



GARD 8000

Teleprotection Channel



System Features

- One product for all your digital, analog, and IEC 61850 teleprotection needs
- User defined logic and alarms for your specific applications
- Straight forward web browser user interface for settings and diagnostics; no proprietary application program required
- Supports SNTP (Simple Network Time Protocol)
- Optional, built-in GPS receiver provides accurate time tags
- Complete address and checkback testing
- DNP3, Level 2 compliant
- SNMPV2 Compliant
- IEC-61850 HMI standard
- Full system redundancy option available
- Optional pass-through 56/64kbs or 19.2kbs Mirrored Bit multiplexer relaying channels
- Additional plug-in protection modules such as RFL Distance and Current Differential Relays
- Supports NERC/FERC security standards

Teleprotection Features

- Digital system comes standard with 32 functions for tripping applications
- 4 Channels available on Audio Teleprotection Module
- 16 point bidirectional status & RS-232 data option available for analog TPC systems
- Optional IEC-61850 LAN tripping module
- System can accommodate multiple teleprotection schemes in one chassis
- Analog and digital systems can be mixed in one chassis
- 1+1 and other redundant back-up schemes are easily supported
- 96 bit high capacity 56/64kpbs status transfer module option
- Complete range of digital and fiber optic interfaces including C37.94
- Remote interrogation of far end with analog and digital systems
- 10 Year Warranty

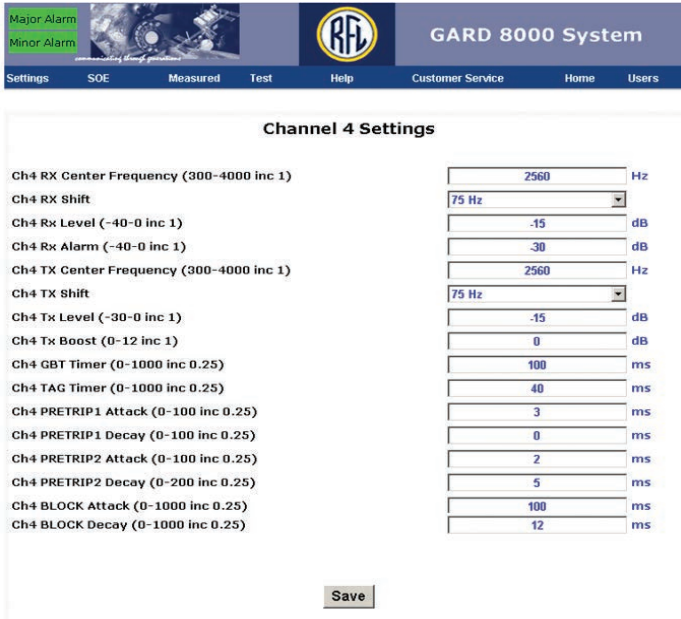


Figure 4. Channel Parameter Settings

System Specifications

Audio Teleprotection

The GARD 8000 audio tone teleprotection module provides four FSK transmitters/receivers. All transceivers are bidirectional and can be programmed for any operating frequency or bandwidth between 300 and 4,000 Hz. Channel one can be set to operate as a modem channel. This channel provides a communication link to the remote terminal for remote interrogation.

Channel one can also be configured to be used for bidirectional status, up to 16 points are supported. The channel can also be used to transmit RS-232 data at rates up to 300bps. When status or data is enabled, the remote interrogation feature can not be used.

Audio Interface Configurations

Single Two-Wire Terminals
Single Four-Wire Terminals

Recommended Channel Frequencies

Range: 300 Hz to 4000 Hz
Resolution: 1Hz

Transmit Level

Adjustable from -30 dBm +0 dBm in 1dB steps

Receiver Sensitivity

Minimum Input Level: -40 dBm
Maximum Input Level: 0 dBm

Receiver Dynamic Range (referenced to center point)

-17 dB to + 11 dB

Adjacent Channel Rejection

40 dB

60-Hz Rejection

A received tone at -30 dBm will not be affected by a 50 Hz or 60 Hz signal as great as 40 Vrms with optional 50/60 Hz blocking filter.

Amplitude Stability

The Transmit level will vary by no more than ± 1 dB.

