COGNEX

In-Sight® Micro Series Vision System

Installation Manual

IN-SIGHT
Vision Systems

Legal Notices

Cognex P/N 597-0109-03

Regulations/Conformity

Note: For the most up-to-date regulations and conformity information, please refer to the In-Sight online support site: http://www.cognex.com/Support/InSight.

Declaration of Conformity	
Manufacturer	Cognex Corporation One Vision Drive Natick, MA 01760 USA
Declares this CE-marked Machine Vision System Product	
Product Type	In-Sight Micro 1020/1050/1100/1110/1400/1410: Type 821-0043-1R In-Sight Micro 1100C/1400C: Type 821-0044-1R In-Sight Micro 1403/1413: Type 821-0047-1R In-Sight Micro 1403C: Type 821-0048-1R
Complies With	2004/108/EC Electromagnetic Compatibility Directive
Compliance Standards	EN 55022:2006 Class A EN 61000-6-2:2005
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	In-Sight Micro 1020/1050/1100/1110/1400/1410: CGX-ISM1400-00(A) In-Sight Micro 1100C/1400C: CGX-ISM1400-C00(A) In-Sight Micro 1403/1413: CGX-ISM1403-00(A) In-Sight Micro 1403C: CGX-ISM1403-C00(A)
NRTL	TÜV SÜD AM SCC/NRTL OSHA Scheme for UL/CAN 60950-1.
CB	TÜV SÜD AM, IEC/EN 60950-1. CB report available upon request.
RoHS	RoHS 6 Compliant.

Precautions

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

- An IEEE 802.3af compliant, and UL or NRTL listed, Power over Ethernet (PoE) power source rated Class 0, 2, 3 or 4 must be used. Any other voltage creates a risk of fire or shock and can damage the In-Sight vision system components. Applicable local and national wiring standards and rules must be followed.
- 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 In-Sight vision systems where they are directly exposed to environmental hazards such as excessive heat, dust, moisture, humidity, impact, vibration, corrosive substances, flammable substances, or static electricity.
- Do not expose the CCD to laser light; CCDs can be damaged by direct, or reflected, laser light. If your application requires the use of laser light that may strike the CCD, a lens filter at the corresponding laser's wavelength is recommended. Contact your local integrator or application engineer for suggestions.
- The In-Sight vision system does not contain user-serviceable parts. Do not make electrical or mechanical modifications to In-Sight vision system components. Unauthorized modifications may void your warranty.
- Changes or modifications not expressly approved by the party responsible for regulatory compliance could void the user’s authority to operate the equipment.
- 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 bend radius or service loop is tighter than 10X the cable diameter.
- This device is for business purposes and is qualified and registered for electromagnetic compatibility. The seller or purchaser should be notified if you incorrectly purchased these products; please exchange them for home use.
- This device should be used in accordance with the instructions in this manual.

Table of Contents

Introduction

This manual describes how to install the In-Sight® Micro vision system.

The In-Sight vision system is a compact, network-ready, stand-alone machine vision system used for automated inspection, measurement, identification and robot guidance applications on the factory floor. All models can be easily configured remotely over a network using an intuitive user interface.

Support

Many information resources are available to assist you in using the vision system:

- *In-Sight® Explorer Help*, an online HTML Help file provided on the In-Sight CD-ROM.
- In-Sight computer-based tutorials provided on CD-ROM with selected In-Sight starter accessories kits.
- The In-Sight online support site: http://www.cognex.com/Support/InSight.

Standard Components

In-Sight Micro vision systems are shipped with the standard components listed in Table 1-1.

Table 1-1: Standard Components

Component	Description
Vision System	Provides image acquisition, vision processing, job storage, Ethernet connectivity and discrete I/O.
Mounting Kit	Includes M3 screws for mounting the vision system (quantity 4) and an optional mounting block for securing the vision system to a mounting surface.
Extension Ring	A 5mm extension ring (for use with C-mount lenses).

Cables

Note: Cables are sold separately.

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

Ethernet Cable

The Ethernet cable provides the Ethernet connection for network communications and supplies power to the vision system. The pin-outs for the cable are listed in the *Ethernet Cable Specifications* on page 17. This cable is available in the lengths and styles listed in Table 1-2.

Table 1-2: Ethernet Cables

Length	Standard Part #	45-Degree Key Right-Angle Part #	135-Degree Key Right Angle Part #
0.6 m	CCB-84901-1001-00	N/A	N/A
2 m	CCB-84901-1002-02	CCB-84901-6005-02	CCB-84901-7005-02
5 m	CCB-84901-1003-05	CCB-84901-6001-05	CCB-84901-7001-05
10 m	CCB-84901-1004-10	CCB-84901-6002-10	CCB-84901-7002-10
15 m	CCB-84901-1005-15	CCB-84901-6003-15	CCB-84901-7003-15
30 m	CCB-84901-1006-30	CCB-84901-6004-30	CCB-84901-7004-30

Breakout Cable

The Breakout cable provides access to the vision system's trigger and high-speed outputs. The Breakout cable can be connected to devices, such as a PLC, trigger sensor or strobe light. The pin-outs for the cable are listed in the *Breakout Cable Specifications* on page 18. This cable is available in the lengths listed in Table 1-3.

Table 1-3: Breakout Cables

Length	Part #
0.6 m	CCB-M8IO-00
2 m	CCB-M8IO-02
5 m	CCB-M8IO-05
10 m	CCB-M8IO-10
15 m	CCB-M8IO-15

I/O Module Cable

The I/O Module cable is used with the CIO-MICRO or CIO-MICRO-CC I/O module. The I/O Module cable connects the vision system directly to the I/O module via the DB15 connector. When connected, the I/O Module cable provides access to the vision system's trigger and high-speed outputs. The pin-outs for the cable are listed in the *I/O Module Cable Specifications* on page 19. This cable is available in the lengths listed in Table 1-4.

Table 1-4: I/O Module Cables

Length	Part #
0.7 m	CCB-M8DSIO-00
2 m	CCB-M8DSIO-02
5 m	CCB-M8DSIO-05
10 m	CCB-M8DSIO-10
15 m	CCB-M8DSIO-15

Installation

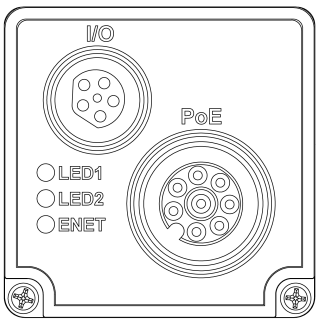
This section describes the connection of the vision system to its standard and optional components. For a complete list of options and accessories, contact your Cognex sales representative.

