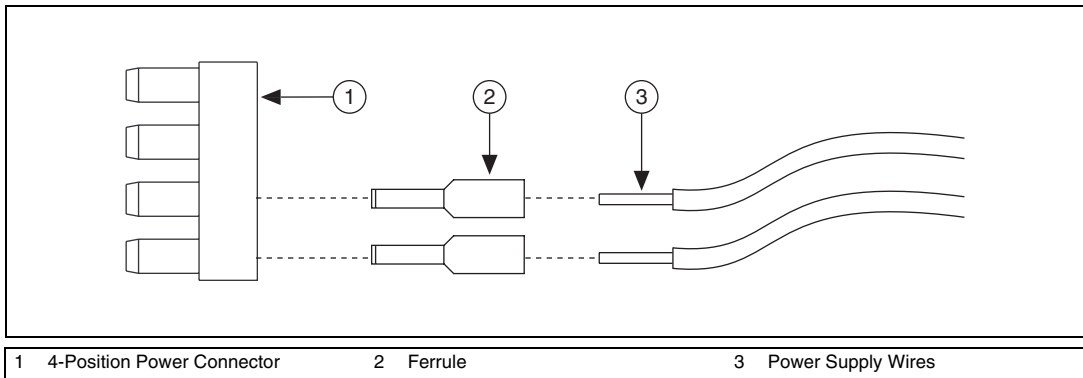
| 1 | 4-Position Power Connector | 2 | NI Desktop Power Supply | 3 | Power Supply Cord (to Outlet) |
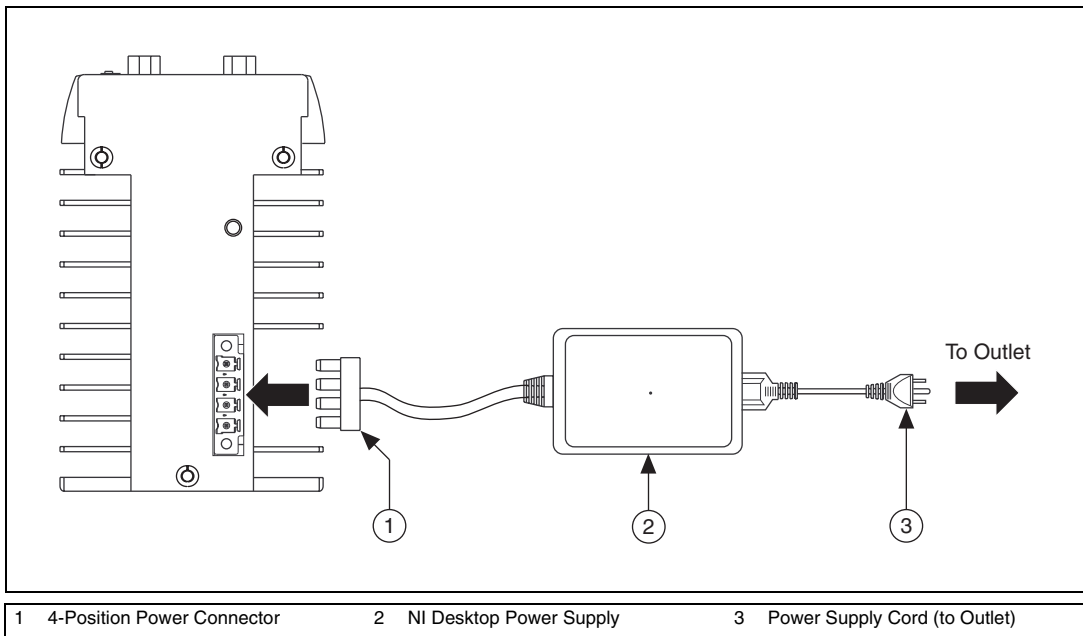
Figure 3. Wiring Power to the NI CVS-1450 Device

Connecting to a Separate Main Supply

If you use a power supply other than the NI desktop power supply, follow the instructions in this section to connect power to the NI CVS-1450 device.

Note If you are not using the NI desktop power supply, use 0.75 mm², 18 AWG ferrules according to manufacturer specifications to terminate the wires leading to the 4-position power connector, as shown in Figure 4. Ferrules are available from Phoenix Contact (part number 3200519).

| 1 | 4-Position Power Connector | 2 | Ferrule | 3 | Power Supply Wires |

Figure 4. Wiring a Third-Party Power Supply to the 4-Position Power Connector

Caution Do *not* connect the NI CVS-1450 device main power to a source other than 24 VDC ±10%. Do *not* connect the NI CVS-1450 device isolated power to a source less than 5 VDC or greater than 30 VDC. Doing so could damage the NI CVS-1450 device.

