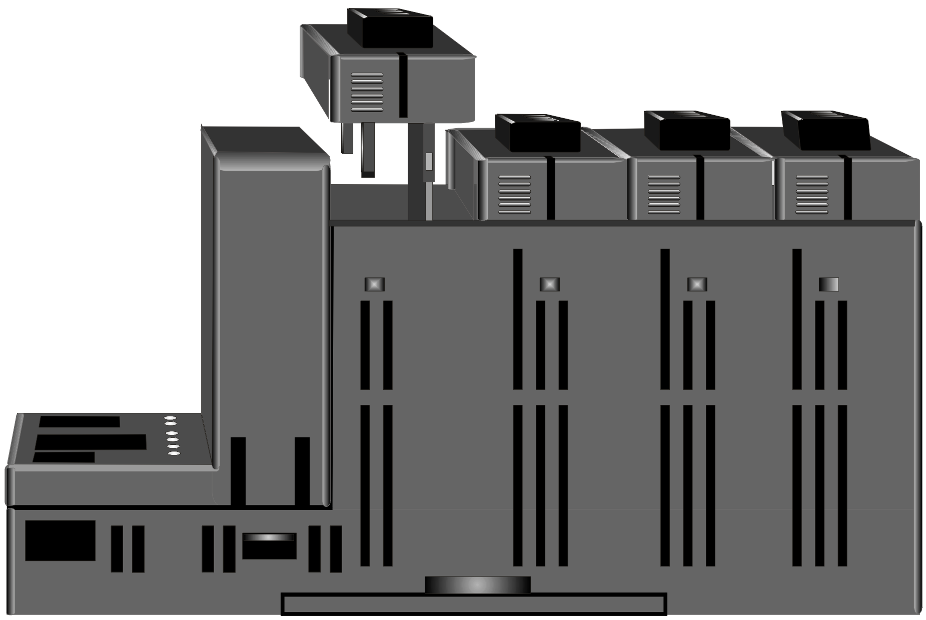
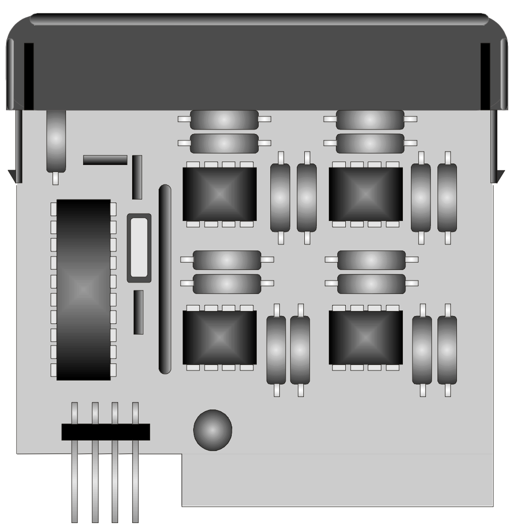
# OptiLogic Input/Output Modules





Optimal Automation for Industry

*Optimation, Inc.* (256)883-3050
www.optimate.com

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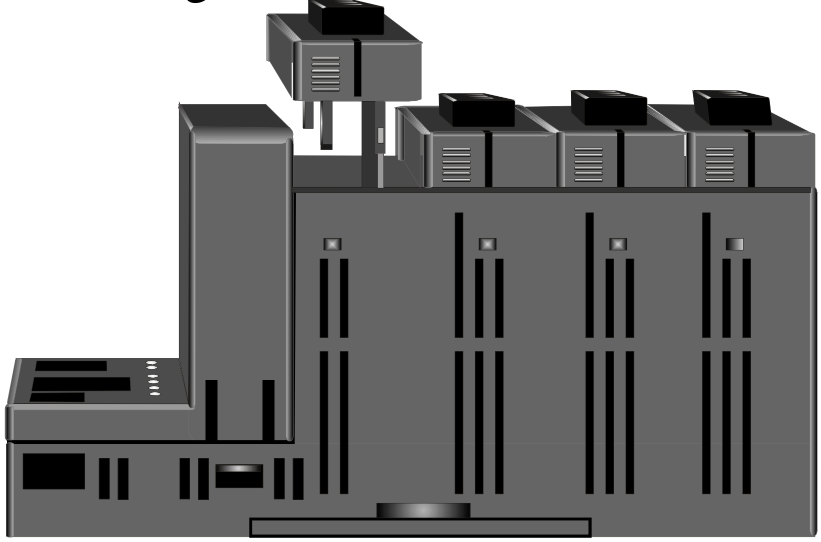
# Revision History

| Issue | Date | Pages | Description |
|---|---|---|---|
| Original | 8/99 | 1-24 | Original release |
| 1.1 | 1/00 | 13, 18, 25 | Added OL2104, OL2205, OL2418 |
| 1.2 | 9/00 | 25-28 | Added OL2258, OL2304 |
| 1.3 | 04/01 | various | Added specs requested by UL |
| 1.4 | 09/02 | 15 | Changed wording of OL2108 voltage rating spec |
| 1.5 | 10/2012 | 14, 15 | Changed voltage ratings of OL2104 and OL2108 to match UL ratings |

# OptiLogic Input/Output Modules



## Introduction

Optimation's OptiLogic series is a flexible, modular system, designed to allow you the ability to configure an optimal solution for your exact needs. To accomplish this goal, Optimation has developed a series of I/O modules, communications modules, specialty modules and operator panels that can be plugged together in nearly any combination. This manual covers the currently available modules that plug into the card cage.

Additional I/O modules are under development. Please check our web site at optimate.com for a complete list of available modules.

Most OptiLogic modules can be installed in any card cage slot and used in any combination and quantity that will fit in the card cage. This applies to all general purpose digital and analog I/O. If you need all digital inputs - plug in digital input modules only. If you need a mixture of analog and digital inputs and output - select the mixture that fits your needs. Snap together modularity gives you the ability to optimize your system for your needs.

OptiLogic I/O modules are designed to meet your needs in real world application. They are all small circuit boards with a few available points to minimize your system cost. Most module connectors are pluggable terminal strips for easy connection, and easy maintainability. The snap-together design means low labor costs - or costs on your time. Visual status indicators on digital I/O and communications modules provide a convenient means for monitoring operation. All together, the result is a cost effective, easy to use and maintain set of industrial control hardware.

This manual covers general I/O characteristics and applications first. Specific I/O boards are covered in the latter pages. The general pages should serve as a guide to selecting and installing I/O boards in your application.

Communications and specialty modules are covered in the latter pages of this manual.

It is Optimation's desire for this manual to serve as a guide in your selection of the modules appropriate for your application, as well as to provide complete information for their use.

# Digital Inputs

Digital I/O modules are used to either monitor (input) or control (output) the “state” of something. “State” being on or off, active or inactive, open or closed - etc. In the “real world” digital I/O requirements come in a variety of shapes and sizes. Therefore, there are a variety of available modules designed to meet the variety of needs.

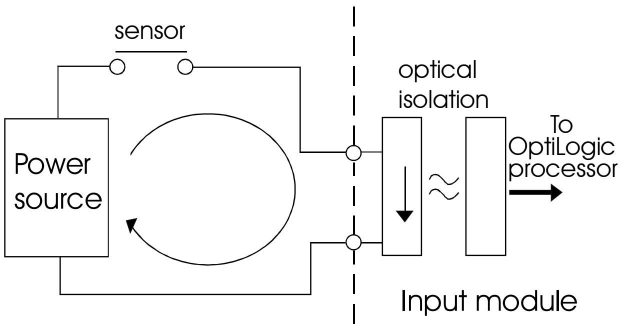
Typical digital inputs are connected to switches, buttons, digital outputs from other equipment, discrete level sensors, thermostats and other on/off sensing devices.

Digital status is sensed by a controller, such as an OptiLogic system, by passing current through an input sensor. When the current is on, the input state is active. When it is not there, the input state is inactive.

## Input Isolation

In most cases, it is important to “isolate” the real world inputs from the internal electronics of the controller. You want to prevent some external situation from “zapping” the controller’s electronics.

An effective means of providing such electrical isolation is ***optical isolation***. The figure below illustrates the basic concepts of optical isolation of a digital input circuit. In the figure shown, when the digital input contact closes, the circuit path is complete and current will flow. On the input module this circuit path passes through a device which emits light when current flows through it. The light emitter is in very close physical proximity to (actually in the same chip) a photo sensor, which will turn on when it senses light. In this way, a digital input module can sense whether the input device is closed (current flow) or open (no current flow) without a direct electrical connection between the external sensor and the internal electronics.

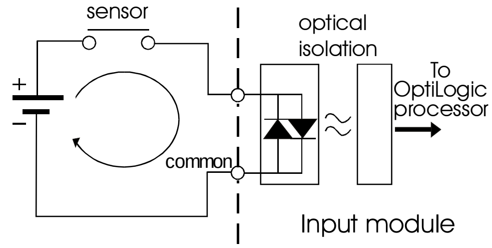



## DC Inputs

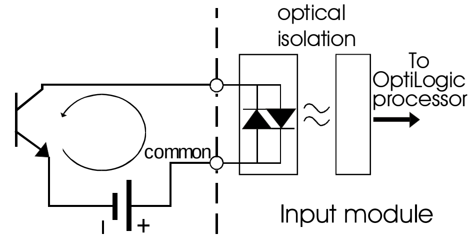
DC digital inputs are typically supplied by a DC power supply. The most common DC supplies used in industry are 12VDC and 24VDC.

