

 ***Vision*120TM OPLCTM**
Graphic *O*perator Panel & *P*rogrammable *L*ogic *C*ontroller

User Guide



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Preface

This guide contains essential information for Vision120 OPLC™ users.

Warnings and Safety Guidelines

Read this section carefully before installing and operating the device.

Chapter 1: Overview

Contains a general description of the device's features and functions.

Chapter 2: Mounting

Describes mounting considerations and procedures.

Chapter 3: Power Supply

Explains wiring procedures and considerations.

Chapter 4: I/Os

Presents information regarding on-board I/Os and I/O expansion modules.

Chapter 5: Communications

Contains program download instructions as well as information on serial communications and CANbus networking, including wiring.

Chapter 6: Information Mode

Describes how to use Information Mode to view runtime values, set timer values, reset and initialize the controller and check I/O module status.

Appendix A: System Data Types

Contains tables showing internal system elements.

Appendix B: New PLC Users

Provides information for new PLC users.

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Warnings and Safety Guidelines

Guidelines for user safety and equipment protection

This manual 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.

Symbols are used to highlight information relating to the user's personal safety and protection of the equipment throughout this manual.

When any of the following symbols appear, the associated information must be read carefully and understood fully.

Danger Symbols

Symbol	Meaning	Description
	Danger	The identified danger can cause severe physical and property damage.
	Warning	The identified danger can cause physical and property damage.
<i>Caution</i>	Caution	Use caution.

Warnings

- 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.
- 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.
- Due to the great variety of possible applications for this equipment, the user must assess the suitability of this product for specific applications.
- Make sure to have safety procedures in place to stop any connected equipment in a safe manner if the controller should malfunction or become damaged for any reason.
- Do not replace electrical parts or try to repair this product in any way.
- Only qualified service personnel should open the device's housing or carry out repairs.
- The manufacturer is not responsible for problems resulting from improper or irresponsible use of this device.
- Please dispose of this product in accordance with local and national standards and regulations.

Chapter 1: Overview

Introducing the Vision120 OPLC™ ¹

The palm-sized Vision120 OPLC™ is a member of the Vision OPLC series, programmable logic controllers that comprise an integral graphic operating panel. The Vision120 offers an on-board I/O configuration that varies according to model. Plug-in **I/O Expansion Modules** can also be easily integrated to greatly extend the system's control capacity. All Vision OPLCs offer serial communications, CANbus networking options, and a real-time clock (RTC).

Vision OPLC operating panels contain a graphic LCD screen and a keyboard. The LCD screen displays operator instructions, alarms, and real-time variable system information via text and graphic images. The operator uses the programmable keyboard to enter or modify data within the Vision-controlled system. This communication interface between the controller and operator is referred to as the **HMI**, or Human Machine Interface, throughout this manual.



Figure 1. The Vision120 OPLC™ System

These features combine to offer a cost-effective solution for small-sized industrial applications that require both an operator's interface and the ability to control low-end processes according to time and ambient conditions.

¹ Acronym for Operating panel + Programmable Logic Controller

Technical Description

The Vision120 OPLC (V120)

- Dimensions: 96 x 96 x 64mm (3.78" x 3.78" x 2.52").
- Mounting: either panel or DIN rail mountable.
- Power supply: 12 or 24VDC.
- Real-time clock (RTC): enables time and date controlled functions.
- Battery back-up: protects real-time clock (RTC) and all data, including variable data.

Operating Panel

The operating panel comprises a graphic display screen and keyboard:

- The LCD screen displays both user-defined text; according to fonts selected in the HMI program; and user-designed graphic images.
- The V120 keypad contains 16 keys.

I/Os

Different V120 models offer different on-board I/O configurations. In addition to the on-board I/Os, the controller's I/O expansion port enables up to 8 I/O Expansion Modules to be connected to a single controller.

Note that I/O technical specifications are provided in separate documents.

Communications

Serial Communications

The controller has 2 serial communication ports. These may function in conjunction with either the RS232 or RS485 standard, in accordance with the instructions provided in "Chapter 5: Communications", page 19.

CANbus

Specific controller models comprise 1 port for CANbus networking purposes.

Programming

Vision OPLC programs comprise both PLC and HMI applications. Both applications are programmed on a PC using VisiLogic software.

PLC Application

The PLC application enables Vision to perform automation tasks. V120-12-xx models have an application memory of up to 256K; V120-22-xx up to 448K. VisiLogic enables the programmer to:

- Build the PLC application using click-and-drop Ladder elements and functions.
- Create a modular program, comprised of separate subroutines that can be called into the PLC application at any time.

HMI Application

The HMI application customizes the operator interface. Use it to:

- Assign functions to the keyboard keys and enable the operator to enter data via the controller keyboard.
- Create and display text, graphic images, and variable system data on the controller’s screen in response to run-time conditions.

An HMI application can comprise up to 255 Displays. Each Display can include text, graphic images, and variables.

Variables allow you to display system data on the controller’s LCD screen: bit, integer, and timer values, times and dates, I/O status and values, and text from the variable text display list. Variables can also use a graphic image or a bar graph to represent a value or range of values. Up to 32 fonts may be included in a typical application. A variety of languages are supported.

When the VisiLogic program is complete, the programmer downloads it into the controller.

The data types in the tables below can be used in your applications.

