Zebra Concord PoE™

Installation and Hardware Reference

ZEBRA

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Chapter

1

Introduction

This chapter outlines the key features of Zebra Concord PoE.

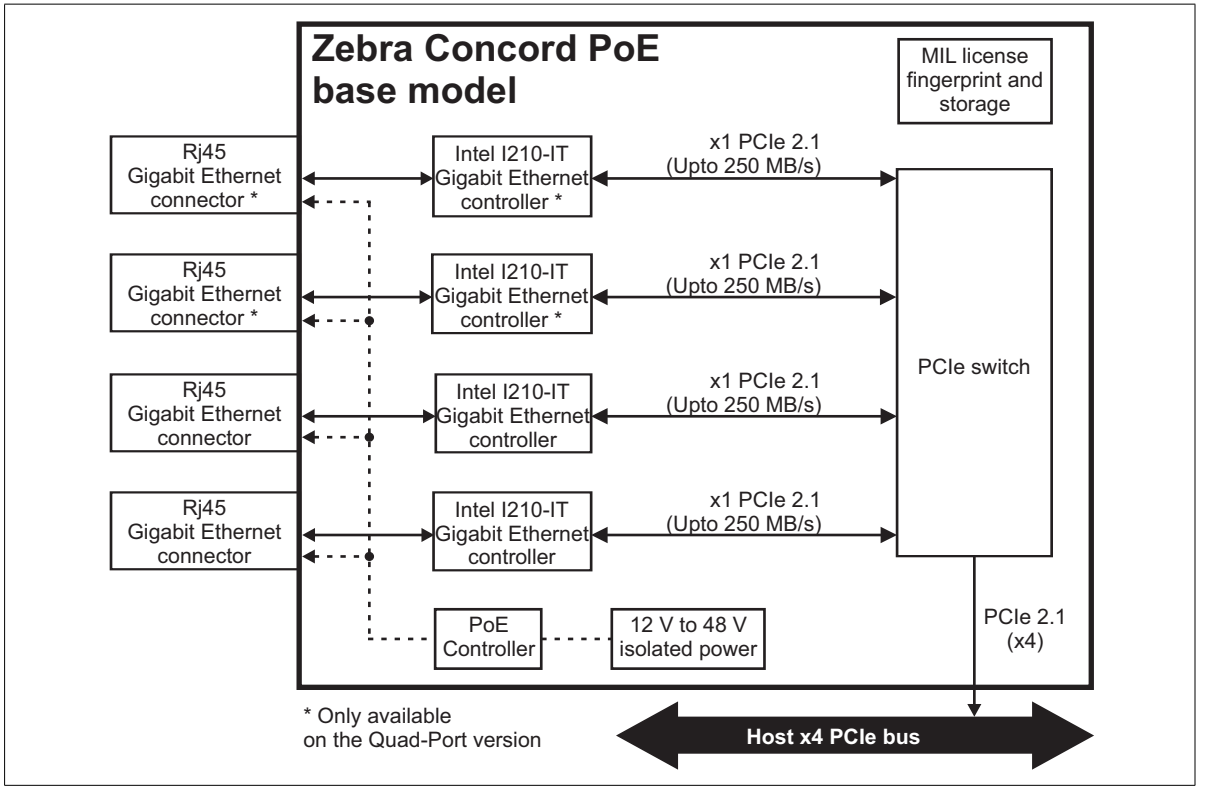
Zebra Concord PoE overview

The Zebra Concord PoE family consists of two models: the Zebra Concord PoE (Power over Ethernet) base model, and Zebra Concord PoE with ToE (Trigger over Ethernet).

Acquisition with Zebra Concord PoE base model

Zebra Concord PoE base model is a half-length, full height Gigabit Ethernet adapter for interfacing one or more GigE Vision cameras supporting PoE. Zebra Concord PoE base model comes with either two (Dual-Port version) or four (Quad-Port version) Gigabit Ethernet network interfaces (ports).

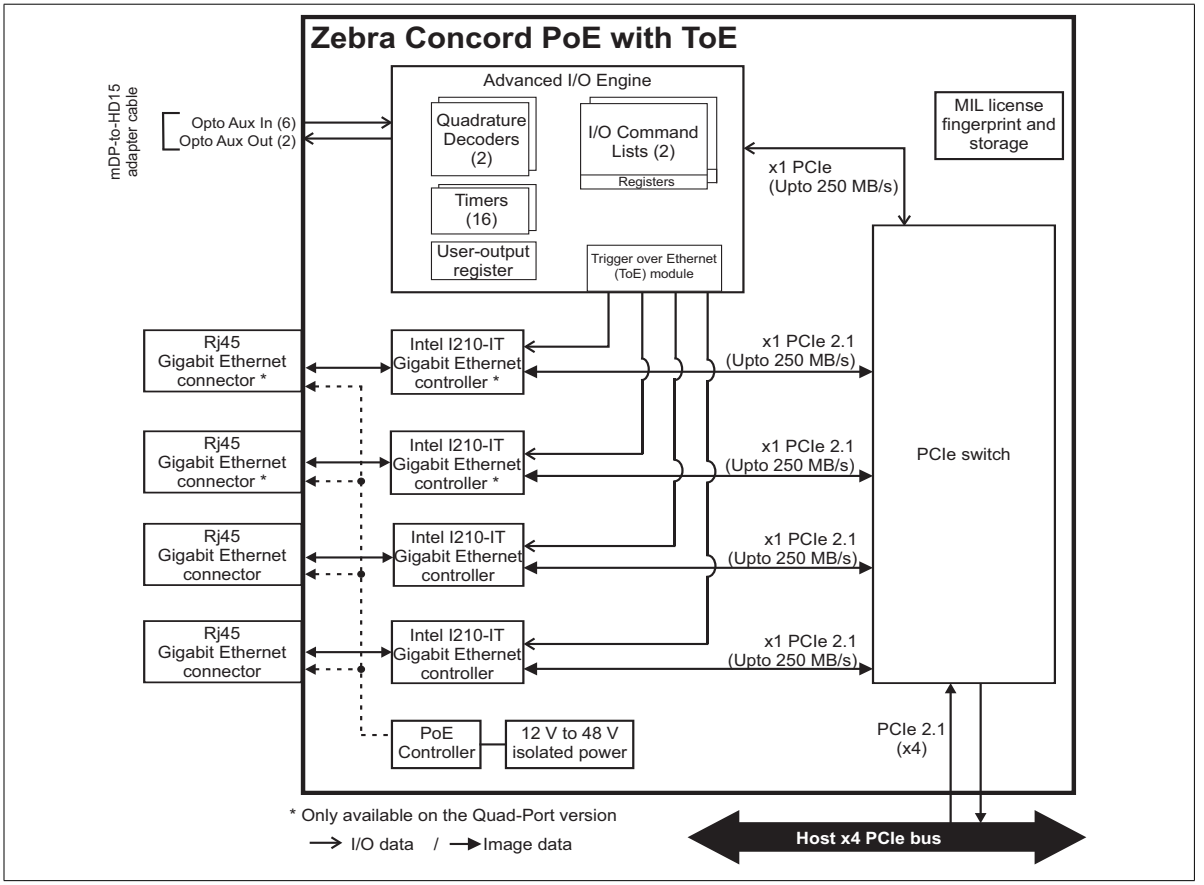
The following diagram illustrates the data flow of Zebra Concord PoE base model.



Acquisition with Zebra Concord PoE with ToE

Similar to the base model, Zebra Concord PoE with ToE is a half-length, full height Gigabit Ethernet adapter for interfacing one or more GigE Vision cameras supporting PoE. In addition, it includes an Advanced I/O Engine. The Advanced I/O Engine provides use of 8 auxiliary I/O signals (6 inputs and 2 outputs), supports sending a Trigger-over-Ethernet packet (action command or software trigger) upon reception of an internal or external event (without Host intervention), and includes 16 timers, 2 I/O command lists, and 2 quadrature decoders. Zebra Concord PoE with ToE also comes in two versions: Zebra Concord PoE with ToE Dual-Port and Zebra Concord PoE with ToE Quad-Port.

The following diagram illustrates the data flow of Zebra Concord PoE with ToE.



Communication over Ethernet

Each port supports 10/100/1000 BaseT connections and is designed for direct connection to a GigE Vision-compliant camera. For image acquisition from supported network cameras, the board is also pre-licensed for use with the MIL GigE Vision driver. Using the MIL GigE Vision driver, Zebra Concord PoE can capture video from multiple[1] cameras compliant with the GigE Vision specification.

Power over Ethernet

Each port has built-in power-over-Ethernet (PoE), which provides up to 15.4 W (12.95 W + cable loss) per port. The power source is electrically isolated from the rest of your computer.

Data transfer

Zebra Concord PoE is a x4 PCIe 2.1 board, so it can transfer data over most PCIe slots that are x4 or larger. Under optimum conditions, Zebra Concord PoE can exchange data with the Host at a peak transfer rate of up to 500 Mbytes/sec if the board is installed in a PCIe 2.1 slot.

Documentation conventions

This manual refers to the Zebra Concord PoE family as the Zebra Concord PoE. When necessary, this manual will distinguish between the models as: Zebra Concord PoE base model and Zebra Concord PoE with ToE. Also note that, when the term Host is used in this manual, it refers to the host computer.

Software

To operate Zebra Concord PoE, you can use one or more Zebra software products that support the board. These are MIL and its derivatives (for example, MIL-Lite and Matrox Capture Works). MIL is supported under Windows and Linux when using Zebra Concord PoE. Consult your software manual for supported versions of these operating systems.

MIL

MIL is a high-level programming library with an extensive set of optimized functions for image capture, processing, analysis, transfer, compression, display, and archiving. Image processing operations include point-to-point, statistical, spatial filtering, morphological, geometric transformation, and FFT operations.

1. Refer to MIL documentation for the number of cameras from which Zebra Concord PoE can simultaneously capture video.

Analysis operations support camera calibration, are performed with sub-pixel accuracy, and include pattern recognition (normalized grayscale correlation and Geometric Model Finder), blob analysis, edge extraction and analysis, measurement, image registration, metrology, character recognition (template-based, and for both normal and dot-matrix text, feature-based using String Reader and SureDotOCR respectively), code recognition and grading (1D, 2D, and composite code types), bead inspection (continuous strip of material), 3D reconstruction, 3D processing, 3D analysis, classification, and color analysis.

MIL applications are easily ported to new Zebra hardware platforms and can be designed to take advantage of multi-processing and multi-threading environments.

MIL-Lite

MIL-Lite is a subset of MIL. It includes all the MIL functions for image acquisition, transfer, display control, and archiving. It also allows you to perform processing operations that are typically useful to preprocess grabbed images.

Matrox Capture Works

Matrox Capture Works is a utility that allows you to rapidly evaluate the performance and functionality of virtually any GenICam-compliant camera, 3D sensor, or other device using MIL[1]. Matrox Capture Works will list all detected GenICam-compliant devices connected to each allocated board. It can start or stop capturing images, display acquired images, save the last grabbed image, send a software trigger, as well as browse and control the selected device's features. You can view and change acquisition properties, and view acquisition statistics. Matrox Capture Works is distributed with MIL and MIL-Lite.

1. Unlike when using other Zebra boards, image acquisition with Zebra Concord PoE is made possible because the operating system recognizes the GigE Ethernet network interfaces as other network ports. So when you allocate a MIL GigE Vision system (using MIL or one of its derivatives), you can grab from GigE Vision-compatible devices connected to the Gigabit Ethernet network interface. For all other functionality on the board, you must allocate a MIL Concord PoE system. Matrox Capture Works can allocate and interface with a MIL GigE Vision system, and not with a MIL Concord PoE system. Refer to MIL documentation for more information.

Essentials to get started

To use Zebra Concord PoE, you must have a computer with the following:

- An available x4 PCIe slot[1].
- Processor with a x86 architecture or equivalent.
- A computer with a relatively up-to-date PCI chipset. This generally offers better performance in terms of data transfer rates.
- MIL or one of its derivatives. This should be installed after you install your board.

Consult your software package for other computer requirements like the operating system and memory requirements.

1. The internal auxiliary 12 V power connector shall be connected to your power supply if the total power consumption exceeds the amount of power that the selected slot can provide, or if your devices will draw more than 2.2 A total (26 W) from PoE.

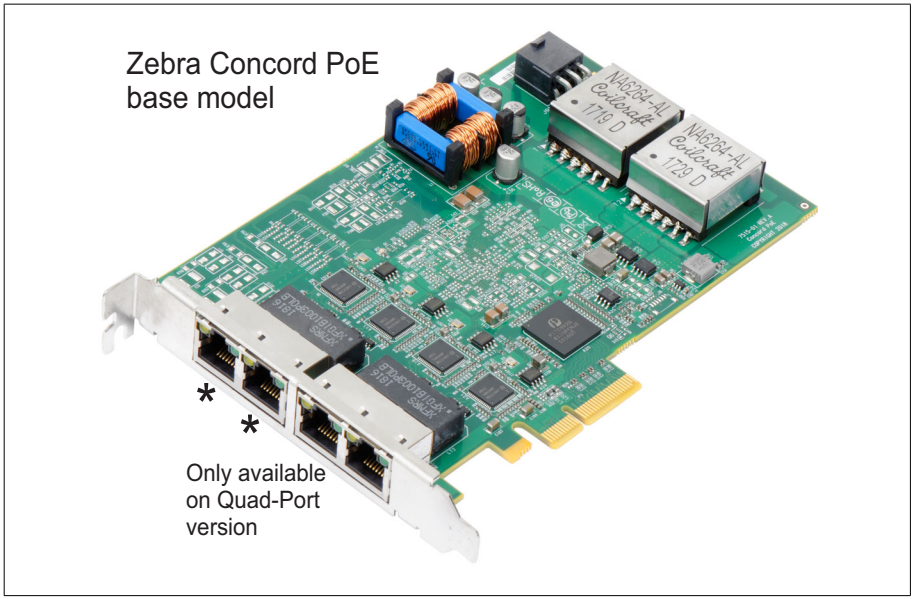
Inspecting the Zebra Concord PoE package

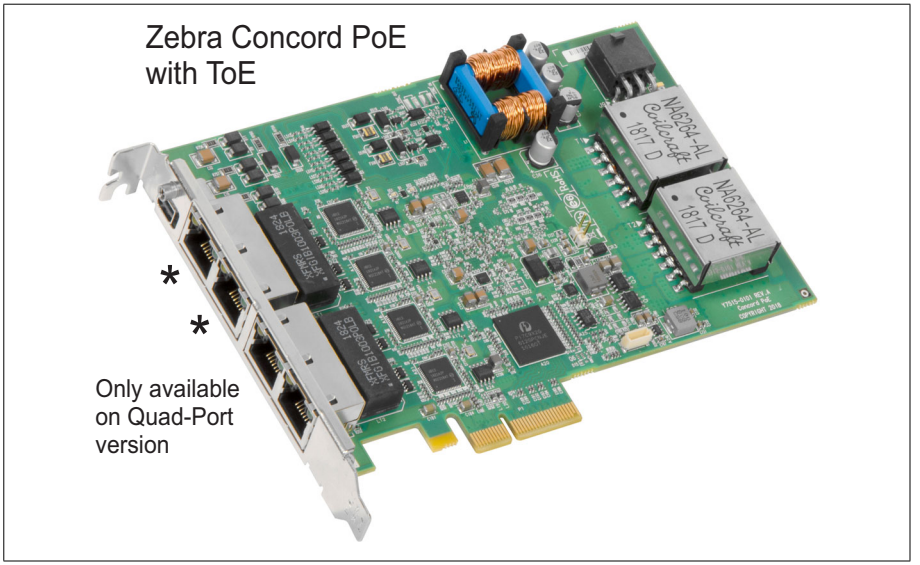
When you unpack your Zebra Concord PoE package, you should check its contents. Note that optional parts might or might not be included, depending on what you ordered. If something is missing or damaged, contact your Zebra representative.

Standard package

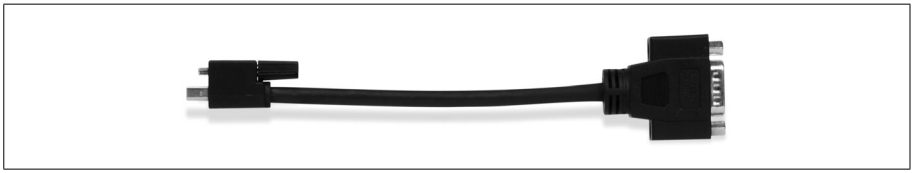
With the standard Zebra Concord PoE package, you will receive the following item:

- The Zebra Concord PoE board that your ordered.





