USER GUIDE

NI CVS-1450 I/O Terminal Block and Prototyping Accessory

This document describes the features of your NI CVS-1450 I/O Terminal Block and Prototyping Accessory, what you need to get started, and the installation and operation of the device.

Introduction

The CVS-1450 I/O Accessory breaks out the I/O functionality of the National Instruments CVS-1450 Series Compact Vision System, providing screw terminals for easy connections. The CVS-1450 I/O Accessory also provides LEDs for each signal, which you can use to quickly prototype and troubleshoot your CVS-1450 application.

You can use the CVS-1450 I/O Accessory in demo mode or user mode. Demo mode allows you to quickly prototype your CVS-1450 application, and user mode allows you to debug a deployed CVS-1450 application.

What You Need to Get Started

- ❑ NI CVS-1450 I/O Terminal Block and Prototyping Accessory
- ❑ NI CVS-1450 Series Compact Vision System

  Refer to the *NI CVS-1450 Series User Manual* for system requirements, configuration, and procedural information about the CVS-1450 device.
- ❑ Vision Builder for Automated Inspection (Vision Builder AI) script or LabVIEW VI to run on the CVS-1450 device

NATIONAL INSTRUMENTS™

Related Documentation

The following documents contain information you may find helpful as you set up and use the CVS-1450 I/O Accessory:

- *NI CVS-1450 Series User Manual*
- *NI 1450 Series Compact Vision System Quick Start Guide*
- *NI 1450 Series Compact Vision System Digital I/O Help*

Unpacking

The CVS-1450 I/O Accessory ships in an antistatic package to prevent electrostatic discharge from damaging device components. To avoid such damage in handling the device, take the following precautions:

- Ground yourself using a grounding strap or by holding a grounded object.
- Touch the antistatic package to a metal grounded object before removing the device from the package.

Caution *Never* touch the exposed pins of connectors.

Remove the device from the package and inspect it for loose components or any other signs of damage. Notify National Instruments if the device appears damaged in any way. Do *not* use a damaged device.

Store the CVS-1450 I/O Accessory in the antistatic envelope when not in use.

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.

Compliance with FCC/Canada Radio Frequency Interference Regulations

Determining FCC Class

The Federal Communications Commission (FCC) has rules to protect wireless communications from interference. The FCC places digital electronics into two classes. These classes are known as Class A (for use in industrial-commercial locations only) or Class B (for use in residential or commercial locations). All National Instruments (NI) products are FCC Class A products.

Depending on where it is operated, this Class A product could be subject to restrictions in the FCC rules. (In Canada, the Department of Communications (DOC), of Industry Canada, regulates wireless interference in much the same way.) Digital electronics emit weak signals during normal operation that can affect radio, television, or other wireless products.

All Class A products display a simple warning statement of one paragraph in length regarding interference and undesired operation. The FCC rules have restrictions regarding the locations where FCC Class A products can be operated.

Consult the FCC Web site at `www.fcc.gov` for more information.

FCC/DOC Warnings

This equipment generates and uses radio frequency energy and, if not installed and used in strict accordance with the instructions in this manual and the CE marking Declaration of Conformity[1], may cause interference to radio and television reception. Classification requirements are the same for the Federal Communications Commission (FCC) and the Canadian Department of Communications (DOC).

Changes or modifications not expressly approved by NI could void the user's authority to operate the equipment under the FCC Rules.

[1] The CE marking Declaration of Conformity contains important supplementary information and instructions for the user or installer.

Class A

Federal Communications Commission

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user is required to correct the interference at their own expense.

Canadian Department of Communications

This Class A digital apparatus meets all requirements of the Canadian Interference-Causing Equipment Regulations.

Cet appareil numérique de la classe A respecte toutes les exigences du Règlement sur le matériel brouilleur du Canada.

Compliance with EU Directives

Users in the European Union (EU) should refer to the Declaration of Conformity (DoC) for information[1] pertaining to the CE marking. 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.

Installation

Complete the following steps to install the CVS-1450 I/O Accessory:

