**Overview**

The H1 Fieldbus Device Round Card is a hardware interface for developing FOUNDATION Fieldbus-compliant devices. The round card contains all electronics necessary for interfacing to the fieldbus. The round card fieldbus interface operates at H1 speed (31.25 kb/s) using a Motorola 68331 microprocessor and Fuji Electric FRONTIER-1 fieldbus interface chip. The round card is bus-powered and certified for intrinsically safe (IS) operation. Interfacing to the device measurement electronics is accomplished by means of a daughter-card adapter, either purchased from National Instruments or designed by the device developer. The round card executes Fieldbus Foundation-conformant communications stack software developed by National Instruments. Additional software available for development and execution on the round card includes the NI-FBUS Function Block Shell, and HART and serial interface software for implementing serial software protocols.

**H1 Fieldbus Round Card Hardware**

The H1 Fieldbus Device Round Card contains the hardware and firmware required to interface a field device to an H1 FOUNDATION Fieldbus network. The card is 2.44 in. in diameter. The round card uses a Motorola 68331 microprocessor to execute the FOUNDATION Fieldbus communications stack. The fieldbus interface chip is a Fuji Electric FRONTIER-1 with integrated MAU. The round card is available with two memory configurations – 128 KB x 16 SRAM and 128K x 16 KB Flash memory for development applications, 64 KB x 16 SRAM and 128K x 16 KB Flash memory for OEM applications. The round card is powered from the H1 fieldbus. The round card physical layer is certified for intrinsically safe (IS) operation (per EEX IA 2C – T6 specification).

**Device Electronics Interface**

The round card interfaces to measurement electronics by means of a daughter-card adapter. Daughter-card adapters are available from National Instruments for common electronics interfaces, including 0-5 V and 4-20 mA signals. The daughter-card interface is fully documented, so that device developers can design custom adapters to their device electronics. The daughter-card interface includes synchronous and asynchronous serial and parallel I/O connections to the round card. The daughter-card interface includes a +5 VDC, 4 mA, power supply for the daughter-card and device electronics.

**Communication Stack Software**

The H1 Fieldbus round card executes the communications stack software implemented by National Instruments specifically for FOUNDATION Fieldbus. The National Instruments FOUNDATION Fieldbus H1 communications stack is fully conformant to the FOUNDATION Fieldbus specifications, having passed requirements of the Fieldbus Foundation Conformance Tester. The communications stack requires a real-time operating environment to ensure the deterministic and reliable operation of the fieldbus network. The round card provides this real-time environment. The round card is capable of acting as either a Link Master or Basic Device.

**NI-FBUS Function Block Shell Software**

NI-FBUS Function Block Shell software provides a high-level interface
FOUNDATION Fieldbus
Device Development Tools

for developing the blocks required in a FOUNDATION Fieldbus device. With the NI-SHELL Function Block Shell, a device developer can implement a FOUNDATION Fieldbus device without in-depth communications expertise. The Function Block Shell performs the following functions.

Maintains the Object Dictionary (OD) and Handles GetOD Requests - The Object Dictionary (OD) is a directory of available data objects within a FOUNDATION Fieldbus device. The Function Block Shell automatically maintains the OD and responds to GetOD requests, in which the host of a system reads the OD from the device.

Performs Connection Management - Communication on the FOUNDATION Fieldbus network requires certain connections to be established with the objects within a device. The Function Block Shell automatically handles these connections when requested by the host in the system.

Invokes Function Block Algorithms - Function Blocks are the basic unit of control functionality available in a FOUNDATION Fieldbus device. Function block algorithms are standard control functions such as Analog Input, Analog Output, and PID control. The developer of a device must implement the function block algorithm(s) for the device. On a FOUNDATION Fieldbus network, the host system configures the rate at which function block algorithms execute within a device. The Function Block Shell automatically executes the function blocks in the device based upon the execution schedule of the system.

Handles Communication of Alarm Processing - FOUNDATION Fieldbus specifies a mechanism for reporting alarms. The communication portion of alarm handling is performed by the Function Block Shell.

Manages TREND Objects - FOUNDATION Fieldbus devices have the ability to store trend information on any of their function block parameters. The Function Block Shell automatically handles the trending of any function block parameter.

Implements Find Tag Service - Parameters in a FOUNDATION Fieldbus device can be addressed by logical tagname, for example, "T1-101.PV." The Function Block Shell automatically handles the Find Tag service so that a host can find a tag in a device.