The NI CVS-1450 device ships with a 4-position power connector that plugs directly into the power input connector on the NI CVS-1450 device. To wire power to the 4-position connector, complete the following steps:

1. Wire the voltage output of the 24 VDC ±10% power supply to the main voltage input, labeled **V**, on the 4-position connector.

2. Wire the common-mode signal (ground) output of the power supply to the common-mode signal input, labeled **C**, on the 4-position connector.

If you are using a separate power supply for the NI CVS-1450 device isolated outputs, connect the voltage output on the power supply to the isolated power (V_{iso}) on the 4-position connector. Connect the common-mode signal on the power supply to the isolated common-mode signal (C_{iso}) on the connector.

Note If you do not require a separate power supply for the NI CVS-1450 device isolated outputs, you can daisy-chain the **V** to the V_{iso} and the **C** to the C_{iso} on the connector.

For information about grounding the NI CVS-1450 device chassis to earth ground, refer to the *NI CVS-1450 Series User Manual*.

Connecting the NI CVS-1450 Device to a Network

Use a standard CAT 5 or CAT 6 Ethernet cable to connect the NI CVS-1450 device to a network.

If the development computer is already configured on a network, you must configure the NI CVS-1450 device on the same network. If the development computer is not connected to a network, you can connect the development computer and the NI CVS-1450 device directly using a CAT 5 or CAT 6 Ethernet crossover cable.

Caution To prevent data loss and to maintain the integrity of your Ethernet installation, do *not* use a cable longer than 100 m. If you are using a 100 Mbps Ethernet, National Instruments recommends using a CAT 5 or CAT 6 shielded twisted-pair Ethernet cable.

Subnet Considerations

To configure the NI CVS-1450 device, it must reside on the same subnet as the development computer. Once the NI CVS-1450 device is configured, other subnets can access and use it.

To use the NI CVS-1450 device on a subnet other than the one on which the development computer resides, first connect and configure the NI CVS-1450 device on the same subnet as the development computer. Next, physically move the NI CVS-1450 device to the other subnet and reassign an IP address. Contact your network administrator for assistance in setting up the development computer and NI CVS-1450 device on the same subnet.

Connecting the NI CVS-1450 Device to the Development Computer

The development computer communicates with the NI CVS-1450 device over an Ethernet connection. Use a standard Ethernet cable to connect from the network port to the NI CVS-1450 device.

Note If you are *not* connecting through a network, use an Ethernet crossover cable to connect the NI CVS-1450 device directly to the development computer.

To connect the NI CVS-1450 device to the development computer, refer to Figure 5 while completing the following steps:

1. Verify that the development computer is connected to the network and is powered on.

2. Using a standard Ethernet cable, connect from the network port to the Ethernet port on the NI CVS-1450 device.

3. Using a standard Ethernet cable, connect from the network port to the Ethernet port on the development computer.

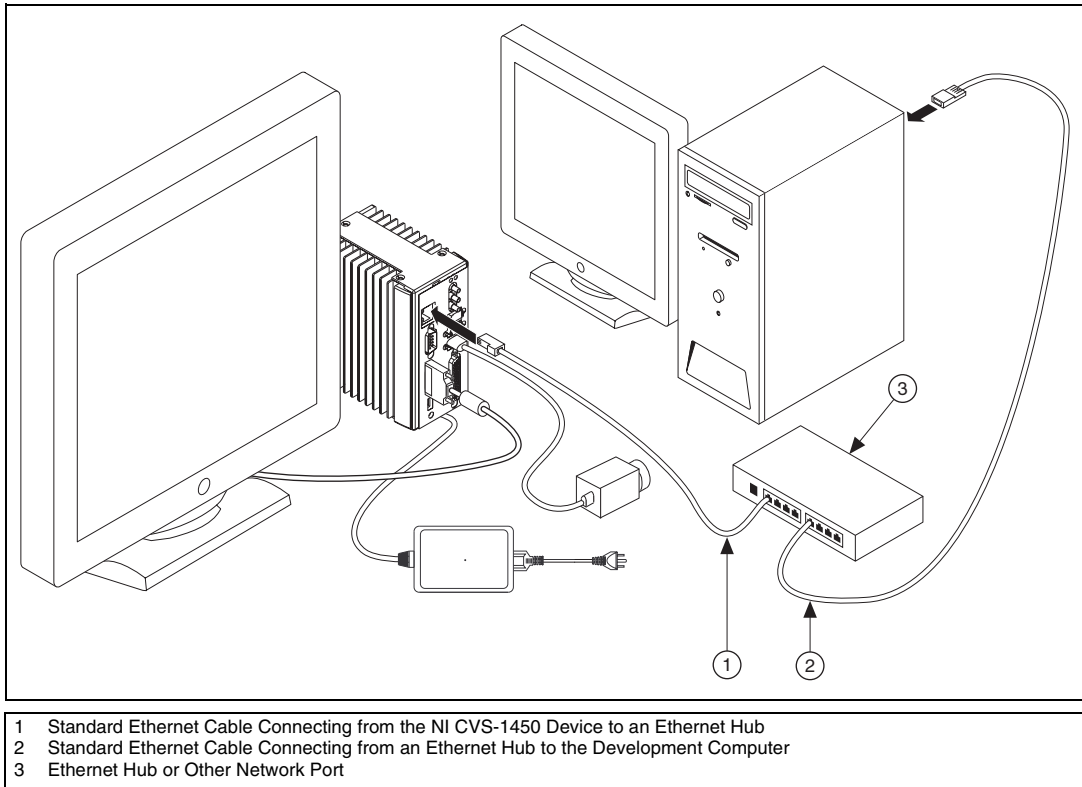|	
1	Standard Ethernet Cable Connecting from the NI CVS-1450 Device to an Ethernet Hub
2	Standard Ethernet Cable Connecting from an Ethernet Hub to the Development Computer
3	Ethernet Hub or Other Network Port

