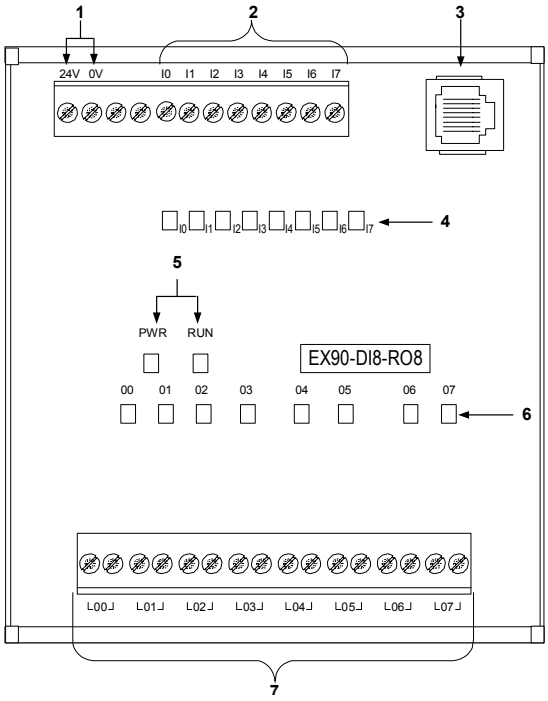
EX90-DI8-RO8 I/O Expansion Module 8 Inputs, 8 Outputs

The EX90-DI8-RO8 is an I/O expansion module that can be used in conjunction with specific Unitronics OPLC controllers.

The module offers 8 digital inputs, type pnp (source), and 8 relay outputs.

The EX90-DI8-RO8 is snap-mounted on a DIN rail.



	Component identification
1	Power supply
2	Input connection points
3	OPLC-module communication port
4	Input status indicators
5	Status indicators
6	Output status indicators
7	Output connection points

User safety and equipment protection guidelines

This document is intended to aid trained and competent 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 electrical wiring of this device.

- Under no circumstances will Unitronics be liable or responsible for any consequential damage that may arise as a result of installation or use of this equipment, and is not responsible for problems resulting from improper or irresponsible use of this device.
- All examples and diagrams shown in the manual are intended to aid understanding. They do not guarantee operation.
- Unitronics accepts no responsibility for actual use of this product based on these examples.
- Only qualified service personnel should open this device or carry out repairs.
- Please dispose of this product in accordance with local and national standards and regulations.

- Check the user program before running it.
- Do not attempt to use this device with voltage exceeding permissible levels.
- Install an external circuit breaker and take all appropriate safety measures against short-circuiting in external wiring.

- 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.

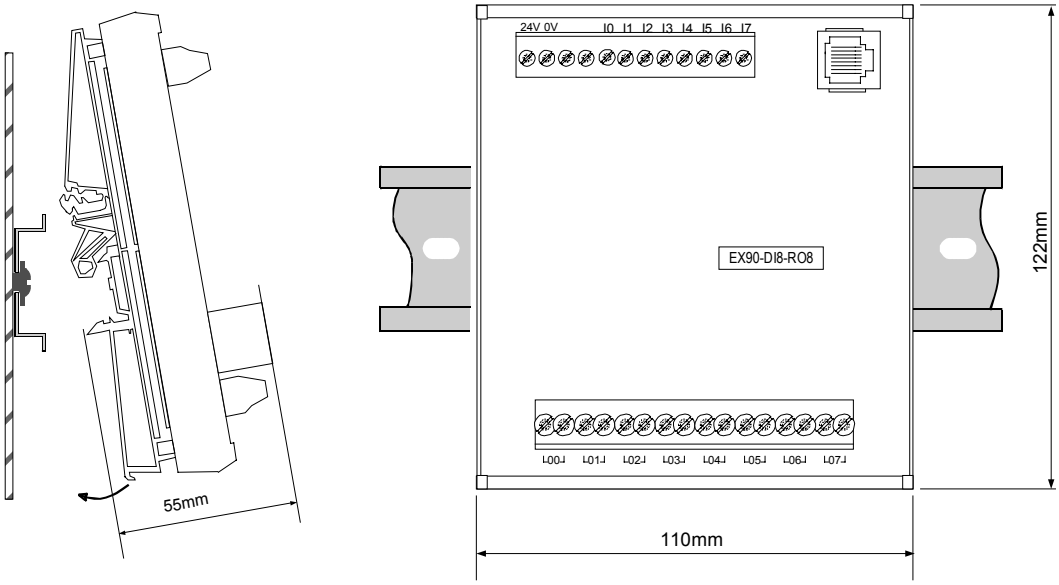
Mounting the Module

Mounting 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.
- Provide proper ventilation by leaving a minimum space of 10mm 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.

DIN-rail mounting

1 Snap the EX90-DI8-RO8 onto the DIN rail as shown below; the device will be squarely situated on the DIN rail as shown below.

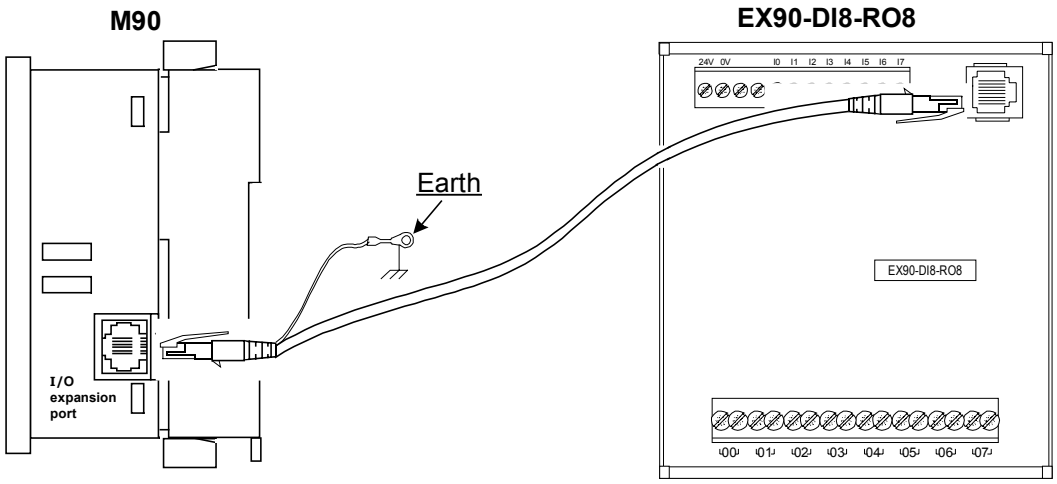


Connecting the OPLC to the EX90-DI8-RO8

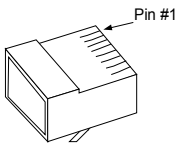
An OPLC, such as the M90 micro-OPLC, is connected to the EX90-DI8-RO8 as shown below, via a category 5 shielded twisted pair cable (CAT 5, STP), terminated by RJ45 connectors. The cable provided with the EX90-DI8-RO8 is one meter long; cables of other lengths are available by separate order.

Note that the cable must be earthed on the M90 side, via the yellow-green wire.

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

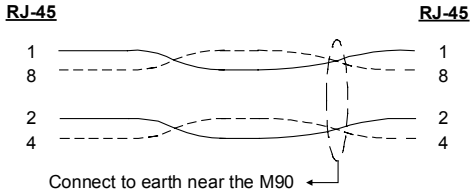


Shielded RJ45 connector pin-out



RJ-45 pin #	signal
1	D -
8	D +
2	CK-
4	CK+
3	0V
6	0V

Cable description



Wiring

Wire Size

Use 26-12 AWG wire (0.13 mm ^{2}–3.31 mm^2) for all wiring purposes.

Wiring Considerations

- Do not use tin, solder or any other substance on the stripped wire that might cause the wire strand to break.
- We recommend that you use crimp terminals for wiring.
- Install at maximum distance from high-voltage cables and power equipment.

General Wiring Procedures

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 touch live wires.
- Double-check all the wiring before turning on the power supply.

- **Wiring**

Wiring DC Power Supply

1 Connect the "positive" cable to the 24V terminal, and the “negative” to the 0V terminal.

- A non-isolated power supply can be used provided that a 0V signal is connected to the chassis.
- Do not connect the ‘Neutral or ‘Line’ signal of the 110/220VAC to the device’s 0V pin.
- In the event of voltage fluctuations or non-conformity to voltage power supply specifications, connect the device to a regulated power supply.

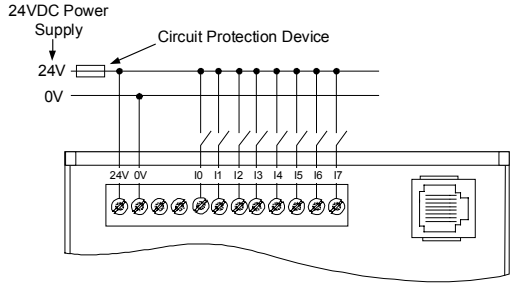
Wiring I/Os

- 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/output lines used over an extended distance. Use wire that is properly sized for the load.

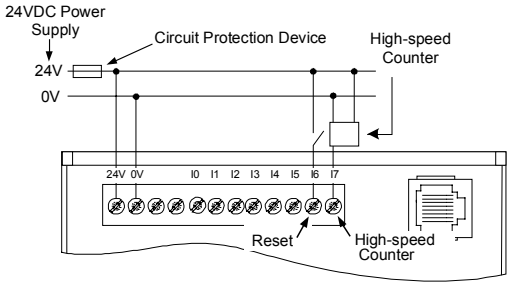
Wiring Inputs

- Note that the power supply and input signals must be connected to the same 0V signal.

pnp (source) inputs



pnp (source) high-speed counter/frequency measurer

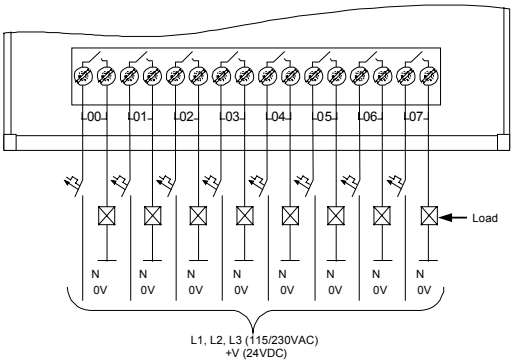


Wiring Outputs

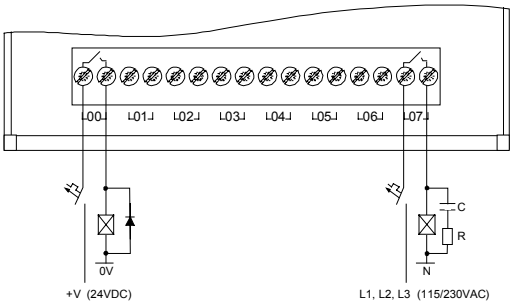
The EX90-DI8-RO8 has 8 relay outputs. To increase the life span of these contacts and protect the EX90-DI8-RO8 from potential damage by reverse EMF, connect:

- a clamping diode in parallel with each inductive DC load,
- an RC snubber circuit in parallel with each inductive AC load.

Outputs



Increasing Contact Life Span



EX90-DI8-RO8 Technical Specifications

Power Supply	See Note 1.
Input voltage	24VDC
Permissible range	20.4 to 28.8VDC
Max. current consumption	150mA@ 24VDC
Typical power consumption	2.5W@ 24VDC
Status indicators	
(RUN)	Green LED: —Lit when a communication link is established between module and OPLC. —Blinks when the communication link fails.
(PWR)	Green LED: Lit when power is on.
Inputs	
Number of inputs	8 (in one group)
Input type	pnp (source)
Galvanic isolation	None
Status indicators (I0 to I7)	Green LEDs—Lit when the corresponding input is active.
Nominal input voltage	24VDC
Input voltage	0-5VDC for Logic '0' 15-28.8VDC for Logic '1'
Input current	7.5mA@ 24VDC
Response time	10mSec
Input #7	The specifications below apply when this input is wired for use as a high-speed counter input/frequency measurer. See Notes 2 and 3.
Resolution	16-bit
Frequency	5kHz maximum
Minimum pulse width	80µs
Outputs	
Number of outputs	8 relay
Output type	SPST-NO relay; 230VAC / 24VDC
Type of relay	Takamisawa JY-24H-K or NAIS (Matsushita) JQ1AP-24V or OMRON G6B-1114P-24VDC
Isolation	By relay
Output current	5A maximum (resistive load) 1A maximum (inductive load)
Maximum frequency	10Hz
Contact protection	External precautions required (see page 4, Increasing Contact Life Span)
Status Indicators	
(O0 to O7)	Red LEDs—Lit when the corresponding output is active.
Environmental	
Operating temperature	0° to 50° C
Storage temperature	-20° to 60° C
Dimensions (WxHxD)	110mm x 122mm x 55mm
Weight	212g (7.42oz.)
Mounting	Snaps onto a 35mm DIN-rail

Notes:

1. Note that both the OPLC and the EX90-DI8-RO8 must be connected to the same power supply. The EX90-DI8-RO8 and the OPLC must be turned on and off simultaneuosly.
2. Input #7 can function either as a high-speed counter, a frequency measurer, or as a normal digital input. When Input #7 is used as a normal digital input, normal input specifications apply.
3. Input #6 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.

Accessories

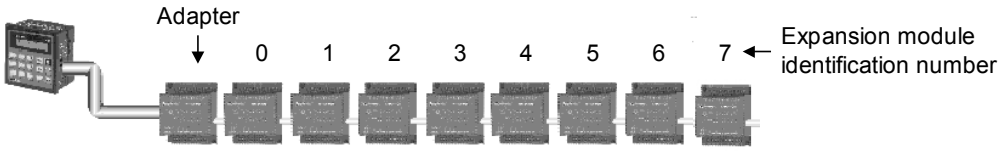
EX1-CA050	0.5 meter communication cable
EX1-CA100*	1 meter communication cable
EX1-CA200	2 meter communication cable
EX1-CA400	4 meter communication cable

*EX1-CA100 is provided with the EX90-DI8-RO8; other cables are available by separate order.

Addressing I/Os on M90 Expansion Modules

Inputs and outputs located on I/O expansion modules that are connected into an M90 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 conjuction with the M90 OPLC.

X is the number representing a specific module's location (0-7). Y is the number of the input or output on that specific module (0-15).

The number that represents the I/O's location is equal to:

$$32 + x \bullet 16 + y$$

Examples

- Input #3, located on expansion module #2 in the system, will be addressed as I 67, 67 = 32 + 2 • 16 + 3
- Output #4, located on expansion module #3 in the system, will be addressed as O 84, 84 = 32 + 3 • 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 M90 OPLC will be addressed as I 149, 149 = 32 + 7 • 16 + 5

8 Convenient I/O Expansion Modules

	Digital I/O (transistor)			Digital I/O (relay)			Analog I/O	PT 100
	IO-DI8-TO8*	IO-DI16*	IO-TO16*	IO-D18-RO4*	IO-RO8*	EX90-DI8-RO8*	IO-AI4-AO2*	IO-PT4*
Digital inputs (24 VDC)	8 pnp/npn (source/sink)	16 pnp/npn (source/sink)	—	8 pnp/npn (source/sink)	—	8 pnp/npn (source/sink)	—	—
Analog inputs	—	—	—	—	—	—	4 inputs 0-10V, 0-20mA 4-20mA	4 PT100 -50°C-460°C
Analog input resolution	—	—	—	—	—	—	12 bit	12 bit
Digital outputs	8 pnp (source)	—	16 pnp (source)	4 relay outputs	8 relay outputs	8 relay outputs	—	—
Analog outputs	—	—	—	—	—	—	2 outputs +/-10V,0-20mA, 4-20mA	—
Analog output resolution	—	—	—	—	—	—	12 bit + sign	—
High speed counter/ Frequency measurement	one	one		one		one		

*Used in conjunction with EX-A1=Expansion adapter

To order the expansion module that best fits your system, contact your local distributor.
For a list of Unitronics distributors, check our website: http://www.unitronic.com/contact.htm

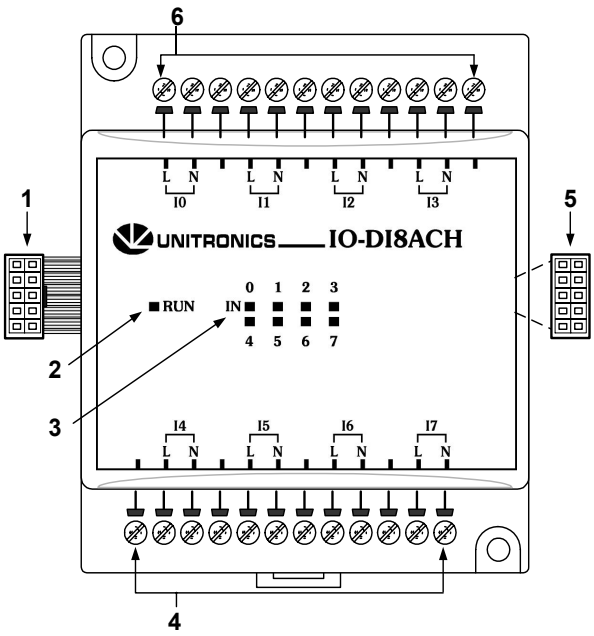
IO-DI8ACH I/O Expansion Module Eight 110/220VAC Inputs

The IO-DI8ACH is an I/O expansion module that can be used in conjunction with specific Unitronics OPLC controllers.

