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Find the *National Instruments FP-2000* at our website: *Click HERE*

LabVIEW Real-Time Controller Interfaces with Ethernet

NI FP-2015, NI FP-2010, NI FP-2000

Controller Overview
- Real-time LabVIEW embedded controllers for intelligent industrial I/O
- Operates as stand-alone embedded real-time controller or PC-based distributed I/O Ethernet interface
- Industrial-grade reliability
  - Automatic self-diagnostics
  - Redundant power supply inputs
  - Isolated communication bus to I/O modules
- RS-232 serial port for local device control

Operating Systems
- Windows 2000/NT/XP/Me/9x
- Real-time performance with LabVIEW

Recommended Software
- LabVIEW
- LabVIEW Real-Time Module
- LabVIEW Datalogging and Supervisory Control Module

Other Compatible Software
- LabWindows/CVI
- Measurement Studio
- Lookout
- VI Logger

Driver Software (included)
- Measurement & Automation Explorer
- OPC server (2.0 compliant)



Module	DRAM Memory	Nonvolatile Storage	Ethernet Ports	Serial Ports
FP-2015	32 MB	512 MB	1	1
FP-2010	32 MB	64 MB	1	1
FP-2000	16 MB	32 MB	1	1

Overview and Applications

FieldPoint is a small, modular I/O architecture with built-in signal conditioning and isolation for direct connection to industrial sensors such as analog voltage, 4 to 20 mA current, thermocouple, RTD, pressure, strain, flow, pulse-width modulation (PWM), and 24 V digital I/O. With the National Instruments FP-2015, FP-2010, and FP-2000 controller interfaces, you can develop powerful control, data logging, and signal processing applications using LabVIEW Real-Time and reliably run the program on the embedded controller. Engineers and scientists use the NI-FP-20xx controllers in intelligent distributed applications requiring industrial-grade reliability, such as process and discrete control systems, to open and close valves, run control loops, log data, perform real-time simulation and analysis, and communicate over serial, phone, and Ethernet.

System Configurations

A single FP-20xx controller interface manages a node of up to nine FieldPoint bases and accompanying I/O modules. A node consists of a FieldPoint controller and any mix of analog and digital I/O modules. The controller module and terminal bases snap together and mount as a unit on a DIN rail. The controller module and terminal bases form a high-speed data bus for communication between the controller module and the I/O modules. With modular terminal bases, it is easy to expand your FieldPoint system to meet changing application needs.

For more details on configuring a FieldPoint system, see page 532.

Highly Productive Software

When your application requires powerful functionality and rapid development, the key is flexible software that integrates seamlessly with hardware. LabVIEW is an industry-standard graphical development environment that provides all the tools necessary to create advanced and full-featured measurement and control applications. LabVIEW makes it easy to construct simple or complex applications using an extensive palette of functions and tools – from simple analog PID process control loops to high-channel-count hybrid control systems that combine both analog and digital components.

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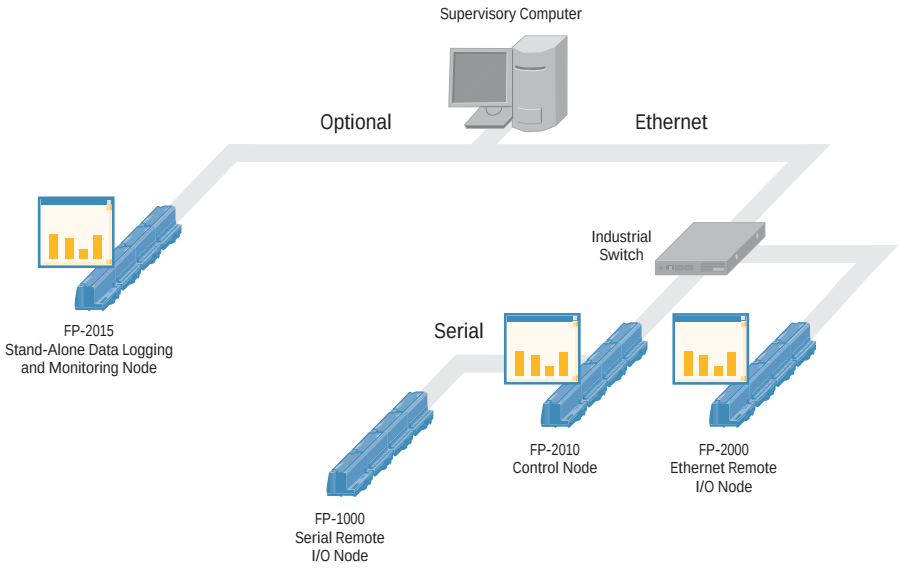