Typical DC digital input circuits are shown below. As shown, the physical optical emitter on the input module is an LED (light emitting diode). OptiLogic DC inputs use bidirectional LEDs - i.e. Your inputs may either source or sink current. The top figure shows a sourcing input. The figure below it shows a sinking input. When inputs are connected to a “common” (most instances), inputs must be either all sourcing or all sinking.

Sourcing DC input



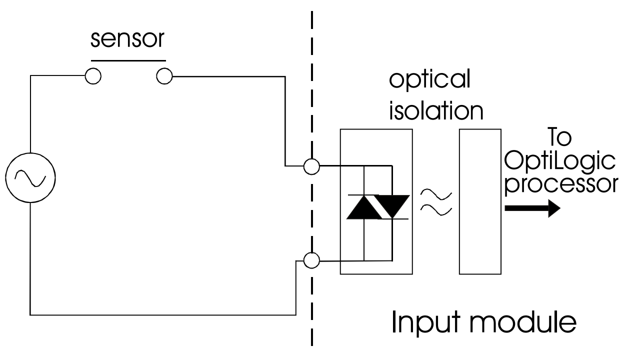

Sinking DC input



## AC Inputs

AC digital inputs are typically supplied either directly from line voltage or transformed down from line voltage. The most common AC inputs are 120VAC and 24VAC, although any voltage range is possible.

A typical AC input circuit is shown below. As shown, the physical optical emitter on the input module consists of two LEDs of opposite polarity. An AC (alternating current) connection flows current one way, then the other. Light is emitted in both cases.




There is a short period when voltage, and therefore current flow, switches from one direction to the other when no current flows. This is called zero crossover. During zero crossover, the digital input circuit must "debounce" the signal to ensure that the system does not provide a false indication that the input contact is not closed when it is, in fact, closed. OptiLogic AC digital inputs handle such zero crossover conditions.

## Digital Input Voltage

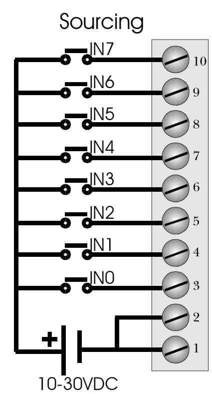
Any digital input module, AC or DC, is designed to operate within an input voltage range. The input voltage directly controls the amount of current flowing through the circuit. The minimum voltage corresponds to a voltage that creates enough current to produce LED light sufficient to be sensed by the optical sensor. The maximum voltage corresponds to the maximum current the optocoupler can handle without being damaged.

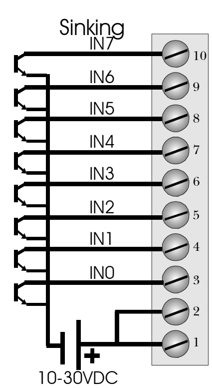
## I/O "Common" Terminals

For a digital input circuit, one input terminal and one output terminal is necessary for operation. For practical application, one of these two terminals may be "common" to several circuits.

In most systems, the power source for all digital inputs is from the same supply. In such cases, connecting all of the circuit return lines together results in reduced equipment costs as well as simpler system wiring.

The example below illustrates a digital input board that has eight inputs and two commons. This can be accomplished with a 10 terminal connector block.



# Digital Outputs

Digital outputs are used to turn "loads" on and off. "Loads" may be lights, motors, solenoids, or any type of on/off device found in the "real world".

Digital outputs in the OptiLogic series come in three types - relay, transistor and solid state relay. Each type has applications it is best suited for. The following is a general list of application characteristics for each output type.

**Relay**

- Low contact loss
- AC or DC
- Moderate to high current rating
- Low cost

Should not be used for

- Ultra low current switching (less than 10mA)
- Switching loads at high frequency

**Transistor**

- DC application only
- Low current rating
- High frequency switching
- Low cost

**Solid State Relay**

- AC application
- Any switching frequency
- Moderate current
- Moderate cost

## Relay Outputs

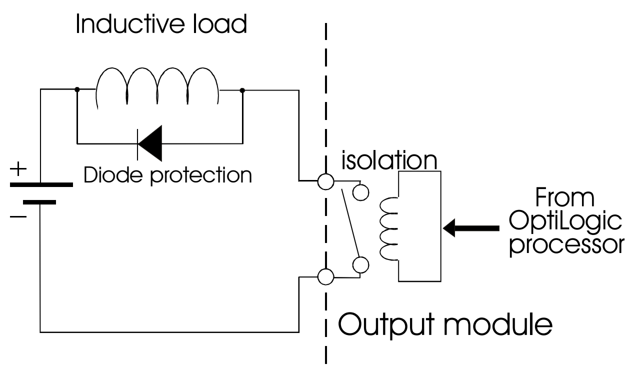
Relays are basically electrically controlled mechanical switches. All current OptiLogic Relay output boards utilize form A relays - i.e. the contact is either open or closed.

**Relay Loads**

Relays are affected by the type of load that is switched. Inductive loads (solenoids, motors, etc.) tend to wear the relay much more than resistive loads (lights, heaters, etc.).

Inductive load wear is due to the fact that inductive loads will continue to conduct current for a period, even after the circuit is broken. This current flow builds up opposing polarity charges between the contact segments that just separated. This makes the two segments attract each other - making opening the contact more difficult. It also can result in arcing while the contact is being opened. Arcing, in turn, builds up carbon deposits, i.e. wear.

This situation can be improved for DC inductive circuit loads by the addition of external diode protection of the circuit. The figure below illustrates diode protection. When the contact is closed, the diode is reverse biased and no current flows through it. When the contact opens, current will continue to flow through the inductive load. The diode provides a path for current flow. The result that is the energy is dissipated in the inductive coil and not the relay contact.

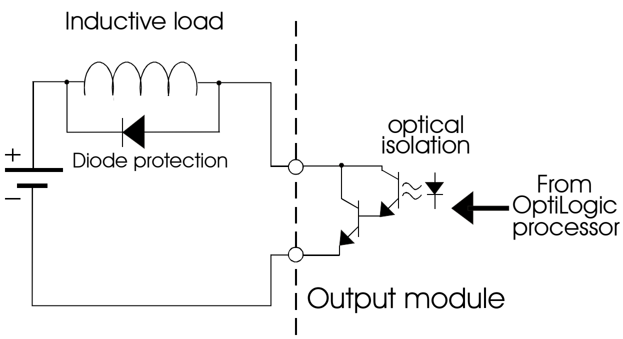



Note : Do not use this circuit for AC loads.

## Transistor Outputs

## NPN Transistor Sinking Outputs

An NPN transistor sinking output provides a path to ground. A typical circuit is shown below.




There is a small voltage drop across the transistor in such a circuit. The voltage drop will generate heat in the transistor. Therefore NPN transistor outputs are generally limited to lower current applications.

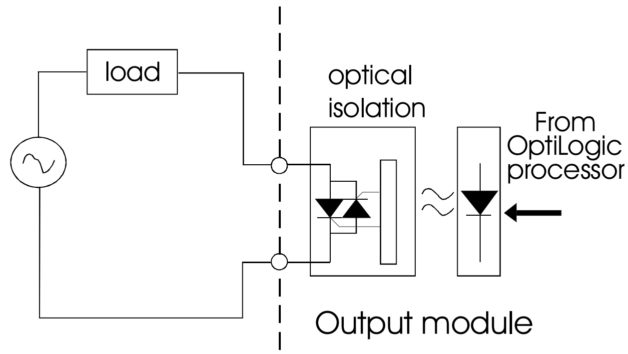
Transistor outputs can be operated at high frequency. There is no effective wear on a transistor output from switching, as there is in a mechanical relay.

Diode protection applied to inductive loads is recommended in cases where the load current approaches the rated current limit of the output. In most cases OptiLogic outputs are designed to withstand voltages of at least twice the rated output voltage. However, diode protection like that shown above will ensure that turn off voltage spikes will never get to that level.

## Solid State Relay Outputs

Solid state relays are semiconductor switches that operate very much like mechanical relays. They have an advantage over mechanical relays by virtue of the fact that they are semiconductors. Solid state relays can be switched at relatively high frequencies and they do not wear out. However they are more expensive and there is a small voltage drop across the contact.

The figure below illustrates a typical solid state relay output. OptiLogic Solid state relays are designed for AC load operation.



# Analog Inputs

Analog inputs are used to monitor the value of some continuously variable measurement. Typical analog inputs are measurements of temperature, pressure, weight, liquid level, pH, flow rate and many other “real world” parameters.

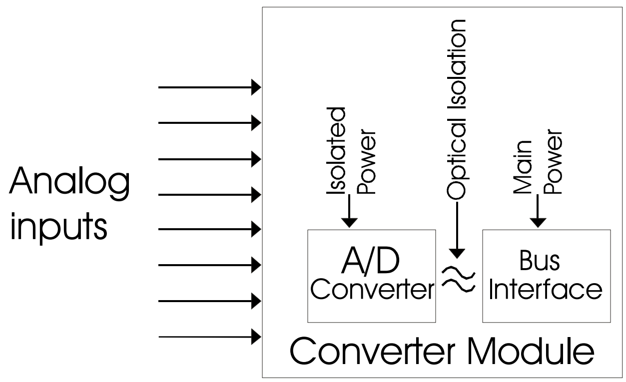
The purpose of an analog input module is to convert the measurement into a format that is usable by the data acquisition or control system. To be usable by an computer-based system, the analog measurement must be converted to digital format. Doing so accurately and, in some cases, quickly, is the goal of the analog to digital converter module.