Note:

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

Connectors and Indicators

Table 2-1: Vision System Connectors and Indicators



Connector/Indicator	Function
I/O Connector	Provides connections to the acquisition trigger input and high-speed outputs.
PoE Connector	Provides the Ethernet connection for network communications and supplies power to the vision system.
LED1	Green when active. User-configurable using Discrete Output Line 4 (Line 10 when using the CIO-MICRO or CIO-MICRO-CC I/O module).
LED2	Red when active. User-configurable using Discrete Output Line 5 (Line 11 when using the CIO-MICRO or CIO-MICRO-CC I/O module).
ENET	100-BaseT: Red when the vision system is receiving power during startup, momentarily switches to green when a network connection is established, and then blinks green when network traffic is detected. If a network connection cannot be established, the LED remains red. 10-BaseT: Red when the vision system is receiving power during startup, momentarily switches to green when a network connection is established. The LED is solid green with red blinking when network traffic is detected. If a network connection cannot be established, the LED remains red.

Install the Mounting Block (Optional)

Use the mounting block to secure the vision system to a mounting surface.

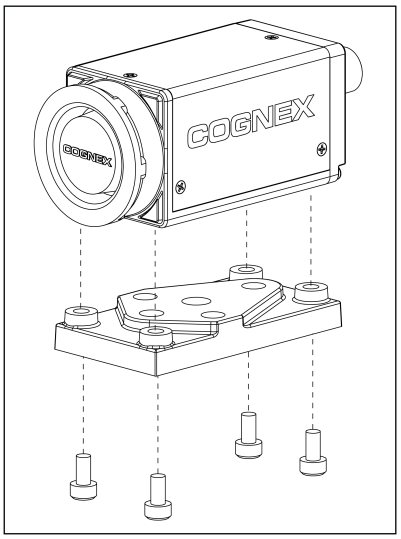


Figure 2-1: Attach the Mounting Block

1. Align the mounting block with the mounting holes on the vision system.
2. Insert the M3x6 (quantity 4) screws into the mounting holes and tighten the screws using a 2.5mm hex wrench; the maximum torque is 0.9039 Nm (8 in-lb).

Install the Lens

1. Remove the protective lens cap and the protective film covering the CCD, if present.
2. Attach a CS-Mount or C-Mount (with 5mm extension ring) lens to the vision system. The exact lens focal length needed depends on the working distance and the field of view required for your machine vision application.

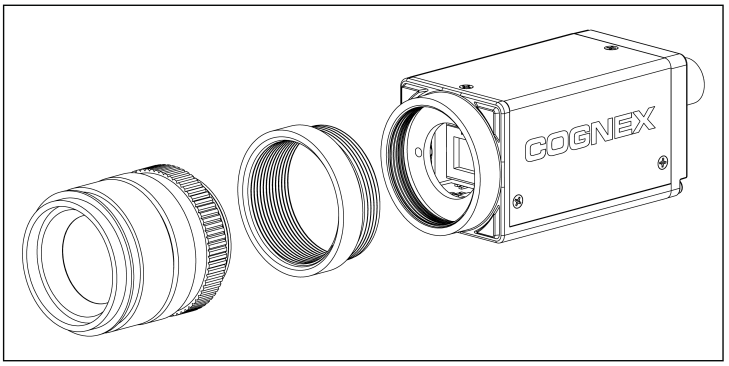


Figure 2-2: Install the Lens (C-Mount with Extension Ring)

Connect the Inputs and Outputs (Optional)

The vision system's I/O connector supplies connections for the acquisition trigger and high-speed outputs.

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

Option 1: Connect the Breakout Cable

Note: Unused bare wires can be clipped short or tied back using a tie made of non-conductive material.

1. Connect the Breakout cable's M8 connector to the vision system's I/O connector.
2. Connect the trigger and high-speed I/O wires to an appropriate device (for example, a PLC, trigger sensor or strobe light). The pin-outs for the cable are listed in the *Breakout Cable Specifications* on page 18.

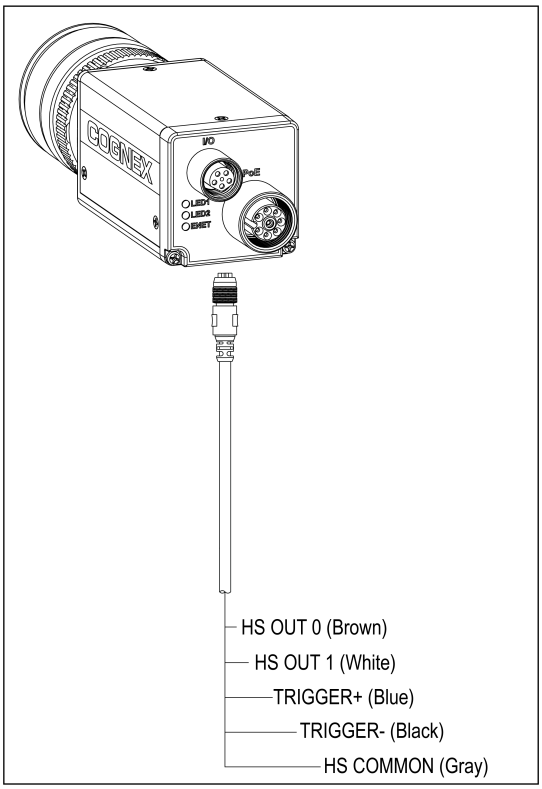


Figure 2-3: Connect the Breakout Cable

Option 2: Connect the I/O Module Cable

Note: Refer to the *In-Sight® Explorer Help* file for details on configuring the discrete input and output lines.

