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Chapter 1.
General Information

Description

The ProTech-GII is a device designed to safely shutdown steam, gas and hydro turbines, as well as motors, compressors, reciprocating engines and other equipment, upon sensing an overspeed or over-acceleration event.

The ProTech-GII consists of three independent modules whose trip outputs are either independent or voted in a 2-out-of-3 configuration. The ProTech-GII includes Overspeed/Overacceleration, Alarm, and Trip log functions with time-stamping. Indication that a test was active at the time of the event is provided on all logs and first-out indications are provided for Trip logs.

The ProTech-GII provides various pre-defined test features including automated periodic tests.

There are several ways to interface with the ProTech-GII. The front panel allows the user to view current values, and to perform configuration and test functions. All of the features and most of the information available from the front panel are also accessible via the Modbus® * interface. Finally, the Programming and Configuration Tool (PCT) is software that is run on a PC to download log files and manage settings files.

*—Modbus is a trademark of Schneider Automation Inc.

This product is designed for critical applications and when installed correctly meets API-670, API-612, API-611, and IEC61508 (SIL-3) standards.

IMPORTANT

Note that the trip cycle time feature is not available on the ProTech-GII. If this function is desired, to determine the time between when a trip command is issued and the feedback from the system that the equipment has actually been tripped, a ProTechTPS or ProTech-SX must be purchased.

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The following table shows the various hardware configurations (mounting options, power supplies, and trip relay options) available:

Table 1-1. Available ProTech-GII Models

Part Number	Description
8237-1244	ProTech-GII - Bulkhead Mount, HV/LV, Independent Relay
8237-1367	ProTech-GII - Panel Mount, HV/LV, Independent Relay
8237-1245	ProTech-GII - Bulkhead Mount, HV/HV, Independent Relay
8237-1368	ProTech-GII - Panel Mount, HV/HV, Independent Relay
8237-1246	ProTech-GII - Bulkhead Mount, HV/LV, Voted Relays
8237-1369	ProTech-GII - Panel Mount, HV/LV, Voted Relays
8237-1247	ProTech-GII - Bulkhead Mount, HV/HV, Voted Relays
8237-1370	ProTech-GII - Panel Mount, HV/HV, Voted Relays
5437-1121	Spare Module for 8237-1244 Rev B or later, 8237-1367 Rev B or later
5437-1122	Spare Module for 8237-1245 Rev D or later, 8237-1368 Rev B or later
5437-1119	Spare Module for 8237-1246 Rev E or later, 8237-1369 Rev B or later
5437-1120	Spare Module for 8237-1247 Rev E or later, 8237-1370 Rev D or later
5437-1080	Spare Module for 8237-1244 Rev A or earlier -1367 Rev A or earlier
5437-1081	Spare Module for 8237-1245 Rev C or earlier -1368 Rev A or earlier
5437-1078	Spare Module for 8237-1246 Rev D or earlier, -1369 Rev A or earlier
5437-1079	Spare Module for 8237-1247 Rev D or earlier -1370 Rev C or earlier

Applications

The ProTech-GII is designed to be applied as an overspeed device for any size steam, gas, or hydro turbine, reciprocating engine, or plant process equipment. The device's fast (12 millisecond) response time, 0.5 to 32 000 rpm speed range, and integrated overspeed and acceleration detection/protection functionality, make it ideal for application on critical low-speed or high-speed rotating motors, compressors, turbines or engines. This device accepts one speed (MPU or PROX) input per module (3 total). In addition to the trip relay outputs, each ProTech-GII module provides 1 relay output that is dedicated to an alarm function (3 total) and 1 analog speed output (3 total).

The ProTech-GII utilizes a triple modular redundant architecture and 2-out-of-3 voting logic to accurately determine unsafe conditions and ensure that no single-point failure will affect system reliability or availability. With this design, failures in overspeed system components (switches, transducers, modules) are detected, annunciated, and allowed to be repaired or replaced while the monitored system continues to operate on-line. The ProTech-GII is designed for critical applications where both personnel safety and unit availability (operation run time) is a concern or necessity.

The ProTech-GII is certified as an IEC61508 SIL-3 (Safety Integrity Level 3) safety device and can be applied as a stand-alone IEC61508-based device or within an IEC61511-based plant safety system.