- One Y16289-00 mDP-to-HD15 adapter cable[1]. The cable has an mDP connector at one end, and a HD-15 connector at the other end. It allows for interfacing with the mDP connector to access the auxiliary I/O signals.



1. The mDP-to-HD15 adapter cable is only included for Zebra Concord PoE with ToE.

General warnings and key to symbols on the board

You shall be aware of the meaning of the symbols on the board and important usage and handling precautions.

Zebra Concord PoE safety precautions and key to symbols

Before installing, connecting to, and using Zebra Concord PoE, you shall be aware of the meaning of the symbols on the board and important safety precautions. The following is a list of precautionary symbols on the board and their meaning:

Symbol[1]	Precaution
	• Caution: Consult this manual[2] before installing, connecting to, and using Zebra Concord PoE. For hardware installation instructions, refer to *Chapter 2: Hardware installation*; for environmental and electrical specifications and connector pinout descriptions, refer to *Appendix B: Technical information*. This product shall be used as specified; otherwise, the protection provided by its components might be compromised. • Refer to the Electrical specifications section, in Appendix B: Technical information, for voltages and current ratings. • There are no serviceable parts on this product. In case of defect, contact your Zebra representative. • This product is intended to be used in a properly ventilated computer enclosure that has its cover installed. The cover ensures that internal components are not accessible. • Do not touch the product's components when it is under operation and/or when it is connected to external peripherals. • This product meets the requirements of a Category I installation as per industry standards[3]. • This product is designed for use in a pollution degree 2 environment as per industry standards[3]. • This product is designed for indoor use only. • This product is designed to operate at temperatures ranging from 0°C to 55°C in the vicinity of the board inside the computer, at a non-condensing relative humidity up to 95% non-condensing.[4] • This product is not intended for use at altitudes exceeding 2000 m.
	DC current only. Zebra Concord PoE Dual-Port draws up to 1.0 A from the 3.3 VDC power rail and up to 3.6 A from the 12 VDC power rail. Zebra Concord PoE Quad-Port draws up to 1.0 A from the 3.3 VDC power rail and up to 6.3 A from the 12 VDC power rail. You shall ensure that the Host computer can supply these and still meet the power requirements of the other devices of the computer.

1. Not necessarily in the same color.
2. Manual available on the Zebra website at www.zebra.com/us/en/products/industrial-machine-vision-fixed-scanners.html.
3. As per CAN/CSA-C22.2 No 61010-1-12, UL std. No 61010-1 (3rd edition), and EN Std. No. 61010-1 (3rd Edition).
4. It is the responsibility of the integrator of the product to provide adequate cooling, and if necessary add infrared shielding inside the computer.

Handling components

The electronic circuits in your computer and the circuits on the Zebra Concord PoE board are sensitive to static electricity and surges. Improper handling can seriously damage the circuits. Be sure to follow these precautions:

- Drain static electricity from your body by touching a metal fixture (or ground) before you touch any electronic component.
- Avoid letting your clothing come in contact with the circuit boards or components.

Caution

Before you add or remove devices from your computer, always turn off the power to your computer and all peripherals. In addition, unplug your computer because even if it is turned off, auxiliary power is still present on the PCIe slot connector.

Installation

The installation procedure consists of the following steps:

1. Complete the hardware installation as described in *Chapter 2: Hardware installation*.
2. Complete the software installation procedure described in the documentation accompanying your software package.

More information

Need help?

If you experience problems during installation or while using this product, you can refer to the support page on the Zebra website: supportcommunity.zebra.com/s/contactsupport?brand=matrox. The support page provides information on how to contact technical support.

To request support, you should first complete and submit the online Technical Support Request Form, accessible from the above-mentioned web page. Once you have submitted the information, a Zebra support agent will contact you shortly thereafter by email or phone, depending on the problem.

Chapter

2

Hardware installation

This chapter explains how to install the Zebra Concord PoE hardware.

Installing Zebra Concord PoE

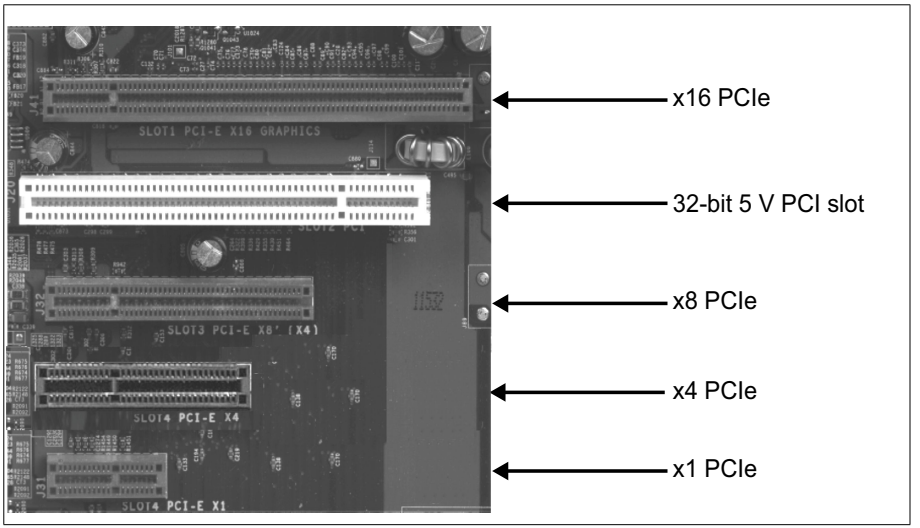
Before you install your Zebra Concord PoE board, some precautionary measures must be taken. Turn off the power to your computer and its peripherals, and drain static electricity from your body (by touching a metal part of the computer chassis).

❖ Note that it is recommended that you install your board before you install your software.

Use the following steps to install your Zebra Concord PoE board:

1. Remove the cover from your computer using the instructions from your computer manual.

2. Check that you have an empty slot that can accommodate your Zebra Concord PoE board. Zebra Concord PoE needs a x4 PCIe slot or bigger. Illustrated below are some of the more common PCIe and PCI slots.



If necessary, remove a board from your computer to make room for your Zebra Concord PoE board.

3. If present, remove the blank metal plate located at the back of the selected slot. Keep the removed screw; you will need it to fasten the Zebra Concord PoE board.

4. Carefully position the Zebra Concord PoE board in the selected empty PCIe slot.

5. Once perfectly aligned with the slot's connector, press the board firmly but carefully into the connector.

Important

6. Anchor the board by replacing the screw that you removed.

7. If your peripherals (for example, cameras) will draw more than 2.2 A total (26 W) over the combined connectors, or if the selected slot cannot provide the required current, you shall attach the internal auxiliary 12 V power connector of the board to the power supply, as described in the *Using the internal auxiliary 12 V power connector* section

8. Attach your peripherals as described in the *Connecting peripheral devices over an Ethernet connection* section.

Caution

- In an industrial environment, ensure that your computer and the peripherals are powered off before adding or removing peripherals.

9. Turn on your computer. If you have not yet installed the software for the board, note that when you boot your computer under Windows, Windows' Plug-and-Play system will detect that the device driver for a *PCI Data Acquisition and Signal Processing Controller* is not installed. This is expected and you should click on **Close**.

Important

10. Select to install the GigE Vision driver during the installation of MIL if you want to acquire from GigE Vision cameras.

    For all other functionality on the board, you must select to install the Zebra Concord PoE driver. This is also necessary for MIL license support. To acquire images and use the full functionality of the board, you must install both drivers.

    Finally, you must also install the Intel i210 network controller driver (if it is not already installed) and configure it appropriately; you can download it from the Intel website. In addition, adapter teaming (for link aggregation) requires the Intel Advanced Network Services (ANS) driver; this driver can also be downloaded from the Intel website. Refer to the MIL documentation for required driver configuration information. If you want to use Zebra Concord PoE without MIL, you will need to install only this driver.

11. If you plan on acquiring images from a GigE Vision-compatible camera:

    a. Disable active state power management (ASPM) for PCIe devices, to maximize the performance of Zebra Concord PoE. In the BIOS, disable all ASPM (or equivalent) settings (typically accessible from the **Power management** sub-menu of the **Advanced Configurations** menu). In addition, if the operating system has an **ASPM for PCIe devices** option, disable this option as well. For example, under Microsoft Windows 7, open the **Power Options** dialog box from the Windows Control Panel. For the currently selected power plan, click on **Change Plan Settings** and then click on **Change Advanced Power Settings**. In the presented dialog, expand **PCI Express**, and then expand **Link State Power Management** and set it to **Off**.

    b. Set the power plan option to high performance to maximize the performance of Zebra Concord PoE. For example, under Microsoft Windows 7, open the **Power Options** dialog box from the Windows Control Panel and set the power plan option to **High Performance**.

Using the internal auxiliary 12 V power connector

The Zebra Concord PoE board can receive power, through its internal auxiliary 12 V power connector, directly from the power supply of your computer. This is essential if the total power consumption of the board and PoE devices exceeds the amount of power that the selected slot can provide, or if the power consumption from PoE exceeds 26 W. When the internal auxiliary 12 V power connector is plugged into the power supply, Zebra Concord PoE Dual-Port can still support a total consumption of up to 26 W for all PoE devices combined, and Zebra Concord PoE Quad-Port can support a total consumption of up to 52 W for all PoE devices combined. This information applies equally to both models of Zebra Concord PoE (base model and with ToE).

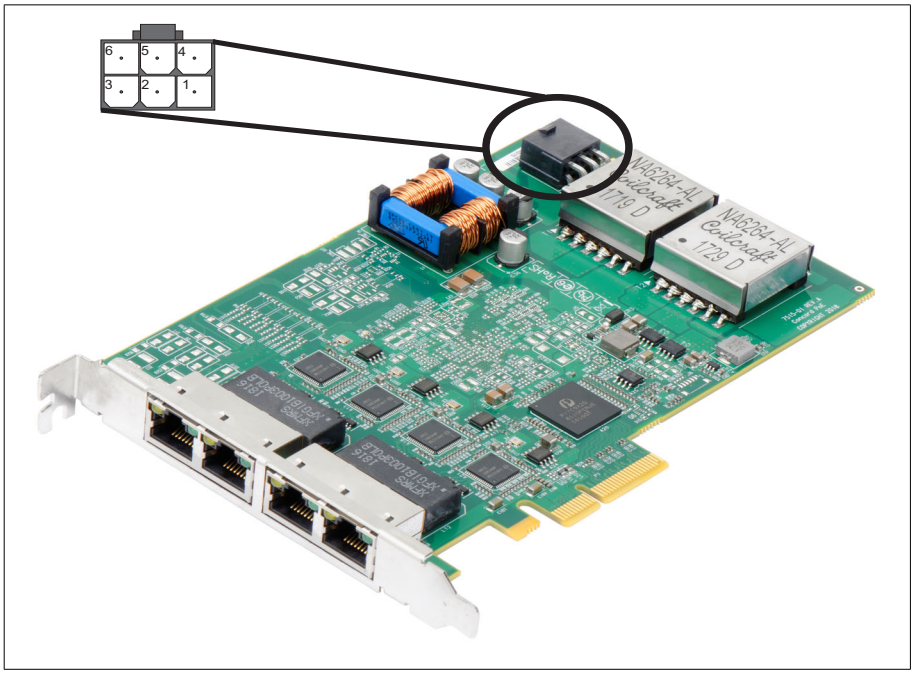
Important

You shall review your computer's power specifications to know whether the selected slot will be able to supply enough power to your Zebra Concord PoE. Refer to the *Electrical specifications* section, in *Appendix B: Technical information* of this manual for details on the power requirements of Zebra Concord PoE.

To properly connect the power supply to the internal auxiliary 12 V power connector of Zebra Concord PoE, do the following:

1. If the cable attached to the power supply of your computer has PCIe 6-pin, compatible, mating 12 V connectors, find one available connector to which you can connect the Zebra Concord PoE board.

2. Attach the PCIe 6-pin connector of your power supply cable to Zebra Concord PoE's internal auxiliary 12 V power connector. The PCIe 6-pin connectors on the cable and on Zebra Concord PoE are polarized so that they cannot be connected incorrectly; they lock into position using a latch.



Caution When attaching the PCIe 6-pin connector to the board's internal auxiliary 12 V power connector, do so carefully and slowly to avoid lifting the connector and loosening its attachment to the board.

Connecting peripheral devices over an Ethernet connection

Zebra Concord PoE comes with either two or four Ethernet connectors used to receive video input from GigE Vision-compliant cameras and transmit/receive communication signals between the camera and the Host computer. The connectors can also be used to receive data from and transmit data to other types of Ethernet devices.

Connecting to Zebra Concord PoE board

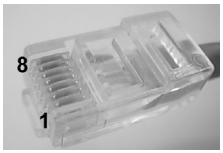
Zebra Concord PoE can gain access to your LAN via Gigabit Ethernet (1000 BaseT), Fast Ethernet (100 BaseT), or Twisted Pair Ethernet (10 BaseT) through the Gigabit Ethernet connectors.

Required cabling for Ethernet connections

To make the connection, use an appropriate network cable. The required type of network cable depends on the type of connection:

Connection	Minimum category for network cable
Gigabit Ethernet	Category 5e (CAT5e)/ Category 6 (CAT6) cable
Fast Ethernet (100 Mbits/sec)	Twisted Pair Category 5 (UTP5) cable
10 Mbits/sec	UTP5/UTP3 cable

An RJ45 connector (shown below) must be attached to one end of the cable.



Note that for optimal performance in the case of a GigE Vision-compatible camera, connect the camera directly to Zebra Concord PoE, instead of using a router or network switch in between (although supported).

Using a PoE device with your Zebra Concord PoE board

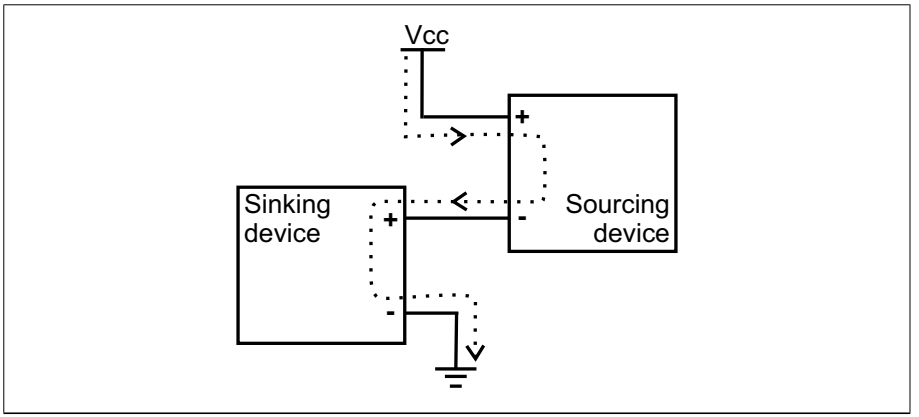
The Gigabit Ethernet network interface has built-in power-over-Ethernet (PoE) support. By default, when a PoE-capable device is detected, Zebra Concord PoE boards provide a connected PoE device with up to +48 V_{dc} and a maximum load of 15.4 W (12.95 W + cable loss). This power source is electrically isolated from the rest of your computer. To provide power, Zebra Concord PoE shall be installed in a PCIe slot that meets the electrical requirements detailed in the *Electrical specifications* section, in *Appendix B: Technical information*; furthermore, if your devices will draw more than 2.2 A total (26 W) from PoE, you shall connect the internal auxiliary 12 V power connector to your computer's power supply.

Connecting to the auxiliary I/O interface

Zebra Concord PoE with ToE comes with one mDP connector used to transmit auxiliary I/O signals from the board to peripheral devices or vice versa. The mDP connector should not be used to connect to a display device and is only intended for use with auxiliary I/O signals. The auxiliary I/O interface has 8 optically isolated auxiliary signals that support sinking and sourcing configurations. 6 are inputs that can receive 24 V, and 2 are outputs that support up to 24 V nominal.

❖ This section only applies to Zebra Concord PoE with ToE.

Note that sinking and sourcing concepts refer to the *conventional current flow*, which means current flows from the positive potential towards the negative potential. A sinking device provides a path to *sink* current towards ground or to the *return path;* a sinking device does not provide power. A sourcing device provides a path that sources current; it provides a path from the power source. In the following diagram, the device on the right is the sourcing device, and the device on the left is the sinking device.



