

Modbus in China

Modbus-IDA and ITEI Organize Four-City Tour

One year ago, Mr. Jinsong Ouyang, Director of Standardization, Department of **Instrumentation Technology & Economy Institute (ITEI)**, People's Republic of China, and General Secretary of the National Standardization Technical Committee on Industrial Process Measurement and Control announced that the Standardization Administration of China had formally launched three standards for industrial automation in the People's Republic of China:

- Modbus Industrial Automation Network Specification Part 1 – Modbus Application Protocol,
- Modbus Industrial Automation Network Specification Part 2 – Modbus Protocol Implementation Guide over Serial Link, and
- Modbus Industrial Automation Network Specification Part 3 – Modbus Protocol Implementation Guide over TCP/IP.

Today, 11 companies are formally introducing their Modbus products to audiences in Beijing, Chongqing, Guangzhou, and Shanghai. From October 21 through October 28, Modbus-IDA members are meeting manufacturers, academics, and government officials at events focused exclusively on Modbus. In each city, Modbus-IDA members are showcasing their Modbus devices at a table-top exhibition and providing special presentations. Member company **ProSoft Technologies** is giving a talk titled, *Extend Your Modbus Communication Connectivity*; **Hirschmann** is speaking on *The Future Ethernet Technology*, and **HMS Industrial Networks** is providing a program on *Connecting Modbus to Other Industrial Networks*.

ITEI joined Modbus-IDA over the summer and has stepped up its Modbus-related activities, starting with the four-city tour. Audiences in each city include participants from local universities, manufacturers, and government officials from the industrial sector. Modbus-IDA will be introduced by Mr. Feng Xiaosheng, head of ITEI and Modbus-IDA Board Director. Other presentations include an introduction to the ITEI Modbus Conformance Test Laboratory by Test Engineer, Mr. Mei Ke, and an introduction to basic Modbus technology by Dr. Sun Xin of Northern Jiaotong University. A press conference is also planned on the tour's opening day in Beijing. (*continued on page 3*)

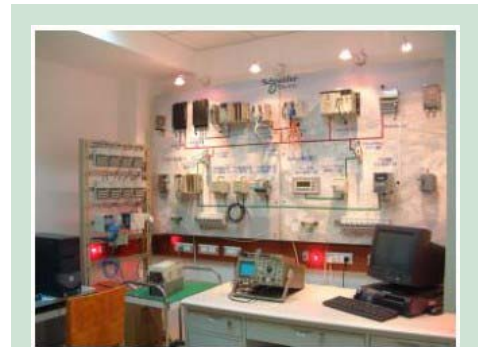
Modbus Test Program Expands

On October 18, 2005 Modbus-IDA and the Instrumentation Technology & Economy Institute (ITEI) announced the opening of ITEI's Modbus Conformance Test Laboratory in Beijing. As part of its expanding Conformance Test Program, Modbus-IDA is contracting with organizations in locations around the world to offer conformance testing and certification of Modbus devices. The ITEI laboratory is the first of several planned testing sites worldwide that will make it easier for companies to get their devices tested closer to home.

Planning for the ITEI lab started in January 2005. With the help of Schneider Electric engineers, the lab is open today and available to test and certify devices as conforming to the specification for Modbus TCP/IP or Modbus over Serial Line. Conformance testing is performed with equipment donated by Schneider Electric.

Tested devices are listed on the Modbus-IDA website (www.modbus-ida.org), which features a growing database of Modbus devices for users to search and identify the right Modbus devices for their applications.

Modbus-IDA is expecting to announce partnerships for Modbus Conformance Testing in Europe in the near future.



ITEI's Modbus Conformance Test Laboratory, Beijing, China

Meet Some of Our Members...



