

# Zebra 4Sight EV7™

## Installation and Hardware Reference



**ZEBRA**

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**Regulatory Compliance**

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**Limited Warranty**





**Chapter**

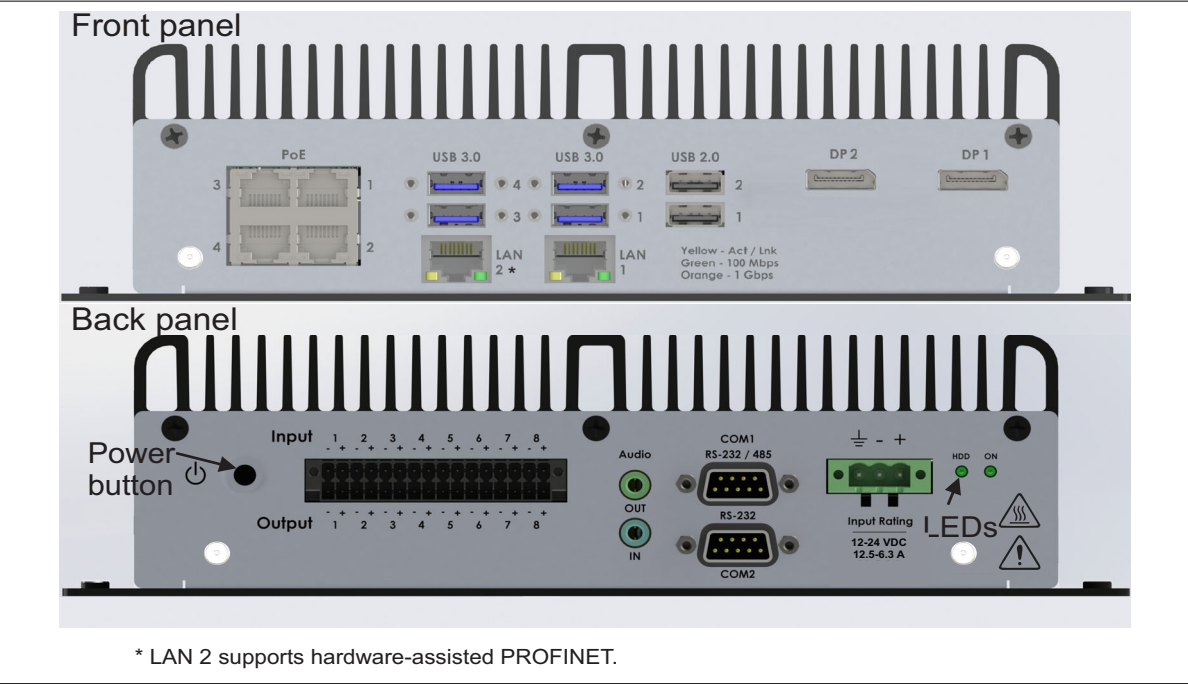
# 1

## **Before you begin**

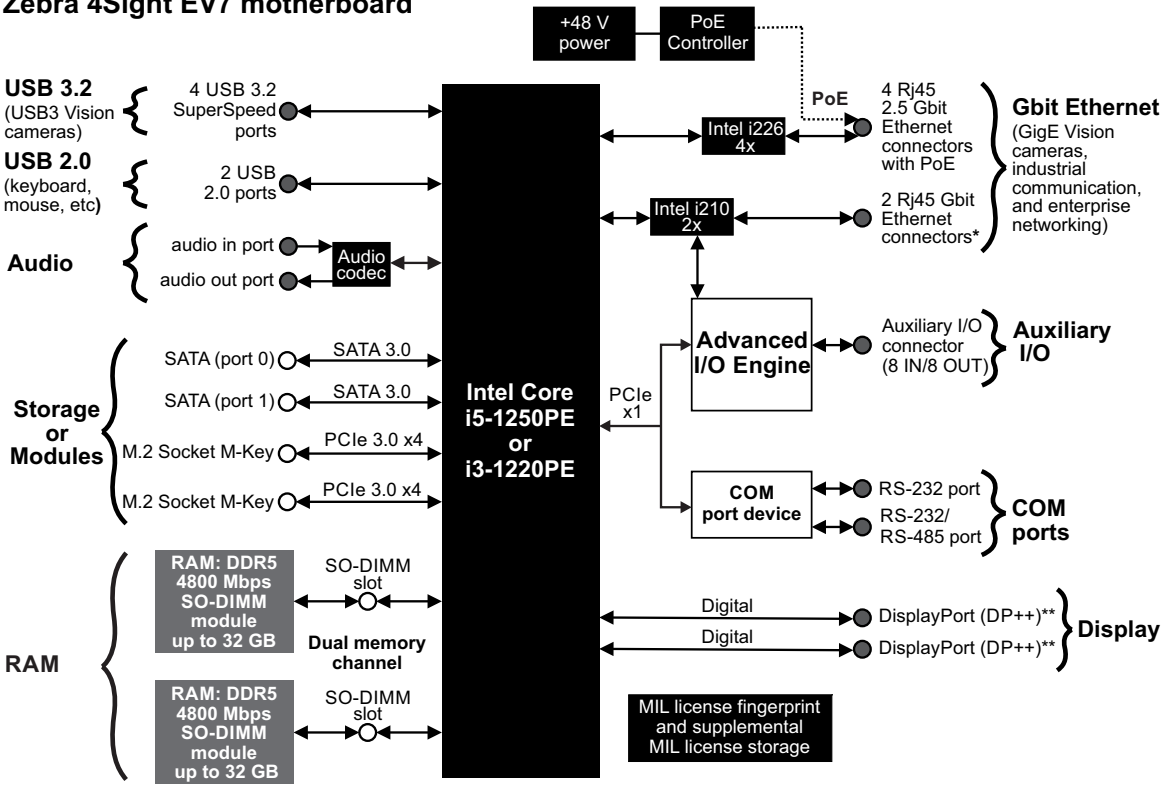
This chapter introduces you to the key features of Zebra 4Sight EV7, key to the symbols on the unit, general warnings, and handling precautions.

# Overview

Zebra 4Sight EV7 is a self-contained, fanless, industrial computer that integrates processing and display capabilities, along with image capture from multiple GigE Vision and/or USB3 Vision cameras. The cameras are supported using four 2.5 Gigabit Ethernet ports (with PoE) and four USB 3.2 SuperSpeed ports, respectively. Zebra 4Sight EV7 supplies networking and industrial communication over GigE Ethernet ports or RS-232/RS-485 ports (PROFINET, EtherNet/IP, CCLink, or Modbus). It also supports general purpose auxiliary I/O signals (digital I/Os) with linear/rotary encoder support. It includes a Zebra Advanced I/O Engine for real-time synchronization of a vision application with automation devices.



Zebra 4Sight EV7 motherboard



Legend

- Chips on motherboard
- Non-serviceable RAM modules
- Implemented with an FPGA

- External connectors on front or back panel of unit
- Internal connectors on motherboard
- \* The port labeled LAN-2 supports hardware-assisted PROFINET
- \*\* Be aware that when using a passive DisplayPort cable adapter, DVI/HDMI resolutions are limited to HD only. Also, when using a passive DisplayPort-to-HDMI cable adapter, there will be no audio support.

## Operating system

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The Zebra 4Sight EV7 unit uses Microsoft Windows 10 IoT Enterprise (64-bit version).

- ❖ By default, secure boot is enabled in the UEFI<sup>1</sup>. When secure boot is enabled, all drivers you install must be properly signed for operating with the secure boot. If your drivers are not properly signed to operate with secure boot, you might have driver issues (for example, driver issues with USB devices). Refer to the documentation accompanying the operating system for more information.

Zebra Technologies Corporation designed the Zebra 4Sight EV7 unit for a specific use (such as, creating and installing software to process images). You may only use the operating system and associated software on the unit for that use.

You may use other programs with the operating system as long as the other programs:

- Directly support the manufacturer's specific use for the device, or
- Provide system utilities, resource management, or anti-virus or similar protection.

Software that provides consumer or business tasks or processes might not run on the device. This includes email, word processing, spreadsheet, database, scheduling, and personal finance software. The device can use Remote Desktop Services to access such software running on a server.

If you acquired the operating system and associated software on the unit, or on a disc or other media, a genuine Certificate of Authenticity label with a genuine copy of the software identifies licensed software. To be valid, this label must be affixed to the device, or included on or in Zebra Technologies Corporation's software packaging. If you receive the label separately, it is not valid. You should keep the label on the device or packaging to prove that you are licensed to use the operating system and associated software.

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1. On legacy computers, this was referred to as a BIOS, and in some menu items, BIOS and UEFI are still used interchangeably.

The Microsoft operating system and associated software was designed for systems that do not require fail-safe performance. You may not use the Microsoft operating system and associated software in any device or system in which a malfunction of the software would result in foreseeable risk of injury or death to any person. This includes operation of nuclear facilities, aircraft navigation or communication systems, and air traffic control.

## Zebra software

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Zebra 4Sight EV7 can be used with one or more Zebra software products that support the unit. These are MIL and its derivatives (for example, Matrox Design Assistant, Matrox Capture Works, and MIL-Lite). Zebra software is supported under the version of Windows installed on your unit.

### Matrox Design Assistant

The Matrox Design Assistant package is a flowchart-based, Windows program that integrates a development environment for Zebra 4Sight EV7. It allows you to create an imaging application without writing a single line of code. Application development is visually a step-by-step approach, where each step is taken from an existing toolbox and is configured through a series of dialog windows. An application developed with Matrox Design Assistant can be deployed locally (on the same computer as that used for application development) or remotely. Once the project is built and deployed, it can run without the Matrox Design Assistant interface being installed.

With Matrox Design Assistant, you can:

- Create your project as a series of steps using a flowchart.
- Test your project from your computer without any additional code editors or compilers and without deploying (copying and running) your project on the target computer (for example, Zebra 4Sight EV7).
- Design and layout a web page (operator view) to receive operator input and to display your project's output.
- Run, terminate, and re-run the project on your target computer from within Matrox Design Assistant.

Imaging projects can:

- Grab images from your camera or use images from disk.
- Analyze images using several industry-proven image analysis and measurement tools (for example, code reader and Geometric Model Finder tools). Blob and edge analysis is also supported, along with color matching, code recognition, character recognition, bead inspection, measurement, metrology, 3D reconstruction, and a number of additional processing and analysis features.
- Perform calibration for 2D images.
- Send and receive user-defined digital I/O signals (auxiliary I/O signals) controlled by software or by the timers in the Advanced I/O engine.
- Write image and text files (for example, CSV) locally or on network drives.
- Provide HMI user input and result display through configurable, web-accessible operator views.
- Send and receive information and save images across the network using OPC-UA.
- Send and receive information across the network using TCP/IP, Modbus, CCLink, EtherNet/IP, and PROFINET protocols.
- Communicate with industrial robots to offer an integrated machine vision solution.

### 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. Analysis operations support camera calibration, are performed with sub-pixel accuracy, and include pattern recognition (normalized grayscale correlation, Geometric Model Finder, and AGM), blob analysis, edge extraction and analysis, measurement, image registration, metrology, character recognition (template-based and for both normal and dot-matrix text), code recognition and grading (1D, 2D, and composite code types), bead inspection (continuous strips 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 GUI for 2D and 3D GenICam-compliant imaging devices that use a standard interface like GigE Vision, USB3 Vision, CoaXPress, or GenTL. With this utility, you can rapidly evaluate the performance and functionality of virtually any GenICam-compliant camera or 3D sensor (or other device). Matrox Capture Works will list all detected devices connected to your computer/network that use the selected GenICam standard. 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 information about Zebra 4Sight EV7's interface with the device (such as, for GigE Vision, the network adapter's IP address, packet size, inter-packet delay), view and change device information (such as, the user-defined name of your device), view and change acquisition properties, and view acquisition statistics. When used with a GigE-Vision compliant camera, you can use Matrox Capture Works to configure the device and network adapter in static IP mode (or point-to-point connection mode) or DHCP mode (or corporate network mode). Matrox Capture Works uses the Zebra device discovery service to automatically detect when GigE Vision-compliant devices are added to or removed from your network. Matrox Capture Works is distributed with MIL and Matrox Design Assistant; it is also available with MIL-Lite.

## **Power management and temperature control**

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### **ACPI technology**

Zebra 4Sight EV7 is compliant with advanced configuration and power interface (ACPI) technology. This technology monitors how the UEFI, operating system, and peripheral devices communicate with each other about power usage. ACPI allows the Zebra 4Sight EV7 unit to conserve energy by transitioning unused devices into lower power states. ACPI components gather information about power consumption from the unit and pass this information onto the operating system. The operating system then manages power to the unit's different components on an as-needed basis.

The ACPI features implemented in the Zebra 4Sight EV7 unit include:

- The ability for the unit to perform a complete shut-down, in which it will be powered off automatically.
- Support for an S4 sleeping state, for which the operating system can be enabled or disabled to automatically wake the unit from hibernation mode.
- Support for processor power management.
- Support for temperature management using passive cooling techniques.

### **Enhanced Intel Speed Shift technology**

The Intel Core i3-1220PE and i5-1250PE processors use Enhanced Intel Speed Shift technology to enable very high performance, while also meeting the power-conservation needs of the Zebra 4Sight EV7 unit. The operating system dynamically adjusts processor voltage and core frequency (CPU speed) based on the CPU's demand for processing power. This results in decreased average power consumption and decreased average heat production.



## Inspecting the Zebra 4Sight EV7 package

The following tables list standard items that are included in the Zebra 4Sight EV7 package, as well as additional items that are available from Zebra. If anything is missing or damaged, contact your Zebra representative.

### Standard items

Your Zebra 4Sight EV7 package should include the following standard items:

Standard package item	Details
Zebra 4Sight EV7 unit	<ul style="list-style-type: none"><li>• Zebra 4Sight EV7 motherboard.</li><li>• 8 or 16 Gbytes of total memory on the Zebra 4Sight EV7 unit, depending on what was ordered.</li><li>• 256 Gbyte M.2 NVMe SSD<sup>1</sup>.</li></ul>
Zebra 4Sight EV7 software package	<ul style="list-style-type: none"><li>• An operating system license.</li><li>• Drivers and utilities. These are pre-installed and are also compressed in the following file on your Zebra 4Sight EV7: <i>C:\Drivers and Utilities\SystemDriverAndUtilities.zip</i></li><li>• Microsoft Windows 10 IoT Enterprise rescue image (64-bit version).</li></ul>
Mating connectors and adapters	<ul style="list-style-type: none"><li>• 1 x 32 mating terminal-block connector, configured in a 2 x 16 single block (for auxiliary I/Os connectivity). I/O cabling is not included.</li><li>• 1 x 3 mating connector (for power supply connectivity).</li><li>• 1 power connector latch<sup>2</sup> (mates with the power connector) and two terminal-block connector latches (mate with the terminal-block connectors).</li></ul>

Standard package item	Details
Hard disk drive installation kit	<ul style="list-style-type: none"><li>• 1 bag of 12 metal slot-topped screws.</li><li>• Brackets for the installation of up to 2 additional mass storage devices (such as an SSD or HDD).</li><li>• 2 x SATA data cables.</li><li>• 1 x SATA power cable.</li></ul>
Safety notice with URL to the <i>Zebra 4Sight EV7 installation and hardware reference</i>	<ul style="list-style-type: none"><li>• A sheet that includes warning symbols and a URL that directs you to the Zebra website to download this manual.</li></ul>

1. Note that the size of the SSD is subject to change without notice, but is a minimum of 240 Gbytes.
2. If the Zebra 4Sight EV7 power supply with the open-wire cable is purchased, the power connector latch will be attached to the open-wire cable.

**Additional components**

You can also purchase the following additional component from Zebra Technologies Corporation.

Additional component	Description
Zebra 4Sight EV7 power supply with an open-wire cable	24 V power supply with an open-wire cable which is used to connect to the power connector of your unit. Note that the power connector latch is already connected to the open-wire cable of the power supply.




Contact your Zebra sales representative for availability.

# General warnings and key to symbols on the unit

You should be aware of the meaning of the symbols on the unit and important usage and handling precautions.

## Zebra 4Sight EV7 safety precautions and key to symbols

Before installing, connecting to, and using Zebra 4Sight EV7, you shall be aware of the meaning of the symbols on the unit and important safety precautions. The following is a list of precautionary symbols on the unit and their meaning:

Symbol <sup>1</sup>	Description
	The case of your Zebra 4Sight EV7 can become quite hot and should not be touched while operating. Always allow hot surfaces to cool down before touching your Zebra 4Sight EV7.
	<ul style="list-style-type: none"> <li>Caution: Consult this manual<sup>2</sup> before installing, connecting to, and using Zebra 4Sight EV7. For hardware installation instructions, refer to <i>Chapter 2: Getting started with your Zebra 4Sight EV7 unit</i> and <i>Chapter 3: Adding devices to Zebra 4Sight EV7</i>; for environmental and electrical specifications and connector pinout descriptions, refer to <i>Appendix B: Technical reference</i>.</li> <li>This product must be used as specified; otherwise, the protection provided by its components might be compromised. Any usage, changes, or modifications to Zebra equipment not expressly approved by Zebra could compromise product safety and void the user's authority to operate the equipment.</li> <li>Refer to the <i>Zebra 4Sight EV7 electrical specifications</i> section, in <i>Appendix B: Technical reference</i> for voltages and current ratings.</li> <li>There are no serviceable parts on this product. In case of defect, contact your Zebra representative.</li> <li>This product meets the requirements of a Category I installation as per industry standards<sup>3</sup>.</li> <li>This product is designed for use in a pollution degree 2 environment as per industry standards<sup>3</sup>.</li> <li>This product is designed for indoor use only.</li> <li>This product is designed to operate at temperatures ranging from 0°C to 45°C at a non-condensing relative humidity of 10 to 90%.</li> <li>This product is not intended for use at altitudes exceeding 2000 m.</li> </ul>
	<p>DC current only.</p> <p>Zebra 4Sight EV can be powered using a power supply between 12 V DC and 24 V DC<sup>4</sup>.</p>

1. Note that these symbols might not necessarily be the same color as depicted.

2. Manual available on the Zebra website at <http://www.https://www.zebra.com/us/en/products.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. The supply source of the equipment has not been evaluated as part of this investigation. Supply of the equipment shall be done by an Approved/Listed/Certified power supply unit that provides an output of 12-24 VDC, minimum of 150 W and isolated from the Mains by Reinforced Insulation.

### **General warnings**

To avoid damaging the Zebra 4Sight EV7 motherboard, follow these precautions:

- To ensure EMC conformity, connect the chassis ground pin of your Zebra 4Sight EV7 unit to earth.
- In environments where your Zebra 4Sight EV7 is subjected to vibrations, connect your third-party device to your unit using locking cables.

To avoid damaging the Zebra 4Sight EV7 unit, follow these precautions:

- Avoid the use of any chemicals or cleaning solutions. If necessary, the device can be wiped clean with a clean damp cloth.

### **Handling precautions**

The Zebra 4Sight EV7 motherboard is sensitive to static electricity and surges. To avoid damaging the motherboard, follow these precautions.

#### **Caution**

Be sure to turn off the power to the unit and all peripherals, as well as unplug the power from the unit before adding or removing devices.

- Do not touch the heat sink while the unit is operating; it might be very hot.
- Drain static electricity from your body by touching a metal fixture (or ground) before touching the motherboard.
- Wear a grounded wrist strap designed to prevent static discharge.
- Avoid letting your clothing come in contact with the motherboard.

## Manual overview

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This installation and hardware reference explains how to setup your Zebra 4Sight EV7 and connect external and internal devices.

This manual contains the following information:

- *Chapter 1: Before you begin* introduces you to the key features of your Zebra 4Sight EV7 unit, key to symbols on the unit, general warnings, and handling precautions.
- *Chapter 2: Getting started with your Zebra 4Sight EV7 unit* details how to get your Zebra 4Sight EV7 up and running. It includes instructions for connecting various peripherals to the front and back panels of the Zebra 4Sight EV7 unit.
- *Chapter 3: Adding devices to Zebra 4Sight EV7* details how to add devices to the Zebra 4Sight EV7 motherboard.
- The appendices provide useful information regarding the Zebra 4Sight EV7 unit. The appendices include a technical reference and a glossary.