Equivalent circuit only

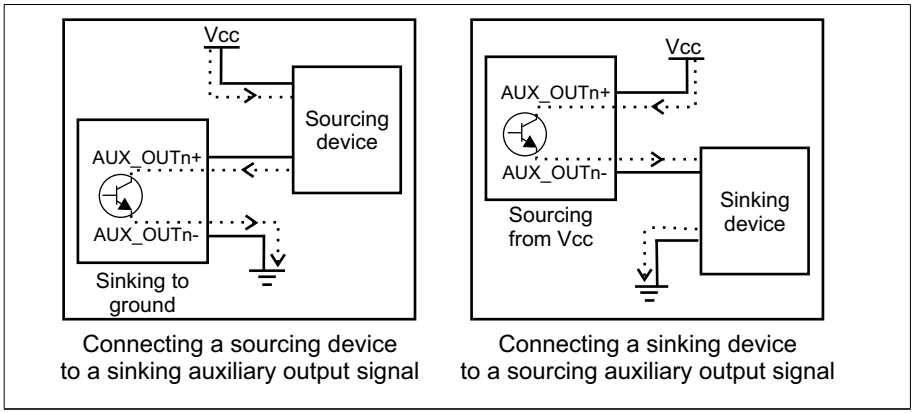
When setting up auxiliary I/O, be aware that you need to configure these pins on the software side as well. Refer to the MIL help file for this information.

The signal names in this section are shortened to fit in the diagrams. AUX_OPTOIND_IN_COMMON_n-n has been shortened to AUX_IN_COMn-n, AUX_OPTOIND_INn has been shortened to AUX_INn, and AUX_OPTOIND_OUTn has been shortened to AUX_OUTn.

Connecting devices to the auxiliary output signals

Zebra Concord PoE with ToE auxiliary output signals can be interfaced with input modules (with sourcing or sinking input signals) found on most programmable logic controllers (PLCs) and other devices. The auxiliary output signals can also be interfaced with inductive load devices (such as a relay or a small motor).

The Zebra Concord PoE with ToE auxiliary output signals are based on an NPN-type transistor. They need to be connected to an external power source or a sourcing device because on their own, they are not capable of providing voltage to drive a device. When an auxiliary output signal is **on**, the circuit between its AUX_OUTn+ and AUX_OUTn- pins is closed, allowing current to flow from the AUX_OUTn+ pin to the AUX_OUTn- pin, if the AUX_OUTn+ pin is attached to a power source or a sourcing device. When an auxiliary output signal is **off**, the circuit between the AUX_OUTn+ and AUX_OUTn- pins of the signal is opened and no current flows through. The exact connection between the output signal, the connected device, and the power source depends on the type of device to which you connect.



Equivalent circuit only

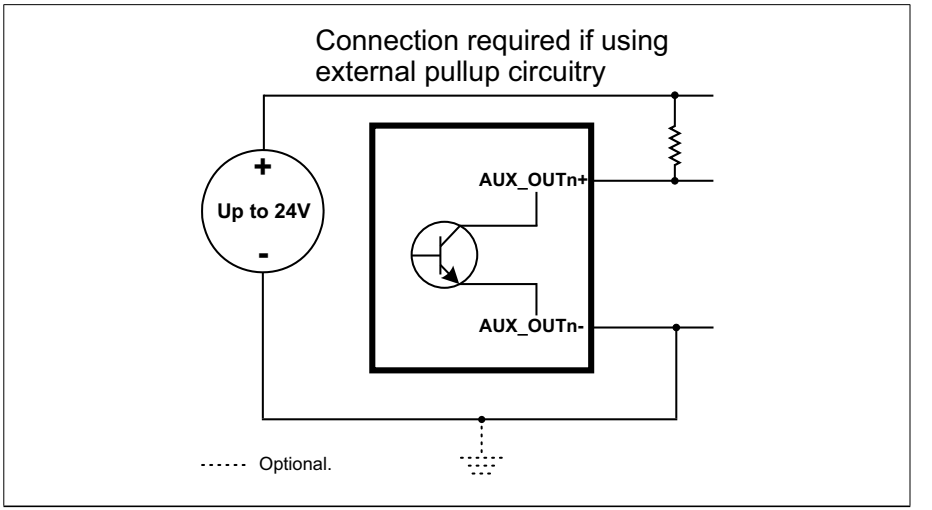
Important Note that the power source must be provided externally.

Depending on whether the auxiliary output signal is attached to a sinking device or sourcing device, the following can be observed:

Connection	Observed at	Observed voltage	
		Signal on (closed so current can flow from AUX_OUTn+ to AUX_OUTn- pin)	Signal off (open so current cannot flow from AUX_OUTn+ pin to AUX_OUTn- pin)
Sourcing device attached to AUX_OUTn+ pin and return path attached to AUX_OUTn- pin	AUX_OUTn+ pin	Low	Floating (voltage level is imposed by the sourcing device)
	AUX_OUTn- pin	Low	Low
Power supply attached to AUX_OUTn+ pin and sinking device attached to AUX_OUTn- pin	AUX_OUTn+ pin	High	High
	AUX_OUTn- pin	High	Floating (voltage level is imposed by the sinking device)

Connecting to a digital device that requires two predictable voltage levels to operate

The auxiliary output signals can, therefore, only present one predictable voltage level for a given configuration: a low voltage level in a sinking configuration or a high voltage level in a sourcing configuration. Their other output state is, by default, floating. So, if you need to connect to a digital device that requires two predicable voltage levels to operate, pullup or pulldown circuitry must be added.



Equivalent circuit only

To add pullup or pulldown circuitry, attach an external pullup or pulldown resistor, respectively. A resistance value between 2 and 5 kOhms is suggested to protect your Zebra Concord PoE with ToE board. Since your Zebra Concord PoE with ToE auxiliary output signals can sink up to 100 mA, use the documentation of your input to calculate the required resistance for your external pullup/pulldown resistor (if necessary).

In the connections above, the pullup circuitry causes an inversion if the input of the device is connected to the AUX_OUTn+ pin. When the auxiliary output signal is **on**, the circuit between its AUX_OUTn+ and AUX_OUTn- pins is closed, and current flows from the power source to the AUX_OUTn- pin. So the observed voltage at the AUX_OUTn+ pin will be low. Whereas, when the auxiliary output signal is **off**, the circuit between its AUX_OUTn+ and AUX_OUTn- pins is open, and current flows from the power source to the input of the device. In this state, the current is limited by the pullup's resistor value.

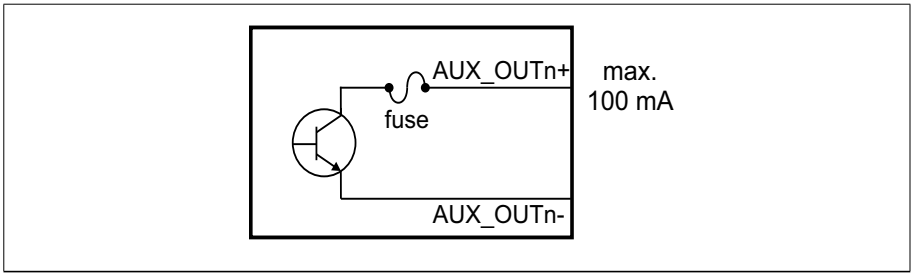
Warning

The Zebra Concord PoE with ToE auxiliary output signals are compatible with voltages up to 24 V. However, by default, the auxiliary output signals offer low resistance. When they are **on** (their circuit is closed), current flows directly through them. Ensure that the circuit created between the power source, the output signal, the connected device, and return path does not cause more than 100 mA to flow through the signal.

Fuse protection

As a precaution, the auxiliary output signals are individually fuse-protected up to 100 mA. Zebra Concord PoE with ToE uses resettable fuses. The fuses protect Zebra Concord PoE with ToE if you accidentally connect their corresponding auxiliary output signal to a device that sources/sinks more current than Zebra Concord PoE with ToE can safely transmit. If more than 100 mA of current goes through your Zebra Concord PoE with ToE, the fuse will eventually trip. After disconnecting your Zebra Concord PoE with ToE, the fuse will reset only after it has sufficiently cooled.

The diagram below depicts Zebra Concord PoE with ToE's on-board fuse.



Equivalent circuit only

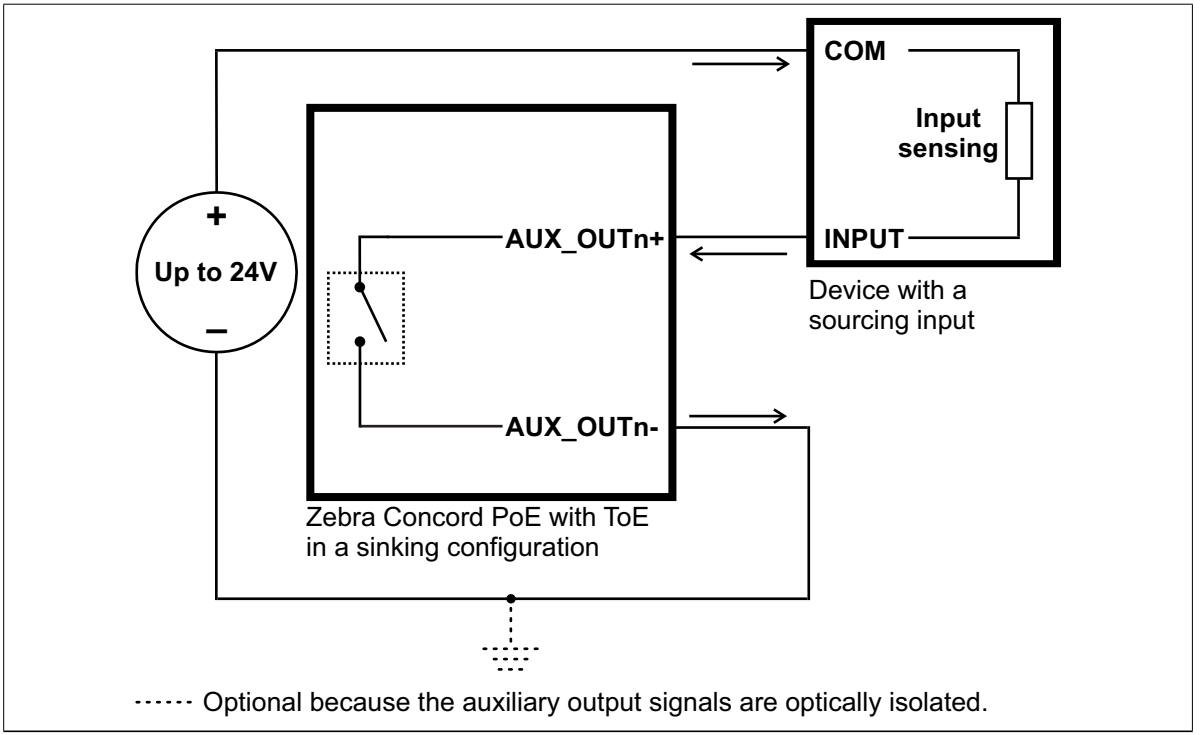
About the connections in the following subsections

The following subsections detail how to connect the most common third-party devices to the Zebra Concord PoE with ToE auxiliary output signals. Ground is only shown in the following subsections for reference, in case you need to reference your return path to ground.

Power, as depicted in the following diagrams, represents a nominal voltage of up to 24 V (+/- 10%). For minimum and maximum voltage requirements, refer to the electrical specification of the auxiliary output signals, in *Appendix B: Technical reference*.

Connecting an auxiliary output signal to a sourcing input

Connect a Zebra Concord PoE with ToE auxiliary output signal to a sourcing input, as shown below.

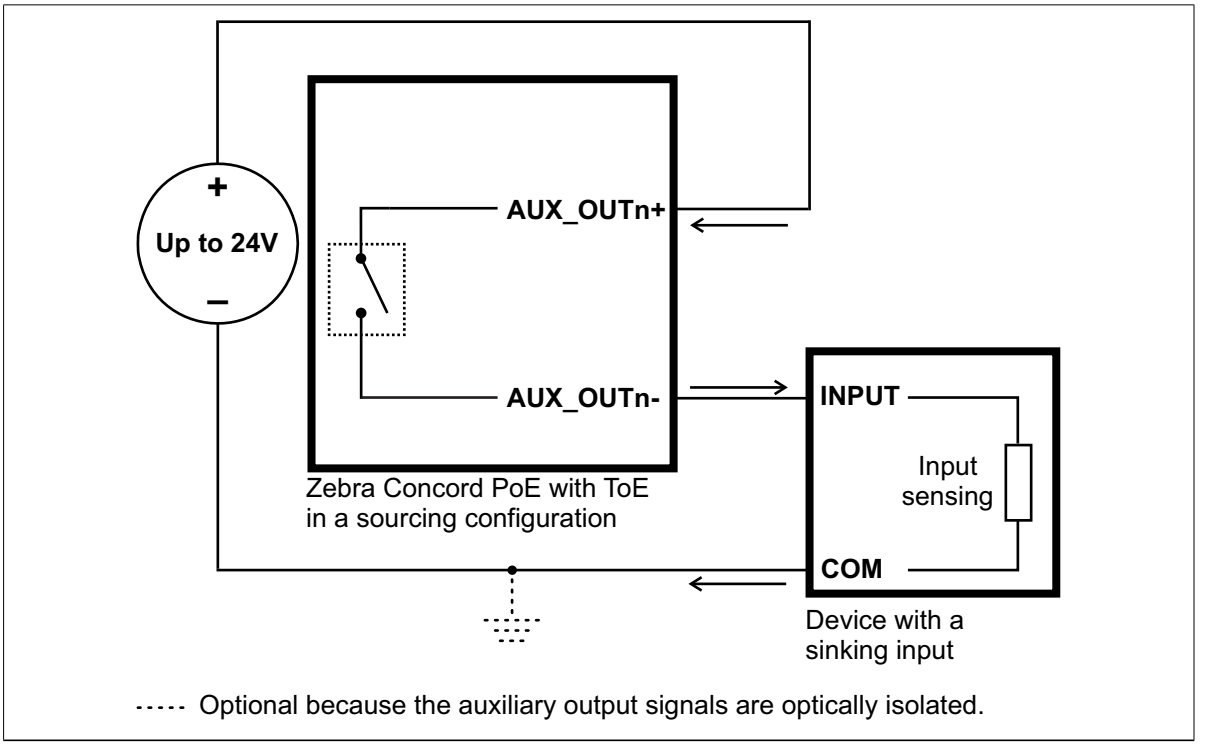


Equivalent circuit only

❖ Note that, when connecting a resistive load sourcing device instead of an input sensing sourcing device, the same connection would be used as displayed above.

Connecting an auxiliary output signal to a sinking input

Connect a Zebra Concord PoE with ToE auxiliary output signal to a sinking input, as shown below. In this case, the pullup circuitry is used to source the current to the sinking input.

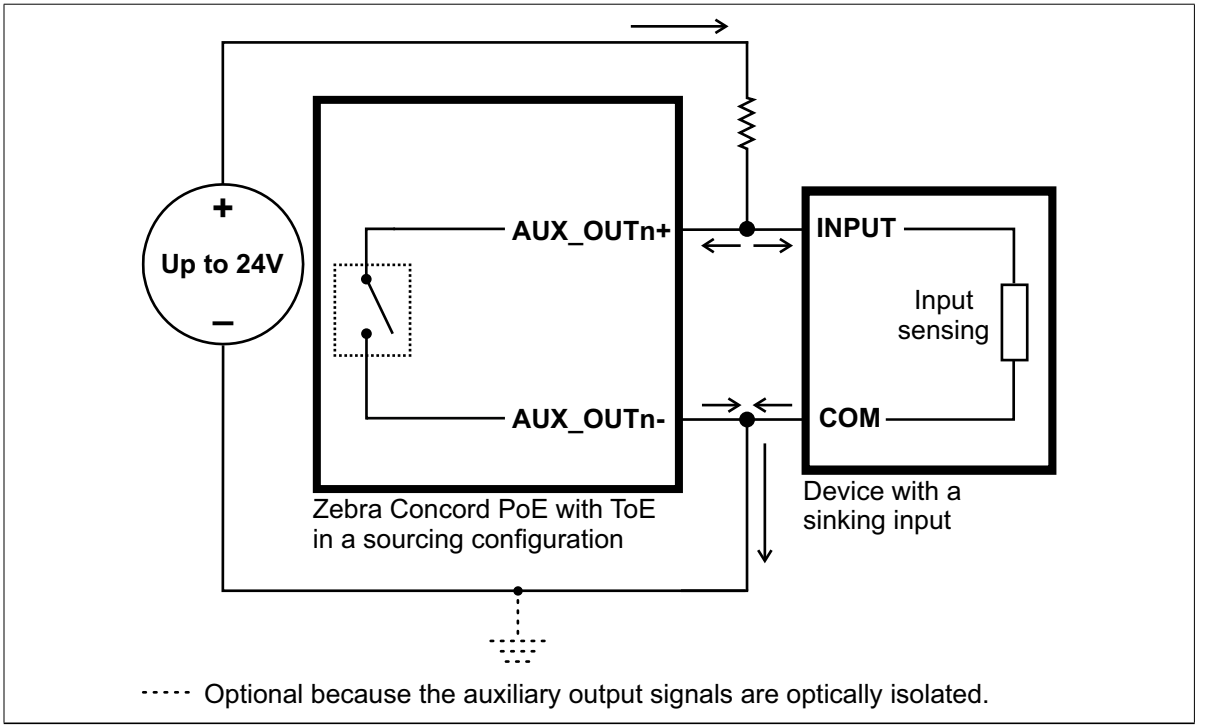


Equivalent circuit only

❖ Note that, when connecting a resistive load sinking device instead of an input sensing sinking device, the same connection would be used as displayed above.