Millennial Net develops commercial- and industrial-grade wireless sensor networking software, systems, and services that enable OEMs and systems integrators to quickly implement wireless sensor networks. These networks enable remote monitoring and management of critical devices while providing data to enable more informed decision-making, better control and increased revenue opportunities. Millennial Net's patented ad hoc, self-organizing wireless sensor networking MeshScape™ system is a leader in power efficiency, support for dynamic systems and mobile sensors, reliability, and scalability. Millennial Net's products are installed in commercial building and industrial environments. The company is backed by top-tier venture firms and is headquartered in Burlington, Mass. (www.millennialnet.com)



APEX Automation Technologies GmbH designs, manufactures and sells process-data transmission networks within the automation engineering sector. The process-data transmission network PDnetIP is one of the company's innovative product lines. PDnetIP allows the networking and migration of older plants to new communication technologies. The ability to network diverse terminal devices with PDnetIP using standard protocols such as Modbus TCP/IP, ICOS/TCP or RFC-1006 offers reliability and a truly open network choice for modern communication solutions. (www.apex.de)

Based in Hopkinton, Mass., **Control Technology Corporation** designs, manufactures and markets products that enable electronic automation devices to be monitored, controlled, configured or reprogrammed over the Internet and/or intranets. The



company has a long history of providing innovative automation solutions to its customer base. In the 1990s Control Tech was the first company to incorporate web server and Internet technologies into programmable automation controllers and was granted several patents in this area. (www.ctc-control.com)



Spectrum Controls has provided products for the industrial controls marketplace since 1983. The company's products fall into three major categories: I/O modules, operator interfaces and communications devices. Spectrum Control's products have been successfully deployed in water/wastewater, utility/power, oil/petrochemical, mining/quarrying, pulp/paper, food/beverage, material handling, biopharmaceuticals and a variety of other industries. (www.spectrumcontrols.com)



Afcon Software and Electronics is a fully owned subsidiary of the Afcon Industries Group. Founded in 1945, Afcon is a public company listed on the Tel-Aviv Stock Exchange (TASE). Afcon Industries Group (AIG) is one of Israel's leading industrial enterprises engaging in the design, manufacture, sales and installation of a wide range of electrometrical equipment and industrial control systems. Afcon Software and Electronics provides fast and easy software solutions in the area of SCADA/HMI and Cellular systems. (www.afcon-inc.com)



**Join
Modbus-IDA**
see back cover for
details...

Modbus in China *(continued from page 1)*

In addition to the table-top exhibitions and company presentations, Dr. Sun Xin, Northern Jiaotong University, will introduce basic Modbus technology and Philippe Gelin, **Schneider Electric** will provide advanced Modbus TCP/IP training. A Chinese language magazine was produced in conjunction with the tour with excerpts from past Modbus-IDA newsletters and introductions to companies participating in the tour.

We look forward to helping our members develop relationships with Chinese manufacturers and universities over the coming years. Producing material in Chinese, such as these signs made for the tour, will make it easier for new customers and new developers in China to work with Modbus-IDA, and learn about our activities and opportunities for collaboration.



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连接新旧架构的桥梁

ProLinx 1000 系列工业以太网系列可独立驱动的智能 I/O 智能控制、网络控制、网络控制的能力以及其灵活的本地通信的能力。客户可以通过多种网络协议证实其在各种特殊环境。 实现最佳的本地设备。 其集成的网络控制设备的特点。 网络控制可实现。 网络工业以太网 (Ethernet) 网络 Modbus TCP/IP 网络。 网络控制。 网络工业以太网。



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Modbus-IDA

the architecture for distributed automation

**Join the Marketing Committee
 and
 help us help you!**



Modbus Products and Innovations

CM090 Ethernet Option for Yaskawa Variable Frequency Drives Modbus TCP/IP Certified

Yaskawa Electric offers the CM090 Ethernet Option Card for use with its Variable Frequency Drives, GPD515/G5, F7, G7 and P7. This card allows interoperability among different vendor devices using the Modbus TCP/IP protocol to communicate among the devices. The complete CM090 (Ethernet Modbus TCP/IP Option kit) includes the Ethernet Option Card, a shielded RJ45 M-F cable, ground wire, insulated tubing, cable ties, and an installation guide.