## Need help?

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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](https://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.

Address: Zebra Technologies Corp3 Overlook Point, Lincolnshire, Illinois 60069, USA



**Chapter**

# 2

## **Getting started with your Zebra 4Sight EV7 unit**

This chapter explains how to operate your Zebra 4Sight EV7, including how to connect peripherals to the unit.

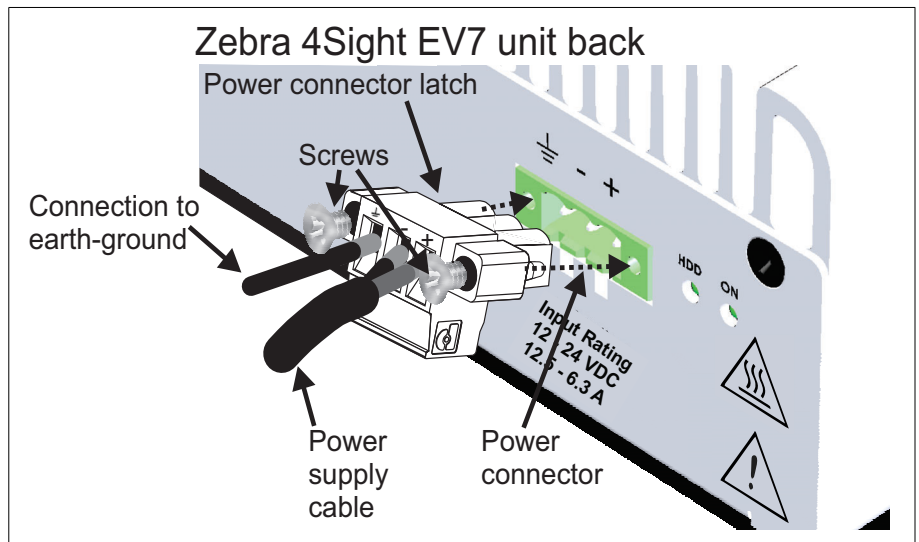
## Operating your Zebra 4Sight EV7 for the first time

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Perform the following steps to operate Zebra 4Sight EV7 for the first time:

1. Connect the power connector latch to the power supply cable's open wires and to earth ground.
2. Connect the power connector latch (attached to the power supply cable) to the unit's power connector.

Use the screws on the sides of the power connector latch to secure it in place. Note that the power connector latch will only fit into the unit's power connector in the following way:



3. Connect your display device(s), USB keyboard, and USB mouse to the unit.
4. Plug the power cable into a DC supply. The socket outlet should be located near the equipment and be easily accessible.

### Important



5. Turn the unit on using the power button on the back panel.

The default language is English. Additional display languages are provided, but must be installed using the OSConfig utility, accessible from the Windows Start menu. You can add or remove languages using this utility. Windows assumes that your keyboard language is the same as the language you selected. For more details, click on the More Info button of the OSConfig utility.

6. Verify that your connected devices are operating correctly.

Once your devices are operational, you can power down the unit to connect more devices to the motherboard, networking interface, or connect devices to the auxiliary I/O interface. For information on connecting devices to the auxiliary I/O interface, refer to the *Connecting to the auxiliary I/O interface* section, later in this chapter. For information on adding hardware to the Zebra 4Sight EV7 motherboard, refer to *Chapter 3: Adding devices to Zebra 4Sight EV7*.

### **Turning off the Zebra 4Sight EV7 unit**

To turn off the Zebra 4Sight EV7 unit, press the power button. You can also shut down the unit by shutting down Windows with the Shut Down command. If the unit does not respond to the above methods, push and hold the power button until the unit shuts down.

To disconnect power, remove the power supply input cord from the socket outlet. The socket outlet should be located near the equipment and be easily accessible.

#### **Caution**

Be sure to turn off the power to the unit and all peripherals, as well as unplug the power from the unit before adding or removing devices.

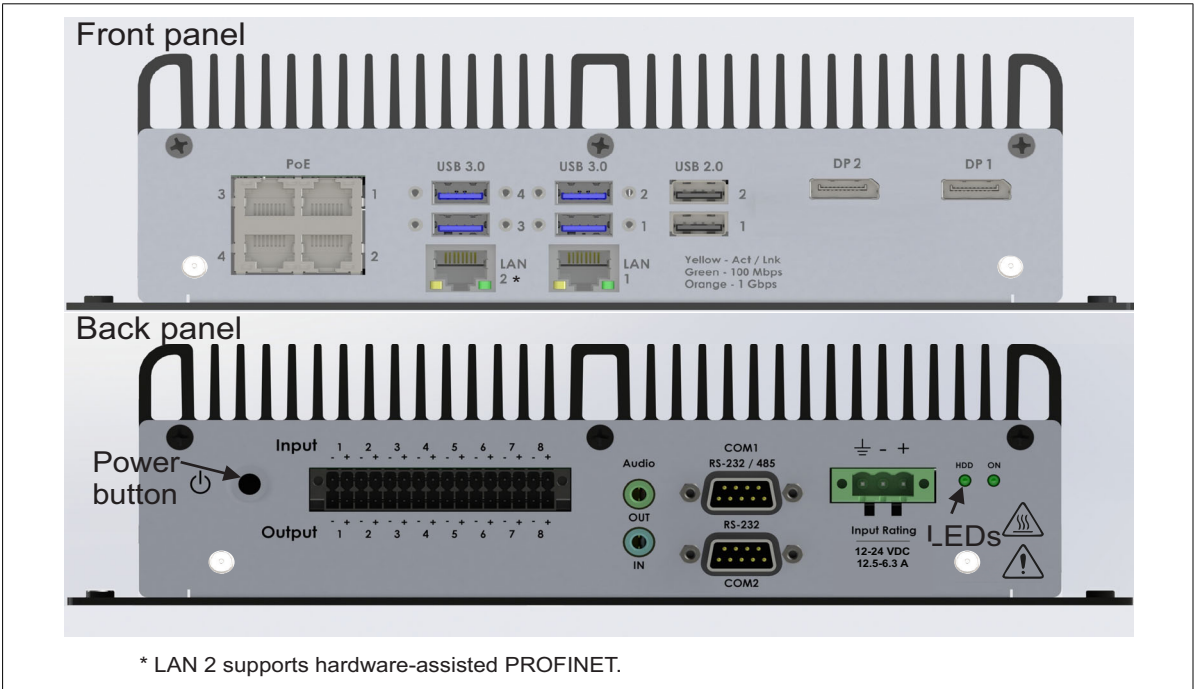
### **Rebooting the unit**

When the unit is on, you can reboot the unit using one of the two following techniques:

- Press the Control-Alt-Delete keys on your keyboard simultaneously.
- Press the power button to turn the unit off, and then press the power button to turn the unit on again. If you need to enter the UEFI Setup utility, you must press the Esc key during power-on self-test (POST). You only have a few moments to press the Esc key before the boot-up process continues.

## Connecting peripheral devices

The following sections describe how to connect various devices to the external connectors on the Zebra 4Sight EV7 unit.



### Caution

Be sure to turn off the power to the unit and all peripherals, as well as unplug the power from the unit before adding or removing devices.

Zebra 4Sight EV7 has connectors on its front and back panels to connect to the following devices:

- 6 Ethernet ports to connect to GigE Vision cameras and industrial and enterprise networks. There are four 2.5 Gigabit Ethernet ports that support Power-over-Ethernet (PoE) and two Gigabit Ethernet ports that do not. Typically, you connect your GigE Vision cameras to the ports that support PoE, and you use the other two ports to connect to your industrial and enterprise networks. Note that only LAN port 2 supports hardware-assisted PROFINET.

- 6 USB connectors are available to connect to devices such as USB3 Vision cameras, USB mouse, keyboard, printer, flash drive, or hard disk drive. USB hubs can also be used to connect multiple USB devices to a USB connector. Typically, you connect your USB3 Vision cameras to the USB 3.2 SuperSpeed connectors because they support speeds of up to 5 Gbps.

### Warning

In environments where your Zebra 4Sight EV7 is subjected to vibrations, connect your third-party USB devices to your unit using locking cables.

- 2 COM port interfaces (one RS-232 compatible and one which is both RS-232 and RS-485 compatible) to support connection to legacy automation devices.
- 2 DisplayPort (DP++) connectors to connect up to 2 high-resolution display devices<sup>1</sup>. For information on supported resolutions, see the *Summary* section, in *Appendix B: Technical reference*.
- 1 auxiliary I/O interface with 16 auxiliary I/O signals (8 inputs/8 outputs) that can be used to connect with external devices (for example, rotary encoder).
- 1 audio codex with support for line-level stereo audio input and output (for example, from a microphone with a pre-amplifier or to a speaker with an amplifier).

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1. Be aware that when using a passive DisplayPort cable adapter, DVI/HDMI resolutions are limited to HD only. Also, when using a passive DisplayPort-to-HDMI cable adapter, there will be no audio support.

## Networking connections

You can connect Zebra 4Sight EV7 to your local area network (LAN) to receive data from, for example, a GigE Vision-compatible camera, a robot controller, or a device (such as a PLC) that communicates using the PROFINET, EtherNet/IP, or Modbus industrial protocol. To do so, connect a network cable to one of the 6 Ethernet connectors, located on the back panel of the chassis. Typically, you connect your GigE Vision cameras to the ports that support PoE, and you use the other two ports to connect to your industrial and enterprise networks. Note that only the LAN 2 port supports hardware-assisted PROFINET.

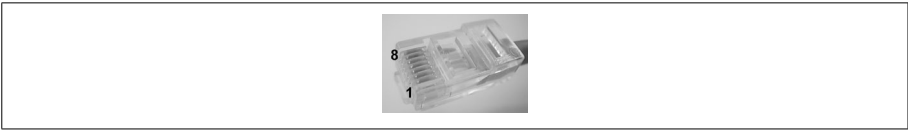
**Required cabling  
for Ethernet  
connections**

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
2.5 Gigabit Ethernet <sup>1</sup> (2.5 Gbits/sec)	Category 6 (CAT6) cable
Gigabit Ethernet (1 Gbits/sec)	Category 5e (CAT5e)/ Category 6 (CAT6) cable
Fast Ethernet (100 Mbits/sec)	Twisted Pair Category 5 (UTP5) cable
Twisted Pair Ethernet (10 Mbits/sec)	UTP5/ UTP3 cable

1. This speed is only supported on the ports that are labeled PoE.

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



**Network connections for Industrial communications**

To communicate using industrial protocols (such as Ethernet/IP or PROFINET), you must enable the service on your computer using the MILConfig utility, under the Communication tab. If using the PROFINET protocol, you must also have your device plugged into the LAN 2 port, which is the only port that supports hardware-assisted PROFINET.

### Using a PoE device with your Zebra 4Sight EV7

To power an external device with your Zebra 4Sight EV7 unit using Power-over-Ethernet (PoE), you must connect the device to the 2.5 Gigabit Ethernet connectors labeled PoE on the chassis and not those labeled LAN. By default, Power-over-Ethernet is disabled and must be enabled in the UEFI Setup utility before it can be used. If PoE is not enabled, the connectors operate as standard Gigabit Ethernet connectors.

To enable PoE, you must enter the UEFI Setup utility by restarting Zebra 4Sight EV7 and pressing the Esc key during power-on self-test (POST). You only have a few moments to press this key before the boot-up process continues. In the UEFI Setup utility, select the Peripheral configuration menu item from the Advanced menu. Then, select the Power Over Ethernet option, and in the next menu enable PoE by selecting Power Over Ethernet Port n, where n is the port you want to enable PoE on. Only enable PoE on the ports that require it. After this, reboot your system for the changes to take place.

- ❖ Note that, when PoE is enabled, each port can provide up to 15.4 W (12.95 W + cable loss) powered at +48 V<sub>dc</sub>.

### Important

A PoE camera connected to your Zebra 4Sight EV7 must be electrically isolated from the Zebra 4Sight EV7's chassis ground (functional ground). If required, use some isolation material between the camera and its fixture (camera mount). The PoE +48 V generated by the Zebra 4Sight EV7 unit is not electrically isolated from the chassis ground. It is important to avoid any alternate current return path to the Zebra 4Sight EV7 unit, which could jeopardize proper operation of your PoE camera.

### Important

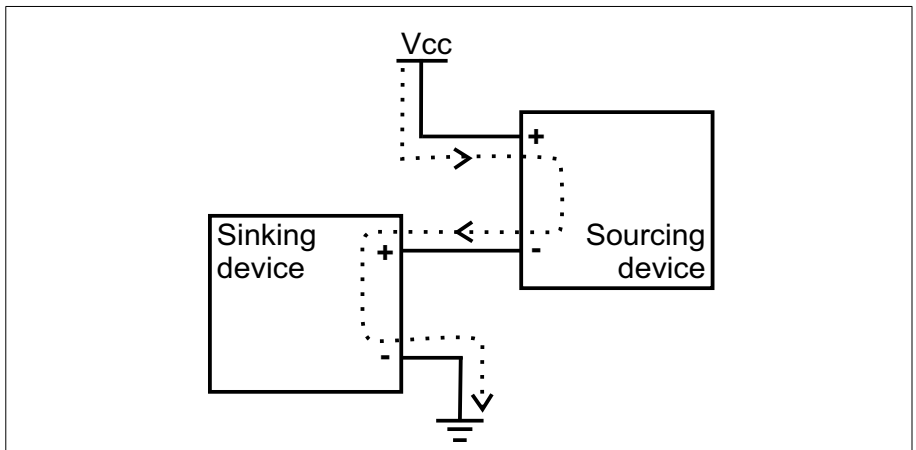
The following precautions should be taken whenever using PoE ports or peripherals:

- Make sure that your Zebra 4Sight EV7 unit is turned off prior to connecting or disconnecting any PoE peripherals.
- Enable Power over Ethernet (PoE) only on the ports that require it. If a peripheral does not require power from the Ethernet cable, keep PoE disabled on that port, through the UEFI.

## Connecting to the auxiliary I/O interface

Zebra 4Sight EV7 has an auxiliary I/O interface with 16 electrically isolated, industrial auxiliary signals that support sinking and sourcing configurations. 8 are inputs that can receive 24 V, and 8 are outputs that support up to 24 V.

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. If you are using Matrox Design Assistant, refer to the *Using I/O steps with GigE/USB3 Vision cameras* section of the *I/O steps* chapter in the *Matrox Design Assistant* help file for this information. If you are using MIL, refer to *Using MIL with GenICam* section in the *Grabbing with your digitizer* chapter in the *MIL* help file.

The signal names in this section have been shortened in both the text and the diagrams. AUX\_ISOIND\_INn has been shortened to AUX\_INn, and AUX\_ISOIND\_OUTn has been shortened to AUX\_OUTn.

### **Migrating from Matrox 4Sight GPM to Zebra 4Sight EV7**

Zebra 4Sight EV7 was designed to easily migrate devices already connected to a Matrox 4Sight GPM. The connections and signal names are the same between these two products; however, the following considerations should be made when migrating devices:

- Zebra 4Sight EV7 does not support TTL devices; therefore, TTL devices previously wired to Matrox 4Sight GPM cannot be migrated. Connecting TTL devices to your Zebra 4Sight EV7 unit could damage the device and unit.
- The auxiliary input signals of this product are meant to be used with a reference voltage of 24 V. Using a lower voltage power supply might provide unreliable detection of on and off states. For the auxiliary output signals, using a reference voltage below 24V might also cause issues if the voltage drop across the output is such that the connected device cannot detect an on state. When interfacing the output with a Type-2 or Type-3 digital input, an on state requires a voltage of at least 11 V across the input, whereas interfacing with a Type-1 digital input requires a voltage of at least 15 V across the input.
- Each individual auxiliary I/O signal on Zebra 4Sight EV7 is electrically isolated; therefore, there is no common reference to ground. When connecting I/O, be sure that each negative pin (-) is individually referenced to the ground of the power supply.
- 2-wire proximity sensors are supported, but will require a 2.2 KOhm bleeder resistor to be installed across the input terminals (the + and - pin). You must use at least a 250 mW rated resistor for this purpose.

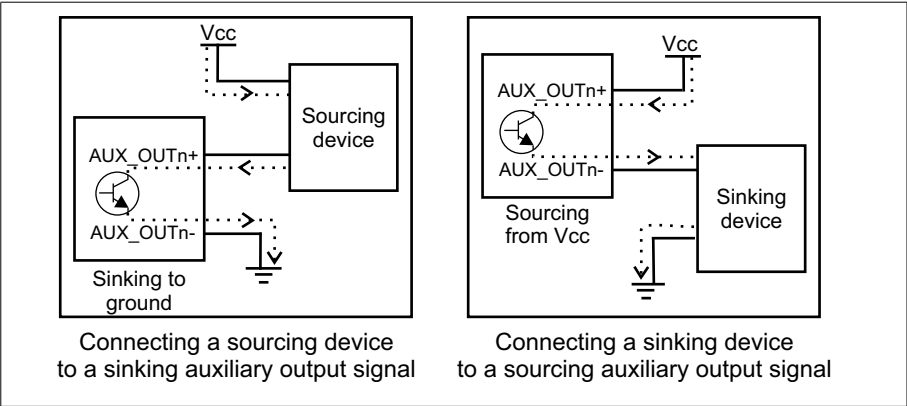
### **Connecting devices to the auxiliary output signals**

Zebra 4Sight EV7 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 4Sight EV7 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\_OUT+ and AUX\_OUT- pins is closed, allowing current to flow from the AUX\_OUT+ pin to the AUX\_OUT- pin, if the AUX\_OUT+ pin is attached to a power source

or a sourcing device. When an auxiliary output signal is off, the circuit between the AUX\_OUT+ and AUX\_OUT- 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 entirely on the type of device to which you connect. You should essentially connect your device respecting the following:



Equivalent circuit only

Important

Notice that the power source must be provided externally.

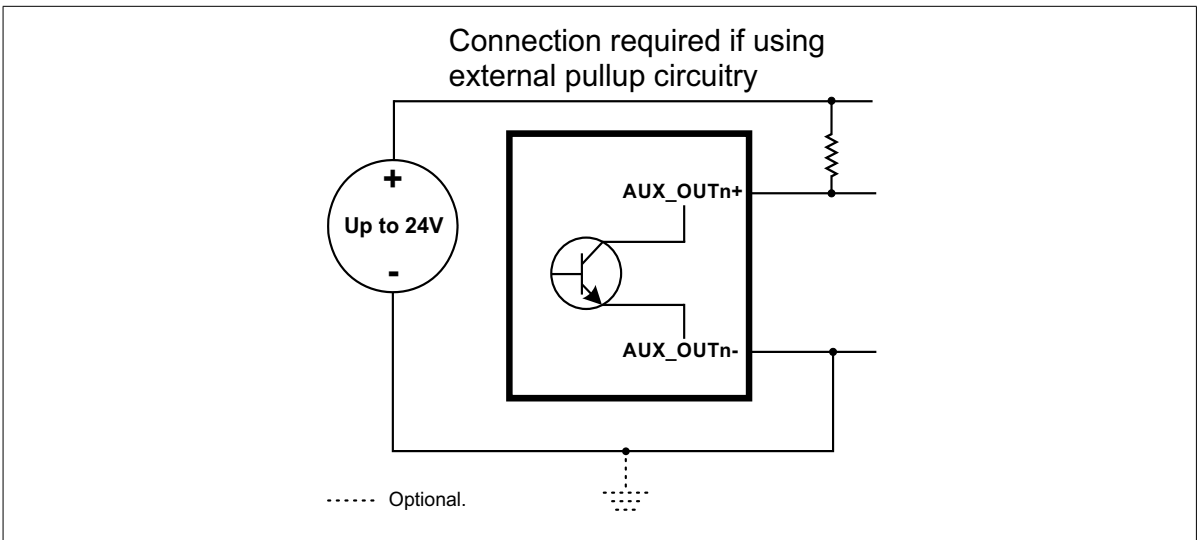
Depending on whether the auxiliary output signal is attached to a sourcing device or sinking device, the following can be observed:

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 source 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 predictable voltage levels to operate, pullup circuitry must be added.



