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NEWPORT introduces the world's first Controllers, Panel Meters, and Signal Conditioners with an Embedded Web Server!

Internet-Ready Controllers

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Control technology in the processing industries is an important element in the advancement toward plant-wide process monitoring, control, and automation. Taking advantage of Internet technology, web-enabled controllers allow process monitoring and control through a web browser from anywhere on the Internet.

Imagine being able to check the status of all plant processing equipment merely by surfing the web, or being able to integrate controls on a piece of equipment as easily as the plug-and-play components of a computer. A step in that direction is the use of a series of controllers, panel meters, transmitters and signal conditioners having an embedded Web server, which allows direct connection to an Ethernet network without requiring a PC server. The direct connection eliminates a level of system complexity and cost, and alternatively offers system monitoring and process control through a standard web browser from anywhere within a facility or from anywhere in the world. The iSeries Internet devices (Newport Electronics Inc.) connect directly to an Ethernet LAN (local area network) using a standard RJ-45 connector and can send and receive data in standard TCP/IP protocol, a standard for exchanging data over the Internet. The devices can serve as web pages, can have a specific name, such as "Oven1" or "Carb1," etc., and can have an IP address that makes it accessible to authorized personnel from virtually any Internet ready device.

Fig 1 *NEWPORT iSeries controllers, signal conditioners, and panel meters*

Extensive remote capabilities are possible for process monitoring and troubleshooting. For example, temperature controllers can monitor and/or control a heating system, set points and alarm points can be modified, and heating systems can be turned on and off from anywhere on the local network or from anywhere on the Internet. Other tasks also are possible. Many manufacturing facilities already are equipped with similar system capabilities. However, the difference is that the iSeries Internet devices connect directly to the Ethernet network, and are not slave devices connected to the serial port of a master computer.

Network configurations

A data communication protocol defines the rules and structure of messages used by all devices on the network for data exchange. For serial communication, a typical transaction consists of a request from the master server (PC) followed by response from one or more slave devices. Either a single (point-to-point RS 232) or multidrop network (multipoint RS 485) is possible. Table 1 compares RS 232 and RS 485 communication interfaces.

The type of network configuration used is based on the operating requirements of a particular facility. Today, many plants operate using a desktop PC connected to an Ethernet hub using conventional RS 485 serial communications (figure 1). An alternative configuration (figure 2) allows direct connection of the panel meter or controller to the Ethernet device via a 10Base-T RJ-45 connector, which allows the 1/8 DIN and 1/16 DIN instruments to function as stand-alone web servers having unique addresses if preferred. A server also can be integrated into the system, which allows use of 1/32 DIN instruments and connection of up to 32 devices (Figure 3).