1. Connect the I/O Module cable's M8 connector to the vision system's I/O connector.

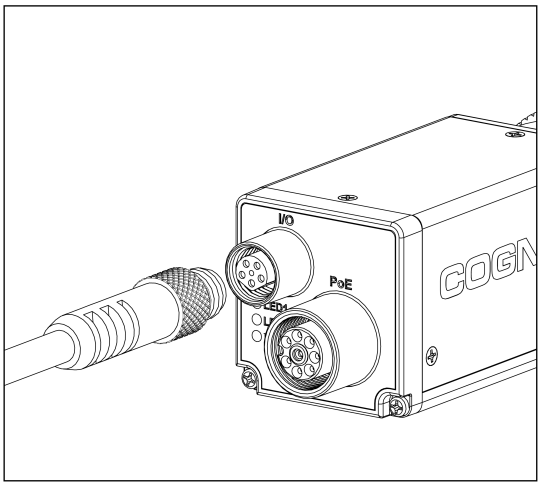


Figure 2-4: Connect the I/O Module Cable to the Vision System

2. Plug the I/O Module cable's DB15 connector into the I/O module's I/O connector.

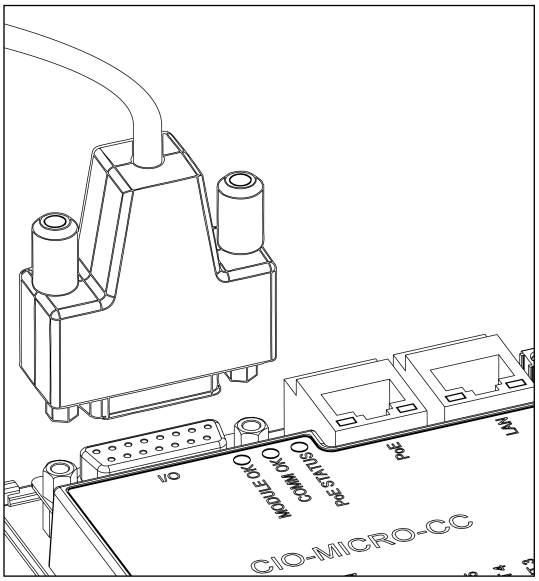


Figure 2-5: Connect the I/O Module Cable to the I/O Module

Connect the Ethernet and Power

The vision system's PoE connector provides the Ethernet connection for network communications and supplies power to the vision system.

The following steps illustrate how to connect the In-Sight Micro vision system to the In-Sight CIO-MICRO or CIO-MICRO-CC I/O module. If neither I/O module is used, the Cognex VisionView® Operator Interface Panel, a third-party PoE injector or a PoE switch must be used to supply power to the vision system.

Note: Refer to the *In-Sight® CIO-MICRO and CIO-MICRO-CC I/O Module Installation Manual* for detailed connection information.

Connect the Power Wires

CAUTION: Never connect the I/O module to a power source other than 24VDC. Any other voltage creates a risk of fire or shock and can damage the hardware. Do not connect the 24VDC power source to any terminals other than the 24VDC + and – power connectors.

1. Verify that the 24VDC power supply being used is unplugged and not receiving power.
2. Use a screwdriver to loosen the I/O module's power terminals (labeled 24VDC + and –).
3. Insert the 24VDC + and – wires (16 - 22 AWG, solid or stranded wire) from the power supply into the 24VDC + and – terminals on the I/O module.
4. Tighten the screw terminals with the screwdriver to secure the wire leads in the terminal block; the maximum torque is 0.1921 Nm (1.7 in-lb).

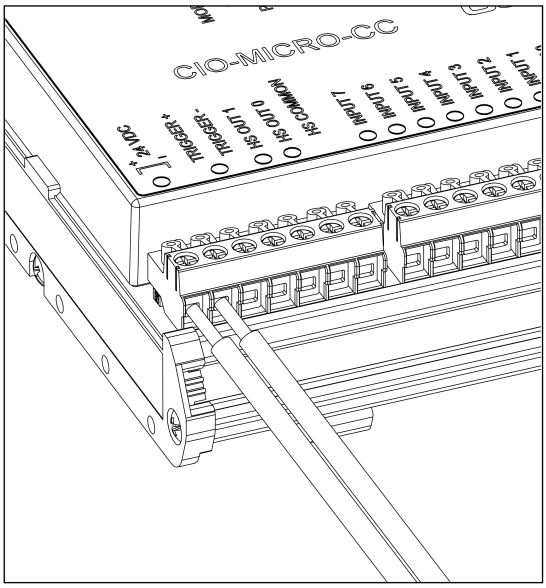


Figure 2-6: Connect the Power Wires

5. Connect a frame ground wire to the I/O module's Frame Ground terminal.

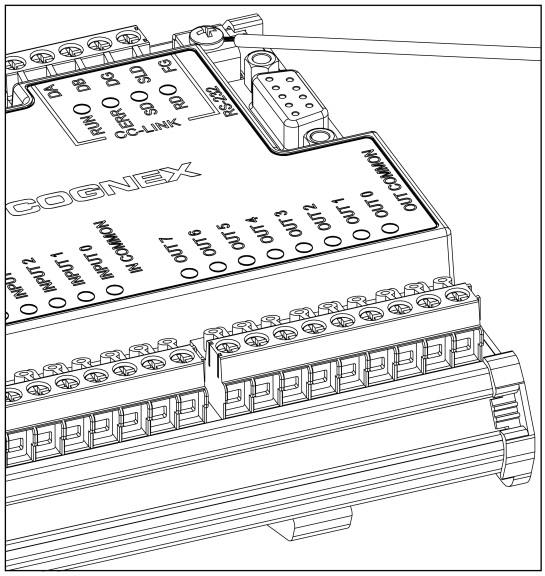


Figure 2-7: Connect the Frame Ground Wire

6. Connect the other end of the frame ground wire to frame ground.

CAUTION: The shield ground connections of the RS-232 port, LAN port, PoE port, I/O port and Frame Ground terminal are internally connected. The system grounding is designed to be at a zero ground potential; this zero ground potential extends through the cable and to peripheral equipment (e.g. a vision system, PLC, etc.). To ensure safe operating conditions, it is strongly recommended that all ground connections are checked to ensure that a zero ground potential is met.

Connect an RJ-45 LAN Cable

To connect the vision system to an Ethernet network, plug a LAN cable (RJ-45 connector) into the I/O module's LAN port and connect the other end of the cable to a switch/router or PC, as applicable.