Each module offers 8 AC digital inputs.

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	
1	Module-to-module connector
2	Communication status indicator
3	Input status indicators
4	Input connection points: I4-I7
5	Module-to-module connector port
6	Input connection points: I0-I3

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- Please dispose of this product in accordance with local and national standards and regulations.
- Only qualified service personnel should open this device or carry out repairs.

User safety and equipment protection guidelines

This document is intended to aid trained and competent 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.

Symbol	Meaning	Description
	Danger	The identified danger causes physical and property damage.
	Warning	The identified danger can cause physical and property damage.
Caution	Caution	Use caution.

- 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

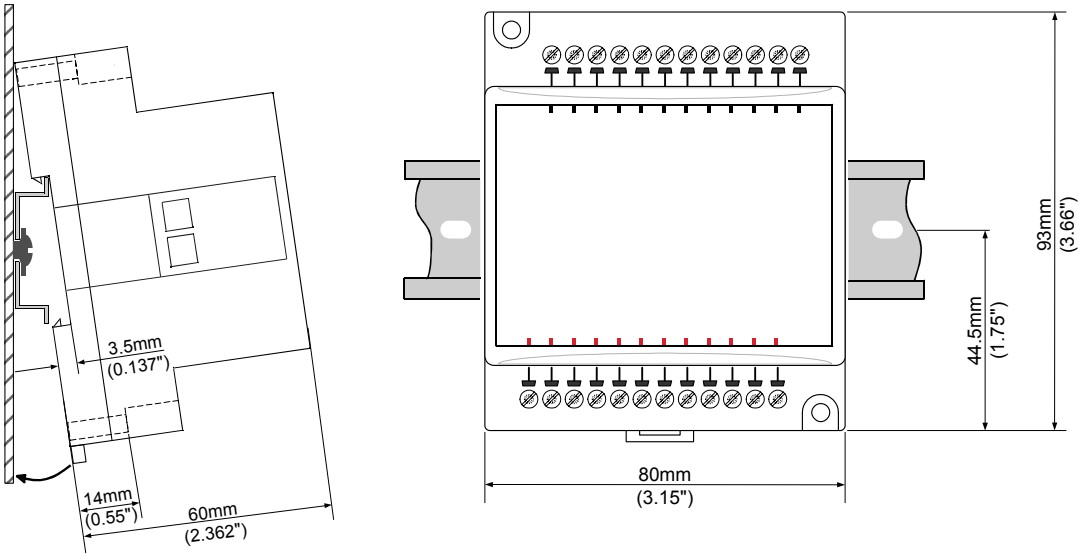
- Do not install in areas with: excessive or conductive dust, corrosive or flammable gas, moisture or rain, excessive heat, regular impact shocks or excessive vibration.

- 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

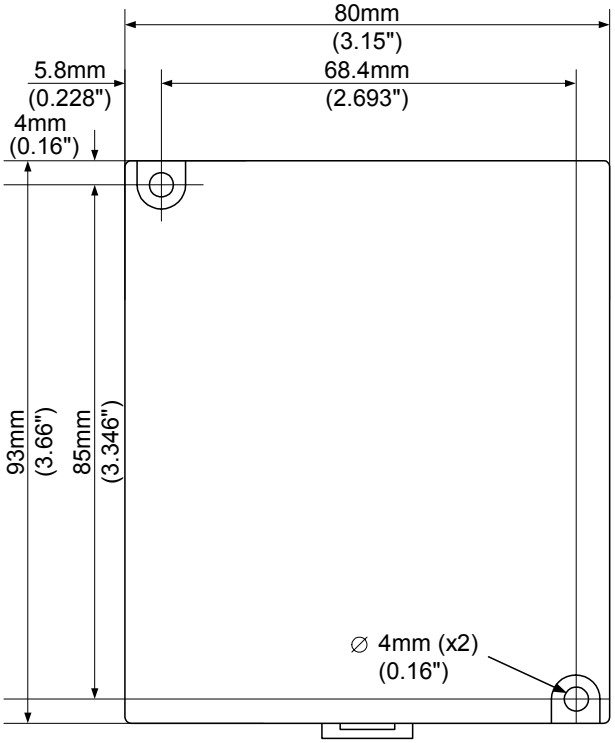
DIN-rail mounting

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



Screw-Mounting

The figure below is not 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

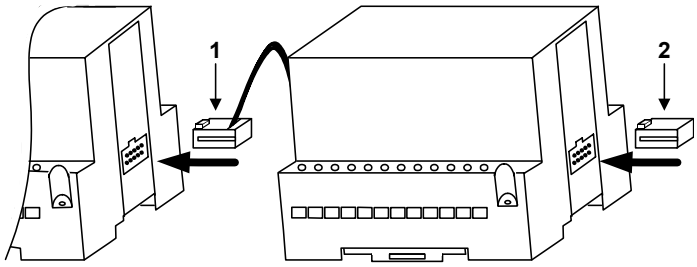
An adapter provides the interface between the OPLC and an expansion module. To connect the I/O module to the adapter or to another module:

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	
1	Module-to-module connector
2	Protective cap



Wiring

- Do not touch live wires.

- Unused pins should not be connected. Ignoring this directive may damage the device.
- Double-check all wiring before turning on the power supply.

Wiring Procedures

Use crimp terminals for wiring; use 26-12 AWG wire (0.13 mm ^{2}–3.31 mm^2) 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.

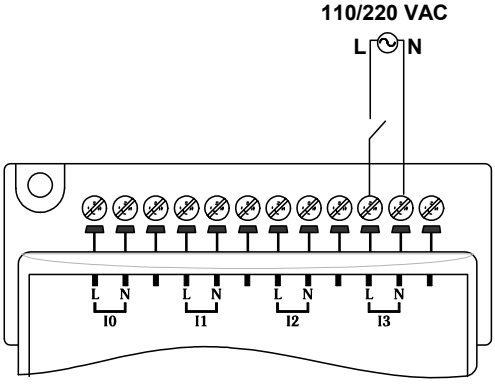
- To avoid damaging the wire, do not exceed a maximum torque of 0.5 N·m (5 kgf·cm).
- Do not use tin, solder, or any other substance on stripped wire that might cause the wire strand to break.
- Install at maximum distance from high-voltage cables and power equipment.

I/O Wiring—General

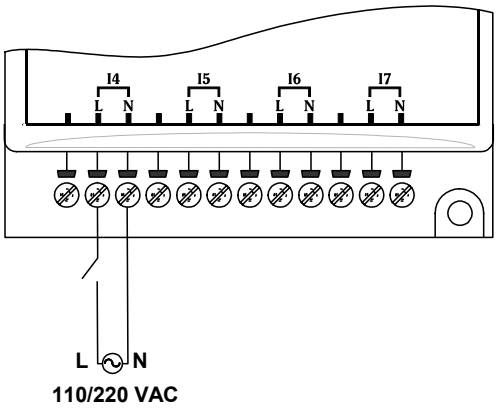
- Input or output cables should not be run through the same multi-core cable or share the same wire.
- Allow for voltage drop and noise interference with input lines used over an extended distance. Use wire that is properly sized for the load.

Digital Inputs

Input wiring
(top group of inputs)



Input wiring
(bottom group of inputs)



IO-DI8ACH Technical Specifications

Max. current consumption	45mA maximum from the adapter's 5VDC	
Typical power consumption	0.2W @ 5VDC	
Status indicator		
(RUN)	Green LED: —Lit when a communication link is established between module and OPLC. —Blinks when the communication link fails.	
Inputs		
Number of inputs	8	
Input type	AC	
Galvanic isolation		
Channel to bus	Yes	
Channel to power supply	Yes	
Channel to channel	Yes	
Status indicators (IN)	Green LEDs —Lit when the corresponding input is active. See Note 1	
Input voltage range	80 to 250VAC (50, 60 Hz)	
Nominal Input voltage	110VAC	220VAC
ON voltage (min)	80VAC	160VAC
OFF voltage (max)	30VAC	50VAC
Input current	8mA	12mA
Response time (typical)	Rise: 30mSec	
	Fall: 40mSec	
Environmental	IP20 / NEMA1	
Operating temperature	0° to 50°C (32° to 122°F)	
Storage temperature	-20° to 60° C (-4° to 140°F)	
Relative Humidity (RH)	5% to 95% (non-condensing)	
Dimensions (WxHxD)	80mm x 93mm x 60mm (3.15" x 3.66" x 2.362")	
Weight	161g (5.7oz.)	
Mounting	Either onto a 35mm DIN-rail or screw- mounted.	

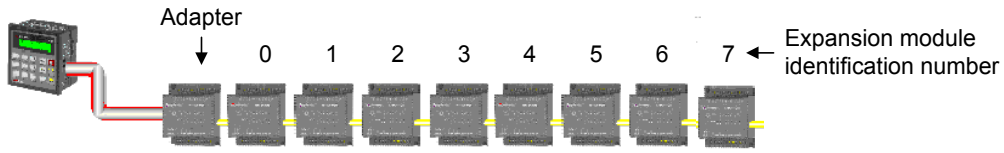
Notes:

1. The inputs' LEDs light up only when communication link is established between module and OPLC.

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[1] as shown in the figure below.



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

X is the number representing a specific module's location (0-7). Y is the number of the input or output on that specific module (0-15).

The number that represents the I/O's location is equal to:

$$32 + x \bullet 16 + y$$

Examples

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

[1] The maximum number of I/Os varies according to the types of I/O modules linked to the PLC.

About Unitronics

Unitronics has been producing PLCs, automation software and accessory devices since 1989.

Unitronics' OPLC controllers combine full-function PLCs and HMI operating panels into single, compact units. These HMI + PLC devices are programmed in a single, user-friendly environment. Our clients save I/O points, wiring, space, and programming time; elements that translate directly into cost-efficiency.

Unitronics supports a global network of distributors and sales representatives, as well as a U.S. subsidiary.

For more information regarding Unitronics products, contact your distributor, Unitronics headquarters via email: export@unitronics.com, or visit the Unitronics website at http://www.unitronics.com/.

5408-0250-4

IO-DI8-RO4, IO-DI8-RO4-L I/O Expansion Modules 8 Inputs, 4 Outputs

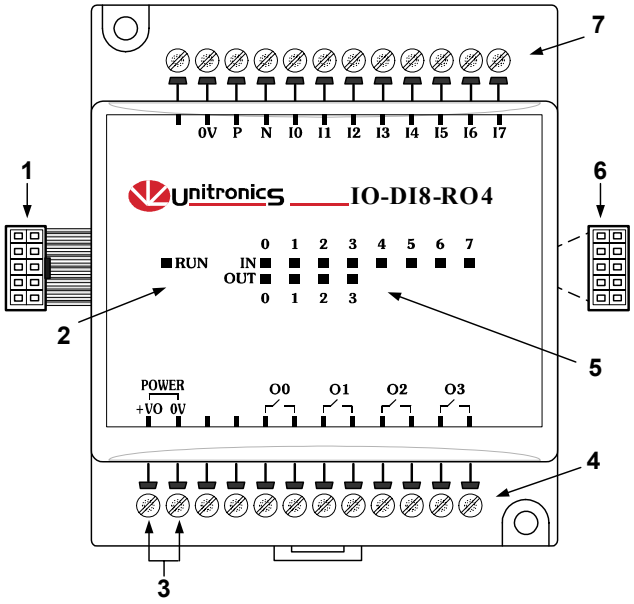
The IO-DI8-RO4 and IO-DI8-RO4-L are I/O expansion modules that can be used in conjunction with specific Unitronics OPLC controllers.

The modules are identical except for their voltage specifications: IO-DI8-RO4 runs at 24 VDC; IO-DI8-RO4-L at 12 VDC.

Both modules offer 8 digital inputs, type pnp/npn (source/sink), and 4 relay outputs.

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	
1	Module-to-module connector
2	Communication status indicator
3	Outputs' power supply connection points
4	Output connection points
5	Input/Output status indicators
6	Module-to-module connector port
7	Input connection points

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	Warning	The identified danger can cause physical and property damage.
Caution	Caution	Use caution.

- 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

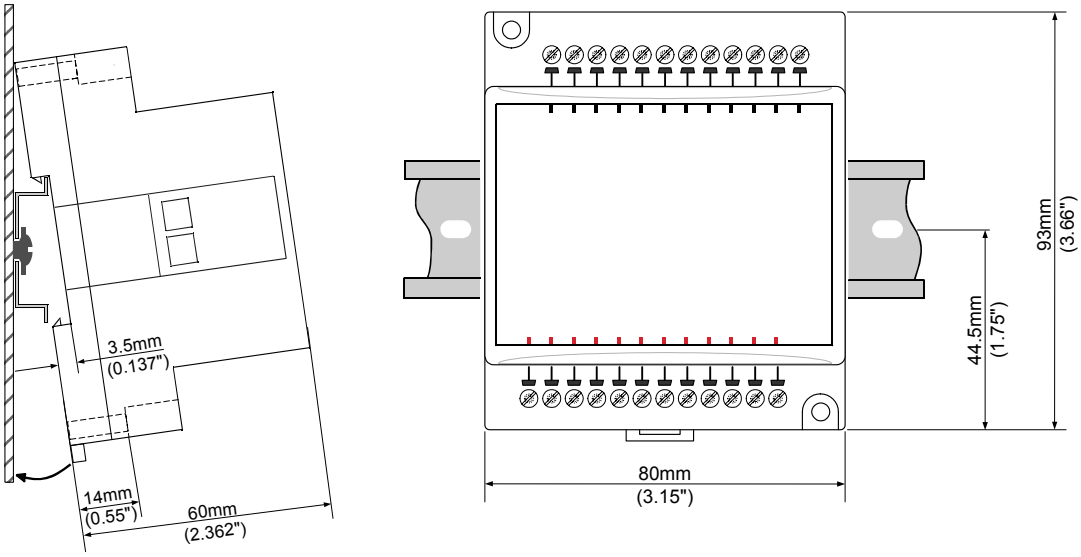
- Do not install in areas with: excessive or conductive dust, corrosive or flammable gas, moisture or rain, excessive heat, regular impact shocks or excessive vibration.

