Specifications

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

Vision System Specifications

Table 3-1: Vision System Specifications

Specifications	In-Sight 7010/7020/7050/7200/ 7210/7230/7400/7410/7430	In-Sight 7010C/7200C/7400C	In-Sight 7402/7412/7432	In-Sight 7402C
Minimum Firmware Requirement	In-Sight Version 4.7.1/4.7.3[1]	In-Sight Version 4.8.0	In-Sight Version 4.7.1/4.7.3[1]	In-Sight Version 4.8.0
Job/Program Memory	512MB non-volatile flash memory; unlimited storage via remote network device.			
Image Processing Memory	256MB SDRAM			
Sensor Type	1/1.8-inch CMOS			
Sensor Properties	5.3mm diagonal, 5.3 x 5.3µm sq. pixels		8.7mm diagonal, 5.3 x 5.3µm sq. pixels	
Resolution (pixels)	800 x 600		1280 x 1024	
Electronic Shutter Speed	16µs to 950ms			
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.
Image Gain/Offset	Controlled by software.			
Frames Per Second[2]	102 full frames per second.	50 full frames per second.	60 full frames per second.	30 full frames per second.
Lens Type	M12 or C-Mount.			
Image Sensor Alignment Variability[3]	±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 and RS-232C.			
Discrete Inputs	3 general-purpose inputs when connected to the Power and I/O Breakout cable. (Eight additional inputs available when using the optional CIO-MICRO or CIO-MICRO-CC I/O module.)			
Discrete Outputs	4 high-speed outputs when connected to the Power and I/O Breakout cable. (Eight additional outputs available when using the optional CIO-MICRO or CIO-MICRO-CC I/O module.)			
Status LEDs	Network link and activity, power and 2 user-configurable.			
Internal LED Ring Light	Red, Green, Blue, White, IR (M12 lens configuration only).			
Network Communication	Ethernet port, 10/100 BaseT with auto MDI/MDIX. IEEE 802.3 TCP/IP protocol. Supports DHCP (factory default), static and link-local IP address configuration.			
Serial Communication	RS-232C: 4800 to 115,200 baud rates.			

[1] Firmware version 4.7.1 is the minimum firmware requirement for models with the C-Mount Lens configuration. Firmware version 4.7.3 is the minimum firmware requirement for models with the M12 Lens configuration.

[2] Maximum frames per second is job-dependent, based on the minimum exposure for a full image frame capture using the dedicated acquisition trigger, and assumes there is no user interface connection to the vision system.

[3] Expected variability in the physical position of the image sensor, from vision system-to-vision system. This equates to ~ ±24 pixels on a 800 x 600 resolution CMOS and a 1280 x 1024 resolution CMOS.

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Specifications	In-Sight 7010/7020/7050/7200/ 7210/7230/7400/7410/7430	In-Sight 7010C/7200C/7400C	In-Sight 7402/7412/7432	In-Sight 7402C
Power Consumption	24VDC ±10%, 2.0 amp. External Light - Continunously on; output 24V, 500mA Max. External Light - Strobe; output 24V, 1amp Max at 50% duty cycle (max on time of 100ms).			
Material	Aluminum housing.			
Finish	Painted.			
Mounting	Four M3 threaded mounting holes (1/4 - 20, M6 and flathead mounting holes also available on mounting bracket).			
M12 Lens Configuration Dimensions	55mm (2.17in) x 84.8mm (3.34in) x 55mm (2.17in)			
C-Mount Lens Configuration Dimensions	75mm (2.95in) to 83mm (3.27in) x 84.8mm (3.34in) x 55mm (2.17in) with lens cover installed.			
	42.7mm (1.68in) x 84.8mm (3.34in) x 55mm (2.17in) without lens cover installed.			
Weight	220 g (7.8 oz.) with lens cover and typical M12 lens installed.			
Operating Temperature	0°C to 45°C (32°F to 113°F)			
Storage Temperature	-30°C to 80°C (-22°F to 176°F)			
Humidity	90%, non-condensing (Operating and Storage)			
Protection	IP67 with lens cover properly installed.			
Shock	80 G Shock per IEC 60068-2-27.			
Vibration	10 G from 10-500 Hz with 150 grams lens per IEC 60068-2-6.			
Regulatory Compliance	CE, FCC, KCC, TÜV SÜD NRTL, RoHS			

I/O Specifications

Cable and connector specifications and connection examples for acquisition trigger input, general-purpose inputs, high-speed outputs, RS-232 receive and transmit, and light connectors are provided in the following sections.
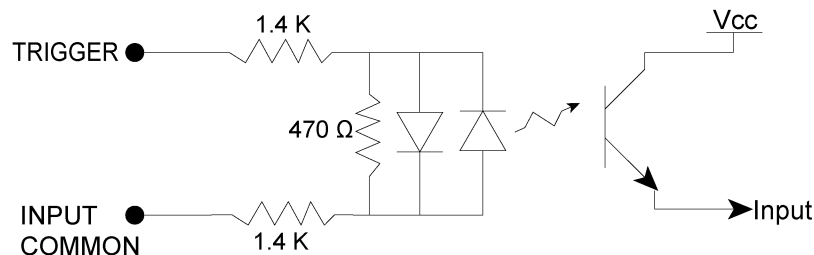
Acquisition Trigger Input

The vision system features one acquisition trigger input, which is optically isolated. The acquisition trigger input can be configured to trigger from either an NPN (current sinking) or PNP (current sourcing) device.

