# GE IS220PPRFH1A

## PROFIBUS Master Gateway I/O Pack



GE IS220PPRFH1A is the Mark VIe PROFIBUS Master Gateway I/O pack, linking PROFIBUS slave-device data to the controller's I/O Ethernet network. It operates as a PROFIBUS DPV0 Class 1 master, exchanging the configured input and output data so that external PROFIBUS equipment can participate in the Mark VIe control application. The gateway supports a single Ethernet connection, dual Ethernet connections or a paired hot-backup arrangement. In the hot-backup configuration, one pack is the active master while the second remains ready to take over communication after an active-master failure.

## Technical Specifications

| | |
|---|---|
| **Product Identity** | |
| Control system | GE Mark VIe |
| **Functional Configuration** | |
| Product function | PROFIBUS master gateway |
| PROFIBUS role | DPV0 Class 1 master |
| Per-slave data | Up to 244 input bytes and 244 output bytes |
| PROFIBUS connector | DE-9 RS-485 |
| I/O Ethernet | 2 RJ45 connectors |
| ID / mounting board | SPIDG1A |
| Engineering tool | ToolboxST |
| **Performance & Power** | |
| Data rate | 9.6 kbaud to 12 Mbaud |
| Slave capacity | Up to 125 slaves |
| **Environment** | |
| Internal temperature monitoring | The pack monitors its internal temperature and reports it through the fixed I/O point IOPackTmpr. |

Selected original manufacturer material follows on pages 3–6.

## Compatibility & Selection Guide

System and software compatibility. Configuration is performed in ToolboxST for the actual Mark VIe application. Supported arrangements include one pack with a single or dual Ethernet connection, or two packs in an active/standby hot-backup arrangement. The PPRF interface is DPV0; the communication component inside it does not establish DPV1 support for the complete pack.

## Wiring & Installation Reference

### Network and power connections

DE-9 · PROFIBUS RS-485 · Correct polarity and segment termination

ENET1 / ENET2 · Mark VIe I/O Ethernet · Configured network arrangement

Three-pin supply · Pack power · Nominal 28 V DC

### Mounting and configuration

1. Check the ID board Verify the SPIDG1A identification and mounting board.

2. Fit the pack Align the pack and its mounting supports without forcing the connector.

3. Configure and verify Use ToolboxST to confirm slave definitions, I/O mapping and the single-pack or hot-backup role.

### Installation precautions

Follow GE isolation and handling instructions before changing connections.

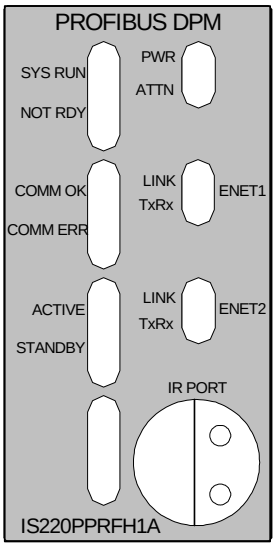
Do not substitute a dual/TMR scheme for the documented PPRF hot-backup configuration.

View network diagram (PDF) — page 3 · View installation instructions (PDF) — page 4