A good understanding of analog input modules includes an understanding of isolation, accuracy, single and differential inputs, multiplexing, resolution and range. The following paragraphs provide an overview of these subjects.

## Isolation

In many applications there is a good deal of benefit to be derived from isolating the analog measurement source from the RTU’s power supply. In some cases, signal inputs may contain voltages or noise signals which could adversely affect the main processor’s operation. Likewise, noise on the main power bus can degrade the accuracy of the analog value measurement. Both potential problems can be solved by isolating the analog inputs from the main power supply.

Isolation involves totally isolating the analog to digital (A/D) converter from the main power bus. This can be accomplished in two ways. The A/D input module can use a separate power source input, which is isolated from the power input to the base. The A/D module can also use the main power supply and isolated power via a switching power converter and a transformer. There are OptiLogic analog input modules in both categories. Neither is functionally superior to the other. The on-board power generation may save the cost of an additional external power supply.




The other aspect of isolation is the fact that the measured value must be transmitted from the analog to digital converter, operating on one power supply, to the main system, which is operating on another power supply. This is commonly accomplished through optical isolators.

## Resolution

Resolution is the number of significant bits of information the A/D converter uses to express the value of the measured input. A 12-bit A/D converter uses 12 bits of information, meaning the entire range is covered by a number between 0 and $(2^{(12)}-1)$ or 0 to 4095. A 14-bit A/D expresses the same range as a number between 0 and 16,383. In other words, the more bits used, the finer the increment. In general terms, the higher the resolution, the better.


## Accuracy

Accuracy is expressed as the worst case deviation from the "ideal value" across the entire input range. For example, for a 0 to 5V input range and a 12-bit A/D module, a 2.0 volt input should yield a value equal to 1638 (0.4 x 4096). If it returns a value of 1636, and this is the worst case error across the entire range of 0 to 5V, the accuracy is 12 bits +/- 2 counts.

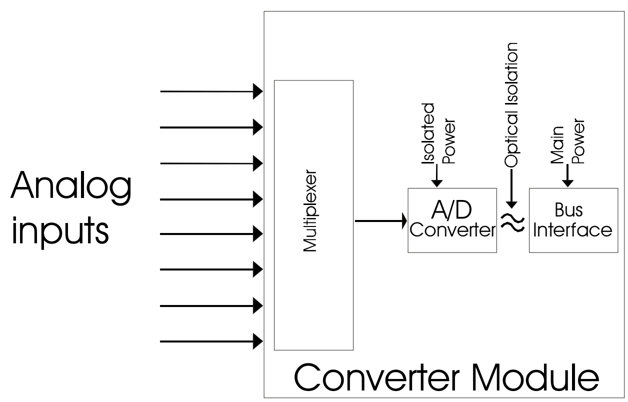
## Range

The analog input range is the minimum and maximum voltage, or current level, measured by the A/C converter. Typical ranges are 0 to 5 volts, 0 to 10 volts, +/- 5 volts, +/- 10 volts, and 4 to 20 mA.

You should try to match the input range to the range of the signal that you are measuring.

## Multiplexing

Analog to digital converter devices are typically quite expensive. In order to keep the cost per channel of analog inputs down, a multiplexer is commonly used.

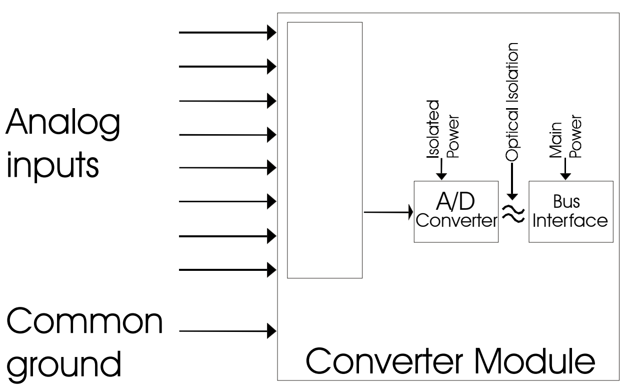



A multiplexer switches one analog input at a time into the A/D converter. Each input is converted in sequence. The trade off is reduced sampling rate for a particular channel versus reduced cost per channel measured. In most industrial applications, the conversion rate is so fast in relation to the rate of change in the measured value, that sampling rate is not a factor.

## Single Ended Inputs

Single ended inputs are all referenced to the same ground point. In many applications, single ended inputs produce significant advantages. Single ended inputs require only one ground connection and one signal input per measured value. The result is reduced wiring costs along with the reduced cost per channel on the analog input module.

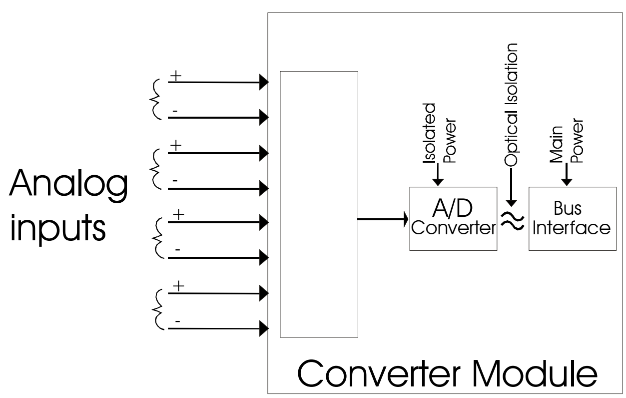
In order to use single ended inputs, the ground connection must be very good. The measurement devices must also be capable of being referenced to a common ground.




## Differential Inputs

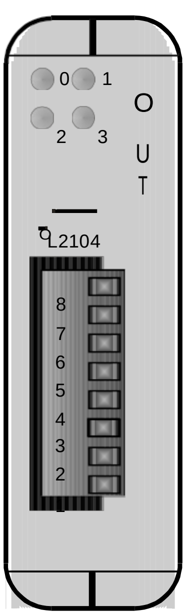
There are cases when the individual analog inputs cannot be connected to a common ground. In those cases, a differential input A/D converter should be used.

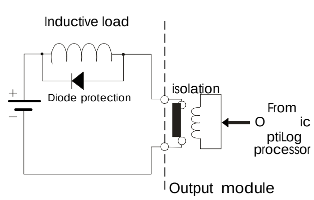
With a differential analog input, both a positive and negative signal line must be connected for each signal. The analog input module then measures the difference between the positive and negative. The effect of one channel's signal on another channel's signal should be as little as possible. That relationship of the effect on the measured value of one channel to the value input on a second channel is called "common mode". The higher the "common mode rejection ratio (CMRR)" the better.



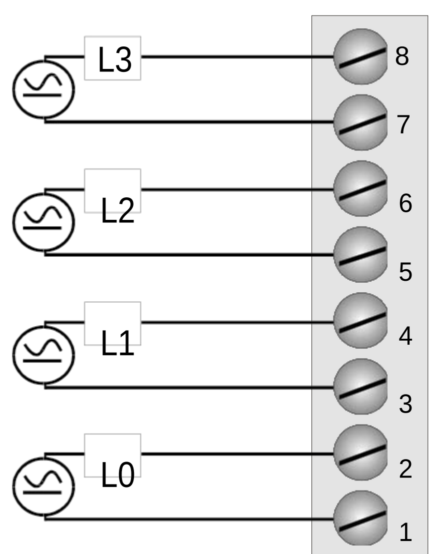
# OL2104 Relay Output Module

| | | | |
|---|---|---|---|
| **Outputs** | 4 | **Card Cage Power Required** | 215 mA |
| **Output Type** | Mechanical relay | **Contact resistance** | 0.1 ohm (initial) |
| **Contact voltage rating** | 0 - 24 VDC<br>0 - 120 VAC | **Status Indicators** | Logic Side LED |
| **Contact rating** | 1A (resistive)/point @24 VDC, 1A/point @120 VAC, 1A/point | **Terminal Strip** | Plug In (removable) |
| **Contact type** | Form A (SPST) | **Terminal Screws** | Slotted (0.1î blade max) |
| **Minimum load** | 10 mA | **Maximum terminal wire gauge** | 18 AWG (use copper conductors) |
| **Contact arrangement** | 4 isolated normally open contact relays | **Terminal block torque** | 2.2 lb-in |
| **Mechanical life** | 10,000,000 operations per relay (at no load) | **Required Temperature rating of field installed conductors** | 60°C/75°C |
| **Electrical life** | 100,000 operations per relay (at full load) | **Weight** | 1.6 oz (58 g) |
| **Type** | 8 | **Subtype** | 1 |