Table 3-2: Acquisition Trigger Input Specifications

Specification	Description
Voltage	ON: 20 to 24V (24V nominal)
	OFF: 0 to 3V (0V nominal)
Current	ON: 3.0mA
	OFF: < 2.5mA
	Resistance: ~10,000 Ohms
Delay[1]	90µs maximum latency between leading edge of trigger and start of acquisition. Input pulse should be a minimum of 1ms wide.

To trigger from an NPN type photoelectric sensor or PLC output, connect INPUT COMMON to +24V and TRIGGER to the output of the photoelectric sensor. When the output turns ON, it pulls INPUT COMMON down to 0V, turning the opto-coupler ON.

To trigger from a PNP type photoelectric sensor or PLC output, connect INPUT COMMON to 0V and TRIGGER to the output of the photoelectric sensor. When the output turns ON, it pulls TRIGGER up to +24V, turning the opto-coupler ON.

Figure 3-1: Acquisition Trigger Input Schematic

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

General-Purpose Inputs

The vision system features three built-in general-purpose inputs, which are optically isolated. The inputs can be configured as either NPN (current sinking) or PNP (current sourcing) lines.

Note: Since all general-purpose inputs share a common ground (INPUT COMMON), all connected input devices must be either current sinking or current sourcing.

Table 3-3: General-Purpose Inputs Specifications

Specification	Description
Voltage	ON: 20 to 24V (24V nominal)
	OFF: 0 to 3V (0V nominal)
Current	ON: 3.0mA
	OFF: < 2.5mA
	Resistance: ~10,000 Ohms
Delay[1]	90µs maximum latency between leading edge of trigger and start of acquisition. Input pulse should be a minimum of 1ms wide.

For NPN lines, to utilize an input, connect INPUT COMMON to +24V and attach the photoelectric sensor or PLC output to the corresponding input.

For PNP lines, to utilize an input, connect INPUT COMMON to 0V and attach the photoelectric sensor or PLC output to the corresponding input.
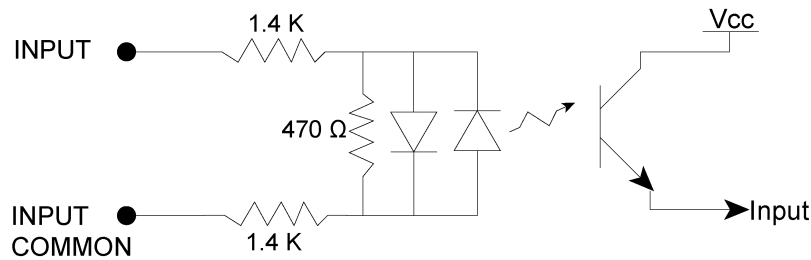
Figure 3-2: General-Purpose Input Schematic

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

General-Purpose Input - NPN Configuration

The Power and I/O Breakout cable can be used to connect to an NPN-compatible PLC output. Connect any input directly to the PLC output. For more information, refer to the *Power and I/O Breakout Cable Specifications* on page 22.
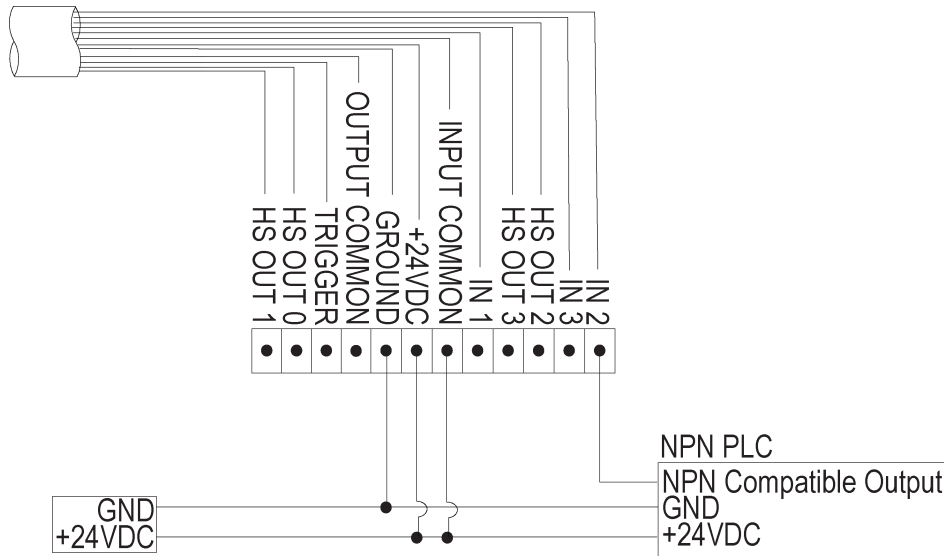

