V200-18-E46B  Snap-in I/O Module

The V200-18-E46B plugs directly into the back of compatible Unitronics OPLCs, creating a self-contained PLC unit with a local I/O configuration.

Features
- 18 isolated digital inputs configurable to type pnp/npn (source/sink), includes 2 shaft encoder inputs.
- 15 isolated relay outputs.
- 2 isolated pnp/npn (source/sink) transistor outputs, includes 2 high-speed outputs.
- 9 analog inputs.
- 2 isolated analog outputs.

- 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.

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

- Failure to comply with appropriate safety guidelines can result in severe personal injury or property damage. Always exercise proper caution when working with electrical equipment.
- Check the user program before running it.
- Do not attempt to use this device with parameters that exceed permissible levels.
- Install an external circuit breaker and take appropriate safety measures against short-circuiting in external wiring.
- To avoid damaging the system, do not connect / disconnect the device when the power is on.

Caution
- Ascertain that terminal blocks are properly secured in place.

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.
- Provide proper ventilation by leaving at least 10mm of space 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.

UL Compliance

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


UL Ratings, Programmable Controllers for Use in Hazardous Locations,
Class I, Division 2, Groups A, B, C and D

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

Caution

This equipment is suitable for use in Class I, Division 2, Groups A, B, C and D, or Non-hazardous locations only.

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

Relay Output Resistance Ratings

The products listed below contain relay outputs: V200-18-E1B, V200-18-E2B.
- When these specific products are used in hazardous locations, they are rated at 3A res, when these specific products are used in non-hazardous environmental conditions, they are rated at 5A res, as given in the product’s specifications.

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

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

Attention

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

Certification de la résistance des sorties relais


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

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**Wiring Procedures**

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

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**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.

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**Earthing the product**

To maximize system performance, avoid electromagnetic interference as follows:

- Use a metal cabinet.
- Connect the 0V and functional ground points (if exist) directly to the earth ground of the system.
- Use the shortest, less than 1m (3.3 ft.) and thickest, 2.08mm² (14AWG) min, wires possible.
Digital Inputs

Each group of 9 inputs has a common signal. Each group can be used as either pnp (source) or npn (sink), when appropriately wired as shown in the following figures.

- Inputs I0 and I2 can be used as normal digital inputs, as high-speed counters, or as part of a shaft encoder.
- Inputs I1 and I3 can be used as normal digital inputs, as high-speed counter resets, or as part of a shaft encoder.

![npn (sink) digital input wiring](image)

![pnp (source) digital input wiring](image)

![npn (sink) high-speed counter](image)

![pnp (source) high-speed counter](image)

Inputs I0, I1, and I2, I3 can be used as shaft encoders as shown below.

![npn (sink) shaft encoder wiring](image)

![pnp (source) shaft encoder wiring](image)
Digital Outputs

Wiring Power Supplies
Use a 24VDC power supply for both relay and transistor outputs.
1. Connect the "positive" lead to the "V1" terminal, and the "negative" lead to the "0V" terminal.
   - In the event of voltage fluctuations or non-conformity to voltage power supply specifications, connect the device to a regulated power supply.

Relay Outputs
- Each group can be wired separately to either AC or DC as show.
- The 0V signal of the relay outputs is isolated from the controller’s 0V signal.

Increasing Contact Life Span
To increase the life span of the relay output contacts and protect the device 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.

Transistor Outputs
- Each output can be wired separately as either npn or pnp.
- The 0V signal of the transistor outputs is isolated from the controller’s 0V signal.
Analog Inputs

9 analog inputs, which can be wired to work with either current or voltage:

- Inputs 0 to 2 are 10-bit.
- Inputs 3 to 8 are 12 to 14-bit.

To configure an input, open the device and set the jumpers according to the instructions beginning on page 7. Shields should be connected at the signal source.

Analog Inputs

- All inputs share a common ACM signal, which must be connected to the 0V of the controller.

Analog Outputs Power Supply

Use a 24VDC power supply for all analog output modes.

1. Connect the “positive” cable to the “V2” terminal, and the “negative” to the “0V” terminal.

- In the event of voltage fluctuations or non-conformity to voltage power supply specifications, connect the device to a regulated power supply.
- Since the analog I/O power supply is isolated, the controller’s 24VDC power supply may also be used to power the analog I/Os.

The 24VDC power supply must be turned on and off simultaneously with the controller’s power supply.

Analog Outputs

- Shields should be earthed, connected to the earth of the cabinet.
- An output can be wired to either current or voltage, use the appropriate wiring as shown below.
- Do not use current and voltage from the same source channel.
Changing Jumper Settings

To access the jumpers, you must remove the snap-in I/O module from the controller, and then remove the module’s PCB board.

- Before you begin, turn off the power supply, disconnect and dismount the controller.
- Before performing these actions, touch a grounded object to discharge any electrostatic charge.
- Avoid touching the PCB board directly by holding the PCB board by its connectors.

Accessing the Jumpers

First, remove the snap-in module.