- 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

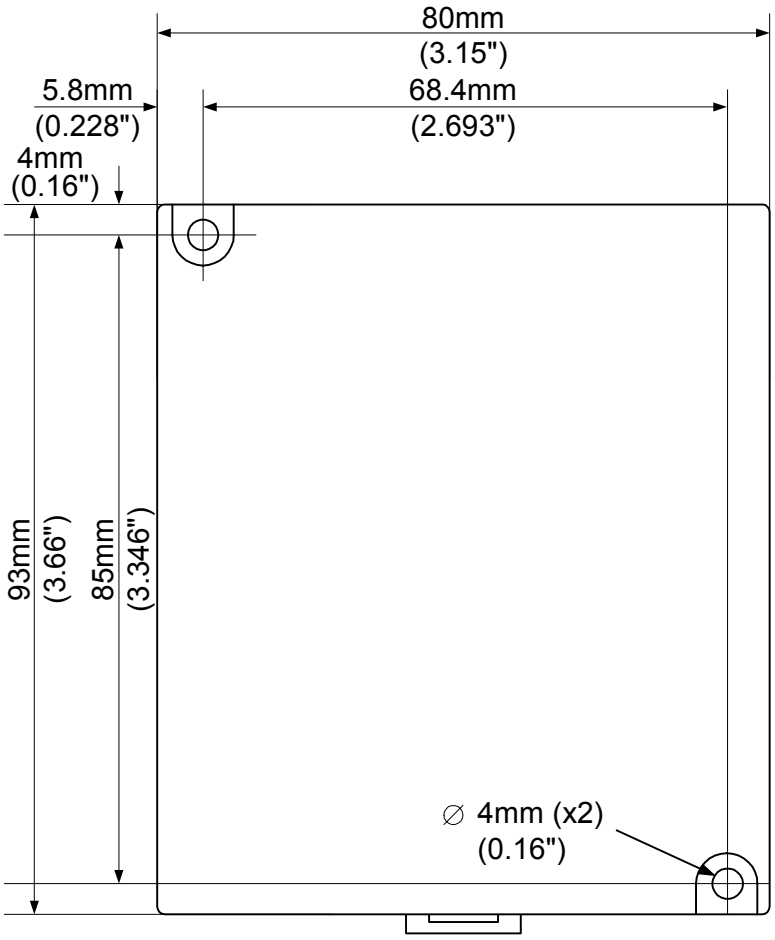
DIN-rail mounting

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.


80mm
(3.15")
5.8mm
(0.228")
68.4mm
(2.693")
4mm
(0.16")
93mm
(3.66")
85mm
(3.346")
∅ 4mm (x2)
(0.16")

Connecting Expansion Modules

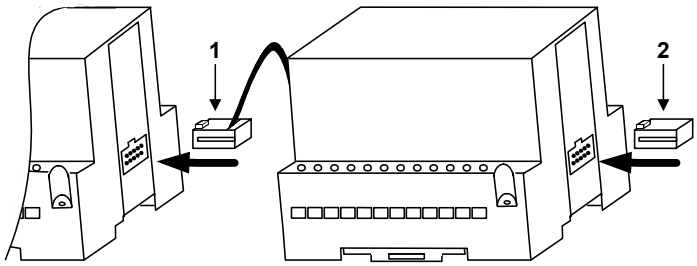
An adapter provides the interface between the OPLC and an expansion module. To connect the I/O module to the adapter or to another module:

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	
1	Module-to-module connector
2	Protective cap



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 mm ^{2}–3.31 mm^2) 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.

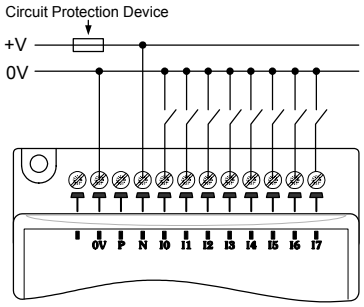
I/O Wiring—General

- 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/output lines used over an extended distance. Use wire that is properly sized for the load.
- The adapter, input signals, and outputs' power supply must be connected to the same 0V signal.

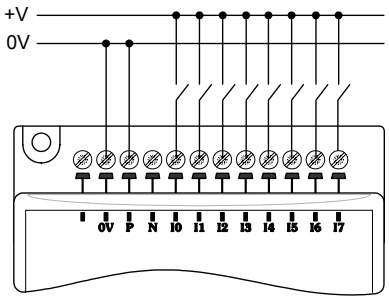
Digital I/Os

- Inputs may be wired as either pnp (source) or npn (sink) inputs.

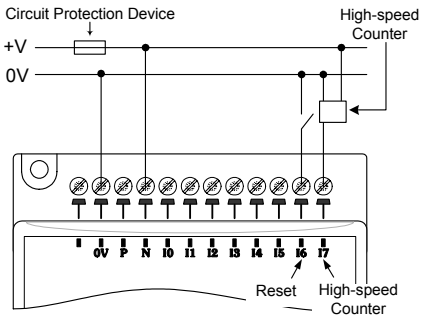
npn (sink) inputs



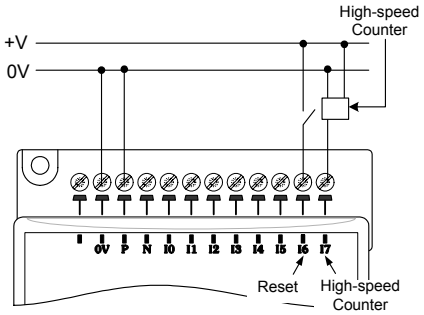
pnp (source) inputs



npn (sink)
high-speed counter/frequency measurer



pnp (source)
high-speed counter/frequency measurer



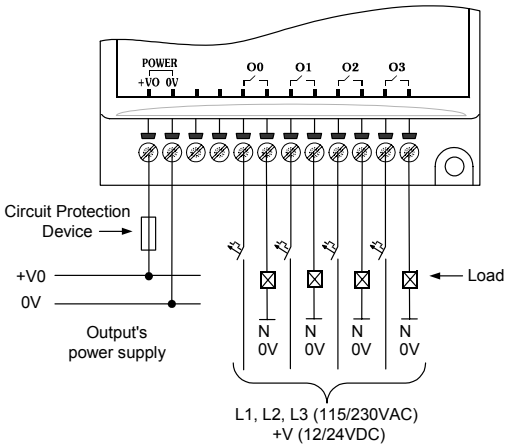
Wiring the Output's Power Supply

Wiring DC supply

1. Connect the "positive" cable to the "+V0" terminal, and the "negative" to the "0V" terminal.

- A non-isolated power supply can be used provided that a 0V signal is connected to the chassis.
- Do not connect the 'Neutral or 'Line' signal of the 110/220VAC to the device's 0V pin.
- In the event of voltage fluctuations or non-conformity to voltage power supply specifications, connect the device to a regulated power supply.

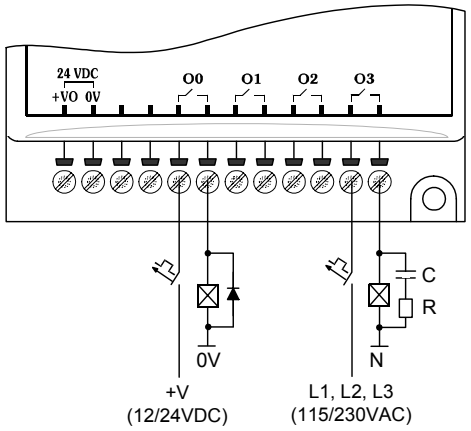
Outputs



Increasing Contact Life Span

Both modules have 4 relay outputs. To increase the life span of these contacts and protect the module from potential damage by reverse EMF, connect:

- a clamping diode in parallel with each inductive DC load,
- an RC snubber circuit in parallel with each inductive AC load.



IO-DI8-RO4, IO-DI8-RO4-L Technical Specifications

Max. current consumption	60mA maximum from the adapter's 5VDC	
Typical power consumption	0.15W @ 5VDC	
Status indicator		
(RUN)	Green LED: —Lit when a communication link is established between module and OPLC. —Blinks when the communication link fails.	
Inputs		
Number of inputs	8 (in one group)	
Input type	pnp (source) or npn (sink)	
Galvanic isolation	None	
Status indicators		
(IN)	Green LEDs—Lit when the corresponding input is active. See Note 1.	
Nominal input voltage	24VDC for IO-DI8-RO4, 12VDC for IO-DI8-RO4-L	
Input voltage	IO-DI8-RO4	IO-DI8-RO4-L
pnp (source)	0-5VDC for Logic '0' 17-28.8VDC for Logic '1'	0-3VDC for Logic '0' 8-15.6V for Logic '1'
npn (sink), voltage/current	17-28.8VDC/<1.1 mA for Logic '0' 0-5VDC/>4.3mA for Logic '1'	8-15.6VDC/<1.1 mA for Logic '0' 0-3VDC/>4.3mA for Logic '1'
Input current	6mA@24VDC	6mA@12VDC
Response time	10mSec typical	
Input #7	The specifications below apply when this input is wired for use as a high-speed counter input/frequency measurer. See Notes 2 and 3.	
Resolution	16-bit	
Frequency	5kHz maximum	
Minimum pulse width	80µs	

Outputs		
Number of outputs	4 relay	
Output type	SPST-NO relay; 230VAC / 24VDC	
Type of relay		
IO-DI8-RO4	Takamisawa JY-24H-K or NAIS (Matsushita) JQ1AP-24V or OMRON G6B-1114P-24VDC	
IO-DI8-RO4-L	Takamisawa JY-12H-K or NAIS (Matsushita) JQ1AP-12V or OMRON G6B-1114P-12VDC	
Isolation	By relay	
Status Indicators		
(OUT)	Red LEDs—Lit when the corresponding output is active.	
Output current	5A maximum (resistive load) 1A maximum (inductive load)	
Maximum frequency	10Hz	
Contact protection	External precautions required (see above: Increasing Contact Life Span)	
Outputs' power supply	IO-DI8-RO4	IO-DI8-RO4-L
Nominal operating voltage	24VDC	12VDC
Operating voltage	20.4 to 28.8VDC	10.2 to 15.6VDC
Maximum current consumption	40mA@24VDC	75mA@12VDC
Environmental	IP20 / NEMA1	
Operating temperature	0° to 50°C (32° to 122°F)	
Storage temperature	-20° to 60° C (-4° to 140°F)	
Relative Humidity (RH)	5% to 95% (non-condensing)	
Dimensions (WxHxD)	80mm x 93mm x 60mm (3.15" x 3.66" x 2.362")	
Weight	164g (5.8oz.)	
Mounting	Either onto a 35mm DIN-rail or screw- mounted.	

Notes:

1. The inputs' LEDs light up only when communication link is established between module and OPLC.
2. Input #7 can function either as a high-speed counter, a frequency measurer, or as a normal digital input. When Input #7 is used as a normal digital input, normal input specifications apply.
3. Input #6 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.

About Unitronics

Unitronics Industrial Automation Systems has been producing PLCs, automation software and accessory devices since 1989.

Unitronics' OPLC controllers combine full-function PLCs and HMI operating panels into single, compact units. These HMI + PLC devices are programmed in a single, user-friendly environment. Our clients save I/O points, wiring, space, and programming time; elements that translate directly into cost-efficiency.

Unitronics supports a global network of distributors and sales representatives, as well as a U.S. subsidiary.

For more information regarding Unitronics products, contact your distributor, Unitronics headquarters via email: export@unitronics.com, or visit the Unitronics website at http://www.unitronics.com/.

5408-0041-6

IO-DI8-RO8, IO-DI8-RO8-L I/O Expansion Modules 8 Inputs, 8 Outputs

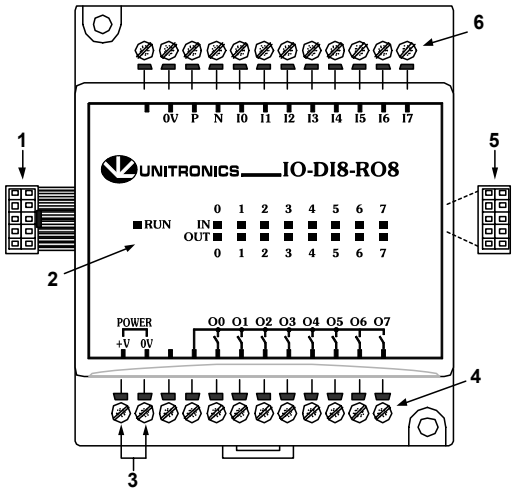
The IO-DI8-RO8 and IO-DI8-RO8-L are I/O expansion modules that can be used in conjunction with specific Unitronics OPLC controllers.

The modules are identical except for their voltage specifications: IO-DI8-RO8 runs at 24 VDC; IO-DI8-RO8-L at 12 VDC.

Both modules offer 8 digital inputs, type pnp/npn (source/sink), and 8 relay outputs.

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	
1	Module-to-module connector
2	Status indicators
3	Connection points for power supply to outputs
4	Output connection points
5	Module-to-module connector port
6	Input connection points

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- All examples and diagrams shown herein are intended to aid understanding, and do not guarantee operation. Unitronics accepts no responsibility for actual use of this product based on these examples.
- Please dispose of this product in accordance with local and national standards and regulations.
- Only qualified service personnel should open this device or carry out repairs.

User safety and equipment protection guidelines

This document is intended to aid trained and competent 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.

Symbol	Meaning	Description
	Danger	The identified danger causes physical and property damage.
	Warning	The identified danger can cause physical and property damage.
Caution	Caution	Use caution.

- 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

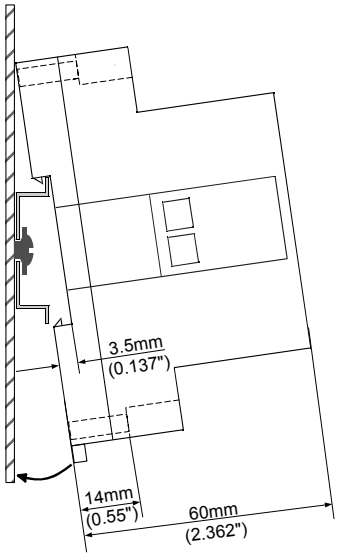
- Do not install in areas with: excessive or conductive dust, corrosive or flammable gas, moisture or rain, excessive heat, regular impact shocks or excessive vibration.

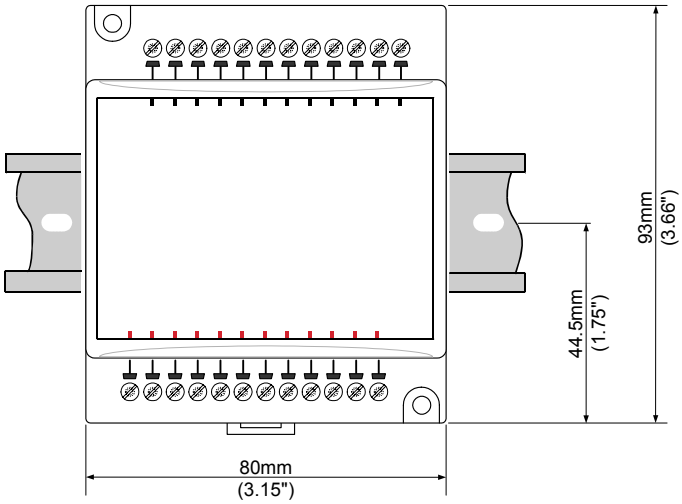
- Leave a minimum of 10mm space for ventilation between the top and bottom edges of the device and the enclosure walls.
- Do not place in water or let water leak onto the unit.
- Do not allow debris to fall inside the unit during installation.

Mounting the Module

DIN-rail mounting

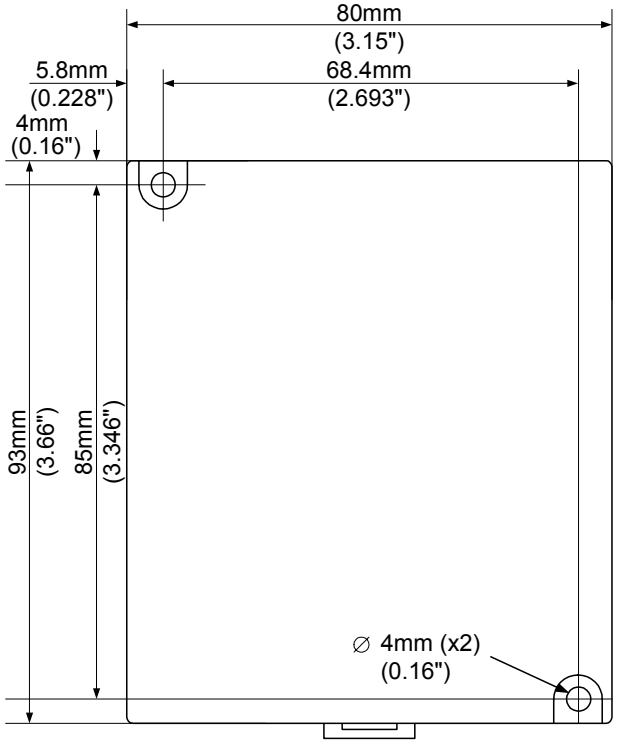
Snap the device onto the DIN rail as shown below; the module will be squarely situated on the DIN rail.





