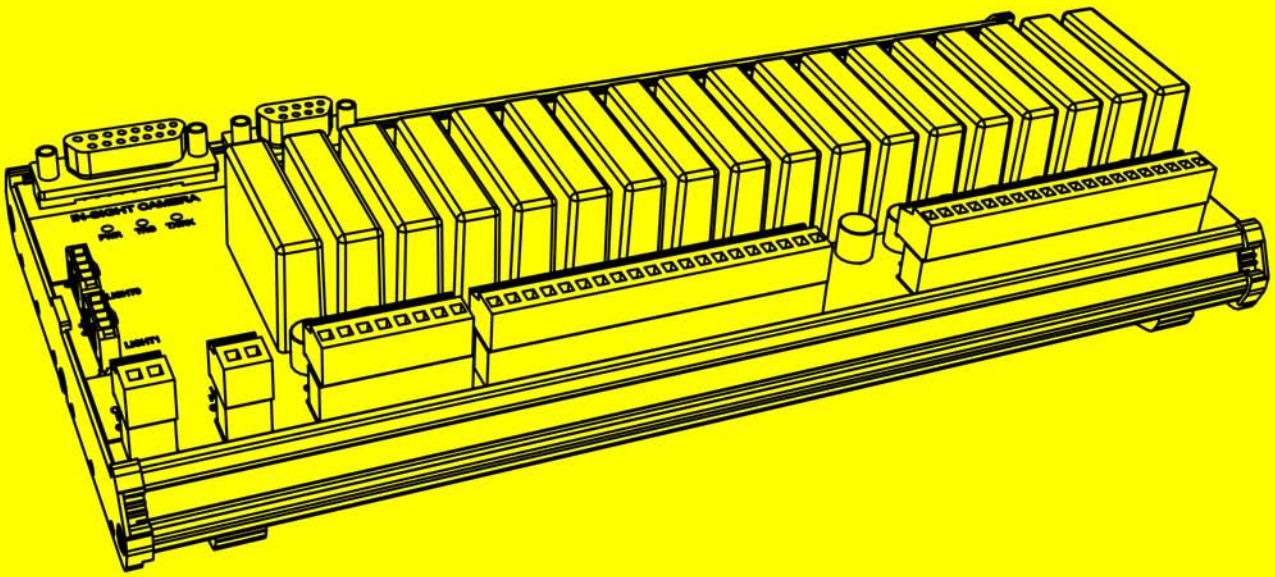
In-Sight®

COGNEX
Vision for Industry®

In-Sight®
Model 1460 I/O Expansion Module
Installation and Reference Manual



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Cognex P/N 597-0029-02

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Hardware	4,972,359; 5,526,050; 5,657,403; 5,793,899
Vision Tools	5,495,537; 5,548,326; 5,583,954; 5,602,937; 5,640,200; 5,717,785; 5,742,037; 5,751,853;5,768,443; 5,796,868; 5,818,443; 5,825,483; 5,825,913; 5,845,007; 5,859,466; 5,872,870;5,909,504

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Regulations/Compliance

Declaration of Conformity

Manufacturer	Cognex Corporation One Vision Drive Natick, MA 01760 USA
Declares this CE -marked product	
Product Number	In-Sight® Model 1460 I/O Expansion Module
Complies With	89/336/EEC Electromagnetic Compatibility Directive
Compliance Standards	EN 55011 Class A EN 61000-6-2
European Representative	Cognex France Immeuble le Patio 104 avenue Albert 1er 92563 Rueil Malmaison France

Safety

c UL us	LISTED (UL 508: Standard for Industrial Control Equipment)	CUL Certification marks are present on products
FC	FCC Part 15, Class A	

Precautions

Observe these precautions when installing the In-Sight Model 1460 I/O Expansion Module to reduce the risk of injury or equipment damage:

- Never connect the I/O Expansion Module to a power source other than 24VDC, and always use the two pin 24VDC power connector on the I/O module. Any other voltage creates a risk of fire or shock and can damage the hardware.
- The Light power supply must be isolated or share a common negative ground with the Camera power supply.
- Do not install the I/O Expansion Module in areas directly exposed to environmental hazards such as excessive heat, dust, moisture, humidity, impact, vibration, corrosive substances, flammable substances, or static electricity without a protective enclosure.
- 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.
- The I/O Expansion Module does not contain user-serviceable parts. Do not make any electrical or mechanical modifications. Unauthorized modifications may violate your warranty.
- Never remove or replace an opto-isolator or fuse in a live circuit.

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1 Introduction

In this Section…

1.1 Model 1460 I/O Expansion Module Overview

The model 1460 I/O Expansion Module provides a convenient way to access the power, serial, trigger and high-speed output connections of the In-Sight 3400 and 5000 series sensors.

The 1460 I/O Expansion Module also extends the capabilities of these sensors by adding eight general-purpose, discrete inputs/outputs and hardware handshaking for serial communications.

Other features of the model 1460 I/O Expansion Module include:

- Detachable terminal blocks.
- Status LEDs for all connections.
- Light power input (12 or 24VDC).
- Two on-board power terminals for CCS light modules.
- Plug-in connections for input and output opto-isolator modules.
- DIN-Rail mountable.

1.2 Model 1460 I/O Expansion Module Kit Contents

The 1460 I/O Expansion Module kit is available in four different configurations. These kit configurations are listed in Table 1-1.

Table 1-1: 1460 I/O Expansion Module Kit Contents

Kit Part Number	Model 1460 I/O Module	I/O Cable P/N	Light Power Cable	Opto-isolator Modules	Retention Bar	Fuses
CIO-1460-06	800-5815-1	185-0098 (2M M12 to DB15)	185-0221	168-0152 (Input, 8ea) 168-0153 (Output, 10ea)	372-0013	121-0048 (12ea)
CIO-1460-15	800-5815-1	185-0099 (5M M12 to DB15)				
CIO-1460-30	800-5815-1	185-0090 (10M M12 to DB15)				
CIO-1460-50	800-5815-1	185-0091 (15M M12 to DB15)				

All 1460 I/O Expansion Module kits contain the Model 1460 I/O Expansion module (Figure 1-1), a Light cable (Figure 1-2) and an I/O cable (Figure 1-3). The I/O cable is terminated with an M12 connector.

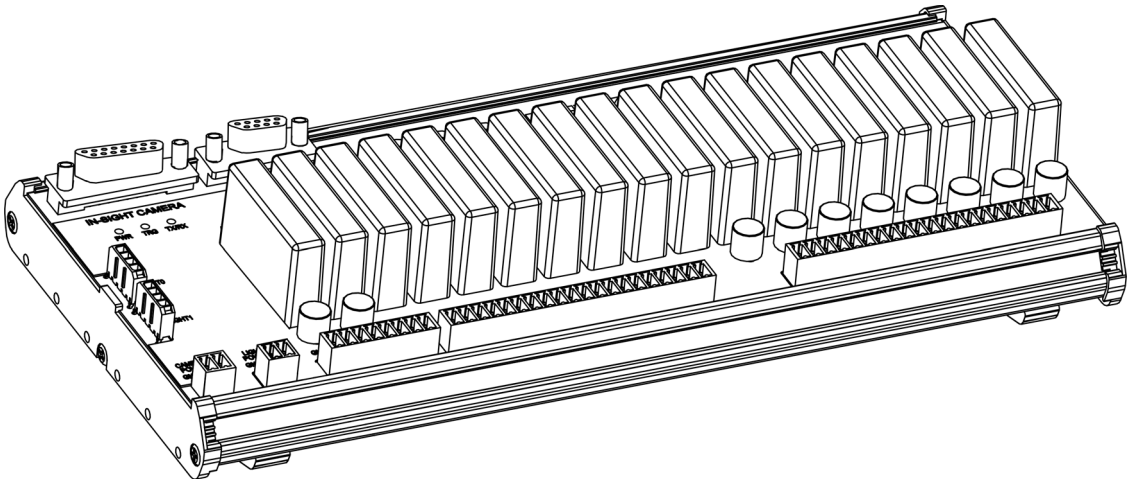


Figure 1-1: Model 1460 I/O Expansion Module (P/N 800-5815-1)

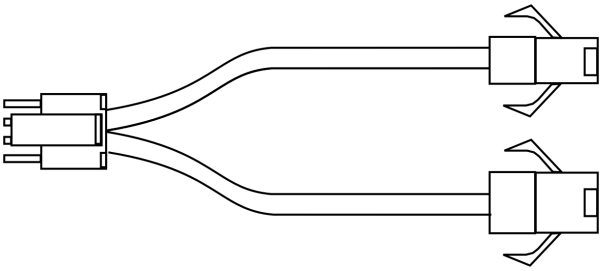


Figure 1-2: Light Cable (P/N 185-0221)

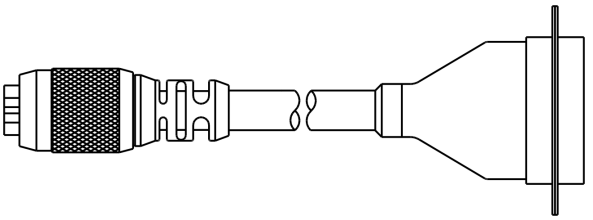


Figure 1-3: M12 Terminated I/O Cable, 5M (P/N 185-0099) or 15M (P/N 185-0091)

1.3 In-Sight Support

Many information resources are available to assist you in using the 1460 I/O Expansion Module with In-Sight vision sensors.

- *Getting Started with In-Sight*, Cognex P/N 590-6368 (English), 590-6368F (French), 590-6368G (German), or 590-6368J (Japanese).
- *In-Sight® Explorer Reference Guide,* (for In-Sight Explorer) an on-line HTML Help file provided on the In-Sight CD-ROM.
- *In-Sight® Guide & Reference*, (for In-Sight 3400 and PC Host) an on-line HTML Help file provided on the In-Sight CD-ROM.
- *Installing In-Sight® 3400 Vision Sensors,* Cognex P/N 597-0025-xx (English), 597-0025-xxF (French), 597-0025-xxG (German).
- *Installing In-Sight® 5000 Series Vision Sensors,* Cognex P/N 597-0027-xx (English), 597-0027-xxF (French)
- The In-Sight Online Support and Learning Center at: www.cognex.com/support/In-Sight.asp (Registered In-Sight users only).

2 Installation

In this section…

2.1 Overview

The model 1460 I/O Expansion Module is comprised of a series of connections, LEDs, fuses and opto-isolators. Figure 2-1 illustrates these items and Table 2-1 outlines their function.

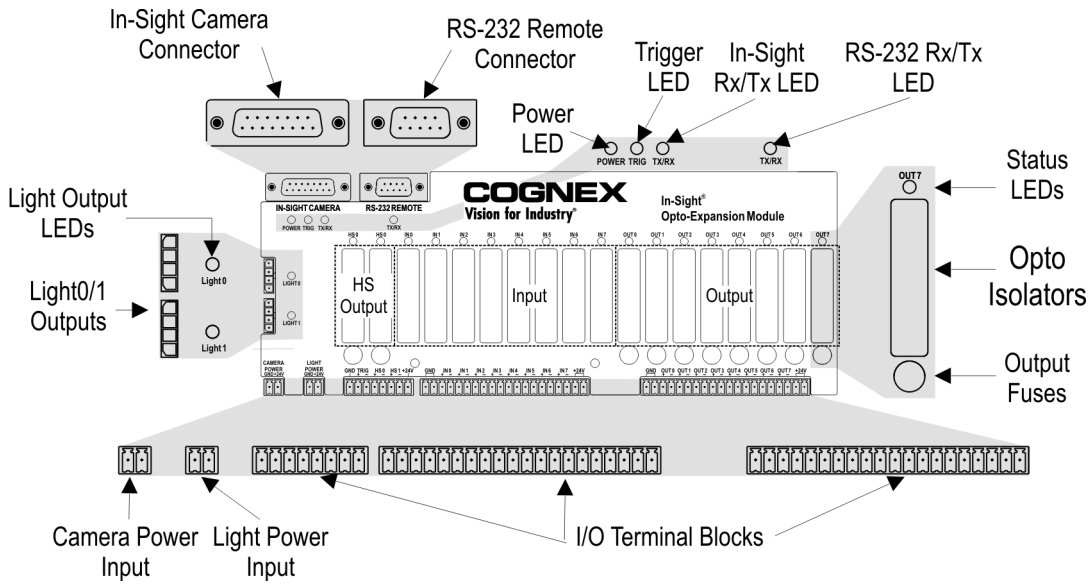


Figure 2-1: Model 1460 I/O Expansion Module Callouts

Table 2-1: Model 1460 I/O Expansion Module Component Functions

ITEM	FUNCTION
In-Sight Camera Connector	Connects the I/O cable, which provides the power, trigger and I/O signals to the connected In-Sight sensor.
RS-232 Remote Connector	Connects the Serial cable, which provides the RS-232 communications between the I/O module and an external serial device.
Light Outputs	Connects power to the Light Output cable, providing power for up to two external lighting modules.
Camera Power Input	Power for the I/O module and camera is applied to this connection.
Light Power Input	Power for the external light accessories is applied to this connection.
I/O Opto-Isolators	The 1460 I/O Expansion module supports up to 10 output (8 general purpose, 2 high-speed) and 8 input opto-isolators. These opto-isolators allow for the connection to external devices, independent of source or sink limitations from the I/O module.
Fuses	The general purpose and high-speed outputs are each protected by 2.0A fuses (field replaceable). **NOTE**: 2.0A output is derated by 33ma/C at temperatures over 25°C.
Status LEDs	Status LEDs are green when the applicable input or output is active.
Power LED	I/O Module power is indicated by a Green (normal) or flashing Red (error) condition. On initial power, the LED will flash green until connection to the In-Sight sensor is established.
Trigger LED	Trigger status is indicated by Green (when active).
Light0 and Light1 LEDs	Light LEDs indicate the presence of Light Output power. The LED will be green for the duration that light power is present.
In-Sight RX/TX LED	In-Sight RX/TX LED indicates In-Sight communications status by two states: Green (TX Active - In-Sight sensor is transmitting) and Red (RX Active - In-Sight sensor is receiving).
Serial RX/TX LED	RS-232 communication status is indicated by two states: Green (TX Active - In-Sight sensor is transmitting) and Red (RX Active - In-Sight sensor is receiving).
Terminal Blocks	Terminal blocks are provided for external I/O, trigger, power and ground connections.