# PPRF PROFIBUS Master Gateway

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### Functional Description



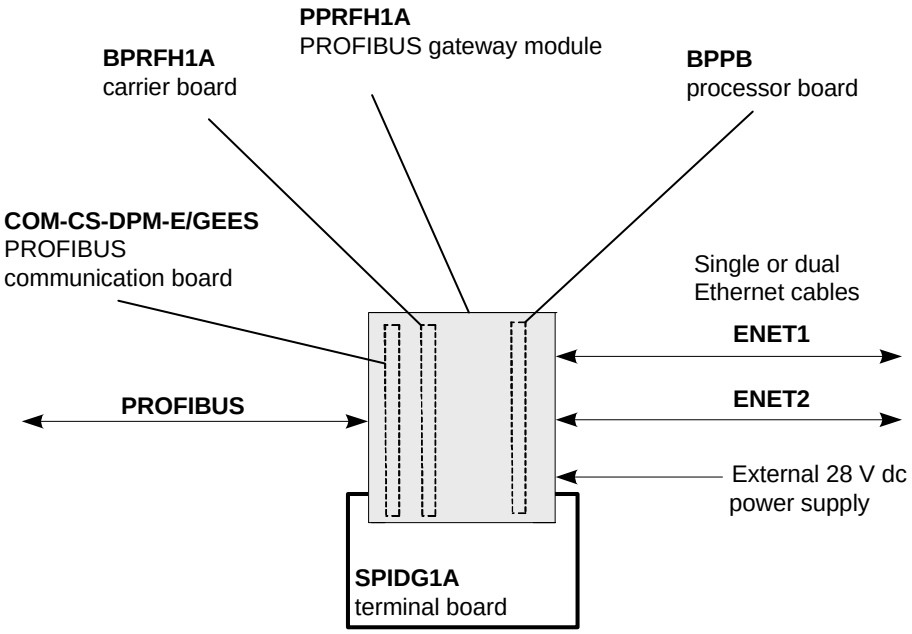

The PROFIBUS Master Gateway (PPRF) pack is a PROFIBUS DPV0, Class 1 master that maps I/O from PROFIBUS slave devices to Mark* VIe controllers on the I/O Ethernet.

The module contains a processor board common to all Mark VIe distributed I/O modules and an acquisition carrier board fitted with a COM-C PROFIBUS communication module supplied by Hilscher GmbH. The COM-C module provides a PROFIBUS RS-485 interface through a DE-9 D-sub receptacle connector. It serves as a PROFIBUS DP master supporting transmission rates from 9.6 KBaud to 12 MBaud and up to 125 slaves with 244 bytes of inputs and outputs per slave.

The PPRF supports the following redundancy options:

- Single I/O pack with single I/O Ethernet connection (no redundancy)
- Single I/O pack with dual I/O Ethernet connections
- Hot-backup I/O pack with dual I/O Ethernet connections

The dual I/O Ethernet connection configuration is common to other IO packs. However, in the hot-backup two PPRFs are employed, one operating as the active PROFIBUS master communicating with slave devices, and the other operating in a passive, stand-by mode, ready to become the active master in the event of an active master failure




*PPRF Simplified Diagram*

## Compatibility

The PROFIBUS Master Gateway Terminal board (SPIDG1A) is used to mount the PPRF and to supply an electronic ID. Its only connection is the interface to the PPRF itself, as the PROFIBUS connection is made to the DE-9 D-sub receptacle connector exposed on the side of the PPRF. Visual diagnostics are provided through indicator LEDs on the PPRF. An infrared port provides local diagnostic serial communication.

| **Terminal Board** | **SPIDG1A** | | | |
|---|---|---|---|---|
| Control mode | Simplex-yes | Dual -no | TMR-no | Hot-backup-yes |

Control mode refers to the number of I/O packs used in a signal path:

- Simplex uses one I/O pack with one or two network connections
- Hot-backup uses two I/O packs with two network connections each

## Installation

### ➢ To install the PPRF pack

**1** Securely mount the SPID terminal board.

**2** Directly plug the PPRF into the terminal board connector. For hot-backup configurations, repeat steps 1 and 2 with a second SPID and PPRF.

**3** Mechanically secure the packs using the threaded inserts adjacent to the Ethernet ports. The inserts connect to a mounting bracket specific to the terminal board type. The bracket should be adjusted so there is no right angle force applied to the DC-37 pin connector between the pack and the terminal board. This adjustment is required once during the life of the product.

**4** Plug in one or two Ethernet cables depending on the system configuration. The pack operates over either port. If dual connections are used, standard practice is to hook ENET1 to the network associated with the R controller; however, the PPRF is not sensitive to Ethernet connections and will negotiate proper operation over either port.

**5** Connect and secure the PROFIBUS cable into the DE-9 D-sub receptacle connector. As per PROFIBUS requirements, the PROFIBUS must be terminated on either end.

**6** Apply power to the connector on the side of the pack. It is not necessary to insert the connector with power removed from the cable. The PPRF has inherent soft-start capability that controls current inrush on power application.