Screw-Mounting

The figure below is not 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

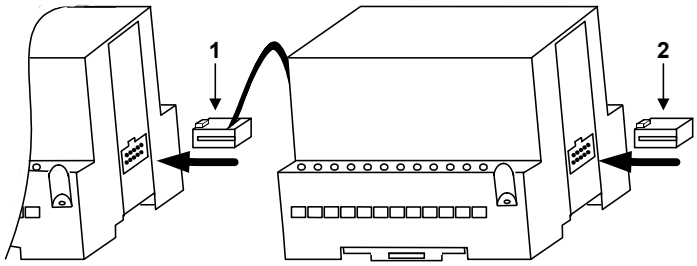
An adapter provides the interface between the OPLC and an expansion module. To connect the I/O module to the adapter or to another module:

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	
1	Module-to-module connector
2	Protective cap



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 mm ^{2}–3.31 mm^2) 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·cm).
- 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.

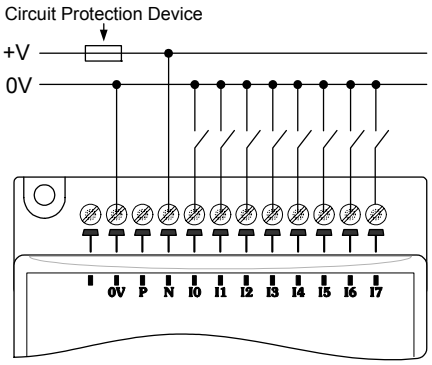
I/O Wiring—General

- 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/output lines used over an extended distance. Use wire that is properly sized for the load.
- The adapter and I/O signals must be connected to the same 0V signal.

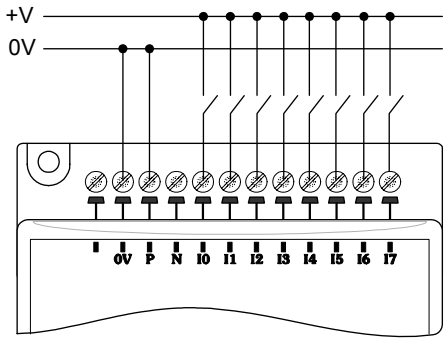
Digital I/Os

- Inputs may be wired as either pnp (source) or npn (sink) inputs.

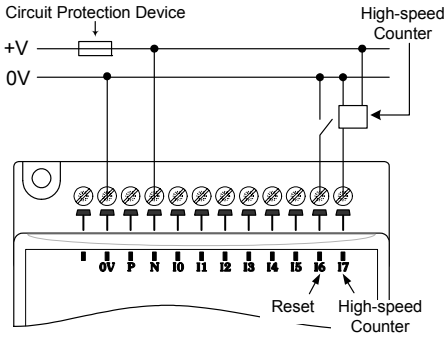
npn (sink) inputs



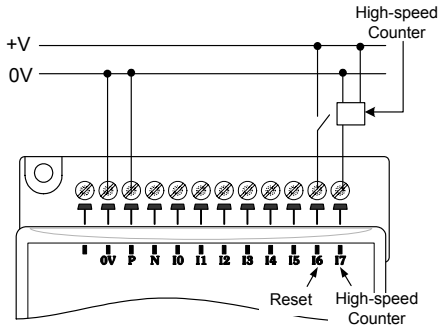
pnp (source) inputs



npn (sink)
high-speed counter/frequency measurer



pnp (source)
high-speed counter/frequency measurer



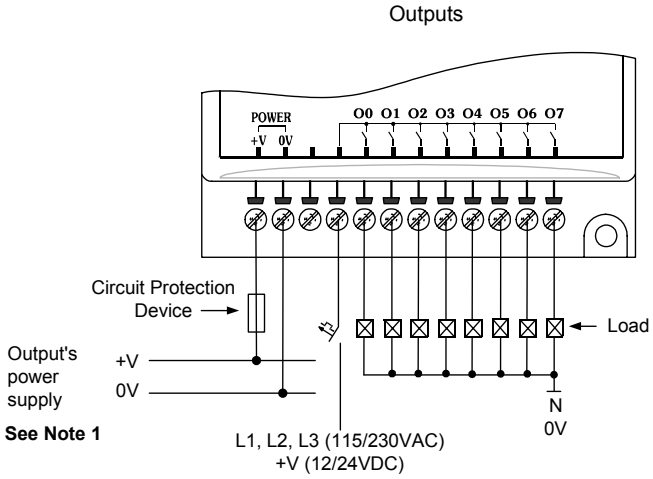
Wiring the Outputs' Power Supply

Wiring DC supply

1 Connect the "positive" cable to the "+V" terminal, and the "negative" to the "0V" terminal.

- A non-isolated power supply can be used provided that a 0V signal is connected to the chassis.
- Do not connect the 'Neutral' or 'Line' signal of the 110/220VAC to the device's 0V pin.
- In the event of voltage fluctuations or non-conformity to voltage power supply specifications, connect the device to a regulated power supply.

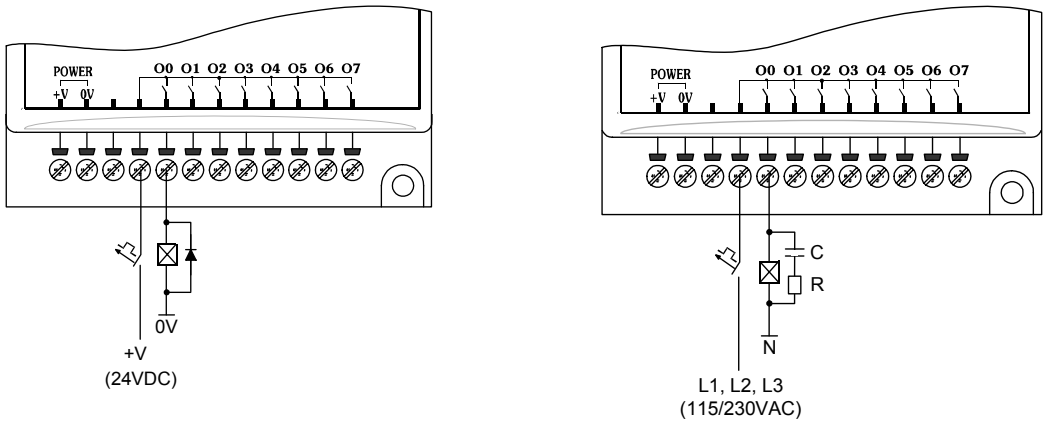
Notes: 1. The adapter and output's power supply must be connected to the same 0V signal.



Increasing Contact Life Span

Both modules have 8 relay outputs. To increase the life span of these contacts and protect the module from potential damage by reverse EMF, connect:

- a clamping diode in parallel with each inductive DC load,
- an RC snubber circuit in parallel with each inductive AC load.



IO-DI8-RO8, IO-DI8-RO8-L Technical Specifications

Max. current consumption	70mA maximum from the adapter's 5VDC
Typical power consumption	0.18W @ 5VDC
Status indicator	
(RUN)	Green LED: —Lit when a communication link is established between module and OPLC. —Blinks when the communication link fails.

Inputs

Number of inputs	8 (in one group)	
Input type	pnp (source) or npn (sink)	
Galvanic isolation	None	
Status indicators(IN)	Green LEDs—Lit when the corresponding input is active. See Note 1.	
Nominal input voltage	24VDC for IO-DI8-RO8, 12VDC for IO-DI8-RO8-L	
Input voltage	IO-DI8-RO8	IO-DI8-RO8-L
pnp (source)	0-5VDC for Logic '0' 17-28.8VDC for Logic '1'	0-3VDC for Logic '0' 8-15.6V for Logic '1'
npn (sink), voltage/current	17-28.8VDC/<1.1 mA for Logic '0' 0-5VDC/>4.3mA for Logic '1'	8-15.6VDC/<1.1 mA for Logic '0' 0-3VDC/>4.3mA for Logic '1'
Input current	6mA@24VDC	6mA@12VDC
Response time	10mSec typical	
Input #7	The specifications below apply when this input is wired for use as a high-speed counter input/frequency measurer. See Notes 2 and 3.	
Resolution	16-bit	
Frequency	5kHz maximum	
Minimum pulse width	80µs	

Outputs

Number of outputs	8 relay
Output type	SPST-NO (Form A) All relays share a common signal
Isolation	By relay
Type of relay	
IO-DI8-RO8	Tyco PCN-124D3MHZ or compatible
IO-DI8-RO8-L	Tyco PCN-112D3MHZ or compatible
Output current	3A maximum per output (resistive load) 8A maximum total for common (resistive load).
Rated voltage	250VAC / 30VDC
Minimum load	1mA@5VDC
Life expectancy	100k operations at maximum load
Response time	10mS (typical)
Status Indicators (OUT)	Red LEDs—Lit when the corresponding output is active.
Contact protection	External precautions required (see above: Increasing Contact Life Span)
Outputs' power supply: IO-DI8-RO8	
Nominal operating voltage	24VDC
Operating voltage	20.4 to 28.8VDC
Maximum current consumption	70mA@24VDC

Outputs' power supply: IO-DI8-RO8-L	
Nominal operating voltage	12VDC
Operating voltage	10.2 to 15.6VDC
Maximum current consumption	90mA@12VDC
Environmental	IP20 / NEMA1
Operating temperature	0° to 50°C (32° to 122°F)
Storage temperature	-20° to 60° C (-4° to 140°F)
Relative Humidity (RH)	5% to 95% (non-condensing)
Dimensions (WxHxD)	80mm x 93mm x 60mm (3.15 " x 3.66 " x 2.362 ")
Weight	172g (6.07oz.)
Mounting	Either onto a 35mm DIN-rail or screw- mounted.

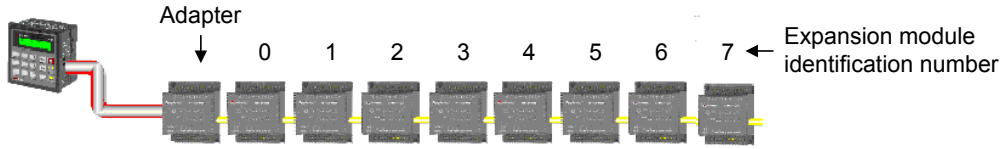
Notes:

1. The inputs' LEDs light up only when communication link is established between module and OPLC.
2. Input #7 can function either as a high-speed counter, a frequency measurer, or as a normal digital input. When Input #7 is used as a normal digital input, normal input specifications apply.
3. Input #6 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.

X is the number representing a specific module's location (0-7). Y is the number of the input or output on that specific module (0-15).

The number that represents the I/O's location is equal to:

$$32 + x \cdot 16 + y$$

Examples

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

IO-DI8-TO8, IO-DI8-TO8-L I/O Expansion Modules 8 Inputs, 8 Outputs

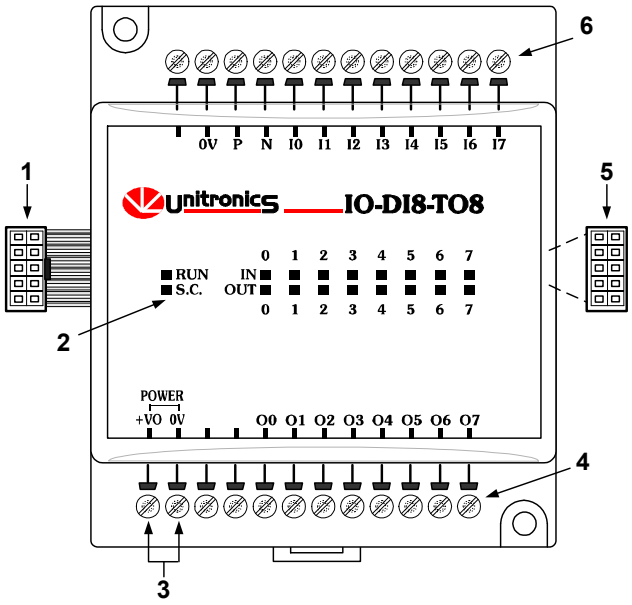
The IO-DI8-TO8 and IO-DI8-TO8-L are I/O expansion modules that can be used in conjunction with specific Unitronics OPLC controllers.

The modules are identical except for their voltage specifications: IO-DI8-TO8 runs at 24 VDC; IO- DI8-TO8-L at 12 VDC.

Both modules offer 8 digital inputs, type pnp/npn (source/sink), and 8 pnp (source) transistor outputs.

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	
1	Module-to-module connector
2	Status indicators
3	Connection points for power supply to outputs
4	Output connection points
5	Module-to-module connector port
6	Input connection points

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Symbol	Meaning	Description
	Danger	The identified danger causes physical and property damage.
	Warning	The identified danger can cause physical and property damage.
Caution	Caution	Use caution.

- 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

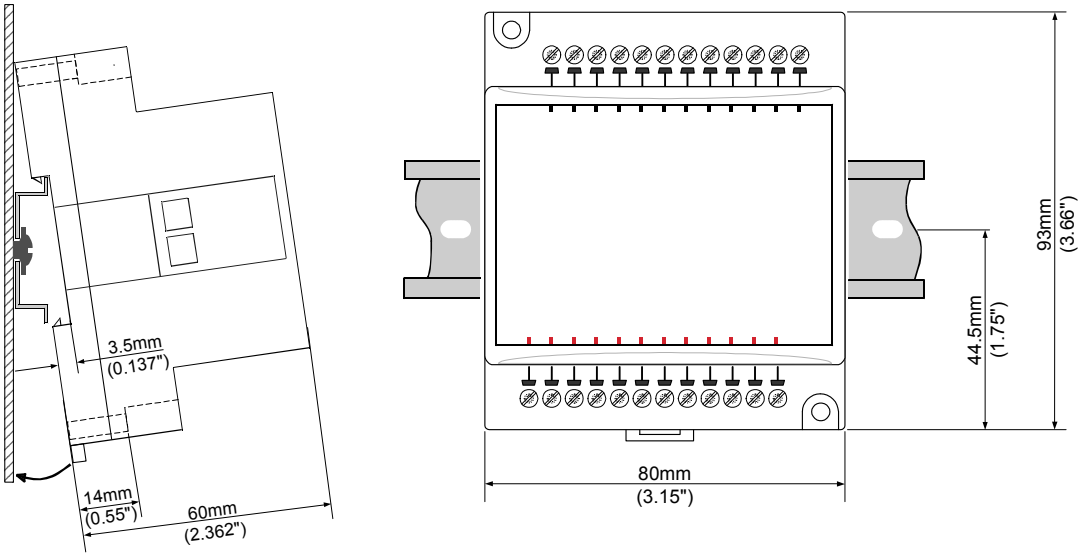
- Do not install in areas with: excessive or conductive dust, corrosive or flammable gas, moisture or rain, excessive heat, regular impact shocks or excessive vibration.

- 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

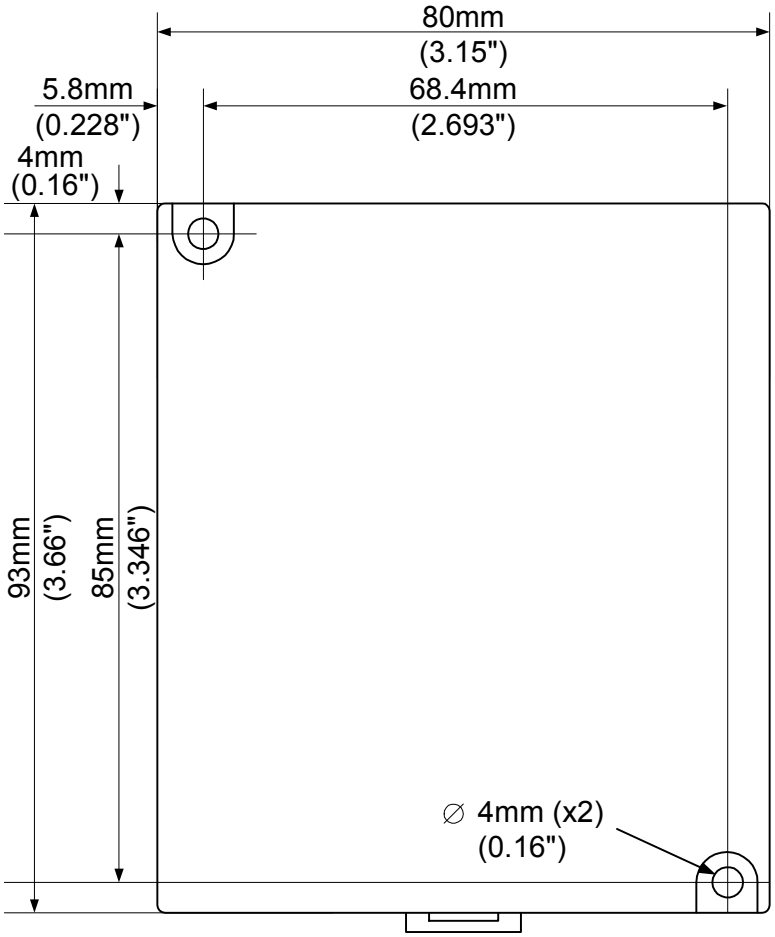
DIN-rail mounting

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.


