WOODWARD

Product Line
Overspeed Protection Device

Installation and Operation Manual

⚠ **General Precautions**	Read this entire manual and all other publications pertaining to the work to be performed before installing, operating, or servicing this equipment. Practice all plant and safety instructions and precautions. Failure to follow instructions can cause personal injury and/or property damage.

⚠ **Revisions**	This publication may have been revised or updated since this copy was produced. To verify that you have the latest revision, check manual *26455*, *Customer Publication Cross Reference and Revision Status & Distribution Restrictions*, on the *publications page* of the Woodward website: **http://www.woodward.com/** The latest version of most publications is available on the *publications page*. If your publication is not there, please contact your customer service representative to get the latest copy.

⚠ **Proper Use**	Any unauthorized modifications to or use of this equipment outside its specified mechanical, electrical, or other operating limits may cause personal injury and/or property damage, including damage to the equipment. Any such unauthorized modifications: (i) constitute "misuse" and/or "negligence" within the meaning of the product warranty thereby excluding warranty coverage for any resulting damage, and (ii) invalidate product certifications or listings.

⚠ **Translated Publications**	If the cover of this publication states "Translation of the Original Instructions" please note: The original source of this publication may have been updated since this translation was made. Be sure to check manual *26455*, *Customer Publication Cross Reference and Revision Status & Distribution Restrictions*, to verify whether this translation is up to date. Out-of-date translations are marked with ⚠. Always compare with the original for technical specifications and for proper and safe installation and operation procedures.

Revisions— A bold, black line alongside the text identifies changes in this publication since the last revision.

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Important Definitions

⚠️ This is the safety alert symbol used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

- **DANGER** - Indicates a hazardous situation, which if not avoided, will result in death or serious injury.
- **WARNING** - Indicates a hazardous situation, which if not avoided, could result in death or serious injury.
- **CAUTION** - Indicates a hazardous situation, which if not avoided, could result in minor or moderate injury.
- **NOTICE** - Indicates a hazard that could result in property damage only (including damage to the control).
- **IMPORTANT** - Designates an operating tip or maintenance suggestion.

⚠️WARNING Overspeed / Overtemperature / Overpressure	The engine, turbine, or other type of prime mover should be equipped with an overspeed shutdown device to protect against runaway or damage to the prime mover with possible personal injury, loss of life, or property damage. The overspeed shutdown device must be totally independent of the prime mover control system. An overtemperature or overpressure shutdown device may also be needed for safety, as appropriate.

⚠️WARNING Personal Protective Equipment	The products described in this publication may present risks that could lead to personal injury, loss of life, or property damage. Always wear the appropriate personal protective equipment (PPE) for the job at hand. Equipment that should be considered includes but is not limited to: • **Eye Protection** • **Hearing Protection** • **Hard Hat** • **Gloves** • **Safety Boots** • **Respirator** Always read the proper Material Safety Data Sheet (MSDS) for any working fluid(s) and comply with recommended safety equipment.

⚠️WARNING Start-up	Be prepared to make an emergency shutdown when starting the engine, turbine, or other type of prime mover, to protect against runaway or overspeed with possible personal injury, loss of life, or property damage.

Electrostatic Discharge Awareness

NOTICE **Electrostatic Precautions**	**Electronic controls contain static-sensitive parts. Observe the following precautions to prevent damage to these parts:** • **Discharge body static before handling the control (with power to the control turned off, contact a grounded surface and maintain contact while handling the control).** • **Avoid all plastic, vinyl, and Styrofoam (except antistatic versions) around printed circuit boards.** • **Do not touch the components or conductors on a printed circuit board with your hands or with conductive devices.** **To prevent damage to electronic components caused by improper handling, read and observe the precautions in Woodward manual *82715*, *Guide for Handling and Protection of Electronic Controls, Printed Circuit Boards, and Modules*.**

Follow these precautions when working with or near the control.
1. Avoid the build-up of static electricity on your body by not wearing clothing made of synthetic materials. Wear cotton or cotton-blend materials as much as possible because these do not store static electric charges as much as synthetics.
2. Do not remove the printed circuit board (PCB) from the control cabinet unless absolutely necessary. If you must remove the PCB from the control cabinet, follow these precautions:
   • Do not touch any part of the PCB except the edges.
   • Do not touch the electrical conductors, the connectors, or the components with conductive devices or with your hands.
   • When replacing a PCB, keep the new PCB in the plastic antistatic protective bag it comes in until you are ready to install it. Immediately after removing the old PCB from the control cabinet, place it in the antistatic protective bag.

Regulatory Compliance

European Compliance for CE Marking

EMC Directive:	Declared to Directive 2014/30/EU of the European Parliament and of the Council of 26 February 2014 on the harmonization of the laws of the Member States relating to electromagnetic compatibility (EMC).
Low Voltage Directive:	Directive 2014/35/EU on the harmonisation of the laws of the Member States relating to the making available on the market of electrical equipment designed for use within certain voltage limits.
ATEX – Potentially Explosive Atmospheres Directive:	Directive 2014/34/EU on the harmonisation of the laws of the Member States relating to equipment and protective systems intended for use in potentially explosive atmospheres II 3 G, Ex nA IIC T4

Other European Compliance

Compliance with the following European Directives or standards does not qualify this product for application of the CE Marking:

RoHS Directive:	Restriction of Hazardous Substances 2011/65/EU: Woodward Turbomachinery Systems products are intended exclusively for sale and use only as a part of Large Scale Fixed Installations per the meaning of Art.2.4(e) of directive 2011/65/EU. This fulfills the requirements stated in Art.2.4(c) and as such the product is excluded from the scope of RoHS2.

North American Compliance

CSA:	Certified for Class I, Division 2, Groups A, B, C, and D, T4 at 60 °C Ambient for use in the United States and Canada. Certificate 160584-2217246

Other International Compliance

Australia (& New Zealand) RCM:	Compliance is limited to application for those units bearing the Regulatory Compliance Mark (RCM). Only EMC is applicable in virtually all Woodward intended applications. RCM on WWD products is very limited due to allowed exemptions from applying the RCM or having a DoC. **EMC:** Electromagnetic Compatibility (EMC) Declaration of Conformity (DoC) RCM requirements for the Australian (& New Zealand) Radiocommunications Act is a separate document only created for products applying the RCM to the label. Products with a RCM on the label have an EMC Declaration of Conformity available: Woodward products typically comply with at least CISPR11 Group1, Class A emissions limits, Electromagnetic Interference (EMI) testing, even if not marked with the RCM: as long as the "CE mark" is on the label.
TÜV:	TÜV certified for SIL-3 per IEC 61508 Parts 1-7, Functional Safety of Electrical / Electronic / Programmable Electronic Safety Related Systems

> ⚠ **WARNING**   The controller may only be installed in Class 2 Hazardous areas.

Other Compliance

Gas Corrosion: IEC60068-2-60:1995 Part 2.60 Methods 1 and 4 (conformal coating)

Machinery Protection: API-670, API-612, & API-611 compliant

Special Conditions for Safe Use

This Equipment is Suitable for use in Class I, Division 2, Groups A, B, C, D or Non Hazardous Locations Only.

This equipment is suitable for use in European Zone 2, Group IIC environments or Non Hazardous Locations Only.

Wiring must be in accordance with North American Class I, Division 2, or European Zone 2, Category 3 wiring methods as applicable, and in accordance with the authority having jurisdiction.

A fixed wiring installation is required and a switch or circuit breaker shall be included in the building installation that is in close proximity to the equipment and within easy reach of the operator and that is clearly marked as the disconnecting device for the equipment. The switch or circuit breaker shall not interrupt the protective earth conductor.

Protective Earth Grounding is required by the input PE terminal.

Field wiring must be rated at least 85 °C for operating ambient temperatures expected to exceed 50 °C.

For European ATEX compliance on panel mount models, this equipment must be installed in an area providing adequate protection against the entry of dust or water. A minimum ingress protection rating of IP54 is required for the enclosure.

Personnel must discharge their electrostatic build up to the cabinet ground point or use an ESD strap prior to touching the ProTech® interior surfaces if the engine/turbine is operational. The unit is designed to have one of three modules be removed during operation; however ESD to the remaining operational modules may cause signal deviations. Signal deviations due to direct ESD may be large enough to result in the operational module to trip, shutting down the engine since two modules are in a tripped mode. Signal deviations were noted when ESD testing was done to the Speed pins, the IRIG-B pins, Service Port pins, and RS-232/RS-485 Modbus communications port pins.

> ⚠ **WARNING**   Do not remove module unless module is de-energized and all wire connections have been disconnected

The Service Port (RS-232 communication) is not designed to remain connected during operation except at servicing and programming intervals. It should not have a cable connected to it other than during programming and servicing.

This device contains a single cell primary battery. This battery is not to be charged and is not customer replaceable.

Control is suitable for installation in pollution degree 2 environments.

> ⚠️ **WARNING**   Measurement inputs are classified as permanently connected IEC measurement Category I and are designed to safely withstand occasional transient overvoltages up to 1260 Vpk. To avoid the danger of electric shock, do not use these inputs to make measurements within measurement categories II, III, or IV.

> ⚠️ **WARNING**   Explosion Hazard—Do not connect or disconnect while circuit is live unless area is known to be non-hazardous.
>
> Substitution of components may impair suitability for Class I, Division 2 or Zone 2 applications.

> ⚠️ **AVERTISSEMENT**   Risque d'explosion—Ne pas raccorder ni débrancher tant que l'installation est sous tension, sauf en cas l'ambiance est décidément non dangereuse.
>
> La substitution de composants peut rendre ce matériel inacceptable pour les emplacements de Classe I, applications Division 2 ou Zone 2.

Safety Symbols

Symbol	Description
⎓	Both direct and alternating current
∼	Alternating current
⎓	Direct current
⚡	Caution, risk of electrical shock
⚠️	Caution, refer to accompanying documents
⏚	Protective conductor terminal
⏚	Frame or chassis terminal

Acronyms and Definitions

2oo3	2-out-of-3
Block Identifier	The identifier used for each logic block for configuration purposes (Chapter 9)
CAN	Controller Area Network
DC	Diagnostic Coverage
DCS	Distributed Control System
Module	Functionality contained within one of the three identical sections
MPU	Magnetic Pick-up
PC	Personal Computer or laptop with Windows operating system
PCT	Programming and Configuration Tool
PFD	Probability of Failure on Demand
PFH	Probability of dangerous Failure per Hour
PLC	Programmable Logic Controller
PROX	Proximity Probe
RTU	Remote Terminal Unit
Settings-File	A file that contains the configuration settings loaded with the ProTech Programming and Configuration Tool (.wset).
GII	ProTech Overspeed Protection Device

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.

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.
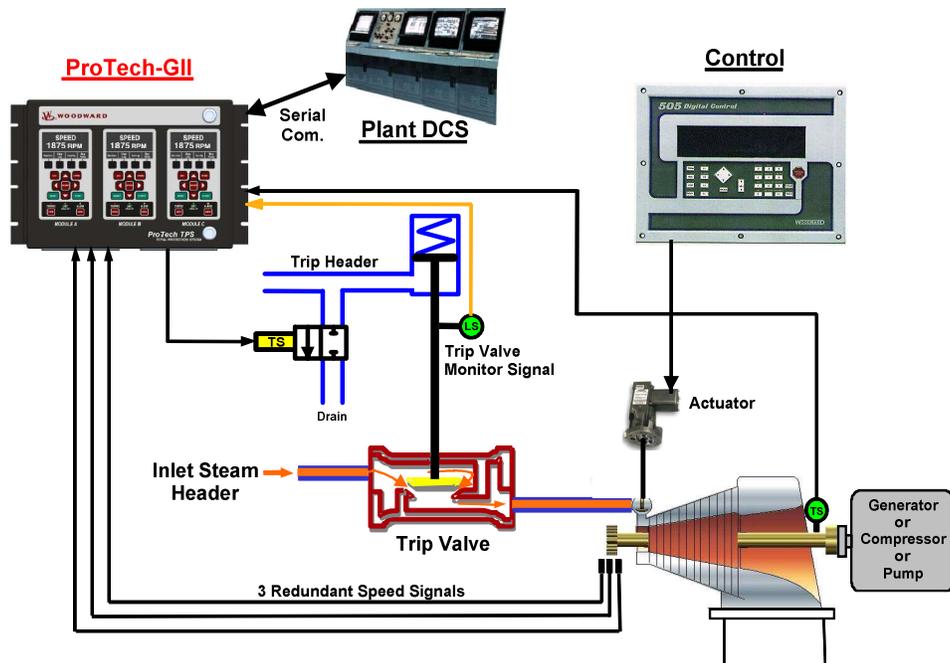
Figure 1-1. Typical ProTech-GII Application (Voted Trip Relay Models)
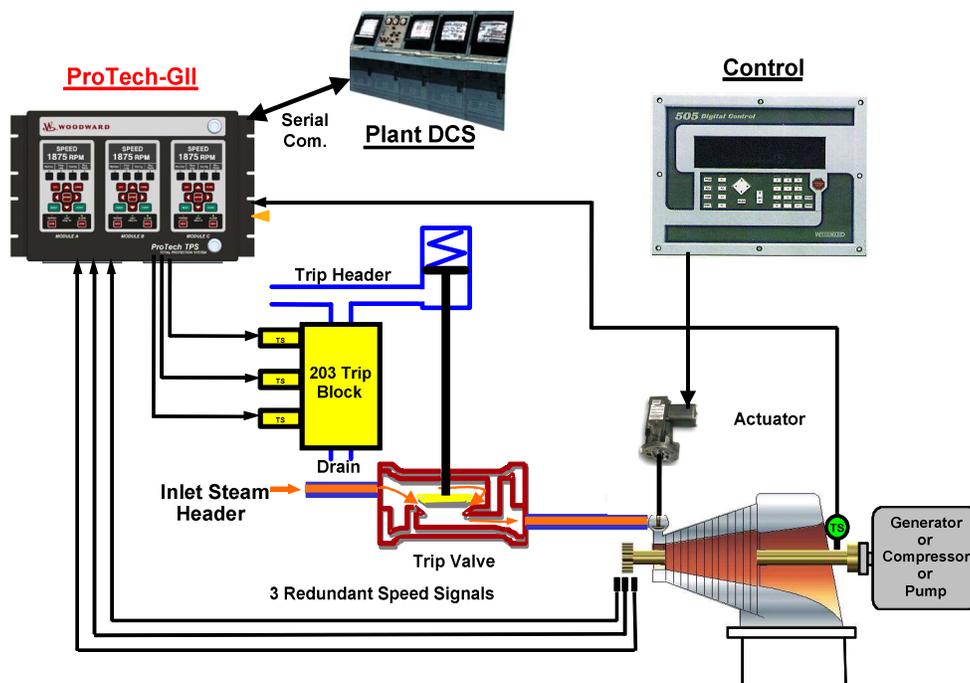
Figure 1-2. Typical ProTech-GII Application (Independent Trip Relay Models)
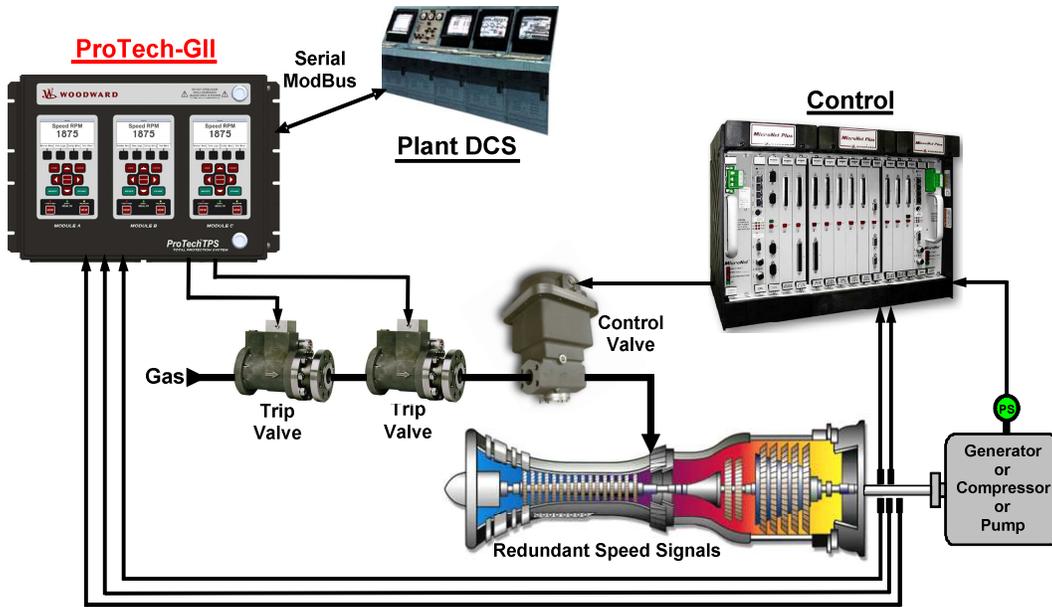
Figure 1-3. Typical Gas Turbine Application (Voted Trip Relay Models)

Chapter 2.
Installation

Introduction

This chapter provides instructions on how to mount and connect the ProTech-GII into a system. Hardware dimensions, ratings, and jumper configurations are given to allow a customer to mount, wire, and configure the ProTech-GII package to a specific application.

Electrical ratings, wiring requirements, and options are provided to allow for full integration of the ProTech-GII into a new or existing application.

Unpacking

Before opening the shipping packaging, inspect the shipping container for damage and document any damage.

Be careful when opening and removing the shipping container. You may retain the original shipping container for unit storage or return shipping for suggested refurbishment. (See Asset Management chapter for storage details.)

Be careful when unpacking the ProTech-GII system from the shipping container. The precautions called out in the Electrostatic Discharge Awareness section should be followed during unpacking, handling, installation and operation during maintenance.

Once removed from the shipping packaging, check the device for signs of damage such as a bent or dented case and loose or broken parts. If damage is found, notify the shipper immediately.

Hardware Installation Procedure

1. Read and understand this manual completely before proceeding.
2. Create a site specific wiring diagram by referencing included wiring diagrams and constraints. Then perform mechanical and electrical installation following this chapter's instructions.
3. Visual inspection
   a. Verify that all mounting hardware is tightened and that no wires are pinched.
   b. Verify that no wiring insulation is nicked or abraded.
   c. Verify that all terminal blocks are installed and terminal screws are tight. Follow control wiring instructions for all terminal blocks.
   d. If used, verify that speed sensors have been correctly installed, and have the correct clearance from the speed gear. Adjust if necessary. See manual 82510, Magnetic Pickups and Proximity Switches for Electronic Governors.
4. Apply power to each module, one at a time, and verify that each module boots up and its front panel screen displays turbine or equipment speed.

Enclosures

> **NOTICE**   Module identification is always from left to right, with module A on the left, module B in the center, and module C on the right. This applies to either the bulkhead-mount versions with the front cover open, or the panel-mount versions with the back cover removed.

Depending on the model purchased, the ProTech-GII has either a bulkhead-mounted or a panel-mounted enclosure package.

The bulkhead-mounted enclosure models are designed to be mounted on a wall or skid next to the turbine or equipment and are rated for IP56-based environments. With these models, field wiring access is through gland plates located on the bottom of the enclosure. Figures 2-1, 2-2, and 2-3 display the bulkhead-mounted ProTech-GII model's physical layout and mounting pattern.

The ProTech-GII panel-mounted enclosure models are designed for installation in a control room panel or cabinet and, by itself, cannot be bulkhead-mounted. Once installed within an IP56 rated panel or cabinet, the ProTech-GII panel-mounted models are rated for IP56-based environments. A gasket is attached to the rear side of the package's bezel to properly seal the ProTech-GII control's face-plate and around the mounting studs to a panel. With these models, field wiring access is located on the ProTech-GII control's back side, and a back cover is included to protect wiring terminals after installation. Figures 2-4 and 2-5 display the Panel-Mount ProTech-GII model's layout and mounting pattern.
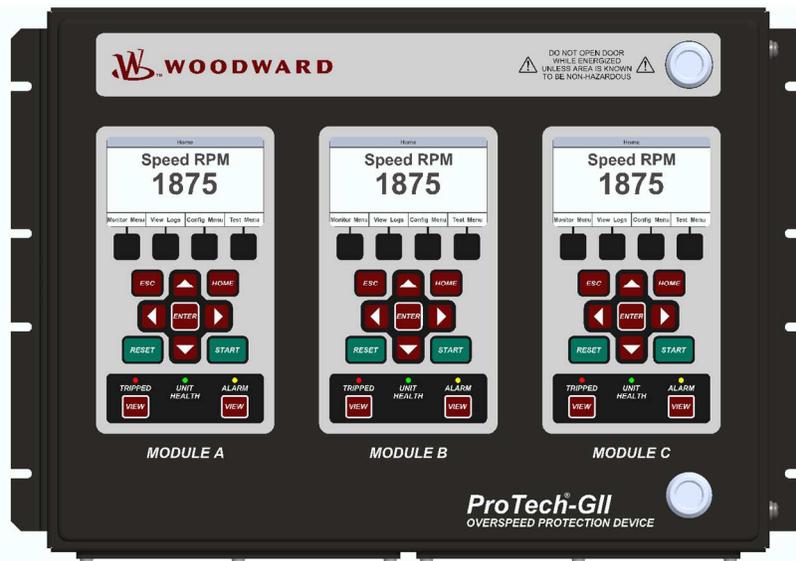
Figure 2-1. Typical ProTech-GII Bulkhead Package—Front View

Figure 2-2a. Typical ProTech-GII Bulkhead Package—Front Door Open
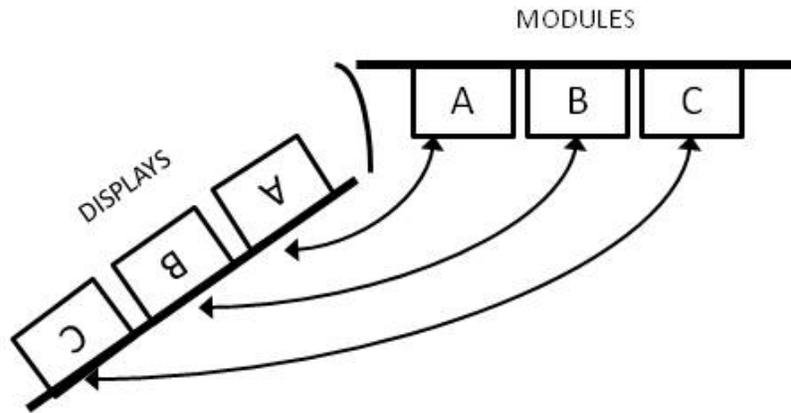
Figure 2-2b. Bulkhead Schematic Showing Front Panel A Connection to Module A
and Front Panel C Connection to Module C—Top View

Figure 2-3. Mounting Outline Diagram for Bulkhead-Mounted Models

Note: The outline drawings for the TPS and GII are identical. The TPS is shown for reference.

Module Removal and Installation—Bulkhead Mount Package

Follow this procedure for module removal and installation:

Removal:
1. Disconnect power from the module to be removed.
2. Verify power removed by observing power LED is OFF.
3. Remove terminal blocks from module terminals.
4. Loosen four module retention screws.
5. Remove module by pulling the two handles simultaneously.
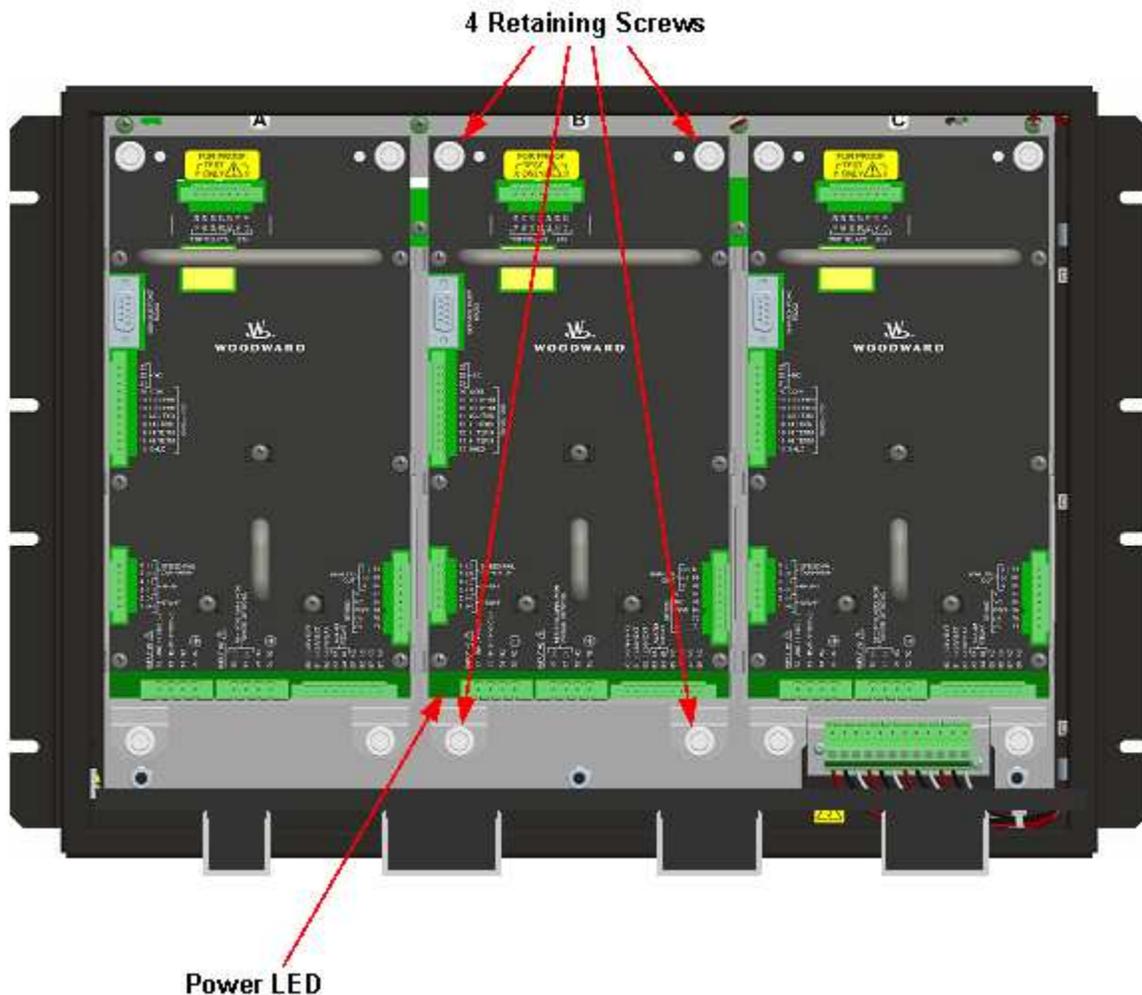
Installation:
1. Insert module into slot by pressing firmly on handles. The module has guides to assist in location.
2. Tighten four module retention screws.
3. Install terminal blocks.
4. Apply power and observe that the power LED is ON.
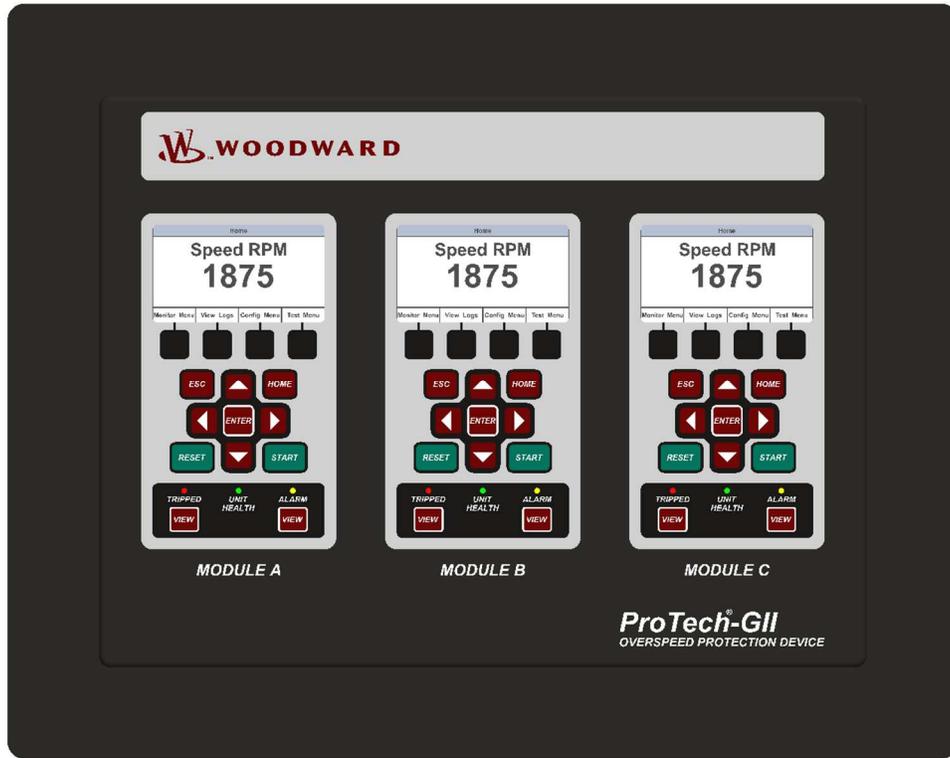
Figure 2-4a. Typical ProTech-GII Panel Mount Package—Front View
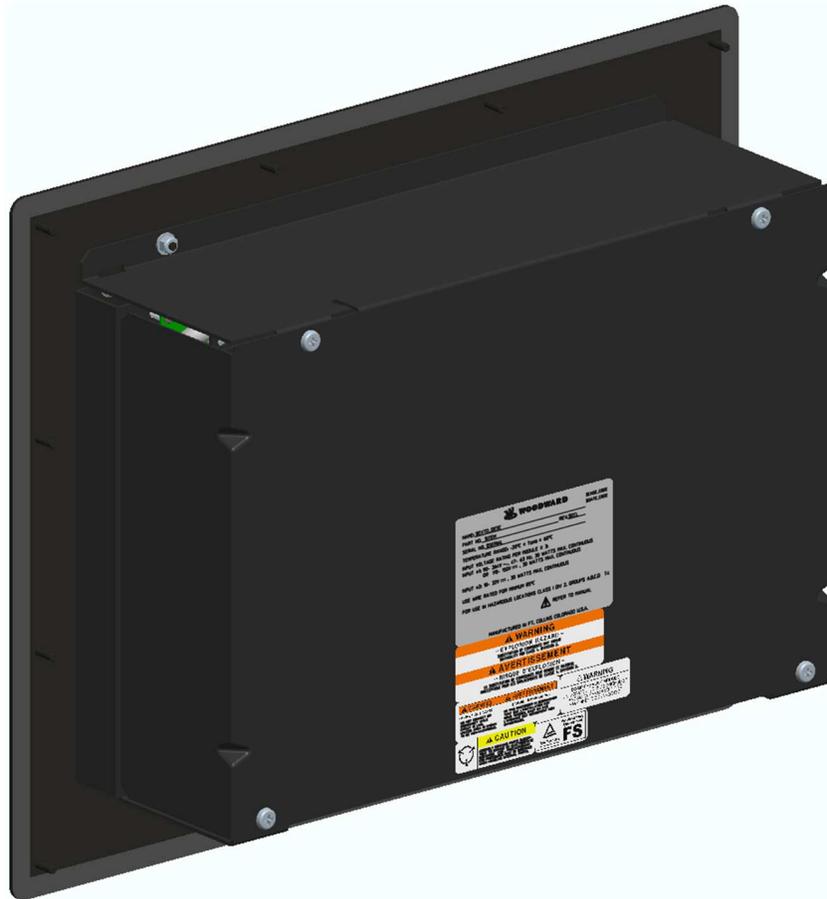
Figure 2-4b. Typical ProTech-GII Panel Mount Package—Rear View with Cover
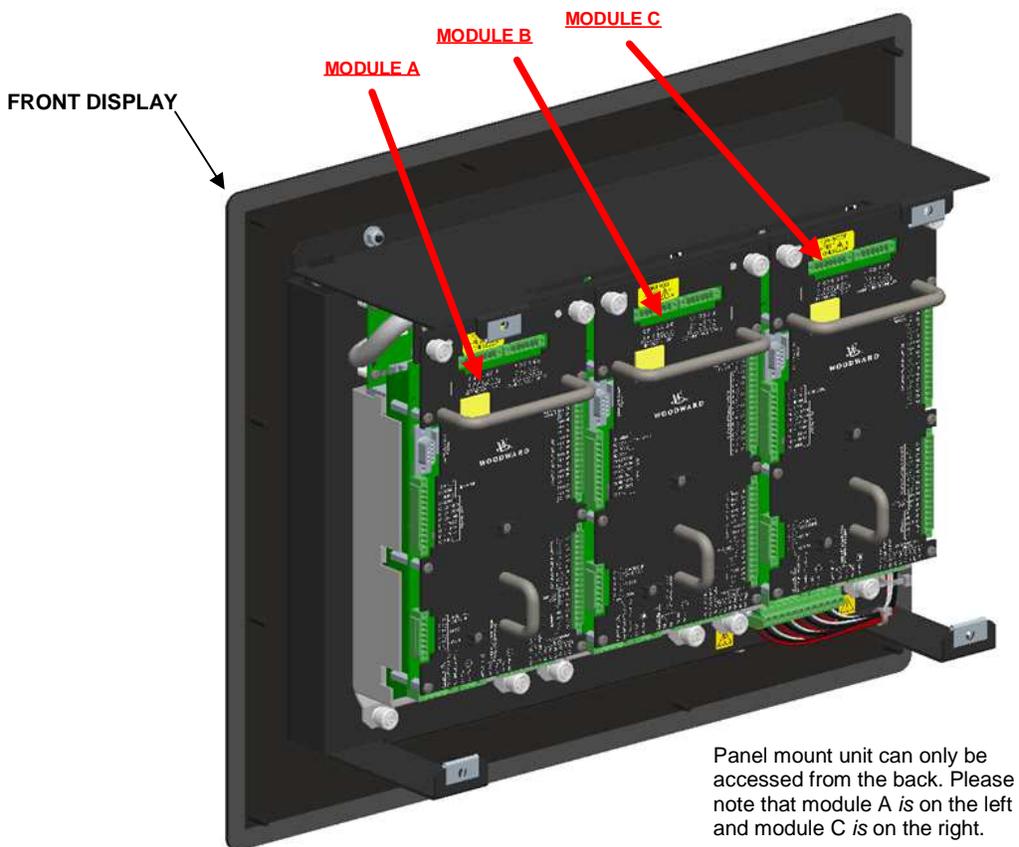
Figure 2-4c. Typical ProTech-GII Panel Mount Package—Rear View
without Cover Showing Module Orientation

FRONT DISPLAY

MODULE A

MODULE B

MODULE C

Panel mount unit can only be
accessed from the back. Please
note that module A *is* on the left
and module C *is* on the right.

NOTICE	Module identification is always from left to right, with module A on the left, module B in the center, and module C on the right. This applies to either the bulkhead-mount versions with the front cover open, or the panel-mount versions with the back cover removed.
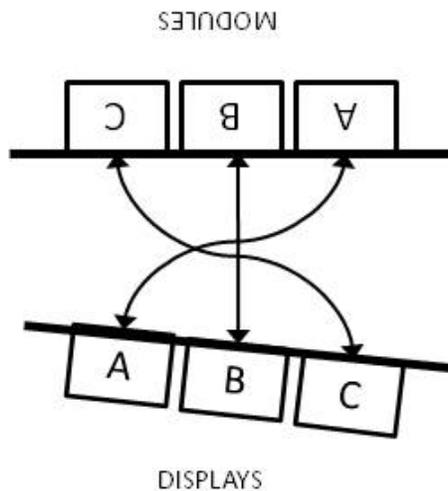
Figure 2-4d. Panel Mount Schematic Showing Front Panel A Connection to Module A and
Front Panel C Connection to Module C—Top View

Figure 2-5a. Mounting Outline Diagram for Panel-Mount Models
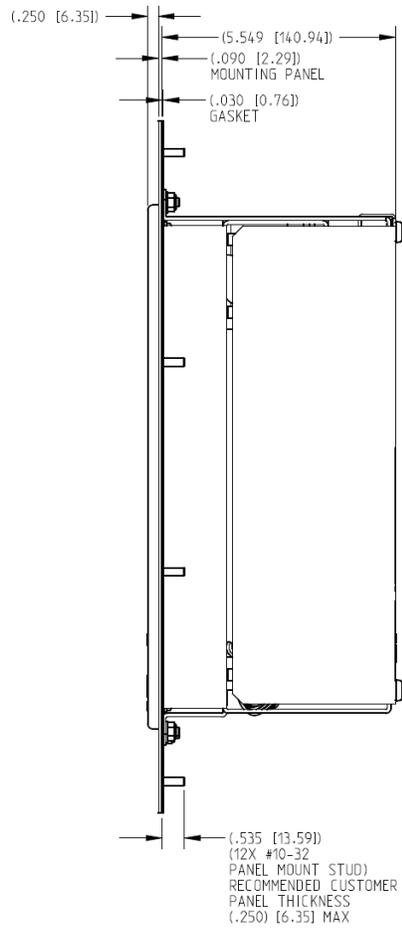
Figure 2-5b. Mounting Outline Diagram for Panel-Mount Models
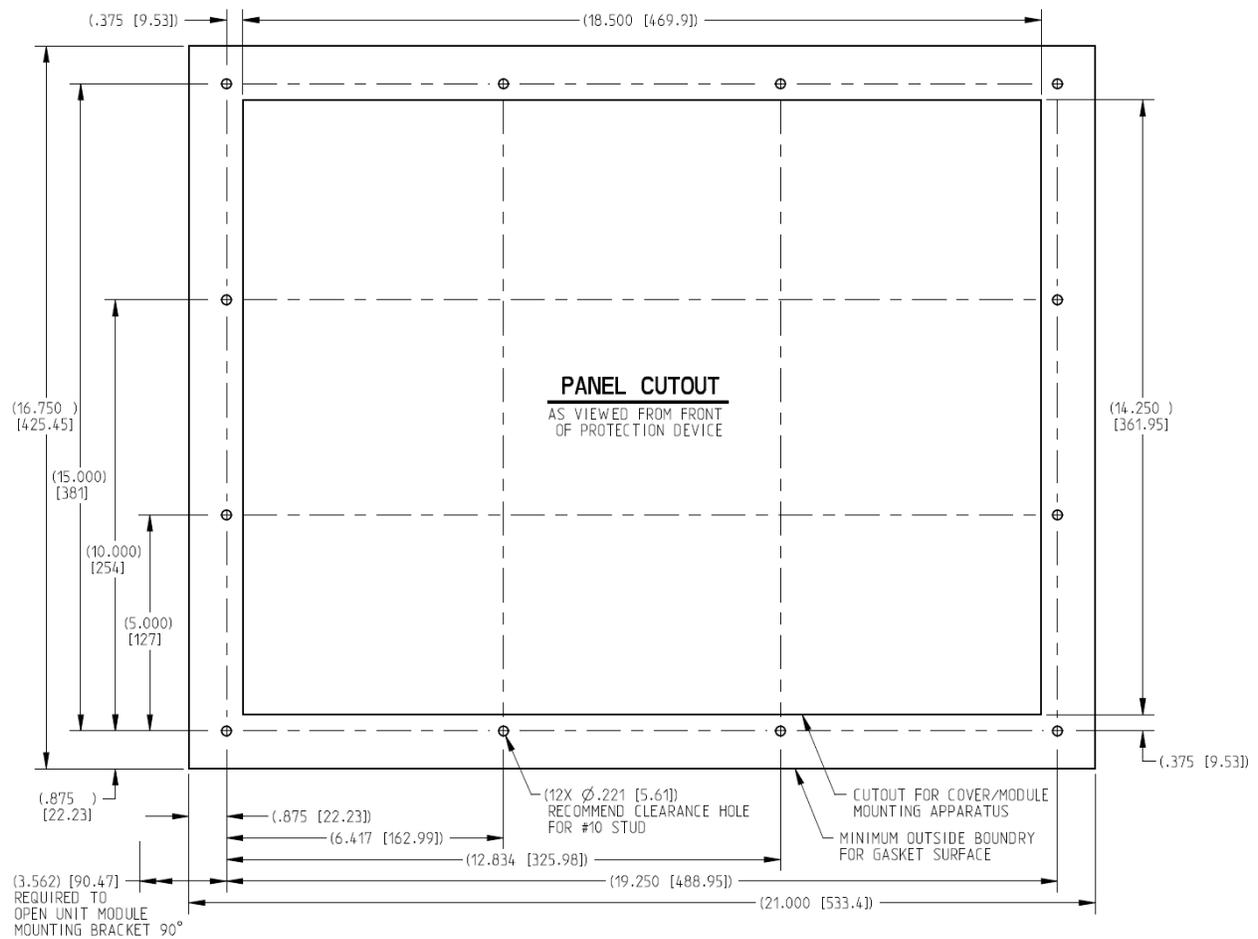
Figure 2-5c. Panel Cutout Diagram for Panel-Mount Models

Module Removal and Installation—Panel Mount Package

Follow this procedure for module removal and installation:

Removal:
1. Disconnect power from the module to be removed.
2. Remove 4 back panel retaining screws.
3. Remove back panel.
4. Verify power removed by observing power LED is OFF.
5. Remove terminal blocks from module terminals.
6. Loosen 4 module retaining screws.
7. Remove module by pulling the two handles simultaneously.
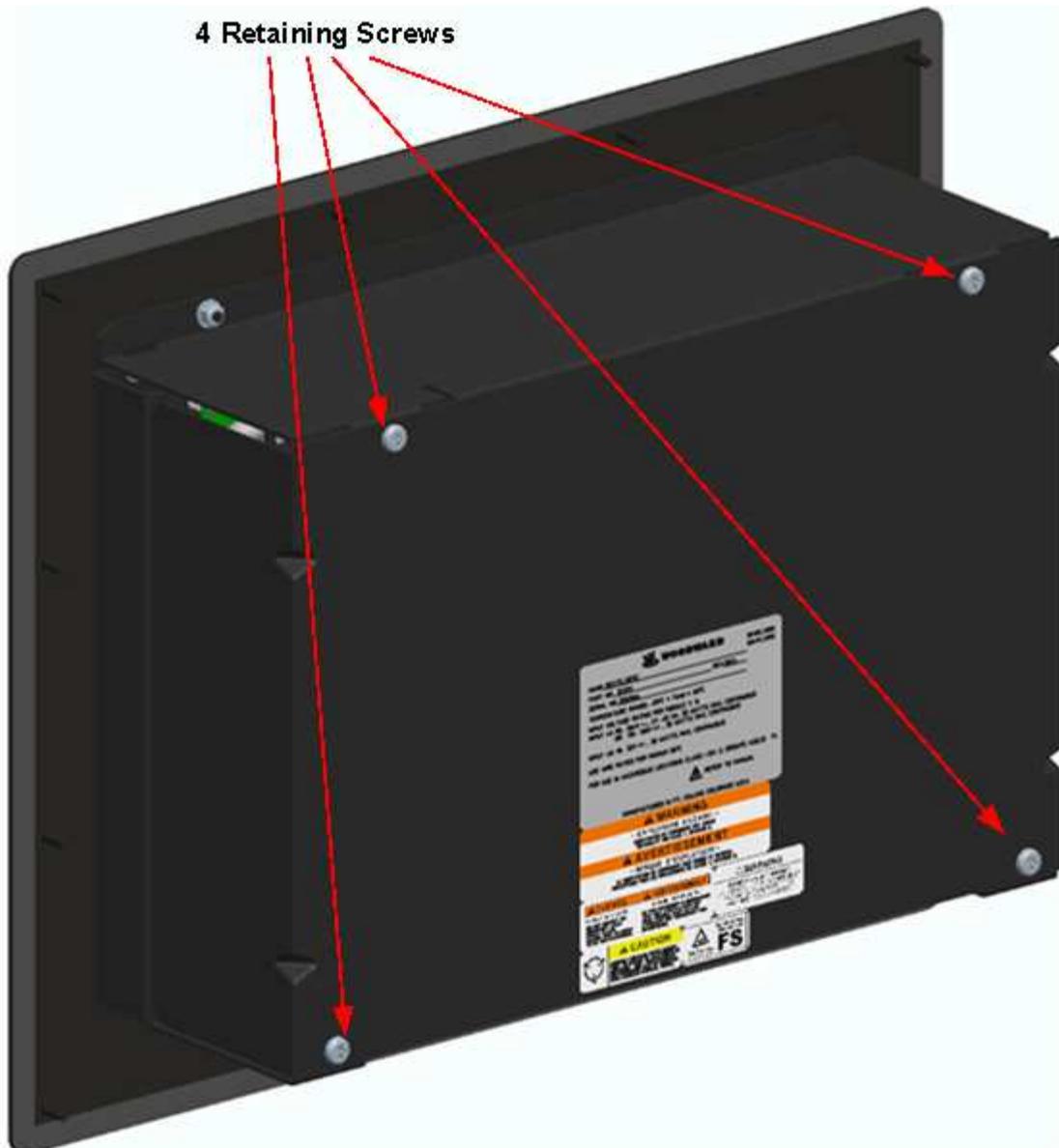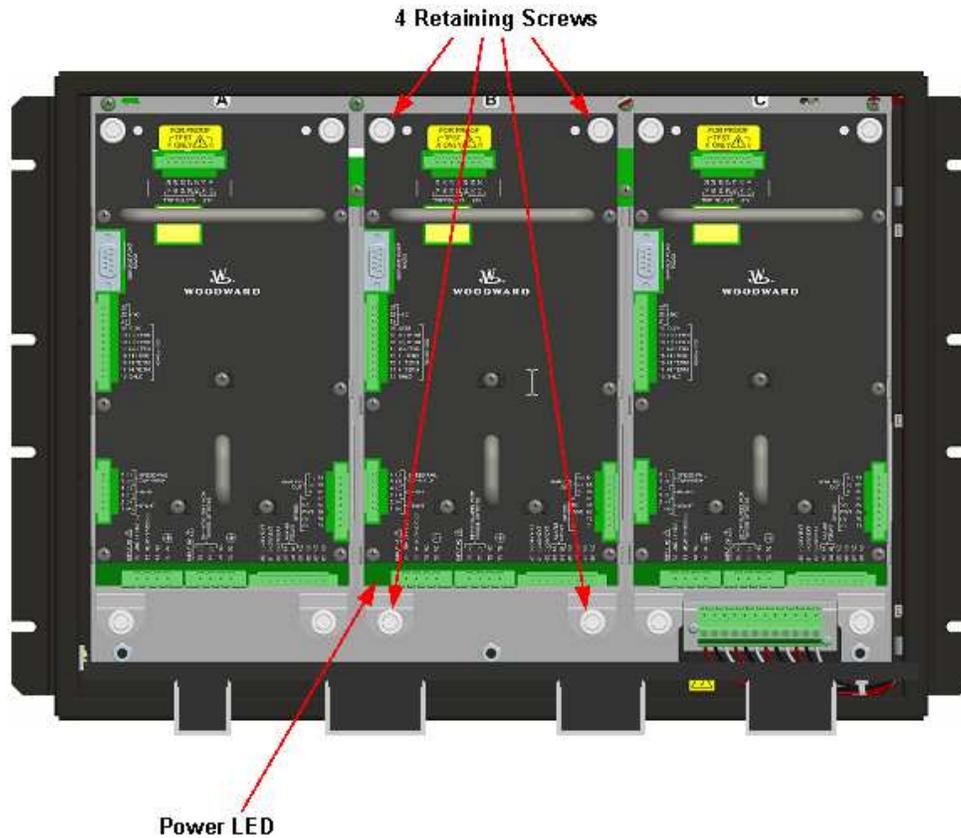
Installation:
1.   Insert module into slot by pressing firmly on handles. The module has guides to assist in location.
2.   Tighten 4 module retaining screws.
3.   Install back panel.
4.   Install 4 retaining screws.
5.   Install terminal blocks.
6.   Apply power and observe that the power LED is ON.