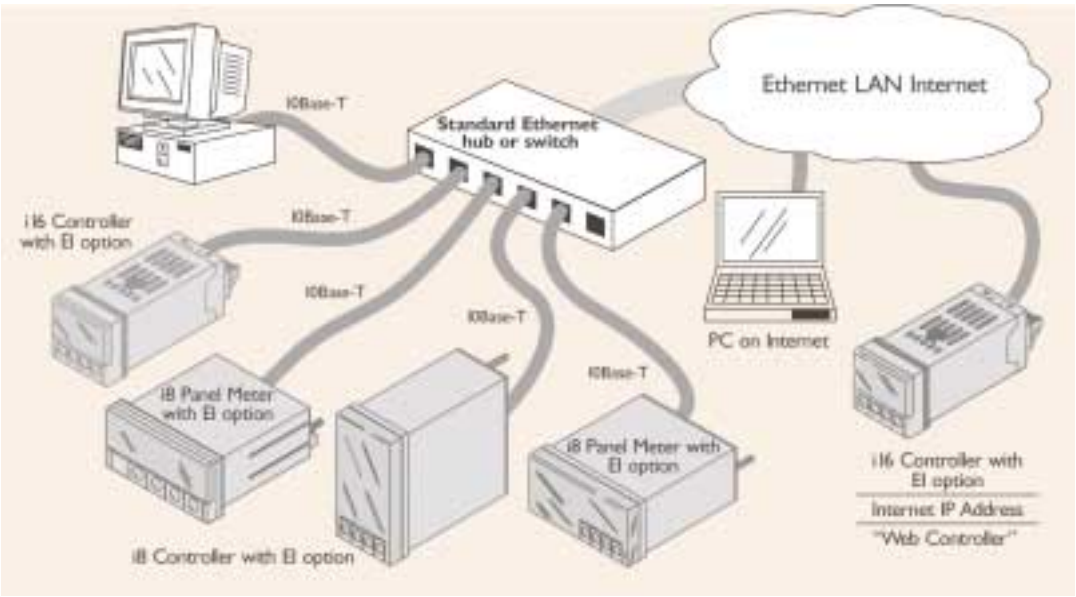

Fig 2 *Direct connection to Ethernet LAN or Internet*

Software

The only requirement to view data and supervise the controller is a web browser. Special software is not required, but conventional data-acquisition and control programs, industrial automation software from a variety of vendors, as well as Visual Basic and Excel (Microsoft) can be used. The serial version of the devices allows selection from a menu of the type of communication interface wanted; choices are RS 232, RS 422, RS 485 and MODBUS serial communication.

Communication protocol and address basics

For network communication, an Ethernet LAN allows communication or surfing through the computers and devices connected directly to the LAN. The Ethernet server can be connected to the network using standard TCP/IP protocols, which enable the use of the standard web browser software for viewing. Each active device connected to the TCP/IP must have a unique IP address, which is used to build a connection to the Ethernet server. In addition, each computer using TCP/IP should have a unique 32-bit address. It is divided into two portions: the network ID and a host ID. For instance, each computer on the same network uses the same network ID, and they all have a different host ID at the same time. An IP address and a port number define each TCP connection. The port number is an internal address that provides an interface between an application running on your computer and network through the TCP/IP protocol software. Essentially, this is the address or the phone number where the particular device can be reached. These are superimposed on a local Ethernet network until, if preferred, a connection is made to the Internet. A media access control (MAC) address is a computer's unique hardware number. When connected to the Internet from a computer, a correspondence table relates the IP address to the computer's MAC (physical) address on the LAN. A facility can begin with internal communication through the Ethernet LAN and later expand to allow password-protected access to the system.

Table 1 Comparison of RS 232 and RS 485 communication interfaces

Data-transmission characteristics	RS232	RS485
Capability	Point-to-point	Multipoint
Transmission mode	Single ended	Differential
Electrical connection	Three wire	Two wire
Drivers per line	1	32
Recievers per line	1	32
Maximum data rate, bits/sec	20 k	10 M
Maximum cable length, ft (m)	50 (15)	4000 (1200)

Applications

Many current uses of the devices involve their integration into high-tech proprietary applications, such as the manufacture of fiber optic cable and computer monitors. Applications also exist for monitoring plant process conditions. For example, Newport integrated the iSeries controllers in a retrofit of its burn-in ovens. In the company's manufacturing process, all products are subjected to a 24-hour burn-in period, during which the devices are switched on and off and cycled between ambient temperature and

