LINC LETTER

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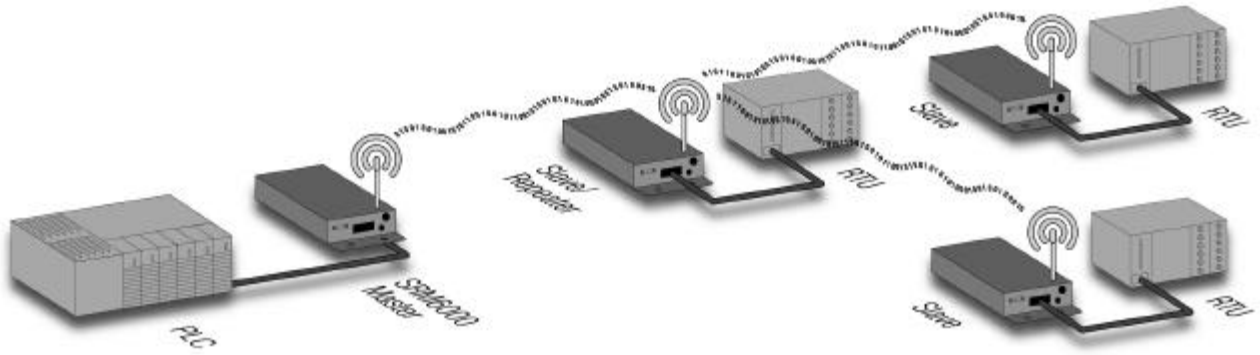
Simultaneous Slave and Repeater Mode Simplifies Radio Modem System Design



The* SRM6000's *new slave/repeater mode does the job of two radio modems.

DATA-LINC recently added a slave and repeater mode to its SRM6000 Radio Modem line. With this additional mode, the popular spread spectrum radio modem now supports simultaneous slave and repeater operation and enables a slave location to also serve as a repeater for communications with other remote slaves.

The new feature simplifies radio modem design and reduces system costs because one modem will do the work of two or, in some cases, even three modems. The SRM6000 accomplishes this feat by invoking a "store and forward" operation in which the data received is passed to the slave device (such as an RTU) and also transmitted to other remote slave modems.

Applications such as water/wastewater systems and oil/gas pipelines in which an ideal repeater location often coincidentally includes a slave device can greatly benefit from this feature. For example, installing an SRM6000 on a water tank will now facilitate communication with the tank's PLC and act as a repeater for communications with the pump stations.

The SRM6000 is an intelligent modem designed specifically for industrial applications and harsh environments. The modem is field configurable to function as a master, slave, repeater, and now, a slave/repeater. This flexibility makes the SRM6000 a great choice for systems that evolve over time and where spares are required.

For more information, contact DATA-LINC Technical Support at 425-882-2206.

Inside

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Tutorial

Extend Your Plant Network with Industrial Wireless Ethernet

An excerpt from an upcoming article in I&CS *magazine*

Ethernet has taken industrial data communications by storm. Virtually every brand of programmable controller (PLC) remote terminal unit (RTU) and SCADA models now have models with Ethernet ports. Once the subject of great controversy regarding its suitability in the industrial environment, Ethernet is now occupying an ever growing niche in data acquisition and process control. Its application is no longer limited to just information exchange, but is used routinely for real-time data retrieval and command and control. It is also now used much for its ease of connectivity and inherent multiplexing characteristics as for its high data throughput.

Wireless Ethernet

The increasing use of wireless Ethernet in industrial applications is being driven by more than convenience and the elimination of wiring. For example, plants often need to connect remote or isolated devices to a main Ethernet network but can't because (1) the devices are farther away than permitted by Ethernet cable length; (2) the connection would not be economically feasible; or (3) the devices are mobile. Each of these situations presents special installation and operating considerations involving trade-offs of data throughput, range, data integrity and physical restrictions.

Several parameters (e.g. interference, signal levels, licensing) related to radio transmissions affect the data integrity and throughput, cost, and ease of installation and maintenance of wireless Ethernet communications. Therefore, anyone designing a wireless Ethernet system should give careful thought to the expected EMI/RFI noise environment, the nature of the data being communicated, antenna requirements, system interconnectivity, and licensing legalities.

In North America, the most used bands are 902 to 928 MHz and 2.4 to 2.483 GHz. Both bands permit the operation of spread spectrum radio modems, which can successfully and routinely communicate at ranges from a few feet to tens of miles at data rates from 1200 bits/s. A new 5.8 MHz band with similar characteristics to the 2.4 GHz band is just becoming available.

Combining the radio modem with Ethernet

Industrial spread spectrum radio modems are available in both asynchronous (typical format for RS-232/422/485 data) and Ethernet versions. Asynchronous radio modems have maximum port speeds of from 9600 to 115.2 Kbps, depending on brand and model. Ethernet modems have port speeds of up to 10 Mbps.

Just remember: port speed and data throughput are not the same thing. This difference is a consequence of operating overhead (packetizing, error detection, buffering) and the number of retries needed to get the data packets through. Depending on noise conditions, range, operating power, antenna type and internal data processing, the throughput can be markedly different than port speed. This is particularly true with Ethernet radio modems. Even cabled Ethernet 10Base-T (10 Mbps) very rarely operates with throughput above 7 Mbps because of its own collision avoidance and packetizing functions.

