

ProTech[®]-GII Overspeed Protection Device with Voted Inputs

**8237-1594, -1595, -1596, -1597, -1598, -1599,
-1600, -1601, -1656, -1660**

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.



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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.



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Warnings and Notices

Important Definitions



This is the safety alert symbol. It is 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.

WARNING

**Automotive
Applications**

On- and off-highway Mobile Applications: Unless Woodward's control functions as the supervisory control, customer should install a system totally independent of the prime mover control system that monitors for supervisory control of engine (and takes appropriate action if supervisory control is lost) to protect against loss of engine control with possible personal injury, loss of life, or property damage.

NOTICE**Battery Charging
Device**

To prevent damage to a control system that uses an alternator or battery-charging device, make sure the charging device is turned off before disconnecting the battery from the system.

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 2004/108/EC COUNCIL DIRECTIVE of 15 Dec 2004 on the approximation of the laws of the Member States relating to electromagnetic compatibility and all applicable amendments.

Low Voltage Directive: Declared to 2006/95/EC COUNCIL DIRECTIVE of 12 December 2006 on the harmonization of the laws of Member States relating to electrical equipment designed for use within certain voltage limits. (Non Explosive Atmospheres)

ATEX – Potentially Explosive Atmospheres Directive: Declared to 94/9/EC COUNCIL DIRECTIVE of 23 March 1994 on the approximation of the laws of the Member States concerning equipment and protective systems intended for use in potentially explosive atmospheres. Zone 2, Category 3, Group II G, Ex nA IIC T4 X

Other European Compliance

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

RoHS Directive: Exempt from 2002/95/EC of the European Parliament and of the Council of 27 January 2003 on the restriction of the use of certain hazardous substances in electrical and electronic equipment. Exempt per Annex IA of Directive 2002/95/EC referring to "monitoring and control instruments" within the meaning of Category 9.

WEEE Directive: Exempt/Compliant as a component with 2002/96/EC of the European Parliament and of the Council of 27 January 2003 on waste electrical and electronic equipment (WEEE).

EuP Directive: Exempt/Compliant from 2009/125/EC of the European Parliament and of the Council of 21 October 2009 establishing a framework for the setting of ecodesign requirements for energy-related products.

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

- C-Tick:** Declared to Australian Radiocommunications Act of 1992 and the New Zealand Radiocommunications Act of 1989.
- TÜV:** TÜV certified for SIL-3 per IEC 61508 Parts 1-7, Functional Safety of Electrical / Electronic / Programmable Electronic Safety Related Systems.
- GOST R:** Certified for use in explosive atmospheres within the Russian Federation per GOST R Certificate POCC US.ГБ04.В01594 with marking ExnAIICT4GcX.

Other Compliance

- Gas Corrosion:** IEC60068-2-60:1995 Part 2.60 Methods 1 and 4 (conformal coating)
- Machinery Protection:** API670, API612, & 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.

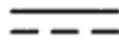
Safety Symbols



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 an overspeed safety device designed to safely shut down steam, gas, and hydro turbines of all sizes upon sensing an overspeed or over-acceleration event. This device accurately monitors turbine rotor speed and acceleration via active or passive MPUs (magnetic pickups) and issues a shutdown command to the turbine's trip valve(s) or corresponding trip system.

The ProTech-GII consists of three independent modules whose trip outputs, dependent upon model used, are either independent or voted in a 2-out-of-3 configuration. An isolated bus architecture is used to share all inputs and latch status information between the three modules. Optionally each ProTech-GII module can be configured to use only its sensed "local" input signals or the voted result of all three modules' signals in its event latch decision logic. Optionally module trip and alarm latch statuses can also be configured to be shared with all other modules.

The ProTech-GII includes Overspeed and Over-acceleration functions as well as time stamped Alarm, and Trip logs. 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 also provides various pre-defined test routines including an automated periodic test routine to assist users with verifying system operation.

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.

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

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

Part Number	Description
8237-1594	ProTech-GII—Bulkhead Mount, HV/LV, Ind Relay, Voted Inputs
8237-1598	ProTech-GII—Panel Mount, HV/LV, Ind Relay, Voted Inputs
8237-1595	ProTech-GII—Bulkhead Mount, HV/HV, Ind Relay, Voted Inputs
8237-1599	ProTech-GII—Panel Mount, HV/HV, Ind Relay, Voted Inputs
8237-1596	ProTech-GII—Bulkhead Mount, HV/LV, Voted Relays, Voted Inputs
8237-1600	ProTech-GII—Panel Mount, HV/LV, Voted Relays, Voted Inputs
8237-1597	ProTech-GII—Bulkhead Mount, HV/HV, Voted Relays, Voted Inputs
8237-1601	ProTech-GII—Panel Mount, HV/HV, Voted Relays, Voted Inputs
8237-1656	ProTech-GII—Bulkhead Mount, HV/HV, Voted Relays, Voted Inputs – Limited Functions
8237-1660	ProTech-GII—Panel Mount, HV/HV, Voted Relays, Voted Inputs – Limited Functions
5437-1126	Spare Module for 8237-1594, 8237-1598
5437-1127	Spare Module for 8237-1595, 8237-1599
5437-1124	Spare Module for 8237-1596, 8237-1600
5437-1125	Spare Module for 8237-1597, 8237-1601

Table 1-1. Available ProTech-GII Models

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 response time (8–26 milliseconds depending on model and configuration), 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 one relay output that is dedicated to an alarm function (3 total) and one 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. Optionally the ProTech-GII can be configured to share and vote on all speed inputs as required by the application. 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.

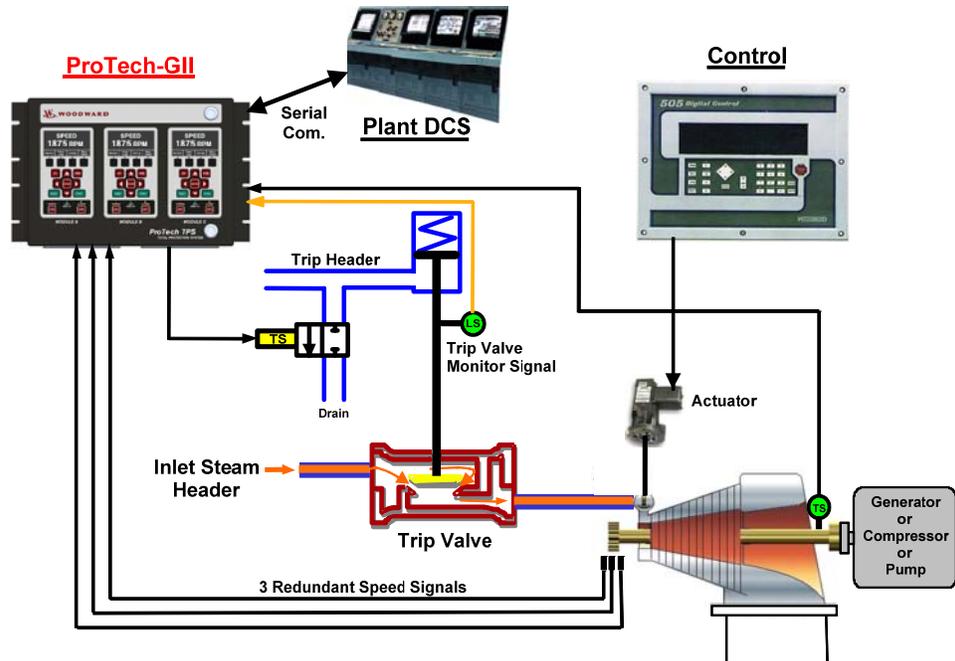


Figure 1-1. Typical ProTech-GII Application (Voted Trip Relay Models)

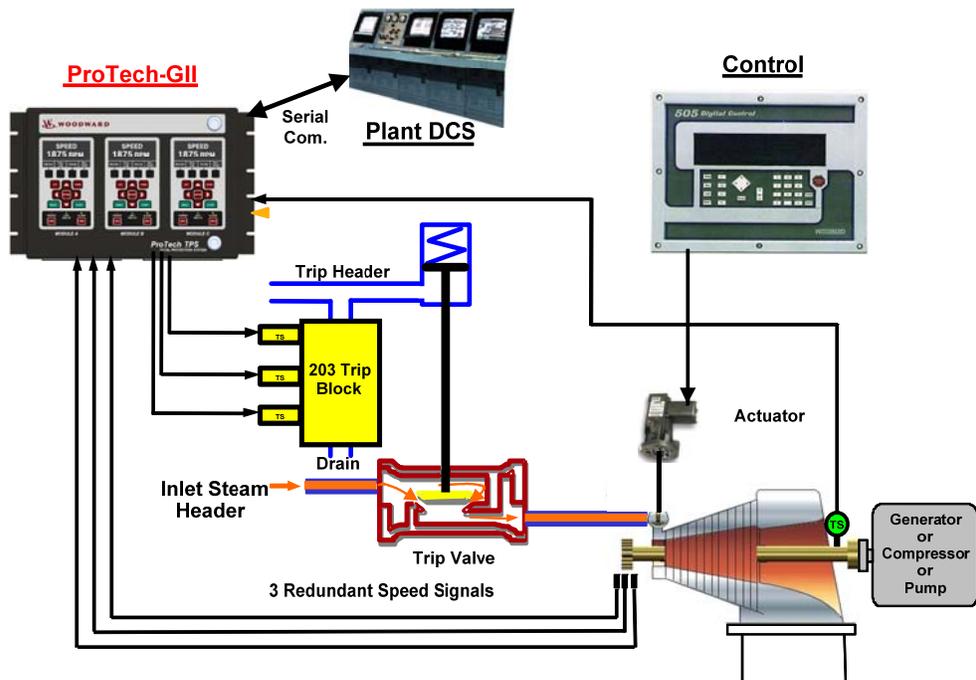


Figure 1-2. Typical ProTech-GII Application (Independent Trip Relay Models)

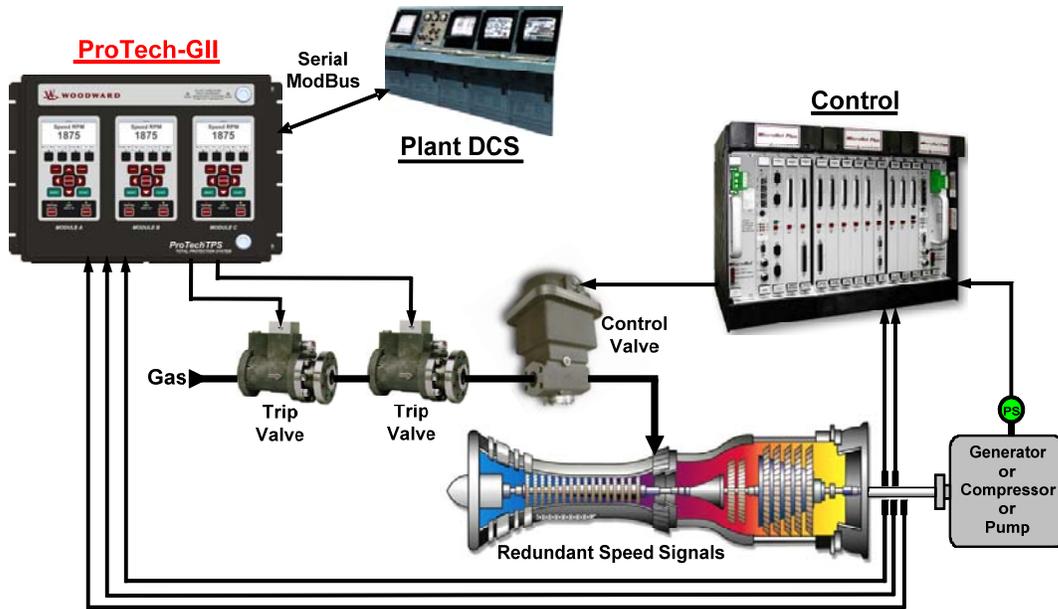


Figure 1-3. Typical Gas Turbine Application (Voted Trip Relay Models)

Chapter 2. Installation

Introduction

This chapter provides instructions on how to mount and connect the ProTech-GII overspeed safety device 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.
5. Enter the configuration mode and configure all settings to the specific application's requirements.

6. Perform a full system checkout by verifying that all system trips, alarms, and test routines function correctly before starting the machinery/system.
7. When ready, start the turbine/machinery, following the equipment manufacturer's recommended starting procedure.

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.

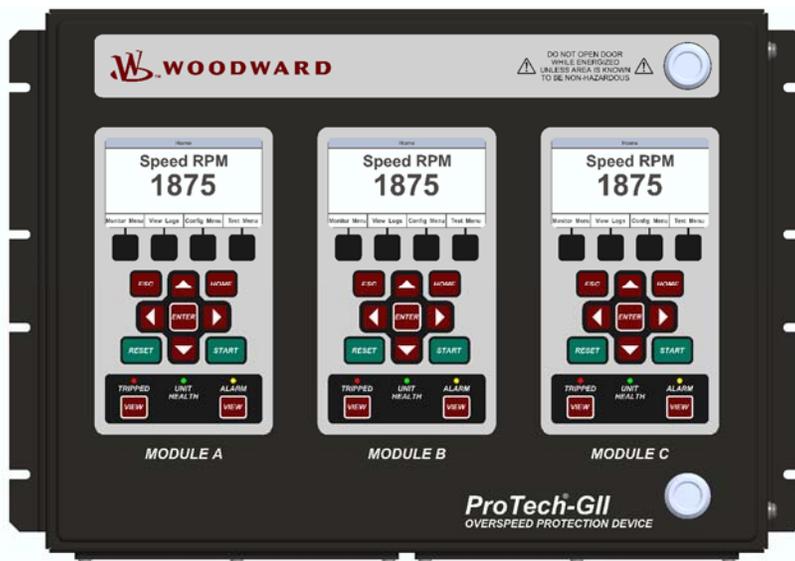


Figure 2-1. Typical ProTech-GII Bulkhead Package—Front View



Figure 2-2a. Typical ProTech-GII Bulkhead Package—Front Door Open

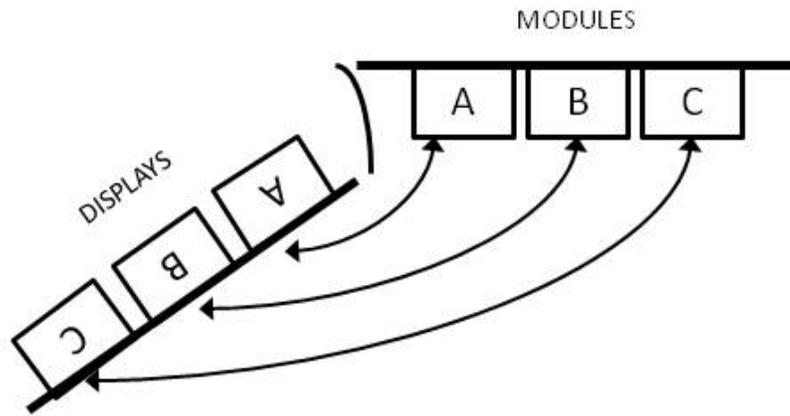


Figure 2-2b. Bulkhead Schematic Showing Front Panel A Connection to Module A and Front Panel C Connection to Module C—Top View

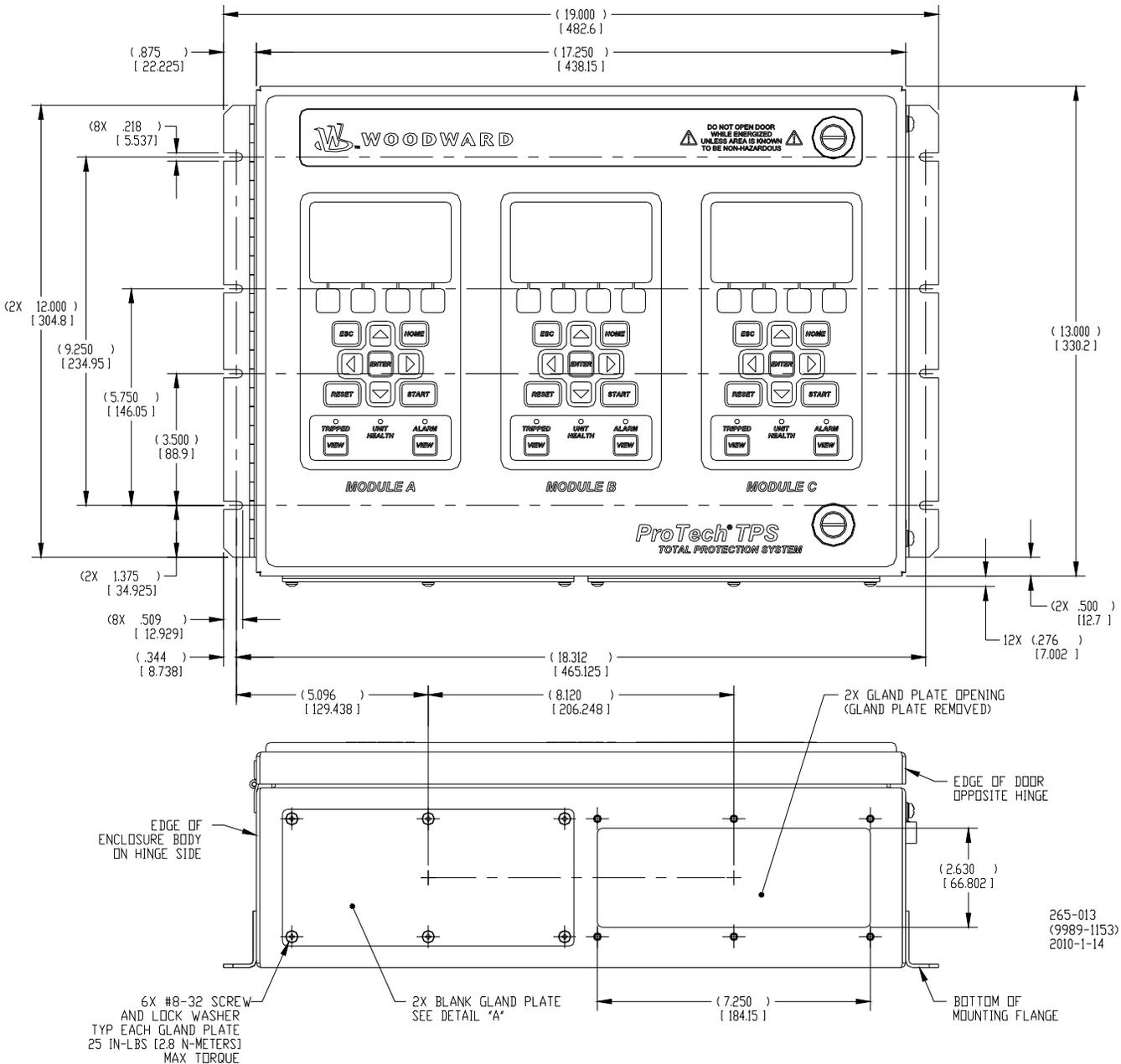


Figure 2-3. Mounting Outline Diagram for Bulkhead-Mounted Models

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

Module Removal and Installation—Bulkhead Mount Package



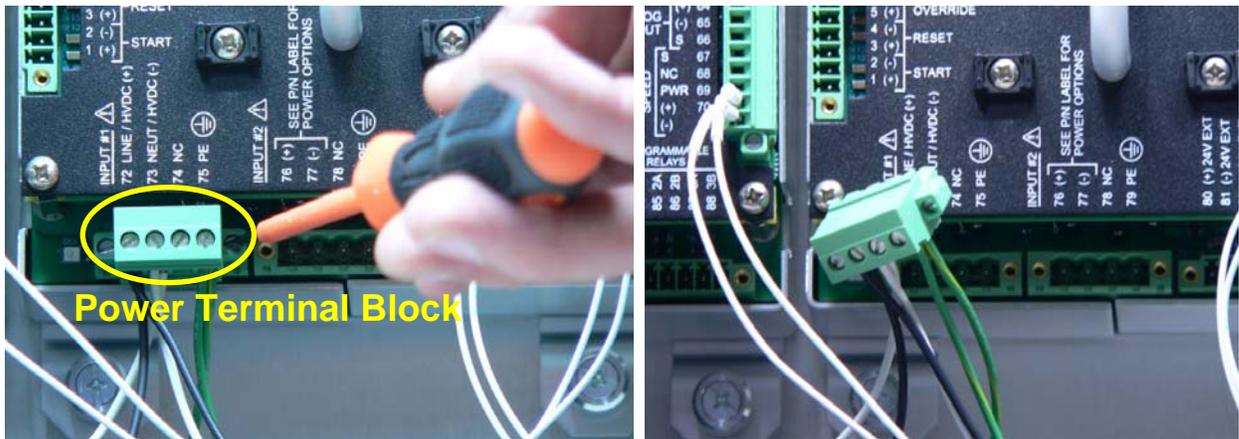
WARNING

Currently, display circuit boards are not replaceable. Users should not attempt to remove or install any display board. If a display board is unresponsive, contact Woodward for a recommendation regarding service options. **DO NOT ATTEMPT TO REPAIR!**

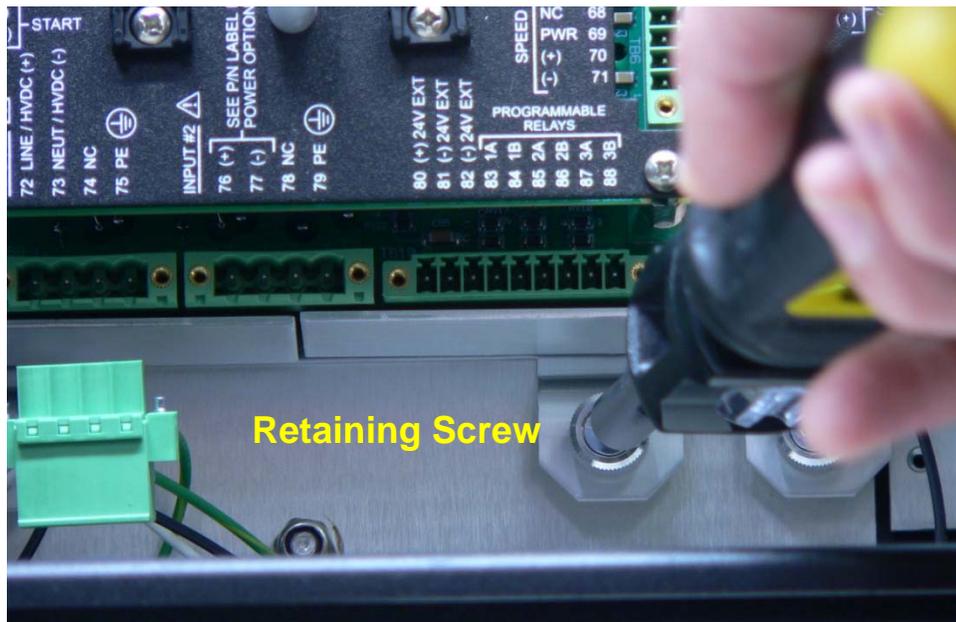
Follow this procedure for module removal and installation:

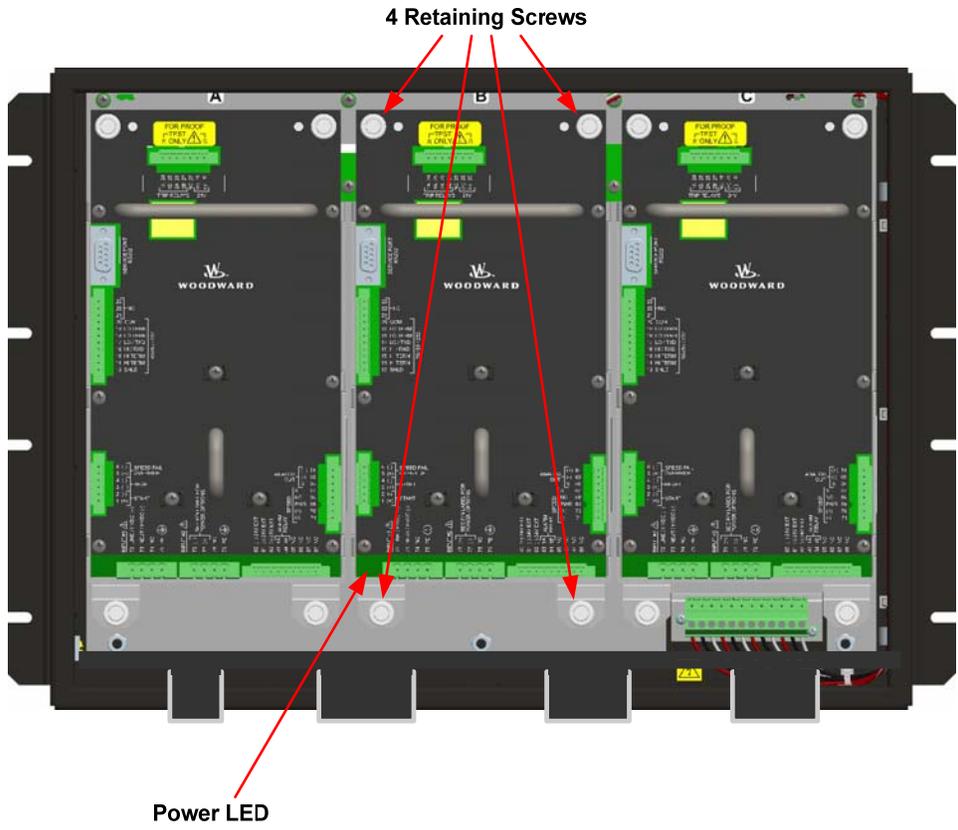
Removal:

1. Disconnect power from the module to be removed.

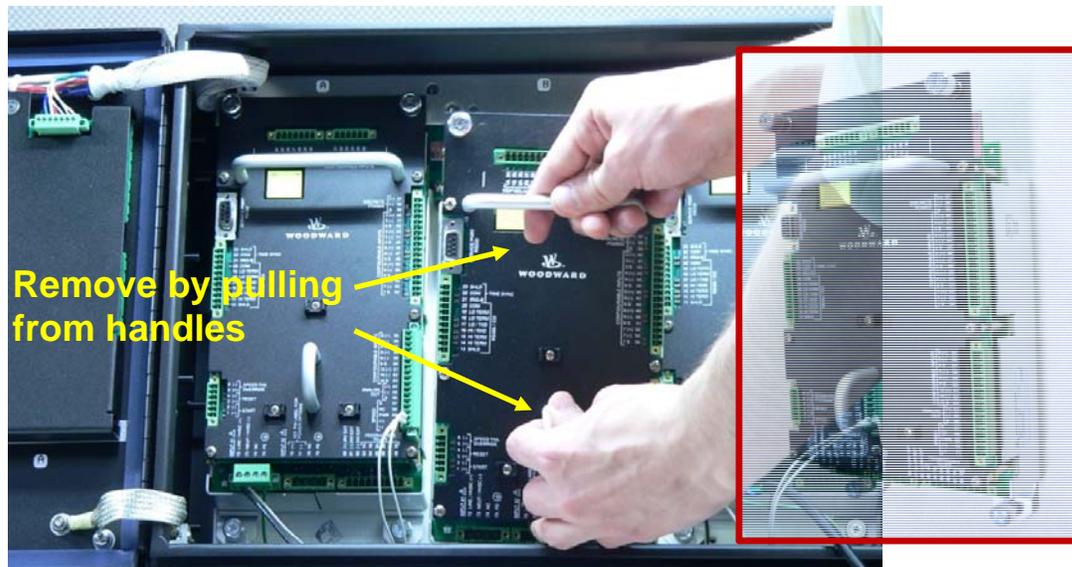


2. Verify power removed by observing power LED is OFF.
3. Remove terminal blocks from module terminals.
4. Loosen 4 module retention screws.

