

Welcome to Monitor, thank you for subscribing. In spite of the rise of newer communication technologies like Ethernet and wireless, RS-485 remains widely employed in numerous situations where its specific advantages are valued. Today we recap exactly what makes it still useful and explain the different RS485 set ups.

You can download Monitor as a pdf file from <https://www.windmill.co.uk/monitor/monitor292.pdf>.



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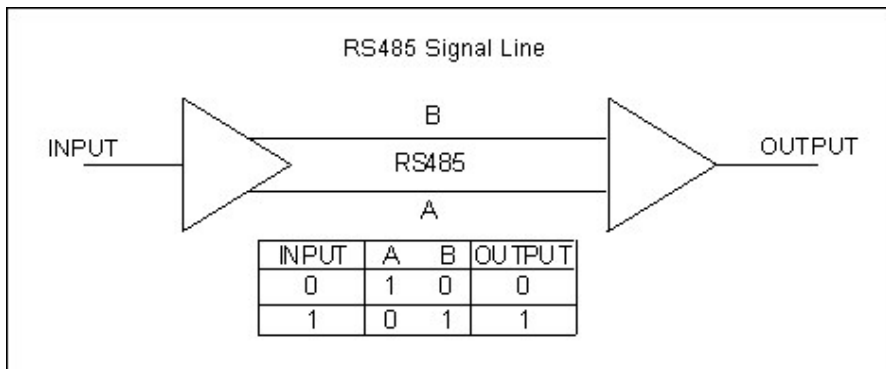
Understanding RS485

Web link: <https://www.windmill.co.uk/rs485.html>

RS-485 (Recommended Standard 485) is still widely used in various industries and applications. Despite being an older technology, RS-485 remains popular in numerous industrial situations due to its robustness, reliability and long-distance communication capabilities.

RS485 - Two wires for greater distances

In RS485 two wires are required for each signal. If you wish to transmit four signals then eight wires are needed. The figure below shows a single RS485 signal being transmitted. To transmit a logic 1, line B is high and line A is low. To transmit a logic 0, line B is low and line A is high. The advantage of this arrangement is that signals can be transmitted faster and over greater distances than is possible with a single wire.



RS485 Wiring Arrangements

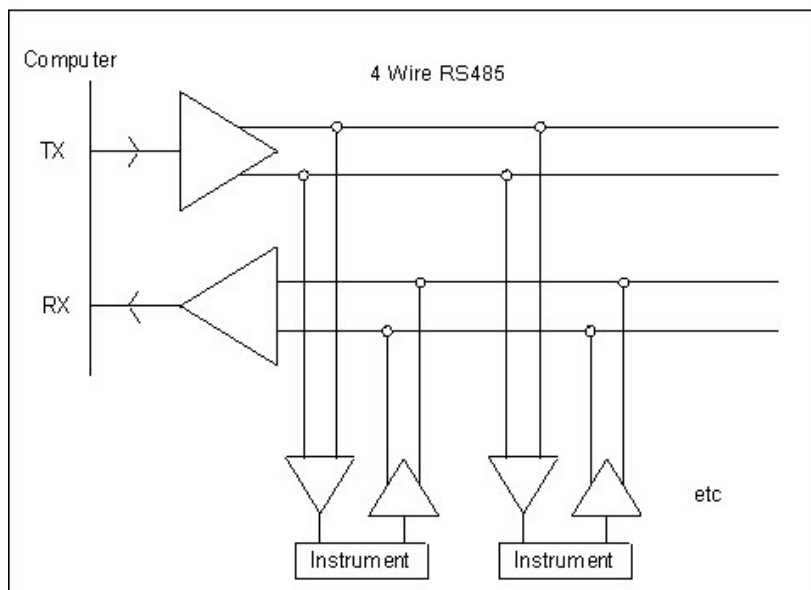
The RS485 standard defines only the electrical characteristics of the driver. When instruments are described as having an RS485 interface this tells you nothing for sure about the signals being transmitted. Usually though, only the Transmit Data (TX) and Receive Data (RX) of a normal serial port are converted to RS485. The other signals of the serial port are not used. Two are commonplace: 4-wire (full duplex) and

2-wire (half duplex).

Full Duplex System: Sending and Receiving Data over 4 Wires

Full Duplex means that data can pass simultaneously both to and from the instruments. This requires **4 wires** - one pair to Transmit and one pair to Receive. The computer alone controls the TX transmit line. It sends out a message which includes an Address. The addressed instrument alone replies by driving the RX line.