With the CM090, a maximum of 10 simultaneous connections are allowed. This implementation of MODBUS TCP/IP supports MODBUS functions 3 (read multiple registers), 6 (write single register) and 16 (write multiple registers). The Yaskawa website provides an excellent example of the product's use in a document titled, *Using Yaskawa VFD's "Modbus TCP-Ethernet Option" with Allen Bradley CLX Programmable Controllers*, which describes an implementation using Yaskawa's 5 and 7 series variable frequency drives with Modbus-IDA member company Prosoft Technology's MV156-MNET interface module.



CM090 Modbus/TCP/IP Option Card



Stanley Assembly Technologies QPM Sigma Controller Certified

With Stanley Assembly's QPM Assembly Systems, users get total control over the threaded fastening process and can tightly integrate process-related data into their plant systems.

The QPM family of high performance assembly tools uses standard modular components offering a wide range of tool geometries (pistol, straight, angle, and offset), mounting options (reaction bars, base mount brackets, flanges, and spring-loaded spindles), and output types (crowfoot, tubenut, hold-n-drive, and flush socket heads). The torque range of the QPM family of handheld and fixtured assembly tools is 0.5 Nm (4.5 in-lb) to 2000 Nm (1475 ft-lb). Stanley also delivers custom configurations to address extreme geometry or very high torque assembly challenges.

Every Stanley QPM controller is compatible with every handheld and fixtured QPM Assembly Tool. The controller has a fully functional keypad and display for programming, rundown data, statistics, and diagnostics. Communication capabilities include Ethernet, multiple Fieldbus technologies including Modbus TCP/IP, serial and parallel ports, plus 24VDC I/O.

The QPM Sigma Controller, Model Q3000 was tested for conformance to Modbus-IDA Conformance Test Policy Version 2.1.



QPM Family of high performance assembly tools

Modbus Products and Innovations

PCN Introduces iPLC™ Modbus Bridge

Member company **PCN Technology, Inc.** this month introduced its iPLC™ Modbus Bridge module for OEM and ODM customers.



The device is designed to provide mission-critical wireless solutions leveraging existing power distribution systems.

The iPLC™ Modbus Bridge is an industrial power communication technology created for hardened and harsh environments. It leverages the existing power distribution system to provide OEMs with an alternative wireless solution. Added benefits include reduction and elimination of wire, harnesses, bulk, weight, heat, and costs. PCN's solutions provide iPLC™ technology, flash program/data self programming, I2C Master/Slave, Ethernet, RS-232, RS-485, CAN, Modbus, DeviceNet, Profibus, USB, and SPI support on module. Additional networks are also supported.

The PCN iPLC™ Model EC-2504 supports up to 8 Mbps and is an embedded open protocol Conducted Medium Network Convergence Communication System. Current implementation of the application layer consists of support for Modbus 2-Wire/4-Wire RS-232, RS-422, RS-485, or direct TTL UART interface to a microcontroller system. Standard baud rates supported range from 1200 Baud to 250K Baud. The conducted medium (powerline) system communicates in the robust mode on 120 redundant communication channels to provide maximum reliability and flexibility.

Multiple socket and network MAC addressable configurations can also be supported to provide compatible communication at up to 4 Mbps on the conducted medium with the EC2504. The EC2504 Modbus Convergence Layer supports RTU, ASCII, and

proprietary iPLC ASCII compression mode. The iPLC Modbus modes are independent and interchangeable regardless of Baud Rate, RTU vs. ASCII, and physical hardware interface type. For example, an ASCII Master Module can speak on RS-232 to a Slave that is 2-Wire RS-485 in RTU mode (or any other combination).

Current support for Industrial Ethernet-IP addressable communication with programmable multiprotocol support (e.g., Modbus TCP/IP) are in process.

