

Flexible Modbus Solutions

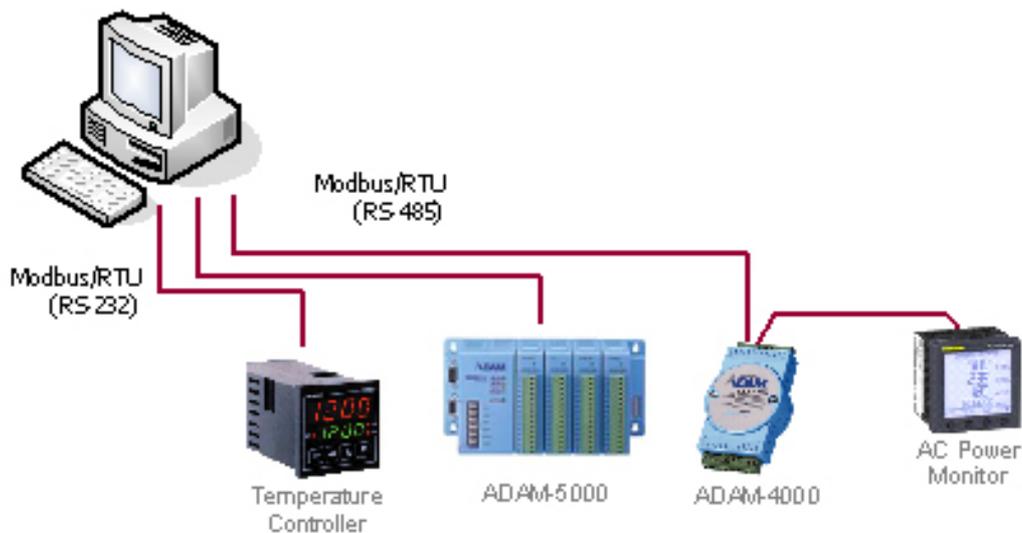
Modbus is a serial communications protocol published by Modicon in 1979 for use with its programmable logic controllers (PLC's). It has become the standard communications protocol in industry, and is now the most commonly available means of connecting industrial electronic devices.

Modbus allows for communication between many devices connected to the same network, for example a system that measures temperature and humidity and communicates the results to a computer. Modbus is often used to connect a supervisory computer with a remote terminal unit (RTU) in supervisory control and data acquisition (SCADA) systems.

In the past few years, the advent of Ethernet has made it possible to solve the distance and interface limitations of this protocol. Ethernet is a ubiquitous solution that has established itself as the principal industrial network through its combination of high data rate and shelf infrastructure. Adopting itself to this new communications method, Modbus TCP allows Modbus to communicate with many Ethernet backbone devices.

Modbus is a master-slave system used to establish master-slave/client-server communication between intelligent devices. The 'master' is typically a PLC, PC, DCS (Distributed Control System) or RTU (Remote Terminal Unit). The 'slaves' are often field devices, intelligent devices and sensors and instruments which connect to the network in a multi-drop configuration. When a Modbus RTU master wants information from a device, the master sends a message that contains the device's address, information on the requested data, and a checksum for error detection. Every other device on the network sees the message, but only the device that is addressed responds. Slave devices on a Modbus network cannot initiate communication.

One of the easiest ways to bring fields devices into a process control system is to simply connect it to a distributed I/O system that has Modbus communication capability. For example, Advantech's ADAM-4000 series allows users to connect analog and digital signals remotely, which can be connected to a Modbus master via twisted pair cable.



There are three common Modbus version used today:

- Modbus/RTU
- Modbus/ASCII
- Modbus/TCP

All Modbus messages are sent in the same format. The only difference among the three Modbus types is in how the messages are coded.