**7** Using the ToolboxST* application, configure the PPRF and PROFIBUS as necessary.

# Operation

## Processor

The processor board in the pack is common to all Mark VIe Ethernet I/O packs. It contains the following:

- High-speed processor with RAM and flash memory
- Two fully independent 10/100 Ethernet ports with connectors
- Hardware watchdog timer and reset circuit
- Internal I/O pack temperature sensor
- Infrared serial communications port
- Status-indication LEDs
- Electronic ID and the ability to read IDs on other boards
- Substantial programmable logic supporting the acquisition board
- Input power connector with soft start/current limiter
- Local power supplies, including sequencing and monitoring

The processor board connects to an acquisition board specific to the I/O pack function. Upon application of input power, the soft-start circuit ramps up the voltage available on the processor board. The local power supplies are sequenced on, and the processor reset is removed. The processor completes self-test routines and then loads application code specific to the I/O pack type from flash memory. The application code reads board ID information to ensure the correct matching of application code, acquisition board, and terminal board. With a good match, the processor attempts to establish Ethernet communications, starting with request of a network address. The address request uses the industry standard dynamic host configuration protocol (DHCP) and the unique identification read from the terminal board. After Ethernet initialization, the processor programs the on-board logic, runs the application, and enables the acquisition board to begin operation.

The processor application code contains all the logic necessary to allow the pack to operate from one or two Ethernet inputs. When operated from two Ethernet inputs, both network paths are active all the time. A failure of either network will not result in any disturbance to the I/O pack operation, and the failure will be indicated through the working network connection. This arrangement is more tolerant of faults than a classic hot-backup system where the second port is only used after a primary port failure is detected. The Ethernet ports on the processor auto-negotiate between 10 MB/s and 100 MB/s speed, and between half-duplex and full-duplex operation.

An industry-standard infrared serial communications port is provided on the processor board. Accessible through the pack front, this port provides diagnostic information on the pack status and an ability to program the pack when both Ethernet connections fail. It is possible to communicate with this port using most notebook computers and most hand-held Personal Digital Assistants (PDA).

### PROFIBUS Gateway Hardware

The PPRFs COM-C module, built on a PROFIBUS core based on Siemens ASPC2 technology, contains firmware that implements the PROFIBUS DP (Decentralized Periphery) functionality. Though the COM-C module is DPV1 capable, the PPRF only provides the basic DPV0 functionality, which includes configuring slave devices, cyclically exchanging I/O data with them, and obtaining PROFIBUS diagnostics.

The COM-C's firmware, residing in a flash memory, is released as part of the PPRF firmware and downloaded to the COM-C's flash at I/O pack startup time only if necessary (for instance when the PPRF firmware is released with an updated COM-C firmware).

The COM-C module requires a PROFIBUS configuration file that is created by the ToolboxST application. This file, specifying the DP master parameter set, is loaded from the ToolboxST application along with the other standard I/O pack configuration files, and, if changed, requires a PPRF reboot following the load. As is the case with the COM-C firmware file, the PROFIBUS configuration file is stored in COM-C flash and only downloaded from PPRF flash if necessary.

### Data Flow between PPRF and Controller

Data flow between the PPRF and the controller is of two types, fixed I/O and PROFIBUS I/O. The limited amount of fixed I/O includes the inputs that are common to all I/O packs, for example L3DIAG and IOPackTmpr, but no application-driven outputs. The set of fixed I/O is pre-defined in the PPRF firmware. PROFIBUS I/O consists of the data exchanged with PROFIBUS slave devices, and its definition varies according to hardware configuration specified by the application.

The PPRF is guaranteed to handle 500 inputs and 500 outputs, half Boolean and half analog, at a 40 ms frame rate. The Boolean inputs may have input event detection enabled, and the analogs may be configured such that point-to-variable data type conversion and scaling take place. The PPRF does not place an architectural limit on the number of I/O points; the 500 input/output value is not a limit but a guarantee.

### Parameters and Online Loads

In general, I/O pack parameters may be changed online, without restarting the system. PPRF parameters consist of I/O transfer scaling values and whether Boolean input event detection is enabled or not for given points. However, the PPRF also handles changes in point data type conversion and the addition and removal of variables attached to points through online loads, as long as the ToolboxST application command, Compress Variables is not done, which would rearrange the EGD exchange.

### PROFIBUS Diagnostics

The PPRF receives and stores all PROFIBUS diagnostics generated by slave devices. In addition to any portion of the diagnostic data (including the standard and extended portions), controller applications receive an input Boolean that is set to True when PROFIBUS diagnostics have been received from one or more slave devices (diagnostics presence) and also receive input Booleans set to True to identify specific slave devices that have generated diagnostics (station diagnostics presence).

The ToolboxST application provides an Advanced Diagnostics command, as part of the Troubleshoot Module, which can be used to display any PROFIBUS diagnostics that are generated by slave devices.