Spurious Output

All harmonics and spurious outputs are at least 40 dB lower than the carrier.

Transmitter Stability

The transmitter frequency is stable within 0.02 percent over the full range of temperature and input power variations.

Trip Boost

Amplitude: Adjustable from zero to +12 dB in 1 dB steps.
Duration: Adjustable from zero to 30 seconds in .25ms steps.

Input and Output Impedance

600 Ohms

16 Point Bidirectional Status

Requires use of modem channel
Bandwidth 300Hz (± 150 Hz)
Transmit time: 110ms (one way)

RS-232 Data Channel

Requires use of modem channel
Bandwidth 300Hz (± 150 Hz)
Data rate: 300bps
RS-232: Software handshaking, TX, RX data

Digital Teleprotection

Each Digital TPS Engine can transfer up to 32 functions. These functions are broken down into 4 different function blocks. Each can be configured independently, and sent over the communications bus to the communications interface of choice.

Figure 5. shows a GARD 8000 with the four standard function blocks configured with three different communications interfaces.

Specifications are subject to change without notice



receipt of a command input to the response of a solid-state output, less any channel propagation time.

Pre-Trip Timer

Adjustable in 0.25 ms steps

Trip Hold Timer

Adjustable in 0.25 ms steps

Command Extend Timer

Adjustable in 0.25 ms steps

Non-Volatile Storage

All parameters relating to system operation are stored in erasable non-volatile RAM. All parameters related to event logging are stored in capacitor-backed RAM.

RFI Susceptibility

ANSI PC37.90.2 (35 Volts/Meter)

EN 60255-22-3 (RFI Class III)

Interface Dielectric Strength

All contact inputs, solid-state outputs, power supply inputs and relay outputs meet the following specifications:

ANSI C37.90-1989 (Dielectric)

ANSI C37.90.1-2002 (SWC and Fast Transient)

EN 60255-5 (1500 Vrms Breakdown Voltage and Impulse Withstand)

EN 60255-22-1 (SWC Class III)

EN 60255-22-2 (ESD Class III)

EN 60255-22-4 (Fast-Transient Class III)

EN 60834-1

Temperature

Operating: -20° C to +75° C (-4° F to + 167° F)

Storage: -40° C to +85° C (-40° F to +185° F)

Relative Humidity

Up to 95 percent at +40° C (+104° F), non-condensing

Warranty Statement

RFL's standard warranty for the GARD 8000 Teleprotection unit is **10 years** from date of delivery for replacement or repair of any part which fails during normal operation or service.

it is not necessary to make field configurations, if not desired. The web browser User Interface makes interaction with the device highly intuitive and handling greatly simplified.

Front Panel LEDs

Two rows of ten multi-colored LEDs provide basic event information. The LED operation is fully configurable and labels can be changed to suit the application. Custom configuration and labeling can be factory-made by RFL without extra charge. Any field modifications required are simply made by use of the browser interface.

Front Panel Display

An optional touch screen display (TSD) is available for metering, targets and settings. The TSD provides a color screen that will automatically orientate itself for horizontal or verticle mounting. User programmable buttons are provided for unique customer requirements. For things such as breaker control or cut-in/cut-out switches.

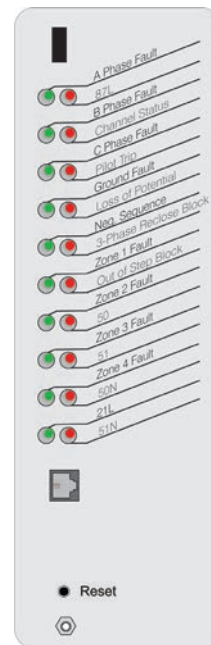


Figure 6. GARD 8000 Front Panel LEDs (6U)

User Interface

Protection system reliability may be compromised by increased complexity of protection devices. While these protection devices offer added flexibility they also increase the risk for errors. Complicated settings, configurations and interconnections all combine to having an undesirable effect on protection system security and dependability.

The GARD 8000 System is designed with ease-of-use in mind. While high functionality and great detail is provided,



Figure 7. GARD 8000 3U Front Panel

Specifications are subject to change without notice

Native IEC-61850

The GARD 8000 complies to the requirements stated in IEC-61850-2 for teleprotection equipment. The HMI functions come standard with the GARD 8000, however, if tripping capability over a LAN is desired, the optional ethernet tripping module is required.

