

# Unitronics Devices and RS485

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## RS485 Options

The information in this topic is common to all Unitronics' controllers networked via RS485. Note that before you carry out any tasks associated with wiring, you must read and fully understand the safety guidelines.

### About RS485

RS485 is a balanced serial interface for the transmission of digital data, which enables you to create a multi-drop network containing up to 32 devices, or nodes

RS485 gives you 2 main advantages over RS232: longer cable lengths and greater immunity to noise. In comparison to RS232, RS485 uses lower voltage and differential signals. RS485 uses a differential voltage loop interface (balanced differential signal); differential data transmission reduces the effects of ground shifts and induced noise signals, even in an electrically noisy environment. The system is based on balanced circuits that rely on twisted-pair wires (A & B). Thus, the data conversion of logical 0 and 1 is made by converting the polarity of the two wires by reference to each other, instead of changing polarity of a single wire by reference to the "SG" (Signal Ground).

The noise immunity results from the fact that, when electromagnetic noise is induced over the differential signals, the same noise is induced on both signals. When the receiver subtracts the differential signals, the result is noise compensation.

The same 2 wires are used for transmitting and receiving; therefore, within RS485 networks, only one device can transmit while all of the other devices 'listen' (receive).

Unitronics' controllers offer different options for networking via RS485, according to the network series.

### Network Topology & Wiring

The network topology is multi-drop bus. Every RS485 network includes 2 types of nodes; node refers to every device that is physically connected to the network.

- End Nodes: The devices attached at both physical ends of the network, containing a network terminator.
- In-line Node: All devices connected to the network that are not end nodes.

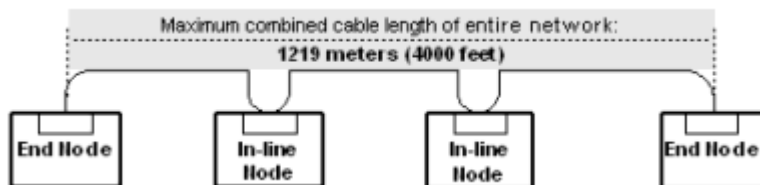
To enable a rapid rate of communication over relatively long distances, the wires function as transmission lines. For this reason, the end nodes of the network must contain network terminators for the purpose of impedance matching. The method for setting network terminators is described individually for each device.

### RS485 Network Wiring

Use shielded twisted pair (STP) cables to network devices. Recommended cables types are:

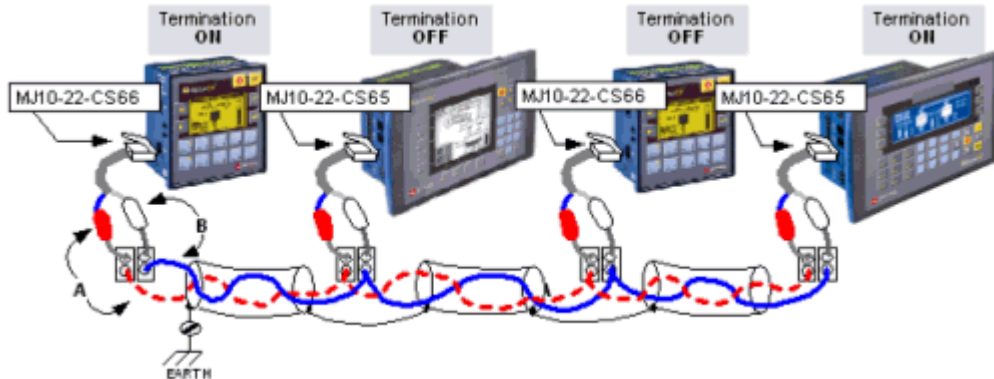
- Twinax cable, type H8106 • Control cable, type due 4001 (0.5mm<sup>2</sup>, twisted pair)
- Twinax cable, type H3094 • Control cable, type V45551-F21-B5 (1.5mm<sup>2</sup>, twisted pair)

The combined total length of all network cables cannot exceed 1219 meters, as shown below.