Equivalent circuit only

To add pullup circuitry, attach an external pullup resistor. A resistance value between 2.2 and 5 KOhms, is suggested to protect your Zebra 4Sight EV7. Since your Zebra 4Sight EV7 auxiliary output signals can sink up to 100 mA, use the documentation of your input to calculate the required resistance for your external pullup 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.

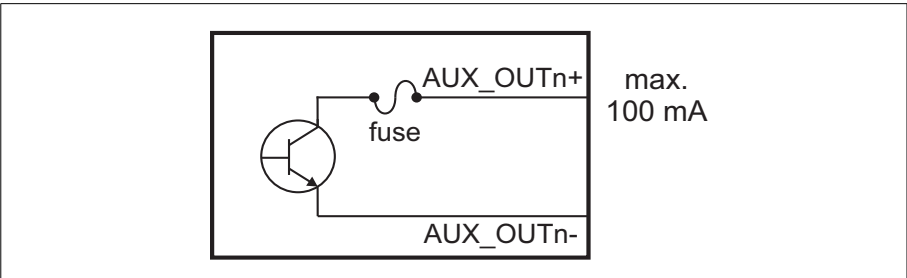
**Warning**

The Zebra 4Sight EV7 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 4Sight EV7 uses resettable fuses. The fuses protect Zebra 4Sight EV7 if you accidentally connect their corresponding auxiliary output signal to a device that sources/sinks more current than Zebra 4Sight EV7 can safely transmit. If more than 100 mA of current goes through, the fuse will eventually trip. After disconnecting your Zebra 4Sight EV7 from your device, the fuse will reset only after it has sufficiently cooled.

The diagram below depicts Zebra 4Sight EV7’s on-board fuse.



Equivalent circuit only

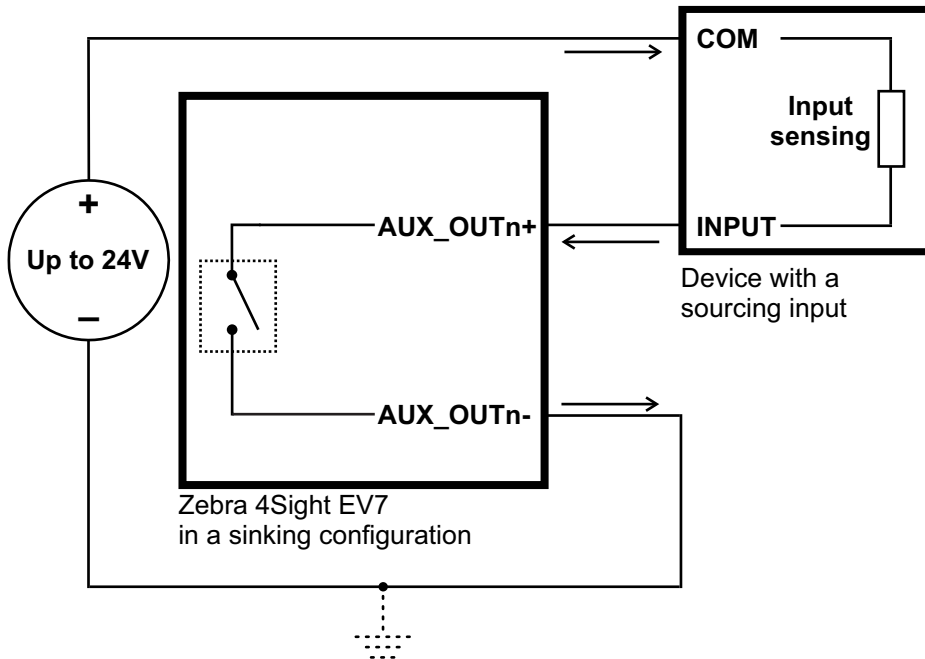
**About the connections in the following subsections**

The following subsections detail how to connect the most common third-party devices to the Zebra 4Sight EV7 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 the *Zebra 4Sight EV7 electrical specifications* section, of *Appendix B: Technical reference*.

### Connecting an auxiliary output signal to a sourcing input

Connect a Zebra 4Sight EV7 auxiliary output signal to a sourcing input, as shown below.



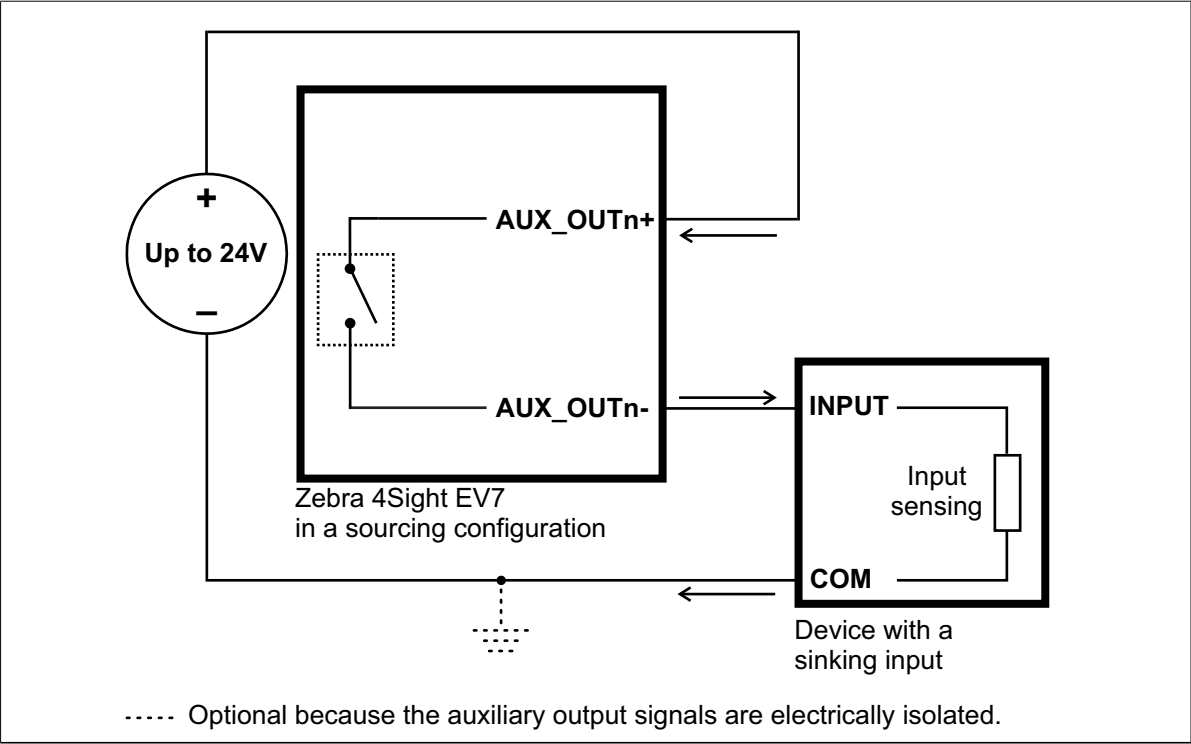
----- Optional because the auxiliary output signals are electrically isolated.

Equivalent circuit only

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

**Connecting an auxiliary output signal to a sinking input**

Connect a Zebra 4Sight EV7 auxiliary output signal to a sinking input, as shown below.

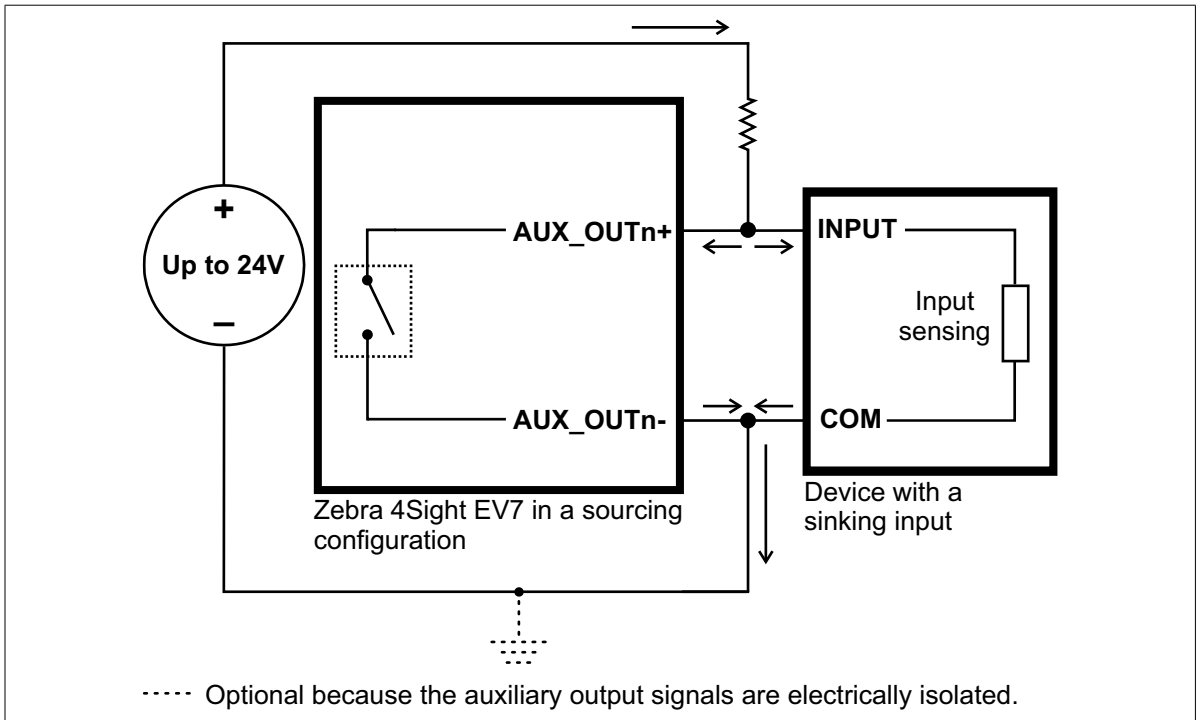


Equivalent circuit only

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

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

Connect a Zebra 4Sight EV7 auxiliary output signal to a sinking input using an external pullup resistor, as shown below. Since your Zebra 4Sight EV7 auxiliary output signals can sink up to 100 mA, use the documentation for your sinking device to calculate the required resistance for your external pullup resistor (if necessary).



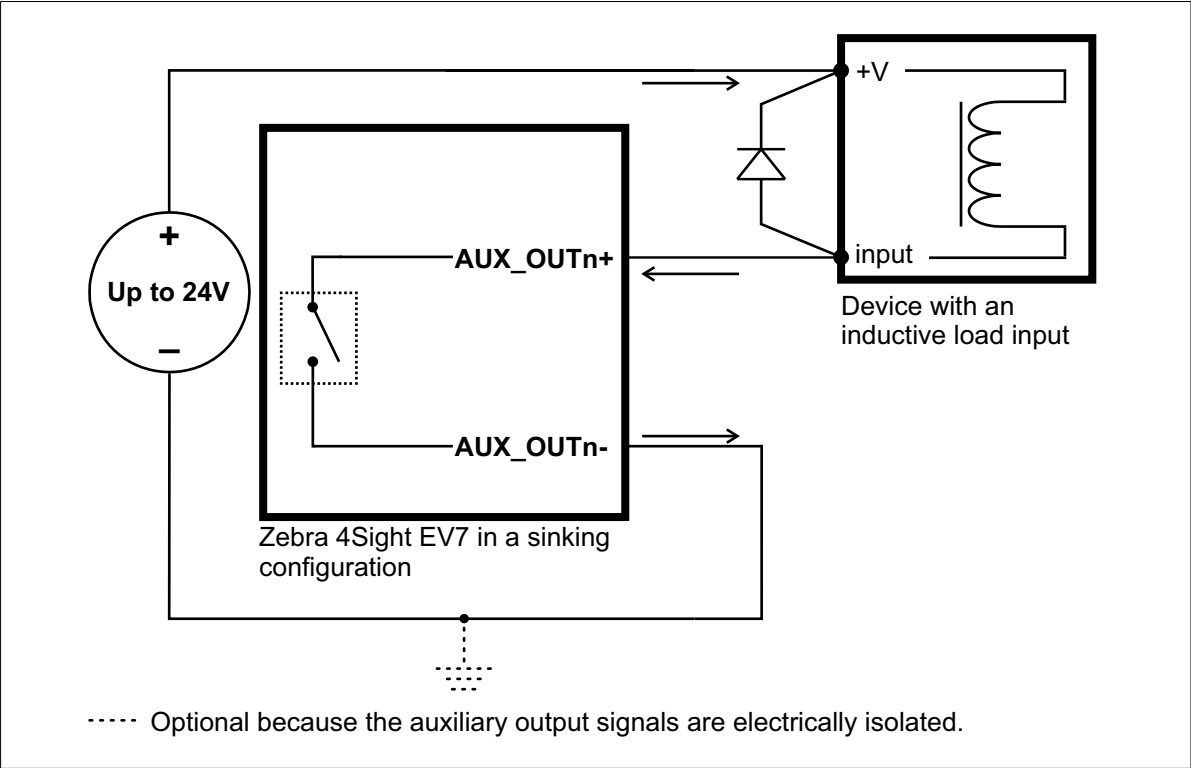
Equivalent circuit only

- ❖ 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 an inductive load input**

Connect a Zebra 4Sight EV7 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 4Sight EV7 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.

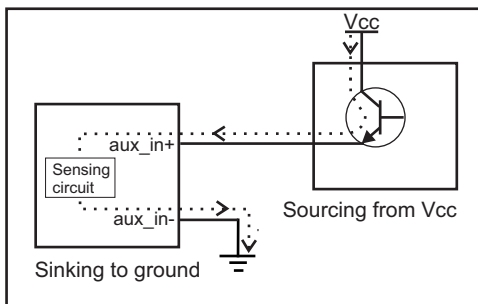


Equivalent circuit only

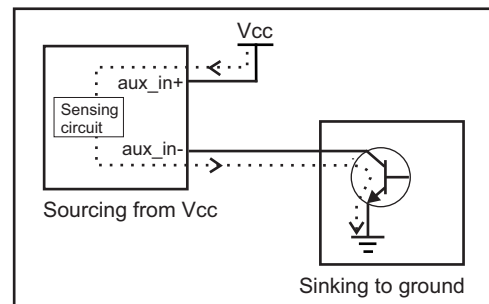
## Connecting devices to the auxiliary input signals

Zebra 4Sight EV7 auxiliary input signals can be interfaced with a wide variety of devices (such as proximity detectors and linear/rotary encoders). The Zebra 4Sight EV7 auxiliary input signals only detect when current flows between their AUX\_IN+ pin to their AUX\_IN- 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*.

You can connect the auxiliary input signals in a sinking or 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 a sourcing output device  
to a sinking auxiliary input signal



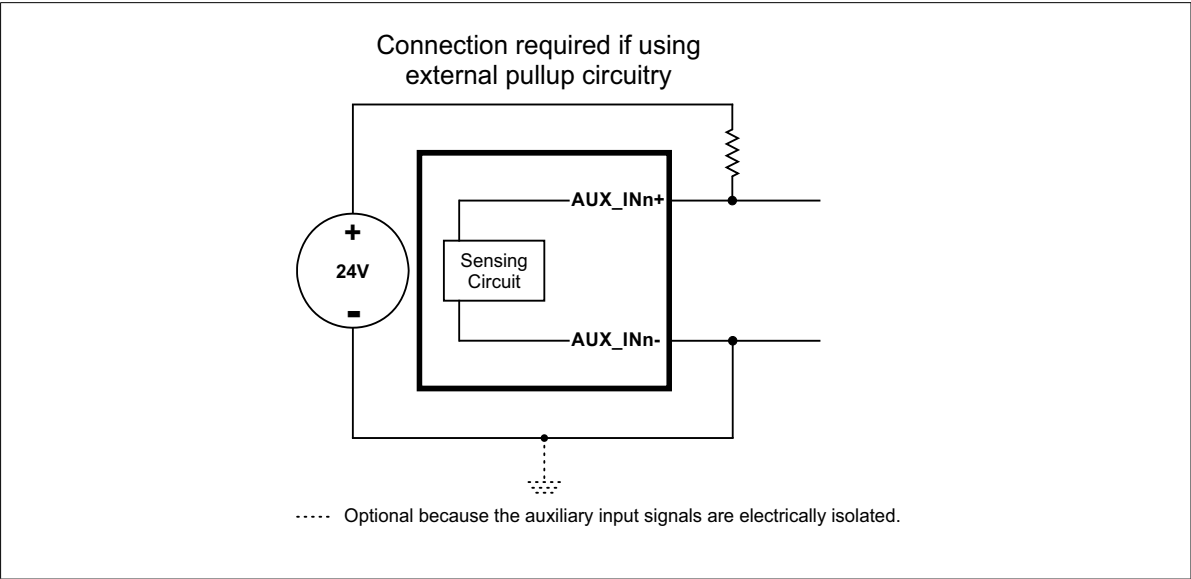
Connecting a sinking output device  
to a sourcing auxiliary input signal

Equivalent circuit only

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\_INn- pin to the electrical return path and the third-party output device is in a sinking configuration. In this case, select a resistor value that will not over current the output device and instead provides just enough current and voltage to your Zebra 4Sight EV7 auxiliary input signals, according to the *Zebra 4Sight EV7 electrical specifications* section in *Appendix B: Technical reference*. Note that you should use a resistor with an appropriate power rating for your circuit.

