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IC-3120

IC-3120

Industrial Controller

This document contains detailed electrical and mechanical information for the National Instruments IC-3120.

Contents

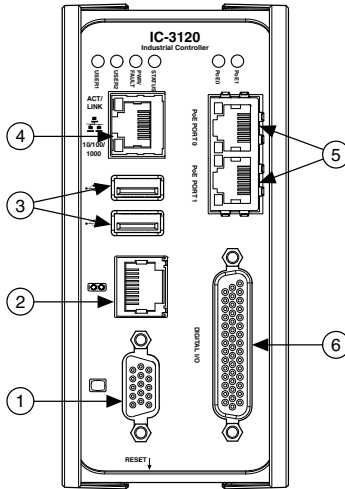
| | |
|--|----|
| Hardware Overview..... | 1 |
| Connector Pinouts..... | 2 |
| LED Indicators..... | 14 |
| Using the RESET Button..... | 19 |
| Software Options..... | 20 |
| BIOS Configuration and System Recovery..... | 20 |
| Entering BIOS Setup..... | 20 |
| BIOS Keyboard Navigation..... | 21 |
| Main Menu..... | 21 |
| Advanced Menu..... | 21 |
| Boot Menu..... | 22 |
| Save & Exit Menu..... | 24 |
| Restoring the NI Linux Real-Time Operating System..... | 25 |
| Restoring the Windows Operating System..... | 25 |
| Mounting the IC-3120..... | 27 |
| Securing the IC-3120 to a Mount..... | 31 |
| Clearance Requirements..... | 31 |
| Where to Go Next..... | 32 |
| Worldwide Support and Services..... | 32 |

Hardware Overview

The IC-3120 front panel consists of a VGA port, RJ50 serial port, two USB 2.0 ports, a 10/100/1000 Ethernet port, and two Gigabit Ethernet PoE ports.

The IC-3120 front panel also includes LEDs for communicating system status and a 44-pin Digital I/O port. The Digital I/O port offers 8 isolated inputs, 8 isolated outputs, 2 bidirectional differential I/O (RS-422) or single-ended input lines that can be used with a quadrature encoder, and 8 bidirectional TTL lines.

Figure 1. IC-3120 Front Panel Connectors



- | | |
|------------------------------|------------------------------------|
| 1. VGA Connector | 4. Gigabit Ethernet Port |
| 2. RS-232/RS-485 Serial Port | 5. Gigabit Ethernet Ports with PoE |
| 3. USB 2.0 Ports | 6. 44-pin Digital I/O Connector |

Connector Pinouts

The IC-3120 provides the following connectors.

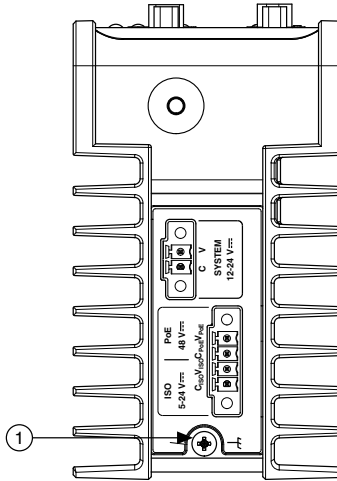
Chassis Grounding Screw

Use the grounding screw to connect the chassis to earth ground. An earth ground connection is optional.



Note An earth ground connection does not connect C or C_{ISO} to earth ground.

Figure 2. Chassis Grounding Screw



1. Chassis Grounding Screw

Power Input Connectors

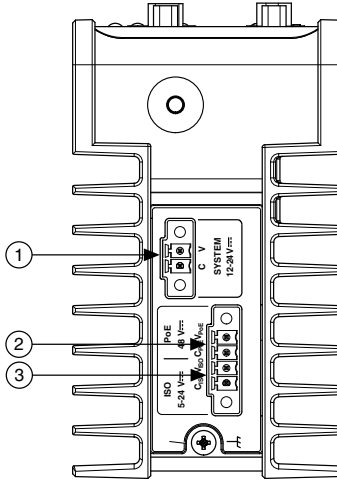
The IC-3120 requires a power supply to power the system. If needed for your application, additional power sources are required to enable Power over Ethernet and to power the isolated outputs.

The same power supply may be used for both the system power and isolated outputs power if isolation is not required and the power supply meets the voltage and power requirements for both inputs. Refer to the *IC-3120 Specifications* for power requirements.

NI recommends the following power supplies for the IC-3120.

| Power Supply | Part Number |
|---|-------------|
| NI PS-15 Industrial Power Supply, to power the system or isolated outputs | 781093-01 |
| 48 V, DIN Rail, Industrial Power Supply for Power over Ethernet | 783307-01 |
| 48 V, Desktop Power Supply for Power over Ethernet | 783308-01 |

Figure 3. Power Connectors



1. System Power Connector
2. PoE Power Connector
3. Isolated Outputs Power Connector

Table 1. Power Connector Terminals

| Terminal | Description |
|------------------|---------------------------------------|
| C | Common signal |
| V | System power (12-24 VDC) |
| C _{ISO} | Isolated common signal |
| V _{ISO} | Power for isolated outputs (5-24 VDC) |
| C _{PoE} | PoE common signal |
| V _{PoE} | PoE power (48 VDC) |

Ethernet Ports

The IC-3120 provides 3 Gigabit Ethernet ports. PoE PORT 0 and PoE PORT 1 are capable of providing Power over Ethernet (PoE). The Ethernet ports provides a connection between the IC-3120, a network, and other Ethernet devices. The IC-3120 automatically detects the speed of the connection and configures itself accordingly.

The IC-3120 can power PoE-capable devices when a PoE power supply is connected. When the IC-3120 supplies PoE, the LED that corresponds to the port illuminates. You can use non-PoE Ethernet devices with the PoE-enabled Ethernet ports.

A CAT 5e or CAT 6 1000Base-T Ethernet cable is required to achieve 1,000 Mbps (Gigabit) Ethernet performance. CAT 5 Ethernet cables are not guaranteed to meet the necessary requirements. While CAT 5 cables may appear to work at 1,000 Mbps, CAT 5 cables can cause bit errors, resulting in degraded or unreliable network performance.

(Windows only) The primary Gigabit Ethernet port provides Wake-on-LAN functionality from the power off state when associated with the Intel® driver. Wake-on-LAN must be enabled in the Power Management tab of the Intel I210 Gigabit Network Connection Properties dialog for the primary Ethernet port in Device Manager. The NI GigE Vision driver (NI-GEV) does not support Wake-on-LAN. The PoE Ethernet ports do not support Wake-on-LAN.