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Low Voltage Input

Table 2-4. Low Voltage Input Specifications

Voltage Input Range	18–32 Vdc @ 30 W per module Nominal 24 Vdc
Current Input Max*	1.5 A @ 18 Vdc 1 A @ 32 Vdc
Inrush Current	0.05 A^2sec
Reverse Polarity Protection	Yes
Interrupt Time	3 ms, when operating on one power supply only

NOTICE

***Note that the input current specifications are for one module, measured with the other power supply input disconnected. With both power supply inputs connected, input current will never exceed the maximum specification. However, the two power supplies do not load share internally.**

Internally Generated Limited Power Supply

Table 2-5 Relay Output Power Supply Specifications

Relay Output Power Supply (24V_P)

Output Voltage	24 Vdc ±10%
Current Limit	500 mA

Each ProTech-GII module will function normally with power sourced to both or either power supply input independently, however Woodward recommends that both input power sources be used to improve system availability. Please refer to Table 1-1 for available ProTech-GII models.

IMPORTANT

Since the ProTech-GII is designed to detect a failure of either power supply input, a continuous "Power Supply Fault Alarm" will be issued if power-sources are not connect for both power supply inputs.

Each ProTech-GII module requires a power source capable of a certain output voltage and current. In most cases, this power rating is stated in Volt-Amps (VA). The maximum VA of a source can be calculated by taking the rated output voltage times the maximum output current at that voltage. This value should be greater than or equal to the VA requirement listed.

⚠WARNING

Each power source must be provided with an external disconnecting means that is identifiable to the specific power supply (A, B, or C).

NOTICE

A PE (Protective Earth) ground wire for each of the high voltage power supplies must be connected to PE ground. The PE ground connection wire must originate and be connected to PE at the power source. The PE ground wire must follow the power wires to the applicable power input connector PE Ground pin, so that each HV input has a PE ground. The PE ground wire gauge must be capable of handling the same current as the individual power wiring.

NOTICE

A PE (Protective Earth) ground wire for the enclosure must be provided and connected to PE Ground. At least one of the enclosure's PE labeled connection points must have a wire going from the enclosure to a building PE ground point. This wire must be of sufficient gauge to handle the rated current of all the interposing relay wires or 1.5 mm² (16 AWG), whichever is larger.

Input/Output Specifications

Speed Input Specifications

Table 2-6. General I/O Specifications

Number of Inputs	1, selectable as passive or active probe by front panel configuration
Speed Sensing Accuracy	Accuracy: ±0.04% of current speed over –20 to +60 °C ambient temperature
Acceleration Sensing Accuracy and Range	Accuracy: ±1% of current speed Detectable over-acceleration range: 0 to 25000 rpm/s
Signal Cable Length	Must be limited to 1500 ft /457 m (low capacitance 16 AWG / 1.3 mm²)
Internal Test Frequency Generator	6 Hz to 32 kHz, selectable in different test modes, see Chapter 4, Configuration and Operation

Table 2-7. Passive Probe (MPU) Specifications

Input Frequency	Passive Probe (MPU): 100 Hz to 32 kHz
Input Amplitude	1 Vrms to 35 Vrms
Input Impedance	1.5 kΩ
Isolation	500 Vac from input to chassis and input to all other circuits
Open Wire Detection	MPU only > 7.5 kΩ

Table 2-8. Active Probe Specifications (Proximity, Eddy Current)

Input Frequency	Active Probe (Proximity, Eddy Current): 0.5 Hz to 25 kHz
Input Amplitude	Active Probe: 24 V probes
Probe Power	24 V ±10% @ 1 W, probe power switched on only in active probe mode.
Internal Pull-up Resistor	10 kΩ, input suitable for use with open collector probe outputs (see Note)
Input Threshold (Vlow)	< 2 V
Input Threshold (Vhigh)	> 4 V
Isolation	500 Vac from input to chassis and input to all other circuits

⚠WARNING

When Active Probes are used it is recommended to always enable (USED) the Speed Fail Trip function. Reference the Configuration Guidance section under the Troubleshooting Chapter for more detail.

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IMPORTANT

Each speed input is designed to operate from its own speed probe. Do not connect a speed probe to more than one input. This will compromise the ability of the ProTech-GII to sense open wire (passive mode only) and interfere with the minimum amplitude sensitivity and accuracy.

IMPORTANT

When using open collector probes, verify that the signal is being read properly at higher frequencies (>10 kHz). Long cable lengths can significantly reduce the signal strength at higher frequencies. In this case, add an external pull-up resistor of approximately 2 kΩ (0.25 W) from terminals 70 to 69 and verify that the signal is read properly by the ProTech-GII.

