Happy Holidays and All the Best in 2011!

2011 marks the beginning of the Modbus Organization's ninth year. We'd like to take a moment to thank our members and the many suppliers and users who contribute to our active community.

The Modbus Device Directory has grown to include over 1000 devices, and is searched daily by users seeking the right Modbus device for their application. The Modbus.org website and Modbus discussion forum site combine to serve the needs of over 40,000 unique visitors each month, looking for advice on Modbus implementations, downloading the protocol specification and implementation guides, seeking links to free, open-source Modbus resources.

Together, the community supports the implementation of Modbus throughout the world in the most diverse markets.

We are happy to be there for you and with you.

Best wishes for a healthy and prosperous New Year!

Modbus Wireless Access to HART Instruments

Phoenix Contact recently launched a HART7-compliant WirelessHART® gateway that allows Modbus TCP users to access their HART-compatible instruments remotely. The Highway Addressable Remote Transducer (HART) protocol has been used in process, measurement and control applications for the past two decades, and more than 30 million installed instruments already have built-in HART functionality.

Historically, a Distributed Control System (DCS) has been used with HART devices, but the HART functionality has not always been used. The HART signal is superimposed over a standard 4-20mA signal, and in many cases, the price differential between an Analog I/O card with HART and one without has led customers to choose the latter.

According to Garrett Schmidt at Phoenix Contact, the WirelessHART gateway allows customers to network up to 250 WirelessHART field devices and use a second control platform to monitor the behavior and calibration of each device. Phoenix Contact uses the entire suite of Modbus TCP commands. Schmidt says that even a PLC with TCP capability can be used in less critical non-process applications.

The 45 mm-wide RAD-WHG/WLAN-XD features an integrated 802.11b/g WLAN transceiver, is rail-mounted and can increase the reliability and flexibility of an existing HART network. The integrated WLAN can serve as the backhaul connection, allowing the gateway to be installed in the field closer to the monitored devices.

Contemporary Controls Systems has a long history of developing products for diverse automation industries. The company's communications hardware designs include hubs, switches, routers and gateways.

Contemporary Controls' BAS Remote product line provides a convenient way to expand building automation systems in the field when using Ethernet for network communication. In addition to BACnet/IP or Modbus TCP universal I/O points, the unit can map Modbus variables

into BACnet objects. With the BAS Remote, users have a flexible building block for integrating diverse building automation protocols or expanding the number of points in a building automation system.

Secure Crossing's team of security professionals develops and implements powerful, protocol filtering tools unlike any other, to support industrial automation, critical infrastructure and remote connectivity at an affordable cost.

With the growing need for broadband and wireless access to perform remote maintenance and to access distant equipment, Secure Crossing's products are well suited for SCADA and remote location usage in power/ smart grid, freshwater/ wastewater, oil and gas, life sciences, machine builders and other remote plant-floor applications.

Andover, Mass.-based **MKS Instruments** is a global provider of instruments, subsystems and process control solutions that measure, control, power, monitor and analyze critical parameters of advanced manufacturing processes to improve process performance and productivity.

MKS Instruments' control products contain high density mixed I/O to afford the lowest possible price per point in the market. High-resolution and high-accuracy analog and digital I/O, plus dry contact relays and temperature I/O provide a flexible environment to build controllers to the specifications customers require.

The Modbus Organization Mission

The Modbus Organization, Inc. 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 Organization also provides the infrastructure to obtain and share information about the protocols, their application, and certification to simplify implementation by users resulting in reduced costs.

Modbus Newsletter

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

For more information about membership and other services, please refer to our website: www.modbus.org

Newsletter Editor:
Lenore Tracey
(lenore@modbus.org)

Colway Solutions Makes It Easy to Integrate Modbus

Colway Solutions is building its reputation by helping developers easily integrate Modbus into their applications and devices.

In the typical development project, engineers are pressed for time as they develop and test the core functionalities of their product. In addition, they may be required to build a communications infrastructure, including programming the communications protocols. Today's engineers need to save time, money, and device memory on this part of the project and concentrate on their proprietary design to achieve competitive differentiation.

As a lightweight Modbus Server Protocol stack in C source code for Modbus TCP, Colway Solutions' first product addresses this problem directly. Colway chose the eight key functions from the Modbus protocol specification and made it available as a library. Customers buy only the function codes they need —single function codes or all eight function codes bundled together. The library takes up approximately 5 kB of code space and about 512 bytes of RAM.

Deploying this source code offers a huge savings in development costs. Typical time saved is up to six or eight weeks per project.