Figure 5. Ethernet Connection

Software Installation

This section contains information about installing LabVIEW, the LabVIEW Real-Time Module, the NI Vision Development Module, and NI Vision Acquisition Software on the development computer. It also contains information on obtaining an IP address, installing software on the NI CVS-1450 device, and configuring the NI CVS-1450 device to acquire an image using the LabVIEW Real-Time Module.

Installation

Complete the following steps to install LabVIEW, the LabVIEW Real-Time Module, the NI Vision Development Module, and NI Vision Acquisition Software onto the development computer.

Note You must install LabVIEW, the LabVIEW Real-Time Module, and the NI Vision Development Module software *before* installing NI Vision Acquisition Software.

1. Insert the LabVIEW CD into the CD-ROM drive.
2. When the installation screen appears, click **Install LabVIEW**, and follow the setup instructions.
3. Insert the LabVIEW Real-Time Module CD into the CD-ROM drive.
4. When the installation screen appears, click **Install LabVIEW Real-Time Module**, and follow the setup instructions.

5. Insert the NI Vision Development Module CD into the CD-ROM drive.

6. When the installations screen appears, click **Install NI Vision Development Module**, and follow the setup instructions.

7. Insert the NI Vision Acquisition Software disk 1 CD into the CD-ROM drive.

8. When the installation screen appears, click **Install NI Vision Acquisition Software**, and follow the setup instructions.

9. When prompted, restart the development computer.

Configuring the IP Address Using the Measurement & Automation Explorer (MAX)

To configure an IP address for the NI CVS-1450 device using MAX, complete the following steps:

1. Launch MAX by double-clicking the MAX icon on the desktop, or select **Start»All Programs»National Instruments»Measurement & Automation**.

2. Expand the **Remote Systems** branch of the configuration tree, and click **192.168.10.12** to display the Network Settings tab. `192.168.10.12` is the IP address assigned to all unconfigured NI CVS-1450 devices.

   To uniquely identify unconfigured NI CVS-1450 devices, connect and configure one NI CVS-1450 device at a time.

3. In the **Network Settings** tab, enter a name for the device in the **Name** field and a description of the device in the **Comment** field.

   Device names are limited to 15 characters with no spaces or special characters except hyphens. The first and last characters must be alphanumeric.

4. If the network is configured to issue IP addresses using DHCP, select **Obtain IP address from DHCP server**. Otherwise, configure the IP address manually by selecting **Edit the IP settings**, **Suggest Values**, and **OK**.

5. Click **Apply**.

6. When prompted, restart the NI CVS-1450 device. The initialization process may take several minutes.

Downloading Software to the NI CVS-1450 Device

To download software to the NI CVS-1450 device using MAX, complete the following steps:

1. In the MAX configuration window, click the **Software** tab.

2. Click **Add/Remove Software** on the MAX toolbar.

   When you update software on a LabVIEW Real-Time target, such as the NI CVS-1450 device, while the Windows Firewall is enabled on the host computer, a dialog box may appear giving you the option to allow MAX to communicate over a network. Select **Unblock this program** to allow MAX to communicate with your LabVIEW RT target. You must have Administrator privileges to modify this setting. For more information, visit `ni.com/info` and enter `winxpsp2`.

