

PICK-IQ™

Technical Considerations of Network Topologies

Serial communications effectively exchange data between a controller and multiple devices. It is important to follow good engineering practices when creating a network, although not all networks are subject to the same constraints. Networks implemented at the physical wiring level using differential signaling are especially robust and adaptable.

PICK-IQ™ uses standard Modbus protocol over an RS-485 physical layer using differential signaling. PICK-IQ™ uses proprietary communications schemes to enable high application speeds, even at slower baud rates, by using the Common ID (a unique feature of PICK-IQ™) and traditional Slave ID. PICK-IQ™ also provides robust communication on diverse network topologies in industrial environments and with standard industrial cables.

There are many successful installations of PICK-IQ™ networks that do not require following high-speed network cabling design practices. It's impossible to qualify all possible network topologies, but using lower baud rates raises confidence that an installation works well without inhibiting application speed.

Considerations and Recommendations:

- Use a 19.2k baud rate; maximum baud rate is 230.4k
- Network terminating resistors are not required at slower baud rates such as 19.2k, but multiple split cabling runs may require them
 - Use a 120-ohm terminating resistor at each end of the cabling run to properly terminate the network
- Slower signaling rates suffer fewer communication issues compared to faster signaling rates, allowing for use of splitter cables and branching network topologies
- Shielded cables are typically not required
 - If used, all devices should share the shield, and connect it to earth ground
 - Interconnect cables must also maintain the shield connection
 - Twisted pair cabling is also not necessary
- Maximum cable length depends on the initial voltage and number of units, but can total hundreds of meters in a 24 V dc system
- Power supplies can be rated based on typical consumption per unit multiplied by the number of units, but the actual total current draw depends on simultaneous device operation
 - The M12 connectors limit the total current to 4A
 - Use power injection for high-count installations

Several PTL110 devices with PICK-IQ® communication were connected to test these recommendations. Oscilloscope measurements confirm successful communication in both linear and branching topologies, with and without terminating resistors, at speeds from 19.2 to 230.4 kbaud, and with hundreds of meters of cable between the signal source and measurement point. Further testing was done with a noisy VFD nearby, and communication was not interrupted.

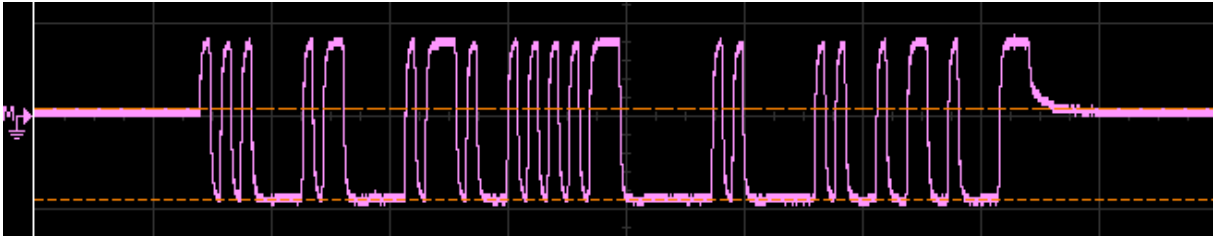


Figure 1. Successful communication in a linear system with >600m of cable length at 230.4 kbaud

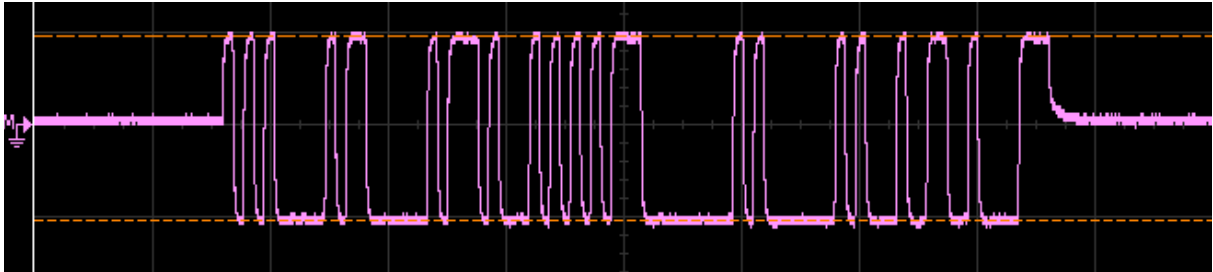


Figure 2. Successful communication in a multidrop system with >300m of cable at 230.4 kbaud