Figure 4. Ethernet Port Pin Locations

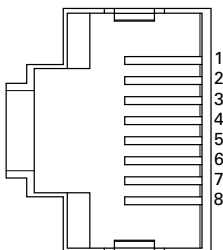


Table 2. Ethernet Port Pin Descriptions

| Pin | Fast Ethernet (100 Mbps) | Gigabit Ethernet | |
|-----|--------------------------|------------------|--------|
| | | MDI | MDI-X |
| 1 | TX+ | BI_DA+ | BI_DB+ |
| 2 | TX- | BI_DA- | BI_DB- |
| 3 | RX+ | BI_DB+ | BI_DA+ |
| 4 | No Connect | BI_DC+ | BI_DD- |
| 5 | No Connect | BI_DC- | BI_DD- |
| 6 | RX- | BI_DB- | BI_DA- |
| 7 | No Connect | BI_DD+ | BI_DC+ |
| 8 | No Connect | BI_DD- | BI_DC- |

USB 2.0 Ports

The USB ports support common USB peripheral devices such as USB flash drives, USB hard drives, USB-to-IDE adapters, keyboards, mice, and USB cameras.

(RT only) LabVIEW usually maps USB mass-storage devices to the /U, /V, /W, or /X drive, starting with the /U drive if it is available. Refer to the *LabVIEW Help* for more information.

Figure 5. USB 2.0 Pin Locations

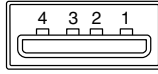


Table 3. USB 2.0 Port Pin Descriptions

| Pin | Signal Name | Signal Description |
|-----|-------------|-------------------------|
| 1 | VBUS | Cable Power (+5 VDC) |
| 2 | D- | USB Data - |
| 3 | D+ | USB Data + |
| 4 | GND | Ground for power return |

RS-485/422/232 Serial Port

The IC-3120 has a single serial port that can operate in either RS-485/422 mode or RS-232 mode. Set the serial port mode in the BIOS setup utility.

The serial port is a 10-position RJ50 modular jack, which can connect to serial devices, such as PLCs, scanners, and lighting devices.

NI recommends the following serial cables for the IC-3120.

| Cable | Part Number |
|--|-----------------------------|
| RJ50 10-position modular plug to DB-9 serial cable | 182845-01 for 1 meter cable |
| | 182845-02 for 2 meter cable |
| | 182845-03 for 3 meter cable |

Figure 6. RS-485/422/232 Serial Port Pin Locations

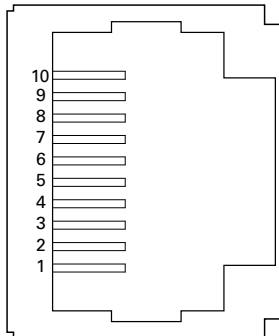


Table 4. RS-485/422/232 Serial Port Pin Descriptions

| Pin | RS-485/422 Mode | RS-232 Mode |
|-----|-----------------|-------------|
| 1 | No Connect | No Connect |
| 2 | TXD- | Unused |
| 3 | TXD+ | Unused |
| 4 | No Connect | No Connect |
| 5 | No Connect | No Connect |
| 6 | RXD- | GND |
| 7 | RXD+ | Unused |
| 8 | Unused | TXD |
| 9 | Unused | RXD |
| 10 | GND | GND |

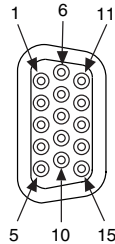
Related Information

[Serial Port Configuration Submenu](#) on page 22

VGA Port

Use the VGA port to connect a monitor to the IC-3120. Use any standard 15-pin VGA cable to access the VGA port. The VGA port has a maximum resolution of 1920 x 1200 at 60 Hz.

Figure 7. VGA Port Pin Locations



| Pin | Signal Name | Signal Description |
|-----|-------------|---------------------------|
| 1 | RED | Red analog video signal |
| 2 | GREEN | Green analog video signal |
| 3 | BLUE | Blue analog video signal |
| 4 | RESERVED | Reserved |

| Pin | Signal Name | Signal Description |
|-----|--------------|--------------------------------------|
| 5 | GND | Ground reference |
| 6 | RED RETURN | Ground reference |
| 7 | GREEN RETURN | Ground reference |
| 8 | BLUE RETURN | Ground reference |
| 9 | PWR | 5 V power for DDC |
| 10 | GND | Ground return for power |
| 11 | NC | No connect |
| 12 | DDC_D | Data signal of serial communication |
| 13 | HSYNC | Horizontal synchronization signal |
| 14 | VSYNC | Vertical synchronization signal |
| 15 | DDC_C | Clock signal of serial communication |

Digital I/O

The 44-pin Digital I/O port on the IC-3120 offers 8 isolated inputs, 8 isolated outputs, 2 bidirectional differential inputs (RS-422) or single-ended input lines that can be used with a quadrature encoder, and 8 bidirectional TTL lines. The Digital I/O port can be connected to any appropriate shielded device or connector block using a shielded cable.

NI recommends the following digital I/O cables for the IC-3120.

| Cable | Part Number |
|---|--------------------------------|
| 44-pin D-sub male to pigtail cable | 156083-03 for 3 meter cable |
| 44-pin D-sub male to 44-position D-sub female cable | 156084-03 for 3 meter cable |
| | 156084-0R5 for 0.5 meter cable |

Refer to the following image and table for pin locations and descriptions.

Figure 8. 44-pin Digital I/O Connector Pin Locations

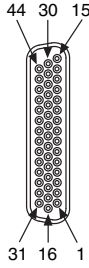


Table 5. Digital I/O Pin Descriptions

| Pin Number | Signal | Description |
|------------|------------------|--|
| 1 | Diff 0+ | Bidirectional RS-422 I/O (positive side), or quadrature encoder phase A+ |
| 2 | GND | Digital ground reference for TTL and differential I/O |
| 3 | TTL 0 | Bidirectional TTL I/O |
| 4 | TTL 1 | Bidirectional TTL I/O |
| 5 | GND | Digital ground reference for TTL and differential I/O |
| 6 | TTL 2 | Bidirectional TTL I/O |
| 7 | TTL 3 | Bidirectional TTL I/O |
| 8 | GND | Digital ground reference for TTL and differential I/O |
| 9 | Diff 1+ | Bidirectional RS-422 I/O (positive side), or quadrature encoder phase B+ |
| 10 | V _{ISO} | Isolated power voltage reference output |
| 11 | C _{ISO} | Common ground reference for isolated inputs and outputs |
| 12 | Iso Out 0 | General purpose isolated input |
| 13 | Iso Out 1 | General purpose isolated input |
| 14 | C _{ISO} | Common ground reference for isolated inputs and outputs |
| 15 | Iso Out 4 | General purpose isolated output |
| 16 | Diff 0- | Bidirectional RS-422 I/O (negative side), or quadrature encoder phase A- |
| 17 | GND | Digital ground reference for TTL and differential I/O |
| 18 | TTL 4 | Bidirectional TTL I/O |