Figure 3-3: General-Purpose Input - NPN Configuration

General-Purpose Input - PNP Configuration

The Power and I/O Breakout cable can be used to connect to a PNP-compatible PLC output. Connect any input directly to the PLC output. For more information, refer to the *Power and I/O Breakout Cable Specifications* on page 22.
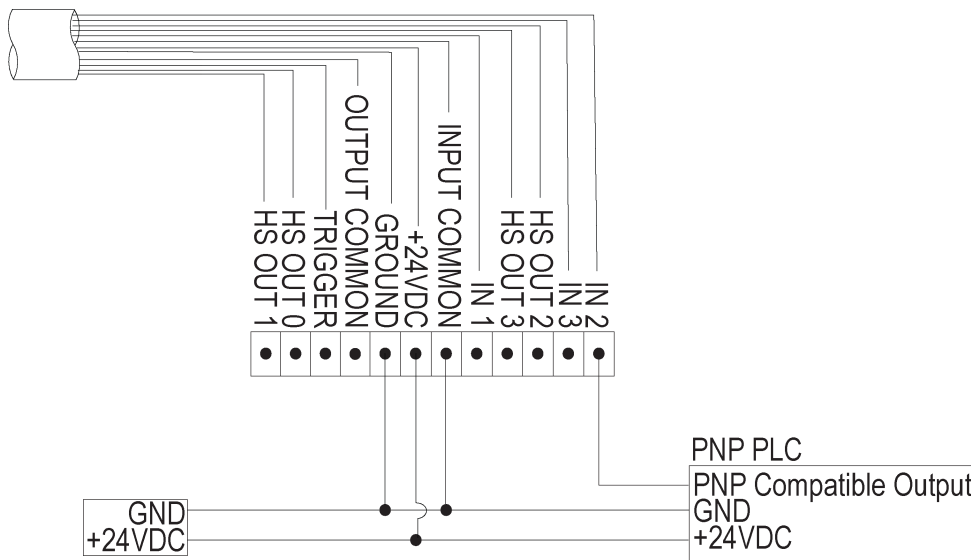

Figure 3-4: General-Purpose Input - PNP Configuration

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High-Speed Outputs

The vision system features four built-in high-speed outputs, which are optically isolated. The outputs can be configured as either NPN (current sinking) or PNP (current sourcing) lines.

> **Note**: Since all high-speed outputs share a common ground (OUTPUT COMMON), all connected output devices must be either current sinking or current sourcing.

Table 3-4: High-Speed Outputs Specifications

Specification	Description
Voltage	30V maximum through external load.
Current	100mA maximum sink current.
	OFF state leakage current 100µA maximum.
	Internal resistance < 10 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 an external protection diode.
Delay	ON: 750µs maximum latency
	OFF: 200µs maximum latency

For NPN lines, the external load should be connected between the output and the positive supply voltage (+24V nominal). OUTPUT COMMON should be connected to the negative supply voltage (0V). The outputs pull down to 1V or less when ON, which causes current to flow through the load. When the outputs are OFF, no current flows through the load.

For PNP lines, the external load should be connected between the output and the negative supply voltage (0V). When OUTPUT COMMON is connected to the positive supply voltage (+24V nominal), the outputs pull up to 23V or greater when ON, and current flows through the load. When the outputs are OFF, no current flows through the load.
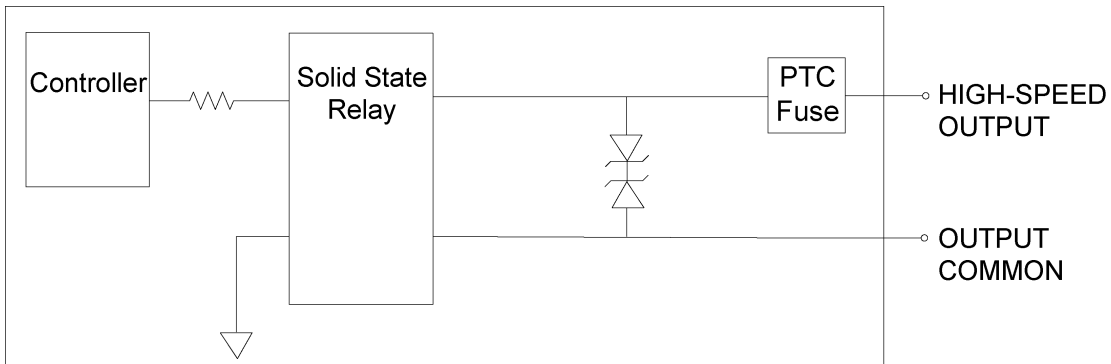
Figure 3-5: High-Speed Output Schematic