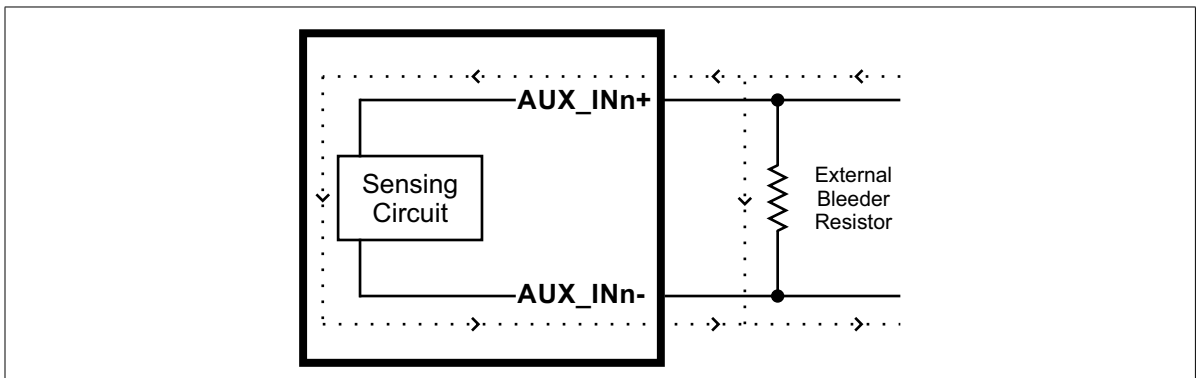


Equivalent circuit only



**Bleeder resistor**

By default, if properly configured, the current should flow from the AUX\_INn+ pin to the AUX\_INn- pin (when connected to a sourcing device), or from the AUX\_INn- 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 sensor). To boost the flowing current, connect a 2.2 KOhm external bleeder resistor between the AUX\_INn+ and AUX\_INn- pins. For example:



Equivalent circuit only

**About the  
connections in the  
following  
subsections**

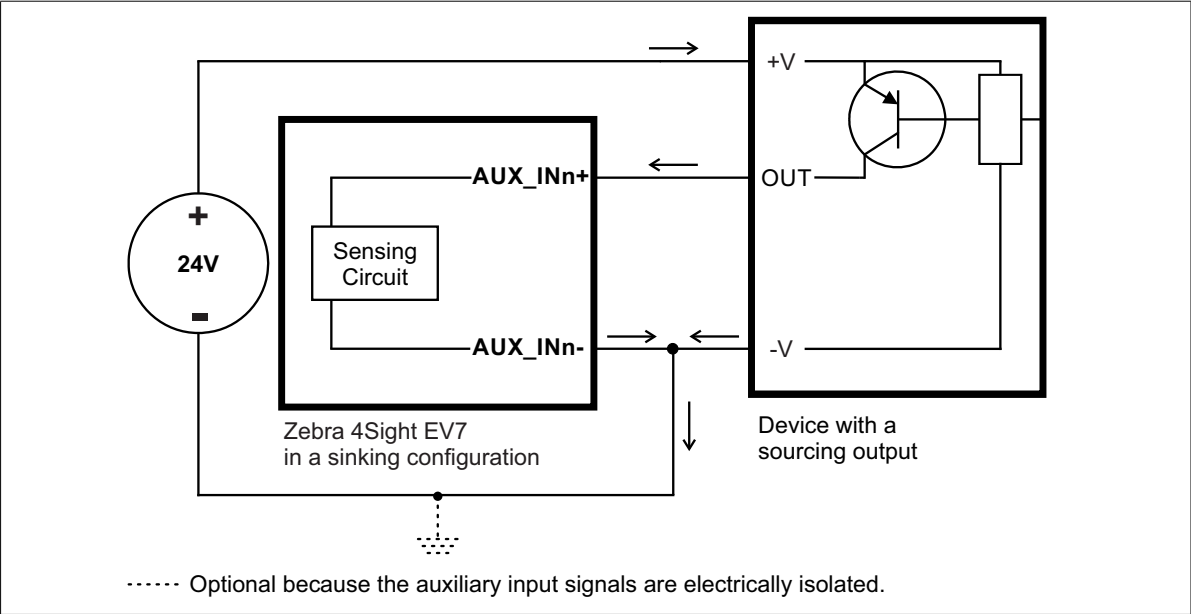
The following subsections detail how to connect the most common third-party devices to the Zebra 4Sight EV7 auxiliary input signals.

Note that ground is only shown in the following subsections for reference, in case you need to reference your return path to ground for some other reason (for example, if you want to reference your return path to the chassis's 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 electrically-isolated auxiliary input signals, in the *Zebra 4Sight EV7 electrical specifications* section, of *Appendix B: Technical reference*.

Connecting a sourcing output device to an auxiliary input signal

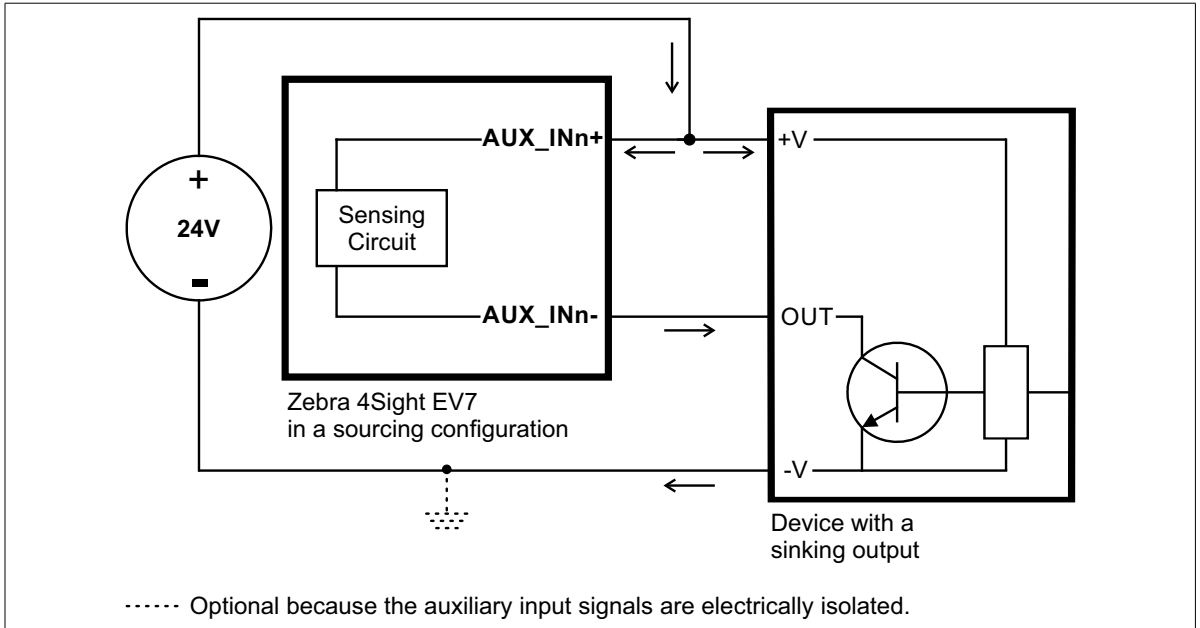
Connect a sourcing output device to Zebra 4Sight EV7 auxiliary input signal, as shown below.



Equivalent circuit only

### Connecting a sinking output device to an auxiliary input signal

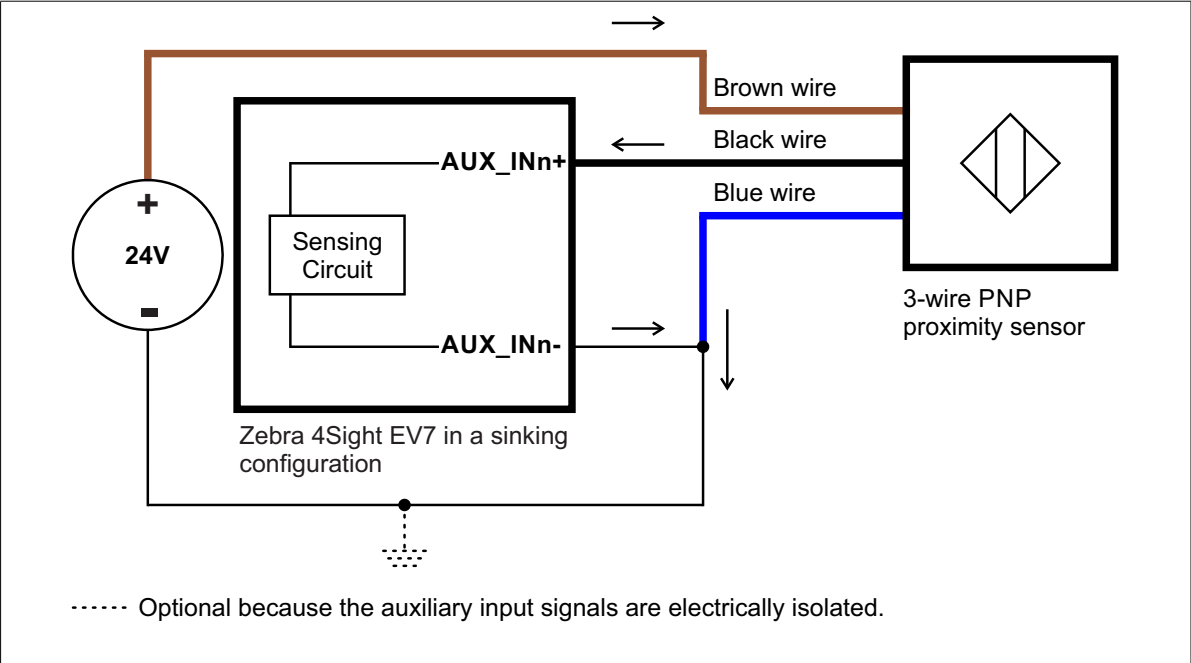
Connect a sinking output device to a Zebra 4Sight EV7 auxiliary input signal, as shown below.



Equivalent circuit only

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

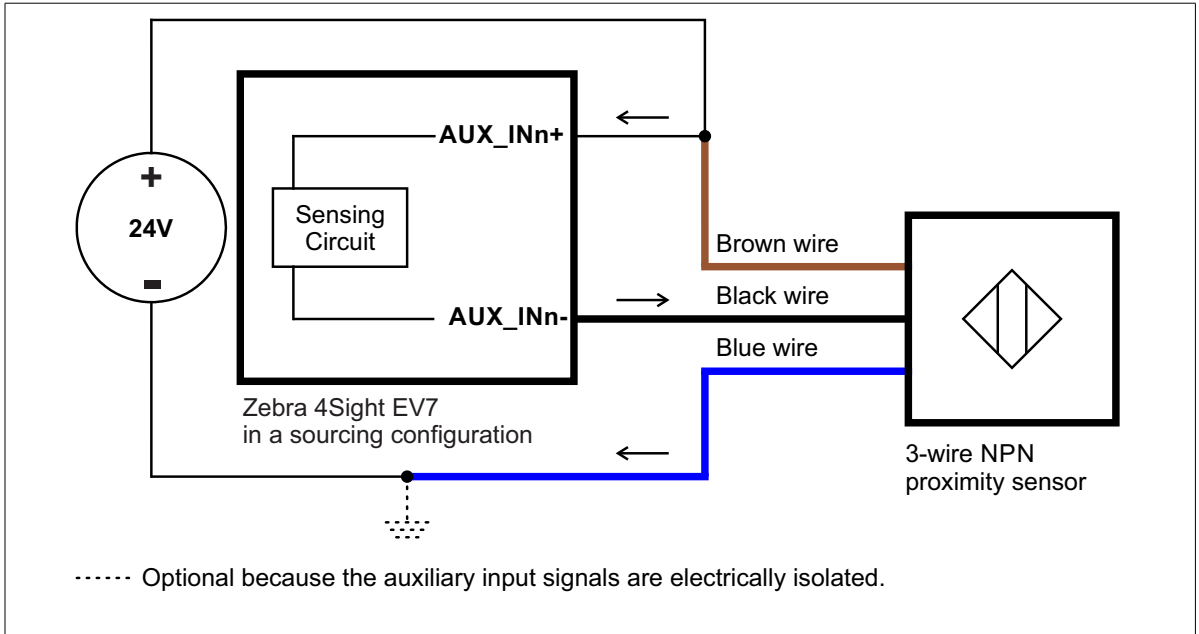
Connect a 3-wire PNP proximity sensor to a Zebra 4Sight EV7 auxiliary input signal, as shown below.



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 4Sight EV7 auxiliary input signal, as shown below.



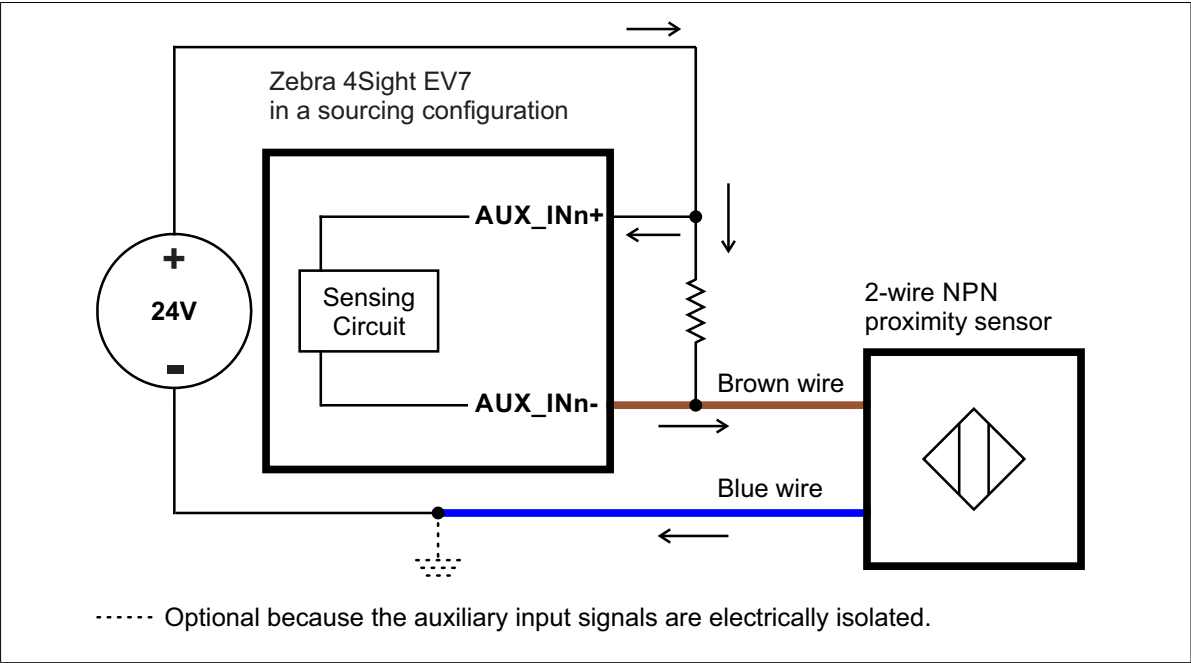
Equivalent circuit only

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

You can connect a 2-wire proximity sensor to a Zebra 4Sight EV7 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.

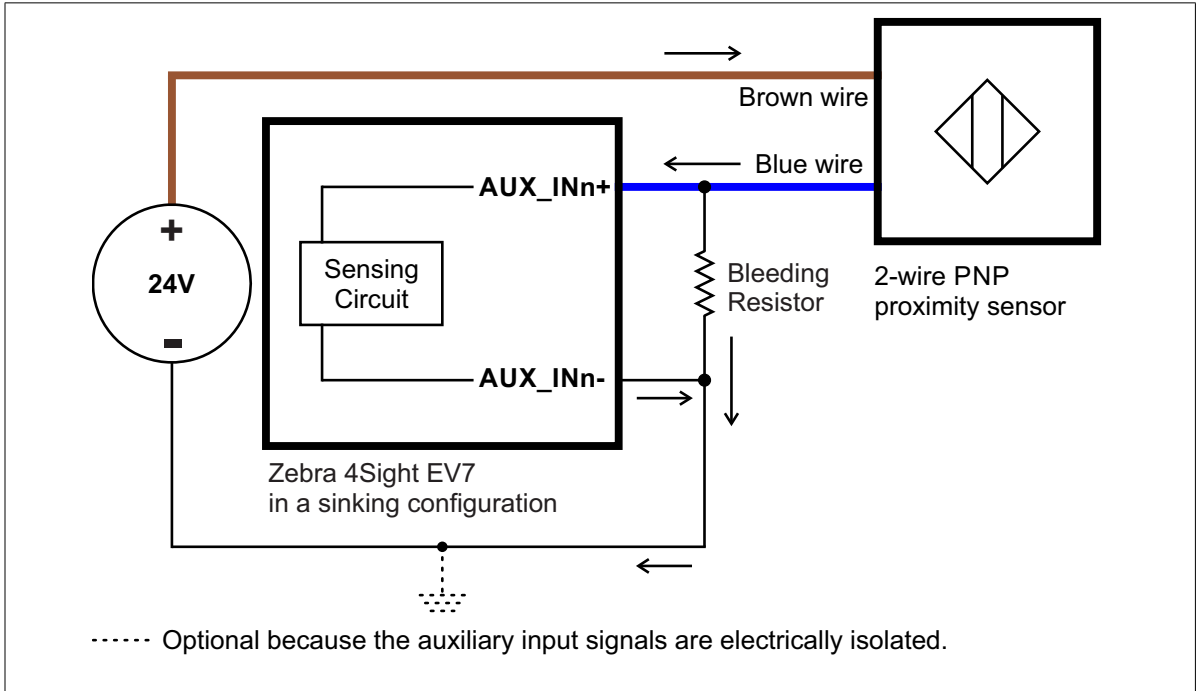
The bleeder resistor's value should guarantee that the minimal required current is provided to the connected sensor (the third-party device). Typically, a 2.2 KOhm bleeder resistor should be sufficient. For details regarding the sensor's minimum current requirements, refer to its documentation. Note 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\_INn+ pin and brown wire of the proximity sensor.



Equivalent circuit only

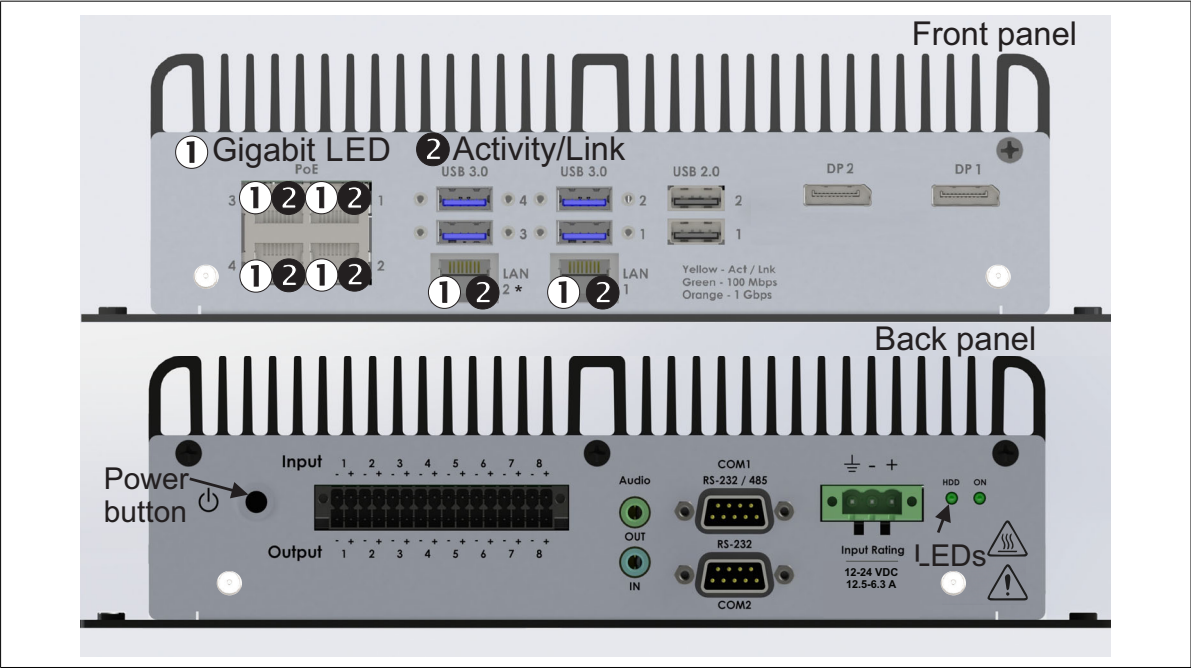
- For the auxiliary input signal to sink the current, connect the 2-wire device to an auxiliary input signal as shown below. Install the external bleeder resistor between the blue wire of the proximity sensor and the AUX\_INn- pin.



Equivalent circuit only

## Light emitting diodes (LEDs)

There are a total of 14 clearly-labeled LEDs on the Zebra 4Sight EV7 unit.





**Front panel LEDs**

On the front panel, there are two network LEDs for each of the Ethernet ports:

**Ethernet port LEDs**

- Ethernet link speed LED (orange/green). This LED turns orange when the port is using the 2.5 GBaseT or 1000 BaseT Ethernet network connection, and the LED turns green when the port is using the 100 BaseT Ethernet network connection.

This LED shuts off when the port is not using the 2.5GBaseT, 1000 BaseT, or 100 BaseT connection. When this LED is off, it indicates that the unit is using the 10 BaseT connection, *but only if the activity/link LED is yellow.*

- Activity/link LED (yellow). The activity/link LED for the Ethernet port turns yellow when the port is connected to a network, and blinks during data transfers. This LED shuts off when there is no activity present.

**Back panel LEDs**

On the back panel, there are two LEDs:

- Power LED. The power LED is on when Zebra 4Sight EV7 is receiving power and turned on.
- HDD LED. The mass storage LED turns green when any of the attached SSDs or HDDs are working (for example, reading or writing).