Connecting an auxiliary output signal to a sinking input using an external pullup resistor

You can also connect an auxiliary output signal to a sinking input as follows. Note that, in this configuration, you will need to connect an external pullup resistor. Since your Zebra Concord PoE with ToE auxiliary output signals can sink up to 100 mA, use the documentation of your sinking device to calculate the required resistance for your external pullup resistor (if necessary).

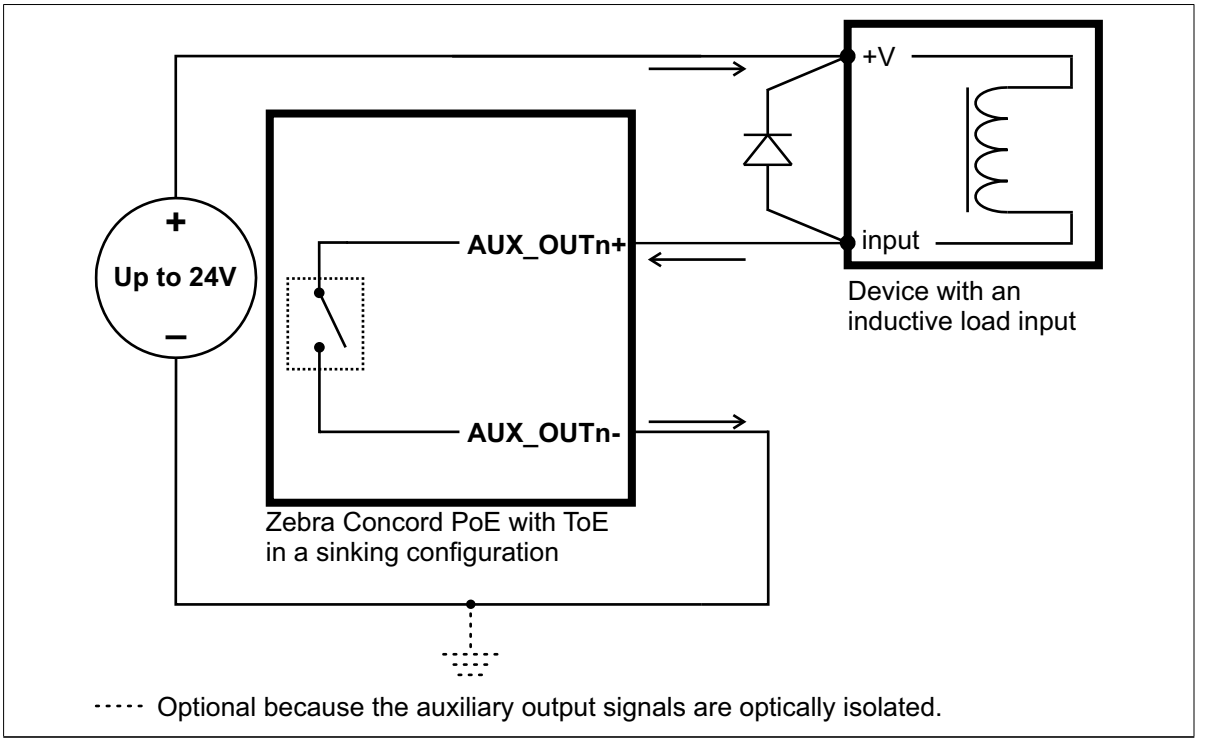


Equivalent circuit only

Connecting an auxiliary output signal to an inductive load input

Connect a Zebra Concord PoE with ToE auxiliary output signal to an inductive load input, as shown below.

An inductive load device, such as a traditional relay, requires that you use a flyback diode to protect Zebra Concord PoE with ToE from over and under-voltage, as shown below. This diode should be connected as close as possible to the input and voltage source of your inductive load device.



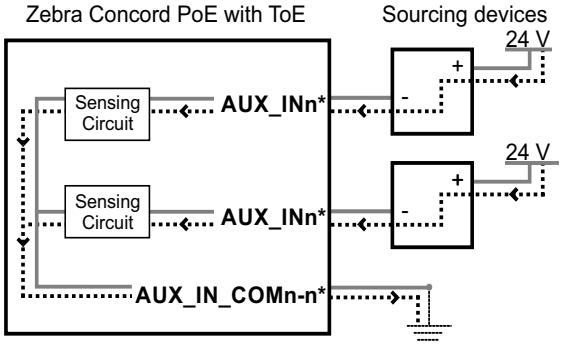
Equivalent circuit only

Connecting devices to the auxiliary input signals

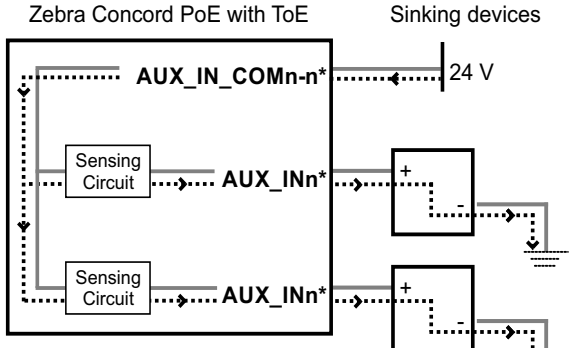
Zebra Concord PoE with ToE auxiliary input signals can be interfaced with a wide variety of devices (such as proximity detectors). The Zebra Concord PoE with ToE auxiliary input signals only detect when current flows between their AUX_INn pin and AUX_IN_COMn-n pin. As such, an auxiliary input signal must be connected to a device that controls the flow of current. When current is detected, the signal is reported as **on**; otherwise, it is reported as **off**. In software, you can enable an interrupt to be generated the moment current is detected. For information on the electrical specifications of the **on** and **off** voltage levels, see the *Electrical specifications* section, in *Appendix B: Technical information*.

The 6 auxiliary input signals are grouped into banks of 2 signals; the signals in each bank share a common pin. Therefore, each auxiliary input signal has one dedicated pin (AUX_OPTOIND_INn) and shares its other pin (AUX_OPTOIND_IN_COM_n-n) with another auxiliary input signal. As such, the inputs grouped together in a bank are not electrically isolated from each other.

You can connect the auxiliary input signals in a sinking or sourcing configuration. Since each bank of the auxiliary input signals shares a common pin, the input signals in a given bank must both be in a sinking configuration or both be in a sourcing configuration. The exact connection between the input signal, the connected device, and the power source depends entirely on the type of device to which you connect. You should essentially connect your device respecting the following:



Connecting 2 sourcing devices to the auxiliary input signals (sinking)



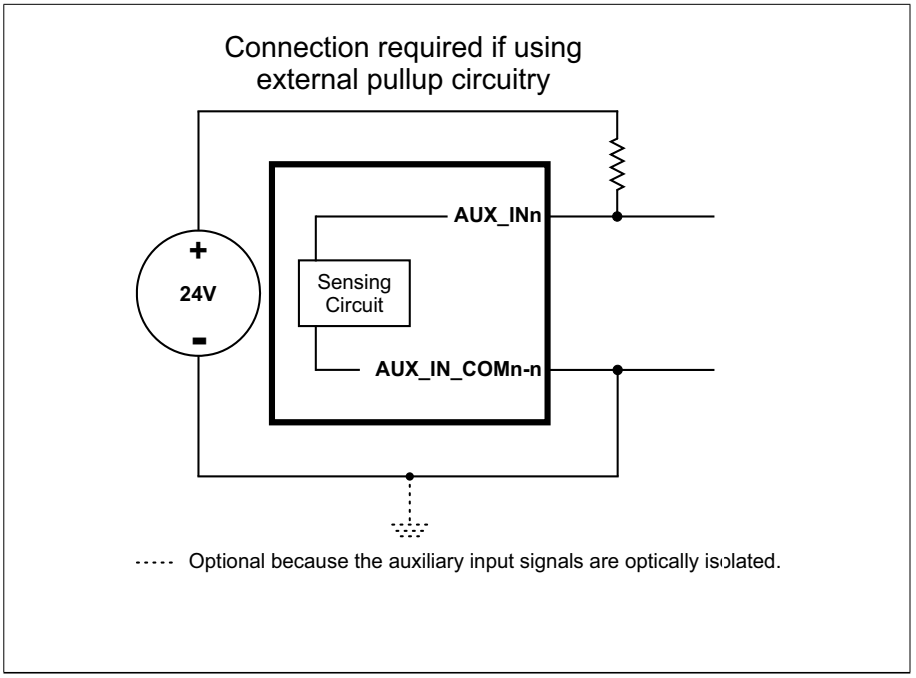
Connecting 2 sinking devices to the auxiliary input signals (sourcing)

* The auxiliary input signals are grouped into three separate banks; in this diagram, we only show one of these banks. Each bank of input signals must use their bank's common pin.

Pullup circuitry

In some cases, you must add pullup circuitry to connect an output device to an auxiliary input signal; specifically, you must attach an external pullup resistor between the voltage source and the AUX_INn pin.

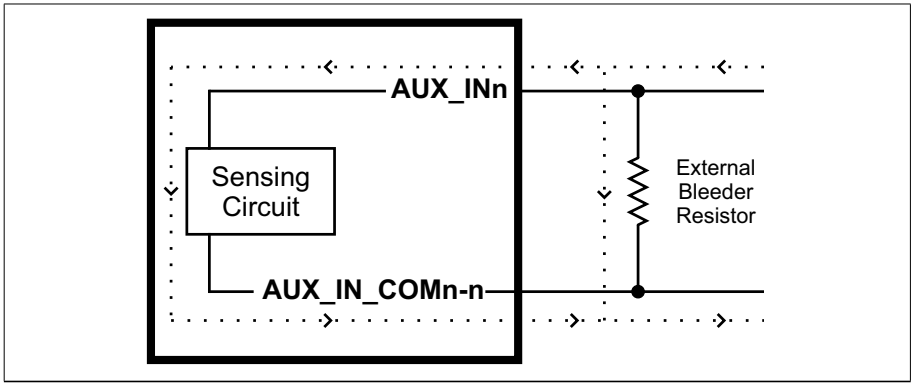
This is required when you connect the AUX_IN_COMn-n pin to the electrical return path and the third-party output device is sinking. In this case, select a resistor value that will not over-current the output device and provides just enough current and voltage to your Zebra Concord PoE with ToE auxiliary input signals, according to the *Electrical specifications* subsection in *Appendix B: Technical reference*. Note that you should use a resistor with an appropriate power rating for your circuit.



Equivalent circuit only

Bleeding resistor

By default, if properly configured, the current should flow from the AUX_INn pin to the AUX_IN_COMn-n pin (when connected to a sourcing device), or from the AUX_IN_COMn-n pin to the AUX_INn pin (when connected to a sinking device). In some cases, the amount of current going through the sensing circuit is insufficient for the connected output device to match its minimum current requirement when the device is in an on or off-state, depending on the configuration of the circuit (for example, 2-wire proximity sensors). To boost the flowing current, connect a 2.2 kOhm external bleeder resistor between the AUX_INn and AUX_IN_COMn-n pins. For example:



Equivalent circuit only

About the connections in the following subsections

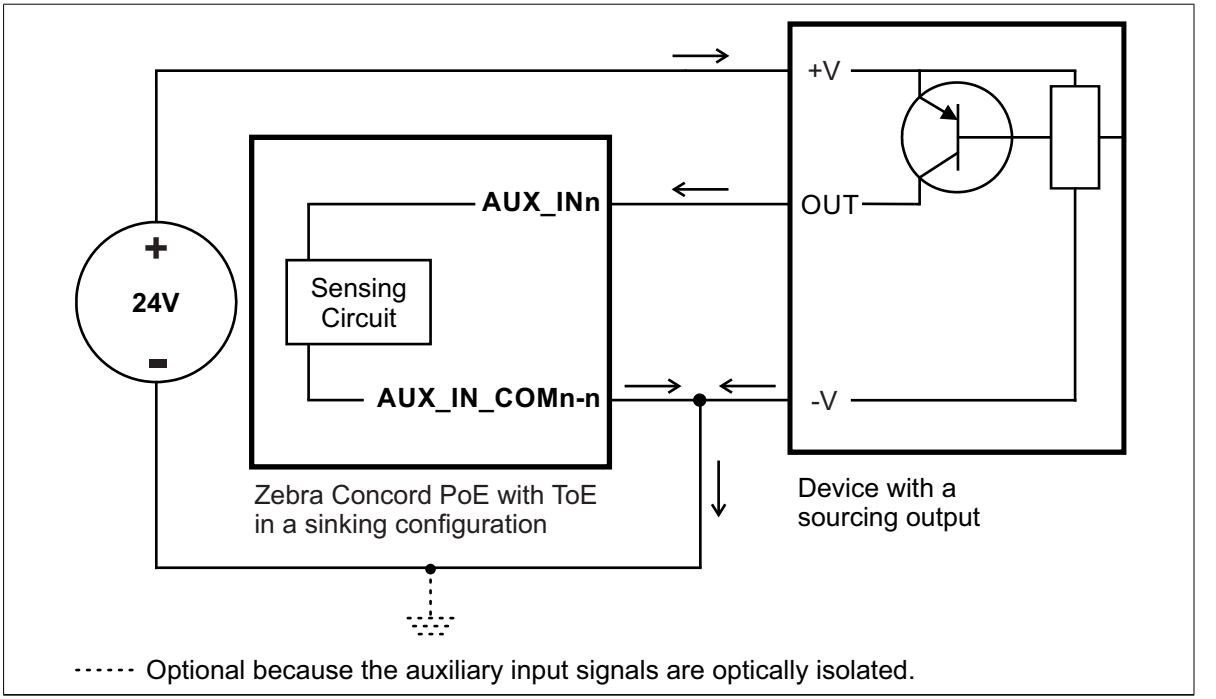
The following subsections detail how to connect the most common third-party devices to the Zebra Concord PoE with ToE auxiliary input signals.

Note that Zebra Concord PoE with ToE auxiliary input signals are optically isolated. Ground is only shown in the following subsections for reference, in case you need to reference your return path to ground.

Power, as depicted in the following diagrams, represents a nominal voltage of 24 V (+/- 10%). For minimum and maximum voltage requirements, refer to the electrical specification of the opto-isolated auxiliary input signals, in the *Electrical specifications* subsection in *Appendix B: Technical reference*.

Connecting a sourcing output device to an auxiliary input signal

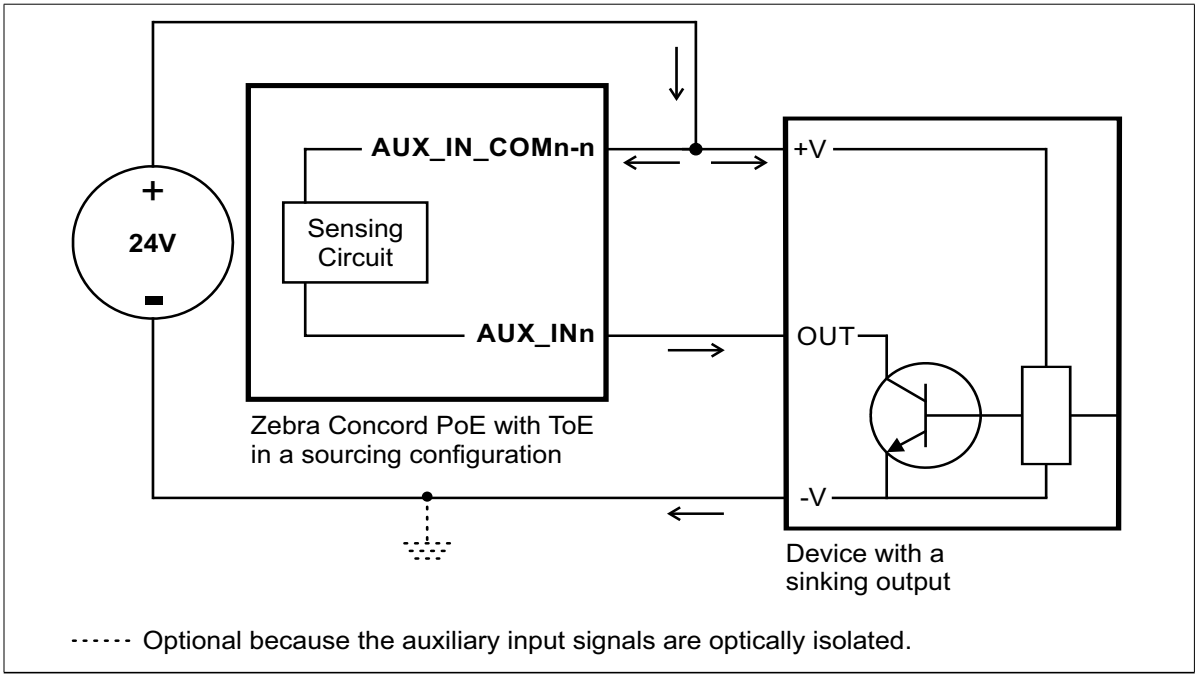
Connect a sourcing output device to Zebra Concord PoE with ToE auxiliary input signal, as shown below.



