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SCADA Primer, Part 1: *How Do You Spell RTU?*

PLC, RTU, What is the difference? How do you decide what makes more sense for your SCADA system? The answer may be moot, as the differences between these classes of controllers becomes more and more blurred. It has gotten to the point that the two terms "PLC" and "RTU" are used interchangeably, although RTU is the more correct term. It may help you to gain an understanding of the subtle differences if you first have an understanding of their origins.

Programmable Logic Controllers (PLCs) began with the auto assembly plants, and were designed to replace the thousands of timers, relays and switches that made up the controls for running the assembly line for the manufacturing of automobiles. The programming was designed to be as easy for a plant electrician to understand and trouble-shoot as possible. What better way than to make the programming resemble the electrical diagrams used to build the relay panels that the PLCs were designed to replace? The language is called Ladder Logic Diagramming (LLD) and it has become a standard for all PLCs. It is, in fact, the identifying feature that makes a controller a PLC.

As the technology advanced, the controllers began to be networked to enable communication from one PLC to another up and down the line, and finally up to a Management Information System (MIS) for full plant automation. Eventually, engineers in the process industries began to see a place for PLCs as the devices started to offer more features that were aimed toward continuous control such as Proportional + Integral + Derivative (PID) controllers.

Remote Terminal Units (RTUs), on the other hand, have evolved from the telemetry market where processing and communications speed is less important, and the types of control haven't necessitated as accessible a programming language. Therefore, RTUs are often programmed in BASIC, Assembly or some sort of custom-designed higher level language. A great deal of attention was paid to the ability of the RTU to communicate over a wide variety of transmission media, such as radio, dial-up modem or leased lines; however, few RTUs offered any real LAN connectivity because, as their name implies, they are designed for remote operation. As the RTU gained processing power, they began to replace local switches and relays much the way that PLCs did in their applications. As the need arose for more sophisticated local control functions, such as chemical addition and pump alternation, RTUs have added more powerful control functions like PID control etc.

The RTU will often support some communications features that a PLC may omit, such as RTS/CTS (Ready To Send/Clear To Send) hardware handshaking. This is the ability to control and detect the state of a modem which greatly simplifies the most difficult part of any SCADA system — making the system talk. What RTS/CTS consists of is a signal between an RS-232 port and a modem that indicates the readiness of each to begin communications. Without it, programmed delays must be set in the controller that assume that the modem is ready to begin transmitting or receiving. The adjustment of these timers can be the source of headaches that can cause a SCADA system to have slow response and add to the difficulty of starting-up and trouble-shooting a new system.

Some RTUs support even more advanced communications features, such as store-and-forward which is the ability to accept a signal from one station and retransmit it to another. This is especially useful in radio telemetry systems where a host station may not be able to reach a destination directly, but can route it through an intermediary. Radios that offer this function are also available, but are generally incompatible with other radio systems, adding expense for those trying to upgrade an existing system.

Today, there are devices available today that address both the ease of programming of PLCs and the communications capabilities of RTUs, and the question of which to use is becoming one of spelling more than a commitment to a particular class of technology, so I tend to use the terms *RTU* and *PLC* interchangeably. As long as your RTU is easy to program or your PLC has built-in communications/modem support and either uses an open protocol, a rose by any other name smells as sweet.

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