

**SURESTEP™**  
**COMMUNICATIONS**

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**CHAPTER**  
**11**

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## Connecting to a Host Using RS-485

The Advanced integrated motor/drives (STP-MTRD-xxxxxR) support RS-485 ASCII/SCL serial communication. RS-485 communication allows connection of more than one drive to a single host PC, PLC, HMI or other computer. It also allows the communication cable to be long (more than 300 meters or 1000 feet).

For electrically noisy environments we recommend twisted pair cable with an overall shield and drain wire. Connect the drain wire at one end of the cable to earth ground.

RS-485 can be used with either four-wire or two-wire configurations. Both types of configurations can be used for point-to-point (i.e. one drive and one host) or multi-drop networks (one host and up to 32 drives).

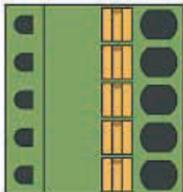
GND (circuit ground)

TX-

TX+

RX-

RX+



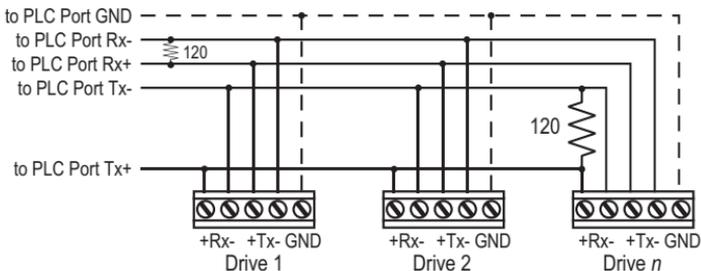
RS-485 Connector Diagram



To use the STP-MTRD-xxxxxR RS-485 with SureMotion Pro, the STP-MTRD-xxxxxR must be connected to the PC in the four-wire "point-to-point" configuration and configured one axis at a time. The DA command is useful in setting up multiple drives.

### Four-Wire Configuration

Four-wire systems utilize separate transmit and receive wires. One pair of wires must connect the host's transmit signals to each drive's RX+ and RX- terminals. The other pair connects the drive's TX+ and TX- terminals to the host's receive signals. A logic ground terminal is provided on each drive and can be used to keep all drives at the same ground potential. This terminal connects internally to the DC power supply return (V-), so if all the drives on the RS-485 network are powered from the same supply it is not necessary to connect the logic grounds. One drive's GND terminal should still be connected to the host computer ground.



A 120 ohm terminating resistor is required at the end of a four-wire network.



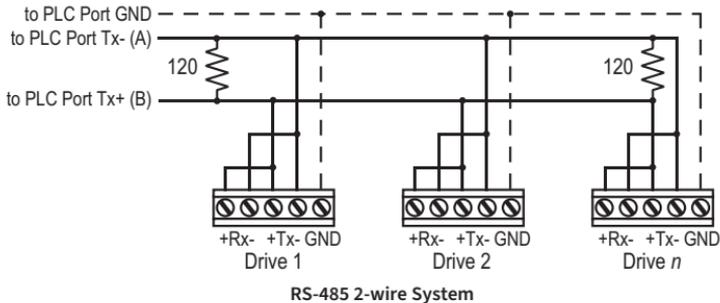
If the PC does not have an RS-485 serial port, a converter will be required. ADC part number STP-USB485-4W is recommended.

## Two-Wire Configuration

Two-wire systems use the same pair of wires to transmit and receive. This can lead to trouble as the host must not only disable its transmitter before it can receive data, it must do so quickly before a drive begins to answer a query. The STP-MTRD-xxxxR includes a “transmit delay” parameter that can be adjusted to compensate for a host that is slow to disable its transmitter. This adjustment can be made over the network using the TD command, or it can be set using the SureMotion Pro software. It is not necessary to set the transmit delay in a four-wire system.



2-wire communication is not recommended for STP-MTRD-xxxxR systems when connected to SureMotion Pro configuration software. Some SureMotion Pro features (firmware upgrade, etc.) may not work correctly. Use a 4-wire configuration for best results.