3. Select **NI-IMAQdx RT**. For initial installation, make sure all checkboxes are selected.

   Note The NI-IMAQ for IEEE 1394 RT 2.0 driver software is available for legacy applications.

4. Review your selection in the **Summary** window. Use the **Back** button to modify your software settings if needed.

5. Click **Next**.

6. Once the software is installed, the NI CVS-1450 device will automatically restart. Click **Finish** when this process is completed.

Acquiring an Image

This section contains information on acquiring images using the LabVIEW Real-Time Module and MAX.

Acquiring an Image Using the LabVIEW Real-Time Module

Complete the following steps to acquire an image using the LabVIEW Real-Time Module.

1. Launch LabVIEW, and select **Real-Time Project**.

2. Select **Custom project** for the **Project type**, enter a **Project name**, select the **Project folder** where you want to store the project and click **Next**.

3. Select **Import Existing VIs to host and target**, and click **Add VIs** in the **VIs imported to run on target** section.

4. Navigate to `<LabVIEW>\examples\IMAQ\IMAQdx examples.llb`, and click **Add VIs**. `<LabVIEW>` is the location to which LabVIEW is installed.

5. Click `Grab.vi`, and click **Add VIs**.

6. Click **Next**.

7. Click **Browse targets** to add a target or device to the project.

8. Select the **Existing target or device** option from **Targets and Devices**, expand the **Compact Vision System** branch, select your device, and click **OK**.

9. Click **Next**.

10. Verify that the NI CVS-1450 device appears correctly in the LabVIEW Real-Time Project, and click **Finish**.

11. After your project has launched, specify which camera your NI CVS-1450 device will use by selecting a camera from the **Camera Name** control.

12. Click the **Run** button on the VI front panel to begin acquiring images.

Acquiring an Image Using MAX

Complete the following steps to acquire an image using the MAX.

1. Launch MAX.

2. In the MAX configuration tree, expand the **Remote Systems** folder.

3. Expand the device folder of your NI CVS-1450 device.

4. Expand **Devices and Interfaces**.

5. Expand **NI-IMAQdx Devices**.

6. Select a camera.

7. Click the **Snap** button to acquire a single image, or click the **Grab** button to acquire continuous images.

Now that you are acquiring images, you can use the NI Vision Development Module and the installed NI CVS-1450 device drivers to process images and control inputs and outputs.

Specifications

The following specifications apply to the NI CVS-1450 device. These specifications are typical at 25 °C, unless otherwise stated.

Power Requirements

Main supply voltage..24 VDC ±10%

    Power (excluding cameras)...........................12 W, typical
    22 W, maximum

    IEEE 1394 bus power ....18 W, maximum
    (shared by all three ports)

Isolated supply[1]...5 to 30 VDC

Memory

SDRAM ....128 MB

Nonvolatile storage
    NI CVS-1454 ....64 MB
    NI CVS-1455 ....128 MB
    NI CVS-1456 ....256 MB

Processor

NI CVS-1454 ....Intel Celeron 400 MHz processor

NI CVS-1455 ....Intel Celeron 650 MHz processor

NI CVS-1456 ....Intel Celeron 733 MHz processor

Network

Network interface...10BaseT and 100BaseTX Ethernet

Compatibility ....IEEE 802.3

Maximum cabling distance...................................100 m/segment

TTL Inputs and Outputs

Digital logic levels

Level	Minimum	Maximum
Input low voltage (V_{IL})	0 V	0.5 V
Input high voltage (V_{IH})	2.2 V	5 V
Output low voltage (V_{OL}), at 5 mA	—	0.4 V
Output high voltage (V_{OH}), at 5 mA	2.4 V	—

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[1] Do *not* draw more than 500 mA combined from the Viso pins on the 44-pin DSUB connector. Do *not* draw more than 100 mA from 24V or 30V isolated outputs. Do *not* draw more than 50 mA from 5V isolated outputs.

TTL Inputs

Number of channels 2

Maximum pulse rate ....2 MHz

Minimum pulse detected......................................500 ns

Power-on state...Input (high-impedance)
61.9 kΩ pull-up to 5 V

TTL Outputs

Number of channels 10

Output voltage range..0 to 5 V

Maximum pulse rate ....2 MHz

Optically Isolated Inputs and Outputs

Isolated (Current Sinking) Inputs

Number of channels 13

Input voltage range ....0 to 30 V
    Input ON voltage..3.5 to 30 V
    Input OFF voltage ....0 to 2 V