Equivalent circuit only

Connecting a sinking output device to an auxiliary input signal

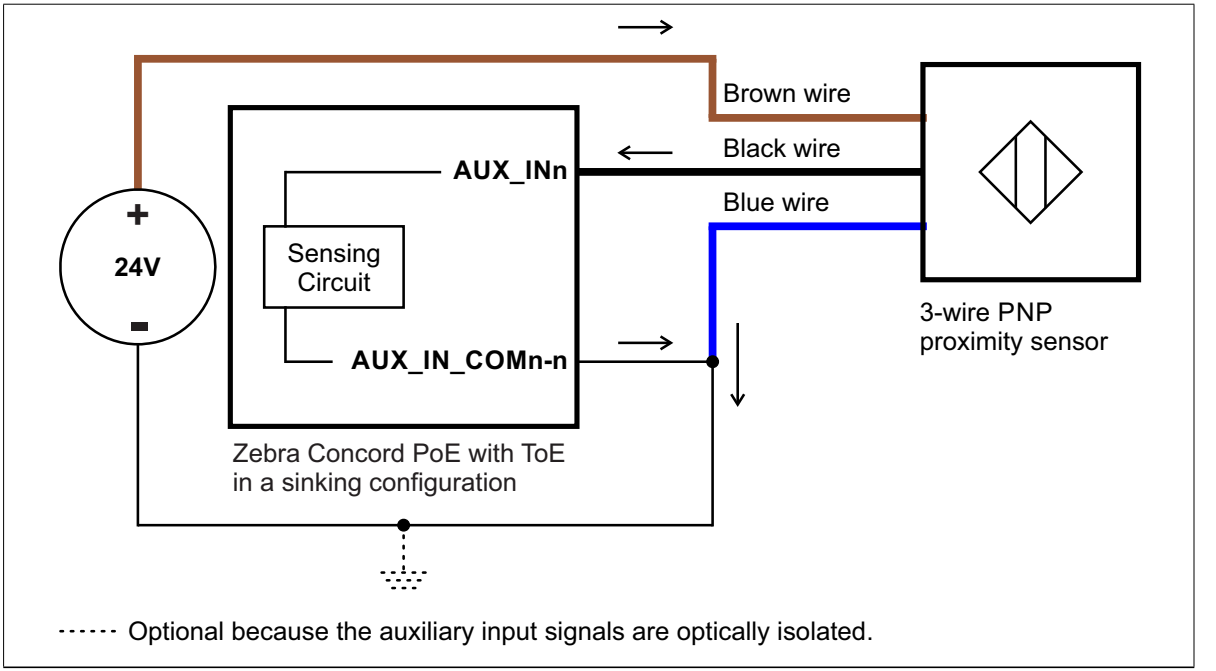
Connect a sinking output device to a Zebra Concord PoE with ToE auxiliary input signal, as shown below.



Equivalent circuit only

Connecting a 3-wire PNP proximity sensor to an auxiliary input signal

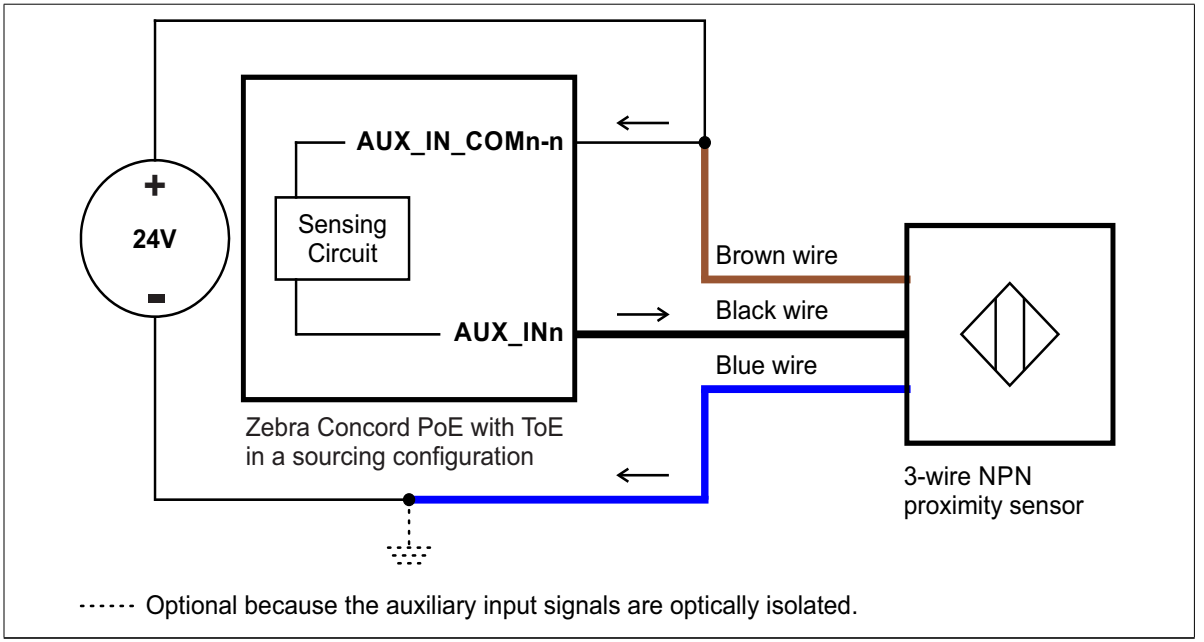
Connect a 3-wire PNP proximity sensor to a Zebra Concord PoE with ToE auxiliary input signal, as shown below.



Equivalent circuit only

Connecting a 3-wire NPN proximity sensor to an auxiliary input signal

Connect a 3-wire NPN proximity sensor to a Zebra Concord PoE with ToE auxiliary input signal, as shown below.



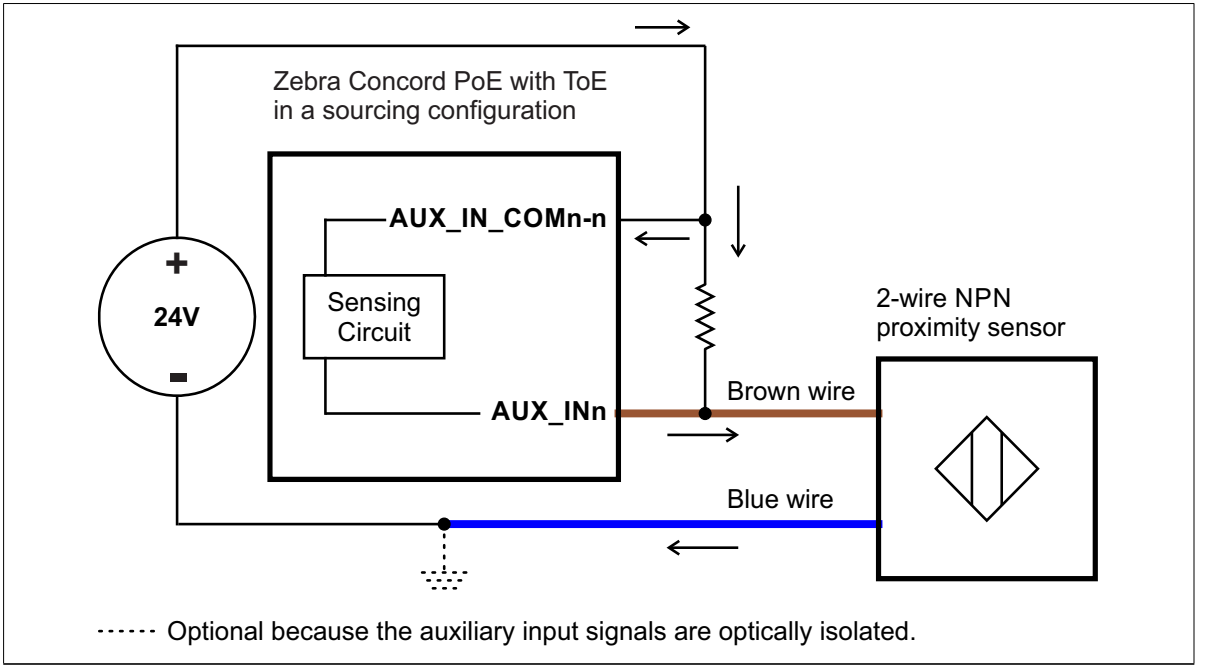
Equivalent circuit only

Connecting a 2-wire proximity sensor to an auxiliary input signal

You can connect a 2-wire proximity sensor to a Zebra Concord PoE with ToE auxiliary input signal in either a sourcing or sinking configuration (that is, on a positive or negative power wire). Note that in both cases, you will need to install an external bleeder resistor, to ensure that a minimum amount of current flows into the proximity sensor in its on-state and in its off-state.

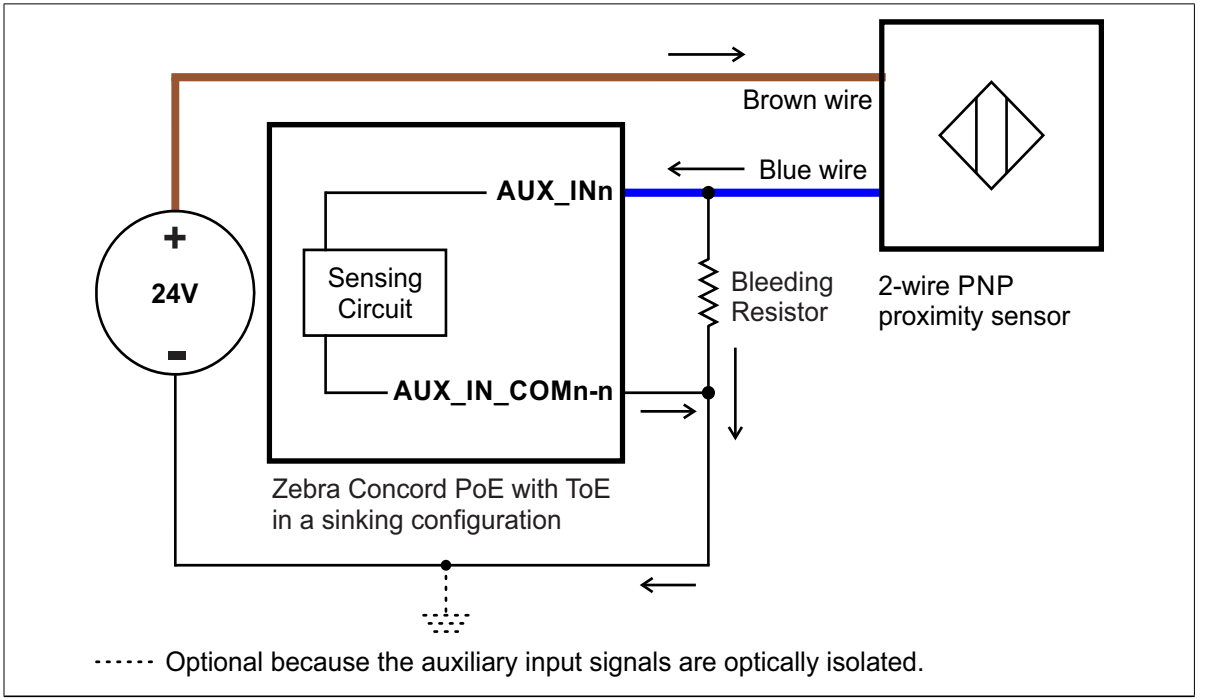
The bleeder resistor's value should guarantee that the minimal required current is provided to the connected sensor (the third-party device). Typically a 2.2 kOhm bleeder resistor should be sufficient. For details regarding the sensor's minimum current requirements, refer to its documentation. Note that you should use a bleeder resistor with an appropriate power rating for your circuit.

- For the auxiliary input signal to source the current (that is, to connect an auxiliary input signal on a positive power wire), connect the 2-wire device to the auxiliary input signal as shown below. You must also install an external bleeder resistor between the AUX_IN_COMn-n pin and brown wire of the proximity sensor.



Equivalent circuit only

- For the auxiliary input signal to sink the current, connect the 2-wire device to an auxiliary input signal as shown below. Install the external bleeder resistor between the blue wire of the proximity sensor and the AUX_IN_COMn-n pin.



Equivalent circuit only

Examples of attaching multiple devices to the auxiliary I/O interface

This section shows examples of how to connect multiple devices to Zebra Concord PoE with ToE. These are not exhaustive examples, but show common devices that can be used with Zebra Concord PoE with ToE. Note that although the examples show how to connect devices that are all sourcing or all are sinking, you can connect a mix (except if on the same input pair).

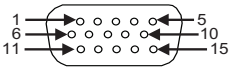
Connecting multiple sourcing peripheral devices

The following example illustrates connecting multiple sourcing peripheral devices to the auxiliary I/O interface of Zebra Concord PoE with ToE. In this setup, each connected auxiliary signal is sinking the current and the pin of the corresponding peripheral device is sourcing the current.

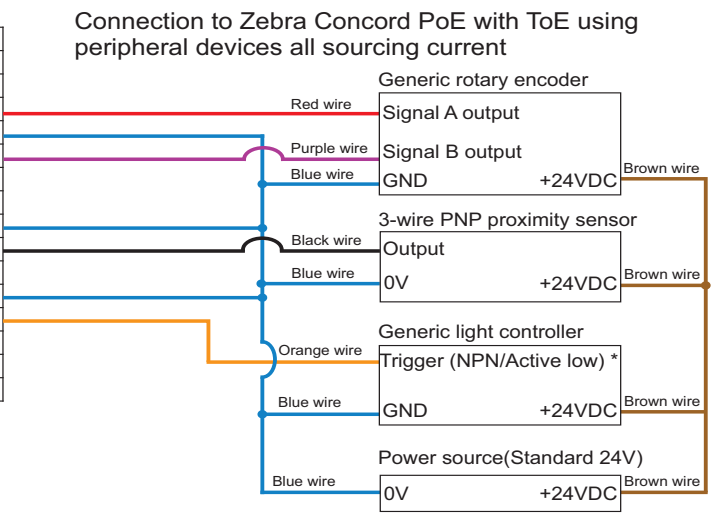
Important

Note that if labeled, the input pin of a device is typically labeled with the type of signal that it expects to receive; whereas the output pin of a device is typically labeled with the type of output it is able to provide. Below, the trigger input pin of the light controller is labeled NPN because it expects the connected auxiliary output signal to be sinking the current. Whereas, the proximity sensor is labeled PNP because its output pin is sourcing the current. Refer to the documentation of your devices to establish if they follow this convention.

Signal Name	Pin#
AUX_OPTOIND_OUT1-	1
AUX_OPTOIND_IN5	2
AUX_OPTOIND_IN3	3
AUX_OPTOIND_IN_COM_2-3	4
AUX_OPTOIND_IN2	5
AUX_OPTOIND_OUT1+	6
NC	7
AUX_OPTOIND_IN_COM_4-5	8
AUX_OPTOIND_IN4	9
NC	10
AUX_OPTOIND_OUT0-	11
AUX_OPTOIND_OUT0+	12
AUX_OPTOIND_IN7	13
AUX_OPTOIND_IN_COM_6-7	14
AUX_OPTOIND_IN6	15



Auxiliary I/O connection



* Note that this trigger signal is labeled NPN because the output signal it expects from Zebra Concord PoE with ToE should be a sinking (NPN) signal.

