

COGNEX

Vision Controller

Installation Manual

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The following symbols indicate safety precautions and supplemental information.

 **WARNING:** This symbol indicates the presence of a hazard that could result in death, serious personal injury or electrical shock.

 **CAUTION:** This symbol indicates the presence of a hazard that could result in property damage.

 **Note:** Notes provide supplemental information about a subject.

 **Tip:** Tips provide helpful suggestions and shortcuts that may not otherwise be apparent.

Regulations/Conformity

Note: For the most up-to-date regulations and conformity information, please refer to the Cognex online support site: <http://www.cognex.com/Support/VisionPro>.

Declaration of Conformity	
Manufacturer	Cognex Corporation One Vision Drive Natick, MA 01760 USA
Declares this 	-marked Machine Vision Controller
Product Type	VC5: Regulatory Model 1AAC
Complies With	2004/108/EC Electromagnetic Compatibility Directive
Compliance Standards	EN 61326-1:2013
European Representative	COGNEX INTERNATIONAL Immeuble "Le Patio" 104 Avenue Albert 1er 92563 Rueil Malmaison Cedex - France
Safety and Regulatory	
FCC	FCC Part 15, Class A This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference; and (2) this device must accept any interference received, including interference that may cause undesired operation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at their own expense.
KCC 	VC5: Regulatory Model MSIP-REM-CGX-1AAC
NRTL	TÜV SÜD AM SCC/NRTL OSHA Scheme for UL/CAN 61010-1.
CB	TÜV SÜD AM, IEC/EN 61010-1. CB report available upon request.
RoHS	Compliant to the latest applicable Directive.

Precautions

Observe these precautions when installing the vision controller to reduce the risk of injury or equipment damage:

- The vision controller is intended to be supplied by a NRTL listed power supply with a minimum output rated 24VDC, 5A and must be used with the Cognex-supplied 24VDC power connector. Any other voltage creates a risk of fire or shock and can damage the components. Wire and connections must be in accordance with these instructions, the National Electrical Code and applicable national and local wiring standards and rules.
- To reduce the risk of damage or malfunction due to over-voltage, line noise, electrostatic discharge (ESD), power surges, or other irregularities in the power supply, route all cables and wires away from high-voltage power sources.
- Do not install the vision controller in areas directly exposed to environmental hazards such as excessive heat, dust, moisture, humidity, impact, vibration, corrosive substances, flammable substances, or static electricity.
- The system fuse is the only user-serviceable part in this product. The replacement fuse must be a Littelfuse® (Part 0217005) or an equivalent UL-recognized fast-blow fuse rated at 5A, low breaking capacity, and 250V. It must also be rated for DC operation at a voltage of 24VDC or higher. Refer to [Replace the Fuse on page 41](#) for more information.
- The vision controller does not contain any other user-serviceable parts. Do not make electrical or mechanical modifications to the vision controller components. Unauthorized modifications may void your warranty.
- Service loops should be included with all cable connections.
- Cable shielding can be degraded or cables can be damaged or wear out more quickly if a service loop or bend radius is tighter than 10X the cable diameter. The bend radius must be at least six inches from the connector.
- Changes or modifications not expressly approved by the party responsible for regulatory compliance could void the user's authority to operate the equipment.
- Remove power from the vision controller before connecting or disconnecting any cables or the I/O terminal blocks.
- The maximum torque that can be applied to the I/O terminal connectors is 0.25 Nm (2.2 in-lb). Applying torque above this limit can damage the connectors.
- Remove power from the vision controller before connecting or disconnecting the 24VDC power connector.
- The maximum torque that can be applied to the 24VDC power connector is 0.6 Nm (5.3 in-lb). Applying torque above this limit can damage the connector.
- Class A Equipment (broadcasting and communication equipment for office work): Seller and user shall be notified that this equipment is suitable for electromagnetic equipment for office work (Class A) and can be used outside the home.
- This device should be used in accordance with the instructions in this manual.
- All specifications are for reference purposes only and may be changed without notice.

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Introduction

The Cognex Vision Controller (henceforth, referred to as the "vision controller") is a compact, network-ready vision controller that can be directly connected to Cognex industrial GigE cameras and Cognex DS1000 series displacement sensors. Cognex industrial GigE cameras are light-weight digital cameras with a GigE Vision® interface. Cognex DS1000 series displacement sensors provide an integrated digital camera and laser stripe illuminator, mounted in a single mechanically robust package. All models are designed for easy integration with Cognex's industry-leading software applications.

The vision controller extends the capabilities of the connected Cognex devices by providing:

- Direct connection to a Gigabit Ethernet network.
- Industrial Ethernet protocol support.
- Direct VGA output.
- 8 inputs, optically isolated.
- 16 outputs, optically isolated.
- Support for current sinking (NPN) and current sourcing (PNP) devices.
- Encoder inputs, for connecting a single-ended or differential encoder.
- RS-232 for serial communications.
- DIN-rail mountable.

Support

Several resources are available to assist you in using the vision controller with the connected Cognex device:

- *Cognex Industrial Cameras Getting Started Guide*, a two-page insert that is shipped with each Cognex Industrial GigE Camera.
- *DS1000 Series Displacement Sensors Quick Reference Guide* that is shipped with each Cognex DS1000 series displacement sensor.
- The *Cognex VisionPro* help file, included with VisionPro software.
- VisionPro online support: <http://www.cognex.com/Support/VisionPro>.

Standard Components

The vision controller is shipped with the components listed below.

Note:



- If any of the standard components appear to be missing or damaged, immediately contact your Cognex Authorized Service Provider (ASP) or Cognex Technical Support.
- Cables are sold separately.

Table 1-1: Standard Components

<p>Component</p>
<p>Cognex Vision Controller (1) (VC5: P/N 821-0102-xR; P/N 821-0119-xR)</p>
<p>Terminal Block Accessory Kit (1) (P/N 820-9126-xR)</p> <ul style="list-style-type: none"> • INPUTS terminal blocks (2) • OUTPUTS terminal blocks (2) • ENCODER terminal blocks (2) • 24VDC power connector (1)
<p>Quick Start Guide (1) (P/N 590-7179)</p>

Accessories

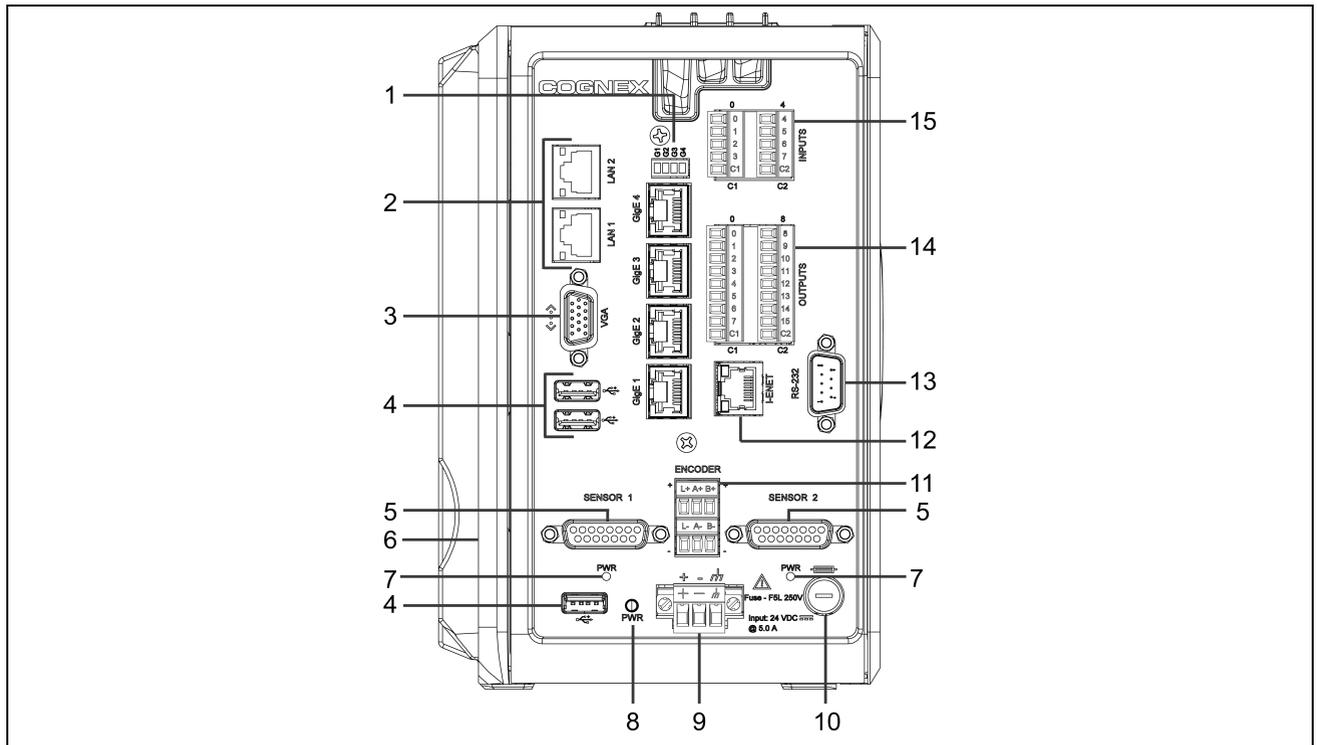
The following optional components can be purchased separately. For a complete list of options and accessories, contact your local Cognex sales representative.