Table 5. Digital I/O Pin Descriptions (Continued)

| Pin Number | Signal | Description |
|------------|------------------|---|
| 19 | TTL 5 | Bidirectional TTL I/O |
| 20 | GND | Digital ground reference for TTL and differential I/O |
| 21 | TTL 6 | Bidirectional TTL I/O |
| 22 | TTL 7 | Bidirectional TTL I/O |
| 23 | GND | Digital ground reference for TTL and differential I/O |
| 24 | Diff 1- | Bidirectional RS-422 I/O |
| 25 | V _{ISO} | Isolated power voltage reference output |
| 26 | C _{ISO} | Common ground reference for isolated inputs and outputs |
| 27 | Iso Out 2 | General purpose isolated output |
| 28 | Iso Out 3 | General purpose isolated output |
| 29 | C _{ISO} | Common ground reference for isolated inputs and outputs |
| 30 | Iso Out 5 | General purpose isolated output |
| 31 | Iso In 0 | General purpose isolated input |
| 32 | iso In 1 | General purpose isolated input |
| 33 | C _{ISO} | Common ground reference for isolated inputs and outputs |
| 34 | Iso In 2 | General purpose isolated input |
| 35 | Iso In 3 | General purpose isolated input |
| 36 | C _{ISO} | Common ground reference for isolated inputs and outputs |
| 37 | Iso In 4 | General purpose isolated input |
| 38 | Iso In 5 | General purpose isolated input |
| 39 | C _{ISO} | Common ground reference for isolated inputs and outputs |
| 40 | Iso In 6 | General purpose isolated input |
| 41 | Iso In 7 | General purpose isolated input |
| 42 | C _{ISO} | Common ground reference for isolated inputs and outputs |
| 43 | Iso Out 6 | General purpose isolated output |
| 44 | Iso Out 7 | General purpose isolated output |

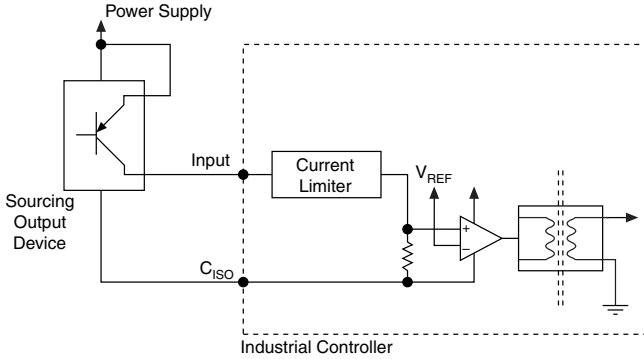
Wiring an Isolated Input

You can wire an isolated input to a sourcing output device.



Caution Do not allow the voltage on the isolated inputs to exceed 30 VDC. Doing so will damage the IC-3120.

Figure 9. Connecting an Isolated Input to a Sourcing Output Device



Wiring an Isolated Output

The digital isolated output circuits source current to external loads.

When an inductive load, such as a relay or solenoid, is connected to an output, a large counter-electromotive force may occur at switching time due to energy stored in the inductive load. This flyback voltage can damage the outputs and the power supply.

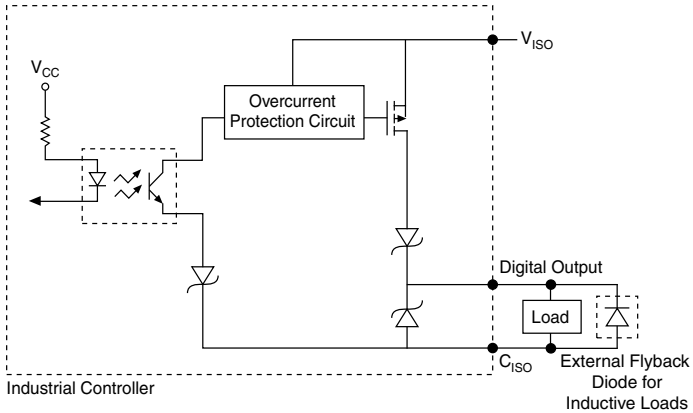
To limit flyback voltages at the inductive load, install a flyback diode across the load. Mount the flyback diode as close to the load as possible. Use this protection method if you connect any of the isolated outputs on the IC-3120 to an inductive load.

The following image shows an example of an isolated output wired to an external load with a flyback diode installed across the load.



Caution Do not draw more than 35 mA from each isolated output when V_{ISO} is 5 V. Do not draw more than 80 mA from each isolated output when V_{ISO} is 24 V.

Figure 10. Connecting an Isolated Output to an External Load



Connecting to Differential I/O

The IC-3120 accepts differential (RS-422) line driver inputs. Each of the two differential I/O can be configured as an output. Use shielded cables for all applications. Unshielded cables are more susceptible to noise and can corrupt signals.

Figure 11. Quadrature Encoder/RS-422 Input/Output Circuit

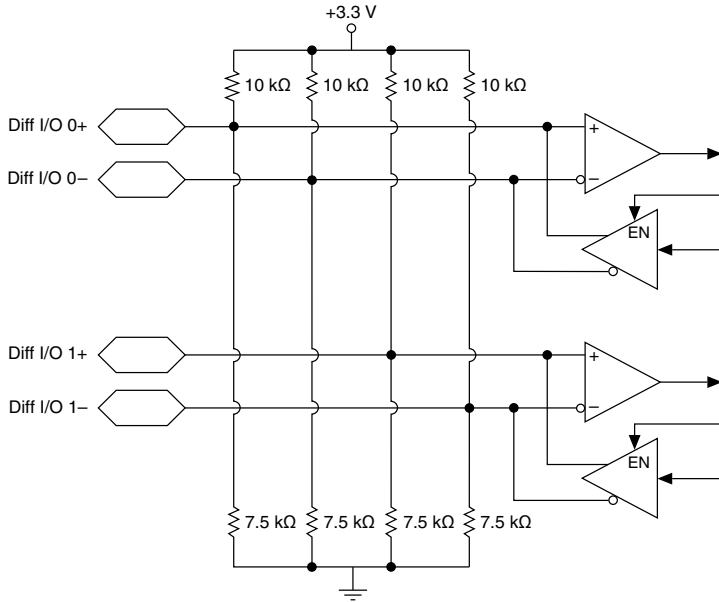


Figure 12. Connecting Differential Line Drivers

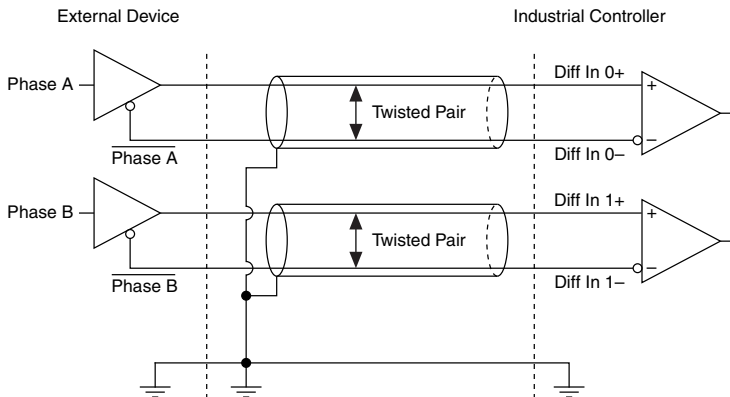
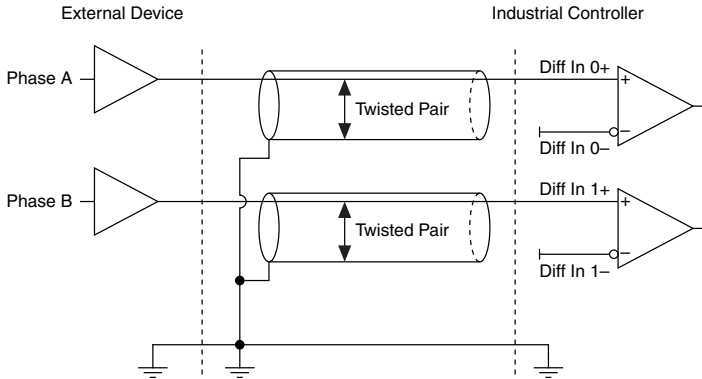


