Snap-in I/O Modules

User Guide

V200-18-E4XB

The V200-18-E4B 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, includes 2 H.S.C inputs, type pnp/npn (source/sink)
- 15 isolated pnp (source) outputs
- 2 isolated pnp/npn (source/sink) transistor outputs, includes 2 H.S. outputs
- 4 isolated analog/PT100/TC inputs
- 4 isolated analog outputs

General Description

The Snap-in I/O plugs directly into the back of compatible Unitronics PLCs, creating a self-contained PLC unit with a local I/O configuration. Detailed Installation Guides containing the I/O wiring diagrams for these models, technical specifications, and additional documentation are located in the Technical Library in the Unitronics website: https://unitronicsplc.com/support-technical-library/

Alert Symbols and General Restrictions

When any of the following symbols appear, read the associated information carefully.

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

- Before using this product, the user must read and understand this document.
- All examples and diagrams 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 according to local and national standards and regulations.
- Only qualified service personnel should open this device or carry out repairs.

⚡
- Failure to comply with appropriate safety guidelines can cause severe injury or property damage.

⚠
- Do not attempt to use this device with parameters that exceed permissible levels.
- To avoid damaging the system, do not connect/disconnect the device when 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, in accordance with the standards given in the product's technical specification sheet.
- Do not place in water or let water leak onto the unit.
- Do not allow debris to fall inside the unit during installation.

⚠
- Ventilation: 10mm space required between controller's top/bottom edges & enclosure walls.
- Install at maximum distance from high-voltage cables and power equipment.

UL Compliance

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

The following models: V200-18-E1B, V200-18-E2B, V200-18-E6B, V200-18-E6BL are UL listed for Hazardous Locations.

The following models: V200-18-E1B, V200-18-E2B, V200-18-E3B, V200-18-E3XB, V200-18-E46B, V200-18-E46BL, V200-18-E4B, V200-18-E4XB, V200-18-E5B, V200-18-E6B, V200-18-E6BL,

V200-18-ECB, V200-18-ECXB, V200-18-ESB are UL listed for Ordinary Location.

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

Les produits énumérés ci-dessous contiennent des sorties relais:

- V200-18-E1B, V200-18-E2B.
- 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.

- This equipment is designed to operate only in SELV/PELV/Class 2/Limited Power environments.
- All power supplies in the system must include double insulation. Power supply outputs must be rated as SELV/PELV/Class 2/Limited Power.
- Do not connect either the 'Neutral or 'Line' signal of the 110/220VAC to device's 0V pin.
- All wiring activities should be performed while power is OFF.
- Use over-current protection, such as a fuse or circuit breaker, to avoid excessive currents into the power supply connection point.
- Unused points should not be connected (unless otherwise specified). Ignoring this directive may damage the device.
- Double-check all wiring before turning on the power supply.

Caution

- To avoid damaging the wire, do not exceed a maximum torque of:
  - Controllers offering a terminal block with pitch of 5mm: 0.5 N·m (5 kgf·cm).
  - Controllers offering a terminal block with pitch of 3.81mm f 0.2 N·m (2 kgf·cm).
- Do not use tin, solder, or any substance on stripped wire that might cause the wire strand to break.
- Install at maximum distance from high-voltage cables and power equipment.

Wiring Procedure

Use crimp terminals for wiring;

- Controllers offering a terminal block with pitch of 5mm: 26-12 AWG wire (0.13 mm^2 –3.31 mm^2).
- Controllers offering a terminal block with pitch of 3.81mm: 26-16 AWG wire (0.13 mm^2 – 1.31 mm^2).

1. Strip the wire to a length of 7±0.5mm (0.270–0.300").
2. Unscrew the terminal to its widest position before inserting a wire.
3. Insert the wire completely into the terminal to ensure a proper connection.
4. Tighten enough to keep the wire from pulling free.

Wiring Guidelines

- Use separate wiring ducts for each of the following groups:
  - Group 1: Low voltage I/O and supply lines, communication lines.
  - Group 2: High voltage Lines, Low voltage noisy lines like motor driver outputs.

  Separate these groups by at least 10cm (4"). If this is not possible, cross the ducts at a 90˚angle.
- For proper system operation, all 0V points in the system should be connected to the system 0V supply rail.
- Product-specific documentation must be fully read and understood before performing any wiring.