High-Speed Output - NPN Configuration

The Power and I/O Breakout cable can be used to connect to an NPN-compatible PLC input. Connect any output directly to the PLC input. When enabled, the output pulls the PLC input down to 1V or less. For more information, refer to the *Power and I/O Breakout Cable Specifications* on page 22.
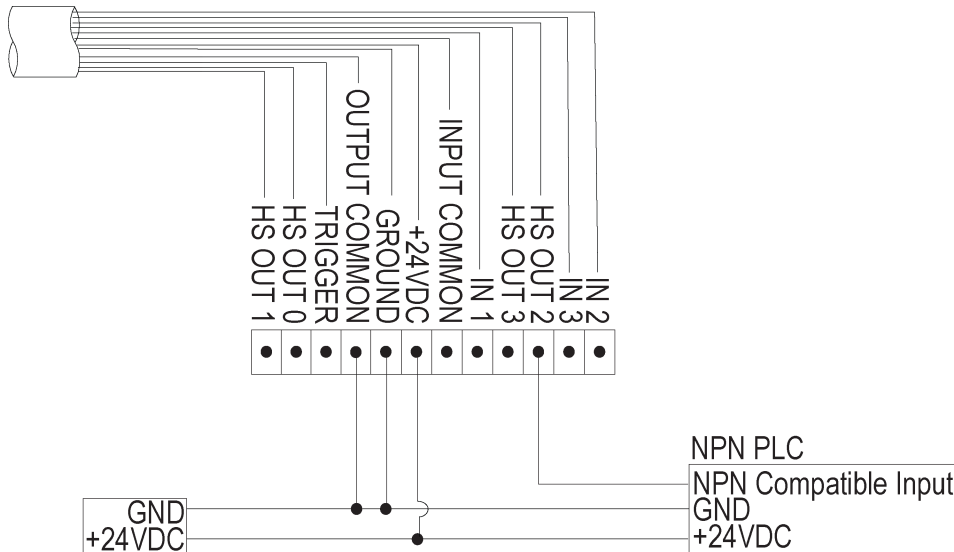
Figure 3-6: High-Speed Output - NPN Configuration

High-Speed Output - PNP Configuration

The Power and I/O Breakout cable can be used to connect to a PNP-compatible PLC input. Connect any output directly to the PLC input. When enabled, the output pulls the PLC input up to 23V or greater. For more information, refer to the *Power and I/O Breakout Cable Specifications* on page 22.
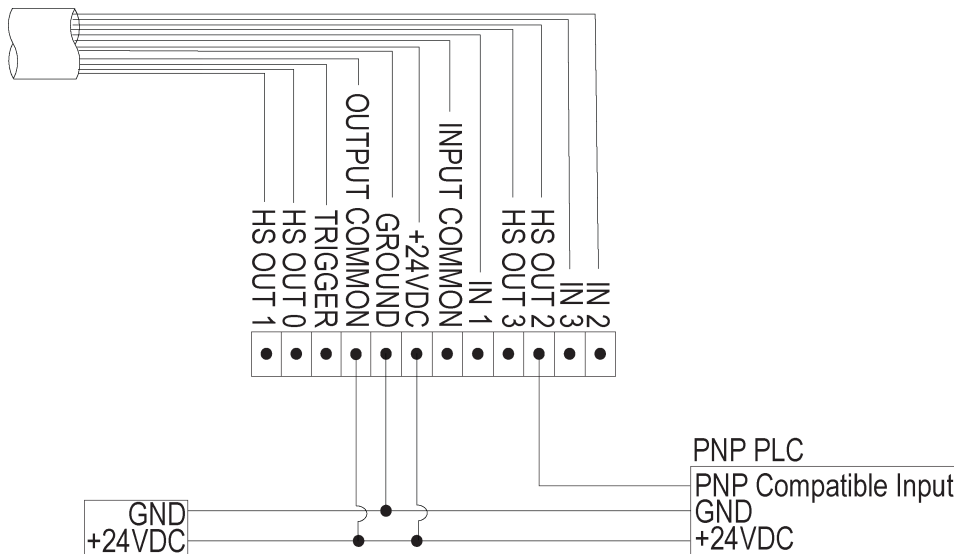
Figure 3-7: High-Speed Output - PNP Configuration

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RS-232 Receive and Transmit

The vision system can be connected to an RS-232 interface, which is non-isolated. When enabled, the RS-232 RECEIVE signal replaces IN 1, and the RS-232 TRANSMIT signal replaces HS OUT 1.

Table 3-5: RS-232 Receive and Transmit Specifications

Specification	Description
Resistance	>10,000 Ohms
Baud rates	4800, 9600, 19200, 38400, 57600 and 115200.
Data Bits	7, 8
Stop Bits	1, 2
Parity	None, even and odd.
Handshaking	Software: Xon/Xoff.
	Hardware: None.[1]

RS-232 Connector Configuration

The Power and I/O Breakout cable can be used to connect to an RS-232 connector. For more information, refer to the .

Tip: If the serial signal output is not detected, make sure the ground line is connected between the PC and the vision system.
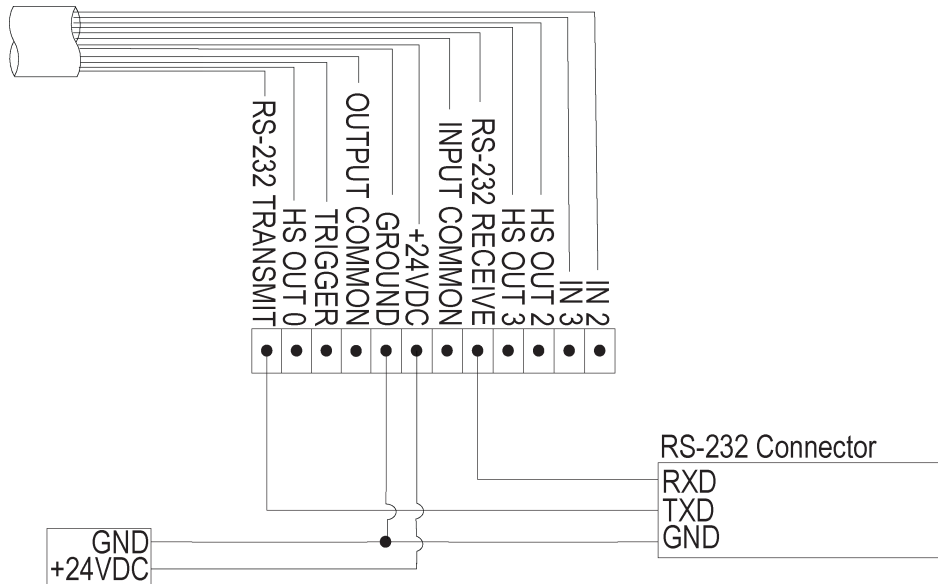
Figure 3-8: RS-232 Connector Configuration

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[1] If hardware handshaking is required, an I/O module must be used.