80mm
(3.15")
5.8mm
(0.228")
68.4mm
(2.693")
4mm
(0.16")
93mm
(3.66")
85mm
(3.346")
∅ 4mm (x2)
(0.16")

Connecting Expansion Modules

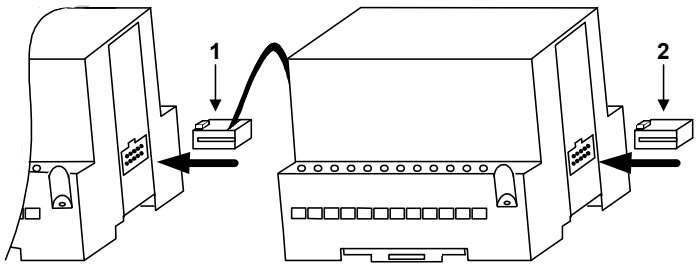
An adapter provides the interface between the OPLC and an expansion module. To connect the I/O module to the adapter or to another module:

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	
1	Module-to-module connector
2	Protective cap



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 mm ^{2}–3.31 mm^2) 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.

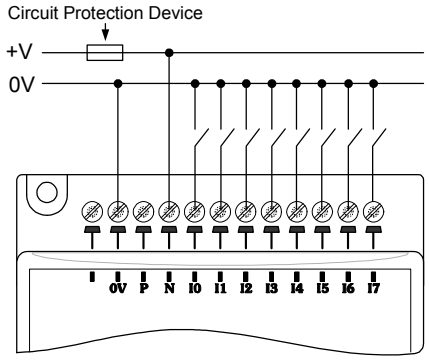
I/O Wiring—General

- 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/output lines used over an extended distance. Use wire that is properly sized for the load.
- The adapter and I/O signals must be connected to the same 0V signal.

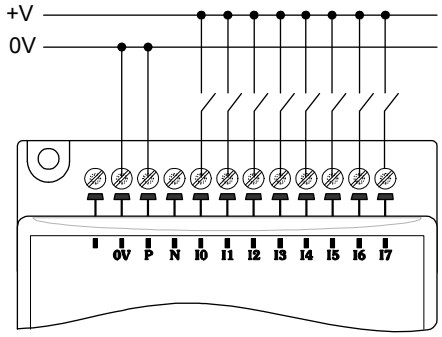
Digital I/Os

- Inputs may be wired as either pnp (source) or npn (sink) inputs.

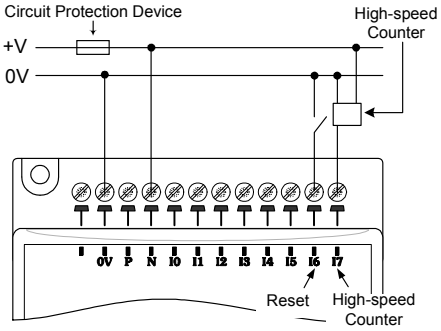
npn (sink) inputs



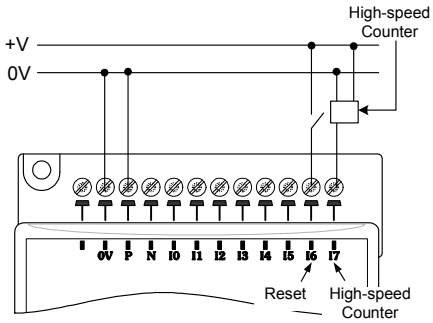
pnp (source) inputs



npn (sink)
high-speed counter/frequency measurer



pnp (source)
high-speed counter/frequency measurer



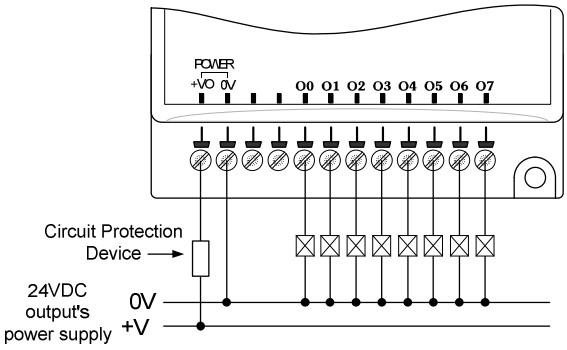
Wiring the Output's Power Supply

Wiring DC supply

1. Connect the "positive" cable to the "+V0" terminal, and the "negative" to the "0V" terminal.

- A non-isolated power supply can be used provided that a 0V signal is connected to the chassis.
- Do not connect the 'Neutral or 'Line' signal of the 110/220VAC to the device's 0V pin.
- In the event of voltage fluctuations or non-conformity to voltage power supply specifications, connect the device to a regulated power supply.

Outputs



IO-DI8-TO8, IO-DI8-TO8-L Technical Specifications

Max. current consumption	70mA maximum from the adapter's 5VDC	
Typical power consumption	0.15W @ 5VDC	
Status indicator		
(RUN)	Green LED: —Lit when a communication link is established between module and OPLC. —Blinks when the communication link fails.	
Inputs		
Number of inputs	8 (in one group)	
Input type	pnp (source) or npn (sink)	
Galvanic isolation	None	
Status indicators		
(IN)	Green LEDs—Lit when the corresponding input is active. See Note 1.	
Nominal input voltage	24VDC for IO-DI8-TO8, 12VDC for IO-DI8-TO8-L	
Input voltage	IO-DI8-TO8	IO-DI8-TO8-L
pnp (source)	0-5VDC for Logic '0' 17-28.8VDC for Logic '1'	0-3VDC for Logic '0' 8-15.6V for Logic '1'
npn (sink), voltage/current	17-28.8VDC/<1.1 mA for Logic '0' 0-5VDC/>4.3mA for Logic '1'	8-15.6VDC/<1.1 mA for Logic '0' 0-3VDC/>4.3mA for Logic '1'
Input current	6mA@24VDC	6mA@12VDC
Response time	10mSec typical	
Input #7	The specifications below apply when this input is wired for use as a high-speed counter input/frequency measurer. See Notes 2 and 3.	
Resolution	16-bit	
Frequency	5kHz maximum	
Minimum pulse width	80µs	
Outputs		
Number of outputs	8 pnp (source)	
Output type	P-MOSFET (open drain) for both 24VDC and 12VDC outputs	
Galvanic isolation	None	
Output current	0.5A maximum (per output) Total current: 3A maximum (all outputs)	
Maximum frequency	20Hz (resistive load) 0.5 Hz (inductive load)	
Short circuit protection	Yes	
Status Indicators		
(OUT)	Red LEDs—Lit when the corresponding output is active.	
(S.C)	Red LED—Lit when an output's load short-circuits. See Note 4 below.	
Voltage		
Operating voltage	10.2 to 28.8VDC	
Nominal operating voltage	12/24VDC	
Environmental	IP20 / NEMA1	
Operating temperature	0° to 50°C (32° to 122°F)	
Storage temperature	-20° to 60° C (-4° to 140°F)	
Relative Humidity (RH)	5% to 95% (non-condensing)	
Dimensions (WxHxD)	80mm x 93mm x 60mm (3.15" x 3.66" x 2.362")	
Weight	141g (4.9oz.)	
Mounting	Either onto a 35mm DIN-rail or screw- mounted.	

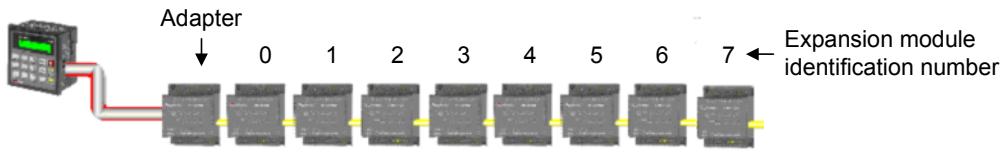
Notes:

1. The inputs' LEDs light up only when communication link is established between module and OPLC.
2. Input #7 can function either as a high-speed counter, a frequency measurer, or as a normal digital input. When Input #7 is used as a normal digital input, normal input specifications apply.
3. Input #6 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.
4. When an output is connected to a load that short-circuits, that output turns off and the S.C. LED lights up on the module. The short circuit is also identified by the software program within the controller connected to the module. Within the M90 OPLC, for example, SB 5 turns ON. SI 5 contains a bitmap indicating the module containing the affected output. For more information, refer to the on-line help supplied with the controller.

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.

X is the number representing a specific module's location (0-7). Y is the number of the input or output on that specific module (0-15).

The number that represents the I/O's location is equal to:

$$32 + x \bullet 16 + y$$

Examples

- Input #3, located on expansion module #2 in the system, will be addressed as I 67, 67 = 32 + 2 • 16 + 3
- Output #4, located on expansion module #3 in the system, will be addressed as O 84, 84 = 32 + 3 • 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 • 16 + 5

About Unitronics

Unitronics has been producing PLCs, automation software and accessory devices since 1989.

Unitronics' OPLC controllers combine full-function PLCs and HMI operating panels into single, compact units. These HMI + PLC devices are programmed in a single, user-friendly environment. Our clients save I/O points, wiring, space, and programming time; elements that translate directly into cost-efficiency.

Unitronics supports a global network of distributors and sales representatives, as well as a U.S. subsidiary.

For more information regarding Unitronics products, contact your distributor, Unitronics headquarters via email: export@unitronics.com, or visit the Unitronics website at http://www.unitronics.com/.

IO-DI16, IO-DI16-L I/O Expansion Modules 16 Digital Inputs

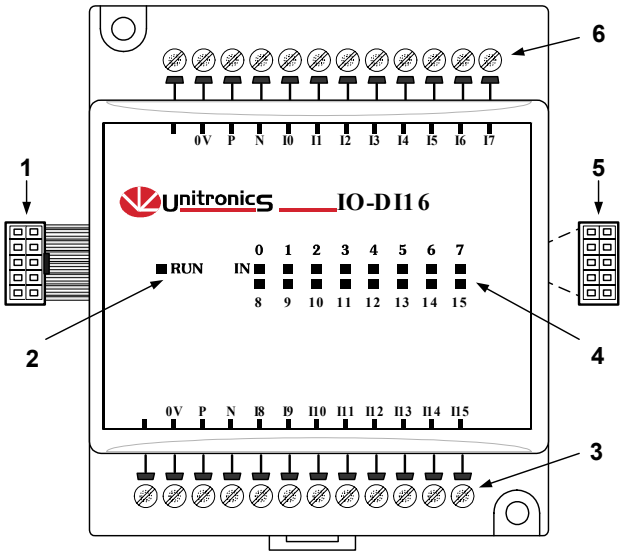
The IO-DI16 and IO-DI16-L are I/O expansion modules that can be used in conjunction with specific Unitronics OPLC controllers.

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	
1	Module-to-module connector
2	Communication status indicator
3	Input connection points: I8-I15
4	Input status indicators
5	Module-to-module connector port
6	Input connection points: I0-I7

- Before using this product, it is the responsibility of the user to read and understand this document and any accompanying documentation.
- All examples and diagrams shown herein are intended to aid understanding, and do not guarantee operation. Unitronics accepts no responsibility for actual use of this product based on these examples.
- Please dispose of this product in accordance with local and national standards and regulations.
- Only qualified service personnel should open this device or carry out repairs.

User safety and equipment protection guidelines

This document is intended to aid trained and competent 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.

Symbol	Meaning	Description
	Danger	The identified danger causes physical and property damage.
	Warning	The identified danger can cause physical and property damage.
Caution	Caution	Use caution.

- 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

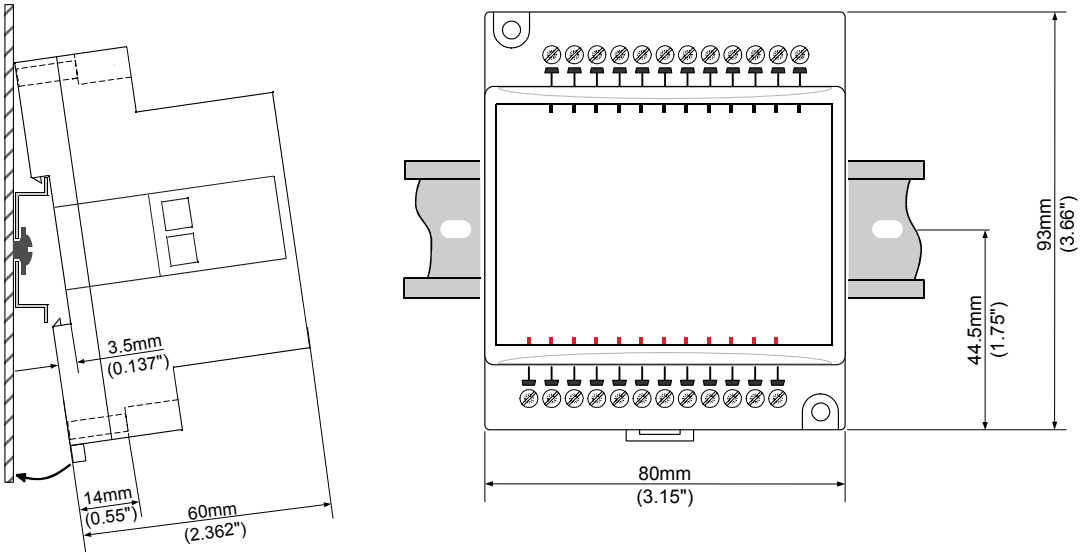
- Do not install in areas with: excessive or conductive dust, corrosive or flammable gas, moisture or rain, excessive heat, regular impact shocks or excessive vibration.

- 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

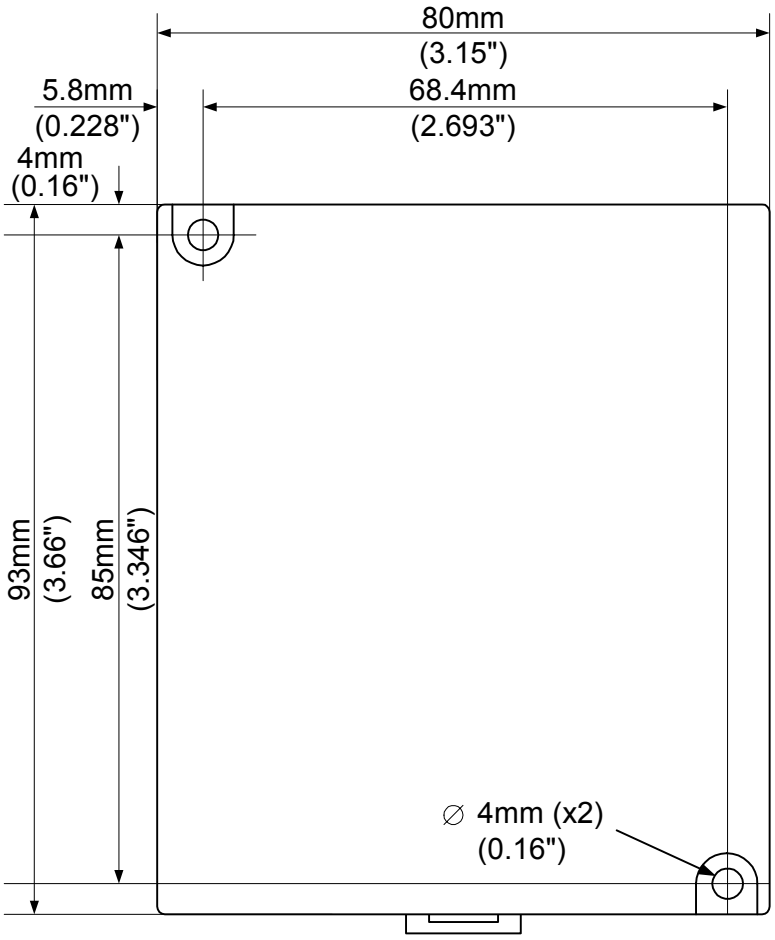
DIN-rail mounting

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.