Allow for voltage drop and noise interference with input lines used over an extended distance.
Use wire that is properly sized for the load.

Earthing the product

To maximize system performance, avoid electromagnetic interference as follows:

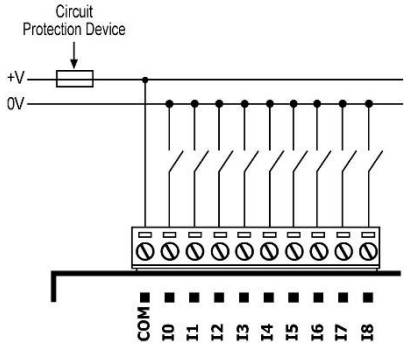
- Use a metal cabinet.
- Connect the 0V and functional ground points (if exist) directly to the earth ground of the system.
- Use the shortest, less than 1m (3.3 ft.) and thickest, 2.08mm² (14AWG) min, wires possible.

Digital Inputs

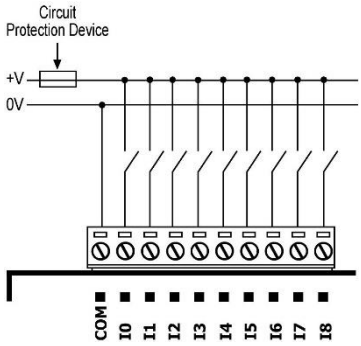
Each group of 9 inputs has a common signal. Each group can be used as either pnp (source) or npn (sink), when appropriately wired as shown in the following figures.

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.

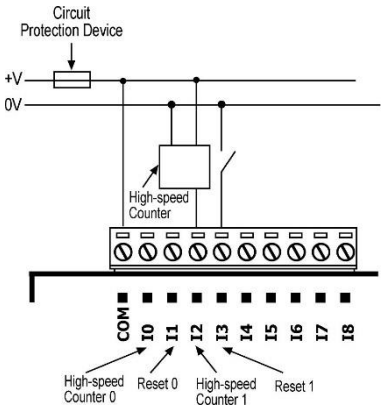
npn (sink) digital input wiring



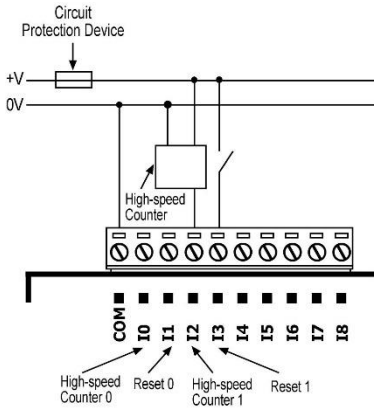
pnp (source) digital input wiring



npn (sink) high-speed counter

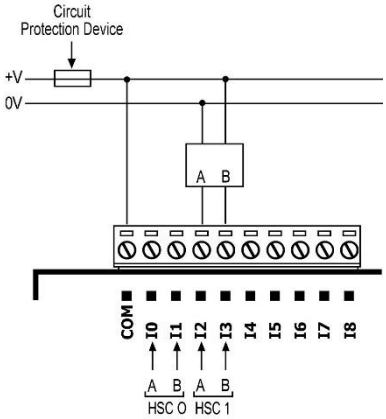


pnp (source) high-speed counter

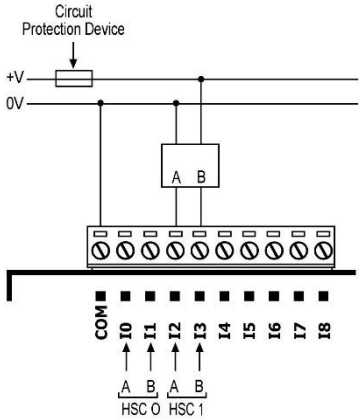


Inputs I0, I1, and I2, I3 can be used as shaft encoders as shown below.