Light Connector

The vision system's light connector can be configured to support either continuous illumination mode or strobed illumination mode.

Continuous Illumination

The Light connector can be used to provide continuous illumination. In continuous illumination mode, the external current consumption is limited to 500mA. For more information, refer to the *Light Cable Specifications* on page 21.
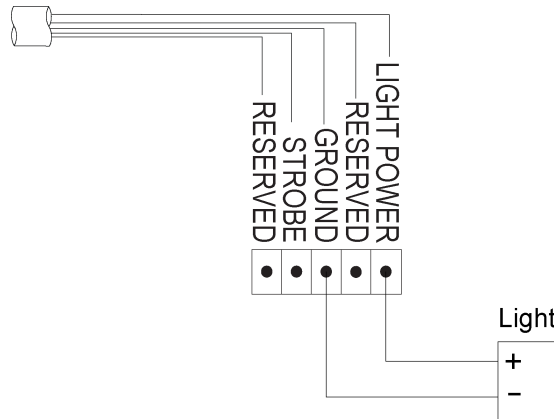

Figure 3-9: Continuous Illumination

Strobed Illumination

The Light connector can be used to provide strobed illumination. In strobed illumination mode, the current consumption is limited by the duty cycle and the peak on power. The strobe control signal can be configured to actively drive a light control in either a PNP or NPN configuration. For more information, refer to the *Light Cable Specifications* on page 21.

Note: A pull-down or pull-up resistor may be required for either a PNP or NPN configuration, depending on the light vendor.
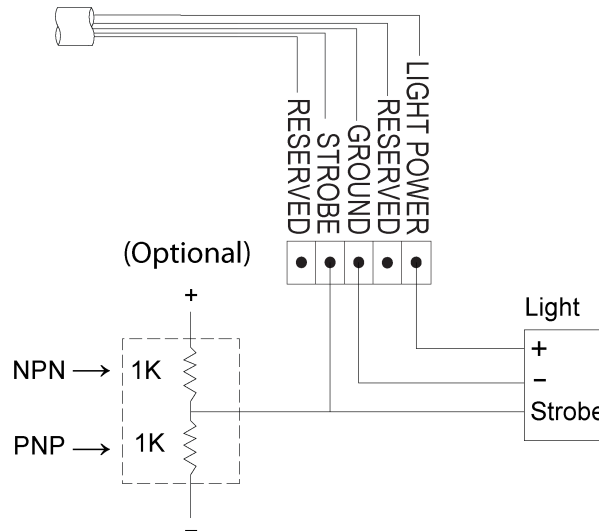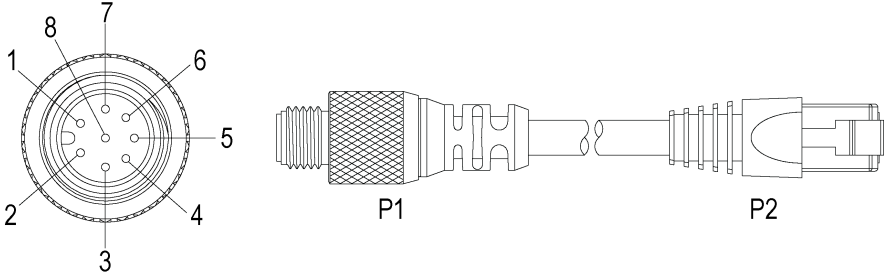

Figure 3-10: Strobed Illumination

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Ethernet Cable Specifications

The Ethernet cable is used to connect the vision system to other network devices. The Ethernet cable can be connected to a single device or provide connections to multiple devices via a network switch or router.

Table 3-6: Ethernet Cable Pin-Out

P1 Pin#	Signal Name	Wire Color	P2 Pin#
6	TPO+	White/Orange	1
4	TPO-	Orange	2
5	TPI+	White/Green	3
7	TRMA	Blue	4
1	TRMB	White/Blue	5
8	TPI-	Green	6
2	TRMC	White/Brown	7
3	TRMD	Brown	8

Note:
- Cables are sold separately.
- The wiring for this cable follows standard industrial Ethernet M12 specifications. This varies from the 568B standard.

Light Cable Specifications

The Light cable is used to connect the vision system to an external lighting device, providing power and strobe control.

Table 3-7: Light Cable Pin-Out

Female Connector   Male Connector

Pin#	Signal Name	Wire Color
1	LIGHT POWER	Brown
2	RESERVED	White
3	GROUND	Blue
4	STROBE	Black
5	RESERVED	Grey

Note: Cables are sold separately.

