The IO-DI16 and IO-DI16-L are I/O expansion modules that can be used in conjunction with specific Unitronics OPLC controllers. The modules are identical except for their input specifications: IO-DI16 uses 24 VDC; IO-DI16-L uses 12 VDC. Each module offers 16 digital inputs in 2 groups, type pnp/npn (source/sink). The interface between a module and the OPLC is provided by an adapter. These modules may either be snap-mounted on a DIN rail, or screw-mounted onto a mounting plate.

Component identification

<table>
<thead>
<tr>
<th></th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Module-to-module connector</td>
</tr>
<tr>
<td>2</td>
<td>Communication status indicator</td>
</tr>
<tr>
<td>3</td>
<td>Input connection points: I8-I15</td>
</tr>
<tr>
<td>4</td>
<td>Input status indicators</td>
</tr>
<tr>
<td>5</td>
<td>Module-to-module connector port</td>
</tr>
<tr>
<td>6</td>
<td>Input connection points: I0-I7</td>
</tr>
</tbody>
</table>

User safety and equipment protection guidelines

This document is intended to aid trained personnel in the installation of this equipment as defined by the European directives for machinery, low voltage, and EMC. Only a technician or engineer trained in the local and national electrical standards should perform tasks associated with the device’s electrical wiring.

Symbols are used to highlight information relating to the user’s personal safety and equipment protection throughout this document. When these symbols appear, the associated information must be read carefully and understood fully.

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Meaning</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>⚠️</td>
<td>Danger</td>
<td>The identified danger causes physical and property damage.</td>
</tr>
<tr>
<td>⚠️</td>
<td>Warning</td>
<td>The identified danger can cause physical and property damage.</td>
</tr>
<tr>
<td>⚠️</td>
<td>Caution</td>
<td>Use caution.</td>
</tr>
</tbody>
</table>

Failure to comply with appropriate safety guidelines can result in severe personal injury or property damage. Always exercise proper caution when working with electrical equipment.

- Check the user program before running it.
- Do not attempt to use this device with parameters that exceed permissible levels.
- Install an external circuit breaker and take appropriate safety measures against short-circuiting in external wiring.
- To avoid damaging the system, do not connect / disconnect the device when the power is on.
Environmental Considerations

- Do not install in areas with: excessive or conductive dust, corrosive or flammable gas, moisture or rain, excessive heat, regular impact shocks or excessive vibration.

- Leave a minimum of 10mm space for ventilation between the top and bottom edges of the device and the enclosure walls.

- Do not place in water or let water leak onto the unit.

- Do not allow debris to fall inside the unit during installation.

Mounting the Module

DIN-rail mounting
Snap the device onto the DIN rail as shown below; the module will be squarely situated on the DIN rail.

Screw-Mounting
The figure on the next page is drawn to scale. It may be used as a guide for screw-mounting the module.
Mounting screw type: either M3 or NC6-32.
Connecting Expansion Modules
An adapter provides the interface between the OPLC and an expansion module. To connect the I/O module to the adapter or to another module:

1. Push the module-to-module connector into the port located on the right side of the device.

Note that there is a protective cap provided with the adapter. This cap covers the port of the final I/O module in the system.

- To avoid damaging the system, do not connect or disconnect the device when the power is on.

Component identification

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Module-to-module connector</td>
</tr>
<tr>
<td>2</td>
<td>Protective cap</td>
</tr>
</tbody>
</table>

Wiring

- Do not touch live wires.
- Unused pins should not be connected. Ignoring this directive may damage the device.
- Do not connect the ‘Neutral or ‘Line’ signal of the 110/220VAC to the device’s 0V pin.
- Double-check all wiring before turning on the power supply.

Wiring Procedures
Use crimp terminals for wiring; use 26-12 AWG wire (0.13 mm²–3.31 mm²) for all wiring purposes.

1. Strip the wire to a length of 7±0.5mm (0.250–0.300 inches).
2. Unscrew the terminal to its widest position before inserting a wire.
3. Insert the wire completely into the terminal to ensure that a proper connection can be made.
4. Tighten enough to keep the wire from pulling free.

- To avoid damaging the wire, do not exceed a maximum torque of 0.5 N·m (5 kgf·m).
- Do not use tin, solder, or any other substance on stripped wire that might cause the wire strand to break.
- Install at maximum distance from high-voltage cables and power equipment.

I/O Wiring—General
- Input or output cables should not be run through the same multi-core cable or share the same wire.
- Allow for voltage drop and noise interference with input lines used over an extended distance. Use wire that is properly sized for the load.
- The adapter and input signals must be connected to the same 0V signal.
Digital Inputs

- Each group of inputs may be wired as either pnp (source) or npn (sink) inputs.