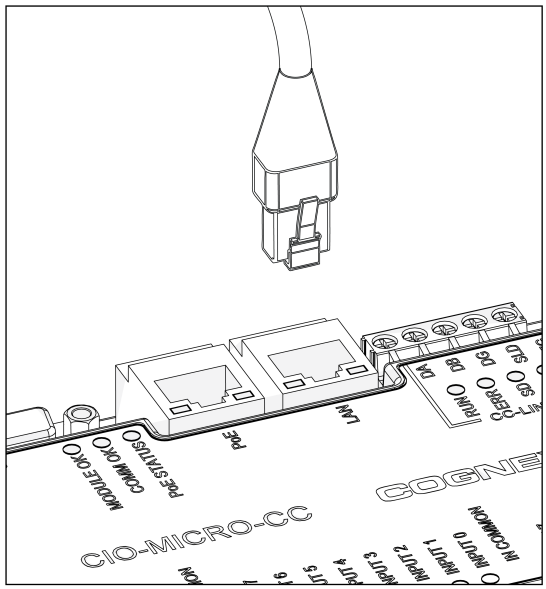


Figure 2-8: Connect an RJ-45 LAN Cable

Connect the Ethernet Cable

CAUTION:

- All cable connectors are “keyed” to fit the connectors on the vision system; do not force the connections or damage may occur.
- The I/O module’s PoE port provides power and Ethernet connectivity to the In-Sight Micro vision system. Connecting third-party devices to the I/O module's PoE port could damage the I/O module.

1. Connect the Ethernet cable’s M12 connector to the vision system's PoE connector.

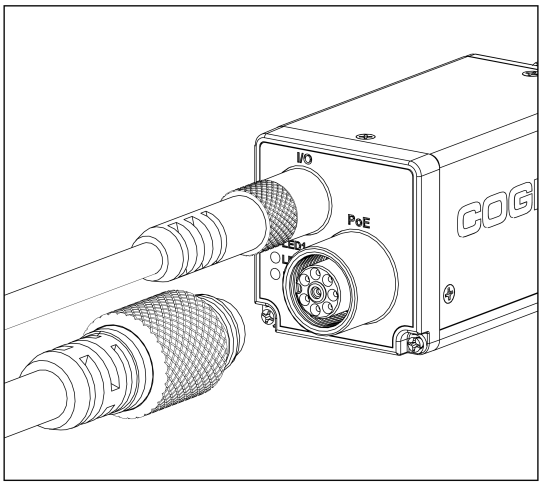


Figure 2-9: Connect the Ethernet Cable to the Vision System

2. Connect the Ethernet cable’s RJ-45 connector to the I/O module’s PoE port.

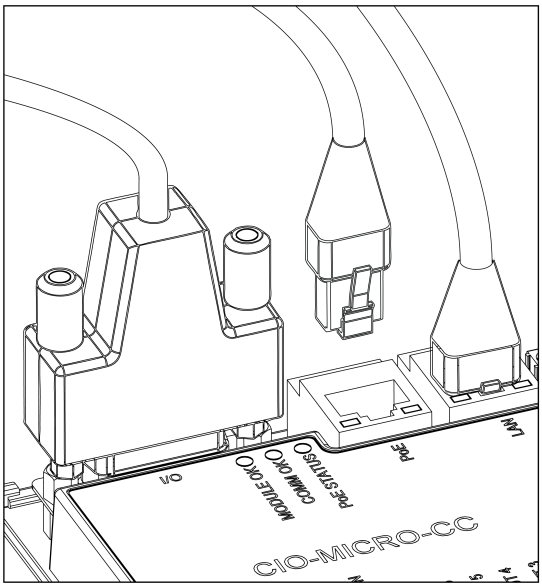


Figure 2-10: Connect the Ethernet Cable to the I/O Module

3. Restore power to the I/O module’s 24VDC power supply and turn it on if necessary.

Specifications

The following sections list general specifications for the In-Sight Micro vision systems.

In-Sight Micro Vision System Specifications

Table 3-1: In-Sight Micro Vision System Specifications

Specifications	1020/1050	1100/1110	1100C	1400/1410	1400C	1403/1413	1403C
Minimum Firmware Requirement	In-Sight version 4.4.3						
Job/Program Memory	128MB non-volatile flash memory; unlimited storage via remote network device.						
Image Processing Memory	256MB						
Sensor Type	1/3-inch CCD					1/1.8-inch CCD	
Sensor Properties	5.92mm diagonal, 7.4 x 7.4µm sq. pixels					8.8mm diagonal, 4.4 x 4.4µm sq. pixels	
Resolution (pixels)	640 x 480					1600 x 1200	
Electronic Shutter Speed	16µs to 1000ms					52µs to 1000ms	
Acquisition	Rapid reset, progressive scan, full-frame integration.						
Bit Depth	256 grey levels (8 bits/pixel)		24 bit color	256 grey levels (8 bits/pixel)	24 bit color	256 grey levels (8 bits/pixel)	24 bit color
Image Gain/Offset	Controlled by software.						
Frames Per Second[1]	60 full frames per second		58 full frames per second	60 full frames per second	58 full frames per second	14 full frames per second	7 full frames per second
Lens Type	CS-mount and C-mount (with 5mm extension, included).						
CCD Alignment Variability[2]	±0.127mm (0.005in), (both x and y) from lens C-mount axis to center of imager.						
Trigger	1 opto-isolated, acquisition trigger input. Remote software commands via Ethernet. (RS-232C available when using the optional CIO-MICRO or CIO-MICRO-CC I/O module.)						
Discrete Inputs	None. (Eight additional inputs available when using the optional CIO-MICRO or CIO-MICRO-CC I/O module.)						
Discrete Outputs	2 opto-isolated, NPN/PNP high-speed outputs. (Eight additional outputs available when using the optional CIO-MICRO or CIO-MICRO-CC I/O module.)						
Status LEDs	Network, 2 user-configurable.						
Network Communication	1 Ethernet port, 10/100 BaseT with auto MDI/MDIX. Supports DHCP (factory default), static and link-local IP address configuration.						
Serial Communication	None. (RS-232C: 4800 to 115,200 baud rates when connected to the optional CIO-MICRO or CIO-MICRO-CC I/O module).						
Power	Class 2 Power over Ethernet (PoE) device.						
Power Type	A and B.						

[1] Maximum frames per second is job-dependent and based on the minimum exposure for a full image frame capture.

[2] Expected variability in the physical position of the CCD, from vision system-to-vision system. This equates to ~ ±17 pixels on a 640 x 480 resolution CCD and ~ ±29 pixels on a 1600 x 1200 resolution CCD.