npn (sink) shaft encoder wiring



pnp (source) shaft encoder wiring



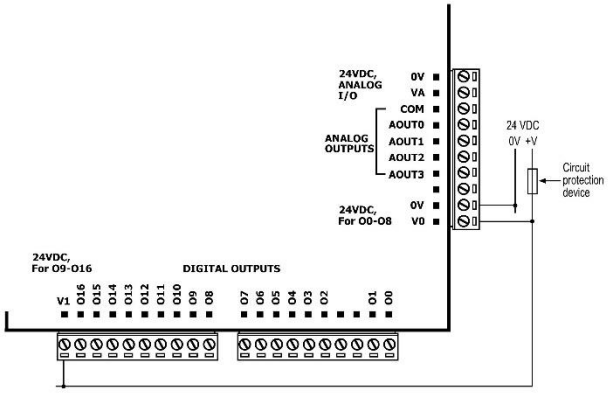
Digital Outputs

Wiring Power Supplies

Use a 24VDC power supply for all digital outputs.

1. Connect the "positive" lead to the "V0" and "V1" terminal, and the “negative” lead to the common "0V" terminal.

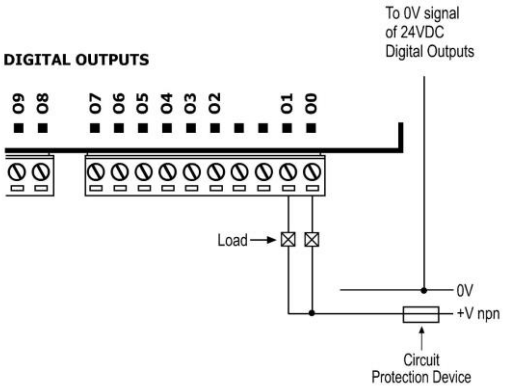
- V0 provides the power supply for Outputs #0, 1, 2, 3, 4, 5, 6, 7, and 8.
- V1 provides the power supply for Outputs #9, 10, 11, 12, 13, 14, 15, and 16.
- In the event of voltage fluctuations or non-conformity to voltage power supply specifications, connect the device to a regulated power supply.



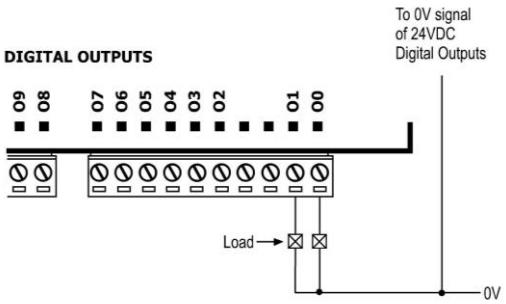
Transistor Outputs

- Outputs 0 and 1 can function as either npn or pnp, in accordance with jumper settings and wiring. Open the device and set the jumpers according to the instructions beginning on page 7.
- Outputs 2 to 16 function as pnp only.
- The 0V signal of the transistor outputs is isolated from the controller’s 0V signal.

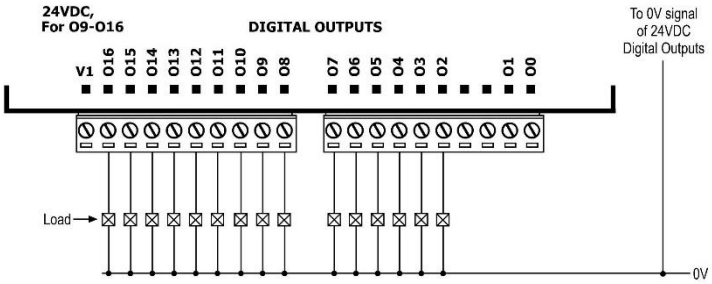
npn (sink)



pnp (source)



pnp (source)



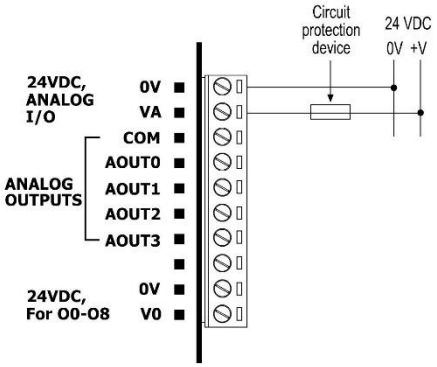
Analog I/O Power Supplies

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

1. Connect the "positive" cable to the "VA" 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 / PT100 / TC Inputs

- Each input may be set as either analog, RTD, or thermocouple. To set an input:

