LINC LETTER

INDUSTRIAL DATA COMMUNICATION NEWS & TECHNIQUES

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National Instruments Becomes Alliance Partner

DATA-LINC recently expanded its alliance partnerships with the addition of National Instruments.

Based on its ability to communicate in high interference environments, the SRM6000 was selected by National Instruments as a preferred wireless solution for their *FieldPoint* I/O system.

Additionally, a FieldPoint system is now part of DATA-LINC's test lab to aid in product development and technical support.

DATA-LINC's alliance partnerships also include Rockwell Automation (Allen-Bradley), GE Fanuc, Schneider Automation and Siemens. The alliance partnership program allows DATA-LINC to work closely together with automation manufacturers to provide highly reliable solutions.

Inside

DATA-LINC Wireless Modems Let You Install Allen-Bradley PanelViewÒ Anywhere You Need It!

PanelView made wireless with the **DATA-LINC** ***SRM6000 Radio Modem***

The space-saving design of the Allen-Bradley PanelView, available in a flat panel or 14-inch CRT, makes it very convenient for use in monitoring and control applications on the shop floor. Unfortunately, in the typical industrial environment, wiring it to a PLC that isn't located in the same area is rarely as convenient.

Rather than investing time and money into running cable – or worrying about cabling distance limitations – why not consider a wireless alternative instead?

A pair of DATA-LINC license-free SRM6000 Radio Modems can connect your PanelView Master to a remote DF1 Channel 0 device on a PLC – even at distances up to 20 miles!

Reliable communication even in high interference is assured because of DATA-LINC's *Smart Spectrum*™ technology (see page 4) that uses advanced frequency hopping and error correction. The modems are capable of high-speed data rates including 19.2 KBPS, the typical speed for PanelView. The SRM6000 comes factory-preconfigured for your application for easy installation and operation.

DATA-LINC successfully demonstrated this "wireless" PanelView in action at Automation Fair '99 in St. Louis, controlling discrete I/O with a PanelView connected via wireless link to a remote MicroLogix controller.

What's new at DATA-LINC?
Find out at www.data-linc.com
New Developments section!

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Radio Modems Create "Floating Offices" for British Columbia Ferry Corporation

In 1960, the provincial government of British Columbia established a scheduled ferry service between the lower mainland of British Columbia and Vancouver Island with two vessels and 225 employees.

In 1977, British Columbia Ferry Corporation, a crown corporation of the government of British Columbia, assumed operation of the ferry service. Today, BC Ferry has 39 vessels, 26 routes and more than 3000 employees. On a yearly basis, it carries approximately 22 million passengers and 8 million vehicles.

Until just 2 years ago, on-ship personnel had to keep manual maintenance logs, purchase orders and other records, which were later entered into BC Ferry's computer network after the vessel reached shore.

***BC Ferry's* Queen of the North**

For increased efficiency, BC Ferry then began working with systems integrator Alliance Business Solutions Inc. of Nanaimo, BC, on a pilot project involving ship-to-shore data communications using radio modems. The project started using a commercial wireless Ethernet system, which provides an Ethernet interface and a radio frequency (RF) data rate of 2 Mbps. This enabled on-ship personnel to use email, maintenance software and other applications they could previously only access in the office – but only when the ship was at or near dock.

This was better but not good enough. BC Ferry wanted continuous data communications – even when the vessels were 20 to 30 miles out to sea. But the commercial units weren't designed for such a range.

> ***"They maintain their connection even on the longest route"***

To achieve longer range, parabolic directional antennas are usually necessary with high speed wireless systems. But because the ships move and turn, directional antennas are totally impractical. Enter the DATA-LINC SRM6200E Ethernet Radio Modem, chosen because it offered a highly sensitive RF receiver combined with a reasonable data rate, according to Rick Fielden, president of Alliance Business Solutions. The SRM6200E supported long range communication using a simple omni-directional antenna.

Today each ferry contains a Cisco® router with one LAN port, one high-speed (2 Mbps) wide area network (WAN) port connected to the commercial modem, and one lower speed (100 KBPS) WAN port connected to the DATA-LINC SRM6200E. These communicate with identical units connected to Cisco routers in the BC Ferry terminal offices.

The routers use the higher speed WAN port connected to the commercial modem when the vessel is at or near dock. Once the ferry heads out to sea, however, and the RF link between the commercial units fails, the routers automatically switch to "back-up mode," using the lower speed WAN port connected to the SRM6200E. No user intervention is required to make the switch between radio modems.

"We've been very pleased with the reliability of the DATA-LINC radio modems," said Fielden. "They maintain their connection even on the longest route, between Tsawwassen on the Canadian/U.S. border and Duke Point on Vancouver Island, which is in excess of 30 land miles in distance."

The DATA-LINC SRM6200E Ethernet Radio Modem uses *Smart Spectrum*™ technology, an advanced frequency hopping transmission method (see page 4). While its specifications indicate a range of 15 miles, BC Ferry has found this specification to be quite conservative with reliable communications at distances of 30 miles.