**Chapter**

# 3

## **Adding devices to Zebra 4Sight EV7**

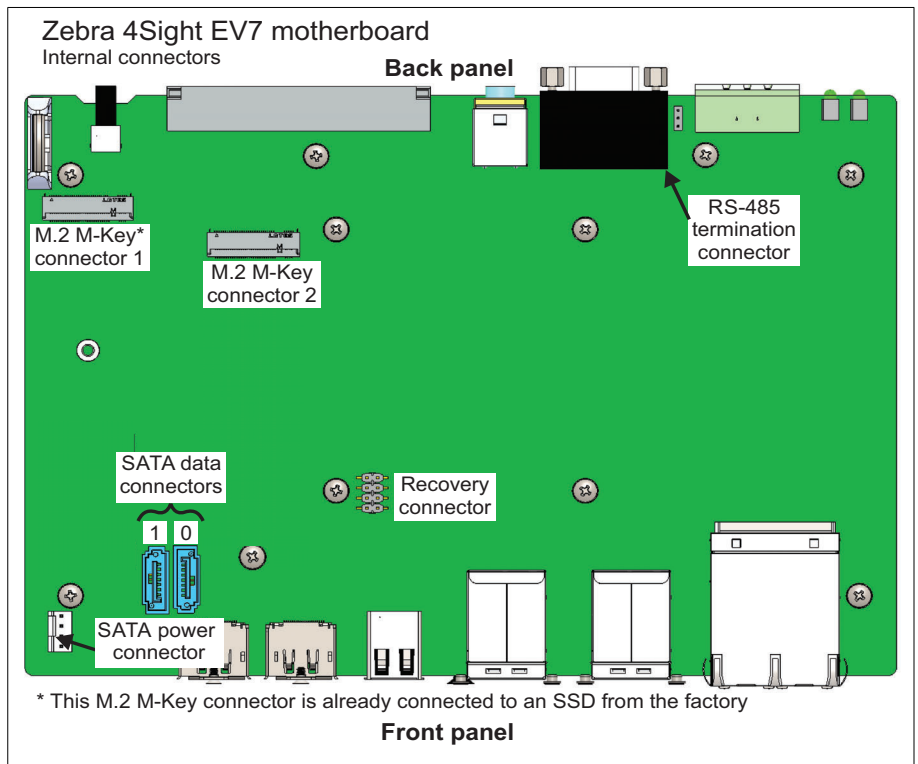
This chapter deals with additions that can be made to Zebra 4Sight EV7.

## Overview

Zebra 4Sight EV7 is designed to accommodate hardware additions through its internal connectors:

- Two M.2 connectors. An M.2 mass storage device comes already attached to M.2 M-Key connector 1.
- Two SATA 3.0 data connectors and one SATA 3.0 power connector. Connect a third-party SATA mass storage device to provide additional mass storage for your unit.

The following diagrams provides a reference to these connectors.

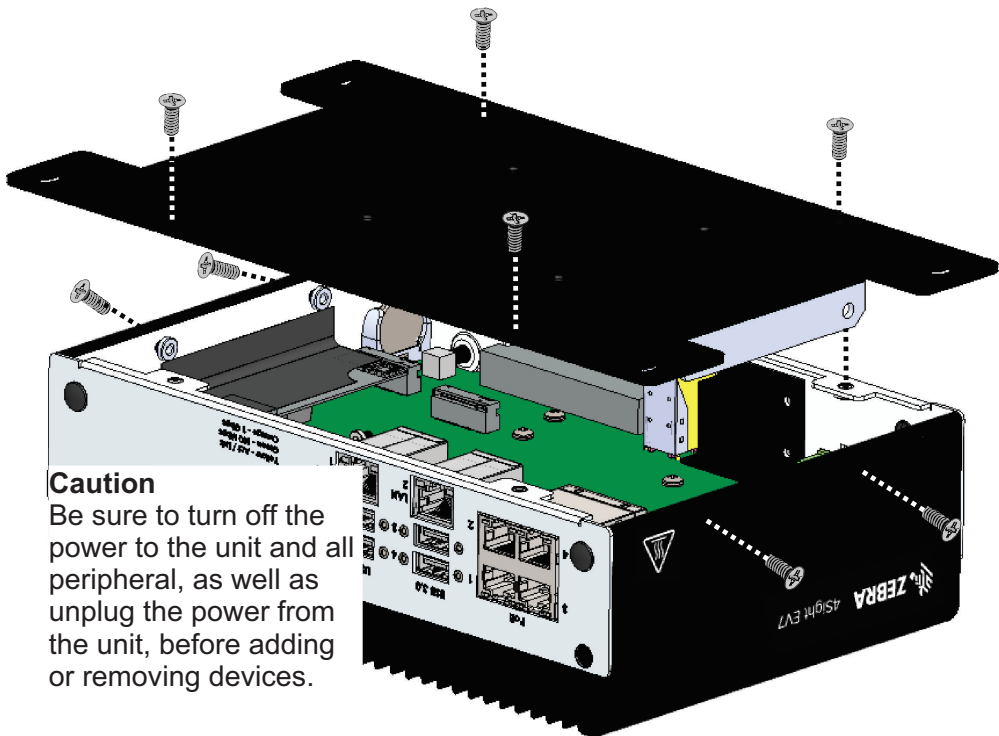


## Removing the Zebra 4Sight EV7 chassis cover

Follow the steps listed below to remove the chassis cover:

### Important

1. Unplug the Zebra 4Sight EV7 power cable.
2. Flip the unit so the bottom plate is easily accessible.
3. Using a Phillips #2 screw driver, remove the screws (illustrated below) from the Zebra 4Sight EV7 unit's sides and bottom panel.



### Caution

Be sure to turn off the power to the unit and all peripheral, as well as unplug the power from the unit, before adding or removing devices.

## Connecting a mass storage device

---

Besides the mass storage device connected to the M.2 connector, you can connect up to two additional mass storage devices (such as a hard disk drive (HDD) or solid-state drive (SSD)), using the SATA 7-pin connectors. Also, an additional NVMe SSD can be connected to the remaining available M.2 connector.

- ❖ Zebra 4Sight EV7 only supplies 5 V of power to its SATA power connector. Therefore, storage devices requiring a 12 V supply are not supported.

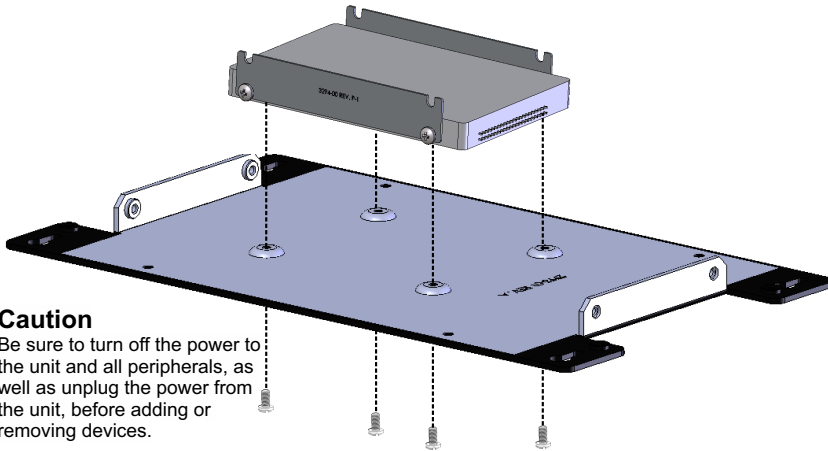
To install additional mass storage devices in the Zebra 4Sight EV7 unit, perform the following:

### Important

1. Unplug the power supply from your unit.
2. Remove the chassis cover. To see instructions on how to do so, refer to *Removing the Zebra 4Sight EV7 chassis cover* section, earlier in this chapter.
3. Two brackets are provided for the addition of one or 2 mass storage devices. Screw the brackets to opposite sides of one of the mass storage devices. The height of the brackets will extend beyond the device so that you can later install a second mass storage device (see image on the next page). It is best to install these brackets even if you don't plan on using a second mass storage device, so that they are not misplaced.

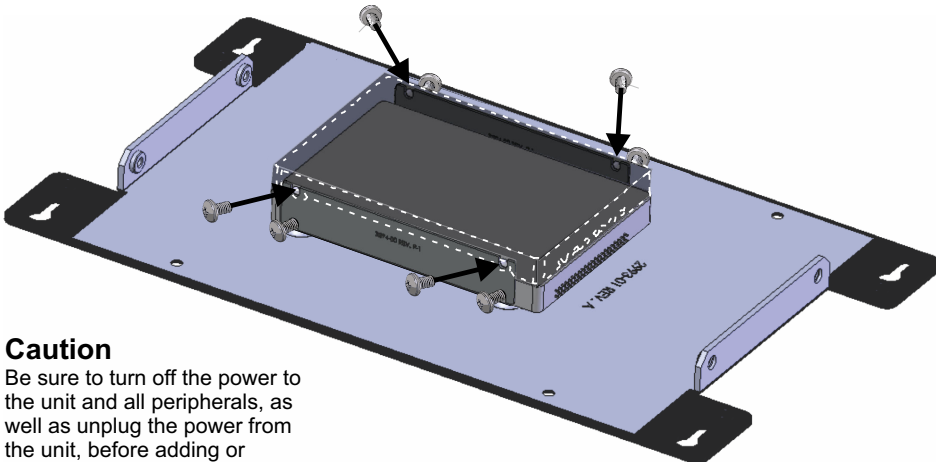
If you are attaching a second mass storage device, do not screw the first mass storage device to the brackets all the way yet.

4. Place the SATA mass storage device against the chassis cover, so that the drive's connector is closest to the serial number on the base plate (as depicted below).

**Caution**

Be sure to turn off the power to the unit and all peripherals, as well as unplug the power from the unit, before adding or removing devices.

5. Use a slotted screwdriver to screw in the 4 slot-head metal screws, included in your Zebra 4Sight EV7 package, to connect the base plate and the mass storage device.
6. If you are also attaching a second mass storage device, place this device on top of the first mass storage device, in between the brackets, and install the screws that connect the mass storage device to the brackets halfway.

**Caution**

Be sure to turn off the power to the unit and all peripherals, as well as unplug the power from the unit, before adding or removing devices.

7. Tighten the 4 screws that hold the bottom mass storage device to the brackets. If you are installing a second mass storage device, also tighten the 4 screws that hold the top mass storage device to the brackets.
8. Each SATA mass storage device has connectors to attach 2 cables: a 7-pin cable for data and a power cable. These must be connected to the appropriate connectors on the motherboard.
  - ❖ Note that, the cables fit best if they are coiled slightly before the base plate is lowered down on to the chassis.

### **Drive assignments**

When you connect a mass storage device to a 7-pin SATA connector, the operating system and UEFI identify it by the SATA connector (port) on the motherboard to which it is connected. The SATA connector closest to the left outer edge of the motherboard (where the peripheral ports are found) is port 1 and the other SATA connector is port 0.

You can run the UEFI Setup utility to verify the configuration of your mass storage devices. Do this by rebooting the Zebra 4Sight EV7 and pressing the Esc key during power-on self-test (POST). You only have a few moments to press this key before the boot-up process continues. In the UEFI Setup utility, you can now make changes to the connected drives, such as selecting a boot order or password protecting each drive.



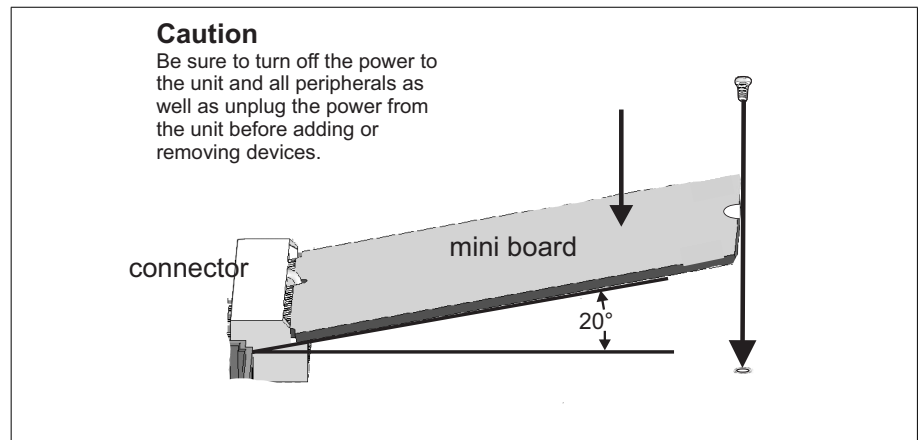
## Replacing the M.2 mass storage device attached to the M.2 connector

An M.2 mass storage device comes pre-installed in M.2 M-Key connector 1. This mass storage device comes pre-loaded with your software and licensing. You should make a backup of this mass storage device before replacing it. The installation procedure is the same for the other M.2 site.

To replace the M.2 mass storage device in the Zebra 4Sight EV7 unit, perform the following:

### Important

1. Unplug the power supply from your unit.
2. Remove the chassis cover. To see instructions on how to do so, refer to *Removing the Zebra 4Sight EV7 chassis cover* section, earlier in this chapter.
3. Remove the screw that holds the M.2 mass storage device to the motherboard. The board will spring up at a 20 degree angle. Pull the board out at the same angle.
4. Slip the edge of the new M.2 mass storage device into the connector from which you removed the previous mass storage device. The connecting edge will fit neatly into the socket, leaving the board at a 20 degree angle from the motherboard.



5. Press the mass storage device down and attach it to the motherboard with the same screw you removed in step 3.
6. Once the mass storage device is seated, reassemble the case.
7. Reconnect the power to your unit.
  - ❖ Note that, unlike the 7-pin SATA mass storage device, the M.2 mass storage device will draw its power directly through the motherboard.
8. After your Zebra 4Sight EV7 boots, run the UEFI Setup utility to verify that the mass storage device is identified correctly.

# **Appendix A:**

## **Hardware glossary**

This appendix defines some of the specialized terms used in the Zebra 4Sight EV7 documentation.

## Glossary

---

- Auxiliary I/O signal

See Auxiliary I/O line.

- Auxiliary I/O line

An auxiliary input or output line represents a physical line (pin) on which a general purpose, digital (on/off) I/O signal (auxiliary I/O signal) can be received or transmitted, respectively. An auxiliary input line can be used to receive, for example, a user-defined input signal, a trigger signal, or bit A or B of a quadrature encoder. An auxiliary output line can be used, for example, to transmit a timer active signal, a counter active signal, the output signal of the encoder interface, or a static software-controlled bit of a user output register.

- 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.

- Cache.

A memory area of the processor. The processor can access data from its cache faster than it can access data from system RAM or mass storage devices.

Many processors have a *primary* cache and a *secondary* cache. When searching for information, the processor first refers to the primary cache. If it cannot find the required information, it will then refer to the secondary cache.

- DDR5 SDRAM.

*Double data rate five synchronous dynamic random access memory.* A type of RAM used for image capture and processing.

See also *RAM*.

- Display memory.

Display memory is a dedicated storage area used for displaying data. Since a computer sends out data faster than a screen can display it, the data is temporarily stored in display memory. By default, the display memory is set to 32 Mbytes in the UEFI.

- Driver.

A software program that services an operating system so that the operating system can use a hardware device.

- Earth ground.

Earth ground is the reference point in an electrical circuit from which voltages are measured, a common return path for electric current, or a direct physical connection to the Earth.

- Ethernet.

The most common standard for the physical wiring and signaling on a local area network (LAN). A Gigabit Ethernet LAN supports data transfer at rates of 10 Mbits/sec, 100 Mbits/sec, or 1000 Mbits/sec, for Fiber Ethernet. In addition, 2.5 Gbits/sec, 5 Gbits/sec, and 10 Gbits/sec are supported for Ethernet over Copper.

See also *LAN*.

- Inductive load devices.

Inductive load devices include all forms of external devices that have inductor wiring, such as a relay or small motor. Devices connected to an inductive load device require a diode to protect them from over-voltage.

- IP address.

*Internet protocol* address. The electronic address of a computer or other device on a TCP/IP network, which should be unique for all devices on the network to function properly. Devices can have either a permanent or dynamically assigned address. The IP address is a dot address that is written as four sets of numbers separated by periods, also called dotted quad notation (for example, 203.142.62.2). The TCP/IP packet uses 32 bits to hold the IP address.

- LAN.

*Local area network*. A LAN is a group (or network) of computers and other devices that are connected together to share the resources (files, printers, devices, and other services such as internet access) of a single workstation or server within a small geographical area. The main LAN connection technology used is Ethernet cable, which connects users (clients) to the LAN's server. Clients download applications and/or services from the server, and then run or use them from their local computer.

- PoE.

*Power-over-Ethernet*. A network connection that passes electrical power along with data using Ethernet cabling. A PoE connection can power devices external to your unit, such as a network-aware camera or telephone.

- POST.

*Power-on self test*. This test is performed by the UEFI, as soon as the computer is turned on. POST gathers information about what the unit contains, and ensures that everything is working properly. It works by performing a list of tasks related to testing the RAM, the on-board hardware, the expansion boards, the mass storage devices, and other installed components. If all the tasks are completed, the UEFI will proceed to boot the operating system. If a task cannot be completed, POST will report an error to the UEFI, and a message will be displayed.

- Quadrature encoder.

An encoder with a quadrature output. It transmits a two-bit code (also known as Gray code) on two wires for each change in position of a rotating shaft (rotary encoder), or of a sensor along a scale (linear encoder). 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).

- RAM.

*Random access memory.* RAM is memory in which the operating system, application programs, and data in current use are stored so that they can be accessed by the processor. Information stored in RAM is lost when power is cut off. RAM chips can be typically installed on a memory module (such as a SO-DIMM memory module) that is plugged into the motherboard.

See also *SO-DIMM*.

- SSD

*Solid state drive.* A data storage device that has no moving (mechanical) components. They are typically more resistant to physical shock, run silently, have lower access time, and less latency than traditional hard disk drives (HDDs).

- SO-DIMM.

*Small outline dual in-line memory module.* A SO-DIMM is a memory module with integrated circuitry.

See also *RAM*.

- UEFI

*Unified Extensible Firmware Interface.* The interface between the operating system and the hardware. It is also responsible for booting the operating system when a unit is turned on. On legacy computers, this was referred to as a BIOS, and in some menu items BIOS and UEFI are used interchangeably.





# **Appendix B:**

## **Technical reference**

This appendix summarizes the key features of the Zebra 4Sight EV7 unit. In addition, this appendix provides pinout descriptions for external and internal connectors of the Zebra 4Sight EV7 unit.

## Summary

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### Motherboard

- Intel Core i3-1220PE or i5-1250PE processor. These processors are designed to accelerate multimedia and imaging applications, using streaming SIMD extensions (SSE, SSE2, SSE3, and SSSE4), and x86 architecture. Intel Quick Sync Video (QSV) technology is also available, which can be used with the MIL to significantly accelerate image conversion, compression, and decompression.
- 12-Mbyte cache.
- 2 262-pin SO-DIMM (dual channel) slots, each of which supports one non-removable, unbuffered DDR5 SDRAM SO-DIMM module, up to 32 Gbytes in size.

### Warning

The SO-DIMM modules are factory installed and should not be modified by the user because of their location.

- 2 M.2 socket connectors that are M-Key connectors.
- Four 2.5 Gigabit Ethernet ports and two Gigabit Ethernet ports. The 2.5 Gigabit Ethernet ports support Power Over Ethernet (PoE) and are labeled on the unit. The port labeled LAN 2 can connect devices to a PROFINET Engine that provides hardware-assisted PROFINET and supports a minimum I/O cycle time of 1 msec.
- 6 USB connectors. 4 of the USB connectors are USB 3.2 SuperSpeed ports and 2 are USB 2.0.
- 2 serial ports (one for RS-232 and one for either RS-232 or RS-485).