Data Type	Symbol
Memory Bits (coils): 2048	MB
Memory Integers (registers): 1600, 16 bit	MI
Memory Long Integers: 256, 32 bit	ML
Double Word (unsigned): 64, 32 bit	DW
Memory Floats: 24	MF

Data Type	Symbol
Timers: 192, 32 bit	T
Counters: 24	C
Inputs: 544	I
Outputs: 544	O

System data types, listed below, are linked to certain values or controller functions and are reserved for use by the system. Some of them are available for use in your program. See “Appendix A: System Data Types,” page 33.

Data Type	Symbol
System Bits: 512	SB
System Integers: 512, 16 bit	SI

Data Type	Symbol
System Long Integers: 64, 32 bit	SL
System Double Word: 64, 32 bit	SDW

Vision controllers also contain Data Tables, which may be used to store data or contain pre-programmed recipe parameters. Data Tables can occupy up to 120K(RAM)/64K (Flash).

Safety Guidelines



- 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 the controller with voltage exceeding permissible levels. Permissible voltage levels are listed in the technical specifications provided with your controller.
- Install an external circuit breaker and take all appropriate safety measures against short-circuiting in external wiring.

Caution

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

Chapter 2: Mounting

The controller can be either panel-mounted or snap-mounted to a DIN rail.

Before You Begin

Before you begin installation procedures, check the contents of the controller kit. Standard kits contain the controller, green plastic plug-in connectors, and 2 black plastic mounting brackets, each with a screw inserted for panel mounting. These elements are illustrated in Figure 2. The kit also contains a black seal, used for panel-mounting the controller; a CD-ROM containing VisiLogic software, used to program the controller, a technical specification sheet, and a programming communication cable. Kits comprising CANbus-ready models also contain a green plastic CANbus plug-in connector. These items are not pictured in Figure 2.

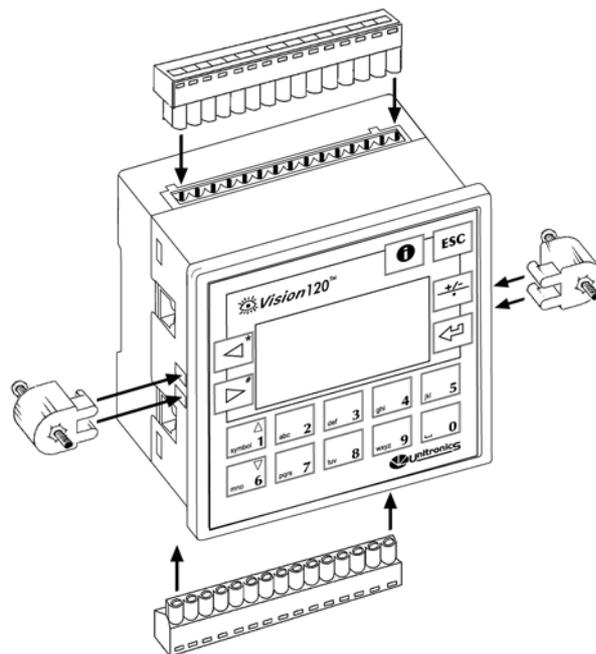


Figure 2. Connectors and Mounting Brackets

Safety and Environmental Guidelines



- 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.
- Do not place in water or let water leak onto the controller.
- Do not allow debris to fall inside the unit during installation.
- **Double-check** all the wiring before turning on the power supply.



- Do not touch live wires.
 - Stay as far as possible from high-voltage cables and power equipment.
 - Leave a minimum of 10mm space for ventilation between the top and bottom edges of the controller and the enclosure walls.
-

Panel Mounting

Before you begin, note that the panel itself cannot be more than 5 mm (0.197") thick.

1. Make a panel cut-out that measures 92 x 92 mm (3.622" x 3.622").
2. Check the seal that is placed over the back of the unit. The seal must fit snugly against the back rim of the operating panel.
3. Slide the controller into the cut-out.
4. Push the two black plastic mounting brackets into their slots on the sides of the controller as shown in Figure 2 on page 9.
5. Tighten the bracket screws against the panel as shown in Figure 3, page 11.

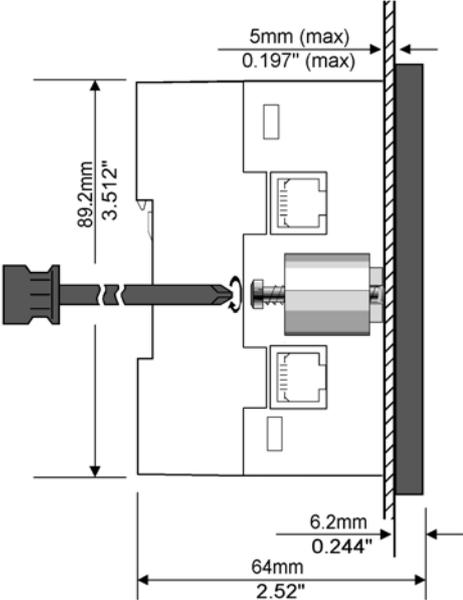


Figure 3. Panel Mounting the Controller

When properly mounted, the controller is squarely situated in the panel cut-out as shown in Figure 4.