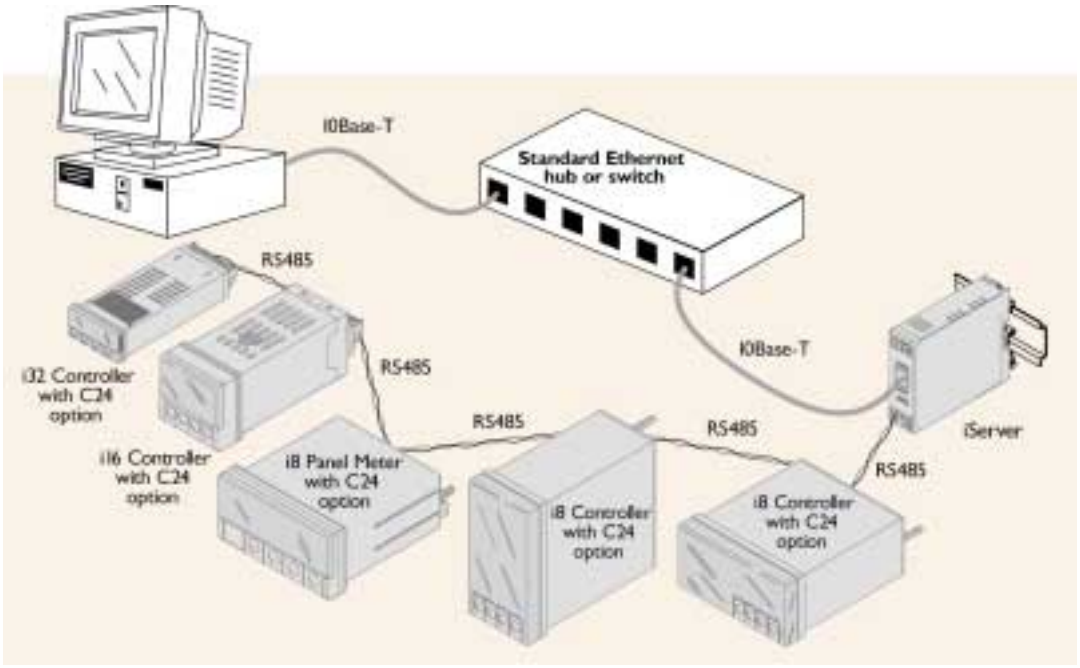

Fig 3 *Integration of server controller hub for up to 32 devices*

70C (160F) after assembly and prior to testing and calibration (figure 4). The burn-in process stresses the analog components in the meters and controllers, and screens out units that later might fail prematurely in the field.

Previously, the ovens were controlled locally using traditional temperature controllers. After installing the embedded Internet controllers, the responsible test engineer or technician can supervise control of the ovens from anywhere on the Ethernet LAN, from home or anywhere else on the Internet. The system also is capable of sending an alarm via e-mail message, pager or Internet-equipped mobile phone. The alarm notification capability ensures that the person who needs to be aware of the problem is notified immediately, regardless of their current location or situation.

In another application, the Internet-ready devices provide Omega Engineering's (Bridgeport, NJ) manufacturing engineering team with the capability to monitor and control the company's heat-treating processes and the calibration testing of products from remote locations and during the evening shift. Omega manufacturers process measurement and control devices, including industrial temperature sensors such as thermocouples, infrared pyrometers and related components, together with the machined elements used in the company's pressure transducers and load cells. Industrial batch, strand, calibration and other furnaces are used in the manufacture of these products. Omega makes its own mineral-insulated thermocouple wire, the critical component used in the manufacturing of industrial thermocouple and RTD sensors. Wire heat treatment is a critical process to achieve the necessary sensor accuracy and other characteristics. The capability of close monitoring and control of the heat-treating process allows the company to manufacture high-accuracy (SLE, or special limits of error) thermocouples. Similar heat-treating monitoring and process control capability allows very close control of residual stresses in components used in pressure transducers and load cells-critical for product accuracy, repeatability and reliability. In some instances, specific or extensive calibration data on a sensor or other product is required. Typically, calibration data on temperature sensors require several hours of testing in a furnace at various temperatures. In these cases, the iSeries controllers provide the opportunity to set up the sensor and have the testing run into evening hours while the results can be monitored and controlled offsite.

Fig 4 *Ovens used to thermally cycle termperature controllers as part of quality assurance testing can be monitored and controlled from anywhere on an Ethernet LAN, from an offsite location, or anywhere else on the Internet.*

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