The Power of the Loop (Back to Basics)

The current loop is probably one of the most underestimated data transmission and control method. It's so simple that we tend to ignore it in favor of more complex and sophisticated methods. Theoretically, you could transmit data/signals infinitely if you had an infinite EMF (E) to push the current (I) over a conductor(R) with < infinite resistance (E=IR). To light up the earth along its equator, you would need about 40,000 volts to light up to about 40,000 LEDs around the equator at 1Km apart; as long as your total wire resistance is < 200K Ohms!

Being an analog signal, the current loop has infinite resolution and its accuracy is determined by the transmitter and receivers. Its low impedance inherently rejects induced electrical noise and its scaling (4-20mA=Zero-full scale) automatically tells you if your process is within range or not. And the wired technology is an important defense against cyber-attacks!

So, what can you do with a current loop? First of all, you have signal and power being transmitter over a single twisted pair of wires requiring no conduit, no shielding, no expensive control room upgrades. Second, you can use the existing energy flowing on the wires to power devices in series with the current loop as long as their impedance (burden) is acceptable to the transmitter's compliance specifications (and if not, you can always increase the power supply output).

Let's talk about loop burden. Typical loop power supplies are ~24-32VDC, of which a typical transmitter requires a minimum of 7-10V to operate within specifications. So if your total burden (of all added receivers) is 10V (500 Ohms), it means that you have 4-7 volts to spare for your wiring voltage drop. Up and until recently, if you wanted to modernize your current loop system by adding digital meters in place of

analog, you would also have to add power to your panel. With these improvements come unforeseen delays and expenses (budgets, engineering, wiring, conduits, inspections, approvals, etc.). More than likely, your manager would say "Forget it."

The first loop powered DPM was introduced in 1974 was LCD and it had ~12 V burden, then in 1990 loop powered LED versions had about 5V burden but their intensity was proportional to the loop current.

Thanks to social intelligence advancements in LED and ASIC technology, our engineering staff and my love affair with the "power of the loop," OTEK has produced a 100% loop powered automatic tricolor bar-digital LED meter with isolated serial I/O (for DCS/SCADA/Intranet), opto-isolated alarms and its most important feature: safety! The new LPD series, alarms you visually and serially for ~ 20 seconds after the loop has died, and it only consumes ~12mW (3V at 4mA)!

Model LPD-3 (3 channel) Loop-Powered Bar Meter from Ortek

So, don't tear down your current loop and use its power to upgrade to digital technology but just replacing the old analog meter!

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