2.2 Retention Bar

The retention bar, which ships with the 1460 I/O Expansion Module, can be installed to insure the security of the fuses and opto-isolator modules, generally in a high-vibration environment. As shown in Figure 2-2, to install the retention bar, seat it over the opto-isolators and fuses, then secure with the two retaining screws. To remove the retention bar, remove the two retaining screws and lift the retention bar from the expansion module. The retention bar must be removed to access the opto-isolators and fuses.

NOTE	Unless required, it is recommended to remove the retention bar in high-temperature environments to allow for unrestricted heat dissipation.

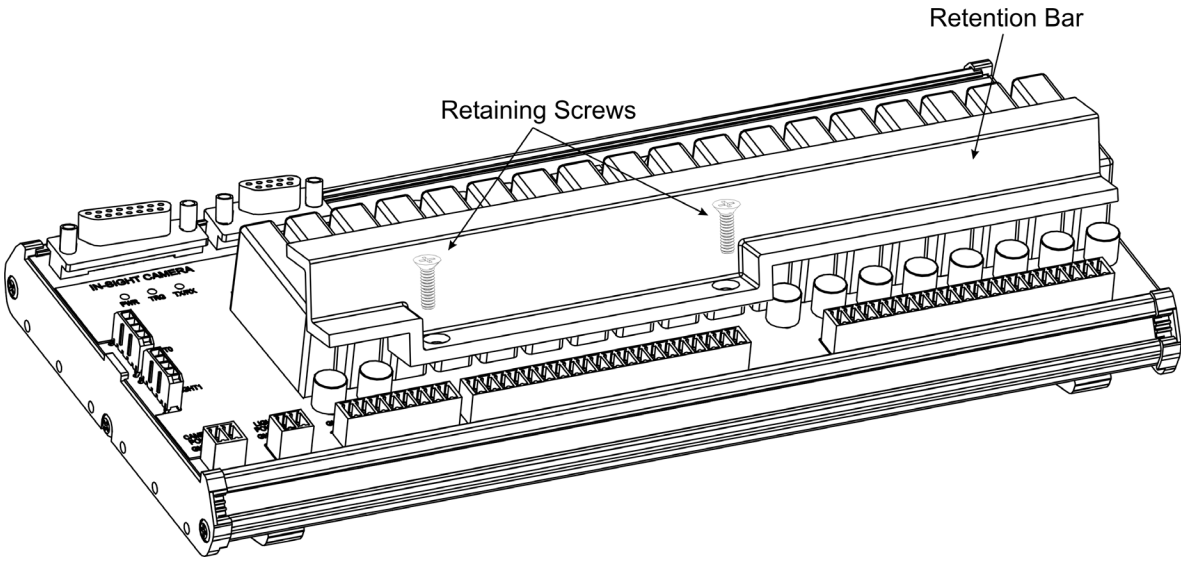


Figure 2-2: Retention Bar Installation

2.3 Opto-Isolators

The 1460 I/O Expansion Module is shipped with 10 output and 8 input opto-isolator modules, which are uninstalled. The opto-isolators are miniature, digital 5VDC modules; output opto-isolators are red and input opto-isolators are white. A variety of single-point opto-isolators may be substituted for applications requiring different sensors and loads. The retention bar must be removed to install or replace an opto-isolator.

Caution: Disconnect power to the 1460 I/O Expansion module before removing or installing opto-isolators.

2.4 Fuses

Each output is protected with a 2.0A, field replaceable fuse (Cognex P/N 121-0048). The retention bar must be removed to install or replace a fuse. Like the opto-isolator modules, the fuses come uninstalled.

Caution: Disconnect power to the 1460 I/O Expansion module before removing or installing fuses.

2.5 Connecting the 1460 I/O Expansion Module

To connect a 1460 I/O Expansion Module to the In-Sight sensor:

1. Verify that the 24VDC power supply is switched off.
2. Connect the power and ground wires from remote I/O devices to terminal blocks on the 1460 I/O Expansion Module.

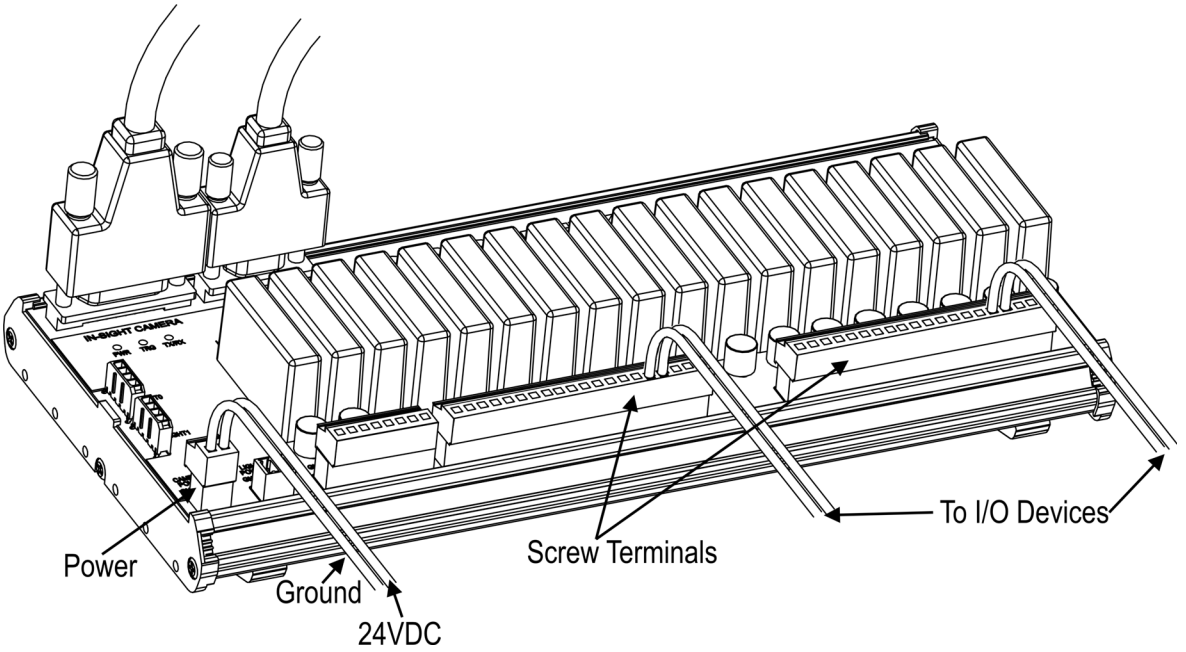


Figure 2-3: Connecting I/O Wires

a. Use a flat-head screwdriver to loosen the screw terminals.
b. Insert wire leads from remote I/O devices into the appropriate positions on the terminal block. Refer to Section 3.5.4 to verify the assigned signal at each position.

NOTE	The 1460 I/O Expansion Module outputs labeled HSOUT 0 and HSOUT 1 correspond to the In-Sight 3400 and 5000 series sensor's built-in outputs. These signals pass through the micro-controller on the 1460 I/O Expansion Module without processing. In contrast, the general-purpose outputs labeled OUT 0 through OUT 7 are lower speed because the micro-controller processes these signals before they are transmitted to remote devices.

c. Tighten the screw terminals with the screwdriver to secure the wire leads in the terminal block.

3. If the In-Sight sensor will be communicating with a remote serial device, plug the male DB9 connector into the RS-232 REMOTE connector (female DB9) on the 1460 I/O Expansion Module.

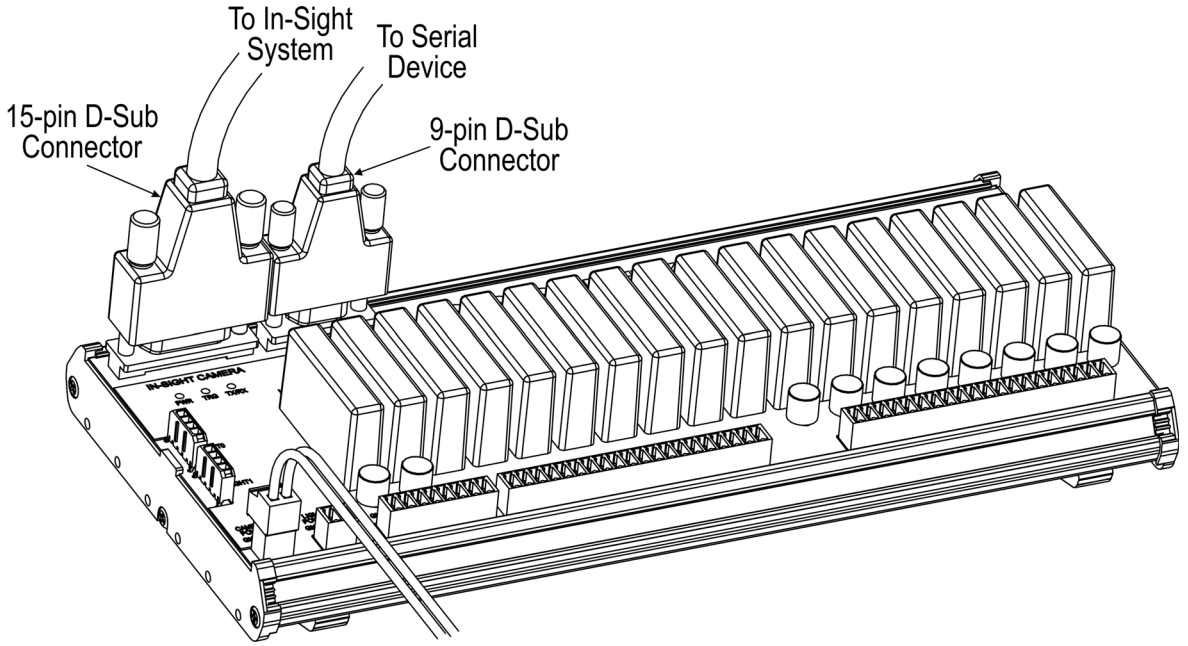


Figure 2-4: Connecting the I/O Cable and Serial Cable

4. Plug the male DB15 connector of the I/O Cable into the corresponding female connector on the 1460 I/O Expansion Module.
5. Connect the M12 connector of the I/0 Cable into the In-Sight sensor's breakout port (labeled 24VDC). The M12 connector is "keyed" to the applicable Breakout port.

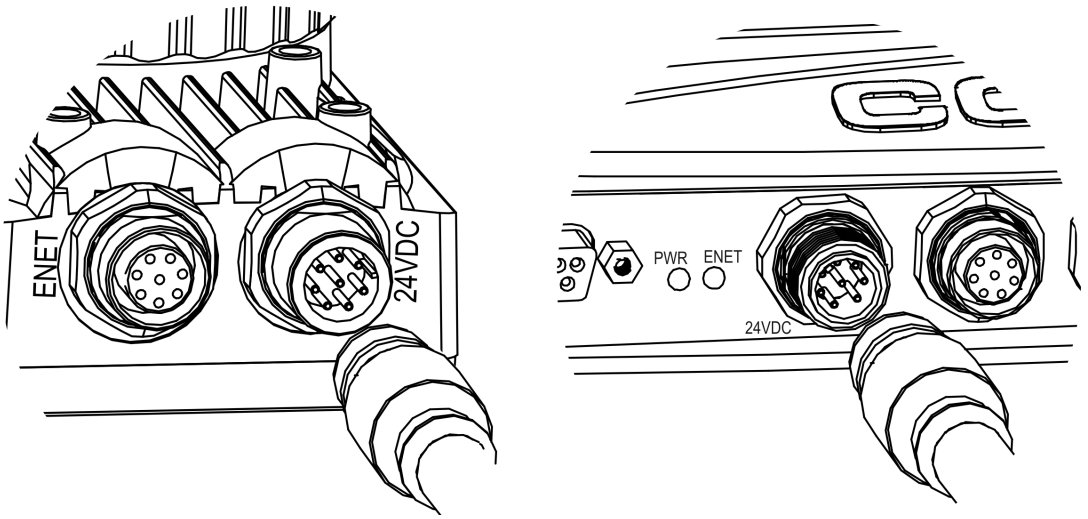


Figure 2-5: Connecting the Expansion Module to In-Sight

6. Insert wire leads from a 24VDC supply for the +24V power and ground into the 2 pin terminal plug labeled “CAMERA POWER” on the Expansion Module (Figure 2-6).

Caution: Never connect the 1460 I/O Expansion 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 source to any terminals other than the two-pin 24VDC power connector.