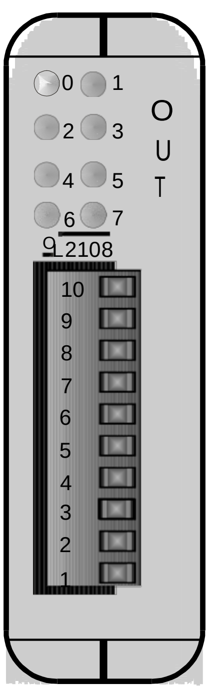

| Terminal | | Terminal | |
|---|---|---|---|
| 1 | Out0 NO | 5 | Out2 NO |
| 2 | Out0 C | 6 | Out2 C |

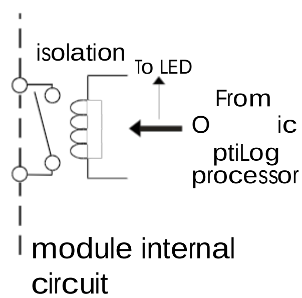



5-30VDC
5-132VAC

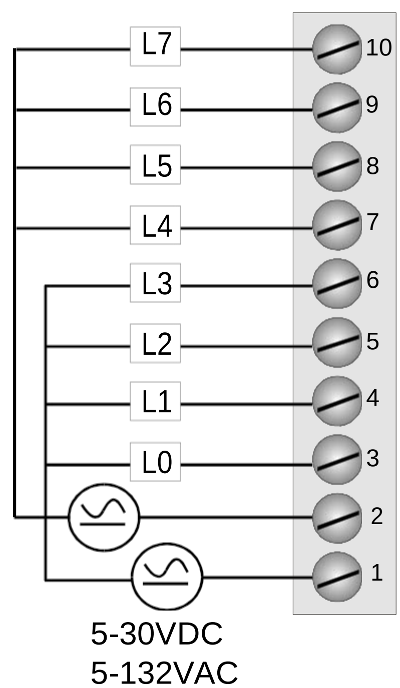
# OL2108 Relay Output Module

| | | | |
|---|---|---|---|
| **Outputs** | 8 | **Card Cage Power required** | 375 mA |
| **Output type** | Mechanical relay | **Contact resistance** | 0.1 ohm (initial) |
| **Contact voltage rating** | 0 - 24 VDC<br>0 - 120 VAC | **Status Indicators** | Logic Side LED |
| **Contact rating** | 1A (resistive)/point @24 VDC, 1A/point @120 VAC, 1A/point | **Terminal Strip** | Plug In (removable) |
| **Contact type** | Form A (SPST) | **Terminal Screws** | Slotted (0.1î blade max.) |
| **Minimum load** | 10 mA | **Maximum Terminal Wire Gauge** | 18 AWG (use copper conductors) |
| **Contact arrangement** | 4 relays per common | **Terminal block torque** | 2.2 lb-in |
| **Mechanical life** | 10,000,000 operations per relay (at no load) | **Required Temperature rating of field installed conductors** | 60°C/75°C |
| **Electrical life** | 100,000 operations per | **Weight** | 2.1 oz (58g) |
| **Type** | 9 | **Subtype** | 1 |




| Terminal | | Terminal | |
|---|---|---|---|
| 1 | Common Out 0-3 | 6 | Out 3 |
| 2 | Common Out 4-7 | 7 | Out 4 |
| 3 | Out 0 | 8 | Out 5 |
| 4 | Out 1 | 9 | Out 6 |
| 5 | Out 2 | 10 | Out 7 |

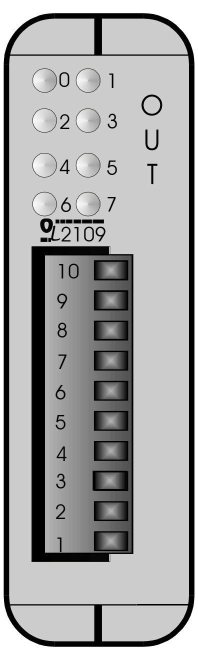


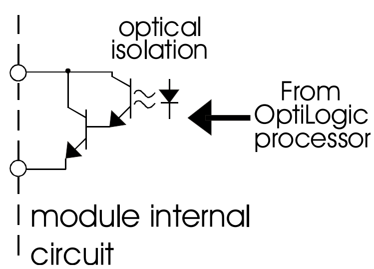

Connection diagram

# OL2109 DC Sinking Output Module

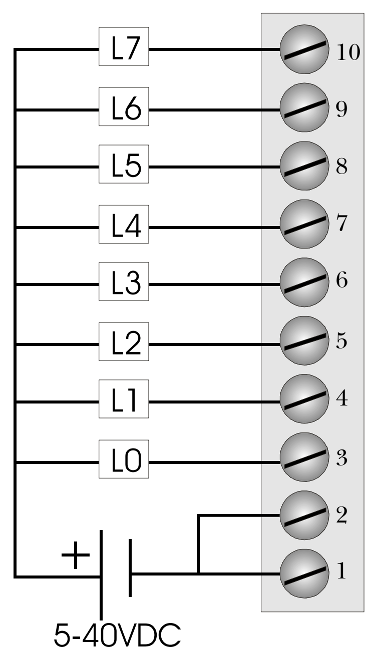
| | | | |
|---|---|---|---|
| **Outputs** | 8 | **Card Cage Power required** | 140 mA |
| **Output Type** | NPN open collector transistor | **Status indicators** | Logic side LED |
| **Voltage Rating** | 0 - 40VDC | **Peak Voltage** | 80VDC |
| **On voltage drop** | .75V @ 100mA<br>.95V @ 300mA | **Terminal strip** | Plug In (removable) |
| **Commons** | 2 (connected internally) | **Terminal screw** | Slotted (0.1" blade max) |
| **Maximum continuous load current** | 300 mA | **Maximum terminal wire gauge** | 18 AWG (use copper conductors) |
| **Maximum surge current** | 1.0A for 5 seconds | **Required Temperature rating of field installed conductors** | 60°C/75°C |
| **Weight** | 1.1 oz (30 g) | **Terminal block torque** | 2.2 lb-in |
| **Type** | 9 | **Subtype** | 2 |

The OL2109 Transistor Output module provides eight optically isolated transistor outputs which can be used for switching small DC loads. Individual LED indicators provide visual feedback of output state.




| Terminal | | Terminal | |
|---|---|---|---|
| 1 | Common | 6 | Out 3 |
| 2 | Common | 7 | Out 4 |
| 3 | Out 0 | 8 | Out 5 |
| 4 | Out 1 | 9 | Out 6 |
| 5 | Out 2 | 10 | Out 7 |

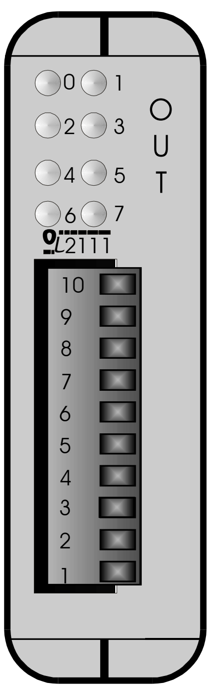


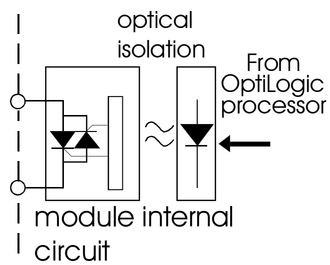

Connection diagram

# OL2111 AC Solid State Relay Module

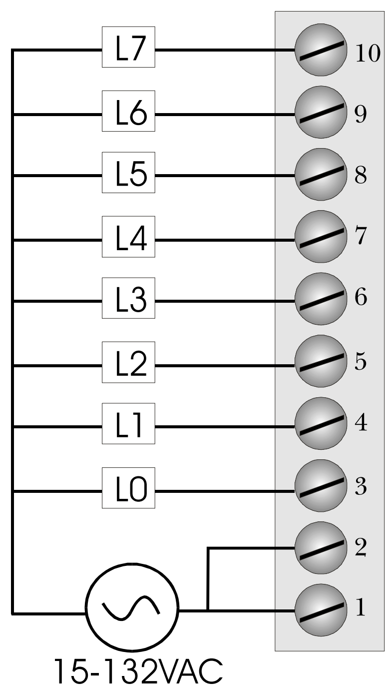
| | | | |
|---|---|---|---|
| **Outputs** | 8 | **Card Cage Power required** | 120 mA |
| **Output Type** | SSR (Trice) | **Commons** | 2 (connected internally) |
| **Voltage Rating** | 12 - 132 VAC | **Status indicators** | Logic side LED |
| **Max. load current** | .5A/point @ 120VAC | | |
| **Min. load current** | 10mA | **Terminal Strip** | Plug In (removable) |
| **On state voltage drop** | 1V (typical) | **Terminal screws** | Slotted (0.1" blade max.) |
| **Peak one cycle surge current** | 15A | **Maximum terminal wire gauge** | 18 AWG (use copper conductors) |
| **AC frequency** | 47 - 63 Hz | **Required Temperature rating of field installed conductors** | 60°C/75°C |
| **Weight** | 1.3oz (38g) | **Terminal block torque** | 2.2 lb-in |
| **Type** | 9 | **Subtype** | 3 |

The OL2111 Solid State Relay module provides eight (8) solid state relay outputs. This module is ideally suited for switching small AC loads. As a solid state device, switch wear will not be a factor. Each output is optocoupled for system isolation. Individual LED indicators provide visual feedback indicating the state that each relay is being driven.