- 1 Advanced I/O Engine that includes the following:
  - 16 independent auxiliary sinking/sourcing I/O signals; 8 of which can be used to receive application-specific user input, and 8 of which can be used to transmit application-specific user output. The auxiliary input signals also have interrupt-generation capabilities.
  - 2 I/O command lists. The I/O command lists allow you to schedule I/O commands to change the state of a bit of an I/O command register at a specified time or counter value. The state of the bits can be routed to auxiliary output signals or can be used, for example, to trigger a timer. A command list allows software to schedule output events to occur at required moments, based on elapsed time or specific input events (number of transitions on an auxiliary input signal or a rotary decoder output signal).
  - 2 integrated quadrature decoders. The quadrature decoders can decode input received from rotary encoders or linear encoders with quadrature output. The quadrature decoders can receive quadrature input on any two auxiliary input signals, and support encoder frequencies of up to 40 kHz at 12 V and 20 kHz at 24 V. An external source must power the encoder.
  - 16 timers. Each timer is 32-bit and can count up to 4294967296 clock ticks before resetting. The timers can use one of the following as a clock source:

Clock source	Description
Zebra 4Sight EV7 Internally generated clock	The internal clock has a period of 80 nsecs, which can be used to program your timers.
Externally generated	Define an appropriate auxiliary input signal to use as a timer-clock input.
Based off another timer output	Timer 1 can use a clock based on Timer 2 or Timer 2 can use a clock based on Timer 1.
Based on a rotary decoder's output	In this case, the timer will act more as a counter because it is unlikely that the rotary decoder's output is periodic.

- 2 DisplayPort connectors (DP++)<sup>1</sup> to connect up to 2 high-resolution display devices; they can be enabled simultaneously for a dual-monitor display (extended desktop or cloned desktop).

Display Device	Maximum display resolution
Digital display device through a standard DisplayPort connection	4096 x 2304 @ 60Hz, 24bpp
Digital display device through a DP++ connection (DVI/HDMI)	1920 x 1200 @ 60Hz, 24bpp

- 1 audio controller with support for line-level stereo audio input and output (for example, from a microphone with a pre-amplifier or to a speaker with an amplifier).
- Power management features.

**Mass storage**

- A 256-Gbyte<sup>2</sup> M.2 2280 NVMe solid state drive (SSD) comes pre-installed from the factory in the Zebra 4Sight EV7 unit. This SSD is connected to an M.2 M-Key connector (which supports PCIe 3.0 x 4 NVMe M.2 SSDs).
- 2 SATA data connectors, which can be used to attach up to 2 more mass storage devices.

**Important**

Zebra 4Sight EV7 only supplies 5 V to the SATA power connector. Therefore, storage devices requiring a 12 V supply are not supported.

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1. When using a passive DisplayPort-to-HDMI cable adapter, there will be no audio support.

2. The size of the SSD is subject to change without notice, but will at minimum be 240 Gbytes.

**Battery**

- Used to maintain time and date settings of the motherboard's real-time clock.
- Chemistry: Lithium Carbon-Monofluoride ( $\text{Li}/(\text{CF})_x$ ) system.
- Capacity: 195 mAh.
- Battery voltage: 3 V.
- Diameter (max): 20 mm.
- Battery type: BR2032.

## **Chassis and dimensions**

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Zebra 4Sight EV7 provides a fanless design, with no moving parts. This reduces the need for physical maintenance and the cost associated with replacing consumable parts (for example, filters and fans).

The Zebra 4Sight EV7 may be placed on a level, flat horizontal surface. If installed in a cabinet, it is the user's responsibility to ensure that maximum operating conditions specified in this manual are not exceeded.

The unit may optionally be mounted vertically utilizing the four (4) integral mounting tabs.

Each mounting tab is provided with both a keyhole slot and a threaded through-hole that may optionally be used depending on the vertical surface and mounting means employed.

To ensure secure mounting when using the keyhole slots, be sure to orient the unit such that the narrow slot of the keyhole is facing upward. Choose fasteners that are suitable for use with the intended mounting surface and are sized to securely fit the keyhole dimensions without slipping.

The provided threaded through-holes are sized to accommodate 6-32 UNC threaded screws (not provided). To ensure secure mounting, use matching 6-32 UNC screws of a suitable length for the intended mounting surface.

The Zebra 4Sight EV7 unit weighs 2 kg.



Zebra 4Sight EV7 electrical specifications

Electrical specifications

- 12 V<sub>dc</sub> to 24 V<sub>dc</sub><sup>1</sup>

	Zebra 4Sight EV7
Steady-state current at nominal voltage operation	12.5 A @ 12 V to 6.3 A @ 24 V
Processor consumption	28 W (Thermal design power)
Enabled PoE consumption	+48 V <sub>dc</sub> (15.4 W) / port

Warning

To ensure EMC conformity, connect the chassis ground pin of your Zebra 4Sight EV7 unit to earth.

Operating voltage and current for the auxiliary signals of Zebra 4Sight EV7.		
Input signals	Operating range	12 V - 24 V (27 V abs.max)
	Input current	1.3 mA - 2.25 mA
	Input voltage threshold	9.4 V <sub>IL</sub> - 9.6 V <sub>IH</sub>
	ON voltage level	> = 10 V @ 1.3 mA
	OFF voltage level	< = 8 V @ 0.8 mA
	Typical OFF to ON response	0.4 μsec @ 12 V 0.2 μsec @ 24 V
	Typical ON to OFF response	0.2 μsec @ 12 V 1 μsec @ 24 V
	Maximum input frequency 12 V, 50% duty cycle	1.25 MHz
	Maximum input frequency 24 V, 50% duty cycle	500 kHz

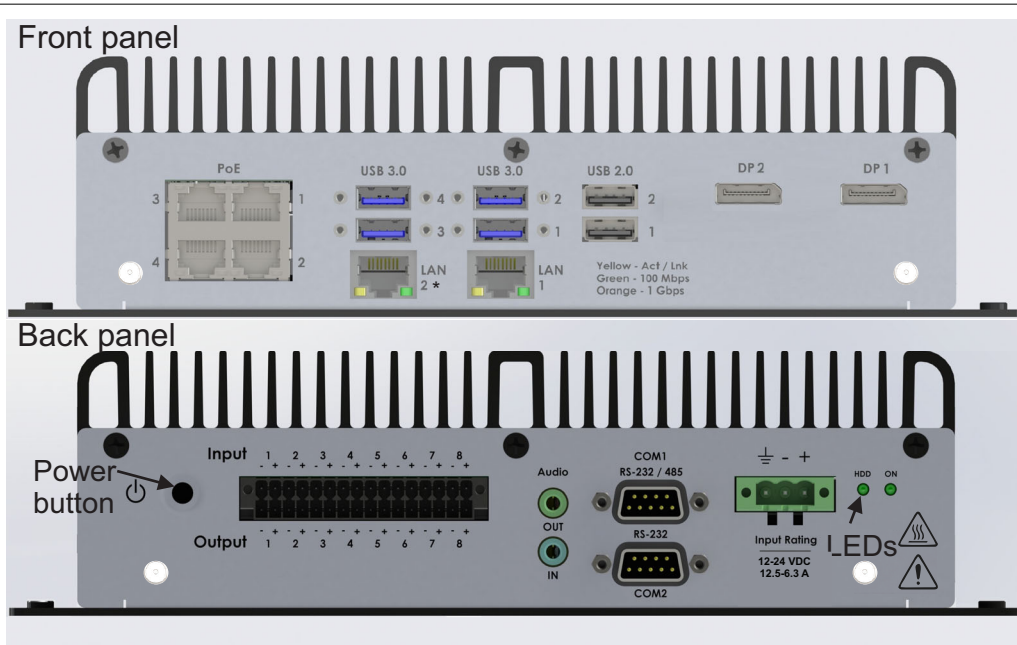
1. The input voltage range applies at the power connector of the unit. Ensure that the selected power supply, wire gauge, and length of cable meet these requirements. Supply of the equipment shall be done by an Approved/Listed/Certified power supply unit providing an output of 12-24 VDC, minimum of 150 W and isolated from the Mains by Reinforced Insulation.



Operating voltage and current for the auxiliary signals of Zebra 4Sight EV7.		
Output signals	Operating range	12 V - 24 V (27 V abs.max)
	Output current	10 mA (typical) - 100 mA (max)
	ON voltage level (closed)	1.5 V drop @ 30 mA across AUX_IOn+ and AUX_IOn- pins.
	Typical OFF to ON response	40 $\mu$ sec @ 12 V 50 $\mu$ sec @ 24 V
	Typical ON to OFF response	150 $\mu$ sec @ 12 V 240 $\mu$ sec @ 24 V
	Maximum output frequency 12 V, 50% duty cycle	6.1 kHz
	Maximum output frequency 24 V, 50% duty cycle	2.5 kHz

## Pinout descriptions of external connectors

Zebra 4Sight EV7 features connectors on the front panel and back panel.



\* LAN 2 supports hardware-assisted PROFINET.

### Front panel connectors

The following connectors are on the front panel of your unit:

- 4 USB 3.2 connectors.
- 2 USB 2.0 connectors.
- 4 2.5 Gigabit Ethernet connectors with PoE support.
- 2 Gigabit Ethernet connectors without PoE support (LAN 2 port supports hardware-assisted PROFINET).
- 2 DisplayPort connectors.

**USB 3.2 connectors**

The 4 USB 3.2 connectors are standard rectangular, Series “A”, 9-pin receptacles. These connectors are backwards compatible with 2.0/1.1. The USB 3.2 ports support SuperSpeed Gen1 x1, which operates at up to 5.0 Gbps. The pinout of these USB 3.2 connectors is described in the Specification v3.2 from the Implementers Forum. These connectors are typically used to connect USB3 Vision cameras.

**Warning**

In environments where your Zebra 4Sight EV7 is subjected to vibrations, connect your third-party device to your unit using locking cables.

- Operating voltage and maximum current: 5 V, 900 mA.
- Over-current protection: Yes.

**USB 2.0 connectors**

The 2 USB 2.0 connectors are standard rectangular, Series “A”, 4-pin receptacles. The pinout of these standard connectors is described in the Specification v2.0 from the Implementers Forum.

**Warning**

In environments where your Zebra 4Sight EV7 is subjected to vibrations, connect your third-party device to your unit using locking cables.

- Operating voltage and maximum current: 5 V, 500 mA.
- Over-current protection: Yes.

**Ethernet connectors**

The 6 Ethernet connectors (10/100/1000 BaseT/2.5 GBaseT) are identical 8-pin, RJ45 connectors. The pinout of the four 2.5 Gigabit Ethernet connectors follows the 2.5 GBaseT Gigabit Ethernet standard and the two other Ethernet connectors follow the 1000 BaseT Gigabit Ethernet standard. The 4 connectors identified as “PoE” are 2.5 Gigabit Ethernet ports that support Power-over-Ethernet, and can be enabled to support PoE individually. The connector labeled LAN 2 supports hardware-assisted PROFINET.

The network interface can be used for acquisition from GigE Vision cameras, for general purpose, network communication, or for communications with external devices using the PROFINET, EtherNet/IP, or Modbus industrial protocols. Typically, the PoE connectors are used to connect GigE Vision cameras.

- ❖ When PoE is enabled on a port, the port is powered at  $+48 V_{dc}$  for a maximum load of 15.40 Watts.

**Important**

A PoE camera connected to your Zebra 4Sight EV7 must be electrically isolated from the Zebra 4Sight EV7's chassis ground (functional ground). If required, use some isolation material between the camera and its fixture (camera mount). The Zebra 4Sight EV7 units provide a connected PoE device  $+48 V_{dc}$  of power. The PoE  $+48 V$  generated by the Zebra 4Sight EV7 unit is not electrically isolated from the chassis ground. It is important to avoid any alternate current return path to the Zebra 4Sight EV7 unit, which could jeopardize proper operation of your PoE camera.

For PROFINET communication on the Gigabit Ethernet connector labeled LAN 2, Zebra 4Sight EV7 includes a PROFINET engine that, if enabled, provides a hardware-assisted PROFINET interface. The hardware-assisted interface supports a minimum I/O cycle time of 1 msec. When enabling the hardware-assisted PROFINET interface, it will create a second Ethernet communication device with its own independent MAC address and IP settings. The LAN connection associated with the hardware-assisted PROFINET interface can be shared with other traffic.

**DisplayPort (DP++ ) connectors**

The two female DisplayPort 1.2 connectors are available to connect to a display device such as a monitor. These connectors are used for digital video output and support DP++. The output on these ports is limited to HD only when using DP++ for DVI/HDMI signaling. When using a passive DisplayPort-to-HDMI cable adapter, there will be no audio support.

- ❖ When using Zebra 4Sight EV7 with a monitor supporting a native resolution above HD through a DVI or HDMI input (using a passive DisplayPort adapter), it is possible that the display will become operational only after booting the operating system (the boot-up splash screen and BIOS setup/GRUB boot menu won't be visible). This means it won't be possible to easily access the BIOS setup/GRUB boot menu. To overcome this limitation, simply use a standard DisplayPort input instead of a DVI or HDMI input, or use an active DisplayPort-to-DVI/HDMI cable adapter.

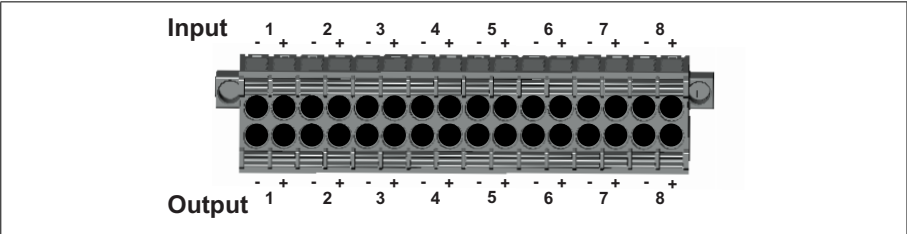
**Back panel connectors**

The following connectors are on the back panel of your unit:

- 1 auxiliary I/O terminal-block connector.
- 2 serial port connectors (one RS-232 COM port connector, and one RS232/485 COM port connector).
- 1 audio output (top) and 1 audio input (bottom) connectors.
- 1 power connector.

**Auxiliary I/O terminal-block connector**

The auxiliary I/O connector is a terminal-block type connector. It is shown below with the mating connector attached to the chassis. Each signal is required to have its own ground as shown in the following table:



Wire-terminal	Hardware signal name	MIL constant for auxiliary signal	Description
IN1 +, IN1-	AUX_ISOIND_IN1	M_AUX_IO8	Isolated, industrial auxiliary signal 8 (input). <sup>1</sup>
IN2 +, IN2-	AUX_ISOIND_IN2	M_AUX_IO9	Isolated, industrial auxiliary signal 9 (input). <sup>1</sup>
IN3 +, IN3-	AUX_ISOIND_IN3	M_AUX_IO10	Isolated, industrial auxiliary signal 10 (input). <sup>1</sup>
IN4 +, IN4-	AUX_ISOIND_IN4	M_AUX_IO11	Isolated, industrial auxiliary signal 11 (input). <sup>1</sup>
IN5 +, IN5-	AUX_ISOIND_IN5	M_AUX_IO12	Isolated, industrial auxiliary signal 12 (input). <sup>1</sup>
IN6 +, IN6-	AUX_ISOIND_IN6	M_AUX_IO13	Isolated, industrial auxiliary signal 13 (input). <sup>1</sup>
IN7 +, IN7-	AUX_ISOIND_IN7	M_AUX_IO14	Isolated, industrial auxiliary signal 14 (input). <sup>1</sup>
IN8 +, IN8-	AUX_ISOIND_IN8	M_AUX_IO15	Isolated, industrial auxiliary signal 15 (input). <sup>1</sup>
OUT1 +, OUT1-	AUX_ISOIND_OUT1	M_AUX_IO0	Isolated, industrial auxiliary signal 0 (output). <sup>2</sup>
OUT2 +, OUT2-	AUX_ISOIND_OUT2	M_AUX_IO1	Isolated, industrial auxiliary signal 1 (output). <sup>2</sup>

Wire-terminal	Hardware signal name	MIL constant for auxiliary signal	Description
OUT3+, OUT3-	AUX_ISOIND_OUT3	M_AUX_IO2	Isolated, industrial auxiliary signal 2 (output). <sup>2</sup>
OUT4+, OUT4-	AUX_ISOIND_OUT4	M_AUX_IO3	Isolated, industrial auxiliary signal 3 (output). <sup>2</sup>
OUT5+, OUT5-	AUX_ISOIND_OUT5	M_AUX_IO4	Isolated, industrial auxiliary signal 4 (output). <sup>2</sup>
OUT6+, OUT6-	AUX_ISOIND_OUT6	M_AUX_IO5	Isolated, industrial auxiliary signal 5 (output). <sup>2</sup>
OUT7+, OUT7-	AUX_ISOIND_OUT7	M_AUX_IO6	Isolated, industrial auxiliary signal 6 (output). <sup>2</sup>
OUT8+, OUT8-	AUX_ISOIND_OUT8	M_AUX_IO7	Isolated, industrial auxiliary signal 7 (output). <sup>2</sup>

- Supported inputs: interrupt/poll (M\_IO\_STATUS), timer clock (M\_TIMER\_CLOCK\_SOURCE), 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)
- Supported outputs: user bit (M\_USER\_BITn), timer output (M\_TIMERn), or an I/O command register bit (M\_IO\_COMMAND\_LISTn+M\_IO\_COMMAND\_BITn).

**Serial port connectors**

The 2 serial port connectors are 9-pin, D-subminiature male connectors (DB-9<sup>1</sup>). Although they are both configured for the RS-232 standard, the configuration of the top connector can be changed to accommodate the RS-485 standard by adjusting the unit’s settings in the UEFI Setup utility.

The top serial port connector (labeled Com1/RS-232/485) in RS-485 mode is not terminated by default. If your configuration requires that you instantiate termination of the RS-485 connection, refer to the *RS-485 termination connector* subsection of the *Pinout descriptions of internal connectors* section, later in this appendix.

The pins in the top serial port connector (RS-232/RS-485 standard) have the following pinout:

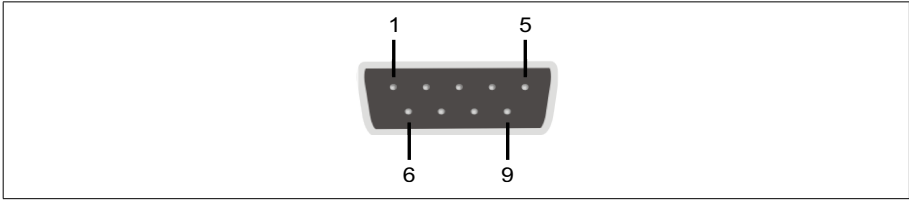
Pin	Hardware signal name	I/O	Description	
			RS-232 standard	RS-485 standard with resistor termination not activated <sup>1</sup>
1	NC	I	Not connected.	Not connected.
2	RXD	I	Receive data.	RXD -.
3	TXD	O	Transmit data.	TX -.
4	NC	O	Not connected.	Not connected.
5	GND	-	Ground.	Ground.
6	NC	I	Not connected.	Not connected.
7	RTS	O	Request to send.	TX +.
8	CTS	I	Clear to send.	RXD +.
9	NC	I	Not connected.	Not connected.

1. To set the RS-485 termination, see *RS-485 termination connector* subsection of the *Pinout descriptions of internal connectors* section, later in this appendix.

1. More accurately known as DE-9.



The pins in the bottom DB-9 connector have the following pinout:



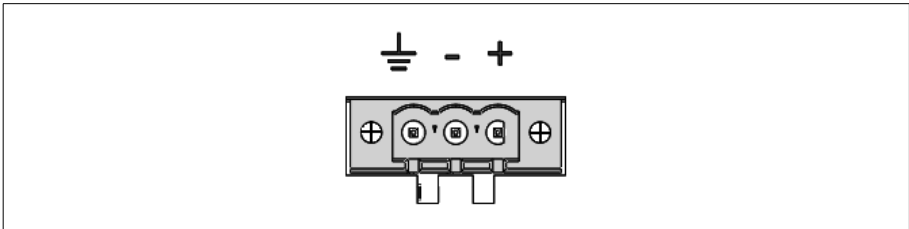
Pin	Signal	Description
1	CD	Carrier detect.
2	RXD	Receive data.
3	TXD	Transmit data.
4	DTR	Data terminal ready.
5	GND	Ground.
6	DSR	Data set ready.
7	RTS	Request to send.
8	CTS	Clear to send.
9	RI	Ring indicator.