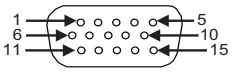
Connecting multiple peripheral sinking devices

The following example illustrates connecting multiple sinking peripheral devices to the auxiliary I/O interface of Zebra Concord PoE with ToE. In this setup, each connected auxiliary signal is sourcing the current and the pin of the corresponding peripheral device is sinking the current.

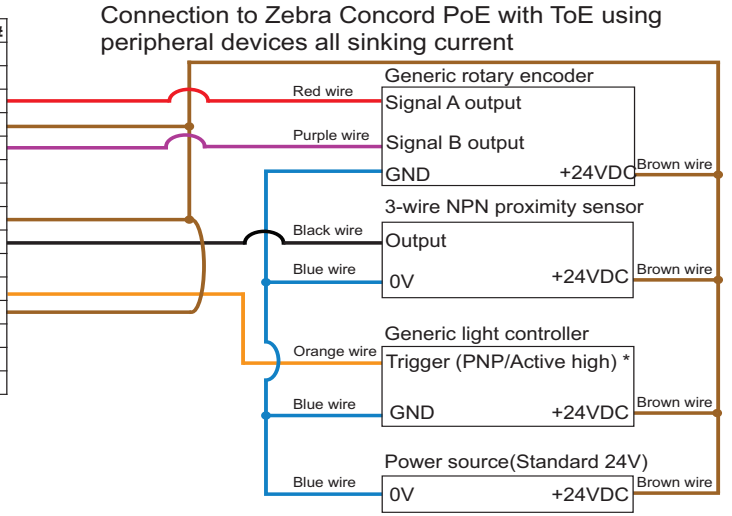
Important

Note that if labeled, the input pin of a device is typically labeled with the type of signal that it expects to receive; whereas the output pin of a device is typically labeled with the type of output it is able to provide. Below, the trigger input pin of the light controller is labeled PNP because it expects the connected auxiliary output signal to be sourcing the current. Whereas, the proximity sensor is labeled NPN because its output pin is sinking the current. Refer to the documentation of your devices to establish if they follow this convention.

Signal Name	Pin#
AUX_OPTOIND_OUT1-	1
AUX_OPTOIND_IN5	2
AUX_OPTOIND_IN3	3
AUX_OPTOIND_IN_COM_2-3	4
AUX_OPTOIND_IN2	5
AUX_OPTOIND_OUT1+	6
NC	7
AUX_OPTOIND_IN_COM_4-5	8
AUX_OPTOIND_IN4	9
NC	10
AUX_OPTOIND_OUT0-	11
AUX_OPTOIND_OUT0+	12
AUX_OPTOIND_IN7	13
AUX_OPTOIND_IN_COM_6-7	14
AUX_OPTOIND_IN6	15



Auxiliary I/O connection



* Note that this trigger signal is labeled PNP because the output signal it expects from Zebra Concord PoE with ToE should be a sourcing (PNP) signal.

Chapter

3

Using multiple Zebra Concord PoE boards

This chapter explains how to use multiple Zebra Concord PoE boards.

Installation of multiple boards

You can install and use multiple Zebra Concord PoE boards in one computer.

Install each additional Zebra Concord PoE board as you installed the first board (refer to *Chapter 2: Hardware installation*). The number of Zebra Concord PoE boards that you can install is primarily dependent on the number of physical slots in your computer, and your BIOS; your BIOS establishes how many PCIe devices can be mapped to the PCIe memory space of your computer.

Using MIL-Lite, you capture images from GigE Vision cameras, connected to different Zebra Concord PoE boards, as you would capture images from cameras connected to a single Zebra Concord PoE board. That is, you allocate a single MIL GigE Vision system (**MsysAlloc** with **M_SYSTEM_GIGE_VISION**) and allocate a digitizer for each camera (network camera) that you want to use to capture images and/or access directly, using **MdigAlloc**().

To access the other functionality on the Zebra Concord PoE boards using MIL-Lite, you must allocate a MIL Concord PoE system for each board (**MsysAlloc**() with **M_SYSTEM_CONCORD_POE**) and then allocate the resources of each MIL system.

Simultaneous image capture from different boards

In addition to capturing images from multiple video sources with a single Zebra Concord PoE board, you can also simultaneously capture images from video sources attached to multiple Zebra Concord PoE boards.

Note that the number of video sources from which you can simultaneously capture images is limited by the Ethernet connection of each board. The use of a Gigabit Ethernet (1000 BaseT) connection will optimize the speed of data transmission from the connected cameras and will minimize data loss. In a Gigabit Ethernet (1000 BaseT) connection, each Zebra Concord PoE board can sustain a maximum bandwidth of 1 Gigabits.

Chapter

4

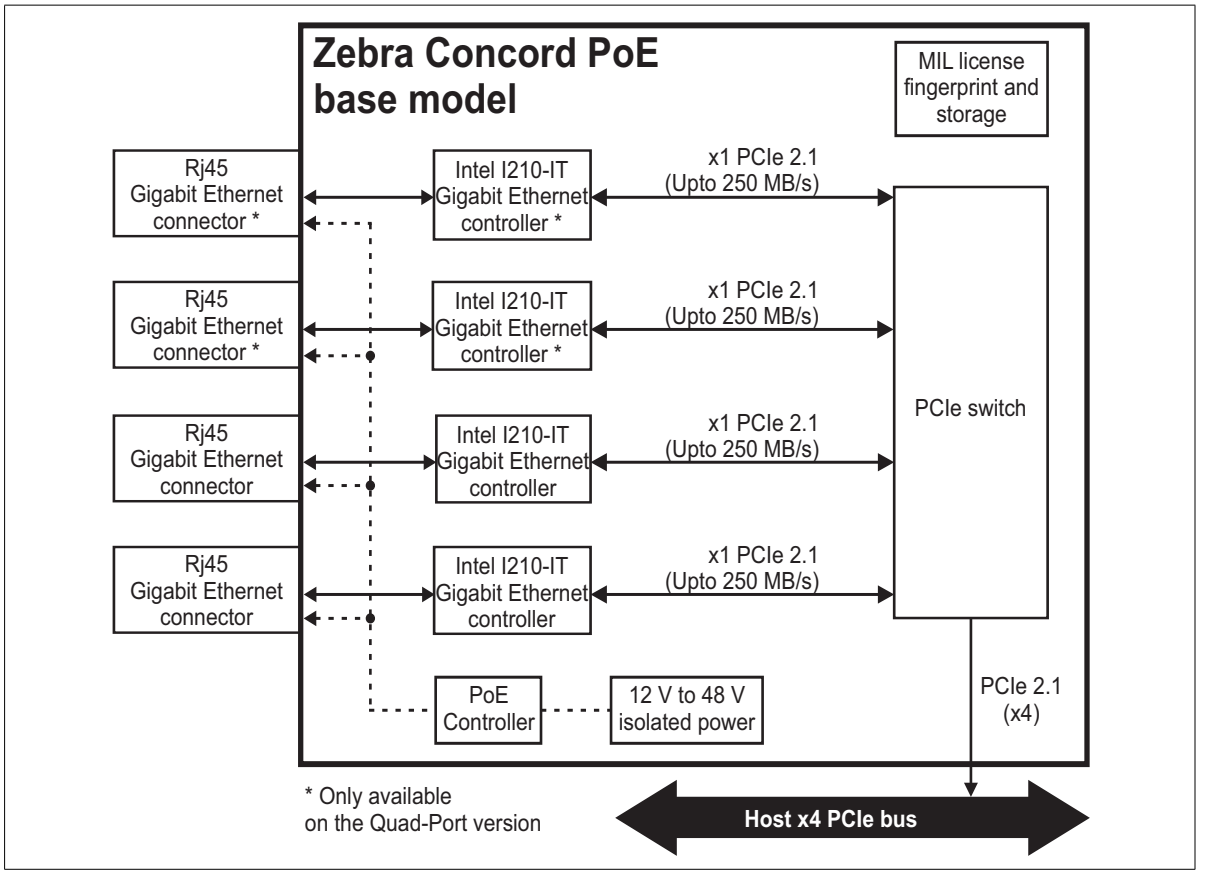
Zebra Concord PoE hardware reference

This chapter describes in more detail the features of the Zebra Concord PoE board.

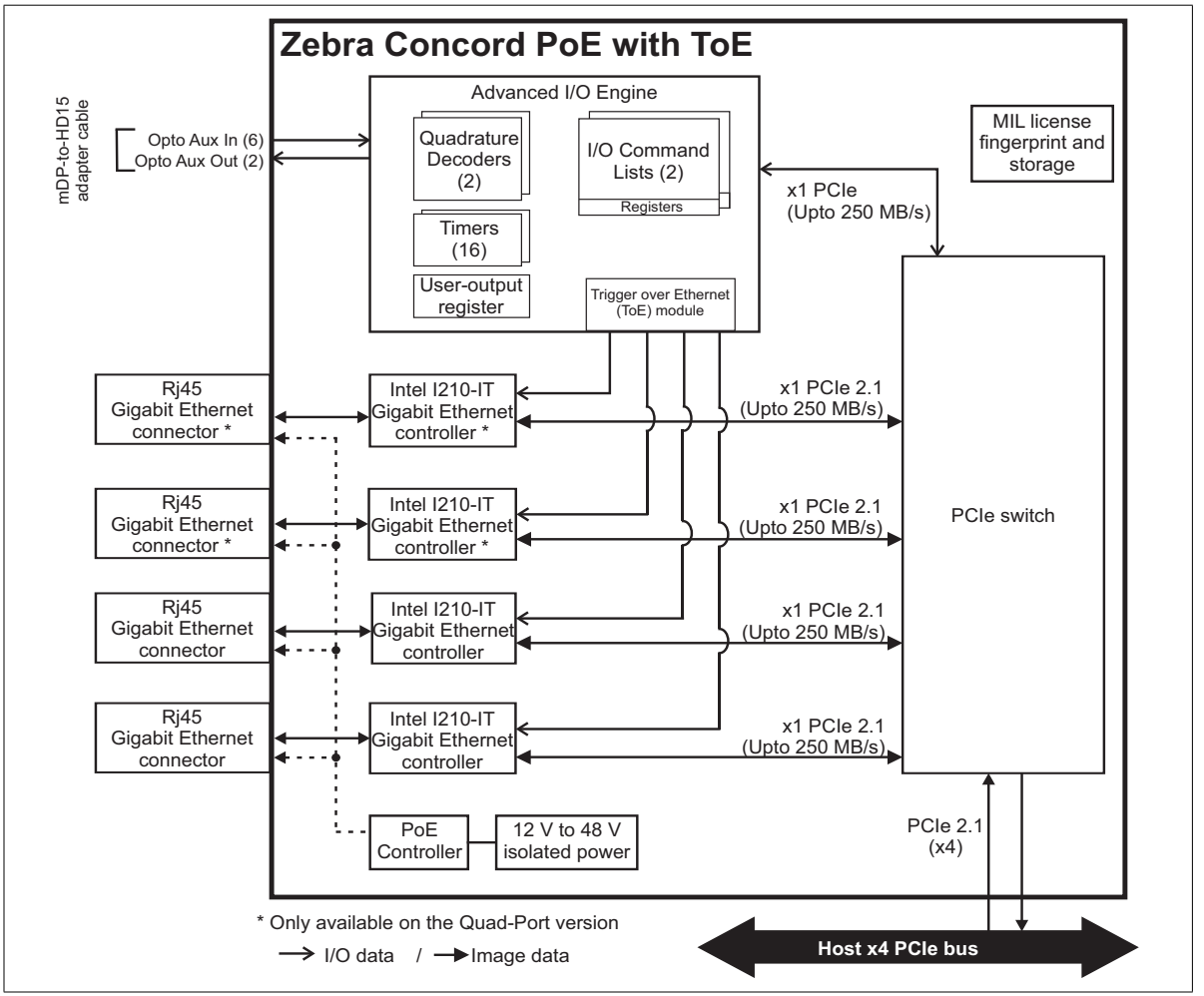
Zebra Concord PoE hardware reference

This chapter provides information on the Zebra Concord PoE hardware. It covers the architecture, features, and modes of the different models of the board. A summary of the features of Zebra Concord PoE, as well as pin assignments for its connectors, can be found in *Appendix B: Technical information*.

The following diagram illustrates the data flow of the Zebra Concord PoE base model.



The following diagram illustrates the data flow of the Zebra Concord PoE with ToE board.



Communication over Ethernet

Zebra Concord PoE has up to 4 Gigabit Ethernet network interfaces with built-in power-over-Ethernet (PoE) support. Each interface is controlled using an Intel I210-IT Gigabit Ethernet controller.

Although you can use each network interface for general purpose (for example, Gigabit network communication), the interface is intended for grabbing from a GigE Vision-compatible camera[1]. Using the MIL GigE Vision driver, Zebra Concord PoE can capture video from multiple[2] cameras compliant with the GigE Vision specification.

Zebra Concord PoE comes equipped with auto medium-dependent interface crossover Ethernet ports (MDIX) that can operate at all link speeds (10, 100, and 1000 Mbits/sec). A MDIX port simplifies setup by automatically detecting and using the appropriate connection type, eliminating the need for cross-over cables.

Power-over-Ethernet

Zebra Concord PoE supports both power-over-Ethernet (PoE) compliant devices and non-PoE devices; Zebra Concord PoE will automatically detect whether the device is PoE-compliant. When connecting to non-PoE compliant devices, Zebra Concord PoE has appropriate circuitry to ensure that no power is transmitted. This power source is electrically isolated from the rest of your computer and supports PSE Mode A. Although the board is Type 1 PoE, no power classification is currently supported for the device.

---

1. Unlike when using other Zebra boards, image acquisition with Zebra Concord PoE is made possible because the operating system recognizes each GigE Ethernet network interface as another network port. So when you allocate a MIL GigE Vision system (using MIL or one of its derivatives), you can grab from GigE Vision-compatible devices connected to the Gigabit Ethernet network interface. For all other functionality on the board, you must allocate a MIL Concord PoE system. Matrox Capture Works can allocate and interface with a MIL GigE Vision system, and not with a MIL Concord PoE system. Refer to MIL documentation for more information.
2. Refer to MIL documentation for the number of cameras from which Zebra Concord PoE can simultaneously capture video.

When a PoE compliant device is detected, Zebra Concord PoE provides the device with up to +48 V_{dc} and a maximum load of 15.4 W (12.95 W + cable loss), provided that the Zebra Concord PoE board is installed in a PCIe slot that meets the electrical requirements detailed in the *Electrical specifications* section, in *Appendix B: Technical information*.

The board can support PoE devices that draw a combined total of up to 26 W if the internal auxiliary 12 V power connector on the board is not plugged into the power supply. If the PCIe slot used cannot supply this power, you shall connect the auxiliary 12 V power connector. If the internal auxiliary 12 V power connector is plugged in, Zebra Concord PoE Dual-Port can still support a total consumption of up to 26 W, for all PoE devices combined, and Zebra Concord PoE Quad-Port can support a total consumption of up to 52 W for all PoE devices combined. This information applies equally to both models of Zebra Concord PoE (base model and with ToE). You shall review your computer's power distribution (including its power supply) to know whether the selected slot will be able to supply enough power to your Zebra Concord PoE (refer to the *Electrical specifications* section, in *Appendix B: Technical information* for details on the power requirements of Zebra Concord PoE).

Depending on whether you are using the power connector or not, the fuse circuitry on Zebra Concord PoE will react differently. When the internal auxiliary12 V power connector is not plugged in, a 5 A fuse rated for 20°C will be enabled, and when the internal auxiliary 12 V power connector is plugged in, a 12 A fuse rated for 20°C will be enabled.

Advanced I/O Engine

Zebra Concord PoE with ToE has an Advanced I/O Engine that controls the auxiliary I/O interface. The engine includes 16 timers, 2 quadrature decoders, 2 command lists, a user output register, 2 auxiliary output signals, 6 auxiliary input signals, and a ToE module.

Auxiliary I/O interface

The auxiliary I/O interface is composed of 6 input and 2 output, optically isolated, digital auxiliary signals.

The auxiliary input signals can trigger functionality in the Advanced I/O Engine (for example, timers), cause software events, or can be rerouted to third-party devices over an auxiliary output signal. Onto an auxiliary output signal, you can route a signal generated in the Advanced I/O Engine (for example, a timer output) or the state of a bit of one of the engine's registers (for example, the user-output register which is set using software). The auxiliary signals support voltages up to 24 V in sinking or sourcing configurations.

By default, an auxiliary input signal at 11.0 V or above is considered high, while anything at 5.0 V or below is considered low.