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Power and I/O Breakout Cable Specifications

The Power and I/O Breakout cable provides connections to an external power supply, the acquisition trigger input, general-purpose inputs, high-speed outputs, and RS-232 serial communications. The Power and I/O Breakout cable is not terminated.

Table 3-8: Power and I/O Breakout Cable Pin-Out
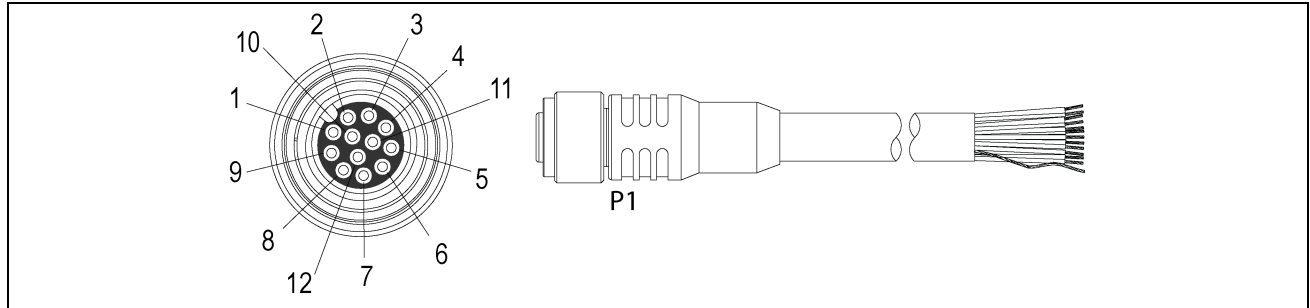
Pin#	Signal Name (I/O Mode)	Wire Color
1	IN 2	Yellow
2	IN 3	White/Yellow
3	HS OUT 2	Brown
4	HS OUT 3	White/Brown
5	IN 1/ RS-232 RECEIVE[1]	Violet
6	INPUT COMMON	White/Violet
7	+24VDC	Red
8	GROUND	Black
9	OUTPUT COMMON	Green
10	TRIGGER	Orange
11	HS OUT 0	Blue
12	HS OUT 1/ RS-232 TRANSMIT[2]	Grey
Shell	SHIELD	Bare Wire

Note:
- Cables are sold separately.
- Unused bare wires can be clipped short or tied back using a tie made of non-conductive material. Keep all bare wires separated from the +24VDC wire.

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[1] If hardware handshaking is required, an I/O module must be used.

[2] If hardware handshaking is required, an I/O module must be used.