**Audio input and audio output connectors**


The audio input and audio output connectors are 3.5 mm TRS mini-jacks designed to carry stereo audio. You can connect a stereo audio device to the audio input and output connectors, using a 3.5 mm audio input/output TRS mini-jack plug. The audio interface is only designed for line-level input/output operations. Since there is no output amplifier or input preamplifier, the interface does not support unamplified speakers or microphones without a preamplifier.

**DC power connector**

The DC power connector is a terminal-block connector. It is shown below with the single x3 mating connector attached to the chassis.



The positive (+) and negative (-) wire terminal slots must be connected for the device to be powered.

Wire-terminal	Purpose	Connecting wire color
	Chassis ground.	
-	Ground (- power).	Black <sup>1</sup>
+	Power.	Red <sup>1</sup>

1. Be aware that some power supplies might have different colors; verify the polarity of your wires before attaching them.

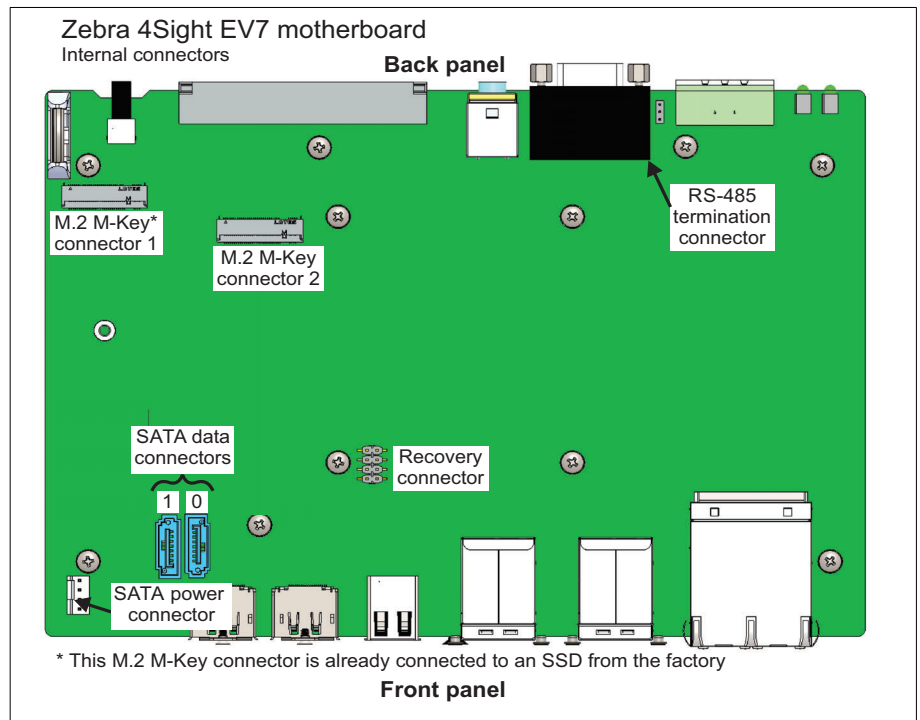
**Warning**

To ensure EMC conformity, connect the chassis ground pin of your Zebra 4Sight EV7 unit to earth.

## Pinout descriptions of internal connectors

Inside the unit on the motherboard, there are the following connectors:

- Two M.2 connectors.
- Two SATA data connectors.
- One SATA power connector.
- Recovery connector.
- A RS-485 termination connector.



**M.2 connectors**

The 2 M.2 connectors are 75-pin edge connectors that are M-Key. M.2 M-Key connector 1 is used to connect the M.2 mass storage device that comes already attached from the factory.

Note that the M.2 connectors only support a PCIe bus interface and not SATA; therefore you should only use NVMe SSDs with the M.2 connectors found on the Zebra 4Sight EV7 unit.

**SATA data connectors for mass storage devices**

The SATA connectors are 7-pin male connectors, used to connect mass storage devices. The pinout for the SATA connector is available on the website of the Serial ATA International Organization, <http://www.sata-io.org>.

When connecting a mass storage device, it should be mounted to the chassis cover. For more information, refer to the *Connecting a mass storage device* section, in *Chapter 3: Adding devices to Zebra 4Sight EV7*.

**SATA power for mass storage device**

The SATA power connector is a 4-pin connector. It is used to power up to 2 mass storage devices. The pinout for the SATA power connector is available on the website of the Serial ATA International Organization, <http://www.sata-io.org>.

- ❖ Zebra 4Sight EV7 only supplies 5 V of power to its SATA power connector. Therefore, storage devices requiring a 12 V supply are not supported.

**Recovery connector**

The recovery connector is a grouping of 2-pin standard, 2.54 mm, male connectors. It can force a hardware-reset of the CMOS, UEFI, and real-time clock.

- ❖ Note that the recovery connector should not be used unless you are directed to do so from Zebra Technical support.

Jumper	Description
Installed on Pins 1-2	Clear CMOS <sup>1</sup> .
Installed on Pins 3-4	Clear real-time clock.
Installed on Pins 5-6	UEFI recovery.
Installed on Pins 7-8	Reserved.

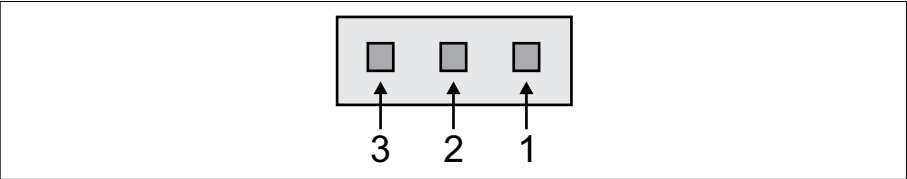
1. Pin 1 is marked with a white arrow on the motherboard. The arrow's direction indicates that pin 2 is directly beside pin 1.

**RS-485 termination connector**

The RS-485 termination connector is a standard 3-pin male connector that allows you to change the termination of the top-most serial port when in RS-485 mode.

To set or determine if the top-most serial port (the RS232/485 COM port) is in RS-232 or RS-485 mode you must set it accordingly in the UEFI Setup utility. To enter the UEFI Setup utility, restart Zebra 4Sight EV7 and press the Esc key during power-on self-test (POST). You only have a few moments to press this key before the boot-up process continues. In the UEFI Setup utility, select the Advanced menu and open the Peripheral configuration sub-section. Under the FPGA Com 1 option, select between RS232 or RS485.

Communication in RS-485 requires a 120  $\Omega$  termination on the differential receiver pair of the RS-485 serial port connector. If your unit is to provide the RS-485 termination for the signal, install the RS-485 termination jumper on pins 3-2.



Jumper	Description
Installed on Pins 3-2	Termination is instantiated by the unit on the RS-485 connection.
Installed on Pins 2-1	No termination is instantiated by the unit on the RS-485 connection.



# **Appendix C:**

## **Operating system recovery**

This appendix provides instructions on how to restore or backup your operating system.

## Zebra 4Sight EV7 Windows 10 IoT Enterprise configuration utility

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Zebra 4Sight EV7 comes with the Windows 10 IoT Enterprise operating system pre-installed. To backup and restore Zebra 4Sight EV7, the Zebra 4Sight EV7 Rescue utility and the Zebra 4Sight EV7 Windows IoT Enterprise configuration utility (OSConfig) come pre-installed; these utilities allow you to:

- Capture for deployment. Creates a master image of your Zebra 4Sight EV7 unit's operating system partition so that you can deploy the unit's operating system, applications, and user settings, to multiple Zebra 4Sight EV7 units. The capture process creates a rescue USB key with a capture-for-deployment backup *.wim* file. When you deploy the image, Out-Of-Box-Experience customization steps are also performed, which assign a new unique ID to the new unit.
  - OS backup. Creates a backup image of your Zebra 4Sight EV7 unit's operating system partition and saves it to a USB key or specified drive. This process makes a backup (*.wim*) file similar to the capture-for-deployment backup, except it retains the unit's ID. This backup is only useful to restore the same unit from which the original backup was made, because it will also restore the unit's unique ID. When creating this type of backup, you have the option to simply save the backup file, or to create a rescue USB key (that is, to also configure the key with other files necessary for installing the backup image).
  - Restore. Reverts Zebra 4Sight EV7 to its factory default settings, restores an OS backup, or restores a capture-for-deployment backup.
- ❖ Note that the default mass storage device shipped with your Zebra 4Sight EV7 (M.2 SSD) has 4 partitions. The partitions are labeled as follows:
- RECOVERY. This partition is not assigned a drive letter.
  - OS. This partition is assigned to the C: drive.
  - SYSTEM. This partition is not assigned a drive letter.
  - MSR. This partition is not assigned a drive letter.

This appendix only deals with the RECOVERY and OS partitions.



The RECOVERY partition houses the Zebra 4Sight EV7 Rescue utility and factory image, and does not get reformatted if you restore an OS backup .wim file from the Matrox Rescue utility console. However, if you use a rescue USB key with a capture-for-deployment backup .wim file (*W10EV7.wim*), then both the RECOVERY and SYSTEM partitions are reformatted and restored to their original factory-configured state with the original software provided by Matrox.

To perform any of the backup, capture, or restore tasks, you must access your Zebra 4Sight EV7 directly since remote desktop is not available in the recovery environment. To access the unit directly, connect a display device, keyboard, and mouse to your Zebra 4Sight EV7. For information, refer to *Connecting peripheral devices* section, in *Chapter 2: Getting started with your Zebra 4Sight EV7 unit*.

For the latest information on backup, capture, and restore features, refer to the *OSreleasenotes.txt* file, found on the C: drive of your Zebra 4Sight EV7.

## Microsoft Windows Out-Of-Box-Experience (OOBE)

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When you start your Zebra 4Sight EV7 for the first time, Microsoft Windows performs its Out-Of-Box-Experience (OOBE) customization steps. The OOBE automatically performs initial customizations (such as setting the date and time), and creates a default user, MtxUser, and password, Matrox. The OOBE also generates a unique ID for your Zebra 4Sight EV7. At the end of your OOBE, a Recommended actions window pops up and prompts you to set your time zone. After you have set your time zone accordingly, ensure that User Account Control (UAC) is off, and optionally choose to create a restore USB. To find the Recommended actions window after completing the OOBE, open the OSConfig utility and go to the Others tab. For information on the OOBE default settings, refer to the *OSreleasenotes.txt* file on your Zebra 4Sight EV7 unit's C: drive.

If you backup your Zebra 4Sight EV7 with the OS backup option, the unique ID and initial OOBE customizations are saved inside the OS backup (*.wim* file); when you restore the OS backup, the unique ID is also restored. Be aware that if two units (or other devices) on the same network have the same ID, you will have issues. However, if you use the capture-for-deployment option to backup your Zebra 4Sight EV7, the ID and initial OOBE customizations are not saved; when you restore a captured backup on a Zebra 4Sight EV7 unit, Windows will perform its OOBE and generate a new unique ID and initial OOBE customizations for the unit.

## Capturing the Zebra 4Sight EV7 operating system partition for deployment

---

You can capture an image of your Zebra 4Sight EV7's operating system partition (the operating system, application, and some settings) and then deploy it on multiple Zebra 4Sight EV7 units. The capture-for-deployment process will save the image to a capture-for-deployment backup *.wim* file, while also creating a rescue USB key so that you can deploy the capture to other Zebra 4Sight EV7 units. The capture-for-deployment backup *.wim* file does not contain the user settings and unique ID of the original unit. When you deploy the capture to the target units and reboot them, Microsoft Windows OOBE will assign them their own unique ID and allow you to configure their user settings.

To capture an image of your Zebra 4Sight EV7 unit's operating system partition, you must access your Zebra 4Sight EV7 directly; you cannot perform this task remotely. To access the unit directly, connect a display device, keyboard, and mouse to your Zebra 4Sight EV7. For information, refer to *Connecting peripheral devices* section, in *Chapter 2: Getting started with your Zebra 4Sight EV7 unit* for more information.

To make a capture-for-deployment backup of your Zebra 4Sight EV7, perform the following steps directly on your Zebra 4Sight EV7:

1. From the Windows Start menu, launch the OSConfig utility. Disable the Unified Write Filter (UWF) (if it is on), so that you can write to the drive. This option is found on the Write Filter tab of the OSConfig dialog.
  2. Configure your Zebra 4Sight EV7 unit to your required specifications and ensure that you do not need to make any more changes.
  3. Open the OSConfig utility from the Windows Start menu and select the Capture OS tab; then, click on the Reboot to Audit Mode button. Your Zebra 4Sight EV7 will reboot in audit mode (administrative mode).
  4. When the reboot process completes, the System preparation tool dialog opens. Click on the Cancel button to close this dialog.
- ❖ Note that, when you boot in audit mode, the System preparation tool dialog opens every time. You can close or ignore this dialog.

5. Now, in audit mode (administrative mode), open the OSConfig utility and select the Capture OS tab; then, click on the Reboot and launch capture tool button.
6. When the reboot process completes, a list of possible options are displayed. Click on the Troubleshoot option and then on the Matrox Rescue Utility option.
7. When the Matrox Rescue Utility dialog opens, you must read the license agreement. When done, click on the I agree button to accept the license agreement.
8. The next page is presented, with an option already selected: Capture the OS for deployment; leave this option as is. Below this, you can specify the location of your USB key. Ensure your USB key has a minimum of 16 Gbytes. If you do not already have your USB key connected, you can do so now. Once you have selected the location of the USB key, you can press OK and the process will begin.

**WARNING!**

This will reformat your USB key and all data will be erased.

The Zebra 4Sight EV7 Rescue utility configures the USB key to be a rescue USB key with all the necessary settings to restore your capture-for-deployment backup *.wim* file onto other Zebra 4Sight EV7 units.

9. When the process completes, a message dialog opens, explaining what was done. Click on the OK button to perform a shut down and reboot of Windows 10 IoT Enterprise.

To use the configured USB key to restore the operating system partition of your Zebra 4Sight EV7, or to configure another Zebra 4Sight EV7, refer to the *Restore Windows 10 IoT Enterprise* section, later in this appendix.

## OS backup of Zebra 4Sight EV7 Windows 10 IoT Enterprise

---

You can create an OS backup *.wim* file of your Zebra 4Sight EV7 unit's operating system partition and save the file to a specified location. It is useful to do this procedure if you need to save any changes made to the specific Zebra 4Sight EV7 unit. Note that the OS backup process will copy the unique ID of the unit. This ID will be applied to any Zebra 4Sight EV7 that is restored with this backup *.wim* file; therefore, an OS backup should only be applied to the same unit from which it was taken. If two units with the same unique ID are running on the same network, there will be network conflicts. Be aware of this limitation when performing an OS backup.

To perform an OS backup, you must access your Zebra 4Sight EV7 directly; you cannot perform this task remotely. To access the unit directly, connect a display device, keyboard, and mouse to your Zebra 4Sight EV7. For information, refer to *Connecting peripheral devices* subsection of the *Connecting peripheral devices* section, in *Chapter 2: Getting started with your Zebra 4Sight EV7 unit* for more information.

To backup your operating system partition, perform the following directly from your Zebra 4Sight EV7:

1. Save all your work and close all running applications.
2. From the Windows Start menu, launch the OSConfig utility.
3. Go to the Write Filter tab. If the Unified Write Filter (UWF) option is enabled, disable it.
4. Click on the Capture OS tab.
5. On the Capture OS tab, click on the Reboot and launch backup tool button that is found in the Backup for this unit area. Your Zebra 4Sight EV7 will reboot.
6. When the reboot process completes, it will display a screen asking you to choose an option. Click on the Troubleshoot option, and then on the Matrox Rescue Utility option.

7. When the Matrox Rescue Utility dialog opens, you must read the license agreement. When done, click on the I agree button to accept the license agreement.
  8. The next page is presented with an option already selected: Backup the OS for this unit; leave this option as is. Below this, you can specify the location of your USB key. If you do not already have your USB key connected, you can do so now. It is not recommended to save the backup in the current operating system partition, or to a virtual drive. It is recommended to save to a USB key with at least 16 Gbytes free. Once you have selected the location of the USB key, click on OK and the Matrox Rescue utility will copy the information to the destination specified.
  9. When the process completes, a message dialog will open, explaining what was done. Click on the OK button.
  10. After the reboot, if UWF was enabled before you started the OS backup process, launch the OSConfig utility from the Windows Start menu, and re-enable UWF.
- ❖ Note that to restore the OS backup without a working copy of the operating system on your Zebra 4Sight EV7, additional files are required. The OS backup *.wim* file can either be used with the Zebra 4Sight EV7 Rescue utility, if the RECOVERY partition is not corrupt, or with a rescue USB key, if the RECOVERY partition is corrupt. To restore your Zebra 4Sight EV7 with the Zebra 4Sight EV7 Rescue utility, refer to the *Restore Windows 10 IoT Enterprise* section. To create a rescue USB key, refer to the section *Making a rescue USB key for Windows 10 IoT Enterprise* section.

## Making a rescue USB key for Windows 10 IoT Enterprise

---

In the case that your Zebra 4Sight EV7 operating system partition becomes corrupt, the easiest way to restore your unit is to use a rescue USB key containing the Matrox Rescue utility and a backup of your operating system partition. This procedure requires a USB key with at least 16 Gbytes.

To create a rescue USB key, you must access your Zebra 4Sight EV7 directly; you cannot perform this task remotely. To access the unit directly, connect a display device, keyboard, and mouse to your Zebra 4Sight EV7. For information, refer to *Connecting peripheral devices* section, in *Chapter 2: Getting started with your Zebra 4Sight EV7 unit* for more information.

When creating a rescue USB key, you must already have a backup file that you want to use for the recovery. This could either be the Zebra default factory settings backup *.wim* file (*W10Ex64EV7.wim*) that comes in your recovery partition, or an OS backup file that you have created (*W10EV7.wim*) using the procedure in the *OS backup of Zebra 4Sight EV7 Windows 10 IoT Enterprise* section earlier in this chapter.

To create a rescue USB key of your operating system partition, perform the following:

1. From the Windows Start menu, select Settings. From the presented window, select Update & Security and then Recovery. Under Advanced Startup, select Restart now. This will restart your Zebra 4Sight EV7 and then display the Matrox Rescue utility.
2. When the reboot process completes, it will display a screen asking you to choose an option. Click on the Troubleshoot option, and then on the Matrox Rescue Utility option.
  - ❖ If you do not have access to Matrox Rescue utility, contact Zebra support.
3. When the Matrox Rescue Utility dialog opens, you must read the license agreement. When done, click on the I agree button to accept the license agreement.
4. In the following dialog, select Create USB drive for factory restore.

5. Insert a USB key into your USB drive. If using a backup file that you have previously made and stored on a USB key, you will need to insert a second USB key with that backup.
6. The Matrox Imaging ResQDisk utility will open. In the Select OS image area, select to use the factory image or browse to the location where your required OS backup *.wim* file is found and use that file. In the Select USB storage device location area, select the USB drive that will be reformatted to a bootable USB drive.

**WARNING!**

❖ Note that this will reformat your USB key and all its data will be erased.

7. Select Go and the process of making a bootable USB drive will begin. When this operation completes successfully, your rescue USB key can then be used to either deploy a capture-for-deployment backup, restore an OS backup, or recover the operating system of your Zebra 4Sight EV7 unit to factory settings, depending on the *.wim* file that you used to make the bootable USB.

## **Restore Windows 10 IoT Enterprise**

---

You can restore the Windows 10 IoT Enterprise operating system partition of your Zebra 4Sight EV7 unit, using the Zebra 4Sight EV7 Rescue utility with an OS backup *.wim* file or a capture-for-deployment backup *.wim* file.