### RS485 wiring considerations

- With the exception of the M90-19-R4, the RS485 signals are NOT isolated. If the controller is used with a non-isolated external device, avoid potential voltage that exceeds  $\pm 10V$ . To avoid severely damaging the system, all non-isolated device ports should relate to the same 0V signal.
- Minimize the stub (drop) length leading from each device to the bus. The stub should not exceed 5 centimeters. Ideally, the main cable must be run in and out of the networked device as shown below. The connectors MJ10-22-CS66 (V120 and M91 series) and MJ10-22-CS65 (V2xxx series), shown below, enable this to be easily accomplished.



- Do not cross positive (A) and negative (B) signals. Positive terminals must be wired to positive, and negative terminals to negative.
- You must create network termination points by using the two end point devices integrated into your network. The method of creating termination points varies according to the controller series.

## RS485, by controller type

RS485 is implemented differently in Unitronics' controllers, according to model type. These options are summarized below.

Vision controllers are programmed using VisiLogic software. When Vision controllers are networked via RS485, the COM ports must be initialized to the RS485 standard as explained in COM Port: Init.

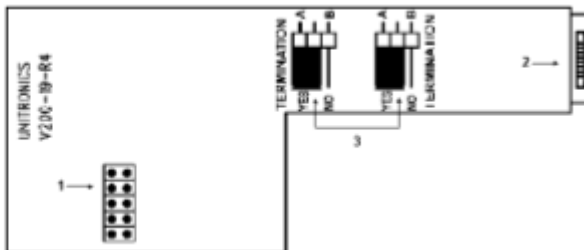
In addition, you must assign a unique Unit ID number to each controller, as explained in the Help topic: Assigning a Unit ID number. Note that there is a range of ID numbers reserved for RS485, numbers 64-127.

### Vision 230/260/280

RS485 ports are available by separate order and easily installed.

Installation instructions are provided together with the module when it is ordered separately. The connector type is RJ-45. RS485 termination settings are determined via jumper.

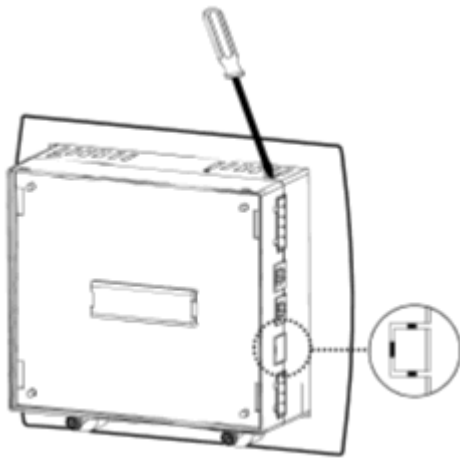
RS485 Module (V200-19-R4)	
1	J1 connector, plugs into PLC board
2	RS485 port
3	Termination jumpers



## Network Termination Settings

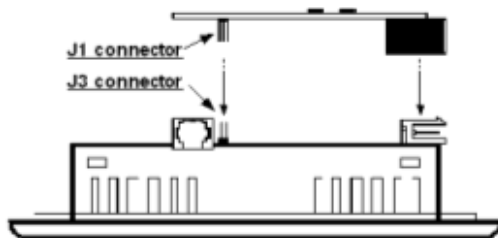
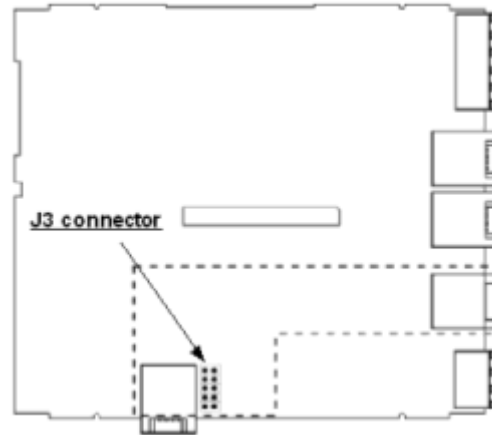
The jumper settings shown above determine whether the controller can function as an end device in a RS485 network. Note that the factory default setting is YES, whether or not the RS485 port was supplied already installed in the controller. If the OPLC is not a network end device, set both jumpers to NO.