Vision System Dimensions

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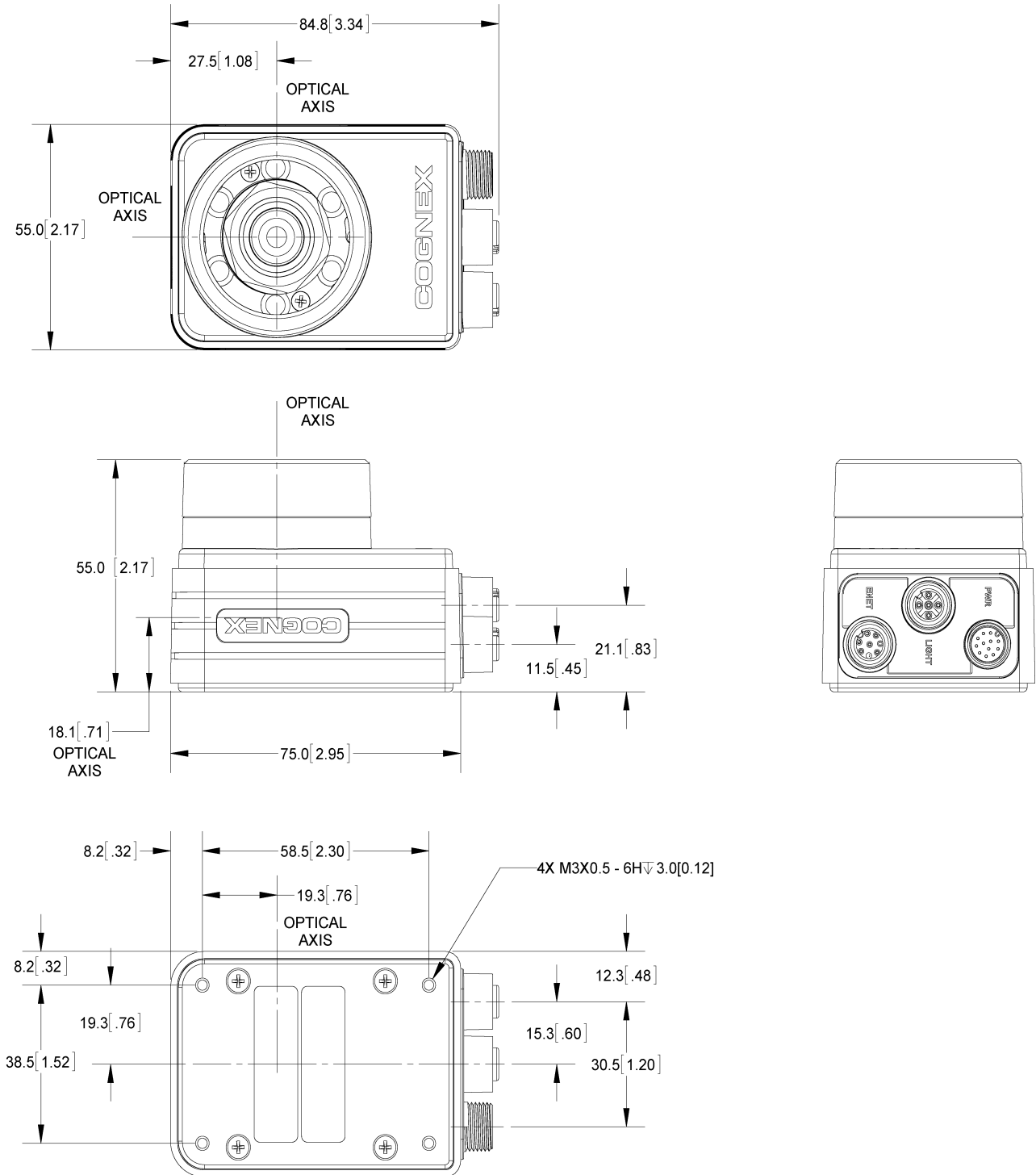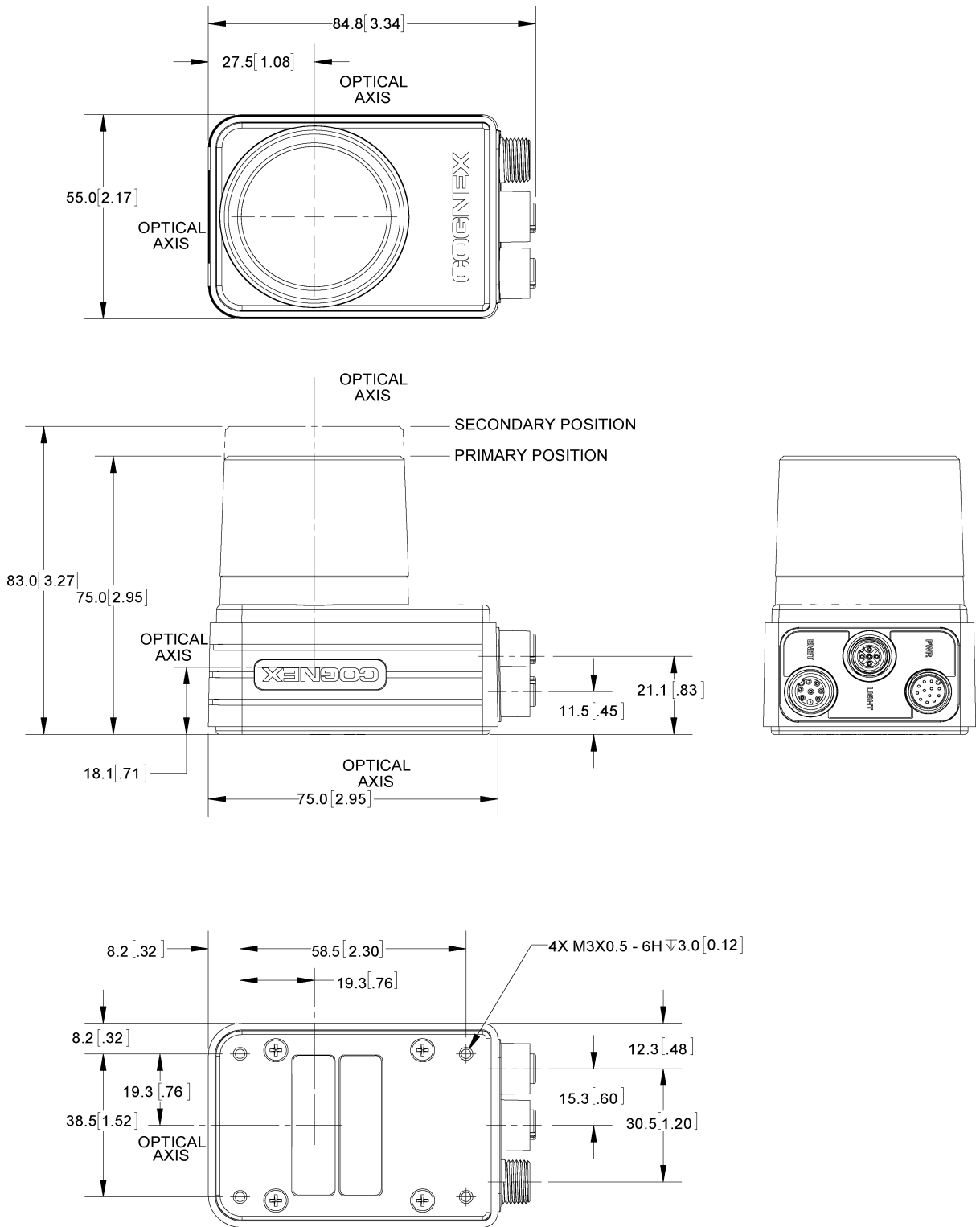- All specifications may be changed without notice.