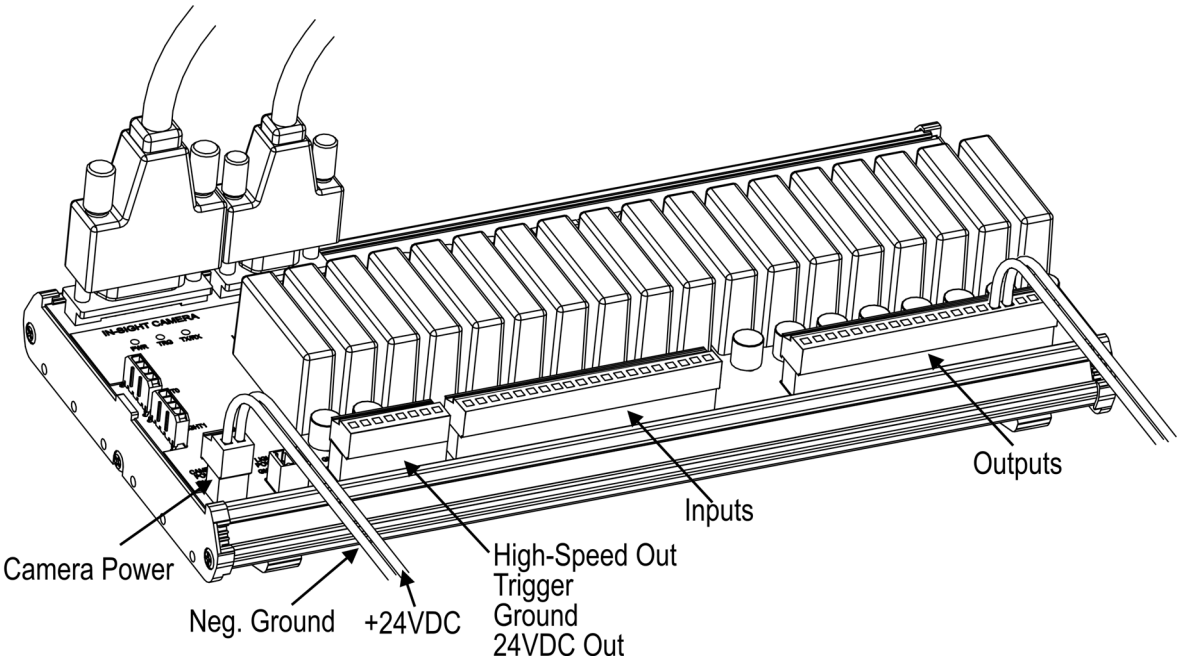


Figure 2-6: Connecting +24VDC and Ground Wires.

NOTE For some of the more common wiring configurations, see Appendix C.

2.6 Software Configuration

Before the 1460 I/O Expansion Module can be used, the In-Sight sensor’s settings must be configured to recognize the availability of the additional inputs and outputs, as well as the added serial hardware handshake capability. The 1460 I/O Expansion Module may be configured using In-Sight Explorer.

NOTES

- The In-Sight sensor can also be configured to recognize the 1460 I/O Expansion Module using the In-Sight PC Host software. For more information, see Appendix B.
- If the In-Sight sensor being configured has firmware 2.53 or older, the sensor’s firmware must be upgraded twice to communicate with the 1460 I/O Expansion Module. The first upgrade allows the sensor to recognize new Expansion Module-specific commands. The second upgrade then allows communication with the 1460 I/O Expansion Module.

2.6.1 Configuring the 1460 I/O Expansion Module using In-Sight Explorer

1. Physically connect the 1460 I/O Expansion Module to the In-Sight sensor, as described previously in Section 2.5.
2. Open the In-Sight Explorer program and log on to the sensor.
3. From the Device menu, select the Discrete I/O Settings submenu. Select the Output Settings option (Figure 2-7).

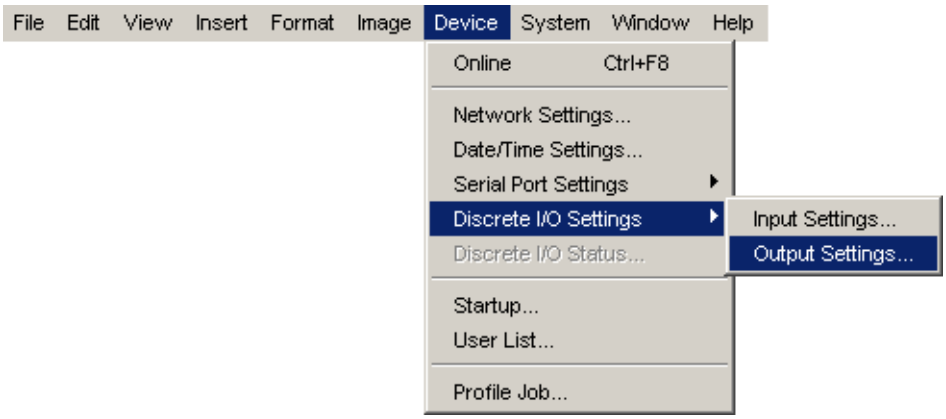


Figure 2-7: Accessing the I/O Output Settings

4. Open the Output Module drop-down list at the bottom left of the window (Figure 2-8) and select I/O Expansion Module. The Discrete Output window will automatically reconfigure to correspond to the I/O Expansion Module, as shown in Figure 2-8.
5. Configure the Line Name, Type and Details as required (Refer to Appendix A).

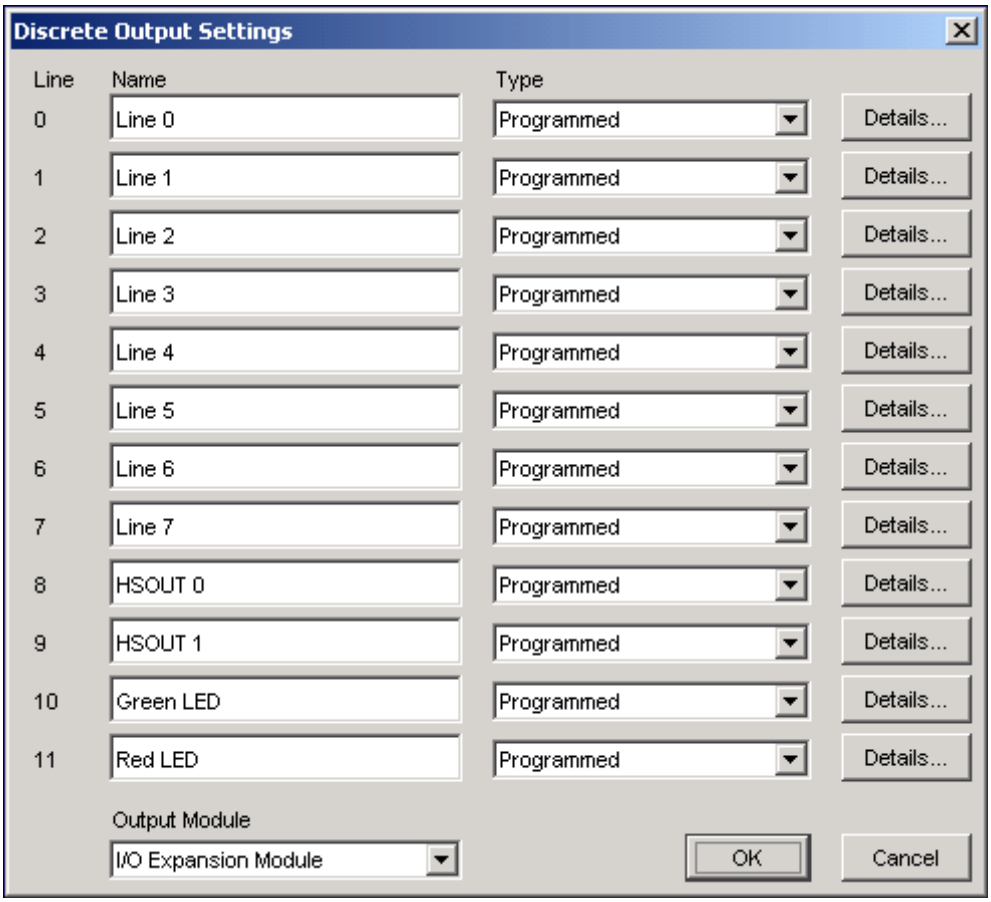


Figure 2-8: Discrete Output Settings (In-Sight Explorer)

NOTE	When an existing .JOB file containing a WriteDiscrete function is loaded on an In-Sight sensor to which the I/O Expansion Module has just been added, the Start Bit and Number of Bits parameters in WriteDiscrete must be changed to reflect the new configuration of the I/O lines. For example, the physical output lines 0 and 1 become lines 8 and 9 (HSOUT 0 and HSOUT 1) when the I/O Expansion Module is enabled.

6. Select OK to save the new settings to the sensor's flash RAM.

NOTE	An error message will appear if the I/O Expansion Module is not attached to the In-Sight sensor, and the Discrete Output dialog will return to its default configuration. Verify that the I/O Expansion Module is connected as described in Section 2.5, then repeat steps 3 - 6.

The sensor can also be configured to use the 1460 I/O Expansion Module by opening the Discrete Input dialog and following step 4, as described above.

Once the 1460 I/O Expansion Module is selected in either the Discrete Input or Discrete Output dialogs, it is automatically enabled for both inputs and outputs, and hardware hand-shaking may be used in serial communications.

2.6.2 Enabling Hardware Handshaking using In-Sight Explorer

1. From the Device menu (Figure 2-9), select the Serial Port Settings submenu. Select Port 1.

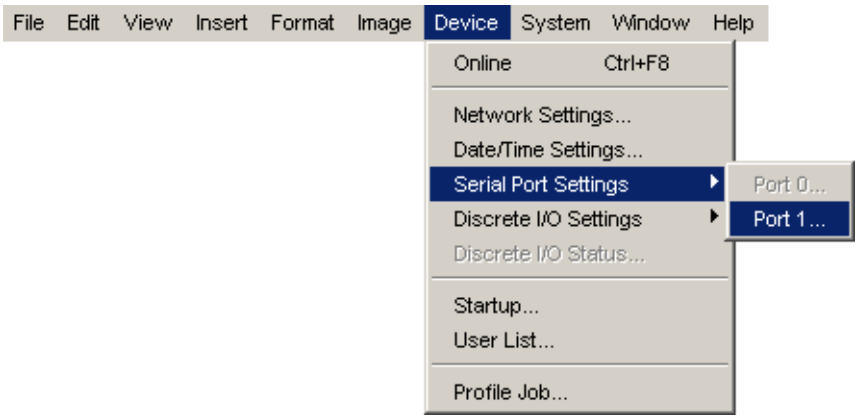


Figure 2-9: Accessing the Serial Port Settings (In-Sight Explorer)

2. Select Hardware from the Handshake drop-down list (Figure 2-10).

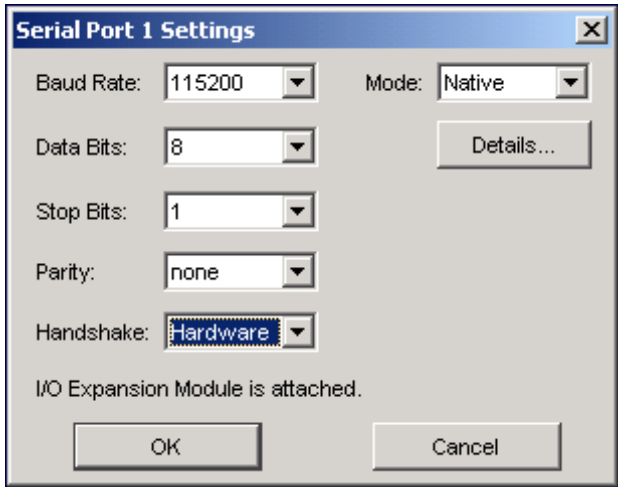


Figure 2-10: Serial Port Settings (In-Sight Explorer)

Refer to the *In-Sight® Explorer Help* HTML Help file installed with In-Sight Explorer for details on using the Discrete and Serial Input/Output functions.

2.7 Connecting and Configuring External Lights

The Model 1460 I/O Expansion Module provides light power output for 2 CCS lights. Light power input is limited to 12 or 24VDC, which must be connected at the LIGHT POWER input connector.

When HSOUT 1 is enabled in the Discrete Output dialog as Light Control, the input light power will be output to both light connectors at the start of acquisition for a duration equal to the set exposure time.

When the HSOUT 1 output is set to Light Control, the HSOUT 1 output is not available as a standard output.

2.7.1 Connecting External Lights

The model 1460 I/O Expansion Module provides two external light connections. When 12 or 24VDC is input at the LIGHT POWER input connector and the module is configured for external lighting, the applied voltage will be output to the light for the duration of the exposure.

1. Connect the light power source (12 or 24VDC) to the LIGHT POWER input.

Caution: The Light power supply must be isolated or share a common negative ground with the Camera power supply.

2. Using the light power cable, connect the Light Power Output (0 or 1) to the light source.

2.7.2 Configuring the External Lights

The Light Control is configured in the Discrete Output dialog.

1. Open the Discrete Output dialog.
2. Verify that I/O Expansion Module is selected as the device.
3. For HSOUT 1 (Line 9), set the Type to Light Control (1460 Only).
4. Set the Details to Rising Edge or Falling Edge as required.

3 Specifications

In this section…

3.1 General Specifications

Table 3-1: 1460 I/O Expansion Module General Specifications

SPECIFICATION		DESCRIPTION
Compatibility		In-Sight 3400 and In-Sight 5000 Series Vision Sensors
I/O	Trigger	1 opto-isolated, acquisition trigger input
	Inputs	8 opto-isolated discrete (general-purpose)
	Outputs	10 opto-isolated discrete (2 high-speed, 8 general-purpose) General purpose Outputs – Maximum 60VDC, 2 Amps resistive, derated at -33mA/C for surrounding air temperatures above 25°C
Communications	Serial	1 RS-232C port (1200 to 115,200 baud rates) RxD, TxD, and Flow control (RTS/CTS)
Status LEDs		1 each for power, external lights, acquisition trigger, inputs and outputs 1 each for Camera and Remote RS-232
Mechanical	Housing	Black plastic
	Mounting	#3 DIN-rail (35mm)
	Dimensions	Width: 269.2mm (10.6"), Depth: 125.4mm (4.94"), Height: 63.5mm (2.5")
	Terminal Block	26 to 16 AWG Maximum torque 0.3 Nm (2.7 in-lb.)
	Weight	737.1 g (26 oz.) Opto-isolators and fuses installed, w/o retention bar.
Power	Camera	24VDC ±10%, 1.25 Amps, 30W supply[1]
	Light Input	12VDC to 24VDC
	Light Output	12VDC to 24VDC
Environmental	Temperature	0°C to 50°C (operating), -10°C to 65°C (storage)
	Humidity	10 to 90%, non-condensing (Operating and Storage)
	Shock	30Gs per IEC 68-2-27 (Pending)
	Vibration	2Gs per IEC 68-2-6 (Pending)
Certifications		CE, UL, FCC

1. Maximum draw when the 1460 I/O Expansion Module supplies power to an In-Sight sensor, and when all inputs, outputs, and LED indicators are in use. Draw will be less than 30W under typical usage.