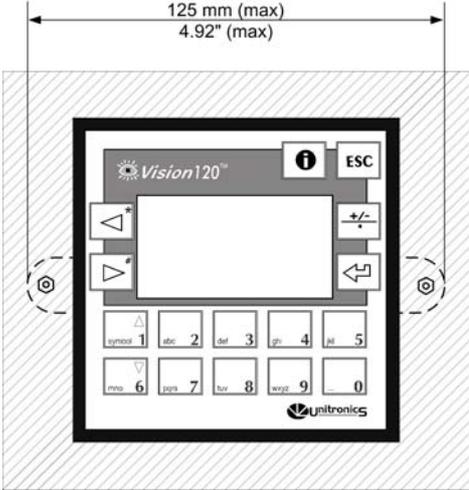


Figure 4. Panel Mounted

DIN Rail Mounting

1. Snap the controller onto the DIN rail as shown in Figure 5.



Figure 5. Snapping the Controller on to the DIN Rail

When properly mounted, the controller is squarely situated on the DIN rail as shown in Figure 6.

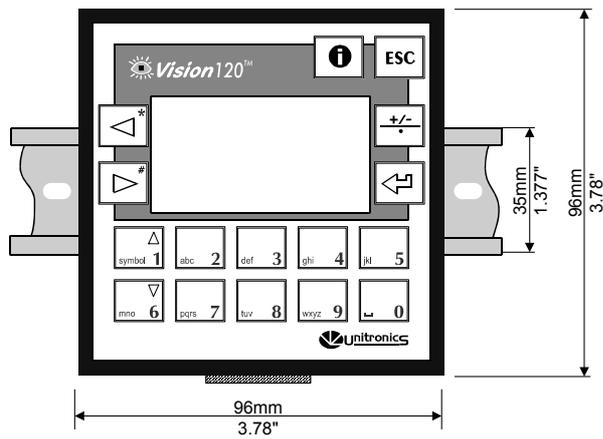


Figure 6. Proper DIN Rail Position

Chapter 3: Power Supply

Power Supply

The controller requires an external 12 or 24VDC power supply. The permissible input voltage range is listed in the technical specifications sheet supplied with the controller. You must use an external circuit protection device as shown in Figure 7, page 14.

Safety Considerations



- Do not touch live wires.
- A non-isolated power supply can be used provided that a 0V signal is connected to the chassis.
- Standard safety considerations require that metal cabinet panels be earthed to avoid electrocution.



- Do not connect either 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.
 - The wiring of this device is specifically designed to be safe and easy. A technician or engineer trained in the local and national electrical standards should perform all tasks associated with the electrical wiring of the device.
 - Double-check all wiring before turning on the power supply.
-

Wiring the Power Supply



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

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We recommend that you use crimp terminals for wiring; use 26-14 AWG wire for all wiring purposes.

1. Strip the wire to a length of 7 ± 0.5 mm (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 a proper connection according to the figure below.
4. Tighten enough to keep the wire from pulling free.

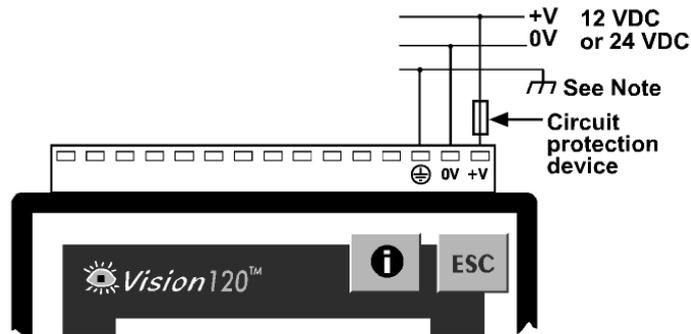


Figure 7. Power Supply Wiring

Earthing the Power Supply

To maximize system performance, avoid electromagnetic interference by

- Mounting the controller on a metal panel.
- Earthing the controller's power supply: connect one end of a wire, 14 AWG, to the chassis signal; connect the other end to the panel.

Note: The wire used to earth the power supply must not exceed 10 cm in length. If your conditions do not permit this, do not earth the power supply.

Chapter 4: I/Os

The controller offers an:

- **On-board I/O Configuration**
Each model offers a different I/O configuration.
- **I/O Expansion Port**
Via an adapter, you can connect a broad variety of I/O modules to the controller's I/O expansion port.

Wiring Considerations



- A technician or engineer trained in the local and national electrical standards should perform all tasks associated with the electrical wiring of the controller.
- Input or output cables should not be run through the same multicore cable or share the same wire.
- Do not lay input/output cables near high voltage power cables.
- Allow for voltage drop and noise interference with input/output lines used over an extended distance. Please use wire that is properly sized for the current load.
- Double-check all the wiring before turning on the power supply.
- Unused I/O pins should not be connected. Ignoring this directive may damage the controller.

On-board I/Os

I/O Connectors

I/O connection points are provided by external connectors at the top and bottom of the controller. The connectors plug in, enabling quick, easy removal. They provide screw-type connection points for the power source, inputs, and outputs. The connection points are clearly labeled on the controller itself.

The top connector generally provides connections for the power supply, analog and / or digital inputs and high-speed counter/shaft-encoder.

The bottom connector generally provides analog and / or digital output connection points.

I/O Connections

1. Strip the wire to a length of $7\pm 0.5\text{mm}$ (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 a proper connection.
4. Tighten enough to keep the wire from pulling free.

Wire Size and Specifications



- Wire the inputs and outputs using 26-14 AWG wire.
- 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 the stripped wire that might cause the wire strand to break.
- We recommend that you use crimp terminals for wiring.

I/O Options: According to Model

Technical specifications regarding specific I/O configurations are supplied with your model controller.