80mm
(3.15")
5.8mm
(0.228")
68.4mm
(2.693")
4mm
(0.16")
93mm
(3.66")
85mm
(3.346")
∅ 4mm (x2)
(0.16")

Connecting Expansion Modules

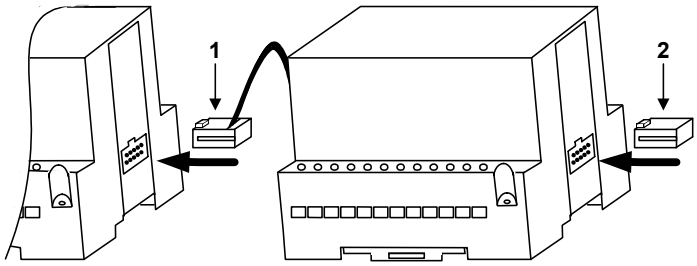
An adapter provides the interface between the OPLC and an expansion module. To connect the I/O module to the adapter or to another module:

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	
1	Module-to-module connector
2	Protective cap



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 mm ^{2}–3.31 mm^2) 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.

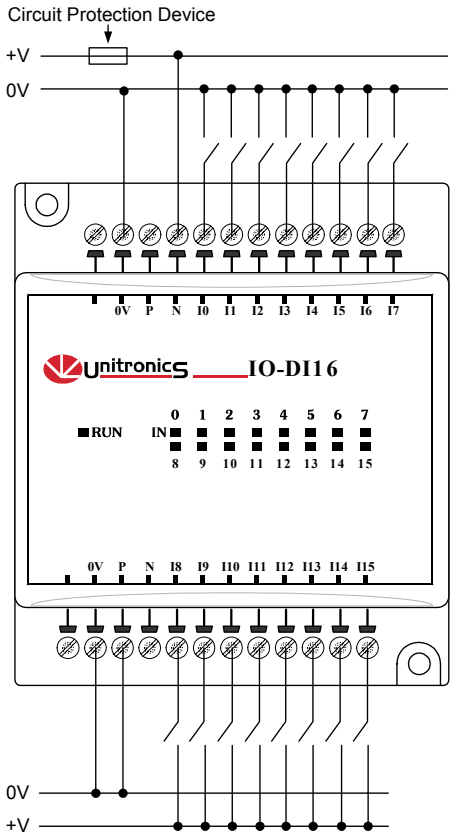
I/O Wiring—General

- 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

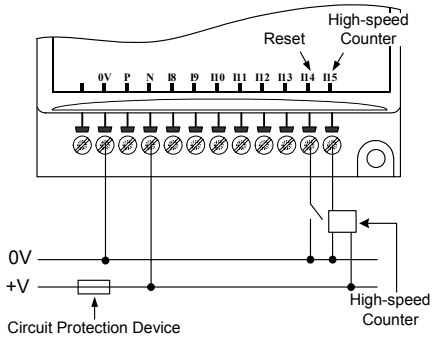
- Each group of inputs may be wired as either pnp (source) or npn (sink) inputs.

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

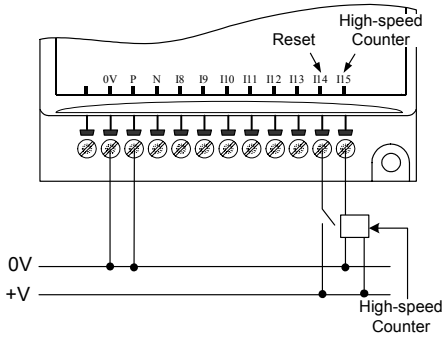


high-speed counter/frequency measurer

npn (sink)



pnp (source)



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

IO-DI16, IO-DI16-L Technical Specifications

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

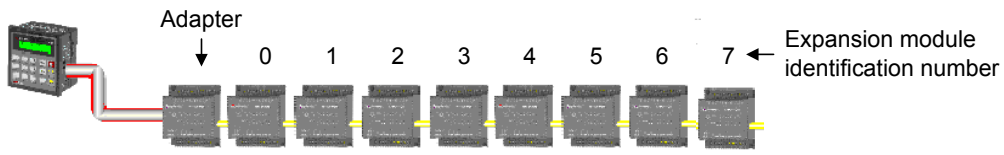
Notes:

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.

X is the number representing a specific module's location (0-7). Y is the number of the input or output on that specific module (0-15).

The number that represents the I/O's location is equal to:

$$32 + x \bullet 16 + y$$

Examples

- Input #3, located on expansion module #2 in the system, will be addressed as I 67, 67 = 32 + 2 • 16 + 3
- Output #4, located on expansion module #3 in the system, will be addressed as O 84, 84 = 32 + 3 • 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 • 16 + 5

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5408-0021-0

IO-RO8, IO-RO8L I/O Expansion Module 8 Relay Outputs

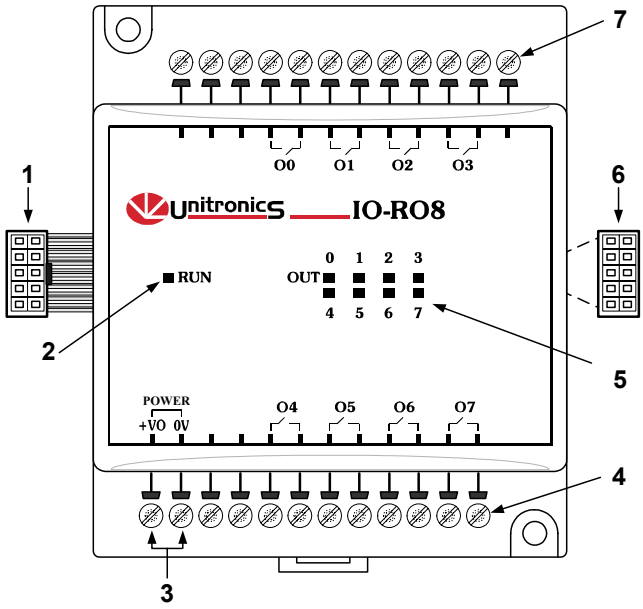
The IO-RO8 and IO-RO8L are I/O expansion modules that can be used in conjunction with specific Unitronics OPLC controllers.

The modules are identical except for their power supply specifications: IO-RO8 runs at 24 VDC; IO-RO8L at 12 VDC.

Both modules offer 8 relay outputs.

The interface between module and 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

1	Module-to-module connector
2	Communication status indicator
3	Outputs' power supply connection points
4	Output connection points: O4-O7
5	Output's status indicators
6	Module-to-module connector port
7	Output connection points: O0-O3

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- All examples and diagrams shown herein are intended to aid understanding, and do not guarantee operation. Unitronics accepts no responsibility for actual use of this product based on these examples.
- Please dispose of this product in accordance with local and national standards and regulations.
- Only qualified service personnel should open this device or carry out repairs.

User safety and equipment protection guidelines

This document is intended to aid trained and competent 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.

Symbol	Meaning	Description
	Danger	The identified danger causes physical and property damage.
	Warning	The identified danger can cause physical and property damage.
Caution	Caution	Use caution.

- 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

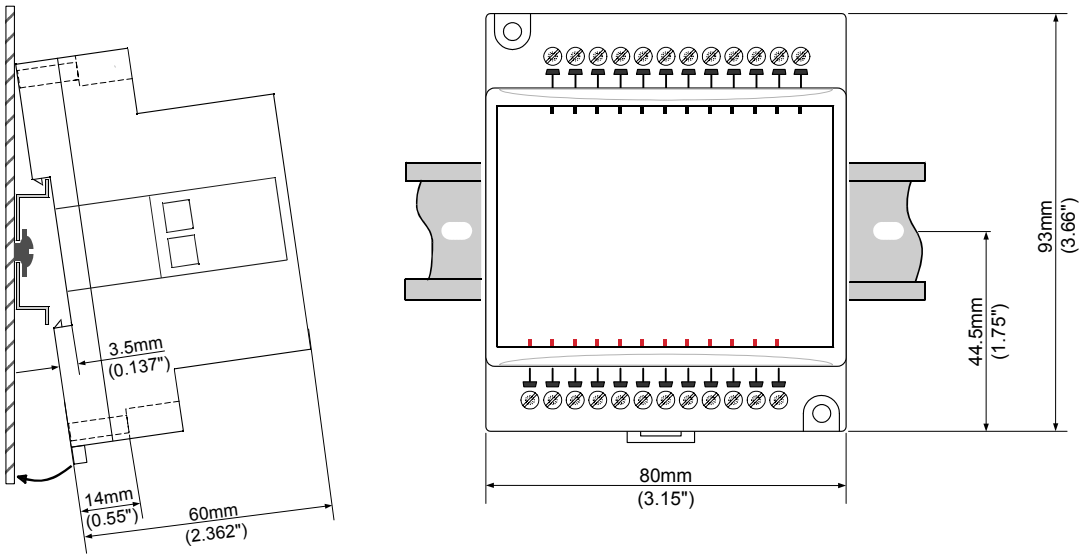
- Do not install in areas with: excessive or conductive dust, corrosive or flammable gas, moisture or rain, excessive heat, regular impact shocks or excessive vibration.

- 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

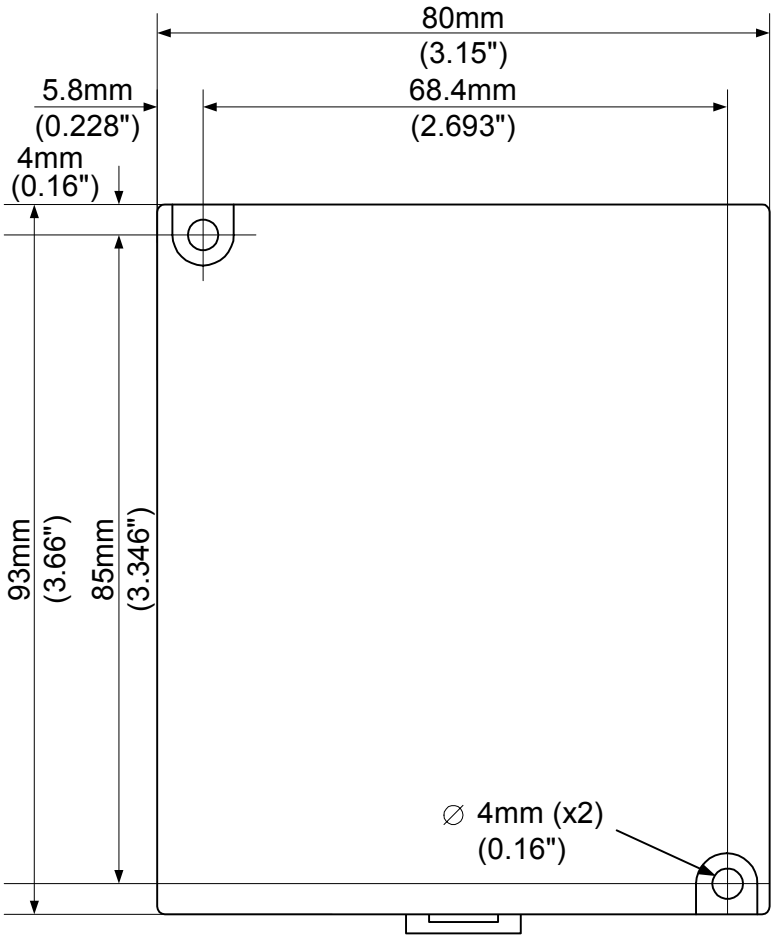
DIN-rail mounting

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.


80mm
(3.15")
5.8mm
(0.228")
68.4mm
(2.693")
4mm
(0.16")
93mm
(3.66")
85mm
(3.346")
∅ 4mm (x2)
(0.16")

Connecting Expansion Modules

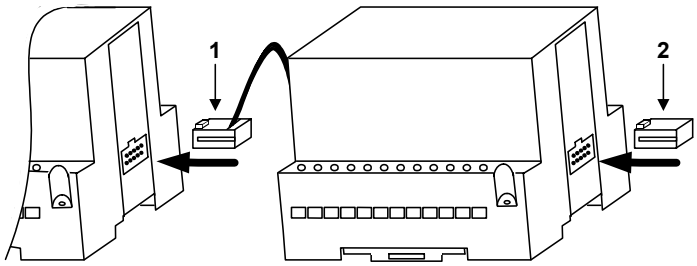
An adapter provides the interface between the OPLC and an expansion module. To connect the I/O module to the adapter or to another module:

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	
1	Module-to-module connector
2	Protective cap



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 mm ^{2}–3.31 mm^2) 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.

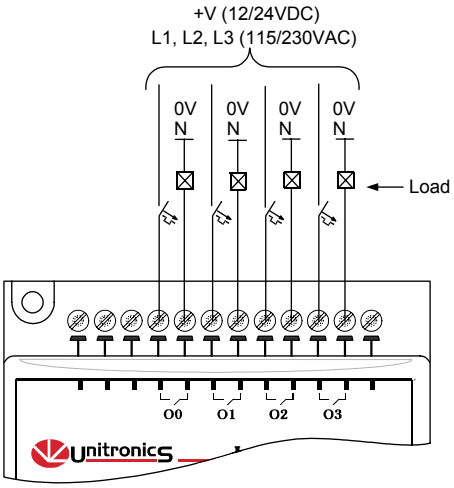
I/O Wiring—General

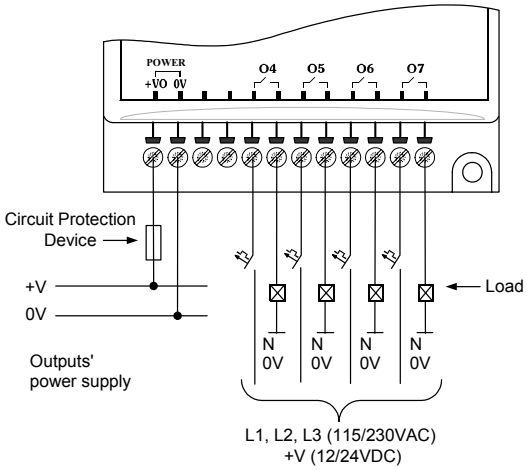
- Input or output cables should not be run through the same multi-core cable or share the same wire.
- Allow for voltage drop and noise interference with input/output lines used over an extended distance. Use wire that is properly sized for the load.
- The adapter and module's power supply must be connected to the same 0V signal.

Relay Outputs

Wiring the Output's Power Supply

1. Connect the "positive" cable to the "+V0" terminal, and the "negative" to the "0V" terminal.
   - A non-isolated power supply can be used provided that a 0V signal is connected to the chassis.
   - Do not connect the 'Neutral or 'Line' signal of the 110/220VAC to the device's 0V pin.
   - In the event of voltage fluctuations or non-conformity to voltage power supply specifications, connect the device to a regulated power supply.

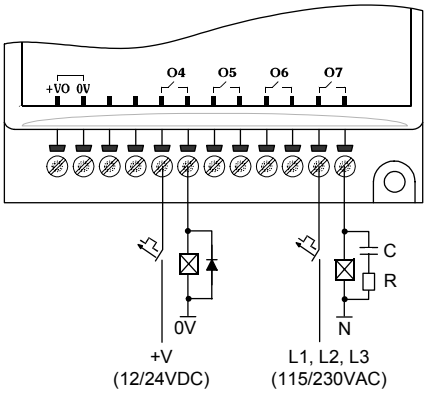




Increasing Contact Life Span

Both modules have 4 relay outputs. To increase the life span of these contacts and protect the module from potential damage by reverse EMF, connect:

- a clamping diode in parallel with each inductive DC load,
- an RC snubber circuit in parallel with each inductive AC load.