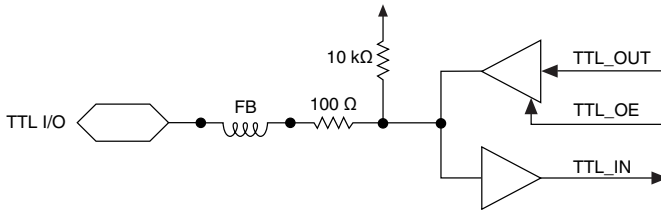
Figure 13. Connecting Single-Ended Line Drivers



TTL I/O

The following image shows the circuit for a bidirectional TTL I/O.

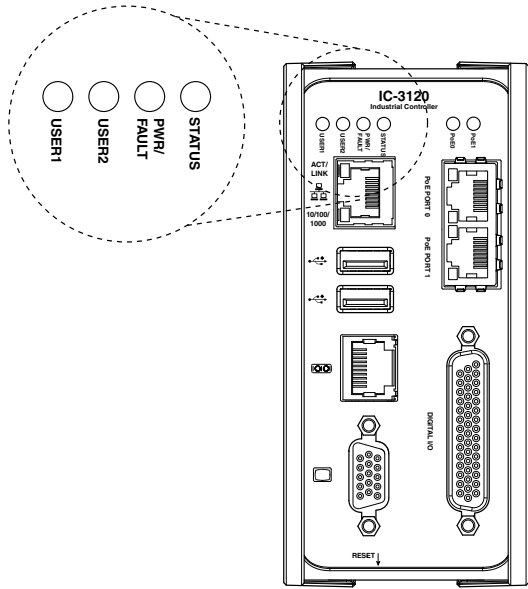
Figure 14. TTL Input/Output Circuit



LED Indicators

The IC-3120 provides the following LED indicators.

Figure 15. LED Indicators



The following table describes the LEDs and indications.

Table 6. LED Indications

| LED | LED Color | LED State | Indication |
|--------|-----------|---------------------|--|
| STATUS | Yellow | OFF | The IC-3120 initialized successfully and is ready for use. |
| | | 2 blinks | (RT only) There is no software installed, which is the out-of-box state, or the IC-3120 has detected an error in its software. The device has automatically started up into safe mode. This usually occurs when an attempt to upgrade the software is interrupted or if system files are deleted from the IC-3120. Reinstall software on the IC-3120. |
| | | 3 blinks | (RT only) The IC-3120 has booted into safe mode. Refer to the <i>Safe Mode</i> section for information about the safe mode state. |
| | | 4 blinks | (RT only) The IC-3120 has experienced two consecutive software exceptions. The IC-3120 automatically restarts after an exception. After the second exception, the IC-3120 remains in the exception state, alerting you to resolve the problem. Reinstall software on the IC-3120 or contact NI for assistance. Refer to the <i>IC-3120 Getting Started Guide</i> for information about installing software on the IC-3120. |
| | | Continuous blinking | (RT only) The IC-3120 has not booted into NI Linux Real-Time. The controller either booted into an unsupported operating system, was interrupted during the boot process, or detected an unrecoverable software error. |
| | | Solid | (RT only) The IC-3120 is booting up. (Windows only) An internal drive is being accessed. |

Table 6. LED Indications (Continued)

| LED | LED Color | LED State | Indication |
|-----------------|------------------|-----------|--|
| PWR/ FAULT | — | OFF | The IC-3120 is OFF. This is not an indication of whether power is applied or not. |
| | Green | Solid | The IC-3120 is operating normally and is properly powered on. |
| | Red | Blinking | The IC-3120 power-up sequence failed. |
| USER1/ USER2 | Green/ Yellow | — | User-controlled LEDs that can be controlled using the NI System Configuration API. |

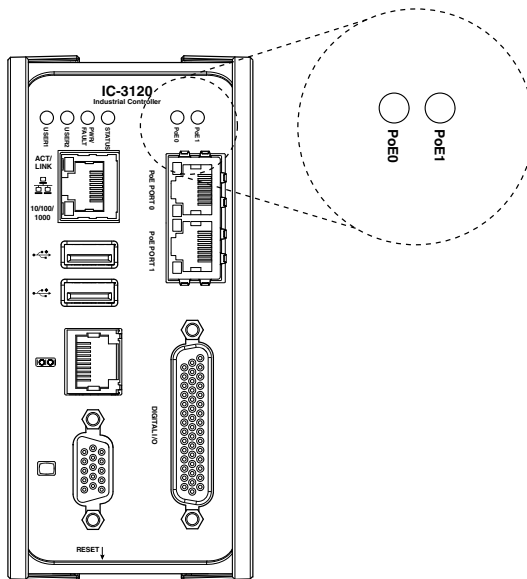
Related Information

Safe Mode on page 19

PoE LEDs

The following figure shows the location of the PoE0 and PoE1 LEDs.

Figure 16. PoE LEDs



The following table describes the PoE LED indications.

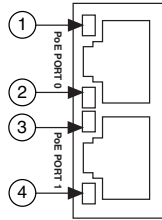
Table 7. PoE LED Indications

| PoE LED State | PoE Status |
|---------------|--|
| OFF | The corresponding PoE port is not supplying power. |
| ON | The corresponding PoE port is powering the connected device. |

Ethernet LEDs

The following figure shows the locations of the LEDs for PoE PORT 0 and PoE PORT 1.

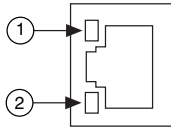
Figure 17. LEDs for Ethernet Ports with PoE



- | | |
|-----------------------------|-----------------------------|
| 1. Port 0 Speed LED | 3. Port 1 Speed LED |
| 2. Port 0 Activity/Link LED | 4. Port 1 Activity/Link LED |

The following figure shows the locations of the LEDs for the network Gigabit Ethernet port.

Figure 18. LEDs for the Network Gigabit Ethernet Port



1. Activity/Link LED
2. Speed LED

Refer to the following table for information about the Ethernet LED indications.