| Terminal | | Terminal | |
|---|---|---|---|
| 1 | Common | 6 | Out 3 |
| 2 | Common | 7 | Out 4 |
| 3 | Out 0 | 8 | Out 5 |
| 4 | Out 1 | 9 | Out 6 |
| 5 | Out 2 | 10 | Out 7 |



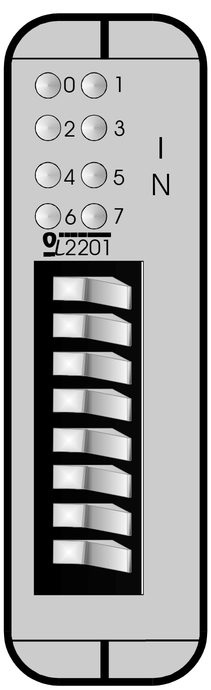

Connection diagram

# OL2201 Digital Input Simulator Module

| | | | |
|---|---|---|---|
| **Inputs** | 8 | **Card Cage Power Required** | 60mA |
| **Input Type** | Toggle Switch | **Status Indicators** | Logic side LED |
| | | **Weight** | 1.1 oz  (30 g) |
| **Type** | 1 | **Subtype** | 3 |

The OL2201 Digital Input Simulator Module is designed to be an aid to program development. Use the OL2201 to simulate real world inputs during your design and debug process. The OL2201 enables the program developer to cause a change in input status at will to simulate a system action. In doing so, you are able to see the program's response. Use of the OL2201 is an aid in the process of thoroughly testing and debugging a system prior to "going live" with real hardware.

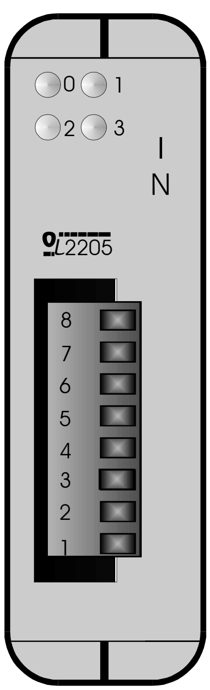
When it becomes time to move to real hardware, replace the OL2201 with the appropriate digital input module. The logic of your program will remain the same.

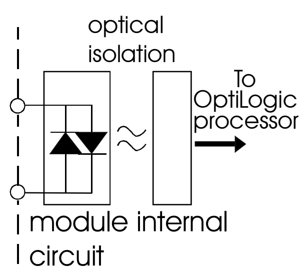


# OL2205 AC/DC Input Module

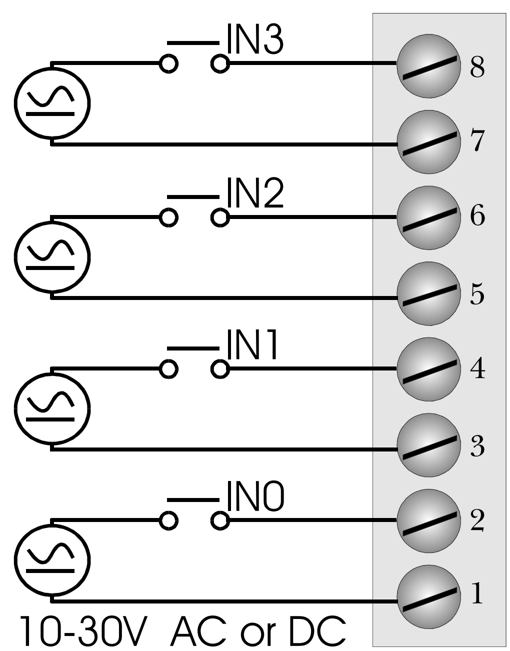
| | | | |
|---|---|---|---|
| **Inputs** | 4 | **Card Cage Power Required** | 60mA |
| **Input Type** | AC Optocoupled | **Status Indicators** | Logic Side LED |
| **Voltage Range** | 10-30 V AC or DC | **Input Impedence** | 2.7K |
| **Min. On Current (per point)** | 3.3 mA | **Inputs** | DC sinking or sourcing / or AC |
| **Max. On Current (per point)** | 11 mA | **Terminal Strip** | Plug In (removable) |
| | | **Terminal Screws** | Slotted (0.1" blade max.) |
| **Max. Terminal wire gauge** | 18 AWG (use copper conductors) | **Required Temperature rating of field installed conductors** | 60°C/75°C |
| **Weight** | 1.2 oz (34g) | **Terminal block torque** | 2.2 lb-in |
| **Type** | 5 | **Subtype** | 1 |

The OL2205 Digital Input module senses up to four (4) AC or DC input signals. All inputs are individually optocoupled for isolation. Inputs are also individually isolated from each other by separate terminal connections. Filtering is provided for zero crossover. Individual LED indicators provide visual feedback of current status.



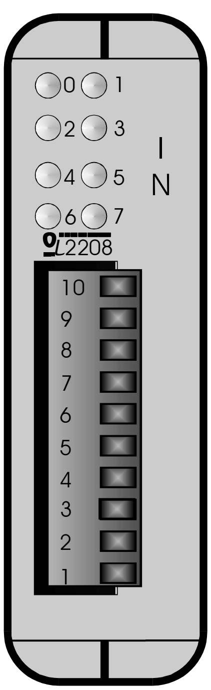

| Terminal | | Terminal | |
|---|---|---|---|
| 1 | In 0 | 5 | In 2 |
| 2 | In 0 | 6 | In 2 |
| 3 | In 1 | 7 | In 3 |

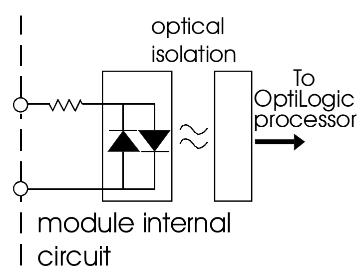


# OL2208 DC Digital Input Module

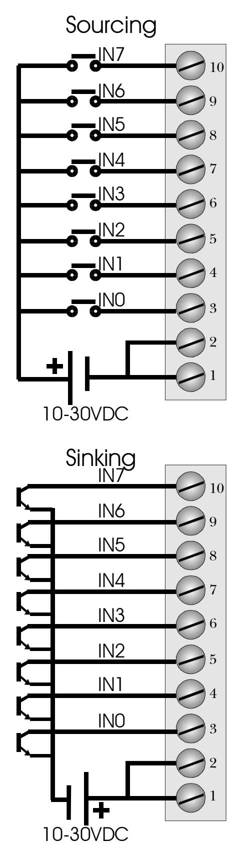
| | | | |
|---|---|---|---|
| **Inputs** | 8 | **Card Cage Power required** | 60mA |
| **Input Type** | DC Optocoupled | **Status Indicators** | Logic side LED |
| **Voltage Range** | 10 - 30 VDC | **Input Impedance** | 2.7K |
| **Min. On Current (per point)** | 3.3 mA | **Max. On Current (per point)** | 11 mA |
| **Commons** | 2 | **Terminal Strip** | Plug In (removable) |
| **Max. Terminal wire gauge** | 18 AWG (use copper conductors) | **Terminal screw** | Slotted (0.1" blade max.) |
| | | **Required Temperature rating of field installed conductors** | 60°C/75°C |
| **Weight** | 1.2 oz (34g) | **Terminal block torque** | 2.2 lb-oz |
| **Type** | 1 | **Subtype** | 1 |

The OL2208 DC Digital Input module can be used in either sourcing or sinking application (all 8 inputs must be used in the same manner). Each input is optocoupled to provide system isolation. Individual LED indicators provide a visual feedback of current status.




| Terminal | | Terminal | |
|---|---|---|---|
| 1 | Common | 6 | In 3 |
| 2 | Common | 7 | In 4 |
| 3 | In 0 | 8 | In 5 |
| 4 | In 1 | 9 | In 6 |
| 5 | In 2 | 10 | In 7 |

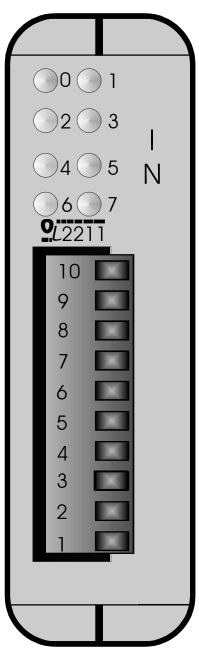


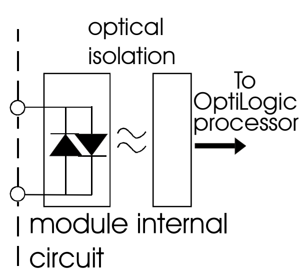

Connection diagram

# OL2211 AC Digital Input Module

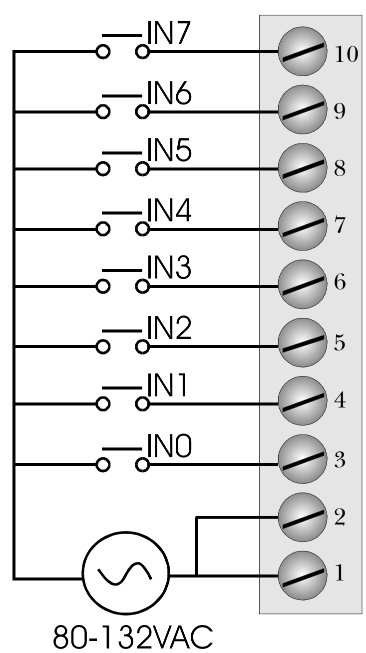
| | | | |
|---|---|---|---|
| **Inputs** | 8 | **Card Cage Power Required** | 60 mA |
| **Input Type** | AC Optocoupled | **Status Indicators** | Logic side LED |
| **Voltage Range** | 80 - 132 VAC | **Input Impedance** | 47K |
| **Min. On Current (per point)** | 1.7 mA | **Commons** | 2 (connected internally) |
| **Max. On Current (per point)** | 2.8 mA | **Terminal Strip** | Plug In (removable) |
| | | **Terminal Screws** | Slotted (0.1" blade max.) |
| **Max terminal wire gauge** | 18 AWG (use copper conductors) | **Required Temperature rating of field installed conductors** | 60°C/75°C |
| **Weight** | 1.3 oz (38g) | **Terminal block torque** | 2.2 lb-in |
| **Type** | 1 | **Subtype** | 2 |

The OL2211 AC Digital input module senses up to eight (8) AC input signals. All inputs are individually optocoupled for isolation. Filtering is provided for zero crossover. Individual LED indicators provide visual feedback of current status.