Figure 1. With LabVIEW Real-Time, you can build stand-alone or networked measurement and control systems. Through I/O expansion, you can also control an FP-1000 or FP1601 module from the embedded program.

Embedded Control Made Easy

LabVIEW Real-Time enables you to perform digital and analog control with FieldPoint. With LabVIEW Real-Time embedded and running on an FP-20xx controller, you can perform simple digital control with Boolean logic, as well as more advanced analog control, such as PID and fuzzy logic. The PID Control Toolset for LabVIEW has drop-down blocks for basic and advanced PID, feed forward, and fuzzy control. You can also use it for linear and nonlinear testing, modeling, and simulation. When developing a control system, you can take advantage of LabVIEW to implement basic control or easily incorporate advanced control techniques such as disturbance decoupling, gain scheduling, and fuzzy logic control. For beginner users, powerful tools such as Autotuning PID make life easier and more productive. For embedded systems, you can effortlessly deploy your LabVIEW application on the real-time FieldPoint hardware target.

Reliable Embedded Operation

Using the FP-20xx industrial controllers powered by LabVIEW Real-Time, you can create flexible control and measurement systems to meet your unique application requirements. Because these controllers contain an onboard processor and up to 512 MB of nonvolatile storage, you can perform embedded monitoring, logging, and machine control. Using LabVIEW Real-Time you can download your application onto the controller and run the application disconnected from the host PC. FieldPoint I/O banks include a number of features for industrial operation, including 2,300 V transient overvoltage protection where dangerous voltage levels are present, a wide temperature range for operation in hostile environments, backup power supply connections to protect against primary power failure, and hot-swappable modules to simplify maintenance and minimize downtime.

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Web-Enabled

With remote panels, you can use a Web browser to connect to the front panel user interface for your LabVIEW application. Several Web browser clients can simultaneously view the front panel, while a single browser can both view and control the application. FP-20xx real-time controllers feature an embedded Web server that handles up to 20 simultaneous remote panel connections. The FP-20xx controllers also offer static Web pages to display system information and automatically run an FTP server to make it easy to update the embedded control program or to share logged data.

Embedded Intelligent Data Logging

FP-20xx controllers all feature built-in nonvolatile memory for data logging, and with the FP-2015 you benefit from 512 MB of onboard flash memory. You can store the data in any DOS-compatible format, including CSV and XML. Once the data is stored, you can easily transfer it to a PC using the embedded FTP server on the FP-20xx. LabVIEW Real-Time expands the functionality beyond the typical data logger because you can make additional calculations and decisions to eliminate logging unneeded data and to perform onboard real-time processing and control. FieldPoint combines data logging, data reduction, control algorithms, HMI, and the ability to communicate with other nodes on the network.

Communication

FP-20xx controllers connect directly to Ethernet and auto negotiate on the network for 10 Mb/s or 100 Mb/s communication rates. The Ethernet port serves as a high-speed link for downloading application code, performing run-time debugging and probing, and transmitting control and indicator values to a graphical user interface (GUI) running on a networked PC. You can also use the Ethernet port for programmatic network communication using protocols such as TCP, UDP, FTP, HTTP, and DataSocket.