Mounting Location Considerations

Consider the following general requirements when selecting the mounting location:
- Adequate ventilation for cooling
- A location that will provide an operating temperature range of –20 to +60 °C (–4 to +140 °F)
- Space for opening & servicing
- Space for installing & removing panel mount covers
- Space for installing cable strain relief as needed
- Vertical orientation of the unit
- Protection from direct exposure to sunlight, water, or to a condensation-prone environments
- Protection from high-voltage or high-current devices which produce electromagnetic interference
- Avoidance of vibration
- A location that has H_2S and SO_2 gases at or below the levels classified in international standard IEC 721-3-3 1994 - environment Class 3C2
- Maximum purge pressure: 4 psi

Table 2-1. Environmental Specifications

Operating Temperature:	−20 to +60 °C (−4 to +140 °F)
Storage Temperature (non operational):	−20 to +65 °C (−4 to +158 °F)
Relative Humidity:	Up to 95% (non-condensing)
Vibration:	0.04 G^2/Hz, 1.04 Grms, 10 to 500 Hz
Shock:	30 G, 11 ms half-sine pulse
Altitude:	Up to 3000 meters above sea level
Enclosure (Bulkhead Mount Version):	IP56 (per IEC 60529)
Enclosure (Panel Mount Version):	IP56, installed in IP56 enclosure/cabinet
Weight (Bulkhead Mount Version):	Approximately 26 lb (12 kg)
Weight (Panel Mount Version):	Approximately 22 lb (10 kg)
Pollution Degree:	2 (per IEC 60664-1)
Overvoltage Category:	II (per IEC 60664-1)
Electromagnetic Compatibility:	Emissions: EN61000-6-4
	Immunity: EN61000-6-2

Power Supply Requirements

Each ProTech-GII system consists of three separate internal modules (A, B, C), and each of these three modules accept two input power sources. Depending on the ProTech-GII model purchased, the internal modules will accept either two high voltage (HV) input power sources or one HV input power source and one low voltage (LV) input power source. For reliability purposes, each ProTech-GII module will function normally with power sourced to either or both power supply inputs.

Power Supply Specifications

Table 2-2. Low Voltage Input Specifications

Number of Inputs	2. Input range depends on model (see following tables): • 2 High Voltage Inputs OR • 1 High Voltage and 1 Low Voltage
Wiring Constraints	Each power supply input must be provided with its own breaker. This is to facilitate both on-line-removal of a module, and also to protect other power supplies from tripping while connected to a common input power circuit.

High Voltage Input

Table 2-3. High Voltage Input Specifications

Voltage Input Range	90–264 Vac/47–63 Hz or 100–150 Vdc @ 30 W per module Nominal 115 Vac / 240 Vac / 125 Vdc
Current Input Max＊	0.5 A @ 90 Vac 0.22 A @ 264 Vac 0.25 Arms @ 110 Vdc 0.18 Arms @ 150 Vdc
Inrush Current	10 A at 115 Vac, 20 A @ 220 Vac
Reverse Polarity Protection	Yes, for DC connection
Interrupt Time	45 ms, when operating on one power supply only

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^{2}sec
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.

> **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)

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)

Shielded Wiring

All shielded cable must be twisted conductor pairs with either a foil or a braided shield. A braided shield is preferred and highly recommended. All analog and communication signal lines should be shielded to prevent picking up stray signals from adjacent equipment. Connect the shields as shown in the control wiring diagram (Figure 2-7). Wire exposed beyond the shield must not exceed 50 mm (2 inches). The shield termination should be done with the shield by opening the braid and pulling the wires through, not with an added wire. If a wire is used it must be the largest gauge accepted by the shield lug terminal. The other end of the shield must be left open or grounded through a capacitor and insulated from any other conductor. Do not run shielded signal wires with other wires carrying large currents or high voltages. See Woodward manual 50532, *EMI Control in Electronic Governing Systems*, for more information.

Installations with severe electromagnetic interference (EMI) may require relay and discrete input wiring to be shielded, conduits and/or double shielded wire may be needed, or other precautions may have to be taken. These additional precautions may be implemented in any installation. Contact Woodward for more information.

Control Wiring Guidelines

Electrical Connections

⚠️ **WARNING**	**EXPLOSION HAZARD—Do not connect or disconnect while circuit is live unless area is known to be non-hazardous.**

Plug-in screw-type terminal blocks are used to connect field wiring to each ProTech-GII module and to the trip (interposing) relay contacts.

The size of the field wiring to the ProTech system should be between 1.5 and 6 mm² (16 and 10 AWG) for power supply wiring and between 0.3 and 4 mm² (22 and 12 AWG) for all other I/O wiring. Wires for the all the pluggable I/O terminal blocks should be stripped at 8 mm (0.3 inch). Torque and screwdriver requirements are listed below.

IMPORTANT	**The screw lug terminal blocks are designed to flatten stranded wire. Do not tin (solder) the wire's strands that terminate at the ProTech Terminal Blocks. If the wire strands are soldered together, the solder will cold flow and shrink over time causing the connection to become intermittent or disconnected.**
	Woodward recommends the following for ProTech-GII: • **Stranded bare copper wire (unless gaseous Sulfur compounds are present) at the wire ends** • **Stranded copper wire with individually tin plated strands at the wire ends** • **Hollow ferrules at the wire ends** • **Use single wire per terminal. There are enough terminals provided for all I/O wiring**

Torque range for screws of Screw Connection Terminal Blocks: 0.22–0.25 N•m (1.95–2.21 lb-in).

Screwdriver blade: 0.4 X 2.5 mm (0.016 X 0.10 inch)
Screwdriver available as Woodward PN 8992-005

Figure 2-6. Screw Connection Terminal Block

The ProTech-GII control's terminal blocks are designed to be removed by hand.

With circuit power and trip (interposing) relay controlled power disconnected, all terminal blocks can be removed, one at a time by unscrewing their terminal-locking screws and pulling them out of their sockets by hand.

NOTICE	**When removing a terminal block, never pull on the wires connected to the terminal block.**

Field wiring access for bulkhead mounted models is through gland plates located on the bottom of the enclosure. These gland plates allow users to bore multiple and different sized access holes for conduit entry, as required. Refer to Figure
2-3 for gland plate location and size. For EMI (electromagnetic interference) reasons, Woodward recommends that all low-voltage field wiring be separated from all high-voltage field wiring by using separate conduit and conduit entries into the ProTech-GII enclosure. Woodward also recommends that power wiring be segregated in the same manner, however LV and HV input power may be routed together.

Field wiring access for panel-mounted models is located on the back of the ProTech-GII enclosure. To allow proper installation of the unit's back cover plate, Woodward recommends that all field wiring be routed from the bottom of the package. The units back cover must be installed. Refer to Figure 2-5 for field wiring access information. For EMI (electromagnetic interference) reasons, Woodward recommends that all low-voltage field wiring be separated from all high-voltage field wiring where possible. Woodward also recommends that power wiring be segregated in the same manner, however LV and HV input power may be routed together.

⚠WARNING	**HIGH VOLTAGE—When wiring to interposing relays, be sure to wire both contacts with the same polarity. Failure to do so will create a potential shock hazard, which could cause injury or death.**

IMPORTANT	**All input and output wiring must be in accordance with Class I Division 2 wiring methods, and in accordance with the authority having jurisdiction.**
	All peripheral equipment must be suitable for the location in which it is being used.

Figures 2-8 and 2-9 show the control wiring diagrams for the ProTech-GII system. Refer to Figure 2-10 for proper routing and stress relief of field wiring entering the ProTech-GII system. Wire tie-wrap fasteners are provided on each module to assist with I/O wire routing and installation.

IMPORTANT	**When wiring to each ProTech module, in order to allow hot replacement of a module in the event of a failure, it is important to make connections such that any single module's terminal blocks and power supplies can be completely disconnected without affecting the rest of the system.**
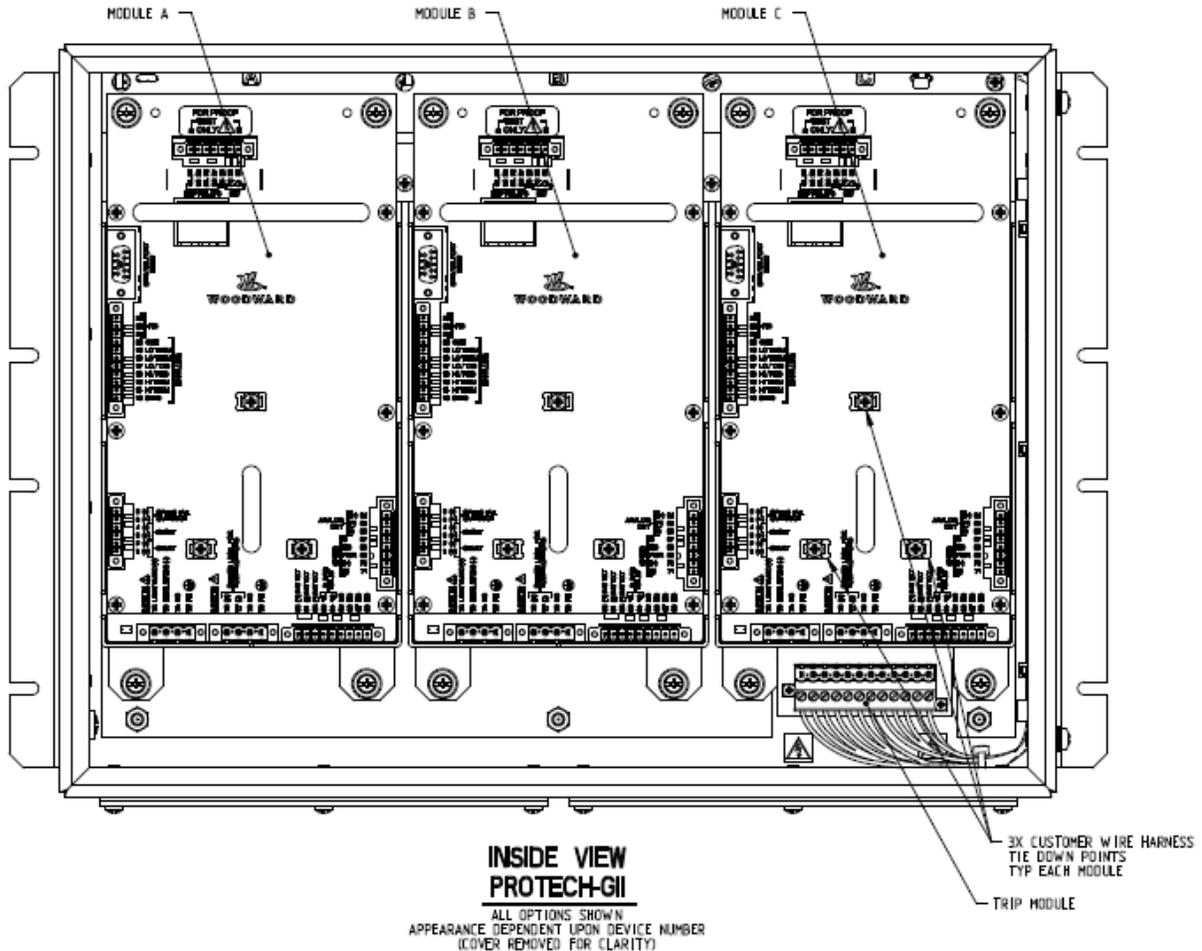
Figure 2-7. Inside View of ProTech-GII
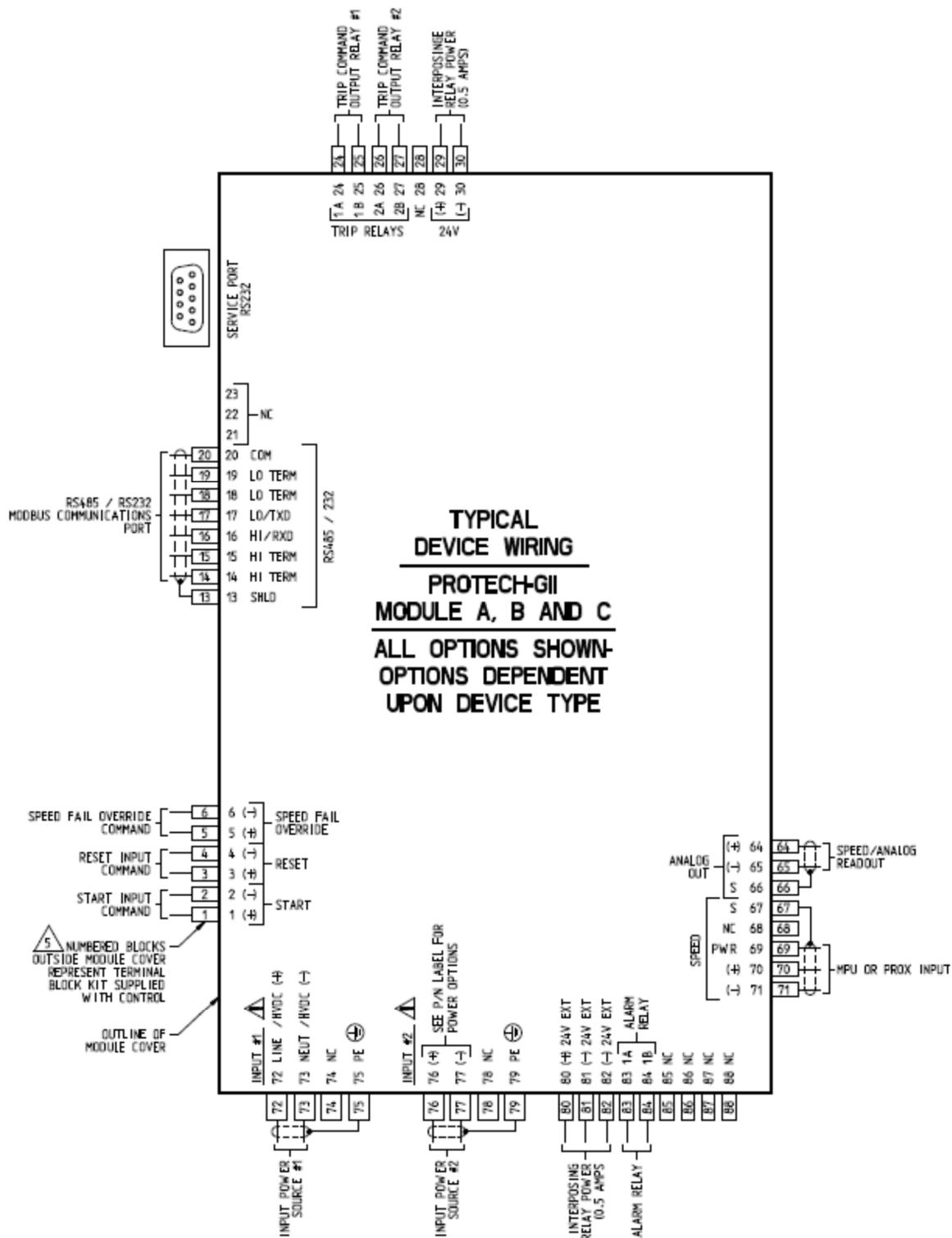
Figure 2-8. ProTech-GII Control Wiring Diagram
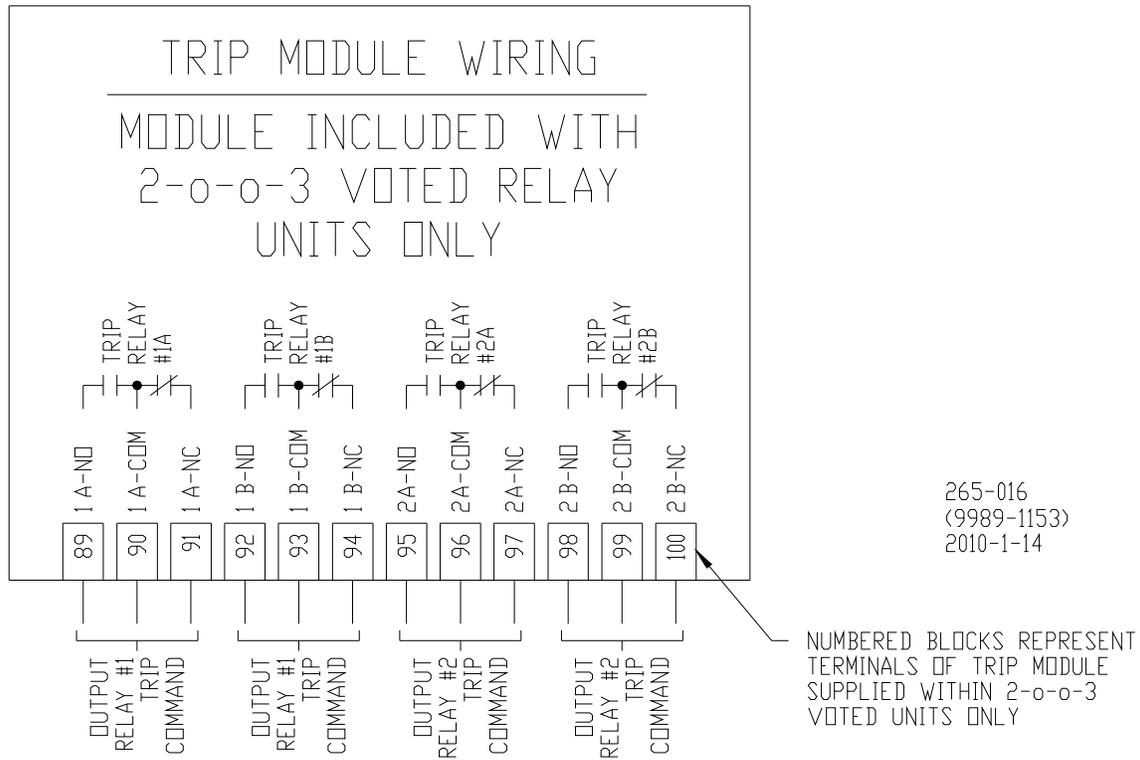
Figure 2-9. Trip Module – Included within Voted Trip Relay Units Only
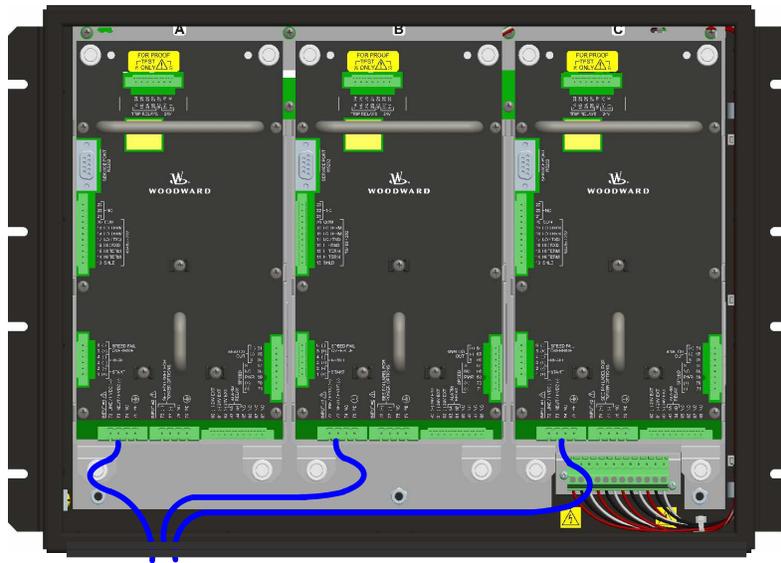
Figure 2-10. Power Supply Field Wiring Routing & Stress Relief Diagram
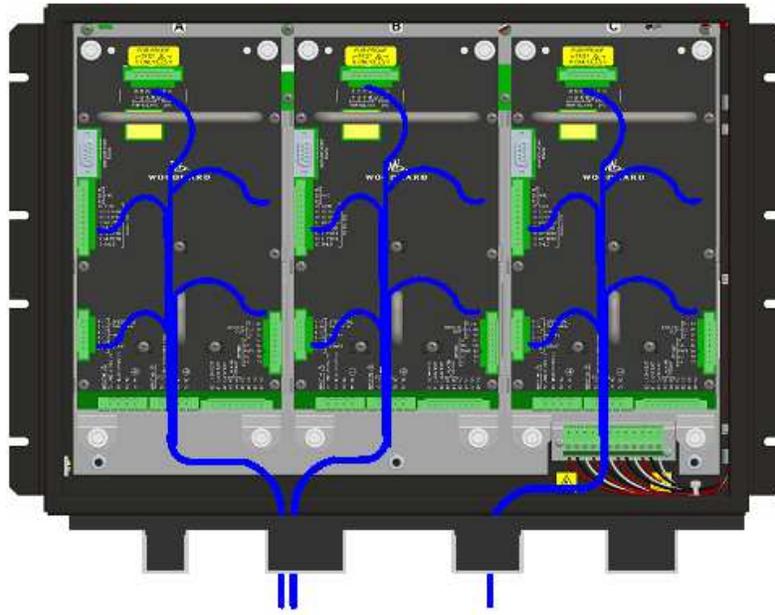
Figure 2-11. I/O Wiring Routing & Stress Relief Diagram
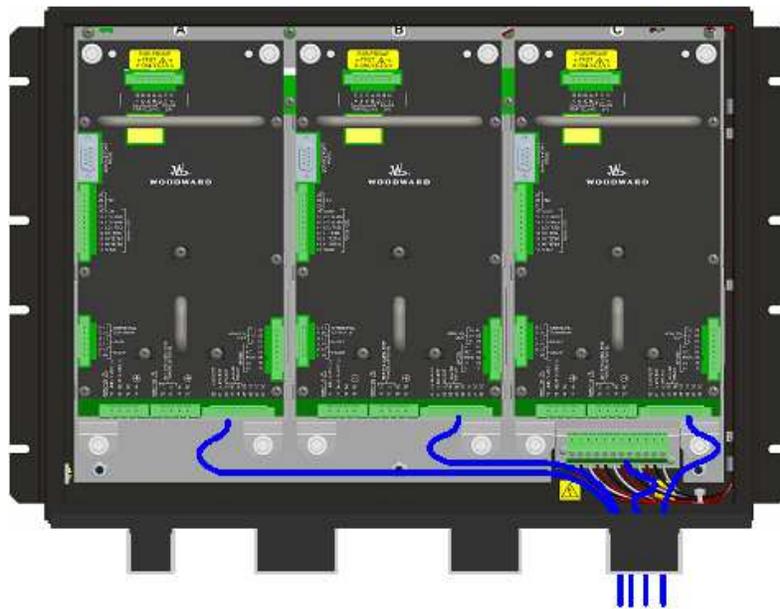
Figure 2-12. Relay Output Field Wiring Routing & Stress Relief Diagram

Speed Sensor Inputs

To sense speed, each ProTech-GII module (A, B, C) accepts a signal from a speed sensor mounted on a gear connected to the turbine rotor or engine crankshaft. Speed sensors may be any of the following:

- Passive magnetic pickup unit (MPU)
- Active proximity probe
- Eddy current probe

A passive MPU provides a frequency output signal corresponding to turbine or equipment speed by sensing the movement of a gear's teeth past the MPU's pole piece. The closer the MPU's pole piece is to a gear's teeth and the faster the gear turns, the higher a passive MPU's output amplitude will be (speed signal amplitude increases with speed increase or distance decrease). The ProTech-GII must sense an MPU voltage of 1 to 35 Vrms for proper operation. With the proper MPU, gear size, and MPU-to-gear clearance, speed measurement can range from 100 to 32 000 Hz. Standard MPU clearance is recommended to be 0.25 to 1.02 mm (0.010 to 0.040 inch) from tooth face to pole piece. For information on selecting the correct MPU or gear size please refer to Woodward manual 82510. Refer to Figure 2-11a of this manual for wiring information.

Proximity and eddy-current probes may be used to sense very low speeds to high speeds (0.5 to 25 000 Hz). The speed probe input voltage must be between 16 and 28 Vdc and output signal must meet Vlow and Vhigh threshold values specified in Table 2-4b for proper speed detection. The voltage for the speed probes must be from the provided voltage port or have its common referenced (connected) to the provided common pin for proper operation. See Figures 2-11b and 2-11c for proximity and eddy-current probe wiring schematics.

An application may use the same or different types of speed probes (MPU, proximity, eddy-current), between the three different inputs depending on the specific application's requirements.

> **IMPORTANT**
> Woodward does *NOT* recommend that gears mounted on an auxiliary shaft that is coupled to the turbine rotor be used to sense turbine speed. Auxiliary shafts tend to turn slower than the turbine rotor (reducing speed-sensing resolution) and have coupling gear back-lash, resulting in less than optimal speed sensing. For safety purposes, Woodward also does *NOT* recommend that the speed sensing device sense speed from a gear coupled to a generator or the mechanical drive side of a system's rotor coupling.
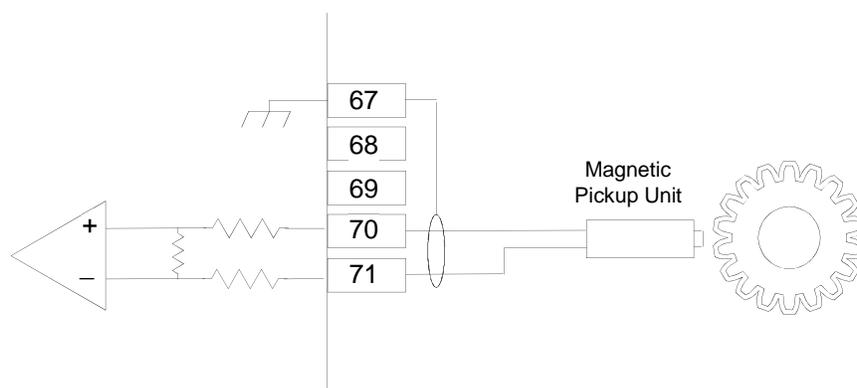
Figure 2-13. Example MPU (Passive Magnetic Pickup Unit) Wiring
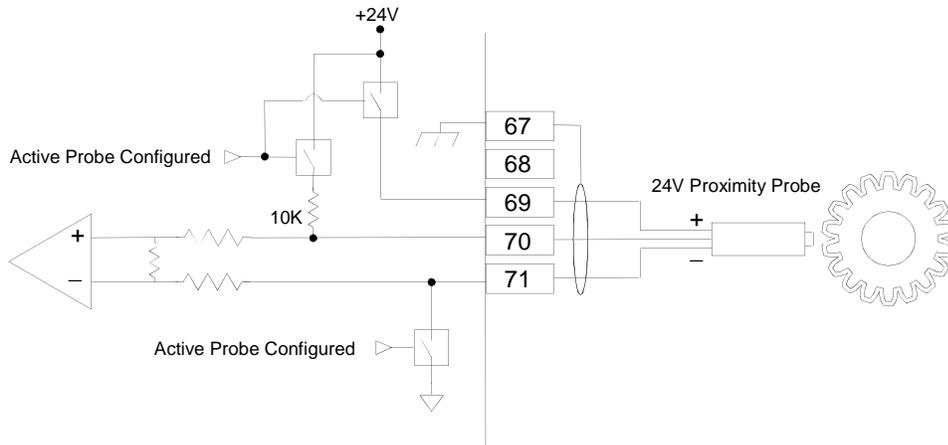
Figure 2-14. Example Proximity Probe (Active Magnetic Pickup Unit) Wiring (Internal Power)
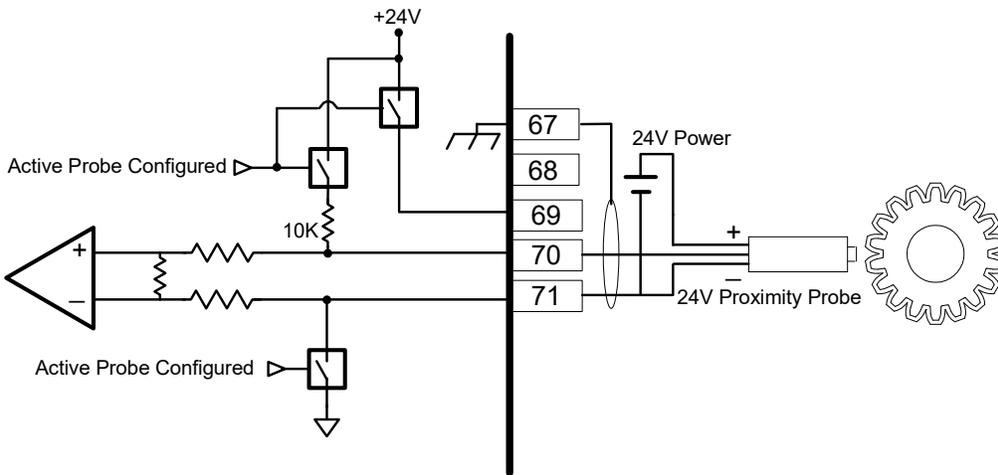
Figure 2-15. Example Proximity Probe (Active Magnetic Pickup Unit) Wiring (External Power, Non-preferred)
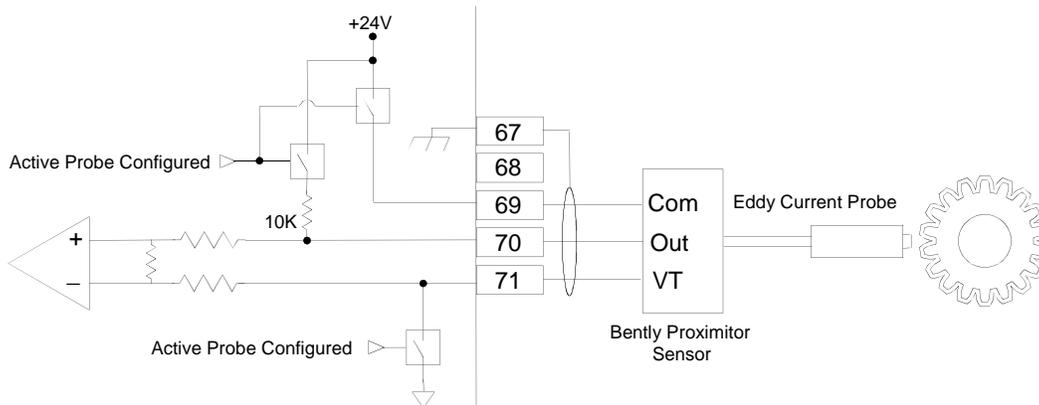
Figure 2-16. Example Eddy Current Probe (Active Magnetic Pickup Unit) Wiring

Dedicated Discrete Inputs

Each ProTech-GII module (A, B, C) accepts three dedicated discrete inputs. All discrete inputs accept dry contacts. Contact wetting voltage is available through terminals 1, 3, and 5 but an external +24 Vdc source can be used. Refer to Figure 2-12 for wiring information. In general, a contact input signal must change state for a minimum of 10 milliseconds for a ProTech-GII module to sense and register a change in state. The Dedicated Discrete Inputs are Start, Reset and Speed-Fail-Override. Refer to Chapter 3 (Functionality) of this manual for information on each discrete input's functionality.
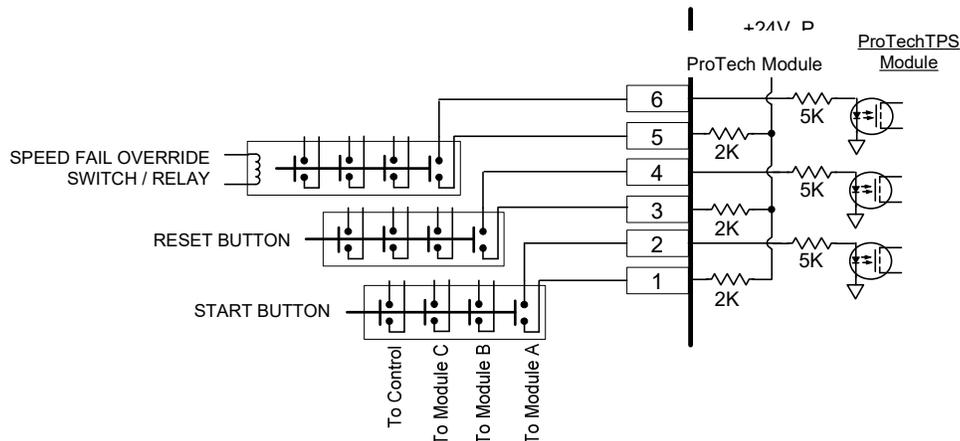
Figure 2-17. Example Standard Discrete Input Wiring (Internal Power Option)
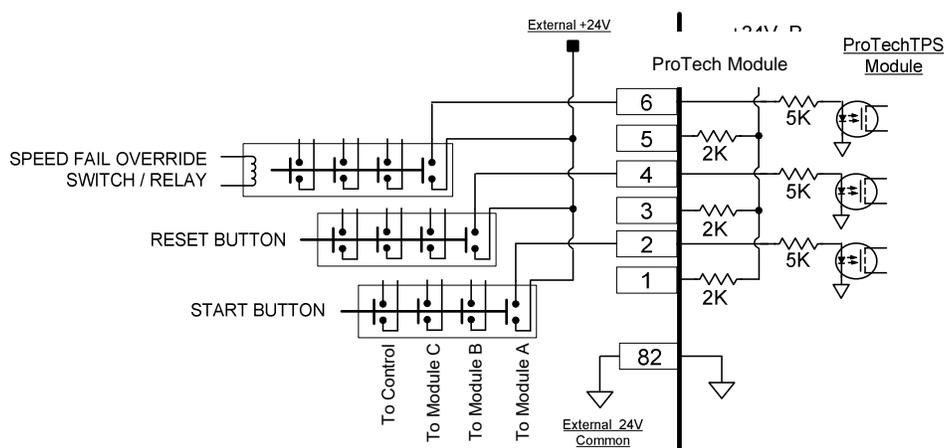
Figure 2-18. Example Standard Discrete Input Wiring (External Power Option)

Analog Output

One programmable 4–20 mA analog output per module (A, B, C) is available to drive a readout meter or interface with other controllers or plant DCS (distributed control systems). This output is designed to drive into an impedance between 0 and 500 Ω. Twisted shielded pair wiring must be used. Refer to Chapter 3 (Functionality) of this manual for information on how to program and use this analog output in an application.
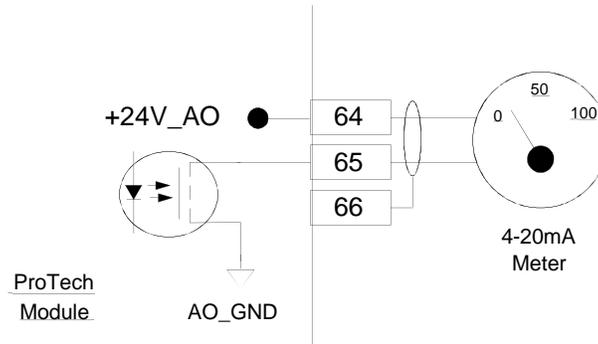
Figure 2-19. Example Analog Output Wiring

Relay Outputs

Two basic ProTech-GII model variations are available depending on the required trip system architecture: the "Independent Trip Relay" model and the "Voted Trip Relay" model. Either version also has 3 programmable Relay Outputs per module. Refer to Figure 2-16a for the general locations for Trip Relay Output wiring in the two models.

IMPORTANT	**Optionally all ProTech-GII models can be configured for de-energize-to-trip or energize-to-trip functionality based on the application action required. However, de-energize to trip is a safer way to fail so that a total power loss to the control will trip a shut down.**
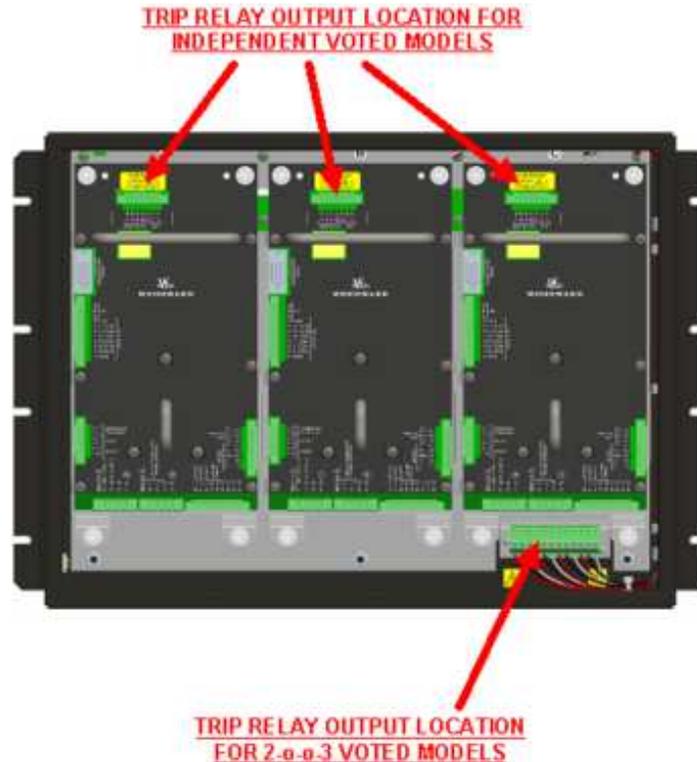
Figure 2-20. Example Trip Relay Output Wiring

Refer to Chapter 3 (Functionality) of this manual for all applicable relay output specifications and for information on how to configure and use each programmable relay output in an application.

Relay Outputs (Independent Trip Relay)

Each ProTech-GII "Independent Trip Relay" model has three independent modules (A, B, C), and each of these modules has three solid-state relay outputs. Each of the three solid-state relays have normally-open type contacts and are rated for 24 Vdc @ 1 A. Two of these relay outputs are dedicated as redundant trip signal outputs, and the third is the Alarm relay. The Independent Trip Relay ProTech-GII models are designed so the each set of trip relays drive one of three external independent trip solenoids, typically used in 2-o-o-3 voted trip block assemblies. Refer to Figure 2-16a for relay terminal location and Figure 2-14b or 2-14c for wiring information.
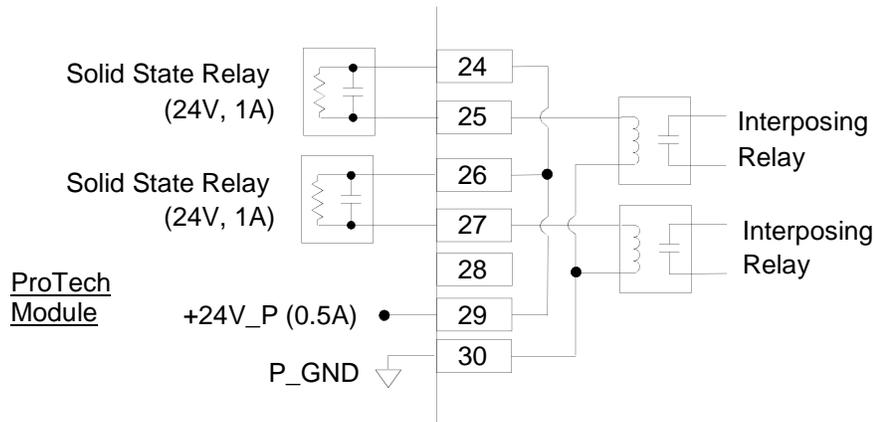
Figure 2-21. Example Trip Relay Wiring (per Module)
(Independent Trip Relay) (Internal Supply)
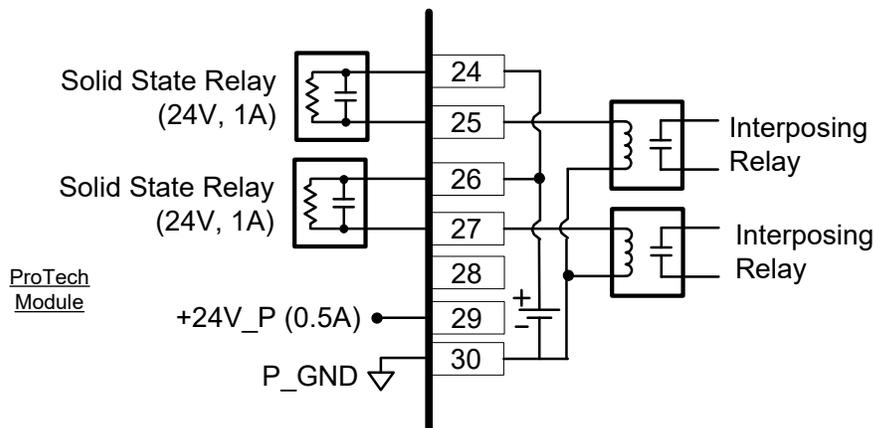
Figure 2-22. Example Trip Relay Wiring (per Module)
(Independent Trip Relay) (External Supply)

Relay Outputs (Voted Trip Relay)

Each "Voted Trip Relay" ProTech-GII model has three independent modules (A, B, C), and each of these modules has three solid-state relay outputs. Each of the three solid-state relays have normally-open type contacts and are rated for 24 Vdc @ 1 A. Two of these relay outputs are dedicated as redundant trip signal outputs, and the output is the alarm relay. Note that, with the "Voted Trip Relay" ProTech-GII models, the two solid-state trip relays located on each module (A, B, C) are not available for use or connection. Each module's trip signal relays are connected internally to the ProTech-GII in a 2-o-o-3 voted fashion to drive two redundant Form-C trip relays. These two redundant have normally-open and normally closed output contacts rated for 220 Vac @ 8 A or 24 Vdc @ 8 A. Refer to Figure 2-14a for relay terminal location and Figure 2-14d for wiring information.
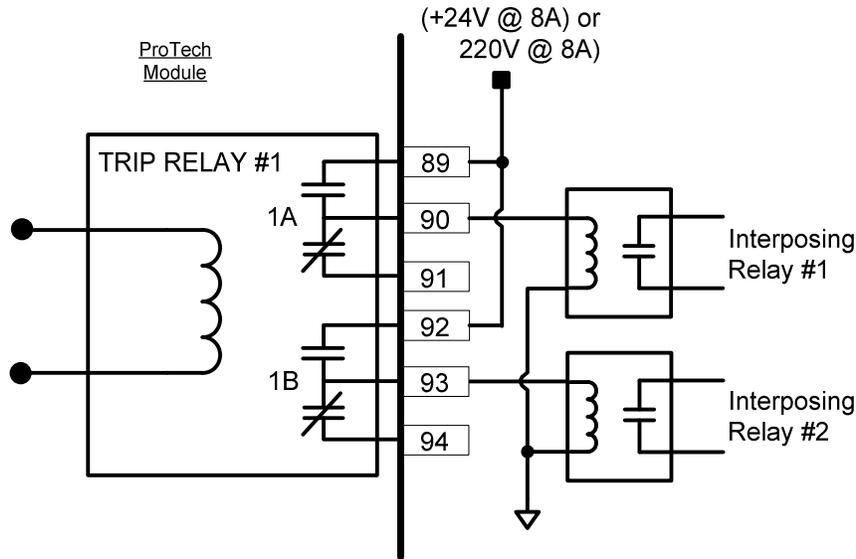
Figure 2-23. Example Trip Relay Wiring (Voted Trip Relay Models)

Alarm Relay Output

In both the Independent and Voted Trip Relay versions, each of the three modules (A, B, C) has an alarm output. The alarm relay output has normally-open type contacts and is rated for 24 Vdc @ 1 A. Refer to Figure 2-14e or 2-14f for wiring information.
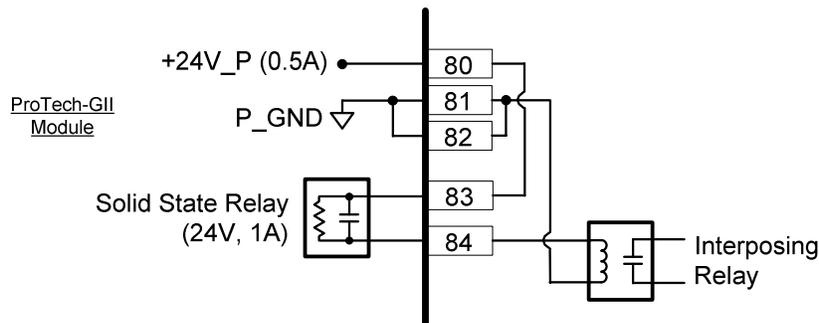
Figure 2-24. Example Alarm Relay Wiring (Internal Supply)
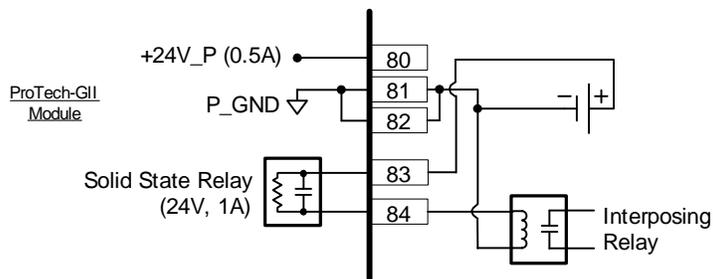
Figure 2-25. Example Alarm Relay Wiring (External Supply)

Internal Power Supplies for Discrete Signals

One internal 24 V power supply is available within each ProTech-GII module for driving external relay coils. The power supply utilizes an internal circuit shutdown to protect the power supply from over-current conditions.