**npn (sink) input wiring (shown in top group of inputs)**

```
  +V
  0V

Circuit Protection Device
```

**npn (sink) high-speed counter/frequency measurer**

```
  0V
  +V

Circuit Protection Device
```

**pnp (source) input wiring (shown in bottom group of inputs)**

```
  0V
  +V
```

**pnp (source) high-speed counter**

```
  0V
  +V

Circuit Protection Device
```

**npn (sink) high-speed counter**

```
  0V
  +V

Circuit Protection Device
```

**pnp (source) high-speed counter**

```
  0V
  +V

Circuit Protection Device
```
## IO-DI16, IO-DI16-L Technical Specifications

<table>
<thead>
<tr>
<th>Specification</th>
<th>IO-DI16</th>
<th>IO-DI16-L</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max. current consumption</td>
<td>75mA maximum from the adapter’s 5VDC</td>
<td></td>
</tr>
<tr>
<td>Typical power consumption</td>
<td>0.2W @ 5VDC</td>
<td></td>
</tr>
<tr>
<td>Status indicator (RUN)</td>
<td>Green LED:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>—Lit when a communication link is established between module and OPLC.</td>
<td>—Blinks when the communication link fails.</td>
</tr>
<tr>
<td>Inputs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of inputs</td>
<td>16 (in two groups)</td>
<td></td>
</tr>
<tr>
<td>Input type</td>
<td>pnp (source) or npn (sink)</td>
<td></td>
</tr>
<tr>
<td>Galvanic isolation</td>
<td>None</td>
<td></td>
</tr>
<tr>
<td>Status indicators (IN)</td>
<td>Green LEDs—Lit when the corresponding input is active. See Note 1</td>
<td></td>
</tr>
<tr>
<td>Nominal input voltage</td>
<td>24VDC for IO-DI16, 12VDC for IO-DI16-L</td>
<td></td>
</tr>
<tr>
<td>Input voltage</td>
<td></td>
<td></td>
</tr>
<tr>
<td>pnp (source)</td>
<td>0-5VDC for Logic ‘0’</td>
<td>0-3VDC for Logic ‘0’</td>
</tr>
<tr>
<td></td>
<td>17-28.8VDC for Logic ‘1’</td>
<td>8-15.6VDC for Logic ‘1’</td>
</tr>
<tr>
<td>npn (sink), voltage/current</td>
<td>17-28.8VDC/&lt;1.1 mA for Logic ‘0’</td>
<td>8-15.6VDC/&lt;1.1 mA for Logic ‘0’</td>
</tr>
<tr>
<td></td>
<td>0-5VDC/&gt;4.3mA for Logic ‘1’</td>
<td>0-3VDC/&gt;4.3mA for Logic ‘1’</td>
</tr>
<tr>
<td>Input current</td>
<td>6mA@24VDC</td>
<td>6mA@12VDC</td>
</tr>
<tr>
<td>Response time</td>
<td>10mSec typical</td>
<td></td>
</tr>
<tr>
<td>Input #15</td>
<td>The specifications below apply when this input is wired for use as a high-speed counter input/frequency measurer. See Notes 2 and 3.</td>
<td></td>
</tr>
<tr>
<td>Resolution</td>
<td>16-bit</td>
<td></td>
</tr>
<tr>
<td>Frequency</td>
<td>5kHz maximum</td>
<td></td>
</tr>
<tr>
<td>Minimum pulse width</td>
<td>80μs</td>
<td></td>
</tr>
<tr>
<td>Environmental</td>
<td>IP20 / NEMA1</td>
<td></td>
</tr>
<tr>
<td>Operating temperature</td>
<td>0° to 50°C (32° to 122°F)</td>
<td></td>
</tr>
<tr>
<td>Storage temperature</td>
<td>-20° to 60°C (-4° to 140°F)</td>
<td></td>
</tr>
<tr>
<td>Relative Humidity (RH)</td>
<td>5% to 95% (non-condensing)</td>
<td></td>
</tr>
<tr>
<td>Dimensions (WxHxD)</td>
<td>80mm x 93mm x 60mm (3.15” x 3.66” x 2.362”)</td>
<td></td>
</tr>
<tr>
<td>Weight</td>
<td>141g (4.9oz.)</td>
<td></td>
</tr>
<tr>
<td>Mounting</td>
<td>Either onto a 35mm DIN-rail or screw-mounted.</td>
<td></td>
</tr>
</tbody>
</table>

### Notes:
1. The inputs’ LEDs light up only when communication link is established between module and OPLC.
2. Input #15 can function either as a high-speed counter, a frequency measurer, or as a normal digital input. When Input #15 is used as a normal digital input, normal input specifications apply.
3. Input #14 can function either as the counter’s reset, or as a normal digital input; in either case, its specifications are those of a normal digital input.
Addressing I/Os on Expansion Modules

Inputs and outputs located on I/O expansion modules that are connected to an OPLC are assigned addresses that comprise a letter and a number. The letter indicates whether the I/O is an input (I) or an output (O). The number indicates the I/O’s location in the system. This number relates to both the position of the expansion module in the system, and to the position of the I/O on that module.