Typically, for an auxiliary output signal to source voltage, you must attach an external power source to Zebra Concord PoE with ToE. When you route an external signal to an auxiliary signal or vice versa, verify that the external signal meets the electrical specifications of the auxiliary signal. The auxiliary output signals are individually fuse-protected up to 100 mA.

The auxiliary signals are opto-isolated. They pass through an opto-coupler, a device that protects the board from outside surges and different ground levels, and allows the board to be isolated.

To configure the auxiliary signals, use the MIL-Lite **MsysControl**() function with the **M_IO...**, control types. To use an auxiliary input signal as a trigger source, use the **MsysControl**() or **MsysIoControl**() function with an **M_..._TRIGGER_SOURCE** control type. Your application can also act upon and interpret the state of an auxiliary input signal. To poll the state of an auxiliary input signal, use **MsysInquire**() with **M_IO_STATUS.** The state of an auxiliary input signal can also generate an interrupt; to do so, use **MsysControl**() with

M_IO_INTERRUPT_STATE and then use **MsysHookFunction**() with **M_IO_CHANGE** to hook a function to this event (that is, to set up an event handler).

Trigger-over-Ethernet module

Zebra Concord PoE with ToE includes a Trigger-over-Ethernet (ToE) module. The ToE module can transmit a Trigger-over-Ethernet packet, either as an action command or a software trigger, upon reception of an internal or external event. The event can come directly from an auxiliary input signal, or from a quadrature decoder, timer, or command list output. The ToE module helps reduce latency and jitter. Both software triggers and action commands allow you to send a trigger over the same cable used to both power your camera and connect it to the network; this reduces the required cabling, making your set up simpler and cheaper. To configure the ToE signal, use the **MsysControl**() function with the **M_GC_ACTIONn** + **M_TRIGGER**... or the **M_GC_TRIGGER_SOFTWAREn** + **M_TRIGGER**... control types.

Timers

Zebra Concord PoE with ToE has 16 timers that can be used to coordinate events. Each timer can generate a timer output signal with one pulse (one low and one high segment) per cycle, either in continuous mode or triggered mode. In continuous mode, the timer starts to output a signal when it is enabled, and repeats the same cycle until the timer is disabled. In triggered mode, an enabled timer waits to receive a trigger signal, before it begins to output a signal with the specified delay and duration.

The timers can be triggered by an auxiliary input signal, the state of a bit of an I/O command list's output register, a quadrature decoder output, another timer, or by software.

Each of the timers (Timer 1 through 16) is a 32-bit timer and can count up to 4,294,967,295 clock ticks before resetting. Each timer can use a specified clock source for its active period and a different specified clock source for its delay period. The clock sources can be selected from the following:

- **A clock that is internally generated.** Each timer can use your Zebra Concord PoE with ToE board's clock generator, which can generate a single clock with a programmable period of up to 128 nsecs.

- **A clock from an external source.** In this case, you must define the appropriate auxiliary input signal as a timer-clock input; the timer-clock input signal must meet the electrical specification of the auxiliary signal.

- **A clock based on another timer output.** For example, Timer 1 can use a clock based on Timer 2, and Timer 2 can use a clock based on Timer 1.

- **A clock based on a rotary decoder's output**. In this case, the timer will act more as a counter because it is rare that a rotary decoder's output is periodic.

To route a timer output on an auxiliary signal, use the MIL-Lite function **MsysControl**() with **M_IO_SOURCE*** + **M_AUX_IOn** set to **M_TIMERm**. Set up the timers using **MsysControl**() with **M_TIMER_...**

Quadrature decoders

Zebra Concord PoE with ToE features 2 quadrature decoders. They are used to decode quadrature input received from rotary or linear encoders with quadrature output. A rotary encoder is a device that provides information about the position and direction of a rotating shaft (for example, that of a conveyor belt). A linear encoder is a device that provides information about the position and direction of a moving sensor along a scale. Encoders with quadrature output transmit a two-bit code (also known as Gray code) on two wires for each change in position of the rotating shaft, or of the sensor along the scale. For a given direction, the encoder outputs the code in a precise sequence (either 00 - 01 - 11 - 10 or 00 - 10 - 11 - 01, depending on how the encoder is attached). If the rotating shaft, or sensor moving along a scale, changes direction, the encoder transmits the Gray code in the reverse sequence (00 - 10 - 11 - 01 or 00 - 01- 11 - 10, respectively).

Upon decoding a Gray code, the rotary decoder increments or decrements its 32-bit internal counter, depending on the direction of movement. You can configure which Gray code sequence represents forward movement and increments the counter; the reverse Gray code sequence will then represent the backward direction and decrement the counter. You can specify the direction of movement occurring when the Gray code sequence is 00 - 01 - 11 - 10, using **MdigControl**() with **M_ROTARY_ENCODER_DIRECTION**.

The Zebra Concord PoE with ToE quadrature decoders can receive quadrature input on any two specified auxiliary input signals and supports single-phase encoder frequencies of up to 40 kHz at 12 V and 20 kHz at 24 V[1].

❖ Note that an external source must be used to power the encoder. Refer to your encoder's data sheet for this information.

You can configure the quadrature decoder's settings, using the MIL-Lite function **MsysControl**() with **M_ROTARY_ENCODER...**

I/O command lists

Zebra Concord PoE with ToE has 2 I/O command lists, each of which allow you to schedule commands to change the state of a bit of an I/O command register at a specified time or counter value. You can route the state of the bit to an auxiliary output signal to control a connected device at a required moment; the state of the bits can be routed to any of the auxiliary output signals or can be used, for examples, to trigger a timer. You can use an I/O command list, for example, when multiple parts are traveling between a sensor and one or more ejector(s) and you need to schedule the ejection/redirection of the different parts based on some analysis.

To offset the moment at which a command should occur, each I/O command list has 4 reference latches. Latches are used to store a timestamp or counter value upon the specified transition of a specified signal (for example, the counter value when a part crosses a sensor). You can then use this timestamp or counter value to schedule commands relative to this event (for example, send a pulse to an ejector when the part has moved in front of the ejector and the part has failed inspection).

1. These values are true for a single-phase encoder and can vary if using a two-phase encoder.

You can add the following commands to an I/O command list:

Command	Description
Cause a rising edge	Changes the specified bit such that the associated signal will transition from low to high, if it is low.
Cause a falling edge	Changes the specified bit such that the associated signal will transition from high to low, if it is high.
Cause an active high pulse	This command adds a rising edge command followed by a falling edge command after a specified duration.
Cause an active low pulse	This command adds a falling edge command followed by a rising edge command after a specified duration.
Cause a very short active high pulse	Unlike a regular active high pulse command, a single command producing the shortest possible pulse is added to the list.

You can configure the I/O command lists, using the MIL-Lite **MsysIo...**() functions. Refer to MIL documentation for more information on I/O command lists.

User-output register

Zebra Concord PoE with ToE has a 2-bit user-output register. This register allows you to manually set the state of an auxiliary output signal to transmit application-specific user output (for example, to start or stop an external process based on some calculation or analysis). You can enable the routing of a user-output register bit to its corresponding auxiliary output signal. Then, when the bit is on, the circuit of the auxiliary output signal is closed and the current flows through; when the bit is off, the circuit of the signal is open. Each bit is referred to as a user-bit. To enable the routing of a user-output register bit to its corresponding auxiliary output signal, use the MIL-Lite function **MsysControl**() with **M_IO_SOURCE** and **M_USER_BITn**; to set the state of a user-bit, use **MsysControl**() with **M_USER_BIT_STATE.**

Data transfer

Zebra Concord PoE is a x4 PCIe 2.1 board, so it can transfer data over most PCIe slots. Under optimum conditions, Zebra Concord PoE can exchange data with the Host at a peak transfer rate of up to 500 Mbytes/sec if the board is installed in a PCIe 2.1 slot.

Appendix A: Glossary

This appendix defines some of the specialized terms used in this Zebra Concord PoE document.

Glossary

- **802.3af**

  802.3af is a PoE standard that allows up to 15.4 W of DC power from the *power sourcing equipment* side, resulting in a maximum power consumption of 12.95 W at the *powered device* side.

- **802.3at**

  802.3at is a PoE standard that allows up to 30 W of DC power from the *power sourcing equipment* side, resulting in a maximum power consumption of 25.50 W at the *powered device* side.

- **Bandwidth**

  A term describing the capacity to transfer data. Greater bandwidth is needed to sustain a higher transfer rate. Greater bandwidth can be achieved, for example, by using a wider bus.

- **Bus**

  A pathway along which signals are sent, generally in two directions, for communication of data.

- **Grab**

  To acquire or capture an image from a camera.

- **Host**

  In general, Host refers to the principal CPUs in one's computer.

- **PCI**

  Peripheral Component Interconnect. An expansion bus for attaching peripheral devices to a computer's motherboard.

- **PCIe**

  Peripheral Component Interconnect Express. A high-speed expansion bus for attaching peripheral devices to a computer's motherboard

- **PD**

  Powered Device. In the context of a **PoE** network connection, the **PD** is the Ethernet device endpoint that relies on the Ethernet wired network to receive its power.

- **PoE**

  Power over Ethernet. Technology allowing support of power along the data lines of a wired Ethernet LAN connection.

- **PSE**

  Power Sourcing Equipment. In the context of a **PoE** network connection, the **PSE** is the Ethernet device responsible for supplying power over the Ethernet wired network.

- **PSE Mode**

  Power Sourcing Equipment Mode. **PSE Mode** describes which conductors provide power for a device. Devices that provide power through conductors 1-2 and 3-6 are Mode A, and those that provide power through conductors 4-5 and 7-8 are Mode B. A **PD** must be capable of accepting power from either mode.

- **ToE**

  Trigger over Ethernet. Technology allowing trigger commands to be sent along the data lines of a wired Ethernet LAN connection.

Appendix B: Technical information

This appendix contains information that might be useful when installing Zebra Concord PoE.

Technical information

The information found in this appendix applies to both Zebra Concord PoE base model and Zebra Concord PoE with ToE, unless otherwise specified. You may find this information useful for installation.

Global information

- Operating system: See your software manual for supported operating systems.

- Computer requirements: A processor with x86 architecture or better. In addition, Zebra Concord PoE needs a x4 PCIe slot or better.

  We recommend a relatively up-to-date PCIe chipset. An up-to-date chipset is recommended because it generally offers better performance in terms of data transfer rates.

Technical features common to both models of Zebra Concord PoE

- x4 PCIe Gen2 (5 Gbps) Host interface.

- 2 or 4 Gigabit Ethernet network interfaces that use standard RJ-45 Ethernet connectors. Each interface is controlled using an Intel I210-IT Gigabit Ethernet controller and supports the following:

  - Power over Ethernet (PoE) for up to 15.4 W (802.3af / 802.3at Type 1, Class 3).

  - Grabbing from GigE Vision-compatible cameras[1].

  - 10/100/1000 Mbps connections.

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1. Unlike when using other Zebra boards, image acquisition with Zebra Concord PoE is made possible because the operating system recognizes each GigE Ethernet network interface as another network port. So when you allocate a MIL GigE Vision system (using MIL or one of its derivatives), you can grab from GigE Vision-compatible devices connected to the Gigabit Ethernet network interface. For all other functionality on the board, you must allocate a MIL Concord PoE system. Matrox Capture Works can allocate and interface with a MIL GigE Vision system, and not with a MIL Concord PoE system. Refer to MIL documentation for more information.

- Jumbo frames/packets up to 9014 bytes.
- Selectable interrupt moderation rate.
- Resizeable receive buffers/descriptors.
- Auto-MDIX (signal crossover).

• Support for MIL license fingerprint and storage.

Technical features specific to Zebra Concord PoE with ToE

• 1 Advanced I/O Engine.

- 8 opto-isolated, digital auxiliary signals (6 inputs and 2 outputs).

  Each auxiliary signal can sink or source up to 24 V. All auxiliary output signals are individually protected up to 100 mA with a resettable fuse.

  Auxiliary input signals have interrupt generating capabilities.

- Trigger-over-Ethernet (ToE) module that allows you to send a Trigger-over-Ethernet packet (as an action command or a software trigger) upon an internal or external event, without Host intervention. The event can come directly from an auxiliary input signal, or from a quadrature decoder, timer, or I/O command list output.
- 16 timers.
- 2 quadrature decoders that support input from rotary or linear encoders with a quadrature output[1].
- 2 I/O command lists that allow you to schedule I/O commands at a specified counter value. A command list enables output events to occur at precise moments, based on elapsed time or specific input events (number of transitions on an auxiliary input signal or a rotary decoder output signal).
- 2-bit user-output register.

1. The decoders support single-phase encoder frequencies of up to 40 kHz at 12 V and 20 kHz at 24 V.

Electrical specifications

The following table lists the electrical specifications of the Dual-Port version of both Zebra Concord PoE base model and Zebra Concord PoE with ToE.

Important

When determining the power requirements for your computer, do not forget to include the power requirements for other peripheral devices.

Typical operating voltage and current drawn by the Dual-Port version of both Zebra Concord PoE base model and Zebra Concord PoE with ToE (starting from version 000).		
Voltage (only from motherboard)	**Current (A)**	**Power (W)**
3.3 V ± 9%	1.0 A	3.2 W typical
12 V ± 8% without PoE device connected	0.3 A	3.4 W typical
12 V ± 8% with PoE device connected	3.6 A maximum	42.6 W maximum[1]
Voltage (with internal auxiliary 12 V power connector plugged in)	**Current (A) drawn from 12 V power connector and motherboard**	**Power (W) drawn from 12 V power connector and motherboard**
12 V +5%/-8% with PoE device connected	3.6 A total maximum	43.0 W total maximum

1. 42.6 W represents the maximum power consumption drawn from the PCIe slot's 12 V rail when the internal auxiliary 12 V power connector is not connected. If the PCIe slot used cannot supply this power, you shall connect the internal auxiliary 12 V power connector to your computer's power supply.

The following table lists the electrical specifications of the Quad-Port version of both Zebra Concord PoE base model and Zebra Concord PoE with ToE.

Typical operating voltage and current drawn by the Quad-Port version of both Zebra Concord PoE base model and Zebra Concord PoE with ToE (starting from version 000).		
Voltage (only from motherboard)	**Current (A)**	**Power (W)**
3.3 V ± 9%	1.0 A	3.2 W typical
12 V ± 8% without PoE device connected	0.4 A	4.6 W typical
12 V ± 8% with PoE device connected	3.4 A maximum	41.0 W maximum[1]
Voltage (with internal auxiliary 12 V power connector plugged in)	**Current (A) drawn from 12 V power connector and motherboard**	**Power (W) drawn from 12 V power connector and motherboard**
12 V +5%/-8% with PoE device connected	6.3 A maximum	76.0 W maximum

1. 41.0 W represents the maximum power consumption drawn from the PCIe slot's 12 V rail when the internal auxiliary 12 V power connector is not connected. If the PCIe slot used cannot supply this power, or if the total power required for PoE devices exceeds 26 W, you shall connect the internal auxiliary 12 V power connector to your computer's power supply.

The following table describes the operating voltage and current for the auxiliary input and output signals of Zebra Concord PoE with ToE.