Ethernet Tripping Module (IEC 61850 compliant)

The GARD 8000 System can be provided with an Ethernet Tripping Module. IEC 61850 substation automation provides a LAN (Local Area Network) in the substation where trip messages are passed between the devices via GOOSE messages on a TCP/IP network.

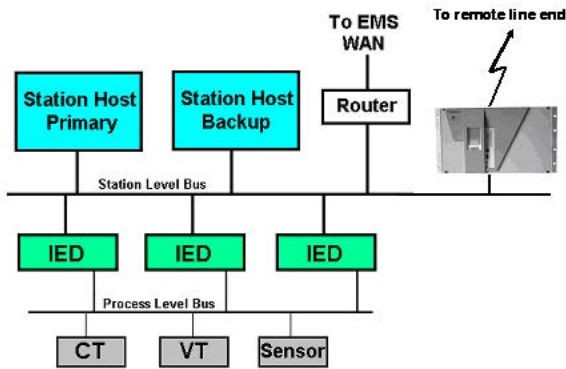


Figure 11. IEC 61850 Substation

The GOOSE message is routed to perform trip functions of circuit breakers, but a shortcoming with the network is that there is no easy means to transfer a GOOSE message to a remote location if the Ethernet network does not encompass the two substations. The GARD 8000 Ethernet tripping module solves this dilemma, by retrieving GOOSE messages from the LAN and transporting them over any of its communication interfaces.

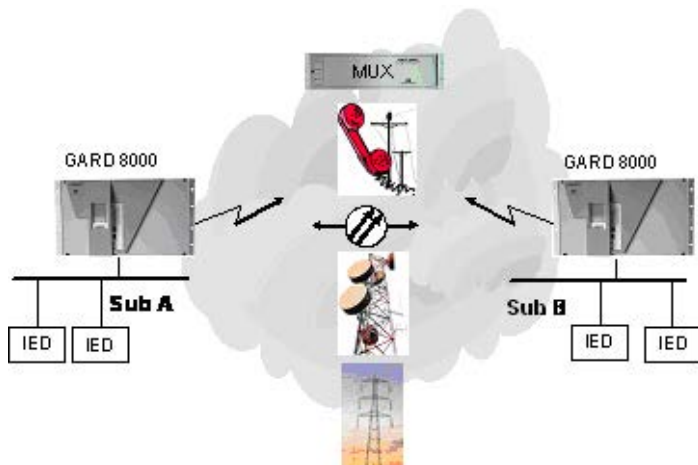


Figure 12. GARD 8000 teleprotection between two IEC 61850 substations

The GARD 8000 provides the link between two IEC 61850 substations over any communication media. The sending GARD 8000 retrieves GOOSE messages from the substation LAN, puts it on a communication link to a remote GARD 8000 that puts it on its substation LAN.

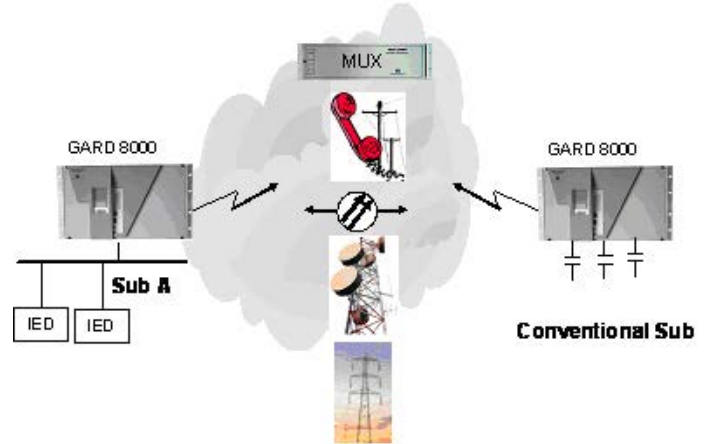


Figure 13. GARD 8000 Teleprotection between an IEC 61850 substation and a conventional substation

Generally, a new IEC 61850 substation needs to interact with a conventional substation at remote line ends. In this case, the GARD 8000 retrieves GOOSE messages for transfer trip or pilot relaying operations from the IEC 61850

substation LAN, transports them over any communication link and the remote, receiving GARD 8000 performs normal teleprotection operations such as tripping of breakers and pilot relaying signaling.