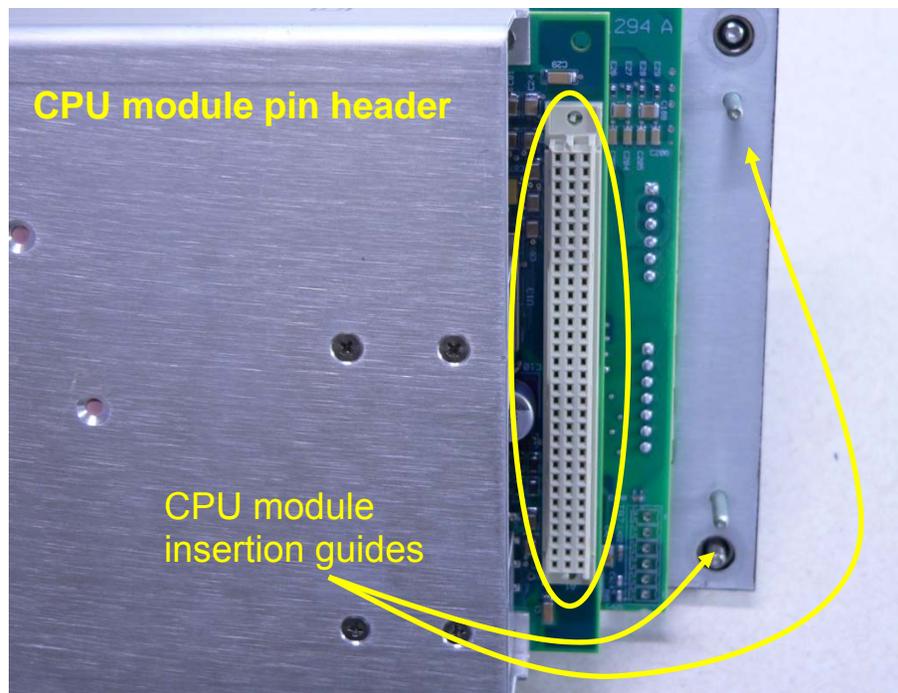
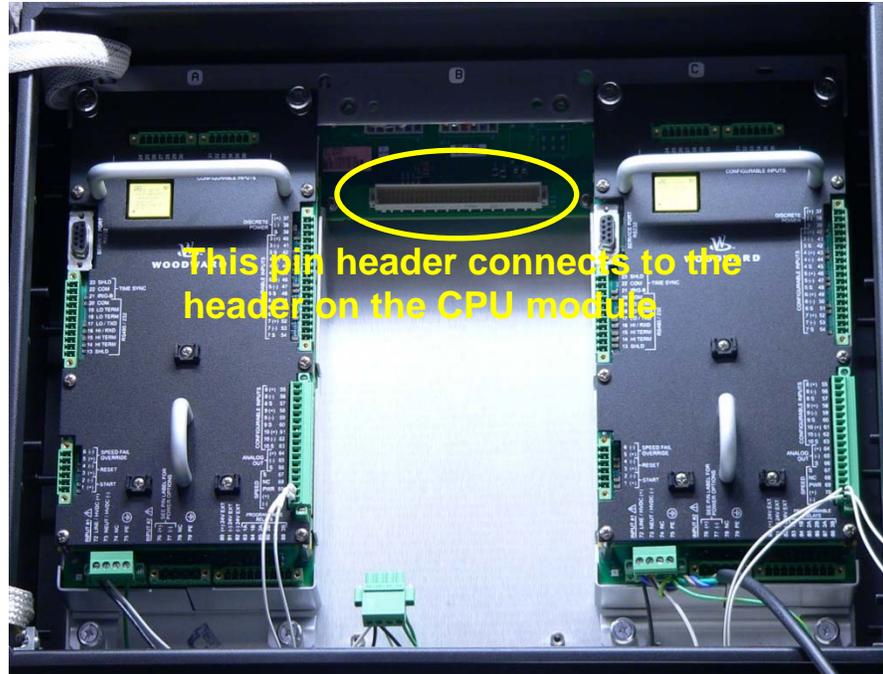




5. Remove module by pulling the two handles simultaneously.



Installation:



1. Insert module into slot by pressing firmly on handles. The module has guides to assist in location.
2. Tighten 4 module retention screws.
3. Install terminal blocks.
4. Insert power terminal block and observe that the power LED is ON.

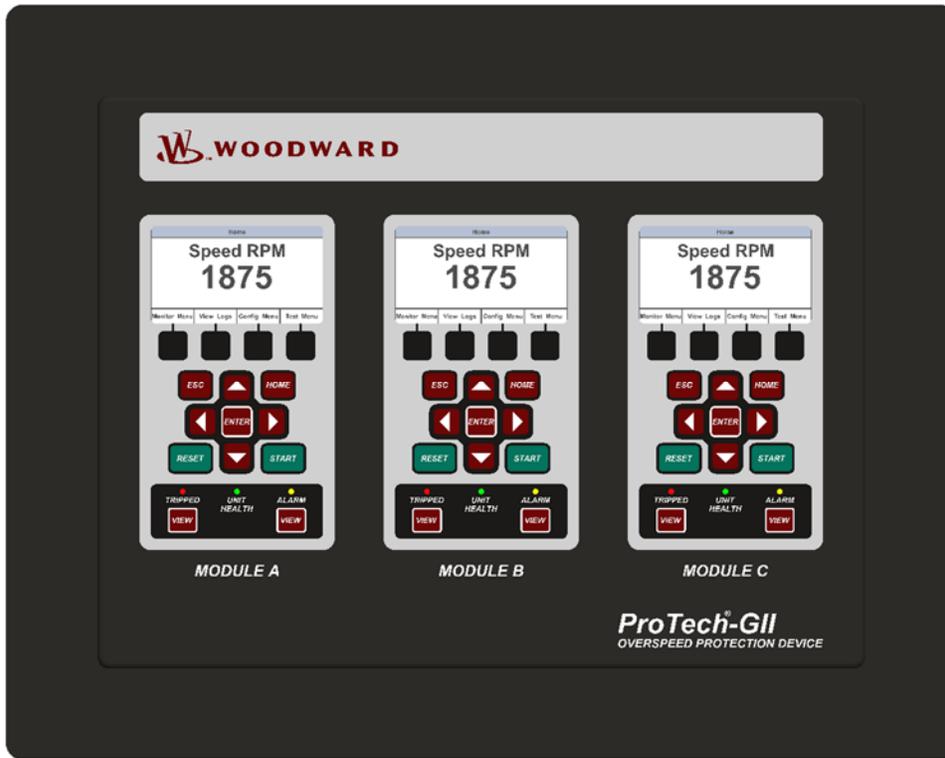


Figure 2-4a. Typical ProTech-GII Panel Mount Package—Front View



Figure 2-4b. Typical ProTech-GII Panel Mount Package—Rear View with Cover

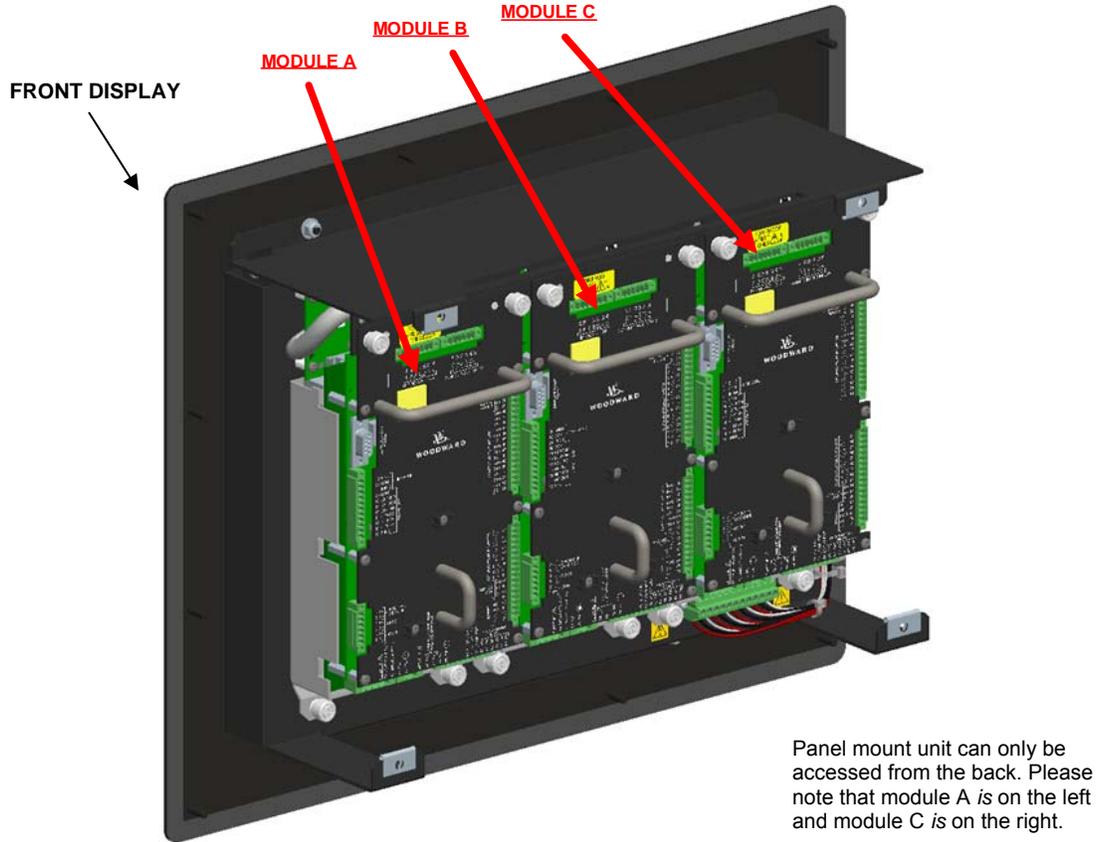


Figure 2-4c. Typical ProTech-GII Panel Mount Package—Rear View without Cover Showing Module Orientation

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.

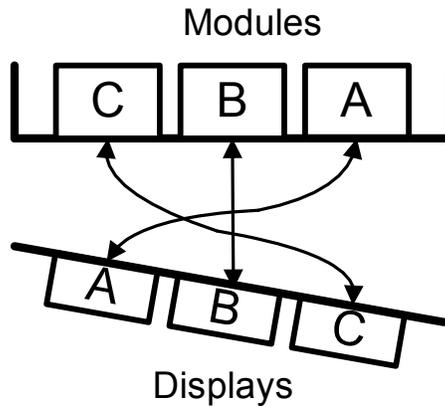


Figure 2-4d. Panel Mount Schematic Showing Front Panel A Connection to Module A and Front Panel C Connection to Module C—Top View

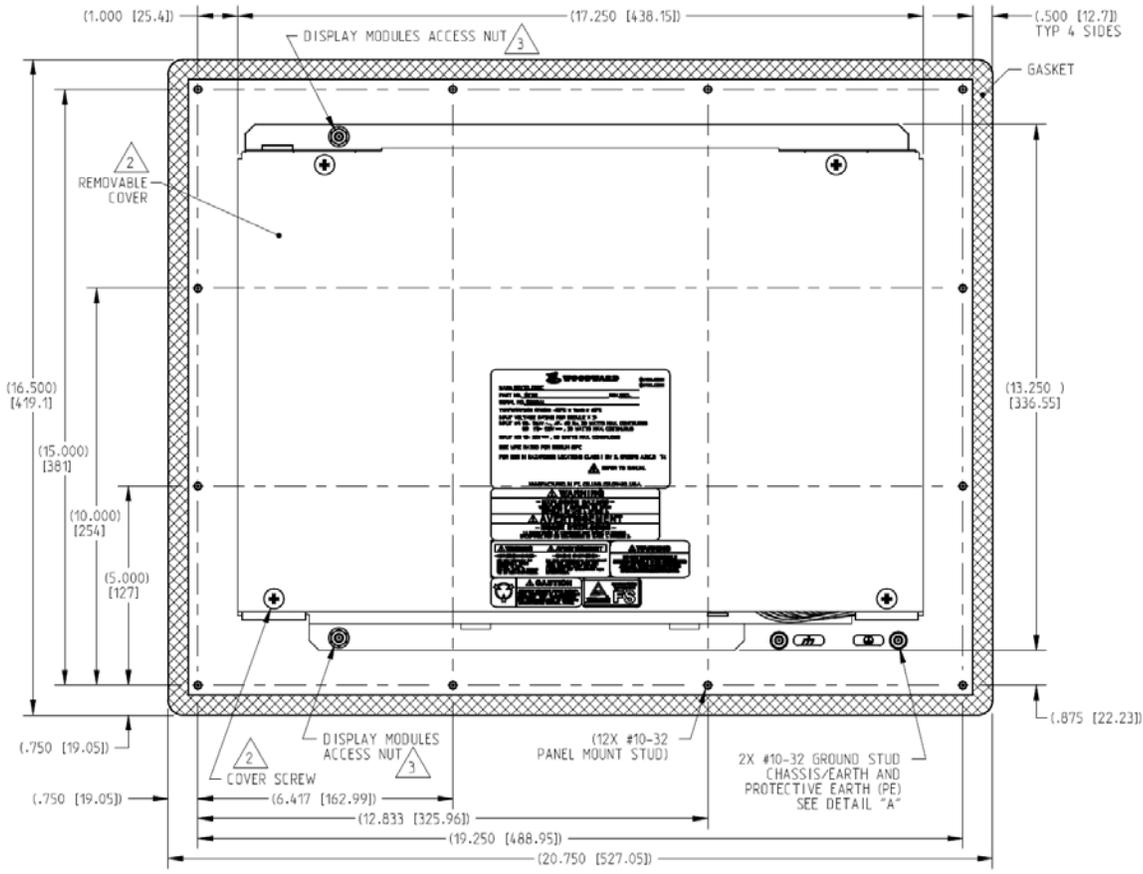


Figure 2-5a. Mounting Outline Diagram for Panel-Mount Models

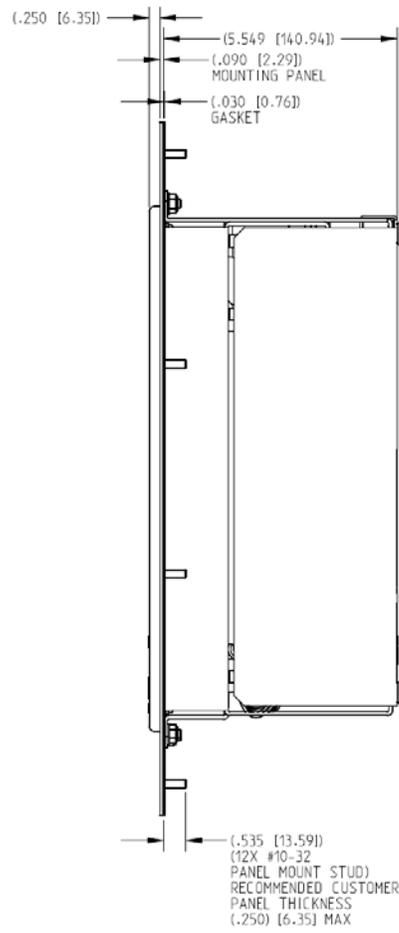


Figure 2-5b. Mounting Outline Diagram for Panel-Mount Models

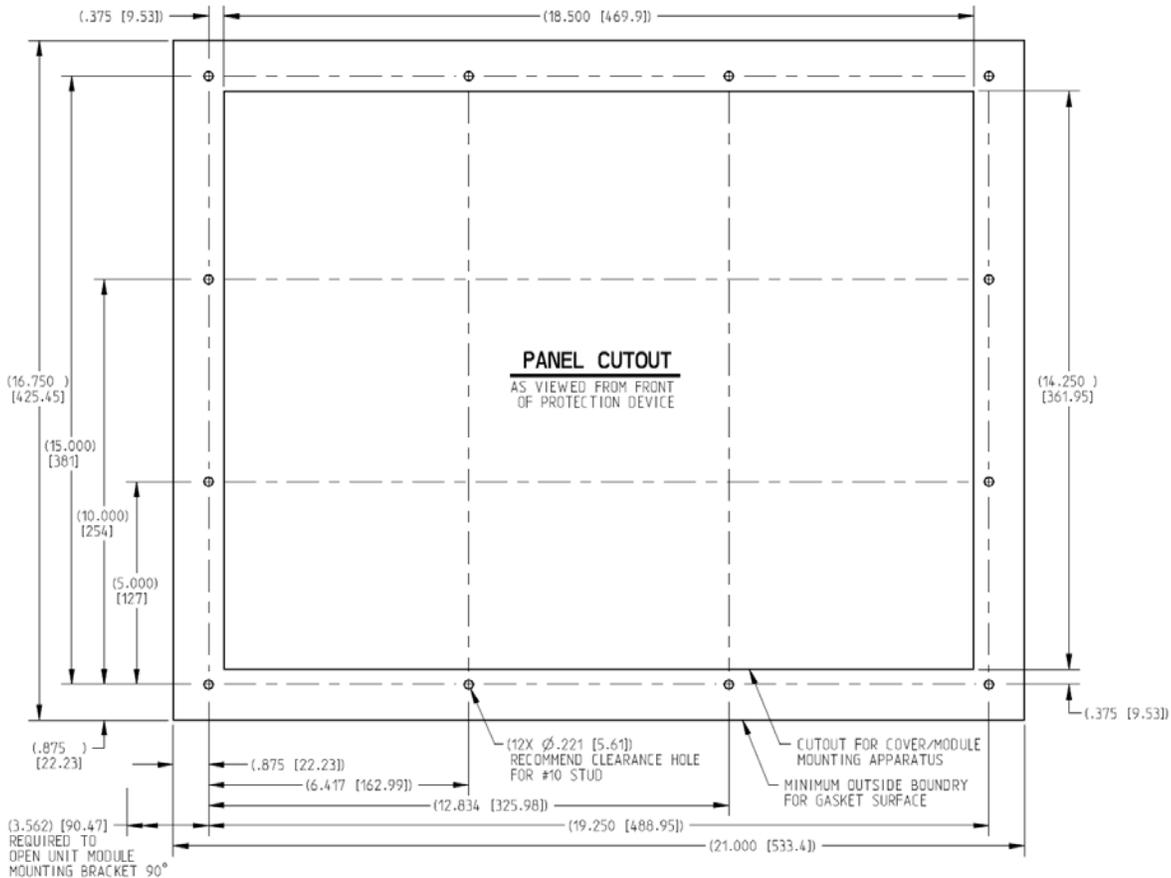


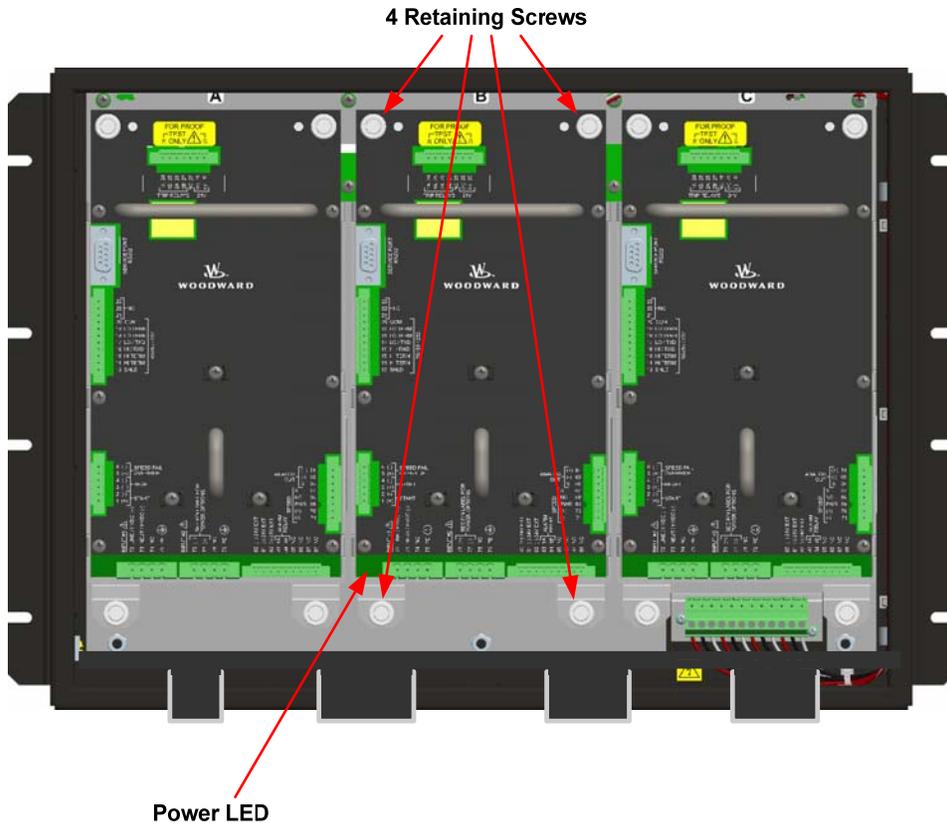
Figure 2-5c. Panel Cutout Diagram for Panel-Mount Models

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

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

Number of Inputs	2. Input range depends on model (see following tables): <ul style="list-style-type: none"> • 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.

Table 2-1a. Low Voltage Input Specifications

High Voltage Input

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

Table 2-1b. High Voltage Input Specifications

Low Voltage Input

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 s
Reverse Polarity Protection	Yes
Interrupt Time	3 ms, when operating on one power supply only

Table 2-1c. Low Voltage Input Specifications

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

Relay Output Power Supply (24V_P)

Output Voltage	24 Vdc ±10%
Current Limit	500 mA

Table 2-2 Relay Output Power Supply Specifications

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, a continuous “Power Supply Fault Alarm” will be issued if a power supply is configured to alarm and a power-source is not connected to that supply.

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

General Specifications

Number of Inputs	1, selectable as passive or active probe by front panel configuration
Speed Sensing Accuracy	Accuracy: $\pm 0.04\%$ of current speed over -20 to $+60$ °C ambient temperature
Acceleration Sensing Accuracy and Range	Accuracy: $\pm 1\%$ 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 mm ²)
Internal Test Frequency Generator	6 Hz to 32 kHz, selectable in different test modes, see Chapter 4, Configuration and Operation

Table 2-3. General I/O Specifications

Passive Probe (MPU) Inputs

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

Table 2-4a. Passive Probe Specifications

Active Probe (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 \pm 10% @ 1 W, probe power switched on only in active probe mode.
Internal Pull-up Resistor	10 k Ω , 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

Table 2-4b. Active Probe Specifications

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 k Ω (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**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 mm ² pair)

Table 2-5a. Independent Trip Relay Specifications

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 2-5b. Voted Trip Relay Specifications

Alarm Relay Output 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 mm ²)

Table 2-6. Alarm Relay Specifications

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 \pm 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

Table 2-7. Dedicated Discrete Input Specifications

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 mm ²)

Table 2-8. Analog Output Specifications

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

Number of Ports	1
Comm Type	RS-232/RS-485, user selectable
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 RS-485 (low capacitance 16 AWG / 1.3 mm ²), 50 ft / 15 m RS-232

Table 2-9. Serial Port Specifications

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.

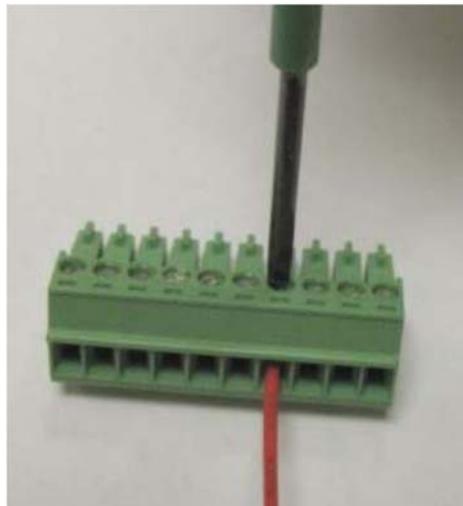
The size of the field wiring to the ProTech system should be between 1.5 and 6 mm² (16 and 10 AWG) for power supply wiring and between 0.3 and 4 mm² (22 and 12 AWG) for all other I/O wiring. Wires for the all the pluggable I/O terminal blocks should be stripped at 8 mm (0.3 inch). Torque and screwdriver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