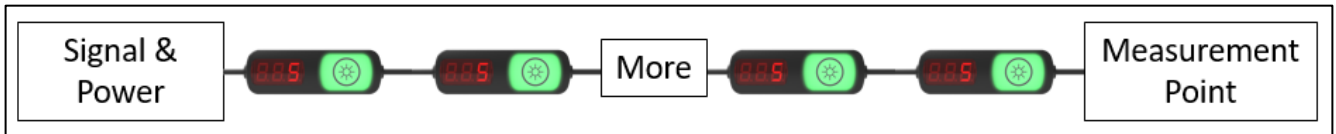


Figure 3. Example linear configuration

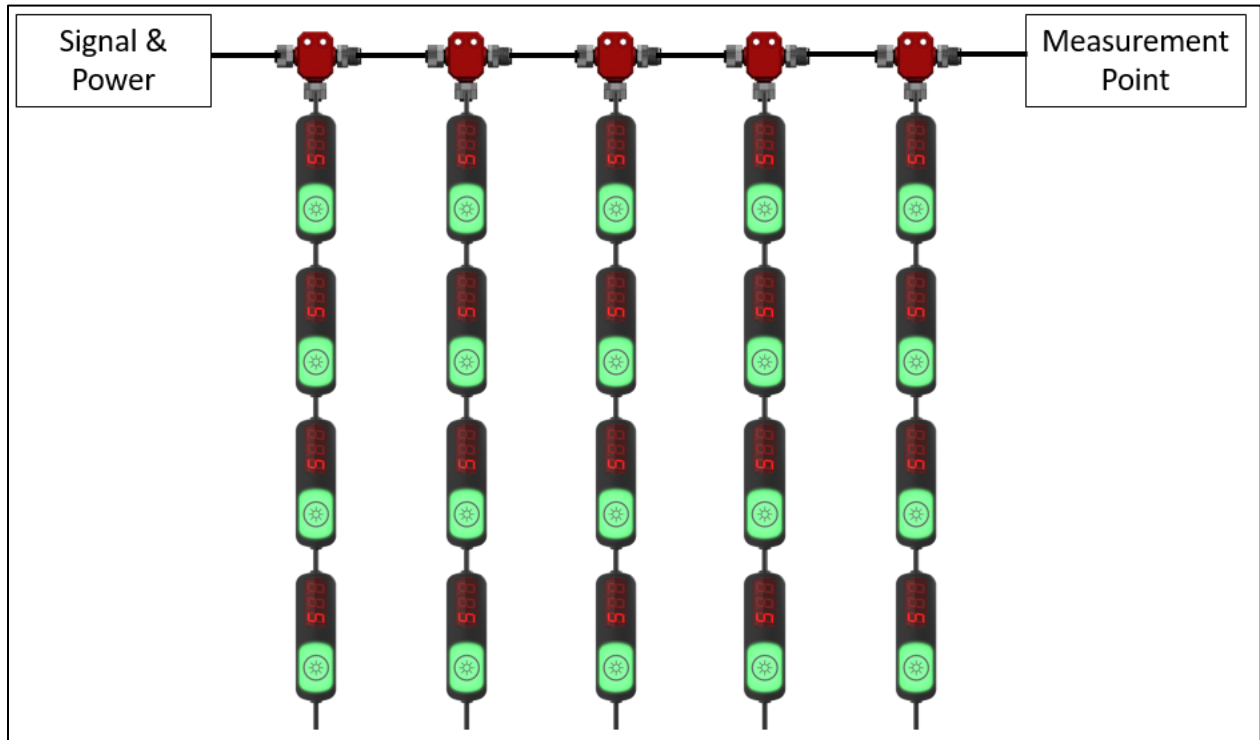


Figure 4. Example branching configuration