In addition, in case pilot relaying and teleprotection need to be performed over an Ethernet network between two conventional substations, a GARD 8000 at each line end can send GOOSE messages over the network for intertripping.

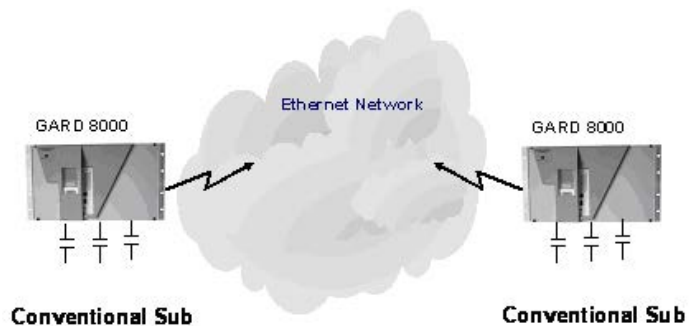


Figure 14. GARD 8000 Teleprotection over an Ethernet Network



Examples of GARD 8000 System Configurations

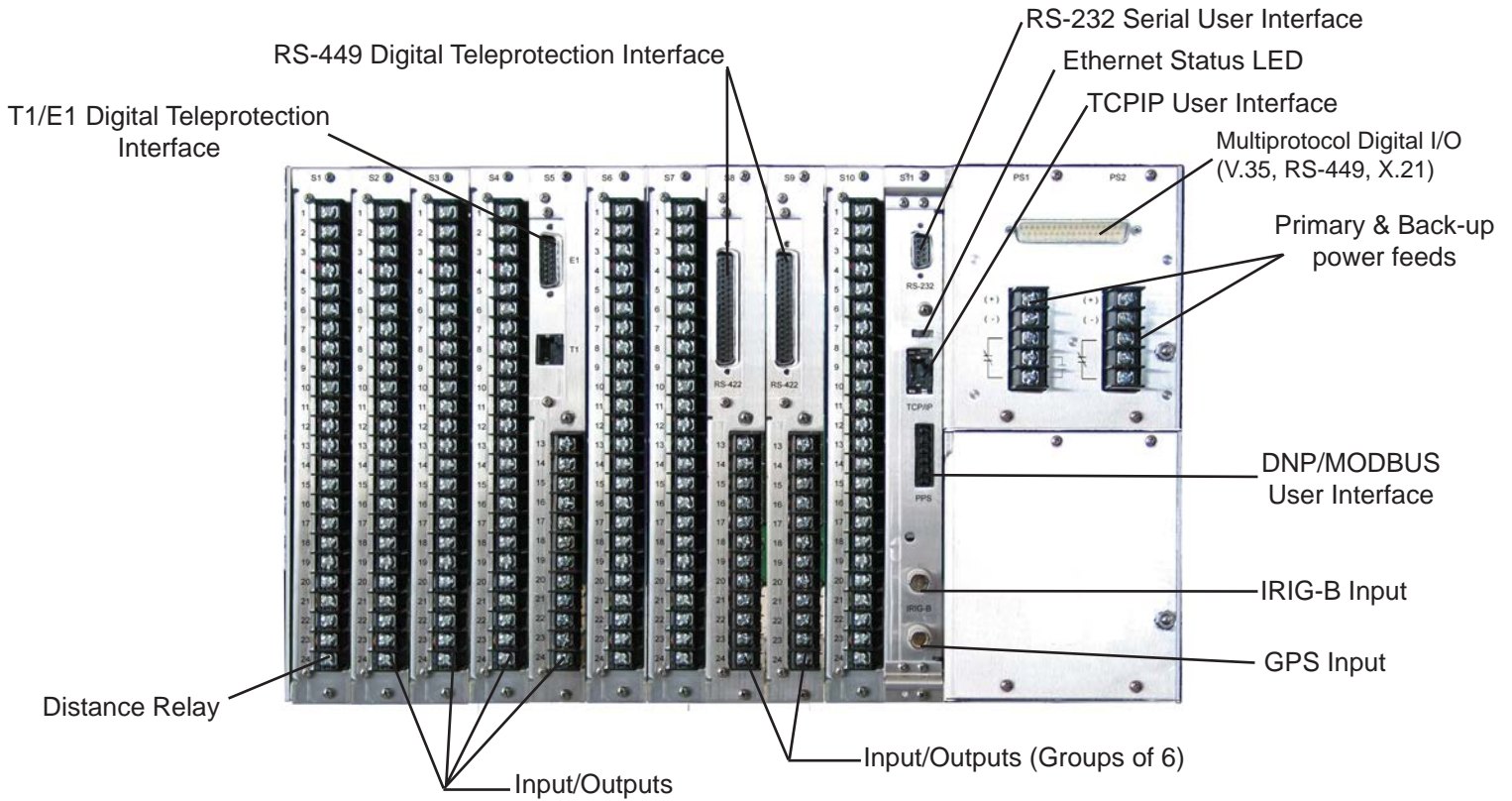


Figure 16. Rear View 6U GARD 8000 Digital Protection System with (4) Digital Interfaces

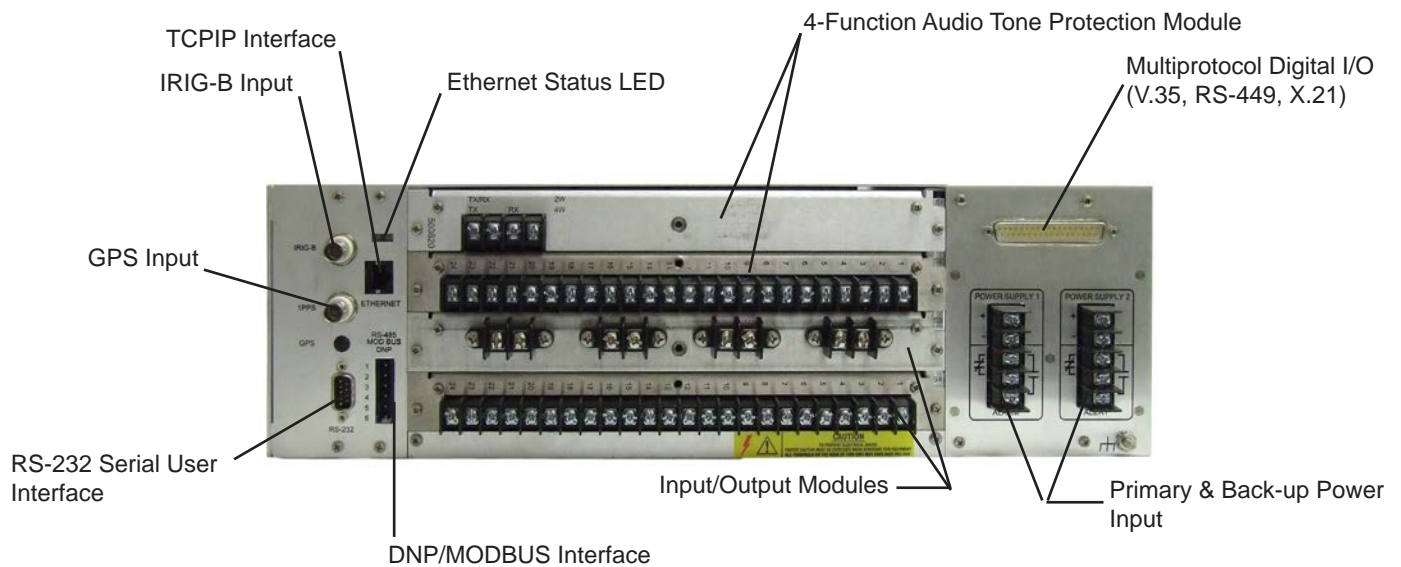


Figure 17. Rear View 3U GARD 8000 Dual Analog Protection System.