1. Locate the 4 buttons on the sides of the module, 2 on either side. Press the 2 buttons on either side of the module as shown, and hold them down to open the locking mechanism.

2. Gently rock the module from side to side, easing the module from the controller.

Using a Philips screwdriver, remove the center screw from the module’s PCB board.

Select the desired function by changing the jumper settings according to the figure and tables shown below.

<table>
<thead>
<tr>
<th>Jumper #</th>
<th>Voltage*</th>
<th>Current</th>
</tr>
</thead>
<tbody>
<tr>
<td>Analog input 0</td>
<td>1 V</td>
<td>I</td>
</tr>
<tr>
<td>Analog input 1</td>
<td>2 V</td>
<td>I</td>
</tr>
<tr>
<td>Analog input 2</td>
<td>3 V</td>
<td>I</td>
</tr>
<tr>
<td>Analog input 3</td>
<td>4 V</td>
<td>I</td>
</tr>
<tr>
<td>Analog input 4</td>
<td>5 V</td>
<td>I</td>
</tr>
<tr>
<td>Analog input 5</td>
<td>6 V</td>
<td>I</td>
</tr>
<tr>
<td>Analog input 6</td>
<td>7 V</td>
<td>I</td>
</tr>
<tr>
<td>Analog input 7</td>
<td>8 V</td>
<td>I</td>
</tr>
<tr>
<td>Analog input 8</td>
<td>9 V</td>
<td>I</td>
</tr>
</tbody>
</table>

* Default factory setting
Reassembling the controller

1. Return the PCB board to the module and secure the center screw.

2. Next, reinstall the module. Line the circular guidelines on the controller up with the guidelines on the Snap-in I/O Module as shown below.

3. Apply even pressure on all 4 corners until you hear a distinct ‘click’. The module is now installed. Check that all sides and corners are correctly aligned.
## V200-18-E46B Technical Specifications

### Digital Inputs
- **Number of inputs**: 18 (in two groups)
- **Input type**: pnp (source) or npn (sink)
- **Galvanic isolation**
  - Digital inputs to bus: Yes
  - Digital inputs to digital inputs in same group: No
  - Group to group, digital inputs: Yes
- **Nominal input voltage**: 24VDC
- **Input voltage**
  - pnp (source): 0-5VDC for Logic '0'
  - 17-28.8VDC for Logic '1'
  - npn (sink): 17-28.8VDC for Logic '0'
  - 0-5VDC for Logic '1'
- **Input current**
  - 8.8mA@24VDC for inputs 0 to 3
  - 6mA@24VDC for inputs 4 to 17
- **Response time**: 10mSec typical
- **High-speed inputs**
  - Specifications below apply when these inputs are wired for use as a high-speed counter input/shaft encoder. See Notes 1 and 2.
  - **Resolution**: 32-bit
  - **Frequency**: 10kHz maximum
  - **Minimum pulse width**: 40μs

### Notes:
1. Inputs 0 and 2 can each function as either high-speed counter or as part of a shaft encoder. In each case, high-speed input specifications apply. When used as a normal digital input, normal input specifications apply.
2. Inputs 1 and 3 can each function as either counter reset, or as a normal digital input; in either case, its specifications are those of a normal digital input. These inputs may also be used as part of a shaft encoder. In this case, high-speed input specifications apply.

### Digital Outputs
- **Digital Output’s Power Supply**
  - **Nominal operating voltage**: 24VDC
  - **Operating voltage**: 20.4 to 28.8VDC
  - **Quiescent current**: 5mA@24VDC.
  - **Max. current consumption**: 85mA@24VDC. See Note 3.
- **Galvanic isolation**
  - Digital power supply to bus: Yes
  - Digital power supply to relay outputs: Yes
  - Digital power supply to transistor outputs: No

### Notes:
3. Maximum current consumption does not provide for npn output requirements. The additional current requirement of npn outputs must be added.

### Relay Outputs
- **Number of outputs**: 15 relays (in two groups). See Note 4.
- **Output type**: SPST-NO (Form A)
- **Isolation**: By relay
- **Type of relay**: Tyco PCN-124D3MHZ or compatible
- **Outputs’ power supply**: See Digital Output’s Power Supply page 11.
- **Galvanic isolation**
  - Relay outputs to bus: Yes
  - Group to group, relay outputs: Yes
  - Relay to transistor outputs: Yes
- **Output current**
  - 3A maximum per output (resistive load)
  - 8A maximum total for common (resistive load)
- **Rate voltage**: 250VAC / 30VDC
- **Minimum load**: 1mA@5VDC
- **Life expectancy**: 100k operations at maximum load
- **Response time**: 10mS (typical)
- **Contact protection**: External precautions required (see Increasing Contact Life Span, p.5)
**Notes:**

4. Outputs 2, 3, 4, 5, 6 and 7 share a common signal. Outputs 8, 9, 10, 11, 12, 13, 14, 15 and 16 share a common signal.

**Transistor Outputs/H.S.O.**

Number of outputs: 2, high-speed. Each can be individually wired as pnp (source) or nnp (sink).

