#72 JULY–AUGUST 2008

control NETWORK

News on the Industry & Information for Contemporary Controls' Most Valued Customers

## INSIDE



## TRADE SHOWS

**Learn the latest innovations in technology by attending these trade shows.**

**Green Sustainable Building Controls Conference**
**September 22–24**
The Fairmont Dallas
Space #16
Dallas, TX USA

**SPS/IPC/Drives**
**November 25–27**
Exhibition Centre Nuremberg
Hall 10, Stand 131
Nuremberg, Germany

**AHR Expo 2009**
**January 26–28**
McCormick Place
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Chicago, IL USA

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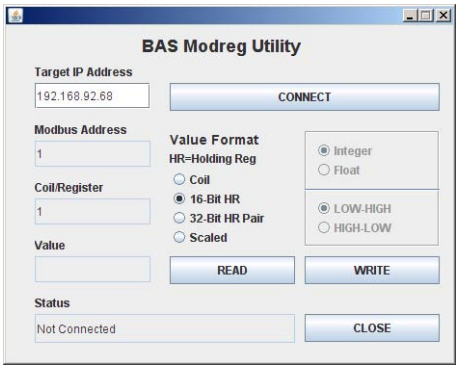
# BAS Remote I/O is "Multilingual"

In addition to the BACnet®/IP protocol, the BAS Remote I/O is fluent in Modbus/TCP. No configuration is required (just an IP address) and the BAS Remote I/O Master will respond to BACnet® read and write requests, in addition to read and write Modbus commands. This allows the channels of I/O to be read and written by both protocols. Now chances are that you would not do that, but I know customers who do some interesting things.

More importantly, the BAS Remote I/O actually has a Modbus gateway function—allowing messages that are not destined for BAS Remote I/O to be sent out the MB (Modbus EIA-485) port for communication with Modbus slave devices. This means that you can communicate with your favorite Modbus slave variable frequency drive (VFD), or a power meter (perhaps to do some sub-metering), or any gizmo that is a Modbus slave device communicating via ASCII or RTU. Think of the many applications that require some I/O (BAS Remote I/O is an excellent choice) and maybe some other Modbus-enabled devices all integrated in a single system with a one-cable interconnect.

The way the gateway works is very simple. If the message coming into the BAS Remote I/O has an ID number that is associated with the BAS Remote Master or any of its three possible expansion modules, the BAS Remote I/O will either return the data located in its channel memory or write the data to its channel memory. If the ID number does not reside in the BAS Remote I/O, then it is passed to the MB port. In this way any Modbus command code can be sent since all the BAS Remote I/O Master does is unpack the TCP message into a Modbus message and send it out the MB port as RTU or ASCII and at the baud rate you selected (those you have to configure). Simple enough. And when the slave responds to the query, the response Modbus message is received at the MB port and packed into a Modbus/TCP packet and sent to the requesting device.

Some things to consider. Keep in mind that there is only one MB port so that all devices connected to it must be EIA-485 compliant, either RTU or ASCII mode slaves (no mixing), communicating at the same baud rate, and have unique Modbus ID numbers. Other than that any slave device can exchange data via the MB port with the Modbus/TCP device. There is no restriction on the type of data. The data can be 16-bit integer, signed integer, 32-bit integer hi word/low word or vice-versa and (of course) floating point. The BAS Remote I/O just passes the data without any judgment made about the data content.




Sometimes start up can be a real bear (and worse). In an effort to make start up more pleasant (less painful, if you will) Contemporary Controls has developed a Java applet called ModReg Utility. When connected to the BAS Remote I/O, this utility can be displayed in a browser and it allows you to prove reading and writing the slave devices connected to the MB port. Once proven to your satisfaction that the slave devices are operating properly, you can then read and write them from your Modbus/TCP enabled controller.

If you have any questions, comments, or suggestions please contact me, Joe Stasiek, at **630-963-7070 x 116** or **jstasiek@ccontrols.com**.

## Case Study

### CANISA Card is the Hidden Gem in the Flight Simulator's Control Loading System

Ever since the Wright Brothers took to the sky in 1903, aircraft simulators enable individuals to experience a wide range of flight situations without running the risks associated with actually operating an airplane.

The control loading system is an important element of a flight simulator. The system is comprised of a model of the aircraft and a command stick that is driven by an electric motor. The end-result is a simulation that has the appearance and feel of the aircraft during all phases of operation.

