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IC-3172

GETTING STARTED GUIDE

IC-317x

Industrial Controller with Reconfigurable I/O

The IC-317x is a high-performance, fanless embedded system designed for rugged industrial applications. This document explains how to install and configure the IC-317x.

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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.

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.

This is a Pollution Degree 2 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.

Electromagnetic Compatibility Guidelines

This product was tested and complies with the regulatory requirements and limits for electromagnetic compatibility (EMC) as stated in the product specifications. These requirements and limits are designed to provide reasonable protection against harmful interference when the product is operated in its intended operational electromagnetic environment.

This product is intended for use in industrial locations. There is no guarantee that harmful interference will not occur in a particular installation, when the product is connected to a test object, or if the product is used in residential areas. To minimize the potential for the product to cause interference to radio and television reception or to experience unacceptable performance degradation, install and use this product in strict accordance with the instructions in the product documentation.

Furthermore, any changes or modifications to the product not expressly approved by National Instruments could void your authority to operate it under your local regulatory rules.



Caution To ensure the specified EMC performance, operate this product only with shielded cables and accessories.

Preparing the Environment

Ensure that the environment in which you are using the IC-317x meets the following specifications.

Operating temperature (IEC 60068-2-1, IEC 60068-2-2)	0 °C to 55 °C, 0 °C to 50 °C when Power over Ethernet (PoE) exceeds 30 W
Operating humidity (IEC 60068-2-56)	10% RH to 90% RH, noncondensing
Pollution Degree	2
Maximum altitude	2,000 m

Indoor use only.



Note Refer to the device specifications on ni.com/manuals for complete specifications.

Configuring the Hardware



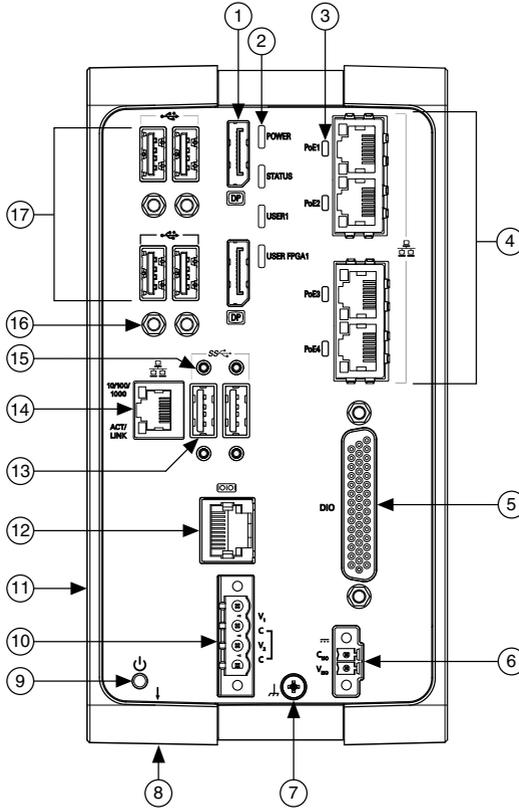
Caution To ensure the specified EMC performance, product installation requires either special considerations or user-installed, add-on devices. See the product installation instructions for further information.

Remove the IC-317x from the package and inspect the system for damage. Notify National Instruments if the system appears damaged in any way. Do not use a damaged system.

Ensure that the AC input into the external power supply is disconnected before plugging in or unplugging any connector. Ground the unit to minimize the possibility of static electricity damage.

Refer to the following figure while configuring the hardware.