Figure 3-11: M12 Lens Configuration

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OPTICAL
AXIS

84.8 [3.34]

27.5 [1.08]

OPTICAL
AXIS

55.0 [2.17]

OPTICAL
AXIS

OPTICAL
AXIS

SECONDARY POSITION

PRIMARY POSITION

83.0 [3.27]

75.0 [2.95]

OPTICAL
AXIS

21.1 [.83]

11.5 [.45]

18.1 [.71]

OPTICAL
AXIS

75.0 [2.95]

ENET

LIGHT

PWR

8.2 [.32]

58.5 [2.30]

4X M3X0.5 - 6H ⍌3.0 [0.12]

19.3 [.76]

8.2 [.32]

12.3 [.48]

19.3 [.76]

15.3 [.60]

38.5 [1.52]

30.5 [1.20]

OPTICAL
AXIS

Figure 3-12: C-Mount Lens Configuration (With Lens Cover)

84.8 [3.34]

27.5 [1.08]

OPTICAL
AXIS

55.0 [2.17]

OPTICAL
AXIS

OPTICAL
AXIS

42.7 [1.68]

21.1 [.83]

11.5 [.45]

18.1 [.71]
OPTICAL
AXIS

75.0 [2.95]

ENET

LIGHT

PWR

8.2 [.32]

58.5 [2.30]

4X M3X0.5 - 6H ▽ 3.0 [0.12]

19.23 [.76]
OPTICAL
AXIS

8.2 [.32]

12.3 [.48]

19.3 [.76]

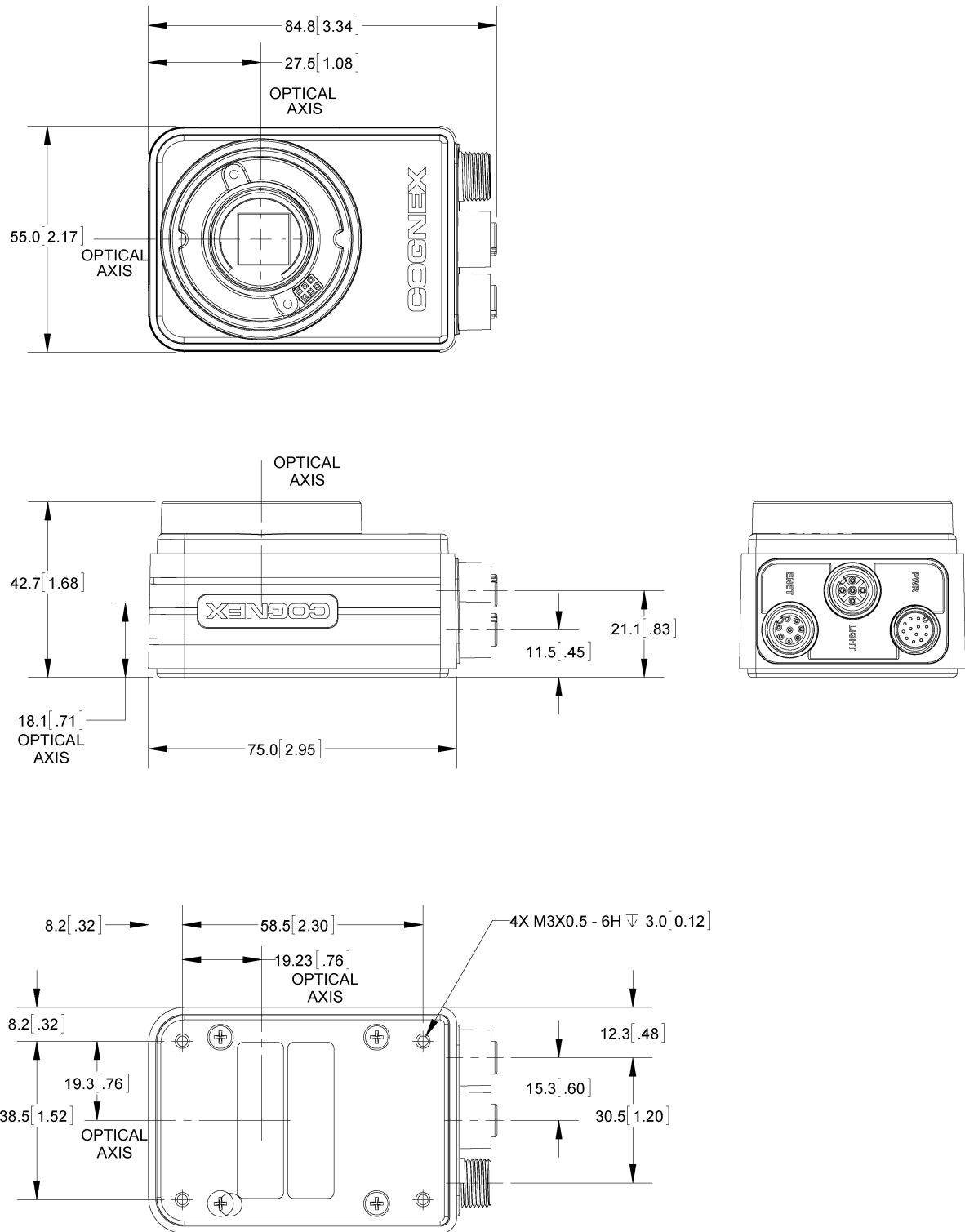15.3 [.60]

38.5 [1.52]

30.5 [1.20]

OPTICAL
AXIS

Figure 3-13: C-Mount Lens Configuration (Without Lens Cover)