The power supply channel (+24 V_P) is capable of providing 24 Vdc ±10% @ 500 mA maximum output current, to power external relays. This supply is used for relay coils driven by the Independent Trip Relay signals and the Alarm Relay. Independent Trip Relay signal connections can be made through terminals 29 and 30 with terminal 30 as common. Coil Voltage for the Alarm Relay is on terminals 80, 81, and 82 with terminals 81 and 82 as the commons. Refer to Figure 2-17 for wiring information.

NOTICE	**In the Independent Trip Relay models, if total current draw through terminals 30 and 80 exceeds 500 mA the power supply's internal breaker will open. Upon such a condition, all load must be removed from the specified terminals to allow this breaker to reset.** **In Voted Trip Relay models, if the total current draw through Terminals 80 exceeds 500 mA the power supply's internal breaker will open. Upon such a condition, all load must be removed from the specified terminals to allow this breaker to reset.**

If additional current capability is needed the Voter and Alarm relay connection points may be used as controlled switch contact connection points with an external power supply. An external supply may be used instead of the *internal supply only for the independent trip relays or alarm relay as* shown in Figure 2-14f. The external supply common should be referenced to terminal 80 or 81.

NOTICE	**In the Independent Trip Relay models, if an external supply is used for coil voltage, it must not have a reference connection to the 24 V EXT supply or Discrete Supply. Referencing input power to DISCRETE PWR or 24 V EXT causes the internal supplies to respond more readily to transients on the power bus.**
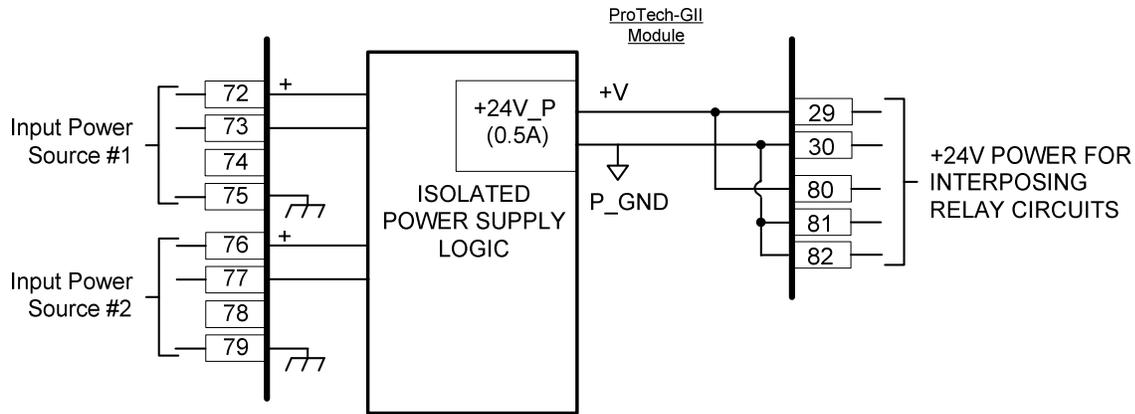
Figure 2-26. Power Supply Relationship Diagram

Serial Modbus Communications

One serial communications port per module (A, B, C) is available for Modbus communication to a plant DCS (distributed control system) or local HMI (human machine interface). This serial port can be wired and configured for RS-232 or RS-485 communications, depending on the specific application requirements. Refer to Figure 2-18a for RS-232 wiring information and to Figure 2-16b for RS-485 wiring information.

Note: only 2-Wire communications is supported.
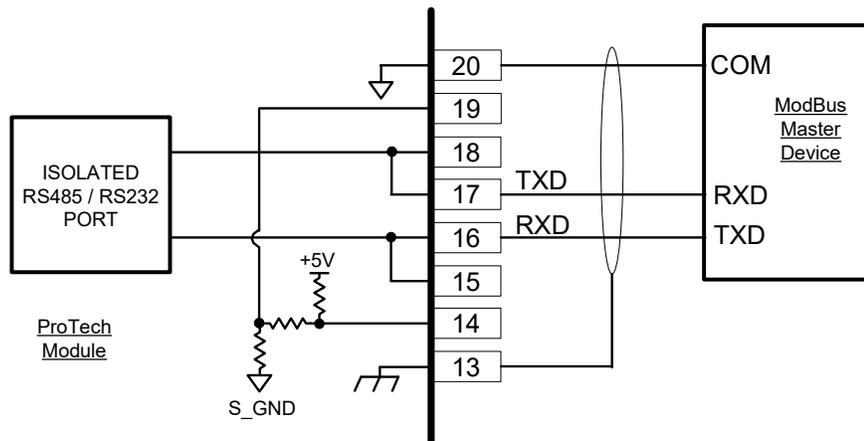
Figure 2-27. Serial Port Interface Diagram—RS-232

Optional termination resistors for RS-485 communication networks are included within the ProTech-GII control's internal circuitry, and only require terminal block wire jumper(s) for connection to a network, for applications requiring these termination resistors. Refer to Figure 2-18b for jumper connections.
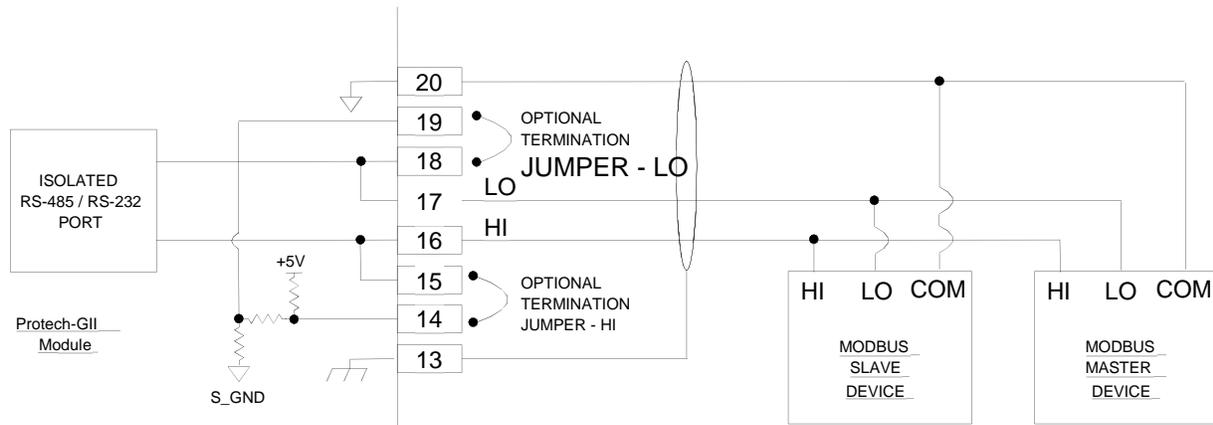
Figure 2-28. Serial Com Port Interface Diagram—RS-485

Service Port Communications

One 9-pin Sub-D based service port per module (A, B, C) is available to interface with a computer for loading program settings and reading stored log files from the ProTech using the Programming and Configuration Tool (PCT). This port is designed to communicate to the computer using a serial DB9 extension (straight-through) type of computer cable.
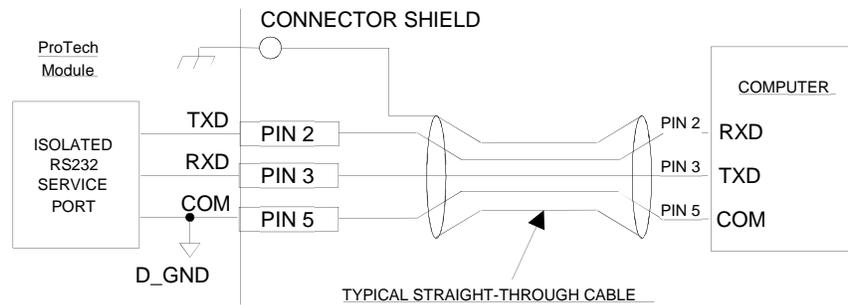
Figure 2-29. Programming and Configuration Tool Cable/Interface Diagram

IMPORTANT	**The RS-232 serial cable must be disconnected when not in use. The port is a service port only. It is not designed for permanent connection.**

Chapter 3.
Functionality

The ProTech-GII includes all the functionality of the original ProTech 203 Overspeed Protection system, but adds additional communications, protection features, and test modes.

Features

Fault Tolerant Design
Each ProTech-GII consists of three independent modules referred to as A, B and C. Each module accepts one speed input and three dedicated-function discrete inputs. Each module also has one alarm relay output and one analog output for the sensed speed output.

The ProTech-GII comes in two basic models – the "Independent Trip Relay" models and the "Voted Trip Relay" models. This relates to the trip signal configuration. The differences between these two models and their application are discussed in detail in the Product Models section of this chapter. Each of the three ProTech-GII modules A, B, and C are fully fault isolated from each other so that faults in one module do not affect other modules. The modules do not share input or output information but each module is aware of the status of the others.

Normally, each module is configured to operate with identical configuration settings. Monitoring logic is used to confirm that all modules are running the same exact configuration as the other modules and will issue an alarm if it detects that one or more of the modules are not running identical configurations. Thus if a change to configuration setting is made to one module while the ProTech-GII is in normal operation and the turbine or equipment is on-line and operating normally, each module will issue an alarm. Once all configuration settings are the same again, this alarm can be reset.

In special cases that require a different configuration to be installed in each module, the Configuration Compare alarm can be disabled.

The ProTech-GII is a SIL-3 (according to IEC-61508) triple modular design that allows users to replace any of its modules (A, B, C) while the monitored turbine or equipment is on-line and operating normally. This is also referred to as 'hot replacement.' Ease of replacement is enhanced by the unit's backplane plug-and-operate structure and its module-to-module program copying function.

Configuring Overview
Each ProTech-GII module includes preset overspeed, over-acceleration, alarm latch, and trip latch functionality and can be custom configured to meet a specific application through a module's front panel or the provided Programming and Configuration Tool (PCT).

A software-based PCT is included with each ProTech-GII that can be loaded onto a computer, and used to:
- Change overspeed and over-acceleration functionality settings
- Save configuration settings to a file
- Upload configuration settings to each ProTech-GII module
- Download configuration settings from a ProTech-GII module
- Download and view stored logged files from a ProTech-GII module

Configuration changes are allowed while the PCT is connected (on-line) as long as the module is in a tripped state. Configuration changes can also be made off-line (PCT not connected) by editing a settings file that is loaded into the module later. Normally, each ProTech-GII module is configured to operate the same exact configuration settings. Program differences between modules are detected and alarmed.

The overspeed and over-acceleration functionality can be programmed from either the PCT or a module's front panel. Entry of the correct "configuration" level password is required to perform any program changes or download a program into a module.

Refer to Chapters 9 and 10 of this manual for more information on performing program changes.

IMPORTANT   The logic unit requires that it be in the tripped state in order to change the configuration.

Security
The ProTech-GII utilizes two password levels, a Test Level Password and a Config Level Password. The same passwords are used by the Programming and Configuration Tool (PCT) and Front Panel.

The Test Level Password is required to:
- Initiate tests
- Reset logs (except for the Peak Speed/Acceleration Log)
- Change the Test Level Password

The Config Level Password provides access to any function that requires the Test Level Password. Additionally, the Config Level Password is required to:
- Change any program setting
- Download configuration settings file into a module using the PCT
- Reset the Peak Speed/Acceleration Log.
- Change the Config Level Password

Each of these passwords meets NERC (North American Electric Reliability Corporation) cyber security requirements.

The default password for Test and Config Level is "AAAAAA".

Module-to-Module Communications
An isolated communications bus is used between modules to:
- Copy a configuration setting from one module to another module
- Compare module configuration settings for differences
- Verify the health and state of the other modules before allowing a module test to be performed
- Pass a "module test token" between modules when performing a "Periodic Overspeed Test" routine

Product Models

Two basic ProTech-GII models are available depending on the required system architecture and related output signal(s).
- The ProTech-GII "Independent Trip Relay" models consist of three independent modules. Each accepts one speed input and outputs two redundant trip commands.
- The ProTech-GII "Voted Trip Relay" models consist of three independent modules. Each accepts one speed input, and the trip output commands are then voted in a 2-out-of-3 fashion to create the 2-out-of-3 trip output command from the entire ProTech unit.

Both of these models can be purchased with different mounting options (bulkhead mount or panel mount) and different input power supply options (two high-voltage power supply inputs or one high-voltage and one low-voltage power supply input). Each ProTech-GII model can be configured to function for energize-to-trip and de-energize-to-trip applications. The de-energize-to-trip functionality is implemented such that a complete loss of power to the module results in a trip of that module. The energize-to-trip functionality is implemented such that a complete loss of power to the module does not result in a trip of that module.

IMPORTANT	Optionally all ProTech-GII models can be configured for de-energize-to-trip or energize-to-trip functionality based on the application action required. However, de-energize to trip is a safer way to fail so that a total power loss to the control will trip a shut down.

ProTech-GII with "Independent Trip Relay" Outputs

ProTech-GII "Independent Trip Relay" models consist of three independent modules. Each accepts one speed input and outputs two redundant trip commands. The trip command outputs are electrically separated, allowing each module to actuate a separate external relay or trip solenoid. These models are typically used with special 2-out-of-3 voted trip block assemblies or 2-out-of-3 voted trip string relay logic.
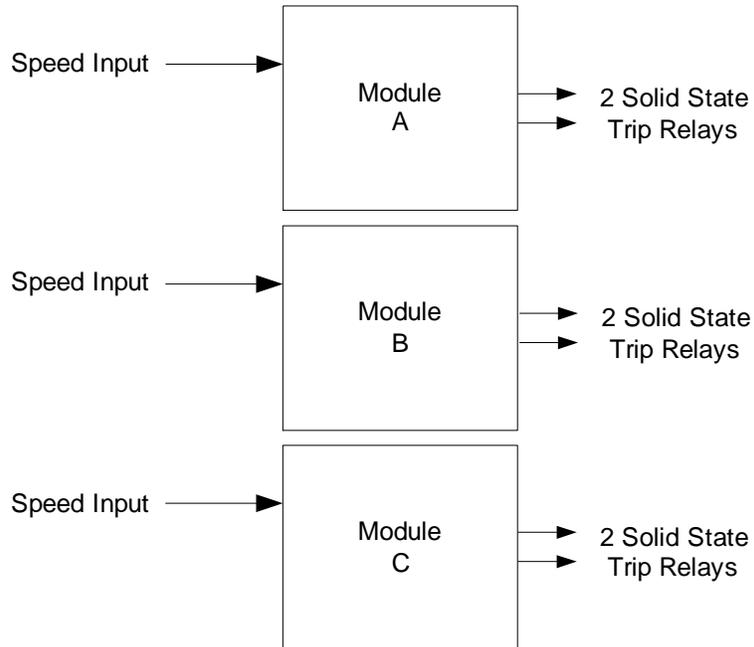
Figure 3-1. Basic Functional Overview of Independent Trip Relay Models
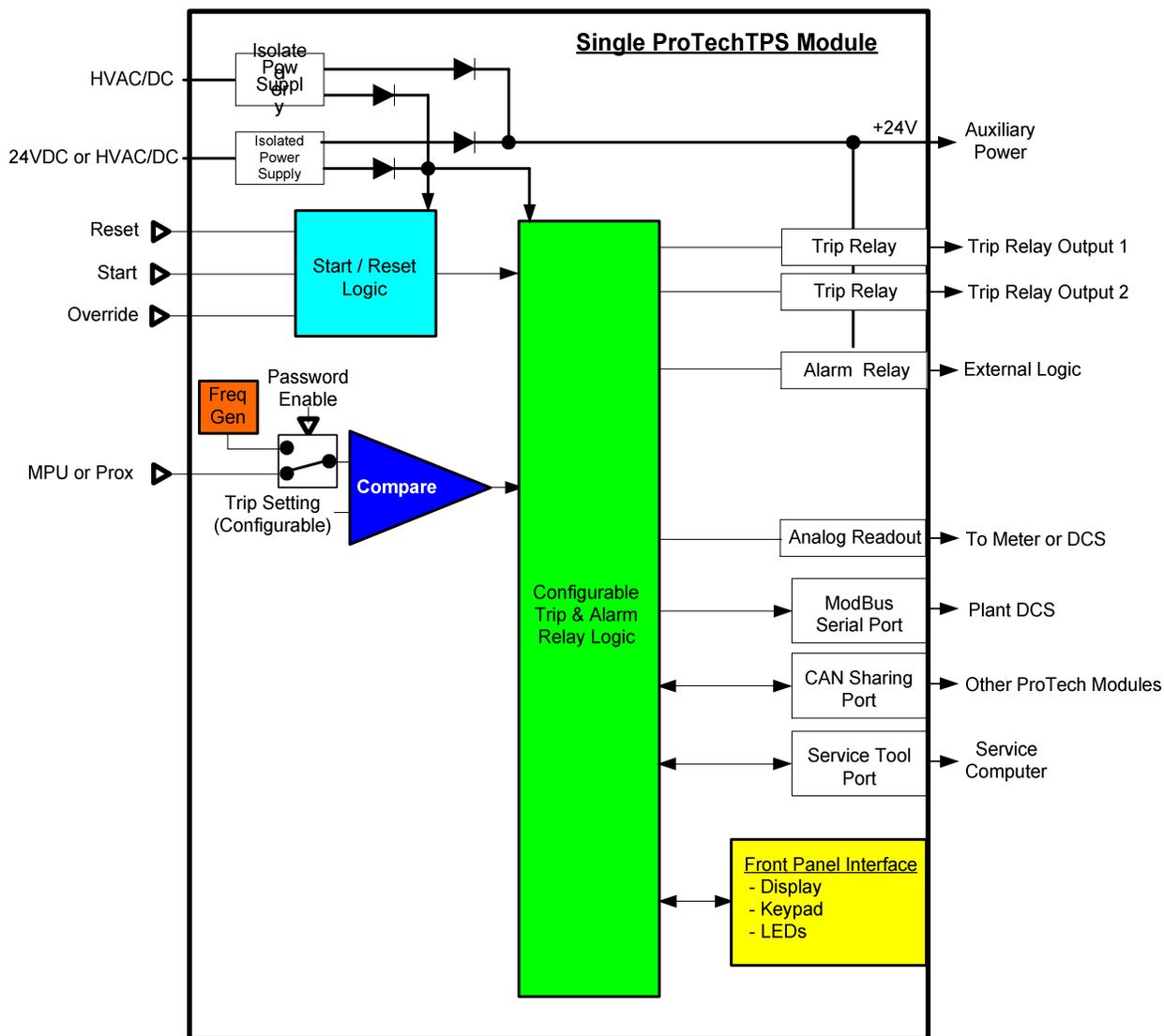
Figure 3-2. Functional Diagram of Single ProTech-GII module with Independent Trip Relay Outputs
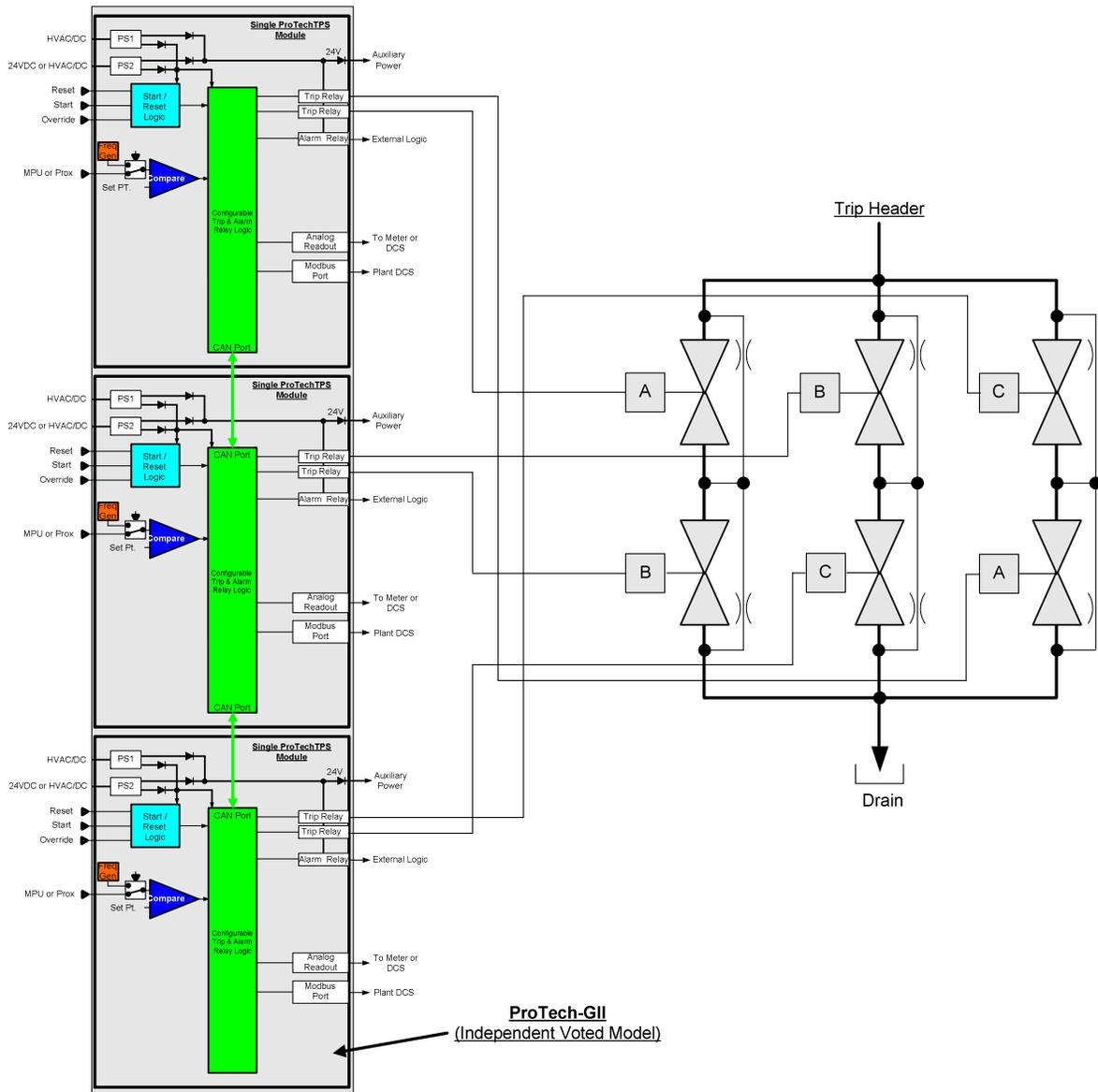
Figure 3-3. Example TMR Trip Block Assembly Interface

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.
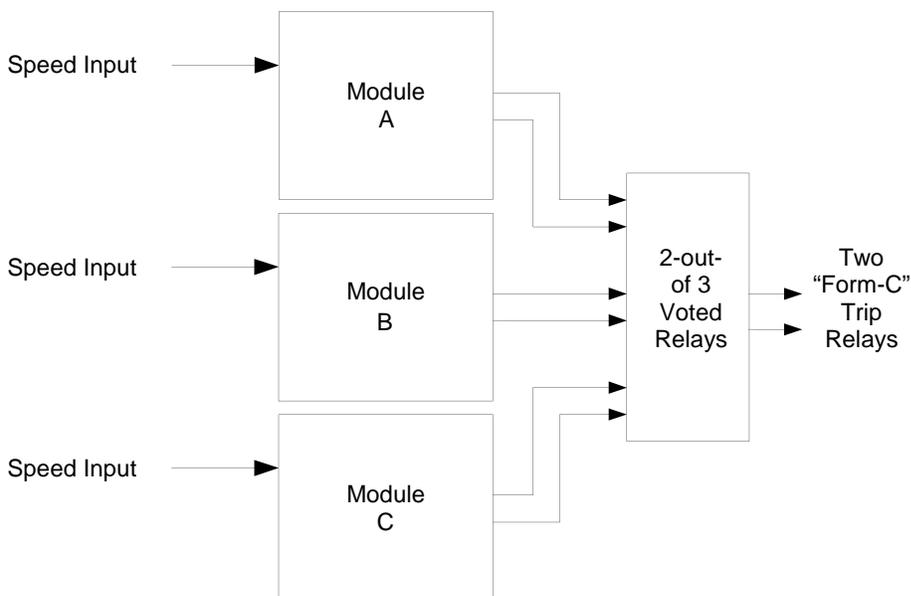
Figure 3-4. Basic Functional Overview of Voted Trip Relay Models
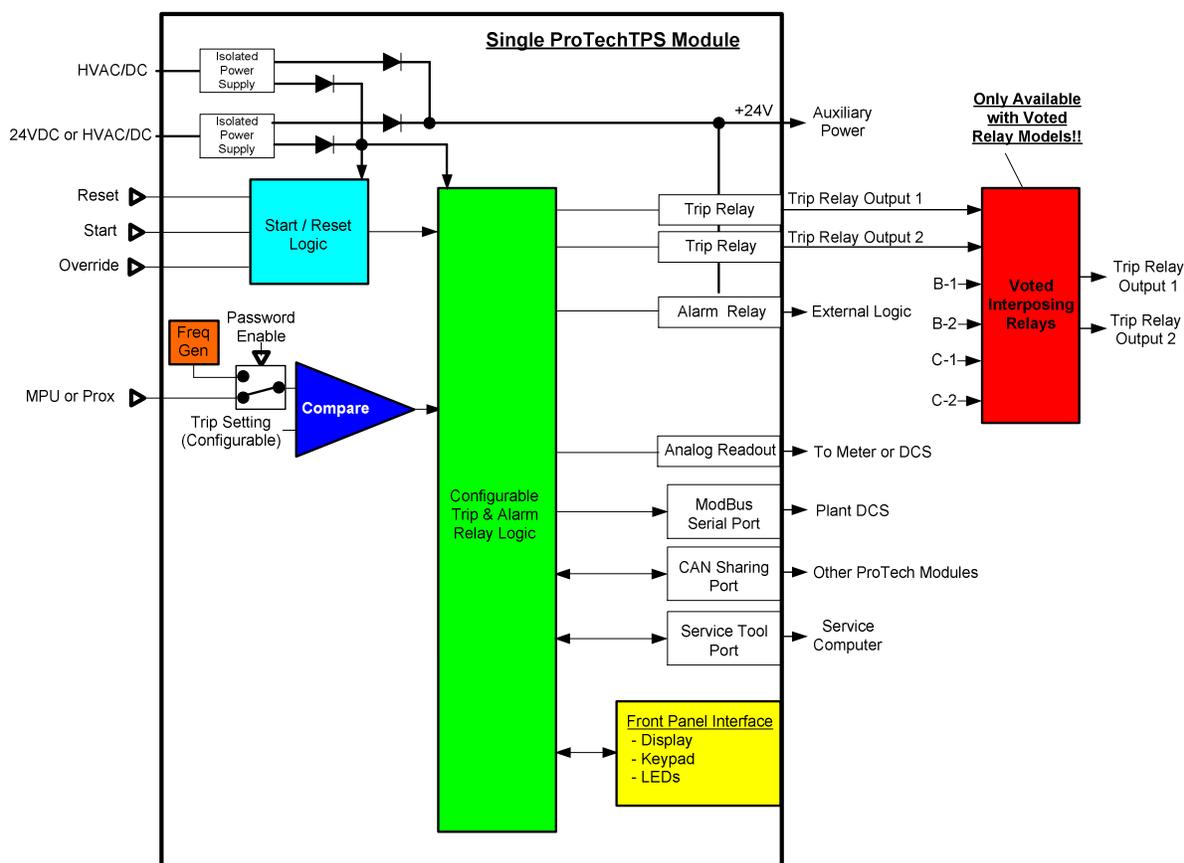
Figure 3-5. Functional Diagram of Single ProTech-GII Module with Voted Trip Relay Outputs
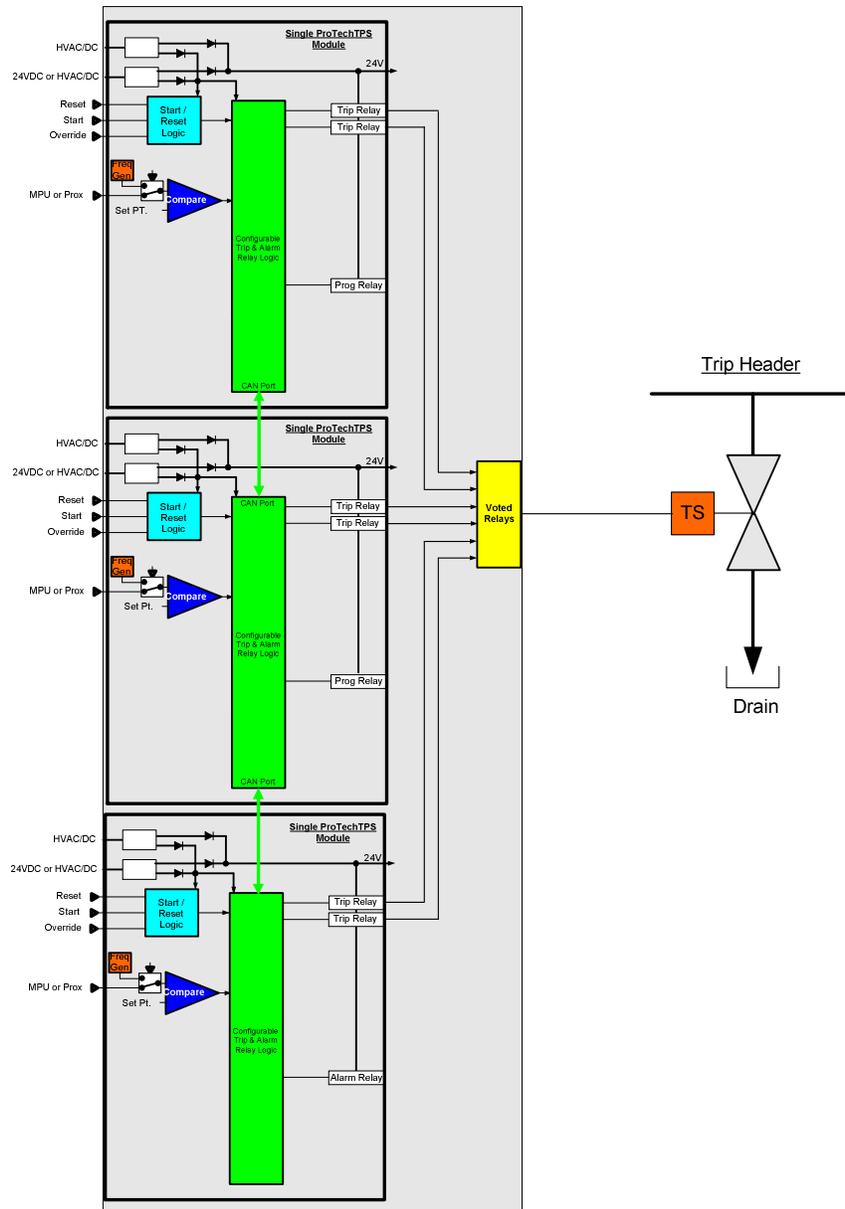
Figure 3-6. Simplex Trip Block Assembly
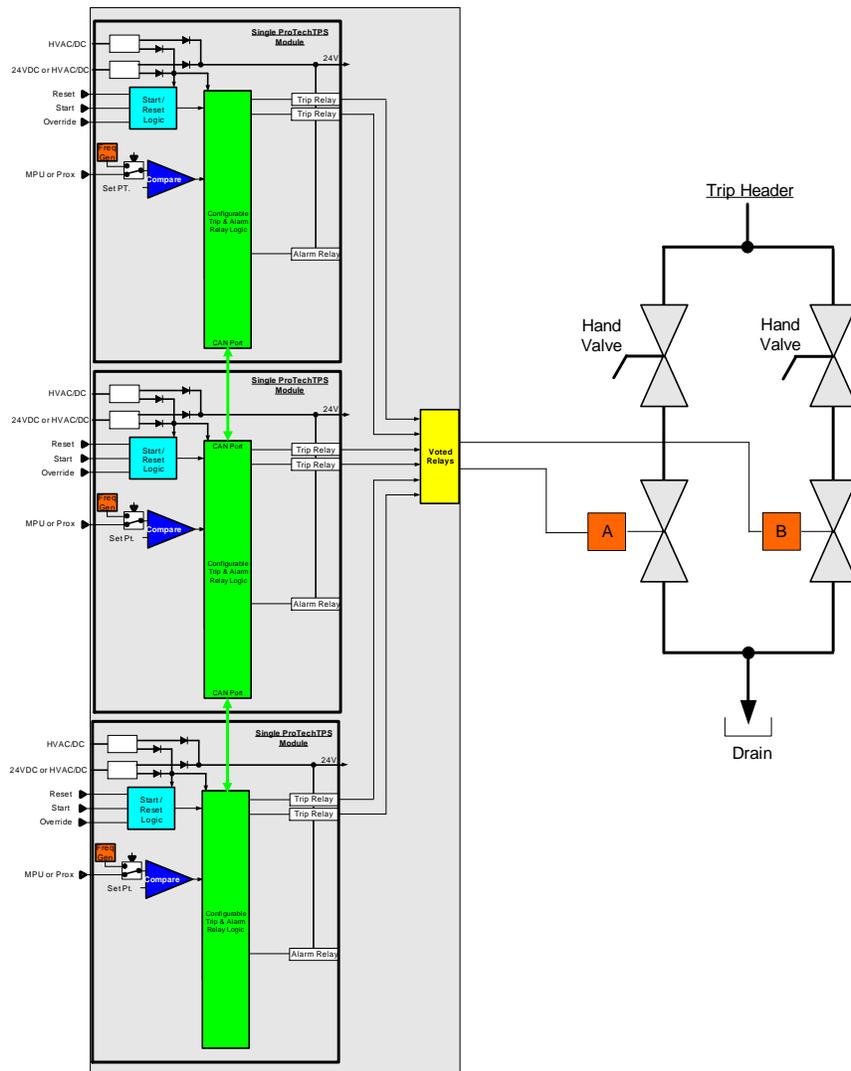
Figure 3-7. Dual Redundant Trip Block Assembly

Inputs and Outputs

Speed Sensor Inputs
Each module has one speed input which can be programmed to accept a passive MPU (magnetic pickup unit) or an active speed sensor (proximity probe signal or an eddy current probe signal).

When configured as an MPU signal input, special MPU open-wire detection circuitry is used to validate that the MPU is properly connected, and special loss-of-speed detection logic is used to validate speed sensor functionality during equipment operation. Depending on the module's program settings, a loss of speed signal or open-wire detection will result in a trip or alarm condition.

> **IMPORTANT** **MPU open-wire detection logic and associated trip/alarm action is only utilized when the speed input is configured a "passive" probe.**

When configured as an MPU signal input, the speed sensor circuitry will sense MPU signals within the voltage range of 1—35 Vrms.

When configured as an (active) probe input, a 24 V power supply is provided to power the probe, but an isolated external supply may be used instead, if it is referenced correctly.

The Number of Gear Teeth and Gear Ratio are configured to convert the frequency input from the speed probe to the unit speed.

⚠ **WARNING**	**The Number of Gear Teeth and Gear Ratio must match the actual unit hardware or speed sensing and all association protection and functionality will not work correctly.**

Dedicated Discrete Inputs
Each ProTech-GII module (A, B, C) accepts three dedicated discrete inputs. The Dedicated Discrete Inputs are Start, Reset and Speed-Fail-Override.

Start
This contact input is used as part of the Start Logic "Speed Fail Timeout Trip" function. When this function is enabled, closing the Start contact will start the Speed Fail Timeout timer. This is an edge triggered signal and re-selecting Start will re-start this timer. Refer to the Start Logic section below for additional details.

Reset
This contact is used to clear module trips and alarms.

Speed-Fail-Override
This is used as part of the Start Logic "Speed Fail Trip" function. When this function is enabled, closing the Speed-Fail-Override contact overrides the Speed Fail Trip. This is a level sensitive trigger so the contact must remain closed to prevent the Speed Fail Trip until speed is greater than the speed fail setpoint. Refer to the Start Logic section below for additional details.

Alarm Relay Output
Each module has 1 alarm relay output. This output is a normally open contact. When an alarm is present the contacts are open.

Analog Output
A single 4–20 mA output is provided on each module to indicate the speed sensed by that module. The 4–20 mA range can be configured to any speed range desired. The accuracy of the analog output is better than ±0.5% of 20 mA over the temperature range of the product.

Shielded twisted pair cable is required when connecting to the analog outputs.

Overspeed and Over-Acceleration Detection and Trip

Each ProTech-GII includes overspeed and over-acceleration functionality and can be configured to meet specific application overspeed and over-acceleration requirements.

The ProTech-GII senses speed and then compares the sensed speed to its programmed overspeed trip setpoint to detect an overspeed condition and generate a trip command.

The ProTech-GII derives acceleration from the sensed speed and then compares this to its programmed over-acceleration trip setpoint to detect an over-acceleration condition and generate a trip command. The ProTech-GII's acceleration detection function can be configured as enabled, disabled, or only enabled above a certain speed setpoint. The over-acceleration trip range is configurable from 0 to 25 000 RPM/s.

Peak speed and peak acceleration are tracked and logged for every overspeed and over-acceleration occurrence. The last 20 occurrences are logged and can be viewed from a front panel or loaded to a computer via the ProTech-GII Programming and Configuration Tool (PCT).
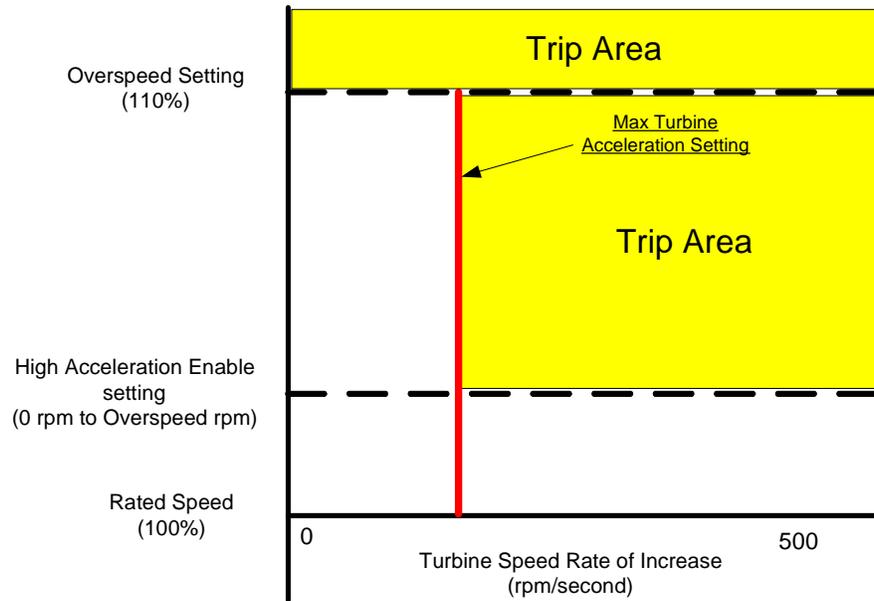
Figure 3-8. Over-Acceleration Enabling Diagram

Start Logic

The start signal is generated by selecting the START button on the module front panel or by closing the dedicated Start contact input. The start signal is edge triggered and re-selecting Start will reset the timer.

The ProTech-GII control's failed speed signal detection logic is used to sense no/zero speed and issue a trip command. However, before a prime mover is started and as its speed gear begins to turn, magnetic speed probes output a zero rpm signal until the speed exceeds the probe's minimum frequency. Two different start logic functions are available to use within the ProTech-GII to override failed speed signal detection logic and allow the prime mover to be started. There is also an alarm that can be enabled to indicate any time the Speed is below the Speed Fail Setpoint.

Speed Fail Trip
If "Speed Fail Trip" is enabled, the Speed-Fail-Override contact input is used to override the speed fail trip logic. When the contact is open, the sensed speed must exceed the Speed Fail Setpoint, otherwise a Speed Fail Trip occurs.
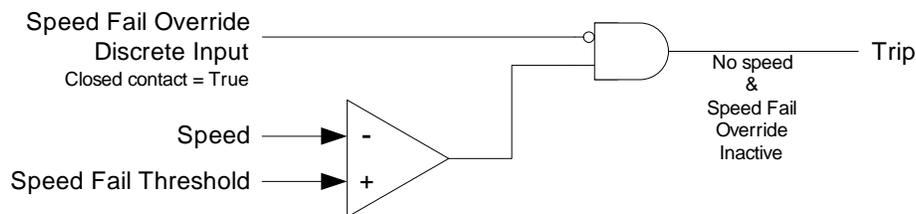
Figure 3-9. Speed Fail Trip Diagram

⚠ **WARNING** | **Speed Fail Trip should be utilized whenever possible. See Configuration Guidance section under the Troubleshooting Chapter for more detail.**

Speed Fail Timeout Trip
If "Speed Fail Timeout Trip" is enabled, the sensed speed must exceed the Speed Fail Setpoint within the Speed Fail Timeout Time after a Start command, otherwise a Speed Fail Timeout Trip occurs.