Table 1-2: Accessories

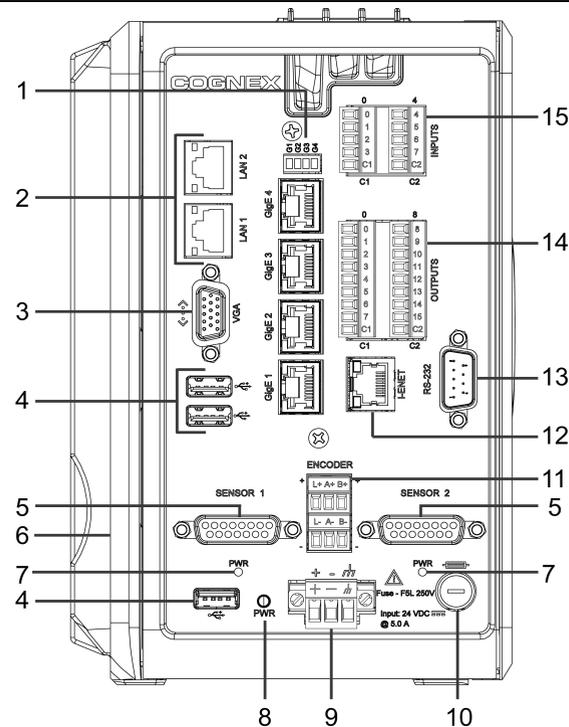
Component	Description
Cognex Industrial GigE Camera	Light-weight digital camera.
Cognex DS1000 Series Displacement Sensor	Integrated 3D profiling sensor.  CAUTION: The vision controller only supports connecting DS1000 series sensors with the following Type number: 821-0116-xR. The Type number is located on the label affixed to the DS1000 series sensor.
Cognex DS1000 Series Power and I/O Cable	M12 to DB15 cable that provides access to the DS1000 series sensor's power, encoder and trigger connections. For more information, refer to Power and I/O Cable Specifications (DS1000 Only) on page 30 .
DIN Rail Mounting Bracket	Bracket for mounting the vision controller to a DIN rail.
DIN Rail Power Supply	A DIN rail-mountable power supply that converts AC mains power to 24VDC.
Terminal Block Accessory Kit (VC-100-ACC-KIT)	Includes replacement terminal blocks and connectors for the vision controller: <ul style="list-style-type: none"> • INPUTS terminal blocks (2) • OUTPUTS terminal blocks (2) • ENCODER terminal blocks (2) • 24VDC power connector (1)

Connectors and Indicators

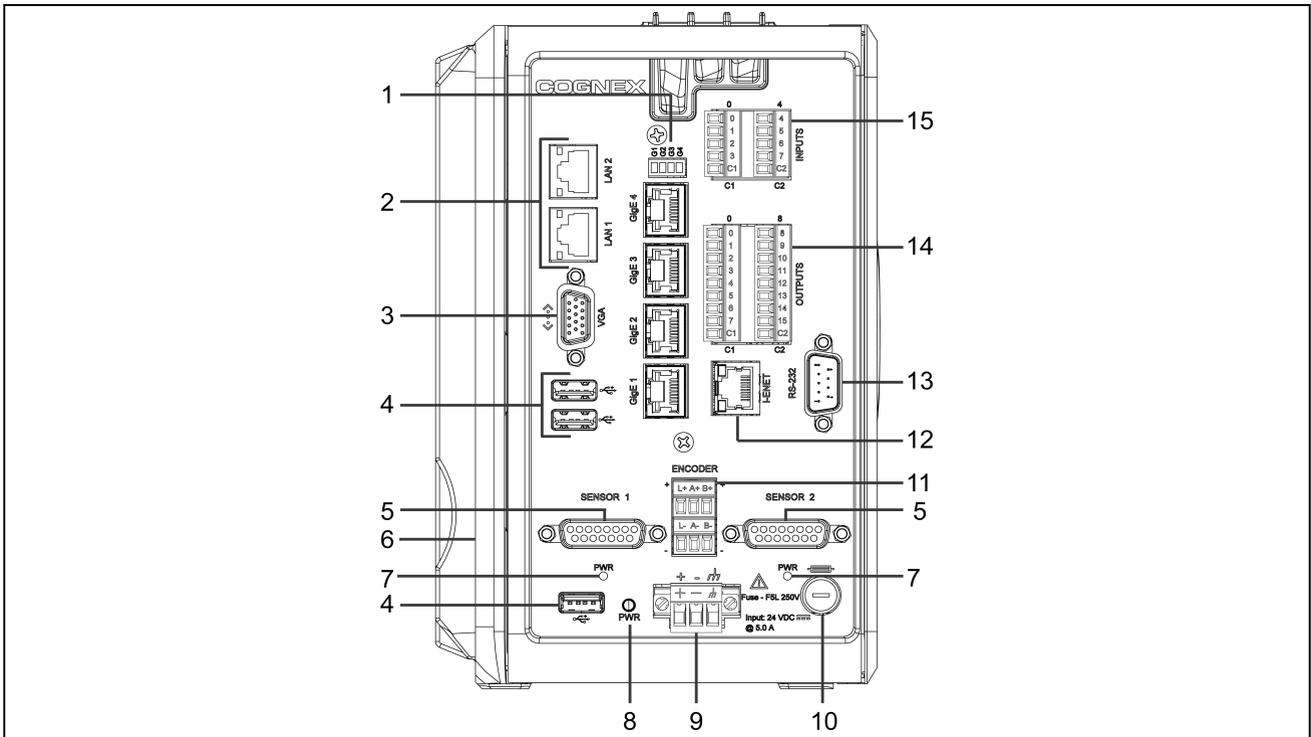
Table 1-3: Connectors and Indicators



Connector/Indicator		Function
1	GigE Ports and LEDs	The four GigE ports (GigE 1 - GigE 4) are 10/100/1000 RJ-45 ports that provide Gigabit Ethernet connectivity to Cognex industrial GigE cameras and Cognex DS1000 series sensors. These ports also provide power to Cognex industrial GigE cameras that support Power over Ethernet (PoE). The G1 - G4 yellow LEDs illuminate to indicate that the corresponding Cognex industrial GigE camera is receiving PoE from the vision controller. For more information, refer to GigE Ports on page 22 .
2	LAN Ports and LEDs	The two LAN ports (LAN 1 and LAN 2) are 10/100/1000 RJ-45 Ethernet ports that are used to connect the vision controller to an Ethernet network. The green LED blinks when a network connection is detected. The yellow LED blinks when network activity is detected. For more information, refer to LAN Ports on page 23 .
3	VGA Port	The VGA port is an analog DB15 connector that provides connection to a VGA monitor. For more information, refer to VGA Port on page 24 .
4	USB Ports	The three USB ports are USB 2.0 ports that can be used to connect HID devices (mouse, keyboard or mass storage device). For more information, refer to USB Ports on page 24 .
5	SENSOR Ports	The two SENSOR ports (SENSOR 1 and SENSOR 2) are DB15 ports that provide power, encoder and trigger connections to Cognex DS1000 series sensors via the Power and I/O cable. For more information, refer to SENSOR Ports on page 25 and Power and I/O Cable Specifications (DS1000 Only) on page 30 .
6	Standby Button	When the vision controller is operating, pressing the Standby button places the vision controller in a low power idle mode. When the vision controller is in its low power idle mode, pressing the Standby button resets the vision controller and restores normal operation.



Connector/Indicator		Function
7	SENSOR 1 - SENSOR 2 PWR LEDs	The green PWR LED illuminates to indicate the corresponding Cognex DS1000 series sensor is receiving power.
8	PWR LED	The green PWR LED illuminates to indicate that the vision controller is powered on.
9	24VDC Power Connector	The 24VDC power connector is used to connect an external power supply to the vision controller. For more information, refer to 24VDC Power Connector Terminal Assignments on page 29 .
10	System Fuse	<p>The vision controller includes a system fuse to provide over-current protection for the vision controller. For more information, refer to Replace the Fuse on page 41.</p> <p>CAUTION: The system fuse is the only user-serviceable part in this product. The replacement fuse must be a Littelfuse® (Part 0217005) or an equivalent UL-recognized fast-blow fuse rated at 5A, low breaking capacity, and 250V. It must also be rated for DC operation at a voltage of 24VDC or higher.</p>
11	ENCODER Terminal Block	<p>The ENCODER terminal blocks connect the vision controller to encoder inputs. For more information, refer to ENCODER Terminal Block Assignments on page 29.</p> <p>Note: The Laser Safety inputs (L+ and L-) are not supported.</p>
12	I-ENET Port and LEDs	The I-ENET port is a 10/100 RJ-45 Ethernet port that can be connected to a network that is dedicated to industrial Ethernet devices (for example, PLCs or robots) to communicate with the devices using supported industrial Ethernet protocols. The green LED blinks when a network connection is detected. The yellow LED blinks when network activity is detected. For more information, refer to I-ENET Port on page 26 .
13	RS-232 Port	The RS-232 port is a DB9 port that connects the vision controller to a serial device. For more information, refer to RS-232 Port on page 26 .



Connector/Indicator		Function
14	OUTPUTS Terminal Block	The OUTPUTS terminal blocks provide access to a total of 16 outputs and 2 common connections. For more information, refer to OUTPUTS Terminal Block Assignments on page 28 .
15	INPUTS Terminal Block	The INPUTS terminal blocks provide access to a total of 8 inputs and 2 common connections. For more information, refer to INPUTS Terminal Block Assignments on page 27 .

Installation

This section describes the connection of the vision controller to its standard and optional components. For a complete list of options and accessories, contact your Cognex sales representative.

Note: Cables are sold separately.

CAUTION: All cable connectors are “keyed” to fit the connectors on the vision controller; do not force the connections or damage may occur.

Mount the Vision Controller

The vision controller provides mounting holes for attachment to either a bottom or backside mounting surface.

Note: The vision controller may be optionally mounted to a DIN rail, using the accessory DIN rail mounting bracket. Please contact your Cognex sales representative for more information.

CAUTION:

- The vision controller must be mounted in a vertical orientation with the top of the controller up, and cannot be mounted in a horizontal orientation.
- To ensure sufficient ventilation, the vision controller must be mounted with 50mm of clearance above the vision controller and 50mm of clearance on both sides. If an adjacent device also produces heat, additional space or cooling is required if air space around the vision controller exceeds 40°C (104°F).
- Allow sufficient clearance and strain relief for wires and cables connected to the vision controller.

1. Drill the clearance holes for the mounting fasteners per the defined bolt pattern. The vision controller mounting hole screw thread is M5 x 0.8.
2. Align the holes on the mounting surface with the mounting holes on the vision controller.
3. Insert and tighten the mounting screws; the maximum torque is 5 Nm (44 in-lb).

CAUTION: The length of the screws used depends on the depth of the mounting surface; thread engagement of the screws must be 5mm - 8mm.