Table 8. Ethernet LED Indications

| LED | Status | Indication |
|---------------|----------|------------------------------|
| Activity/Link | OFF | No link has been established |
| | Solid | A link has been negotiated |
| | Blinking | Activity on the link |

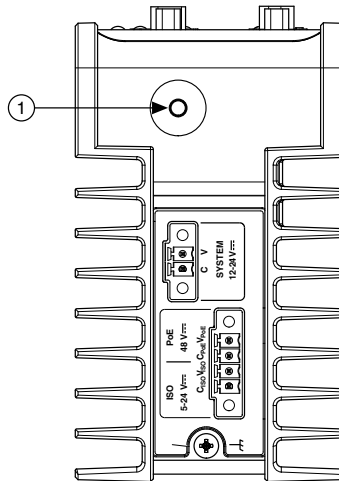
Table 8. Ethernet LED Indications (Continued)

| LED | Status | Indication |
|-------|--------|--------------------------|
| Speed | OFF | No link, or 10 Mbps link |
| | Green | 100 Mbps link |
| | Amber | 1,000 Mbps link |

Using the RESET Button

Pressing the RESET button resets the processor and reboots the system.

Figure 19. RESET Button Locations



1. RESET Button

(RT only) Troubleshooting Network Connectivity

Use the RESET button to troubleshoot network connectivity.

1. Hold the RESET button for 5 seconds, and then release it to boot the IC-3120 into safe mode.
2. After booting the controller into safe mode, hold the RESET button again for 5 seconds to enable IP reset, which resets the network adapter to its default configuration.

Safe Mode

When you boot the IC-3120 into safe mode, it launches only the services necessary for updating its configuration and installing software. To resume normal operations, press the RESET button for less than 5 seconds.

IP Reset

Use IP reset to reset the TCP/IP settings when moving the system from one subnet to another or when the current TCP/IP settings are invalid.

When the IC-3120 is in the IP reset state, the IP address of the network port resets to DHCP or a link-local address. You can then set up a new network configuration for the IC-3120 from a development machine on the same subnet, or you can connect the IC-3120 directly to the development computer.



Note By default, the target automatically attempts to connect to the network using DHCP. If the target is unable to initiate a DHCP connection, the target connects to the network with a link-local IP address (169.254.x.x).

Software Options

Use the following software to develop applications with the IC-3120. Refer to the *IC-3120 Getting Started Guide* for information about installing software.

- NI Industrial Controller Device Drivers 15.5 or later driver software.
- One of the following options for developing machine vision applications:
 - LabVIEW 2014 SP1 or later, LabVIEW Real-Time 2014 SP1 or later, the NI Vision Development Module 2015 SP1 or later.
 - NI Vision Builder for Automated Inspection (Vision Builder AI) 2015 or later.
- Software for using and reconfiguring the IC-3120 FPGA. Different configurations are referred to as hardware personalities, and are defined by bitfiles. NI Industrial Controller Device Drivers include a reconfigurable I/O personality that you can use out of the box. Install the following software if you need to compile a custom personality for your application:
 - LabVIEW 2014 SP1 or later and LabVIEW FPGA Module 2014 SP1 or later—You must install the LabVIEW FPGA Module to reconfigure the default personality of the IC-3120 FPGA.

BIOS Configuration and System Recovery

You can change the configuration settings for the IC-3120 in the BIOS setup utility. The BIOS is the low-level interface between the hardware and PC software that configures and tests your hardware when you boot the system. The BIOS setup utility includes menus for configuring settings and enabling features.

Most users do not need to use the BIOS setup utility. The system ships with default settings that work well for most configurations.

Entering BIOS Setup

Complete the following steps to start the BIOS setup program.

1. Connect a monitor to the VGA connector on the IC-3120.
2. Connect a USB keyboard to one of the USB ports on the IC-3120.

3. While holding down the <Delete> key, power on or reboot the IC-3120.

The IC-3120 will enter the BIOS setup program and display the **Main** menu.

BIOS Keyboard Navigation

Use the following keys to navigate through the BIOS setup:

- Left, right, up, and down arrows—Use these keys to move between different setup menus. Press <Esc> to exit a submenu. Be sure number lock is off to use the numeric keypad arrows.
- <Enter>—Use this key to either open a submenu or display all available settings for the highlighted configuration option.
- <Esc>—Use this key to return to a parent menu of a submenu or cancel an outstanding selection. At the main menu, use this key to exit the BIOS setup.
- <+> and <->—Use these keys to cycle between all available settings.
- <Tab>—Use this key to select time and date fields. When entering date and time and date information, you can also use the number keys to enter the time and date directly.
- <F9>—Use this key to load the optimal default values for BIOS configuration settings. The optimal default values are the same as the shipping configuration default values.

Press <F1> from any root menu to display more information about navigating the BIOS setup program.

Menu items listed in blue are changeable; menu items in gray are not changeable. A blue triangle next to a menu item indicates that the menu item contains a submenu.

Main Menu

The most commonly accessed and modified BIOS settings are in the Main setup menu.

- System Date—Changes the system date. The system date setting is stored in a battery-backed real-time clock. You can also change this setting from within MAX or Vision Builder AI.
- System Time—Changes the system time. The system time setting is stored in a battery-backed real-time clock. You can also change this setting from within MAX or Vision Builder AI.

Advanced Menu

This menu contain BIOS settings that normally do not require modification. If you have specific problems such as unbootable disks or resource conflicts, you may need to examine these settings.

The Advanced setup menu includes the following submenus:

- Power/Wake Configuration
- Serial Port Configuration
- SATA Configuration
- USB Configuration

Power/Wake Configuration Submenu

Use this submenu to apply alternate configurations to the power features of the chipset and controller. Normally, you do not need to modify these settings, as the factory default settings provide the most compatible and optimal configuration possible.

- Restore After Power Loss—Specify what state to go to when power is reapplied after a power failure.

Serial Port Configuration Submenu

Use this submenu to view the serial port configuration.

- RS485/RS232 Select—This setting selects the transceiver mode between RS-232 and RS-485. The default value is **RS485**.
- RS-485 Configuration—Use this menu to configure the RS-485/422 wire-mode. The default value is **Auto**.

Related Information

[RS-485/422/232 Serial Port](#) on page 6

SATA Configuration Submenu

Use this submenu to apply custom configurations to the processor of the IC-3120. Normally, you do not need to modify these settings, as the factory default settings provide the most compatible and optimal configuration possible.

- SATA Controller(s)—Enables or disables the SATA controller. The default is **Enabled**.

USB Configuration Submenu

Use the submenu to apply alternate configurations to the USB ports. Normally, you do not need to modify these settings, as the factory default settings provide the most compatible and optimal configuration possible.

- Legacy USB Support—Specifies whether or not legacy USB support is enabled. Legacy USB support refers to the ability to use a USB keyboard and mouse during system boot or in a legacy operating system such as DOS. The default is **Enabled**.
- Overcurrent Reporting—Enables or disables operating system notifications of USB overcurrent events. The default is **Disabled**.
- Transfer Timeout—Specifies the number of seconds the POST waits for a USB mass storage device to start. The default is **20** seconds.
- Device Reset Timeout—Specifies the maximum amount of time a device can take to properly report itself during the POST. The default value is **Auto**. Alternatively, the **Manual** override setting can be used to support slow USB devices.
- Mass Storage Devices—When USB storage is connected to the device, this menu lists each USB drive. You can set the emulation type of the USB storage. The options include Auto, Floppy, Forced FDD, Hard Disk, and CD-ROM. The default is **Auto**.