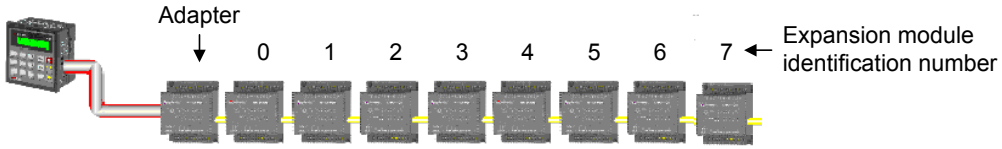
IO-RO8, IO-RO8L Technical Specifications

Max. current consumption	50mA maximum from the adapter's 5VDC
Typical power consumption	0.13W@ 5VDC
Status indicators	
(RUN)	Green LED: —Lit when a communication link is established between module and OPLC. —Blinks when the communication link fails.
Outputs	
Number of outputs	8 relay
Output type	SPST-NO relay; 230VAC / 12/24VDC
Type of relay: IO-RO8	Takamisawa JY-24H-K or NAIS (Matsushita) JQ1AP-24V or OMRON G6B-1114P-24VDC
Type of relay: IO-RO8L	Fujitsu JY-12H-K or NAIS (Matsushita) JQ1AP-12V or OMRON G6B-1114P-12VDC
Isolation	By relay
Status Indicators	
(O0 to O7)	Red LEDs—Lit when the corresponding output is active.
Output current	5A maximum (resistive load) 1A maximum (inductive load)
Maximum frequency	10Hz
Contact protection	External precautions required (see above: Increasing Contact Life Span)
Outputs' power supply: IO-RO8	
Nominal operating voltage	24VDC
Operating voltage	20.4 to 28.8VDC
Maximum current consumption	75mA@24VDC
Outputs' power supply: IO-RO8L	
Nominal operating voltage	12VDC
Operating voltage	10.2 to 15.6VDC
Maximum current consumption	145mA@12VDC
Environmental	IP20/NEMA1
Operating temperature	0° to 50° C (32 to 122°F)
Storage temperature	-20° to 60° C (-4 to 140°F)
Relative Humidity (RH)	5% to 95% (non-condensing)
Dimensions (WxHxD)	80mm x 93mm x 60mm (3.15" x 3.66" x 2.362")
Weight	183g (6.45 oz.)
Mounting	Either onto a 35mm DIN-rail or screw- mounted.

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.

X is the number representing a specific module's location (0-7). Y is the number of the input or output on that specific module (0-15).

The number that represents the I/O's location is equal to:

$$32 + x \bullet 16 + y$$

Examples

- Input #3, located on expansion module #2 in the system, will be addressed as I 67, 67 = 32 + 2 • 16 + 3
- Output #4, located on expansion module #3 in the system, will be addressed as O 84, 84 = 32 + 3 • 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 • 16 + 5

About Unitronics

Unitronics Industrial Automation Systems has been producing PLCs, automation software and accessory devices since 1989.

Unitronics' OPLC controllers combine full-function PLCs and HMI operating panels into single, compact units. These HMI + PLC devices are programmed in a single, user-friendly environment. Our clients save I/O points, wiring, space, and programming time; elements that translate directly into cost-efficiency.

Unitronics supports a global network of distributors and sales representatives, as well as a U.S. subsidiary.

For more information regarding Unitronics products, contact your distributor, Unitronics headquarters via email: export@unitronics.com, or visit the Unitronics website at http://www.unitronics.com/.

5408-0051-9

IO-RO16, IO-RO16-L I/O Expansion Modules 16 Relay Outputs

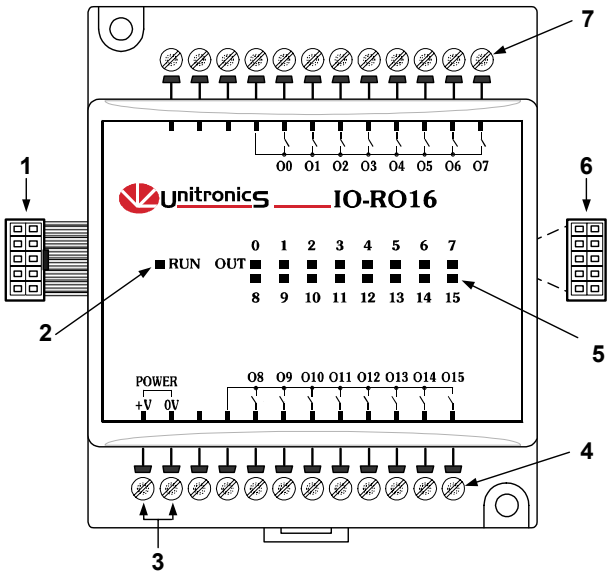
The IO-RO16 and IO-RO16-L are I/O expansion modules that can be used in conjunction with specific Unitronics OPLC controllers.

The modules are identical except for their power supply specifications: IO-RO16 runs at 24 VDC; IO-RO16-L at 12 VDC.

Each module offers 16 relay outputs.

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	
1	Module-to-module connector
2	Communication status indicator
3	Outputs' power supply connection points
4	Output connection points: O8-O15
5	Output's status indicators
6	Module-to-module connector port
7	Output connection points: O0-O7

- Before using this product, it is the responsibility of the user to read and understand this document and any accompanying documentation.
- All examples and diagrams shown herein are intended to aid understanding, and do not guarantee operation. Unitronics accepts no responsibility for actual use of this product based on these examples.
- Please dispose of this product in accordance with local and national standards and regulations.
- Only qualified service personnel should open this device or carry out repairs.

User safety and equipment protection guidelines

This document is intended to aid trained and competent 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.

Symbol	Meaning	Description
	Danger	The identified danger causes physical and property damage.
	Warning	The identified danger can cause physical and property damage.
Caution	Caution	Use caution.

- 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

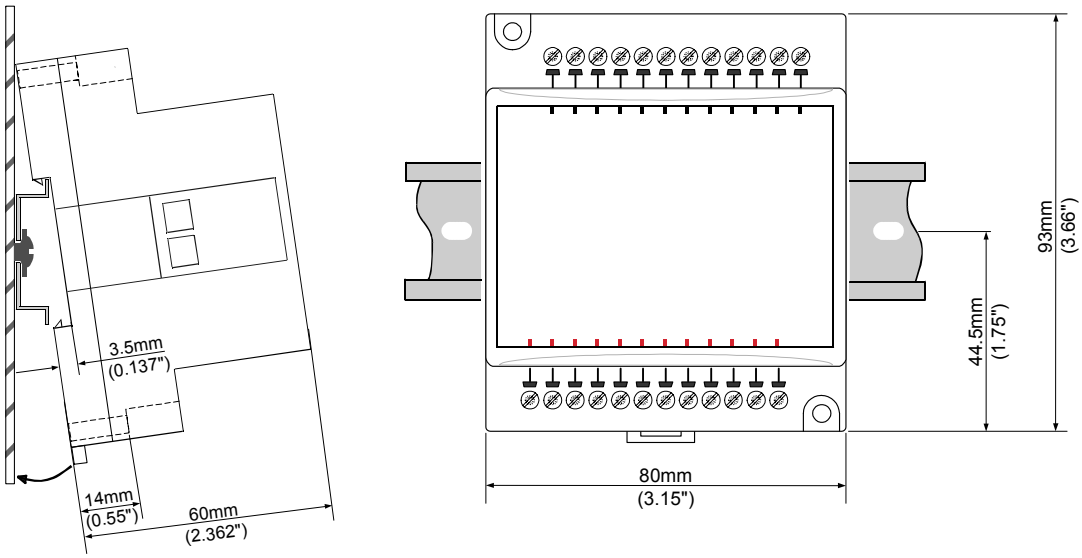
- Do not install in areas with: excessive or conductive dust, corrosive or flammable gas, moisture or rain, excessive heat, regular impact shocks or excessive vibration.

- 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

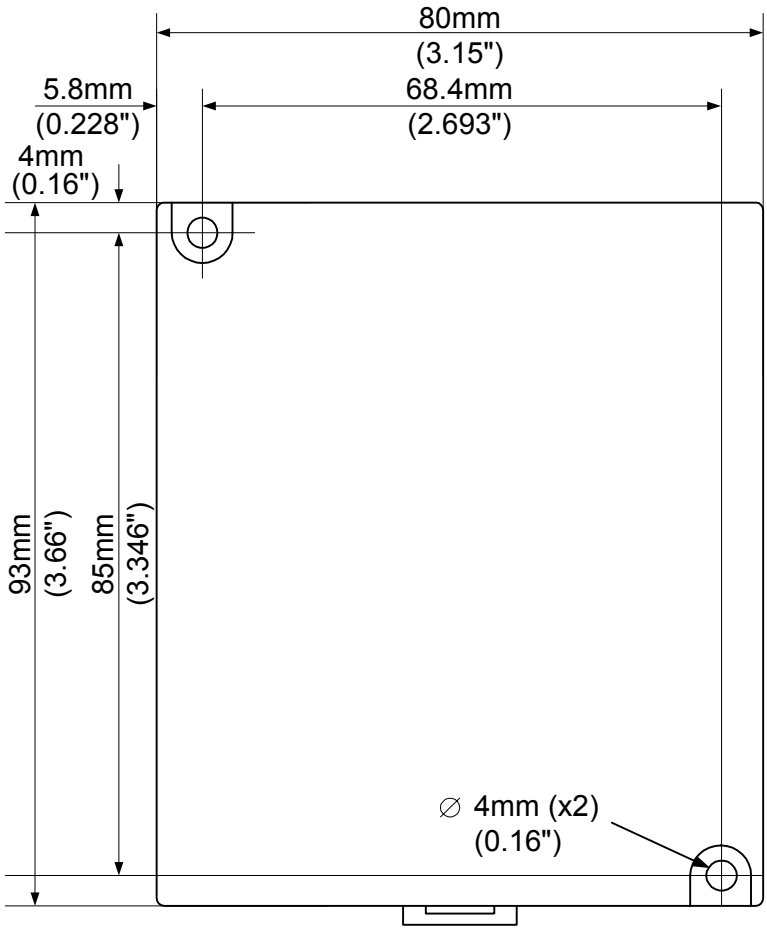
Snap the device onto the DIN rail as shown below; the module will be squarely situated on the DIN rail.



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.


80mm
(3.15")
5.8mm
(0.228")
68.4mm
(2.693")
4mm
(0.16")
93mm
(3.66")
85mm
(3.346")
∅ 4mm (x2)
(0.16")

Connecting Expansion Modules

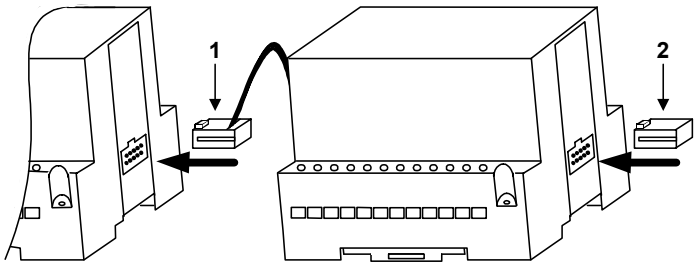
An adapter provides the interface between the OPLC and an expansion module. To connect the I/O module to the adapter or to another module:

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	
1	Module-to-module connector
2	Protective cap



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

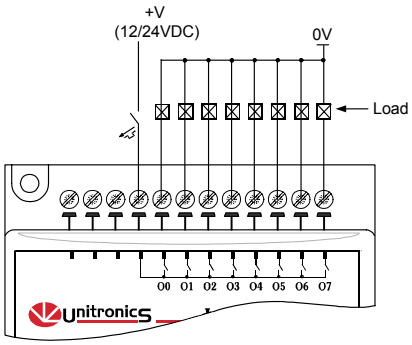
Use crimp terminals for wiring; use 26-12 AWG wire (0.13 mm ^{2}–3.31 mm^2) for all wiring purposes.

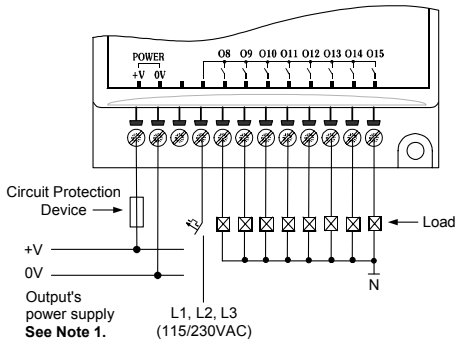
1. Strip the wire to a length of 7±0.5mm (0.250–0.300 inches).
2. Unscrew the terminal to its widest position before inserting a wire.
3. Insert the wire completely into the terminal to ensure that a proper connection can be made.
4. Tighten enough to keep the wire from pulling free.

- 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.





- Each group of 8 outputs may be connected to either DC or AC.

Wiring the Outputs' Power Supply

Wiring DC supply

1 Connect the "positive" cable to the "+V" terminal, and the "negative" to the "0V" terminal.

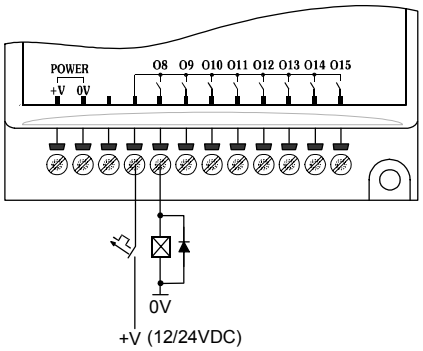
- A non-isolated power supply can be used provided that a 0V signal is connected to the chassis.
- Do not connect the 'Neutral' or 'Line' signal of the 110/220VAC to the device's 0V pin.
- In the event of voltage fluctuations or non-conformity to voltage power supply specifications, connect the device to a regulated power supply.

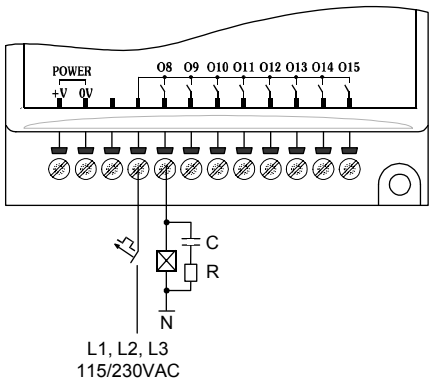
Notes: 1. The adapter and output's power supply must be connected to the same 0V signal.

Increasing Contact Life Span

Both modules have 16 relay outputs. To increase the life span of these contacts and protect the modules from potential damage by reverse EMF, connect:

- a clamping diode in parallel with each inductive DC load, as shown in the left-hand figure below.
- an RC snubber circuit in parallel with each inductive AC load, as shown in the right-hand figure below..





IO-RO16, IO-RO16-L Technical Specifications

Max. current consumption	60mA maximum from the adapter's 5VDC
Typical power consumption	0.18W @ 5VDC
Status indicator	
(RUN)	Green LED: —Lit when a communication link is established between module and OPLC. —Blinks when the communication link fails.
Outputs	
Number of outputs	16 relay (in two groups)
Output type	SPST-NO relay; 230VAC / 12/24 VDC
Type of relay	
IO-RO16	Fujitsu (Takamisawa) NY-24W-K or NAIS (Matsushita) PA1a-24V
IO-RO16L	Fujitsu (Takamisawa) NY-12W-K or NAIS (Matsushita) PA1a-12V
Isolation	By relay
Status Indicators	Red LEDs—Lit when the corresponding output is active.
(O0 to O15)	
Output current	Resistive Load 3A maximum per output 8A maximum total for common. See Note 1. Inductive Load 1A maximum per output 4A maximum total for common. See Note 1
Maximum frequency	10Hz
Contact protection	External precautions required (see above: Increasing Contact Life Span)
Outputs' power supply: IO-RO16	
Nominal operating voltage	24VDC
Operating voltage	20.4 to 28.8VDC
Maximum current consumption	132mA@24VDC
Outputs' power supply: IO-RO16-L	
Nominal operating voltage	12VDC
Operating voltage	10.2 to 15.6VDC
Maximum current consumption	176mA@12VDC

Notes:

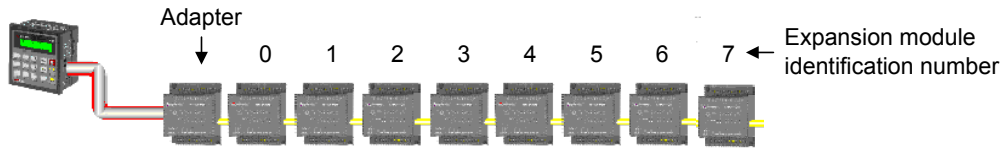
1. Each group of 8 outputs share a common signal.