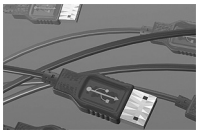
As aircraft simulators and training devices became more sophisticated, companies like WITTENSTEIN aerospace & simulation Inc. of Bartlett, Illinois entered the business to design and construct control loading systems for simulators. Conventional flight simulators apply a controlled load on a target, such as a control stick and associated linkage, by using force sensors located between an actuator (electric motor) or the simulator and the target. The first force sensor detects the external force exerted on the load target and is coupled to the mechanical linkages which transmit the forces from the actuator to the load target. The torque and, therefore force, is controlled by the control electronics to ensure precise and accurate representation/simulation of forces to the pilot. At the same time, a pilot is also applying a force to the target.

To put together a sound simulator control loading system in place, WITTENSTEIN's engineers realized that they required an industrial PC CAN card to interface with the actuators in order to provide a robust control bus. "It allowed us to network a number of axes on a single CAN bus," said Senior Systems Engineer Scott Metcalfe. "The CANISA-DN module from Contemporary Controls provided a simple method to set-up and install a card which could communicate with a number of our control electronics. The CAN card was used to communicate on the CAN bus to the actuators with messages that control the torque and speed of these devices in order to vary the force-feel characteristics. These actuators are modular in form, so the individual can select the servo, gear ratio, and the system control module configuration to suit the application.

Metcalfe said the decision to use the CANISA-DN was made easier because the card is COTS which required no design effort, and is ISA which meant it could be assembled into an industrial PC.

For this application, WITTENSTEIN engineers did not write their own driver for the CANISA nor did they use an off-the-shelf type such as Linux open-source CAN driver. Metcalfe said his team selected one from Contemporary Controls which support Windows® 98/ME/2000/XP, Linux and DOS.

The high performance and programmability of the control loading systems make them equally suitable for the complete range of applications, from PC-based trainers to level-D simulators.



## TECH UPDATE

### Cascading Contemporary Controls Ethernet Switches

The distance limit for each segment of Industrial Ethernet copper cabling is 100 meters. Often this is overcome with a **cascade** of switches, sometimes for many hundreds of meters. The traditional topology is the **star** in which cables radiate to end devices from a single point. A cascade from switch to switch can minimize cabling in some applications.

There are concerns in cascading switches—any topology can present issues. Theoretically, a cascade has no general limit for cabling distance or switch count. But in real life a cascade can present special issues. Here are some to consider.

**Latency**. Delay occurs whenever an Ethernet signal is transmitted. Copper wiring—having a velocity of propagation of 2/3 the speed of light—offers trivial delay. However, the delay incurred in passing through the electronic circuitry of a switch is not trivial. Although small, this 3 to 4 microsecond delay inside the switch becomes significant when enough switches are in the cascade. Perhaps the bigger issue is the amount of time each switch spends re-transmitting each message. This delay will vary depending on the size of the message. The point at which the accumulated delay becomes a problem varies with the application. To determine if cascade latency would be excessive in your situation, you must know what delay is acceptable for your application then calculate the expected latency based on how many switches are involved. Be sure to allow for the turn-around time at the end of the cascade—the time for the destination hardware and/or software to respond.

**Interruptions**. A failed device is a potential problem in any network, but in a cascade it could be catastrophic. A discontinuity in the signal path will disrupt end-to-end communication. Messaging may be preserved for among some devices attached along the path, but end-to-end traffic will be interrupted. If end-to-end traffic is vital in your network, a discontinuity will result in total failure. To lower the chances of total disruption, backup power can be provided at points along the cascade.

**Bottlenecks**. Any switch port is capable of the stated bandwidth. A switch is deemed **wire-speed** when its internal switching fabric can accommodate the bandwidth needs of all ports simultaneously. For example, a wire-speed 8-port 100 Mbps switch must have a fabric bandwidth of 800 Mbps. This capability does not prevent a bottleneck when two or more ingress ports target high traffic for a single egress port. If multiple devices inject high traffic at points along your cascade, then bottlenecks can occur more readily in the cascade than in other topologies.

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## Using the Industrial Ethernet University to Acquire Knowledge of Ethernet Makes Sense

Every day, more individuals know exactly where to go to learn about Ethernet technology and that is the virtual Industrial Ethernet University (IEU) site. Sponsored by Contemporary Controls, the company continually adds up-to-date information to educate the public for the benefit of the industry.