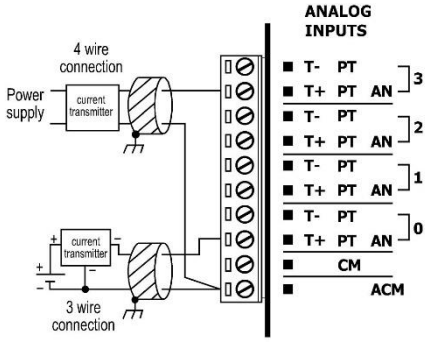
  Use the appropriate wiring as shown below.

  Open the device and set the jumpers according to the instructions beginning on page 8.
- Shields should be connected at the signal source.
- In order to function correctly, the analog power supplies must be wired as shown on page 5.
- To ensure proper performance, a warm-up period of a half an hour is recommended.

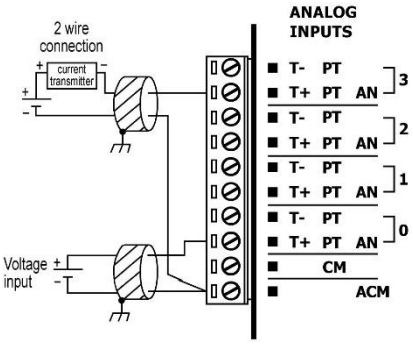
Analog Inputs

- Inputs may be wired to work with either current or voltage.
- When set to current/voltage, all inputs share a common ACM signal.

Current



current/voltage

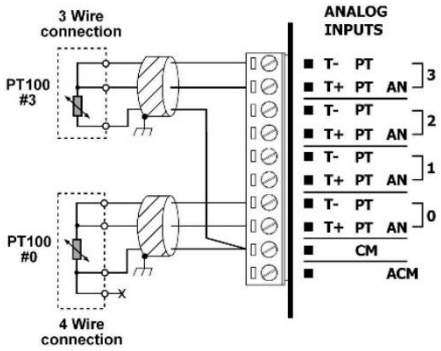


RTD Inputs

1. Wire one lead of each RTD input to the common signal (CM) as shown below.
2. Wire the CM to the ACM signal as shown below, using a single wire, not exceeding 2 cm in length.

4 wire PT100 can be used by leaving one of the sensor leads unconnected.

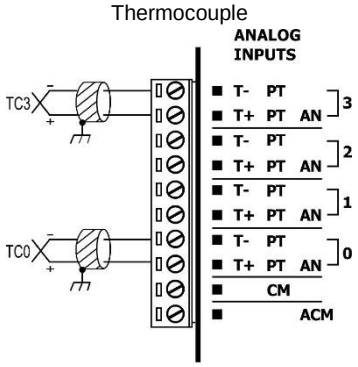
PT100



Thermocouple Inputs

- Supported thermocouple types include B, E, J, K, N, R, S, and T, in accordance with software and jumper settings. See table Thermocouple Input Ranges.
- Inputs may be set to mV by software settings (Hardware Configuration); note that in order to set mV inputs, thermocouple jumper settings are used.

Thermocouple



Analog Outputs

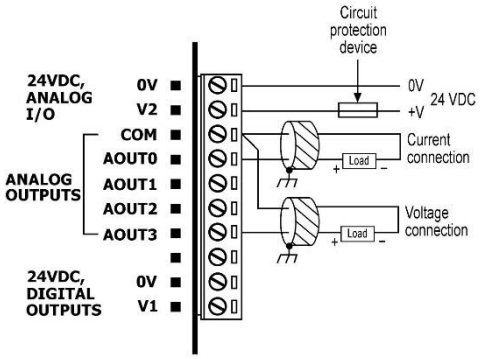
- Shields should be earthed, connected to the earth of the cabinet.
- An output can be wired to either current or voltage.

Use the appropriate wiring as shown below.

Open the device and set the jumpers according to the instructions beginning on page 7.