**Warning!**

The restore operation will reformat and erase all data currently on the Zebra 4Sight EV7 storage drive (SSD). If you have two (or more) partitions on your Zebra 4Sight EV7 storage drive, or have external drives connected, select the correct drive or disconnect from all external hard drives to prevent data being erased by accident.

- ❖ The RECOVERY partition houses the Zebra 4Sight EV7 Rescue utility and does not get reformatted if you restore an OS backup *.wim* file from the Matrox Rescue utility console. However, if you use a rescue USB key with a capture-for-deployment backup *.wim* file (*W10EV7.wim*), or restore to factory default settings file (*W10Ex64EV7.wim*), then both the RECOVERY and OS partitions are reformatted.



To perform any of the backup, capture, or restore tasks, you must access your Zebra 4Sight EV7 directly since remote desktop is not available in the recovery environment. To access the unit directly, connect a display device, keyboard, and mouse to your Zebra 4Sight EV7. For information, refer to *Connecting peripheral devices* section, in *Chapter 2: Getting started with your Zebra 4Sight EV7 unit* for more information.

To restore your Zebra 4Sight EV7 unit's operating system partition, perform the following:

1. From the Windows Start menu, select Settings. From the presented window, select Update & Security and then Recovery. Under Advanced Startup, select Restart now. This will restart your Zebra 4Sight EV7 and then display the Matrox Rescue utility.
  2. When the reboot process completes, it will display a screen asking you to choose an option. Select Zebra 4Sight EV7 - Restore OS.
  3. Select which *.wim* file (*W10EV7.wim*) to restore.
- ❖ Note that these files are created with the OS backup or capture-for-deployment backup options, described earlier in this chapter.
4. Follow all on-screen instructions.



# **Appendix D: Migrating auxiliary I/O connections from Matrox 4Sight GPm to Zebra 4Sight EV7**

This appendix provides instructions on how to migrate I/O connected to your legacy Matrox 4Sight GPm to Zebra 4Sight EV7.

## Overview

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Migrating an installation from a Matrox 4Sight GpM unit to a Zebra 4Sight EV7 unit comes with special considerations concerning the auxiliary I/O. Matrox 4Sight GpM implements sinking inputs and outputs at up to 24 Vdc in a non-isolated manner (that is, each negative I/O pin is referenced to the electrical ground plane of the unit); however, Zebra 4Sight EV7 implements independently isolated industrial digital inputs and outputs, at up to 24 Vdc, with independent support for both sinking and sourcing configurations. The Zebra 4Sight EV7 isolated digital I/O implementation eases wiring, provides increased flexibility when interfacing to industrial field devices of various types, and provides better immunity in an industrial environment. Due to these changes, some restrictions might apply when migrating from Matrox 4Sight GpM to Zebra 4Sight EV7 and require you to verify and possibly re-wire I/O that will be migrated.

## Implications of the changes

---

Zebra 4Sight EV7 auxiliary inputs and outputs are electrically isolated from one another and from the rest of the unit. The change from non-isolated digital I/Os on Matrox 4Sight GpM to isolated digital I/Os on Zebra 4Sight EV7 has an effect on the electrical specifications. The table below outlines the changes to various specifications:

Electrical specifications	Matrox 4Sight GpM	Zebra 4Sight EV7
V <sub>LMax</sub> (Voltage threshold at which a low logical state is detected)	0.9 V	8 V
V <sub>HMin</sub> (Voltage threshold at which a high logical state is detected)	1.5 V	10 V
I <sub>HMin</sub> (Minimum input operating current)	10 µA	2.25 mA
Voltage drop across output pins when in a closed state (varies with current)	0.32 V	1.5 V

The Zebra 4Sight EV7 isolated digital I/O implementation also eliminates the possibility for interfacing with TTL output devices.

❖ Note that verification is required before making use of pre-existing connections.

These changes improve the immunity of the unit, and optionally allow maintaining an electrical isolation between all interfaced field devices. This implementation requires that each auxiliary input/output is referenced independently, unlike the Matrox 4Sight Gpm auxiliary inputs/outputs that only needed a single negative pin to be used as a reference for all of the auxiliary inputs/outputs.

The following connections should still operate seamlessly:

- Interfacing Zebra 4Sight EV7 auxiliary inputs to sourcing devices that were previously interfaced to Matrox 4Sight Gpm auxiliary inputs using a 24 V reference voltage, without connecting external resistors.
  - Interfacing Zebra 4Sight EV7 auxiliary outputs with sourcing devices that were previously interfaced to Matrox 4Sight Gpm auxiliary outputs using a 24 V reference voltage. Sourcing devices must meet specifications for 24 Vdc digital inputs of either type 1, 2, or 3 as per the EN 61131-2:2007 standard.
- ❖ Note that interfacing Zebra 4Sight EV7 auxiliary inputs/outputs with any wiring involving the presence of external resistors requires proper verifications.

## **Migrating an auxiliary output wired to a sinking field device that relies on a pull-up resistor**

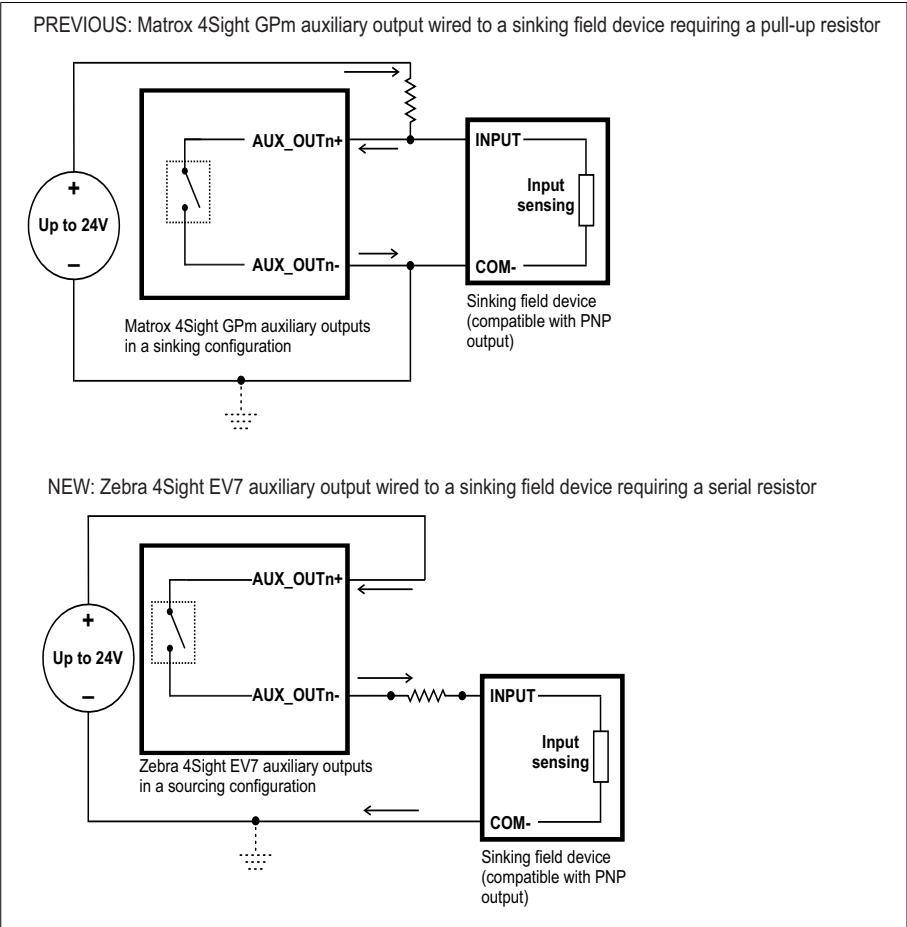
---

To guarantee that a Zebra 4Sight EV7 auxiliary output can reliably replace a Matrox 4Sight Gpm auxiliary output, wired to a sinking field device, the device must meet the specification of industrial 24 V<sub>dc</sub> digital inputs of either type 1, 2, or 3, as per the EN 61131-2:2007 standard. If this is not the case (that is, the sinking field device  $V_{LMAX}$  threshold is below 3.0 V), the voltage drop across the Zebra 4Sight EV7 auxiliary output might prevent the sinking field device from recognizing a low logical state when the output is closed.

To migrate a sinking field device whose  $V_{LMAX}$  threshold is below 3.0 V, you can either re-wire the device in a typical complimentary sourcing-to-sinking connection, or you can add a serial resistor between the AUX\_OUTn- and INPUT pins. Adding a serial resistor will limit the current circulating through the sinking field device, which means you will need to consider the total voltage drop across

both the Zebra 4Sight EV7 auxiliary output and the serial resistor to make sure that the voltage seen at the input of the sinking field device can reliably assure the detection of a high logical state.

The diagram below illustrates the difference between connecting a sinking field device to Matrox 4Sight GpM and connecting it to Zebra 4Sight EV7:



❖ Note that with the above wiring modification, there will be a logical inversion to take into consideration. The sinking field device will not detect an ON condition when the Zebra 4Sight EV7 auxiliary output is closed.

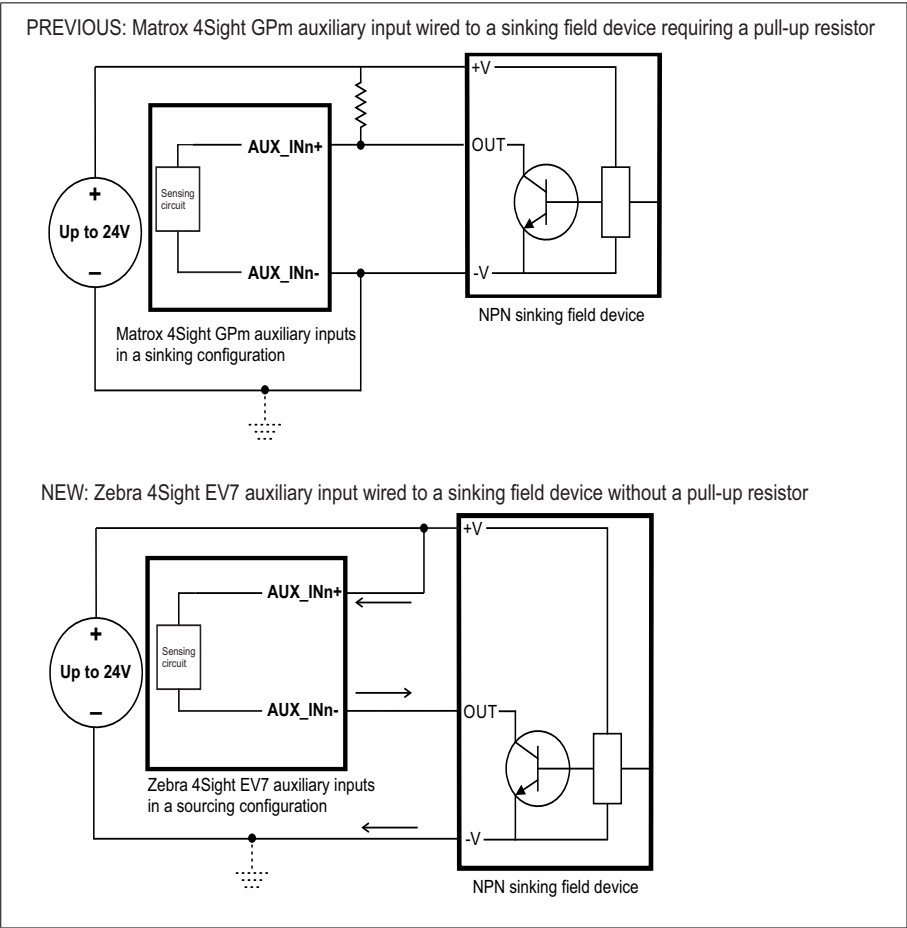
## **Migrating an auxiliary input wired to a sinking field device that relies on a pull-up resistor**

---

To guarantee that a Zebra 4Sight EV7 auxiliary input can reliably replace a Matrox 4Sight GPM auxiliary input, wired to a sinking field device, the pull-up resistor value must allow sourcing a current of up to 2.25 mA through the input. In addition, there must be a voltage drop of at least 11 V across the Zebra 4Sight EV7 AUX\_INn+ and AUX\_INn- pins. This verification is required to ensure reliable operation in an industrial environment. If using 24 V, then the pull-up resistor value must be less than 5.77 Kohms. If using a reference voltage below 24 Vdc, the pull-up resistor value must be equal to or less than the value given by the following formula:

$$\text{Pull-up resistor value} \leq \frac{\text{Reference Voltage} - 11V}{2.25mA}$$

If the values above cannot be achieved, you will need to re-wire the sinking device in a typical complimentary sourcing-to-sinking connection. The diagram below illustrates the difference between connecting a sinking field device to Matrox 4Sight GpM and connecting it to Zebra 4Sight EV7, without using a pull-up resistor:



❖ Note that with the above wiring modification, there will be a logical inversion to take into consideration. The Zebra 4Sight EV7 auxiliary input will now detect an ON condition when the sourcing field device is closed.

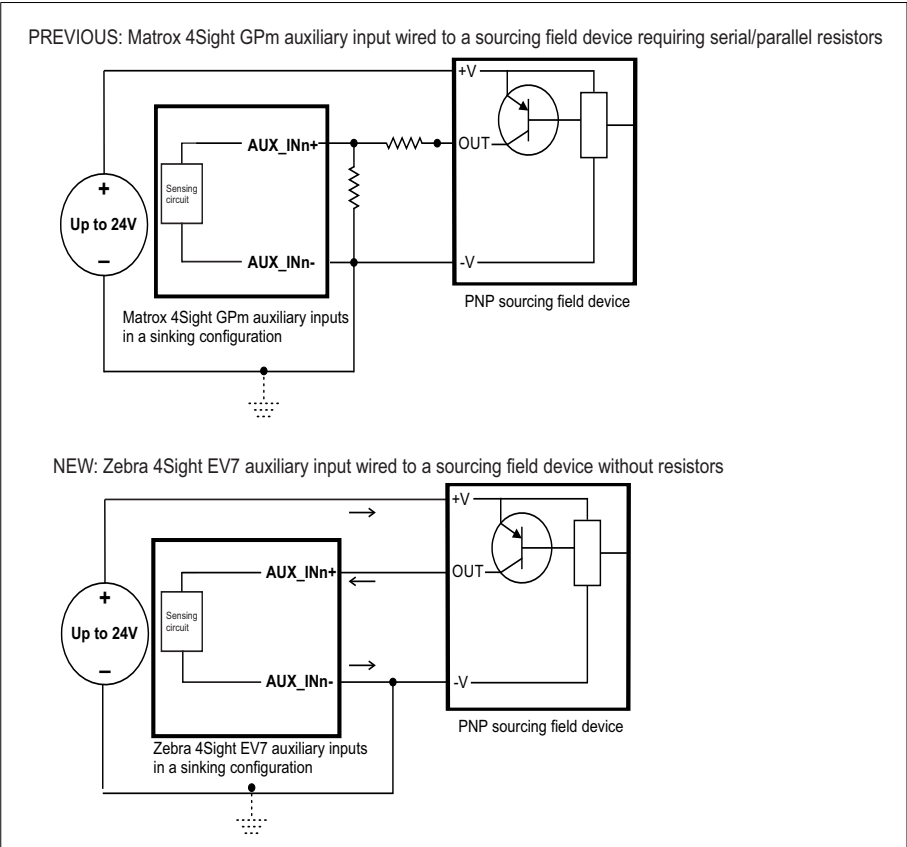


## **Migrating an auxiliary input wired to a sourcing field device that relies on series/parallel resistors**

---

Zebra 4Sight EV7 supports interfacing with sourcing field devices without the use of external resistors, assuming external resistors are not required for the proper operation of the sourcing field device. In this case, you can simply remove the external resistors and wire the sourcing field device directly to the Zebra 4Sight EV7 input. Wiring a sourcing field device directly to a Zebra 4Sight EV7 input will operate reliably as long as the sourcing field device can supply 2.25 mA of current when it is in a closed state (that is, 11 V are detected across the Zebra 4Sight EV7 AUX\_INn+ and AUX\_INn- pins).

The diagram below illustrates the difference between connecting a sourcing field device to Matrox 4Sight GpM and connecting it to Zebra 4Sight EV7, without using a pull-up resistor:



# **Appendix E:**

## **Listing of**

### **Zebra 4Sight EV7**

#### **units**

This appendix lists the key feature changes for specific versions and revisions of the Zebra 4Sight EV7 units.

## Key feature changes

---

Part number	Version	Description
EV7I3M8	001.00	First shipment of the Zebra 4Sight EV7 unit with Intel Core i3-1220PE, 8 Gbyte DDR5 RAM, 256 Gbyte M.2 MLC SSD, with Microsoft Windows 10 IoT Enterprise 2021 (64-bit). Pre-loaded with MIL X and Matrox Design Assistant X run-time environments. Partially licensed for Matrox Design Assistant X and MIL X.
EV7I5M16	001.00	First shipment of the Zebra 4Sight EV7 unit with Intel Core i5-1250PE, 16 Gbyte DDR5 RAM, 256 Gbyte M.2 MLC SSD, with Microsoft Windows 10 IoT Enterprise 2021 (64-bit). Pre-loaded with MIL X and Matrox Design Assistant X run-time environments. Partially licensed for Matrox Design Assistant X and MIL X.
EV7I5M16DA	001.00	First shipment of the Zebra 4Sight EV7 unit with Intel Core i5-1250PE, 16 Gbyte DDR5 RAM, 256 Gbyte M.2 MLC SSD, with Microsoft Windows 10 IoT Enterprise 2021 (64-bit). Pre-loaded with Matrox Design Assistant X design-time and run-time environments. Partially licensed for Matrox Design Assistant X and MIL X.
EV7I5M16DAP	001.00	First shipment of the Zebra 4Sight EV7 unit with Intel Core i5-1250PE, 16 Gbyte DDR5 RAM, 256 Gbyte M.2 MLC SSD, with Microsoft Windows 10 IoT Enterprise 2021 (64-bit). Pre-loaded with Matrox Design Assistant X design-time and run-time environments. Fully licensed for Matrox Design Assistant X and MIL X.
EVPS	001.00	150W AC/DC power adapter (100-240 VAC input/24 VDC output) for Zebra 4Sight EV7.

# **Appendix F:**

# **Acknowledgments**

This appendix lists the copyright information regarding third-party material used to implement components on the Zebra 4Sight EV7 unit.

## UART copyright information

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The following is the copyright notice for the UART design used on the Zebra 4Sight EV7 unit.

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# Regulatory Compliance

## FCC Compliance Statement

### Warning

Changes or modifications to these units 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'utilisateur 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 and EN61326-1.

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 et EN61326-1.

## **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 ZebraWeb site ([www.zebra.com/wcee](http://www.zebra.com/wcee)) 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/wcee](http://www.zebra.com/wcee)) pour l'information concernant le recyclage.

#### **(Deutsch) Information für europäische Anwender – Europäische Regelungen zu Elektro- und Elektronikgeräten (WEEE)**

Bitte wenden Sie sich an dem Zebra-Website ([www.zebra.com/wcee](http://www.zebra.com/wcee)) 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/wcee](http://www.zebra.com/wcee)) per le informazioni di riciclaggio.







## **Caution: Hot surface**

Always allow hot surfaces to cool down before touching the unit.

If the unit has to be operated in an ambient temperature above 45°C, it must be installed in a Restricted Access Location.

## **Attention: Surface chaude**

Laisser l'appareil refroidir avant de le toucher.

Si l'appareil doit fonctionner dans une température ambiante de plus de 45°C, il doit être installé dans une zone d'accès restreint.

## **Caution: Battery replacement**

Risk of explosion if battery is replaced by an incorrect type. Dispose of used batteries according to the instructions.

## **Attention: Pile remplacement**

Il y a un risque d'explosion si la pile est remplacée par une pièce d'un type incorrect. Mettre au rebut les piles usagées conformément aux instructions.

# Limited Warranty

Refer to the warranty statement that came with your product.