Once deployed, the controllers can communicate peer to peer with other [c]FP-20xx intelligent FieldPoint controllers or with passive network interfaces such as the FP-1601 and FP-1000. In addition, FP-20xx controllers can communicate with a Windows computer running LabVIEW, Measurement Studio, Lookout, or your choice of National Instruments or third-party OLE for process control (OPC) client application software. Using industry-standard OPC technology, the FieldPoint controller automatically communicates with the FieldPoint OPC server over the network to read and write I/O remotely without programming. This feature makes it easy to communicate with FieldPoint using any OPC-enabled HMI/SCADA supervisory control software and to add FieldPoint to installations with existing hardware.

Decrease Network Traffic with Event-Driven Ethernet Communication

Using an event-driven communication protocol, the FP-20xx transmits data over Ethernet only when data values change. This eliminates unnecessary network traffic, resulting in more efficient communication. The data values can consist of individual I/O module channels or user-defined variables in the embedded LabVIEW program.

Serial Connectivity

FP-20xx controllers also include an RS-232 serial port to programmatically communicate with other serial devices such as remote FieldPoint banks, LCD display/keypad units, bar code readers, or phone and radio modems.

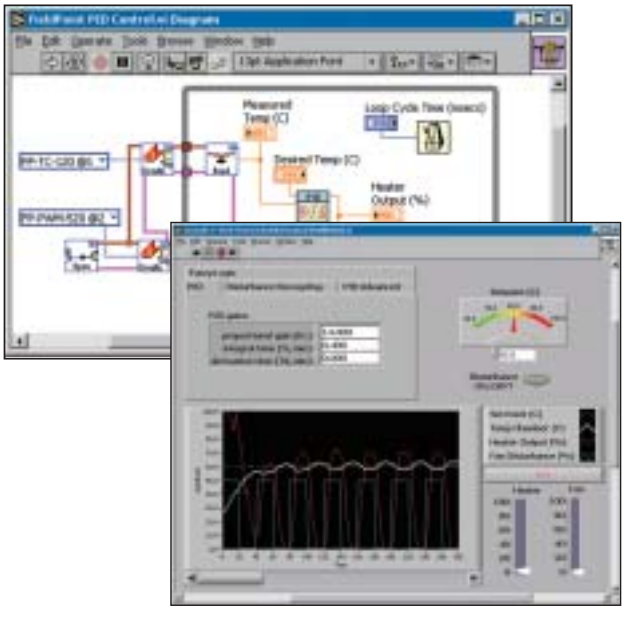


Figure 2. The FP-20xx modules can run your LabVIEW program embedded, for higher reliability and stand-alone operation.

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LabVIEW Real-Time Controller Interfaces with Ethernet

Security

With the advanced security features enabled, only authorized clients can access the FieldPoint system. Authorized clients are Ethernet nodes with IP addresses that match user-defined patterns. You can also further qualify the list of clients by their access rights – none, read only, and read/write (with access to configuration). Initially, the network module grants all clients full access. The user then can select an IP pattern that corresponds to the required list of clients. In addition, you can set a password that any user can enter for full access rights to the FieldPoint System.

Power Supply Backup and Regulation

An 11 to 30 VDC supply powers the FP-20xx. An extra set of screw terminals is available on the network controllers for a backup UPS or battery. The controllers filter and regulate the power input, redistributing power to all the I/O modules in the node over the backplane bus in the terminal bases.

For external power supply options, see FieldPoint Accessories on page 550.

Easy Configuration Software

National Instruments Measurement & Automation Explorer (MAX) configuration software, included with your FieldPoint hardware, simplifies the use and integration of FieldPoint systems. With MAX, you configure the entire system, including network parameters, module and I/O settings, and named-channel items. MAX will search your Ethernet network and return configuration settings on all your FieldPoint nodes. MAX will also automatically detect the I/O modules on each bank, and you can easily configure I/O parameters, such as input ranges, power-up output states, and watchdog states, using intuitive dialog windows. To get your system up and running quickly, from MAX you can also interactively test I/O modules and channels, viewing input data values and setting output values without writing any software code.