Digital Inputs

Depending on your controller model, inputs may:

- function at 12 or 24 VDC in accordance with wiring and jumper settings,
- be set to pnp (source) or npn (sink) via a single jumper and appropriate wiring.

Input values are placed in operands represented by the letter “I” when you write your program. They are numbered from 0.

High-Speed Counter/Shaft-encoder

According to your controller model, certain inputs can function as either a high-speed counters, shaft encoders, or as normal digital inputs.

Analog I/Os

Specific controller models contain analog I/Os. These may also comprise PT100 or thermocouple inputs.

Digital Outputs

Each controller contains either relay or transistor outputs. The digital output value is placed in operand “O” when you write your program.

The power supply for transistor outputs requires an external circuit protection device. See the technical specifications supplied with the controller.

Relay Contact Protection

To increase the life span of your contacts and protect the controller 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.

This is illustrated in Figure 8.

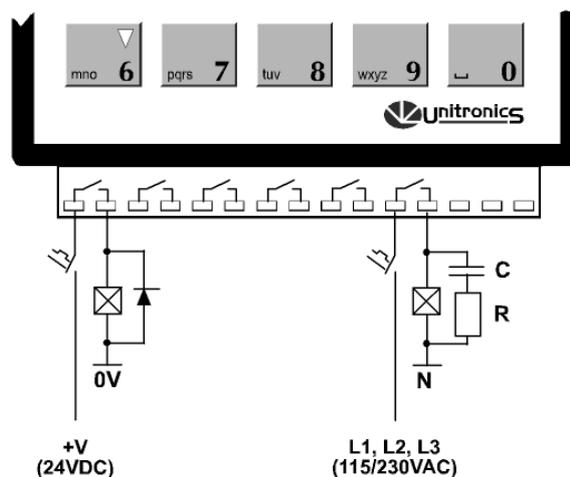


Figure 8. Increase the Contact Life Span

Installing I/O Expansion Modules

An adapter enables you to integrate I/O Expansion Modules into the system. You plug an I/O expansion cable into the appropriate port located on the right side of the controller, connect the cable to the adapter, and then plug I/O Expansion Modules into the adapter as shown in Figure 9, page 18.

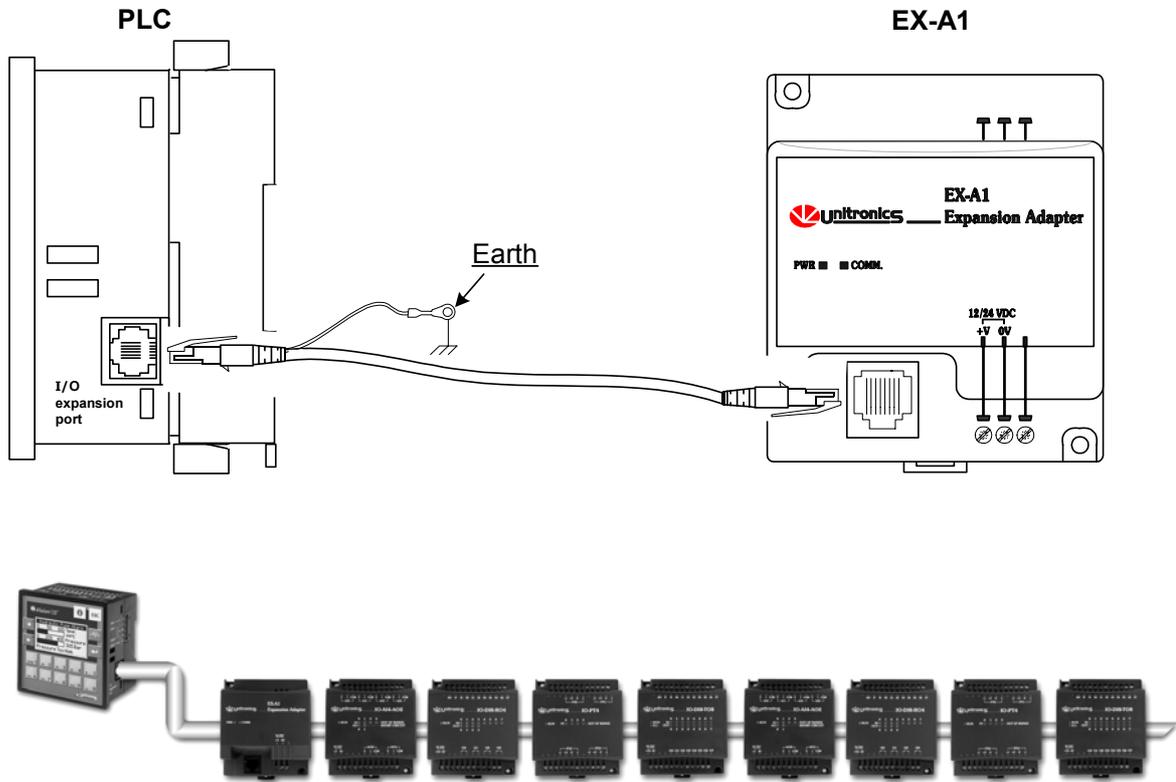


Figure 9. Integrating I/O Expansion Modules

Exact instructions are provided with the adapter and I/O Expansion Modules.



- Turn off the power before installing I/O expansion modules.
-

Chapter 5: Communications

This chapter contains guidelines for communications connections. The controller has 2 RJ-11-type serial communication ports. Each port can be adapted to either the RS232 or RS485 standard, via jumpers located within the controller and the appropriate VisiLogic program settings.