To open the controller in order to access the module and change the jumper settings, follow the relevant instructions listed below.



1. Turn power off before opening the controller.
2. If the controller has an installed Snap-in I/O module, remove it. Instructions are given in 'Removing a Snap-in Module' in the Vision User Guide.
3. Open the OPLC by inserting a screwdriver into the slots located on the sides of the controller as shown, then carefully prying the cover off.
4. The RS485 port's location is covered by plastic. Remove the plastic covering by using a razor cutter to cut through the tabs.

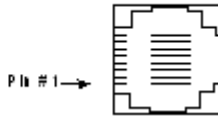
4. Locate the J3 connector.



5. Install the module by placing the J1 connector (female) of the module onto the J3 connector (male) in the controller.
6. Make sure that the connection is secure.
7. Close the controller by snapping the plastic cover back in its place. If the module is correctly placed, the cover will snap on easily.
8. If required, reinstall the Snap-in Module.

**RJ45 Connector Pin-out**

Pin Number	Function
8	A signal (+)
1	B signal (-)

**Vision 120/ M91****Vision 120 series**

The V120 series offers 2 serial communication ports. Each port can be adapted to either the RS232 or RS485 standard, via jumpers located within the controller and VisiLogic software settings. Note that the ports are not isolated. The connector type is RJ-11. RS485 termination settings are determined via jumper.

**M91 series**

An M91 that contains an RS485/RS232 port has a part number that includes the number '4', for example: M91-19-4UN2.

RS485 is via an RJ-11-type serial communication port. Each port can be adapted to either the RS232 or RS485 standard, via jumpers located within the controller. The M91 is programmed using U90 Ladder software.

The port mode is determined by SI 64, Set COM Port Mode, as described in the U90 Ladder help topic: COM Port Mode: RS232/RS485 (M91 only).

Note that the port is not isolated. RS485 termination settings are determined via jumper.

**Vision 120/ M91 RS232/RS485 COM ports**

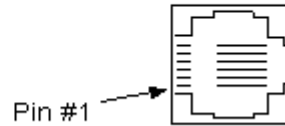
The information below applies to both Vision 120 and M91 series controllers. The controllers in these series offer RJ-11-type serial communication ports. Each port can be adapted to either the RS232 or RS485 standard, via jumpers located within the controller. In the case of the Vision 120, appropriate VisiLogic program settings are also required.

## RJ-11 type port

The pinout below is of the RJ-11 type port, when the port is used for RS485.

### RJ11 Connector Pin-out

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



**Note** ♦ 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.



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.

## RS232/RS485 Jumper Settings

Use the jumper settings shown below to change the functionality of the controller's COM port.

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

COM 2		
To use as:	JP5	JP6
RS232*	A	A
RS485	B	B

To open the controller and access the jumpers, refer to the instructions below.

## RS485 Network Termination Settings

The jumper settings shown below 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.

COM 1		
Termination	JP3	JP4
ON*	A	A
OFF	B	B

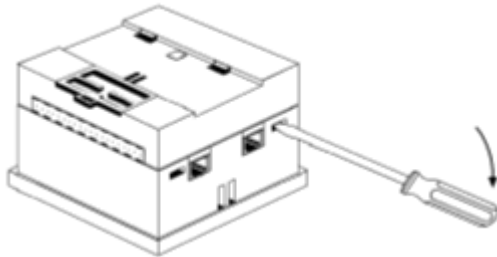
COM2		
Termination	JP7	JP8
ON*	A	A
OFF	B	B

\* Default factory setting.