Output type:
- pnp: P-MOSFET (open drain)
- nnp: N-MOSFET (open drain)

Galvanic isolation:
- Transistor outputs to bus: Yes
- Transistor outputs to transistor outputs: No
- Transistor outputs to relay outputs: Yes

Output current:
- pnp: 0.5A maximum per output
- nnp: 50mA maximum per output

Maximum frequency:
- Resitive load:
  - pnp: 0.5kHz
  - nnp: 100kHz
- Inductive load: 0.5Hz

ON voltage drop:
- pnp: 0.5VDC maximum
- nnp: 0.4VDC maximum

Short circuit protection: Yes (pnp only)

Voltage reference:
- pnp (source): See Digital Output's Power Supply page 11
- nnp (sink): 3.5V to 28.8VDC, unrelated to the voltage of either the I/O module or the controller

**Notes:**

5. Output #0 and 1 may be used as high-speed outputs.

**Analog Inputs**

Number of inputs: 9

Type of input: Set via appropriate wiring and jumper settings.

Isolation: None

**Analog Inputs**

<table>
<thead>
<tr>
<th>AN0-AN2 (10-bit)</th>
<th>AN3-AN8 (12-14-bit)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input range</td>
<td>0-10V, 0-20mA, 4-20mA</td>
</tr>
<tr>
<td>Conversion method</td>
<td>Successive approximation</td>
</tr>
<tr>
<td>Normal mode</td>
<td></td>
</tr>
<tr>
<td>Resolution, except 4-20mA</td>
<td>10-bit (1024 units)</td>
</tr>
<tr>
<td>Resolution at 4-20mA</td>
<td>204-1023 (820 units)</td>
</tr>
<tr>
<td>Conversion time</td>
<td>Synchronized to scan time</td>
</tr>
<tr>
<td>Fast Mode</td>
<td></td>
</tr>
<tr>
<td>Resolution, except 4-20mA</td>
<td>—</td>
</tr>
<tr>
<td>Resolution at 4-20mA</td>
<td>—</td>
</tr>
<tr>
<td>Conversion time</td>
<td>—</td>
</tr>
<tr>
<td>Input impedance</td>
<td>&gt;100kΩ—voltage</td>
</tr>
<tr>
<td></td>
<td>500Ω—current</td>
</tr>
<tr>
<td>Absolute maximum rating</td>
<td>±15V—voltage</td>
</tr>
<tr>
<td></td>
<td>±30mA, 15V—current</td>
</tr>
<tr>
<td>Full-scale error</td>
<td>±3 LSB (0.3%)</td>
</tr>
<tr>
<td>Linearity error</td>
<td>±3 LSB (0.3%)</td>
</tr>
<tr>
<td>Status indication</td>
<td>Yes. See Note 6.</td>
</tr>
</tbody>
</table>

**Notes:**

6. The analog value can indicate a fault:

<table>
<thead>
<tr>
<th>Value: 10-bit</th>
<th>Possible Cause</th>
</tr>
</thead>
<tbody>
<tr>
<td>1024</td>
<td>Deviates above the input range</td>
</tr>
</tbody>
</table>

7. The analog value can indicate faults:

<table>
<thead>
<tr>
<th>Value: 12-bit</th>
<th>Value: 14-bit</th>
<th>Possible Cause</th>
</tr>
</thead>
<tbody>
<tr>
<td>-1</td>
<td>-1</td>
<td>Deviates slightly below the input range</td>
</tr>
<tr>
<td>4096</td>
<td>16384</td>
<td>Deviates slightly above the input range</td>
</tr>
<tr>
<td>32767</td>
<td>32767</td>
<td>Deviates greatly above or below the input range</td>
</tr>
</tbody>
</table>
## Analog Outputs

### Analog Output’s Power Supply
- **Nominal operating voltage**: 24VDC
- **Operating voltage**: 20.4 to 28.8VDC
- **Quiescent current**: 30mA@24VDC
- **Max. current consumption**: 80mA@24VDC
- **Galvanic isolation**:
  - Analog power supply to bus: Yes
  - Analog power supply to analog outputs: No

### Analog Outputs
- **Number of outputs**: 2 (single-ended)
- **Output range**: 0-10V, 4-20mA. See Note 8.
- **Resolution**: 12-bit (4096 units)
- **Conversion time**: Synchronized to scan time
- **Load impedance**:
  - Voltage: 500Ω maximum
  - Current: 1kΩ minimum
- **Galvanic isolation**:
  - Analog outputs to bus: Yes
  - Analog output to analog output: No
- **Linearity error**: ±0.1%
- **Operational error limits**: ±0.2%

### Notes:
8. Note that the range of each I/O is defined by wiring and within the controller’s software.

### Environmental
- **IP Rating**: IP20 / NEMA1
- **Operating temperature**: 0°C to 50°C (32°F to 122°F)
- **Storage temperature**: -20°C to 60°C (-4°F to 140°F)
- **Relative Humidity (RH)**: 10% to 95% (non-condensing)
- **Dimensions (WxHxD)**: 138x23x123mm (5.43x0.9x4.84”)
- **Weight**: 140g (4.94oz)