PCN has focused the company's products on increasing security, reliability, and performance while reducing power consumption in control, automation, computing and converged devices. PCN products use the proprietary iPLC™ network protocol allowing mission critical industrial OEM & ODM customers the ability to have an alternative wireless solution without the reliability and security issues of traditional wireless in a mission critical industrial environment. (www.pcntechnology.com)

**List your company's
Modbus compatible
products on the
Modbus-IDA website.**

info@modbus-ida.org

SoftDEL Unveils New miDELware Components

SoftDEL Systems Inc. has introduced new software components for its miDELware suite of connectivity solutions for product manufacturing companies.



The suite consists of:

- **DELhistorian.** An optimized data archiver that accesses data from other OPC DA, OPC HDA client servers or protocols and provides schedules, script control, annotations, aggregation, and data mirroring.
- **DELScripter.** A plug-in component that adds scripting capabilities to existing software applications and is designed to work in real time. DELScripter has a debugger and scheduler for scripting multiple events and is suited to applications that require high-speed compilation and execution of scripts.
- **DELTune.** A complete new auto tune PID software plugin provides a novel approach to relay-based tuning and overcomes the drawbacks of most other methods. DELTune can sit on top of any PID controller.
- **DELMODBUS** is a combination of Modbus driver and OPC server components that acts as a connectivity solution between OPC Clients and Modbus protocol compliant devices. DELMODBUS comes in both Modbus RTU and Modbus TCP/IP versions. SoftDEL works in embedded, real-time and PC hosted software. It helps product manufacturing companies in industrial and building automation enhance their products and accelerate development time. SoftDEL offers off-the-shelf and custom technology plugins as well as other technology services. (www.softdel.com)

Modbus-IDA Discussion Forums

Q&A

From the Modbus User's Forum...

Modbus RTU Topology...

Tom asked the Forum:

I'm fairly new to modbus so this might be a stupid question. Is there any way to run modbus RTU in redundant ring topology in case we get a wire break we won't lose communication?

Lynn Linse replied:

This is a common question (not stupid - just "hopeful" thinking). Yes, at common baud rates like 9600 you CAN wire up a bunch of RS-485 slaves in a loop on one or two Master ports. The noise caused by this won't interfere much with communication. However, it won't be useful or redundant (other than looking important on paper).

First problem is you've a 99.9% chance that the line fault will be a 1-of-N wire break or one screw terminal come loose. So your 2-wire becomes 1-wire

or 4-wire becomes 3-wire at some point of the loop. Thus, a master talking on one end of the "loop" will still be electrically affecting the other "broken" end. You will NOT be able to treat the 2 halves of the loop as 2 buses!

And even if you are "lucky" and have a complete 100 percent break of all 2 or 4 wires, assuming this is a serious field run of 1000+ feet, you now have two unterminated buses which may or may not work at all.

Modbus/RTU can only be redundant if you have slaves with TWO ports and run TWO distinct cable systems.

Ian Poulett offered:

Westermo Data Communications offer a devices that enables RS-232 or Rs-485 data to be passed in a redundant ring.

Modbus CRC with 16f876 microcontroller...

Gauri asked the Forum:

Hello everybody. I am using 16f876 microcontroller for Modbus communication. [I] have a receiver which receives the data sent by Modbus tester. This Modbus tester is being provided on <http://www.modbus.pl>, which sends a string of data along with CRC code. When I receive the data and calculate the CRC, it doesn't match with that of the tester. I am doubtful about the preset value which is X-ORed with the CRC register in case its lsb is not zero.

I have seen that while programming in C or VB programmers use the CRC code table for getting this preset value, however my processor doesn't have so much memory to create such a big table.

Lynn Linse replied:

Try making a routine on a PC under normal C and also on your uP. Then compare the values loop by loop. See where you go wrong. Very likely you're not handling the unsigned overflow correctly. Precedence rules mean different compiler can treat unsigned equations differently. Sign-extending a value that should not be extended will throw your answer off, so make sure you use all unsigned ops.