CANbus-ready models also offer a CANbus port.



Caution

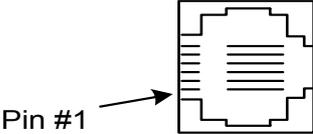
- Turn off power before making communications connections.
 - Do not connect the controller directly to a telephone or telephone line.
 - The RJ-11 type serial ports are not isolated; note that communication signals are related to the controller's 0V; this is the same 0V used by the power supply.
 - Ports must always be used with an appropriate adapter.
-

RS232

Via RS232, you can:

- Download programs from a PC.
- Communicate with external devices.
You can, for example, use your PC to access a networked controller via its RS232 port. You can then view, read, and write data into any unit. RS232 also allows you to view the network via a SCADA program.

Table 1: RS232: Pinout

Diagram	Pin Number	RS232: Function
	1	DTR signal
	2	0V reference
	3	TxD signal
	4	RxD signal
	5	0V reference
	6	DSR signal

Note that standard programming cables do not provide connection points for pins 1 and 6. In addition, note that when a port is adapted to RS485, Pin 1 (DTR) is used for signal A, and Pin 6 (DSR) signal is used for signal B as shown in Table 2.

Downloading Your Program

You can download programs via a direct cable connection between your PC and the controller. The cable should not exceed 3 meters in length.

Connecting the Controller to the PC

- Connect the controller to your PC using the communication cable as shown in Figure 10.

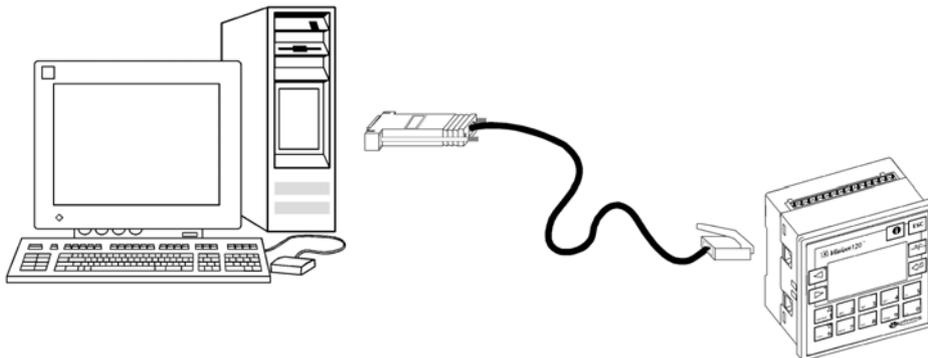
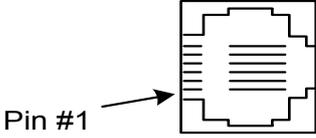


Figure 10. Connecting the PC to the Controller

RS485

Use RS485 to create a multi-drop network containing up to 32 devices.

Table 2: RS485: Pinout

Diagram	Pin Number	Function
	1	A signal (+)
	2	(RS232 signal)
	3	(RS232 signal)
	4	(RS232 signal)
	5	(RS232 signal)
	6	B signal (-)

Note that when a port is set to RS485, both RS232 and RS485 can be used simultaneously **if** flow control signals DTR and DSR are not used.



Caution

- Note that the ports are not isolated. If the controller is used with a non-isolated external device, avoid potential voltage that exceeds $\pm 10V$. To avoid damaging the system, all non-isolated device ports should relate to the same ground signal.
- Use shielded, twisted pair cables.
- Minimize the stub (drop) length leading from each device to the bus.
- Ideally, the main cable should be run in and out of the network device.
- Do not cross positive (A) and negative (B) signals. Positive terminals must be wired to positive, and negative terminals to negative.

RS485 Network Termination Settings

The jumper settings shown in Table 4 determine whether the controller can function as an end device in a RS485 network. Note that the factory default setting is **ON**. If the OPLC is **not** a network end device, set both jumpers to **OFF**.

RS232/RS485 Jumper Settings

The tables below show how to set a specific jumper to change the functionality of the controller.

To open the controller and access the jumpers, refer to the instructions on the next page.

Table 3: RS232/RS485 Jumper Settings

COM 1			COM2		
To use as:	JP1	JP2	To use as:	JP5	JP6
RS232*	A	A	RS232*	A	A
RS485	B	B	RS485	B	B

Table 4: RS485 Termination Settings

COM 1			COM2		
Termination	JP3	JP4	Termination	JP7	JP8
ON*	A	A	ON*	A	A
OFF	B	B	OFF	B	B

- Default factory setting.

Opening the Controller



- Before opening the controller, touch a grounded object to discharge any electrostatic charge.
 - Avoid touching the PCB board directly by holding the PCB board by its connectors.
-