Specifications	1020/1050	1100/1110	1100C	1400/1410	1400C	1403/1413	1403C
Power Consumption	6.49 W maximum per Class 2 PoE.						
Current	Per Class 2 PoE requirements.						
Voltage	48 V nominal, applied from a Class 2 PoE injector which is typically powered from some other voltage.						
Material	Die-cast zinc housing.						
Finish	Painted						
Mounting	Four M3 threaded mounting holes (1/4 - 20 and M6 mounting holes also available on mounting block).						
Dimensions	30mm (1.18in) x 30mm (1.18in) x 60mm (2.36in) without mounting block. 30mm (1.18in) x 38.2mm (1.50in) x 60mm (2.36in) with mounting block.						
Weight	121g (4.27oz.) without mounting block. 146g (5.15oz.) with mounting block.						
Temperature	Operating: 0°C to 45°C (32°F to 113°F) Storage: -30°C to 80°C (-22°F to 176°F)						
Humidity	90%, non-condensing (Operating and Storage)						
Protection	IP51 with cables and lens attached.						
Shock	80 G shock with 50 gram or lighter lens attached per IEC 68-2-27 EA.						
Vibration	10 G with 50 gram or lighter lens attached 2 hrs/axis (10-500 Hz) per IEC 68-2-6, FC.						
Regulatory Compliance	CE, FCC, KCC, TÜV SÜD NRTL, RoHS						

I/O Specifications

Cable and connector specifications and connection examples for the acquisition trigger input and the high-speed outputs are provided in the following sections.

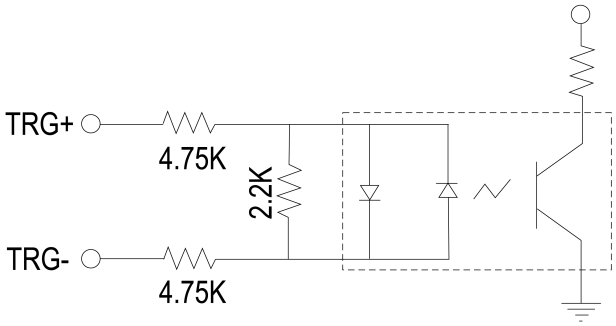
Acquisition Trigger Input

Table 3-2: Acquisition Trigger Input Specifications

Specification	Description	
Voltage	ON	20 to 28V (24V nominal)
	OFF	0 to 3V (8V nominal threshold)
Current	ON	2.0 to 2.9mA
	OFF	< 250µA
	Resistance	~10,000 Ohms
Delay[1]	In-Sight Micro 1020, 1050, 1100, 1100C, 1110, 1400, 1400C & 1410	63µs maximum latency between leading edge of trigger and start of acquisition. Input pulse should be minimum of 1 ms wide.
	In-Sight Micro 1403 & 1413	81µs maximum latency between leading edge of trigger and start of acquisition. Input pulse should be minimum of 1 ms wide.
	In-Sight Micro 1403C	116µs maximum latency between leading edge of trigger and start of acquisition. Input pulse should be minimum of 1 ms wide.

The acquisition trigger input is opto-isolated. To trigger from an NPN (pull-down) type photoelectric sensor or PLC output, connect pin 3 (TRG+) to +24V and connect pin 4 (TRG-) to the output of the photoelectric sensor.

When the output turns ON, it pulls TRG- down to 0V, turning the opto-coupler ON. To trigger from a PNP (pull-up) photoelectric sensor or PLC output, connect pin 3 (TRG+) to the output of the photoelectric sensor and connect pin 4 (TRG-) to 0V. When the output turns ON, it pulls TRG+ up to 24V, turning the opto-coupler ON.



28V Max. Across input pins - Transition approx. 8V (Nom).

Figure 3-1: Acquisition Trigger Input Schematic

[1] Maximum latency is based on a 1µs trigger debounce.

High-Speed Outputs

The In-Sight Micro vision system features two built-in, high-speed outputs, which are optically isolated. The high-speed outputs can be used as either NPN (pull-down) or PNP (pull-up) lines.

Table 3-3: High-Speed Output Specifications

Specification	Description
Voltage	28V maximum through external load.
Current	100mA maximum sink current.
	OFF state leakage current 100µA maximum.
	External load resistance 240 Ohms to 10K Ohms.
	Each line rated at a maximum 100mA, protected against over-current, short circuit and transients from switching inductive loads. High current inductive loads require external protection diode.

For NPN lines, the external load should be connected between the output and the positive supply voltage (24V nominal). The OUT COMMON should be connected to the negative supply voltage (0V). The outputs pull down to less than 3V when ON, which causes current to flow through the load. When the outputs are OFF, no current flows through the load.

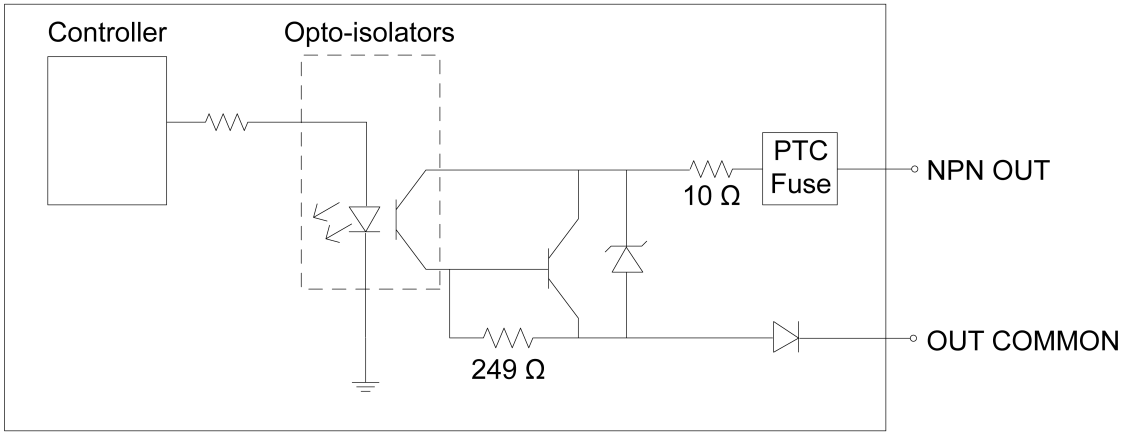


Figure 3-2: NPN High-Speed Output Schematic

For PNP lines, the external load should be connected between the output and the negative supply voltage (0V). When the OUT COMMON is connected to the positive supply voltage (24V nominal), the outputs pull up to greater than 21V when ON, and current flows through the load. When the outputs are OFF, no current flows through the load.