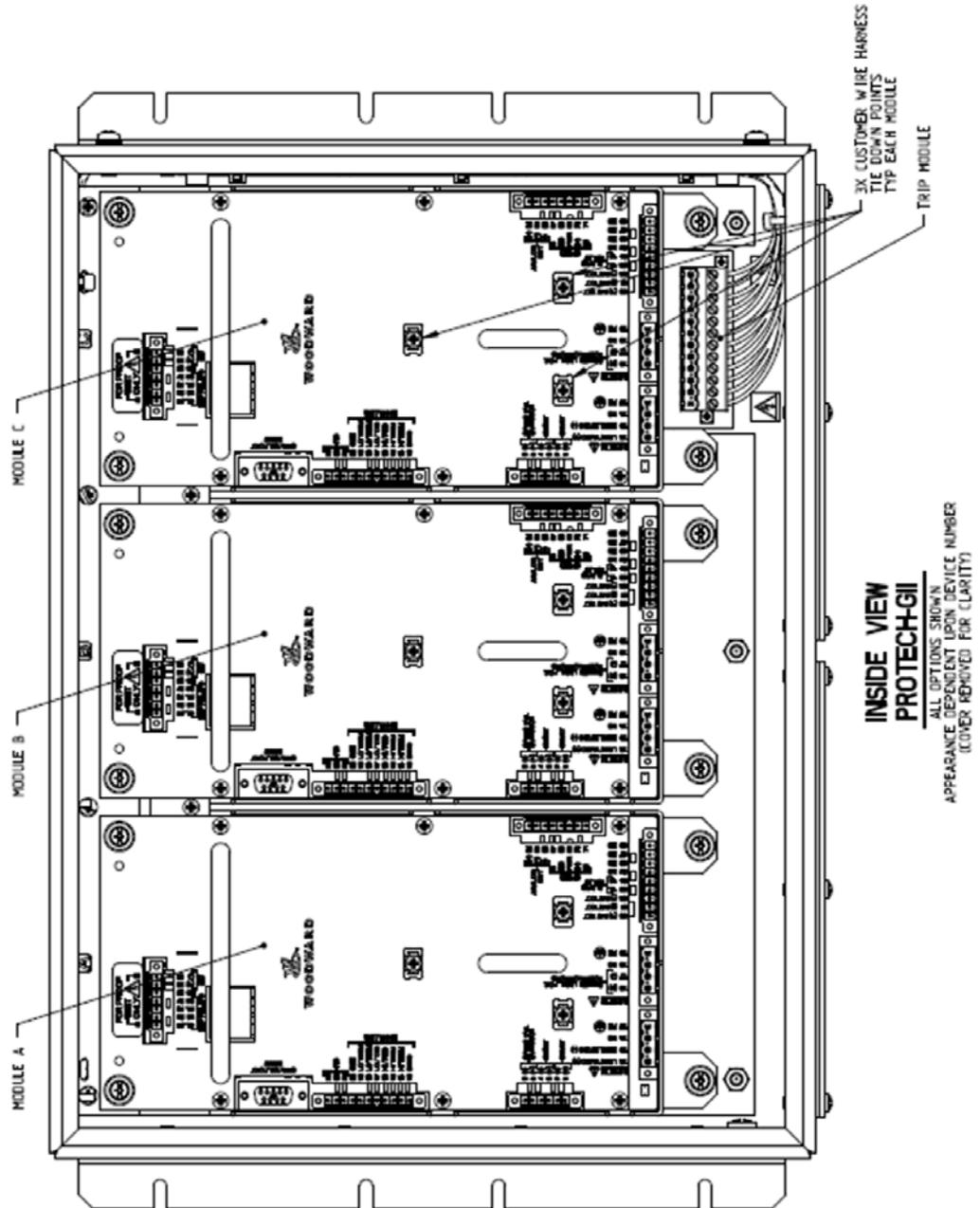


Figure 2-7. Inside View of ProTech-GII

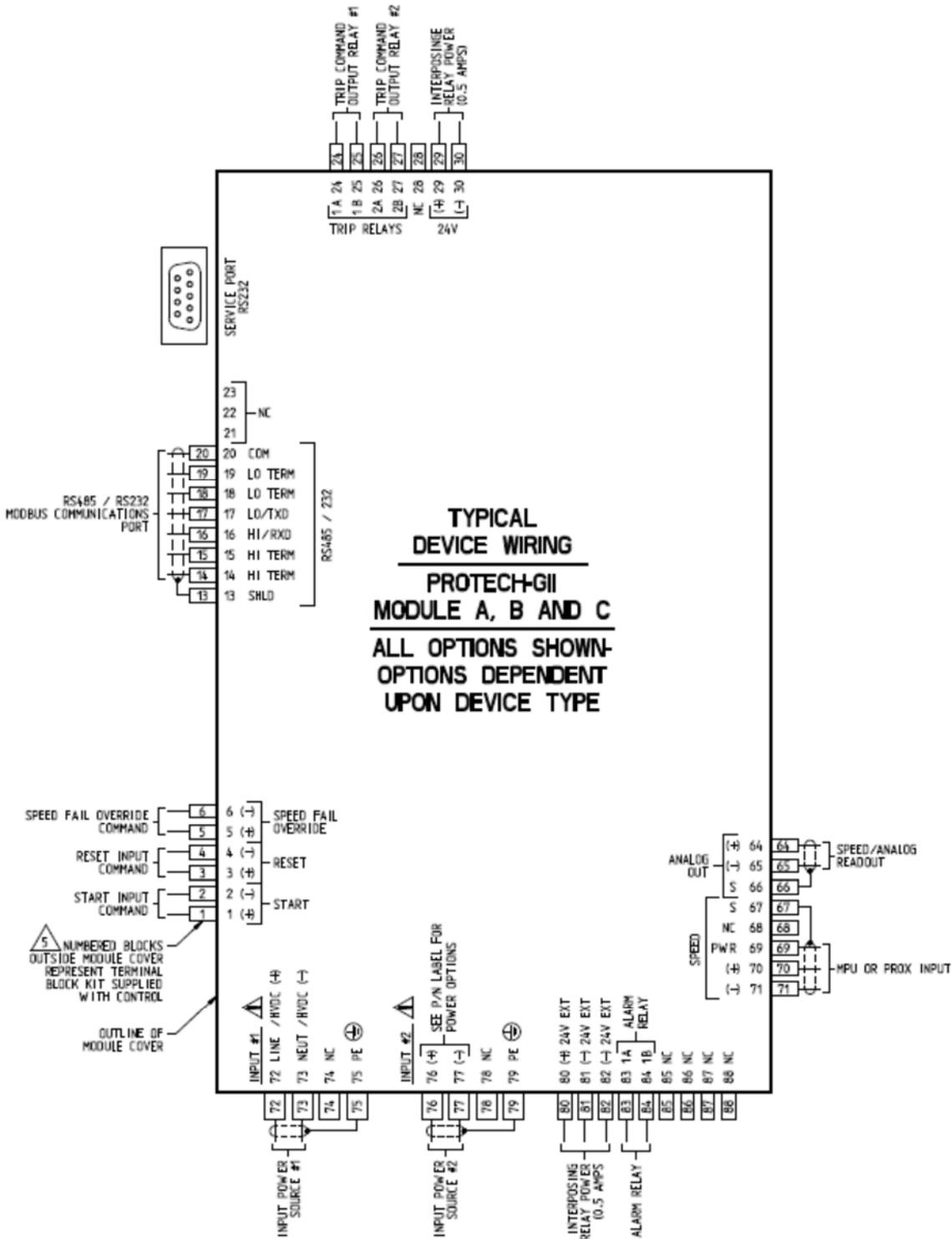


Figure 2-8. ProTech-GII Control Wiring Diagram

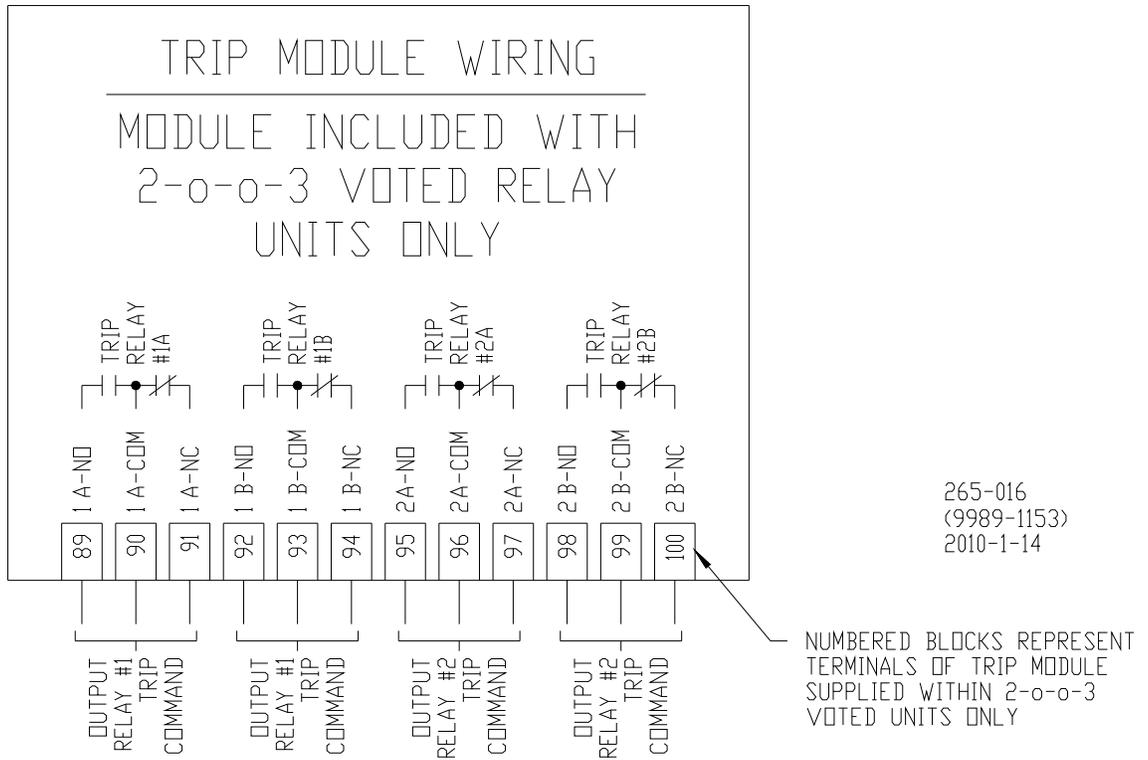


Figure 2-9. Trip Module—Included within Voted Trip Relay Units Only

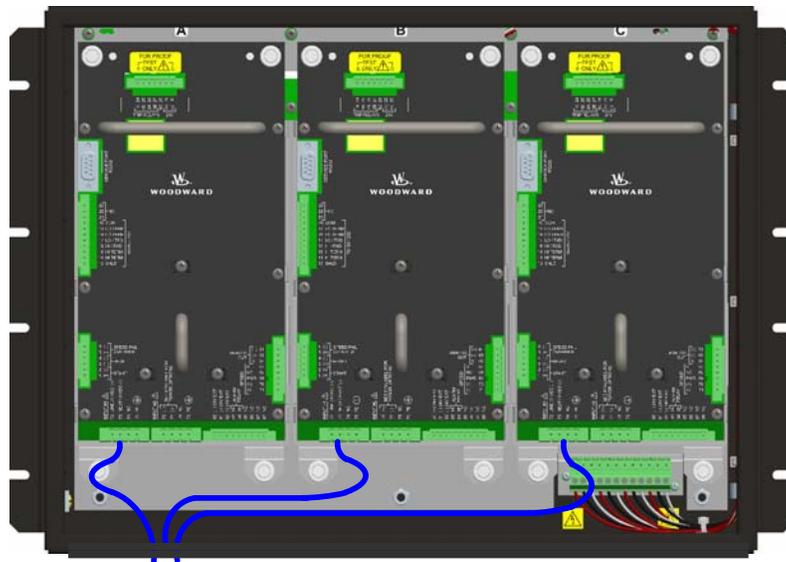


Figure 2-10a. Power Supply Field Wiring Routing & Stress Relief Diagram

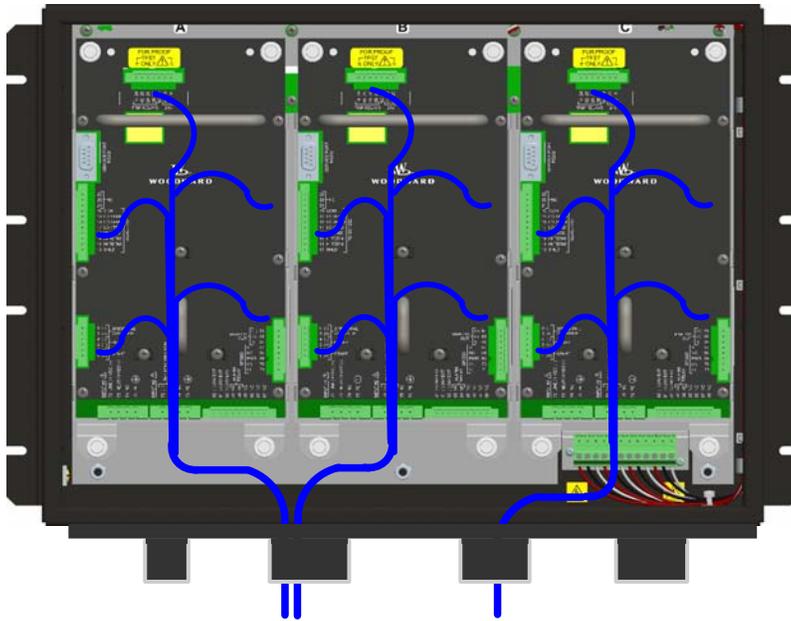


Figure 2-10b. I/O Wiring Routing & Stress Relief Diagram

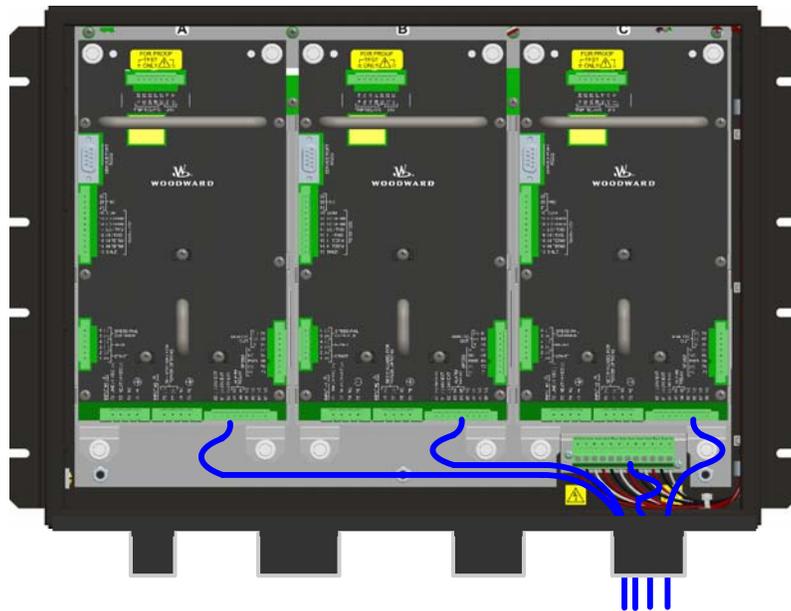


Figure 2-10c. Relay Output Field Wiring Routing & Stress Relief Diagram

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 the 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 backlash, 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.

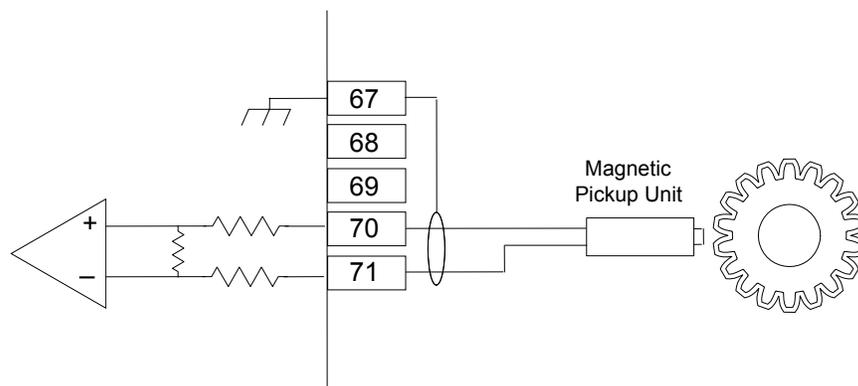


Figure 2-11a. Example MPU (Passive Magnetic Pickup Unit) Wiring

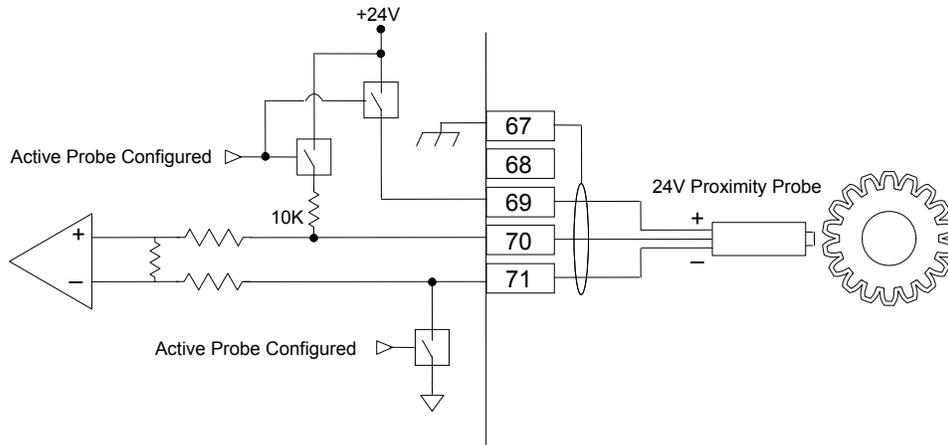


Figure 2-11b. Example Proximity Probe (Active Magnetic Pickup Unit) Wiring (Internal Power)

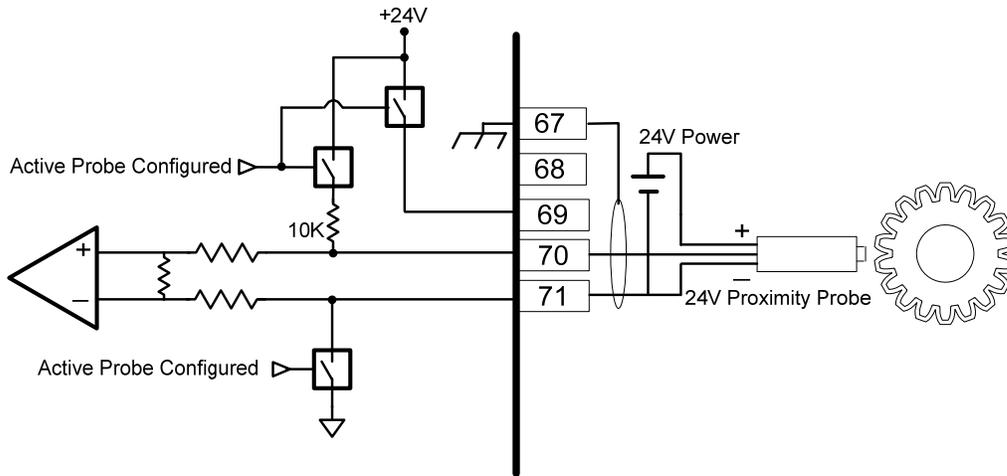


Figure 2-11c. Example Proximity Probe (Active Magnetic Pickup Unit) Wiring (External Power, Non-preferred)

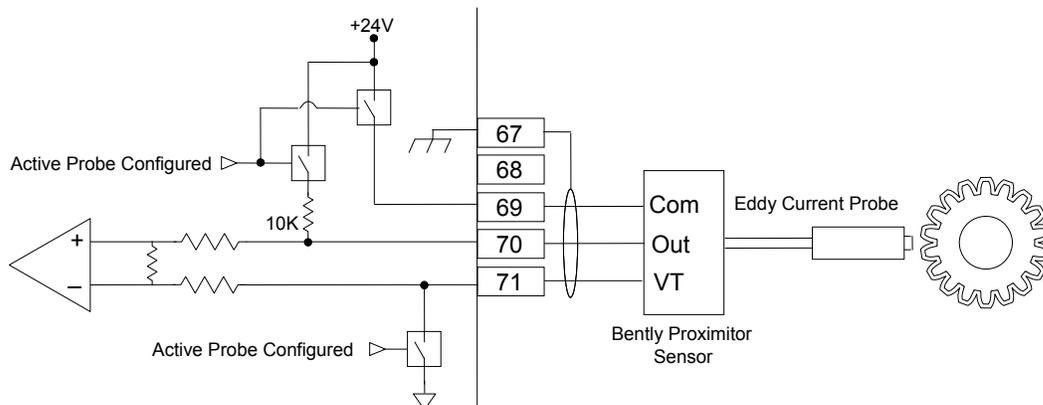


Figure 2-11d. Example Eddy Current Probe (Active Magnetic Pickup Unit) Wiring

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.

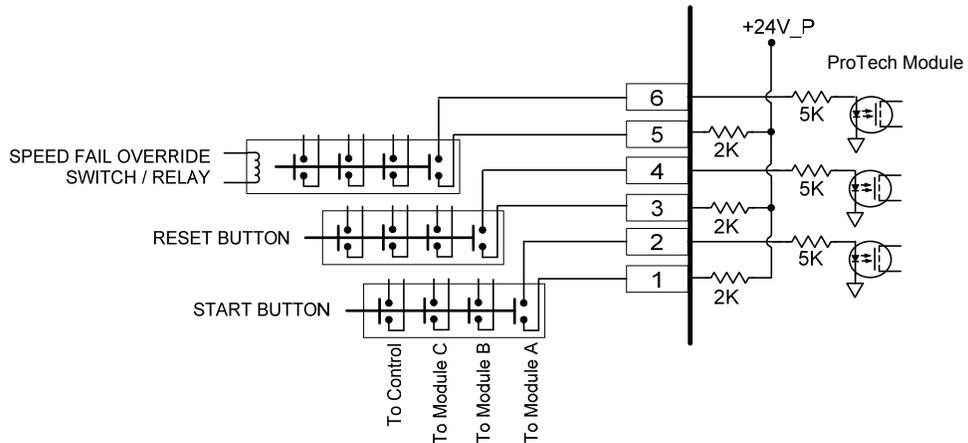


Figure 2-12a. Example Standard Discrete Input Wiring (Internal Power Option)

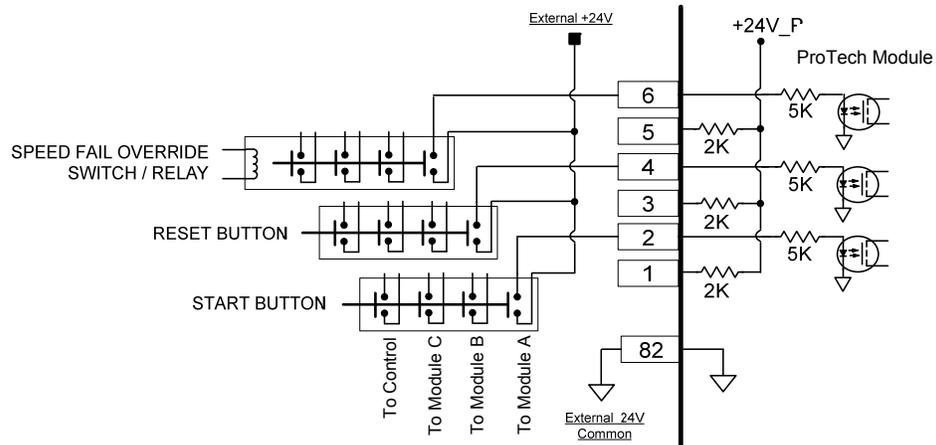


Figure 2-12b. Example Standard Discrete Input Wiring (External Power Option)

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.

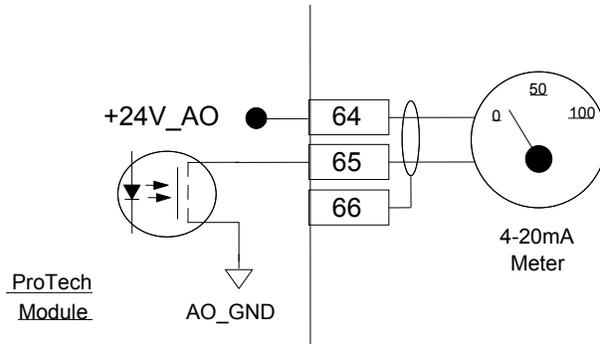


Figure 2-13. Example Analog Output Wiring

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. Refer to Figure 2-16a for the general locations for Trip Relay Output wiring in the two models.

IMPORTANT	<p>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 the prime mover.</p>
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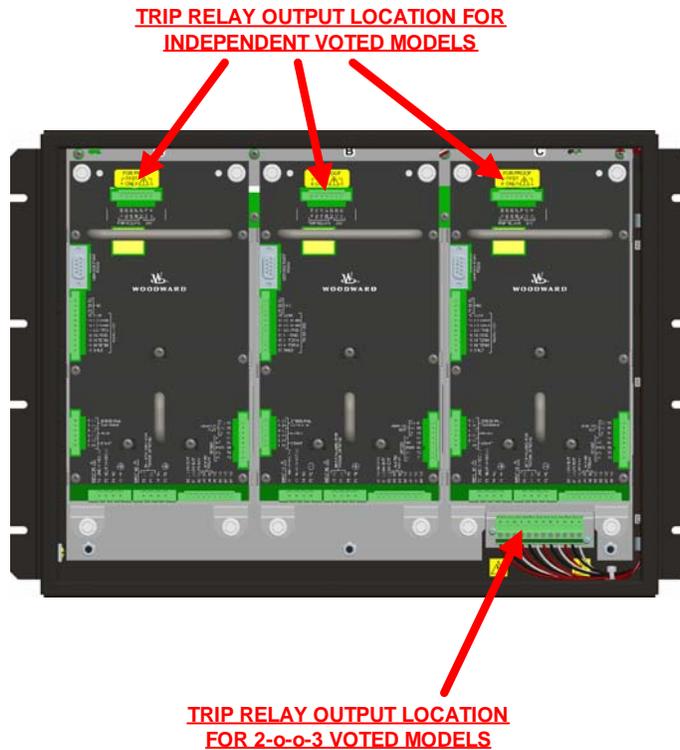


Figure 2-14a. Example Trip Relay Output Wiring

Refer to Chapter 3 (Functionality) of this manual for all applicable relay output specifications and related information.

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 2oo3 voted trip block assemblies. Refer to Figure 2-16a for relay terminal location and Figure 2-14b or 2-14c for wiring information.

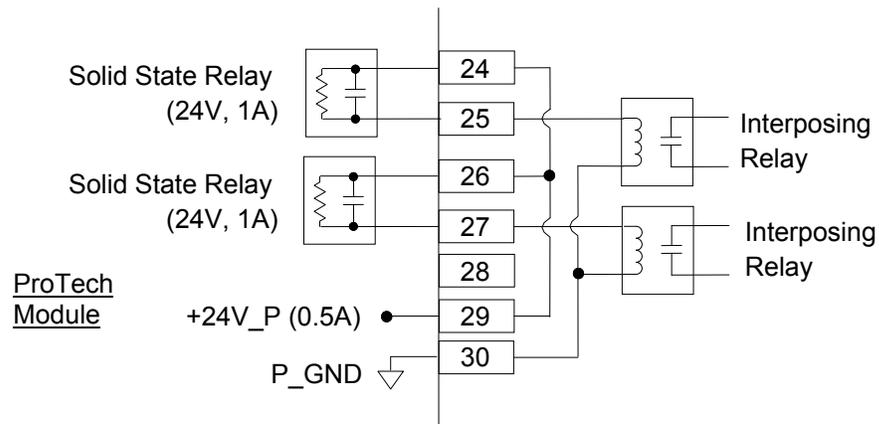


Figure 2-14b. Example Trip Relay Wiring (per Module)
(Independent Trip Relay) (Internal Supply)

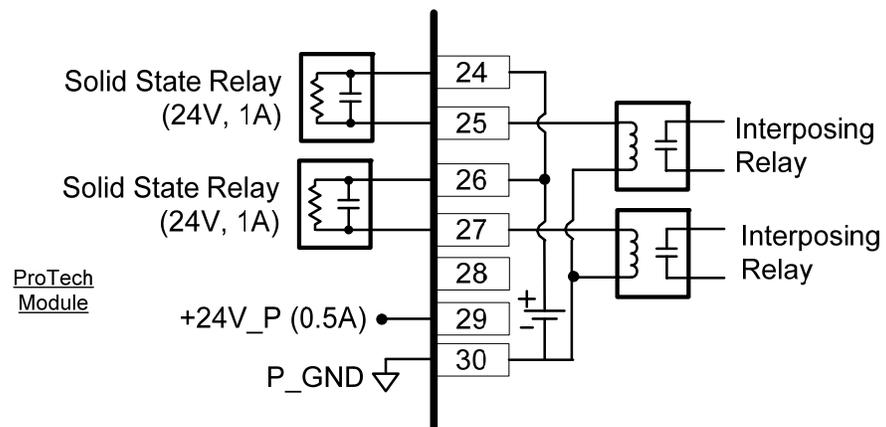


Figure 2-14c. Example Trip Relay Wiring (per Module)
(Independent Trip Relay) (External Supply)

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 to drive the ProTech’s 2-out-of-3 voted relay module, and the third output per module dedicated as the module’s alarm relay output. See the “Monitor Alarms” section of this manual for information on what events cause the Alarm relay output to change state.

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 2oo3 voted fashion to drive two redundant Form-C trip relays on the unit’s 2-out-of-3 voted relay module. These two voted redundant relays 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.

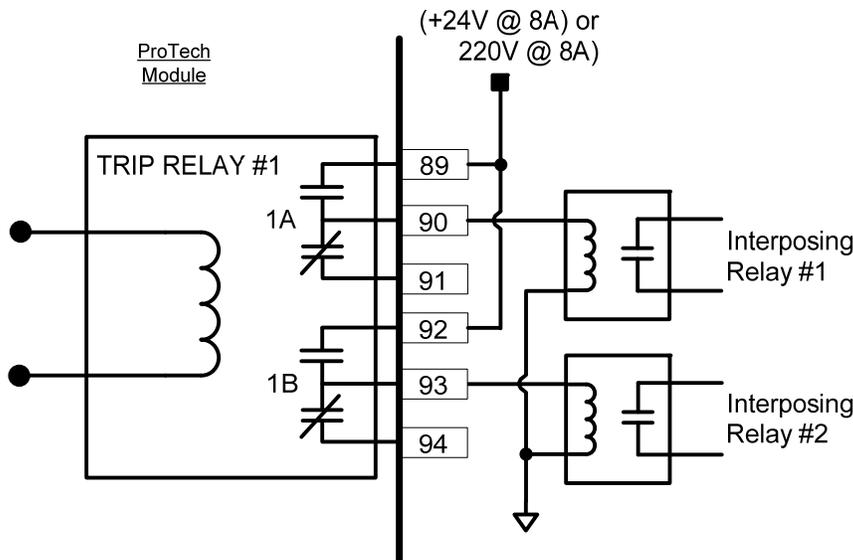


Figure 2-14d. Example Trip Relay Wiring (Voted Trip Relay Models)

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.

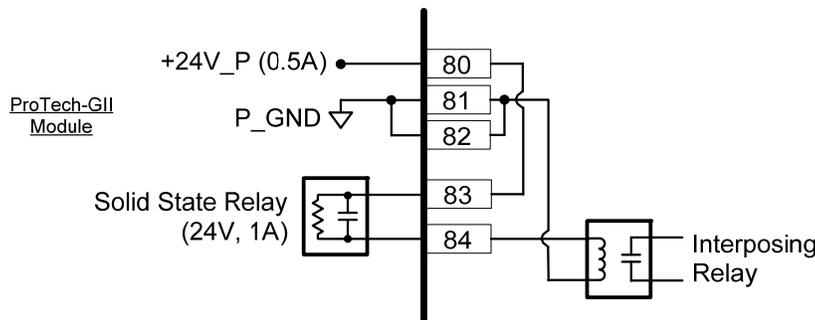


Figure 2-14e. Example Alarm Relay Wiring (Internal Supply)

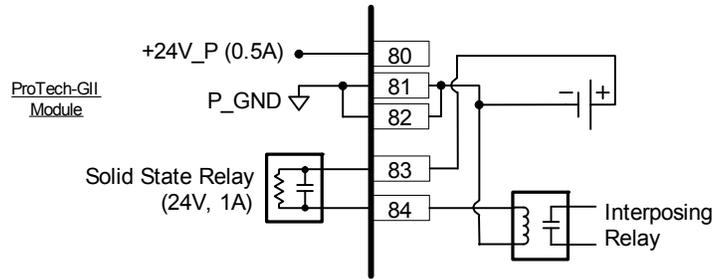


Figure 2-14f. Example Alarm Relay Wiring (External Supply)

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 $\pm 10\%$ @ 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.