Figure 1. IC-317x Front Panel



- | | |
|--|--|
| <ul style="list-style-type: none"> 1. DisplayPort Connectors 2. LED Indicators 3. Power over Ethernet (PoE) LED Indicators 4. Gigabit Ethernet Ports with PoE 5. 44-pin Digital I/O Connector 6. Isolated Power Input Connector 7. Chassis Grounding Screw 8. Reset Button (not pictured) 9. Power Button | <ul style="list-style-type: none"> 10. System Power Connector 11. User-Accessible Battery Compartment (not pictured) 12. RS-232/RS-485 Serial Port 13. USB 3.0 Ports 14. Primary Gigabit Ethernet Port 15. Retention Mounts for USB 3.0 Ports 16. Retention Mounts for USB 2.0 Ports 17. USB 2.0 Ports |
|--|--|

Connecting the System Power Supply

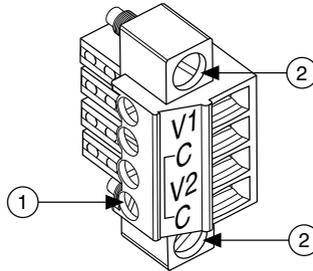
NI recommends the following power supply for the IC-317x.

Power Supply	Part Number
NI PS-15 Industrial Power Supply	781093-01

Complete the following steps to connect a power supply to the controller:

1. Verify the power source is turned off. Verify the power source for SYS PWR IN is between 9 to 30 VDC, 21.6 to 30 VDC when using Power over Ethernet (PoE), and can provide up to 150 W.
2. Loosen the connector screws and remove the system power connector plug from the controller. The following figure shows the terminal screws, which secure the wires in the screw terminals, and the connector screws, which secure the connector plug on the front panel.

Figure 2. Power Screw Terminal Connector Plug



1. Terminal Screw
2. Connector Screws



Caution Do not tighten or loosen the terminal screws on the power connector while the power is on.

3. Connect the positive lead of the primary power source to the V1 terminal of the power connector plug and tighten the terminal screw to 0.20 to 0.25 N · m (1.8 to 2.2 lb · in.) of torque.
4. Connect the negative lead of the power supply to one of the C terminals of the power connector and tighten the terminal screw to 0.20 to 0.25 N · m (1.8 to 2.2 lb · in.) of torque.
5. Optionally, you can connect the positive lead of another power supply to the V2 terminal and the negative lead to the other C terminal.



Caution The C terminals are internally connected to each other.

6. Install the power connector into SYS PWR IN on the front panel of the controller and tighten the connector screw flanges to 0.3 to 0.4 N · m (2.7 to 3.5 lb · in.) of torque.
7. Turn on the external power source(s).



Note Refer to the *IC-317x User Manual* on ni.com/manuals for a complete description of power inputs and controller startup options.

Connecting the Isolated Outputs Power Supply

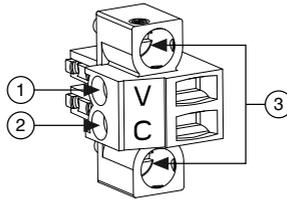
NI recommends the following power supply for the IC-317x.

Power Supply	Part Number
NI PS-15 Industrial Power Supply	781093-01

Complete the following steps to supply power to the isolated outputs.

1. Verify the power source is turned off. Verify the power source for ISO PWR IN is between 4.5 V to 30 V.
2. Loosen the connector screws and remove the isolated outputs power connector plug from the controller. The following figure shows the V (positive) terminal screw and the C (negative) terminal screw, which secure the wires in the screw terminals, and the connector screws, which secure the connector plug on the front panel.

Figure 3. 2-Position Power Screw Terminal Connector



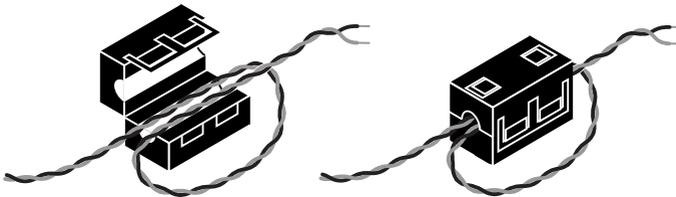
1. V (Positive) Terminal Screw
2. C (Negative) Terminal Screw
3. Connector Screws



Caution Do not tighten or loosen the terminal screws on the power connector while the power is on.

3. Install one ferrite across the negative and positive leads of the power source, approximately 50 to 75 mm (2 to 3 in.) from the end of the power input wires.