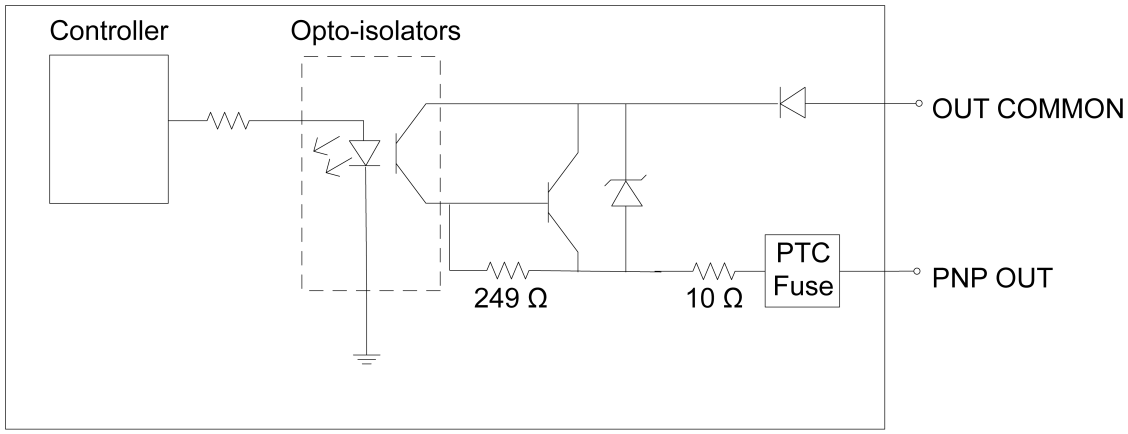


Figure 3-3: PNP High-Speed Output Schematic

Example 1

The Breakout cable (see Table 3-5 on page 18) can be used to connect the high-speed outputs to a relay, LED or similar load. Connect the negative side of the load to the output and the positive side to +24V. When the output switches on, the negative side of the load is pulled down to less than 3V, and greater than 21V appears across the load. Use a protection diode for a large inductive load, with the anode connected to the output and the cathode connected to +24V.

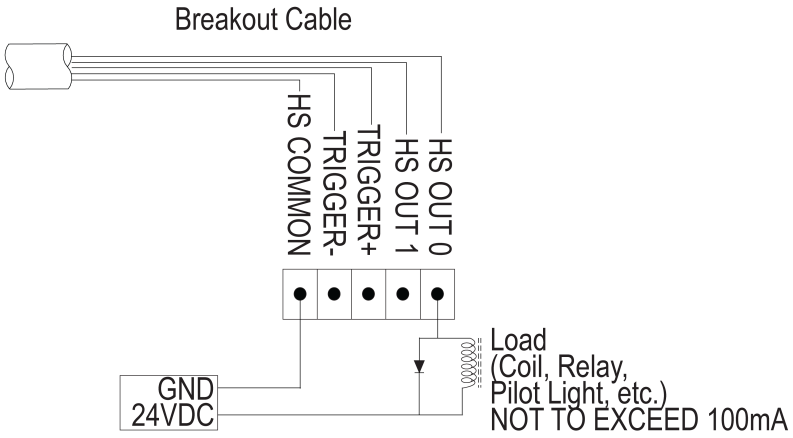


Figure 3-4: High-Speed Output Connection Example 1

Example 2

The Breakout cable (see Table 3-5 on page 18) can be used to connect to an NPN-compatible PLC input. Connect Output 0 or Output 1 directly to the PLC input. When enabled, the output pulls the PLC input down to less than 3V.

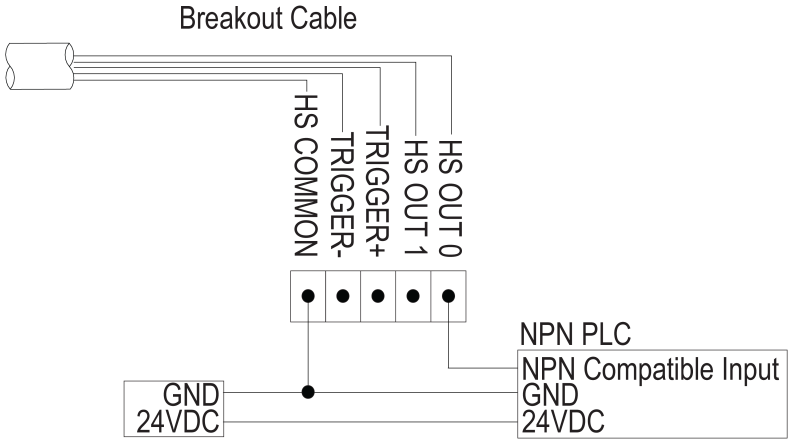


Figure 3-5: High-Speed Output Connection Example 2

Example 3

The Breakout cable (see Table 3-5 on page 18) can be used to connect to a PNP-compatible PLC input. Connect Output 0 or Output 1 directly to the PLC input. When enabled, the output pulls the PLC input up to greater than 21V.

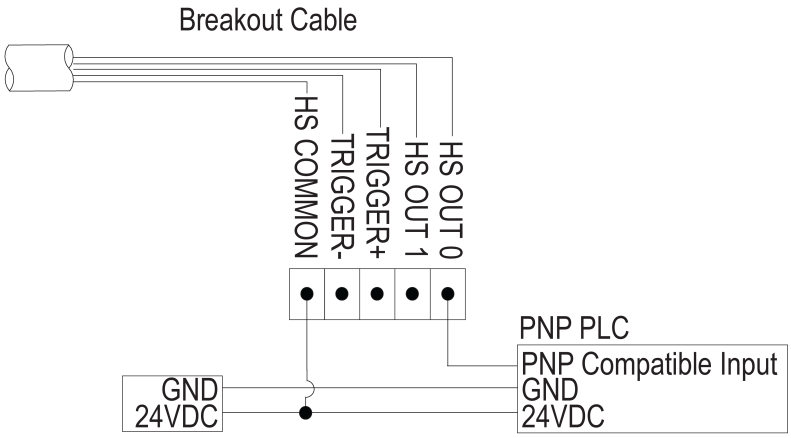
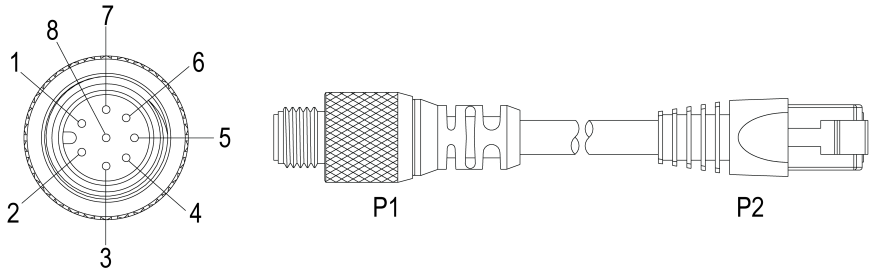


Figure 3-6: High-Speed Output Connection Example 3

Ethernet Cable Specifications

The Ethernet cable provides the Ethernet connection for network communications and supplies power to the vision system.