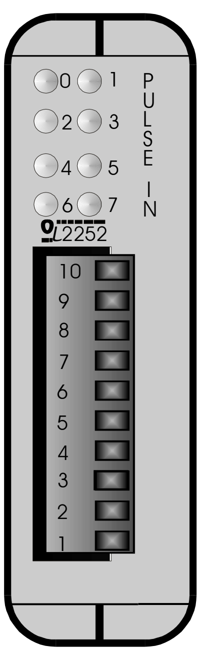

| Terminal | | Terminal | |
|---|---|---|---|
| 1 | Common | 6 | In 3 |
| 2 | Common | 7 | In 4 |
| 3 | In 0 | 8 | In 5 |
| 4 | In 1 | 9 | In 6 |
| 5 | In 2 | 10 | In 7 |

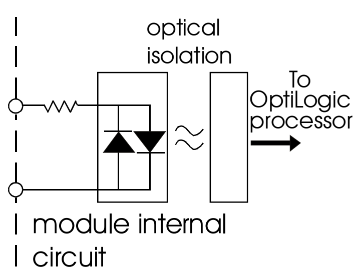


# OL2252 Dual High Speed Pulse Counter

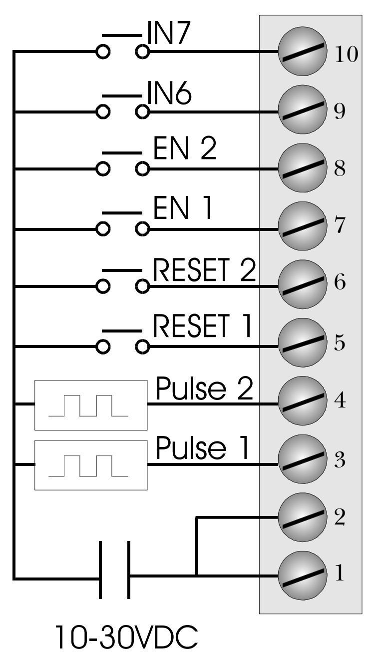
| | | | |
|---|---|---|---|
| **Inputs (all)** | 8 | **Card Cage Power Required** | 100 mA |
| **Pulse Inputs** | 2 | **Status Indicators** | Logic side LED |
| **Input Voltage** | 10 - 30 VDC | **Input Impedance** | 2.7K ohms |
| **Input frequency (on pulse inputs)** | 15 KHz maximum | **Commons** | 2 |
| **Min. On Current (per point)** | 3.3 mA | **Terminal Strip** | Plug In (removable) |
| **Max. On Current (per point)** | 11 mA | **Terminal Screws** | Slotted (0.1” blade max.) |
| **Max terminal wire gauge** | 18 AWG | **Required Temperature rating of field installed conductors** | 60°C/75°C |
| **Weight** | 1.2 oz (34g) | **Terminal block torque** | 2.2 lb-in |
| **Type** | 80 | **Subtype** | 1 |

The OL2252 module provides two independent high speed pulse counter inputs. Each input counter will accurately count pulse inputs up to 15KHz. Inputs may be sourcing or sinking type There are a number of operating options available with the OL2252. The six remaining inputs can be used as predefined control signals or as general purpose inputs. These options are detailed in the following pages.




| Terminal | | Terminal | |
|---|---|---|---|
| 1 | Common | 6 | Reset 2 |
| 2 | Common | 7 | Enable 1 |
| 3 | Pulse 1 | 8 | Enable 2 |
| 4 | Pulse 2 | 9 | In 6 |
| 5 | Reset 1 | 10 | In 7 |



# OL2252 Dual Pulse Counter cont'd

The OL2252 Dual Pulse input module is designed to provide two independent pulse counting inputs. Each input is independent of the other. There are also a number of configuration options available.

The following is a list of the input connections.

| Terminal | Label | Description |
|---|---|---|
| 1 | Common | Sourcing or sinking return line |
| 2 | Common | Sourcing or sinking return line |
| 3 | Pulse 1 | Square wave input up to 15KHz |
| 4 | Pulse 2 | Square wave input up to 15KHz |
| 5 | Reset 1 | If configured as "reset" input , will clear the pulse 1 count when activated. If not configured as "reset" input, can be used as a general purpose input. |
| 6 | Reset 2 | If configured as "reset" input , will clear the pulse 2 count when activated. If not configured as "reset" input, can be used as a general purpose input. |
| 7 | Enable 1 | If configured as an "enable" input, enables the pulse 1 counter when active. If not configured as an "enable" input, can be used as a general purpose input. |
| 8 | Enable 2 | If configured as an "enable" input, enables the pulse 2 counter when active. If not configured as an "enable" input, can be used as a general purpose input. |
| 9 | Input 6 | General purpose input |
| 10 | Input 7 | General purpose input |

## Theory of Operation

The OL2252 Pulse Counter has two independent pulse counter inputs. These pulse counter inputs will accurately count pulses between 0 and 15KHz.

All counts begin at zero and count up to the maximum number the counter can hold (4,294,967,295). If the count should ever get that high, it will roll over to zero.

In order to count, the count input must be enabled. A message with an enable must come from the host PC. The module can also be set up to use the local hardware input enable (in addition to the enable message). If you are using Think & Do, all of this set up and signaling is part of your Think & Do program. If you are using Visual Basic or C, please refer to the interface software manual.

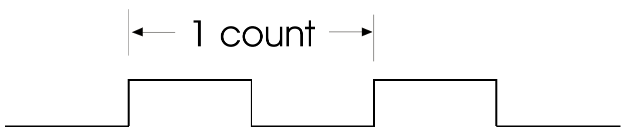
The count can be reset to 0 at any time. Again there is both a reset message that can be sent from the PC and an optional hardware reset signal.

Whether the hardware "reset" and "enable" are used is set up from the host PC via a configuration message. Think & Do will take care of the details. Visual Basic and C users can also easily send this message as part ot their application program.

# OL2252 Pulse Input cont'd

## Input Signal

The input pulse train is a repetitive square wave input that looks something like the following.




If you know the maximum frequency of the pulse train, you can configure the pulse counter to count pulse up to that pulse rate. In doing so, the counter will consider anything above the maximum rate that you have defined to be noise and will ignore it.

# OL2258 High Speed Pulse Counter

| | | | |
|---|---|---|---|
| **Inputs (all)** | 4 | **Card Cage Power Required** | 100 mA |
| **Pulse Inputs** | 2 | **Status Indicators** | Logic side LED |
| **Input signal type** | Sinking, sourcing or differential | **Input Impedance** | 2.0K ohms nominal |
| **Input frequency (on pulse inputs)** | 80/160 KHz maximum | **Count value** | 32 bit signed integer |
| **Min. Input On Voltage (or differential)** | 4.00V | **Frequency data** | 16 bit signed integer (Configurable for 1 second or 200 mS count) |
| **Max. Input Off Voltage (or differential)** | 3.00V | **Counting Modes** | Pulse & Direction<br>Up/Down Count<br>Quadrature |
| **Max. Input voltage** | 28V | | |
| **Outputs** | 2 | **Max terminal wire gauge** | 18 AWG (use copper conductors) |
| **Output Type** | Open collector | **Terminal Strip** | Plug In (removable) |
| **Max Output current** | 300 mA | **Terminal Screws** | Slotted (0.1" blade max.) |
| **Output Voltage range** | 0 - 40VDC | **Required Temperature rating of field installed conductors** | 60°C/75°C |
| **Weight** | 1.24 oz (35g) | **Terminal block torque** | 2.2 lb-in |
| **Type** | 82 | **Subtype** | 1 |

The OptiLogic OL2258 High Speed Pulse Counter module provides for direct pulse counting for a variety of high speed pulse interface applications. Typical applications include motion control, metering and velocity measurement. The OL2258 contains on board intelligence necessary for processing and counting pulse information as well as automatically triggering control outputs.