3.2 Acquisition Trigger Input

The 1460 I/O Expansion Module provides access to the supported vision sensor's high-speed, opto-isolated acquisition trigger input. Unlike the general-purpose inputs, the acquisition trigger input is wired directly to the CCD imager circuitry, thus bypassing the sensor's operating system. The 1460 I/O Expansion Module's micro controller also monitors the acquisition trigger input (Figure 3-1).

3.3 Acquisition Trigger Input Specifications

Table 3-2: Acquisition Trigger Input Specifications

SPECIFICATION	DESCRIPTION
Voltage	ON 20 to 28V (24V nominal)
	OFF 0 to 3V (12V nominal threshold)
Current	ON 10 to 14.4mA
	OFF <300µA
	Resistance ~2K Ohms
Delay	250 µSec maximum latency between leading edge of trigger and start of acquisition. Input pulse should be a minimum of 1 ms wide.

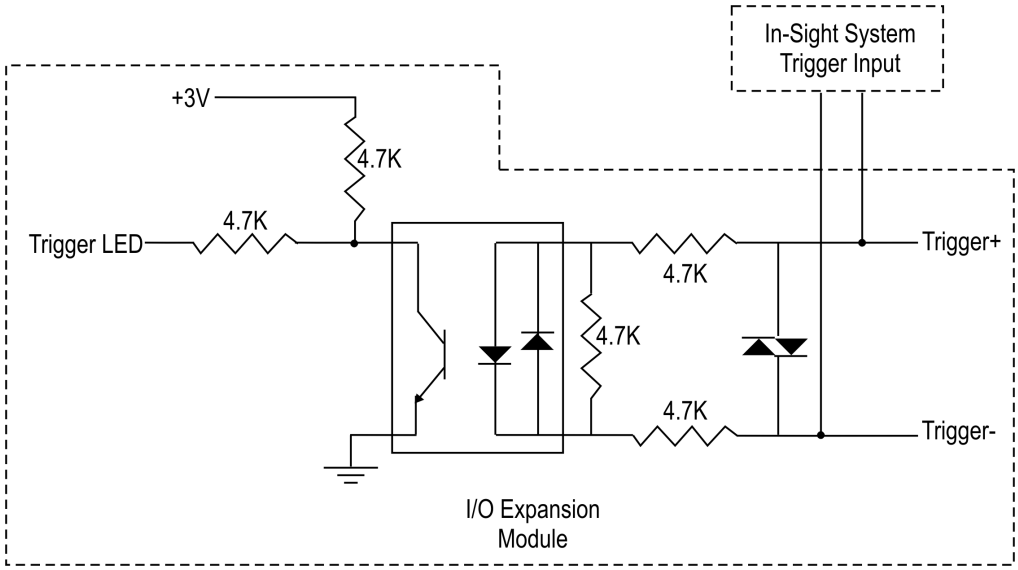


Figure 3-1: Acquisition Trigger Input

To trigger from an NPN (pull-down) type photo-detector or PLC output, connect TRIG+ on the 1460 I/O Expansion Module's terminal block to +24V and connect TRIG– to the output of the detector. When the output turns ON, it pulls TRIG– down to 0V, energizing the In-Sight camera trigger (Figure 3-2).

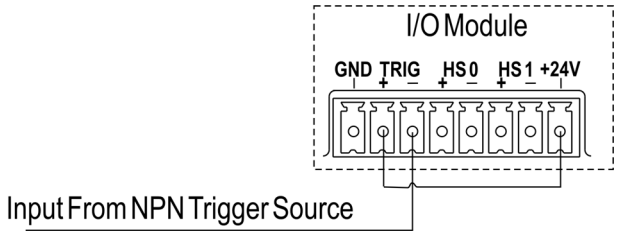


Figure 3-2: Acquisition Trigger Input (NPN Source)

To trigger from a PNP (pull-up) photo-detector or PLC output, connect TRIG+ to the output of the detector and connect TRIG– to 0V. When the output turns ON, it pulls TRIG+ up to the supplied voltage, energizing the In-Sight camera's trigger (Figure 3-3).

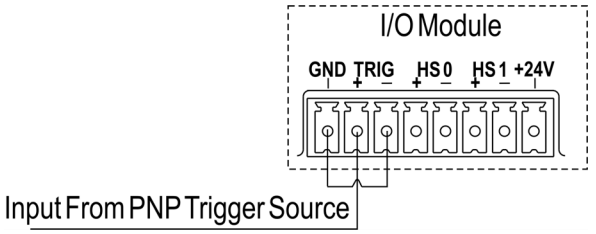


Figure 3-3: Acquisition Trigger Input (PNP Source)

To trigger from a differential input source, connect the negative input to TRIG– and the positive input to TRIG+. When a differential voltage exists, the In-Sight camera trigger is energized (Figure 3-4).

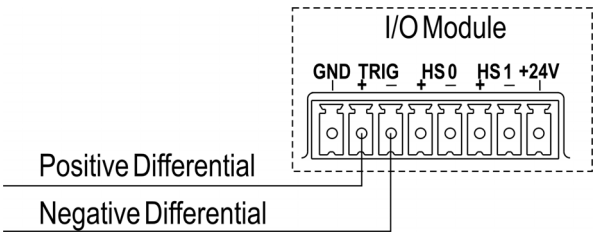


Figure 3-4: Acquisition Trigger Input (Differential Source)

An LED indicator is provided for the acquisition trigger and illuminates when an approximate potential of >2V is supplied across the TRIG+ and TRIG– terminals.

NOTE	Even if the TRIG LED indicator illuminates, this does not guarantee that the logical threshold has been crossed. It only means that the TRIG+ and TRIG– terminals are properly connected to the trigger source.

3.4 Input and Output Specifications

3.4.1 General Purpose Inputs

The 1460 I/O Expansion Module extends the capabilities of supported In-Sight vision sensors by providing eight independent, general-purpose inputs (IN0-IN7) that can be used to trigger event execution on the sensor.

NOTE	The general purpose I/O signals are approximately 1ms slower in updating and are inverse in polarity when compared to the high speed outputs. This delay must be considered when trigger rates are faster than the required processing time.

Table 3-3: General Purpose Input Specifications

SPECIFICATION	DESCRIPTION
Voltage	ON 3 to 32V (24V nominal)
	OFF 0 to 1.5V (10V nominal threshold)
Current	ON >50mA
	OFF <50mA
Delay	600µSec max. between change of input state and completion of serial transmission to the In-Sight sensor.

Opto-isolators are used to interface the general-purpose inputs on the 1460 I/O Expansion Module. Typically used to monitor the status of a load or a sensor (such as a limit switch, pressure switch, or temperature switch), the general purpose inputs may be directly connected to these inputs. When the input is active, it pulls the processor input up to 5V, activating the input circuit (Figure 3-5).

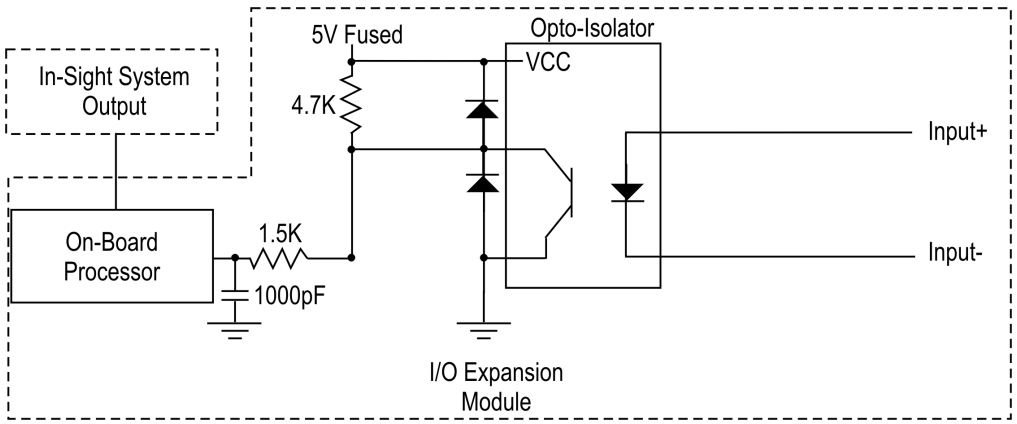


Figure 3-5: General Purpose Input Diagram

3.4.2 High Speed and General Purpose Outputs

In-Sight 3400 and 5000 sensors feature two built-in, high-speed discrete outputs. The 1460 I/O Expansion Module provides access to these outputs while providing an additional eight general-purpose discrete outputs that can be used to trigger remote events. The high-speed outputs are passed through the I/O module without processing.

Table 3-4: Output Specifications

SPECIFICATION	DESCRIPTION
Voltage	60V maximum through external load.
Current	On >50mA, 2.0A max, Fuse protected. **NOTE**: Must be derated at -33mA/C for surrounding air temperatures above 25°C.
	Off <50mA

Opto-isolators are used to interface the high-speed and general purpose outputs on the 1460 I/O Expansion Module. Typically used to trigger the status of a load (such as a solenoid, motor or lamp), the load may be directly connected to these outputs. When the input is active, it pulls the output up to the supplied voltage, activating the load (Figure 3-6).

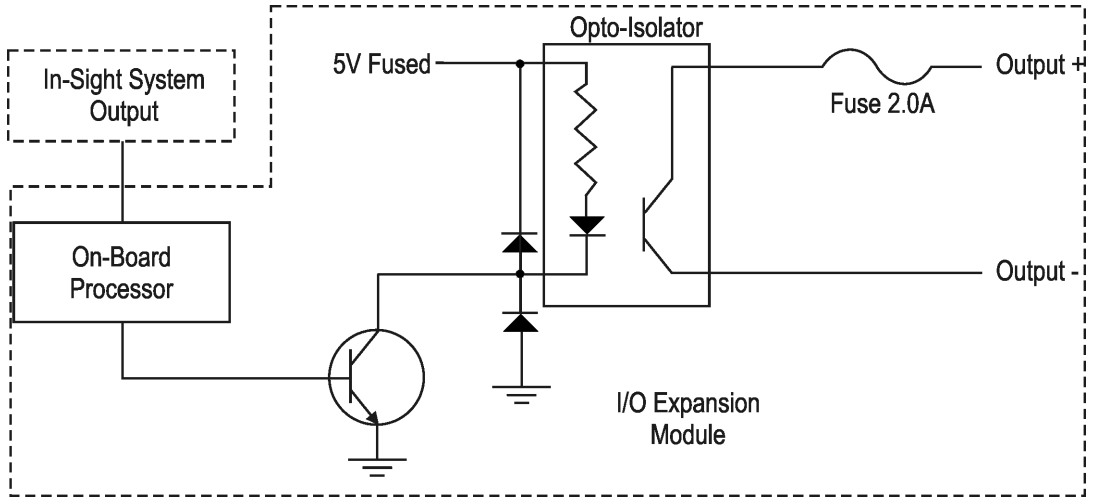


Figure 3-6: High-Speed and General Purpose Outputs

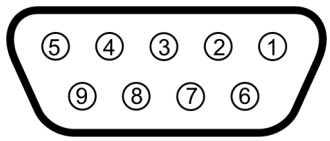
NOTE	The general purpose I/O signals are approximately 1ms slower in updating and are inverse in polarity when compared to the high speed outputs. This delay must be considered when trigger rates exceed the required processing time.

3.5 Connector and Terminal Block Specifications

3.5.1 RS-232 Remote Connector

The RS-232 Remote connector transmits serial data between the 1460 I/O Expansion Module and a remote device. Status LEDs are provided for the TxD and RxD lines on this port. These LEDs will illuminate only when there is activity on the associated line. Table 3-5 identifies the signal assignment for each pin on the RS-232 Remote connector.

Table 3-5: RS-232 Remote Connector Pin Assignments

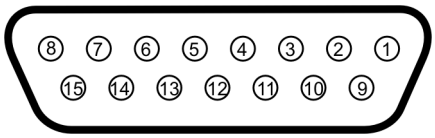


PIN #	ASSIGNMENT	PIN #	ASSIGNMENT	PIN #	ASSIGNMENT
1	No Connect	4	No Connect	7	CTS
2	TxD	5	GND	8	RTS
3	RxD	6	No Connect	9	No Connect

3.5.2 In-Sight Camera Connector

The In-Sight Camera connector transmits discrete I/O and serial data between the sensor and the 1460 I/O Expansion Module, as well as supplying power to the sensor. Status LEDs are provided for the TxD and RxD lines on this port. These LEDs will illuminate only when there is activity on the associated line. Table 3-6 shows the signal assignments for each pin on the In-Sight Camera connector.

Table 3-6: In-Sight Camera Connector Pin Assignments

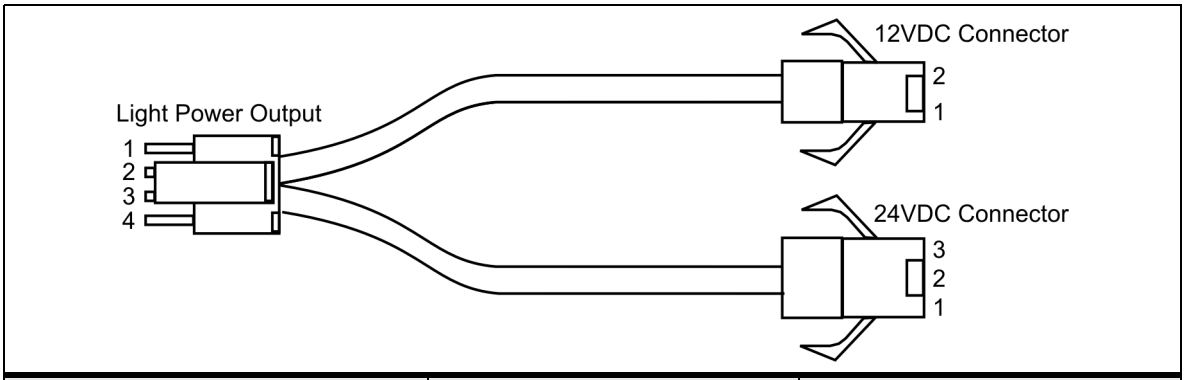


PIN #	ASSIGNMENT	PIN #	ASSIGNMENT	PIN #	ASSIGNMENT
1	+24VDC	6	RxD	11	GND
2	TRIG+	7	TxD	12	GND
3	TRIG–	8	GND	13	GND
4	High Speed Output 0	9	GND	14	GND
5	High Speed Output 1	10	GND	15	GND

3.5.3 Light Cable

The Light Cable provides the interface between the LIGHT 0 and LIGHT 1 power outputs on the 1460 I/O Expansion Module and a +12VDC or +24VDC CCS Light module.