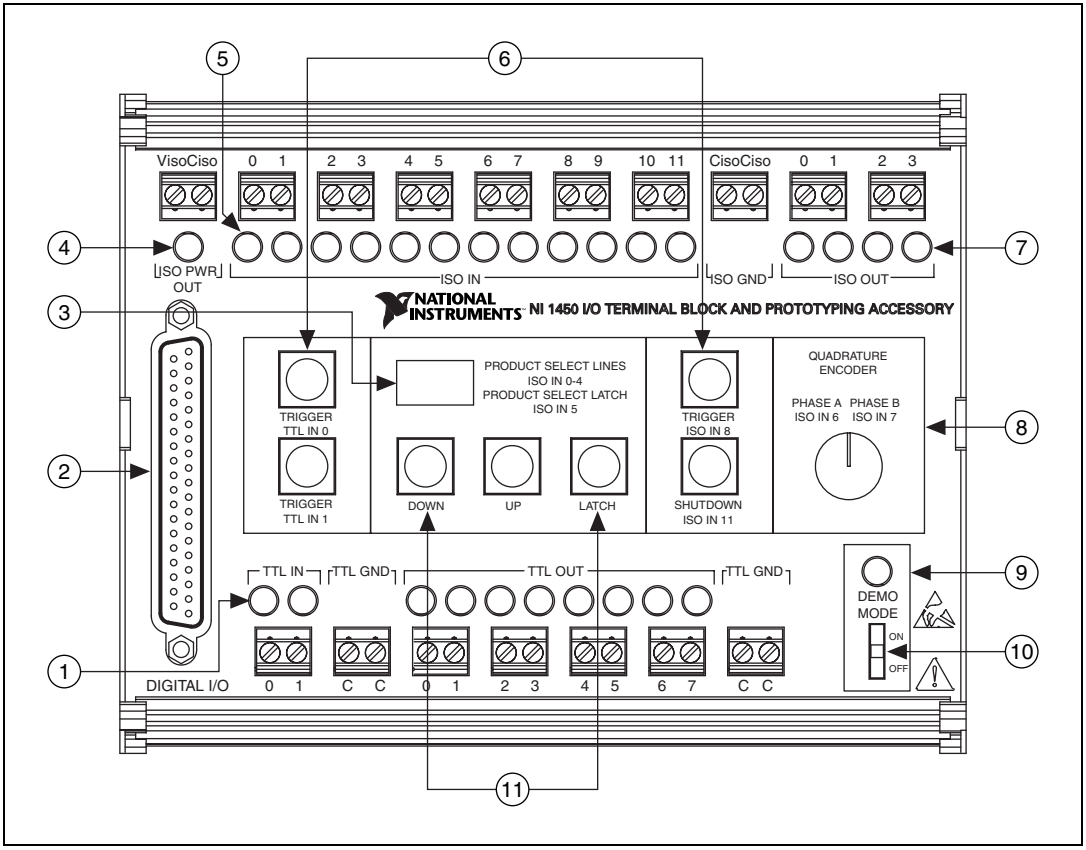
1. Install the CVS-1450 device, accessories, and required software as described in the *NI CVS-1450 Series User Manual.*
2. Use the Digital I/O cable to connect the CVS-1450 device to the CVS-1450 I/O Accessory.

[1] The CE marking Declaration of Conformity contains important supplementary information and instructions for the user or installer.

Device Overview

The following sections describe the features of the CVS-1450 I/O Accessory and instructions for how to use the device in demo mode and user mode.

Figure 1 illustrates the front panel of the CVS-1450 I/O Accessory.



1 LEDs that show which TTL IN and TTL OUT lines are active
2 37-pin D-SUB connector to connect to the CVS-1450 device
3 LED display that shows a digital representation of the product selection lines
4 LED that shows if ISO PWR OUT is active
5 LEDs that shows which ISO IN lines are active
6 Push-button switches that allow you to operate a pulse on the TTL IN 0, TTL IN 1, ISO IN 8, and ISO IN 11
7 LEDs that shows which ISO OUT lines are active
8 Knob you can use to generate quadrature encoder signals to ISO IN 6 and ISO IN 7
9 LED that shows if the CVS-1450 I/O Accessory is in demo mode
10 DIP switch you can use to put the CVS-1450 I/O Accessory in either demo mode or user mode
11 Navigation buttons you can use to select a product selection line and a button that allows you to latch the selected product selection lines

Figure 1. CVS-1450 I/O Accessory Front Panel

TTL and ISO LED Indicators and Product Selection Display

Each I/O line on the CVS-1450 I/O Accessory is connected to an LED, which provides quick status information. Each LED lights up when the associated signal is high. This functionality can be useful both for prototyping your CVS-1450 device solution, as well as for troubleshooting your deployed application. The LEDs function the same way in both demo and user mode.

You typically use product select lines when you have configured your system to perform multiple inspections with one CVS-1450 device, and the system must switch among the inspections on the fly. The following list includes the ISO lines that are used for product selection:

- ISO IN 0
- ISO IN 1
- ISO IN 2
- ISO IN 3
- ISO IN 4
- ISO IN 5—latch line

The product selection LED display operates differently between demo and user mode. In demo mode, the display provides the decimal representation of the product selection based on the push button switches. In user mode, the display provides the decimal representation for the physical state of the isolated inputs lines that correspond to the product selection port. The latch input, ISO IN 5, is not used when displaying the product selection value.

Trigger, Shutdown, and Product Select Line Push-button Switches

The CVS-1450 I/O Accessory provides push-button switches to enable quick development, prototyping, and debugging. You can use the push-button switches to mimic events, such as a trigger from a proximity sensor, an emergency stop signal to shut down the system, or a change to the product selection lines from a programmable logic controller (PLC). When you push the push-button switches, they generate an active-low signal to the CVS-1450. Table 1 shows which signals are connected to the push-button switches.