Boot Menu

This screen displays the boot order of devices associated with the IC-3120. The BIOS proceeds down the **Boot priority order list** in search of a bootable device. Devices under the

Excluded from boot order list will not be used for booting. If the BIOS fails to find any bootable device, an error message is displayed.

The Boot setup menu includes the following submenus:

- **Boot Settings Configuration**—Use this setting to access the **Boot Settings Configuration** submenu.
- **PXE Network Boot**—This setting specifies whether or not the PXE network boot agent is enabled. When this setting is enabled, the Intel Boot Agent is displayed in the **Boot Option Priorities** menu, allowing you to boot from a PXE server on the local subnet. Note that the Intel Boot Agent device names are preceded by **IBA GE Slot** in the **Boot Option Priorities** menu. The system must be restarted for this setting to take effect. The default value is **Disabled**.
- **Boot Option Priorities**—These setting specify the order in which the BIOS checks for bootable devices, including the local hard disk drive, removable devices such as USB flash disk drives or USB CD-ROM drives, or the PXE network boot agent. The BIOS will first attempt to boot from the device associated with **Boot Option #1**, followed by **Boot Option #2** and **Boot Option #3**. If multiple boot devices are not present, the BIOS setup utility will not display all of these configuration options. To select a boot device, press <Enter> on the desired configuration on the desired configuration option and select a boot device from the resulting menu. You can also disable certain boot devices by selecting **Disabled**.



Note Only one device of a given type will be shown in this list. If more than one device of that same type exists, use the Device BBS Priorities submenus to re-order the priority of devices of the same type.

Boot Settings Configuration Submenu

- **Setup Prompt Timeout**—This setting specifies the amount of time the system waits for a BIOS Setup menu keypress (the <Delete> key) in units of a second. The default value is **1** for a delay of one second.
- **Bootup NumLock State**—This setting specifies the power-on state of the keyboard NumLock setting. The default value is **On**.

Device BBS Priority Submenus

The following submenus will be displayed if one or more bootable devices of the corresponding type is present:

- **Hard Drive BBS Priorities**
- **CD/DVD ROM Drive BBS Priorities**
- **Floppy Drive BBS Priorities**
- **Network Device BBS Priorities**

Hard Drive BBS Priorities Submenu

- **Boot Option #1, Boot Option #2, Boot Option #3**—These settings specify the boot priority of hard drive devices. The highest priority device is displayed on the main **Boot Option Priorities** list. Optionally, each device can also be **Disabled** if the device should never be used as a boot device.

CD/DVD ROM Drive BBS Priorities Submenu

- Boot Option #1, Boot Option #2, Boot Option #3—These settings specify the boot priority of CD/DVD ROM drive devices. The highest priority device is displayed on the main **Boot Option Priorities** list. Optionally, each device can also be **Disabled** if the device should never be used as a boot device.

Floppy Drive BBS Priorities Submenu

- Boot Option #1, Boot Option #2, Boot Option #3—These settings specify the boot priority of network devices. The highest priority device is displayed on the main **Boot Option Priorities** list. Optionally, each device can also be **Disabled** if the device should never be used as a boot device.

Network Device BBS Priorities Submenu

- Boot Option #1, Boot Option #2, Boot Option #3—These settings specify the boot priority of network devices. The highest priority device is displayed on the main **Boot Option Priorities** list. Optionally, each device can also be **Disabled** if the device should never be used as a boot device.

Save & Exit Menu

The Save & Exit setup menu includes all available options for exiting, saving, and loading the BIOS default configuration. You can also press <F9> to load BIOS default settings and <F10> to save changes and exit setup.

The Save & Exit setup menu includes the following settings:

- Save Changes and Reset—Any changes made to BIOS settings are stored in NVRAM. The setup utility then exits and reboots the controller.
- Discard Changes and Reset—Any changes made to BIOS settings during this session of the BIOS setup utility since the last save are discarded. The setup utility then exits and reboots the controller. The <Esc> key can also be used to select this option.
- Save Changes—Changes made to BIOS settings during this session are committed to NVRAM. The setup utility remains active, allowing further changes.
- Discard Changes—Any changes made to BIOS settings during this session of the BIOS setup utility since the last save are discarded. The BIOS setup continues to be active.
- Restore Factory Defaults—This option restores all BIOS settings to the factory default. This option is useful if the controller exhibits unpredictable behavior due to an incorrect or inappropriate BIOS setting. Any nondefault settings are also restored to their factory defaults. The <F9> key can also be used to select this option.
- Save as User Defaults—This option saves a copy of the current BIOS settings as the User Defaults. This option is useful for preserving custom BIOS setup configurations.
- Boot Override—This option lists all possible bootable devices and allows the user to override the **Boot Option Priorities** list for the current boot. If no changes have been made to the BIOS setup options, the system will continue booting to the selected device without first rebooting. If BIOS setup options have been changed and saved, a reboot is required and the boot override selection will not be valid.

Restoring the NI Linux Real-Time Operating System

Complete the following steps to restore the NI Linux Real-Time operating system to its factory default condition. These steps do not restore the BIOS settings to factory default. Use the **Restore Defaults** option in the *Save & Exit Menu* of the BIOS setup utility to restore the BIOS settings.



Caution Restoring the operating system erases the contents of the hard drive. Back up any files you want to keep before restoring the hard drive.

1. Start the IC-3120 in safe mode. To start in safe mode, apply power, turn on the device, press the RESET button for more than 5 seconds, then release the button.
2. Launch NI MAX on the development computer.
3. In the MAX configuration tree, expand **Remote Systems**.
4. Right-click the name of the IC-3120 you want to restore and select **Format Disk**.
5. Enter the username and password for the device. By default, the username is `admin` and the password field is blank.
6. Click **Format**.
7. After formatting is complete, a confirmation dialog window appears. Click **Close**.
8. Refer to the *IC-3120 Getting Started Guide* for information about installing software and configuring the device.

Related Information

[Safe Mode](#) on page 19

Restoring the Windows Operating System

You can restore the Windows operating system on the hard drive of the IC-3120 from the reinstallation DVD shipped with device.



Note Restoring the operating system erases the contents of the hard drive. Back up any files you want to keep before restoring the hard drive.

Creating a Bootable USB Flash Drive

You can create a bootable USB flash drive from the reinstallation DVD if you do not have a USB DVD drive to connect to the IC-3120. The USB flash drive must be at least 8 GB. Ensure the USB flash drive appears as a Removable Drive in Windows. Avoid using drives that appear as Fixed Disk drives. Complete the following steps to prepare the USB flash drive for recovery.