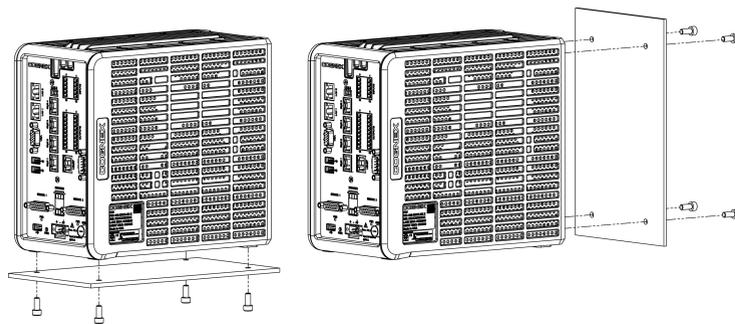


Figure 2-1: Mount the Vision Controller

Connect the Cognex Industrial GigE Camera

The Cognex industrial GigE camera's RJ-45 connector provides a Gigabit Ethernet connection to the camera. Depending on the camera model, the RJ-45 connector can also be used to provide Power over Ethernet (PoE) to the camera. The camera's I/O connector provides access to the physical input and output lines on the camera. It can also be used to supply power to the camera (if PoE is not used). If power is supplied through both sources, the camera will draw power from the first connection that is detected.

Note: The installation steps in this document describe the basic connection of the Cognex industrial GigE camera to the vision controller. For additional usage information, refer to the *Cognex Industrial Cameras Getting Started Guide*, included with your camera.

CAUTION:



- Cognex recommends only cold-plugging the Cognex industrial GigE camera; turn the vision controller power off when connecting or disconnecting the camera.
- The vision controller's GigE ports provide power to Cognex industrial GigE cameras that support Power over Ethernet (PoE); connecting third party devices to these ports could damage the vision controller or the third-party device.

1. Connect one end of the 10/100/1000 RJ-45 Ethernet cable to one of the vision controller's GigE ports. Connect the other end of the cable to the camera's RJ-45 connector.

Note:



- To avoid electromagnetic interference, the Ethernet cable must be shielded. Cognex strongly recommends Cat 6 or Cat 7 Ethernet cables with S/STP shielding.
- The GigE ports are dedicated to Cognex industrial devices and cannot be used to connect to a Gigabit Ethernet network or to communicate via industrial Ethernet communication protocols.

2. Optionally, connect the terminated end of the I/O cable to the camera's I/O connector. Connect the input and output wires to the applicable I/O device (for example, a photo eye trigger or strobe light).



Note: The pin-outs for the I/O cable vary depending on the camera model; contact your Cognex sales representative for information on cables that are compatible with your Cognex cameras.

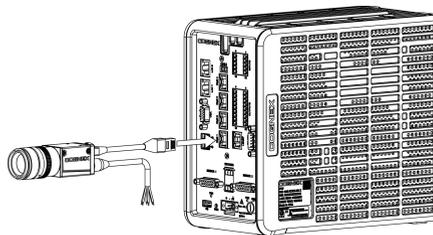


Figure 2-2: Connect the Cognex Industrial GigE Camera

If using PoE, the camera installation is now complete. If not using PoE, complete the following additional steps:

1. Verify that the camera's power supply is unplugged and not receiving power.
2. Connect the power supply to the I/O cable's Camera Power and Camera Ground wires.



Note: The pin-outs for the I/O cable vary depending on the camera model; contact your Cognex sales representative for information on cables that are compatible with your Cognex cameras.

3. Restore power to the camera's power supply and turn it on if necessary.

Connect the Cognex DS1000 Series Sensor

Note: The installation steps in this document describe the basic connection of the Cognex DS1000 series sensor to the vision controller. For complete DS1000 series sensor installation instructions, specifications and precautions, refer to the *DS1000 Series Displacement Sensors Quick Reference Guide*, included with your sensor.

WARNING: The DS1000 series sensors are designated as either a Class 2M or Class 3R laser product. These laser products can be hazardous. Please refer to the *DS1000 Series Displacement Sensors Quick Reference Guide* for important instructions on their safe use.

CAUTION:



- The vision controller only supports connecting DS1000 series sensors with the following Type number: 821-0116-xR. The Type number is located on the label affixed to the DS1000 series sensor.
- Cognex recommends only cold-plugging the DS1000 series sensor; turn the vision controller power off when connecting or disconnecting the DS1000 series sensor.

1. Connect the Ethernet cable's M12 connector to the DS1000 series sensor. Connect the cable's RJ-45 connector to one of the vision controller's GigE ports.

Note:



- The DS1000 series sensor's accessory Ethernet cable must be used to connect to the vision controller. For more information, refer to the *DS1000 Series Displacement Sensors Quick Reference Guide*.
- The GigE ports are dedicated to Cognex industrial devices and cannot be used to connect to a Gigabit Ethernet network or to communicate via industrial Ethernet communication protocols.

2. Connect the Power and I/O cable's M12 connector to the DS1000 series sensor. Connect the cable's DB15 connector to one of the vision controller's SENSOR ports. Tighten the connector screws to secure it to the vision controller.

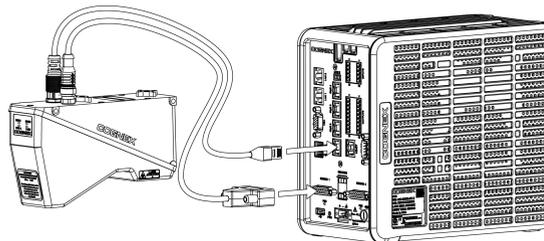


Figure 2-3: Connect the Cognex DS1000 Series Sensor

Connect the INPUTS and OUTPUTS Terminal Blocks

The vision controller is shipped with four terminal blocks for connecting inputs and outputs.

Note: It is recommended that all terminal blocks be installed to the vision controller, even if no devices are wired to the terminal block connectors. For ease of installation, the terminal block connectors on the vision controller are labeled to match the labels on the corresponding terminal blocks.

1. Determine how I/O devices will be connected to the vision controller's INPUTS and OUTPUTS terminals. Refer to [Wire Inputs and Outputs on page 33](#) for common wiring configurations.
2. Use a screwdriver to loosen the wire retention screws on the terminal blocks. Refer to [INPUTS Terminal Block Assignments on page 27](#) and [OUTPUTS Terminal Block Assignments on page 28](#) for terminal block pin assignments.
3. Insert the input and output wires (16 - 26 AWG, solid or stranded wire) into the terminals.

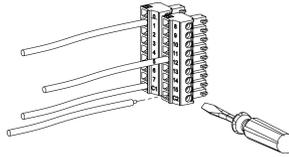


Figure 2-4: Insert Wires and Tighten Retention Screws

4. Tighten the wire retention screws to secure the wire leads in the terminal block; the maximum torque is 0.25 Nm (2.2 in-lb).
5. Insert the terminal blocks into the corresponding INPUTS and OUTPUTS terminal block connectors on the vision controller, and push in until firmly seated.

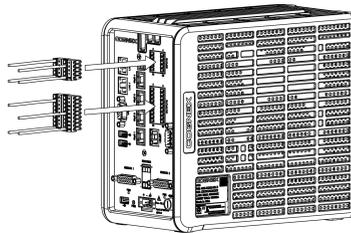


Figure 2-5: Connect the INPUTS and OUTPUTS Terminal Blocks

6. Connect the other end of the input and output wires to the applicable I/O device.

Connect the ENCODER Terminal Blocks

The vision controller features four encoder inputs that can be used to connect to either a single-ended or differential encoder. Using an encoder allows you to specify input and output delay values in pulse counts instead of real time units. The vision controller is shipped with two ENCODER terminal blocks for connecting encoder inputs.

Note:



- It is recommended that all terminal blocks be installed to the vision controller, even if no devices are wired to the terminal block connectors. For ease of installation, the terminal block connectors on the vision controller are labeled to match the labels on the corresponding terminal blocks.
- Non-quadrature, single-channel encoders are not supported.
- The Laser Safety inputs (L+ and L-) are not supported.
- The frequency of encoder pulses must not exceed 50 kHz.

1. Determine how the encoder device will be connected to the vision controller's ENCODER terminals. Refer to [Wire Inputs and Outputs on page 33](#) for common wiring configurations.
2. Use a screwdriver to loosen the wire retention screws on the terminal blocks. Refer to [ENCODER Terminal Block Assignments on page 29](#) for terminal block pin assignments.
3. Insert the encoder wires (16 - 26 AWG, solid or stranded wire) into the ENCODER terminals.

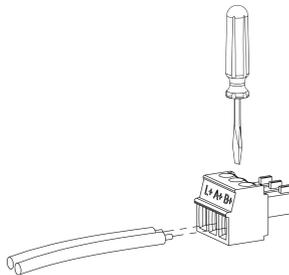


Figure 2-6: Insert Wires and Tighten Retention Screws

4. Tighten the wire retention screws to secure the wire leads in the terminal block; the maximum torque is 0.25 Nm (2.2 in-lb).
5. Insert the terminal blocks into the corresponding ENCODER terminal block connectors on the vision controller, and push in until firmly seated.

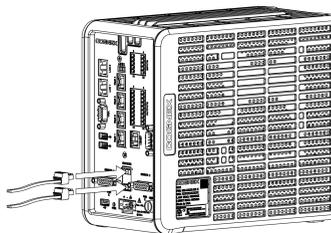


Figure 2-7: Connect the ENCODER Terminal Blocks

6. Connect the other end of the encoder wires to the encoder.
7. Connect the encoder's ground wire to the Frame Ground terminal (Pin 3) on the vision controller's 24VDC power connector. Refer to the [24VDC Power Connector Terminal Assignments on page 29](#) for power connector pin assignments.

Connect to an Ethernet Network (Optional)

Connect one end of the 10/100/1000 RJ-45 Ethernet cable into one of the vision controller's LAN ports. Connect the other end of the cable to an Ethernet network adapter or switch, as applicable.

Note:



- To avoid electromagnetic interference, the Ethernet cable must be shielded. Cognex strongly recommends Cat 6 or Cat 7 Ethernet cables with S/STP shielding.
- The LAN ports are dedicated to connecting to an Ethernet network and cannot be used to connect to Cognex industrial devices or to communicate via industrial Ethernet communication protocols.

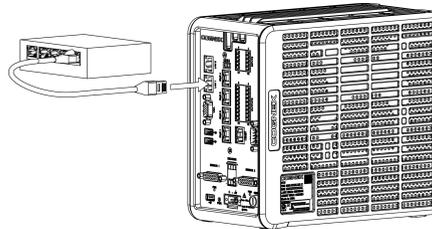


Figure 2-8: Connect to an Ethernet Network

Connect to an Industrial Ethernet Device (Optional)

The vision controller can be connected to a network that is dedicated to industrial Ethernet devices (for example, PLCs or robots) to communicate with the devices using supported industrial Ethernet protocols. Connect one end of a 10/100 RJ-45 Ethernet cable to the vision controller's I-ENET port and connect the other end of the cable to a network switch/router.