Likewise, due to internal methodologies, most 2.4 GHz frequency hopping Ethernet modems are limited to 2 Mbps throughput. In reality, depending on the noise environment and range, actual throughput for 2.4 GHz can rapidly drop to under 500 Kbps. In the case of 900 MHz modems, throughput is typically between 50 and 100 Kbps, but there is little degradation with range (80 Kbps at 20 miles with omni-directional antennas is real). This difference in range between 2.4 GHz and 900 MHz radios has to do with the modem's receiver sensitivity, operating methodologies and internal data processing.

Read the entire article in an upcoming issue of* I&CS *magazine.

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Application

California Water District Saves $24,000 Per Year and Improves System Reliability with DATA-LINC Radio Modems

Approximately 26,000 people in Southern California's central Ventura County rely on the Camrosa Water District for their water service. The District, which encompasses 31 square miles, produces approximately 30% of its water supply through five wells and purchases the remaining 70% from water agencies via meter stations.

Back in 1995, Camrosa was using a SCADA system for the remote monitoring and automated control of its 11 tanks, six pump stations, four sewer lift stations and 12 meter stations which are spread over a seven-mile radius. The system, which was installed and programmed by an RTU vendor, required the use of analog phone lines for communication among the remote locations – the charges for which totaled nearly $24,000 a year. Any time one of the phone lines malfunctioned, Camrosa was at the mercy of the phone company to repair the problem, waiting hours and sometimes days for service. In the meantime, Camrosa was also incurring significant labor charges from sending its own technicians to the remote sites to investigate the phone line problems.

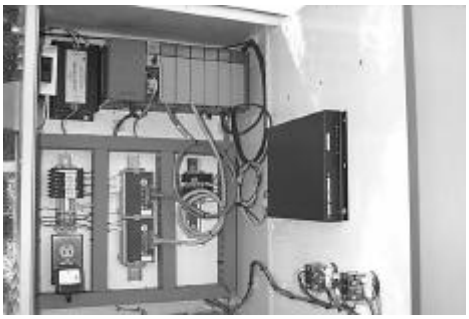
Tony Stafford, superintendent of operations for Camrosa, explained that the District resolved to replace the existing SCADA with an HMI/PLC system to eliminate the monthly leased phone line charges, reduce labor charges and increase reliability. Just as importantly, the District also wanted to gain in-house control of the system.

In 1995, Camrosa began developing and installing its new HMI system, which is powered by Rockwell's WinView™ software (soon to be upgraded to RSView™), using Allen-Bradley Variable Frequency Drives (VFDs) and self-contained SLC 5/03 PLCs. The District operates the PLCs using DF1 protocol at a baud rate of 19200.

> **"...**we've eliminated all phone line charges and reduced our labor costs."

Camrosa then installed two Data-Linc SRM6000 radio modems to serve as masters at its central office, splitting its east and west remote locations between two serial ports on the master HMI PC to speed communications. Because the office is situated in a valley,

Camrosa also installed four SRM6000s, which use Smart Spectrum™ frequency hopping technology, to act as repeaters to negotiate obstructions and maintain connectivity with all modems throughout the hilly terrain. Next, the District began installing SRM6000s at each of its remote locations one at a time over a year and a half span – systematically replacing each RTU and eliminating the phone lines..



One of twenty-nine remote PLC sites

One advantage of Camrosa's new self-designed HMI is that if the master PC crashes, the PLCs are programmed to operate as stand-alone units. Through the use of PC Anywhere software, the District's field technicians can also dial into to the HMI system from any laptop and monitor the PLC status and radio communications online – without having to travel to the remote sites.

In spite of some concern in the industry that the 902-908 MHz spread spectrum employed by the SRM6000 is becoming oversaturated, Stafford said that Camrosa has never experienced any problems – and the district is located near a military base which generates a tremendous amount of RF.

Two years after the new HMI has been up and running, Stafford believes that Camrosa has achieved all of its original objectives. "The new HMI has greatly enhanced our communication reliability and increased system operating efficiency, and we've eliminated all phone line charges and reduced our labor costs."

FAQ

How Can I Manage Multiple PLCs from Remote Locations?

The benefits of dialing into a PLC for programming and diagnostic purposes are significant. Communicating with a PLC via modem will often eliminate the need to travel to the site and, most importantly, get the system back into operation quicker.

But, what if there are more than one PLC to manage? What if there are multiple sites with PLCs? What if the installation of a phone line is expensive or impossible?

Enter the DATA-LINC Group CCS9000 Comprehensive Switching System. The CCS9000 permits remarkably versatile and economic communications with a wide variety of remote devices at distant locations.

The CCS9000 is a multi-path communication link that permits monitoring, troubleshooting, and programming of remote serial devices from one or more central locations. Communications can be established over virtually any communication medium or combination of paths—telco dial-up lines, leased lines, private wire networks, fiber-optic networks, and wireless RF. Any central location with a PC or laptop can communicate with any remote device through its serial data port at any distant location using the CCS9000 system.

The key elements of the CCS9000 are a four-port addressable multi-port modem, and a master PC running DATA-LINC's CONNECT software. When a communication session with a specific remote device is desired, the device's location is selected from the CONNECT menu and a path connection and port selection is automatically made.

The CCS9000 makes managing remote PLCs much easier and reduces phone line costs as well. It is especially useful for organizations supporting many systems in the field. Please call our technical support group at 425-882-2206 for more information.

The CCS9000 family of multi-port modems include versions (shown left-to-right) for Spread Spectrum RF, Fiber Optics and Dial-up/Leased-line.

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