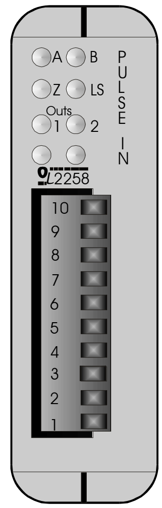
The OL2258 can be configured configured to operate in one of three pulse counting modes. These modes are 1) Pulse & Direction, 2)Up/Down Count and 3) Quadrature . Pulse & Direction and Up/Down count will operate at up to 80KHz input pulse rates. Quadrature inputs count each quadrature state transitions at up to 160 KHz. Additionally, the OL2258 will return frequency information.

# OL2258 High Speed Pulse Counter cont'd

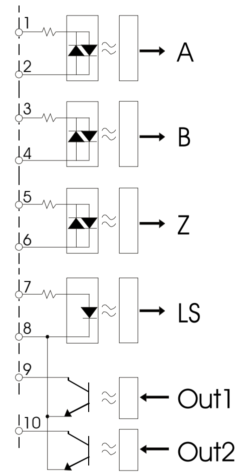
## Interfacing the OL2258

The OL2258 High Speed Pulse counter is designed to interface to a variety of standard pulse encoder devices. The electrical interface is shown on the right.

Differential, sourcing, or sinking type inputs can be interfaced to the OL2258. The figures across the bottom of this page illustrate connections for each type of encoder.




OL2258 Interface

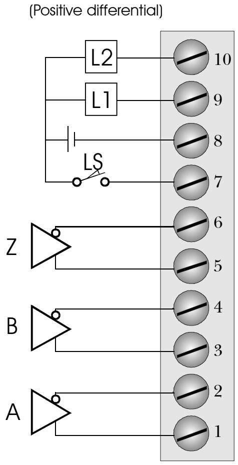



## General Overview

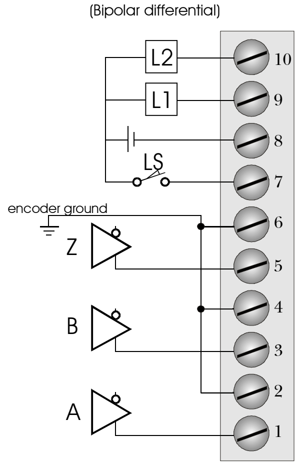
The OL2258 is configurable. It can be used with pulse & direction, up/down count or quadrature type pulse encoders. These signals may come from shaft encoders, flow meters or any other signal source that produces a pulse train output. When operating, the OL2258 maintains a current cummulative count as a 32 bit integer value. It also makes available frequency snapshot data as the most recent count over either 1 second or 200 milliseconds. The Z and LS inputs can be used to automatically reset the count to a user defined value. Each transistor output can be configured to turn on when the count value is within its related count range.

| Term | Label | Description |
|---|---|---|
| 1 | A1 | Pulse input A(quadrature)/ Pulse input (pulse & direction)/ Up pulse (up/down count) |
| 2 | A2 | |
| 3 | B1 | Pulse input B(quadrature)/ Direction (pulse & direction)/ Down pulse (up/down count) |
| 4 | B2 | |
| 5 | Z1 | Z input (optional) |
| 6 | Z2 | |
| 7 | LS | Limit switch input (optional) |
| 8 | Com | Common for limit switch and two outputs |
| 9 | Out1 | Open collector output 1 |
| 10 | Out2 | Open collector output 2 |

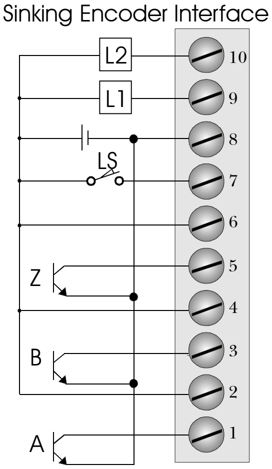
Differential Drive Interface
(Positive differential)



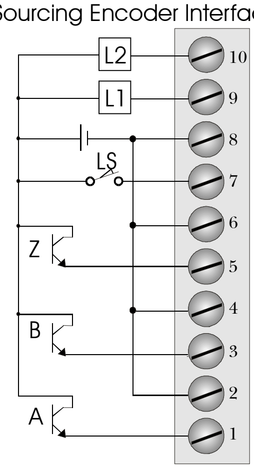

Differential Drive Interface
(Bipolar differential)




Sinking Encoder Interface



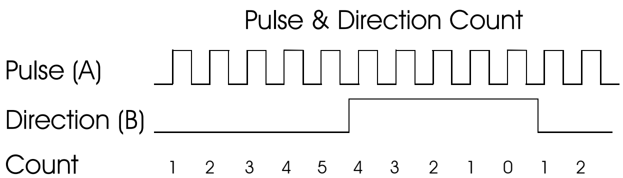

Sourcing Encoder Interface



# OL2258 High Speed Pulse Counter cont'd

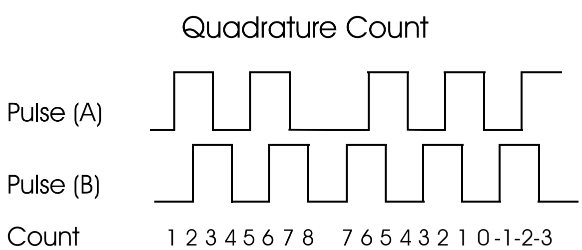
## Pulse and Direction

In this configuration, pulses are input to "A". The counter direction is controlled by input "B". The operation is illustrated below.



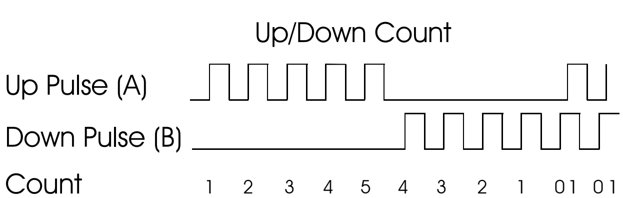

## Quadrature Encoder Input

The counting process for quadrature type encoding is determined by the phase angle between input A and input B. If A leads B, the counter increments. If B leads A, the counter decrements. The count is incremented or decremented on each pulse transition as shown below.




## Up/Down Count

For this type of configuration, the count increments on pulses input to "A" and decrements on pulses input to "B". This is illustrated in the figure below.




## Z and LS Presetting

The count can be preset to a value that you define based on either or both inputs LS and Z. It can also be forced to a preset value on command via a message.

Through the configuration message, the counter can be set up to force a preset value when Z is active, LS is active, both Z and LS are active or on software command.

## Output Control

The two open collector outputs can each be progammed to trigger within a programmable (via an ethernet message) count range. This range can be changed at any time via a "Send Output Range" message, effectively providing and unlimited number of ranges, under user program control.

Outputs will trigger within immediately, when the count enters the related range.

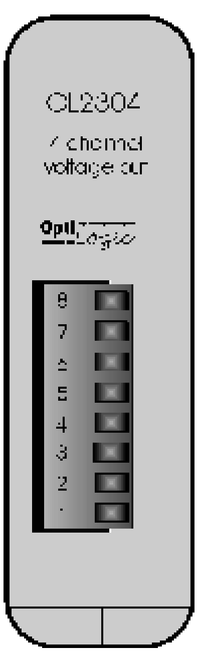
## Frequency Measurement

Frequency data can be read back as a 16 bit signed integer value. The value will correspond to the most recent 1 second or 200 millisecond (configurable) pulse count.

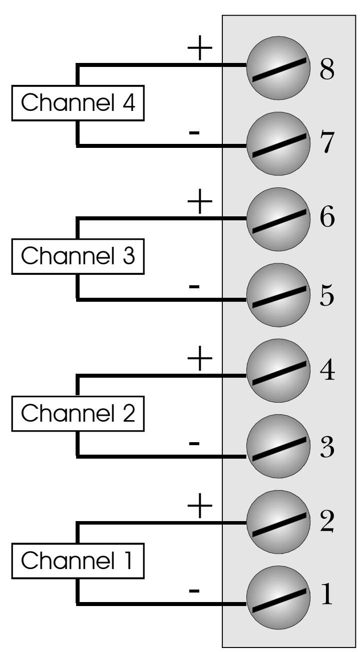
# OL2304 Four Channel Voltage Output

| | | | |
|---|---|---|---|
| **Outputs** | 4 | **Card Cage Power required** | 700mA |
| **Output Ranges** | 0-5V, 0-10V, +/-5V, +/-10V (individual channel configurable) | **External Power required** | none |
| **Resolution** | 12 bit (1 in 4096) | **Output current** | +/-5mA |
| **Output type** | Single ended, 1 common | **Short circuit current** | +/-15mA |
| **Offset calibration error** | +/-8 counts @ +/-10V<br>+/-16 counts @ +/-5V<br>+/-16 counts @ 0-10V<br>+/- 32 counts @ 0-5V | **Max terminal wire gauge** | 18 AWG (use copper conductors) |
| **Nonlinearity** | +/- 1 count | **Terminal strip** | Plug In (removable) |
| **Load impedence** | 2Kohm mimimum | **Terminal screws** | Slotted (0.1" blade max) |
| **Terminal block torque** | 2.2 lb-in | **Required Temperature rating of field installed conductors** | 60°C/75°C |
| **Type** | 25 | **Subtype** | 1 |

The OL2304 analog output module is range configurable, on a channel by channel basis, to any of four common output ranges. Each channel can be configured, via software for either 0-5V, 0-10V, +/-5V or +/-10V ranges. The module generates its own isolated output power supply, eliminating any need for an outside source.