Note:



- To avoid electromagnetic interference, the Ethernet cable must be shielded. Cognex strongly recommends Cat 5e or Cat 6 Ethernet cables with S/STP shielding.
- The I-ENET port is dedicated to industrial Ethernet communications and cannot be used to connect to Cognex industrial devices or a Gigabit Ethernet network.

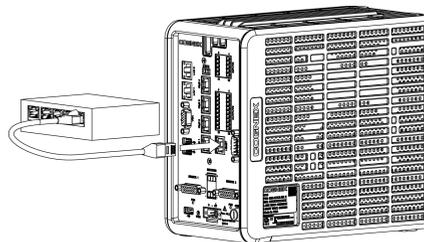


Figure 2-9: Connect to an Industrial Ethernet Device

Connect a VGA Monitor (Optional)

Connect a VGA cable to the vision controller's VGA port and tighten the connector screws to secure it to the vision controller. Connect the other end of the cable to the VGA port on the monitor.

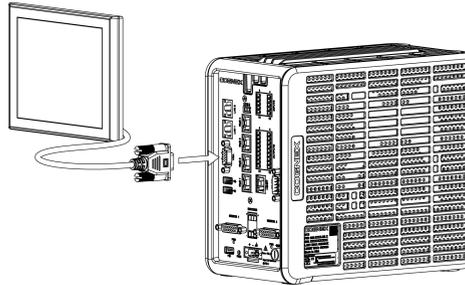


Figure 2-10: Connect a VGA Monitor

Connect USB Devices (Optional)

If connecting a USB mouse, keyboard or mass storage device to the vision controller, connect the USB device to one of the vision controller's USB ports.

CAUTION: Cognex recommends only cold-plugging USB devices; turn the vision controller power off when connecting or disconnecting USB devices.



Note: When using the vision controller in an electrically noisy environment, it is important to use USB devices that are rated for industrial use in the same environment. Most commercially available keyboards, mice, and monitors are rated for home use but are not designed for, or rated for, use in industrial environments. The use of peripherals not fully rated for the environment of use can result in impaired system immunity to nearby electrical noise.

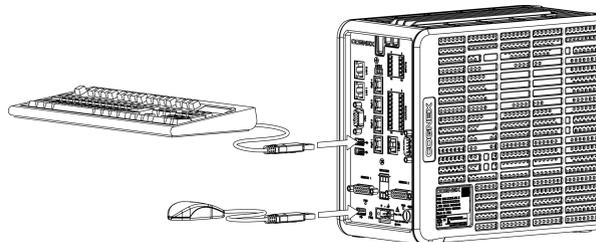


Figure 2-11: Connect USB Devices

Connect an RS-232 Serial Device (Optional)

To connect the vision controller to a serial device, plug an RS-232 serial cable (DB9 connector) into the vision controller's RS-232 port and tighten the connector screws to secure it to the vision controller. Connect the other end of the cable to the serial device.

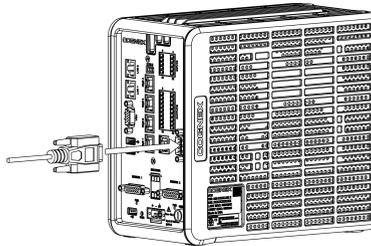


Figure 2-12: Connect an RS-232 Serial Device

Connect the 24VDC Power Supply

The vision controller is shipped with a 24VDC power connector.

Note:

- A DIN rail-mountable power supply accessory is available. Please contact your Cognex sales representative for more information.
- ⓘ • If using a power supply with a ground terminal, the terminal must be connected to earth ground. If using a DIN rail-mounted power supply, the power supply must be mounted to an earth-grounded DIN rail. Wire and connections must be in accordance with these instructions, the National Electrical Code and applicable national and local wiring standards and rules.

1. Verify that the 24VDC power supply being used is unplugged and not receiving power.
2. Use a screwdriver to loosen the wire retention screws on the 24VDC power connector.
3. Insert the power supply's +24VDC (Power) wire to Pin 1 and the -24VDC (Return) wire to Pin 2 on the power connector. Connect a frame ground wire from Pin 3 to frame ground. Recommended wiring is 14 - 18 AWG, solid or stranded wire. Refer to [24VDC Power Connector Terminal Assignments on page 29](#) for terminal pin assignments.

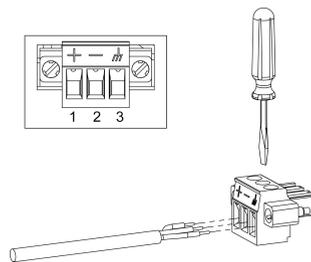


Figure 2-13: Insert Wires and Tighten Retention Screws

CAUTION: Do not connect AC power directly to the vision controller's power connector. Connecting AC power will damage the vision controller.

4. Tighten the wire retention screws to secure the wire leads in the terminals; the maximum torque is 0.6 Nm (5.3 in-lb).

5. Insert the power connector into the vision controller's 24VDC power port. Tighten the connector screws to secure it to the vision controller.

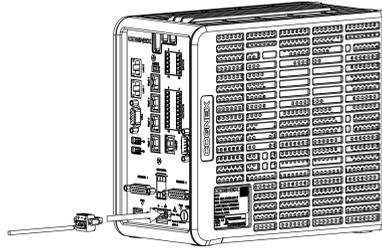


Figure 2-14: Connect the 24VDC Power Supply

6. Restore power to the 24VDC power supply and turn it on if necessary.

Specifications

The following sections list general specifications for the vision controller.

Vision Controller Specifications

Table 3-1: Vision Controller Specifications

Specifications	VC5
Supported Cognex Devices	Cognex Industrial GigE Cameras Cognex DS1000 Series Displacement Sensors
Job/Program Memory	120GB Solid State Memory (80GB available for user) or 480GB Solid State Memory (440GB available for user). Unlimited storage via remote network device. ¹
Image Processing Memory	8GB SDRAM.
Cooling System	Fanless Design.
Inputs	8 optically isolated discrete inputs.
Outputs	16 optically isolated discrete outputs.
Encoder Inputs	4 non-isolated encoder inputs. Note: The Laser Safety inputs (L+ and L-) are not supported.
LAN Ports²	2 RJ-45 Ethernet ports, 10/100/1000 BaseT with auto MDIX. IEEE 802.3 TCP/IP Protocol. Dedicated ports for connecting to wide area network.
GigE Ports³	4 RJ-45 Ethernet ports, 10/100/1000 BaseT with auto MDIX. IEEE 802.3af TCP/IP Protocol. Dedicated ports for connecting directly to supported Cognex devices, additionally supplying power to Cognex industrial GigE cameras that support PoE.
I-ENET Port	1 RJ-45 Ethernet port, 10/100 BaseT with auto MDIX. IEEE 802.3 TCP/IP Protocol. Dedicated port for Ethernet-based industrial protocol communications.
SENSOR Ports	2 DB15 ports that provide power, encoder and trigger connections to Cognex DS1000 series sensors. Each port supplies 24VDC, 500mA maximum.
VGA Port	Analog VGA, DB15 port. This connection may be used to connect a VGA monitor.
USB Ports	3 host USB 2.0 (480 Mb/sec.) ports for connecting HID devices (mouse, keyboard or mass storage device).
RS-232 Port	1 RS-232 port. Handshake lines: DCD, DTR, DSR, RTS, CTS, DTR and RI.
Status LEDs	1 PWR LED (vision controller), 2 PWR LEDs (DS1000 series sensors), 4 GigE LEDs.
Housing	Aluminum die-cast, aluminum sheet metal and injection-molded ABS/PC housing.
Mounting	Four bottom and four backside M5 x 0.8 threaded mounting holes. DIN-rail mountable, using the accessory DIN rail mounting bracket.
Dimensions	207mm (8.15in) x 229.5mm (9.04in) x 133.5mm (5.25in)
I/O Terminal Connectors	16 - 26 AWG, solid or stranded wire. Torque 0.25 Nm (2.2 in-lb).
24VDC Power Connector	14 - 18 AWG, solid or stranded wire. Torque 0.6 Nm (5.3 in-lb).
Weight	4.3 kg (9.5 lb)

¹ Vision controller models with Type number 821-0102-xR have 120GB SSD; models with Type number 821-0119-xR have 480GB SSD. The Type number is located on the label affixed to the vision controller.

² To ensure reliable communication using 1000 BaseT operation, the Ethernet cable must not exceed 100 meters.

³ To ensure reliable communication using 1000 BaseT operation, the Ethernet cable must not exceed 100 meters.

Specifications	VC5
Current	5A (maximum)
Voltage	24VDC ±10%
Power Consumption	120W (maximum)
Operating Temperature¹	0°C to 40°C (32°F to 104°F)
Storage Temperature	-30°C to 80°C (-22°F to 176°F)
Humidity	10% - 85%, non-condensing (Operating and Storage)
Altitude	2,000m (6565ft)
Shock (Storage and Shipment)	30 G, per IEC 60068-2-7EA.
Vibration (Storage and Shipment)	2 G, 2 hrs/axis (10-500 Hz) per IEC 60068-2-6, FC.
Regulatory Compliance	CE, FCC, KCC, TÜV SÜD NRTL, RoHS

¹ To ensure sufficient ventilation, the vision controller must be mounted with 50mm of clearance above the vision controller and 50mm of clearance on both sides. If an adjacent device also produces heat, additional space or cooling is required if air space around the vision controller exceeds 40°C (104°F).

I/O Specifications

Specifications for the vision controller's inputs and outputs are provided in the following section.

Inputs

The vision controller features eight independent inputs (INPUTS 0 - 7), which can be used to trigger vision controller events. The inputs are optically isolated and typically connected (directly or indirectly) to a PLC or photoelectric sensor. The vision controller will respond to an event when the voltage difference between the INPUT and INPUT COMMON exceeds 10VDC. Refer to [Wire Inputs and Outputs on page 33](#) for common wiring configurations.