A 120 ohm terminating resistor is required at both ends of a 2-wire network.

## Assigning RS-485 Addresses

Before wiring the entire system, you'll need to connect each drive individually to the host computer so that a unique address can be assigned to each drive using SureMotion Pro if you want to assign addresses to the drives. This is required if you plan to talk to multiple drives that are on the same network. See the “DA” SCL command. Use the programming cable and the SureMotion Pro software that came with your drive for this purpose.

Connect the drive to your PC and then launch the SureMotion Pro software. Select the com port that is connected to the drive. Finally, apply power to your drive. If you have already configured your drive, then you should click the Upload button so that the SureMotion Pro settings match those of your drive. Click on the Motion & I/O button, then select the “SCL” operating mode. The RS-485 Address panel should appear. If you would like to assign the drive a unique address, just click on the address character of your choice. You can use the numerals 0-9, or any of the following special

characters: ! " # \$ % & ' ( ) \* + , - . / : ; < = > ? @. Just make sure that each drive on your network has a unique address. If you are using a 2-wire network, you may need to set the Transmit Delay too. 10 milliseconds works on most adapters. Once you've made your configuration choices, click Download to save the settings to your drive.

If a drive is assigned an address (1) then it will respond to commands prefixed by that address (for example: 1FL2000) but it will also respond to the same command without the address (for example: FL2000). Commands without an address are known as global commands. The only difference is that the drive will not send an acknowledgement back to the host when given a global command. If you have four addressed drives on a network and you send FL2000, then all drives will respond to the command but none will send an acknowledgement.

### Connecting to an STP-MTRD-xxxxR using the STP-USB485-4W Adapter

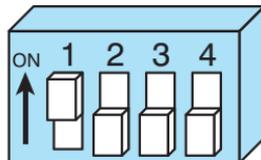
The STP-USB485-4W is an excellent choice for USB to serial conversion. It can be used for all RS-232 and RS-485 applications.

For RS-485 two-wire systems, set the switches and make the connections to the STP-MTRD-xxxxR according to the diagrams below:



*Note: 2-wire is used by some AutomationDirect PLCs.*

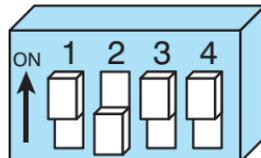
RS-485 Two-wire Settings	
STP-USB485-4W 6-pin screw terminal connector	STP-MTRD-xxxxR 5-pin connector
1	RX-, TX-
2	RX+, TX+
6	GND



RS-485 2-wire Switch Settings

For RS-485 four-wire systems, set the switches and make the connections to the STP-MTRD-xxxxR according to the diagrams below:

RS-485 Four-wire Settings	
STP-USB485-4W 6-pin screw terminal connector	STP-MTRD-xxxxR 5-pin connector
1	RX-
2	RX+
3	TX+
4	TX-
6	GND