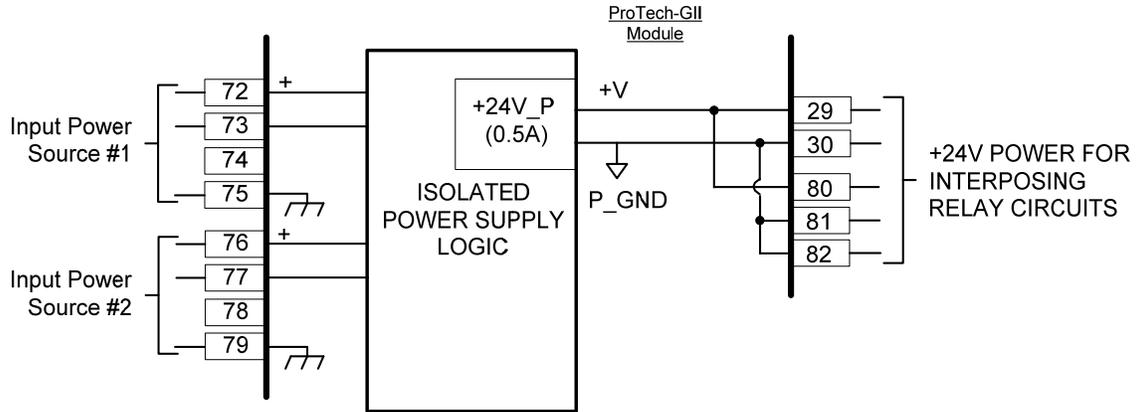


Figure 2-15. Power Supply Relationship Diagram

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.

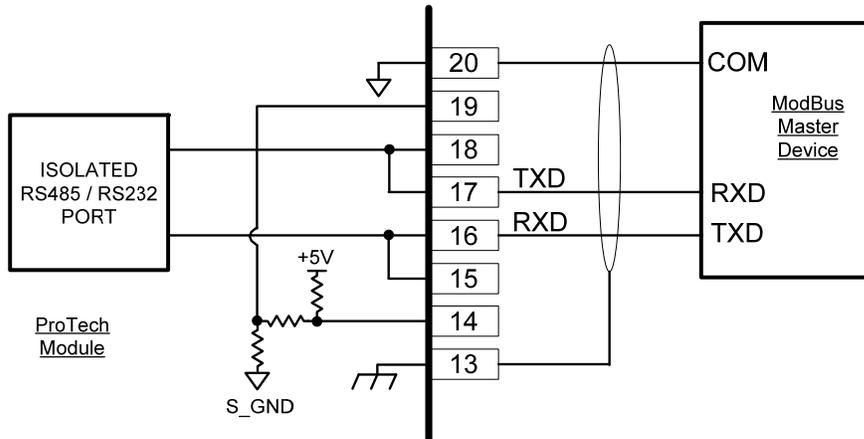


Figure 2-16a. Serial Port Interface Diagram—RS-232

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.

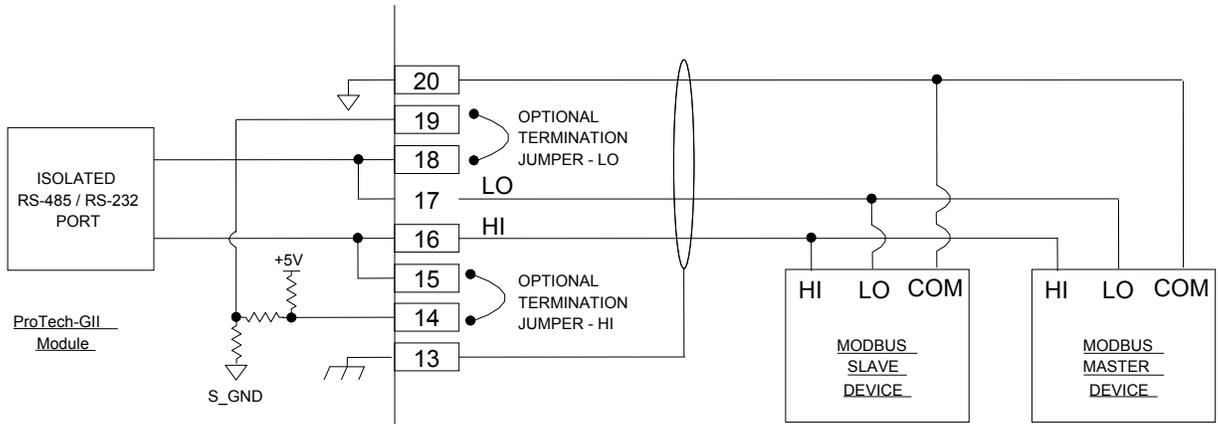


Figure 2-16b. Serial Com Port Interface Diagram—RS-485

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 into the ProTech and for 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.

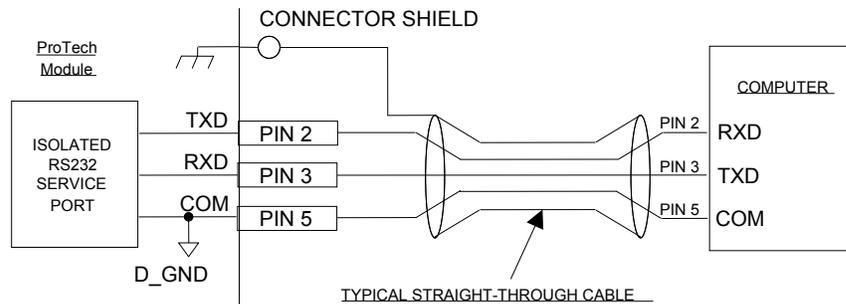


Figure 2-17. Programming and Configuration Tool Cable/Interface Diagram

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

Introduction

The ProTech-GII is an overspeed safety device designed to safely shut down steam, gas, and hydro turbines of all sizes upon sensing an overspeed or over-acceleration event. This device accurately monitors turbine rotor speed and acceleration via active or passive MPUs (magnetic pickups) and issues a shutdown command to the turbine's trip valve(s) or corresponding trip system.

Depending on the system design, the ProTech-GII can be purchased with two dual redundant trip relay outputs using a 2-out-of-3 voted architecture, or with three independent non-voted trip relay outputs. Individual alarm relays, 4–20 mA speed readouts, and Modbus communications make this overspeed device easy to integrate into any turbine safety system.

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 such that faults in one module do not affect any of the other modules. The modules are connected via a safety certified CAN network which allows the sharing of all module input information (speed and discrete inputs) and module configuration information. The ProTech-GII's configuration copy function also utilizes this network to transfer/copy configuration file from one module to another.

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 overspeed device is certified for use in IEC-61508 SIL-3 based applications. This overspeed device's triple modular design 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.

Each ProTech-GII module shares its input values (speed, acceleration discrete inputs) and its trip and alarm latch information with the other two modules. Users can then optionally configure the module's trip and alarm logic to use or not use the shared input and latch information. This type of redundancy allows users the choice of using one two or three speed sensors and connecting to (wiring to) three modules, two modules or only one module and using the sharing and voting logic to manage logic in all three modules. Refer to Figure 3-1 for more information on module to module sharing logic.

IMPORTANT

For system reliability purposes, it is recommended that all critical parameters utilize three independent sensors or circuits, and be individually wired into the ProTech-GII's three independent modules.

Configuration 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). Refer to Figures 3-1 to 3-5 for functional logic diagrams.

A software-based Programming and Configuration Tool (PCT) install kit is included with each ProTech-GII that can be loaded onto a computer, and used to:

- Change all module functional settings (i.e. overspeed and over-acceleration settings).
- Configure speed and acceleration redundancy manager logic.
- 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, over-acceleration, and redundancy manager 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 upload 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.

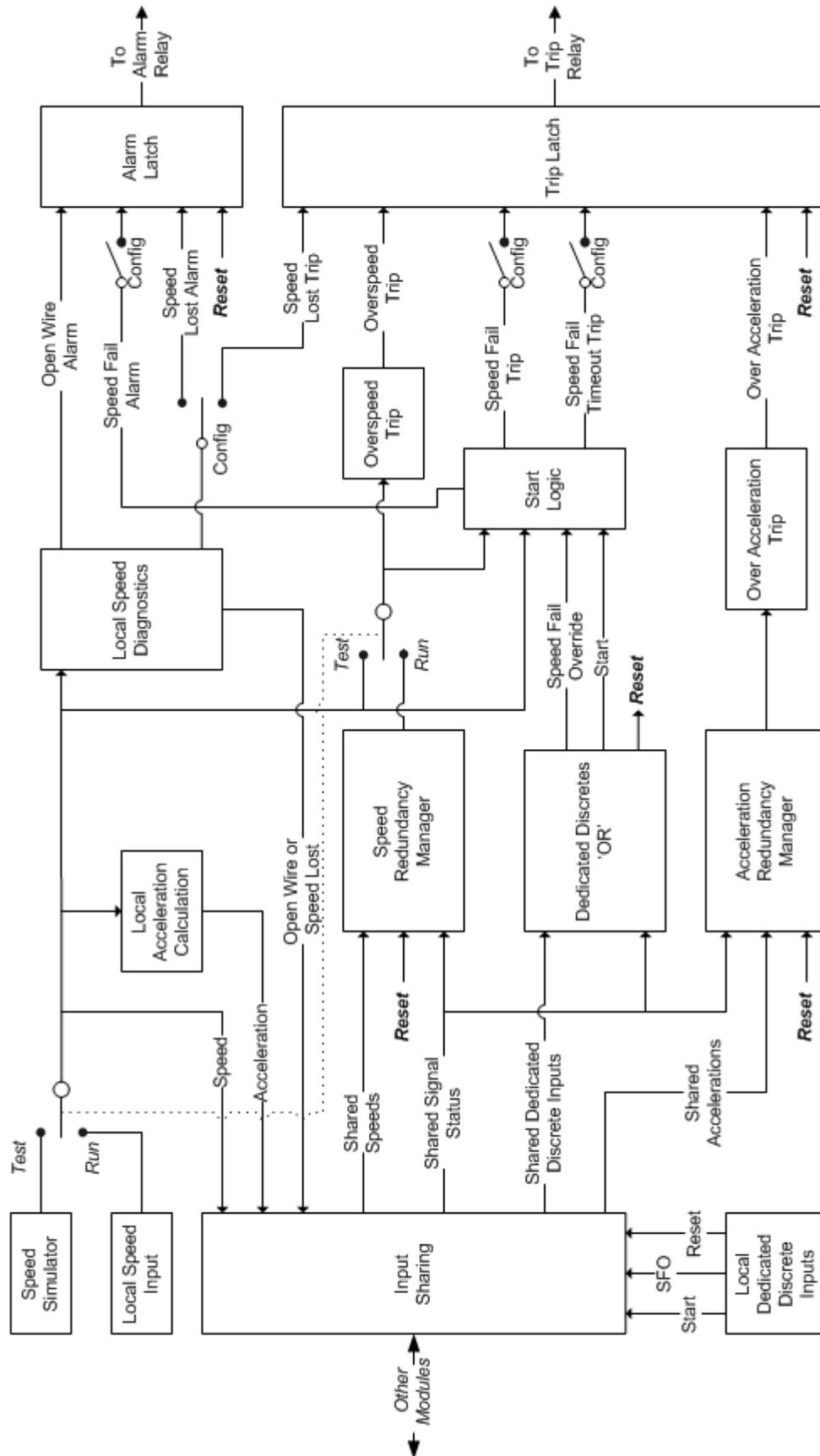


Figure 3-1. Module Diagram with Speed Redundancy Manager Configured

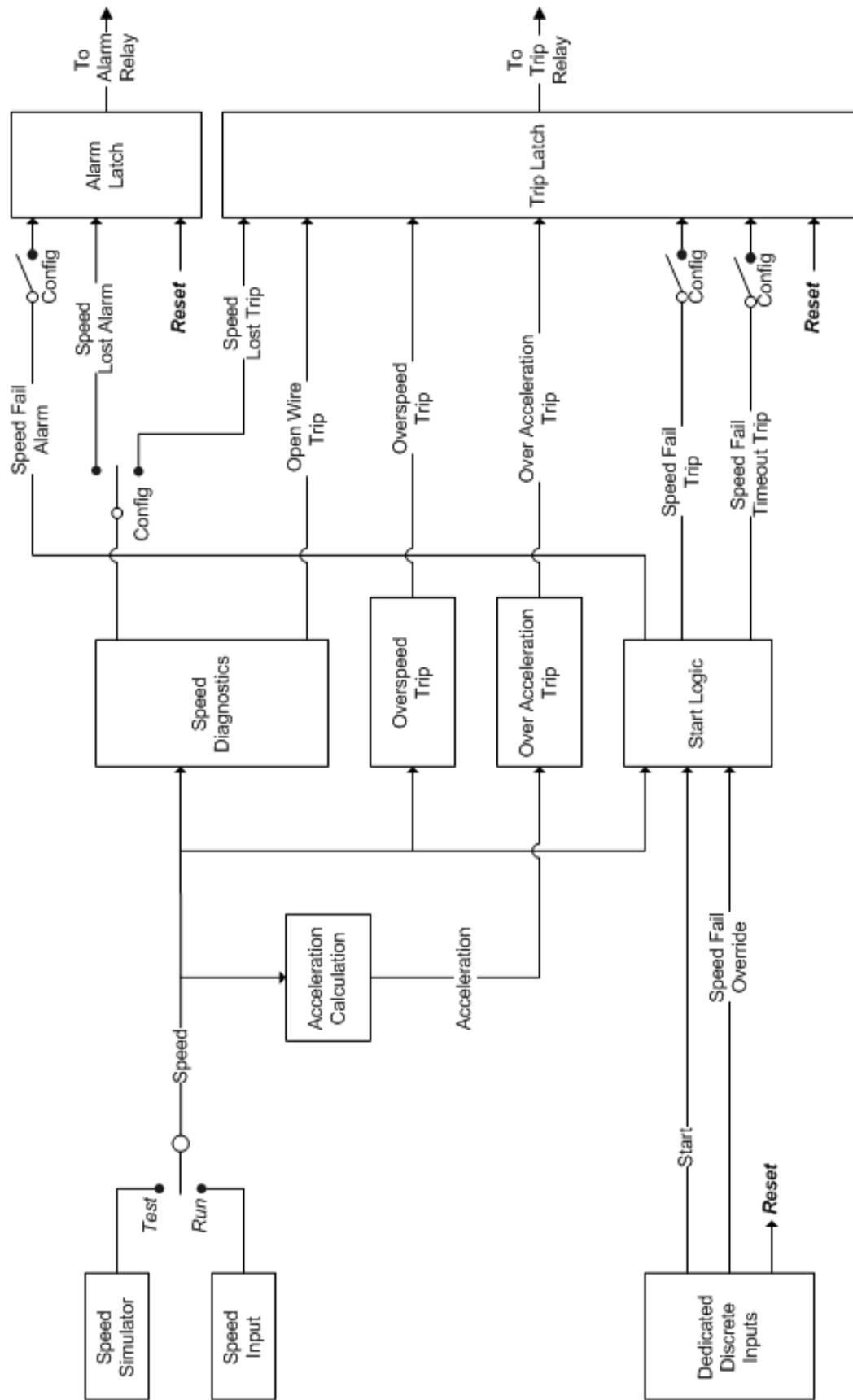


Figure 3-2. Module Diagram without Speed Redundancy Manager Configured

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.
- Upload 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:

- Share module input signals and event latch status information.
- Copy configuration settings 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 an “Auto Sequence 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 the prime mover.

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 3-3. Basic Functional Overview of Independent Trip Relay Models

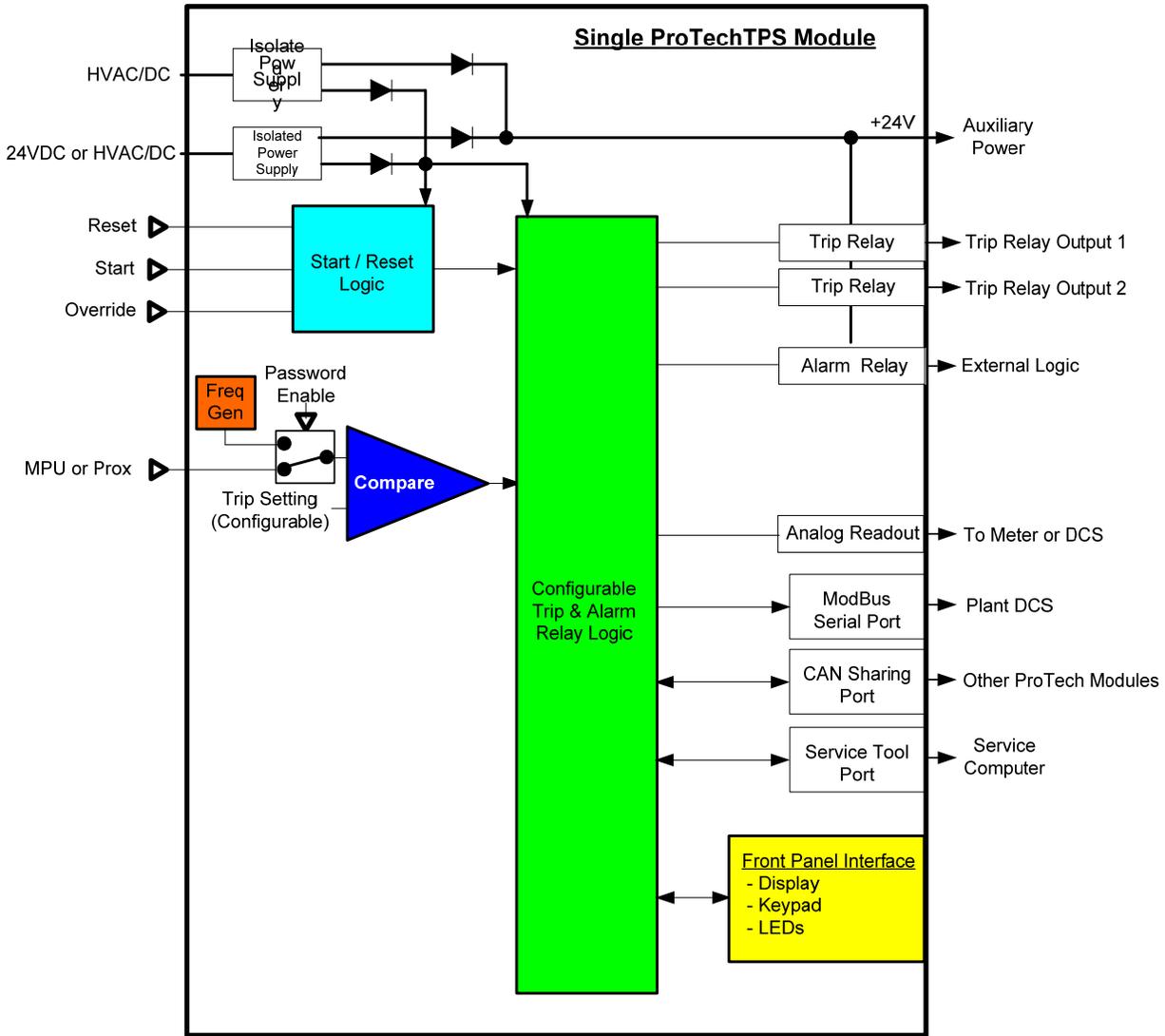


Figure 3-4. Functional Diagram of Single ProTech-GII module with Independent Trip Relay Outputs

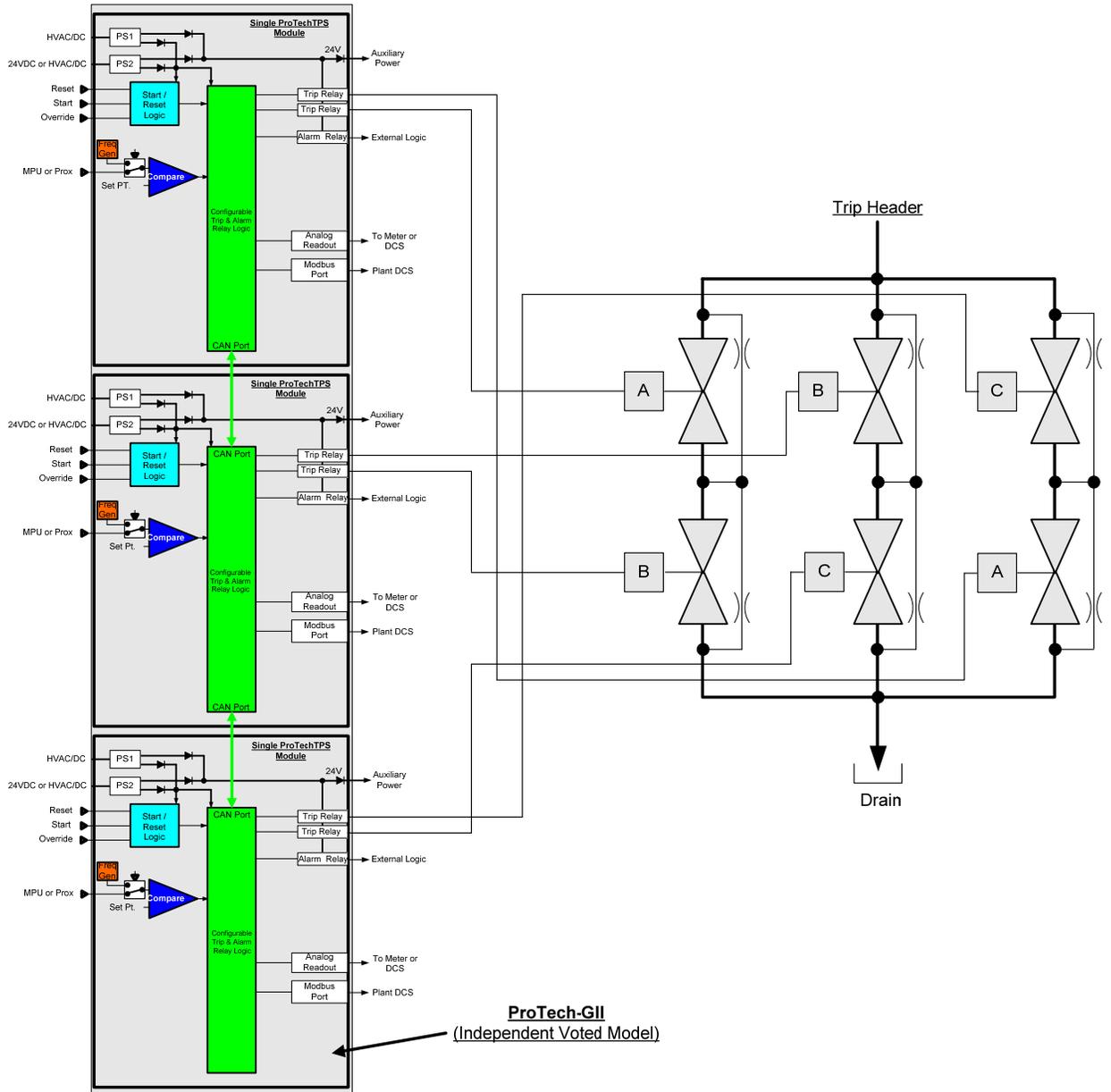


Figure 3-5. Example TMR Trip Block Assembly Interface

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.

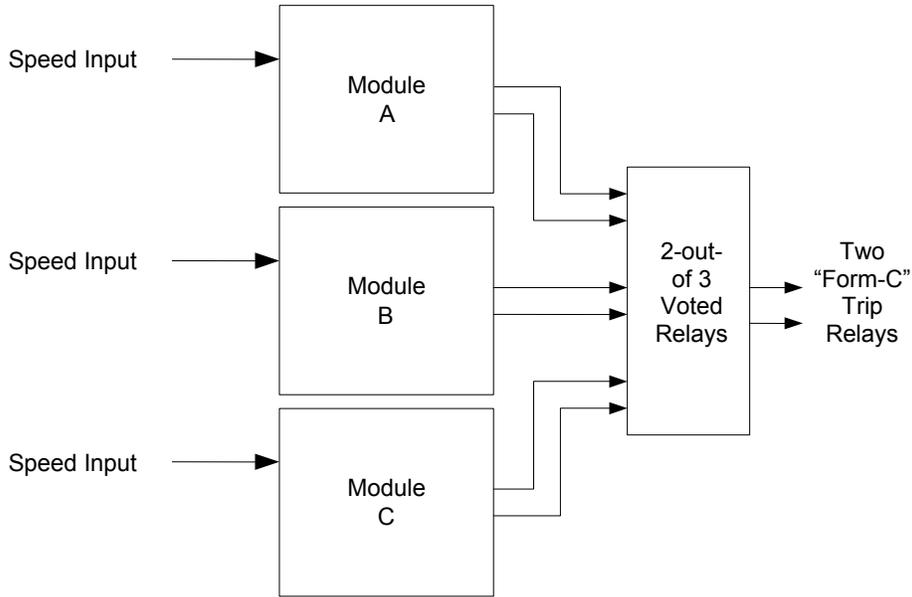


Figure 3-6. Basic Functional Overview of Voted Trip Relay Models

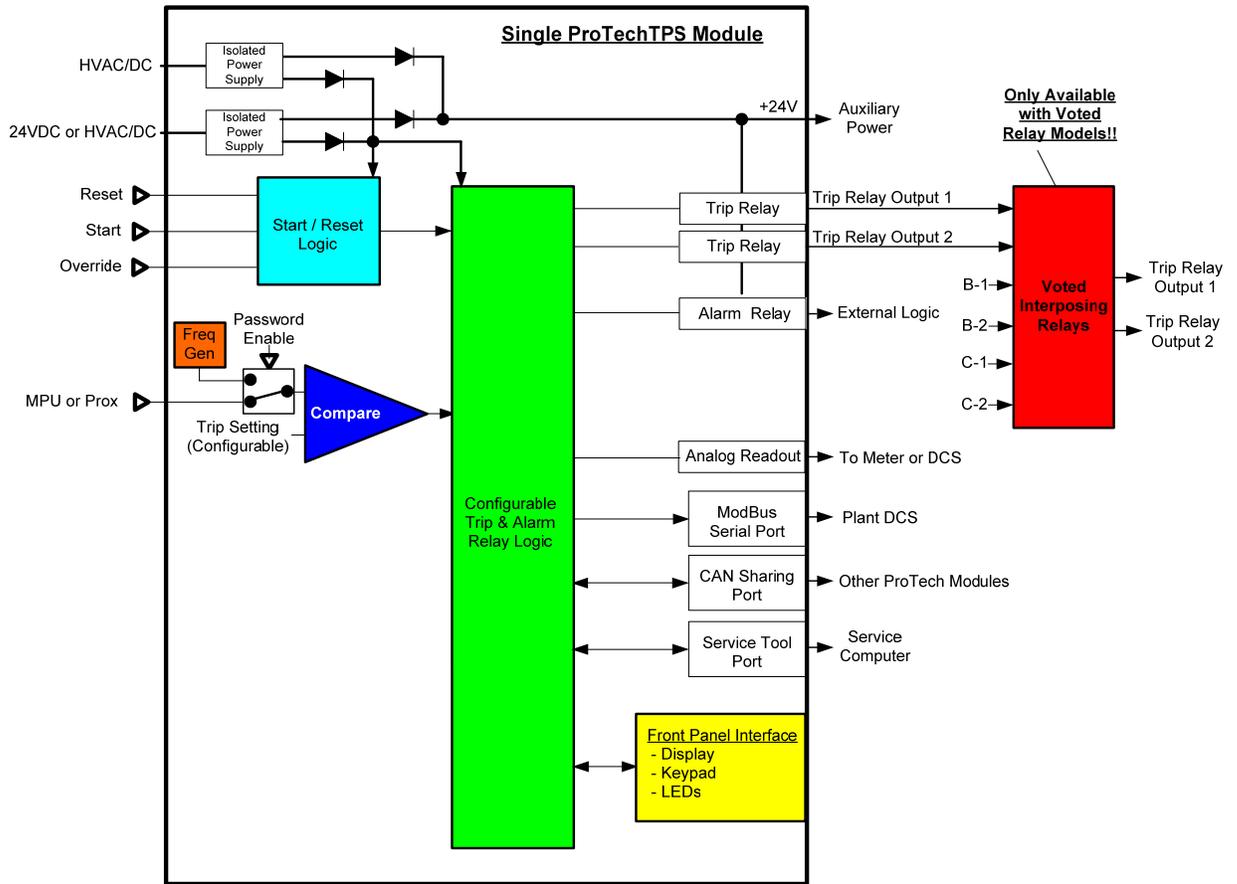


Figure 3-7. Functional Diagram of Single ProTech-GII Module with Voted Trip Relay Outputs