Operating voltage and current for the auxiliary signals of Zebra Concord PoE with ToE.		
Input signals	Operating range	12.0 V - 24.0 V (26 V abs.max)
	Input current	3.3 mA (maximum)
	Input resistance	7.0 kΩ
	ON voltage level	=> 9.1 V @ 1.2 mA
	OFF voltage level	=< 6.1 V @ 0.8 mA
	Typical OFF to ON response	10.0 µsec @ 12.0 V 4.0 µsec @ 24.0 V
	Typical ON to OFF response	26.0 µsec @ 12.0 V 37.0 µsec @ 24.0 V
	Maximum input frequency 12 V, 50% duty cycle	20 kHz
	Maximum input frequency 24 V, 50% duty cycle	10 kHz
Output signals	Operating range	12.0 V - 24.0 V (26.0 V abs.max)
	Output current	100.0 mA (maximum)
	Output resistance	17.0 Ω
	ON voltage level (closed)	1.8 V maximum voltage drop across the AUX_OUTn+ and AUX_OUTn- pins when sinking/sourcing up to 100 mA.
	Typical OFF to ON response	40.6 µsec @ 12.0 V 43.6 µsec @ 24.0 V
	Typical ON to OFF response	1.1 µsec @ 12.0 V 1.1 µsec @ 24.0 V
	Maximum output frequency 12 V-24 V, 50% duty cycle	6 kHz

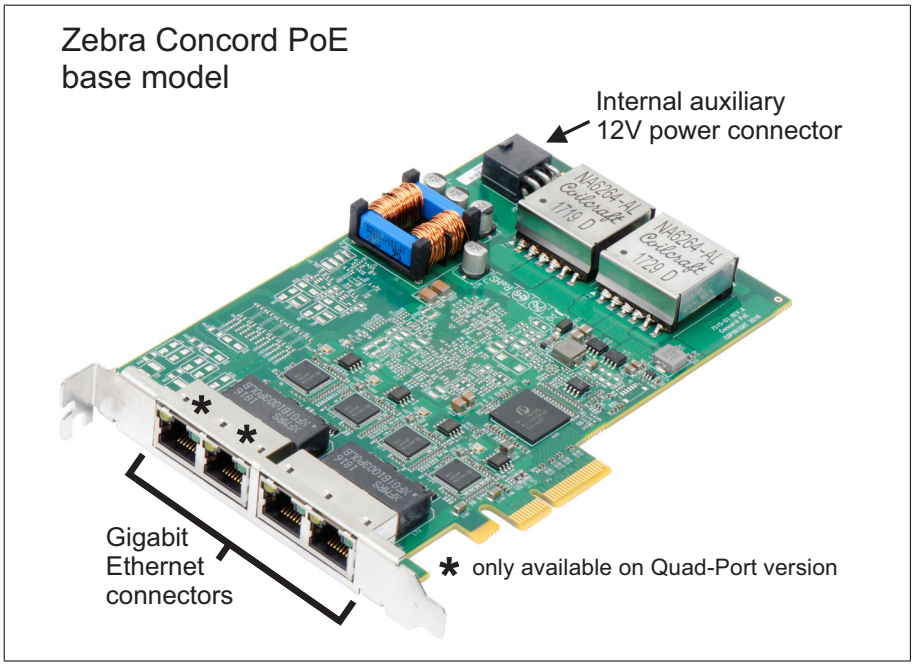
Dimensions and environmental specifications

- Dimensions: 167.65 L x 111.15 H x 18.7 W mm (6.6" x 4.38" x 0.74") from bottom edge of the gold fingers to top edge of board. These values respect the dimensions of a PCIe full-height and half-length board.
- Minimum/maximum ambient operating temperature in the vicinity of the board inside the computer: 0°C to 55°C (32°F to 131°F).[1]
- Minimum/maximum storage temperature: -40°C to 85°C (-40°F to 185°F).
- Operating relative humidity: up to 95% relative humidity (non-condensing).
- Storage humidity: up to 95% relative humidity (non-condensing).
- Not designed for use at altitudes exceeding 2000 m.
- Pollution degree 2 environment.
- Designed for indoor use only.
- Designed for use in a properly ventilated computer enclosure that has its cover installed.

1. It is the responsibility of the integrator of the product to provide adequate cooling, and if necessary add infrared shielding inside the computer.

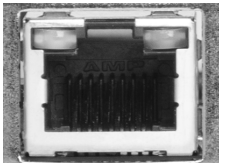
Connectors and LEDs common to both models of Zebra Concord PoE

Both models of the Zebra Concord PoE board have two or four Ethernet connectors located on their bracket and an internal auxiliary 12 V power connector available on the board.



Ethernet connectors

Each Gigabit Ethernet connector (10/100/1000 BaseT) is an 8-pin, RJ45 connector. The pinout of this connector follows the 1000 BaseT Gigabit Ethernet standard found in the IEEE 802.3-2002 standard. The connector also supports Power-over-Ethernet (PoE). It is used to receive video input signals between the camera and the Host computer.



To interface with the Ethernet connector, use Category 5e or Category 6 twisted pair cables. Alternatively, Category 5 twisted-pair (Cat 5 UTP5) cables can be used.

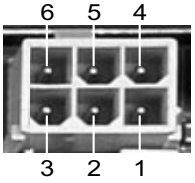
Status LEDs on the Ethernet connectors

Zebra Concord PoE has LEDs to display the status of the Gigabit Ethernet connections on the board. Each Gigabit Ethernet connector has two LEDs that are used to represent the connection state and connection transmission (activity).

LED color and state	Description
Off	Zebra Concord PoE has no connected Gigabit Ethernet connection.
Green, solid	Zebra Concord PoE is connected at a speed of 10/100 Mbps.
Green, blinking	Zebra Concord PoE transmitting at a speed of 10/100 Mbps
Yellow, solid	Zebra Concord PoE is connected at a speed of 1000 Mbps.
Yellow, blinking	Zebra Concord PoE transmitting at a speed of 1000 Mbps

Internal auxiliary 12 V power connector

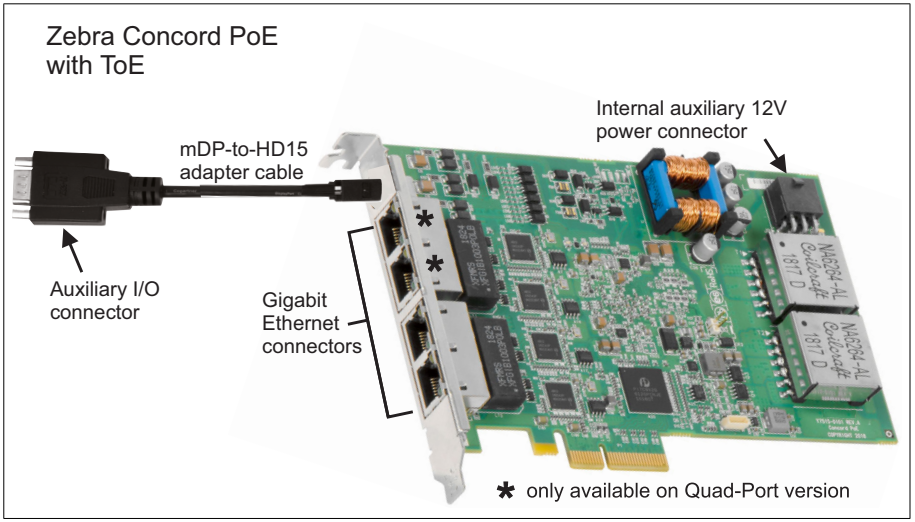
The internal auxiliary 12 V power connector, located at the back of Zebra Concord PoE, is a standard 6-pin male power connector. You can interface this connector with the cable attached to the power supply of your motherboard if the cable has a 6-pin, compatible, mating 12 V connector. The connector's pin assignment is as follows:



Pin	Description
1	+12 V
2	+12 V
3	+12 V
4	Ground
5	Ground
6	Ground

Connector exclusively on Zebra Concord PoE with ToE

Besides the connectors on both models, Zebra Concord PoE with ToE has an mDP connector located on the bracket. You should connect to it using the mDP-to-HD15 adapter cable that comes with your Zebra Concord PoE with ToE. The HD-15 connector at the end of this cable is called the auxiliary I/O connector.



Auxiliary I/O connector

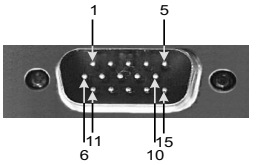
The auxiliary I/O connector on the mDP-to-HD15 adapter cable is a high-density D-subminiature 15-pin (HD-15[1]) male connector.

❖ The auxiliary I/O connector is not compatible with display devices. Connecting the HD-15 connector to a VGA monitor or any other display device might damage both the device and the Zebra Concord PoE with ToE board.

1. Previously referred to as DBHD-15, but more accurately known as DE-15.

❖ In addition, the mDP connector directly on the Zebra Concord PoE with ToE bracket is not compatible with a DisplayPort source. Connecting the mDP connector to such a device might damage both the device and the Zebra Concord PoE with ToE board.

The pinout below applies to the auxiliary I/O connector on the cable.



Pin number	Signal name	MIL constant for auxiliary signal	Description
1	AUX_OPTOIND_OUT1-	M_AUX_IO1	Opto-isolated auxiliary signal 1- (output). See pin 6 for more information.
2	AUX_OPTOIND_IN5	M_AUX_IO5	Opto-isolated industrial auxiliary signal 5 (input). Supported input: interrupt/poll (M_AUX_IO5), timer clock (M_TIMERn), timer arm (M_TIMER_ARM_SOURCE), I/O command list counter source, reference latch trigger (M_REFERENCE_LATCH_TRIGGER_SOURCE), quadrature input bit 0 or 1 (M_ROTARY_ENCODER_BITn_SOURCE), rotary decoder counter reset source (M_ROTARY_ENCODER_RESET_SOURCE).
3	AUX_OPTOIND_IN3	M_AUX_IO3	Opto-isolated industrial auxiliary signal 3 (input). Supported input: interrupt/poll (M_AUX_IO3), timer clock (M_TIMERn), timer arm (M_TIMER_ARM_SOURCE), I/O command list counter source, reference latch trigger (M_REFERENCE_LATCH_TRIGGER_SOURCE), quadrature input bit 0 or 1 (M_ROTARY_ENCODER_BITn_SOURCE), rotary decoder counter reset source (M_ROTARY_ENCODER_RESET_SOURCE).
4	AUX_OPTOIND_IN_COM_2-3	N/A	Common path for auxiliary inputs 2 and 3. See pins 5 and 3 for more information.
5	AUX_OPTOIND_IN2	M_AUX_IO2	Opto-isolated industrial auxiliary signal 2 (input). Supported input: interrupt/poll (M_AUX_IO2), timer clock (M_TIMERn), timer arm (M_TIMER_ARM_SOURCE), I/O command list counter source, reference latch trigger (M_REFERENCE_LATCH_TRIGGER_SOURCE), quadrature input bit 0 or 1 (M_ROTARY_ENCODER_BITn_SOURCE), rotary decoder counter reset source (M_ROTARY_ENCODER_RESET_SOURCE).
6	AUX_OPTOIND_OUT1+	M_AUX_IO1	Opto-isolated auxiliary signal 1+ (output). Supported output: user-bit 1 (M_USER_BIT1), timer output (M_TIMERn), or an I/O command register bit (M_IO_COMMAND_LISTn + M_IO_COMMAND_BITn).
7	NC	N/A	Not Connected.

8	AUX_OPTOIND_IN_COM_4-5	N/A	Common path for auxiliary inputs 4 and 5. See pins 9 and 2 for more information.
9	AUX_OPTOIND_IN4	M_AUX_IO4	Opto-isolated industrial auxiliary signal 4 (input). Supported input: interrupt/poll (M_AUX_IO4), timer clock (M_TIMERn), timer arm (M_TIMER_ARM_SOURCE), I/O command list counter source, reference latch trigger (M_REFERENCE_LATCH_TRIGGER_SOURCE), quadrature input bit 0 or 1 (M_ROTARY_ENCODER_BITn_SOURCE), rotary decoder counter reset source (M_ROTARY_ENCODER_RESET_SOURCE).
10	NC	N/A	Not Connected.
11	AUX_OPTOIND_OUT0-	M_AUX_IO0	Opto-isolated auxiliary signal 0- (output). See pin 12 for more information.
12	AUX_OPTOIND_OUT0+	M_AUX_IO0	Opto-isolated auxiliary signal 0+ (output). Supported output: user-bit 1 (M_USER_BIT1), timer output (M_TIMERn), or an I/O command register bit (M_IO_COMMAND_LISTn + M_IO_COMMAND_BITn).
13	AUX_OPTOIND_IN7	M_AUX_IO7	Opto-isolated industrial auxiliary signal 7 (input). Supported input: interrupt/poll (M_AUX_IO7), timer clock (M_TIMERn), timer arm (M_TIMER_ARM_SOURCE), I/O command list counter source, reference latch trigger (M_REFERENCE_LATCH_TRIGGER_SOURCE), quadrature input bit 0 or 1 (M_ROTARY_ENCODER_BITn_SOURCE), rotary decoder counter reset source (M_ROTARY_ENCODER_RESET_SOURCE).
14	AUX_OPTOIND_IN_COM_6-7	N/A	Common path for auxiliary inputs 6 and 7. See pins 15 and 13 for more information.
15	AUX_OPTOIND_IN6	M_AUX_IO6	Opto-isolated industrial auxiliary signal 6 (input). Supported input: interrupt/poll (M_AUX_IO6), timer clock (M_TIMERn), timer arm (M_TIMER_ARM_SOURCE), I/O command list counter source, reference latch trigger (M_REFERENCE_LATCH_TRIGGER_SOURCE), quadrature input bit 0 or 1 (M_ROTARY_ENCODER_BITn_SOURCE), rotary decoder counter reset source (M_ROTARY_ENCODER_RESET_SOURCE).

To build your own cable, you can purchase the following parts:

	Mating information
Manufacturer:	NorComp, Inc.
Connector:	180-015-203L001
Backshell:	970-015-010-011

These parts can be purchased from third parties such as Digi-Key Corporation (www.digikey.com).

Appendix C: Listing of Zebra Concord PoE boards

This appendix lists the key feature changes to the Zebra Concord PoE boards.

Key feature changes

Part number	Version	Description
CONP2	105	First shipped version of Zebra Concord PoE Dual-Port PCIe 2.1 x4 Gigabit Ethernet NIC with PoE, pre-licensed for MIL Interface package (GigE Vision driver).
CONP4	105	First shipping version of Zebra Concord PoE Quad-Port PCIe 2.1 x4 Gigabit Ethernet NIC with PoE, pre-licensed for MIL Interface package (GigE Vision driver).
CONPT2	108	First shipping version of Zebra Concord PoE with ToE Dual-Port PCIe 2.1 x4 Gigabit Ethernet NIC with PoE and hardware-assisted ToE, pre-licensed for MIL Interface package (GigE Vision driver).
CONPT4	107	First shipping version of Zebra Concord PoE with ToE Quad-Port PCIe 2.1 x4 Gigabit Ethernet NIC with PoE and hardware-assisted ToE, pre-licensed for MIL Interface package (GigE Vision driver).

Regulatory Compliance

FCC Compliance Statement

Warning

Changes or modifications to these devices not expressly approved by the party responsible for the compliance could void the user's authority to operate this equipment.

The use of shielded cables for connections of these devices to other peripherals is required to meet the regulatory requirements.

Note

These devices comply with Part 15 of FCC Rules. Operation is subject to the following two conditions:

1. These devices may not cause harmful interference, and
2. These devices must accept any interference received, including interference that may cause undesired operation.

This equipment has been tested and found to comply with the limits for Class A digital devices, 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 these devices in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his/her own expense.

Innovation, Science and Economic Development Canada Compliance Statement

These digital apparatuses do not exceed the Class A limits for radio noise emission from digital apparatuses set out in the Radio Interference Regulations of Innovation, Science and Economic Development Canada (ISED).

Ces appareils numériques n'émettent pas de bruits radioélectriques dépassant les limites applicables aux appareils numériques de Classe A prescrites dans le Règlement sur le brouillage radioélectrique édicté par Innovation, Sciences et Développement Économique Canada (ISDE).

EU Notice (European Union)

WARNING: These are class A products. In a domestic environment, these products may cause radio interference in which case the user may be required to take adequate measures.

AVERTISSEMENT: Ces appareils sont des produits informatiques de Classe A. Lorsque ces appareils sont utilisés dans un environnement résidentiel, ces produits peuvent entraîner des interférences radioélectriques. Dans ce cas, l'usager peut être prié de prendre des mesures correctives appropriées.

This device complies with Directive 2014/30/EU for Class A digital devices. They have been tested and found to comply with EN55011/CISPR11 and EN61326-1/EC61326-1.

Ces unités sont conformes à la Directive 2014/30/EU pour les unités numériques de Classe A. Les tests effectués ont prouvé qu'elles sont conformes aux normes EN55011/CISPR11 et EN61326-1/EC61326-1.

Directive on Waste Electrical and Electronic Equipment (WEEE)

Europe

(English) European user's information – Directive on Waste Electrical and Electronic Equipment (WEEE)

Please refer to the Zebra Web site (**www.zebra.com/weee**) for recycling information.

(Français) Informations aux utilisateurs Européens – Règlementation des déchets d'équipements électriques et électroniques (DEEE)

Se référer au site Web de Zebra (**www.zebra.com/weee**) pour l'information concernant le recyclage.

(Deutsch) Information für europäische Anwender – Europäische Regelungen zu Elektro- und Elektronikaltgeräten (WEEE)

Bitte wenden Sie sich an dem Zebra-Website (**www.zebra.com/weee**) für Recycling Informationen.

(Italiano) Informazioni per gli utenti europei – Direttiva sui rifiuti di apparecchiature elettriche ed elettroniche (RAEE)

Si prega di riferirsi al sito Web Zebra (**www.zebra.com/weee**) per le informazioni di riciclaggio.

Limited Warranty

Refer to the warranty statement that came with your product.