Table 3-4: Ethernet Cable Pin-Out



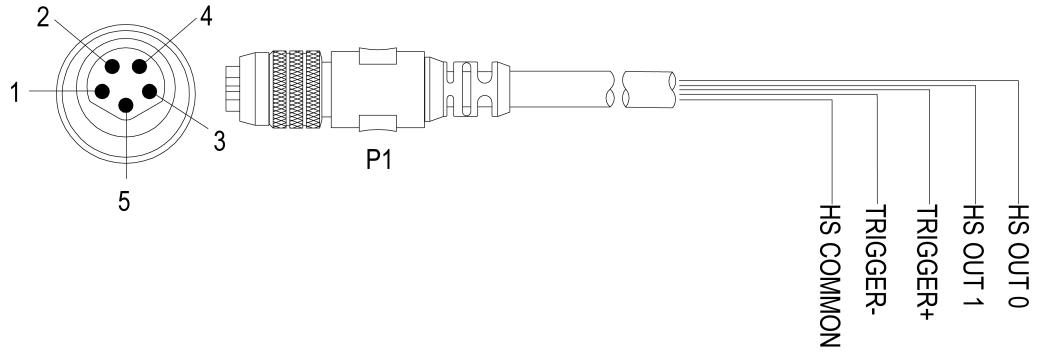
P1 Pin#	Signal Name	Wire Color	P2 Pin#
6	TPO+/+48V (Mode A)	White/Orange	1
4	TPO-/+48V (Mode A)	Orange	2
5	TPI+/+48V RTN (Mode A)	White/Green	3
7	+48V (Mode B)	Blue	4
1	+48V (Mode B)	White/Blue	5
8	TPI-/+48V RTN (Mode A)	Green	6
2	+48V RTN (Mode B)	White/Brown	7
3	+48V RTN (Mode B)	Brown	8

Note: Cables are sold separately.

Breakout Cable Specifications

The Breakout cable provides access to trigger and high-speed outputs.

Table 3-5: Breakout Cable Pin-Out



P1 Pin#	Signal	Wire Color
1	HS OUT 0	Brown
2	HS OUT 1	White
3	TRIGGER+	Blue
4	TRIGGER-	Black
5	HS COMMON	Gray

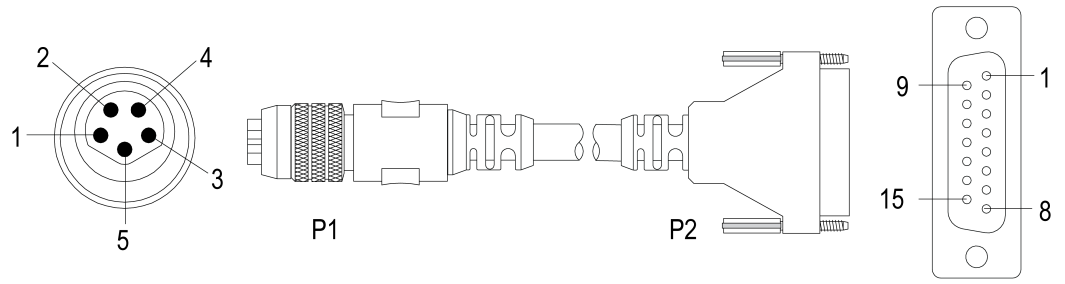
Note:

- Cables are sold separately.
- Unused bare wires can be clipped short or tied back using a tie made of non-conductive material.

I/O Module Cable Specifications

The I/O Module cable is used with the CIO-MICRO or CIO-MICRO-CC I/O module. The I/O Module cable connects the vision system directly to the I/O module via the DB15 connector. When connected, the I/O Module cable provides access to the vision system's trigger and high-speed outputs.

Table 3-6: I/O Module Cable Pin-Out



P1 Pin#	Signal Name	P2 Pin#
1	HS OUT 0	4
2	HS OUT 1	5
3	TRIGGER+	2
4	TRIGGER-	3
5	HS COMMON	15

Note:

- Cables are sold separately.
- Refer to the *In-Sight® CIO-MICRO and CIO-MICRO-CC I/O Module Installation Manual* for detailed connection information.

Dimensional Drawings

Note:

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

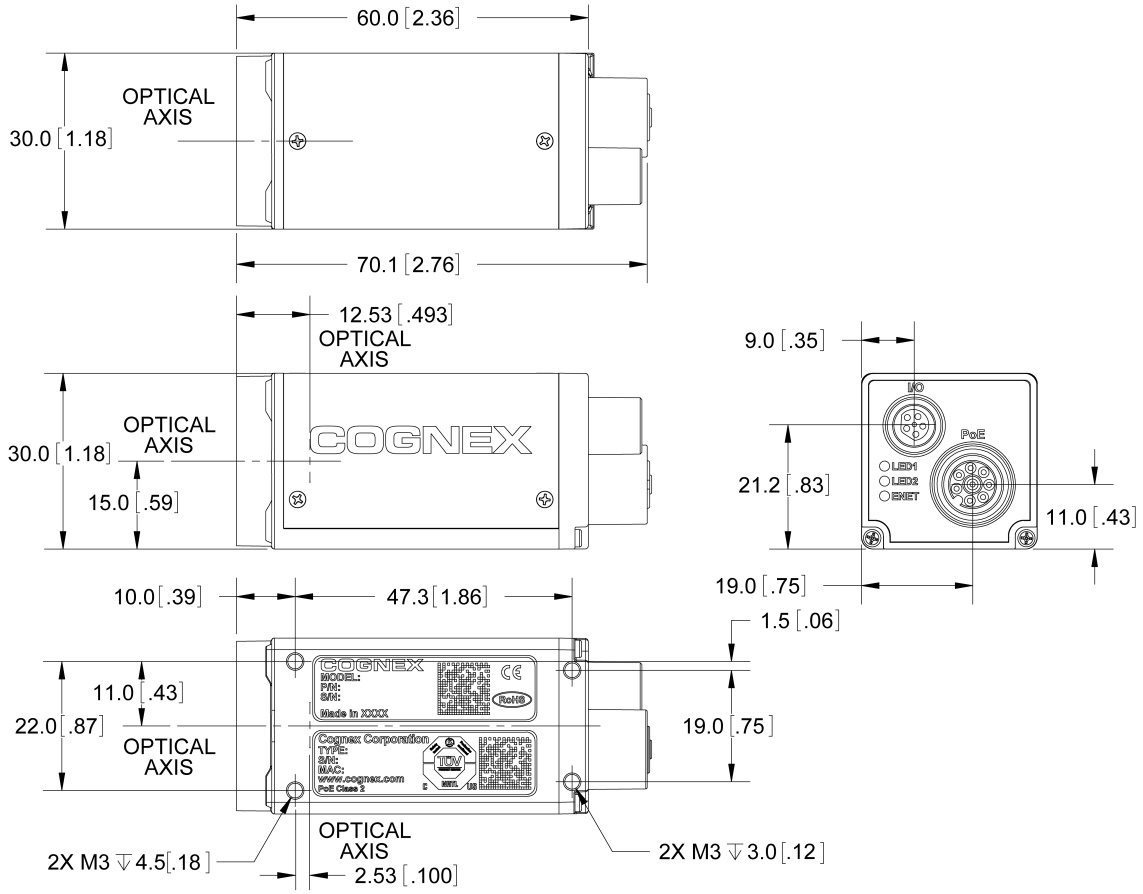


Figure 3-7: In-Sight Micro Vision System Dimensions

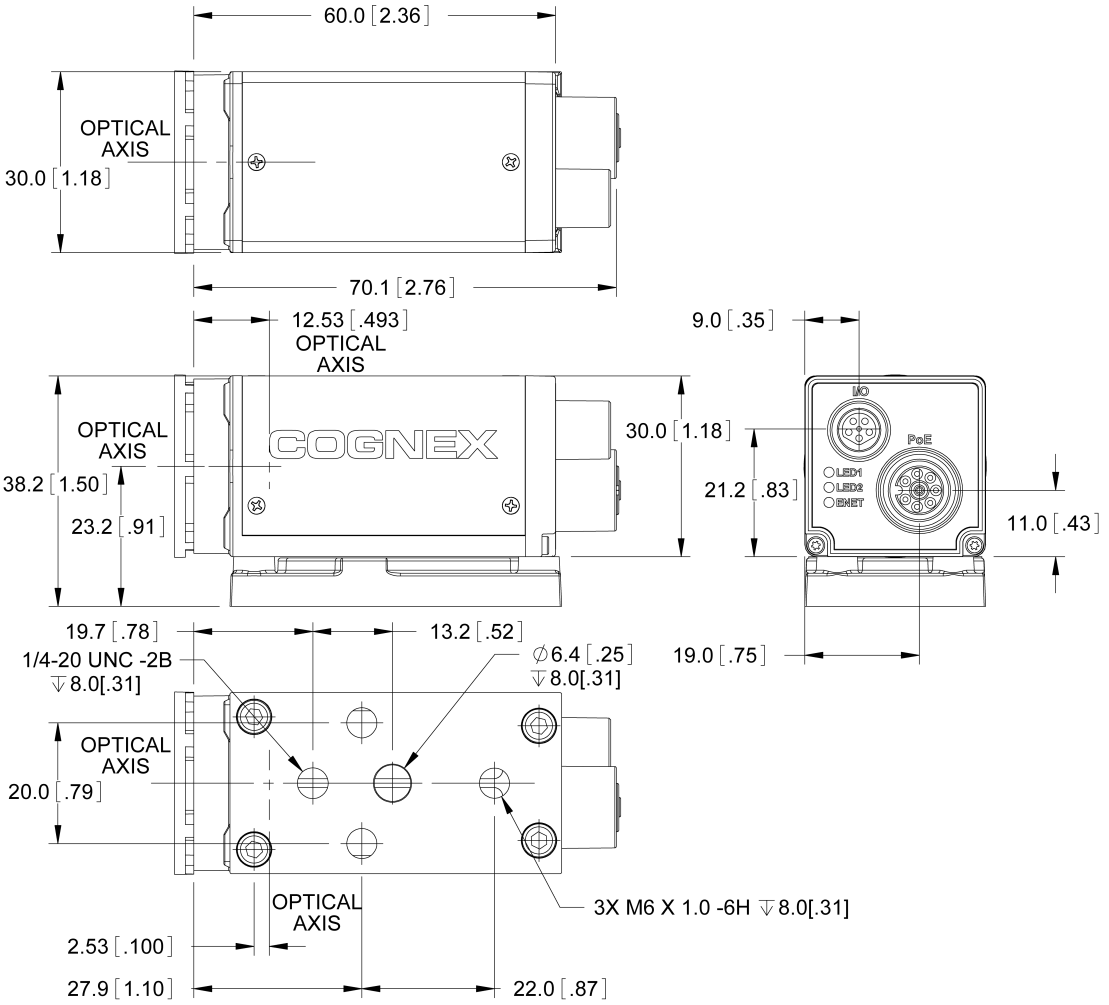


Figure 3-8: In-Sight Micro Vision System Dimensions (with Mounting Block)

Appendix A - Cleaning/Maintenance

Cleaning the Vision System Housing

To clean the outside of the vision system housing, use a small amount of mild detergent cleaner or isopropyl alcohol on a cleaning cloth. Do not pour the cleaner directly onto the vision system housing.

CAUTION: Do not attempt to clean any In-Sight product with harsh or corrosive solvents, including Lye, methyl ethyl ketone (MEK) or gasoline.

Cleaning the Vision System CCD Window

To remove dust from the outside of the CCD window, use a pressurized air duster. The air must be free of oil, moisture or other contaminants that could remain on the glass and possibly degrade the image. Do not touch the glass window. If oil/smudges still remain, clean the window with a cotton bud using alcohol (ethyl, methyl or isopropyl). Do not pour the alcohol directly on the window.

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