In addition to configuring hardware parameters, MAX also configures and manages named-channel items used in your higher-level programming software. From your application software package, such as LabVIEW, LabWindows/CVI, Measurement Studio, or Lookout, you simply address a named-channel item to access the I/O values.

For more details on configuring a FieldPoint system, see page 532.

Ordering Information

NI FP-2015 777517-2015
NI FP-2010 777792-21
NI FP-2000 777792-20

Recommended Products to build a FieldPoint System

NI FP-TB-1 777519-01
NI PS-4 Power Supply 778586-90
NI Developer Suite Professional Control Edition.....777906-03

BUY ONLINE!

Visit ni.com/info and enter fp2015, fp2010, and/or fp2000.

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LabVIEW Real-Time Controller Interfaces with Ethernet

Specifications

Network

Network interface	10BaseT and 100BaseTX Ethernet
Compatibility	IEEE 802.3
Communication rates	10 Mb/s, 100 Mb/s, autonegotiated
Maximum cabling distance	100 m/segment
Maximum power supplied to terminal bases	9 W
Maximum number of banks	Determined by network topology

Memory

FP-2000	32 MB nonvolatile 16 MB DRAM
FP-2010	64 MB nonvolatile 32 MB DRAM
FP-2015	512 MB nonvolatile 32 MB DRAM

For information about the memory used by the LabVIEW Real-Time module and the operating system, go to ***ni.com/info*** and enter **rdfpec.**

Power Requirements

Power supply range	11-30 VDC
Recommended power supply	
FP-20xx with up to 5 modules	15 W (FP-PS-4 or equivalent)
FP-20xx with 6 to 9 modules	20 W
Power consumption	4.5 W + 1.1(I/O module power requirements)

Physical Characteristics

LED indicators	
POWER (green)	Indicates valid power to module
STATUS (red)	Indicates failure condition
LINK (green)	Indicates valid network connection
ACTIVE (green)	Indicates Ethernet activity
100 Mb/s (yellow)	Ethernet speed (10 Mb/s if unlit)
User-defined	3 bicolor, 1 green
DIP switches	5 user-defined, 3 predefined
Serial port	RS-232, DTE
Screw-terminal wiring	16–26 AWG copper conductor wire with 7 mm (0.28 in.) of insulation stripped from the end
Torque for screw terminals	0.5-0.6 N m (4.4-5.3 lb in.)
Weight	278 g (9.8 oz)

Environmental

FieldPoint modules are intended for indoor use only. For outdoor use, they must be installed in a suitable sealed enclosure.

Operating temperature	-25 to 55 °C
Storage temperature	-55 to 85 °C
Relative humidity	10 to 90% , noncondensing
Maximum altitude	2,000 m
Pollution Degree	2

Safety

The FP-20xx is designed to meet the requirements of the following standards for safety and electrical equipment for measurement, control, and laboratory use:

- EN 61010-1, IEC 61010-1
- UL 3121-1, UL 61010C-1
- CAN/CSA C22.2 No. 1010.1

For UL and other safety certifications, refer to the product label or to ***ni.com***

Electromagnetic Compatibility

CE, C-Tick and FCC Part 15 (Class A) Compliant

Emissions	EN 55011 Class A at 10 m FCC Part 15A above 1 GHz
Immunity	EN 61326: 1997+A2: 2001, Table 1

For EMC compliance, operate this device with shielded cabling.

CE Compliance

This product meets the essential requirements of applicable European Directives, as amended for CE Marking, as follows:

Low-Voltage Directive (safety)	73/23/EEC
Electromagnetic Compatibility Directive (EMC)	89/336/EEC

Refer to the Declaration of Conformity (DoC) for this product for any additional regulatory compliance information. To obtain the DoC for this product, visit ***ni.com/hardref.nsf/*** and search by model number or product line.

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