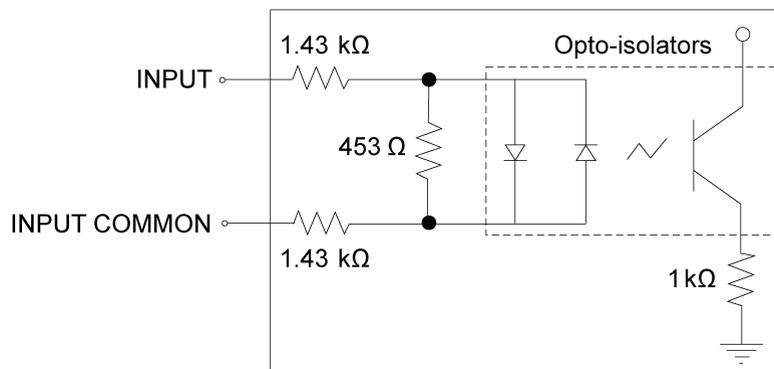
Note:



- There are two input terminal rows. INPUTS 0 - 3 share the COMMON 1 connection and INPUTS 4 - 7 share the COMMON 2 connection. Therefore the input devices for each terminal row must be the same; either current sinking or current sourcing.
- To maintain optical isolation of the I/O lines, the devices connected to these lines must not be connected to the same power supply as the vision controller. If they are connected to, or share a ground with, the same power supply, they may still function but will no longer be optically isolated.

Table 3-2: INPUTS 0 - 7 Specifications

Specification	Description
Input Voltage Limit	24VDC
Voltage	Input ON: >10VDC Input OFF: < 2VDC
Current	Input ON: > 6mA Input OFF: < 1.5mA Each line is optically isolated and polarity-independent.



24VDC Max. across input pins - transition approx. 10VDC (Nom.)

Figure 3-1: Input Schematic

Outputs

The vision controller features sixteen independent outputs (OUTPUTS 0 -15), which are optically isolated.

- OUTPUTS 0 - 7 provide up to 50mA current (maximum). These outputs are typically connected (directly or indirectly) to an input, such as a trigger input or PLC input.
- OUTPUTS 8 - 15 provide up to 100mA of current (maximum). These outputs and are typically connected (directly or indirectly) to a load, such as a relay, indicator light or reject mechanism.

Refer to [Wire Inputs and Outputs on page 33](#) for common wiring configurations.

Note:

- There are two output terminal rows. OUTPUTS 0 - 7 share the COMMON 1 connection and OUTPUTS 8 - 15 share the COMMON 2 connection. Therefore the output devices for each terminal row must be the same; either current sinking or current sourcing.
- To maintain optical isolation of the I/O lines, the devices connected to these lines must not be connected to the same power supply as the vision controller. If they are connected to, or share a ground with, the same power supply, they may still function but will no longer be optically isolated.

Table 3-3: OUTPUTS 0 - 7 Specifications

Specification	Description
Voltage	24VDC maximum between an output and output common.
Current	50mA maximum. Each line protected against over-current, short circuit and reverse polarity.
Maximum Voltage Drop	3VDC @ 50mA
Delay ¹	25µs (maximum due to opto-isolators turning ON)

Table 3-4: OUTPUTS 8 - 15 Specifications

Specification	Description
Voltage	24VDC maximum between an output and output common.
Current	100mA maximum. Each line protected against over-current, short circuit and reverse polarity.
Maximum Voltage Drop	3.5VDC @ 100mA
Delay ²	25µs (maximum due to opto-isolators turning ON)

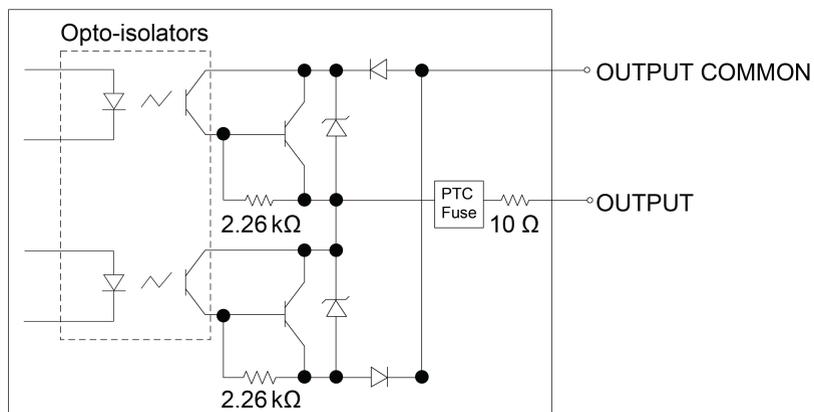


Figure 3-2: Output Schematic

¹ Delay when opto-isolators turn OFF depends on the load to which the output is connected. With a 1K load, the maximum delay will be 500 µs.

² Delay when opto-isolators turn OFF depends on the load to which the output is connected. With a 1K load, the maximum delay will be 500 µs.

Encoder Inputs

The vision controller features four encoder inputs that can be used to connect to either a single-ended or differential encoder. Using an encoder allows you to specify input and output delay values in pulse counts instead of real time units. The encoder signals are buffered and sent to each DS1000 series sensor through the SENSOR ports. Refer to [Wire Inputs and Outputs on page 33](#) for common wiring configurations.

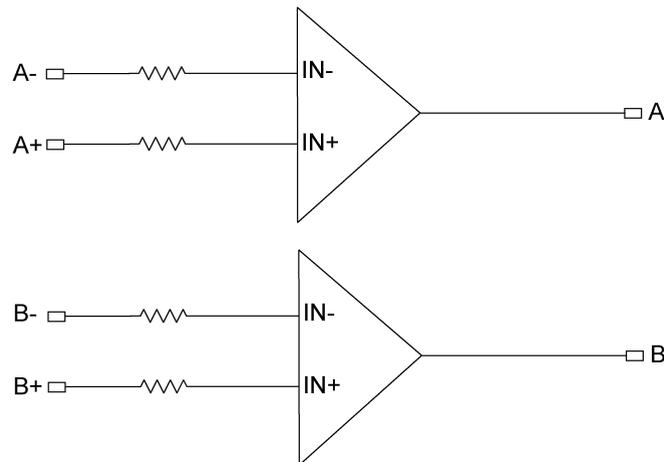
Note:



- Non-quadrature, single-channel encoders are not supported.
- The frequency of encoder pulses must not exceed 50 kHz.

Table 3-5: Encoder Input Specifications

Specification	Description
Differential Encoder	A+/B+: 5 to 24VDC A-/B-: Inverted (A+/B+)
Single-Ended Encoder	A+/B+: 5 to 24VDC A-/B-: VDC = $\frac{1}{2}$ (A+/B+)
Maximum Encoder Frequency	50 kHz (maximum)



Channel A and B Inputs (5 to 24VDC, Non-differential or Differential)

Figure 3-3: Channel A and Channel B Inputs

Port and Terminal Block Specifications

The following sections provide specifications for the vision controller's ports and terminal blocks.

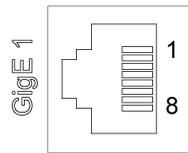
GigE Ports

The four GigE ports (GigE 1 - GigE 4) are 10/100/1000 RJ-45 ports that provide Gigabit Ethernet connectivity to Cognex industrial GigE cameras and Cognex DS1000 series sensors. These ports also provide power to Cognex industrial GigE cameras that support Power over Ethernet (PoE).

CAUTION: The vision controller's GigE ports provide power to Cognex industrial GigE cameras that support Power over Ethernet (PoE); connecting third party devices to these ports could damage the vision controller or the third-party device.

Table 3-6: GigE Port Pin-Out

Pin Number	Signal Name
1	MDI0+ (PoE_DC0V)
2	MDI0- (PoE_DC0V)
3	MDI1+ (PoE_DC48V)
4	MDI2+ (PoE_DC0V)
5	MDI2- (PoE_DC0V)
6	MDI1- (PoE_DC48V)
7	MDI3+ (PoE_DC48V)
8	MDI3- (PoE_DC48V)

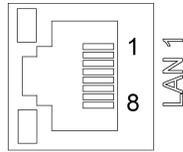


LAN Ports

The two LAN ports (LAN 1 and LAN 2) are 10/100/1000 RJ-45 Ethernet ports that are used to connect the vision controller to an Ethernet network.

Table 3-7: LAN Port Pin-Out

Pin Number	Signal Name
1	TRANSMIT+
2	TRANSMIT-
3	RECEIVE+
4	RJ-1 (for 100 BaseT only)
5	RJ-1 (for 100 BaseT only)
6	RECEIVE-
7	RJ-1 (for 100 BaseT only)
8	RJ-1 (for 100 BaseT only)

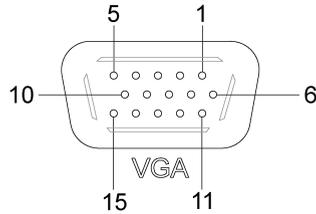


VGA Port

The VGA port is an analog DB15 connector that provides connection to a VGA monitor.

Table 3-8: VGA Port Pin-Out

Pin Number	Signal Name
1	RED
2	GREEN
3	BLUE
4	N/A
5	AGND
6	CRT DET#
7	AGND
8	AGND
9	VGA 5V
10	AGND
11	N/A
12	DDC DAT
13	HORIZONTAL SYNC
14	VERTICAL SYNC
15	DDC CLK

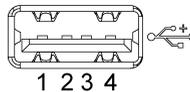


USB Ports

The three USB ports are USB 2.0 ports that can be used to connect HID devices (mouse, keyboard or mass storage device).

Table 3-9: USB Port Pin-Out

Pin Number	Signal Name
1	USB POWER
2	USB DATA -
3	USB DATA+
4	USB GROUND

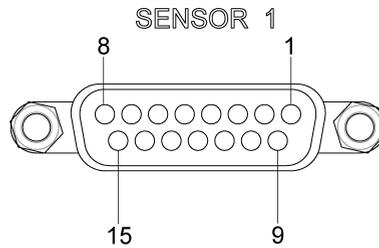


SENSOR Ports

The two SENSOR ports (SENSOR 1 and SENSOR 2) are DB15 ports that provide power, encoder and trigger connections to Cognex DS1000 series sensors via the Power and I/O cable.

Table 3-10: SENSOR Port Pin-Out

Pin Number	Signal Name
1	+24VDC POWER
2	LASER- (NOT USED)
3	LASER+ (NOT USED)
4	CTRL+ (NOT USED)
5	CTRL- (NOT USED)
6	NOT USED
7	NOT USED
8	-24VDC
9	ENCODER A+
10	ENCODER A-
11	TRIGGER+
12	TRIGGER-
13	ENCODER B+
14	ENCODER B-
15	NOT USED

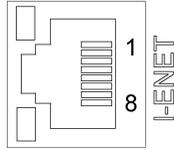


I-ENET Port

The I-ENET port is a 10/100 RJ-45 Ethernet port that can be connected to a network that is dedicated to industrial Ethernet devices (for example, PLCs or robots) to communicate with the devices using supported industrial Ethernet protocols.