Figure 4. Installing a Ferrite on the Power Leads



4. Connect the positive lead of the isolated outputs power source to the V terminal of the power connector.
5. Connect the negative lead of the isolated outputs power source to the C terminal of the power connector plug and tighten the terminal screw to 0.2 to 0.25 N · m (1.8 to 2.2 lb · in.) of torque.
6. Install the power connector plug into ISO PWR IN on the front panel of the controller and tighten the connector screws to 0.4 N · m (3.5 lb · in.) of torque.

7. Turn on the external power source.

Configuring the IC-317x for NI Linux Real-Time

The real-time version of the IC-317x ships preloaded with NI Linux Real-Time. Complete this section if you are using the real-time version of the IC-317x.

Connecting to the Development Computer

The IC-317x can connect to the development computer directly or through a network.

Connecting Directly to the Development Computer

Complete the following steps to connect the device directly to the development computer.

1. Verify the development computer is powered on.
2. Connect one end of an Ethernet cable to the network port on the device.
3. Connect the free end of the cable to an Ethernet port on the development computer.
4. Verify the ACTIVITY/LINK LED on the port is on or blinking.

The device uses a link-local IP address when connected directly to the development computer.

Connecting to the Development Computer Over a Network

To connect over a network, the device must be on the same subnet as the development computer. Complete the following steps to connect the device to the development computer over a network.

1. Verify the development computer is powered on and connected to the network.
2. Connect one end of an Ethernet cable to the network port on the device.
3. Connect the free end of the cable to an Ethernet switch or other network device on the same network as the development computer.
4. Verify the ACTIVITY/LINK LED on the port is on or blinking.

The device negotiates an IP address when connected to a network with a DHCP server or comparable network device.

Using Vision Builder AI with the IC-317x

Complete the following steps to use Vision Builder AI with the IC-317x:

1. Install Vision Builder AI on the development computer.
2. Refer to the *How to Configure NI Vision Builder AI Remote Targets* section in the *Vision Builder for Automated Inspection: Configuration Help*.

When using Vision Builder AI, it is not necessary to install the NI Industrial Controller Device Drivers or use NI MAX to set a system password on the target.

Installing the NI Industrial Controller Device Drivers

Before using the IC-317x, install the drivers onto the device. Complete the following steps to install and configure NI Industrial Controller Device Drivers:

1. Install NI Industrial Controller Device Drivers onto the Windows development machine connected to the IC-317x.
2. Run NI MAX.
3. Expand the **Remote Systems** list in the configuration tree.
4. Select the IC-317x in the list. By default, MAX lists devices by the model number followed by the serial number, such as NI IC-317x-XXXXXXXX.
5. Configure the network settings for the IC-317x. Refer to the *Remote Systems Help* in MAX. Select **Help»Help Topics»Remote Systems** for instructions about configuring network settings.
6. Install a recommended software set. If you would like to install custom software instead of a recommended software set, proceed to the next step.
 - a) Expand the IC-317x under **Remote Systems**.
 - b) Click the **Software** item below the IC-317x in the configuration tree.
 - c) Click **Add/Remove Software** on the MAX toolbar to launch the LabVIEW Real-Time Software Wizard.
 - d) Enter `admin` as the username and leave the password field blank.
 - e) Select **NI Industrial Controller** under the version of LabVIEW Real-Time you are using.
 - f) Click **Next**.
 - g) Select any additional add-ons you would like to install to the IC-317x.
 - h) Click **Next**. Review the list of software to install.
 - i) Click **Next** to begin downloading the software to the IC-317x. When MAX finishes downloading the software, the IC-317x restarts.
 - j) Click **Finish**.
7. Install custom software. You do not need to install custom software if you installed a recommended software set.
 - a) Expand the IC-317x under **Remote Systems**.
 - b) Click the **Software** item below the IC-317x in the configuration tree.
 - c) Click **Add/Remove Software** on the NI MAX toolbar to launch the LabVIEW Real-Time Software Wizard.
 - d) Enter `admin` as the username and leave the password field blank.
 - e) If you are given a choice of recommended software sets, choose **Custom software installation** and click **Next** to proceed with a custom installation.
 - f) Select the NI Industrial Controller Device Drivers, and any additional software you would like to install on the IC-317x.
 - g) Click **Next**. Review the list of software to install.
 - h) Click **Next** to begin downloading the software to the IC-317x. When NI MAX finishes downloading the software, the IC-317x restarts.
 - i) Click **Finish**.
8. Connect hardware to the IC-317x. The NI Industrial Controller Device Drivers enable the IC-317x to detect any hardware connected.
9. Select the target in the configuration tree and click the **Refresh** button. Refresh the target whenever you connect new hardware.