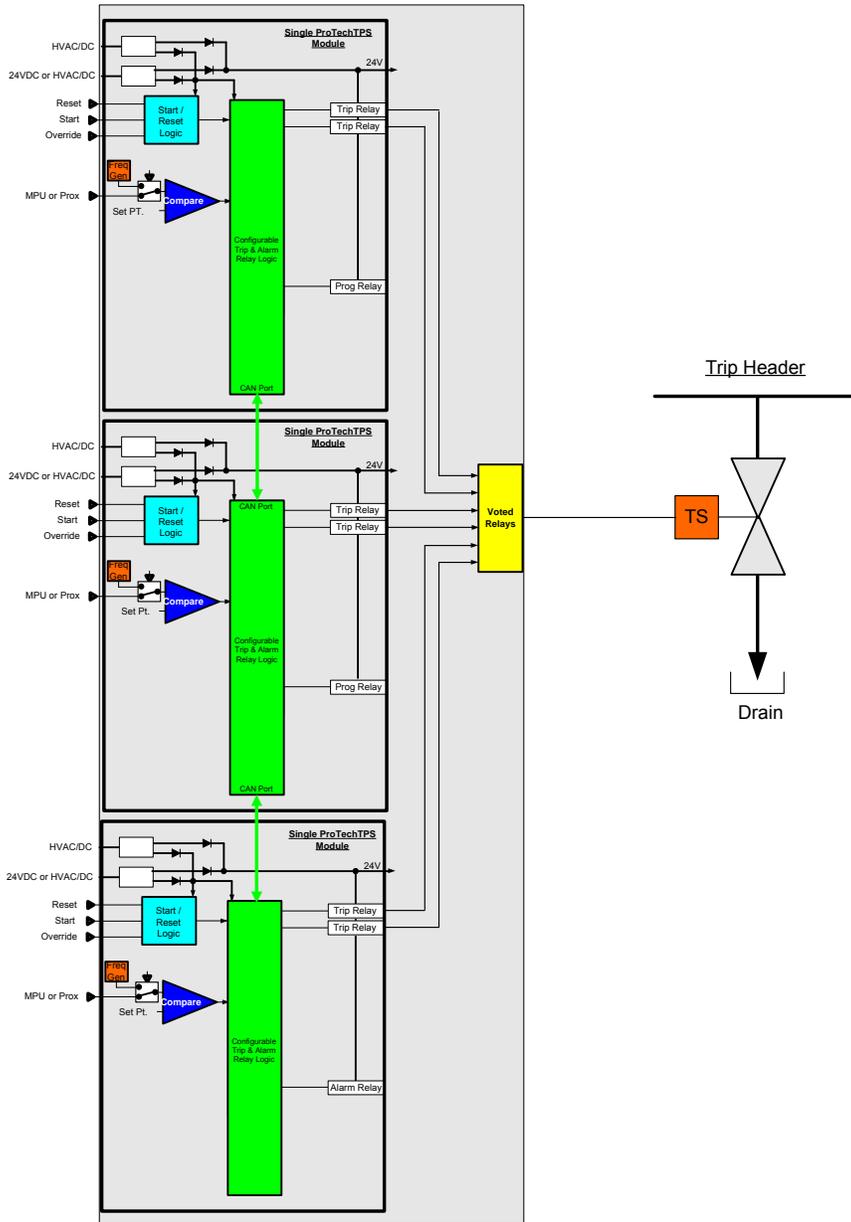


Figure 3-8. Simplex Trip Block Assembly

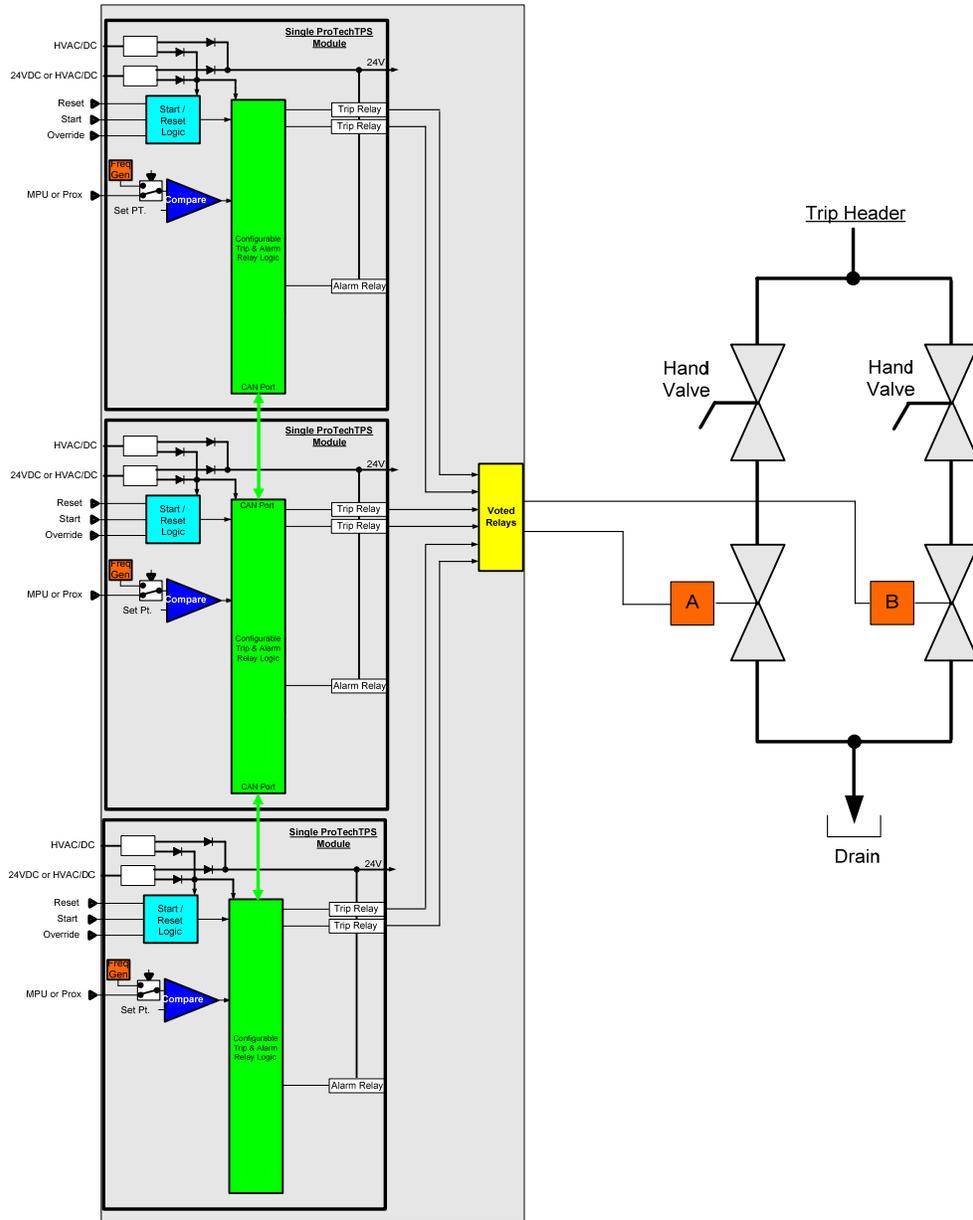


Figure 3-9. Dual Redundant Trip Block Assembly

Inputs and Outputs

Input Redundancy

Each ProTech-GII module shares its input values (speed, acceleration discrete inputs) and its trip and alarm latch information with the other two modules. Users can then optionally configure the module’s trip and alarm logic to use or not use the shared input and latch information. Configurable redundancy manager blocks are available for the speed and acceleration signal redundancy logic. Optionally one or all of the module’s discrete inputs can be configured with “ORed” logic. This type of redundancy allows users the choice of using one two or three speed sensors and connecting to (wiring to) three modules, two modules or only one module and using the sharing and voting logic to manage logic in all three modules.

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 before turbine operation, 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 or eddy current 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.

If the ProTech-GII's speed redundancy manager is not configured for use, then each module simply uses its local speed sensor signal, and compares it to the overspeed setpoint to determine an overspeed event.

If the ProTech-GII's speed redundancy manager is configured for use then each module uses its local sensed speed signal and the shared speed signals from the other two modules to select/vote the signal to use in its overspeed detection logic. The speed redundancy manager can be configured to vote the median, highest or lowest speed signal to use in its overspeed detection logic, and can be configured to change its voting logic based on the number of healthy speed probes/signals.

Note that the Speed Redundancy Manager allows users to elect to use three speed sensing probes, two speed sensing probes, or only one speed sensing probe, depending on the specific application's requirements. If only two probes are used, then the third module can be configured to only use and vote on the shared speed signals (from the other modules) to use in its overspeed and over-acceleration detection logic. Although not recommended, if only one probe is used, then the second and third modules can be configured to only use and vote on the shared speed signal (from the first module) to use in their overspeed and over-acceleration detection logic.

If the unit is configured for only two probes (or just one probe), there will be a configuration mismatch and associated alarm. This alarm can be disabled in the Configuration Management Menu.

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. Each module can be configured to use only its local discrete input signals (start, reset, and speed fail override) or the “ORed” result of its local discrete inputs and the other two modules’ discrete inputs. This is useful if only one or two discrete contacts are available from a specific circuit or application.

Start Input

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.

If it is desired to use one module’s contact inputs to also “Start” the other modules Speed Fail Timeout Trip functions, each module’s Boolean Input Manager logic function can be configured to do so. Each module’s Boolean Input Manager function can be configured to accept, only its local Start contact input, or a specific module’s Start contact input, or all modules’ Start contact inputs.

Note—Since the Start button on the front of the module is physically connected to the Start contact input, sharing the Start contact input will also share the Start button.

Reset Input

This contact is used to clear/reset all local module trips and alarms events from the trip and alarm latches.

If it is desired to use one module’s contact inputs to also “Reset” the other modules trip and alarm latches, each module’s Boolean Input Manager logic function can be configured to do so. Each module’s Boolean Input Manager function can be configured to accept, only its local Reset contact input, or a specific module’s Reset contact input, or all modules’ Reset contact inputs.

Note—The Reset button on the front of the module is a local module command only and cannot be connected to nor affect the “ORed” Reset contact input logic on other modules.

Speed-Fail-Override Input

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.

If it is desired to use one module’s contact inputs to also function as the “Speed Fail Override Input” for the other modules, the module’s Boolean Input Manager logic function can be configured to do so. Each module’s Boolean Input Manager function can be configured to accept, only its local Speed-Fail-Override contact input, or a specific module’s Speed-Fail-Override contact input, or all modules’ Speed-Fail-Override contact inputs.

Alarm Relay Output

Each module has one alarm relay output. This output is a normally open contact. When an alarm is present, the contact is 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 $\pm 0.5\%$ 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 Logic

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 or voted 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. With the configuration of the acceleration redundancy manager each ProTech-GII module uses the acceleration values from all three modules to select/vote the acceleration value to compare to the configured over-acceleration trip setpoint and detect an over-acceleration condition. 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 the front panel or loaded to a computer via the ProTech-GII Programming and Configuration Tool (PCT).

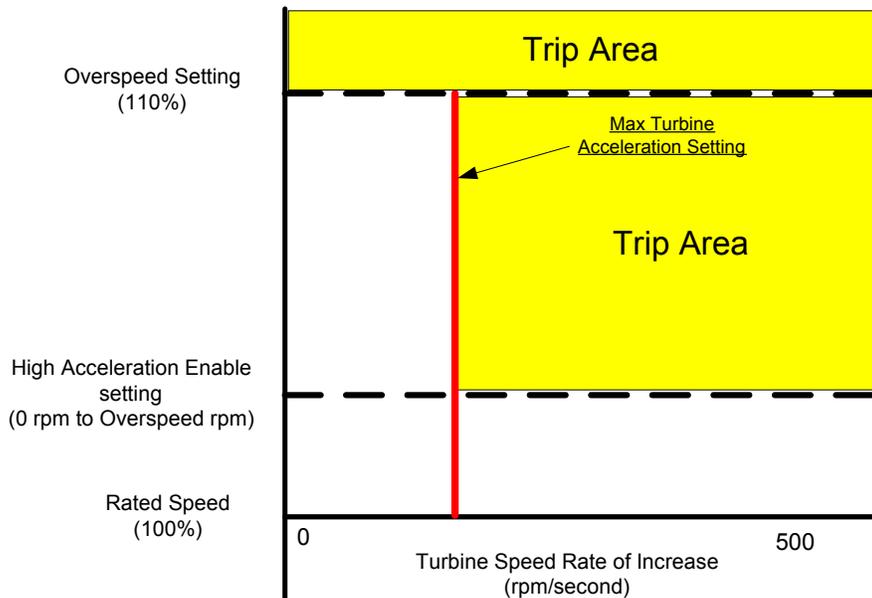


Figure 3-10. Over-Acceleration Enabling Diagram

Speed Redundancy Manager

The configuration/use of the Speed Redundancy Manager is not required to use either the independent voted or 2-out-of-3 voted ProTech-GII models. Independent voted and 2-out-of-3 voted logic is based on the ProTech-GII's output voting architecture and not its inputs. If the ProTech-GII's speed redundancy manager is not configured for use, then each module simply uses its local speed sensor signal and compares it to its internal/local overspeed setpoint to determine an overspeed event.

The use of the Speed Redundancy Manager allows users to elect to use three speed sensing probes, or two speed sensing probes or only one speed sensing probe in each modules' overspeed logic depending on the specific application's requirements. If only two probes are used then the third module can be configured to only use and vote on the shared speed signals (from the other modules) to use in its overspeed and over-acceleration detection logic. Although not recommended, if only one probe is used then the second and third modules can be configured to only use and vote on the shared speed signal (from the first module) to use in their overspeed and over-acceleration detection logic.

NOTE—If a speed probe is not connected to a ProTech-GII module the “Probe type” setting must be set to “Not Used”.

If the unit is configured for only two probes (or just one probe), there will be a configuration mismatch and associated alarm. This alarm can be disabled in the Configuration Management Menu.

If the module's Speed Redundancy Manager is configured for use then each module uses its local sensed speed signal and the shared speed signals from the other two modules to select/vote the signal to use in its overspeed detection logic. Each module's Speed Redundancy manager can be configured as follows depending on the number of used or healthy speed signals:

1. Three used/healthy speed signals condition (Base Function):
 - a. Median signal (middle signal)
 - b. Highest signal
 - c. Lowest signal
2. Two used/healthy speed signals condition (Fallback Function):
 - a. Highest signal
 - b. Lowest signal
3. One used/healthy speed signal condition (Two Inputs Failed Action):
 - a. Used/sensed healthy speed signal
 - b. Issue a trip command

In the Speed Redundancy Manager there is the Difference Alarm Limit and the Difference Alarm Time. The Difference Alarm time is the time a difference is allowed before an alarm is set.

NOTICE

When the Speed Redundancy Manager is used, losing one of the speed signals will result in an alarm in all three modules. Once that speed signal is fixed, all three modules will need to be reset to clear the alarms (If the Reset inputs are shared, then one reset may reset multiple modules).

Acceleration Redundancy Manager



Do not configure the Acceleration Redundancy Manager without configuring the Speed Redundancy Manager.

The configuration/use of the Acceleration Redundancy Manager is not required. If the ProTech-GII's acceleration redundancy manager is not configured for use, then each module simply uses its local speed sensor signal, and compares its calculated acceleration rate to the modules' over-acceleration setpoint to determine an over-acceleration event.

If the ProTech-GII's acceleration redundancy manager is configured for use then each module uses its local calculated acceleration rate (calculated from the local speed signal) and the shared acceleration rates from the other two modules to select/vote the signal to use in its over-acceleration detection logic. The acceleration redundancy manager can be configured to vote the median highest or lowest acceleration rate signal to use in its over-acceleration detection logic, and can be configured to change its voting logic based on the number of healthy speed probes/signals.

If the module's Acceleration Redundancy Manager is configured for use then each module uses its local derived acceleration signal and the shared acceleration signals from the other two modules to select/vote the signal to use in its over-acceleration detection logic. Each module's Acceleration Redundancy Manager can be configured as follows depending on the number of used or healthy speed signals:

1. Three used/healthy speed/acceleration signals condition (Base Function):
 - a. Median signal (middle signal)
 - b. Highest signal
 - c. Lowest signal
2. Two used/healthy speed/acceleration signals condition (Fallback Function):
 - a. Highest signal
 - b. Lowest signal
3. One used/healthy speed/acceleration signal condition (Two Inputs Failed Action):
 - a. Used/sensed healthy speed/acceleration signal
 - b. Issue a trip command

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. Either, both, or neither of these methods can be selected. There is also an alarm that can be enabled to indicate any time the Speed is below the Speed Fail Setpoint.

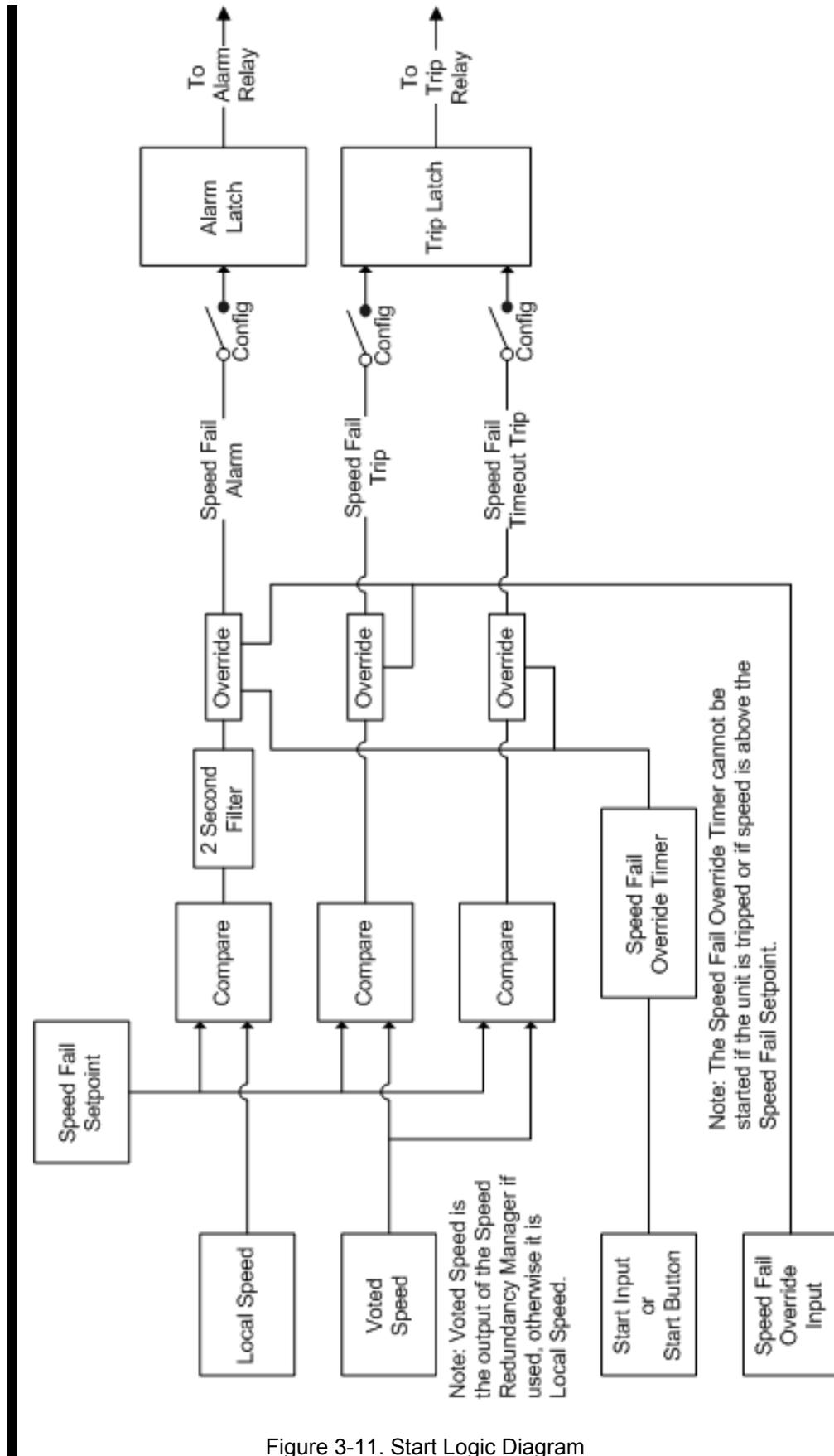


Figure 3-11. Start Logic Diagram

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.

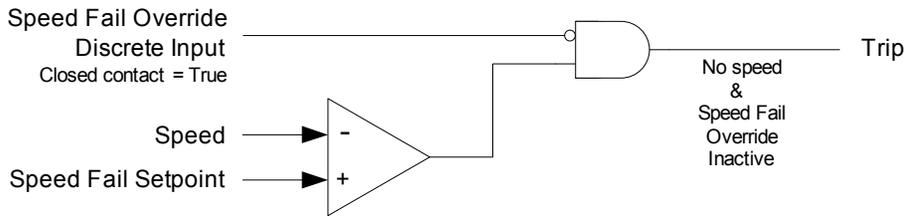


Figure 3-12. Speed Fail Trip Diagram

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.

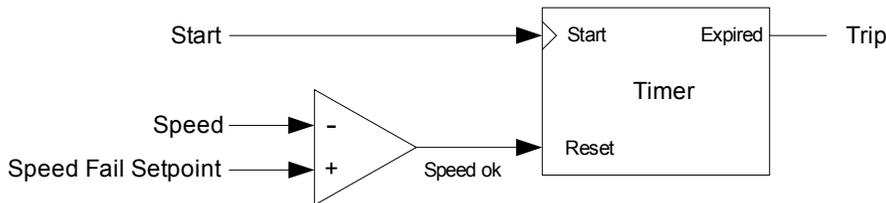


Figure 3-13. Speed Fail Timeout Trip Diagram

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 roll-down 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.

There is a configurable test mode permissive that is provided to prevent a test from being started if any module is tripped, in test, or in alarm. This permissive can be configured: Not Tripped—if another module is tripped or in a test; Not In Alarm—if another module is in alarm or in a test; or None—for no permissive. Selecting None means that tests can be run on any module regardless of the condition of the other modules. A test will always be prevented from running if the current module is tripped or in test. Also, tests will be aborted if another module trips or alarms, depending on the test mode permissive setting. One exception to these rules is the Temporary Overspeed Trip Setpoint, which can be applied to multiple modules even if another module is tripped or in alarm. Another exception is the Auto-Sequence Test, which will never be allowed to run if any module is tripped in test or in alarm. Finally, the Lamp Test 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.

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 an Auto Sequence Test function that will automatically run the Auto Speed Test on all three modules 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.

WARNING

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.

The Temporary Overspeed Setpoint is designed to allow users to test the module's overspeed function at a 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 highest level of the Test Mode Permissive so that a module cannot be placed in test while any other unit is tripped, in test, or in alarm. If it is desired to test a unit trip by tripping multiple modules through these simulated speed tests, the Test Mode Permissive can be set to a lower level.

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. If a trip does not occur within 12 seconds from the beginning of the test, the test is aborted and a test failed alarm is generated and logged in the module's alarm log.

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.

Auto Sequence 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 can be initiated from the front panel or by a configurable timer. If the configurable timer is used, the test Interval can be configured from 1 to 999 days. When initiated from the front panel, the test interval will be reset.

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

The operator can disable the Auto Sequence test from the front panel of the module. When the Auto Sequence test is disabled, or if any module is in trip, alarm, 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 the Auto Sequence Test is enabled again, and no modules are in trip, alarm, or test, this limit on the timer will no longer be in effect.

Configuration and initiation of the Auto Sequence Test can only be performed on 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:

- Internal Fault Alarm
- Configuration Mismatch (if configured)
- Power Supply 1 Fault (if configured)
- Power Supply 2 Fault (if configured)
- Speed Fail Alarm (if configured and speed input is used)
- Speed Lost Alarm (if configured and speed input is used)
- MPU Open Wire Alarm (if speed redundancy manager is used and speed input is Passive)
- Speed Redundancy Manager Input Difference Alarm (if speed redundancy manager is used)
- Speed Redundancy Manager Input 1 Invalid (if speed redundancy manager input 1 is used)
- Speed Redundancy Manager Input 2 Invalid (if speed redundancy manager input 2 is used)
- Speed Redundancy Manager Input 3 Invalid (if speed redundancy manager input 3 is used)
- Temporary Overspeed Setpoint Active Alarm
- Manual Simulate Speed Test Active Alarm
- Auto Simulated Speed Test Active Alarm
- Auto Simulated Speed Test Failed Alarm
- Auto-Sequence Test Active Alarm
- TRIP (if configured)

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 as a 2-out-of-3 (2oo3) 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 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 the RESET button on the unit's front panel, or by activating the discrete input that is dedicated to the reset function.

Here is the complete list of possible trips:

- Internal Fault Trip
- Power Up Trip (if configured for de-energize to trip)
- Configuration Trip
- Parameter Error Trip
- Overspeed Trip (if speed redundancy manager is used or speed input is used)
- Over-Acceleration Trip (if configured and speed redundancy manager is used or speed input is used)
- Speed Redundancy Manager Trip (if speed redundancy manager is used)
- Speed Probe Open Wire Trip (if speed redundancy manager is not used and the speed input is Passive)
- Speed Lost Trip (if configured and the speed input is used)
- Speed Fail Trip (if configured and the speed input or speed redundancy manager is used)
- Speed Fail Timeout Trip (if configured and the speed input or speed redundancy manager is used)

System Logs

Each module in the ProTech-GII logs (saves to memory) all trips, alarms, overspeed, and over-acceleration events, and the time and date the event occurred. Peak speed and peak acceleration are also logged with the time and date of the last peak. 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 the Peak Speed/Acceleration Log. The Config Level Password is required to Reset the Peak Speed/Acceleration Log.

Overspeed/Acceleration Log

Each module logs the time and date of the last 20 overspeed or over-acceleration events, the speed and acceleration levels sensed upon issuing a system trip command, and the related maximum speed and acceleration values detected during the trip condition. This includes values generated by internal simulation testing. If the trip occurred during testing, this will also be indicated in the log.

Trip Log

Each module logs the last 50 trip events sensed. This log stores the trip description, time and date of the event, “first out” trip indication, and indication if the module was performing a test when the trip occurred. Pressing the TRIPPED VIEW button on the ProTech-GII’s front panel will display the Trip Log screen. This screen displays the most recent TRIP event at the top of the list, and allows users to scroll through all logged events.

Alarm Log

Each module logs the last 50 alarms sensed. This log stores the alarm description, time and date of the event, and indication if the module was performing a test when the trip occurred. Pressing the ALARM VIEW button on the ProTech-GII’s front panel will display the Alarm Log screen. This screen displays the most recent ALARM event at the top of the list, and allows users to scroll through all logged events.

Peak Speed/Acceleration Log

This log stores the maximum speed and acceleration levels, and associated time of the latest maximum since the last time the log was reset/cleared. This includes the speed and acceleration levels sensed during an automatic or manual overspeed testing routine. This log can be reset from the front panel with the use of the Config Level Password.

ProTech-GII Response Time Performance

The ProTech-GII's total throughput response time can be as fast as 4 milliseconds or as slow as 19 milliseconds for frequencies above 1000 Hz depending on the following:

- Independent Trip Relay or 2oo3 Voted Relay models
- Sensed frequency at overspeed trip point
- Configuration/use of the Speed Redundancy Manager function

The definition of “total throughput response time” as used within this manual and is displayed within the below graphs is the following: “the average time difference between a change of input speed at the input terminal is made to the time a change of output relay state at the output terminal is detected”. Average time difference is displayed as event occurrence to module sample time differences can result in a ± 2 millisecond time difference.

Since the ProTech-GII 2oo3 Voted Relay models utilize extra internal interposing relays to perform the 2-out-of-3 voting logic, the response time for these models is longer than that of the ProTech-GII Independent Voted Relay models. Refer to the graphs below to understand the system response differences between models.

As can be verified by the following graphs, the faster the input frequency, the faster a module's speed detection logic can sense and accurately calculate a speed signal.

Since the Speed Redundancy Manager function requires the sharing of all speed signals between all modules, the total throughput response time of each module configured is longer when the Speed Redundancy Manager function is configured. Refer to below graphs to understand the system response differences.