Table 3-11: I-ENET Port Pin-Out

Pin Number	Signal Name
1	TRANSMIT+
2	TRANSMIT-
3	RECEIVE+
4	N/A
5	N/A
6	RECEIVE-
7	N/A
8	N/A

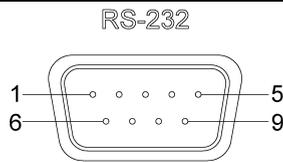


RS-232 Port

The RS-232 port is a DB9 port that connects the vision controller to a serial device.

Table 3-12: RS-232 Port Pin-Out

Pin Number	Signal Name
1	DATA CARRIER DETECT (DCD)
2	RECEIVE DATA (RxD)
3	TRANSMIT DATA (TxD)
4	DATA TERMINAL READY (DTR)
5	GROUND (GND)
6	DATA SET READY (DSR)
7	REQUEST TO SEND (RTS)
8	CLEAR TO SEND (CTS)
9	RING INDICATOR (RI)



INPUTS Terminal Block Assignments

The INPUTS terminal blocks provide access to a total of 8 inputs and 2 common connections. Recommended wiring is 16 - 26 AWG, solid or stranded wire.

CAUTION: The maximum torque that can be applied to the I/O terminal connectors is 0.25 Nm (2.2 in-lb). Applying torque above this limit can damage the connectors.

Table 3-13: INPUT Terminal Block Pin Assignments

Pin Label	Signal Name
0	INPUT 0
1	INPUT 1
2	INPUT 2
3	INPUT 3
C1	INPUT COMMON 1
4	INPUT 4
5	INPUT 5
6	INPUT 6
7	INPUT 7
C2	INPUT COMMON 2

OUTPUTS Terminal Block Assignments

The OUTPUTS terminal blocks provide access to a total of 16 outputs and 2 common connections. Recommended wiring is 16 - 26 AWG, solid or stranded wire.

CAUTION: The maximum torque that can be applied to the I/O terminal connectors is 0.25 Nm (2.2 in-lb). Applying torque above this limit can damage the connectors.

Table 3-14: OUTPUT Terminal Block Pin Assignments

Pin Label	Signal Name
0	OUTPUT 0
1	OUTPUT 1
2	OUTPUT 2
3	OUTPUT 3
4	OUTPUT 4
5	OUTPUT 5
6	OUTPUT 6
7	OUTPUT 7
C1	OUTPUT COMMON 1
8	OUTPUT 8
9	OUTPUT 9
10	OUTPUT 10
11	OUTPUT 11
12	OUTPUT 12
13	OUTPUT 13
14	OUTPUT 14
15	OUTPUT 15
C2	OUTPUT COMMON 2

ENCODER Terminal Block Assignments

The ENCODER terminal blocks connect the vision controller to encoder inputs. Recommended wiring is 16 - 26 AWG, solid or stranded wire.

CAUTION: The maximum torque that can be applied to the I/O terminal connectors is 0.25 Nm (2.2 in-lb). Applying torque above this limit can damage the connectors.

Note: The Laser Safety inputs (L+ and L-) are not supported.

Table 3-15: ENCODER Terminal Block Pin Assignments

Pin Label	Signal Name
L+	LASER+ (NOT USED)
A+	ENCODER A+
B+	ENCODER B+
L-	LASER- (NOT USED)
A-	ENCODER A-
B-	ENCODER B-

24VDC Power Connector Terminal Assignments

The 24VDC power connector is used to connect an external power supply to the vision controller. Recommended wiring is 14 - 18 AWG, solid or stranded wire.

CAUTION: The maximum torque that can be applied to the 24VDC power connector is 0.6 Nm (5.3 in-lb). Applying torque above this limit can damage the connector.

Table 3-16: 24VDC Power Connector Terminal Pin Assignments

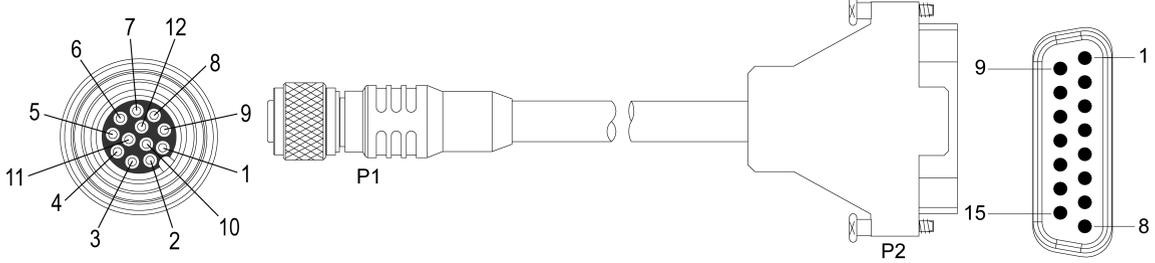
Pin Number	Signal Name
1	+24VDC (POWER)
2	-24VDC (RETURN)
3	FRAME GROUND

Power and I/O Cable Specifications (DS1000 Only)

The Power and I/O cable connects the Cognex DS1000 series sensor directly to the vision controller's SENSOR ports via the DB15 connector. When connected to the vision controller, all power, encoder and trigger lines used by the sensor are connected using the Power and I/O cable.

Note: The SENSOR ports should only be used with Cognex-supplied cables. Cables are sold separately.

Table 3-17: Power and I/O Cable Pin-Out



P1 Pin Number	Signal Name	P2 Pin Number
1	ENCODER B+	13
2	ENCODER B-	14
3	ENCODER A+	9
4	ENCODER A-	10
5	TRIGGER+	11
6	TRIGGER-	12
7	+24VDC POWER	1
8	-24VDC	8
9	LASER+ (NOT USED)	3
10	LASER- (NOT USED)	2
11	CTRL+ (NOT USED)	4
12	CTRL- (NOT USED)	5
N/C	NOT USED	15
N/C	NOT USED	6
N/C	NOT USED	7

Vision Controller Dimensions

Note:

- All dimensions are in millimeters [inches] and are for reference purposes only.
- All specifications may be changed without notice.

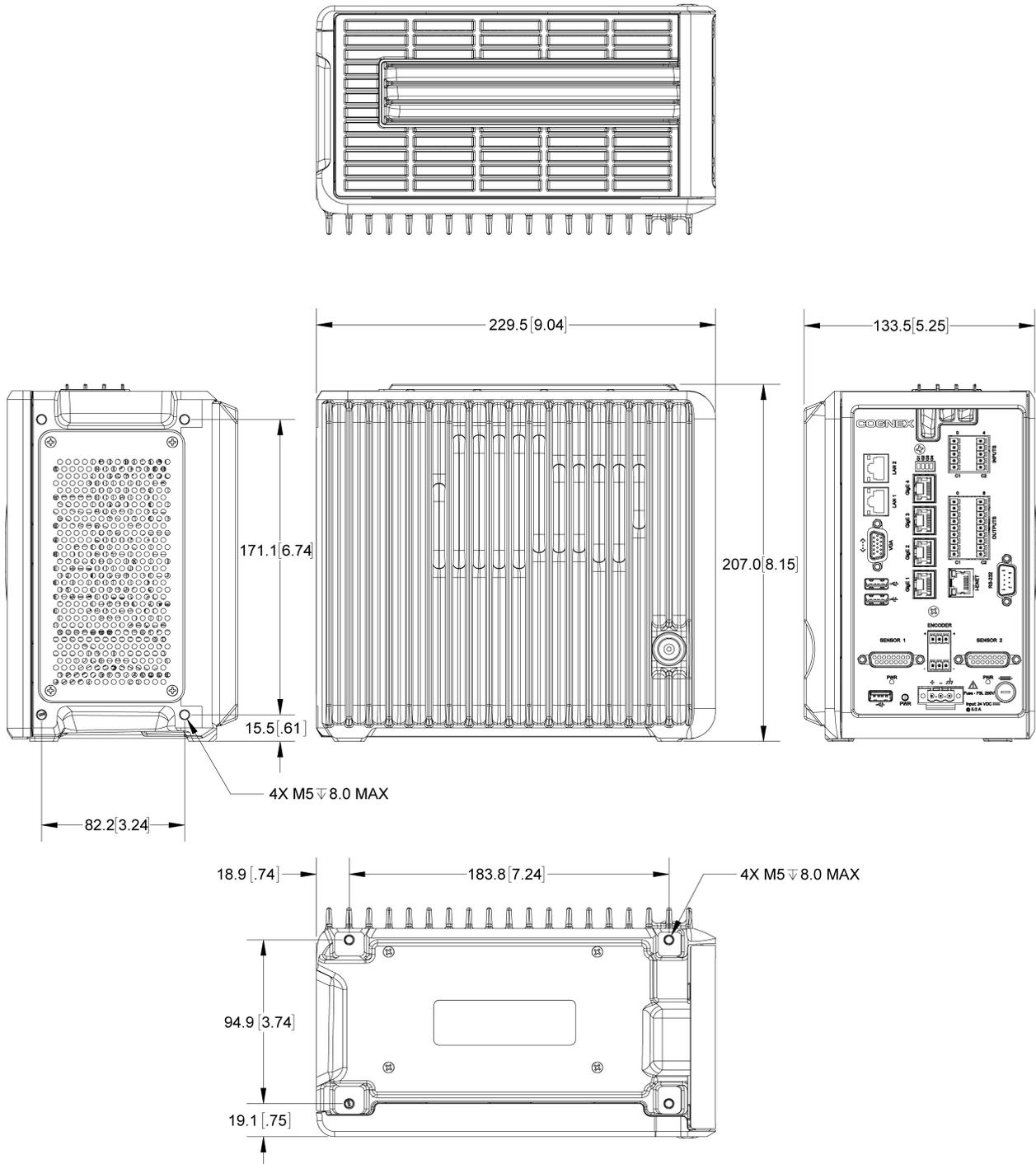


Figure 3-4: Vision Controller Dimensions

Appendix A - Wire Inputs and Outputs

The following figures show basic wiring for some of the more common I/O configurations.

Input from PLC - Current Sinking

To configure the input as a sinking input, connect INPUT COMMON (for example, C1) to the high voltage reference (+24VDC) and connect one of the INPUTS on the same terminal row (for example, INPUT 0) to the OUTPUT of the photoelectric sensor or PLC. When the PLC output turns ON, the INPUT is pulled down to a low voltage level.

