**RS-485 Tips, Tricks, Questions & Answers.**

**Tips for Success in Using RS-485 Data Communications**

**Q: Why do devices use RS-485 Communications?**
**A:** RS-485 devices can be connected to a computer and multi-dropped at various locations in a network style configuration. Devices can be up to 4000 feet (1220 meters) feet away before a repeater is needed, and up to 32 nodes (devices) can be connected. More nodes can be connected using repeaters, up to the addressability limit (usually 256) of the devices used.

**Q: How do I connect my computer to an RS-485 device?**
**A:** You can use an RS-232 to RS-485 converter or USB to RS-485 converter, or install an RS-485 interface card in your computer. PCI bus, PCMCIA/CardBus or ISA bus cards can be used.

You need to know how many wires are used on the RS-485 port of the device you need to connect. A Data (A) and Data (B) line and ground is a "2-wire" 485 connection, if there are more connections and they are labeled TD(A) & TD(B) and RD(A) & RD(B) and ground, you need a "4-wire" converter.

**Q: What should I look for in an RS-485 converter to use with Windows?**
**A:** A converter or interface card that has Automatic Send Data Control is strongly recommended for Windows and other multi-tasking Operating Systems. This is very important for half duplex 2-wire operation. Otherwise, data may be lost. Automatic Send Data Control makes life simple if programming using Visual Basic. (Refer to the B&B Electronics Technical Library for Send Data and RTS Control Illustrations)

**Q: What type of connector does RS-485 use?**
**A:** The RS-485 Standard does not specify the type of connector or pinouts. RS-485 connectors can be DB9, DB25, Terminal Blocks, RJ11, RJ45 or one of the round DIN connectors (just to name a few). Check out the wide variety of RS-485 converters on our web site at www.bb-elec.com.

**Q: What is the maximum connection distance using RS-485 devices?**
**A:** The maximum distance of RS-485 without using a repeater is 4000 feet (1220 meters) at baud rates up to 90Kbps. Extend that distance by adding an RS-485 Repeater or Optically Isolated Repeater every 4000 feet.

**Q: Can I boost the RS-485 signal to add more nodes or distance?**
**A:** Not exactly. You can repeat and refresh the signal periodically along the cable, but not boost it above the specification. B&B offers different styles of RS-485 repeaters/boosters such as 485RPTR, 485OP 485OPDR to let you add another 32 nodes (or 4000 feet) on your RS-485 network.

**Q: Why do I need a RS-485 repeater for more than 32 nodes/devices?**
**A:** A standard RS-485 node has a rated input impedance of 12Kohms. A standard RS-485 transmitter can't drive more than 32 devices and one pair of 120 ohm termination resistors. Simply adding an isolated repeater allows another 32 nodes to be connected.

**Q: How many RS-485 devices can be on a single network?**
**A:** Each 485 device must have a unique address. This typically allows for up to 256 nodes.

**Q: What software protocol is specified for RS-485?**
**A:** The EIA standard does not specify a software protocol, the RS-485 standard simply defines the electrical interface. It is basically an extension to the RS-422 standard to handle multi-drop with many slaves that can share the

same wire pair for Transmit and/or Receive. Some devices don't require a specific protocol, just their software commands with the proper address byte or bytes in the proper command location. A number of popular protocols use RS-485 as their physical layer.

**Q: Where would I use an RS-485 network?**
**A:** Anywhere you need multiple devices at various locations and the devices have a built-in RS-485 port or can be adapted to RS-485 addressability. RS-485 has been used in many factory environments to gather data and control Addressable Motor Drives, Cameras, PLC's, Time Clocks, bar code scanners for process control and other factory equipment.