Table 3-7: Light Power Cable Pin Assignments



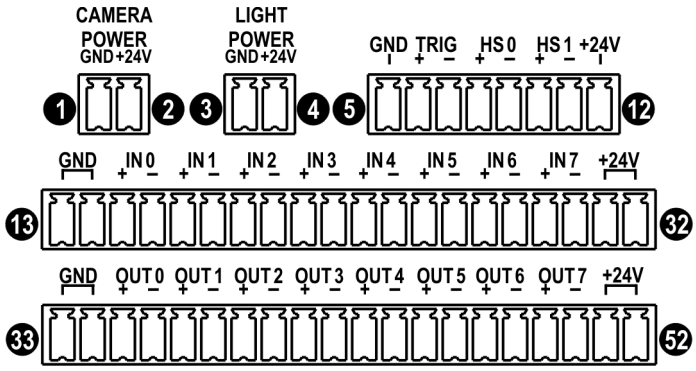
Light Power Output Connector		12VDC Connector		24VDC Connector	
PIN #	**ASSIGNMENT**	**PIN #**	**ASSIGNMENT**	**PIN #**	**ASSIGNMENT**
1	GND (Blue)	1	+12VDC (Brown)	1	+24VDC (Brown)
2	+12VDC (Brown)	2	GND (Blue)	2	No Connect
3	GND (Blue)			3	GND (Blue)
4	+24VDC (Brown)				

3.5.4 Terminal Block Assignments

Table 3-8 shows the signal assignments for each screw terminal on the Expansion Module's terminal blocks.

NOTE	Unless necessary, power should not be provided from the pins labeled +24V (in the Input/Output terminal blocks). If power is provided from these pins, the Inputs/Outputs will no longer be isolated. For the Inputs/Outputs to be isolated, a separate power supply must be used.

Table 3-8: Terminal Block Pin Assignment



PIN #	ASSIGNMENT	PIN #	ASSIGNMENT	PIN #	ASSIGNMENT	PIN #	ASSIGNMENT
1	Ground	14	Ground	27	IN6+	40	Out2-
2	+24VDC	15	IN0+	28	In6-	41	Out3+
3	Ground	16	IN0-	29	IN7+	42	OUT3-
4	+24VDC	17	IN1+	30	IN7-	43	OUT4+
5	Ground	18	IN1-	31	+24VDC	44	OUT4-
6	TRIG+	19	IN2+	32	+24VDC	45	OUT5+
7	TRIG–	20	IN2-	33	Ground	46	OUT5-
8	HS0+	21	IN3+	34	Ground	47	OUT6+
9	HS0-	22	IN3-	35	OUT0+	48	OUT6-
10	HS1+	23	IN4+	36	OUT0-	49	OUT7+
11	HS1-	24	IN4-	37	OUT1+	50	OUT7-
12	+24VDC	25	IN5+	38	OUT1-	51	+24VDC
13	Ground	26	IN5-	39	OUT2+	52	+24VDC

3.6 Dimensions

All dimensions in millimeters (inches).

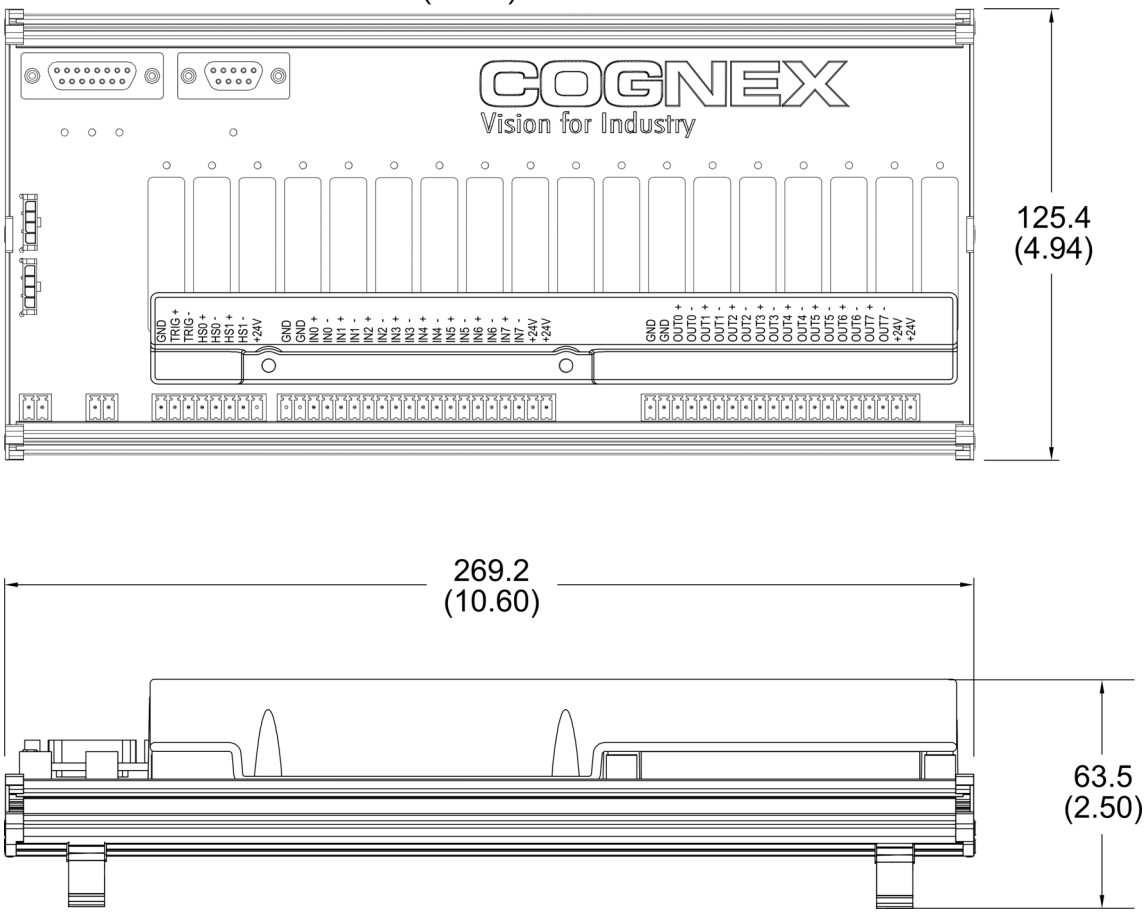


Figure 3-7: 1460 I/O Expansion Module Dimensions

A.1 Configuring the Discrete Output

The Discrete Output Settings dialog configures the parallel digital output lines on an In-Sight device. Discrete output signals are written out from the spreadsheet using the WriteDiscrete function. The number of accessible outputs varies per In-Sight model and is shown in Table A-1.

Table A-1: In-Sight Discrete Output Capability by Model

MODEL	INTEGRATED (BUILT-IN) OUTPUTS	OPTIONAL OUTPUTS
In-Sight 3400 In-Sight 5000 Series	Two (2) high-speed discrete outputs. Two (2) user-configurable LEDs (1 green, 1 red).	Eight (8) additional outputs using the 1460 I/O Expansion Module.

The Discrete Output dialog default settings are shown in Figure A-1.

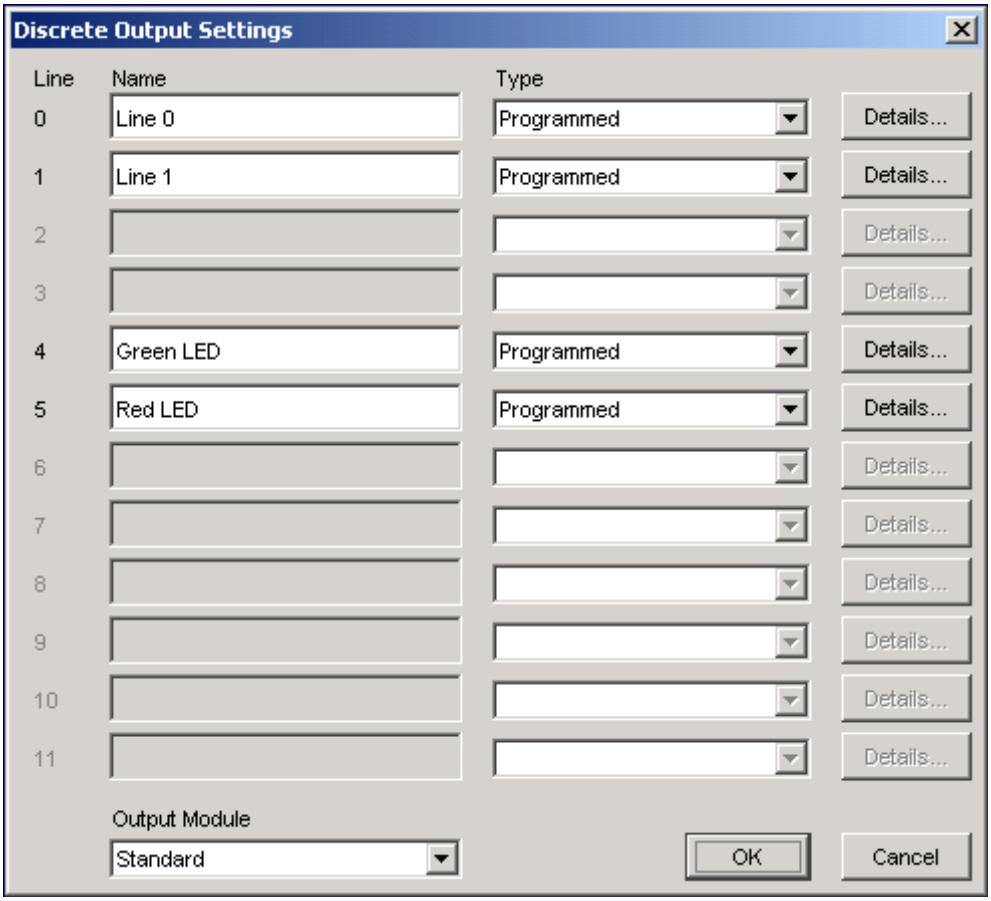


Figure A-1: Discrete Output Dialog Defaults (In-Sight 3400/5000 Series)

The Discrete Output dialog consists of three configurable parameters: Name, Type and Details.

A.1.1 Line Name

A new Name for an output Line may be assigned by selecting the field containing the default name, and entering the new name using the Text Entry dialog. The name may be up to 15 characters. The Line Name is used for reference purposes only; it does not change the functionality of the output line and cannot be referenced in the spreadsheet.

A.1.2 Line Type

One of sixteen available Line Types is selected from the drop-down menu list. The available types are described in Table A-2.

Table A-2: Discrete Output Dialog Type Parameter

TYPE	DESCRIPTION
Programmed	Enables a WriteDiscrete function in the spreadsheet to control the state of this output line. Either pulsed or steady-state.
High	Forces the output to HIGH (1).
Low	Forces the output to LOW (0).
Acquisition Start	Pass through of the acquisition trigger signal. Always pulsed.
Acquisition End	Signals the completion of camera acquisition. Always pulsed.
Job Completed	Signals each time the spreadsheet has completed an update. Always pulsed.
System Busy	HIGH when the In-Sight sensor is running a job or responding to user input, LOW when the In-Sight sensor is idle.
Job Load OK	Signals the successful loading of a job. Always pulsed.
Job Load Fail	Signals the unsuccessful loading of a job. Always pulsed.
ERR: Missed Acquisition	ON means that an acquisition trigger was received before a previous acquisition could be completed. The output line State is automatically cleared whenever the Discrete Output dialog is opened or closed. Always pulsed.
ERR: Tracking Overrun	ON means that the spreadsheet issued a delayed discrete output signal sometime after it was expected. The output line State is automatically cleared whenever the Discrete Output dialog is opened or closed. Always pulsed.
ERR: Tracking Queue Full	ON means that the spreadsheet issued a delayed discrete output for a line where a different output had been previously scheduled to occur at the same time. The output line State is automatically cleared when the Discrete Output dialog is opened or closed. Always pulsed.
Online/Offline	HIGH when In-Sight is Online, LOW when In-Sight is Offline.
Strobe[1]	HIGH when the In-Sight sensor is exposing the CCD. Always pulsed for the duration of the exposure. The leading edge of the signal can be used to trigger a strobe. The exposure time must be 0.50 ms greater than the strobe pulse duration specified on the external strobe device. This output type is only valid for High Speed Output Line 1 (HS OUT 1). The In-Sight sensor and strobe device must be connected to the same ground for the strobe to operate correctly.

Table A-2: Discrete Output Dialog Type Parameter (Continued)

TYPE	DESCRIPTION
I/O Module Standby	On means that the 1460 I/O Expansion Module has detected a loss of communication with the In-Sight sensor and is trying to re-establish the connection. The line is Off as long as the 1460 I/O Expansion Module does not detect a loss of communication between it and the In-Sight sensor. This type is only available when "I/O Expansion Module" is selected.
Light Control (1460 only)	Selecting the Light Control option will enable the Light0/1 outputs. This output type is only valid for High Speed Output line 1 (HS OUT 1) when "I/O Expansion Module" is selected.

1. The In-Sight sensor and strobe device must be connected to the same ground for the strobe to operate correctly. In-Sight 3400 and 5000 series sensors allow the Strobe output type only on Line 1 of Standard I/O, and Line 9 (HSOUT 1) of the 1460 I/O Expansion Module.