"IEU offers an excellent learning experience," says Sales Manager Joe Stasiek. "It gives participants free, flexible anytime/anywhere instruction on this technology unlike the typical classroom. Anyone interested in becoming more informed, should take advantage of IEU."

Contemporary Controls announces a new graduate level course (IE501) entitled "Achieving BACnet® Compliance." This course continues the discussion of object modeling by addressing the requirements for achieving BACnet compliance. It reviews the BACnet interoperable building blocks (BIBBs), the BACnet Standard Device Profiles, BACnet International, the BACnet Testing Laboratories (BTL) Mark, and provides an example of a Protocol Implementation Conformance Statement (PICS). In addition, the course discusses the importance of Plugfests as a convenient method for vendors to test-drive their products before actually incurring the expense and effort of a formal conformance test.

Individuals may explore more topics through lectures on the site provided by industry experts. A new lecture (LS 113) reveals the opinions of H. Michael Newman who is considered the "Father of BACnet." Mr. Newman was recognized at this year's Light+Building trade show in Frankfurt, Germany.

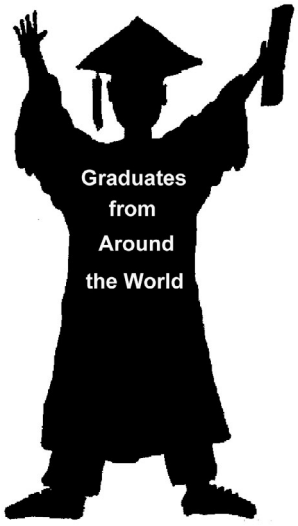
The lecture details the development of the BACnet protocol, the resistance before it became an ANSI standard, and its greatest strengths. Newman concludes by saying that he and those who have been involved in its development and who have persevered through thick and thin have become life-long friends and true "BACneteers." "So for me, and for us, it has all been well worth it," he explains.

## IEU Reaches a Global Audience


Professionals from around the world (more than 3200) have enrolled in the virtual Industrial Ethernet University (IEU) and the number is growing fast. These individuals have used the Ethernet knowledge gained to enhance their effectiveness on the job…and to further their careers.

The majority of the students reside in the United States (770) with a good percentage from India, Brazil, the United Kingdom, Canada, China, Australia, Peru, South Africa, Saudi Arabia, Pakistan, Guatemala, Germany, Nigeria, Mexico, Belgium, New Zealand, and Singapore.

Smaller percentages, for example, are represented in Iceland and less known areas such as Maldives (southwest of Sri Lanka) and Oman (the southeast coast of the Arabian Peninsula).




There are 22 FREE on-line courses vital to running highly-effective, trouble-free Industrial Ethernet and 13 guest lectures from the top ranks of this technology.

At the IEU, you'll learn Ethernet from the physical and data link layers up through the network, transport and application layers. Concise material and concepts are based upon the IEEE Std. 802.3 and relevant Request for Comments (RFCs). These reference documents can be downloaded off the Internet.

The student can obtain additional reference information through the university's library and the university's bookstore. Material offered in the bookstore has been reviewed and found beneficial by Contemporary Controls. The bookstore has a direct link to **http://www..Amazon.com**.

IEU has a virtual professor (William Greer, the company's Senior Product Specialist) who will answer any question by private e-mail. If he is unable to provide sufficient clarification, other experts from the company or outside the company will be consulted

In order to see that each student comprehends the material, he must complete a test. Some gain a certificate of completion upon successful graduation. The number of graduates is 320 with 173 living in the United States, the United Kingdom, India, Canada, China, Belgium, Australia, Zimbabwe, South Africa, Saudi Arabia, Vietnam, United Arab Emirates, and Croatia to name a few. About 167 graduates reported no residence because they requested their certificate in an electronic format.

One recent graduate said, "I recommend all those who are in the field to enroll and make it your solid base of information on Ethernet. IEU sets an excellent example of online learning. Thanks!"

To visit "the campus" please go to **http://www.ieu.cc**.

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- This newsletter's feature article examines why the BAS Remote I/O is "multilingual." In addition to the BACnet/IP protocol, the BAS Remote I/O is fluent in Modbus/TCP.
- The Tech Update examines how cascading switches can present special issues. Some concerns to consider are latency, interruptions, and bottlenecks.
- This issue's Extension Supplement is the first of a two-part series on Modbus. It addresses the protocol itself. The second discusses the Modbus Serial and Modbus/TCP implementations allowing Modbus to remain a very popular protocol.