Expansion modules are numbered from 0-7 as shown in the figure below.

The formula below is used to assign addresses for I/O modules used in conjunction with the OPLC.

\[ \text{The number that represents the I/O's location is equal to:} \]

\[ 32 + x \times 16 + y \]

Examples

- Input #3, located on expansion module #2 in the system, will be addressed as I 67, \( 67 = 32 + 2 \times 16 + 3 \)
- Output #4, located on expansion module #3 in the system, will be addressed as O 84, \( 84 = 32 + 3 \times 16 + 4 \).

EX90-DI8-RO8 is a stand-alone I/O module. Even if it is the only module in the configuration, the EX90-DI8-RO8 is always assigned the number 7.

Its I/Os are addressed accordingly.

Example

- Input #5, located on an EX90-DI8-RO8 connected to an OPLC will be addressed as I 149, \( 149 = 32 + 7 \times 16 + 5 \)
UL Compliance

The following section is relevant to Unitronics’ products that are listed with the UL.

The following models: IO-AI4-AO2, IO-AO6X, IO-ATC8, IO-DI16, IO-DI16-L, IO-DI8-RO4, IO-DI8-RO4-L, IO-DI8-TO8, IO-DI8-TO8-L, IO-RO16, IO-RO16-L, IO-RO8, IO-RO8L, IO-TO16, EX-A2X are UL listed for Hazardous Locations.


UL Ratings, Programmable Controllers for Use in Hazardous Locations,

Class I, Division 2, Groups A, B, C and D

These Release Notes relate to all Unitronics products that bear the UL symbols used to mark products that have been approved for use in hazardous locations, Class I, Division 2, Groups A, B, C and D.

Caution

- This equipment is suitable for use in Class I, Division 2, Groups A, B, C and D, or Non-hazardous locations only.
- Input and output wiring must be in accordance with Class I, Division 2 wiring methods and in accordance with the authority having jurisdiction.
- WARNING—Explosion Hazard—substitution of components may impair suitability for Class I, Division 2.
- WARNING – EXPLOSION HAZARD – Do not connect or disconnect equipment unless power has been switched off or the area is known to be non-hazardous.
- WARNING – Exposure to some chemicals may degrade the sealing properties of material used in Relays.
- This equipment must be installed using wiring methods as required for Class I, Division 2 as per the NEC and/or CEC.

Relay Output Resistance Ratings

The products listed below contain relay outputs:

Input/Output expansion modules, Models: IO-DI8-RO4, IO-DI8-RO4-L, IO-RO8, IO-RO8L

- When these specific products are used in hazardous locations, they are rated at 3A res, when these specific products are used in non-hazardous environmental conditions, they are rated at 5A res, as given in the product’s specifications.

Certification UL des automates programmables, pour une utilisation en environnement à risques, Class I, Division 2, Groups A, B, C et D.

Cette note fait référence à tous les produits Unitronics portant le symbole UL - produits qui ont été certifiés pour une utilisation dans des endroits dangereux, Classe I, Division 2, Groupes A, B, C et D.
Attention

- Cet équipement est adapté pour une utilisation en Classe I, Division 2, Groupes A, B, C et D, ou dans Non-dangereux endroits seulement.
- Le câblage des entrées/sorties doit être en accord avec les méthodes de câblage selon la Classe I, Division 2 et en accord avec l’autorité compétente.
- AVERTISSEMENT: Risque d’Explosion – Le remplacement de certains composants rend caduque la certification du produit selon la Classe I, Division 2.
- AVERTISSEMENT - DANGER D’EXPLOSION - Ne connecter pas ou ne débranche pas l’équipement sans avoir préalablement coupé l’alimentation électrique ou la zone est reconnue pour être non dangereuse.
- AVERTISSEMENT - L’exposition à certains produits chimiques peut dégrader les propriétés des matériaux utilisés pour l’étanchéité dans les relais.
- Cet équipement doit être installé utilisant des méthodes de câblage suivant la norme Class I, Division 2 NEC et /ou CEC.

Certification de la résistance des sorties relais

Les produits énumérés ci-dessous contiennent des sorties relais:

- Modules d’Extensions d'E/S, modèles: IO-DI8-RO4, IO-DI8-RO4-L, IO-RO8, IO-RO8L.

- Lorsque ces produits spécifiques sont utilisés dans des endroits dangereux, ils supportent un courant de 3A charge résistive, lorsque ces produits spécifiques sont utilisés dans un environnement non dangereux, ils sont évalués à 5A rés, comme indiqué dans les specifications du produit Plages de températures.