Note If you have an external USB DVD drive, you can use the external DVD drive to restore Windows without creating a bootable USB flash drive. Proceed to the next section if you are using an external DVD drive.

1. Insert the USB flash drive into a computer with a DVD drive running Windows, and wait for the flash drive to be recognized.
2. Open a command prompt as an administrator.

- Type `diskpart.exe` and press <Enter>.
- Type `list disk` and press <Enter>.
- Identify the drive number that corresponds to the USB flash drive.
- Type `select disk x`, where *x* is the drive number of the USB flash drive, and press <Enter>. For example, in the following image, the USB flash drive is disk number 5. The command is `select disk 5`.

```

C:\Windows\system32\diskpart.exe
DISKPART> List Disk

Disk ###  Status         Size     Free     Dyn  Gpt
-----  -
Disk 0    Online         465 GB   1024 KB
Disk 1    Online         465 GB   4096 KB
Disk 2    Online         465 GB   4096 KB
Disk 3    Online         465 GB   1024 KB
Disk 5    Online          14 GB     0 B

DISKPART> Select Disk 5

Disk 5 is now the selected disk.

DISKPART> List Disk

Disk ###  Status         Size     Free     Dyn  Gpt
-----  -
Disk 0    Online         465 GB   1024 KB
Disk 1    Online         465 GB   4096 KB
Disk 2    Online         465 GB   4096 KB
Disk 3    Online         465 GB   1024 KB
* Disk 5    Online          14 GB     0 B

DISKPART>

```



Caution Following this process will delete all data on the USB flash drive.

- Type `clean` and press <Enter>. This command deletes all data from the USB flash drive.
- Type `create partition primary` and press <Enter>.
- Type `active` and press <Enter>
- Type `format fs=ntfs quick` and press <Enter> to format the USB flash drive.
- Type `assign letter free volume letter`, where *free volume letter* is a letter not currently associated with any disk drives. For example, assign letter *K*.
- Copy the contents of the reinstallation DVD to the root of the USB flash drive.

The USB flash drive is now bootable and will install Windows.

Reinstalling Windows

Complete the following steps to use the recovery media to install Windows.

- Connect the bootable USB flash drive to one of the USB ports on the IC-3120. Or connect an external DVD drive to one of the USB ports on the IC-3120 and insert the recovery DVD into the external drive.
- Connect a USB hub to the other USB port on the IC-3120. Connect a keyboard and mouse to the USB hub. If a USB hub is not available, the keyboard can be used to navigate the recovery software.
- Power on the IC-3120.
- Press the <F10> key on the keyboard.

5. Select the bootable USB flash drive or the DVD drive.
6. Press any key to boot from the recovery media.
7. Follow the on-screen instructions to format the hard drive and install the operating system.

After restoring the operating system, reinstall any software and drivers onto the IC-3120.

Mounting the IC-3120

This section provides information for creating a custom mount for the IC-3120. If you do not want to create a custom mount, a panel and DIN rail mount kit for the IC-3120 is available from National Instruments (part number 781740-01).



Caution If you choose not to mount the IC-3120 on a DIN rail or flat surface, do not position the IC-3120 with the heat sinks resting on any surface. Doing so may cause the IC-3120 device to overheat. Refer to the *IC-3120 Specifications* for temperature specifications.

The following figures provide dimensional drawings and clearance information for the IC-3120.

Figure 20. Front View with Dimensions in inches [millimeters]

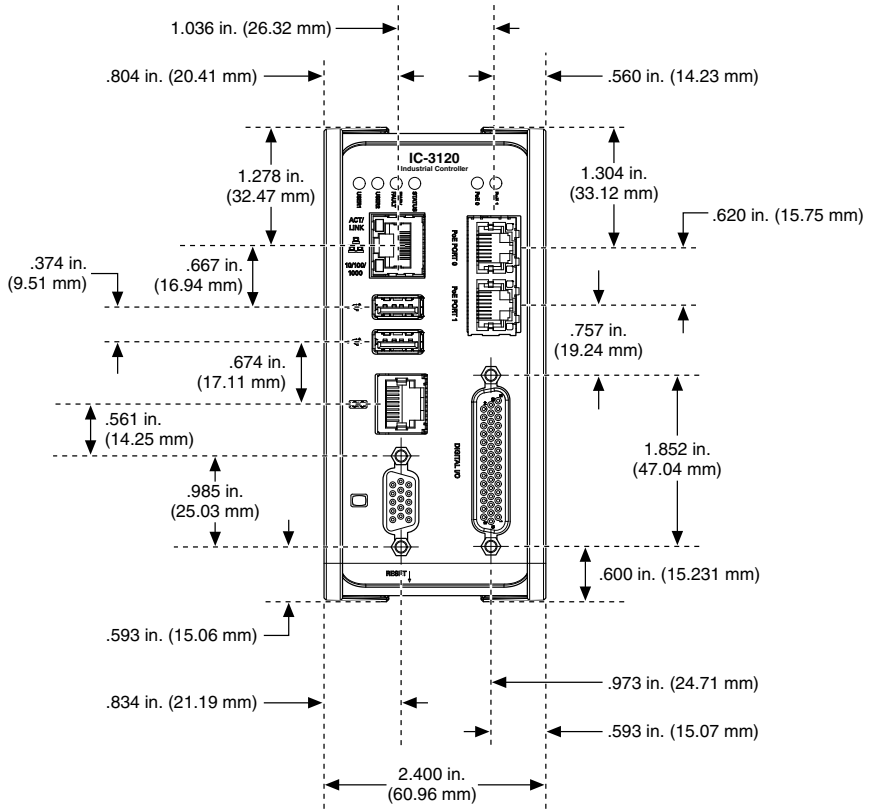


Figure 21. Back View with Dimensions in inches [millimeters]

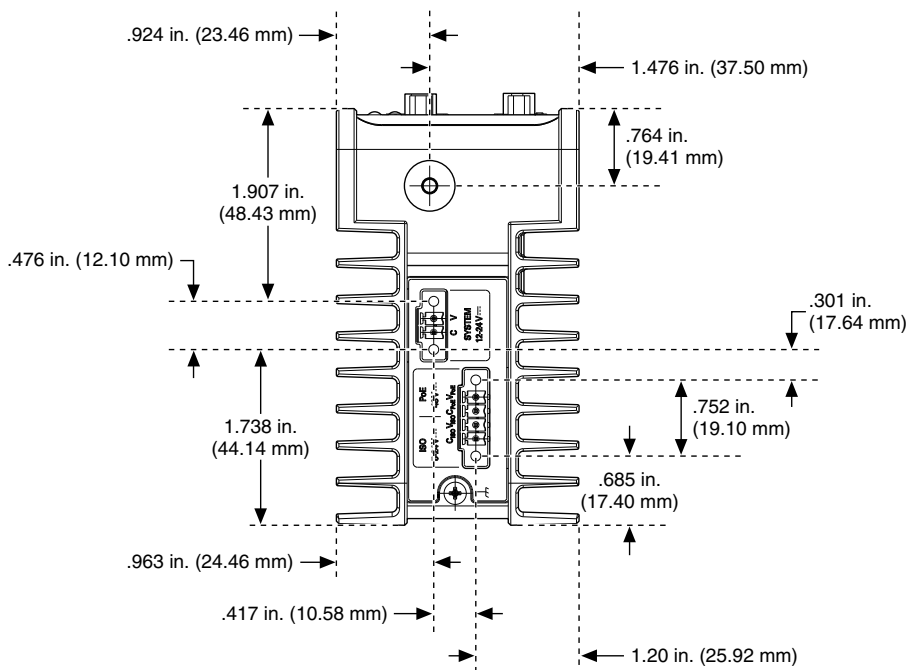


Figure 22. Side View with Dimensions in inches [millimeters]