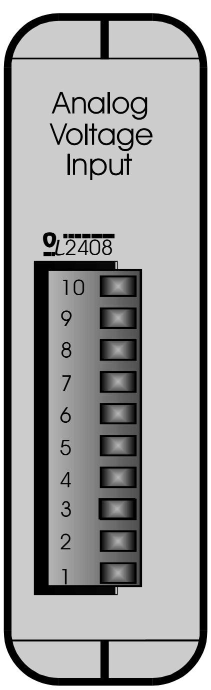

| Terminal | | Terminal | |
|---|---|---|---|
| 1 | Common | 5 | Common |
| 2 | Out 1 | 6 | Out 3 |
| 3 | Common | 7 | Common |
| 4 | Out 2 | 8 | Out 4 |

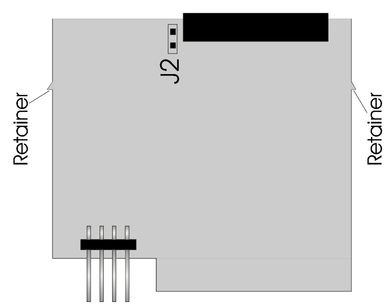


# OL2408 Analog Voltage Input Module

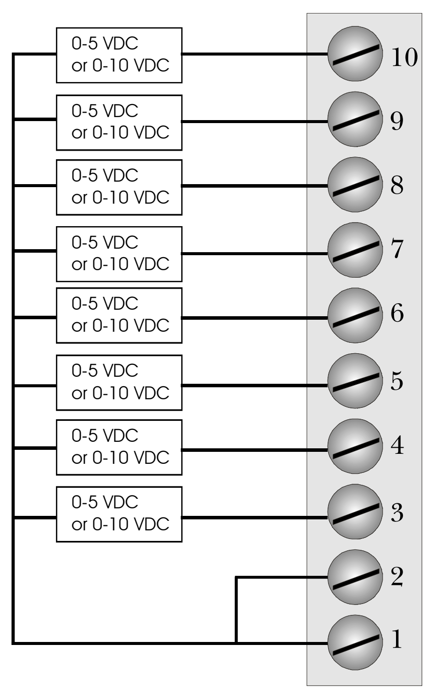
| | | | |
|---|---|---|---|
| **Inputs** | 8 | **Power required** | 700mA |
| **Input Type** | 0-5 VDC or 0-10VDC | **Conversion Type** | Successive approximation |
| **Resolution** | 14 bit (1 in 16384) | **Full Scale Calibration Error** | +/- 15 counts max.<br>+/- 5 counts typical |
| **Input Impedance** | 10 MOhm | **Offset Calibration error** | +/- 2 counts max. |
| **Maximum Voltage Input** | +/- 15VDC | **Max. Terminal wire gauge** | 18 AWG (use copper conductors) |
| **Linearity error** | +/- 1.25 count max | **Terminal Strip** | Plug In (removable) |
| **Input stability** | +/- 2 counts | **Terminal Screws** | Slotted (0.1” blade max.) |
| **Terminal block torque** | 2.2 lb-in | **Required Temperature rating of field installed conductors** | 60°C/75°C |
| **Type** | 17 | **Subtype** | 1 |

The OL2408 comes set up for 0-5VDC input range. If you need 0-10VDC input range, you must remove the plastic module cover by lifting the board latches over the retainer hooks on the PC board. Then, place the jumper on both pins of J2 and replace the plastic module cover. To change back to 0-5VDC range, repeat the process and remove the jumper. Having the cover over the range selector jumper ensures that it will not be inadvertantly changed.



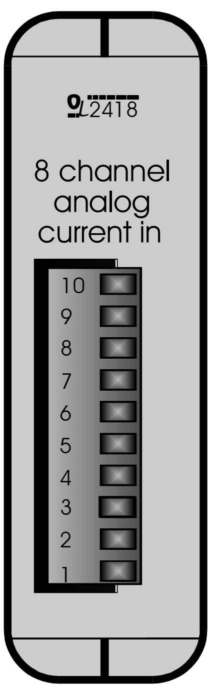



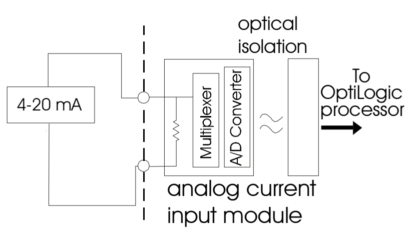

| Terminal | | Terminal | |
|---|---|---|---|
| 1 | Common | 6 | Channel 4 |
| 2 | Common | 7 | Channel 5 |
| 3 | Channel 1 | 8 | Channel 6 |
| 4 | Channel 2 | 9 | Channel 7 |
| 5 | Channel 3 | 10 | Channel 8 |



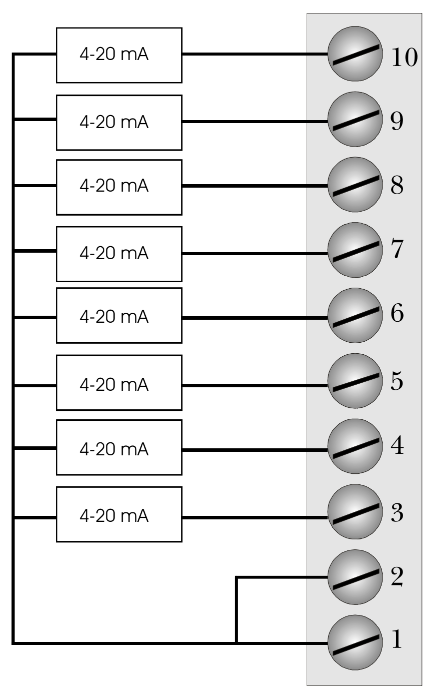
# OL2418 Analog Current Input Module

| | | | |
|---|---|---|---|
| **Inputs** | 8 | **Card Cage Power Required** | 700mA |
| **Input Type** | 4 - 20 mA | **Conversion Type** | Successive approximation |
| **Resolution** | 14 bit (1 in 16384) | **Full Scale Calibration Error** | +/- 15 counts max.<br>+/- 5 counts typical |
| **Input Impedence** | 250 ohm +/- 0.05% | **Offset Calibration Error** | +/- 2 counts max. |
| **Power Isolation** | Transformer | **Signal Isolation** | Optical |
| | | **Max. Terminal Wire Gauge** | 18 AWG (use copper conductors) |
| **Linearity error** | +/- 1.25 counts | **Terminal Strip** | Plug In (removable) |
| **Input Stability** | +/- 2 counts | **Terminal Screws** | Slotted (0.1” blade max.) |
| **Terminal block torque** | 2.2 lb-in | **Required Temperature rating of field installed conductors** | 60°C/75°C |
| **Type** | 18 | **Subtype** | 2 |



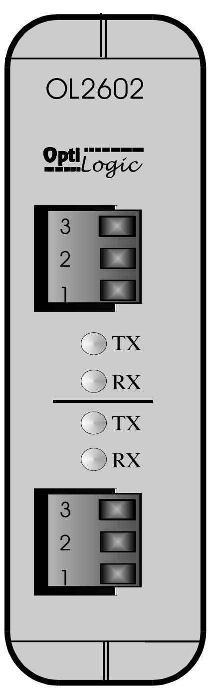

| Terminal | | Terminal | |
|---|---|---|---|
| 1 | Common | 6 | Channel 4 |
| 2 | Common | 7 | Channel 5 |
| 3 | Channel 1 | 8 | Channel 6 |
| 4 | Channel 2 | 9 | Channel 7 |

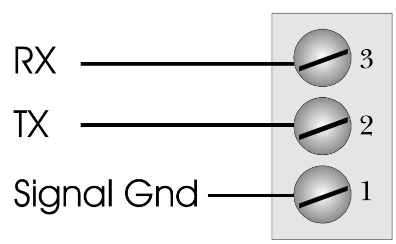


# OL2602 Dual RS232 Module

| | | | |
|---|---|---|---|
| **Communication Ports** | 2 | **Card Cage Power Required** | 110 mA |
| **Type** | RS232C | **Status Indicators** | LEDs for TX and RX |
| **Baud Rates** | 1200, 2400, 4800, 9600, 19,200 (selectable) | **System limitations** | *See below |
| **Parity** | Even, odd or none | **Max. Terminal Wire gauge** | 18 AWG (use copper conductors) |
| **Data bits** | 7 or 8 | **Terminal Strip** | Plug In (removable) |
| **Transmit buffer** | 48 bytes | **Terminal Screws** | Slotted (0.1" blade maximum) |
| **Receive buffer** | 48 bytes | **Required Temperature rating of field installed conductors** | 60°C/75°C |
| **Weight** | 1 oz (29g) | **Terminal block torque** | 2.2 lb-in |
| **Type** | 112 | **Subtype** | 1 |

* For OL4058 ethernet base a maximum of one OL2602 modules may be used. It must be placed in slot 0. For the OL4054 ethernet base, a maximum of two OL2602 may be used. They must be placed in slots 0 and 1.




| Terminal (each port) | |
|---|---|
| 1 | Signal ground |
| 2 | Transmit |
| 3 | Receive |