To ensure proper performance, a warm-up period of a half an hour is recommended.

current/voltage



Changing Jumper Settings

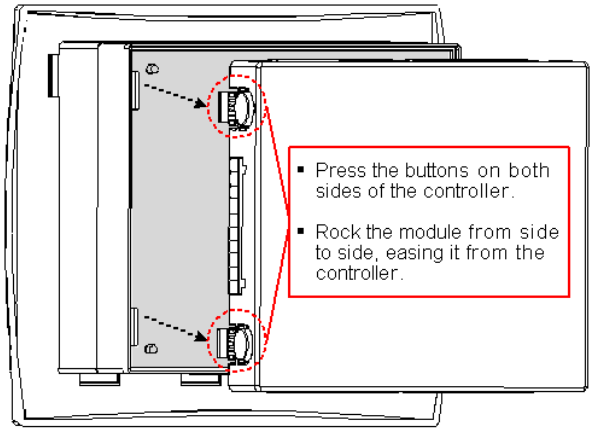
To access the jumpers, you must remove the snap-in I/O module from the controller, and then remove the module's PCB board. Before you begin, turn off the power supply, disconnect and dismount the controller.

- 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.

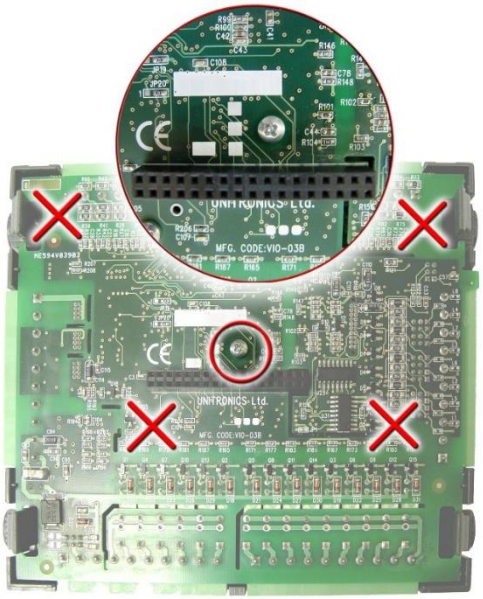
Accessing the Jumpers

First, remove the snap-in module.

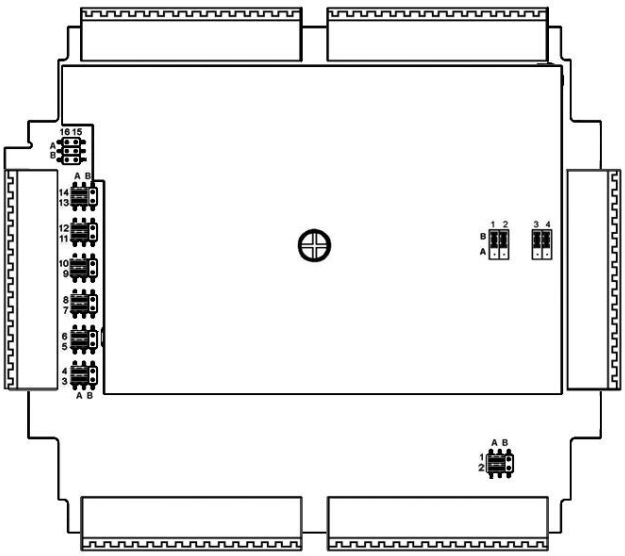
1. Locate the 4 buttons on the sides of the module, two on either side. Press the 2 buttons on either side of the module as shown, and hold them down to open the locking mechanism.
2. Gently rock the module from side to side, easing the module from the controller.



3. Using a Philips screwdriver, remove the center screw, shown in the figure below, from the module's upper PCB board. **Do not remove any other screws**.
4. Holding the PCB board by its edges, gently lift it out of the module.