IMPORTANT	The Speed Fail Timeout trip is cleared by the reset function (the trip and alarm reset function, not the reset input to the timer in the diagram below), even if speed is still below the Speed Fail Setpoint.
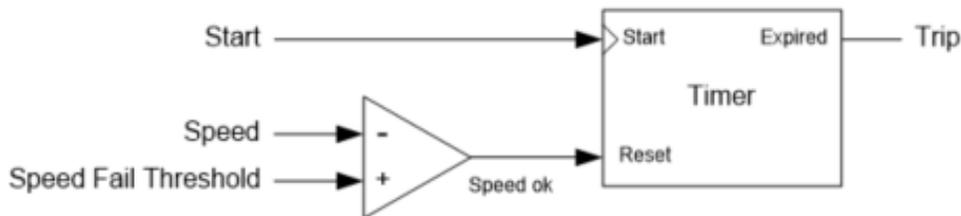
Figure 3-10. Speed Fail Timeout Trip Diagram

Start Example with Speed Fail Timeout Trip
First, any trips or alarms are cleared by issuing a reset command either by pressing the reset key, momentarily closing the reset contact, or issuing the Reset command via Modbus.

When the turbine or equipment is ready to be started, the Speed fail timer is started by pressing the start key or by momentarily closing the start discrete input. The timer expires when it reaches the Speed fail timeout value. If speed does not exceed the Speed fail set point before the timer expires, the unit trips.

If the unit is being restarted after a normal rolldown where there was no trip, the unit does not require a reset. The Speed fail trip is overridden because the Speed fail timer is cleared whenever speed exceeds the Speed fail set point. The Speed fail timer should be started by the operator when the turbine or equipment is ready to be started again.

NOTICE	For the speed fail timeout trip function to provide the intended fault detection, 'Start' must be selected when the turbine or equipment is to be started.
	The timer can only be started when speed is below the Speed Fail Setpoint. Selecting 'Start' has no effect if speed is above the Speed Fail Setpoint.

Test Routines

Each ProTech-GII module provides a variety of test routines to support common test requirements.

In general, a test may not be started if any other module is tripped or in test or if the current module is tripped or in test. Also, tests will be aborted if another module trips. One exception to these rules is the Temporary Overspeed Trip Setpoint which can be applied to multiple modules or if another module is tripped. The other is the Lamp Test which can be applied to any module at any time without a password. If a test is not permitted, or aborted, messages displayed on the front panel explain the cause. This "Test Mode Interlock" can be disabled in the configuration settings.

Any test may be initiated (or cancelled) from the ProTech-GII Front Panel. Modbus provides commands to initiate the Auto Speed Test. Finally, there is a Periodic Overspeed Test function that will automatically run tests at a user-defined interval.

NOTICE	For Modbus commands, a start confirmation is required and an abort is also provided.

Temporary Overspeed Setpoint
This feature temporarily replaces the Overspeed Trip setpoint with a different value for testing. This test mode can be applied to all three modules simultaneously. The Temporary Overspeed Setpoint can be higher or lower than the normal overspeed trip setting.

<table>
<tr><td>⚠️ **WARNING**</td><td>**When the Temporary Overspeed Setpoint is set above the normal overspeed trip, it should not be set above the maximum speed allowed for the unit.**</td></tr>
</table>

The Temporary Overspeed Setpoint is designed to allow users to test the module's overspeed function at level lower than the normal overspeed setting. It also allows users to test the overspeed function of a mechanical bolt or other overspeed protection system that may be at a higher speed than the electronic overspeed trip setting.

An alarm is generated when this test is enabled. Also, there is a Temporary Overspeed Trip Timeout feature that prevents an operator from "forgetting" to disable this test. The timeout can be configured from 0 to 30 minutes. When the test is enabled the timer starts, if it reaches the timeout value, the test is automatically aborted.

Once the module is in its tripped state, this test is disabled and the module's overspeed setpoint is returned to its normal setting.

Simulated Speed Tests
There are three tests that use an internally generated speed signal to test a module's overspeed trip setpoint and trip output function. The ProTech-GII is defaulted to use the Test Mode Interlock so that a module cannot be placed in test while any other unit is tripped or in test. If it is desired to test a unit trip by tripping multiple modules through these simulated speed tests, the Test Mode Interlock can be disabled.

Manual Simulated Speed Test
This allows the user to manually increase/decrease a modules' internal frequency generator to perform a test of the overspeed trip function of that module. This test can only be performed from the front panel of the ProTech-GII.

When the test is initiated, the frequency generator automatically starts at 100 rpm below the overspeed setpoint. Then the operator can adjust the simulated speed up or down from the front panel of the ProTech-GII.

When the overspeed trip occurs, it is logged in the module's trip log and noted as a test.

An alarm is generated while this test is enabled. Also, there is a Simulated Speed Timeout feature that prevents an operator from "forgetting" to disable this test. The timeout can be configured from 0 to 30 minutes. When the test is enabled the timer starts, if it reaches the timeout value, the test is automatically aborted. The operator can abort the test at any time.

Auto Simulated Speed Test
This test allows users to easily test the module's overspeed trip function by having the module's internal frequency generator automatically ramp up to and above the module's overspeed set point. This can be initiated from the front panel or via Modbus. The auto test starts at 100 rpm below setpoint. Then the frequency generator ramps up at approximately 10 rpm/s until the overspeed trip occurs.

When the overspeed trip occurs, it is logged in the modules' trip log and noted as a test.

To initiate the Auto Simulated Speed Test via Modbus, the Initiate Auto Speed Test command (Modbus address 0:0102) must be followed by the Confirm Auto Speed Test (Modbus address 0:0101) within 10 seconds. The intent of the confirmation is to prevent an erroneous signal from initiating a test. The test can be aborted from either the front panel or via Modbus.

Periodic Overspeed Test
This test is similar to the Auto Simulated Speed Test but allows the ProTech-GII to perform the test automatically on each module on a regular basis. The Test Interval can be configured from 1 to 999 days. The test can be manually initiated from the front panel, and then the test will be automatically repeated at the specified test interval.

This test will automatically be applied to all three modules. First, the test will be performed on the A module, and when the overspeed trip occurs, it is logged in the modules trip log and noted as a test. Then, the A module is automatically reset and the B module is tested. When the B module test is completed, the C module is tested. In this way periodic testing can automatically be performed on a regular basis with no operator intervention.

The operator can disable the periodic test from the front panel of the module. When the Periodic test is disabled, or if any module is in trip or test, the Time Remaining Until Next Test will be prevented from counting below 1 hour. If the timer is already below 1 hour it will be increased to 1 hour. When Enable Periodic Test is selected and no modules are tripped or in test, this limit on the timer will no longer be in effect.

Configuration and Management of the Periodic Overspeed Test can only be done through module A.

Alarm and Trip Latches

Reset Function
The Reset Function is associated with both the alarm and trip latches. A Reset can be generated by pressing the reset key on the front panel, from the pre-defined reset contact input, or via Modbus.

Alarm Latch
An "alarm" refers to an action of the ProTech-GII module to bring some condition to the attention to the user. When any of the Alarm Latch inputs becomes true, the output of the alarm latch is set TRUE and the yellow ALARM light is illuminated on the front panel. The Alarm Latch output is connected to the Alarm Relay. Each Alarm Input is individually latched, and those latched outputs are available on Modbus. The individual latches can be reset by the trip reset function if the input is false. The alarm latch output remains TRUE until the reset function occurs and all inputs are false.

Here is the complete list of possible Alarm Latch inputs:
- Configuration Mismatch (if configured)
- Speed Fail (if configured)
- Internal Fault Alarm
- Power Supply 1 Fault
- Power Supply 2 Fault
- Tmp Ovrspd Setpoint On
- Manual Sim. Speed Test
- Auto Sim. Speed Test

Trip Latch
In almost every case, the ProTech-GII and associated trip system will be designed such that two modules must be issuing a trip command before the unit will be tripped. This is referred to a 2-out-of-3 (2-o-o-3) trip scheme. In the "Independent Trip Relay" version of the ProTech-GII, the trip action of each module may put part of the trip system into a tripped state and at least two modules must be tripped to trip the unit. In the "Voted Trip Relay" version of the ProTech-GII, at least two modules would have to be in the tripped state for the voter relay to go to its tripped state.

A "trip" of the module refers to the action of the ProTech-GII module changing the state of its Trip output. When any of the Trip Latch inputs becomes true, the output of the trip latch is set TRUE. The red TRIPPED light is illuminated on the front panel. The module trip relays are put in the trip state (which could be configured as energized or de-energized). Each Trip Input is individually latched, and those latched outputs are available on Modbus. The individual latches are reset by the reset function if the input is false. The first input to set the Trip latch, or First Out (FO), is also latched. This first out indication is available in the trip log and on the Modbus. The Trip latch output remains TRUE and the First Out indication remains unchanged until the reset function occurs and all inputs are false.

IMPORTANT	**When configured as de-energize-to-trip, the modules power up in the tripped state. When configured as energize-to-trip, the modules power up such that they do not enter the tripped state unless a trip condition is present.**

The user can reset a trip by pressing a button on the unit's front panel, or by activating a discrete input that is dedicated to the reset function.

Here is the complete list of possible trips:
- Power Up Trip
- Configuration Trip
- Parameter Error Trip
- Internal Fault Trip
- Overspeed Trip
- Over-Acceleration Trip (if configured)
- Speed Probe Open Wire (if configured)
- Speed Lost Trip (if configured)
- Speed Fail Trip (if configured)
- Speed Fail Timeout Trip (if configured)

System Logs

Each module in the ProTech-GII logs (saves to memory) all trips, alarms, overspeed, and over-acceleration events. Peak speed and peak acceleration are also logged. The logs can be viewed from the front panel of the ProTech-GII or from the PCT tool. With the PCT tool, the Configuration Error Log can also be viewed. Also, the logs can be exported using the PCT tool.

The logs, except the Configuration Error Log, are stored in non-volatile memory so loss of power to the ProTech-GII will not affect this information. The log functions use scrolling buffers that keep the most recent data. The individual log sizes are described in the descriptions below. Logs can be cleared from the front panel with the appropriate password. The Test Level Password is needed to Reset All Logs except of the Peak Speed/Acceleration Log. The Config Level Password is required to Reset the Peak Speed/Acceleration Log.

Overspeed/Acceleration Log
Any time an overspeed or over-acceleration event occurs, the date and time of the trip, the speed and acceleration values at the trip time, and the maximum speed and acceleration will be recorded. If the trip occurred during testing, this will also be noted in the log. The log will save the last 20 overspeed or over-acceleration events.

Trip Log
The module logs the last 50 trips. The log holds the trip description, the date and time of the trip, whether it was the "first out" trip, and whether the module was performing a test when the trip occurred.

Alarm Log

The Alarm Log stores the last 50 alarms. The log holds the alarm description, the date and time of the alarm, and whether the module was performing a test when the alarm occurred.

Peak Speed/Acceleration Log

The maximum speed and acceleration detected by the module will be logged. This includes values generated by internal simulation testing. As this is intended to be a maximum value capture, no date or time information is associated with these values. This can be reset from the front panel with the Config Level Password.

Response Time Performance

Independent Trip Relay

The response time is less than 12 ms (**Note 1**) measured from detection of overspeed or out-of-range process to assertion of the trip relays.

Voted Trip Relay

The response time is less than 20 ms (**Note 1**) measured from detection of overspeed or out-of-range process to assertion of the trip relays.

No operator intervention via the operator interface is required for the logic unit to perform the safety functions.

> **Note:** See the following charts for measured response time. The response time specifications are valid for measured frequencies of 2 kHz and higher. For this reason, it is highly recommended that the user use speed wheel gearing that provides the ProTech with a frequency of at least 3 kHz for the normal operating speed. The internal frequency is calculated from rpm and number of gear teeth:

Frequency = (rpm) * (number of teeth) / 60
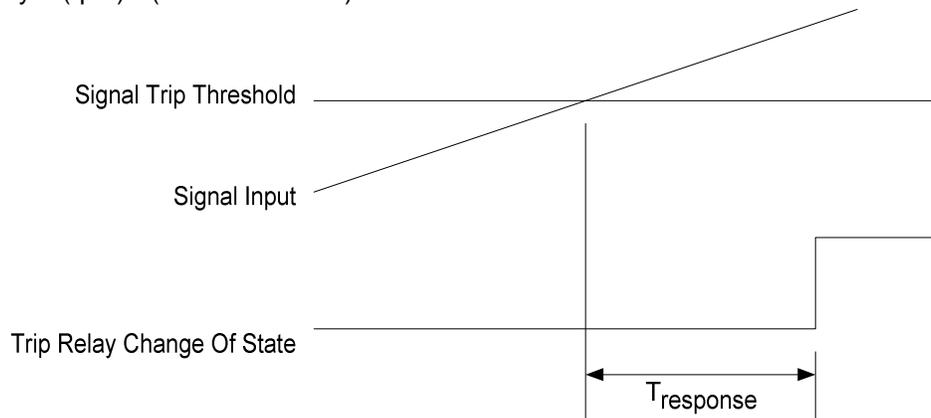
Figure 3-11. Response Time Definition

Analog Output

The response time of the analog output is less than 10 ms measured from a change in speed to a change in the output current.
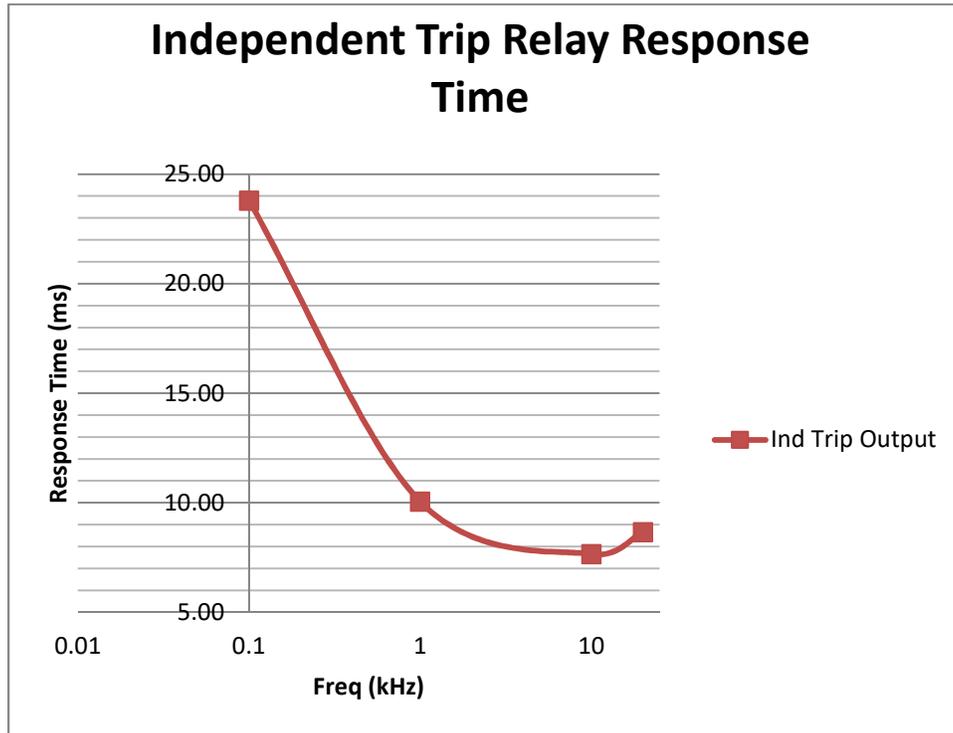
Figure 3-12. Independent Trip Relay Response Time (Typical) Graph
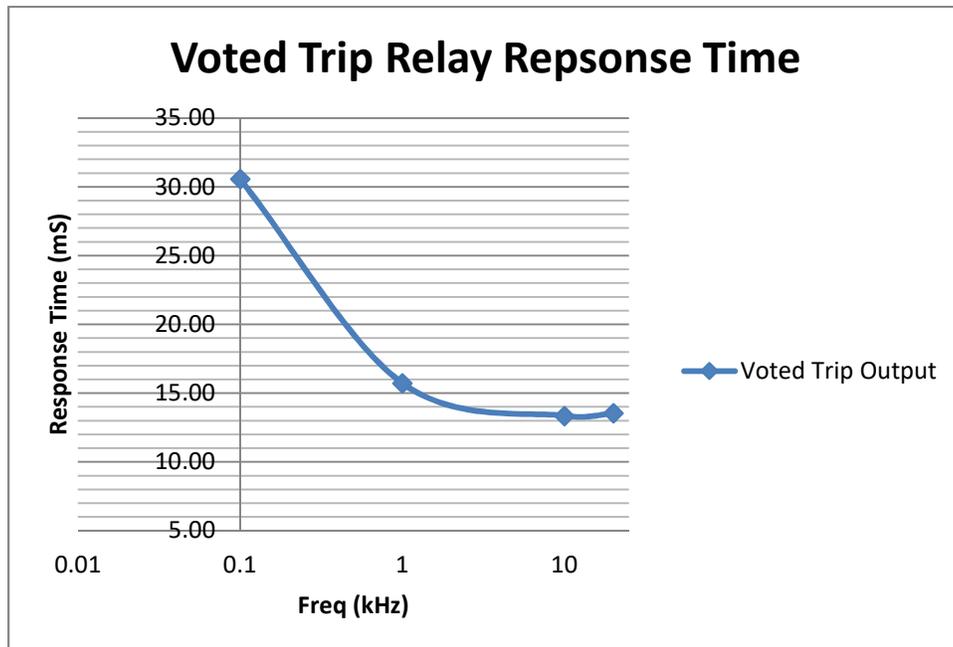
Figure 3-13. Voted Trip Relay Response Time (Typical) Graph

Chapter 4.
Modbus Communications

Modbus Communications

The ProTech-GII can communicate with plant distributed control systems and/or CRT based operator control panels through three Modbus communication ports (one port per module). Each of the three modules (A, B, & C) has a serial port for Modbus communications. These ports support RS-232 or RS-485 communications using a standard Remote Terminal Unit (RTU) Modbus transmission protocol. Modbus utilizes a master/slave protocol. This protocol determines how a communication network's master and slave devices establish and break contact, how a sender is identified, how messages are exchanged, and how errors are detected.

Since each module has its own Modbus port and is fully isolated from the other modules, each Modbus port provides that module's sensed information only (speed, acceleration, etc.).

Monitor Only

Each of the three Modbus communication ports is designed to continually output all Boolean and analog read information and can be configured to accept or ignore "write" commands. This allows the ProTech-GII to be monitored but not controlled from any external device.

If a Modbus port's "Enable Write Commands" setting is configured "No", the respective ProTech-GII module will not accept "write" commands from an external master device (DCS, etc.). For security purposes, the option to ignore "write" commands can only be enabled or disabled with a configuration-level password.

Monitor and Control

If a Modbus port's "Enable Write Commands" setting is configured "Yes", the respective ProTech-GII module will accept "write" commands from an external master device (DCS, etc.). This allows a Modbus compatible device to monitor all read registers and issue "Reset" and "Start/Abort Test Routines" commands only. Modbus ports are independent of each other, and can be used simultaneously.

To ensure that a Modbus-based command to trigger a module test is valid, both "Initiate Test" and "Confirm Test" commands must be received to initiate a test routine. A Confirm must be received within 10 seconds of the Initiate command; otherwise, the sequence must be re-initiated. The ProTech-GII is designed to allow only one module to be tested at a time. Thus a module will only accept an Initiate Test command and perform the requested test if all three modules are healthy, not tripped, and not in a test mode.

Modbus Communication

Each ProTech-GII Modbus communications port is designed to function as a slave device on a Modbus network using the industry-standard Modbus RTU (remote terminal unit) transmission protocol. For more information on Modbus networks and the RTU transmission protocol, refer to Modbus Protocol Reference Guide PI–MBUS–300 Rev. J.

A Modbus function code tells the addressed slaves what function to perform. The following table lists the function codes supported by the ProTech-GII:

Table 4-1. Supported Modbus Function Codes

Code	Definition	Reference Address
02	Boolean Read Registers (Status of Alarms/Shutdowns, Discrete input/outputs)	1XXXX
04	Analog Read Registers (Speed, Acceleration, etc)	3XXXX
05	Boolean Write Registers (Reset and Test Initiate Commands)	0XXXX

As a slave Modbus device, the ProTech-GII is not responsible to sense or annunciate Modbus link communication errors. However, for troubleshooting purposes, the ProTech-GII will display a "Link Error" message in its "Monitor Modbus" screen if a Modbus transaction request is not received within its five-second time-out period. This error message is automatically cleared when Modbus communications are re-established.

Port Adjustments

Before the ProTech-GII can communicate with the master device, the communication parameters must be verified to match the master device's protocol settings. For security purposes, these parameters can only be set in the module's Configuration mode.

Table 4-2. Modbus Serial Communication Port Settings

Parameter	Range
Mode:	RS-232 or RS-485
Baud Rate:	19200 to 115200
Comm Parity:	NONE, ODD or EVEN
Slave Address:	1 - 247
Enable Write Commands:	Yes or No

ProTech-GII Parameter Addresses

Each available read or write parameter has a unique Modbus address. A complete list of the available parameters and their addresses is located at the end of this chapter. This list consists of Boolean Write, Boolean Read, and Analog Read parameters. Analog write parameters are not used with this device.

All values that can be addressed by Modbus are considered to be discrete and numeric. The discrete values are a 1 bit binary on or off value, and the numeric values are 16 bit values. Discrete values are sometimes referred to as coils or digitals, and numeric values are referred to as registers or analogs. All registers are interpreted by the ProTech-GII as signed 16 bit integer values.

Since Modbus can only handle integers, values that require a decimal point in the Modbus Master Device are multiplied by a scaling constant before being sent by ProTech-GII. See the Modbus list for the scaling used on each analog parameter.

Boolean Writes (Code 05)
Boolean Write registers are used by an external master device (plant DCS, etc.) to issue Boolean commands to a ProTech-GII module. The available write commands are listed in Table 4-2.

Once a Modbus port's "Enable Write Commands" setting is configured "Yes", the respective ProTech-GII module will accept "write" commands from an external master device (DCS, etc.).

Note: All write commands are edge-triggered.

Initiating a test mode
Only one test mode can be active at a time. Attempts to start a test are ignored when another test mode is active, another module is tripped, or another module is in a test mode.

Speed/user tests must be requested by first setting the Initiate bit, followed by a setting the confirm bit. If the Confirm bit is not set within 10 seconds after the initiate bit is set, then the test will not be requested.

> **Note:** the confirm-initiate addresses are in reverse order so that an initiate followed by a confirm cannot be executed by a single write command. Both bits must be set to 0 before starting the initiate -confirm sequence.

If an Abort command is set to 1, an initiate-confirm sequence shall be ignored.

Boolean Reads (Code 02)
Boolean Read registers are used by an external master device (plant DCS, etc.) to read the status of internal ProTech-GII module signals (hardware inputs, logic blocks, hardware outputs, etc.). A Boolean read register will have the value 1 if the status of the monitored signal is true and a 0 if false. The available Boolean read registers are listed in Table 4-4.

Analog Reads (Code 04)
Analog Read registers are used by an external master device (plant DCS, etc.) to read the value of internal ProTech-GII module signals (hardware inputs, logic blocks, hardware outputs, etc.). An example of an analog read value would be actual speed.

With the Modbus protocol, analog values are transmitted as 16-bit integer values ranging from –32767 to +32767 (if signed) or 0 to 65535 (if unsigned). Since Modbus can only handle integers, values that have a decimal point are multiplied by a constant before being sent by Modbus. For example, these input registers may be listed as the Modbus value `x100' within the listed parameter table. Some values, like the Timer values, are sent using more than one register. The available Analog read registers, units (scaling), and range are listed in Table 4-3.

Heartbeat indication (1:1301)
The Heartbeat indication provides an indication that toggles every 1 second between logic 1 and logic 0.

Last Trip time and date indication (3:0701 - 707)
Last Trip Date/Time represents the Date/Time of the most recent first out trip.

Unit Health indication (3:0801)
The unit health status indicates the state of the internal fault trip (if known) as follows:
0 = internal fault trip is TRUE (Unit Health LED is green)
1 = internal fault trip is FALSE (Unit Health LED is amber)
2 = state of the internal fault trip is unknown because of a communication fault (Unit Health LED is off)

Table 4-3. Boolean Write Addresses (Code 05)

ADDRESS	DESCRIPTION
0:0001	Reset
0:0101	Confirm Auto Speed Test
0:0102	Initiate Auto Speed Test
0:0103	Abort Auto Speed Test

Table 4-4. Boolean Read Addresses (Code 02)

ADDRESS	DESCRIPTION	ADDRESS	DESCRIPTION
1:0001	Internal Fault Trip	1:1003	Overacceleration Trip Non-Latched
1:0002	Power Up Trip	1:1004	Speed Fail Trip Non-Latched
1:0003	Module Config Mismatch Trip	1:1005	Reserved (Do Not Use)
1:0004	Parameter Error Trip	1:1006	Speed Lost Alarm Non-Latched
1:0005	Overspeed Trip	1:1007	Speed Lost Trip Non-Latched
1:0006	Over Accel Trip	1:1008	Speed Probe Open Wire Non-Latched
1:0007	Open Wire Detected Trip	1:1009	Temp OvrSpd Setpoint On
1:0008	Speed Lost Trip	1:1010	Simulated Speed Active
1:0009	Speed Fail Trip	1:1011	Auto Test Speed Active
1:0010	Speed Fail Timeout Trip	1:1012	Periodic OvrSpd Test Active
1:0011	Resettable Trip Input Trip	1:1013	Reserved (Do Not Use)
1:0101 to 112	Trip Latch First Out Registers 1-12	1:1014	Reserved (Do Not Use)
1:0201	Internal Fault Alarm	1:1015	Reserved (Do Not Use)
1:0202	Module Config Mismatch Alarm	1:1016	Configuration Trip Non-Latched
1:0203	Power Supply 1 Fault Alarm	1:1017	Speed Fail Alarm Non-Latched
1:0204	Power Supply 2 Fault Alarm	1:1018	Trip
1:0205	Speed Fail Alarm	1:1019	Alarm
1:0206	Speed Lost Alarm	1:1211	Internal Fault Trip Non-Latched
1:0207	Temp Overspeed SP is Active Alarm	1:1212	Internal Fault Alarm Non-Latched
1:0208	Simulated Speed Teste in Progress Alarm	1:1213	Configuration Trip Non-Latched
1:0209	Auto Speed Test Active Alarm	1:1214	Resettable Trip Non-Latched
1:0210	Periodic OvrSpd Test Active Alarm	1:1215	Power Supply 1 Alarm Non-Latched
1:1001	Speed Fail Override	1:1216	Power Supply 2 Alarm Non-Latched
1:1002	Overspeed Trip Non-Latched	1:1217	Parameter Error Trip Non-Latched
		1:1301	Heartbeat

Table 4-5. Analog Read Addresses (Code 04)

ADDRESS	DESCRIPTION	UNITS	RANGE
3:0001	Speed	RPM	0-30000
3:0002	Acceleration	RPM/Sec	-32768 -32767
3:0301	Test Mode Time Remaining	Seconds	0-65535
3:0401	Speed Fail Time Remaining	Seconds	0-65535
3:0601	Temp Overspeed SetPoint	RPM	0-65535
3:0602	Simulated Speed RPM	RPM	0-65535
3:0701	Last Trip Month	Months	1-12
3:0702	Last Trip Day	Days	1-31
3:0703	Last Trip Year	Years	2000-2099
3:0704	Last Trip Hour	Hours	0-23
3:0705	Last Trip Minute	Minutes	0-59
3:0706	Last Trip Second	Seconds	0-59
3:0707	Last Trip Millisecond	Milliseconds	0-999
3:0801	Unit Health Status	Enum	0-2
3:0901	Periodic Test Status	Enum	0-3

Chapter 5.
Troubleshooting

Many troubleshooting features are available from the front panel of each module. In general, the following high level approach can be used to troubleshoot the ProTech-GII control.

1. Check the front panel LEDs
2. View the trip and alarm logs by pressing the corresponding view buttons on the front panel
3. Use the messages in the trip and alarm logs to assist in troubleshooting. The messages are summarized in the tables below.
4. Use the Monitor Menu from the front panel to trace and branch to potential I/O, configuration, and programming problems.
5. For more in depth help, use the Programming and Configuration Tool provided with the ProTech-GII.

The entry point for troubleshooting the ProTech-GII is the state of the three LEDs on lower part of the front panel. The Trip Log and the Alarm Log can also be viewed from the front panel. The Programming and Configuration Tool also provides more detailed information in the log pages.

UNIT HEALTH LED
The UNIT HEALTH LED indicates module health status.
    Green – Unit OK and functioning properly.
    Red – Safety Functionality is not running/internal fault trip is present.
    Unlit – Status unknown because of a communication fault with the front panel or the module is not
        powered.

TRIPPED LED
The TRIPPED LED indicates the state of the trip latch.
    Unlit - Unit not tripped or the module is not powered.
    Red – unit tripped, press VIEW button below the LED to see the trip log or navigate to the Monitor
Trip Latch screen to see the active status on each trip input.

ALARM LED
The ALARM LED indicates the state of the alarm latch.
•   Unlit – no alarms or the module is not powered.
•   Yellow – active alarms, press VIEW button below LED to see the alarm log or navigate to the
    Monitor Alarm Latch screen to see the active status on each alarm input.

I/O Troubleshooting

Table 5-1. I/O Troubleshooting

Problem or Diagnostic Indication	Possible Cause	Suggested Actions
Power Supply Inputs not working properly. Power supply input alarm present.	Wiring fault, terminal block loose.	Verify wiring and terminal block connections.
	Power source breaker or fuse open.	Verify breaker or fuse.
	Only one power supply is connected.	On the front panel, press the VIEW button under the ALARM LED and check for Power Supply 1 or 2 Fault.
	Power supply input out of range or insufficient rating.	Check input voltage level and verify it is within acceptable range per electrical specifications. Also check that power supply has appropriate rating to power the ProTech-GII.
Speed Input not working	Wiring fault, terminal block loose.	Verify wiring and terminal block connections.
	Configuration	On the front panel, check the Speed Input Configure Menu and verify that all proper configuration options are selected.
	Alarms and Faults	Verify that there are no alarms or faults that may indicate a setup problem (open wire trip, speed lost, speed fail, etc.)
	Signal level	Verify that the input signal levels are within the electrical specifications. Also verify shield connections.
	Active Probe Power	If using an active probe, verify probe power is correct by disconnecting the probe and measuring from terminals 69 to 71. The voltage should be 24 V ±10%. Attach probe and measure again to verify that the probe is not overloading the voltage provided by the ProTech-GII.
Dedicated discrete input not working (Start, Reset or Speed Fail Override)	Wiring fault, terminal block loose.	Verify wiring and terminal block connections.
	Configuration	On the front panel, check the Dedicated Discrete Inputs Monitor Menu and verify logic state is correct.
	Signal source not working correctly or not within acceptable electrical specifications.	Check signal level and verify it is within acceptable range per electrical specifications.
	Internally supplied wetting voltage fault.	Measure voltage from terminal 1 to terminal 81 and verify it is 23 V ±2 V. If out of range, return unit to Woodward.

Problem or Diagnostic Indication	Possible Cause	Suggested Actions
Trip relays not working	Wiring fault, terminal block loose.	Verify wiring and terminal block connections.
	Configuration	Using the Programming and Configuration Tool or front panel, check to see that the trip configuration is set correctly. Energize to trip vs. de-energize to trip will invert the polarity on the relays.
	External supplies	Check the power supplies that provide voltage to the relay output. If using the 24 V EXT available from the ProTech-GII, measure voltage between terminals 80, 81 and verify 24 V ±10%. If it is not, remove the wiring from the 24 V EXT to unload the output and measure again to verify the voltage is not being overloaded.
Alarm relay output not working	Wiring fault, terminal block loose.	Verify wiring and terminal block connections.
	External supplies	Check the power supplies that provide voltage to the relay output. If using the 24 V EXT available from the ProTech-GII, measure voltage between terminals 80, 81 and verify 24 V ±10%. If it is not, remove the wiring from the 24 V EXT to unload the output and measure again to verify the voltage is not being overloaded.
Analog Output not working	Wiring fault, terminal block loose.	Verify wiring and terminal block connections.
		On the front panel, check the Monitor Analog Output Menu and verify that the analog output is reading an expected output value.
		Measure the current from terminal 64 and verify that is corresponds to the previous step.
		Verify the load on the analog output is within the electrical specifications.
	Configuration	Using the PCT or front panel, verify that the scaling is correct.
MODBUS not working	Wiring fault, terminal block loose.	Verify wiring and terminal block connections. In particular, verify that the HI and LO wires are terminated to the correct terminals for RS-485 and the likewise for TXD and RXD for RS-232. Also verify the terminations jumpers are installed for RS-485 mode
	Configuration	Using the PCT or front panel, verify that the correct settings are selected.

Problem or Diagnostic Indication	Possible Cause	Suggested Actions
Programming and Configuration Tool not working	Wiring and connection	Verify cable that is plugged into DB9 port is not a crossover. A straight-through cable is required.
	COM Port	Check that there is power applied to the ProTech-GII module that the Programming and Configuration Tool is connected. Verify the correct COM port is selected when establishing communications and that Auto Detection BAUD rate is selected.

Trip Indications

Table 5-2. Trip Indications

Problem or Diagnostic Indication	Description	Possible Cause	Suggested Actions
Internal Fault trip	The module tripped on an internal fault	Various	Connect the PCT and view the Module Faults Log. This log expands the Internal Fault annunciation. In general, it is not possible to fix internal faults without returning the unit to Woodward.
Power Up Trip	The module has lost power and has been restored.	Power source fault or breaker reset.	Verify power source, breaker, fuse and wiring integrity. The Reset function will reset the module.
Configuration Trip	Trip is issued internally to keep the module in tripped state while the module is actively saving a configuration.	The module is actively saving a configuration.	Wait for module to finish saving configuration. Reset function will reset the module.
Parameter Error	An error has been detected in the internally stored parameters. Internally stored parameters are constantly checked for data integrity.	Non-volatile memory hardware fault or internal fault.	Reload configuration settings using the PCT. Cycle input power. If Parameter Error persists return unit to Woodward according to the instructions in Chapter 8 of this manual.

Problem or Diagnostic Indication	Description	Possible Cause	Suggested Actions
Overspeed Trip	The module tripped on an overspeed event.	Turbine or equipment overspeed	Check trip system prior to operating turbine or equipment, including ProTech-GII built-in simulated speed tests to verify ProTech-GII functionality.
		Configuration	Using the PCT or front panel, verify that the correct settings are selected.
Overacceleration Trip	The module tripped on an overacceleration event.	Rapid turbine or equipment acceleration	Check trip system prior to operating turbine or equipment, including ProTech-GII built-in simulated speed tests to verify ProTech-GII functionality.
		Configuration	Using the PCT or front panel, verify that the correct settings are selected.
Speed Probe Open Wire	The module has detected an open wire condition on the speed probe (Passive, or MPU probe only)	Wiring fault or probe fault.	Check wiring continuity and probe integrity.
Speed Lost Trip	Sudden Speed Loss is configured as Trip and the module has detected a sudden speed loss.	Wiring fault or probe fault.	Check wiring continuity and probe integrity.
Speed Fail Trip	Start logic – Speed Fail Trip is enabled and the module has detected the Speed Fail Override contact input is open while speed is below the user configured Speed Fail Setpoint.	Wiring fault, speed probe fault	Check wiring continuity and probe integrity.
		Speed Fail Override contact input operation not correct.	Check contact and wiring operation.
		Incorrect speed fail setpoint configured,	See manual for description of function. Use PCT to verify proper configuration settings.
Speed Fail Timeout	Start logic - the module has not detected speed within the time set by the Speed Fail Timeout setting.	Wiring fault, speed probe fault	Check wiring continuity and probe integrity.
		Incorrect speed fail timeout time configured	See manual for description of function. Use PCT to verify proper configuration settings.

Alarm Indications

Table 5-3. Alarm Indications

Problem or Diagnostic Indication	Description	Possible Cause	Suggested Actions
Internal Fault Alarm	The module has an internal fault that is annunciated an alarm and not a trip.	Various	Connect the Programming and Configuration Tool and view the Trip And Alarm Log. This log expands the Internal Fault Alarm annunciation.
Configuration Mismatch	Configuration data does not match between modules.	Different settings loaded than in one or both of the other two modules.	Copy configurations between modules using Configuration Management in the Config Menu, or load settings from Programming and Configuration Tool.
Power Supply 1 Fault	The module has detected a fault on Power Supply 1.	Power supply input 1 is either faulted or the power is disconnected.	Check the power source, breaker, fuse and connections. Note the module will continue to operate normally on power supply 2.
Power Supply 2 Fault	The module has detected a fault on Power Supply 2.	Power supply input 2 is either faulted or the power is disconnected.	Check the power source, breaker, fuse and connections. Note the module will continue to operate normally on power supply 1.
Speed Fail Alarm	Start logic – Speed Fail Alarm is enabled and the module has detected the Speed Fail Override contact input is open while speed is below the user configured Speed Fail Setpoint.	Wiring fault, speed probe fault Speed Fail Override contact input operation not correct. Incorrect speed fail setpoint configured,	Check wiring continuity and probe integrity. Check contact and wiring operation. See manual for description of function. Use PCT or front panel to verify proper configuration settings.
Speed Lost Alarm	Sudden Speed Loss is configured as Alarm and the module has detected a sudden speed loss.	Wiring fault or probe fault.	Check wiring continuity and probe integrity.
Tmp Overspd Setpoint On	Indicates the temporary overspeed setpoint has been activated.	User initiated temporary setpoint test.	See manual for description and limitations. Use PCT or front panel to verify settings.
Manual Sim. Speed Test	Indicates the manual simulated overspeed test has been activated.	User initiated simulated speed test.	See manual for description and limitations.

Problem or Diagnostic Indication	Description	Possible Cause	Suggested Actions
Auto Sim. Speed Test	Indicates the automated simulated overspeed test has been activated.	User initiated simulated speed test.	See manual for description and limitations.
Periodic Overspd Test	Indicates the automated Periodic Overspeed Test has been activated.	User enabled the simulated speed test or test interval time expired and test started.	See manual for description and limitations. Use PCT or module A front panel to verify settings.

Configuration Guidance

The ProTech GII is a fault tolerant safety control device that is fully configured by customers for each unique site application. These products have many functional options available and the system is designed to continually provide its primary function, even when one fault occurs anywhere in the ProTech system.

It has come to our attention that some user configurations of these products, may not react as expected when a second fault occurs in the ProTech system.

These safety products are all configurable by the user, so it is important to emphasize the following points:
- On any configurable device – it is possible to have a valid configuration that may not do all that is expected, verification of customer and installers requirements and unit testing at site commissioning is required to ensure the appropriate response to faults in the system.
- On any fault tolerant system, a single fault should be investigated and addressed. Depending on the configuration, running the system in a prolonged mode with an active alarm, leaves it in a state where a second fault could cause a trip or prevent the unit from performing its primary function.

If your configuration settings are using Active probes (not MPU's) and your configuration has Speed Fail Trip set to "NOT USED" your configuration may be at risk in the event of a second fault.


Figure 5-1. Configuration Guide - Front Panel Interface with Active Probe

It is recommended that on ProTech GII products, the option Speed Fail Trip always be set to "USED" whenever the configuration of the speed input probe type is "Active".

This can be complete using the Front Panel Interface as shown above or can be completed using the PCT (Programming and Configuration Tool) as shown below:
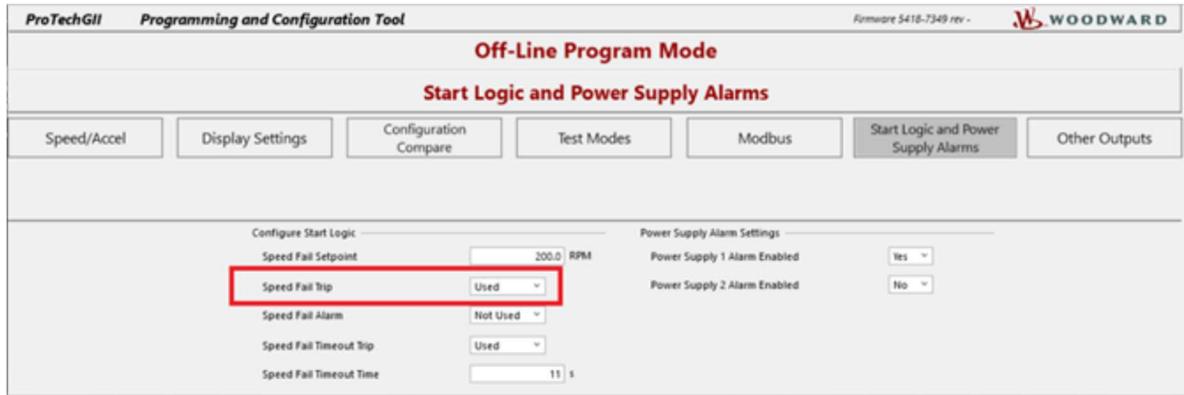
Figure 5-2. Speed Fail Trip Using PCT

To determine the recommended configuration settings for detecting failed speed probes in systems that utilize Active Speed probes, reference the flowchart in Figure 11-3 below:
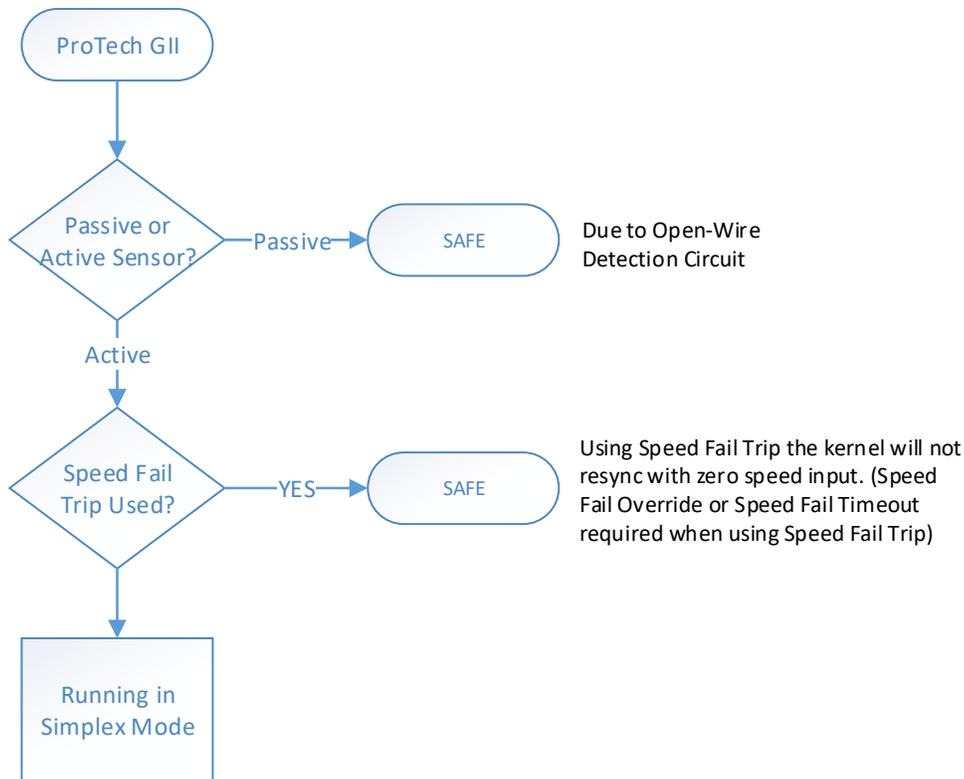
- Turn Speed Fail Trip to USED.
- If Speed Fail Trip cannot be used, then enable Speed Failure Alarm – will give notification of an issue but will not trip.
- Customer should verify speed on the modules before and after reset.
- Using Reset then issuing Start will validate the speed input and will trip if not above Speed Set point by end of start command.

Figure 5-3. Configuration Guidance Flowchart

Chapter 6.
Safety Management

Product Variations Certified

The functional safety requirement in this manual applies to all ProTech-GII variations

These products are certified for use in applications up to SIL3 according to IEC61508.

Safe State

The ProTech-GII is designed so that the safe state can be configured for either de-energize or energize to trip. De-energize to trip will place trip relays into their unpowered, normally open state.

The de-energize-to-trip functionality is implemented such that a complete loss of power to the module results in a trip of that module. The energize-to-trip functionality is implemented such that a complete loss of power to the module does not result in a trip of that module.

When configured as de-energize-to-trip, the modules power up in the tripped state. When configured as energize-to-trip, the modules power up such that they do not enter the tripped state unless a trip condition is present.

Table 6-1. Trip Relay Safe State Configuration

Configuration	Module Power Loss State	Module Power Up State
De-energize to trip	Tripped	Tripped
Energize to trip	Not Tripped	Not Tripped, unless trip condition present.

SIL Specifications

PFD and PFH calculations have been performed on the ProTech-GII according IEC61508. For SIL3, IEC states the following requirements.