Additional answers to Gauri's question can be found at modbus.control.com/1026213890/

The Modbus-IDA Newsletter

This is the newsletter of Modbus-IDA, the international nonprofit organization devoted to the evolution and support of the Modbus and IDA protocols.

For more information about membership and other services of Modbus-IDA, please refer to our website: www.modbus-ida.org

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The Modbus-IDA Mission

Modbus-IDA is a group of independent users and suppliers of automation devices that seeks to drive the adoption of the Modbus communication protocol suite and the evolution to address architectures for distributed automation systems across multiple market segments. Modbus-IDA will also provide the infrastructure to obtain and share information about the protocols, their application and certification to simplify implementation by users resulting in reduced costs.

**Ask your question
or help out a
fellow engineer on
the Modbus
User's Forum:
modbus.control.com**

Modbus Application Stories

State-of-the-art Compressors Keeping Shanghai General Motors Running Smoothly

Danetta Bramhall

What would be one of the most important pieces of equipment in an automobile assembly line plant — something that is tied to nearly every function in the production of a new car?

Give up? The air compressors. When a worker puts on a tire or attaches the new seats, they use a pneumatic tool. So, it goes without saying that the air compressors in an auto assembly line plant are crucial.

Central Control for the Compressors

There are a total of eight Atlas Copco compressors in the Shanghai General Motors plant. Six of these compressors are the ZH model, which is a centrifugal type. Each has an Allen-Bradley SLC 5/03 embedded in its control system. The impeller design of the ZH model is state-of-the-art, with capacities starting at 3000 cfm, in both single and multi-stage, these compressors can provide discharge pressures ranging from 25 to 400 psig.

The remaining two compressors are the Z-pack model, equipped with built-in Modbus communications. This created a problem in networking the compressors, since the Allen-Bradley SLCs are not Modbus compatible. The system integrator, Shanghai Yuandong Science & Technology contacted Rockwell Automation Shanghai and Modbus-IDA member company **ProSoft Technology**, a company specializing in protocol communication devices. They installed ProSoft's 3150 Modbus interface module into the SLCs onboard the ZH compressors, which allowed all the compressors to link to the HMI Host Station over a DH485 network.

“Normally every Atlas Copco compressor would be controlled individually,” said Chen Zong Liang, general manager of Shanghai Yuandong. “With individual control, we found that some compressors would load, unload, and even stop running simultaneously. This made compressor output very inconsistent and therefore unstable. By using ProSoft's 3150-MCM module, we were able to directly connect Allen-Bradley's SLC with Atlas Copco's compressors using the Modbus protocol. With central control, it was possible to stagger the actions (start, load, unload, or stop) of every compressor according to the charge situation.”

The Problem: Shanghai GM needed state-of-the-art air compressors for their new plant, but they also needed central control.

The Answer: Atlas Copco + Modbus + ProSoft Technology.

“Enabling the compressors with central control was easy to implement and created a smooth running operation,” said Lenus Hong, Asian regional sales manager for ProSoft Technology. “Not only did it help increase production, it created a cost savings in terms of electricity and maintenance costs. All of this translates into higher profits.”

When asked how the ProSoft module improved the plant processes, i.e. functionality, speed, convenience, or financial benefits, Liang simply replied, “It just can't work without it!”

Modbus Interface

“With these Modbus communication interfaces, manufacturers are making a great deal of data available to the processor which can enhance the system control,” said Doug Sharratt, lead developer for ProSoft Technology. “The 3150-MCM product, when configured as a Master, is able to read and write to these devices, allowing the SLC ladder program direct access to the devices's data.”

In the past, many communication systems were closed. Since the Modbus protocol is open it has become an industry standard for many industrial devices available today.



Danetta Bramhall is the staff editor for ProSoft Technology, Inc.

Join! Design! Test! Promote! Apply!

We're with you. Modbus-IDA exists to help suppliers and users of Modbus protocols succeed. Our members range from suppliers of Modbus-compliant products, to system integrators, to end users and educational institutions and even individuals.