RS-485 4-wire Switch Settings



*Note: 4-wire is needed for communications to SureMotion Pro.*

## Connecting to a drive using RJ12

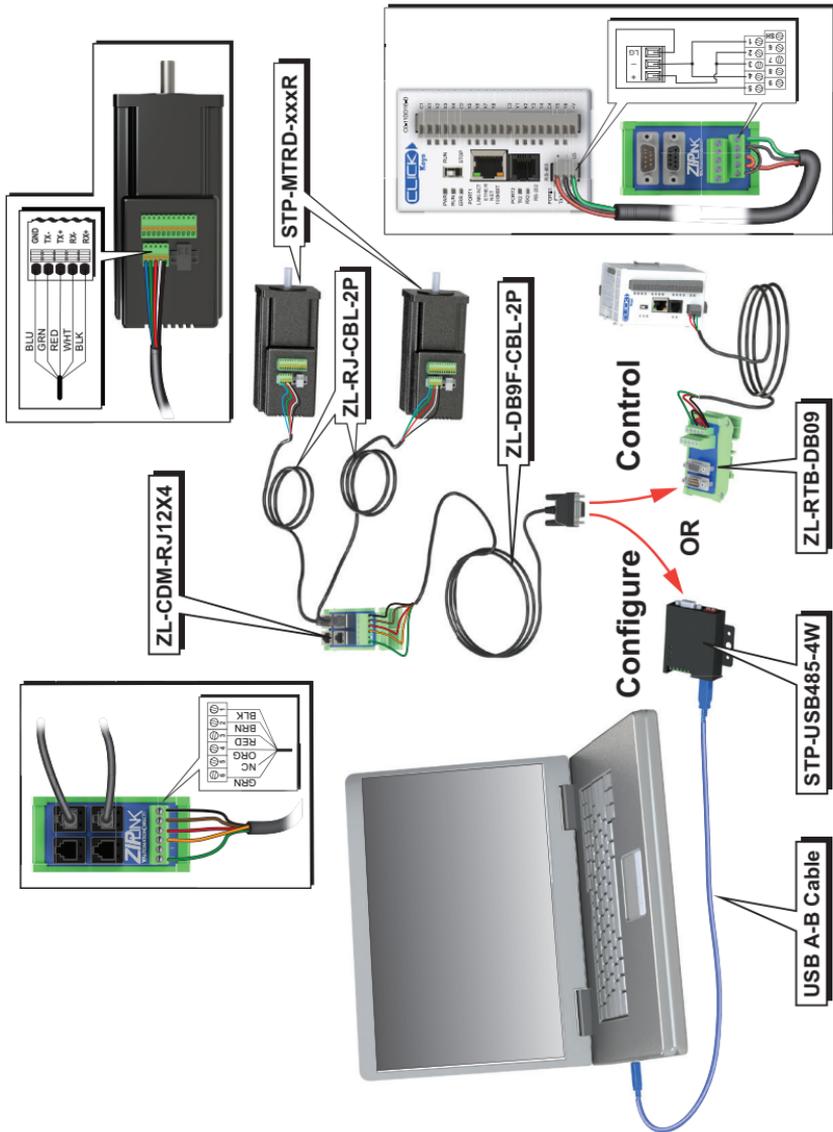
Multiple drives can easily be configured by connecting them using the ZL-CDM-RJ12X4 or ZL-CDM-RJ12X10 RJ12 feedthrough modules. Use SureMotion Pro to assign unique addresses to each drive, then use the feedthrough module to network them together. The diagram on the next page shows a very convenient way to configure (PC) and control (PLC) multiple RS-485 integrated stepper motor/drives. This diagram uses a 2-wire RS-485 connection (CLICK and several other AutomationDirect PLCs only support 2-wire RS-485).

### Drive configuration using SureMotion Pro:

The drives must be configured one at a time using SureMotion Pro (they all have the same network address out-of-the-box). Disconnect all but one drive from the ZL-CDM-RJ12X4 or ZL-CDM-RJ12X10 breakout board. That drive can now be configured by the PC. Plug the cable with the DB9 connector into the USB/RS-485 converter (the “Configure” option in the diagram on the next page). Configure each drive (connect only one at a time to the network) with SureMotion Pro. Remember that the PLC cannot be connected to the network while the PC is configuring drives, as there can only be one master on the network at a time.

### Controlling the network of drives from a PLC using SCL commands:

Once all the drives are uniquely addressed, plug all the RJ12 cables back into the ZL-CDM-RJ12X4 or ZL-CDM-RJ12X10 feedthrough module. Unplug the USB/RS-485 converter from the RS-485 network and plug the DB9 connector into the ZL-RTB-DB09 feedthrough module (the “Control” option in the diagram). Pins 1 & 4 need to be tied together and pins 2 and 3 need to be tied together for 2-wire RS-485 communications (Most AutomationDirect PLCs only support 2-wire RS-485. Only the 06 and 260 CPU support 4-wire RS-485). See “Two-Wire Configuration” on page 9-3 for an example diagram.



RJ12 Connection Methods with Integrated Motor/Drives