Integrates Device Description (DD) Information into OD - The OD must contain references to the content of the DD for a device. A utility supplied with the Device Development Kit automatically inserts these references into the OD, based on the DD for the device.

HART and Serial Interface Software
The round card can be used to add fieldbus capabilities to an existing serial device, such as one using HART (Highway-Addressable Remote Transducer) or proprietary ASCII protocols. Available software simplifies the interfacing to such serial devices. The HART software interface implements all HART Universal and Common Practice commands, and provides a mechanism for implementing user-defined HART commands. The serial software interface provides basic read/write services for communicating to an attached field device by user-defined serial protocols.

Development Systems
Development of software for execution on the H1 Fieldbus Device Round Card requires a set of software utilities. These utilities include a Windows-based application for processing of device specification files and downloading of code to the flash memory on the round card. To get started with device development, we recommend that you purchase the Fieldbus Device Starter Kit. This kit contains all the tools required for device development, including round cards, PC interfaces, configuration and monitor software, power supply and cabling, communications stack and NI-FBUS Function Block Shell software, and development utilities. See the Fieldbus Device Starter Kit product information page for more details.

The Fieldbus Device Development Kit includes a round card, communications stack and NI-FBUS Function Block Shell Software, and development utilities. This kit is appropriate for purchase by developers who have separately purchased PC-based interfacing hardware and software.

NOTE: If you purchase a H1 Fieldbus Device Round Card, you do not receive any communications or development software. You must purchase either a Device Development Kit or Device Starter Kit to receive all of the necessary software for device development using the round card.

OEM Applications
The H1 Fieldbus Device Round Card is available in a memory configuration designed for OEM (nondevelopment) applications. OEM applications require separate licensing of the H1 FOUNDATION Fieldbus communications stack and NI-FBUS Function Block Shell software. Several options are available for licensing, including object and source code licenses. Please contact National Instruments for more information about OEM Round Card applications.
The Fieldbus Benchtop Power Supply kit is designed for benchtop applications of FOUNDATION Fieldbus. Typical applications include engineering labs for device development and instrumentation maintenance facilities. The power supply includes a terminal block with attached wiring for two FBUS interface boards (AT or PCMCIA) and two round cards. The terminal block has an integral fieldbus power supply and termination.

### Specifications

<table>
<thead>
<tr>
<th>Physical</th>
<th>2.44 in. diameter; 0.6 in. thickness max</th>
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<tbody>
<tr>
<td>Processor</td>
<td>Motorola 68331 (4/8 MHz clock)</td>
</tr>
<tr>
<td>Fieldbus interface</td>
<td>Fuji Electric FRONTIER-1, bus-powered, 31.25 kb/s</td>
</tr>
<tr>
<td>Memory</td>
<td>Development Round Card: 128 KB x 16 Flash, 128 KB x 16 SRAM; OEM Round Card: 128 KB x 16 Flash, 64 KB x 16 SRAM</td>
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### Fieldbus Power Requirements

<table>
<thead>
<tr>
<th>Voltage</th>
<th>Current Consumption</th>
</tr>
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<tbody>
<tr>
<td>9-32 V</td>
<td>10 mA at 4 MHz; 18 mA at 8 MHz plus external electronics current draw</td>
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</table>

### Power Supply to External Electronics

<table>
<thead>
<tr>
<th>Voltage</th>
<th>Current</th>
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<tbody>
<tr>
<td>5 VDC</td>
<td>4 mA</td>
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### Top-Side Connectors

- 2 screw terminals for fieldbus connection
- Flash program mode jumper
- Simulation mode jumper
- Reset button
- Cable spacing: 2 by 21, 0.05 in. spacing, through holes for berg sticks or ribbon cable interface to daughter card
- 2 by 5, 0.05 in. spacing, through holes for debug port cable

### Bottom-Side Connectors

- Flash socket
- Mounting holes – 2 for no. 4 hardware

### Part Numbers

- **H1 Fieldbus Device Round Card**
  - Development version (hardware only) ..........184497-01
  - OEM version (hardware only) ....................CALL
- **Fieldbus Device Development Kit** ..........777210-01
- **Fieldbus Device Starter Kit** ..........................777445-01
- **Accessories**
  - Round Card Programming Cable................183776-0
- **Fieldbus Benchtop Power Supply**
  - U.S. 120 VAC ........................................777335-01
  - Universal Euro 240 VAC ..........................777335-31