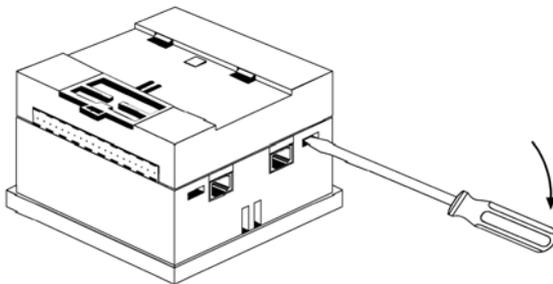


Figure 11. Opening the Controller

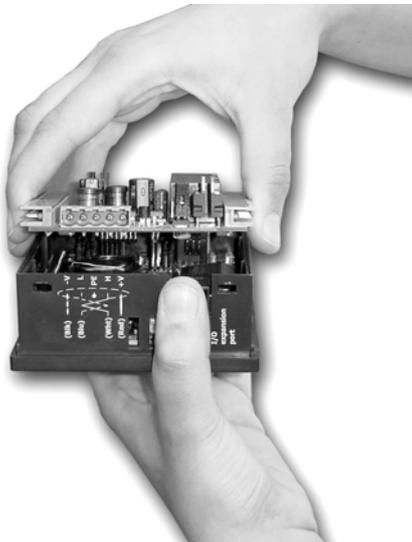


Figure 12. Removing the Top PCB board

1. Turn power off before opening the controller.
2. Locate the 4 slots on the sides of the controller.
3. Using the blade of a flat-bladed screwdriver, gently pry off the back of the controller as shown in Figure 11.
4. Gently remove the top PCB board:
 - a. Use one hand to hold the top-most PCB board by its top and bottom connectors as shown in Figure 12.
 - b. With the other hand, grasp the controller, while keeping hold of the serial ports; this will keep the bottom board from being removed together with the top board.
 - c. Steadily pull the top board off.

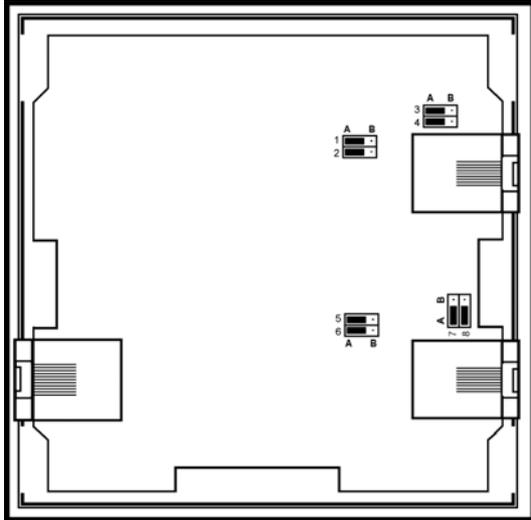


Figure 13. RS232/RS485 Jumpers, Factory Default Settings

5. Locate the jumpers shown in Figure 13, then change the jumper settings as required.

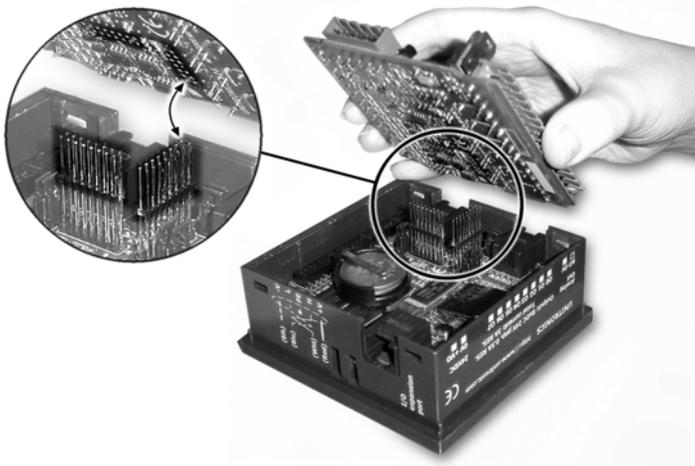


Figure 14. Replacing the Board

6. Gently replace the PCB board as shown in Figure 14. Make certain that the pins fit correctly into their matching receptacle.
 - a. Do not force the board into place; doing so may damage the controller.
7. Close the controller by snapping the plastic cover back in its place. If the card is placed correctly, the cover will snap on easily.

CANbus

Specific controller models comprise 1 port for CANbus networking purposes. Via this port, you can create a decentralized control network of up to 63 controllers. This is sometimes called a multi-master network. In such a network, CANbus enables inter-PLC data exchange.

Unitronics' CANbus control network is run by a separate isolated power supply that is not part of the network power supply.

CANbus Specifications

Power Requirements: 24VDC ($\pm 4\%$), 40mA max. per unit

Galvanic Isolation between
CANbus and controller: Yes

Max. Network Cable Length:

1 Mbit/s -	25 m
500 Kbit/s -	100 m
250 Kbit/s -	250 m
125 Kbit/s -	500 m
100 Kbit/s -	500 m
50 Kbit/s -	1000 m
20 Kbit/s -	1000 m

Note: If you require cable lengths over 500 meters, contact technical support.

Wiring Considerations

- Use twisted-pair cable. DeviceNet® thick shielded twisted pair cable is recommended.
- Network terminators: These are supplied with the controller. Place terminators at each end of the CANbus network. Resistance must be set to 1%, 121 Ω , 1/4W.
- Connect the ground signal to the earth at only one point, near the power supply.
- The network power supply need not be at the end of the network
- Maximum number of controllers in a network: 63