Independent Trip Relay Models—Response Graphs

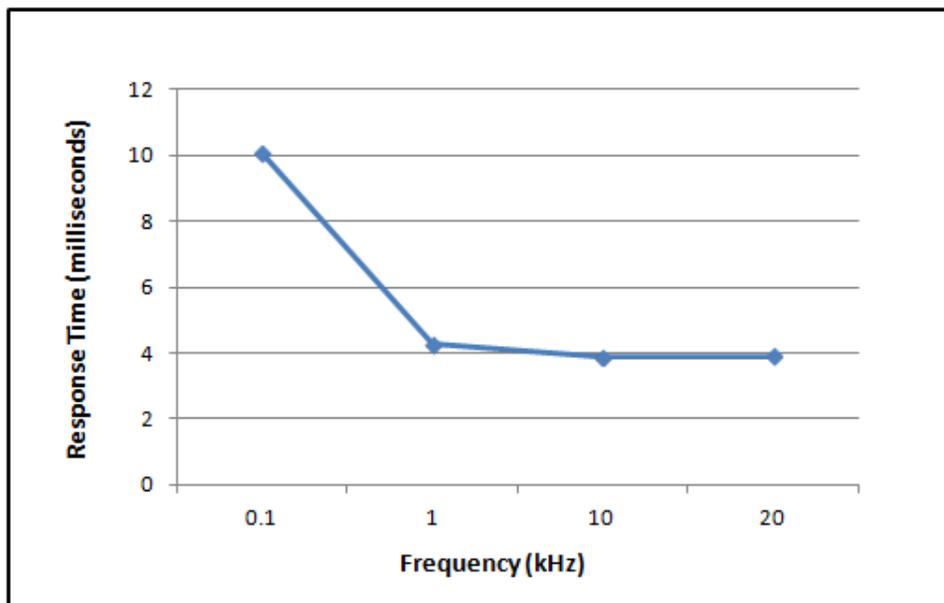


Figure 3-14. Total System Response Time Based on Sensed Frequency Level for Independent Trip Relay Models when Speed Redundancy Manager Function is not Configured

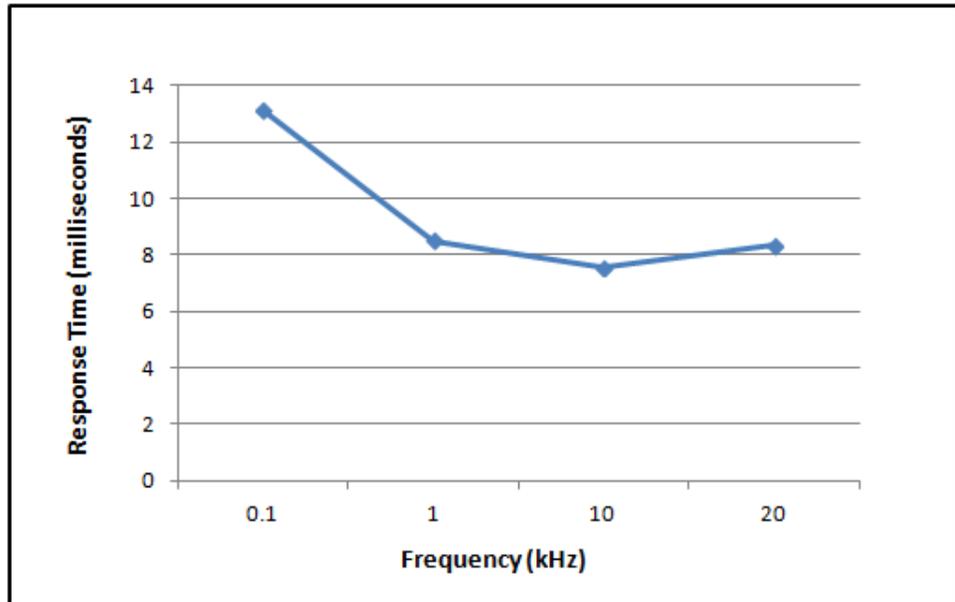


Figure 3-15. Total System Response Time Based on Sensed Frequency Level for Independent Trip Relay Models when Speed Redundancy Manager Function is Configured

Voted Trip Relay Models—Response Graphs

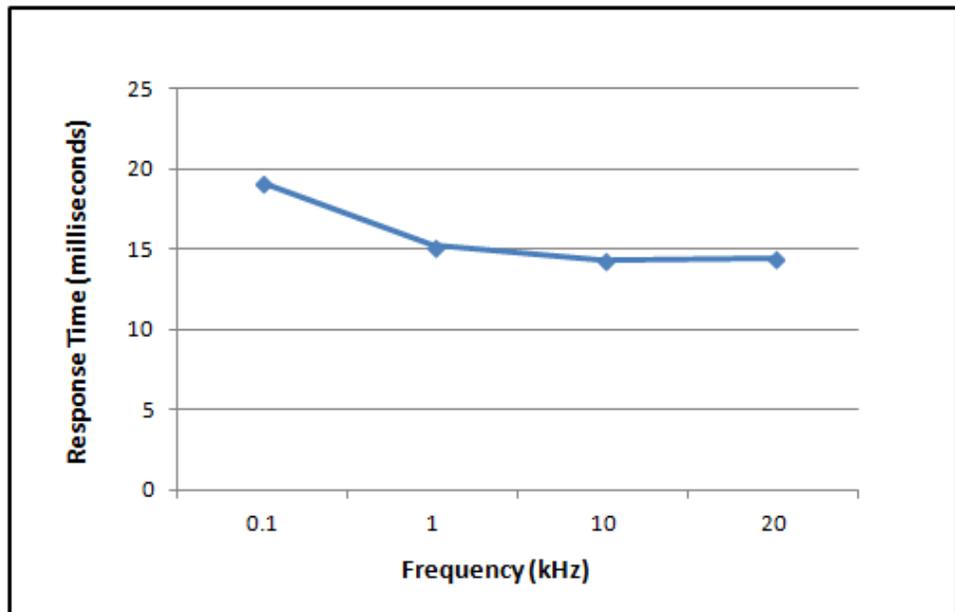


Figure 3-16. Total System Response Time Based on Sensed Frequency Level for 2003 Voted Trip Relay Models when Speed Redundancy Manager Function is not Configured

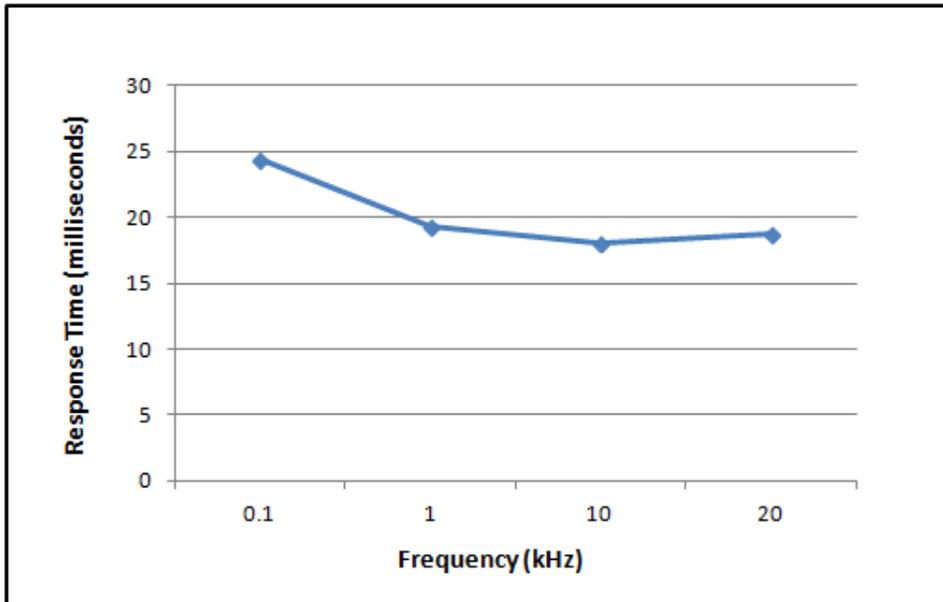


Figure 3-17. Total System Response Time Based on Sensed Frequency Level for 2003 Voted Trip Relay Models when Speed Redundancy Manager Function is Configured

$$\text{Frequency} = (\text{rpm}) * (\text{number of teeth}) / 60$$

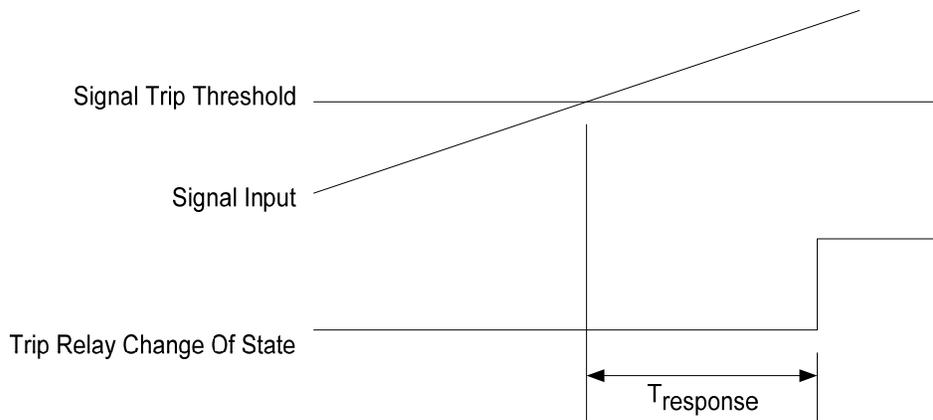


Figure 3-18. Response Time Definition

Analog Output

The response time of the analog output is less than 12 ms measured from a change in speed to a change in the output current.

Chapter 4. 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.

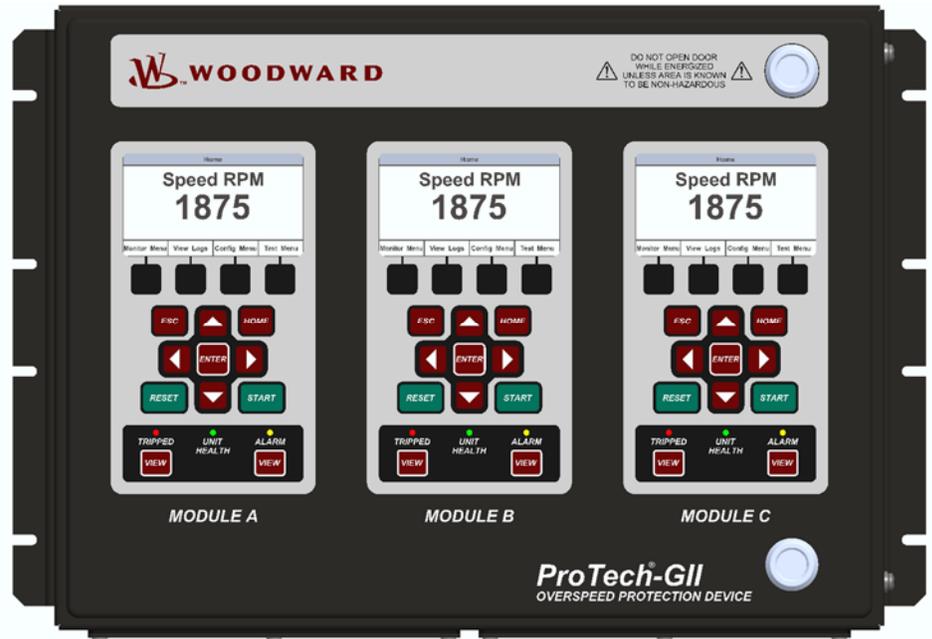


Figure 4-1. ProTech-GII Front Panel

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, Auto Sequence, and Lamp Test.

Screen Layout

Each screen on the ProTech G-II modules follows a consistent layout pattern as shown in Figure 4-2.

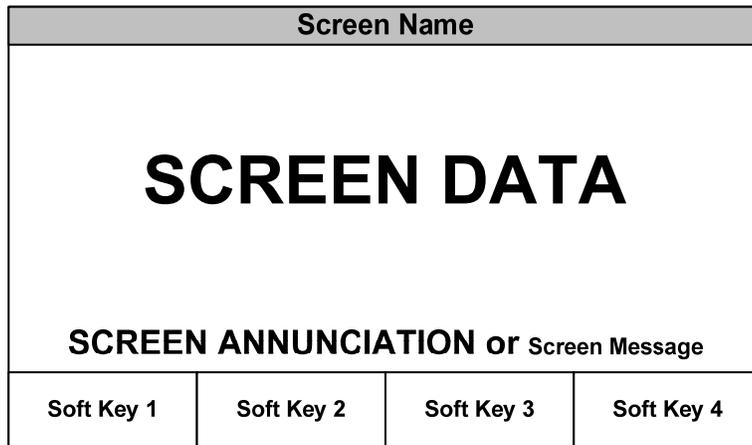


Figure 4-2. ProTech-GII Screen

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 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

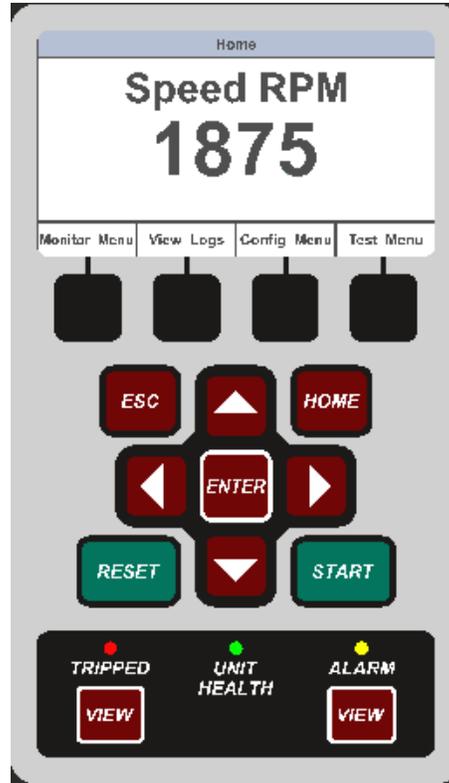


Figure 4-3. ProTech-GII Faceplate

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

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, each module displays its “Home” page. Depending on the module’s configuration, this Home Screen can be set to display any of the module’s screens. As shipped from the factory, the “Home” screen is defaulted to display the sensed speed screen and provides access via four soft keys to the other four main menus (Monitor, Log, Config, Test). Pressing the front panel’s “HOME” button displays the configured “Home” screen. Repeatedly pressing the front panel’s “ESC” button navigates up through the menu hierarchy until the “Home” screen is displayed.

Home Screen Page (with an Alarm condition indicated)

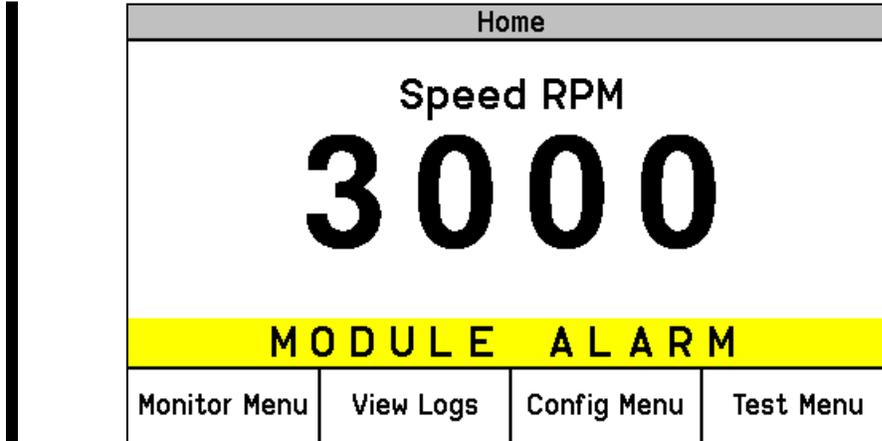


Figure 4-4. Home screen (with Alarm)

Home Screen Page (with a Trip condition indicated)

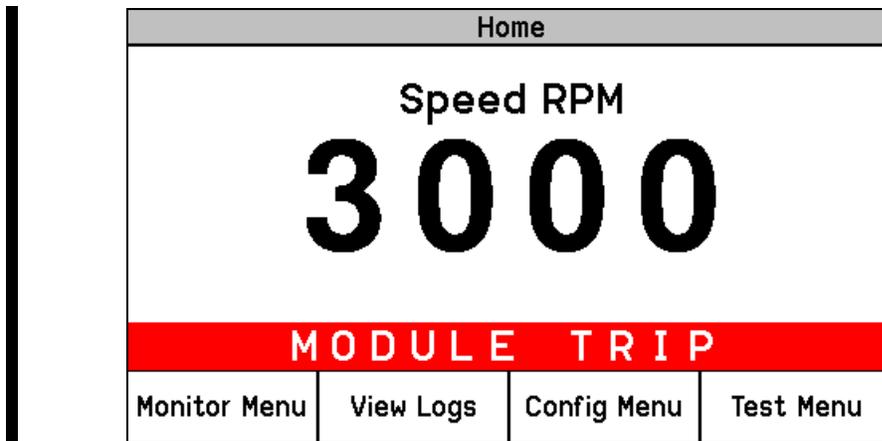


Figure 4-5. Home screen (with Trip)

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.
- Upload 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.

Password Entry Screen

Password Entry			
Enter Password			
U <u>S</u> <u>E</u> <u>T</u> <u>P</u> <u>S</u>			
Press ENTER to submit or ESC to cancel			
Range ABCDEFGHIJKLMNOPQRSTUVWXYZ			
Aa 0-9 @	Value Down	Value Up	Cursor Right

Figure 4-6. Password Entry Screen

When prompted for a password, the above screen 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.).
 - Use the “Aa 0-9 @” soft key to select upper case letters, lower case letters, numbers, or a list of usable special characters.
 - Use the “Value Down” or “Value Up” soft keys to change the highlighted value.
 - Use the “Cursor Right” 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.

Default Test Level Password: AAAAAA (as shipped from factory)
Default Config Level Password: AAAAAA (as shipped from factory)

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:

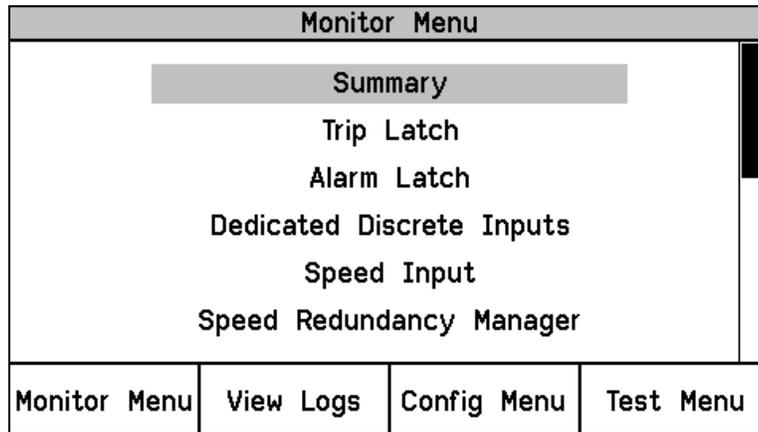


Figure 4-7. Monitor Menu

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 monitor screens are available from the Monitor Menu:

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

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

Monitor Summary Page

Monitor Summary			
Speed	3000	RPM	
Acceleration	0	RPM/s	
Overspeed Trip Setpoint	4000	RPM	
Speed Fail Override Status	FALSE		
Analog Output	5.5	mA	
Date	2014 Aug 29		
Time	11:21:41		
Page 1 of 1			
Monitor Menu	View Logs	Config Menu	Test Menu

Figure 4-8. Monitor Summary (Page 1)

This page displays the module's sensed speed, sensed acceleration, and current state information. The following information is displayed:

- **Speed:** Displays the local module's sensed speed input in RPM.
- **Acceleration:** Displays module's sensed speed input acceleration in rpm/second.
- **Overspeed Trip Setpoint:** Displays configured Overspeed Trip Setpoint in rpm.
- **Speed Fail Override Status:** Displays state of the speed fail override logic.
- **Analog Output:** Displays current value of Analog Output in mA.
- **Date:** Displays current date.
- **Time:** Displays current time.

Monitor Trip Latch Page

Monitor Trip Latch			
TRIPPED			
Latch Input Name	Latched Input	First Out	
Internal Fault Trip	FALSE	FALSE	
Power Up Trip	FALSE	FALSE	
Configuration Trip	FALSE	FALSE	
Parameter Error	FALSE	FALSE	
Overspeed Trip	TRUE	TRUE	
Speed Open Wire Trip	FALSE	FALSE	
Monitor Menu	View Logs	Config Menu	Test Menu

Figure 4-9. Monitor Trip Latch

This page displays the status of each Trip Latch input and indicates which input was sensed first (first out condition). If the trip latch is configured as LATCHING, trip conditions are latched and require a reset command to clear the fault indication.

The following trip functions are always enabled / active:

- **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.
- **Configuration Trip:** Indicates new configuration settings were loaded into the module or a trip was issued from the front panel to enter configuration mode. Pressing the Reset button will clear the error.
- **Parameter Error:** Indicates a parameter error was detected, meaning there was a problem reading the configuration. 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.

The following trip functions are only active when configured for use:

- **Overspeed Trip:** Indicates an overspeed trip. Only provided if speed redundancy is used or the speed probe is configured for use.
- **Overaccel Trip:** Indicates an over-acceleration trip.
- **Power Up Trip:** Indicates a power-up condition was detected. Only provided if the trip latch is configured as de-energize to trip.
- **Speed Redundancy Manager Trip:** Indicates the Speed Redundancy Manager caused a trip.
- **Speed Probe Open Wire:** Indicates a broken wire or faulty speed probe has been detected. Only provided when configured for passive probe type and Speed Redundancy Manager is not configured. If the Speed Redundancy Manager is configured, the Open Wire detection will be indicated as a Speed Probe Open Wire Alarm instead of a Speed Probe Open Wire Trip.
- **Speed Lost Trip:** Indicates a sudden speed loss event. Only provided if the module's Speed Input is configured for use. A Sudden Speed Loss event is detected when 0 Hz is sensed and during the previous 4 millisecond scan a frequency above 200 Hz was sensed.
- **Speed Fail Trip:** Indicates speed was detected below the fail threshold. Only provided when the Speed Redundancy Manager is configured or the speed input is used.
- **Speed Fail Timeout:** Indicates lack of speed detected during a start condition. Only provided when the Speed Redundancy Manager is configured or the speed input is used.
- **Resettable Trip Input:** Indicates a trip from the Resettable Trip function.

Monitor Alarm Latch Page

Monitor Alarm Latch			
ALARMS PRESENT			
Latch Input Name		Latched Input	
Internal Fault Alarm		FALSE	
Power Supply 1 Fault		FALSE	
Power Supply 2 Fault		TRUE	
Tmp Ovrspd Setpoint On		FALSE	
Manual Sim. Speed Test		FALSE	
Auto Sim. Speed Test		FALSE	
Monitor Menu	View Logs	Config Menu	Test Menu

Figure 4-10. Monitor Alarm Latch

This page displays the status of each Alarm Latch input. All alarm conditions are latched and require a reset command to clear the fault indication. The following alarms are always active and displayed if sensed:

- **Internal Fault Alarm:** Indicates a failure internal to the ProTech-GII module. Additional details on the fault cause are provided in the PCT's Module Faults Log.
- **Tmp Overspeed Setpoint On:** Indicates that the Temp Overspeed Setpoint Test routine is enabled/active.
- **Manual Sim. Speed Test:** This alarm indicates that the Manual Simulated Speed Test routine is enabled/active
- **Auto Sim. Speed Test:** Indicates that the Auto Simulated Speed Test routine is enabled/active.
- **Auto Sim. Speed Failed:** Indicates that the module's Auto Simulated Speed Test routine failed. This alarm will occur if module's input speed channel or internal frequency generator have failed.
- **Auto Sequence Test:** Indicates that the Auto Sequence Test routine is enabled/active.

The following alarms are displayed when configured:

- **Configuration Mismatch:** Indicates that the local module's configuration settings file does not match one of the other two module's configuration settings file.
- **Speed Lost Alarm:** Indicates that a sudden loss of speed was sensed and is typically used to indicate a failed active MPU speed sensor.
- **Speed Fail Alarm:** Indicates that speed is detected below the fail threshold. Only provided when the speed input is used.
- **Power Supply 1 Fault:** Indicates that the output voltage of Power Supply 1 is out of range.
- **Power Supply 2 Fault:** Indicates that the output voltage of Power Supply 2 is out of range.
- **Speed Probe Open Wire:** Indicates a broken wire or faulty speed probe has been detected. Only provided when configured for passive probe type and Speed Redundancy Manager is configured. If the Speed Redundancy Manager is not configured, the Open Wire detection will be indicated as a Speed Probe Open Wire Trip instead of a Speed Probe Open Wire Alarm.

- **Speed Redundancy Manager Input Difference:** Indicates the speed on any two inputs to the Speed redundancy Manager is greater than the configured threshold. Only provided when the Speed Redundancy Manager is configured.
- **Speed Redundancy Manager Input 1 Invalid:** Indicates speed signal #1 is invalid. A speed signal can be invalid for the following reasons—failed probe/wire, failed input channel, failed module-to-module network, failed module. Only provided when the module's Speed Redundancy Manager function block is configured for use.
- **Speed Redundancy Manager Input 2 Invalid:** Indicates speed signal #2 is invalid. A speed signal can be invalid for the following reasons—failed probe/wire, failed input channel, failed module-to-module network, failed module. Only provided when the module's Speed Redundancy Manager function block is configured for use.
- **Speed Redundancy Manager Input 3 Invalid:** Indicates speed signal #3 is invalid. A speed signal can be invalid for the following reasons—failed probe/wire, failed input channel, failed module-to-module network, failed module. Only provided when the module's Speed Redundancy Manager function block is configured for use.
- **Module Trip:** Indicates that the module's Trip Latch is in its "Tripped" state.

Monitor Dedicated Discrete Inputs Page

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 4-11. Monitor Dedicated Discrete Inputs

This page provides information for users to test and monitor the module's Start, Reset and Speed Fail Override discrete inputs.

- **Start Input:** Displays a TRUE value if the Front Panel START key is pressed or the START discrete input is active (closed contact input).
- **Reset Input:** Displays a TRUE value if the START discrete input is active (closed contact input).
- **Speed Fail Override Input:** Displays a TRUE value if the Speed Fail Override discrete input is active (closed contact input).

Monitor Speed Input Page

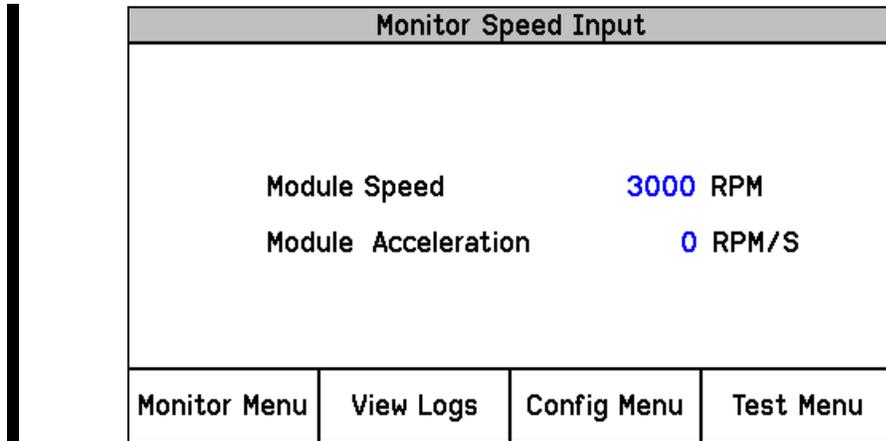


Figure 4-12. Monitor Speed Input

This page provides users information on the module’s sensed speed and calculated acceleration values.

- **Speed:** This gauge displays the sensed/calculated speed being sensed by the module’s input speed channel.
- **Acceleration:** This gauge displays the calculated acceleration.

Monitor Speed Redundancy Manager Page

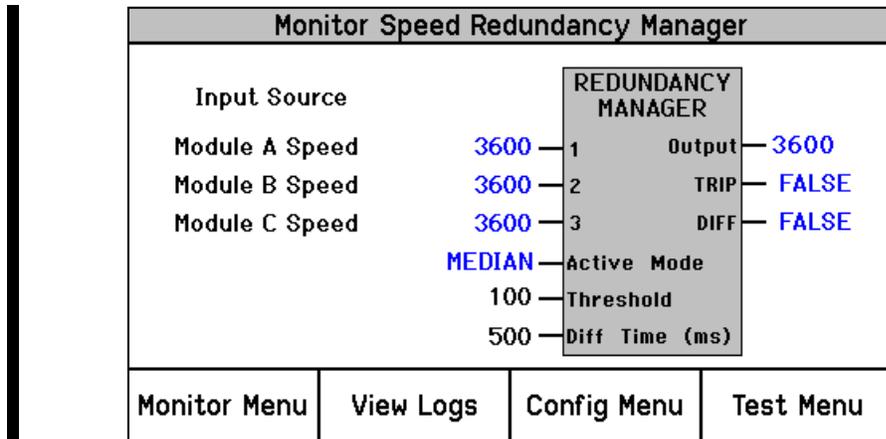


Figure 4-13. Speed Redundancy Manager

This page provides users with a screen from which to monitor the module’s Speed Redundancy Manager functional logic’s inputs, outputs, and current logic state. This screen is useful for validating system health and related logic operation.