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



Analog Input Jumpers

Bottom PCB board

	Jumper #	Voltage*	Current	T/C or mV	PT100
Analog input 3	14	A	B	B	A
	13	A	B	B	A
	12	A	A	B	B
Analog input 2	11	A	B	B	A
	10	A	B	B	A
	9	A	A	B	B
Analog input 1	8	A	B	B	A
	7	A	B	B	A
	6	A	A	B	B
Analog input 0	5	A	B	B	A
	4	A	B	B	A
	3	A	A	B	B

Digital Output Jumpers

Note that Jumpers #15 & 16 are not used

	Jumper #	PNP*	NPN
Digital Output 0	1	A	B
Digital Output 1	2	A	B

Analog Output Jumpers

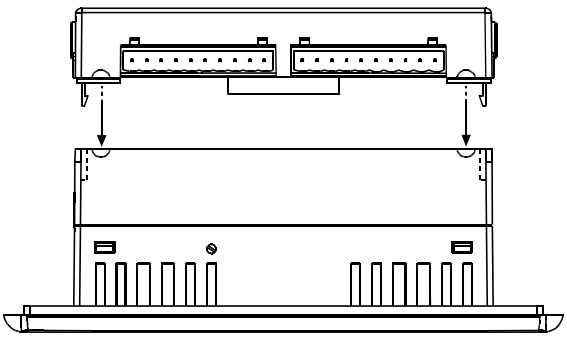
Top PCB board

	Jumper #	Current	Voltage*
Analog Output 0	1	A	B
Analog Output 1	2	A	B
Analog Output 2	3	A	B
Analog Output 3	4	A	B

* 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-E4XB 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 for outputs #0 to #3 2mSec typical for outputs #4 to #17
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	See Note 3.
Nominal operating voltage	24VDC
Operating voltage	20.4 to 28.8VDC
Quiescent current	20mA@24VDC.
Max. current consumption	80mA@24VDC. See Note 4.
Galvanic isolation	
Digital power supply to bus	Yes
Digital power supply to transistor outputs	No

Notes:

3. V0 provides the power supply for Outputs #0, 1, 2, 3, 4, 5, 6, 7 and 8.
   V1 provides the power supply for Outputs #9, 10, 11,12, 13, 14, 15 and 16.
   V0 and V1 share a common 0V signal.
4. Maximum current consumption does not provide for pnp output requirements.
   The additional current requirement of pnp outputs must be added.

Transistor Outputs

Number of outputs	17 (in two groups). See Note 5.
Output type	
Outputs #0 and #1	pnp: P-MOSFET (open drain) npn: N-MOSFET (open drain) Each can be individually set as pnp (source) or npn (sink) via wiring and jumper settings
Outputs #2 to #16	pnp: P-MOSFET (open drain)
Galvanic isolation	
Transistor outputs to bus	Yes
Transistor outputs to transistor outputs	No
Group to group	No
Output current	pnp: 0.5A maximum per output, total maximum current for each group: 3A. npn: 50mA maximum per output
Maximum frequency	Resistive load 20Hz Inductive load 0.5Hz

High-speed output maximum frequency (resistive load). See Note 6	pnp: 2kHz npn: 50kHz
ON voltage drop	pnp: 0.5VDC maximum npn: 0.4VDC maximum
Short circuit protection	Yes (pnp only)
pnp (source) power supply	See Digital Output's Power Supply above
npn (sink) power supply	
operating voltage	3.5V to 28.8VDC, unrelated to the voltage of either the I/O module or the controller

Notes:

5. Outputs #0, 1, 2, 3, 4, 5, 6, 7 and 8 share a common power signal. Outputs #8,9,10,11,12,13,14,15 and 16 share a common power signal. All outputs share a common 0V signal.
6. Output #0 and 1 may be used as high-speed outputs.

Analog I/O's Power Supply

Nominal operating voltage	24VDC
Operating voltage	20.4 to 28.8VDC
Quiescent current	70mA@24VDC
Max. current consumption	130mA@24VDC
Galvanic isolation	
Analog power supply to bus	Yes
Analog power supply to analog inputs	Yes
Analog power supply to analog outputs	Yes

Analog/ PT100/ TC Inputs

Number of inputs	4
Type of input	Set via appropriate wiring and jumper settings.
Analog Inputs Power Supply	
Galvanic isolation	
Analog/PT/TC inputs to bus	Yes
Analog/PT/TC inputs to analog outputs	Yes
Analog /PT/TC inputs to Analog /PT/TC inputs	No
Analog inputs	
Input range	0-10V, 0-20mA , 4-20mA
Power supply	See Analog I/O's Power Supply above
Conversion method	Succesive approximation
Resolution at 0-10V, 0-20mA	14-bit (16384 units). See Note 7.
Resolution at 4-20mA	3277 to 16383 (13107 units). See Note 7.
Conversion time	Synchronized to cycle time
Input impedance	>1MΩ—voltage 121.5Ω—current
Absolute maximum rating	±20V—voltage ±40mA—current
Full-scale error	±0.4%
Linearity error	±0.04%
Status indication	Yes. See Note 8

