RS-485 with a Power Bus over a 4-Wire Cable

RobustDC Application Note #21

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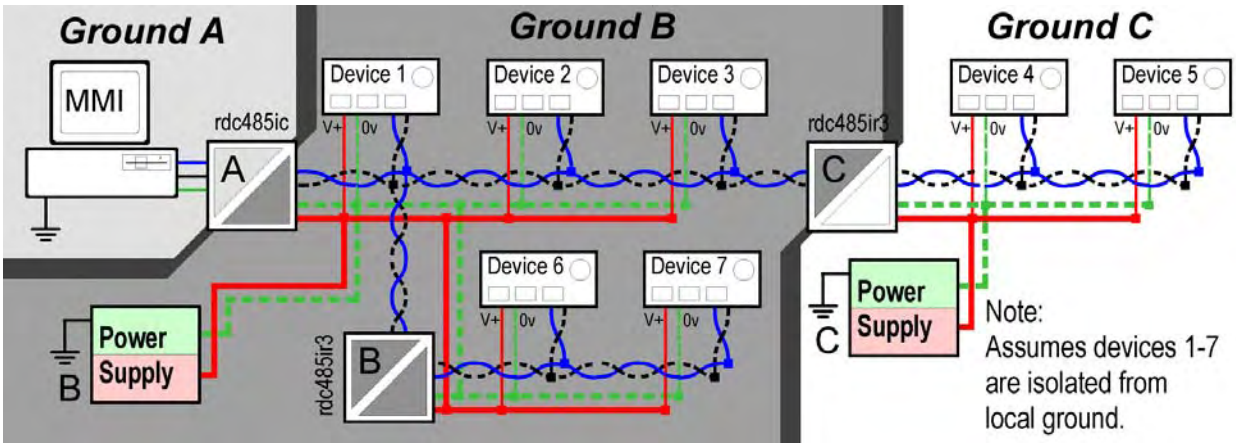
• Overview

Many companies use RS-485 for communications to a network of specialized equipment - for example gas-detectors, tank level gauges, flow computers, or card readers. This network often uses a 4-wire bus design, with 1 twisted pair wire for RS-485 and 1 heavier wire pair for a 12 or 24vdc power bus. Assuming each field device is fully isolated from the field sensors, this is a very effective and robust design. However, the requirement to wire the system as a pure bus, where the cable runs by each device one after the other in a linear fashion can be difficult to implement in the real field. The creative use of isolated RS-485 repeaters offers a great deal of flexibility in fitting the bus system to the actual cable trench and trunking layout present on site.

• Application Example: 2-wire RS-485 with 24-volt Power Bus

Effective use of isolated RS-232 to RS-485 converters (like the rdc485ic) and isolated RS-485 repeaters (like the rdc485ir3) can make this design even more effective, more robust, and more flexible. They allow a more flexible branched tree design, which allows branches to follow natural cable trenches or branch out along rows of tanks in a tank farm. The addition of isolation allows the safe mixing of multiple power sources without creating grounding problems.



This application example shows the use of 2 units of rdc485ir3 and 1 unit of rdc485ic to expand the design of a 4-wire network with RS-485 and a 24vdc power bus. The RS-485 is shown as the twisted wire pair. The 24vdc power bus is shown as the heavier wire pair. One computer and two power supplies are used. Since all the field devices 1-7 are isolated from the field ground, the isolation inherent within the rdc485ic and

rdc485ir3 protect the system from ground potential shifts and create 3 independent ground systems. These are shown in three different colors.

The computer (***Ground A***) is completely isolated by the rdc485ic (#A). This protects the delicate computer from noise and surge energy caused by ground potential shifts. Ground A is probably tied directly to the Physical Earth (PE) of the AC mains supply. This will be slightly different than Ground B, which will likely be tied directly to local grounding rod.

Power supply #B (***Ground B***) powers 5 of 7 field devices and 2 of the RobustDC units. Any surge energy induced within ground B must exit via the power supply panel - a common & robust design. rdc485ir3 (#B) allows a side branch (or spur) to be extended from the main RS-485 bus. Since true, linear bus installations are rare in the field, this installation flexibility is welcomed. This side branch is actually a complete, independent RS-485 network, so can cover another 1000m and include another 31 devices. Ground B is likely tied to a physical earth rod from the panel which houses power supply #B.

Power supply #C (***Ground C***) powers 2 of 7 field devices and the 1 remaining RobustDC unit. Any surge energy induced within ground C exits via the power supply. The rdc485ir3 (#C) fully isolates this end of the bus and separates the ground "scope" of power supply #B and #C. It allows the data to move without allowing any current flow between power supplies or grounding systems.

• For More Information

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