GARD 8000 Single Function PLC 3U System Dimensions

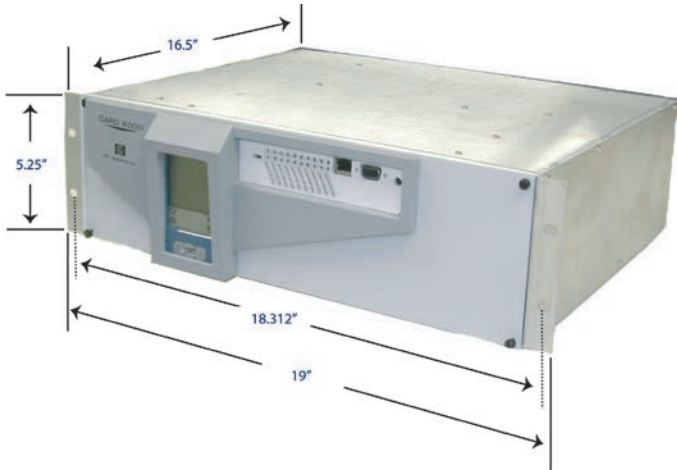


Figure 11. Rack or Cabinet Mounting (3U)

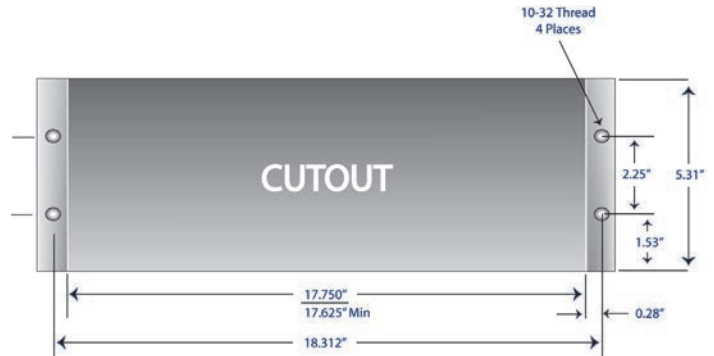


Figure 12. Panel Mounting (3U)

6U System Dimensions

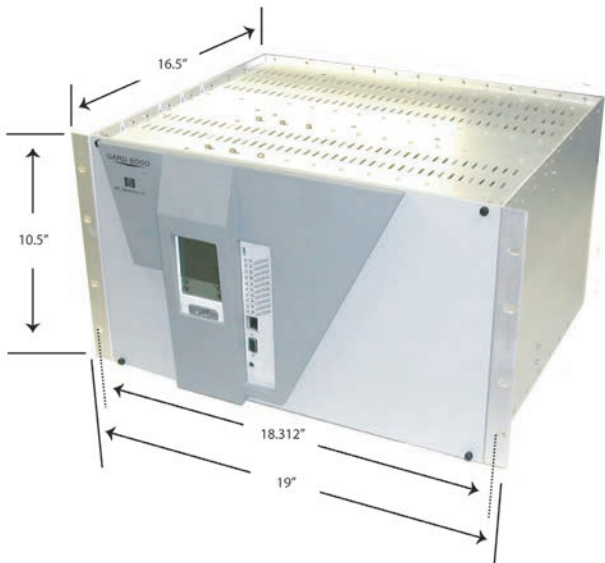


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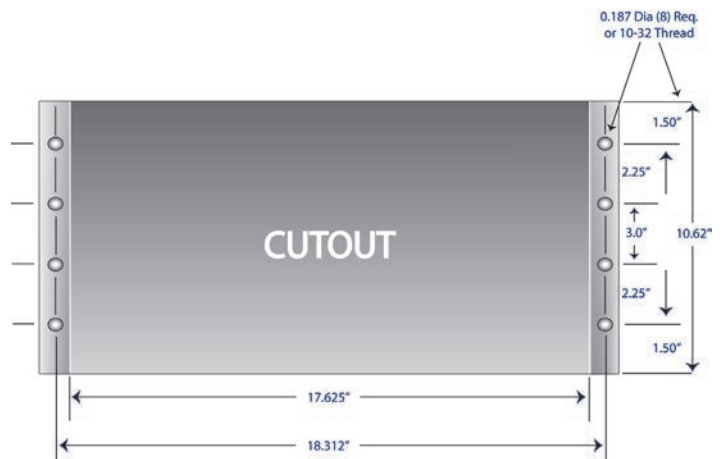


Figure 14. Panel Mounting (6U)



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