10. Expand **Devices and Interfaces** under the IC-317x in the configuration tree. Select the hardware connected to the IC-317x from the list. You can view or modify the device settings as allowed by the hardware.

Setting a System Password

Complete the following steps to set a system password.



Note The default username for the IC-317x is `admin`. There is no default password for the IC-317x, so you must leave the password field blank when logging in until you set a system password.

1. In MAX, right-click the IC-317x and select **Web Configuration**.

The NI Web-Based Configuration and Monitoring utility opens in the default browser and is where you set the password. If you have not installed Microsoft Silverlight, NI Web-based Configuration and Monitoring prompts you to do so.

2. Enter a unique name for your system in the **Hostname** field.
3. Click the **Security Configuration** icon.
4. Click **Login**.
5. In the **Login** dialog box, enter the username `admin` and leave the password field blank.
6. Click **OK**.
7. Click **Change Password**.
8. Enter and re-enter a new password.
9. Click **OK**.
10. Click **Save**.
11. Click **OK** to confirm you are changing the password.



Caution NI cannot recover lost system passwords. If you forget the password, you must contact NI and reformat the controller.

Configuring the IC-317x for Windows

The Windows version of the IC-317x ships preloaded with Windows Embedded Standard 7. Complete this section if you are using the Windows version of the IC-317x.

Connecting the IC-317x to a Network

Complete the following steps to connect the device to a network.

1. Connect one end of an Ethernet cable to the network port on the device.
2. Connect the free end of the cable to an Ethernet switch or other network device.
3. Verify the **ACTIVITY/LINK** LED on the port is on or blinking.

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

Installing the NI Industrial Controller Device Drivers

Before using the IC-317x, install other National Instruments software, such as application development environments, and then install the drivers onto the device.

If you have an external USB DVD drive, you can use the external DVD drive to install the NI Industrial Controller Device Drivers from the DVD shipped with the device. Otherwise, complete the following steps to download and install the NI Industrial Controller Device Drivers

1. Connect a USB keyboard and a USB mouse to the USB ports on the IC-317x.
2. Connect a monitor to the DisplayPort on the IC-317x.
3. Using the web browser on the IC-317x, navigate to ni.com/drivers.
4. In the Drivers search field, search for NI Industrial Controller Device Drivers.
5. Download the latest version of NI Industrial Controller Device Drivers.
6. Run the NI Industrial Controller Device Drivers installer.

Troubleshooting

The following sections provide instructions for troubleshooting the IC-317x.

(RT Only) The IC-317x Does Not Appear in MAX

- The IC-317x may not be powered. Verify that there is system power to the device and that both the IC-317x and the development computer are properly connected to the network. The POWER LED should be lit green and the ACTIVITY/LINK LED on the primary network port should flash green when refreshing the list of devices in MAX.
- Ensure you are connecting to the IC-317x from a Windows development machine with NI Industrial Controller Device Drivers installed.
- The IC-317x may have been configured on another network and then moved to the current network. Reconfigure the IC-317x for the current network.



Note Connect a monitor and keyboard to the IC-317x and press <Enter> to view the current configuration settings of the device.