Table 6-2. SIL Specifications

Type	SIL 3 Value
PFH	10^{-8} to 10^{-7}
PFD	10^{-4} to 10^{-3}
SFF	> 90%

The ProTech-GII meets SIL3 with the following numbers:

PFH
7.8E-8 1/h

PFD	
PFD	**Proof Test Interval**
3.7E-5	6 month
5.6E-5	9 month
7.5E-5	1year

Safe Failure Fraction
SFF > 90%

Diagnostic Coverage
DC > 90%

Failure Rate Data

The Mean Time to Failure (MTTF) is a measure of time between failures that cause a complete process shutdown. In determining this number, IEC61508 evaluation takes into account safe failure and dangerous detected failures that cause a module trip.

Table 6-3. Failure Rate

MTTF
> 54 000 years

Because of the nature of the 2-o-o-3 voting structure, a single module trip does not shut down the process.

Response Time Data

The response time for a safety system must be less than the process safety time. The system integrator must determine the process safety time and the response time of all elements (sensors, ProTech-GII, actuators, etc.) that make up the total process safety time. For this purpose, the ProTech-GII response time is given below.

Table 6-4. Response Time

Response Time	
Independent Trip Relay Versions	< 12 ms
Voted Trip Relay Versions	< 20 ms

The response time of the ProTech-GII is the time from when a signal is received at the ProTech-GII terminal blocks that is out of a range as defined by the programming (i.e. speed, analog input), to the point where the trip relays have changed state.
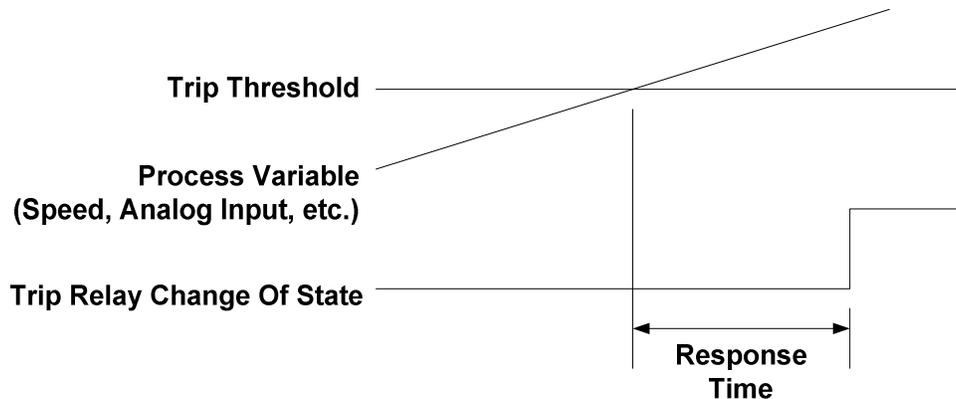

Figure 6-1. Response Time

Limitations

When proper installation, maintenance, proof testing, and environmental limitations are observed, the product life of the ProTech-GII is 20 years.

Management of Functional Safety

The ProTech-GII is intended for use according to the requirements of a safety lifecycle management process such as IEC61508 or IEC61511. The safety performance numbers in this chapter can be used for the evaluation of the overall safety lifecycle.

Restrictions

The user must complete a full functional check of the ProTech-GII after initial installation, and after any modification of the programming or configuration of the device. This functional check should include as much of the safety system as possible, such as sensors, transmitters, actuators and trip blocks. The ProTech-GII has programming capability to facilitate the automatic checkout and periodic maintenance of the safety system. For help on programming, see the chapters on functionality, configuration and the example applications.

The ProTech-GII must be used within the published specification in this manual.

Competence of Personnel

All persons involved in the initial design or modification of the programmable software, installation and maintenance must have appropriate training. Training and guidance materials include this manual, the ProTech-GII Programming and Configuration Tool, and training programs available at Woodward. See Chapter 10 (Service Options) for more information.

Operation and Maintenance Practice

A periodic proof (functional) test of the ProTech-GII is required to verify that no dangerous faults not detected by internal run-time diagnostics remain undetected. More information is in the "Proof Test" section of this chapter. The frequency of the proof test is determined by the overall safety system design, of which the ProTech-GII is part of the safety system. The safety numbers are given in the following sections to help the system integrator determine the appropriate test interval. This will require password access to the front panel menus.

Installation and Site Acceptance Testing

Installation and use of the ProTech-GII must conform to the guidelines and restrictions included in this manual. No other information is needed for installation, programming, and maintenance. This will require password access to the front panel menus.

Functional Testing after Initial Installation

A functional test of the ProTech-GII is required prior to use as a safety system. This should be done as part of the overall safety system installation check and should include all I/O interfaces to and from the ProTech-GII that are part of the safety system. For guidance on the functional test, see the proof test procedure below. This will require password access to the front panel menus.

Functional Testing after Changes

A functional test of the ProTech-GII is required after making any changes that affect the safety system. Although there are functions in the ProTech-GII that are not directly safety related, it is recommended that a functional test is performed after any change. This will require password access to the front panel menus.

Proof Testing (Functional Test)

The ProTech-GII must be periodically proof tested to ensure there are no dangerous faults present that are not detected by on-line diagnostics. Because of the 2-o-o-3 configuration of the ProTech-GII, it is possible to perform the proof test while the ProTech-GII is on-line. Many built-in test modes are included. The test procedure will set the trip outputs on the module under test into a trip state. It is possible to automate several steps of the proof test procedure shown below using the programmability and test mode configurability of the ProTech-GII, but the intent of the steps below must be met.

With the procedure below, the user can expect 99% test coverage of the dangerous failures that are not tested by online diagnostics.

Functional Verification (Proof) Test Procedure (module level):
This procedure requires a digital multimeter for resistance and voltage measurement. This will require password access to the front panel menus.

1. Cycle Power on the module and verify there are no internal faults on the Alarm Latch page of the monitor menu.
2. Remove power from one power supply input (power supply input 1 or 2) at a time and verify the correct fault is read on the Alarm Latch page of the monitor menu.
3. Measure external 24 V EXT (terminals 80 – 81; 23 ±1 V).
4. Verify proper Discrete Input voltage (terminals 37 – 38; 23 ±1 V).
5. Measure SPEED PWR (terminals 69 – 71). Insure active probe mode is selected in Speed Configuration Menu, make the measurement, and insure probe type is in original configuration (23 ±1 V).
6. Test Speed input by using one of the internal speed test modes in the Test Menu. Resistance measurement of each of the voter outputs is required. Verify as follows:
a. With module not tripped, resistance measurement from 1A – 1B, or 2A – 2B must be less than 100 Ω.
b. With module tripped, resistance measurement from 1A – 1B, or 2A – 2B must be greater than 1 MΩ.
7. Cycle dedicated inputs and verify the proper signal by monitoring the respective input on the Monitor Menu/Dedicated Discrete Input page of the front panel.
8. If possible, compare external speed with measured speed reading on the ProTech-GII display.
9. If used as part of the safety system, verify the analog output. Measure this output by performing an automated overspeed trip test as described in step 6.
10. Chassis isolation checks using resistance measurement. Measure from terminals 39, 66, 67 to a point on the ProTech-GII chassis (the grounding braid is a good place for this measurement): < 1 Ω.
11. Perform a lamp test from front panel Test Menu.

Chapter 7.
Asset Management

Product Storage Recommendations

The unit may be stored in its original shipping container until it is ready for installation. Protect the device from weather and from extreme humidity or temperature fluctuations during storage. This product is designed for continuous storage in IP56 rated locations with an ambient temperature range of: –20 to +65 °C.

To ensure product shelf life, Woodward recommends that a stored ProTech-GII be powered up (power source applied to each module) for 5 minutes every 24–36 months. This procedure re-establishes an electrical charge into the product's electrolytic capacitors, extending their shelf life. (See the Unpacking section in the chapter on Installation for unpacking.)

Refurbishment Period Recommendation

This product is designed for continuous operation in a typical industrial environment and includes no components that require periodic service. However, to take advantage of related product software and hardware improvements, Woodward recommends that your product be sent back to Woodward or to a Woodward authorized service facility after every five to ten years of continuous service for inspection and component upgrades. Please refer to the service programs in the following chapter.

⚠ **WARNING**	**EXPLOSION HAZARD—Substitution of components may impair suitability for Class I, Division 2.**

Chapter 8.
Front Panel Interface

Introduction

The front panel of the ProTech-GII allows the user to view current values for any inputs and view logs. The user can also reset a module, initiate start logic, initiate tests, and view or change configuration settings. This chapter defines the features and functions accessible through the front panel of the ProTech-GII.
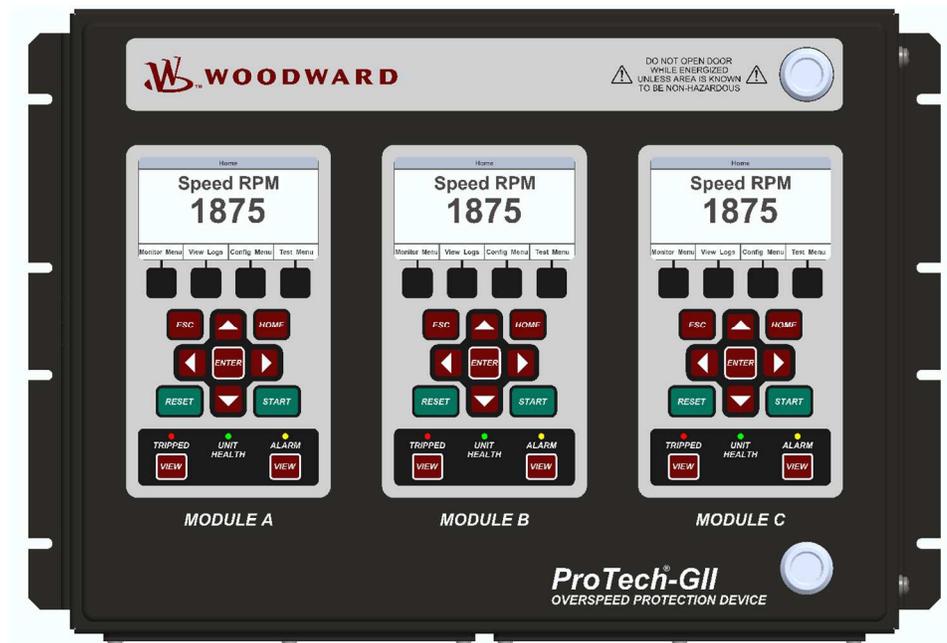

Figure 8-1. ProTech-GII Front Panel

There are four main views:

- **Monitor Menu**—View configuration settings, real time values, and status indications.
- **View Logs**—View all logged events with corresponding time stamps.
- **Config Menu**—Configure basic functions such as overspeed, acceleration trip, etc.
- **Test Menu**—Perform system tests. Overspeed, Simulated Speed, Periodic Overspeed, and Lamp Test

Screen Layout

Each screen on the ProTech G-II modules follows a consistent layout pattern as shown in Figure 8-2.

Screen Name
SCREEN DATA
SCREEN ANNUNCIATION or Screen Message

Soft Key 1	Soft Key 2	Soft Key 3	Soft Key 4
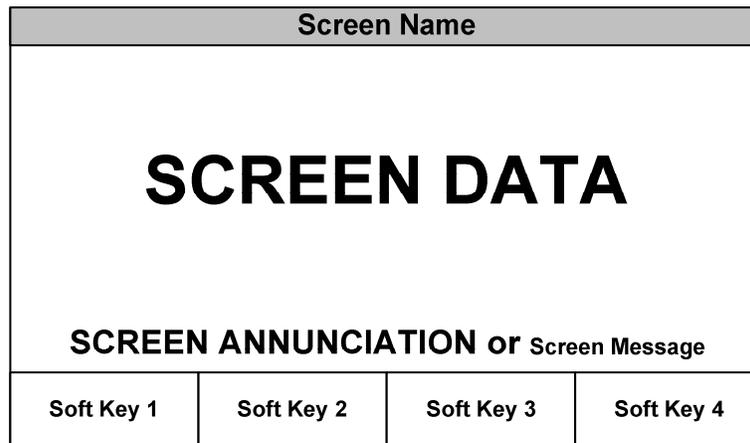
Figure 8-2. ProTech-GII Screen

Screen Name – At the top of each screen is the "Screen Name" which identifies the type of data being displayed or the function being performed on that screen.

Screen Data – The middle or main body of each screen shows either data, a menu of selectable fields, or fields for entering data or passwords. Values in **BLUE font** are values that can change. **BLACK font** is used for static labels or values that can only change by changing the configuration.

> **Note:** In cases where there is too much information to show in the screen data field, a slider bar will appear on the right side to show that additional information can be accessed by using the UP/DN arrow keys.

Screen Annunciation or Message – Below the Screen Data, there is an area reserved for Messages to aid the user. If the screen is in one of the Monitor Menu screens and is just displaying data, this space is reserved to annunciate any alarm or trip messages. The alarm or trip messages are shown in a larger text and highlighted with either yellow or red, respectively. Otherwise this field is used to show user prompts to help with selection or entry of data.

Soft Keys – At the bottom of each screen are four (4) Soft Keys descriptions which are associated with the 4 keys immediately below them. Depending on the screen, the soft keys may be used to select different views, enter data such as setpoints or passwords, select from a list of options, or initiate a function such as performing a test or copying a module's configuration.

Keypad Functions
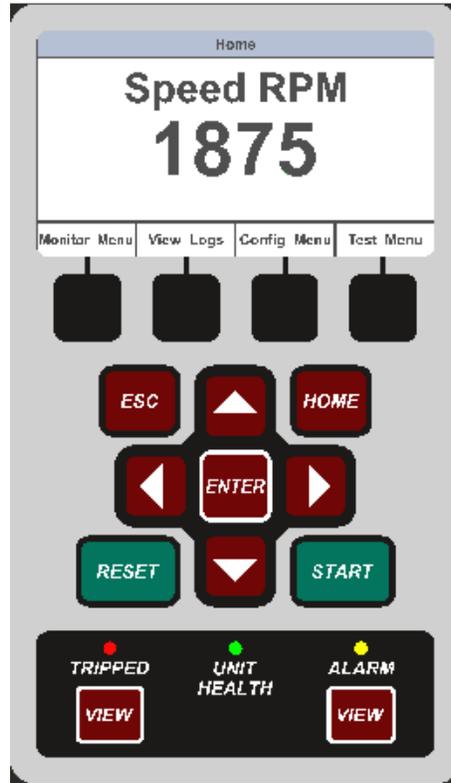
Figure 8-3. ProTech-GII Faceplate

Unless defined otherwise for a particular screen, the keys have the following functions:

Table 8-1. Keys with Function Definitions

ESC	Navigates up one menu in the hierarchy of the selected menu tree. If modifying a value, ESC exits edit mode and restores the value without saving the changes.
HOME	Navigates to the Home screen.
START	One source of the Start signal defined elsewhere in this manual.
RESET	One source of the Reset signal defined elsewhere in this manual.
Up Arrow	Navigate up through the menus or displayed pages.
Down Arrow	Navigate down through the menus or displayed pages.
Right Arrow	Navigate between fields when changing the date
Left Arrow	Navigate between fields when changing the date
ENTER	Select from the menu, or edit a specific value in configuration.
VIEW	Displays the Trip Log or Alarm Log, respectively.
Tripped Indicator	Illuminates RED when a tripped condition exists.
Unit Health Indicator	Illuminates GREEN when there are no errors in the safety functionality. Illuminates RED if there is an error in the safety functionality. Off indicates a communication or power failure either to the display or to the module.
Alarm Indicator	Illuminates YELLOW when an Alarm condition exists.

Navigation

Selecting the Soft Keys below "Monitor Menu", "View Logs", "Config Menu", and "Test Menu", will bring up the associated menu for that category. Use the Up/Down arrows to navigate through the menu items. Select Enter to open the associated screen.

Home

On power-up, the "Home" page is displayed. The "Home" screen shows the sensed speed and provides access to the soft keys to select from the four main menus. Selecting "HOME" brings up the "Home" screen. Selecting "ESC" repeatedly navigates up through the menu hierarchy until the "Home" screen is displayed.

With an Alarm
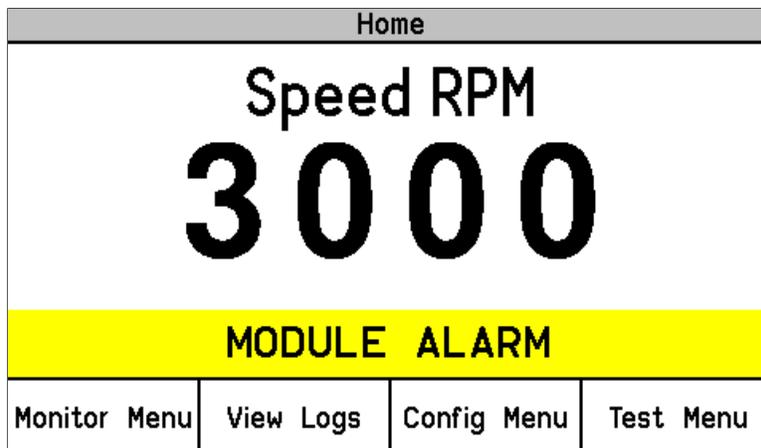
Figure 8-4. Home screen (with Alarm)

With a trip
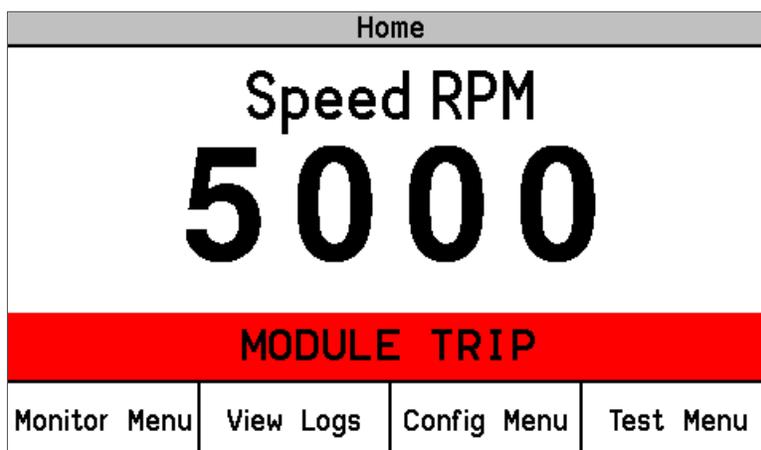
Figure 8-5. Home screen (with Trip)

Passwords

The ProTech-GII utilizes two password levels, a Test Level Password and a Config Level Password. The same passwords are used by the Programming and Configuration Tool (PCT) and Front Panel.

The Test Level Password is required to:
- Initiate tests
- Reset logs (except for the Peak Speed/Acceleration Log)
- Change the Test Level Password

The Config Level Password provides access to any function that requires the Test Level Password. Additionally, the Config Level Password is required to:
- Change any program setting
- Reset the Peak Speed/Acceleration Log.
- Change the Config Level Password

Each of these passwords meets NERC (North American Electric Reliability Corporation) cyber security requirements.

Password Entry
When prompted for a password, the screen below appears.

- The password is six characters long and can be configured using upper and lower case alpha characters, numeric characters, and some special symbols (#, @, !, <, etc.).
    - o Use the "Aa 0-9 @" soft key to select upper case letters, lower case letters, numbers, or a list of usable special characters.
    - o Use the "Value ▼" or "Value ▲" soft keys to change the highlighted value.
    - o Use the "Cursor →" soft key to move the highlighted character to the right.
- Press the Enter Key after the password is selected. If the password is invalid, an error message will appear at the bottom of the screen; otherwise, the password is accepted and the next screen provides access to the password change function.

Figure 8-6. Password Entry Screen

Monitor Menu

From the "Monitor Menu" the user can view configuration settings, real time values, and status indications. When the "Monitor Menu" is selected from the soft keys, the following menu is shown:
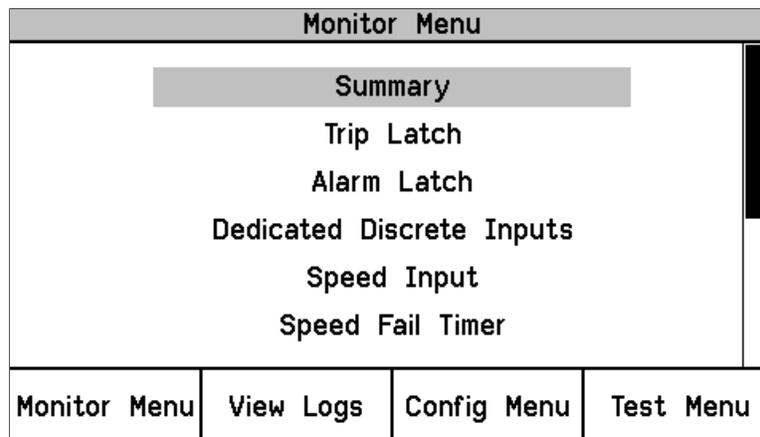
Figure 8-7. Monitor Menu

The "Up Arrow" and "Down Arrow" keys are used to highlight the desired sub-menu item. Pressing the "ENTER" key will open the highlighted item screen. The following items are available from the Monitor Menu:

- Summary
- Trip Latch
- Alarm Latch
- Dedicated Discrete Inputs
- Speed Input
- Speed Fail Timer
- Analog Output
- Modbus
- Date / Time
- System Status
- Module Information

Detailed information on the contents of these screens and examples follows:

Monitor Summary (Page 1)

- Speed—Current value of speed in rpm
- Acceleration—Current value of acceleration in rpm/s
- Overspeed Trip Setpoint—Current setting for overspeed trip in rpm
- Speed Fail Override Status—Condition of the override
- Analog Output—Current value of Analog Output in mA
- Date—Current date
- Time—Current time

```
┌─────────────────────────────────────────────┐
│              Monitor  Summary                 │
├───────────────────────────────────────────────┤
│                      Speed      3000 RPM       │
│               Acceleration         0 RPM/s     │
│      Overspeed  Trip Setpoint   3500 RPM       │
│     Speed Fail Override Status   FALSE         │
│               Analog Output       5.5 mA       │
│                       Date   08 Jun 2010       │
│                       Time   12:20:26          │
├───────────────────────────────────────────────┤
│                Page  1  of  3                   │
├──────────────┬───────────┬──────────┬─────────┤
│ Monitor Menu │ View Logs │Config Menu│Test Menu│
└──────────────┴───────────┴──────────┴─────────┘
```

Figure 8-8. Monitor Summary (Page 1)

Monitor Trip Latch

Displays the status of any latched trip conditions and first out information. All trip conditions are latched and require a reset command to clear the fault indication.

The following trips are always displayed:

- Internal Fault Trip—Indicates a failure internal to the ProTech-GII. Additional details on the fault cause are provided in the PCT's Module Faults Log.
- Power Up Trip—Indicates a power-up condition was detected. Only provided if configured as de-energize to trip.
- Configuration Trip—Indicates new configuration settings were loaded into the module. Pressing the Reset button will clear the error.
- Parameter Error— Indicates a parameter error was detected, meaning there was a problem reading the settings out of the ProTech-GII remains in a tripped state. The configuration must be re-loaded from the PCT and a power cycle is required to clear this error.
- Overspeed Trip—Indicates an overspeed trip.
- Speed Probe Open Wire—Indicates an open wire on the speed input. Only available when configured for passive probe type.
- Speed Lost Trip - Indicates a trip from a sudden speed loss

The following trips are displayed when configured:

- Overaccel Trip—Indicates an overacceleration trip. Speed Lost Trip—Indicates a sudden loss of speed.
- Speed Fail Trip—Indicates speed detected below the fail threshold.
- Speed Fail Timeout Trip—Indicates lack of speed detected during a start condition.

Figure 8-9. Monitor Trip Latch

Monitor Alarm Latch

Displays the status of any latched alarm conditions. All alarm conditions are latched and require a reset command to clear the fault indication. The following alarms are always displayed:

- Internal Fault Alarm—Indicates a failure internal to the ProTech-GII. Additional details on the fault cause are provided in the PCT's Module Faults Log.
- Configuration Mismatch—Modules do not have the same configuration.
- Power Supply 1 Fault—Out of range input power detected on Input #1.
- Power Supply 2 Fault— Out of range input power detected on Input #2.
- Tmp Overspeed Setpoint On—Temp Overspeed Setpoint Test Active.
- Manual Sim. Speed Test—Manual Simulated Speed Test Active
- Auto Sim. Speed Test—Auto Simulated Speed Test Active.

The following alarms are displayed when configured:

- Periodic Ovrspd Test—Periodic Overspeed Test Active (shown in module A only).
- Speed Lost Alarm —Indicates a sudden loss of speed.
- Speed Fail Alarm —Indicates speed detected below the fail threshold.

Figure 8-10. Monitor Alarm Latch

Monitor Dedicated Discrete Inputs

- Condition of the Start, Reset and Speed Fail Override Inputs.
- Start Input—Start Input Active.
- NOTE: This is TRUE if either the Front Panel START key or the START discrete input is active.
- Reset Input—Reset Input Active.
- Speed Fail Override Input—Speed Fail Override Input Active.

Monitor Dedicated Discrete Inputs			
Start Input (or Start Button)			TRUE
Reset Input			FALSE
Speed Fail Override Input			FALSE
Monitor Menu	View Logs	Config Menu	Test Menu

Figure 8-11. Monitor Dedicated Discrete Inputs

Monitor Speed Input

- Monitor speed and acceleration

Monitor Speed Input			
Speed			3000 RPM
Acceleration			0 RPM/s
Monitor Menu	View Logs	Config Menu	Test Menu

Figure 8-12. Monitor Speed Input

Monitor Speed Fail Timer

- Monitor speed fail timer

Monitor Speed Fail Timer			
Timer Running			
Time remaining			
00:00:14			
Speed		50 RPM	
Speed Fail Setpoint		100 RPM	
Monitor Menu	View Logs	Config Menu	Test Menu

Figure 8-13. Monitor Speed Fail Timer

Timer Inactive: Timer not used or not started

Timer Running: Timer started, timer remaining displayed. Timer starts when the start button is pressed or the start discrete signal occurs.

Timer Expired: Indicates Timer reached zero

Note: The Speed Fail Timeout trip is reset by the reset command. If the speed fail timer is active, the Home screen will display the time remaining.

Monitor Analog Output

- Monitor speed and analog output value

Monitor Analog Output			
Speed		2500 RPM	
Analog Output		12.0 mA	
Monitor Menu	View Logs	Config Menu	Test Menu

Figure 8-14. Monitor Analog Output

Monitor Modbus

- Monitor Modbus status.
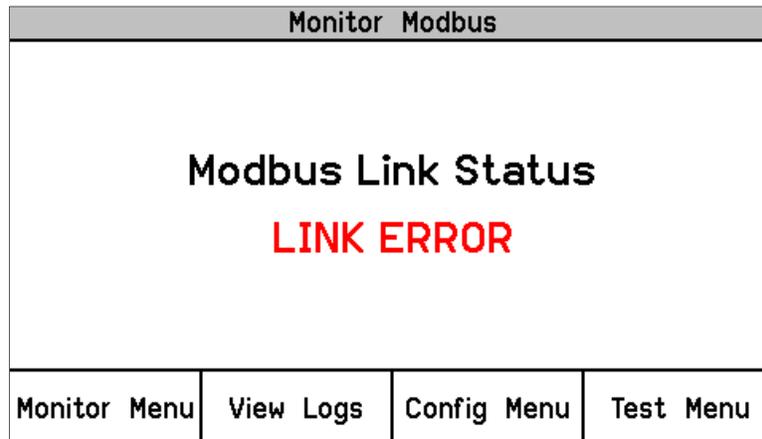
Figure 8-15. Monitor Modbus Status

Link OK: **Modbus** Link OK
Link Error: **Modbus** Link not operating properly

Monitor/Set Date & Time
The screen is used to monitor and set the current date and time. The date automatically accounts for leap year. The time setting must be re-set for all local time changes (e.g. daylight savings time).
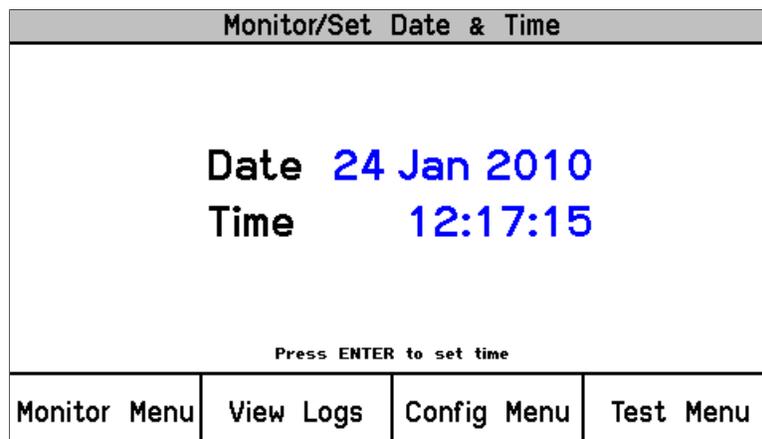
Figure 8-16. Monitor Date & Time

To set the Time and Date, press the "ENTER" key.

Figure 8-17. Set Date & Time

The field to be edited will be highlighted. Pressing the UP/DOWN/RIGHT/LEFT arrows will highlight other fields. Press ENTER to edit the highlighted item and use the soft keys as indicated to adjust the value to the desired value.

Figure 8-18. Set Time

Select ENTER to save the change or ESC to return the value to its original value. Set other fields as required. After all changes have been made, use the soft keys to either "Set Time" or "Cancel".

Figure 8-19. Set Date

Selecting ESC is the same as "Cancel" and the time and date remain at the original values.

System Status

- Monitors the health status of all modules in the system.

Figure 8-20. Monitor System Status

Unknown Status: Status is unknown possibly due to a communication failure with the front panel.

Unit Health OK: Unit is running properly.

Internal Alarm: An internal alarm is present. View the PCT Module Faults Log.

Internal Error: An internal error is present. View the PCT Module Faults Log.

Module Information

- Displays Product ID, Module S/N, and Software P/N and revision.

Figure 8-21. Monitor Module Information

View Logs

From the "View Logs" screens the user can view logged events with corresponding time stamps. Logged data can be viewed and exported to a file using the Programming and Configuration Tool (PCT).

The time stamps in the logs are based on the internal clock at the time of the event. Time stamps are not changed when the internal clock time is modified (i.e. time/date is set).

When the "View Logs" is selected from the soft keys, the following menu is shown:

```
┌─────────────────────────────────────────────────┐
│              Logs  Menu                          │
├─────────────────────────────────────────────────┤
│        ┌───────────────────────────────┐         │
│        │ Overspeed/Acceleration  Log   │         │
│        └───────────────────────────────┘         │
│                 Trip  Log                        │
│                Alarm  Log                        │
│         Peak  Speed/Acceleration  Log            │
│               Reset  Logs                        │
│                                                  │
│                                                  │
├──────────────┬───────────┬────────────┬──────────┤
│ Monitor Menu │ View Logs │ Config Menu│ Test Menu│
└──────────────┴───────────┴────────────┴──────────┘
```

Figure 8-22. Alarm Log Menu

The "Up Arrow" and "Down Arrow" keys are used to highlight the desired Log. Pressing the "ENTER" key will open the highlighted Log screen. The following items are available from the Logs Menu:
- Overspeed/Acceleration Log
- Trip Log
- Alarm Log
- Peak Speed/Acceleration Log
- Reset Logs Menu

Detailed information on the contents of these screens and examples follows:

Overspeed/Acceleration Log
- Log of any overspeed or acceleration trip events.
- Displays the cause of a trip (Overspeed or Overaccelleration)
- Displays the date and time of the trip
- Displays the speed and acceleration at the time of the trip
- Displays the maximum speed and acceleration reached after the trip.
- Displays time and date stamp, actual values, and configured trip values.

```
                  Overspeed/Acceleration  Log

Overacceleration Trip              2010-01-24 12:13:15
Trip Speed      3194 RPM  Trip Acceleration    1085 RPM/s
Max. Speed      6000 RPM  Max. Acceleration    2983 RPM/s

Overspeed Trip                     2010-01-24 12:03:56  TEST
Trip Speed      4255 RPM  Trip Acceleration    2600 RPM/s
Max. Speed      6000 RPM  Max. Acceleration     373 RPM/s

                       Page 1 of 4

Monitor Menu | View Logs | Config Menu | Test Menu
```

Figure 8-23. Overspeed/Overacceleration Log

TEST will appear next to the time in **RED** if the module was in test mode at the time of the trip.

Trip Log
- Log of any trip events. Displays event ID, time and date stamp, first out, and test information.

The first-out (FO) symbol indicates the event(s) that caused the trip. Events that occurred while a test mode was active are noted in the Test column. An example would be an overspeed trip that occurred during a periodic overspeed test.

```
                       Trip  Log
       Event Id                    Time Stamp        FO   Test

Configuration Trip              2010-01-24 12:15:37
Overspeed Trip                  2010-01-24 12:15:26
Overacceleration Trip           2010-01-24 12:14:21    ●
Speed Fail Trip                 2010-01-24 12:13:53
Speed Lost Trip                 2010-01-24 12:13:53
Configuration Trip              2010-01-24 12:13:26
Overspeed Trip                  2010-01-24 12:13:15
                       Page 1 of 5

Monitor Menu | View Logs | Config Menu | Test Menu
```

Figure 8-24. Trip Log

Alarm Log
- Log of any alarm events
- Displays event ID, time and date stamp, and test information

Events that occurred while a test mode was active are noted in the Test column. An example would be a periodic overspeed test.

Figure 8-25. Alarm Log

Peak Speed/Acceleration Log
- Log of peak speed and acceleration recorded since the saved values were last cleared.

Figure 8-26. Peak Speed/Accel Log

Reset Logs

- Allows the user to reset All Logs (Trip, Alarm, and Overspeed/Overacceleration), or just the Peak Speed/Acceleration log.
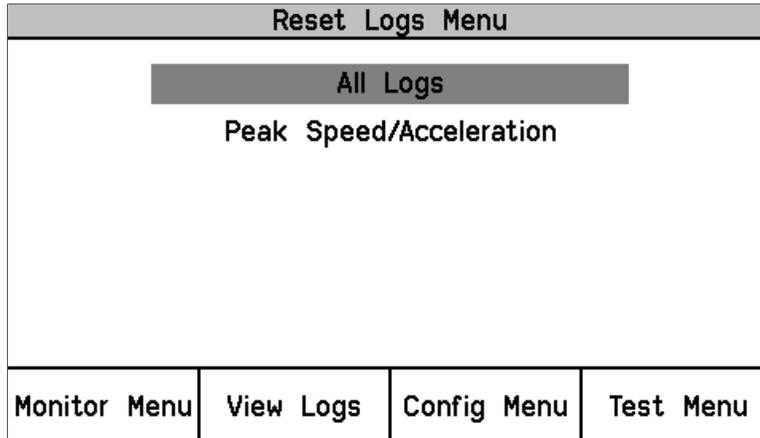
Figure 8-27. Reset Logs

Reset Log Procedure

1. Use the Up Down arrows to select reset "All Logs" or "Peak Speed/Acceleration" and press Enter.

2. At the Prompt to "Reset Logs?" or "Reset Peak Speed/Acceleration" , select Reset to continue, or Cancel to back out of this screen

3. If Reset is selected, the user will be prompted to enter a password. To reset All Logs, either the Test or Config level passwords may be entered. To reset Peak Speed/Acceleration, the Config Level Password must be entered

4. After the correct password is entered, press Enter to reset the log.

Configure Menu

The user can configure the standard values from the front panel or the Programming and Configuration Tool, such as speed, acceleration, analog output scaling, etc. The unit must be in a tripped condition for any configuration parameters to be changed whether the Front Panel or the PCT are used.
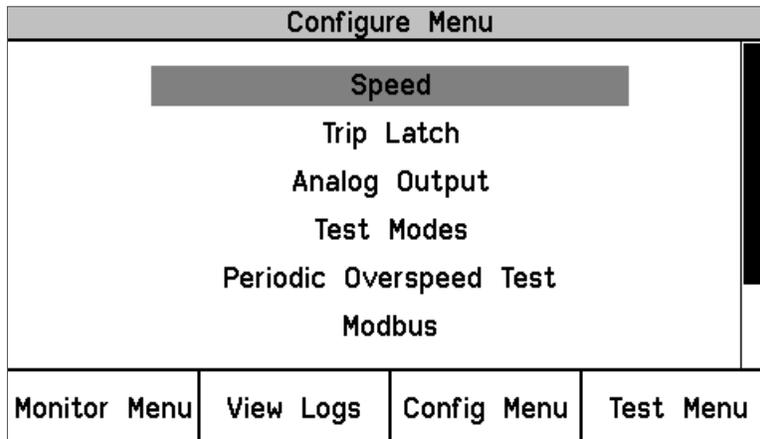
Figure 8-28. Configure Menu

Entering the Edit Mode from the Front Panel
When a value that can be edited is highlighted, the Screen Message "Press ENTER to Edit value" appears. If the module is not Tripped and ENTER is selected the Screen Message "**Module Not Tripped!**" appears briefly (for about 5 seconds). If the module is tripped and ENTER is selected, the Password Entry screen appears. When the correct Config Level Password is entered, the fields can be edited with the soft key selections.

```
┌──────────────────────────────────────────────┐
│           Configure  Speed  Input             │
├──────────────────────────────────────────────┤
│                                                │
│       Probe  Type            ▌PASSIVE▐        │
│                                                │
│       Nr  of  Gear  Teeth          60          │
│                                                │
│       Gear  Ratio              1.0000          │
│                                                │
│       Overspeed  Trip        4000  RPM         │
│                                                │
│       Sudden  Speed  Loss    TRIP              │
│                                                │
│            Press ENTER to edit value           │
├───────────┬──────────┬───────────┬────────────┤
│Monitor Menu│ View Logs │ Config Menu│ Test Menu │
└───────────┴──────────┴───────────┴────────────┘
```

Figure 8-29. Configure Speed Input

Once a password has been successfully entered, it will remain in effect until the user exits the configuration menu tree.

Configuration Procedure
1. Module must be tripped to make any configuration changes.
2. Use the Up / Down function keys to select the category and press Enter.
3. Use the Up / Down function keys to select the parameter.
4. Press Enter to edit a value and the password screen will appear.
5. Select the password for Config level and press Enter.
6. The screen is now in edit mode. Using the soft keys, edit the desired value:
    a. Use the Cursor → key to move to the left.
    b. Use the value ▼ or ▲ keys to change the highlighted value.
    c. Use the Cursor → key to move to the right.
7. Navigate within the Config Menu to other editable values using Front Panel UP/Down Keys and ESC / Enter keys to change pages.
8. After all desired parameters have been changed; press the Home key to exit Configure Mode.
9. If any parameters were changed in Configure Mode, the module will display a prompt "Save Configuration". The options are:
    a. Save – to save any changes then display the Home screen
    b. Discard – to ignore any changes then display the Home screen
    c. Cancel – to go back to the last used configuration screen
    Note: This does not exit the configure mode so re-entering the Password will not be required if ENTER is selected to edit a value.
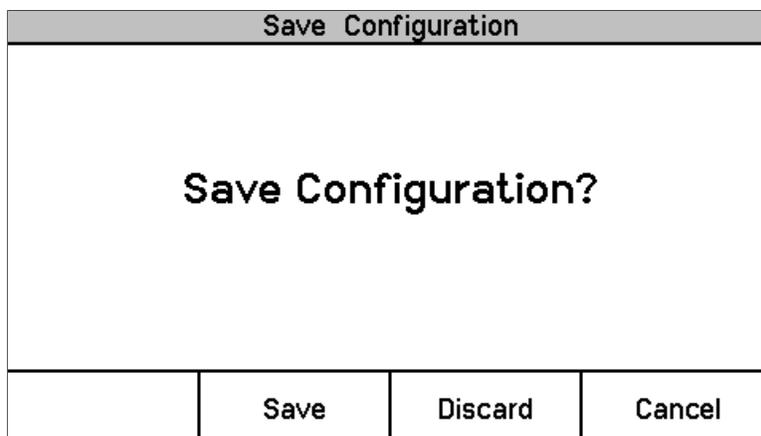
Figure 8-30. Save Configuration

Editing Values from the Front Panel
Once a valid password has been entered, the parameter is highlighted. If the parameter is a value or string, a cursor indicates which digit or character is being edited. The soft keys are used to change the digit or character and to move the cursor. The screen message is used to indicated valid ranges or to select from a list of options (e.g. ACTIVE or PASSIVE, TRIP or ALARM, DE_ENERGIZE TO TRIP OR ENERGIZE TO TRIP). Selecting ESC restores a value being edited to its last entered value.
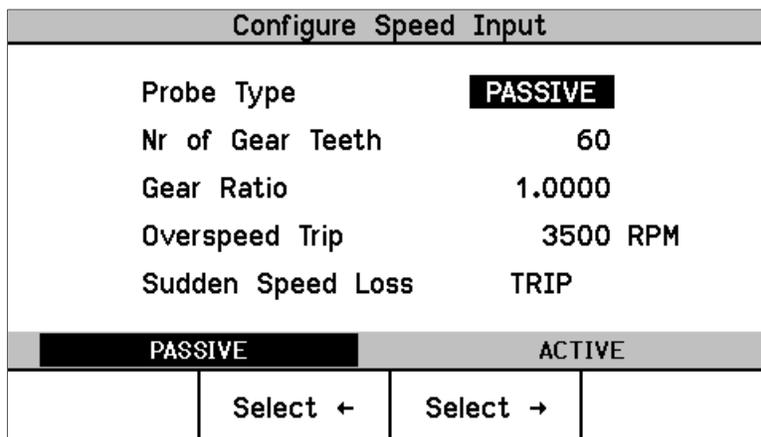
Figure 8-31. Configure Speed Input

If an attempt is made to adjust a value outside of its permitted range, the value is changed to its closest valid value and the message "**LIMIT REACHED**" appears briefly (for about 5 seconds) next to the Screen Message that indicates the valid range.

Configure Speed
- Set values for speed, acceleration, and start logic.

Figure 8-32. Configure Speed Submenu

- Configure Speed Input—Set the following parameters.

Figure 8-33. Configure Speed Input

- Configure Acceleration—Set the following parameters.

Figure 8-34. Configure Acceleration

- Configure Start Logic—Set the following parameters.

Figure 8-35. Configure Start Logic

Configure Trip Latch
- Set action of the Trip Latch (Energize or De-energize to Trip).

Figure 8-36. Configure Trip Latch

Configure Analog Output
- Scale the analog output to RPM.

Figure 8-37. Configure Analog Output

Configure Test Modes

- Set parameters for internal test modes.
    - o Temporary Overspeed Trip – The value that the overspeed trip setpoint will be changed to while the Temporary Overspeed Trip Test is active.
    - o Temp Overspeed Trip Timeout - How long the unit will stay in this test mode, before aborting the test (0-30 minutes).
    - o Simulated Speed Timeout - How long the unit will stay in the Auto or Manual Simulated Speed Test, before aborting the test (0-30 minutes).
    - o Test Mode Interlock Disabled – NO, will prevent the test from being run when any other module is tripped. YES, will allow the user to run this test regardless if any other modules are tripped.

```
         Configure Test Modes

Temporary  Overspeed  Trip           2000  RPM
Temp.  Overspeed  Trip  Timeout    00:00:30 hh:mm:ss

Simulated  Speed  Timeout          00:00:40 hh:mm:ss

Test  Mode  Interlock  Disabled        NO

               Press ENTER to edit value

 Monitor  Menu | View  Logs | Config  Menu | Test  Menu
```

Figure 8-38. Configure Test Modes

Configure Periodic Overspeed Test

- Set parameters for Periodic Overspeed Test.
    - o Periodic Test Enabled – YES, enables this test.
    - o Test Interval – Sets automatic Interval of this test (0-999 days).
    - o Operator Can Disable Test – Set to yes will allow the operator to disable this test from the front panel.

Note: This test can only be configured on module A. Modules B and C automatically use module A's settings.

```
      Configure  Periodic  Overspeed  Test

    Periodic  Test  Enabled         YES
    Test  Interval                  7 days
    Operator  Can  Disable  Test    YES

               Press ENTER to edit value

 Monitor  Menu | View  Logs | Config  Menu | Test  Menu
```

Figure 8-39. Configure Periodic Overspeed

Configure Modbus—Set Parameters for Modbus Communications
- The optional modes are RS-232 or RS-485.
  - Set BAUD rate, parity and slave address
  - Enable Write Commands: NO prevents Modbus data from using write commands, YES allows use of the commands
  - The write commands are Reset, User Defined tests 1 – 3, and Auto Simulated Speed Test.

Figure 8-40. Configure Modbus

Configuration Management Menu
- Configuration Overview—CRC values for configurable parameters.
- Configuration Compare—User selects if this comparison feature is used or not. This feature continuously compares the configuration of the current module against the other two modules in the ProTech-GII.
- Copy Configuration—Allows the user to copy the configuration in the current module to one or both of the other two modules in the ProTech-GII.