Environmental	IP20 / NEMA1
Operating temperature	0° to 50°C (32° to 122°F)
Storage temperature	-20° to 60° C (-4° to 140°F)
Relative Humidity (RH)	5% to 95% (non-condensing)
Dimensions (WxHxD)	80mm x 93mm x 60mm (3.15" x 3.66" x 2.362")
Weight	125g (4.25 oz.)
Mounting	Either onto a 35mm DIN-rail or screw- mounted.

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 M90 OPLC.

X is the number representing a specific module's location (0-7). Y is the number of the input or output on that specific module (0-15).

The number that represents the I/O's location is equal to:

$$32 + x \bullet 16 + y$$

Examples

- Input #3, located on expansion module #2 in the system, will be addressed as I 67, 67 = 32 + 2 • 16 + 3
- Output #4, located on expansion module #3 in the system, will be addressed as O 84, 84 = 32 + 3 • 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 M90 OPLC will be addressed as I 149, 149 = 32 + 7 • 16 + 5

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5408-0210-2

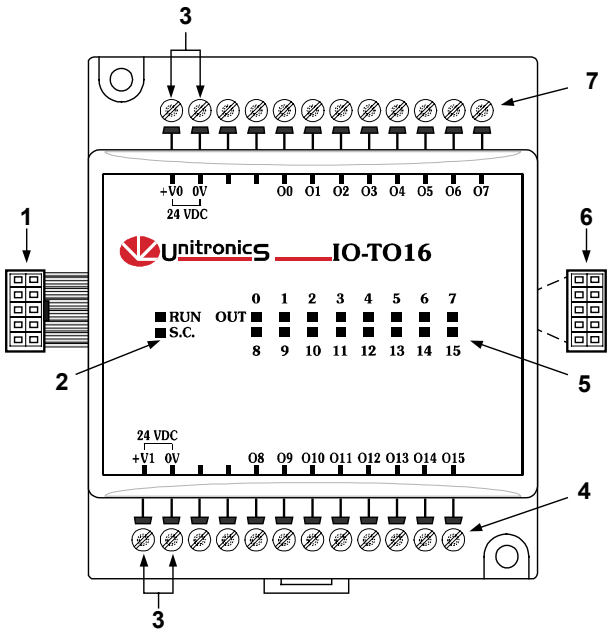
IO-TO16 I/O Expansion Module 16 Transistor Outputs

The IO-TO16 is an I/O expansion module that can be used in conjunction with specific Unitronics OPLC controllers.

The module offers 16 pnp (source) transistor outputs.

The interface between the module and the OPLC is provided by an adapter.

The module may either be snap-mounted on a DIN rail, or screw-mounted onto a mounting plate.



	Component identification
1	Module-to-module connector
2	Status indicators
3	Outputs' power supply connection points for each group of outputs
4	Output connection points: O8-O15
5	Output status indicators
6	Module-to-module connector port
7	Output connection points: O0-O7

User safety and equipment protection guidelines

This document is intended to aid trained and competent 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 electrical wiring of this device.

- Under no circumstances will Unitronics be liable or responsible for any consequential damage that may arise as a result of installation or use of this equipment, and is not responsible for problems resulting from improper or irresponsible use of this device.
- All examples and diagrams shown in the manual are intended to aid understanding. They do not guarantee operation.
- Unitronics accepts no responsibility for actual use of this product based on these examples.
- Only qualified service personnel should open this device or carry out repairs.
- Please dispose of this product in accordance with local and national standards and regulations.

- Check the user program before running it.
- Do not attempt to use this device with voltage exceeding permissible levels.
- Install an external circuit breaker and take all appropriate safety measures against short-circuiting in external wiring.

- 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.

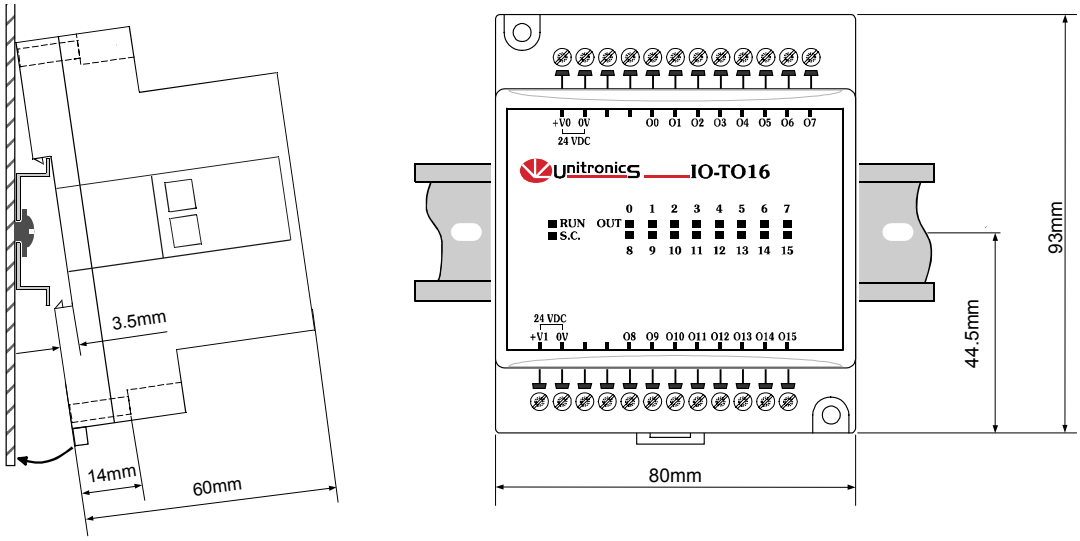
Mounting the Module

Mounting 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.
- Provide proper ventilation by leaving a minimum space of 10mm 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.

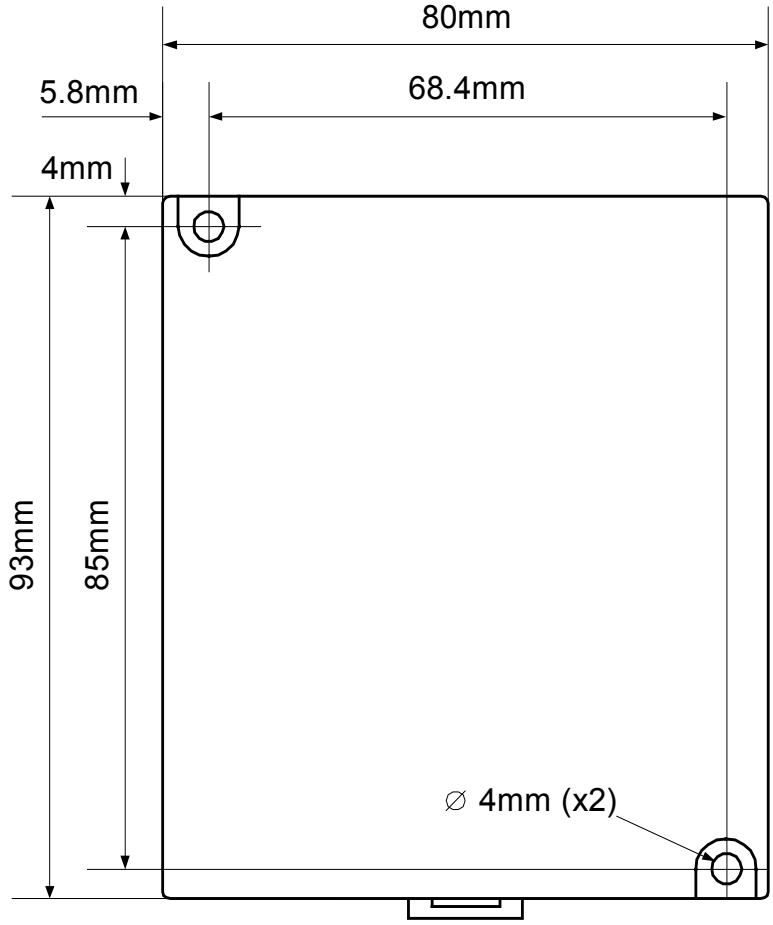
DIN-rail mounting

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.


80mm
5.8mm
68.4mm
4mm
93mm
85mm
∅ 4mm (x2)

Connecting Expansion Modules

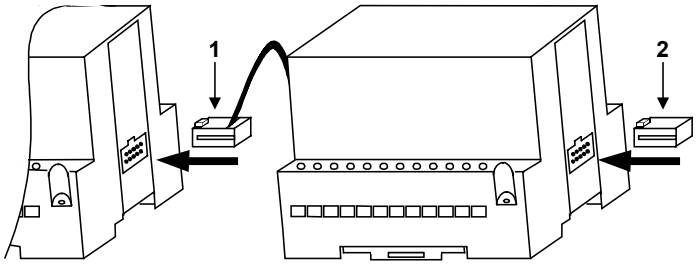
An adapter provides the interface between the OPLC and an expansion module. To connect the I/O module to the adapter or to another module:

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	
1	Module-to-module connector
2	Protective cap



Wiring

Wire Size

Use 26-12 AWG wire (0.13 mm ^{2}–3.31 mm^2) for all wiring purposes.

Wiring Considerations

- Note that the adapter, outputs and the power supply for both groups of outputs must be connected to the same 0V signal.
- Do not use tin, solder or any other substance on the stripped wire that might cause the wire strand to break.
- We recommend that you use crimp terminals for wiring.
- Install at maximum distance from high-voltage cables and power equipment.

General Wiring Procedures

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 touch live wires.
- Double-check all the wiring before turning on the power supply.

I/O Wiring

- 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 output lines used over an extended distance. Use wire that is properly sized for the load.

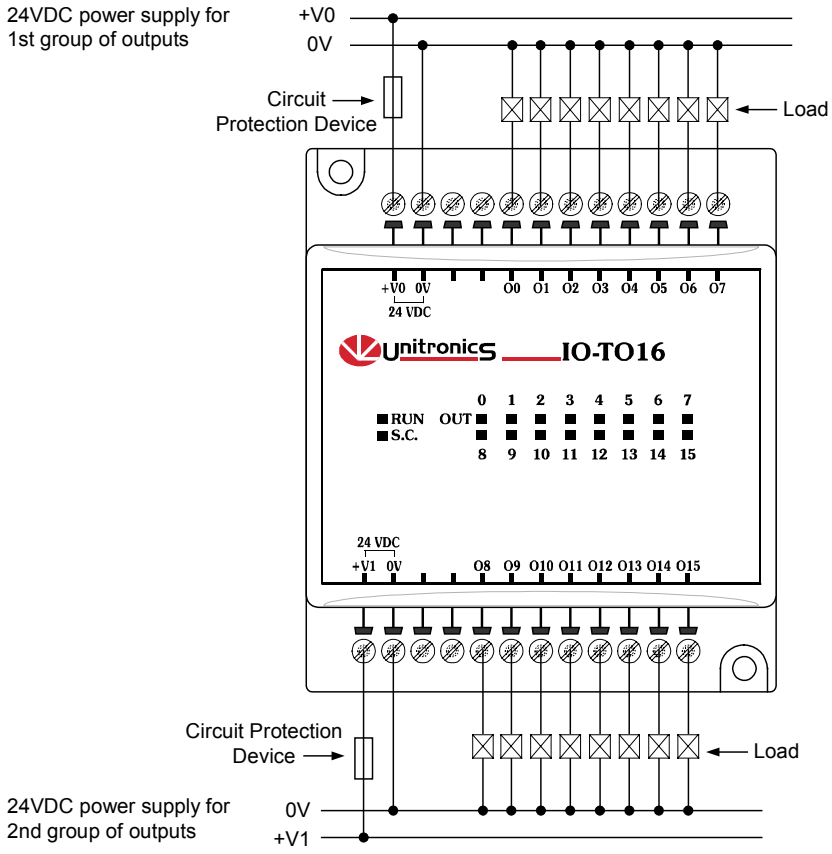
Wiring the Power Supplies to both groups of Outputs

Wiring DC supply

1 First group of outputs: connect the "positive" cable to the "+V0" terminal, and the “negative” to the "0V” terminal.

2 Second group of outputs: connect the "positive" cable to the "+V1" terminal, and the “negative” to the "0V” terminal.

- A non-isolated power supply can be used provided that a 0V signal is connected to the chassis.
- Do not connect the ‘Neutral’ or ‘Line’ signal of the 110/220VAC to the device’s 0V pin.
- In the event of voltage fluctuations or non-conformity to voltage power supply specifications, connect the device to a regulated power supply.



IO-TO16 Technical Specifications

Max. current consumption	50mA maximum from the adapter's 5VDC
Typical power consumption	0.12W @ 5VDC
Status indicator	
(RUN)	Green LED: —Lit when a communication link is established between module and OPLC. —Blinks when the communication link fails.
Outputs	
Number of outputs	16 pnp (source) in 2 groups
Output type	P-MOSFET (open drain), 24VDC
Galvanic isolation	None
Output current	0.5A maximum (per output) Total current: 3A maximum (per group)
Maximum frequency	20Hz (resistive load) 0.5 Hz (inductive load)
Short circuit protection	Yes
Status Indicators	See Notes
(OUT)	Red LEDs—Lit when the corresponding output is active.
(S.C)	Red LED—Lit when an output's load short-circuits.
Operating voltage (per group)	20.4 to 28.8VDC
Nominal operating voltage	24VDC
Environmental	IP20
Operating temperature	0° to 50° C
Storage temperature	-20° to 60° C
Relative Humidity (RH)	5% to 95% (non-condensing)
Dimensions (WxHxD)	80mm x 93mm x 60mm
Weight	144g (5.08oz.)
Mounting	Either onto a 35mm DIN-rail or screw- mounted.

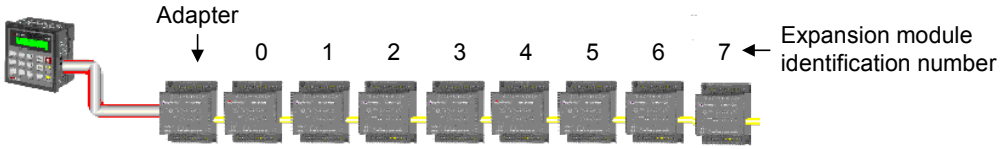
Notes:

1. When an output is connected to a load that short-circuits, that output turns off and the S.C. LED lights up on the module. Although the output turns off, the LED of that output remains lit.
2. The short circuit is also identified by the software program within the controller connected to the module. Within the M90 OPLC, for example, SB 5 turns ON. SI 5 contains a bitmap indicating the module containing the affected output.
   For more information, refer to the on-line help supplied with the programming package of your controller.

Addressing I/Os on M90 Expansion Modules

Inputs and outputs located on I/O expansion modules that are connected into an M90 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 M90 OPLC.

X is the number representing a specific module's location (0-7). Y is the number of the input or output on that specific module (0-15).

The number that represents the I/O's location is equal to:

$$32 + x \bullet 16 + y$$

Examples

- Input #3, located on expansion module #2 in the system, will be addressed as I 67, 67 = 32 + 2 • 16 + 3
- Output #4, located on expansion module #3 in the system, will be addressed as O 84, 84 = 32 + 3 • 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 M90 OPLC will be addressed as I 149, 149 = 32 + 7 • 16 + 5

8 Convenient I/O Modules

	Digital I/O (transistor)			Digital I/O (relay)			Analog I/O	PT 100
	IO-DI8-TO8	**IO-DI16**	**IO-TO16**	**IO-DI8-RO4**	**IO-RO8**	**EX90-DI8-RO8***	**IO-AI4-AO2**	**IO-PT4**
Digital inputs (24VDC)	8 pnp/npn (source/sink)	16 pnp/npn (source/sink)	—	8 pnp/npn (source/sink)	—	8 pnp (source)	—	—
Analog inputs	—	—	—	—	—	—	4 inputs 0-10V, 0-20mA , 4-20mA	4 PT100 -50° to 460°C
Analog input resolution	—	—	—	—	—	—	12 bit	12 bit
Digital outputs	8 pnp (source)	—	16 pnp (source)	4 relay outputs	8 relay outputs	8 relay outputs	—	—
Analog outputs	—	—	—	—	—	—	2 outputs ±10V, 0-20mA, 4-20mA	—
Analog output resolution	—	—	—	—	—	—	12 bit + sign	—
High-speed counter/ Frequency measurement	One	One	—	One	—	One	—	—

* Stand-alone module. Other modules are used in conjunction with the EX-A1 adapter

To order the expansion module that best fits your system, contact your local distributor.
For a list of Unitronics distributors, check our website: http://www.unitronic.com/contact.htm