A.1.3 Line Details

Depending on which Line Type is chosen, an Output Details dialog may appear when the Details button is selected. The Output Details dialog associated with each Line Type is shown in Table A-3. The Ooutput Details dialog parameter options are discussed following Table A-3.

Table A-3: Line Details Dialog

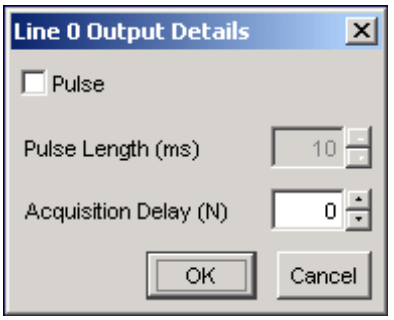
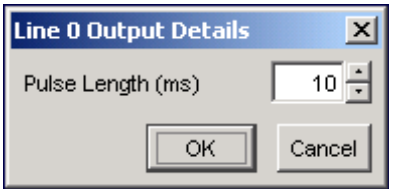
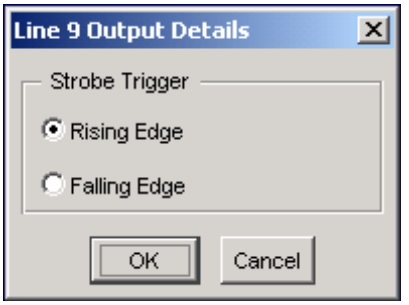
LINE TYPE(S)	SAMPLE OUTPUT DETAILS DIALOG
Programmed	
Acquisition Start Acquisition End Job Completed Job Load OK Job Load Fail ERR: Missed Acquisition ERR: Tracking Overrun ERR: Tracking Queue Full	

Table A-3: Line Details Dialog (Continued)

LINE TYPE(S)	SAMPLE OUTPUT DETAILS DIALOG
Strobed Light Control	
High Low System Busy Online/Offline I/O Module Standby	No Output details are configurable for these Line Types.

Details Dialog Controls

1. Pulse: When this checkbox is enabled, the output will be pulsed. Disable this checkbox for a steady-state output. The output must be pulsed when the Acquisition Delay is greater than 0.
2. Pulse Length (ms): Specifies the duration of an output pulse (10 to 1000 ms).
3. Acquisition Delay (N): Specifies the number of acquisition or tracking pulses (0 to 1000) to delay the output after a signal pulse is received by an output Line. If Acquisition Delay = 0, then the In-Sight device updates the output line immediately on evaluating the WriteDiscrete function. If Acquisition Delay > 0, then the output Line is always pulsed.
4. Strobe Trigger: Rising Edge will trigger a strobe on the rising edge of the signal; Falling Edge will trigger a strobe on the falling edge of the signal.

A.2 Configuring the Discrete Input

The Discrete Input Settings dialog (Figure A-2) configures the parallel input lines on the active In-Sight sensor. Discrete input signals are read into the In-Sight spreadsheet using the ReadDiscrete function. The number of accessible inputs varies per In-Sight model as shown in Table A-4.

Table A-4: In-Sight Discrete Input Capability by Model

MODEL	INTEGRATED (BUILT-IN) INPUTS	OPTIONAL INPUTS
In-Sight 3400 In-Sight 5000 Series	None	Eight (8) additional inputs using the 1460 I/O Expansion.

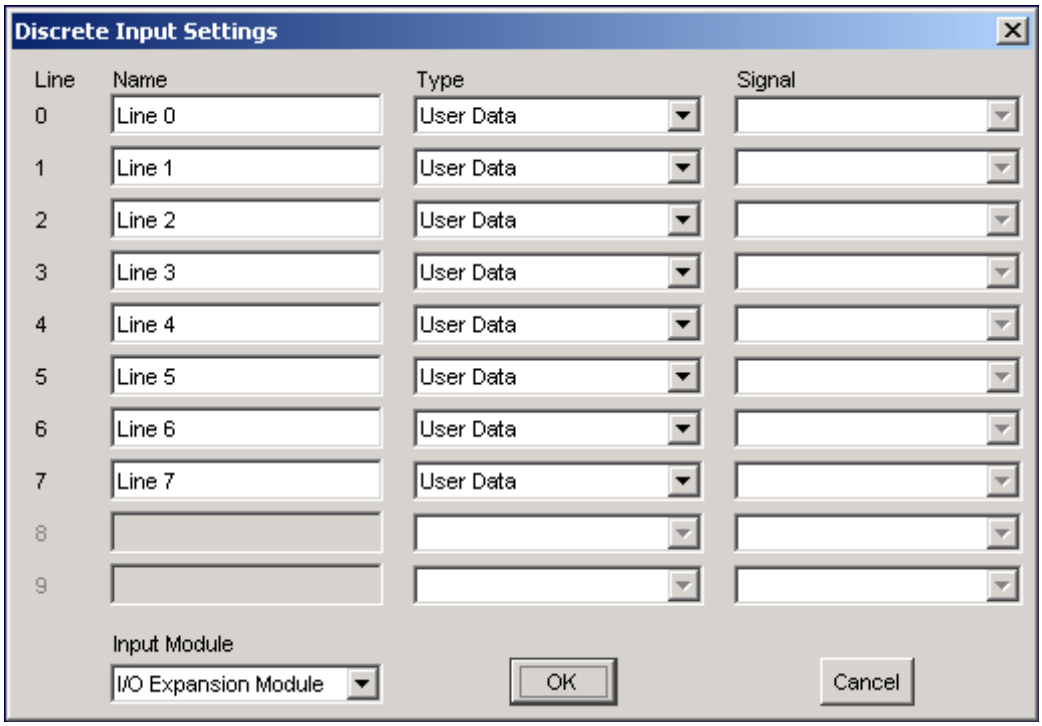


Figure A-2: Discrete Input Dialog Defaults (In-Sight 3400/5000 Series)

The Discrete Input dialog consists of three configurable parameters: Name, Type and Signal.

A.2.1 Line Name

A new Name for an input Line may be assigned by selecting the field containing the default name and entering the new name using the Text Entry dialog. The name may include up to 15 characters. The Line Name is used for reference purposes only; it does not change the functionality of the input line, and cannot be referenced in the spreadsheet.

A.2.2 Line Type

One of seven available Line Types is selected from the drop-down menu list. The available types are described in Table A-5.

Table A-5: Discrete Input Dialog Type Parameter

TYPE	DESCRIPTION
User Data	General purpose input line; used to drive events in the spreadsheet or to set a value in the spreadsheet via the ReadDiscrete function.
Event Trigger	Triggers an event. To update the spreadsheet, the spreadsheet must contain an Event structure with its Trigger parameter set to this discrete input Line Number.
Job ID Number	Provides one bit of a Job ID Number, which is loaded when the State of a different input line with a Type of Job Load Switch is ON. **NOTE**: This functionality is provided for backwards compatibility, but it is strongly recommended to use the direct Camera trigger input line. In order to use the Job ID Number function, the job to be loaded must be saved with a numerical prefix of 0 to 19. For example, “8sample.job”.
Online/Offline	Forces the In-Sight device Offline or Online. 0 = Offline, and 1 = Online.
Acquisition Trigger	Triggers the In-Sight camera to acquire an image. Requires the AcquireImage function's Trigger parameter to be set to External, and that a signal line is physically connected to the trigger input of the In-Sight camera.
Job Load Switch	ON reads all of the Job ID Number lines and loads the specified job. **NOTE**: Do not connect relays to the Job Load Switch Input Line. Multiple job loads will occur.

The available input types for each discrete input line on the various In-Sight device models are summarized in Table A-6.

Table A-6: Discrete Input Dialog Signal Parameters

MODEL	INPUT LINE	VALID INPUT TYPES
In-Sight 3400 In-Sight 5000 Series	Expansion Module Lines 0 through 7	User Data Event Trigger Job ID Number Online/Offline[1] Acquisition Trigger[1] Job Load Switch[1]

1. Indicates that this input type may not be used on more than one input line simultaneously.

A.2.3 Signal Type

Select a signal type for the selected input line, which controls the sensitivity of the input line to edge transitions.

- Rising Edge: Changes the state of the input line on the leading edge of a pulse.
- Falling Edge: Changes the state of the input line on the falling edge of a pulse.

B.1 Configuring the Expansion Module using In-Sight PC Host

As mentioned in Section 2.6, before the 1460 I/O Expansion Module can be used, the In-Sight sensor's settings must be configured to recognize the availability of the additional inputs and outputs, as well as the added serial hardware handshake capability. The 1460 I/O Expansion Module may be configured using the In-Sight PC Host software.

1. Physically connect the 1460 I/O Expansion Module to the In-Sight sensor, as described in Section 2.5.
2. Open the In-Sight PC Host program and log on to the sensor.
3. Open the System menu (Figure B-1) and select Settings to open the Settings menu (Figure B-2).

Figure B-1: System menu (In-Sight PC Host)

Figure B-2: Settings menu (In-Sight PC Host)

4. From the Settings menu, select Discrete Output to open the Discrete Output dialog (Figure B-3).

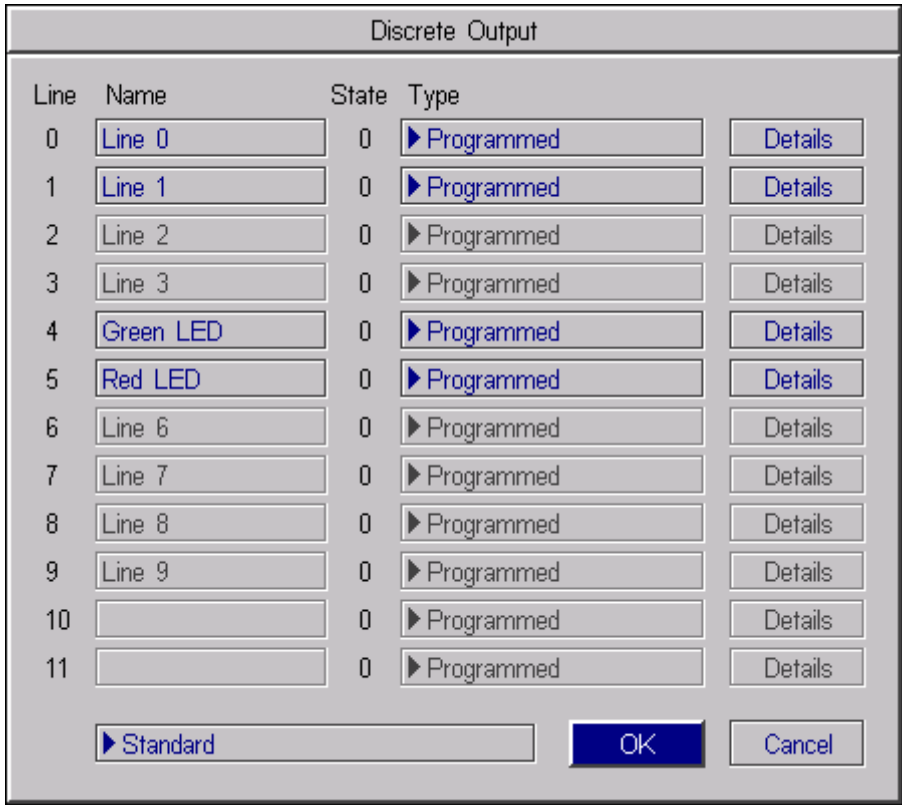


Figure B-3: Discrete Output Dialog, Default Configuration (In-Sight PC Host)

5. Open the drop-down list to the left of the OK button and select I/O Expansion Module. The Discrete Output dialog will automatically reconfigure to correspond to the I/O Expansion Module, as shown in Figure B-4.
6. Configure the Line Name, Type and Details as required (refer to Appendix A).

NOTE	When an existing .JOB file containing a WriteDiscrete function is loaded on an In-Sight sensor to which the I/O Expansion Module has just been added, the Start Bit and Number of Bits parameters in WriteDiscrete must be changed to reflect the new configuration of the I/O lines. For example, the physical output lines 0 and 1 become lines 8 and 9 (HSOUT 0 and HSOUT 1) when the I/O Expansion Module is enabled.

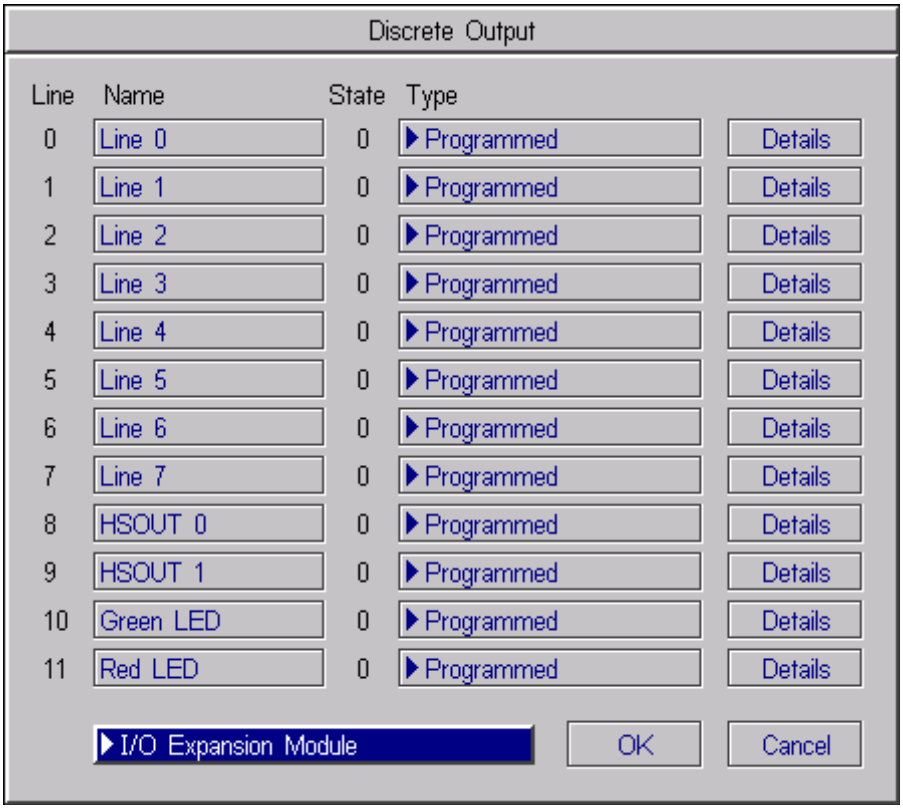


Figure B-4: Discrete Output Dialog, I/O Expansion Configuration (In-Sight PC Host)

7. Select OK to save the new settings to the sensor's flash RAM.

NOTE	An error message will appear if the I/O Expansion Module is not attached to the In-Sight sensor, and the Discrete Output dialog will return to its default configuration. Verify that the I/O Expansion Module is connected as described in Section 2.5, then repeat steps 1 - 7.