- **Input Source:** Indicates the current speed value and where the value comes from. If the source is invalid, the word “INVALID” will appear in RED instead of the speed value.
- **Active Mode:** Indicates the redundancy mode(MEDIAN, HSS or LSS) used to set the output.
- **Diff Threshold:** The threshold for the “Diff Det” output.

- **Diff Time [ms]:** The time a difference must exist before setting “Diff Det” output to TRUE.
- **Output:** Result of a Median, HSS or LSS calculation on the inputs.
- **Trip:** TRUE if all of the used inputs have failed or if “Two Inputs Failed Action” is set to TRIP and two of the three used inputs have failed.
- **Diff Det:** TRUE if any two inputs are greater than Diff Threshold for Diff Time.

Monitor Acceleration Redundancy Manager Page

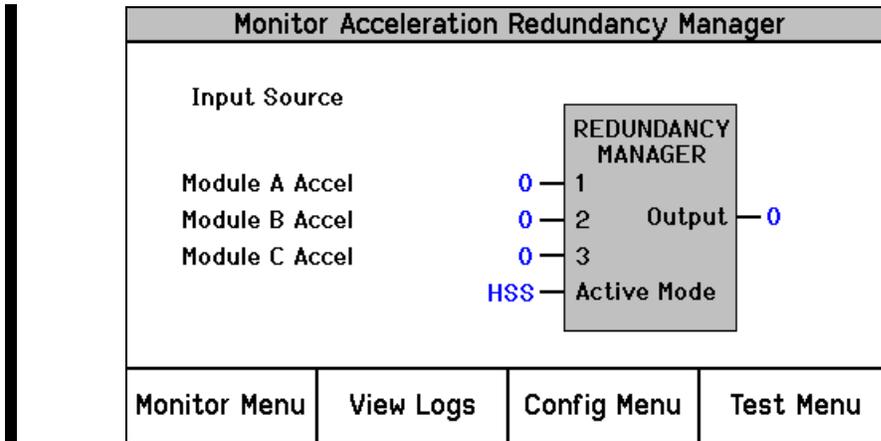


Figure 4-14. Acceleration Redundancy Manager

This page provides users with a screen from which to monitor the Acceleration Redundancy Manager functional logic’s inputs, outputs, and current logic state. This screen is useful for validating system health and related logic operation.

- **Input Source:** Indicates the current speed value and where the value comes from. If the source is invalid, displays INVALID.
- **Active Mode:** Indicates the redundancy mode(MEDIAN, HSS or LSS) used to set the output.
- **Output:** Result of a Median, HSS or LSS calculation on the inputs.

Monitor Speed Fail Timer Page

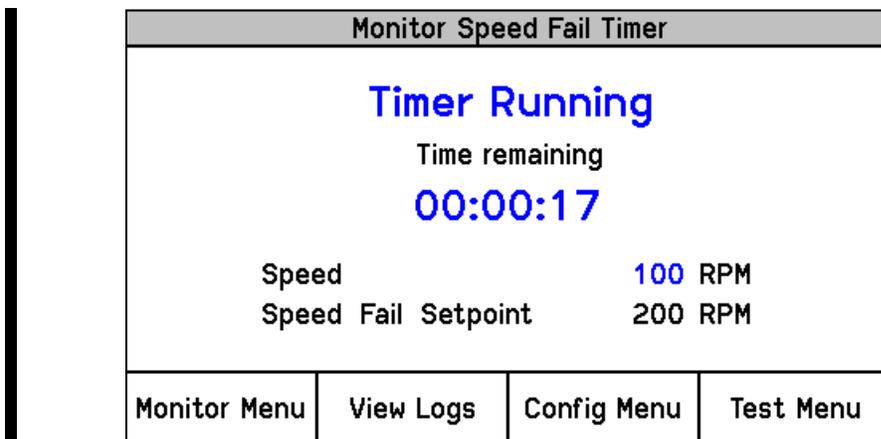


Figure 4-15. Monitor Speed Fail Timer

This page provides users information on the Speed Fail Timer function.

- **Timer Inactive:** This message indicates that the Speed Fail Timer function is not used or not started.
- **Timer Running:** This message indicates that the Speed Fail Timer is started and running. A “Time remaining gauge” is used to display the Speed Fail Timer value. The Speed Fail Timer function starts when the front panel START key is pressed or the module’s Start discrete input first senses a closed contact state.
- **Timer Expired:** This message indicates that the Speed Fail Timer has reached its zero time point.

Note—The Speed Fail Timer function is reset by any reset command (front panel, discrete input or Modbus). If the Speed Fail Timer function is active, the Home screen will display the time remaining.

Speed Readout

This sub-menu item jumps to the “Home” page. This is useful when the home screen is configured to some page other than “Home”.

Monitor Analog Output Page

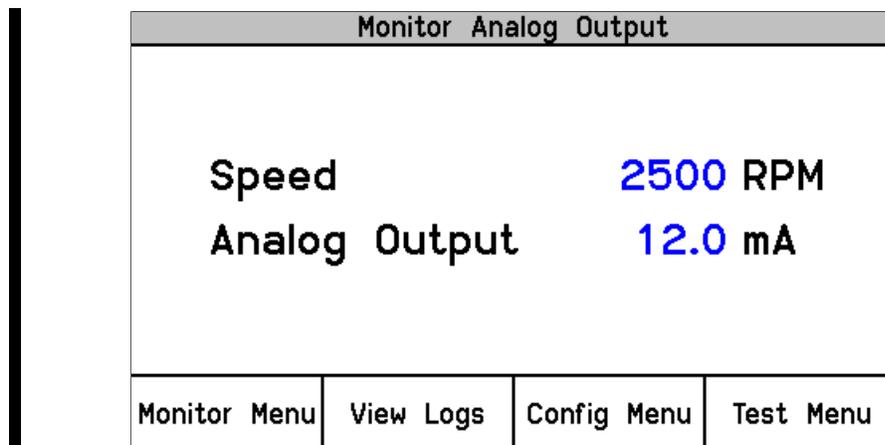


Figure 4-16. Monitor Analog Output

This page provides users information on the Analog Output function.

- **Speed:** This gauge displays the sensed/calculated speed being sensed by the module’s input speed channel.
- **Analog Output:** This gauge displays the current level being output from the module’s analog output channel.

Monitor Modbus Page

Monitor Modbus			
<p>Modbus Link Status</p> <p>LINK ERROR</p>			
Monitor Menu	View Logs	Config Menu	Test Menu

Figure 4-17. Monitor Modbus Status

This page provides users information on the status of the Modbus communications port.

- **Link OK:** This message indicates that Modbus requests are being received.
- **Link Error:** This message indicates that a Modbus request has not been received for 5 seconds.

Monitor/Set Date & Time Page

Monitor/Set Date & Time			
<p>Date 2014 Aug 28</p> <p>Time 07:08:24</p> <p>Press ENTER to set time</p>			
Monitor Menu	View Logs	Config Menu	Test Menu

Figure 4-18. Monitor Date & Time

The page provides users the module's current date and time information and allows access for the setting of the modules time and date parameters. The module's time setting must be re-set for all local time changes (i.e. daylight savings time).

Time & Date Change Procedure

Monitor/Set Date & Time			
Date 2014 Aug 28 Time 07:10:07			
Press ENTER to edit item			
Monitor Menu	View Logs	Config Menu	Test Menu

Figure 4-19. Set Date & Time

1. From the Monitor/Set Date & time page press the "ENTER" key to edit/change the time or date settings. The field to be edited will then be highlighted.
2. Press the UP/DOWN/RIGHT/LEFT arrow keys to highlight the field to be edited.

Monitor/Set Date & Time			
Date 2014 Aug 28 Time 07:11:23			
Range 00:00:00 to 23:59:59			
Cursor Left	Value Down	Value Up	Cursor Right

Figure 4-20. Set Date & Time

3. Press the ENTER key to select the highlighted item to be edited and use the soft keys as indicated to adjust the value to the desired value.
4. Press the ENTER key to save the change or the ESC key to return the value to its original value.
5. Select and edit/change the other fields as required.

Monitor/Set Date & Time			
Date 2014 Aug 28			
Time 07:11:23			
Press ENTER to edit item			
	Set Time	Cancel	

Figure 4-21. Set Date & Time

- Press the “Set Time” soft key to accept all date and time changes or press the “Cancel” soft key or the ESC key to reject all date and time changes.

Monitor System Status Page

Monitor System Status			
MODULE A Unit Health OK			
MODULE B Unit Health OK			
MODULE C Unit Health OK			
Monitor Menu	View Logs	Config Menu	Test Menu

Figure 4-22. Monitor System Status

This page provides users the health status of all modules.

- **Unit Health Unknown:** This message indicates the status of the module is unknown due to one of the following reasons:
 - A module not properly installed
 - A module to module network communication failure
 - A front panel communication failure.
- **Unit Health OK:** This message indicates the module is operating properly.
- **Unit Health Bad:** This message indicates an internal module alarm is present due to one of the following reasons and should be repaired or replaced:
 - Module processor failure
 - Module memory failure
 - Module data bus failure

Module Information Page

Monitor Module Information			
Product ID	ProTech GII		
Module S/N	N/A		
Software P/N	5418-7000 rev NEW		
Monitor Menu	View Logs	Config Menu	Test Menu

Figure 4-23. Monitor Module Information

This page displays the module's coded identification.

- **Product ID:** This gauge displays the module's hardware model.
- **Module S/N:** This gauge displays the module's hardware serial number.
- **Software P/N:** This gauge displays the module's software part number and revision.

View Logs

From the "View Logs" screens, users 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" soft key is pressed the following Logs Menu screen is displayed:

Logs Menu			
<div style="background-color: #cccccc; padding: 2px; display: inline-block; margin-bottom: 5px;">Overspeed/Acceleration Log</div> Trip Log Alarm Log Peak Speed/Acceleration Log Reset Logs			
Monitor Menu	View Logs	Config Menu	Test Menu

Figure 4-24. Logs Menu

From the screen press the “Up Arrow” and “Down Arrow” keys to highlight the desired Log screen to view. Pressing the “ENTER” key will then display the highlighted Log screen. The following log screens 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 Page

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 4-25. Overspeed/Over-acceleration Log

This page displays a log of all sensed and recorded overspeed or over-acceleration events and the associated information:

- Sensed speed and acceleration at the point of the event.
- Event date and time.
- Sensed maximum speed and acceleration reached after the trip.
- Indication if the module was in a test mode during the time the event was sensed and logged. The word “TEST” will appear next to the time in **RED** if the module was in test mode at the time of the logged event.

Trip Log Page

Trip Log			
Event ID	Time Stamp	FO	Test
Speed Open Wire Trip	2013-10-09 11:02:22		
Speed Lost Trip	2013-10-09 11:02:20		
Overspeed Trip	2013-10-09 11:02:15	*	
Power Up Trip	2013-10-09 10:58:48		*
Page 1 Of 1			
Monitor Menu	View Logs	Config Menu	Test Menu

Figure 4-26. Trip Log

This page displays a log of all sensed and recorded trip events and the associated time and date stamp information.

First out indication and test information are indicated by a “●” symbol next to the recorded event in the respective column. A “●” symbol in the first-out (FO) column indicates the first event to cause the module to step to its tripped state. A “●” symbol in the Test column indicates that the event occurred while the module was in a test mode.

Alarm Log Page

Alarm Log			
Event ID	Time Stamp	Test	
Trip Time Mon 1	2013-10-09 11:08:11		
Speed Lost Alarm	2013-10-09 11:08:08		
Power Supply 2 Fault	2013-10-09 11:08:02		
Page 1 Of 1			
Monitor Menu	View Logs	Config Menu	Test Menu

Figure 4-27. Alarm Log

This page displays a log of all sensed and recorded Alarm events and the associated time and date stamp information.

A “●” symbol in the Test column indicates that the alarm event occurred while the module was in a test mode.

Peak Speed/Acceleration Log Page

Peak Speed/Acceleration Log			
Peak Speed	3600 RPM		
Time Peak Speed Occurred	2014 Aug28 11:02:27		
Peak Acceleration	0 RPM/s		
Time Peak Accel Occurred	2014 Aug28 11:02:28		
Monitor Menu	View Logs	Config Menu	Test Menu

Figure 4-28. Peak Speed/Accel Log

This page displays a log of the peak sensed and recorded overspeed or over-acceleration levels sensed since the log was last reset and the associated time and date information.

Reset Logs Page

Reset Logs Menu			
<div style="background-color: #cccccc; padding: 5px; margin: 0 auto; width: 80%;">All Logs</div> Peak Speed/Acceleration			
Monitor Menu	View Logs	Config Menu	Test Menu

Figure 4-29. Reset Logs

This page allows the user to reset All Logs (Trip, Alarm, and Overspeed / Over-acceleration logs), or just the Peak Speed/Acceleration log

Reset Log Procedure

1. Use the Up and Down arrows to select the "All Logs" or "Peak Speed/Acceleration" Reset function then press the ENTER key.
2. At the Prompt to "Reset Logs?" or "Reset Peak Speed/Acceleration", press the Reset soft key to reset the respective logs or the Cancel soft key to exit this screen.
3. If the Reset soft key was pressed, 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 the Enter soft key to reset the log.

Chapter 5.

Configuration of the ProTech-GII via Front Panel

Introduction

Users can configure the ProTech-GII using the following methods:

1. Configure each module separately from its front panel keypad.
2. Configure one module from its front panel keypad and copy the saved configuration file to the other two modules.
3. Use the provided Programming and Configuration Tool software program installed on a computer to create a configuration settings file then connect to one or all of the modules and upload the configuration settings file to one module or all of the modules. Alternatively if the configuration settings file is uploaded to only one module, the module-to-module "COPY" function can be used to copy the file to the other two modules.
4. For safety purposes a module must be in its "tripped" state to allow any configuration settings to be changed or uploaded.

IMPORTANT

Changing the configuration settings in the ProTech-GII is permissible only in a trip condition. If the unit is not in a trip condition, configuration changes are inhibited. If no trip condition is present, the configuration save will ask if a trip is desired. A trip will only be allowed if the other modules are not tripped.

Editing Configuration Settings from the Front Panel

Once a valid password has been entered and the parameter setting is highlighted it can then be edited. If the parameter setting is a multi-digit value, a cursor indicates which digit or character is being edited. The front panel's soft keys are used to change the respective 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). After the correct parameter value has been edited pressing the ENTER key selects/accepts the edited parameter setting. Pressing the ESC key restores the value being edited back to its last entered value.

When a parameter setting that can be edited is highlighted, the Screen Message "Press ENTER to Edit value" appears. If the module is not Tripped and the ENTER key is pressed, the Screen Message "**Module must be in TRIPPED state to enter Configuration Mode. TRIP MODULE?**" appears and gives the user the option to TRIP or Cancel this request. If one of the other modules is already in a TRIPPED state then the unit will not accept the TRIP request, and a message of "Other modules must be running and not tripped" message will appear for a period of 5 seconds. If the module is in its Tripped state and the ENTER key is pressed, the Password Entry screen appears. When the correct Config Level Password is entered, the fields can be edited with the soft key selections.

Once a password has been successfully entered, it will remain in effect until the user exits the Configuration mode.

If an attempt is made to adjust a parameter setting outside of its permitted range, the value is changed to its closest valid value and the message “**LIMIT REACHED**” appears for 5 seconds.

Configure Menu Page

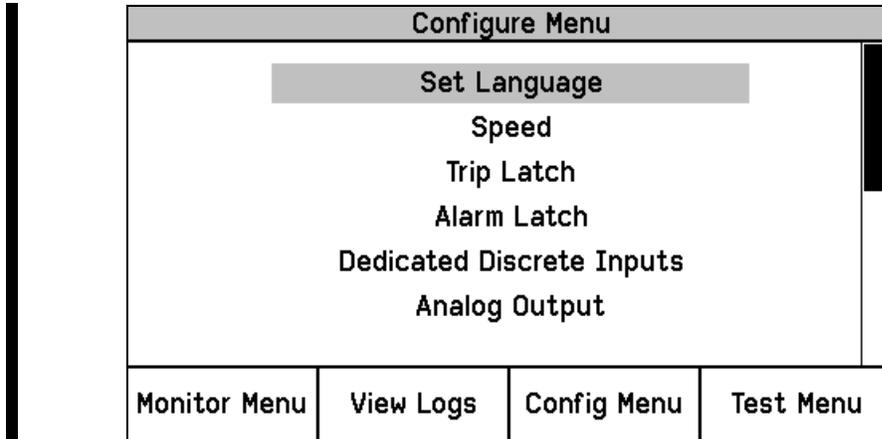


Figure 5-1. Configure Menu

Users can use the up or down scroll buttons to highlight the desired page then press the ENTER key to step to the selected page.

Configure Menu Page Descriptions

- **Set Language:** This page is used to select the language.
- **Speed:** This page is used to configure the module's Speed, Acceleration, Start Logic, Speed Redundancy, and Acceleration Redundancy settings.
- **Trip Latch:** This page is used to configure the module's Trip Latch function.
- **Alarm Latch:** This page is used to configure the module's Alarm Latch function.
- **Dedicated Discrete Inputs:** This page is used to configure the Reset, Start, and Speed Fail Override input sharing.
- **Analog Output:** This page is used to configure the module's Analog Output function.
- **Test Modes:** This page is used to configure the module's Test Routines.
- **Auto-Sequence Test:** This page is used to configure the Auto-Sequence Test Routine. This routine can only be configured from module A.
- **Configure Modbus:** This page is used to configure the module's Modbus communications.
- **Power Supply Alarms:** This page is used to configure the module's power supply alarm logic.
- **Display:** This page is used to configure the modules screen action when a trip occurs and what page is the Home Page.
- **Configuration Management Menu:** This page is used to configure the module's Module-to-Module configuration settings, file comparison function, and to access the module's CONFIGURATION COPY function.
- **Password Change Menu:** Used to configure the module's passwords.

Configuration Procedure

1. Module must be in its “tripped” state to make any configuration changes.
2. Select the “Config Menu” soft button.
3. Use the Up / Down function keys to select the desired category and press the ENTER key to select.
4. Use the Up / Down function keys to scroll to desired parameter setting then press the ENTER key to select.
5. If the module is not in the “Configuration” mode, the password entry screen will appear. Enter the configuration level password then press the ENTER key. See the password section of this manual for information on entering a password.
6. The screen is now in edit mode. Using the soft keys, edit the desired value:
 - a. Use the "Cursor Left" key to move to the left.
 - b. Use the "Value Down" or "Value Up" keys to change the highlighted value.
 - c. Use the "Cursor Right" key to move to the right.
 - d. Use "Select Left" or "Select Right" to select a different option.
7. Use the front panel's UP/Down Keys and ESC / ENTER keys to navigate within all Config Menu pages to configure desired parameter settings.
8. After all desired parameters have been configured; press the HOME key to exit Configure Mode.
9. If any parameters were changed, the module will display a “Save Configuration” screen (refer to below figure). At this point the user can press the respective soft button to choose the desired action:
 - a. Save—This action saves any configuration changes, exits the configuration mode, then displays the Home screen.
 - b. Discard—This action does not save any configuration changes, exits the Configuration mode, then displays the Home screen.
 - c. Cancel—This action does not save any configuration changes, does not exit the Configuration mode, and displays the last viewed configuration screen.

NOTICE

Before putting the ProTech-GII into operation, if the system had been designed such that all modules are required to have the exact same configuration it is recommended that the Configuration Compare routine be used to verify and confirm this is true.

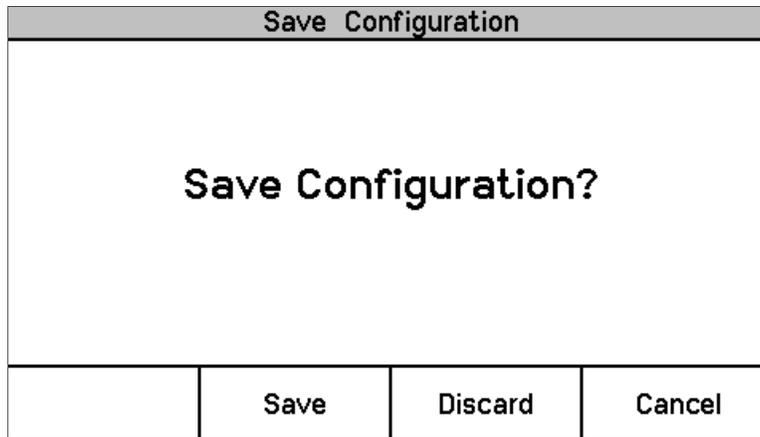


Figure 5-2. Save Configuration

Configure Language Page

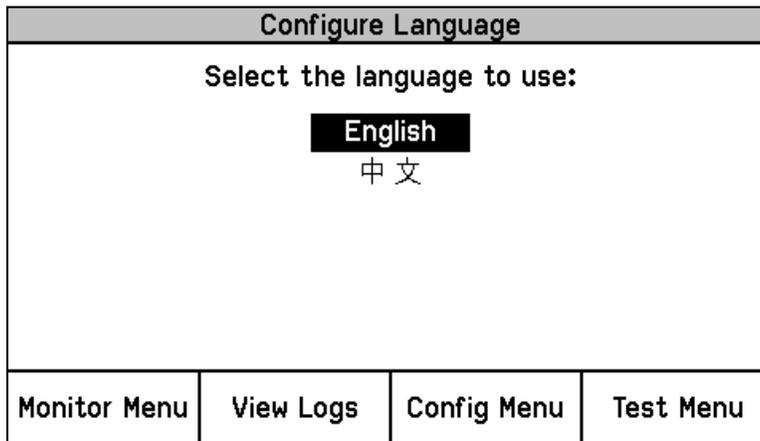


Figure 5-3. Configure Language

This page is used to configure the language used by the ProTech GII.

- **Select the Language to use:** Used to select the language. Language can only be configured from the front panel and cannot be configured from the Programming and Configuration Tool. The selected language is retained through a power cycle. Valid values: English or Chinese.

Configure Speed Submenu Page

Configure Speed Submenu			
<div style="background-color: #cccccc; padding: 2px; display: inline-block; margin-bottom: 5px;">Speed Input</div> Acceleration Start Logic Speed Redundancy Acceleration Redundancy			
Monitor Menu	View Logs	Config Menu	Test Menu

Figure 5-4. Configure Speed Submenu

- **Speed Input:** This page is used to configure the module's speed input and Overspeed Trip function settings.
- **Acceleration:** This page is used to enable and configure the module's over-acceleration trip function.
- **Start Logic:** This page is used to enable and configure the speed fail logic and speed fail override logic.
- **Speed Redundancy:** This page is used to configure the speed redundancy.
- **Acceleration Redundancy:** This page is used to configure the acceleration redundancy.

Configure Speed Input Page

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 5-5. Configure Speed Input

This page is used to configure the Speed Input and Trip function.

- **Probe Type:** Used to select type of speed probe used. Valid values: NOT USED, PASSIVE, or ACTIVE.
- **Nr of Gear Teeth:** Used to set the number of teeth on the gear that the speed sensor is mounted. Valid values: 1-320.
- **Gear Ratio:** Used to set the ratio of the sensed-to-actual speed (sensor wheel/shaft speed). Valid values: 0.1-10.
- **Overspeed Trip:** Used to set the overspeed trip setpoint. Valid values: 0-32000 rpm. Frequency equivalent must not exceed 32000 Hz (configuration error).
- **Sudden Speed Loss:** Used to set the desired action when a sudden speed loss is detected. Valid values: TRIP or ALARM. If this function detects a frequency of 0 Hz and the previous sensed/sampled frequency level was over 200 Hz, then an alarm or trip command is given. This function is typically used to detect a failed speed sensor.

Configure Acceleration Page

Configure Acceleration			
Acceleration Trip Enabled		YES	
Accel. Trip Enable Speed		250 RPM	
Acceleration Trip		5 RPM/S	
Press ENTER to edit value			
Monitor Menu	View Logs	Config Menu	Test Menu

Figure 5-6. Configure Acceleration

This page is used to configure the Acceleration Trip function.

- **Enable Acceleration Trip:** Used to set to yes to enable Acceleration Trip function. Valid values: YES or NO.
- **Acceleration Trip Enable Speed:** Used to set the sensed speed level which the over-acceleration trip function is enabled / activated. Below this speed level the acceleration trip function is disabled. Valid values: 0-32000 rpm.
- **Acceleration Trip:** Used to set the over-acceleration trip setpoint in rpm/second. Valid values: 0-25000 rpm/s.

Configure Start Logic Page

Configure Start Logic			
Speed Fail Setpoint		100	RPM
Speed Fail Trip		NOT USED	
Speed Fail Alarm		NOT USED	
Speed Fail Timeout Trip		USED	
Speed Fail Timeout Time		00:00:30	hh:mm:ss
Press ENTER to edit value			
Monitor Menu	View Logs	Config Menu	Test Menu

Figure 5-7. Configure Start Logic

This page is used to configure the Start Logic function.

- **Speed Fail Setpoint:** Used to set the speed setpoint below which the speed signal is considered failed. Valid values: 0-25000 rpm. This setpoint is used to detect a failed speed sensor.
- **Speed Fail Trip:** Used to enable the Speed Fail Trip function. When configured for “USED” action, a speed failed trip command will be given to the module’s Trip Latch function when speed is below the Speed Fail Setpoint and the Speed Fail Override discrete input is not closed. Valid values: NOT USED or USED. Typically used to detect a failed speed sensor.
- **Speed Fail Alarm:** Used to enable the Speed Fail Alarm function. When configured for “USED” action, a speed failed trip command will be given to the module’s Alarm Latch function when speed is below the Speed Fail Setpoint and the Speed Fail Override discrete input is not closed. Valid values: NOT USED or USED. Typically used to detect a failed speed sensor.
- **Speed Fail Timeout Trip:** Used to enable the Speed Fail Timeout Trip function. When configured for “USED” action, this function issues a trip command to the module’s Trip Latch function when speed is below Speed Fail Setpoint and the Speed Fail Timeout Time expires. Valid values: NOT USED or USED.
- **Speed Fail Timeout Time:** Used to set the period of time between when a “Start” command has been issued and a Speed Fail Timeout Trip command is given to the Trip Latch function. Valid values: 1-28800 seconds.

Configure Speed Redundancy Manager Page

Configure Speed Redundancy			
Input 1	MODULE A		
Input 2	MODULE B		
Input 3	MODULE C		
Base Function	MEDIAN		
Fallback Function	HSS		
Two Input Fail Action?	TRIP		
Diff Alarm Limit	100 RPM		
Diff Alarm Time	500 ms		
Press ENTER to edit value			
Monitor Menu	View Logs	Config Menu	Test Menu

Figure 5-8. Configure Speed Redundancy Manager

This page is used to configure the Speed Redundancy Manager.

- **Input 1-3:** Used to specify the source of the speed signal. Valid values: MODULE A, MODULE B, MODULE C or NOT USED.
- **Base Redundancy Mode:** Used to select the criteria for redundancy. Valid values: MEDIAN, LSS (Low Signal Select), or HSS (High Signal Select).
- **Fallback Redundancy Mode:** Used to select the criteria for redundancy when only two of three speed signals are valid. Valid values: HSS or LSS.
- **Two Inputs Failed Action:** Used to select the action when two speed signals have failed. Valid values: TRIP or NO TRIP.
- **Difference Alarm Threshold:** Used to set the amount the speeds are allowed to differ before the Difference Alarm is set. Valid values: 0–32000 rpm.
- **Difference Alarm Time:** Used to set the time the Speed Difference Alarm is allowed to exist before the difference alarm is set. Valid values: 4–10000 milliseconds.

Configure Acceleration Redundancy Manager Page

Configure Acceleration Redundancy			
Input 1	MODULE A		
Input 2	MODULE B		
Input 3	MODULE C		
Base Function	MEDIAN		
Fallback Function	HSS		
Press ENTER to edit value			
Monitor Menu	View Logs	Config Menu	Test Menu

Figure 5-9. Configure Acceleration Redundancy Manager

This page is used to configure the Acceleration Redundancy Manager.

- **Input 1-3:** Used to specify the source of the acceleration signal. Valid values: MODULE A, MODULE B, MODULE C or NOT USED.
- **Base Redundancy Mode:** Used to select the criteria for redundancy. Valid values: MEDIAN, LSS (Low Signal Select), or HSS (High Signal Select).
- **Fallback Redundancy Mode:** Used to select the criteria for redundancy when only two of three acceleration signals are valid. Valid values: HSS or LSS.