Note:



- There are two input terminal rows. INPUTS 0 - 3 share the COMMON 1 connection and INPUTS 4 - 7 share the COMMON 2 connection. Therefore the input devices for each terminal row must be the same; either current sinking or current sourcing.
- To maintain optical isolation of the I/O lines, the devices connected to these lines must not be connected to the same power supply as the vision controller. If they are connected to, or share a ground with, the same power supply, they may still function but will no longer be optically isolated.

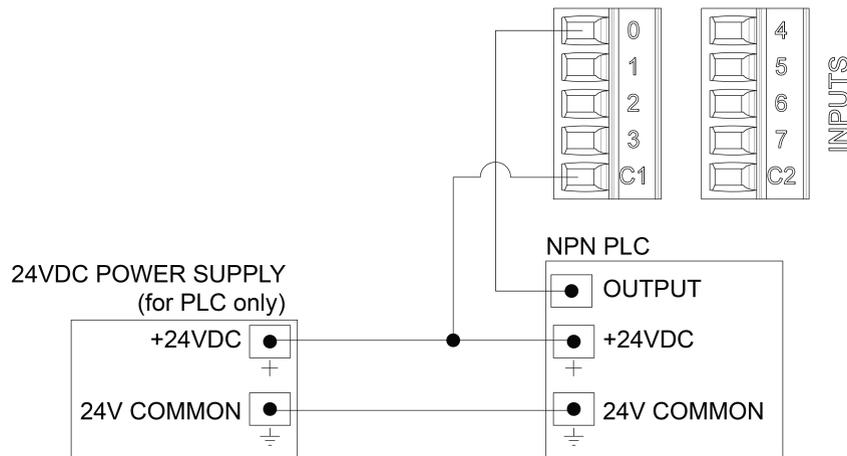


Figure A-1: Input from PLC - Current Sinking

Input from PLC - Current Sourcing

To configure the input as sourcing input, connect INPUT COMMON (for example, C1) to the low voltage reference (24V COMMON) and one of the INPUTS on the same terminal row (for example, INPUT 0) to the OUTPUT of the photoelectric sensor or PLC. When the PLC output turns ON, the INPUT is pulled up to a positive voltage level.

Note:



- There are two input terminal rows. INPUTS 0 - 3 share the COMMON 1 connection and INPUTS 4 - 7 share the COMMON 2 connection. Therefore the input devices for each terminal row must be the same; either current sinking or current sourcing.
- To maintain optical isolation of the I/O lines, the devices connected to these lines must not be connected to the same power supply as the vision controller. If they are connected to, or share a ground with, the same power supply, they may still function but will no longer be optically isolated.

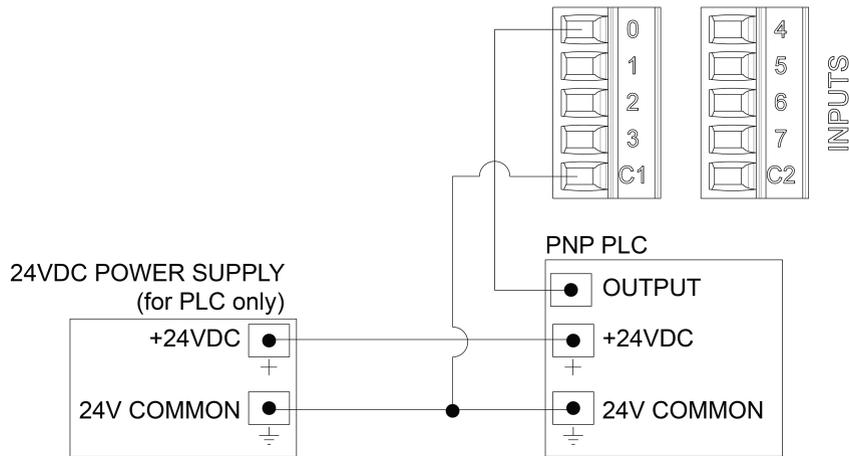


Figure A-2: Input from PLC - Current Sourcing

Output to PLC - Current Sinking

To configure the output as a sinking output, connect OUTPUT COMMON (for example, C1) to the low voltage reference (24V COMMON) and connect one of the OUTPUTS on the same terminal row (for example, OUTPUT 4) to the INPUT of the photoelectric sensor or PLC. When the vision controller output turns ON, the PLC input is pulled down to a low voltage level.

Note:

- OUTPUTS 0 - 7 provide up to 50mA current (maximum).
- There are two output terminal rows. OUTPUTS 0 - 7 share the COMMON 1 connection and OUTPUTS 8 - 15 share the COMMON 2 connection. Therefore the output devices for each terminal row must be the same; either current sinking or current sourcing.
- To maintain optical isolation of the I/O lines, the devices connected to these lines must not be connected to the same power supply as the vision controller. If they are connected to, or share a ground with, the same power supply, they may still function but will no longer be optically isolated.

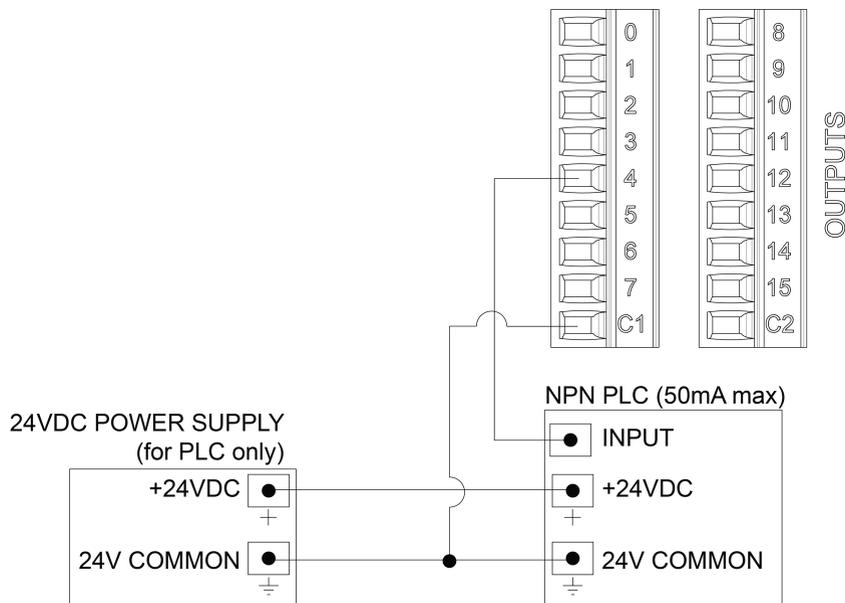


Figure A-3: Output to PLC - Current Sinking

Output to PLC - Current Sourcing

To configure the output as a sourcing output, connect OUTPUT COMMON (for example, C1) to the high voltage reference (+24VDC) and connect one of the OUTPUTS on the same terminal row (for example, OUTPUT 4) to the INPUT of the photoelectric sensor or PLC. When the vision controller output turns ON, the PLC input is pulled up to a high voltage level.

Note:

- OUTPUTS 0 - 7 provide up to 50mA current (maximum).
- There are two output terminal rows. OUTPUTS 0 - 7 share the COMMON 1 connection and OUTPUTS 8 - 15 share the COMMON 2 connection. Therefore the output devices for each terminal row must be the same; either current sinking or current sourcing.
- To maintain optical isolation of the I/O lines, the devices connected to these lines must not be connected to the same power supply as the vision controller. If they are connected to, or share a ground with, the same power supply, they may still function but will no longer be optically isolated.

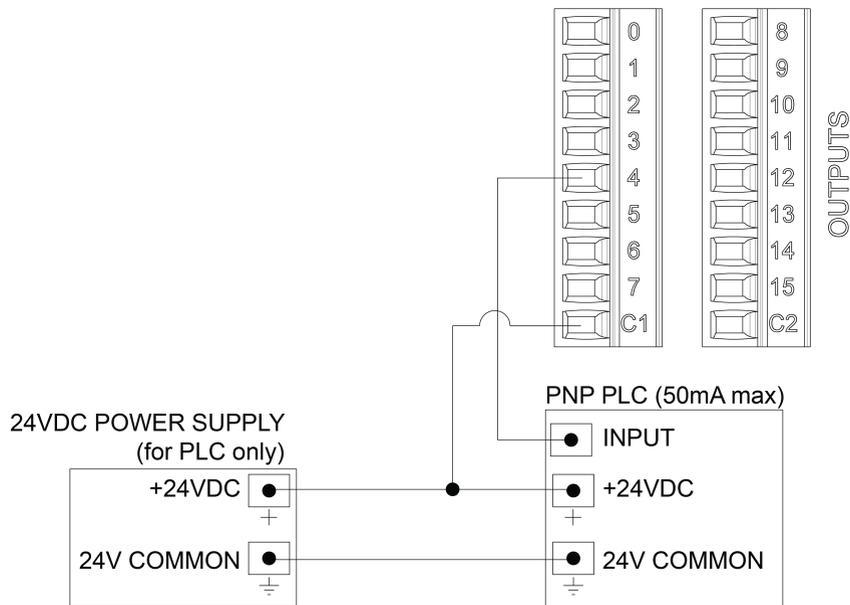


Figure A-4: Output to PLC - Current Sourcing

Output to Pilot Light - Current Sinking

To configure the output as a sinking output, connect OUTPUT COMMON (for example, C2) to the power supply's low voltage reference (24V COMMON) and connect one of the OUTPUTS on the same terminal row (for example, OUTPUT 12) to the pilot light's low voltage reference (24V COMMON).

Note:

- OUTPUTS 8 - 15 provide up to 100mA of current (maximum).
- There are two output terminal rows. OUTPUTS 0 - 7 share the COMMON 1 connection and OUTPUTS 8 - 15 share the COMMON 2 connection. Therefore the output devices for each terminal row must be the same; either current sinking or current sourcing.
- To maintain optical isolation of the I/O lines, the devices connected to these lines must not be connected to the same power supply as the vision controller. If they are connected to, or share a ground with, the same power supply, they may still function but will no longer be optically isolated.

