OPTICAL ISOLATOR ELECTRONIC MODULE

This is a versatile interface between an incremental encoder and receiving electronics. It accepts single ended or differential inputs and provides single ended or differential outputs in either an open collector or line driver configuration. It accommodates all standard operating voltages from 5 to 28 VDC. Up to eight Optical Isolator Modules can be daisy-chained to provide multiple, simultaneous outputs to controllers or PLC’s. This Optical Isolator can help clean up noisy signals by converting to a different line driver output. It has a 1 MHz throughput capability and can be used wherever a fast, optically isolated interface is required.

Output Code Format From Encoder
Dual Channel in quadrature plus index and complements. Data lines are designated A, B, Z, A/, B/, Z/ at the module

Output Signal Type From Encoder
Differential line driver (Use Connection Instructions #1)
Single ended line driver (Use Connection Instructions #2)
Single ended open collector with pull-up resistors internal to encoder (Use Connection Instructions #3)
Single ended, open collector (Use Connection Instructions #3)

Output Signal Voltage Level From Encoder
5 VDC (TTL, RS422 compatible, line driver)
12-15 VDC
24VDC

Frequency Response of Optical Isolator
1 MHz, maximum

Power Requirements For Optical Isolator
5-28 VDC ±5%, 75mA plus load current

Optical Isolator Output Options
28V/V Line Driver, 100mA source/sink, Vout = Vin
28V/5 Line Driver, 100mA source/sink, Vout = 5V (Derate output current to 50mA with supply voltage > 12VDC)
28V/OC NPN Open Collector, 80mA sink

Protection Level
Supply lines protected against over voltage to 60 volts and reverse voltage

Tristate Outputs
Available as –S Special Feature

ELECTRICAL SPECIFICATIONS

POWER:
The optical isolator can accommodate standard operating voltages from 5 to 28 VDC. It should never be connected directly to AC power mains. The module draws approximately 75 mA and a green LED indicates the unit is powered. The optical isolator module does not provide power to the encoder. Any encoders used in conjunction with this module must be connected to their own power.

SIGNAL:
Specifying an optical isolator module requires knowledge of three system parameters: the DC supply voltage available in the system; the encoder output type (logic levels and driver type); and the input signal specifications of the receiving electronics.

MECHANICAL SPECIFICATIONS

Package dimensions are 114.4 mm high by 99 mm wide by 22.5 mm thick. The package mounts to a DIN rail type EN 50 022 (35mm X 7.5mm). A length of DIN rail is supplied with each module. The module simply snaps directly to the DIN rail and is ready to use.

22.5 mm (0.89 inches)
114.5 mm (4.51 inches)
99 mm

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**CONNECTION INSTRUCTIONS #1**

**Differential Line Driver**
Encoder signals from 5 VDC to 24 VDC (must specify the voltage when ordering)

This is the preferred type of encoder output as it has the best noise immunity. Connect each encoder signal to its like optical isolator input (A to A, A' to A', etc).

**CONNECTION INSTRUCTIONS #2**

**Single Ended Line Driver**
Encoder signal from 5 VDC to 24 VDC (must specify the voltage when ordering)

Connect encoder output A to optical isolator module input channel A, B to B and Z to Z. Connect the A', B', and Z' inputs of the optical isolator to circuit common of the encoder supply. Single ended operation is limited to shorter cable runs and is more susceptible to noise.
**CONNECTION INSTRUCTIONS #3**

Open Collector with or without Internal Pull-up Resistors
Encoder NPN (sinking) outputs.

Connect encoder output A to optical isolator module input A/, B to B/ and Z to Z/. Connect the A, B, and Z inputs of the optical isolator to the auxiliary output terminal on the optical isolator module for 5V module and to higher voltage when specified by module model and part number. This connection results in a logic inversion within the optical isolator module. To compensate for the logic reversal, swap A for A/, B for B/, and Z for Z/ at the optical isolator outputs.

![Connection Diagram](image)

To 5 AUX for 5V module.
To 12-15 for 24V dependent on specified module input voltage.

**Uses for Optical Isolator Module**

**Example 1: Resolve an electrical conflict between encoder output and receiving electronics**

Sometimes system constraints result in an incompatibility between the encoder output and the receiving electronics or the cabling. A typical symptom of this problem is missed or intermittent counts. As an example, a single-ended TTL receiver that is more than 20 feet from the encoder may not be able to compensate for the signal attenuation and ringing caused by the encoder cabling. An optical isolator module installed near the receiver as shown in Figure 4 can receive the signal, rejecting the cable effects and produce a signal compatible with the input device.