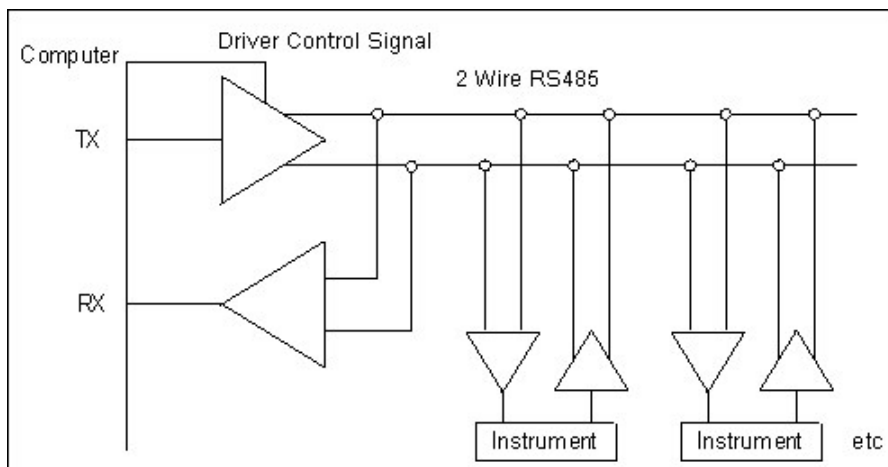
This does mean that all the connected instruments must use the same software protocol - otherwise there will be confusion as to which instrument is being addressed. A simple conversion of RS232 to RS485 will suffice for this arrangement and no special demands are made on general purpose software such as [ComDebug](#).



Half Duplex System: Sending and Receiving Data over 2 Wires

Half Duplex means that data can only pass in one direction at a time. In this arrangement both TX and RX signals share a single pair of wires. This can save in installation costs.

The computer drives the lines to send out its request message but must turn its driver off to allow the instrument to reply. This is the tricky bit. However USB-to-Serial converters can perform the task of controlling the RS485 driver very well. If you need to implement a 2-wire RS485 system you should always obtain a USB-to-RS485 converter that advertises this special feature. Such a unit can work with general purpose software such as ComDebug or HyperTerminal. Be aware though that it may not work with the special software supplied by instrument manufacturers which may assume a particular RS232- to-RS485 converter and may produce errors when used with any other unit.



Preventing Voltage Reflection

When a signal is sent down a cable there is always a reflection voltage which returns up the cable. This reflection is bigger as signals' edges get faster and lines get longer. It can be minimised by terminating the ends of the line with the characteristic impedance of the system. This is 120 ohm for RS485.

Ideal RS485 Wiring

Ideally an RS485 system consists of a single linear cable (no branches) with 120 ohm resistors connected across the 2 wires at each end of the cable.

RS485 can handle speeds of over 10 Mbits per second and line lengths of over 1 km. If you are operating anywhere near these values you must arrange your wiring close to the ideal.

For many applications where baud rates are slow (say 9600 baud), and lines are only tens of meters long, this is not essential. The wiring requirements can then be relaxed to allow cables to run in star arrangement from the computer and the terminating resistors become optional.

Line Pull Ups: Avoiding Serial Errors

In many RS485 multidrop systems there are times when no unit is driving the RS485 lines. They can then go to any voltage and may produce serial errors. To avoid this it is often necessary to fit resistors which pull one line high and the other line low putting the line into the passive state. The RS485 converters usually include such resistors which can be connected if needed.

RS485 Signal Names: Caution Required

You will find that your RS485 signal names for a line pair are either A,B or +,-. In an ideal world you would simply connect A on the computer to A on the instrument. However these names are not consistently applied by manufacturers and you may need to connect A on the computer to B on the instrument.

RS485 Software Tools

[Free RS485 Trouble-Shooting Software](#)

You can use the comDebug software to pin-point and solve problems with RS485 connections.

Your DAQ Questions Answered: Serial Connectors

Question

*"I found your website and was looking at the [Microlink 840: Versatile Data Logging](#) and saw it has 8 hardware inputs. Does it have serial connectors at the back to connect with instruments?
I have a scenario where there are 4 instruments, 3 of which has serial, and the other has Serial and TCP. I would like to know what's the best configuration to link these 3 instruments and what products, be it hardware or software would you recommend from Windmill. "*

Answer

The Microlink 840 is designed for logic signals, switch closures,

analogue signals and digital sensors, so wouldn't be appropriate for Serial connections. However, you can use Windmill and comDebug software to talk to instruments with serial or tcp connections. This is **free to our newsletter subscribers!** You will need a usb-to-serial adaptor to connect your serial instruments to the computer. Contact monitor@windmillsoft.com for a free copy of Windmill and comDebug.

Learn more about [serial communications and comDebug here](#).

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