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Tutorial

High Frequency FSK Modulation Solves a Number of Problems Common to Industrial Data Communications

Data communications equipment that functions just fine in a business office environment often produces highly unsatisfactory results when called on to perform in an industrial environment. Such equipment wasn't designed to handle the electromagnetic interference (EMI), radio frequency interference (RFI), unstable ground planes, extended distance requirements and lack of suitable wiring typically found in facilities with the need for industrial data acquisition and control. The result is often unreliable data transmission or complete operational failure.

To meet the needs of instrumentation engineers and technicians – who have neither the time nor the inclination to spend hours troubleshooting data communication problems between computers, PLCs and RTUs – data communications equipment was developed specifically for industrial applications. One example of this is equipment that uses frequency shift key (FSK) carrier modulation. Rather than sending digital signals represented by changing voltage levels – which are inherently sensitive to EMI and RFI – an FSK transmitter converts digital signals from a computer, PLC or RTU to frequency (a process known as modulation). The FSK receiver converts frequency back to digital signals for the equipment on that end of the transmission line (a process known as demodulation). The terms "**mo**dulation" and "**dem**odulation" are combined to create the term "modem."

> ***"it is highly immune to noise, because the 100 kHz band is well above that of common EMI sources"***

An FSK modem, such as the DATA-LINC MDL500 Dedicated-Wire FSK Modem, which operates in the 100 KHz frequency band, offers a number of advantages in an industrial environment. First, it is highly immune to noise, because the 100 KHz band is well above that of common EMI sources, such as AC power lines and motor drives, and well below most radio frequencies. Additionally, it is not affected by ground plane changes.

DATA-LINC's MDL500 FSK Modem

Another benefit is distance. FSK signal attenuation caused by long-distance transmission does not prevent accurate data reception. The MDL500 supports distances to 4 miles full-duplex or 8 miles half-duplex at 9600 BPS on 2-conductor 22 AWG wire – unshielded, shielded, twisted or nontwisted – in point-to-point or multipoint applications. It can also transmit over metal components like slip rings, sliding or rolling contacts and crane booms that are isolated from the ground. As an added benefit, in certain applications, data can be superimposed over other signals, such as power, instrumentation or PBX telephone lines.

Highly versatile, FSK can interface with virtually any digital signal, including RS-232, RS-422 and RS-485. This makes it ideal for communication between PLCs and RTUs, SCADA and alarm monitoring and many other innovative data communication solutions. A properly designed and configured FSK modem can provide easy installation, as well as ongoing maintenance-free service.

FAQ

What Is Smart Spectrum™?

Not all wireless spread spectrum communication technologies are created equal. Choosing the wrong technology can lead to unreliable data transmission and system problems. DATA-LINC's Smart Spectrum technology is an advanced implementation of frequency hopping that provides unparalleled reliability in industrial applications prone to high noise.

Ideal for PLC, SCADA and DCS communication where system integrity is critical, Smart Spectrum uses a unique combination of radio frequency (RF) attributes to achieve this high level of performance.

Algorithmic frequency hopping over 112 channels

Spread spectrum radio modems typically use one of two spreading methods: direct sequence or frequency hopping.

Direct sequence continuously spreads data across a wide portion of the frequency band. If a frequency is not available — because other equipment or too much noise occupies the band — then that data is lost. In a high-noise environment, the reliability of the data is dependent on the signal-to-noise ratio. The percentage of frequencies unavailable represents the percentage of data that will be lost.

Frequency hopping, on the other hand, takes incoming data and breaks it down into smaller individual packets, which are then sent on separate frequencies. Once the packets have been transmitted, the data is recompiled in its original format. If a packet cannot be successfully sent on a given frequency, it is re-sent on another. With 112 channels over which to send the data packets, Smart Spectrum ensures that your critical data gets through.

High RF data rate of 144 KBPS

Smart Spectrum radio modems communicate with each other at 144 KBPS – well above the data rate of most PLC and other industrial data acquisition and control systems. This is important because RF speed determines overall system performance. As interference increases, effective throughput decreases. If a radio modem's RF data rate is only 22 KBPS, 75% interference leaves you with an effective throughput of only 4.8 KBPS. If, on the other hand, you're using a DATA-LINC Smart Spectrum radio modem, the 144 KBPS RF data rate with 75% interference still leaves you with an effective throughput of 28.8 KBPS – providing a reserve of performance to ensure communication integrity.

Highly sensitive RF receiver

Another advantage of Smart Spectrum radio modems is that their receive sensitivity can be set very high. This allows the processor to sample several frequencies and compare the data, resulting in its ability to distinguish valid data from noise.

32-bit CRC forward error correction

After transmitting data over the RF link, a Smart Spectrum radio modem performs a cyclical redundancy check (CRC) on each packet. In this way, Smart Spectrum not only ensures that your data gets through, but also that your data gets through *accurately.*

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Radio Modems
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Analog/Discrete Signal Muxes

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