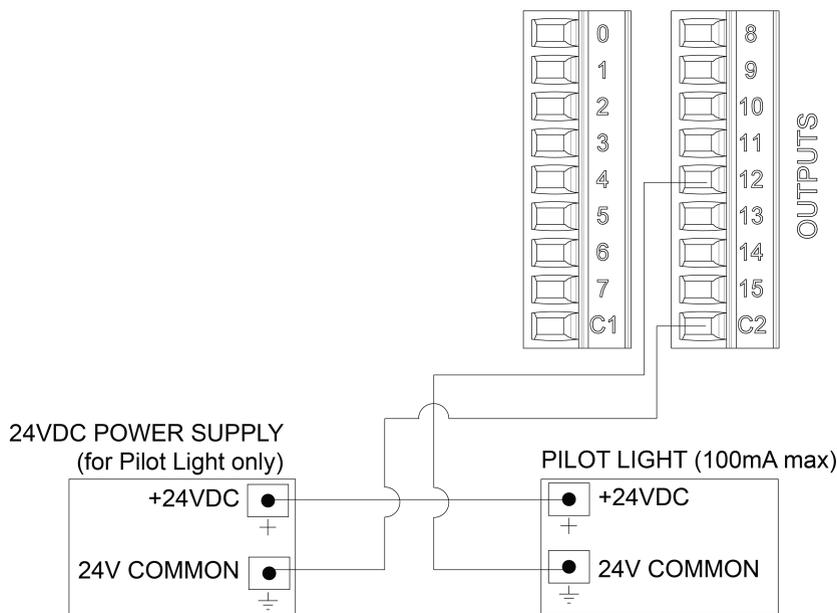


Figure A-5: Output to Pilot Light - Current Sinking

Output to Pilot Light - Current Sourcing

To configure the output as a sourcing output, connect OUTPUT COMMON (for example, C2) to the power supply's high voltage reference (+24VDC) and connect one of the OUTPUTS on the same terminal row (for example, OUTPUT 12) to the pilot light's high voltage reference (+24VDC).

Note:

- OUTPUTS 8 - 15 provide up to 100mA of current (maximum).
- There are two output terminal rows. OUTPUTS 0 - 7 share the COMMON 1 connection and OUTPUTS 8 - 15 share the COMMON 2 connection. Therefore the output devices for each terminal row must be the same; either current sinking or current sourcing.
- To maintain optical isolation of the I/O lines, the devices connected to these lines must not be connected to the same power supply as the vision controller. If they are connected to, or share a ground with, the same power supply, they may still function but will no longer be optically isolated.

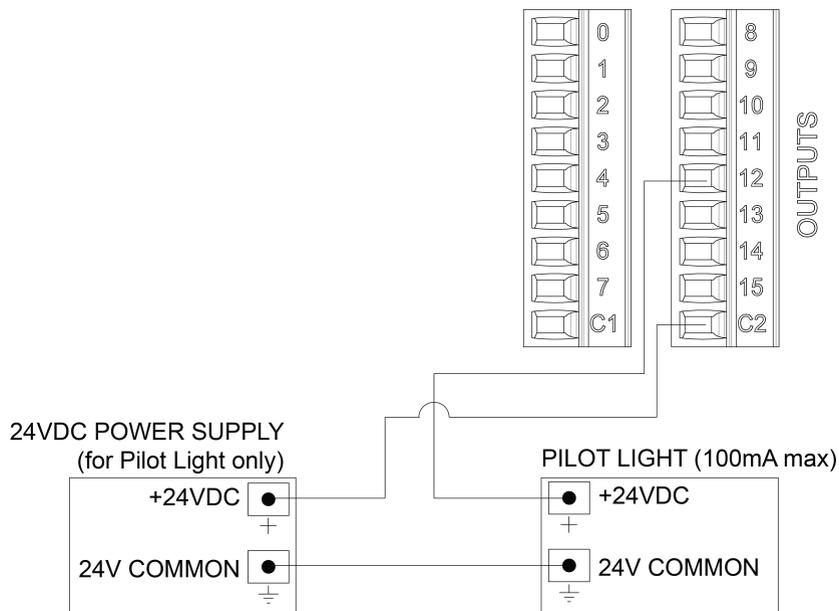


Figure A-6: Output to Pilot Light - Current Sourcing

Differential Encoder Configuration

For a differential encoder, connect A+, B+, A- and B- to the corresponding encoder outputs. Connect the encoder's ground wire to the Frame Ground terminal (Pin 3) on the vision controller's 24VDC power connector. Refer to [24VDC Power Connector Terminal Assignments on page 29](#) for terminal pin assignments.

Note:



- Non-quadrature, single-channel encoders are not supported.
- The Laser Safety inputs (L+ and L-) are not supported.
- The frequency of encoder pulses must not exceed 50 kHz.

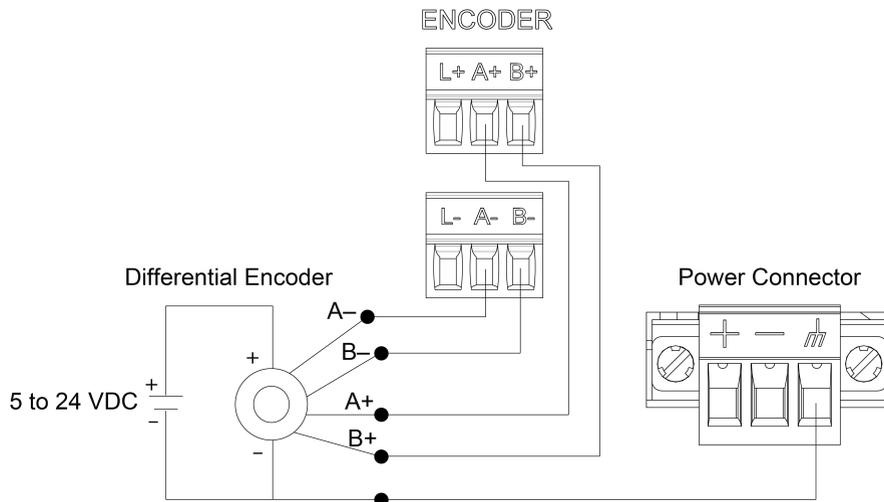


Figure A-7: Differential Encoder Configuration

Single-Ended Encoder Configuration

For a single-ended encoder, connect A+ and B+ to the corresponding encoder outputs. Derive A- and B- from the encoder voltage source and make them equal to 50% of the encoder reference voltage (for example, if the encoder is connected to 24VDC, set A- and B- to 12VDC). Connect the encoder's ground wire to the Frame Ground terminal (Pin 3) on the vision controller's 24VDC power connector. Refer to [24VDC Power Connector Terminal Assignments on page 29](#) for terminal pin assignments.

Note:



- Non-quadrature, single-channel encoders are not supported.
- The Laser Safety inputs (L+ and L-) are not supported.
- The frequency of encoder pulses must not exceed 50 kHz.

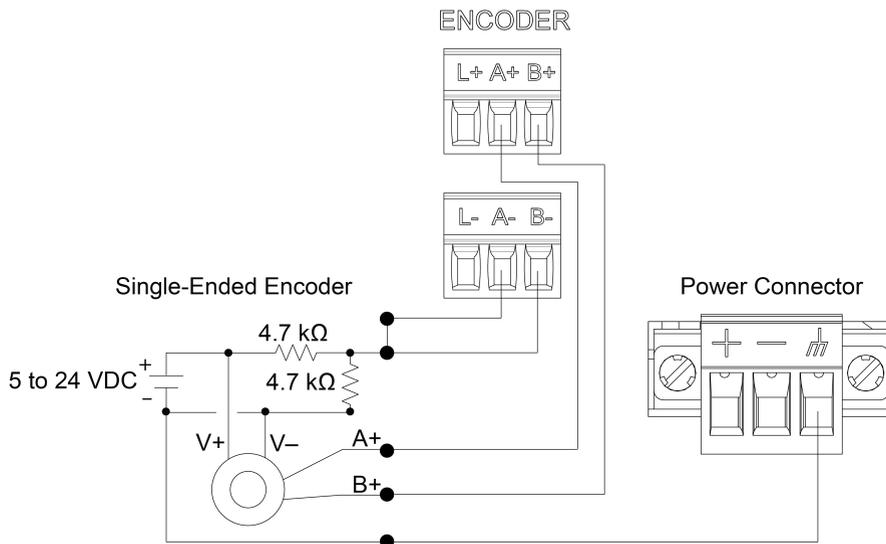


Figure A-8: Single-Ended Encoder Configuration

Appendix B - Replace the Fuse

The vision controller includes a system fuse to provide over-current protection for the vision controller.

CAUTION: The system fuse is the only user-serviceable part in this product. Do not open this product; there are no other user serviceable parts. Unauthorized modifications may void your warranty.

1. Verify that the 24VDC power supply being used is unplugged and not receiving power.
2. Using a flat-head screw driver, firmly press the fuse capsule in and turn the fuse capsule counter-clockwise by 90 degrees.
3. Remove the fuse capsule from the fuse holder on the vision controller.

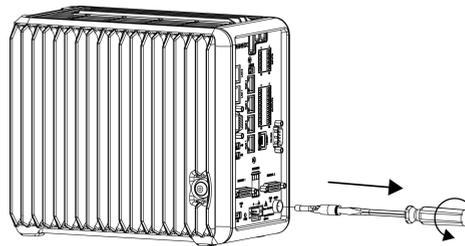


Figure B-1: Remove the Fuse Capsule

4. Remove the fuse from the capsule and replace it with the new fuse.

CAUTION: The replacement fuse must be a Littelfuse® (Part 0217005) or an equivalent UL-recognized fast-blow fuse rated at 5A, low breaking capacity, and 250V. It must also be rated for DC operation at a voltage of 24VDC or higher.

5. Insert the fuse capsule into the fuse holder on the vision system. The screw thread should be in a vertical orientation.
6. Using a flat-head screw driver, firmly press the fuse capsule in and turn the fuse capsule clockwise by 90 degrees.

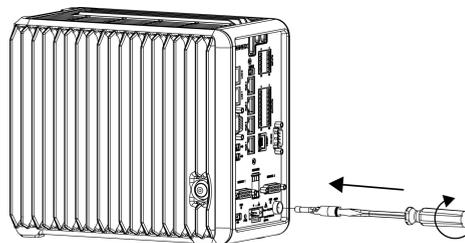


Figure B-2: Install the Fuse Capsule

7. Restore power to the 24VDC power supply and turn it on if necessary.

Appendix C - Cleaning/Maintenance

Use a cleaning cloth or brush to remove dirt, dust and smudges from the vision controller. Keep all liquids away from the vision controller connectors and openings.

 **CAUTION:** Cleaning chemicals should not be used on the vision controller.