Notes:

7. 12 or 14-bit resolution may be selected via software.
8. The analog value can indicate faults as shown below:

Value	Possible Cause
16384	Input value deviates **slightly above** the input range
32767	-Input value deviates **greatly above** or **below** the input range -Power supply disconnected

PT100 inputs

Input range	-200 to 600°C/-328 to 1100°F. 1 to 320Ω. See Note 9.
Conversion method	Voltage to frequency
Resolution	0.1°C/0.1°F
Conversion time	200mS minimum per channel, depending on software filter type
Input impedance	>10MΩ
Auxillary current for PT100	150µA typical
Full-scale error	±0.4%
Linearity error	±0.04%
Status indication	Yes. See Note 10.

Notes:

9. The device can also measure resistance with the range of 1-320 Ω at a resolution of 0.1 Ω.
10. The analog value can indicate faults as shown below:

Value	Possible Cause
32767	- Sensor is not connected to input - Value exceeds permissible range - Power supply disconnected
-32767	Sensor is short-circuited

Thermocouple inputs

Input range	As shown in the table on page 11. See Note 11.
Conversion method	Voltage to frequency
Resolution	0.1°C/0.1°F maximum
Conversion time	100mS minimum per channel, depending on software filter type
Input impedance	>10MΩ
Cold junction compensation	Local, automatic
Cold junction compensation error	±1.5°C / ±2.7°F maximum
Absolute maximum rating	±0.6VDC
Full-scale error	±0.4%
Linearity error	±0.04%
Warm-up time	½ hour typically, ±1°C/±1.8°F repeatability
Status indication	Yes. See Note 12.

Notes:

11. The device can also measure voltage within the range of -5 to 56mV, at a resolution of 0.01mV. The device can also measure raw value frequency at a resolution of 14-bits(16384)
12. The analog value can indicate faults as shown below:

Value	Possible Cause
32767	- Sensor is not connected to input - Sensor value exceeds the maximum value - Power supply disconnected
-32767	Sensor value is under the minimum value

Table 1: Thermocouple input ranges

Type	Temperature range	Wire Color	
		ANSI (USA)	BS 1843 (UK)
mV	-5 to 56mV	-	-
B	200 to 1820°C (300 to 3276°F)	+Grey -Red	+None -Blue
E	-200 to 750°C (-328 to 1382°F)	+Violet -Red	+Brown -Blue
J	-200 to 760°C (-328 to 1400°F)	+White -Red	+Yellow -Blue
K	-200 to 1250°C (-328 to 2282°F)	+Yellow -Red	+Brown -Blue
N	-200 to 1300°C (-328 to 2372°F)	+Orange -Red	+Orange -Blue
R	0 to 1768°C (32 to 3214°F)	+Black -Red	+White -Blue
S	0 to 1768°C (32 to 3214°F)	+Black -Red	+White -Blue
T	-200 to 400°C (-328 to 752°F)	+Blue -Red	+White -Blue

Analog Outputs

Number of outputs	4 (single-ended)
Output range	0-10V, 4-20mA. See Note 13.
Resolution	12-bit (4096 units)
Conversion time	Synchronized to scan time.
Load impedance	1kΩ minimum—voltage 500Ω maximum—current
Galvanic isolation	
Analog outputs to bus	Yes
Analog outputs to Analog/PT/TC inputs	Yes
Analog outputs to analog outputs	No
Linearity error	±0.1%
Operational error limits	±0.2%

Notes:

13. Note that the range of each I/O is defined by wiring, jumper settings, and within the controller's software.

Environmental	IP20 / NEMA1
Operating temperature	0° to 45°C (32° to 113°F)
Storage temperature	-20° to 60°C (-4° to 140°F)
Relative Humidity (RH)	5% to 90% (non-condensing)
Dimensions (WxHxD)	138x23x123mm (5.43x0.9x4.84")
Weight	262g (9.25 oz)

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