The sensor can also be configured to use the 1460 I/O Expansion Module by opening the Discrete Input dialog and following steps 3 - 7, as described above.

Once the I/O Expansion Module is selected in either the Discrete Input or Discrete Output dialogs, it is automatically enabled for both inputs and outputs, and hardware handshaking may be used in serial communications.

B.2 Enabling Hardware Handshaking using In-Sight PC Host

1. Open the System menu (Figure B-1).
2. Select Settings to open the Settings menu (Figure B-2).
3. Select Serial Port 1 to open the Serial Port 1 dialog (Figure B-5).

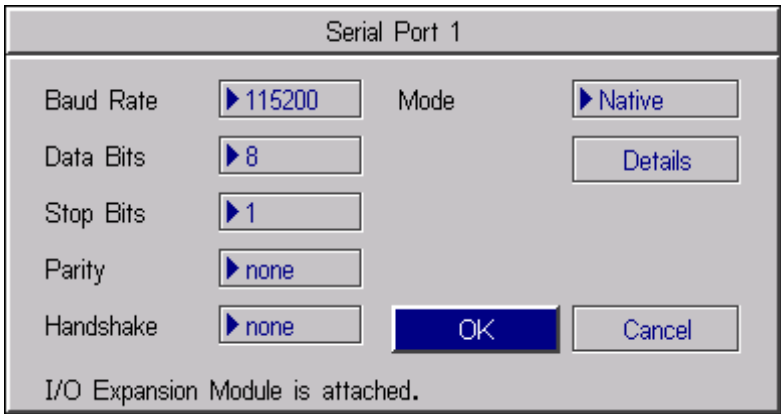


Figure B-5: Serial Port Dialog (PC Host)

4. Select Hardware from the Handshake drop-down list (Figure B-6).

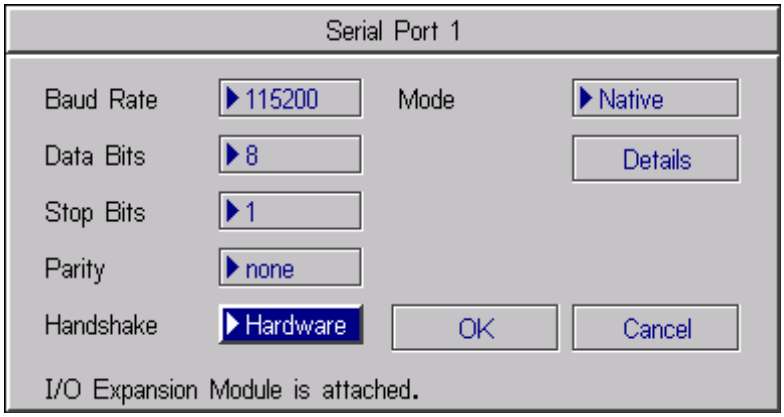


Figure B-6: Serial Port Dialog, Hardware Handshaking Enabled (PC Host)

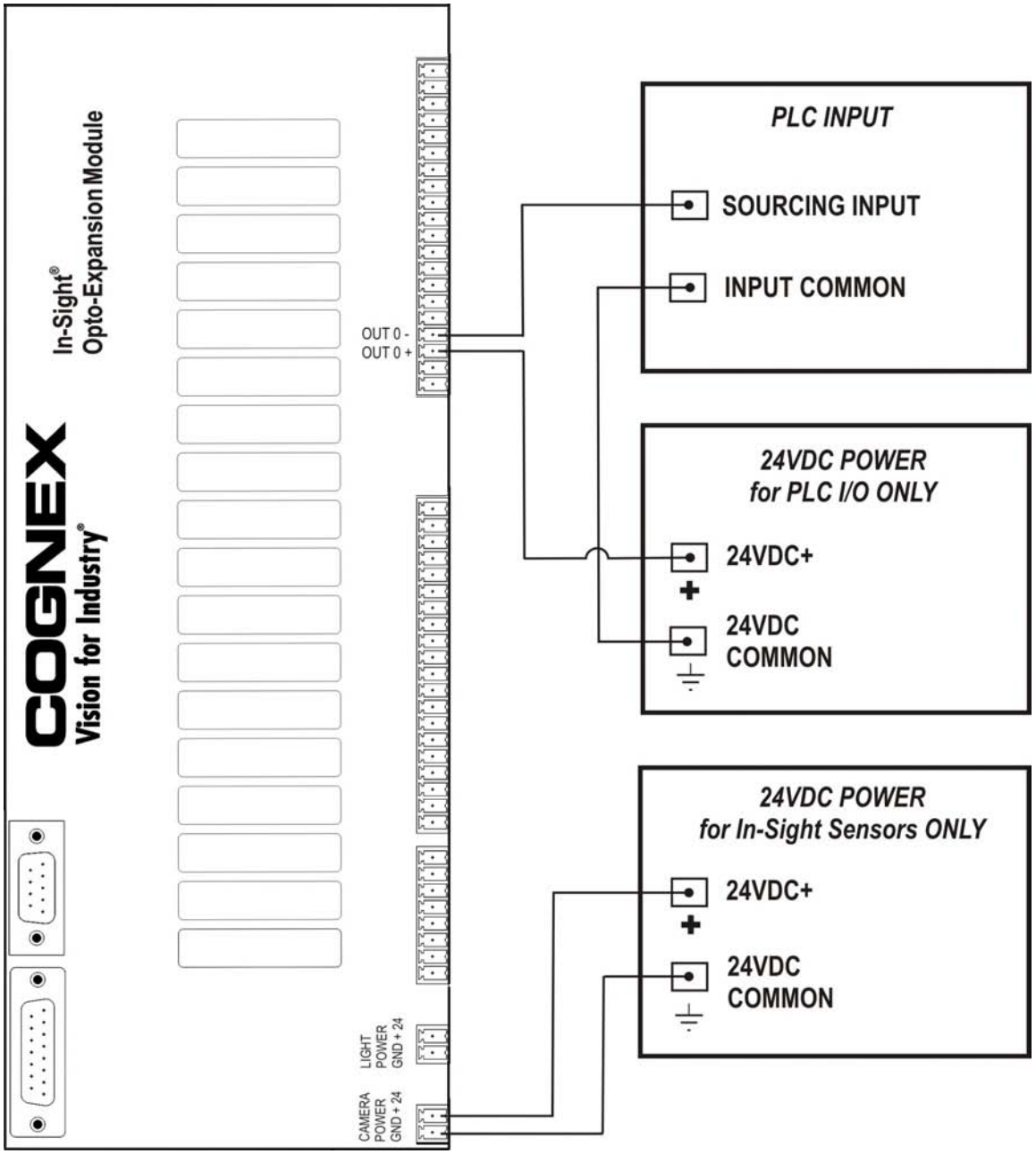
Refer to the *In-Sight® Guide & Reference* HTML Help file installed with the In-Sight PC Host for details on using the Discrete and Serial Input/Output functions in the In-Sight spreadsheet.

C.1 Wiring Inputs and Outputs

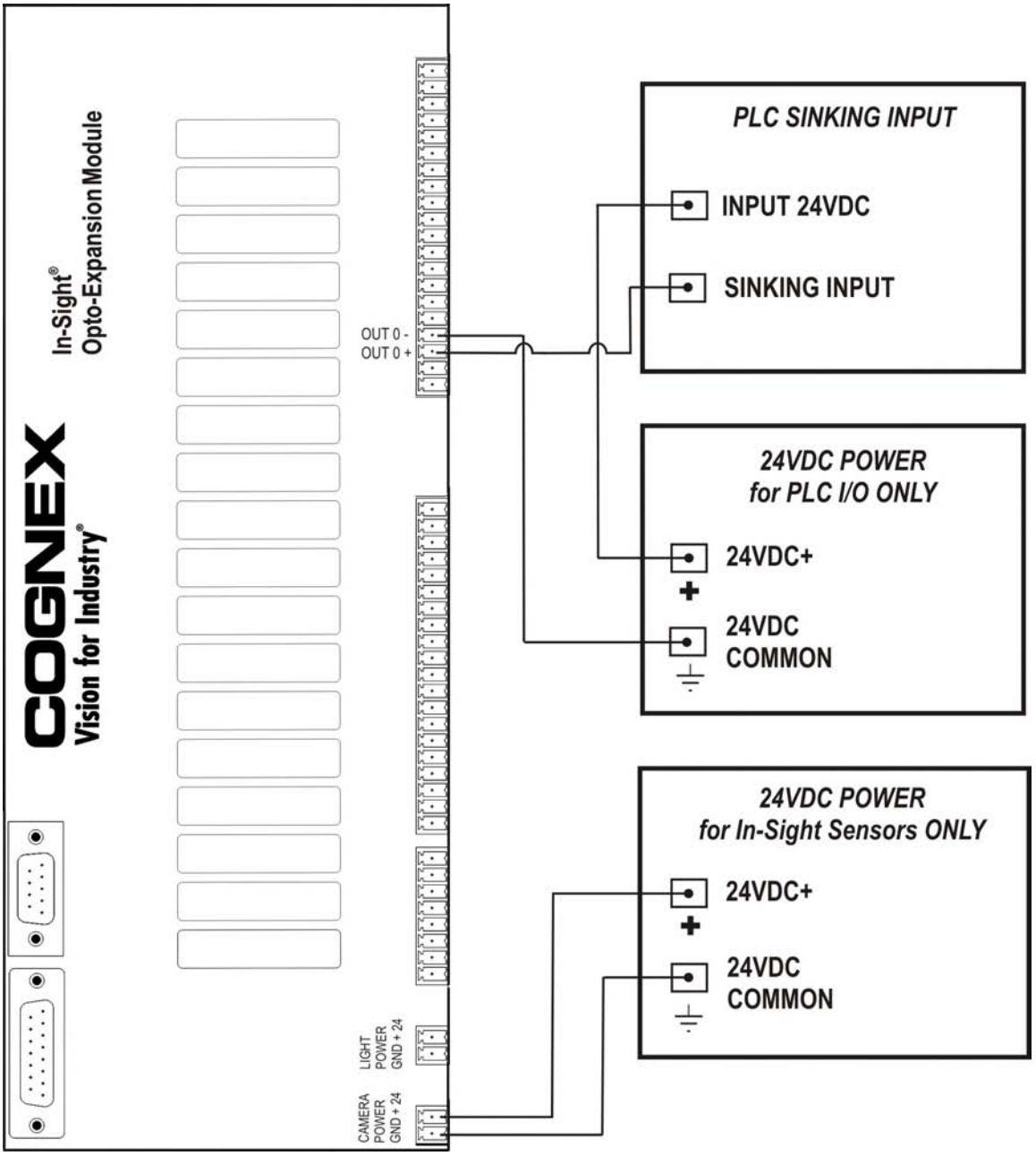
The following figures show basic wiring for some of the more common configurations.

NOTES	• The 2 pin 24VDC input, labeled CAMERA POWER, is the only +24VDC connection required on the 1460 I/O Expansion Module. • Unless necessary, power should not be provided from the pins labeled +24V (in the Input/Output terminal blocks). If power is provided from these pins, the Inputs/Outputs will no longer be isolated. For the Inputs/Outputs to be isolated, a separate power supply must be used. • Do not connect relays to the Job Load Switch Input Line. Multiple job loads will occur.