The common link? They all value the information and services provided by Modbus-IDA, and they all play a role in determining the future of the world's most broadly applied protocol.

**To join Modbus-IDA,
order a Toolkit, or
arrange conformance
testing, visit our website:**

**WWW.
modbus-
ida.org**

Designing with Modbus

Each day, Modbus developers turn to Modbus-IDA for valued assistance with their projects:

- Start with downloading specifications and other design documents from the modbus-ida.org website.
- To really save time, purchase the Modbus TCP Toolkit CD (hint: it's FREE with membership), which contains source code and a myriad of other resources.
- Then, if you come across technical issues that have you stumped, post your question on our highly active developer's forum. One of the many experienced Modbus implementers who frequent this forum will likely have your answer.

Conformance Testing

When your project's done, what then? How do you know it really conforms to Modbus specifications? How do your users know?

The answer starts with running the conformance test suite included with your Modbus TCP Toolkit. This self-

test helps you check your design assumptions and catch the subtle "gotchas" that might otherwise slip through your design review.

But to make the definitive statement of your company's commitment to open protocols, submit your product for testing to the independent Modbus-IDA Conformance Test Lab. We'll certify your product as compliant, and post that information on the Modbus-IDA website for the world to see.

Visibility for You and Your Products

And, speaking of the world seeing your products, your membership in Modbus-IDA opens the door to a powerful range of visibility options to highlight your company as a supplier of Modbus-based products.

Exposure on our website, in our newsletter, and through our various trade show appearances are all options that allow you to make the most of your Modbus-IDA membership.

If your company is truly on the cutting edge of new technology, you'll likely also value the opportunity to participate in our technical committees. There, your company's knowledge, experience and technology can help guide future enhancements, extensions and adaptations of Modbus to keep it the world's leader for decades to come.

Time to Apply

When it comes time to get your Modbus network up and running, it's comforting to know that hundreds of thousands of applications have preceded yours. But what if things don't go as planned?

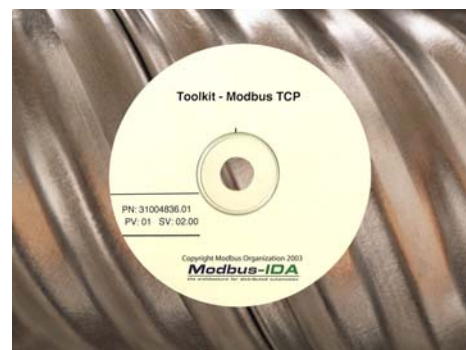
The modbus-ida.org users forum is ready to answer your questions and provide guidance. Thousands of users from diverse backgrounds read the forum, giving you a powerful base of experience from which to draw.

The Future is Yours

So, whatever your role in the use of Modbus, consider joining Modbus-IDA. You'll get the support you need today, and have opportunities to help guide Modbus to a dynamic future.

The Modbus TCP Toolkit CD

The Modbus Toolkit provides all the necessary pieces to develop a Modbus-compliant device, including documentation, diagnostic tools, sample source code, and pre-test software to prepare for Modbus-IDA conformance certification. The toolkit is available as a benefit of membership in Modbus-IDA or can be purchased separately for US\$500 plus shipping and handling.



Toolkit Contents

Modbus Documentation

- Modbus Application Protocol Specification, V 1.0
- Modbus Messaging on TCP Implementation Guide, Rev. 1.0

Tools

- Modbus/TCP Client Diagnostic Tool
- Modbus/TCP Server Diagnostic Tool

Sample Source Code

- Modbus/TCP Sample Client Code for Visual Basic Win32
- Modbus/TCP Sample Client Code for C/C++ Win32
- Modbus/TCP Sample Server Code for C/C++ Win32
- Modbus/TCP Sample Server Code for C VxWorks
- Modbus/TCP Sample Server Code for C++ VxWorks

Conformance Testing

- Modbus/TCP Conformance Test Software