- Another device on the network is using the IP address assigned to the IC-317x. This can happen when you assign the same static IP to two devices, you assign a static IP that is in the range of the IP address available for DHCP use on your network, or the DHCP assigns the same IP address to another device. Either remove or reconfigure the other device, or reconfigure the IC-317x to use a different IP address by putting it into the IP RESET state and restarting into the normal state. Refer to the *IC-317x User Manual* on ni.com/manuals for instructions on how to perform an IP RESET.
- The cable you are using may be inappropriate for the speed of your network, causing network communication dropout. While 1,000 Mbps communication over short cable lengths can be achieved with the CAT5 cable commonly used for 10 and 100 Mbps, CAT5e and CAT6 cables are more reliable and recommended for 1,000 Mbps links. The IC-317x has the ability to perform auto-crossover, allowing the use of straight or crossover Ethernet cables, independent of the connection configuration.

- The IC-317x is configured to acquire an IP address from a DHCP server, but no DHCP server is available. By default, the target will automatically attempt 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).
- You may be experiencing firewall issues. If you are having difficulty detecting the system and setting up the IC-317x on your network, you must configure the firewall to open the TCP/UDP ports used by the IC-317x and the host machine. Refer to the following table for more information about TCP/UDP ports.

Table 1. TCP/UDP Ports Used by the IC-317x

Port	Type	Details
3580	TCP/UDP	Reserved as nati-srvloc (NATI-ServiceLocator). Used by MAX to locate remote targets.
7749	TCP	Used for remote image display (not reserved).
7750	TCP	Used for NI-IMAQdx remote configuration (not reserved).
3363	TCP/UDP	Reserved as nati-vi-server (NATI VI Server). Used by Vision Builder AI to configure a remote target.

If your firewall is controlled remotely or you are unsure about configuring the firewall, contact your network administrator.

(RT Only) No Software is Installed

MAX reports that no software is installed. Install application and driver software on the IC-317x.

Related Information

[Installing the NI Industrial Controller Device Drivers](#) on page 7

Cannot Drive Isolated Outputs

Verify that you have power connected to the V_{ISO} and C_{ISO} inputs on the IC-317x isolated power connector and that the contact at the screw terminals is solid. Because these outputs are electrically isolated from the IC-317x device main supply, they require power in addition to the IC-317x main supply.

LED Error Indications

The IC-317x indicates specific error conditions by flashing the STATUS LED a specific number of times.

Table 2. STATUS LED Indications

LED	LED Color	LED State	Indication
STATUS	Yellow	OFF	The IC-317x 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-317x 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-317x. Reinstall software on the IC-317x.
		3 blinks	(RT only) The IC-317x 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-317x has experienced two consecutive software exceptions. The IC-317x automatically restarts after an exception. After the second exception, the IC-317x remains in the exception state, alerting you to resolve the problem. Reinstall software on the IC-317x or contact NI for assistance. Refer to the <i>IC-317x Getting Started Guide</i> for information about installing software on the IC-317x.
		Continuous blinking	(RT only) The IC-317x 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-317x is booting up. (Windows only) An internal drive is being accessed.

Related Information

[Installing the NI Industrial Controller Device Drivers](#) on page 7

POWER LED Is Not Lit When the IC-317x is Powered On

If the system power supply is properly connected (polarity is not reversed) to the IC-317x, but the POWER LED does not light up, check that the power supply is within the specifications listed in the *IC-317x Specifications*. Using a power supply that is not within these

specifications might result in an unresponsive or unstable system and could damage the device.

If the BIOS setting Restore After Power Loss is set to **Stay Off**, the IC-317x may be powered, but turned off. Use the power button to turn on the device.

Where to Go Next

The following documents and resources contain information you may find helpful as you use the IC-317x in an application. Refer to the National Instruments Product Manuals Library at ni.com/manuals for the most recent versions of product documentation.

- *IC-317x Specifications*—Contains detailed specifications for the IC-317x.
- *IC-317x User Manual*—Contains connector pinouts, configuration information, mounting information, and answers to common troubleshooting questions.
- *NI CVS I/O Accessory User Manual*—Contains installation and operation instructions for the NI CVS I/O Accessory.

Worldwide Support and Services

The NI website 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.

Visit ni.com/services for NI Factory Installation Services, repairs, extended warranty, and other services.

Visit ni.com/register to register your NI product. Product registration facilitates technical support and ensures that you receive important information updates from NI.

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