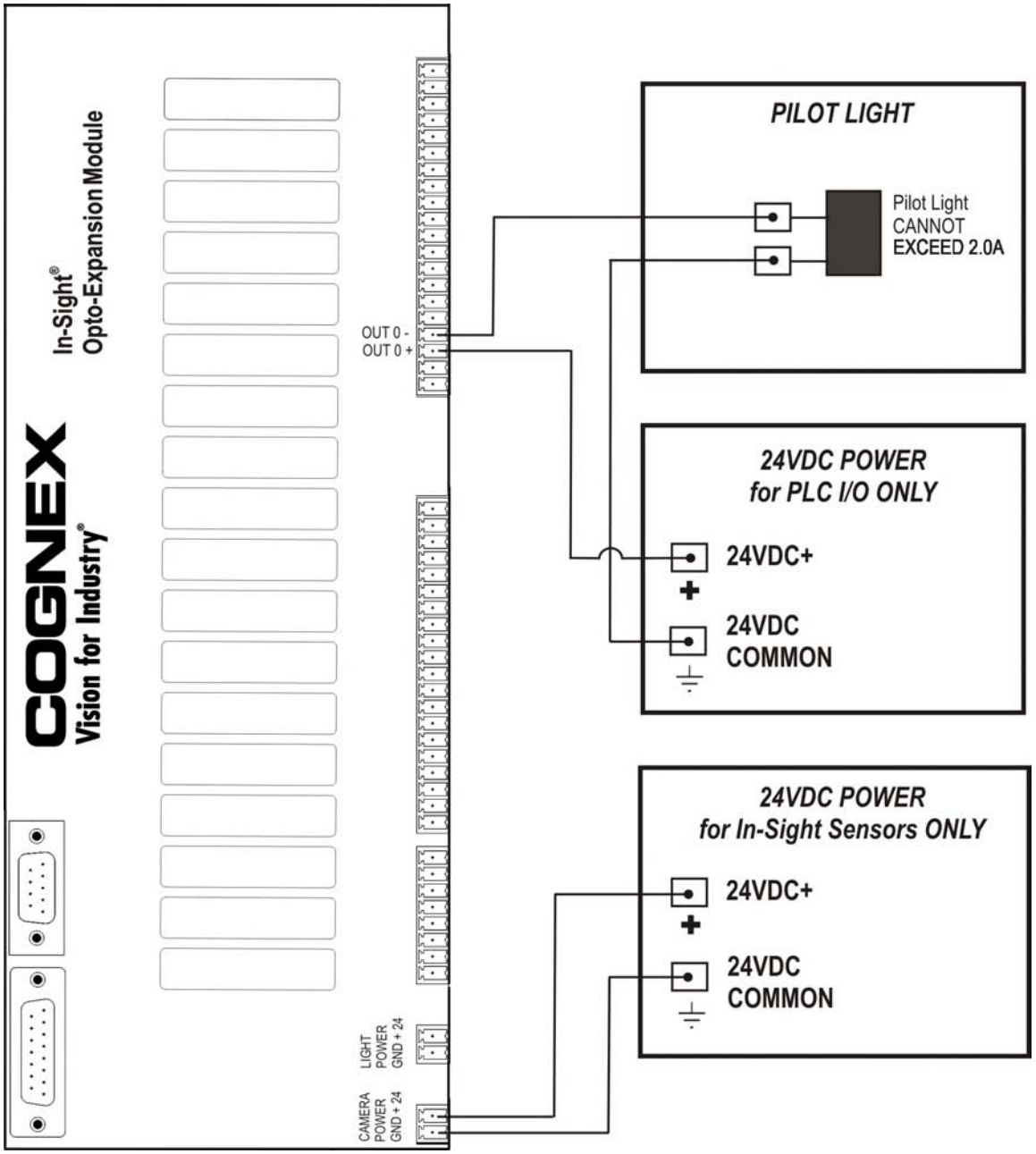
C.1.1 1460 I/O Expansion Module Output to PLC Input



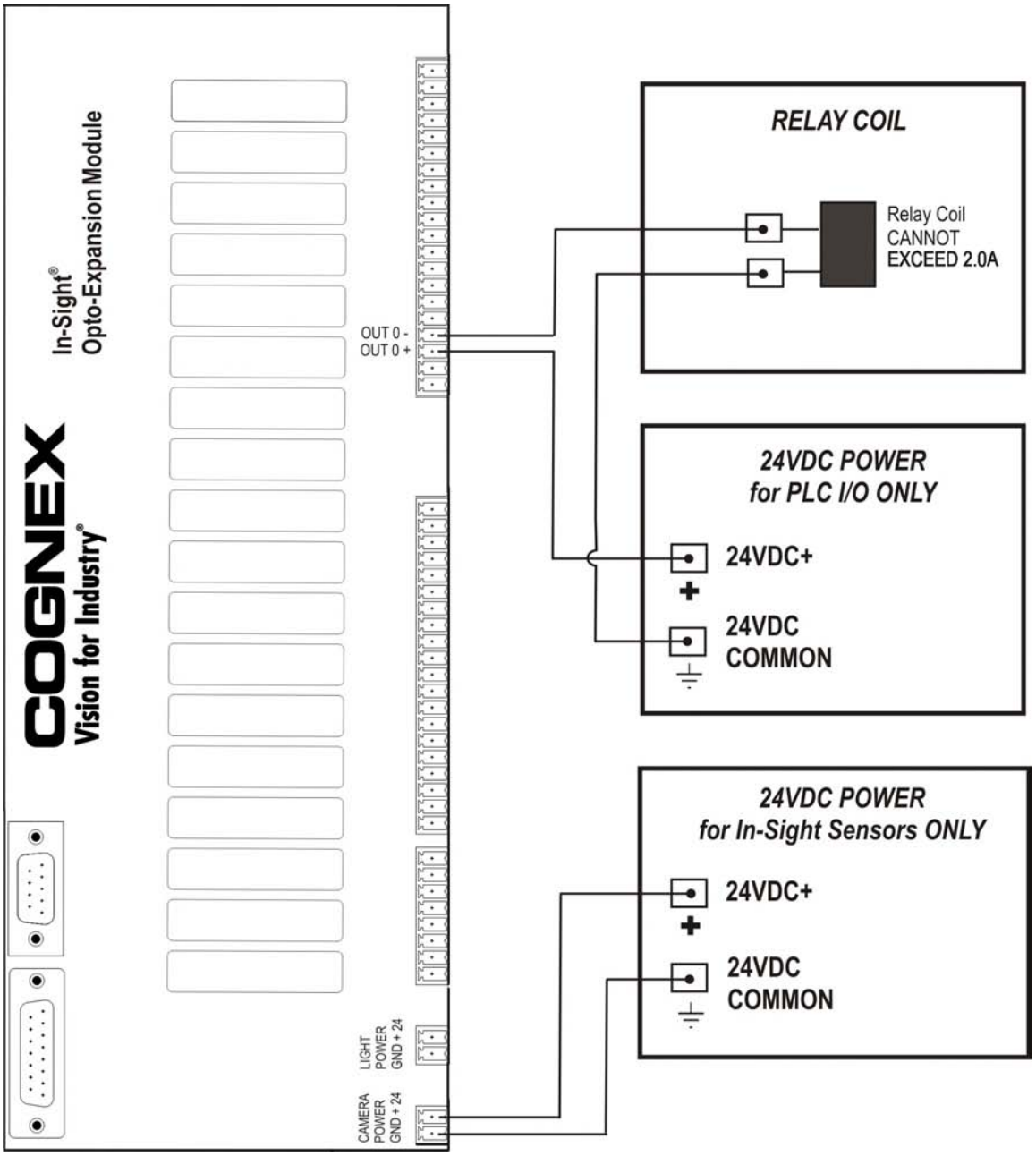
C.1.2 1460 I/O Expansion Module Output to PLC Sinking Input



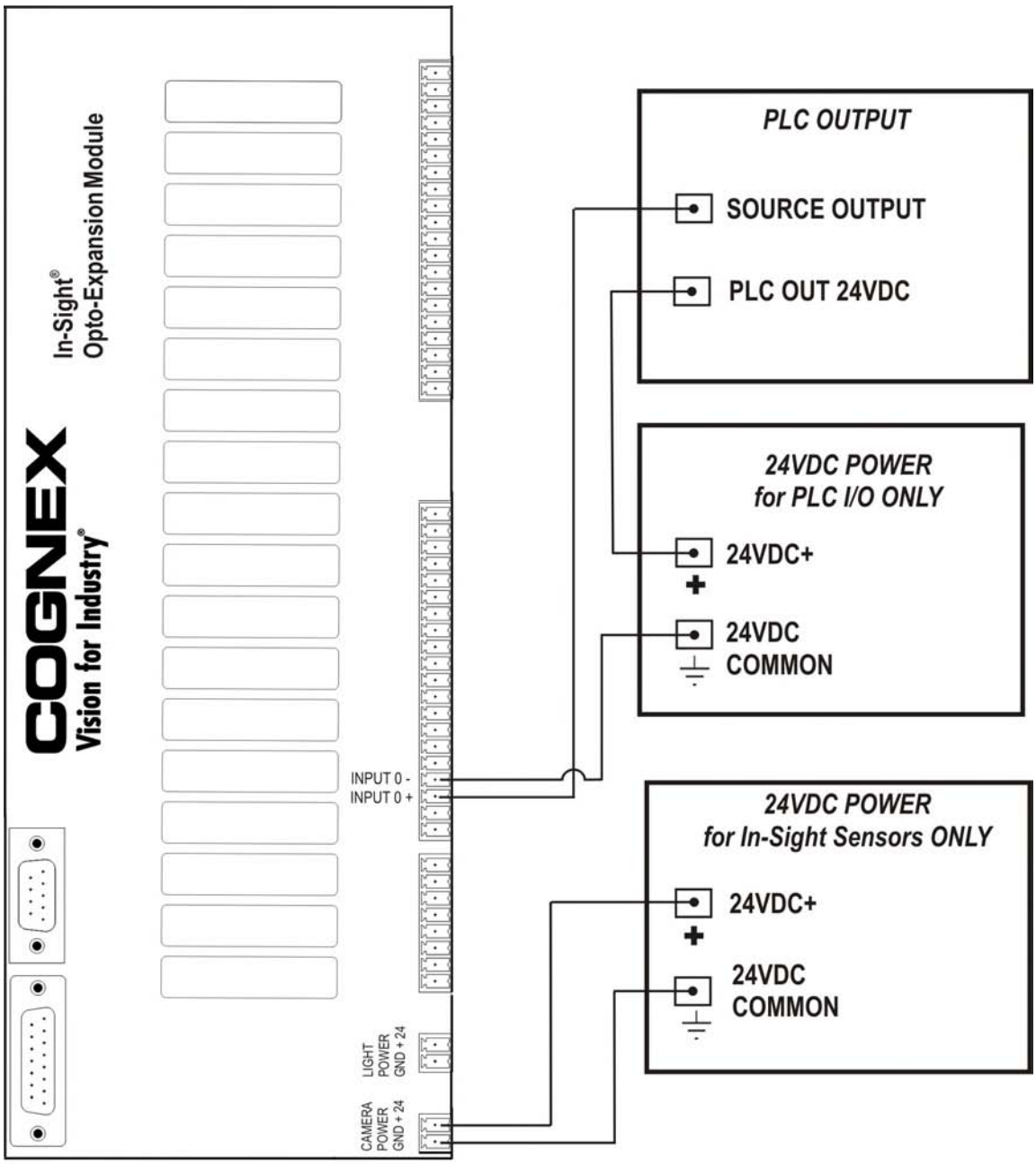
C.1.3 1460 I/O Expansion Module Output to Pilot Light Input



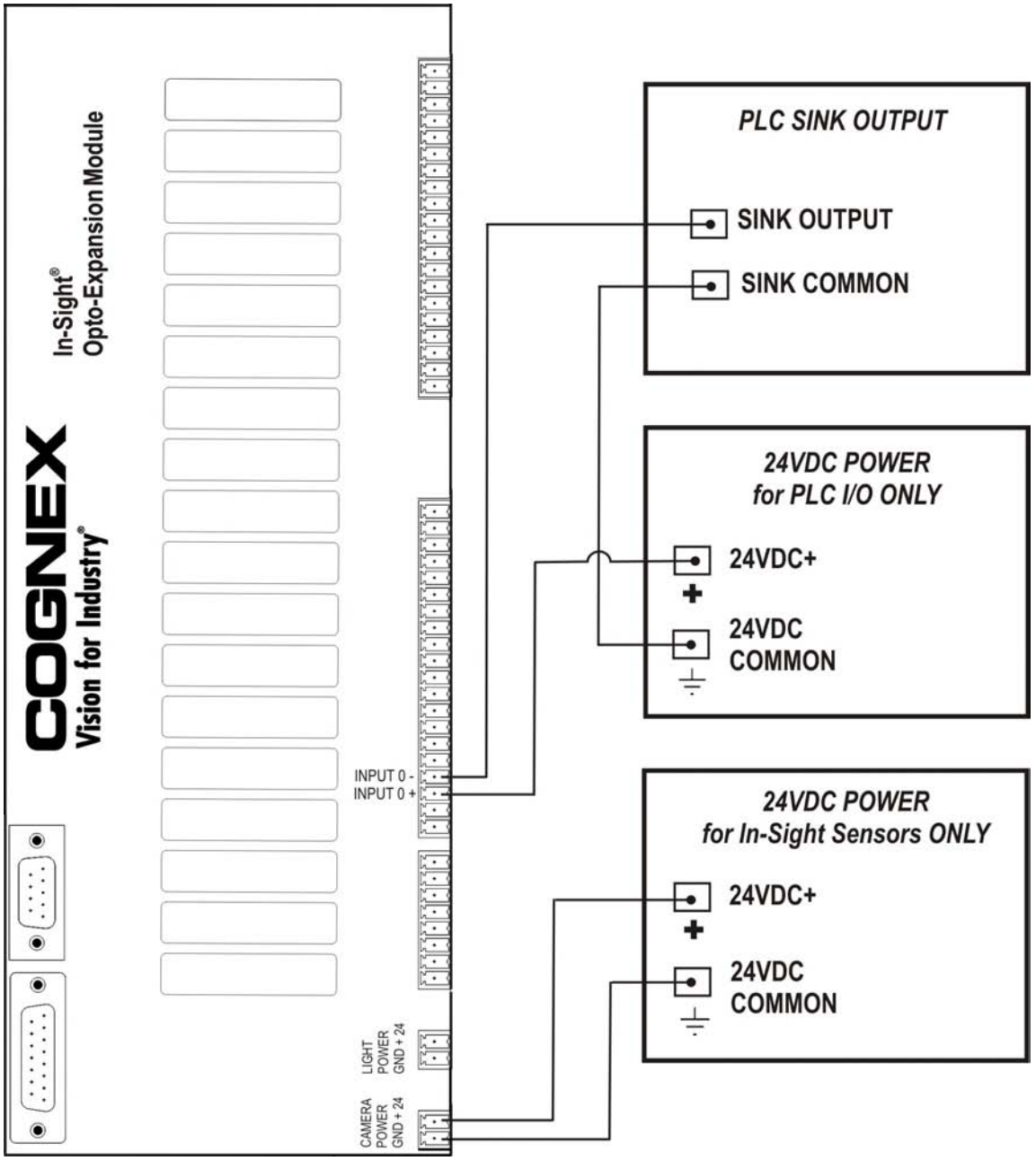
C.1.4 1460 I/O Expansion Module Output to Relay Coil Input



C.1.5 1460 I/O Expansion Module Input to PLC Output



C.1.6 1460 I/O Expansion Module Input to PLC SINKING Output



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In-Sight® Model 1460 I/O Expansion Module Installation and Reference

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