IMPORTANT

Shielded cable is required when connecting to the speed input.

Relay Specifications

Table 2-9. Independent Trip Relay Output Specifications

Number of Channels	2 (actuated simultaneously)
Output Type	SPST Solid-state, Normally Open
Current Rating	1 A
Voltage Rating	24 V (32 V max)
Isolation	500 Vac from output to chassis and output to all other circuits
Signal Cable Length	Must be limited to 1000 ft / 305 m (low capacitance 16 AWG / 1.3 mm² pair)

Table 2-10. Voted Trip Relay Output Specifications

Number of Channels	2 (both channels actuated simultaneously), see wiring and installation
Output Type	Form C, dual SPDT
Contact Rating	8 A @ 220 Vac / 8 A @ 24 Vdc
Max. Switching Voltage	220 Vac / 150 Vdc
Max. Switching Power	2000 VA / 192 W
Isolation	1500 Vac from contact to chassis and contacts to all other circuits

Table 2-11. Alarm Relay Specifications

Output Type	SPST Solid-state, Normally Open
Current Rating	1 A
Voltage Rating	24 V (32 V max)
Isolation	500 Vac from output to chassis and output to all other circuits
Signal Cable Length	Must be limited to 1000 ft / 305 m (low capacitance 16 AWG / 1.3 mm²)

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Dedicated Discrete Input Specifications

Table 2-12. Dedicated Discrete Input Specifications

Number of Channels	3, (Start, Reset, Speed Fail Override)
Input Thresholds	<= 8 Vdc = “OFF”
	>= 16 Vdc = “ON”
Input Current	3 mA ±5% at 24 V (for externally power wiring, see, Chapter 2)
Wetting Current Supply	24 V at 2 W available (see installation diagrams, Chapter 2). This power supply is current limited.
Max Input Voltage	32 V (for externally power wiring, see, Chapter 2)
Isolation	500 Vac from output to chassis and output to all other circuits

Analog Output Specifications

Table 2-13. Analog Output Specifications

Number of Channels	1
Output Type	4–20 mA, isolated
Max Current Output	25 mA
Accuracy	±0.1% at 25 °C, ±0.5% over temperature
Resolution	12 bit
Response Time	< 2 ms (2 to 20 mA)
Min Current Output	0 mA
Min Resistive	0 Ω
Max Resistive Load	500 Ω at 25 mA
Isolation	500 Vac from output to chassis and output to all other circuits
Signal Cable Length	Must be limited to 1000 ft / 305 m (low capacitance 16 AWG / 1.3 mm²)

Serial Communication Port (RS-232/RS-485) Specifications

Table 2-14. Serial Port Specifications

Number of Ports	1
Comm Type	RS-232/RS-485, user selectable (2-Wire Only)
Termination Resistor	RS-485 on board, terminal block selectable
Isolation	500 Vac from output to chassis and output to all other circuits
Signal Cable Length	Must be limited to 1500 ft / 305 m (low capacitance 16 AWG / 1.3 mm²)

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ProTech with Voted Trip Relay Output

ProTech-GII "Voted Trip Relay" models consist of three independent modules that each accept one speed input whose trip output commands are then voted in a 2-out-of-3 (2oo3) fashion to create the 2oo3 trip output command. Two redundant "Form-C" 2oo3 voted relays are used in these models providing four isolated relay output signals with normally open and normally closed contacts.