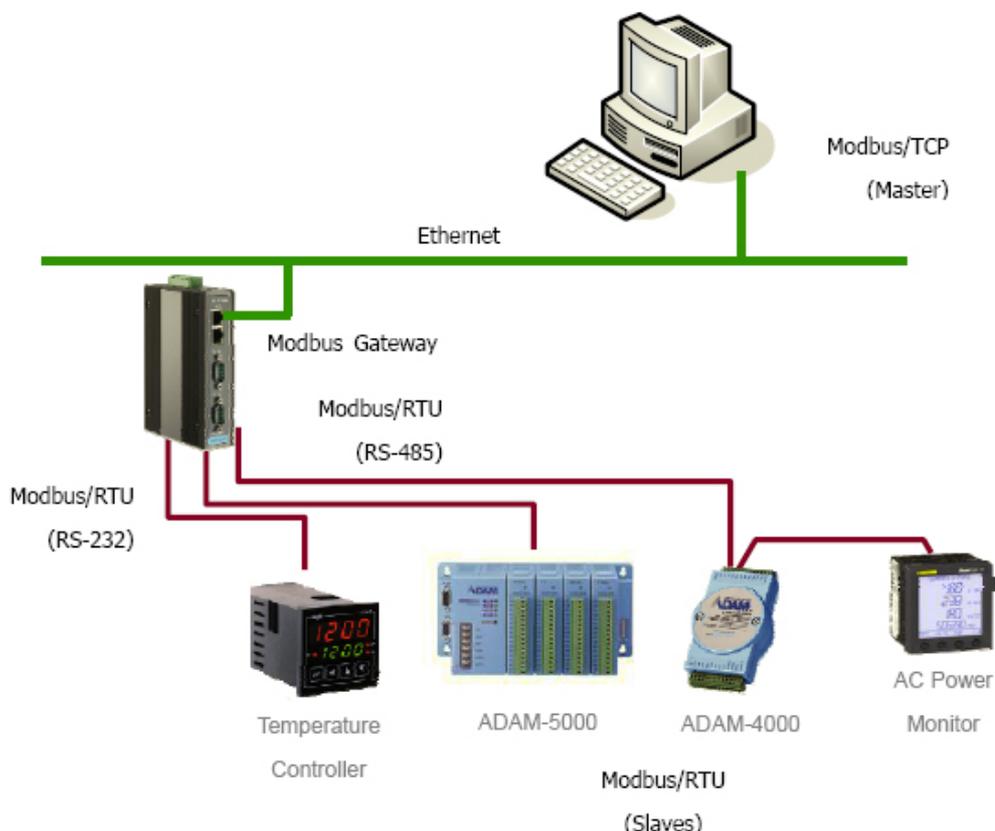
In Modbus/ASCII, all messages are coded in hexadecimal, using 4-bit ASCII characters. In Modbus RTU, data is encoded in binary, and requires only one communication bytes per data byte. This is ideal for use over RS-232 or multi-drop RS-485 networks, at speeds from 1200 to 115K baud. The most common speeds are 9600 and 19200 baud. Modbus/RTU is the most popular used between these common Modbus protocol.

Modbus/TCP is often referred to as Modbus over Ethernet. TCP/IP is the common Internet protocol, providing a reliable data transport mechanism between machines. Ethernet is the standard of corporate enterprise systems and has also become the standard for factory networking. Instead of using device addresses to communicate with slave devices, IP addresses are used. For the most part, Modbus/CP is simply Modbus packets encapsulated in standard TCP/IP packets.

Most PLC vendors have adopted their own proprietary protocol over Ethernet, but almost all of them support Modbus/TCP. Another advantage of Modbus/TCP is ability to support multiple masters. Modbus/TCP will allow multiple masters to poll the same slave device simultaneously. It's much more flexible than Modbus/RTU and Modbus/ASCII.