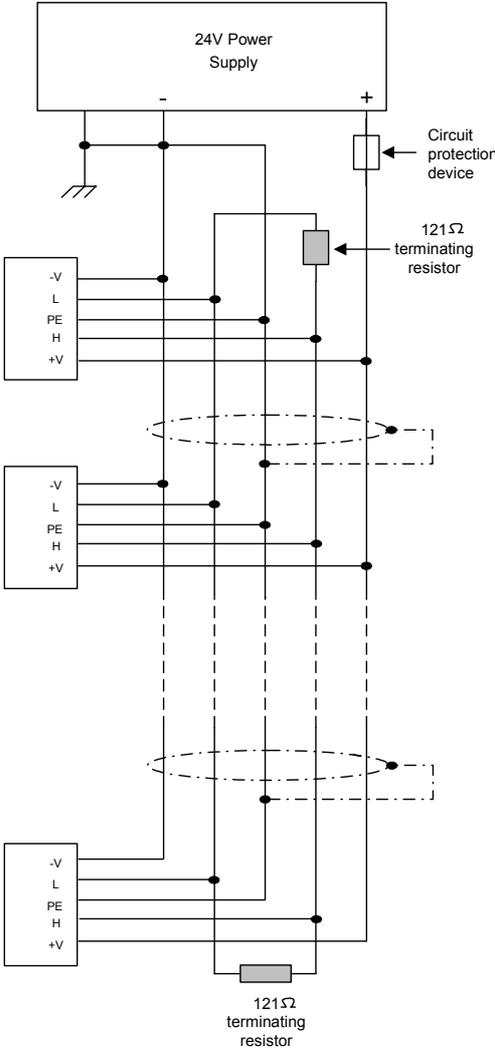


Figure 15. CANbus Wiring Diagram

Chapter 6: Information Mode

Information Mode is a utility that is embedded in the operating system of the controller. Via Information Mode, you can view data on the LCD screen, use the controller's keyboard to directly edit data, and perform certain actions such as resetting the controller. You can enter Information Mode at any time without regard to what is currently displayed on the LCD screen

Viewing data does not affect the controller's program. Performing actions, such as initializing the controller, can influence the program.

Note that when you use Information Mode, the keyboard is dedicated to that purpose. The keys return to normal application functions when you exit Information Mode.

Using Information Mode

1. To enter Information mode, press the <i>button on the Vision's keyboard down for several seconds.
2. Enter your password. The default password is 1111. This password remains in effect **until** you change it via the Information Mode screen described in the table below.
3. The controller enters Information Mode, showing the first category, Data Types.

Caution • The controller will block entry into Information mode until the correct password has been entered. This is why you must record any password you set for your controller.

The data in Information Mode is arranged in Categories. Each Category contains several Subjects. You navigate Information Mode by using the keyboard buttons as shown below.

To exit Information mode, press the <ESC>button on the Vision's keyboard. Each press returns one level up. Press the number of times necessary to exit.

Note that when you reenter Information Mode, the controller will return to the last Category viewed.



Figure 16. Navigating Information Mode

Table 5 shows the categories of information that can be accessed in this mode.

Table 5: Information Mode

<i>Category</i>	<i>Subject</i>	<i>Possible Actions</i>
Data Types	Inputs	<ul style="list-style-type: none"> View input status. Force input status to 1 (FR1) or 0 (FR0). Forced values stay in effect until Normal mode (NRM) is selected, or until the controller is initialized or reset. Note that forced values do influence your program. This can be useful in testing the effect of an input condition on an output status.
	Outputs	<ul style="list-style-type: none"> View output status. Force output status to 1 (FR1) or 0 (FR0). Note that forced output values do not affect your program. Set/Reset output status.
	Memory Bits System Bits	<ul style="list-style-type: none"> View bit status. Change bit status (Set/Reset).
	Timers	<ul style="list-style-type: none"> Enter a Preset Timer value. View the current timer value and status by selecting the R.T. option.
	Memory Integers System Integers Memory Longs System Longs Memory Double Words System Double Words	<ul style="list-style-type: none"> View integer/long integer/double word values. Change values. Toggle Base: view the value in decimal or hexadecimal form.

<i>Category</i>	<i>Subject</i>	<i>Possible Actions</i>
System	Model & O/S Ver	<ul style="list-style-type: none"> • Check the controller's model number and operating system version. • Check whether the controller is in Run or Stop mode.
	Working Mode	<ul style="list-style-type: none"> • Check whether the controller is in Run or Stop mode. • Reset the controller. This restarts your program. • Initialize the controller. This restarts your program and initializes all values.
	Time & Date	<ul style="list-style-type: none"> • View the Real Time Clock (RTC) settings. Note that the RTC settings control all time-based functions. • Change the RTC settings via the controller's keyboard.
	Unit ID	<p>The Unit ID number identifies a networked controller. You can:</p> <ul style="list-style-type: none"> • Change the ID number.
	Serial Port 1 Serial Port 2	<ul style="list-style-type: none"> • View and edit communication settings. • Select to change the new settings.
	CANbus Baud Rate	<ul style="list-style-type: none"> • Change the CANbus baud rate.

<i>Category</i>	<i>Subject</i>	<i>Possible Actions</i>
Function Block	FBs in use	<ul style="list-style-type: none"> Shows a list of all function blocks that have been downloaded into the controller. Both the FB name and its version are displayed.
Password	New	<ul style="list-style-type: none"> Set a New Password
Hardware Configuration		<ul style="list-style-type: none"> Check if I/O Expansion Modules are installed. Note that I/O Expansion Modules are represented by letters. Identical module types are represented by identical letters as shown below. Shows if an on-board I/O or I/O module is short-circuited.