The following are expected to be unique and are not included in the compare or copy functions:
- Configurable Input names and units
- Trip Latch names
- Alarm Latch names
- Modbus Slave Address

Note: Passwords are not considered part of the configuration.

Figure 8-41. Configuration Management Menu

NOTICE	Before putting the ProTech-GII into operation, verify that the same configuration is in all three modules. Use the Configuration Compare routine to confirm that this is true.

```
            Configuration  Overview
          Configuration  CRC    68EEh
                Parameter Block           CRC Value
          Speed  Sense                 2C98h
          Overaccel  Trip              4DF2h
          Overspeed  Trip              CE70h
          Start  Logic                 3CEFh
          Analog  Output               E63Eh
          Programmable  Relays         73ECh
                      Page  1  of  4
  Monitor  Menu    View  Logs    Config  Menu    Test  Menu
```

Figure 8-42. Configuration Overview

For additional details on the values displayed on this screen, refer to the Parameter Block Definitions in the Configuration Overview screen section of the Programming and Configuration Tool (PCT) chapter.

- Configuration Compare—User selects whether this comparison feature is USED or NOT USED. This routine compares the configuration of the current module against the other two modules in the ProTech-GII and generates an alarm if there is a difference.

```
          Configure  Configuration  Compare



          Configuration  Compare       USED



                  Press ENTER to edit value
  Monitor  Menu    View  Logs    Config  Menu    Test  Menu
```

Figure 8-43. Configuration Compare

- Copy Configuration—Allows the user to copy the configuration in the current module to one or both of the other two modules in the ProTech-GII.
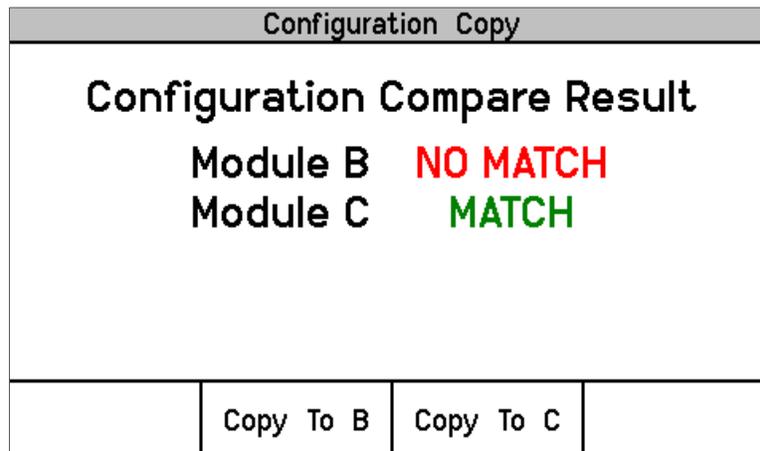
Figure 8-44. Configuration Copy

Configuration Copy Procedure
1. Configuration Compare must be configured to "Used" on the current module and the target module(s), for this routine to function.
2. If Configuration Compare is NOT USED on the current module, selecting Copy Configuration will bring up the screen:
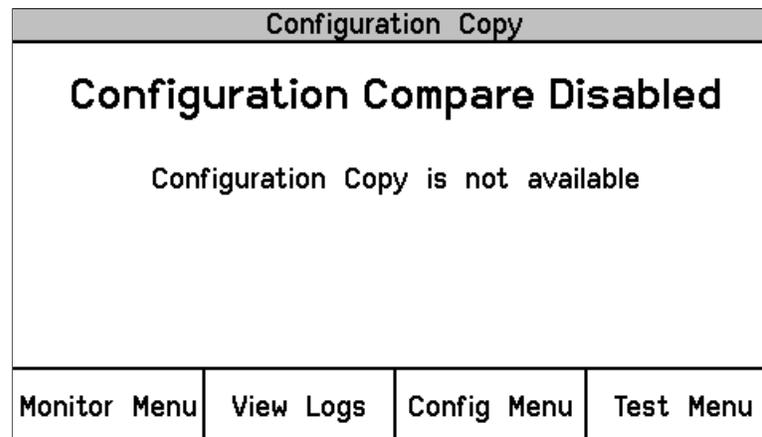
Figure 8-45. Configuration Copy

3. If the Configuration Compare is NOT USED on the target module, its Configuration Compare Result will show as UNKNOWN and there will be no soft key option to copy to that module.
4. The Configuration Copy screen will display the current configuration status of the other two modules.
   a. Match – Indicates that the target module already has the same configuration as the current module.
   b. No Match – Indicates that the configurations do not match.
   c. Unknown – Indicates that the target module is not configured to use Configuration Compare so cannot be read or copied to or that the module is missing, powered off, or that the CAN communications to that module are not working.
5. The current module can be in a tripped, or un-tripped state.

6.   Any target modules must be in a tripped state to accept the configuration.

7.   Press "Copy to _" for either of the other two modules.

8.   Select the password for Config level, and press Enter.

9.   Displays "Copying configuration to target…".

10. Displays "Done saving target configuration"

11. The screen will show that the target module is now a Match.

Password Change Menu
- Allows the user to change the Test Level or Configuration Level passwords.
- The current password must be re-entered before any changes can be made.

```
┌─────────────────────────────────────────────────┐
│             Password Change Menu                │
├─────────────────────────────────────────────────┤
│          ╔═══════════════════════════╗          │
│          ║    Test Level Password    ║          │
│          ╚═══════════════════════════╝          │
│             Config Level Password               │
│                                                 │
│                                                 │
│                                                 │
│                                                 │
│                                                 │
├────────────┬────────────┬───────────┬───────────┤
│Monitor Menu│ View Logs  │Config Menu│ Test Menu │
└────────────┴────────────┴───────────┴───────────┘
```

Figure 8-46. Password Change

Password Change Procedure

1.   Select the Level of password to change.

2.   At the Change Password prompt Select Yes to continue, or Cancel to back out of this screen.

3.   If changing the Test Level Password, either the current test or configure password may be entered. If changing the Config Level Password, the current configure password must be entered.

4.   After successfully entering the current password, press Enter.

5.   The user must now enter the new password for that level.

   a.   Use the "Aa 0-9 @" soft key to select upper case letters, lower case letters, numbers, or a list of usable special characters.

   b.   Use the value ▼or ▲ keys to change the highlighted value.

   c.   Use the Cursor → key to move the highlighted character to the right.

6.   Once the new password has been selected press Enter to save it.

7.   A message will appear to confirm that the password has been changed.

IMPORTANT	**There is no means to reset the password if it is forgotten. Units requiring a password reset must be returned to Woodward.**

Test Modes Menu

The Test Modes Menu provides access to all of the ProTech-GII tests. The user can initiate any configured test the front panel. The Test or Config Level password must be entered to start any of these tests except for the Lamp Test.

The system is equipped with several internal test routines to verify configurable logic and that parameters are working correctly. The test menu of the ProTech-GII keypad contains following tests:

- Temporary overspeed setpoint

   This is an overspeed test with adjusted test speed setpoint executed with the real hardware speed signal from the rotating machine. The speed of the rotating machine must be raised within the allowed test time span in order to test trip action. If the overspeed setpoint is not exceeded within this time span, the overspeed test is aborted.

- Manual simulated speed test

   This is an overspeed test with the speed setpoint that is valid for the machine executed with a simulated speed signal from an internal frequency generator that initiates at the overspeed setpoint minus 100 rpm and must be manually raised within the allowed time span to above the overspeed setpoint in order to test the trip action. If the overspeed setpoint is not exceeded within this time span, the overspeed test is aborted.

- Auto simulated speed test

   This is an overspeed test with the speed setpoint that is valid for the machine executed with a simulated speed signal from an internal frequency generator that initiates at the overspeed setpoint minus 100 rpm and is automatically raised to above the overspeed setpoint in order to test the trip action. If the overspeed setpoint is not exceeded within the requested time span, the overspeed test is aborted.

- Periodic overspeed test

- The periodic overspeed test provides an auto simulated speed test at the configured test interval. Since module A initiates the test sequence, the periodic overspeed test can only be configured in module A.

Figure 8-47. Test Modes Menu

In general, a test may not be started if any other module is tripped/in test or if the current module is tripped/in test. One exception to these rules is the Temporary Overspeed Trip Setpoint which can be applied to multiple modules or if another module is tripped. The other is the Lamp Test which can be applied to any module at any time without a password. If a test is not permitted, or aborted, the following messages explain the cause:

Module Already Tripped! Test Aborted – Indicates that the test cannot be started because the module is already tripped.

Test in Progress - Indicates that the test cannot be started because the module is already in the test mode.

Other Module Tripped! Test Aborted – Indicates that the test cannot be started or that a running test was aborted because another module is tripped.
NOTE: This test mode interlock can be disabled in the Test Modes Configuration of the PCT.

Other Module In Test Mode! Test Aborted. – Indicates that the test cannot be started because either of the other modules are in a test mode.

NOTICE	The Test Mode Interlock can be disabled in the configuration, preventing a module from checking if any other module is tripped or in test before starting a test.

Temporary Overspeed Setpoint Test
- Temporary Overspeed Trip Setpoint—Trip setting for testing.
- Actual Speed—Current Actual Speed.
- Overspeed Trip Setpoint—Configured Actual Overspeed Setpoint.

Figure 8-48. Temporary Overspeed Test Configuration

Temp. Overspeed Test Procedure
To configure this test, see Configure Test Modes Procedure in the section above. See Chapter 3 for a full description of this test.

1. Module cannot be tripped to run this test.
2. Press the Start Test softkey.
3. Select the password for Test or Config level.
4. To run the test press Apply, or press Cancel to exit..
5. The Temp Overspeed Trip Timer will be displayed and counting down.
6. The user can end the test and restore the Overspeed Trip Setpoint to the Configured Actual Overspeed Setpoint.
7. If the Timer expires before the test has ended, the unit will display a message Test Time Expired, and revert back to the Start test screen

Figure 8-49. Temporary Overspeed Trip Setpoint Active

The following Messages may be seen on the Temp. Overspeed Threshold Test page:

At Least One Other Module Is Tripped! – This is only used for the Temporary Overspeed Trip as a warning that another module is tripped. It does not prohibit applying this test.

Temporary Overspeed Trip Setpoint Active - Indicates the Temporary Overspeed Trip Test is active (and the current speed is less that the Overspeed Trip Setpoint).

Speed > Overspeed Trip Setpoint! - Indicates the Temporary Overspeed Trip Test is active and the current speed is greater than the Overspeed Trip
Setpoint. When the test is ended by the user or when the Test Time is Expired, the module will trip.

Test Time Expired - Indicates the timer has reached zero.

Simulated Speed Test
- Test Mode—Manual or Auto.
- Actual Speed—Current Actual Speed.
- Overspeed Trip Setpoint—Configured Actual Overspeed Setpoint.

Figure 8-50. Manual Simulated Speed Test

The resolution of the internal simulated speed decreases as frequency increases. The following table indicates a few spot frequencies. In the following table and graph, it is assumed that a 60 teeth gear is used with a gear ratio of 1, making frequency the same as RPM.

Table 8-2. Simulated Speed Resolution

RPM	Resolution (RPM)
6	9.5E-5
100	.0016
1000	0.16
10000	2.0
32000	20.5

The resolution of the internal frequency generator is described in the following graph. The discontinuities in the chart occur when different internal clock scaling occurs to optimize resolution.
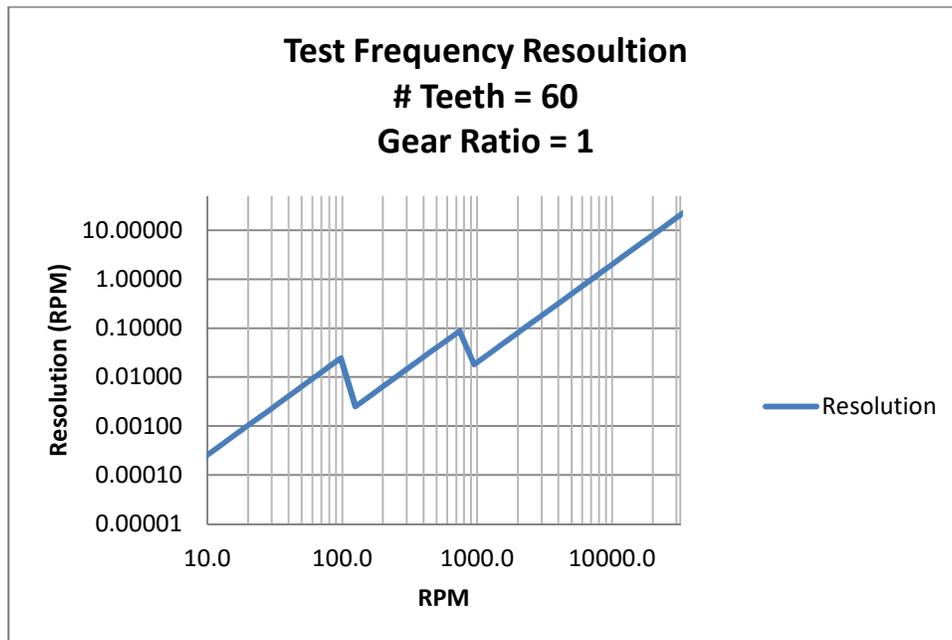
Figure 8-51. Test Frequency Resolution

The following Messages may be seen on the Manual Simulated Speed Test page:

Manual Simulated Speed Active - Indicates the Manual Simulated Speed Test is active.

Auto Simulated Speed Active - Indicates the Auto Simulated Speed Test is active.

Test Time Expired - Indicates the timer has reached zero.

Test Ended by Modbus - Indicates the test was ended by a Modbus command.

Simulated Speed Test (Auto or Manual) Procedure
To configure this test, see Configure Test Modes Procedure in the section above. See Chapter 3 for a full description of this test.

1. Module cannot be tripped to run this test.

2. Press the Start Test soft key.

3. Select the password for Test or Config level.

4. To run the test press Apply, or press Cancel to exit.

   a. Manual Mode
      i. The Simulated Speed Timeout counter will be displayed and counting down.
      ii. The user can use the value ▼or ▲ keys to change the simulated speed setting
      iii. If the simulated speed is raised above the trip point, the unit will switch to the Home screen with the Module Trip displayed.
      iv. Select End Test to Exit
      v. If the timer expires before a simulated trip occurs, the unit will display a message Test Time expired and revert back to the Start test Screen.

   b. Auto Mode
      i. The module will automatically start ramping the simulated speed up to the trip point
      ii. When the simulated speed exceeds the trip point, the unit will switch to the Home screen with the Module Trip displayed.
      iii. There is no timer in Auto mode.
      iv. Select End Test to Exit

Figure 8-52. Manual Simulated Speed Test

Periodic Overspeed Test
- Displays time until the next test.
- Display results of last test.
- This test can only be configured on module A.

```
┌──────────────────────────────────────────────────┐
│            Periodic  Overspeed  Test              │
├──────────────────────────────────────────────────┤
│                                                    │
│        Time  Remaining  Until  Next  Test          │
│          7 days    0 hours    0 mins               │
│                                                    │
│             Result  Of  Last  Test                 │
│                  TEST  PASSED                       │
│                                                    │
│                                                    │
├──────────┬──────────┬──────────┬──────────────────┤
│          │          │          │    Disable        │
│Start  Test│          │          │ Periodic  Test    │
└──────────┴──────────┴──────────┴──────────────────┘
```

Figure 8-53. Periodic Overspeed Test

Result of Last Test can be:
TEST NOT STARTED
TEST PASSED
TEST FAILED
TEST NOT COMPLETED

Periodic Overspeed Test Procedure
To configure this test, see Configure Periodic Overspeed Test Procedure in the section above. See Chapter 3 for a full description of this test.

1. No module can be tripped or in the test mode when this test is started.
2. Test can only be initiated on module A.
3. Press the Start Test soft key.
4. Enter the Test or Config Level Password and select "ENTER".
5. Once the correct password has been entered, press the Start Test soft key to initiate the test.
6. Module A will initiate the internal Overspeed Trip Test.
7. Periodic Overspeed test Active
8. If any module is tripped or placed in test, the Time Remaining Until Next Test timer will be prevented from counting below 1 hour. If the timer is already below 1 hour it will be increased to 1 hour.
9. If no other module is tripped.
    a. The test will run on module A only
    b. Switch to the Home screen and display "Module Trip".
    c. Automatically reset the module.
    d. Move on to module B and repeat steps b and c.
    e. Move on to module C and repeat steps b and c.
10. This test will repeat at the next configured interval.

The operator can disable the periodic test from the front panel of the module. When the Periodic test is Disabled, or if any module is in trip or test, the Time Remaining Until Next Test will be prevented from counting below 1 hour. If the timer is already below 1 hour it will be increased to 1 hour. When Enable Periodic Test is selected and no modules are tripped or in test, this function is removed.

Lamp Test
The Lamp Test is provided to verify front panel LED functionality. During the test, each LED is cycled off and through the provided color combinations listed below. The test can be repeated as needed. A cancel function is also available. No password is required to run the test.

Lamp Test Procedure
1. Select Start Test
   a. Tripped LED—Turns red.
   b. Unit Health LED—Turns red, then green.
   c. Alarm LED—Turns yellow.
2. When the test is complete, LEDs return to normal operation.

Figure 8-54. Lamp Test

Chapter 9.
Programming and Configuration Tool

General

Each ProTech-GII module includes preset overspeed, over-acceleration, alarm latch, and trip latch functionality. It can be custom configured to meet a specific application through a module's front panel or the provided Programming and Configuration Tool (PCT).

The ProTech-GII includes a software-based PCT that can be loaded onto a computer and used to:
- Change overspeed and over-acceleration functionality settings
- Save configuration settings to a file
- Download configuration settings to each ProTech-GII module
- Upload configuration settings from a ProTech-GII module
- Upload and view stored logged files from a ProTech-GII module

⚠️ **WARNING**	**An unsafe condition could occur with improper use of these software tools. Only trained personnel should have access to these tools.**
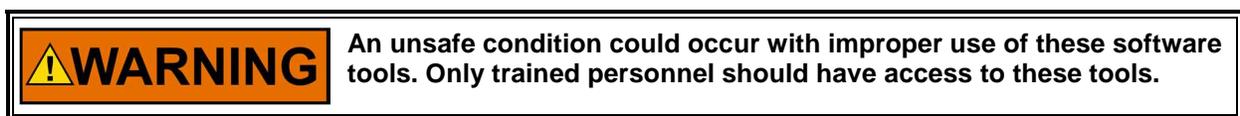
A straight-through serial cable is used to allow the designated computer (with the PCT program loaded on it) to communicate with a ProTech-GII. Refer to Figure 2-18 for cable-specific information.

The PCT consists of a combination of Woodward's "ToolKit" HMI (Human Machine Interface) software program and a special ProTech-GII application file. Although the PCT is provided with each ProTech-GII on an included software installation CD, it can also be loaded from Woodward's Internet website (**www.woodward.com/software**).

The PCT is designed to allow off-line (while not connected to the ProTech-GII) program and configuration settings to be generated, saved, and then downloaded into a ProTech-GII. On-Line (while connected to the ProTech-GII) configuration settings can be manipulated. This is an example of a typical process to follow to program and/or make changes to the ProTech-GII via the PCT:
1. Open ToolKit and connect the computer to the desired module's RS-232 service port.
2. On the toolbar, click 'Connect' and connect to the ProTech-GII via the PCT connection wizard.
3. Select the appropriate security level and enter the password, then click "Log In".
4. Under the 'Settings' menu, choose the desired task.
5. Select a .wset file to modify/edit or create a new one from default values.
6. Save the .wset file to a directory on the computer.
7. Under the settings menu, click Load Settings File to Device to download the saved .wset file to the ProTech-GII module (module must be in tripped state).
8. Using the Config Menu's Configuration Management function, if desired, copy the downloaded program to the other two ProTech-GII modules.

Installation of the PCT

The ProTech-GII control's PCT is a combination of Woodward's "Toolkit" software and a special ProTech-GII application program.

Use the following installation procedure to install the PCT (Programming and Configuration Tool).

1. Locate/obtain ProTech-GII PCT Installation CD provided with each ProTech-GII. (Alternatively, the ProTech-GII PCT can be downloaded from Woodward's website [**www.woodward.com/software**]).
2. Run the installation program and follow all installation instructions.

Programming and Configuration Tool (PCT) Help
On-Line Programming and Configuration Tool (PCT) help is available and included with the installation of the Programming and Configuration Tool (PCT) product. Help can be accessed from the Programming and Configuration Tool (PCT) 'Help' menu located on the Main Window.

Levels of Operation of the Programming and Configuration Tool (PCT)
The ProTech-GII Programming and Configuration Tool (PCT) has three operating levels:
*   Isolated from the ProTech-GII (Off-Line)
*   Test Level (On-Line)
*   Config Level (On-Line)

Isolated level:
*   A communication link between PC and ProTech-GII is not required.
*   Password is not required.
*   The configuration file to be loaded into the ProTech-GII can be created by the Programming and Configuration Tool (PCT).

Test Level:
*   A serial communication link must be established and operational.
*   Password for Test Level is required.
*   The configuration file to be loaded into the ProTech-GII can be created by the Programming and Configuration Tool (PCT).
*   The configuration file stored in the ProTech-GII can be copied to the PC.
*   Log files can be viewed or exported.
*   All logs (except Peak Speed and Peak Acceleration) can be reset.

Config Level:
*   A serial communication link must be established and operational.
*   A password for Config Level is required.
*   The configuration file stored in the ProTech-GII can be copied to the PC.
*   The configuration file created by the Programming and Configuration Tool (PCT), can be uploaded to the ProTech-GII.
*   Log files can be viewed, exported, or reset.
*   On-Line configuration is enabled.

Using the Programming and Configuration Tool (PCT)

In order to use the ProTech-GII Programming and Configuration Tool (PCT), the following actions must be executed:

1. The correct Toolkit version is supplied with the Installer CD that is provided with the product and must be installed on a PC.

2. Run the Toolkit service tool by double-clicking on the file ProTech-GII.wstool. The following introduction screen will be displayed on the PC.
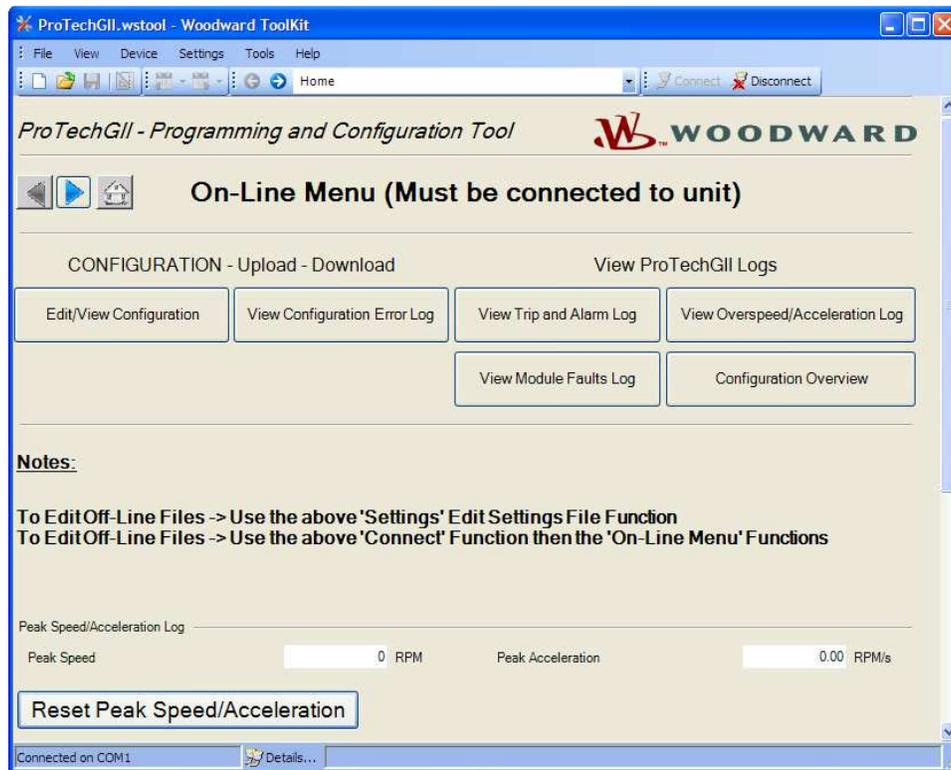
The PCT is ready to be used in isolated level. In order to use the PCT in either Test or Config level, the following actions must be executed:

3. A serial interface cable must be installed between PC and one of the units of the ProTech-GII.

4. Establish communication by using the "connect" function. After pressing "Connect", the following pop-up window appears which prompts you to select a network:
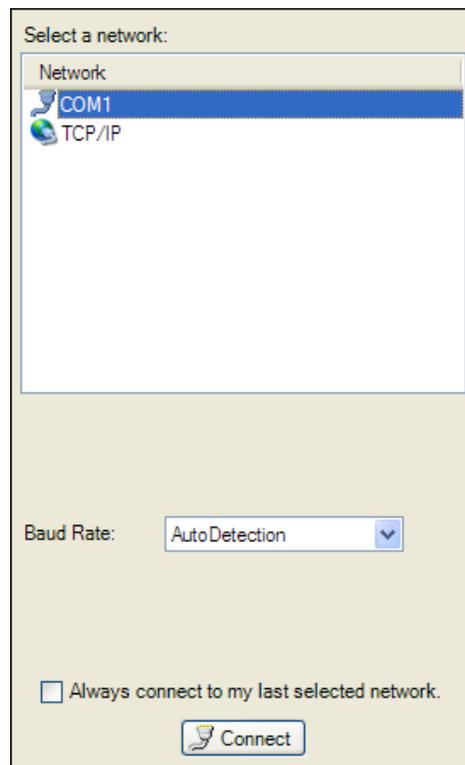
5. Select the Communication port that the serial interface cable is connected to and click on the Connect button in the pop-up window.

6. When the communication link is established, the following pop-up window appears:

7. Select either "Test Level", or "Config Level", and enter the associated Password for the selected level and log in. Select Close if Test or Config level functions are not required.

8. If the communication link cannot be established, the Programming and Configuration Tool (PCT) continues to attempt to establish the communication link until the Disconnect Button is pressed.

9. After communication has been established, the ProTech-GII Programming and Configuration Tool (PCT) provides two menu options:
   o On-Line Menu
   o Off-Line Menu

On-Line Menu
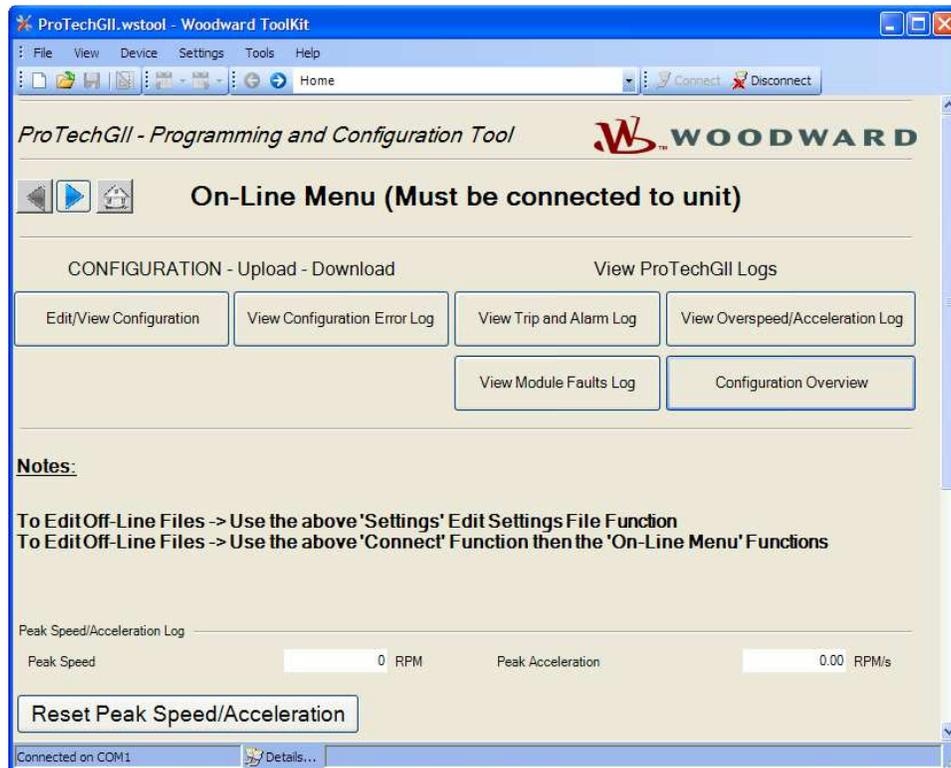
The On-Line menu provides six buttons:

- Edit/View Configuration
- View Configuration Error Log
- View Trip and Alarm Log
- View Overspeed/Acceleration Log
- View Module Faults Log
- Configuration Overview

This menu is always available, however a communication link must be established before the information in the logs is available for monitoring.

Home

The "Home" button is used to return to the On-Line Menu after any one of the four logs have been opened.

View Configuration Error Log

After selecting "View Configuration Error Log", a list of all configuration faults for the configuration that has been loaded in the ProTech-GII is displayed.

> **Note:** If the configuration has not been changed since the last power cycle, configuration faults do not appear.
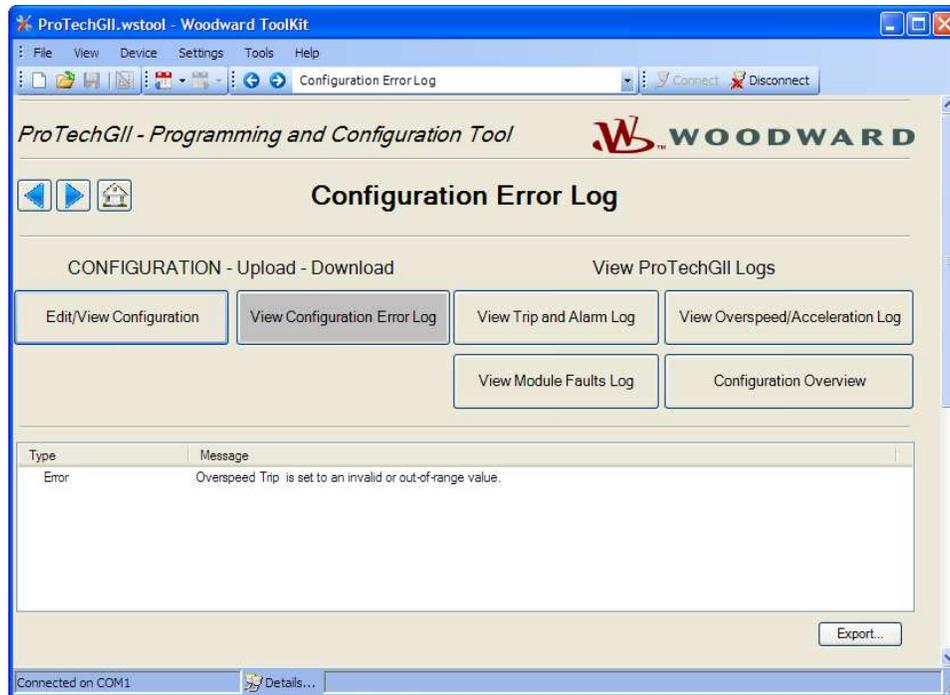
If a configuration error exists, the configuration is not saved and the following screen appears when trying to upload the settings file to the ProTech-GII.

All configuration errors must be resolved before a successful upload of the settings file can be completed.

Data Entry Errors

When editing an existing settings file, or modifying the settings currently loaded in a ProTech-GII, an error window is displayed if data entered is invalid, incomplete, or out-of-range (as shown in the example below).
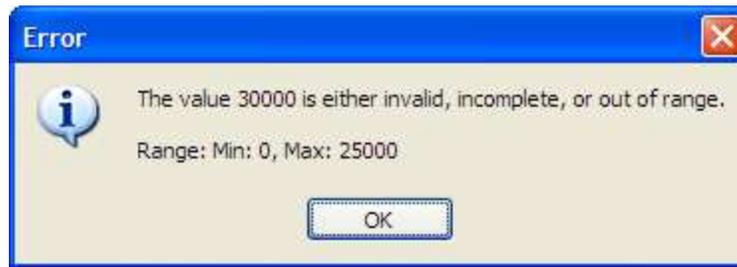
View Trip and Alarm Log

After selecting "View Trip and Alarm Log", a list of all recent trips and/or alarms that have been detected and logged in the ProTech-GII are displayed. Each log can contain up to 50 events. Logs can be cleared from the View Trip and Alarm Log screen or from the front panel user interface, with Test Level permissions or higher.
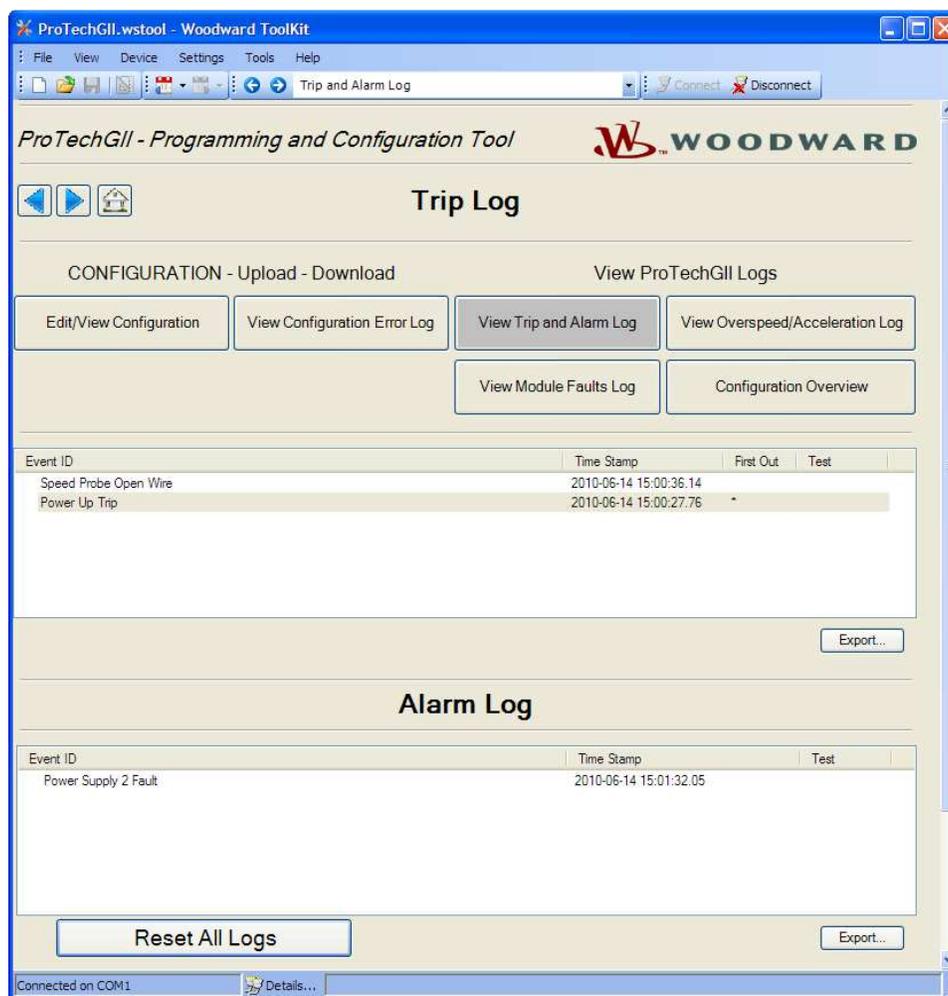
The log contains a description, the time stamp, first-out and/or test-mode indicators. The first-out indicator contains an asterisk (*) for the first detected fault condition(s) after the latch was cleared of all active faults. The test mode indication contains an asterisk (*) if the ProTech-GII was in any of the test modes when the fault condition(s) occurred. The logs can be saved to an html file using the Export button.

Selecting the **Reset All Logs** button will clear the Trip, Alarm and Overspeed/ Acceleration logs. The Reset All Logs button is only visible when logged in with Test Level permissions or higher. If desired, the logs can be cleared from the front panel user interface (see Logs Menu). The logs can be saved to an html file using the Export button.

Log Timestamp
The time stamps in the logs are based on the internal clock at the time of the event. Time stamps are not changed when the internal clock time is modified (i.e. time/date is set).

View Overspeed/Acceleration and Trip Cycle Time Log
After selecting "View Overspeed/Acceleration and Trip Cycle Time Log", one list is displayed:
- A list of all recent overspeed trips and alarms that have been detected and logged in the ProTech-GII is displayed. The maximum length of this list is 20 lines. The list contains a description, the timestamp, the actual speed when overspeed was detected, the acceleration when overspeed was detected, the maximum speed reached (after trip) and the maximum acceleration.

NOTICE	The Trip Cycle Time Log is not an available option on the ProTech-GII.
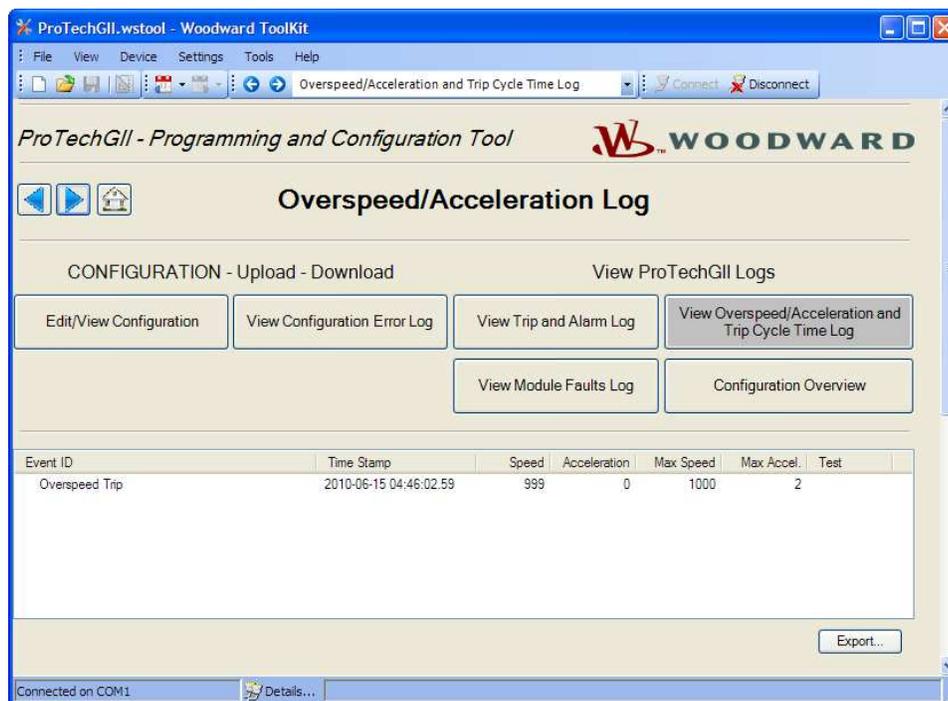
View Module Faults Log

It is possible to view additional details of Internal Fault Alarm and Trip conditions by selecting "View Module Faults Log". The list contains a description containing type of fault (trip or alarm), fault originator (identify which CPU faulted: Logic, Comm or Display), fault type, fault source code address, and a time stamp of the fault.

Select the **Clear Module Faults Log** button to clear this log. This button is only visible with when logged in with Test Level permissions or higher.

The Module Faults Log is only available from the Programming and Configuration Tool (PCT), it is not displayed on the front panel user interface. The log can be saved to an html file using the Export button.
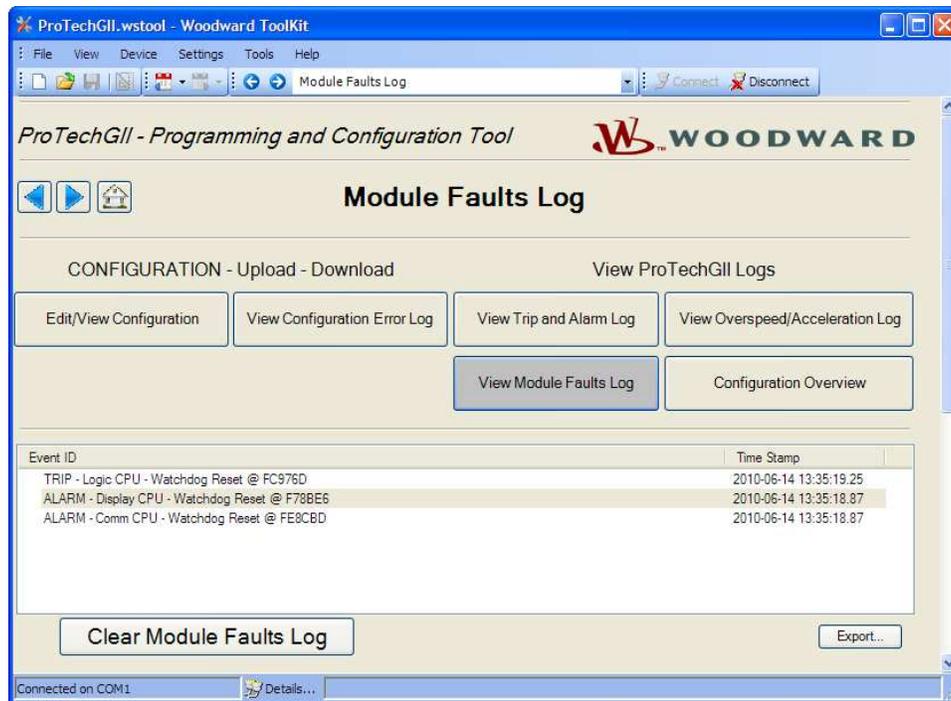
Configuration Overview

The Configuration Overview screen shows CRC codes associated with the overall configuration and with individual (sub-component) configurations. The CRC is a value calculated from the configuration data, so that if the data changes, the CRC will change. CRC codes that do not match represent dissimilar configurations and matching CRC codes represent identical configurations.
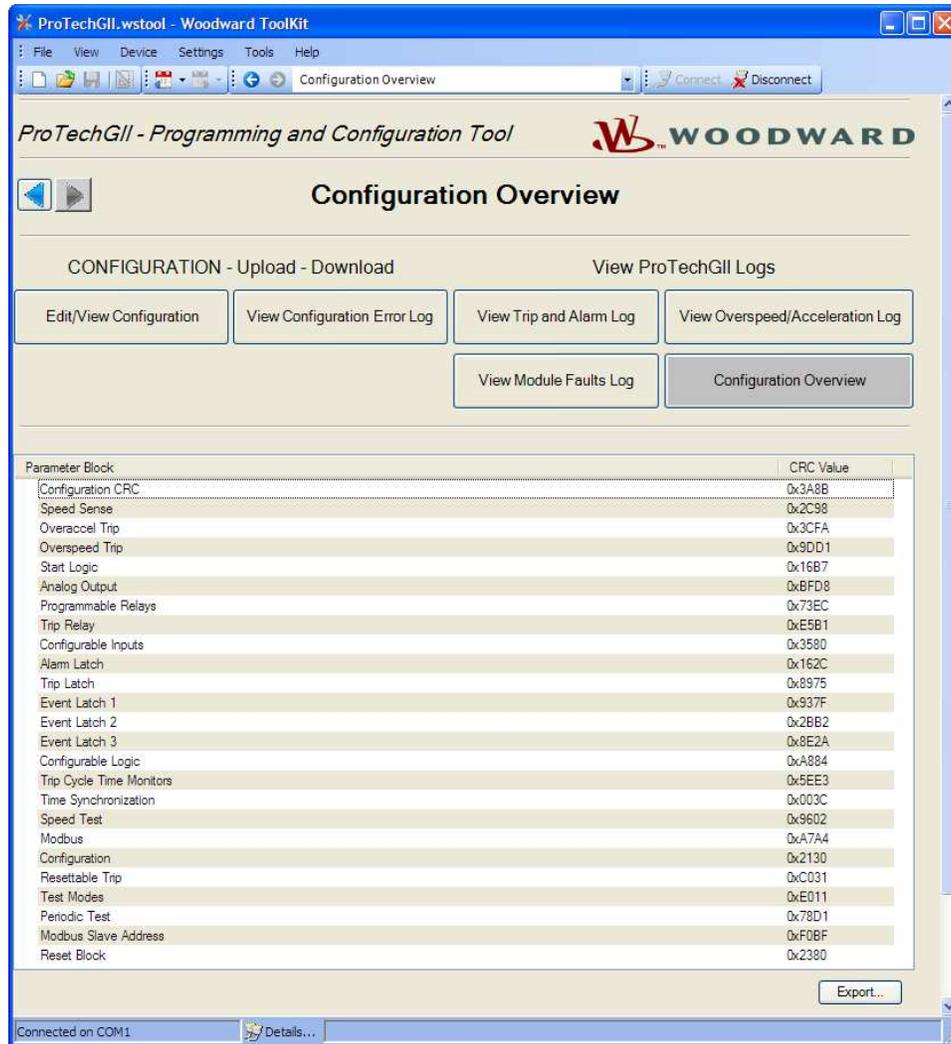
Comparing CRCs between modules or before and after a software change can provide confirmation of where configurations are the same and to facilitate isolation of configuration changes. The log can be saved to an html file using the Export button.