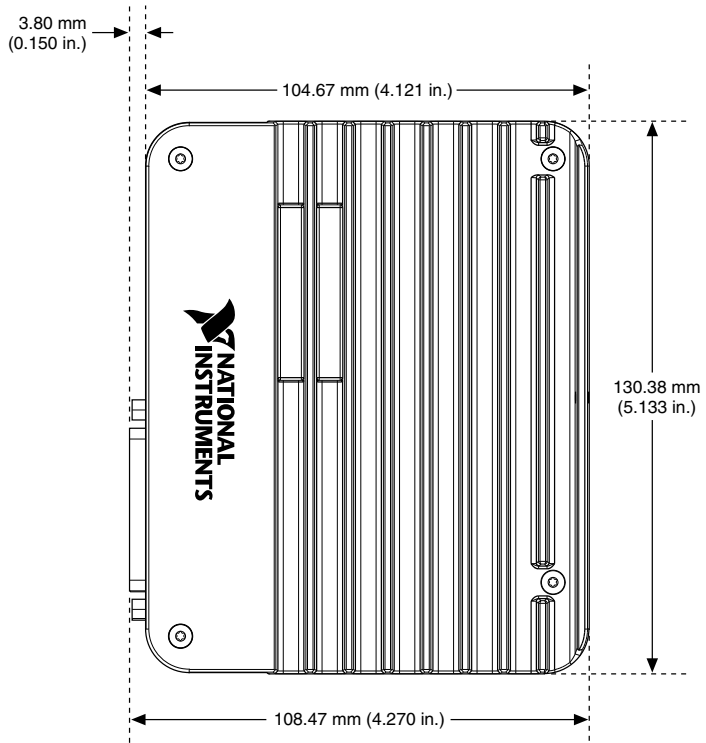
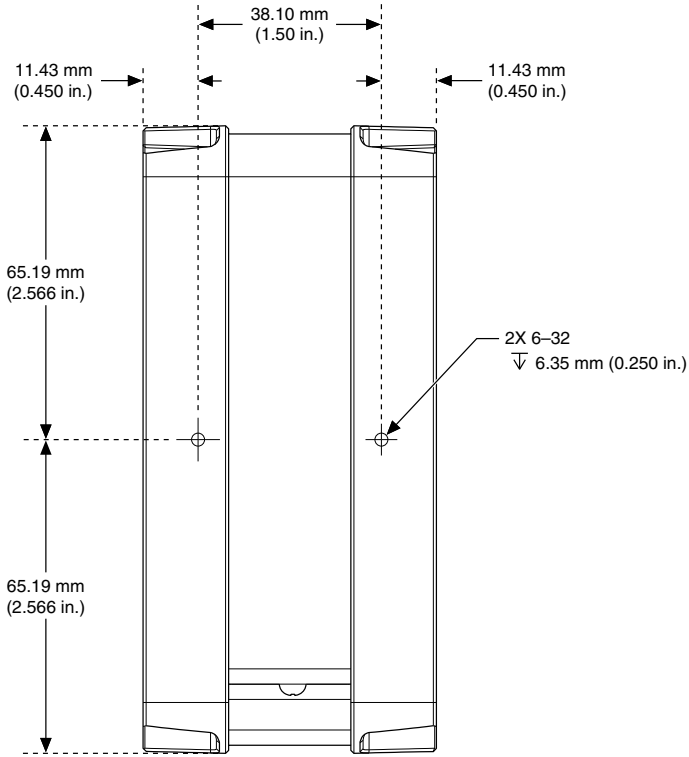


Figure 23. Bottom View with Dimensions in inches [millimeters]



Securing the IC-3120 to a Mount

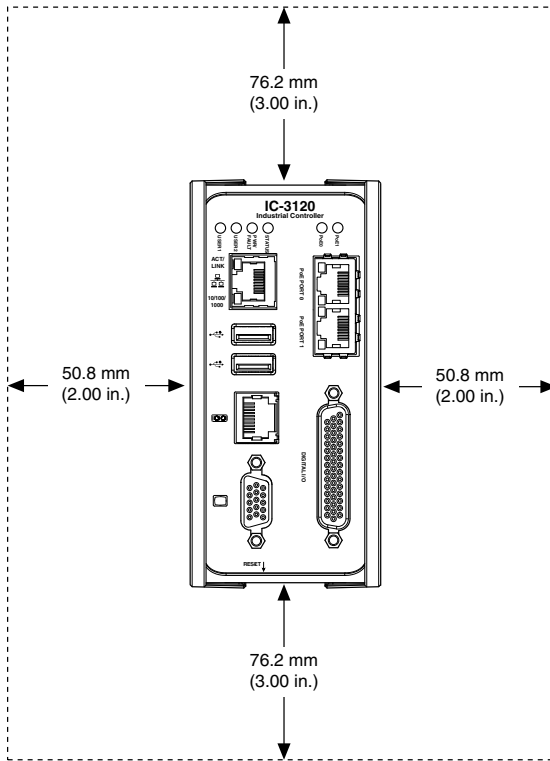
1. Align the screw holes of the mounting bracket with the two holes on the back of the IC-3120.
2. Insert two 6-32 screws and tighten them until they are secure (3.5 in-lb). Make sure the heads of the screws are flush with the mounting bracket.

Clearance Requirements

The IC-3120 installation must meet the following space and cabling clearance requirements for optimum cooling:

- Allow 76.2 mm (3.0 in.) on the top and bottom of the IC-3120 for air circulation.
- Allow 50.8 mm (2.0 in.) on the sides of the IC-3120 for air circulation.
- Allow enough space in front of the IC-3120 to connect cables.

Figure 24. Clearance Requirements for the IC-3120



Where to Go Next

The following documents and resources contain information you may find helpful as you use the IC-3120 in an application. Refer to the National Instruments Product Manuals Library at ni.com/manuals for the most recent versions of product documentation.

- *IC-3120 Specifications*—Contains detailed specifications for the IC-3120.
- *IC-3120 Getting Started Guide*—Explains how to install and configure the software necessary to use the IC-3120, and how to get started using the hardware.
- *NI CVS I/O Accessory User Manual*—Contains installation and operation instructions for the NI CVS I/O Accessory.

Worldwide Support and Services

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376097A-01 Apr16