

Spartan Controls Simplified RS-485 Guideline



This document is to be used in conjunction with RS-485 communication devices

Version 1.01
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RS-485 Description

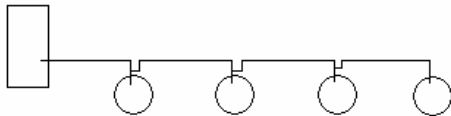
RS-485, now referred to as TIA/EIA-485, supports up to 32 devices in half-duplex, multi-drop mode. Depending on data transfer speed, transmission can extend up to 1.2Km. The signal uses a balanced differential with levels -7 to +12V. The RS-485 Standard only describes the transmission method, not the protocol used.

Emerson devices using RS-485 transmission are 3095FB, Remote MVS Sensor, and FB103s, et al.

Network Topology

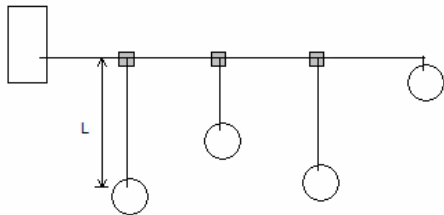
The major advantage for use of RS-485 is the ability for one master to communicate to up to 32 devices, connected by a single two wire channel. If cable runs are short, network topology should not be an issue; however, to avoid signal reflection, only a true multi-drop technique should ever be used, this is described in the diagram below. The slave devices do not necessarily need to be the same type.

Best



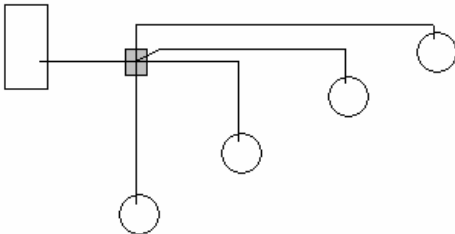
A twisted pair cable comes from the master connecting to the first slave; from the first slave, the pair is connected to the second device. The communications cable then continues on to additional devices.

Workable (Common Trunk with stubs)



This network is workable. The stub length L should not exceed 2m

Avoid (Star Pattern)



A star pattern can exist in a number of variations, a twisted pair is brought from the host into a junction box; slave devices are connected into the network through the box. Communications may be possible with only a few devices and short cable length

To illustrate one symptom of signal reflection in a RS-485 network; a system is initially designed with only two or three devices wired within a junction box, at a later date, an additional device is added into this same point. Signal reflections now cause communication errors. Often, only one device will fail, the other devices will continue to operate. When this situation arises, the most heard statement is, 'Well, it worked before'.

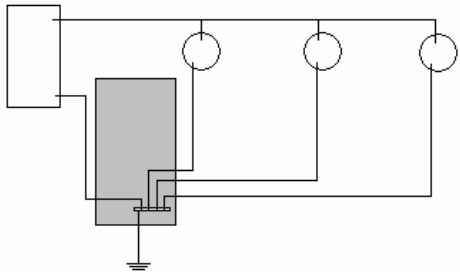
It should be noted, that in such cases where the RS-485 network is not ideal, Spartan Controls will suggest that the current wiring be changed to conform to the RS-485 Standard, otherwise support will be offered as 'Best Effort'.

Termination

The RS-485 Standard recommends termination, especially for high baud rate and long cable runs. There are many different methods for termination; Spartan recommends installing a 120Ω resistor at the master device and at the last device in the network. Termination is used to deaden signal echo. Added termination does increase power consumption however. In the above example where devices are arranged in a ‘star’ pattern, it is often hard to determine where the ‘last’ device in the network actually is.

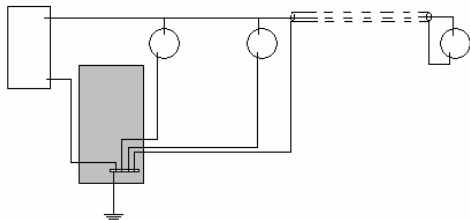
Grounding

There are a number of methods used to ground a RS-485 network; the diagram below provides the best.



The RS-485 master and slave devices are grounded at one common point, usually a power distribution panel. This provides the least difference in potential between the different devices in the network

On occasion the above grounding is not feasible, usually attributed to cable length; most RS-485 twisted pair provides a shield that can be used to ground the distant transmitter to the same potential as the rest of the network. A description of grounding in this case is provided below. **Never wire the distant transmitter to a separate earth ground; earth ground itself is ‘noisy’ causing communication errors, also the potential energy developed between these grounds, especially during a ‘transient event’ can cause damage to electronics.**



The RS-485 master and two slave devices were close enough to come to a common grounding point, a third slave device was situated too far distant and uses the shield ground provided with the twisted pair.

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