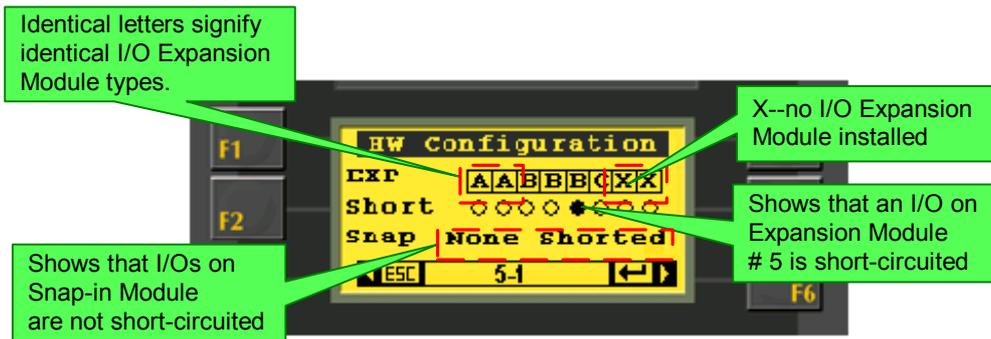


Figure 17. Information Mode: Hardware Configuration

Appendix A: System Data Types

The Vision OPLC operating system – user program interface includes System Bits (SB), System Integers (SI), System Long Integers (SL), and System Double Words (SDW) listed in the tables below. Specific data types are linked to fixed parameters and are read-only by the user program, such as **SB 2 Power-up bit**.

You may write into certain data types. These are marked with an asterisk (*), such as **SI 8 Unit ID**. All SBs, SIs, SLs, and SDWs not listed are reserved for use by the system.

To obtain a complete, updated list of system operands, refer to the VisiLogic software.

Table 6: System Bit Functions

System Bits (SB)	Function
0	Always 0
1	Always 1
2	Power-up bit
3	1 second pulse
4	Divide by zero
5	Output(s) short circuit
6	Keyboard is active
7	100 mS pulse
8	Battery low
30	HMI keypad entries completed
31*	Refresh current LCD screen display
32	HMI keypad entry in progress
40-63	Keypad keys (see the following table)
200*-215*	Network operands
236	Network communication error
237*	Network disable
250	Keypad entry within limits
251	Keypad entry exceeds limits

Table 7: Keypad System Bit Functions

System Bit (SB)	Keypad Key	System Bit (SB)	Keypad Key
SB 40		SB 49	
SB 41		SB 50	
SB 42		SB 51	
SB 43		SB 52	
SB 44		SB 53	
SB 45		SB 57	
SB 46			
SB 47			
SB 48			

Table 8: System Integer Functions

System Integer	Function
0	Scan Time (mSec)
6	Current key pressed
7*	LCD contrast
8*	Unit ID
9*	LCD Backlight intensity
30*	Current second—according to RTC
31*	Current time—according to RTC
32	Current date—according to RTC
33	Current year— according to RTC
34	Current day— according to RTC
80	Modem Status: COM 1
81	Modem Error Code: COM 1
82	Modem Status: COM 2
83	Modem Error Code: COM 2
200*-201*	Network operands
236	Network communication error code
237	Network: failed unit ID

Table 9: System Long Integer Functions

System Long Integer	Function
4	Divide Remainder (signed divide function)

Table 10: System Double Word Functions

System Double Word	Function
0	10mS counter
4	Divide Remainder (unsigned divide function)
5	Output(s) short circuit bitmap

Appendix B: New PLC Users

PLCs, or programmable logic controllers, are electronic control systems based on microprocessors. A PLC performs control functions in accordance with its software program of external automated equipment.

Parts of a PLC

Operating Panel

The operating panel provides what is called the HMI, or Human Machine Interface, between you and the PLC. The panel is composed of an LCD screen and a customizable keypad. The LCD screen displays messages to the operator. You assign functions to the keys when you write your software program.

Inputs

Inputs receive signals from external devices such as switches, push buttons and variable voltage signals from analog devices. The inputs convert the voltage to signals that the PLC can process.

Outputs

Outputs send signals from the PLC to external devices such as lights or contactor coils. Outputs convert the PLC program results into signals that these external devices can process.

CPU

The Central Processing Unit is the brain of the PLC. It executes the control program.

How PLCs Work

The figure below shows the PLC cycle. This cycle is called a scan. The scan cycle is performed continuously.

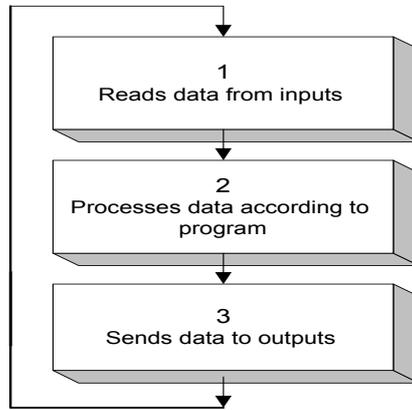


Figure 18. PLC Scan

First, the input data is read at the beginning of each scan. The data has two sources: the PLC’s physical inputs, and data that are entered via the PLC’s keypad.

Next, the program is executed. The user creates the PLC control program. The program is composed of instructions that are written in the Ladder language, and is written using the PLC’s proprietary software. All program instructions are executed in each scan cycle.

Last, the outputs are updated with the new data.

The sample program below causes an alarm, connected to output #1, to actuate whenever a gate, connected to input #1, opens.



The command  means that the status of the gate is checked at the beginning of each scan. When the gate is open, the value in the operand is 1 or on. When the gate is closed, the value in the operand is 0 or off.

The command  controls the alarm. When the value in  contact 1 is found to be 1, the alarm is switched on. When the value is 0, the alarm is off.

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