The CRC values are also displayed on the front panel user interface (see Configuration Management Menu/Configuration Overview screens).

> **Note:** Although some functions are not available (as noted below) on ProTech-GII, the Parameter Block CRC's are still available.

Parameter Block Definitions

- **Configuration CRC:** CRC codes for the entire configuration individually listed below.
- **Speed Sense:** CRC codes of the following settings in the Configure Speed Input section on the Speed page: Probe Type, Nr of Gear Teeth, Gear Ratio, and Sudden Speed Loss.
- **Overaccel Trip:** CRC codes of the Configure Acceleration section on the Speed page.
- **Overspeed Trip:** CRC codes of the Overspeed Trip setting in the Configure Speed Input section on the Speed page.
- **Start Logic:** CRC codes of the Configure Start Logic section on the Speed page.
- **Analog Output:** CRC codes of Configure Analog Output settings on the Other Outputs page.
- **Programmable Relays (Not available on ProTech-GII models):** CRC codes of Configure Discrete Outputs settings on the Other Outputs page.
- **Trip Relay:** CRC codes of Configure Trip Latch setting on the Trip Latch page.
- **Configurable Inputs (Not available on ProTech-GII models):** CRC codes of programmable input settings (Programmable Inputs 1-10) on the Inputs page. This CRC does not include the user-definable input names or units.
- **Alarm Latch:** CRC codes of Alarm Latch settings (1-50) on the Alarm Latch page. This CRC does not include the user-definable input names.
- **Trip Latch:** CRC codes of Trip Latch settings (1-25) on the Trip Latch page, excludes the Trip Configuration (energize/de-energize) which is individually stored/displayed (see Trip Relay above). This CRC does not include the user-definable input names.
- **Event Latch 1 (Not available on ProTech-GII models):** CRC codes of Event Latch 1 settings on the Event Latches page. This CRC codes does not include the user-definable input names.
- **Event Latch 2 (Not available on ProTech-GII models):** CRC codes of Event Latch 2 settings on the Event Latches page. This CRC does not include the user-definable input names.
- **Event Latch 3 (Not available on ProTech-GII models):** CRC codes of Event Latch 3 settings on the Event Latches page. This CRC does not include the user-definable input names.
- **Configurable Logic (Not available on ProTech-GII models):** CRC codes of the entire configurable logic (Gates, Latches, Delays, Unit Delays, Comparators, Timers, and User Defined Tests). This includes:
  - o   Gate settings (1-50) on the Logic Gates page
  - o   Latch settings (1-10) on the Latches page
  - o   Delay settings (1-15) on the Delays page
  - o   Unit Delay settings (1-10) on the Unit Delays page
  - o   Comparators settings (1-10) on the Comparators page
  - o   Timers settings (1-15) on the Timers page
  - o   User-defined Test settings (1-3) on the Test Modes page
- **Trip Cycle Time Monitors (Not available on ProTech-GII models):** CRC codes of the settings on the Trip Cycle Timers page.
- **Time Synchronization (Not available on ProTech-GII models):** CRC codes of the settings on the Time Synchronization page.
- **Speed Test:** CRC codes of the Temporary Overspeed Trip, Temporary Overspeed Trip Timeout, and Simulated Speed Timeout settings in the Configure Test Modes section of the Test Modes page. Note: see Test Modes CRC for Test Mode Interlock Disabled setting.
- **Modbus:** CRC codes of Configure Modbus settings on the Modbus page, excluding the Slave Address setting which has a separate CRC.
- **Configuration:** CRC codes of Module to Module Configuration Compare settings on the Home page of the Program Mode.
- **Resettable Trip (Not available on ProTech-GII models):** CRC codes of Resettable Trip settings on the Reset Logic page.
- **Test Modes:** CRC codes of Test Mode Interlock Disabled setting on the Test Modes page.
- **Periodic Test:** CRC codes of Configure Periodic Overspeed Test settings on the Test Modes page.
- **Modbus Slave Address:** CRC codes of Modbus Slave Address setting on the Modbus page. This setting, when used, will typically be unique for each device. As a result, this setting is included in the overall CRC but is not used in the configuration compare function (not copied or compared).

- **Reset Block (Not available on ProTech-GII models):** CRC codes of Configurable Reset Source setting on the Reset Logic page.

Edit/View Configuration

After selecting "Edit/View Configuration", all parameters can be set or changed and loaded to the device while the ProTech-GII is operational. After selecting this button, the following screen is displayed:
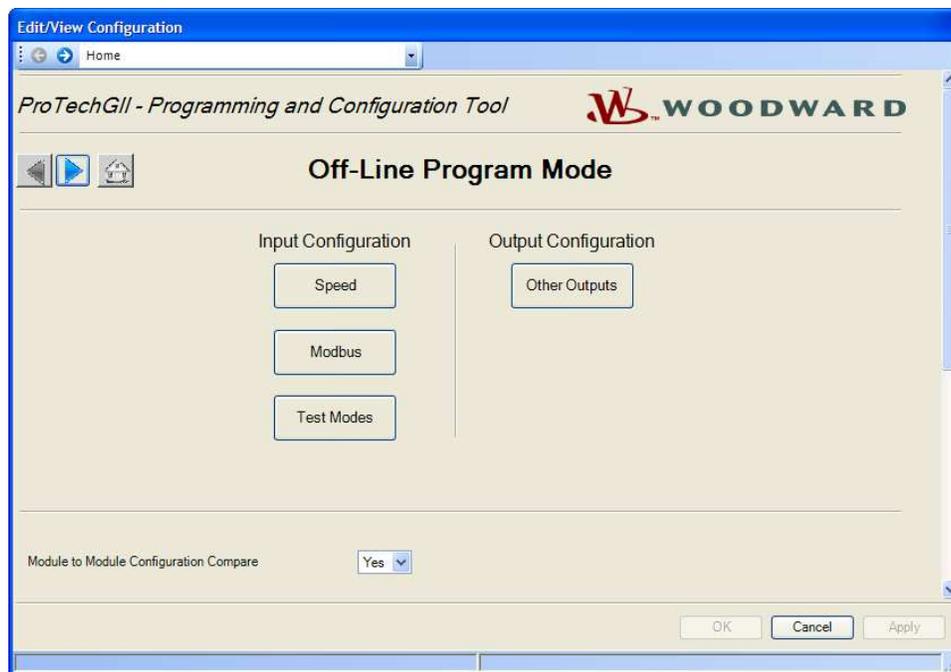
A selection can be made for the parameters to be configured on-line. The changes have the same result as off-line configuration - changed parameters are immediately operational. In Off-Line configuration, parameters are only changed in a configuration file.

The Off-Line program mode has the following buttons on the "Home" screen:

Input Configuration:
- Speed
- Modbus
- Test Modes

Output Configuration:
- Other Outputs

These buttons can be used either in On-Line configuration or in Off-Line configuration. Reference the following paragraphs.

Configuration of the ProTech-GII

IMPORTANT	**Changing the configuration settings in the ProTech-GII is permissible only in a trip condition. If the unit is not in trip condition, configuration changes are inhibited. If no trip condition is present, a power-up trip condition can be generated by a power supply cycle.**

There are two options for changing the configuration settings in ProTech-GII:
- Using the ProTech-GII front panel
- Using the Programming and Configuration Tool (PCT)

The changes that can be done via the front panel are limited to the following functions:
- Speed Probe Type
- Number of Gear Teeth
- Gear Ratio
- Overspeed Trip [Setpoint]
- Sudden Speed Loss [Alarm/Trip]
- Enable Acceleration Trip [No/Yes]
- Accel Trip Enabled Speed [Setpoint]
- Acceleration Trip [RPM/s]
- Speed Fail Setpoint [RPM/s]
- Speed Fail Trip [Not Used/Used]
- Speed Fail Alarm [Not Used/Used]
- Speed Fail Timeout Trip [Not Used/Used]
- Speed Fail Timeout Time
- Trip Latch [De-energize/Energize to Trip]
- Analog Output [4 mA and 20 mA settings]
- Test Modes
- Periodic Overspeed Test
- Modbus Communication Parameters
- Configuration Compare and Copy Features
- Changing Passwords

All other configurations, including the ones that can be configured by the front panel, can only be implemented by use of the Programming and Configuration Tool (PCT). With the PCT, it is possible to do:
- On-Line configuration
- Off-line configuration

On-Line Configuration

IMPORTANT	**On-Line Configuration is only possible in Config Level:** • **A serial communication link must be established and operational.** • **A password for Config Level is required.**

After selecting "Edit/View Configuration", all parameters can be set or changed and loaded to the device while the ProTech-GII is operational.

For on-line configuration, the following "Home" screen buttons are available:

Input Configuration:
- Speed
- Modbus
- Test Modes

Output Configuration:
- Other Outputs

These buttons are only available if a serial communications link is established.

After selecting one of the buttons, a pop-up screen is displayed in which particular parameters for the selected function can be checked and modified if necessary.

For executing this configuration, see "Configuration Settings" in this chapter.

The right bottom corner of each sub-screen has three buttons and an information bar.

The information bar shows the minimum and maximum values that can be selected on the input field where the cursor is located.

In the example below (in the speed pop-up screen), if the cursor is located at the overspeed setting, the valid range of values is between 100 and 32000.
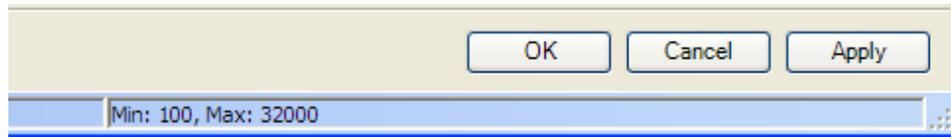
If a serial communication link is active, and Config level is active, and there are no configuration errors, then:

- After the OK or Apply button is pressed, the new configuration setting will immediately be uploaded to the ProTech-GII.

If the new configuration setting is not immediately uploaded, there are three possibilities:

- Test level was selected.
- A configuration error is detected.
- ProTech-GII module is not in trip condition.

Test level was selected
If test level was selected, the following pop-up window appears:
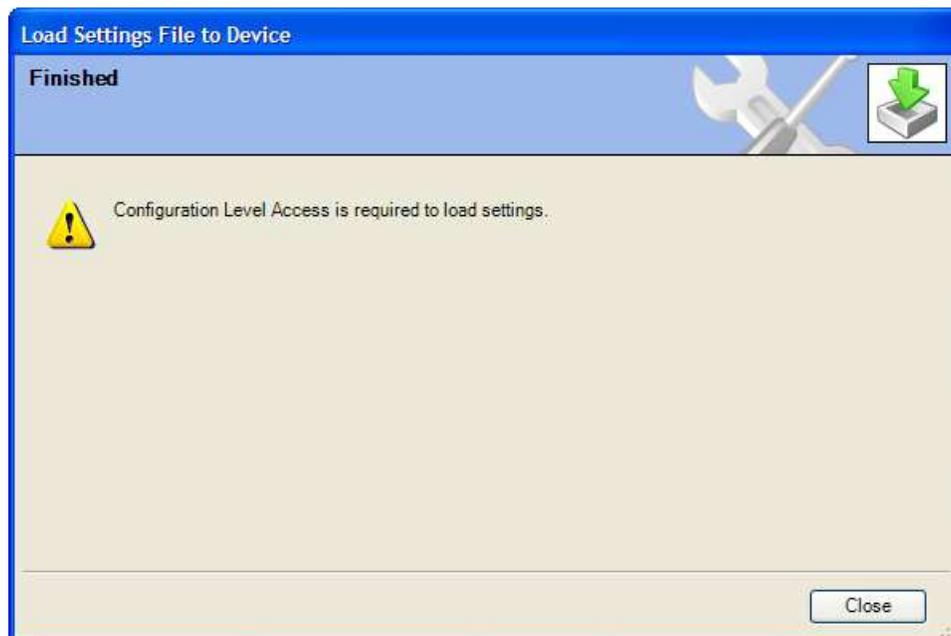
Communications must be stopped and restarted using Config level. Once logged in at the Config level, configuration settings can be changed.

A configuration error is detected
If a configuration error is detected, the following pop up window appears:
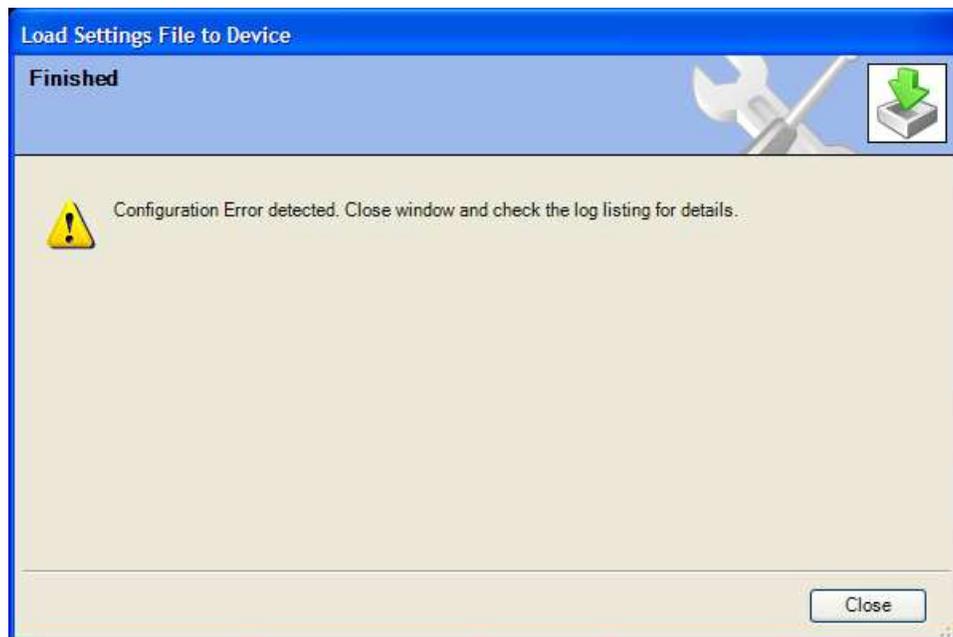
ProTech-GII module is not in a trip condition
If the ProTech-GII module is not in a trip condition, the following pop-up window appears:
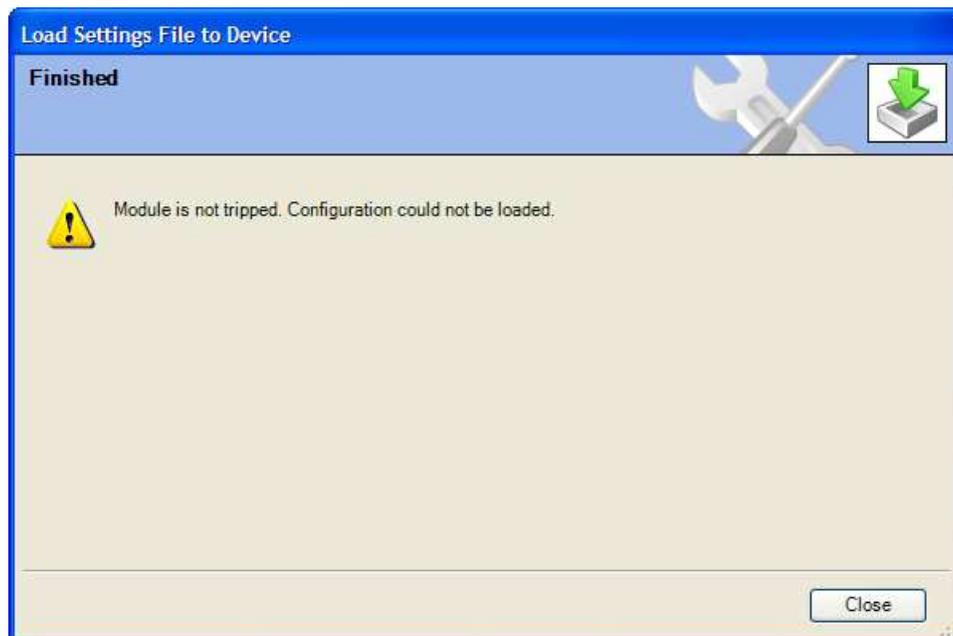
To load a configuration from a PC to a ProTech-GII, the ProTech-GII must be in a trip condition. If the unit is not in trip condition, uploading is inhibited. If no trip condition is present and the unit is configured as "De-energize to Trip", a power-up trip condition can be established by cycling the power supply.

For configuration of all particular parameters, see "Configuration Settings" in this chapter.

Off-Line Configuration

With the Programming and Configuration Tool (PCT), a settings file can be created, modified, saved, loaded to and retrieved from the ProTech-GII.

Configuration can only be created or modified by the editing of the settings files that are transferred to or from the ProTech-GII.

Creating the configuration settings in the ProTech-GII:
1. Create the settings file.
2. Save the settings file on the PC.
3. Load the settings file from PC to the ProTech-GII.

Modifying the configuration settings in the ProTech-GII:
1. Copy the settings file from ProTech-GII to a file on the PC.
2. Modify the settings file.
3. Save the settings file on the PC.
4. Load the settings file to the ProTech-GII.

See **Drop-down Menu "Settings"** for information on how to create and modify configuration files.

Drop-down Menu "Settings"

The drop-down menu settings are used to create and modify the configuration files for the ProTech-GII.

Configuration files can be created, modified, loaded, retrieved, compared, etc.

The following selections are available in the Drop-down Menu "Settings":

Using the Programming and Configuration Tool (PCT) for preparation of the configuration file
When using the ProTech-GII Programming and Configuration Tool (PCT) for preparation of the configuration file (in isolated level), the following selections from the settings drop-down menu can be used:
*   New from SID Specification Defaults
*   Edit Settings File
*   Compare Settings File Differences

Using the Programming and Configuration Tool (PCT) in Test Level
When using the ProTech-GII Programming and Configuration Tool (PCT) in test level, the management of log files is active, and the following selections from the settings pull down menu can be used:
- New from SID Specification Defaults
- Save from Device to File
- Edit Settings File
- Compare Settings File Differences

Using the Programming and Configuration Tool (PCT) in Config Level
When using the ProTech-GII Programming and Configuration Tool (PCT) in config level, the management of log files is active, and the following selections from the settings pull down menu can be used:
- New from SID Specification Defaults
- Save from Device to File
- Edit Settings File
- Load Settings File to Device
- Compare Settings file Differences

New from Defaults
With the selection "New from SID Specification Defaults…", under "Settings", a new application with default settings can be started.

After clicking this selection, the following sub-window appears with a list of applications:
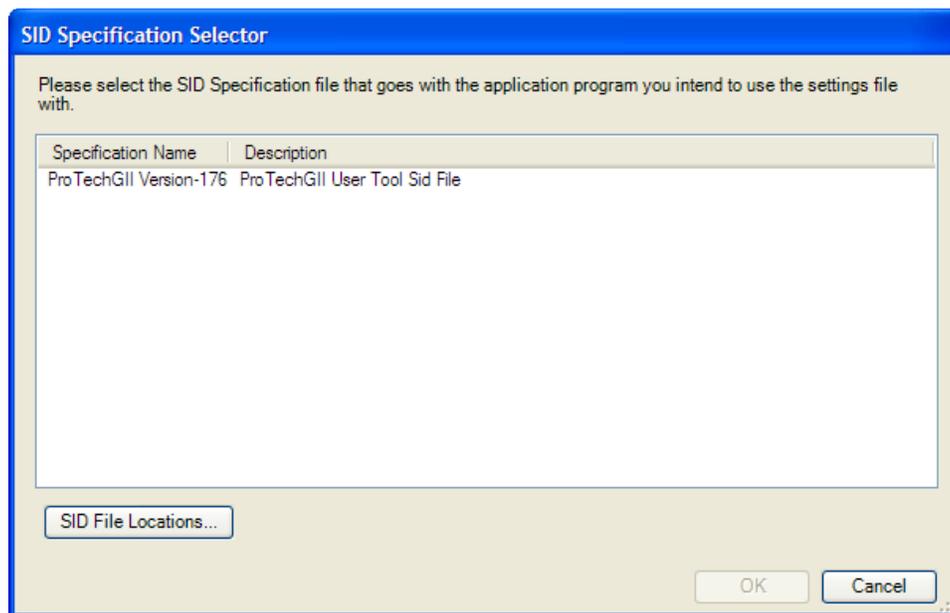
Select the appropriate file compatible with your ProTech software. If other Woodward applications are installed on your PC, a list of choices in addition to ProTech may appear in this list.

With this new window, a new configuration file for the ProTech-GII can be created which means that:
- No logic is pre-programmed
- No Trip, Alarm or Event latches have been configured
- No inputs have been configured
- No test routines have been configured
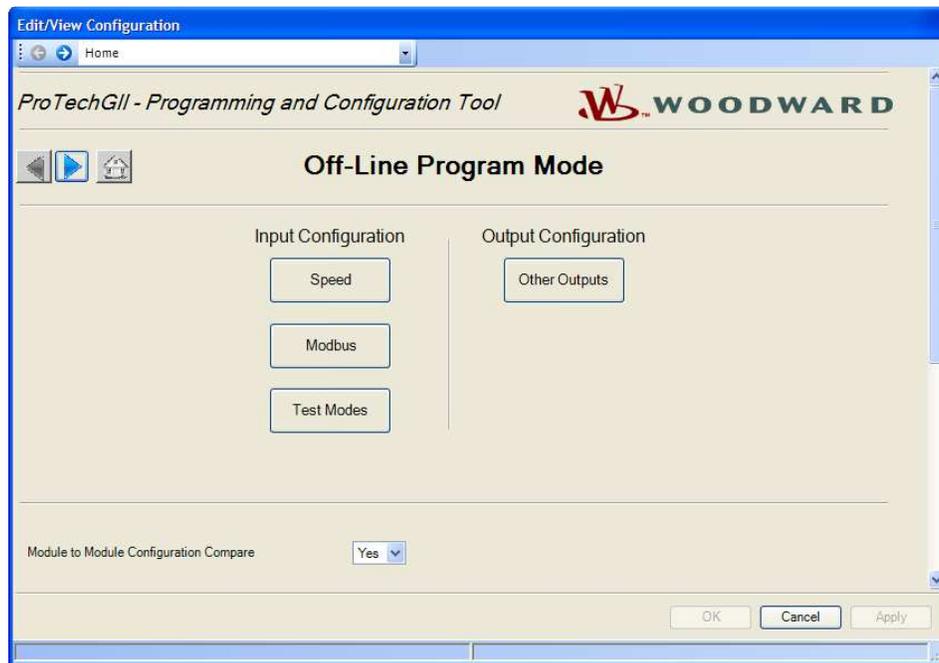
For executing this configuration, see "Configuration Settings" in this chapter.
After the configuration is complete, the newly created settings file must be saved by using the drop-down menu "File", followed by "Save As". The settings files have a *.wset extension.

Assign a file location and name, save the file on the PC and close the Settings Editor screen.

Once the file is saved, it can be uploaded to the ProTech-GII by using pull down menu "Settings" followed by sub-selection "Load settings file to Device".

Save from Device to File
In order to modify the configuration in the ProTech-GII, either the settings file of the ProTech-GII must be already available or a settings file must be created by loading the configuration data from the ProTech-GII to a file on PC. With the selection "Save from Device to File", a configuration file can be loaded from the ProTech-GII to a settings file on a PC. A new file can be created or an existing file can be modified.

To save a setting file from the ProTech-GII to a file, either the test or config level login is required.

After clicking this selection, the following sub-window appears:
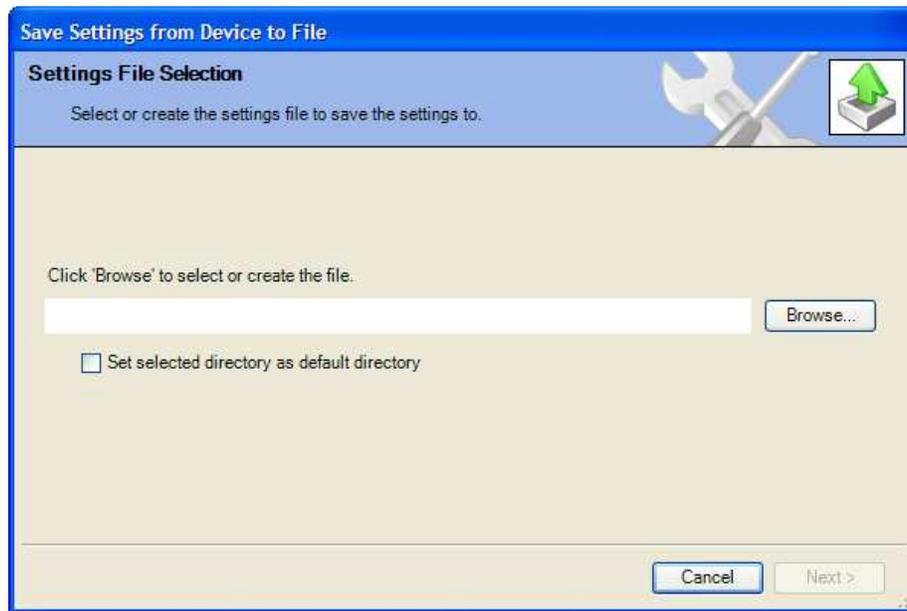
1.   Use the Browse button to select the location and name of the settings file to be created or to be modified. The settings files have a *.wset extension.
2.   Saving settings from device to file requires either the test or config level login. There are two valid conditions:
     - Serial communication was already established, and test level or config level was selected.
     - Serial communication was not yet established.

Serial communication was already established, and test level or config level was selected
3.   If serial communication was already established, and test level or config level was selected, the transfer of the configuration file from the ProTech-GII starts immediately.
4.   The configuration file is ready to be modified by the ProTech-GII Programming and Configuration Tool (PCT). See "Edit Setting File" in this chapter for information on how to modify the configuration file.

Serial communication was not yet established
5.   If serial communication was not yet established, and after the filename is defined and the "Next" button is selected, the following pop-up screen appears. Select the appropriate network.
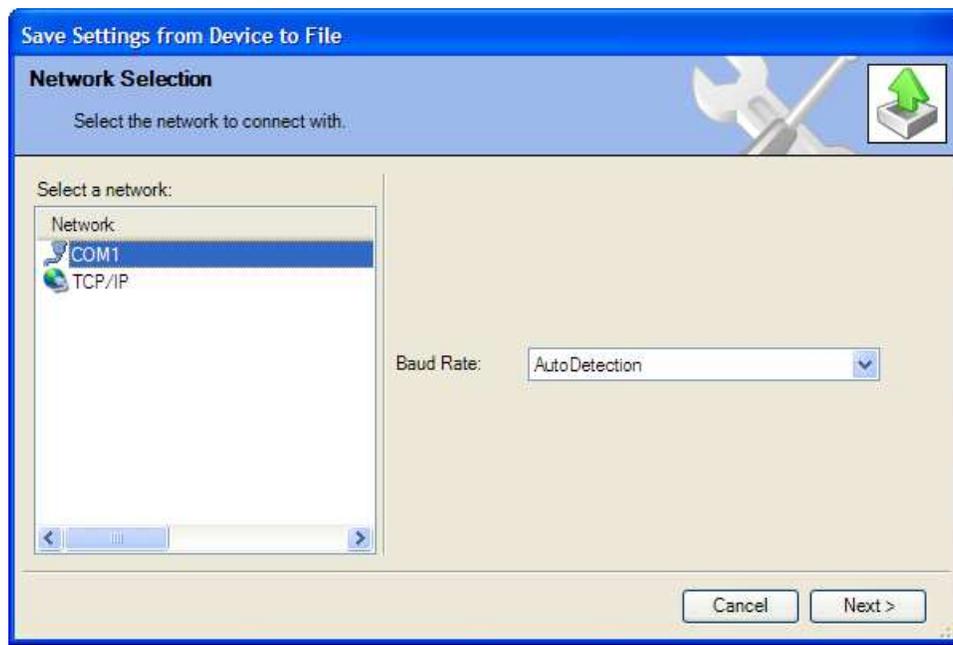
6. Highlight the communication port where the serial interface cable is connected to and click on the Next button in the pop-up window.
7. If a communications link is established, the following pop-up window appears:

8. Select "Config Level" in the drop down menu and enter the associated password for the selected level. After the password is entered, click on the Next button and the transfer of the configuration file from the ProTech-GII to the PC file starts immediately.
9. The configuration file is ready to be modified by the ProTech-GII Programming and Configuration Tool (PCT). See "Edit Setting File" below for information on how to modify the configuration file.
10. If the communication link cannot be established, the PCT will continue to attempt to establish the communication link until the Disconnect Button is selected.

## Edit Settings File

With this selection, an existing configuration file can be modified.

In order to modify the configuration in the ProTech-GII, a file must be created (see "Save from Device to File" section), then modified (instructions in this section), and then re-loaded to the ProTech-GII (see Load Settings File to Device).

After clicking the selection "Edit Settings File" in the pull down menu "Settings", the following sub-window appears with a list of settings files. The settings-files have extension *.wset.
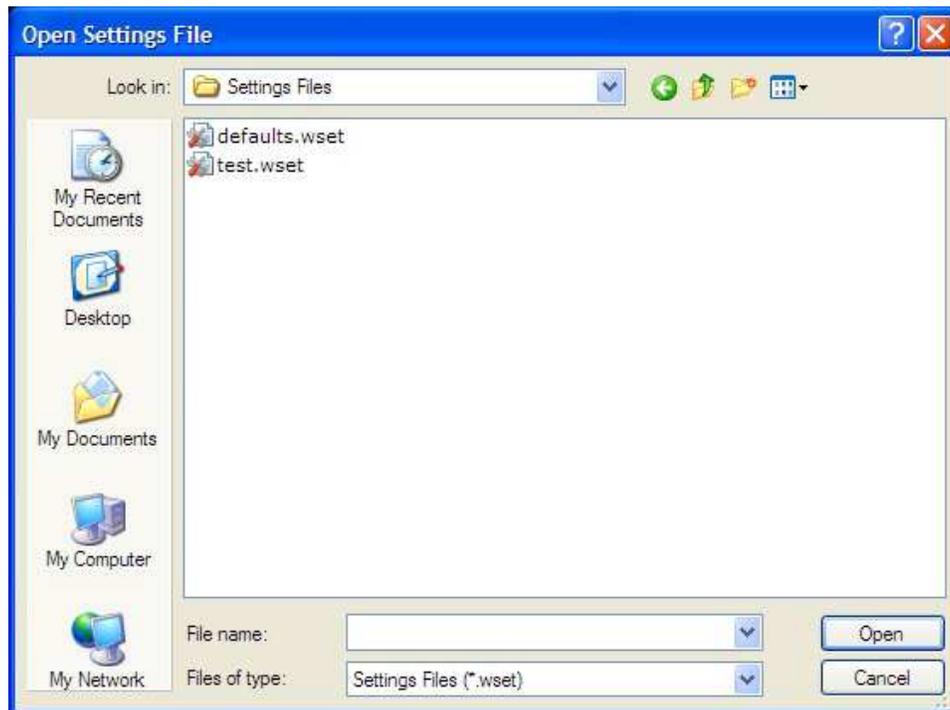
If no settings files are available, a settings file must be created (New from SID Specification Defaults), or a settings file must be loaded from the ProTech-GII to a PC (Save from Device to File).

After file selection, the Settings Editor window opens.
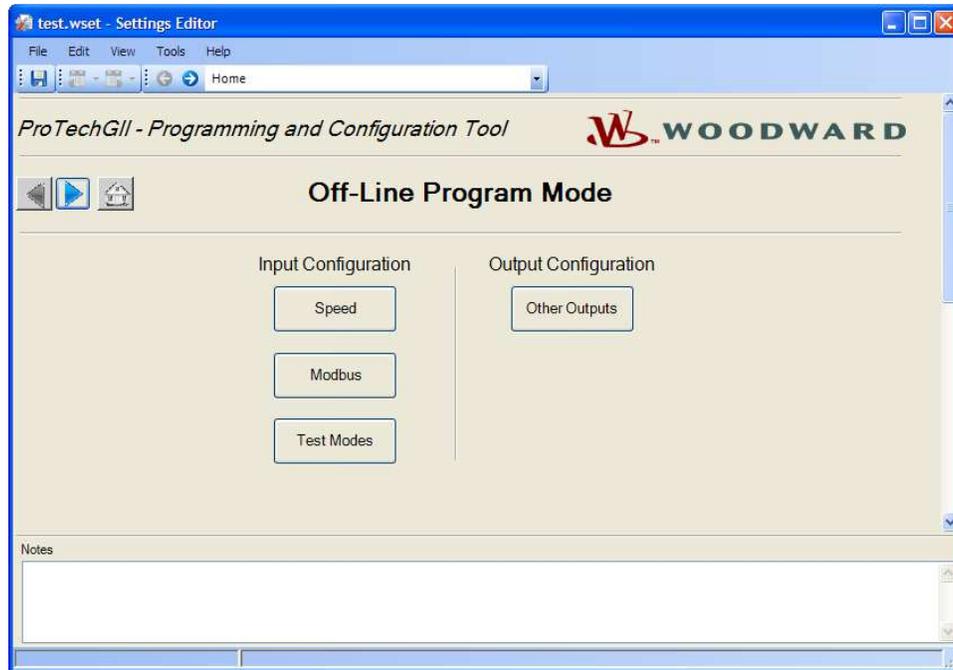
With this new window, the configuration file for the ProTech-GII can be modified by using the left-right arrow buttons or the drop down menu.
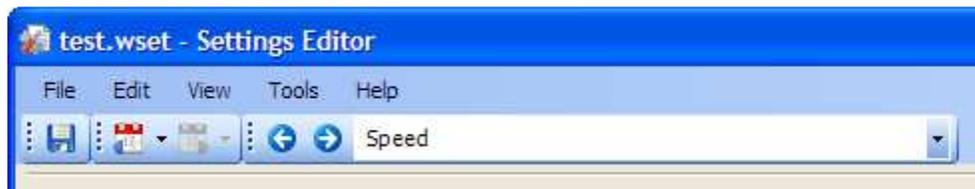
For off-line configuration, the following selections can be used:

Input Configuration:
- Speed
- Modbus
- Test Modes

Output Configuration:
- Other Outputs

After the configuration is finished, the newly created settings file must be saved by using the drop down menu "File", followed by "Save", or "Save As".

Assign a file location and name, and save the file, or overwrite the existing settings file on the PC, then close the Settings Editor screen. The settings files have a *.wset extension.

Once the file is saved, it can be uploaded to the ProTech-GII by using drop down menu Settings followed by sub-selection "Load settings file to Device". For configuration of all particular parameters, see "Configuration Settings" in this chapter.

IMPORTANT	Before the Settings editor is closed, the newly created or modified settings file must be saved in order to have this file available for upload to the ProTech-GII.

To save the created file, use the drop down menu "File".

Load Settings File to Device

In order for the newly created or modified settings to be applied to the ProTech-GII, the saved settings file must be uploaded to the ProTech-GII.

With the selection "Load Settings File to Device", a configuration file can be loaded from the PC to the ProTech-GII.

IMPORTANT	To save a settings file from the Device to a file, the Config security level is required. The Test security level is not sufficient. To load a settings file to the Device, the ProTech-GII must be in a trip condition. If the unit is not in a trip condition, uploading is inhibited. If no trip condition is present, a power-up trip condition can be established by cycling the power supply.

After clicking "Load Settings File to Device", the following sub-window appears:
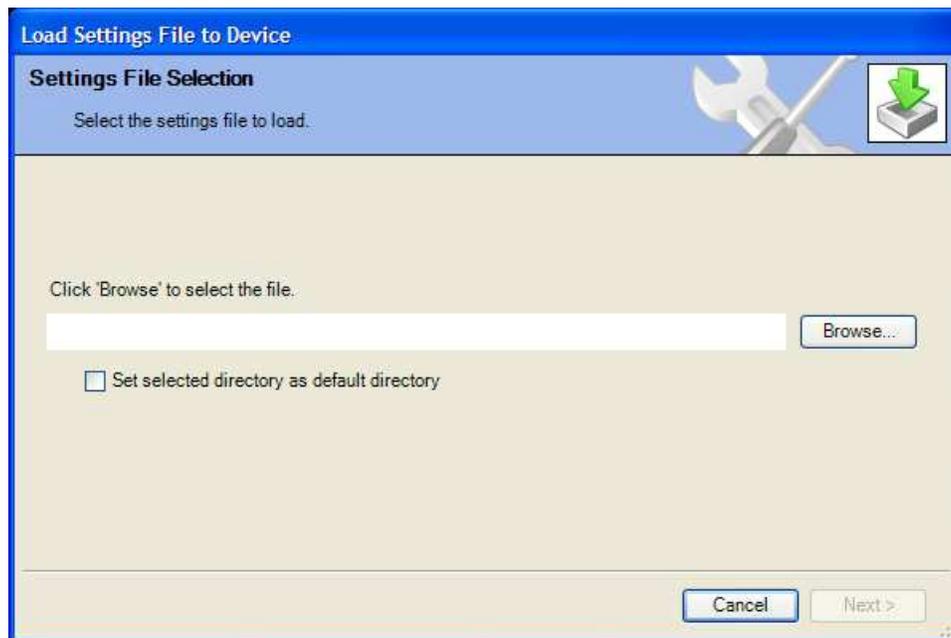
1. Use the Browse button to select the location and name of the settings file to be uploaded to the ProTech-GII. The settings-files have a *.wset extension.
2. For uploads, Config level is required. Test level is not sufficient. There are three valid conditions:
   - Serial communication was already established, and config security level was selected.
   - Serial communication was already established, and test security level was selected.
   - Serial communication was not yet established.

Serial communication was already established, and config security level was selected
3. If serial communication was already established and Config level was selected, and there are no configuration errors, the transfer of the configuration file to the ProTech-GII starts immediately. For uploads, Config level is required. The Test level is not sufficient. If no trip condition exists, transfer is inhibited. A trip condition can be established by a power supply cycle.

If a configuration error exists, uploading of the configuration file is inhibited. All configuration errors must be resolved before a successful upload can be accomplished. See "View Configuration Error Log" in this chapter.

Serial communication was already established, and test security level was selected
4. If serial communication was already established, and test level was selected, then the transfer of the configuration file to the ProTech-GII cannot be established. For uploads, Config level is required. Test level is not sufficient. The following sub-window appears:
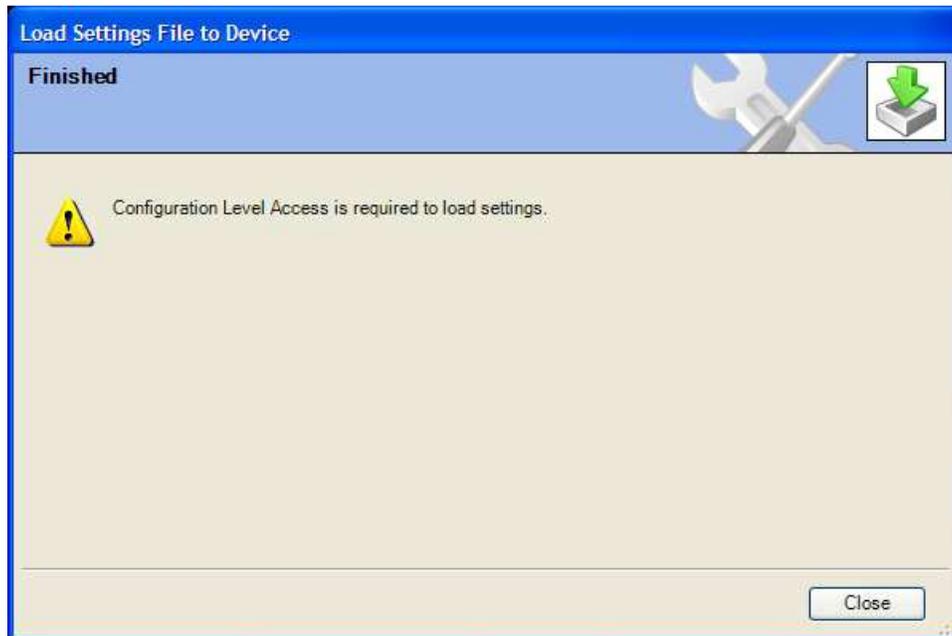
5. Use the disconnect button and reconnect utilizing the password for Config security level and restart the "Load Settings File to Device" procedure.

Serial communication was not yet established
6. If serial communication was not yet established, and after the filename is defined and the "Next" button is selected, the following pop-up screen appears that requests you to select a Network.
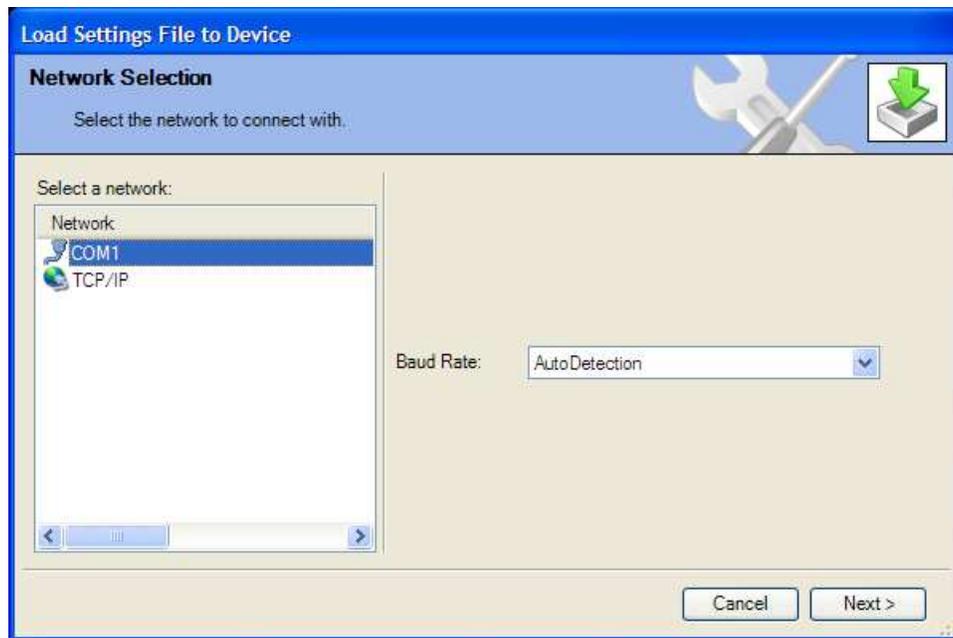
7. Highlight the communication port where the serial interface cable is connected to and click on the Next button in the pop-up window.

8. If a communications link is established, the following pop-up window appears:

9. Select "Config Level", and enter the associated password for the selected security level. After the password is entered, the transfer of the configuration file to the ProTech-GII starts. For uploads, Config level is required. Test level is not sufficient. If no trip condition exists, transfer is inhibited. A trip condition can be established by cycling the power supply.

10. If the communication link cannot be established, the PCT will continue to attempt to establish the communication link until the disconnect button is used.

Compare Settings File Differences

The ProTech-GII Programming and Configuration Tool can compare two configuration files. By selecting "Compare Settings File Differences", the files can be compared for differences in either values and/or names.

After clicking this selection, the following sub-window appears:

Select the files to be compared by clicking the appropriate Browse button and select the "OK" button.

The following sub-window is displayed, which shows all differences between the files:

If the configuration contents of a ProTech-GII need to be compared with the configuration contents of a file, a configuration file of the contents of the ProTech-GII must first be created by selecting "Save from Device to File".

Configuration Settings

The parameter configuration of the ProTech-GII can be modified by either on-line or off-line configuration. Once the communication link is established for on-line configuration, or the **settings editor** is active in off-line configuration, the following parameters can be configured by using the selection buttons in the settings editor:

Input Configuration:
- **Speed**
- **Modbus**
- **Test Modes**

Output Configuration:
- **Other Outputs**

Speed
If the "Speed" button is selected, the following screen is displayed:

The following parameters can be set:

Configure Speed Input
- **Probe Type:** Select speed probe type. Valid values: passive or active.
- **Nr of Gear Teeth:** Set the number of teeth on the gear that the speed sensor is mounted. Valid values: 1-320
- **Gear Ratio:** Set the ratio of the sensed-to-actual speed (sensor wheel/shaft speed). Valid values: 0.1-10
- **Overspeed Trip:** Speed setpoint for an overspeed trip. Valid values: 0-32000 rpm. Frequency equivalent must not exceed 32000 Hz (configuration error).
- **Sudden Speed Loss:** Select action to take when a sudden speed loss is detected. Valid values: trip or alarm

Configure Acceleration
- **Enable Acceleration Trip:** Set to yes to use this function. Valid values: yes or no.
- **Acceleration Trip Enable Speed:** Speed setpoint at which over-acceleration trip is active. Below this speed the acceleration trip is not active. Valid values: 0-32000 rpm.
- **Acceleration Trip:** Over-acceleration trip setpoint in rpm/second. Valid values: 0-25000 rpm/s.