Table 1. CVS-1450 Signals with Push-Button Connectivity

Signal Name	Primary Function
TTL Input 1	Trigger Input
TTL Input 2	Trigger Input
ISO Input 8	Trigger Input

Table 1. CVS-1450 Signals with Push-Button Connectivity (Continued)

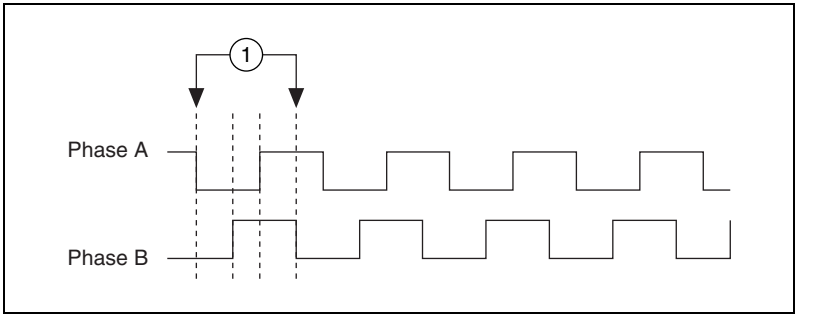
Signal Name	Primary Function
ISO Input 11	User Shutdown
ISO Input 0	Product Selection Port, Data (0)
ISO Input 1	Product Selection Port, Data (1)
ISO Input 2	Product Selection Port, Data (2)
ISO Input 3	Product Selection Port, Data (3)
ISO Input 4	Product Selection Port, Data (4)
ISO Input 5	Product Selection Port, Data (5) rising edge latch

Note The push-button switches are disabled when the CVS-1450 I/O Accessory is in user mode.

Quadrature Encoder

The CVS-1450 I/O Accessory can demonstrate the use of the quadrature encoder counting capability of the CVS-1450 device. The accessory provides a 24-pulse per revolution quadrature encoder generator.

The quadrature encoder pulse trains are generated corresponding to the shaft position as you rotate the knob. Depending on the direction of the rotation, phase A leads phase B by 90 or phase B leads phase A by 90. This relationship is illustrated in Figure 2.



1 Quadrature encoder counts

Figure 2. Quadrature Encoder Pulse Trains

Note The quadrature encoder knob is disabled when the CVS-1450 I/O Accessory is in user mode.

DIP Switch

Use the DIP switch on the CVS-1450 I/O Accessory to determine which mode the accessory is in. The demo mode LED lights when the CVS-1450 I/O Accessory is in demo mode.

Using the CVS-1450 I/O Accessory

You can use the CVS-1450 I/O Accessory in either demo mode or user mode.

Demo Mode

To use the CVS-1450 I/O Accessory in demo mode, move the DEMO MODE DIP switch to the ON position. The LED lights up when the CVS-1450 I/O Accessory is in demo mode.

Use the trigger and product selection push-button switches and the product selection display LED to prototype possible scenarios on the CVS-1450. For example, if you want to prototype a CVS-1450 application that inspects two different types of products, you can use the product selection push-button switches to toggle between inspections. You also can use the product selection display LED and the ISO IN LEDs to determine which product selection line is currently active.

While the CVS-1450 I/O Accessory is in demo mode, you can use the ISO and TTL LEDs to observe when the associated signals are high.

Use the quadrature encoder to test the triggering functionality of the CVS-1450 for applications that require triggering at a particular position rather than a time. For example, if you want to trigger an image acquisition every few counts, use the quadrature encoder knob to get a feel for how those image acquisitions are triggered.

User Mode

To use the CVS-1450 I/O Accessory in user mode, move the DEMO MODE DIP switch to the OFF position.

Use the various TTL and ISO LEDs to view the state of all knobs and trigger lines to allow easy troubleshooting. For example. you can use the TTL OUT LEDs to view which TTL lines are currently triggering other devices.

Use the product selection display LED to view which product selection is currently active.

Note The product selection push-button switches are unavailable in user mode.

Note The quadrature encoder is unavailable in user mode.

Specifications

This section lists the specifications of the CVS-1450 I/O Accessory. These specifications are typical at 25 °C, unless otherwise noted.

Refer to the *NI CVS 1450 Series User Manual* for detailed specifications for the NI CVS-1450 Series Compact Vision System.

Power Requirement

Main supply voltage .....24 VDC ±10%

Power (excluding
V_{iso} and C_{iso} connections).....5 W max

Note Power is supplied by the 44-pin D-SUB cable connected from the NI CVS-1450 Series device to the CVS-1450 I/O Accessory via the V_{iso} and C_{iso} screw terminal connector.

Physical

Box dimensions (including feet).....6.34 in. × 5 in. × 2 in.

Weight .....10 oz

Environmental

Operating temperature .....0 to 55 °C

Storage temperature .....–20 to 70 °C

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

Maximum altitude.....2,000 m

Pollution Degree 2

The NI CVS-1450 I/O Accessory is intended for indoor use only.

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
- 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 in the Certification column.

Electromagnetic Compatibility

Emissions ..... EN 55011 Class A at 10 m
FCC Part 15A above 1 GHz

Immunity ..... EN 61326:1997 + A2:2001, Table 1

CE, C-Tick, and FCC Part 15 (Class A) Compliant

Note For EMC compliance, operate this device with shielded cabling.

CE Compliance

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

Low-Voltage Directive (safety) 73/23/EEC

Electromagnetic Compatibility
Directive (EMC) 89/336/EEC

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.

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