Turn-on current ....7.1 mA, typical
14 mA, maximum

Maximum pulse rate ....100 kHz

Minimum pulse detected......................................10 μs

Reverse polarity protection ....Yes, –30 V

Isolated (Current Sourcing) Outputs

Number of channels 4

On-state voltage range ....5 to 30 V, maximum
    Maximum on-state voltage
    drop from V_{iso} ....1.2 V at 100 mA

Output current
    5 V_{iso} ....50 mA, maximum
    24 V_{iso} ....100 mA, maximum
    30 V_{iso} ....100 mA, maximum

Maximum pulse rate ....10 kHz (maximum load resistance 100 kΩ)

Minimum pulse generated ....100 μs

Reverse polarity protection ....Yes

IEEE 1394

Number of ports 3

Camera interface ....IEEE 1394a

Speed...100, 200, or 400 Mbps

Available bus power ....Refer to the *Power Requirements* section

Physical Characteristics

Dimensions ....10.2 cm × 12.7 cm × 6.4 cm
(4 in. × 5 in. × 2.5 in.)

Weight ....1 kg (2.2 lb)

Refer to Appendix B, *Mounting Information*, of the *NI CVS-1450 Series User Manual* for dimensional drawings of the NI CVS-1450 device.

Environmental

The NI CVS-1450 device is intended for indoor use only.

Operating temperature

Vertical mounting position............................0 to 55 °C

All other positions...0 to 45 °C

Storage temperature ....−20 to 85 °C

Humidity ....10 to 90% RH, noncondensing

Pollution Degree 2

Operating shock (IEC 68-2-27) ....50 g, 6 ms half sine, 3 shocks per side;
30 g 11 ms half sine, 3 shocks per side

Operating vibration

Random (IEC 60068-2-34) ....10 to 500 Hz, 5 G_{rms}

Swept Sine (IEC 60068-2-6).........................10 to 500 Hz, 5 g

Approved at altitudes up to 2,000 m.

Safety

The NI CVS-1450 device meets the requirements of the following standards for safety and electrical equipment for measurement, control, and laboratory use:

• EN 61010-1, IEC 61010-1

• UL 61010-1

• CAN/CSA-C22.2 No. 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 the Certification column.

Electromagnetic Compatibility

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

- EN 61326 EMC requirements; Minimum Immunity
- EN 55011 Emissions; Group 1, Class A
- CE, C-Tick, ICES, and FCC Part 15 Emissions; Class A

Note For EMC compliance, operate this device to product documentation.

CE Compliance

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

- 73/23/EEC; Low-Voltage Directive (safety)
- 89/336/EEC; 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.

Environmental Management

National Instruments is committed to designing and manufacturing products in an environmentally responsible manner. NI recognizes that eliminating certain hazardous substances from our products is beneficial not only to the environment but also to NI customers.

For additional environmental information, refer to the *NI and the Environment* Web page at `ni.com/environment`. This page contains the environmental regulations and directives with which NI complies, as well as other environmental information not included in this document.

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`.

电子信息产品污染控制管理办法 （中国 **RoHS**）

中国客户 National Instruments 符合中国电子信息产品中限制使用某些有害物质指令 (RoHS)。关于 National Instruments 中国 RoHS 合规性信息，请登录 `ni.com/environment/rohs_china`。(For information about China RoHS compliance, go to `ni.com/environment/rohs_china`.)

Where to Go for Support

The National Instruments Web site is your complete resource for technical support. At `ni.com/support` you have access to everything from troubleshooting and application development self-help resources to email and phone assistance from NI Application Engineers.

A Declaration of Conformity (DoC) is our claim of compliance with the Council of the European Communities using the manufacturer's declaration of conformity. This system affords the user protection for electronic compatibility (EMC) and product safety. You can obtain the DoC for your product by visiting `ni.com/certification`. If your product supports calibration, you can obtain the calibration certificate for your product at `ni.com/calibration`.

National Instruments corporate headquarters is located at 11500 North Mopac Expressway, Austin, Texas, 78759-3504. National Instruments also has offices located around the world to help address your support needs. For telephone support in the United States, create your service request at `ni.com/support` and follow the calling instructions or dial 512 795 8248. For telephone support outside the United States, contact your local branch office:

Australia 1800 300 800, Austria 43 662 457990-0, Belgium 32 (0) 2 757 0020,
Brazil 55 11 3262 3599, Canada 800 433 3488, China 86 21 5050 9800,
Czech Republic 420 224 235 774, Denmark 45 45 76 26 00, Finland 358 (0) 9 725 72511,
France 01 57 66 24 24, Germany 49 89 7413130, India 91 80 41190000, Israel 972 3 6393737,
Italy 39 02 41309277, Japan 0120-527196, Korea 82 02 3451 3400, Lebanon 961 (0) 1 33 28 28,
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