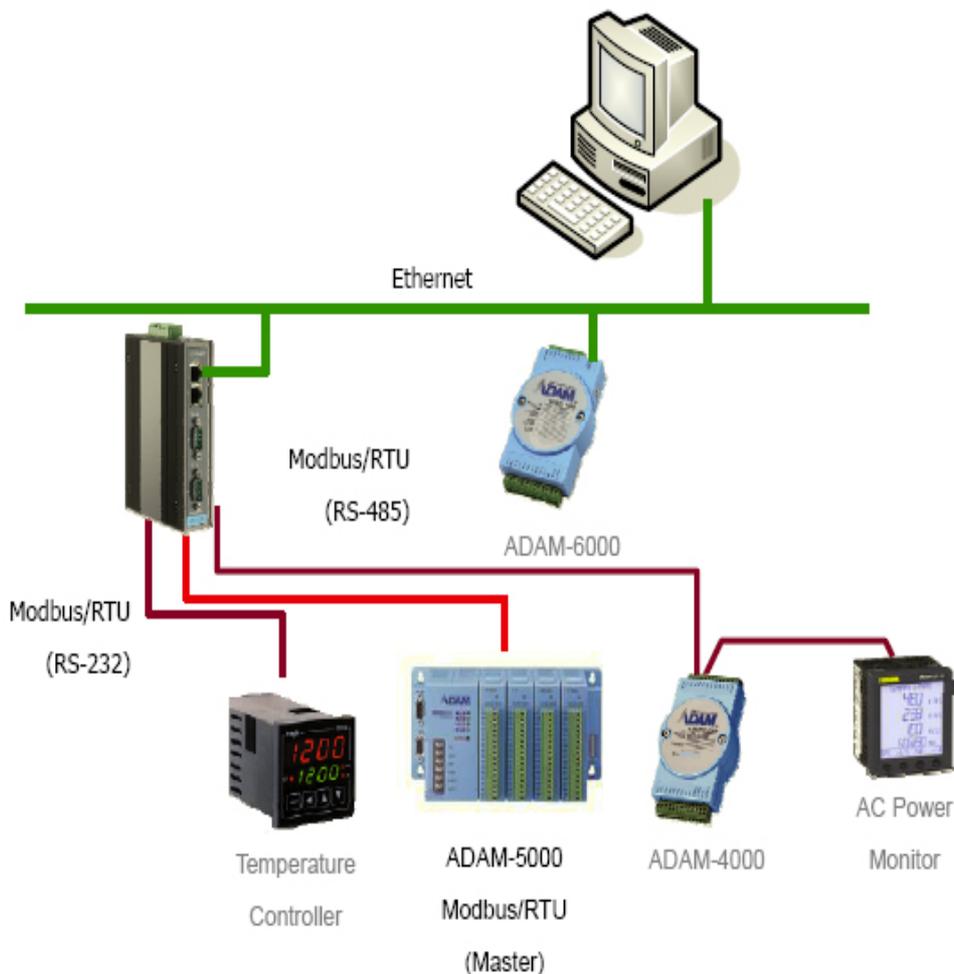
Connecting Modbus Devices

Intelligent field devices, control systems, and PLC's have Modbus communication capability, and can act as slaves or masters. These devices will be networked via Ethernet and located around the factory or plant. Most of the time, a PLC will act as a Modbus/TCP master, so it can have access to (and control) the hundreds of Modbus/RTU or Modbus/ASCII devices on the network. Advantech's ADAM-4572 for example, translates Modbus/TCP requests to Modbus slaves and relies on the responses from the Modbus/TCP master transparently.