### Opening the Controller



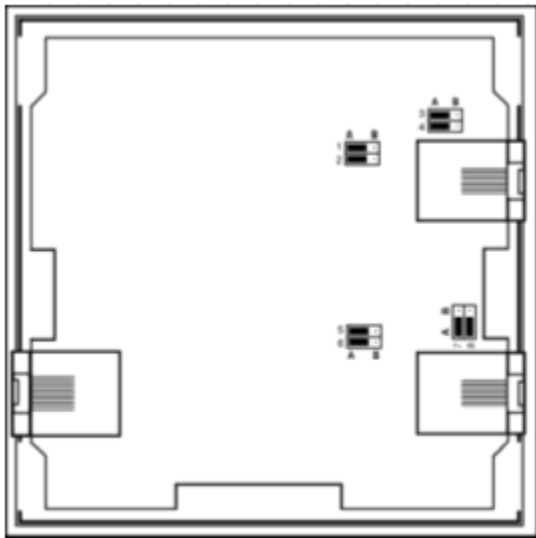
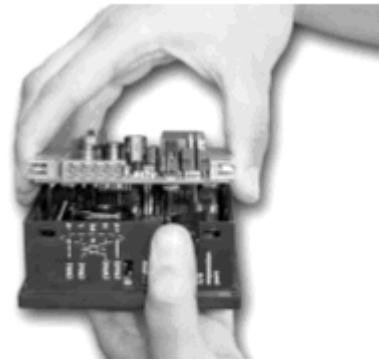
- Before opening the controller, touch a grounded object to discharge any electrostatic charge.
- Avoid touching the PCB board directly by holding the PCB board by its connectors.



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.

4. Gently remove the top PCB board:

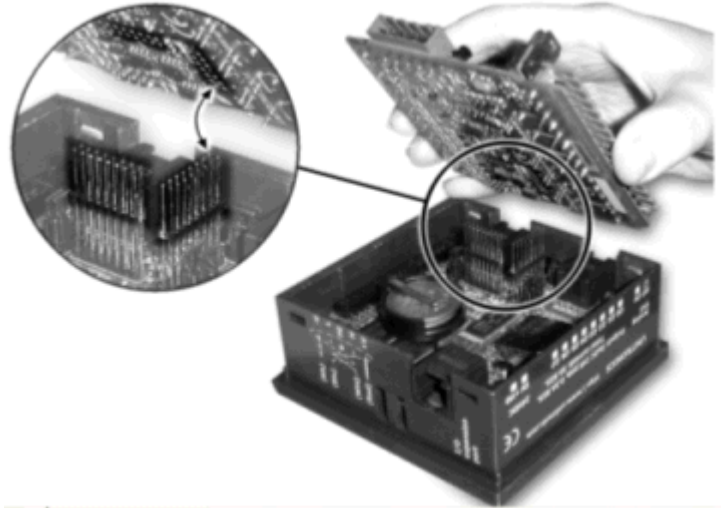
- Use one hand to hold the top-most PCB board by its top and bottom connectors as shown.
- With the other hand, grasp the controller, while keeping hold of the serial ports; this will keep the bottom board from being removed together with the top board.
- Steadily pull the top board off.



5. Locate the jumpers shown in Figure 9, then change the jumper settings as required.



6. Gently replace the PCB board as shown. Make certain that the pins fit correctly into their matching receptacle.
  - 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.



## M90

These controllers are programmed via U90 Ladder.

RS485 communications are enabled via an external RS232/RS485 converter, such as Unitronics' M90-19-R4, which can be connected to the controller's RS232 port. No U90 Ladder software settings are required.

The M90-19-R4 RS485 port is isolated.

Note that since the M90-19-R4 is an external converter, it is also compatible with other devices, such as PCs.

## Vision / M91 RS485 Port Specifications

The specifications below apply to RS485 ports for all Vision and M91 controllers.

Input Voltage -7 to +12V differential max.

Cable type Shielded twisted pair, in compliance with EIA RS485

Cable length 1200m maximum (4000 feet)

Galvanic Isolation No

Baud rate 110 - 57600 bps



Complete specification for the M90-19-R4, which converts serial data from the RS232 standard to either RS422 or RS485, is located on the Setup CD. It is also available from your local Unitronics distributor. This module is recommended for use with M90 controllers and other devices.

## User safety and equipment protection guidelines

This information 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.

Before using a Unitronics' product, it is the responsibility of the user to read and understand this document and any accompanying documentation.

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.
<i>Caution</i>	Caution	Use caution.

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



- 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 a device with parameters exceeding 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 or disconnect a device when the power is on.
- Do not touch live wires.
- Double-check all the wiring before turning on the power supply.