Licensing

Customers may need to impart Modbus functionality to either a single product or multiple products in their portfolio. Colway Solutions' royalty-free licensing model supports unlimited embedded copies for either scenario.
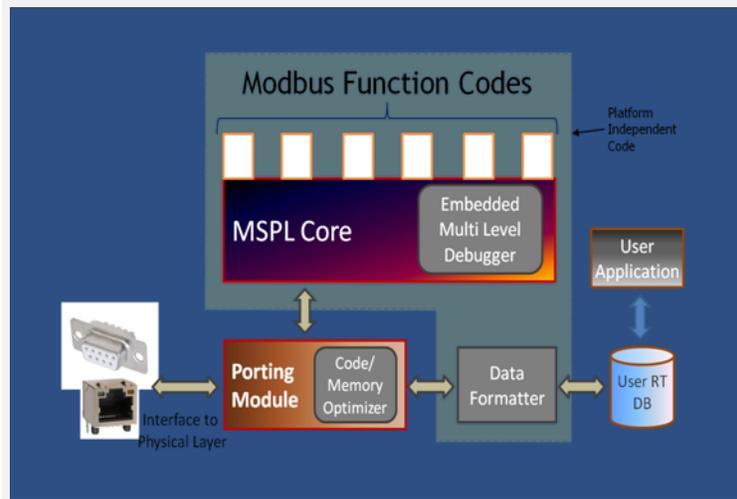
This also benefits systems integrators who may wish to deploy Modbus on specific devices for network consolidation. A single Modbus function can be deployed on a single product for $50.00.

In addition to packaging and licensing, Colway Solutions offers other ease-of-deployment features:

Free downloadable Modbus Protocol Tester. After the source code is integrated with the application and embedded in the target device, the Colway Tester is a handy tool to check compliance, verify the robustness of the communication interface, and gather and analyze data on communications performance.

Free "semi-ports". Colway Solutions has tested and characterized its source code on popular

micro-controller hardware including ARM, 8051 and Coldfire. The microcontroller-specific porting steps, such as setting variables and macros, is already done and available free to Colway customers. Colway plans to add semi-ports for additional micro-controller hardware.

Specific task-oriented on-line documentation. Engineers do not need to plough through reams of documentation. Colway's on-line documentation is readily available in an easy to understand "how-to" format for each step in the porting process.

Visit **Colway Solutions** for more information.

	Coils	Discrete Inputs	Holding Registers	Input Registers
Read	√	√	√	√
Write Single	√		√	
Write Multiple	√		√	
Customers buy only the Modbus Functions Codes they need.				

Q&A from the Modbus Discussion Forum...

Accessing a Memory Address...

Ax wrote to the forum:

I am new to Modbus and looking for some enlightenment. I have read a few good tutorials, but I still have some questions.

I am assigned to connect to a Modbus server that uses six-bit addressing and access memory 308195.

So when I am given address 308195 to access, does that mean I need to use Function Code 3 and address 8195?

Mark answered:

I would suggest reading the protocol specification.

The function code for reading an input register 3XXXXX is 4. 3 is for reading a holding register (4XXXXX).

M Griffin offered:

First I wish to clarify something important. So far as the actual Modbus protocol is concerned, there is no such thing as 4-digit addressing, 6-digit addressing, or anything else like that. All Modbus addresses are 16-bit binary numbers starting at 0 and going up to 65535.

Any other way of expressing addresses is simply some manufacturer's idea of how to write their manuals or software user interface. It has nothing to do with what actually gets sent through the wires.

One documentation convention that is sometimes used is to prefix the addresses with a numeric digit indicating the type of address. These are typically as follows: "0" = coils, "1" = discrete inputs, "3" = input registers, and "4" = holding registers (note there is no "2"). This is analogous to how IEC PLC addresses are prefixed by "I", "Q", "M", etc. There is nothing about this in the Modbus protocol specification because it isn't part of the official Modbus protocol. It's just a unofficial convention that some people use.

Another thing to note is that some manufacturers write their addresses starting at "1", while others start at "0". However, that is also a documentation issue, the actual Modbus addresses always start at "0".

I have a web page at the following URL which may provide some additional details:

http://mblogic.sourceforge.net/mbapps/ModbusBasics-en.html

Read more or add your comments to this thread.

How to assign coil address in PIC?

Iman asked the forum:

I am doing a project of controlling a relay that will control another motor using Modbus. A computer will be the client and a PIC16F877 connected using RS232 the server. The circuit is a lot similar to that of Modbus.pl by Andrei (memory max 232)

My question is how to assign Modbus address of coils to a specific port in Microchip PIC? I am using PIC16F877 with the compiler PIC C.