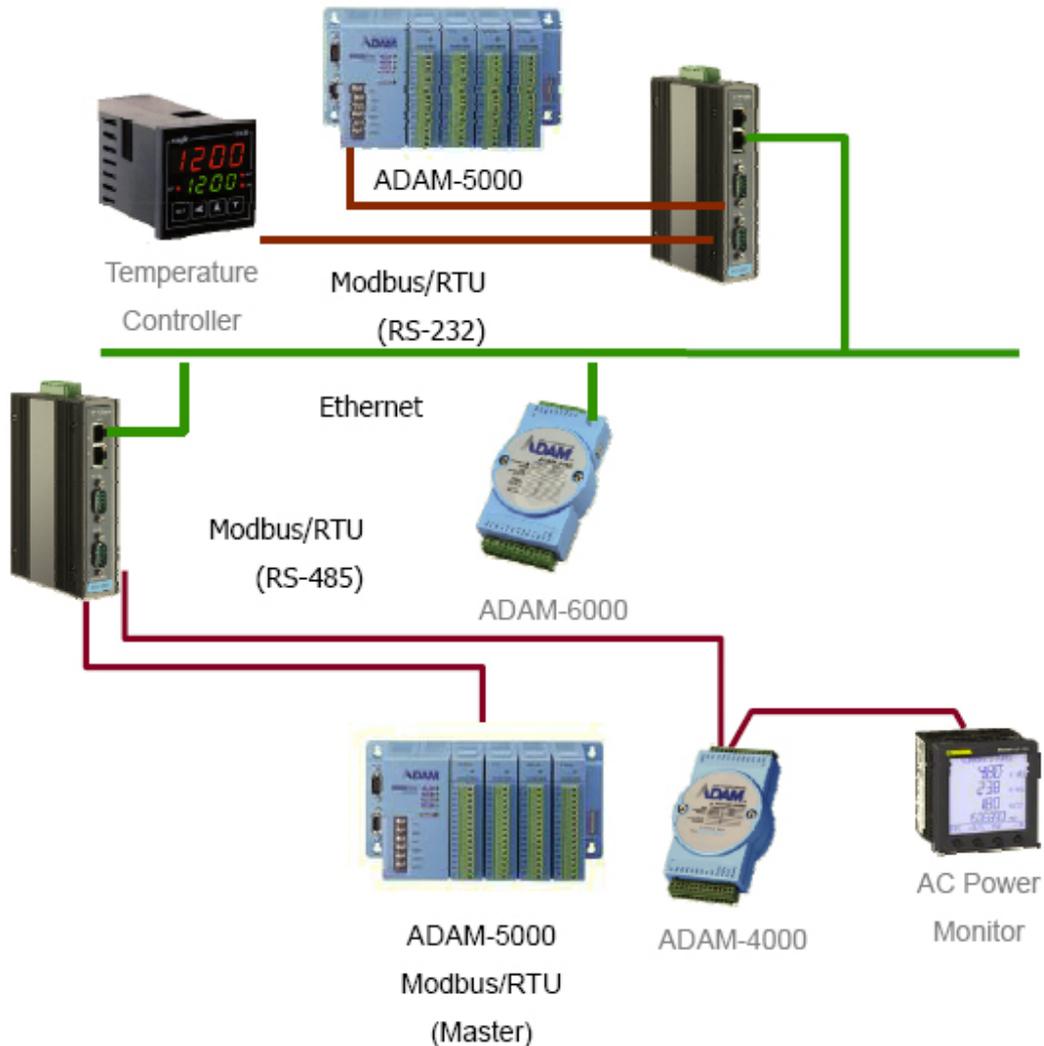


In most factories, a highly reliable control and monitoring system is one of the most important elements. Advantech's EKI-1221, EKI-1222 and EKI-1224 (EKI-1220 series) not only have all features of the ADAM-4572, but also support dual Ethernet port connection and Multi-access functionality. Dual Ethernet ports allow the EKI-1220 series to establish two separate physical Ethernet connections so that if one of the connections is broken, the Modbus gateway will switch to the other connection automatically. This idea of 'redundancy' within a network can guarantee that devices will always be connected and that information will never be lost.

In some cases, existing plants may have a Modbus/RTU master. The challenge in these systems is that the Modbus/RTU master not only accesses the Modbus/Slave, but also collects the Modbus/TCP slave data. Again here, Advantech's EKI-1220 series provides an inexpensive and convenient way to support Modbus to Modbus/TCP translation. In this way the Modbus/RTU master can deal with the Modbus/TCP slaves without any significant changes to the network architecture.



Another challenge for existing plants is the possibility of having hundreds of field devices installed around the factory connected by twisted cables. This typical setup is very difficult to expand and maintain. While it is possible to acquire the benefits of Ethernet and integrate these devices, this is rarely done due to its difficulty and cost. Here too, Advantech's EKI-1220 series provides an excellent way to fully integrate all Modbus devices over the Ethernet network.



Although Modbus is one of the oldest communication protocols, it is still the most popular, easy to use, reliable, and inexpensive communication protocol. However, Modbus/TCP has become ubiquitous due to its openness, simplicity, low-cost, and minimum hardware required to support it. Integrating hundreds and thousand of field devices and control systems in a modern factory is one of the most difficult changes a company can face, and yet Advantech's EKI-1220 series now provides an easy solution with redundant network capability and multi-access capacity.