Configure Start Logic
- **Speed Fail Setpoint:** Speed setpoint below which the speed signal is considered failed. Valid values: 0-25000 rpm
- **Speed Fail Trip:** When Used, this trip is activated when speed is below the Speed Fail Setpoint and the Speed Fail Override discrete input is not closed. Valid values: Not Used or Used
- **Speed Fail Alarm:** When Used, this alarm is activated when speed is below the Speed Fail Setpoint. Valid values: Not Used or Used
- **Speed Fail Timeout Trip:** When Used, this trip is activated if speed is below Speed Fail Setpoint when the Speed Fail Timeout Time expires. Valid values: Not Used or Used
- **Speed Fail Timeout Time:** Max time for speed to exceed the Speed Fail Setpoint after a 'start' command. This setting is used in conjunction with the Speed Fail Timeout Trip. Valid values: 1-28800 seconds

Modbus

If the "Modbus" button is selected, the following screen is displayed:
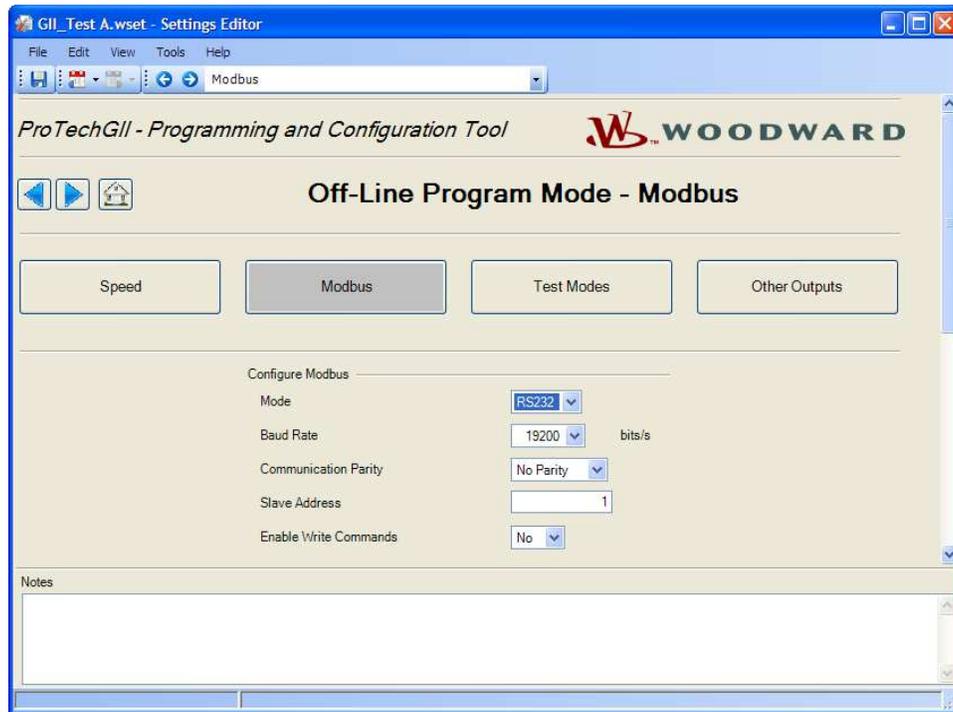
The parameters for Modbus communication can be set in the "Modbus Interface" menu. Modbus utilizes a master/slave network protocol. The ProTech-GII is always a "slave".

The following fields are available:

Configure Modbus settings

- Mode: Select the serial communication mode. Valid values: RS-232 or RS-485.
- Baud Rate: Sets the serial data rate. Valid values: 19200, 38400, 57600, or 115200 bits/second.
- Communication Parity: Sets the serial parity. Valid values: No Parity, Even Parity, or Odd Parity.
- Slave Address: Unique identifier for this module. If all three modules are connected, each will need a unique identifying address. Valid values: 1-247.
- Enable Write Commands: Set to yes to allow Modbus commands to be written to the ProTech (e.g. Reset, Initiate User-def Test 1) – see Monitor and Control section in Modbus chapter. When set to no, Modbus becomes a monitor-only interface. Valid values: Yes or No.

Test Modes

The system is equipped with several internal test routines to verify configurable logic and that parameters are working correctly. The test menu of the ProTech-GII keypad contains following tests:

- **Temporary overspeed setpoint**
  This is an overspeed test with adjusted test speed setpoint executed with the real hardware speed signal from the rotating machine. The speed of the rotating machine must be raised within the allowed test time span in order to test trip action. If the overspeed setpoint is not exceeded within this time span, the overspeed test is aborted.
- **Manual simulated speed test**
  This is an overspeed test with the speed setpoint that is valid for the machine executed with a simulated speed signal from an internal frequency generator that initiates at the overspeed setpoint minus 100 rpm and must be manually raised within the allowed time span to above the overspeed setpoint in order to test the trip action. If the overspeed setpoint is not exceeded within this time span, the overspeed test is aborted.

- **Auto simulated speed test**
  This is an overspeed test with the speed setpoint that is valid for the machine executed with a simulated speed signal from an internal frequency generator that initiates at the overspeed setpoint minus 100 rpm and is automatically raised to above the overspeed setpoint in order to test the trip action. If the overspeed setpoint is not exceeded within the requested time span, the overspeed test is aborted.
- **Periodic overspeed test**
  The periodic overspeed test provides an auto simulated speed test at the configured test interval. Since module A initiates the test sequence, the periodic overspeed test can only be configured in module A.
- **Lamp test**
  The lamp test verifies the front panel LED functionality by cycling through the color combinations. When the test is started, the following sequence is followed.
  1. Tripped, Unit Health, and Alarm LEDs are turned **off** for 1 second.
  2. Tripped LED is on and **red**, Unit Health LED is on and **red**, and Alarm LED is on and **yellow** for 1 second.
  3. Unit Health LED turns **green** for one second.
  4. Tripped, Unit Health, and Alarm LEDs are turned **off** for 1 second.
  5. LEDs return to displaying their active state based on operating conditions.

The test can be repeated as needed. A cancel option is also provided to cancel the test or to return to the previous test modes screen.

If the "Test Modes" button is selected, the following screen is displayed:
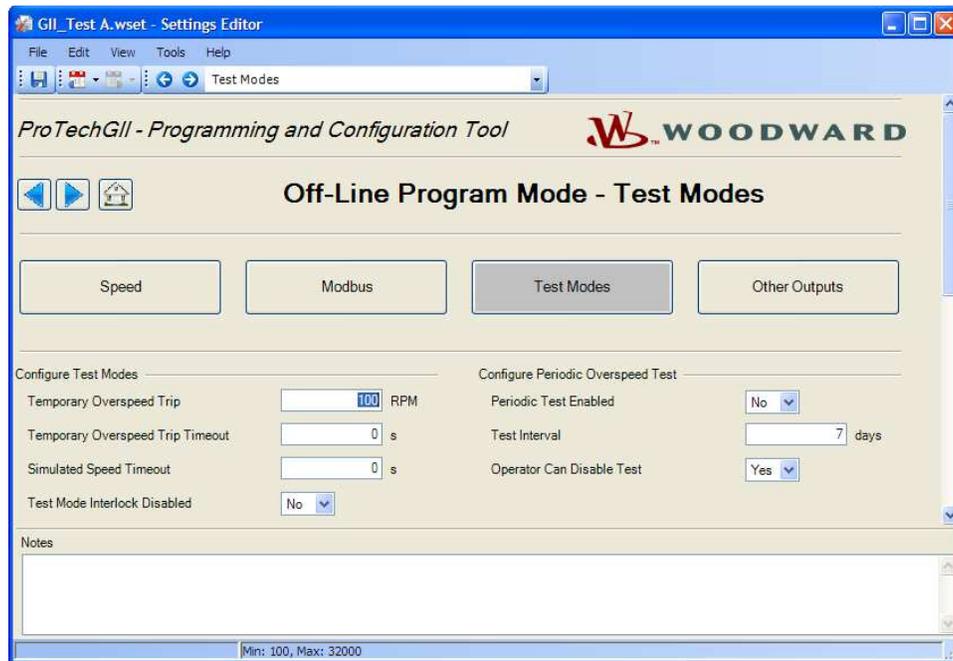
The following fields are available:

Configure Test Modes settings
- **Temporary Overspeed Trip:** Overspeed setpoint setting for overspeed tests with actual turbine or equipment speed signal. Valid values: 0-32000 rpm and frequency equivalent must not exceed 32000 Hz (configuration error).
- **Temporary Overspeed Trip Timeout:** Sets the time allowed to raise the actual turbine or equipment speed above the temporary overspeed setpoint in order to test the trip action. If the overspeed setpoint is not exceeded within this time span, the overspeed test is aborted. Valid values: 0-1800 seconds.

- **Simulated Speed Timeout:** Sets the maximum time allowed during the Manual Simulated Speed Test. If the overspeed setpoint is not exceeded within this time span, the overspeed test is aborted. Valid values: 0-1800 seconds.
- **Test Mode Interlock disable:** Set to yes to disable the interlock. Normally this is set to No, however, disabling the interlock may be desirable during commissioning to facilitate testing while the other modules are tripped. Valid values: Yes or No.

Configure Periodic Overspeed Test settings
- **Periodic Test Enabled:** Set to yes to use the function. Valid values: Yes or No
- **Test Interval:** Interval time for the periodic test (how often it runs). Valid values: 1-999 days
- **Operator can disable test:** Set to yes to permit test intervention. Test disable command options are available from the front panel. When set to no, the test cannot be manually stopped. Valid values: Yes or No

Other Outputs
Each unit has one 4–20 mA analog output.

The analog output is a 4–20 mA signal proportional with measured speed of which scaling can be adjusted using the 4 mA value and 20 mA value input fields.

When "Other Outputs" is selected, the following screen is displayed:
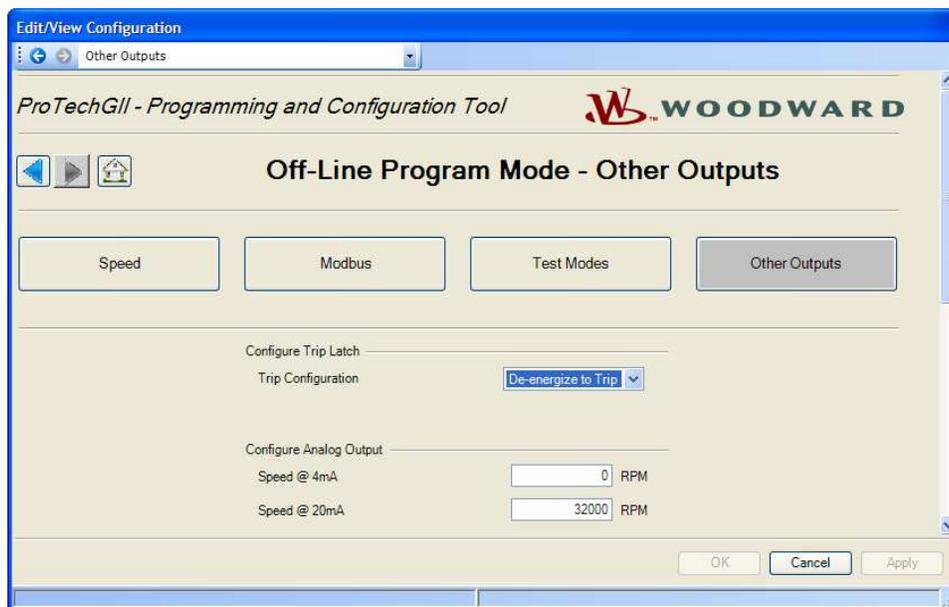
Configure Trip Latch
- **Trip Configuration:** The trip voter relays can be configured to energize for trip or de-energize for trip, which can be selected by entering the selection in the trip configuration field. Valid values: De-energize to Trip or Energize to Trip.

Configure Analog Output
- **Speed @ 4 mA:** The speed value at min (4 mA) for scaling the analog output. Valid values: 0-32000 RPM
- **Speed @ 20 mA:** The speed value at max (20 mA) for scaling the analog output. Valid values: 0-32000 RPM

ProTech-GII Configuration Checks

When a settings file is loaded to the device, the values are checked in the control. Configuration **Warnings** are provided for detected configuration issues that are questionable and should be verified. A Configuration Error indicates a problem in the settings file that needs correcting. If a configuration error is detected during a settings file load, the file load is aborted and the values are discarded. Detection of configuration warnings will not preclude a settings file load operation.

IMPORTANT	Configuration Checks are only detecting customer input values such as limits, required values, syntax errors, etc. Configuration Checks are not detecting functional safety settings. All functional safety and operation settings need to be verified for the specific site application to ensure the system response meets the customer requirements.

Configuration Check Message Summary
1.   Error – <*block identifier*> is set to an invalid or out-of-range value.
2.   Error - Proposed configuration contains data that is invalid (out-of-range).

Error Messages and Solutions

Configuration Error

If a configuration error exists, the Configuration Error Log must be reviewed. See "View Configuration Error Log" section in this chapter.

Note: The configuration check is performed by the ProTech-GII after a settings file is loaded to the ProTech. The PCT must be connected to the ProTech-GII to see this log. The results are stored in volatile memory so a power cycle would clear this log.

Chapter 10.
Product Support and Service Options

Product Support Options

If you are experiencing problems with the installation, or unsatisfactory performance of a Woodward product, the following options are available:

- Consult the troubleshooting guide in the manual.
- Contact the manufacturer or packager of your system.
- Contact the Woodward Full Service Distributor serving your area.
- Contact Woodward technical assistance (see "How to Contact Woodward" later in this chapter) and discuss your problem. In many cases, your problem can be resolved over the phone. If not, you can select which course of action to pursue based on the available services listed in this chapter.

OEM or Packager Support: Many Woodward controls and control devices are installed into the equipment system and programmed by an Original Equipment Manufacturer (OEM) or Equipment Packager at their factory. In some cases, the programming is password-protected by the OEM or packager, and they are the best source for product service and support. Warranty service for Woodward products shipped with an equipment system should also be handled through the OEM or Packager. Please review your equipment system documentation for details.

Woodward Business Partner Support: Woodward works with and supports a global network of independent business partners whose mission is to serve the users of Woodward controls, as described here:

- A **Full Service Distributor** has the primary responsibility for sales, service, system integration solutions, technical desk support, and aftermarket marketing of standard Woodward products within a specific geographic area and market segment.

- An **Authorized Independent Service Facility (AISF)** provides authorized service that includes repairs, repair parts, and warranty service on Woodward's behalf. Service (not new unit sales) is an AISF's primary mission.

A current list of Woodward Business Partners is available at **www.woodward.com/directory**.

Product Service Options

The following factory options for servicing Woodward products are available through your local Full-Service Distributor or the OEM or Packager of the equipment system, based on the standard Woodward Product and Service Warranty (5-01-1205) that is in effect at the time the product is originally shipped from Woodward or a service is performed:

- Replacement/Exchange (24-hour service)
- Flat Rate Repair
- Flat Rate Remanufacture

Replacement/Exchange: Replacement/Exchange is a premium program designed for the user who is in need of immediate service. It allows you to request and receive a like-new replacement unit in minimum time (usually within 24 hours of the request), providing a suitable unit is available at the time of the request, thereby minimizing costly downtime. This is a flat-rate program and includes the full standard Woodward product warranty (Woodward Product and Service Warranty 5-01-1205).

This option allows you to call your Full-Service Distributor in the event of an unexpected outage, or in advance of a scheduled outage, to request a replacement control unit. If the unit is available at the time of the call, it can usually be shipped out within 24 hours. You replace your field control unit with the like-new replacement and return the field unit to the Full-Service Distributor.

Charges for the Replacement/Exchange service are based on a flat rate plus shipping expenses. You are invoiced the flat rate replacement/exchange charge plus a core charge at the time the replacement unit is shipped. If the core (field unit) is returned within 60 days, a credit for the core charge will be issued.

Flat Rate Repair: Flat Rate Repair is available for the majority of standard products in the field. This program offers you repair service for your products with the advantage of knowing in advance what the cost will be. All repair work carries the standard Woodward service warranty (Woodward Product and Service Warranty 5-01-1205) on replaced parts and labor.

Flat Rate Remanufacture: Flat Rate Remanufacture is very similar to the Flat Rate Repair option with the exception that the unit will be returned to you in "like-new" condition and carry with it the full standard Woodward product warranty (Woodward Product and Service Warranty 5-01-1205). This option is applicable to mechanical products only.

Returning Equipment for Repair

If a control (or any part of an electronic control) is to be returned for repair, please contact your Full-Service Distributor in advance to obtain Return Authorization and shipping instructions.

When shipping the item(s), attach a tag with the following information:
- Return authorization number
- Name and location where the control is installed
- Name and phone number of contact person
- Complete Woodward part number(s) and serial number(s)
- Description of the problem
- Instructions describing the desired type of repair

Packing a Control

Use the following materials when returning a complete control:
- Protective caps on any connectors
- Antistatic protective bags on all electronic modules
- Packing materials that will not damage the surface of the unit
- At least 100 mm (4 inches) of tightly packed, industry-approved packing material
- A packing carton with double walls
- A strong tape around the outside of the carton for increased strength

NOTICE	To prevent damage to electronic components caused by improper handling, read and observe the precautions in Woodward manual 82715, *Guide for Handling and Protection of Electronic Controls, Printed Circuit Boards, and Modules.*

Replacement Parts

When ordering replacement parts for controls, include the following information:
- The part number(s) (XXXX-XXXX) that is on the enclosure nameplate
- The unit serial number, which is also on the nameplate

Engineering Services

Woodward offers various Engineering Services for our products. For these services, you can contact us by telephone, by email, or through the Woodward website.
- Technical Support
- Product Training
- Field Service

Technical Support is available from your equipment system supplier, your local Full-Service Distributor, or from many of Woodward's worldwide locations, depending upon the product and application. This service can assist you with technical questions or problem solving during the normal business hours of the Woodward location you contact. Emergency assistance is also available during non-business hours by phoning Woodward and stating the urgency of your problem.

Product Training is available as standard classes at many of our worldwide locations. We also offer customized classes, which can be tailored to your needs and can be held at one of our locations or at your site. This training, conducted by experienced personnel, will assure that you will be able to maintain system reliability and availability.

Field Service engineering on-site support is available, depending on the product and location, from many of our worldwide locations or from one of our Full-Service Distributors. The field engineers are experienced both on Woodward products as well as on much of the non-Woodward equipment with which our products interface.

For information on these services, please contact us via telephone, email us, or use our website: **www.woodward.com**.

Contacting Woodward's Support Organization

For the name of your nearest Woodward Full-Service Distributor or service facility, please consult our worldwide directory at **www.woodward.com/directory**, which also contains the most current product support and contact information.

You can also contact the Woodward Customer Service Department at one of the following Woodward facilities to obtain the address and phone number of the nearest facility at which you can obtain information and service.

Products Used in Electrical Power Systems	Products Used in Engine Systems	Products Used in Industrial Turbomachinery Systems
Facility --------------- Phone Number	**Facility --------------- Phone Number**	**Facility --------------- Phone Number**
Brazil ------------- +55 (19) 3708 4800	Brazil ------------- +55 (19) 3708 4800	Brazil ------------- +55 (19) 3708 4800
China ----------- +86 (512) 6762 6727	China ----------- +86 (512) 6762 6727	China ----------- +86 (512) 6762 6727
Germany:	Germany ------ +49 (711) 78954-510	India --------------- +91 (124) 4399500
Kempen---- +49 (0) 21 52 14 51	India --------------- +91 (124) 4399500	Japan---------------+81 (43) 213-2191
Stuttgart - +49 (711) 78954-510	Japan---------------+81 (43) 213-2191	Korea---------------+82 (51) 636-7080
India --------------- +91 (124) 4399500	Korea---------------+82 (51) 636-7080	The Netherlands--+31 (23) 5661111
Japan---------------+81 (43) 213-2191	The Netherlands--+31 (23) 5661111	Poland -------------- +48 12 295 13 00
Korea---------------+82 (51) 636-7080	United States-----+1 (970) 482-5811	United States-----+1 (970) 482-5811
Poland -------------- +48 12 295 13 00		
United States-----+1 (970) 482-5811		

Technical Assistance

If you need to contact technical assistance, you will need to provide the following information. Please write it down here before contacting the Engine OEM, the Packager, a Woodward Business Partner, or the Woodward factory:

General

Your Name	
Site Location	
Phone Number	
Fax Number	

Prime Mover Information

Manufacturer	
Turbine Model Number	
Type of Fuel (gas, steam, etc.)	
Power Output Rating	
Application (power generation, marine, etc.)	

Control/Governor Information

Control/Governor #1

Woodward Part Number & Rev. Letter	
Control Description or Governor Type	
Serial Number	

Control/Governor #2

Woodward Part Number & Rev. Letter	
Control Description or Governor Type	
Serial Number	

Control/Governor #3

Woodward Part Number & Rev. Letter	
Control Description or Governor Type	
Serial Number	

Symptoms

Description	

If you have an electronic or programmable control, please have the adjustment setting positions or the menu settings written down and with you at the time of the call.

Chapter 11.
ProTech-GII Configuration Worksheet

ProTech Part Number:_____   Date:_____

ProTech Serial Number:_____

Site/Application:_____

CONFIGURATION FUNCTIONS (Minimum Required) –

Configuration of the unit can be done directly on the front panel display or the PCT software.

CONFIGURATION MENU –
    SPEED SUBMENU –
        Speed Inputs
        Acceleration
        Start Logic

Parameter	Option/Range	Default	User Setting	
SPEED INPUTS	Probe Type	Passive / Active	PASSIVE	
	No. Gear Teeth	1-320	60	
	Gear Ratio	0.10 - 10	1.0000	
	Overspeed Trip	100-32000	100	
	Sudden Speed Loss	TRIP / ALARM	TRIP	

Parameter	Option/Range	Default	User Setting	
ACCELERATION	Enable Acceleration Trip	Yes / No	NO	
	Accel. Trip Enabled Speed	0-32000 rpm	100	
	Acceleration Trip	0-25000 rpm/s	0	

Parameter	Option/Range	Default	User Setting	
START LOGIC	Speed Fail Setpoint	0-25000 rpm	100	
	Speed Fail Trip	Used / Not Used	NOT USED	
	Speed Fail Alarm	Used / Not Used	NOT USED	
	Speed Fail Timeout Trip	Used / Not Used	NOT USED	
	Speed Fail Timeout Time	00:00:01 to 08:00:00	00:00:01 (hh:mm:ss)	

TRIP LATCH –

Parameter	Option/Range	Default	User Setting	
TRIP LATCH	Trip Configuration	De-Energize to Trip / Energize to Trip	De-Energize to Trip	

ANALOG OUTPUT –

Parameter	Option/Range	Default	User Setting	
ANALOG OUTPUT	Speed at 4 mA	0-32000 rpm	0	
	Speed at 20 mA	0-32000 rpm	32000	

TEST MODES –

Parameter	Option/Range	Default	User Setting	
TEST MODES	Temporary Overspeed Trip	0-32000 rpm	100	
	Temporary Overspeed Trip Timeout	00:00:00 to 00:30:00	00:00:00 (hh:mm:ss)	
	Simulated Speed Timeout	00:00:00 to 00:30:00	00:00:00 (hh:mm:ss)	
	Test Mode Interlock Disabled	Yes/No	NO	

PERIODIC OVERSPEED TEST – (module A only)

Parameter	Option/Range	Default	User Setting	
PERIODIC OVERSPD TEST	Periodic Test Enabled	Yes/No	YES	
	Test Interval	1 to 999	7	
	Operator Can Disable Test	Yes/No	YES	

MODBUS –

Parameter	Option/Range	Default	User Setting	
MODBUS	Mode	RS-232 / RS-485	RS-232	
	Baud Rate	19200 38400 57600 115200	19200	
	Parity	Even / Odd / None	NO PARITY	
	Slave Address	1-247	1	
	Enable Write Commands	Yes / No	NO	

CONFIGURATION MANAGEMENT –

No user settings here – this provides a list of the CRC values calculated from each section of programming logic.

PASSWORD CHANGE –

	Default	**User Setting**
Test Level Password	**AAAAAA**	
Config Level Password	**AAAAAA**	

Appendix.
Modbus Ethernet Gateway Information

Introduction

For customers who want to use Modbus Ethernet communications or put the ProTech® on the plant network, Woodward recommends the following Ethernet-to-Serial Gateways:

1. B&B Electronics –
    Model: MESR901
    Serial: RS-232, RS-485, or RS-422
    Power Input: 10–48 Vdc

    B&B Electronics Mfg. Co.
    707 Dayton Road
    P.O. Box 1040
    Ottawa, IL 61350
    USA

    Phone: (815) 433-5100 (8-5:00 CST, M-F)
    Email: orders@bb-elec.com
    Web: www.bb-elec.com

2. Lantronix –
    Model: UDS100-Xpress DR IAP
    Serial: RS-232, RS-485, or RS-422
    Power Input: 9–30 Vdc, 9–24 Vac

    Lantronix
    15353 Barranca Parkway
    Irvine, CA 92618
    USA

    Phone: 1-800-422-7055
    Email: sales@lantronix.com
    Web: www.lantronix.com

B&B Electronics Setup

Below you will find the wiring setup and software configuration for the MESR901. Remember that the pictures below are for reference—you will need to set up the serial configuration to match the settings you chose in the ProTech. When multi-dropping the 3 modules together using RS-485/422, you will need to assign each module a unique node address, which can be found in the Modbus configuration screen on the ProTech.

Wiring
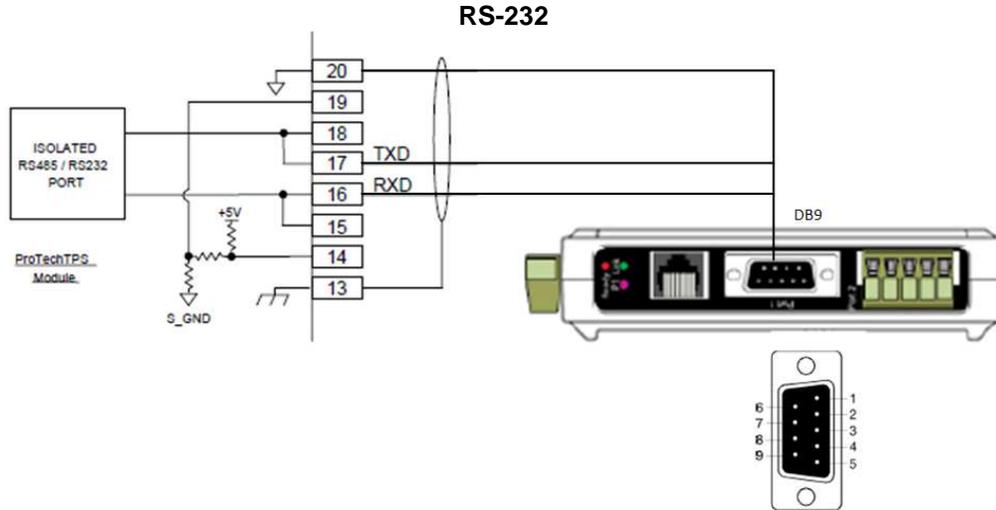
RS-232

DB9 M Pin	Direction	RS-232
1	Input	DCD
2	Input	RXD
3	Output	TXD
4	Output	DTR
5	---	GND
6	Input	DSR
7	Output	RTS
8	Input	CTS
9	Input	RI

B&B Electronics – RS-232

Note: The Serial DB9 connection is used for RS-232 communication only.

RS-485 2-wire

Terminal	RS-422/485 4-Wire	RS-485 2-Wire
A	TDA (-)	Data A (-)
B	TDB (+)	Data B (+)
C	RDA (-)	---
D	RDB (+)	---
E	GND	GND
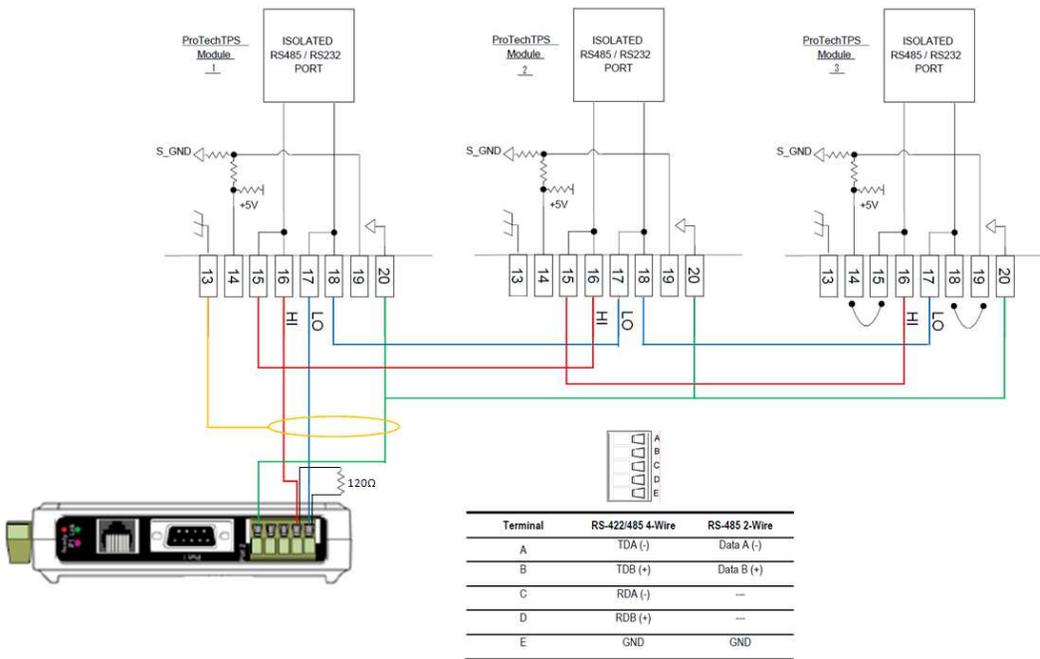
B&B Electronics – RS-485 Multi-drop Connection

Note: Use the terminal block for wiring of RS-485 communications.

When configuring for RS-485, termination resistors (120 ς) are needed at each end of the network. Note the location of the resistor on the device. The ProTech has the termination resistor built into the module, jumpers are necessary between terminals 14 – 15 and 18 – 19 to activate the termination.

Configuration –

Configuration of the MESR901 is done through Vlinx Modbus Gateway Manager. The configuration software is provided with the device.

Network Settings

Modbus TCP Settings

Serial Communication Settings

Note: For RS-485 communication, select RS-485 under Mode, and use the terminal block connections. The DB9 port is for RS-232 communications only.

Serial Modbus Settings

Lantronix Setup

Below you will find the wiring setup and software configuration for the UDS100-Xpress DR IAP. Remember that the pictures below are for reference, you will need to setup the serial configuration to match the settings you chose in the ProTech. When multi-dropping the three modules together using RS-485/422, you will need to assign each module a unique node address, which can be found in the Modbus configuration screen on the ProTech.

Wiring
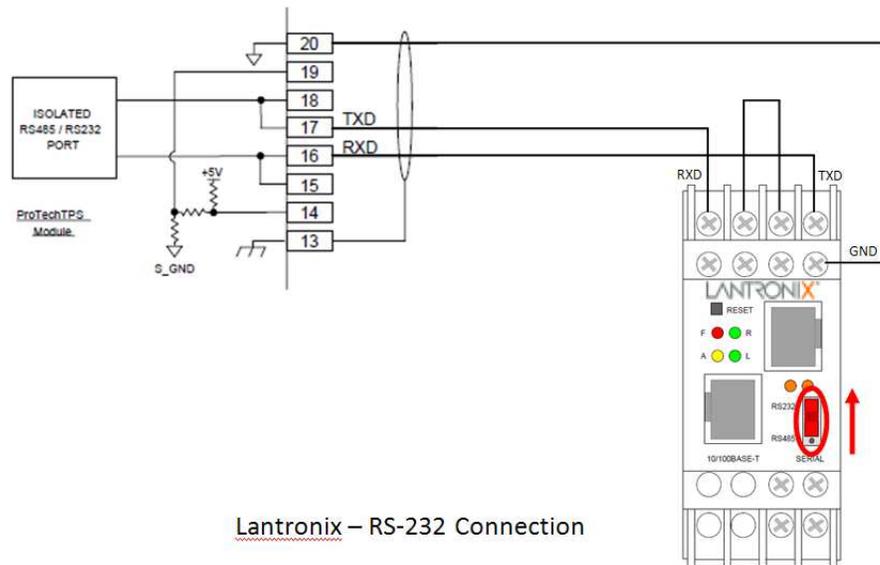
RS-232

Lantronix – RS-232 Connection

Verify that the dip switch on the front of the device is in the up position, indicating RS-232 communications.

RS-485 2-wire
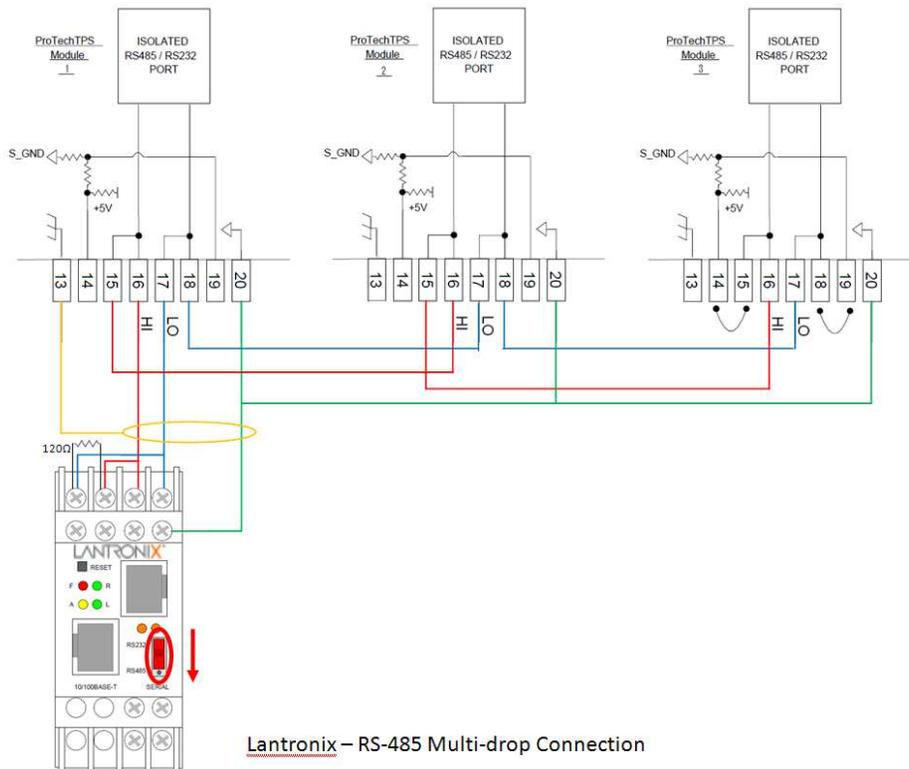
Lantronix – RS-485 Multi-drop Connection

Verify that the dip switch on the front of the device is in the down position, indicating RS-485 communications. When configuring for RS-485, termination resistors (120 ς) are needed at each end of the network. Note the location of the resistor on the device. The ProTech has the termination resistor built into the module, jumpers are necessary between terminals 14 – 15 and 18 – 19 to activate the termination.

Configuration

Configuration of the UDS100-Xpress DR IAP is done through DeviceInstaller. The configuration software is provided with the device.

Overview
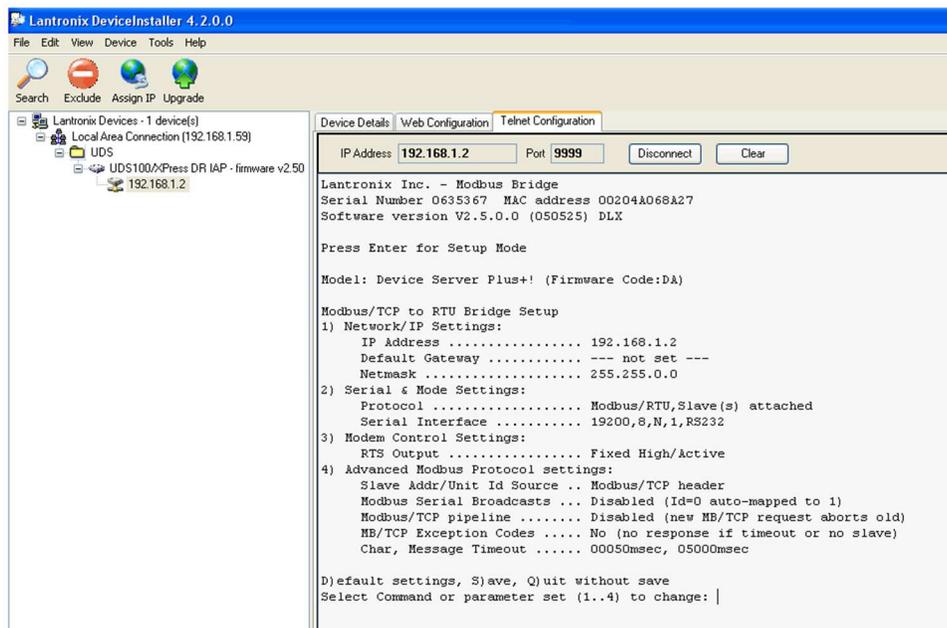
Network Menu
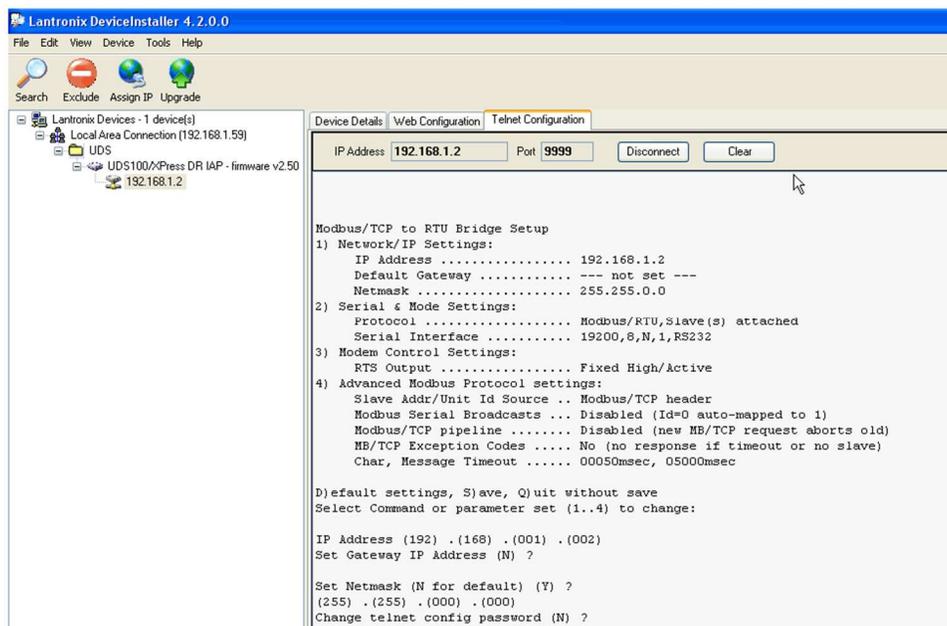
Serial Settings Menu
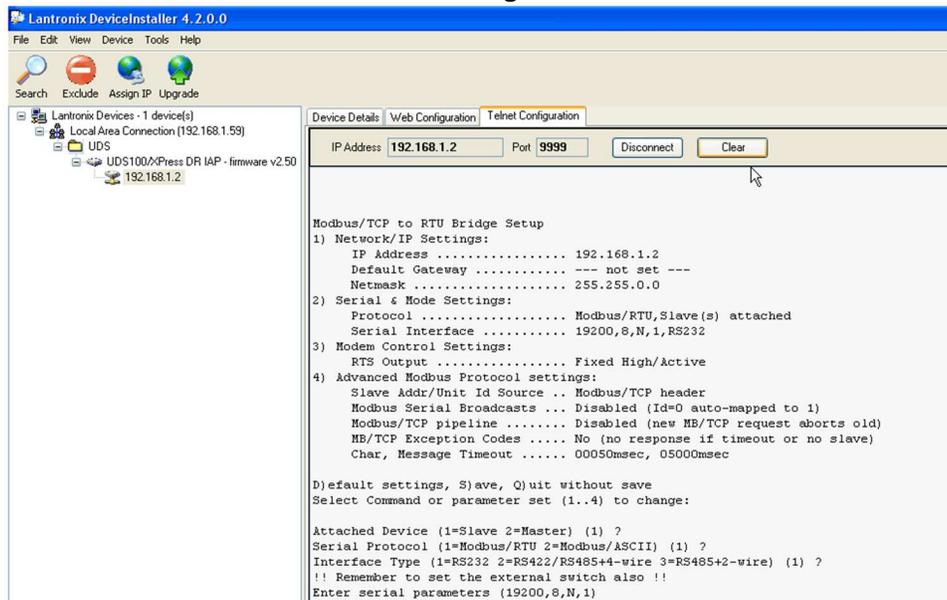
Note: For RS-485 communications, choose option 3 under interface type and don't forget to set the dip switch on the front of the device.

Modem Control Menu

Advanced Menu

Revision History

Changes in Revision G—
- Added Warning Boxes on Pgs. 30 and 57
- Added content to Comm Type in Table 2-14
- Note added to Serial Modbus Communications in Chapter 2
- Added Important Boxes on Pg. 144

Changes in Revision F—
- Edited the ATEX – Potentially Explosive Atmospheres Directive in Regulatory Compliance Section
- Removed WEEE, EuP, and C-Tick Directives in Regulatory Compliance Section
- Replaced RoHS Directive in Regulatory Compliance Section
- Added RCM Directive in Regulatory Compliance Section
- Changed Heartbeat indication value in Chapter 4, ProTech-GII Parameter Addresses section

Changes in Revision E—
- Updated Regulatory and Compliance Section
- Updated DOC/DOI

Changes in Revision D—
- Added new warning required by GOST R

Changes in Revision C—
- Updated manual to reflect changes to MPU input threshold and impedance
- Added GOST R information to Regulatory Compliance section

Declarations

EU DECLARATION OF CONFORMITY

EU DoC No.:	00396-04-EU-02-01
Manufacturer's Name:	WOODWARD INC.
Manufacturer's Contact Address:	1041 Woodward Way Fort Collins, CO 80524 USA
Model Name(s)/Number(s):	ProTech®-GII, ProTech® TPS, and the MicroNet® Safety Module
The object of the declaration described above is in conformity with the following relevant Union harmonization legislation:	Directive 2014/34/EU on the harmonisation of the laws of the Member States relating to equipment and protective systems intended for use in potentially explosive atmospheres
	Directive 2014/30/EU of the European Parliament and of the Council of 26 February 2014 on the harmonization of the laws of the Member States relating to electromagnetic compatibility (EMC)
	Directive 2014/35/EU on the harmonisation of the laws of the Member States relating to the making available on the market of electrical equipment designed for use within certain voltage limits
Markings in addition to CE marking:	⟨Ex⟩ Category 3 Group II G, Ex nA IIC T4 X
Applicable Standards:	EN61000-6-2:2005: EMC Part 6-2: Generic Standards - Immunity for Industrial Environments
	EN61000-6-4:2007/A1:2011: EMC Part 6-4: Generic Standards - Emissions for Industrial Environments
	EN60079-15, 2010: Electrical apparatus for explosive gas atmospheres – Part 15: Type of protection 'n'
	EN60079-0, 2012/A11:2013: Electrical apparatus for explosive gas atmospheres – Part 0: General requirements
	EN61010-1, 2001: Safety requirements for electrical equipment for measurement, control, and laboratory use - Part 1:General Requirements
Last two digits of the year in which the CE marking was affixed for the first time:	10

This declaration of conformity is issued under the sole responsibility of the manufacturer
We, the undersigned, hereby declare that the equipment specified above conforms to the above Directive(s).

MANUFACTURER

[signature]

Signature

Christopher Perkins

Full Name

Engineering Manager

Position

Woodward, Fort Collins, CO, USA

Place

13 - JUL - 2016

Date

5-09-1183 Rev 26

We appreciate your comments about the content of our publications.

Send comments to: **icinfo@woodward.com**

Please reference publication **26545**.

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