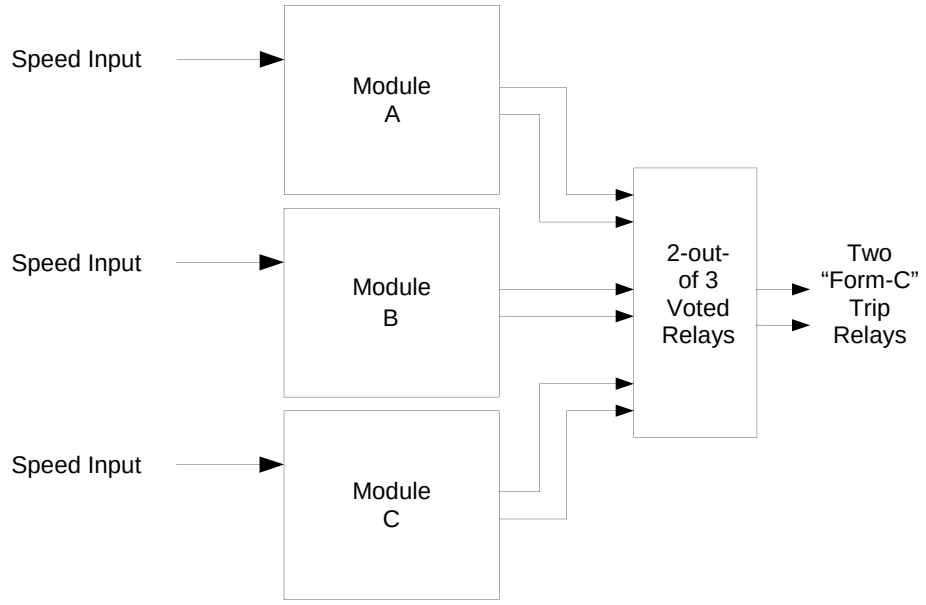


Figure 3-4. Basic Functional Overview of Voted Trip Relay Models

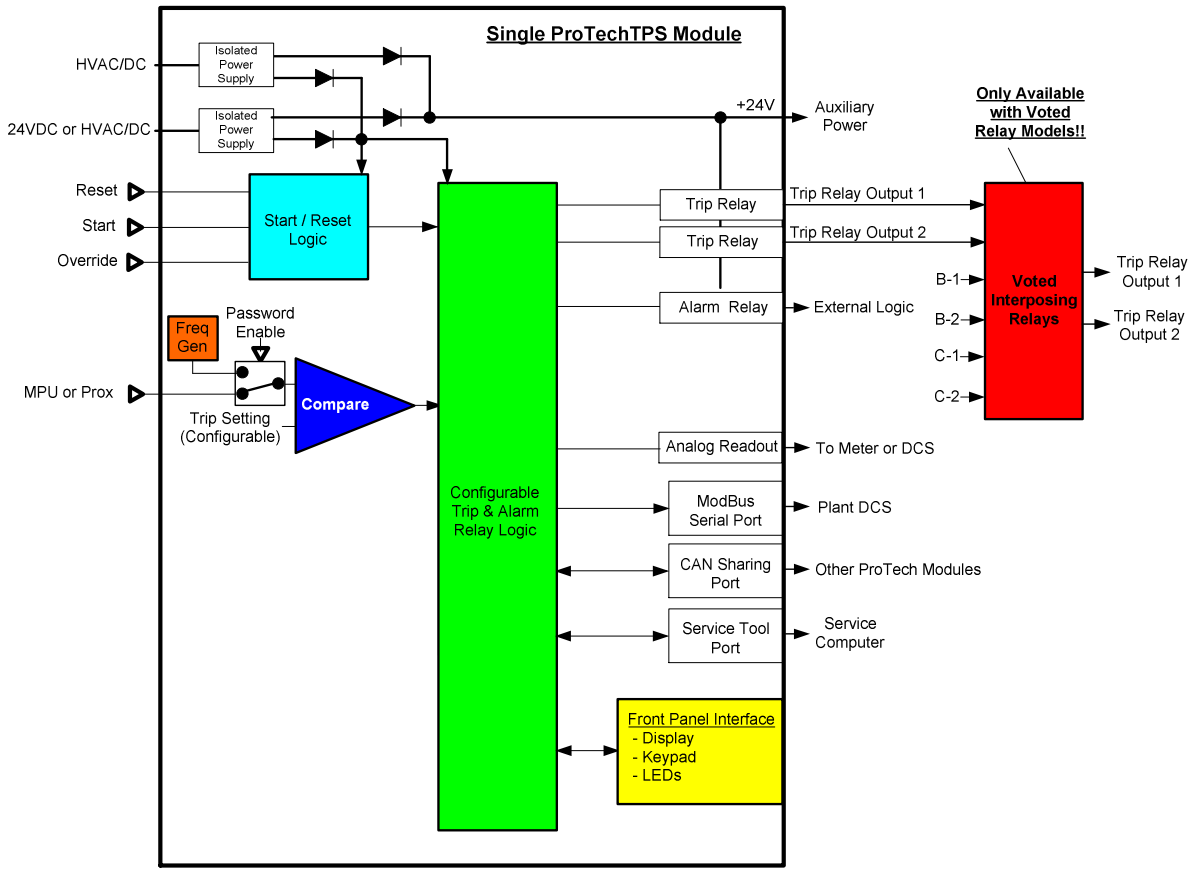


Figure 3-5. Functional Diagram of Single ProTech-GII Module with Voted Trip Relay Outputs