When I used function 05 which is to force a single coil to close or open, it will actually affect the relay. Any ideas?

Curt Wuollet suggested:

Look at how the reference code on Modbus.org works to receive a request. You will need to implement something like it to receive requests and sort out which coil needs actuation. Then you will figure out how that is done on the PIC and when the request comes in, wiggle the pin.

The Modbus Community is where it's happening:

- **Active technical discussions**
- **Knowledge aggregation**
- **Contact with other Modbus users**

Discussion supported by...

control.com®

Modbus Wireless Access to HART Instruments

This allows the user to create a "clustered" network topology, effectively creating several smaller WirelessHART networks with a wireless connection to the host system.

To maintain a secure connection, the gateway uses the 802.11i (WPA2) standard with 128-bit AES encryption to protect the WLAN data. The WLAN transceiver can also be disabled, and the host connection made via the wired Ethernet port. All programming and diagnostics can be accessed via an embedded web server. The RAD-WHG/WLAN-XD can also be programmed using a HART handheld programmer.

The WirelessHART gateway, designed and manufactured in the U.S., is uniquely positioned to allow Modbus system integrators to build both new and refurbished networks using a PLC and HART-compatible instruments. This is ideal in infrastructure projects using the funds from the American Recovery and Reinvestment Act of 2009 (ARRA).

To learn more, visit Phoenix Contact.

Assign coil address in PIC...

You will probably need to fake just enough to do what you want and ignore other requests as the whole ball of wax might be kinda large for a PIC depending which you have. And yes, it's non-trivial.

Iman replied:

Thanks for the reply. It always bugs me when I see in other forums that they only touch the memory part. They send signal from and to the PIC and read whether they are correct or not. But actually, the pins control any input that you want to capture or control any output. But little explanation is done on this part.

I guess I have just to do trial and error to assign specific address functions only to the specific pins?

Bruce Durdle's advice:

If you are writing the software for a Modbus server, you can do what you like to allocate I/O pins to internal memory bit or byte addresses.

You can also do what you like to allocate Modbus addresses to internal memory or I/O.

In my Modbus server routine, I assign an array of internal memory addresses as "holding registers," "input registers," (loaded from A/D likewise for internal bit strings and input bit strings (derived from input ports).

It is not always a good idea to allocate Modbus addresses directly to I/O addresses as some processing allows isolation. Analogue values read in from the A/D converter need to be buffered into memory anyway.

Read more or add your comments to this thread.

We're with you. The Modbus Organization is there to help suppliers and users of the Modbus protocol succeed. Our members range from Modbus device suppliers, to system integrators, end users, and educational institutions.

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

Designing with Modbus

Modbus developers rely on the Modbus Organization for valued assistance with their projects:

- Start by downloading specifications and other design documents from the modbus.org website.
- To save time, purchase the Modbus TCP Toolkit CD (FREE to general members); it contains source code and a myriad of other resources.
- If you come across technical issues that have you stumped, post your question on the modbus.org forum. One of the many experienced Modbus implementers who frequent this forum will likely have your answer.

Conformance Testing

When your project's done, how do you know it really conforms to the Modbus specification? 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.

Then submit your product for testing to the Modbus Organization for conformance testing. We'll certify your product as compliant, and post that information on the Modbus website for the world to see.

Visibility: Your Company & Your Products

Your membership in the Modbus Organization also 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, our newsletter, and through our various trade show appearances are all options that allow you to make the most of your Modbus Organization membership.

Your company will 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?

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

The Future is Yours

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

Download the Modbus Organization Membership Application to learn about the different membership levels and their associated benefits.

Modbus TCP Toolkit v3.0

The Modbus TCP Toolkit provides all the necessary pieces to develop a Modbus-compliant device, including documentation, diagnostic tools, sample source code, and pretest software to prepare for Modbus conformance certification.
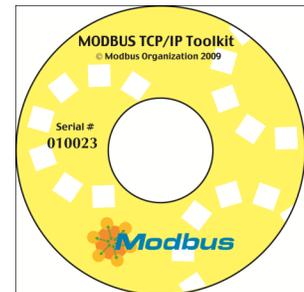
The   toolkit is available as a benefit of corporate-level membership in the Modbus Organization or can be purchased separately for US$500 plus shipping and handling. The toolkit contains the following items:

Modbus Documentation

- Modbus Application Protocol Specification, v1.1b
- Modbus Messaging on TCP Implementation Guide, v1.0b

Tools

- Modbus TCP Client & Server Diagnostic Tools

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

Modbus Conformance Testing

- Conformance Test Tool v3.0
- Conformance Test Tool v2.1

Additional Resources