Typical Industrial RS-485 2-Wire Network
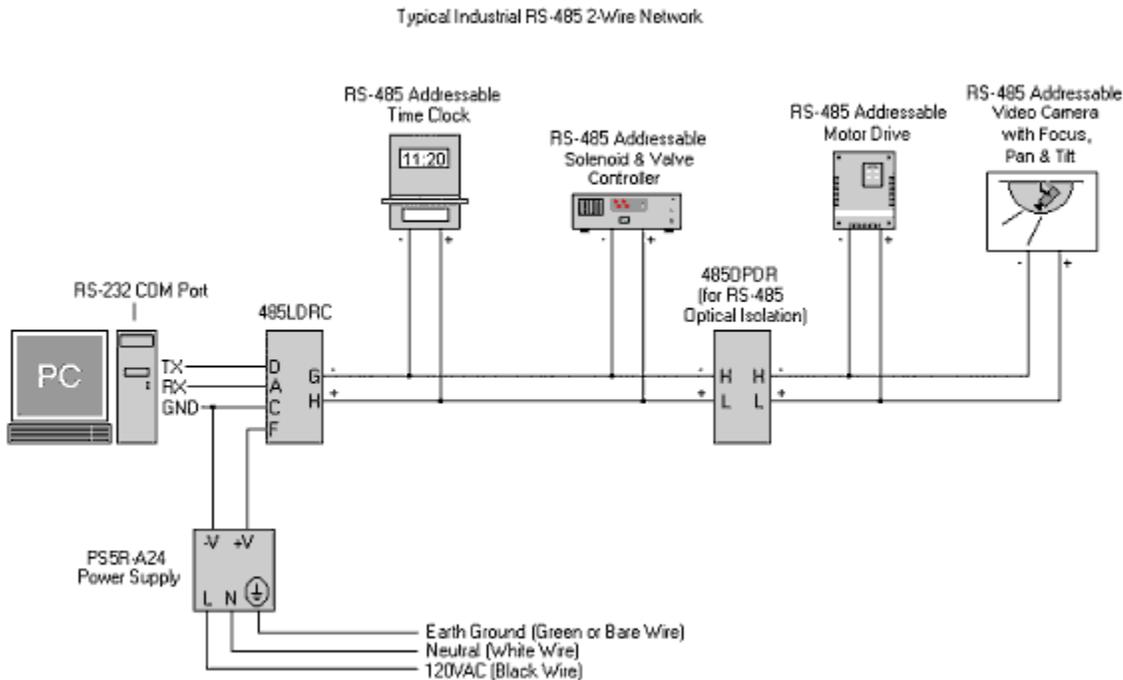
**Q: What does an RS-485 network consist of?**
**A:** At least one Master device with RS-485 interface, such as a computer, embedded controller, RTU or PLC and at least one RS-485 Slave device. Additional RS-485 devices can be added to extend the network and functionality.

**Q: How can I make a RS-485 network using RS-232 devices?**
**A1:** If the RS-232 devices are addressable (only respond to a command with a unique byte or byte sequence), and use only Receive, Transmit and Ground connections, you can use a standard 4-wire 485 converter on each unit. The master will use a standard converter or interface.

**A2:** If the RS-232 devices are not addressable, you can use a 485 Addressable RS-485 to RS-232 Converter such as the 485DSS. Up to 256 devices can be added to a network using repeaters.

**Q: What's the advantage of using RS-485 for data acquisition compared to RS-232?**
**A:** Noise immunity. Due to RS-485's differential signaling, it is much less affected by stray EMI/RFI "noise" than other serial protocols. Also, one serial port can talk to multiple devices at distances from a few feet to thousands of feet away. Additional serial ports aren't needed. Optically isolated converters can be used to protect the computer from voltages and ground loops from connected devices.

**Q: I'm interested in programming software for RS-485 Control. Do you have any examples for Visual Basic?**

**A:** There are VB source code demos to access our 485SDD16 and 485SDA12 data acquisition modules. Other than the additional RS-485 features of the modules, the command code is similar to the RS-232 versions, the 232SDD16 and 232SDA12. Note: We used converters with Automatic Send Data Control for these 485 demos.

**Q: What is the difference between RS-422 and RS-485?**

**A:** RS-422 devices don't tri-state the transmitter, but RS-485 devices do. With RS-422, two units cannot connect to one receiver, because when one device tries to "talk" the other device is trying to hold the lines in one state, the other trying to toggle them high/low. RS-422 is always full duplex (if the device is not listen only), RS-485 can be full (4-wire mode) or half duplex (2-wire mode). RS-422 devices can have more signals for handshaking (RTS/CTS & DTR/DSR). RS-485 never has more than 2 signals, receive and transmit.

**Q: Where can I learn more about RS-485?**

**A:** Download the B&B Electronics RS-422/485 Application Note from our website Technical Library support page.

For more information on serial ports, we recommend *Serial Port Complete* and *C Programmer's Guide to Serial Communication*.