![Fig 4](image)
Example 2: Signal Splitter

The optical isolator can be used to connect a single encoder to multiple devices. Optical isolator can be used to split an encoder output to drive up the 8 devices as shown in Figure 5. One optical isolator module is used to drive each receiver. Optical isolator modules can be specified with outputs to match receiver inputs; i.e. an encoder signal can be split to drive a differential TTL input with one module, a 12 V line driver with another module and provide an open collector, NPN signal with another module.

* Also see the BEI Encoder Signal Broadcaster Module on page 5 for this application*

Example 3: Repeater

On extremely long cable runs (greater than 500 feet), an optical isolator module may be needed as a mid-point repeater to receive, amplify and re-broadcast the signal. An example is illustrated in Figure 6.
**Optical Isolator Selection Table**

To find the correct optical isolator for your application, look in column 1 for the logic voltage of your encoder. Then choose the correct row in column 2 that describes the type of output from the isolator that is compatible with your receiving electronics. Read across to columns 3 and 4 to find the module and part number of the correct optical isolator.

<table>
<thead>
<tr>
<th>Encoder Output Logic Level Voltage</th>
<th>Optical Isolator Output Logic Level Voltage</th>
<th>(3) Model Number</th>
<th>(4) Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>5V</td>
<td>Vout = Vin</td>
<td>EM-DR1-IC-5-TB-28V/V</td>
<td>60001-003</td>
</tr>
<tr>
<td></td>
<td>Vout = 5V</td>
<td>EM-DR1-IC-5-TB-28V/5</td>
<td>60001-002</td>
</tr>
<tr>
<td></td>
<td>Vout = OC</td>
<td>EM-DR1-IC-5-TB-28V/OC</td>
<td>60001-004</td>
</tr>
<tr>
<td></td>
<td>Vout = 5V</td>
<td>EM-DR1-IC-15-TB-28V/5</td>
<td>60001-012</td>
</tr>
<tr>
<td></td>
<td>Vout = OC</td>
<td>EM-DR1-IC-15-TB-28V/OC</td>
<td>60001-014</td>
</tr>
<tr>
<td>24V</td>
<td>Vout = Vin</td>
<td>EM-DR1-IC-24-TB-28V/V</td>
<td>60001-010</td>
</tr>
<tr>
<td></td>
<td>Vout = 5V</td>
<td>EM-DR1-IC-24-TB-28V/5</td>
<td>60001-011</td>
</tr>
<tr>
<td></td>
<td>Vout = OC</td>
<td>EM-DR1-IC-24-TB-28V/OC</td>
<td>60001-013</td>
</tr>
</tbody>
</table>

**Additional Modules and Accessories**

**ENCODER SIGNAL BROADCASTER MODULE**
Accepts standard incremental encoder inputs and can broadcast up to four encoder signals to four independent devices. Each of the broadcast signals are optically isolated eliminating ground loops.

**POWER SUPPLY**
With a wide range of acceptable input voltages (AC and DC) this DIN Rail mountable power supply is usable in virtually all industrial applications worldwide. It has built in surge protection to reduce faults due to transients and it has 100% reserve capacity for startup and overload conditions.

**CABLE AND CABLE ASSEMBLIES**
Cable reels for your own custom wiring requirements or cable assemblies are available, using high quality custom BEI standard cable consisting of four, low capacitance shielded twisted pairs with an overall shield, extra large conductors for power, and signal ground; all within an abrasion-resistant PVC jacket.

**Cable Reels**
- Part No. 37048-003-100
- Part No. 37048-003-500

**Cable Assemblies**
- Part Nos. for MS3106F14S-6S Mating Connector
  - 10 ft. # 31186-1410  | 20 ft. # 31186-1420  | 30 ft. # 31186-1430
- Part Nos. for MS3106F16S-1S Mating Connector
  - 10 ft. # 31186-1610  | 20 ft. # 31186-1620  | 30 ft. # 31186-1630
- Part Nos. for MS3106F18S-1S Mating Connector
  - 10 ft. # 31186-1810  | 20 ft. # 31186-1820  | 30 ft. # 31186-1830