

## Data Communications Reference

### Working With RS-485 Networks

**Objective:** To connect field instruments to RS-485 communication networks.

- Equipment:**
- Milltronics EnviroRanger ERS500 (or other RS-485 equipped device)
  - Host device (supporting the RS-485 network)
  - Any necessary links, modems, or converters

While every effort was made to verify the following information, no warranty of accuracy or usability is expressed or implied.

#### Overview:

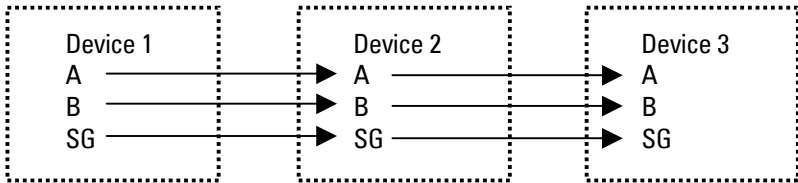
Some field instruments are equipped with an RS-485 serial communication port. The RS-485 physical layer incorporates voltage levels and timing as prescribed by the EIA/TIA-485 standard. Compared to the RS-232 standard, RS-485 can be run over greater distances and supports multi-dropped connections.

Where only two devices may be interconnected with a maximum separation of 15 meters (50 feet) using RS-232, up to 32 devices (nodes) can be connected on one segment of an RS-485 network. Each segment can be up to 1200 meters (4000 feet) long. When more devices or longer runs are required, a repeater may be used. A repeater electrically isolates each segment of the network. Up to three repeaters may be used for a total of four segments.

#### Connections:

All Siemens Milltronics instruments that support Modbus ASCII or RTU communications may be connected to a 2-wire RS-485 network. Use a quality dual twisted pair shielded cable, such as Belden 9842, (120 ohms and less than 17 pf per foot). Connect one twisted pair to the differentially balanced A and B signals, and one conductor of the other pair to the signal ground.

#### 2 - Wire Multi-Drop



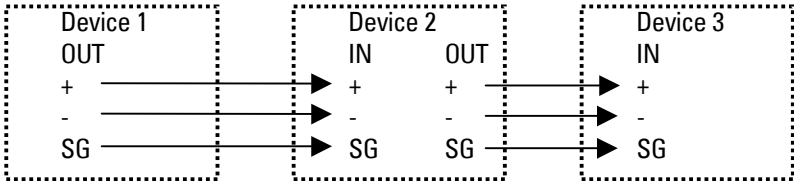
Sometimes A is marked “-” and B is marked “+”. Do not connect A to B (or - to +) on an RS-485 link or it will not work. (This is a common error.) SG refers to signal ground; the cable shield must be kept separate and be connected to earth at one end only.

### **MILLTRONICS**

# APPLICATION GUIDE

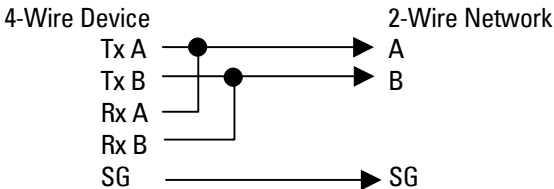
## Daisy Chain

Note that some devices may provide IN and OUT terminals to simplify daisy chain connection as follows.



## 4 - Wire Devices

Modbus ASCII and RTU protocols support 2-wire networks. However, some devices may have separate transmit and receive terminals for use with other protocols that require a 4-wire network. To connect a 4-wire device to a 2-wire network, jumper the transmit and receive terminals. Do not jumper "A" and "B" or "-" and "+" terminals together.



## Taps and Legs

Run cable serially to each RS-485 node. Tapping a parallel leg can cause significant line reflections affecting data reliability. If a tap must be used to branch off a cable between nodes, keep the leg as short as possible.

## RS-232 / RS485 Conversion

To connect an RS-485 network to a personal computer RS-232 serial interface port, an RS-232 / RS-485 converter is required. Siemens Milltronics supplies a port powered converter (part number 20150159) that requires no external power connection and has been successfully applied to all of our equipment.

## Line Termination and Biasing

For long cable runs and high data rates, a termination resistor equal to the cable impedance may be required at each extreme end of a segment to prevent line reflections. Note that termination resistors add significant load and may reduce the number of devices that can be connected to a port powered segment.

Network biasing may be required to maintain a minimum 200 mV difference between "A" and "B" signals when the network is idle. This is accomplished by attaching a pull-up resistor from a DC supply to the "B" line, and pull-down resistor to ground from the "A" line. The resistor value required depends on the number of nodes and supply voltage, and is significantly affected if load resistors are used for line terminations.