Configure Trip Latch Page

Configure Trip Latch			
Trip Configuration		DE-ENERGIZE TO TRIP	
Trip Latch Output		LATCHING	
Press ENTER to edit value			
Monitor Menu	View Logs	Config Menu	Test Menu

Figure 5-10. Configure Trip Latch

This page is used to configure the different actions of the Trip Latch function.

- **Trip Configuration:** This setting is used to change the action of the Trip Latch (ENERGIZE TO TRIP or DE-ENERGIZE TO TRIP).
- **Trip Latch Output:** This setting is used to configure how the trip latch output responds to a “Reset” command.
 - If configured for “LATCHING” action, the Trip Latch function will latch to a true state if any Trip Latch input signal goes true then back false. When configured for this action a “Reset” command must be given to reset (un-latch) the Trip Latch function’s output.
 - If configured for “NON-LATCHING” action, the Trip Latch function will not latch to a true state if any Trip Latch input signal goes true then back false. When configured for this action if all input signals to the Trip Latch function are false the latch output signal will be false. A Reset command is not required to change the Trip Latch’s output signal to its false state.

Configure Alarm Latch Page

Configure Alarm Latch			
Trip Is Alarm YES			
Press ENTER to edit value			
Monitor Menu	View Logs	Config Menu	Test Menu

Figure 5-11. Configure Alarm Latch

This page is used to configure the Alarm Latch function.

- **Trip is Alarm:** This setting is used to include the module's trip state into the module's Alarm Latch logic. This capability allows any module trip to be indicated as a module Alarm condition also.

Configure Dedicated Discrete Submenu Page

Configure Dedicated Discrete Submenu			
Start Input Sharing			
Reset Input Sharing			
Speed Fail Override Input Sharing			
Monitor Menu	View Logs	Config Menu	Test Menu

Figure 5-12. Configure Dedicated Discrete Submenu

- **Start Input Sharing:** This page is used to configure the start input sharing.
- **Reset Input Sharing:** This page is used to configure the reset input sharing.
- **Speed Fail Override Input Sharing:** This page is used to configure the speed fail override input sharing.

Configure Start Input Sharing Page

Configure Start Input Sharing			
Input 1		MODULE A	
Input 2		MODULE B	
Input 3		MODULE C	
Press ENTER to edit value			
Monitor Menu	View Logs	Config Menu	Test Menu

Figure 5-13. Configure Start Input Sharing

This page is used to configure what other modules can provide a Start signal.

- **Input 1-3:** Used to specify the source of the start signal. Valid values: MODULE A, MODULE B, MODULE C or NOT USED.

Configure Reset Input Sharing Page

Configure Reset Input Sharing			
Input 1		MODULE A	
Input 2		MODULE B	
Input 3		MODULE C	
Press ENTER to edit value			
Monitor Menu	View Logs	Config Menu	Test Menu

Figure 5-14. Configure Reset Input Sharing

This page is used to configure what other modules can provide a Reset signal.

- **Input 1-3:** Used to specify the source of the Reset signal. Valid values: MODULE A, MODULE B, MODULE C or NOT USED.

Configure Speed Fail Override Input Sharing Page

Configure Speed Fail Override Input Sharing			
Input 1		MODULE A	
Input 2		MODULE B	
Input 3		MODULE C	
Press ENTER to edit value			
Monitor Menu	View Logs	Config Menu	Test Menu

Figure 5-15. Configure Speed Fail Override Input Sharing

This page is used to configure what other modules can provide a Speed Fail Override signal.

- **Input 1-3:** Used to specify the source of the Speed Fail Override signal. Valid values: MODULE A, MODULE B, MODULE C or NOT USED.

Configure Analog Output Page

Configure Analog Output			
Speed @ 4mA		0 RPM	
Speed @ 20mA		5000 RPM	
Press ENTER to edit value			
Monitor Menu	View Logs	Config Menu	Test Menu

Figure 5-16. Configure Analog Output

This page is used to configure the module's analog output to the device (meter, DCS input, etc.) it is connected to.

- **Speed @ 4 mA:** This setting is used to configure the speed value which corresponds to the output's 4 mA current level. Valid values: 0-32000 RPM.
- **Speed @ 20 mA:** This setting is used to configure the speed value which corresponds to the output's 20 mA current level. Valid values: 0-32000 RPM.

Configure Test Modes Page

Configure Test Modes			
Temporary Overspeed Trip		3000	RPM
Temp. Overspeed Trip Timeout		00:01:00	hh:mm:ss
Simulated Speed Timeout		00:00:10	hh:mm:ss
Test Mode Permissive		NOT IN ALARM	
Press ENTER to edit value			
Monitor Menu	View Logs	Config Menu	Test Menu

Figure 5-17. Configure Test Modes

This page is used to configure the module's Temporary Test mode, Auto/Manual Test mode timeout, and Test Mode Permissive.

- **Temporary Overspeed Trip:** This setting is used to set the Temporary Overspeed Trip Setpoint level that the overspeed trip setpoint will be changed to while the Temporary Overspeed Trip Test is active. Valid values: 0-32000.
- **Temp. Overspeed Trip Timeout:** This setting is used to set how long the module will stay in this test mode, before aborting the test. Valid values: 0-1800 seconds.
- **Simulated Speed Timeout:** This setting is used to set how long the unit will stay in the Auto or Manual Simulated Speed Test, before aborting the test. Valid values: 0-30 minutes.
- **Test Mode Permissive:** This setting is used to prevent any of the module's overspeed test modes from being enabled when any module is in a tripped state, alarm state, or running a test. Valid choices are: "NONE" (i.e., No permissive), "NOT TRIPPED" (i.e., Module not tripped and not running a test), "NOT IN ALARM" (i.e., Module not tripped, not in alarm and not running a test).

Configure Auto-Sequence Test Page

Configure Auto-Sequence Test			
Periodic Test Timer Enabled		NO	
Periodic Test Timer Interval		7	days
Operator Can Disable Test		YES	
Press ENTER to edit value			
Monitor Menu	View Logs	Config Menu	Test Menu

Figure 5-18. Configure Auto-Sequence Test

This page is used to configure the Auto-Sequence Test mode. Note that module “A” is the first module tested in this function, next is module “B”, then finally module “C”.

- **Periodic Test Timer Enabled:** This setting is used to enable the Auto-Sequence Test function to be performed on a periodic basis. When set to “Yes” the Auto-Sequence Test routine will be performed periodically based on the Periodic Test Timer interval setting. When enabled, this timer starts at power-up. Valid values: YES or NO.
- **Periodic Test Timer Interval:** This setting is used to set the time interval/period between when an Auto-Sequence Test function is periodically performed. Valid values: 1–999 days.
- **Operator can disable test:** This setting is used to allow operators/users to temporarily disable the Auto-Sequence Test function from being performed. The test disable/enable command options are available from the front panel’s Auto-Sequence Test operation screen. When this setting is set to “No” then an operator/user cannot manually disable this test from being performed. Valid values: YES or NO.

NOTE—This test can only be configured on module A. Modules B and C automatically use module A’s settings.

Configure Modbus Page

Configure Modbus			
Mode	RS232		
Baud Rate	19200 bits/s		
Communication Parity	NO PARITY		
Slave Address	1		
Enable Write Commands	NO		
Press ENTER to edit value			
Monitor Menu	View Logs	Config Menu	Test Menu

Figure 5-19. Configure Modbus

This page is used to configure the module’s Modbus communications port.

- **Mode:** This setting is used to select the serial communication mode used by the module’s serial communications port. Valid values: RS-232 or RS-485.
- **Baud Rate:** This setting is used to set the serial data rate used by the module’s serial communications port. Valid values: 19200, 38400, 57600, or 115200 bits/second.
- **Communication Parity:** This setting is used to enable and set the parity value used by the module’s serial communications port. Valid values: NO PARITY, EVEN PARITY, or ODD PARITY.
- **Slave Address:** This setting is used to set the unique slave address used by the module’s serial communications port. If all three modules are connected to the same network, each will require a unique address. Valid values: 1-247.

- Enable Write Commands:** This setting is used to enable or disable Modbus “Write” commands to be written to the ProTech (e.g., Reset command, Initiate Auto Speed Test command). See Monitor and Control section in Modbus chapter for more information. When this setting is set to “NO”, the module’s serial Modbus communication port can only be used for monitoring values. Valid values: YES or NO.

Configure Power Supply Alarms Page

Configure Power Supply Alarms			
Enable Power Supply 1 Alarm		YES	
Enable Power Supply 2 Alarm		YES	
Press ENTER to edit value			
Monitor Menu	View Logs	Config Menu	Test Menu

Figure 5-20. Configure Power Supply Alarms

This page is used to enable or disable the respective power supply input failed alarms.

- Enable Power Supply 1 Alarm:** This setting is used to enable or disable the module’s Failed Power Supply 1 Alarm. Valid values: YES or NO.
- Enable Power Supply 2 Alarm:** This setting is used to enable or disable the modules Failed Power Supply 2 Alarm. Valid values: YES or NO.

For reliability purposes it is recommended that two power sources be connected to each module at all times. However, in the event that two power sources are not available, users can disable either alarm.

Configure Display Page

Configure Display			
Jump To Home Screen On Trip:		YES	
Select Which Home Screen to Use:		Home	
Press ENTER to edit value			
Monitor Menu	View Logs	Config Menu	Test Menu

Figure 5-21. Configure Power Supply Alarms

This page is used to configure the Home screen action.

- **Home Screen On Trip Option:** This setting is used to configure the action of the display upon sensing an alarm or trip condition. If configured “Yes” the module’s display will automatically display the configured “Home Screen” upon sensing a trip condition. If configured “NO” the module’s display will not change upon a sensed trip condition. During system troubleshooting it may be useful to temporarily set this setting to “NO” to allow other screens to be viewed during a trip event. Valid values: YES or NO.
- **Home Screen:** This setting is used to select the home screen. This is the screen the unit will display when a trip occurs, if the above action is configured YES, when the HOME key is pressed, or when powered up. Valid values:

- | | |
|---------------------------|------------------------------|
| Home | Modbus |
| Monitor Summary | Date & Time |
| Trip Latch, Alarm Latch | System Status |
| Dedicated Discrete Inputs | Module Information |
| Speed Input | Overspeed/Acceleration Log |
| Speed Redundancy Manager | Trip Log |
| Accel Redundancy Manager | Alarm Log |
| Speed Fail Timer | Peak Speed/Acceleration Log. |
| Analog Output | |

Configuration Management Menu Page

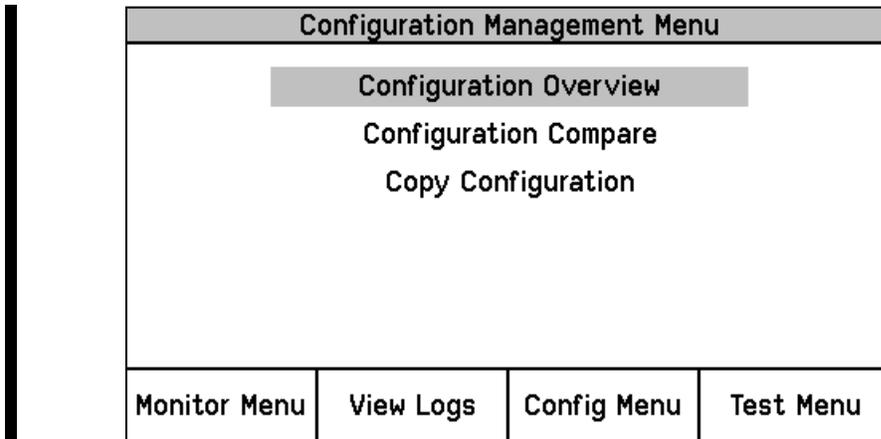


Figure 5-22. Configuration Management Menu

This page is used to select the Configuration Overview, Configuration Compare or the Copy Configuration pages.

- **Configuration Overview:** This page displays the saved setting file’s CRC checksum values.
- **Configuration Compare:** This page allows users to enable or disable the Module to Module Configuration compare alarm.
- **Copy Configuration:** This page allows users to verify if the module’s configuration settings file matches the other module’s configuration settings files and allows the user to copy the configuration to another module.

Configuration Overview Page

Configuration Overview			
CRC: 0xDD68		Updated: 2014 Aug27 14:43:03	
Parameter	Block	CRC	Value
Speed Sense		0xF89A	
Speed Redundancy Manager		0x1B20	
Accel Redundancy Manager		0x35F1	
Overacceleration Trip		0xE014	
Overspeed Trip		0xADE5	
Start Logic		0x355D	
Page 1 of 5			
Monitor Menu	View Logs	Config Menu	Test Menu

Figure 5-23. Configuration Overview

This page displays the 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.

The overall CRC value is shown in the upper left corner of the Configuration Overview page and can be different between modules as the Home Screen setting, Jump To Home Screen On Trip setting, and Modbus slave addresses are expected to be different between modules.

Comparing CRCs between modules before and after a software change can provide confirmation on where configurations are the same and to facilitate isolation of configuration changes.

Note that passwords are not included in the configuration and are therefore not compared or copied between modules.

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.

Configure Configuration Compare Page

Configuration Compare			
Configuration Compare		USED	
Press ENTER to edit value			
Monitor Menu	View Logs	Config Menu	Test Menu

Figure 5-24. Configuration Compare

This page is used to configure module's configuration compare function.

- Configuration Compare:** This setting is used to enable or disable the Module to Module Configuration compare alarm. When enabled/used this function compares the configuration of the current module against the other two modules and generates an alarm if there is a difference. Valid values: USED or NOT USED.

If each of the modules is deliberately configured differently to meet a specific application's requirements, then this setting should be set to NOT USED.

The Configuration Compare function only compares the individual (sub-component) CRCs between modules and will not alarm when the overall CRCs are different between modules. This is because the module's overall CRC calculation can be different between modules as the Home Screen setting, Jump To Home Screen On Trip setting, and Modbus slave addresses are expected to be different between modules.

Configuration Copy Page

Configuration Copy			
Configuration Compare Result			
Module B		NO MATCH	
Module C		MATCH	
	Copy To B	Copy To C	

Figure 5-25. Configuration Copy

This page allows users to verify if the module's configuration settings file matches the other module's configuration settings files and allows the user to copy the configuration to another module.

- **Copy to "X"**: Allows users to copy a module's configuration settings file to one of the other two ProTech-GII modules. This copy function copies all configuration file settings except the Home Screen setting, Jump To Home Screen On Trip setting, Password settings, and Modbus Slave Address settings.

If the Configuration Compare function is configured to "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.

The Configuration Copy screen will display the current configuration status of the other two modules. The possible status indications are as follows:

- MATCH**—Indicates that the target module already has the same configuration as the local module.
- NO MATCH**—Indicates that the target module does not have the same configuration as the local module.
- UNKNOWN**—Indicates that the target module's Configuration Compare function is not enable, or that the module is missing, powered off, or the module-to-module CAN communications network is not functioning. Verify that the target module is in its tripped state to accept the configuration. Note that the local module can be either in its tripped, or not-tripped state during this procedure.

Configuration Copy Procedure

1. Verify that the Configuration Compare function is enabled on both the local and target module(s). If the Configuration Compare function is configured to "NOT USED" on the local module, selecting Copy Configuration will bring up the following screen:

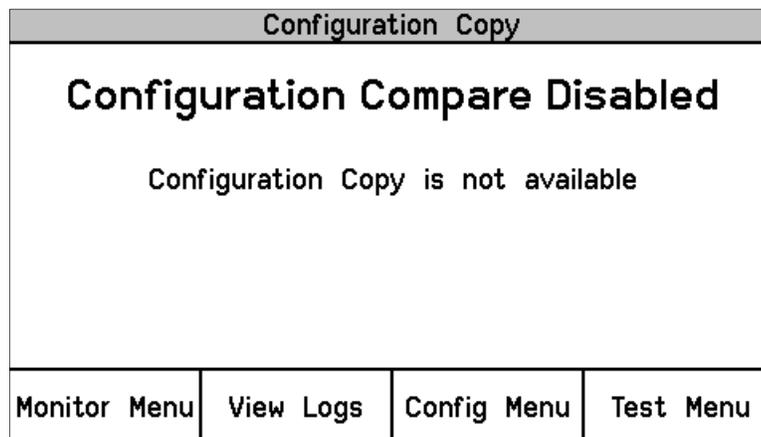


Figure 5-26. Configuration Copy

2. Press the "Copy to X" soft button to initiate copy routine to the respective module.
3. When the Password Entry screen is displayed, enter the configuration level password and press the ENTER key.

4. The screen will then temporarily display a “Copying Configuration To Target...” message, then a “Done Saving Target Configuration” message.
5. The Configuration Copy page will then indicate a “MATCH” status between the local module’s configuration settings files and the respective module that was copied to.

Password Change Menu Page

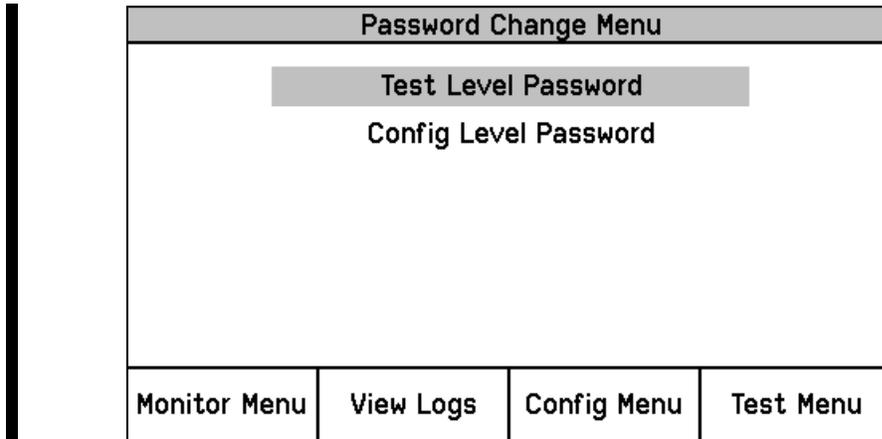


Figure 5-27. Password Change

This page is used to select either the Test or Configuration Level password configuration pages.

- **Test Level Password:** This setting is used to set the Test Level password which is required to be correctly entered before the following can be performed:
 - Initiate any module test from the front panel.
 - Reset any module’s log file (Note: The Peak Speed/Acceleration Log can only be reset with the Config Level password).
 - Change a module’s Test Level Password.
- **Config Level Password:** This setting is used to set the Config Level password which is required to be correctly entered before the following can be performed:
 - Change any module configuration setting from the front panel.
 - Change any module configuration setting from the PCT program or upload a configuration file into a module.
 - Reset a module’s Peak Speed/Acceleration Log.
 - Change a module’s Config Level Password.

Both the Test and Config level passwords meet NERC (North American Electric Reliability Corporation) cyber security requirements.

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 the ENTER key.

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 Down" or "Value Up" keys to change the highlighted value.
 - c. Use the "Cursor Right" key to move the highlighted character to the right.
6. Once the new password has been selected press the ENTER key to save it.
7. A message will appear to confirm that the password has been changed.

Default Test Level Password: AAAAAA (as shipped from factory)

Default Config Level Password: AAAAAA (as shipped from factory)

IMPORTANT

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

Chapter 6. Test Routines

Test Modes Menu

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

Test Modes Menu			
Temporary Overspeed Setpoint Manual Simulated Speed Test Auto Simulated Speed Test Auto-Sequence Test Lamp Test			
Monitor Menu	View Logs	Config Menu	Test Menu

Figure 6-1. Test Modes Menu

The ProTech-GII is equipped with several internal test routines to verify that the system is working correctly. The Test Modes Menu contains the following tests:

- **Temporary Overspeed Setpoint:** This page allows users to initiate the Temporary Overspeed Setpoint test function.
- **Manual Simulated Speed Test:** This page allows users to initiate the Manual Simulated Speed Test function.
- **Auto Simulated Speed Test:** This page allows users to initiate the Auto Simulated Speed Test function.
- **Auto-Sequence Test:** This page allows users to initiate the Auto-Sequence Test function.
- **Lamp Test:** This page allows users to initiate the Lamp Test function.

Temporary Overspeed Setpoint Test

Temporary Overspeed Setpoint Test			
Temporary Overspeed Trip Setpoint			
2000 RPM			
Actual Speed		2000 RPM	
Overspeed Trip Setpoint		3500 RPM	
Start Test			

Figure 6-2a. Temporary Overspeed Test

- **Temporary Overspeed Trip Setpoint:** This gauge displays the configured Temporary Overspeed Trip Setpoint setting.
- **Actual Speed:** This gauge displays the sensed actual speed.
- **Overspeed Trip Setpoint:** This gauge displays the module's current Overspeed Setpoint.

When enable, this test function temporarily sets/steps the module's overspeed setpoint to the configured "Temporary Overspeed Trip" setpoint level for the configured "Temp. Overspeed Trip Time-Out" period of time.

This setting can be set above or below the module's "Overspeed Trip" setting. If a secondary overspeed device is used which has an overspeed trip level that is above the ProTech-GII's, then it may be desirable to use this function to temporarily raise the ProTech-GII's overspeed trip setpoint above the secondary device for testing purposes.

If it is desired to not increase the monitored rotating equipment (turbine, generator or compressor) up to its actual overspeed trip level to validate the overspeed trip logic and associated trip circuitry/functions, the "Temporary Overspeed Setpoint" function can be used to temporarily lower the module's overspeed setpoint to or slightly above the rotating equipment's rated speed level. If set to slightly above the rotating equipment's rotating speed level, the rotating equipment speed can then be slightly raised until its speed is at or above the "Temporary Overspeed Setpoint" level and validate the related trip circuitry function for proper operation.

When this function is enabled, if the rotating equipment's speed is not taken above the "Temporary Overspeed Setpoint" level within the configured "Temp. Overspeed Trip Time-Out" time span, this test function is aborted, and the module's "Overspeed Trip" setpoint is set/stepped back to its normal "Overspeed Trip" level/setting. If during this time the rotating equipment's speed is taken above the "Temporary Overspeed Setpoint" level, the module's Overspeed Trip function will issue a trip command (tripping the module), and the Overspeed Trip setpoint will be set back to its normal "Overspeed Trip" level/setting.

Temporary Overspeed Test Procedure

1. Verify module is not in its tripped state.
2. From the Temporary Overspeed Setpoint Test screen, Press the “Start Test” soft key.
3. The “Enter Password” screen will appear. From this screen enter the “Test Level” password.
4. Press the “Apply” soft key to temporarily change the module’s overspeed setpoint to the configured Temporary Overspeed Setpoint level, or press the “Cancel” soft key to exit the screen.
5. The Temporary Overspeed Trip Timer screen will then be displayed including a “Test Time Remaining” timer.

A user can end this function at any time and restore the Overspeed Trip Setpoint to its normal level by pressing the “End Test” soft key.

If the “Test Time Remaining” timer expires before the test has ended, the unit will display a message “Test Time Expired”, and will revert back to the Start test screen.

Temporary Overspeed Setpoint Test			
Temporary Overspeed Trip Setpoint 2000 RPM			
Actual Speed		1600 RPM	
Overspeed Trip Setpoint		3500 RPM	
Test Time Remaining 00:00:25			
Temporary Overspeed Trip Setpoint Active			
			End Test

Figure 6-2b. Temporary Overspeed Test

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

At Least One Other Module is Tripped!—This message is only displayed when the Temporary Overspeed Setpoint Test function is applied and warns the user that another module is in its tripped state. This message does not prohibit applying this test.

Temporary Overspeed Trip Setpoint Active—This message indicates the Temporary Overspeed Trip Test is active (and the current speed is less than the Overspeed Trip Setpoint).

Speed > Overspeed Trip Setpoint!—This message 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 Remaining” Timer has expired, the module will trip.

Test Time Expired—This message indicates the “Test Time Remaining: timer has reached zero (expired).

Manual Simulated Speed Test

Manual Simulated Speed Test			
Test Mode	MANUAL MODE		
Actual Speed	3500 RPM		
Overspeed Trip Threshold	4000 RPM		
Start Test			

Figure 6-3. Manual Simulated Speed Test

- **Test Mode:** This gauge displays the test mode (MANUAL MODE).
- **Actual Speed:** This gauge displays sensed actual speed.
- **Overspeed Trip Setpoint:** This gauge displays the Configured Overspeed Trip setpoint.

This test switches the module's internal frequency generator into the module's input speed channel and sets the frequency to 100 rpm below the module's "Overspeed Trip" level setting. The user then must manually raise the module's frequency generator's simulated speed via the "Value ▲" soft key above the Overspeed Trip setting causing the Overspeed Trip function to step the module to its trip state. This test validates operation of the module's input speed sensing circuitry, overspeed trip function, and output trip relay.

If the frequency generator's simulated speed level is not taken above the module's "Overspeed Trip" setting within the configured "Simulated Speed Timeout" time span, this test will be aborted and the module's speed sensor input signal will be switched back into the module's speed channel.

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

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

Table 6-1. Simulated Speed Resolution

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.

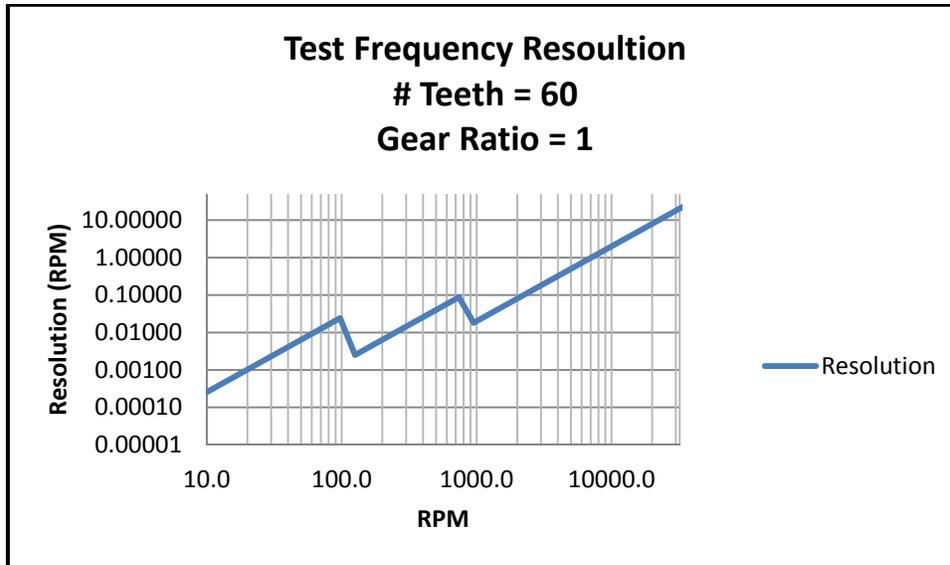


Figure 6-4. Test Frequency Resolution

Manual Simulated Speed Test			
Test Mode	MANUAL MODE		
Actual Speed	3400 RPM		
Overspeed Trip Setpoint	3500 RPM		
Simulated Speed	3400 RPM		
Test Time Remaining: 00:00:34			
Manual Simulated Speed Active			
	Value Down	Value Up	End Test

Figure 6-5. Manual Simulated Speed Test Screen

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

Manual Simulated Speed Active—This message indicates the Manual Simulated Speed Test is active.

Test Time Expired—This message indicates the “Test Time Remaining” timer has reached zero before the simulated speed level was raised above the Overspeed Trip setpoint.

Manual Simulated Speed Test Procedure

1. Verify no modules are in their Tripped or Alarmed state (depends on the configured Test Mode Permissive setting).
2. From the Manual Simulated Speed Test Screen, press the “Start Test” soft key.
3. The “Enter Password” screen will appear. From this screen enter the “Test Level” password.
4. Press the “Apply” soft key to initiate this test or press the “Cancel” soft key to exit the screen.
 - a. The module’s input speed channel is then switched from sensing actual rotating equipment speed to sensing the module’s internal frequency generator which is automatically set to a simulated speed of 100 rpm below the module’s “Overspeed Trip” level setting.
 - b. The Simulated Speed Timeout counter will be displayed and will begin counting down.
5. Press the “Value Up” soft key to increase the frequency generator’s simulated speed level up to or above the module’s Overspeed Trip setpoint.
6. If the simulated speed signal is raised up to or above the trip point, the module’s output “Trip Relay” will step to its tripped state and the module’s display will switched to its “Home screen”.
 - a. If the screen’s “End Test” soft key is pressed before the simulated speed is taken up to or above the Overspeed Trip setpoint, the module will revert back to the “Start Test” screen.
 - b. If the “Test Time Remaining” timer expires before the simulated speed is taken up to or above the Overspeed Trip setpoint, the module will display a message “Test Time Expired and revert back to the “Start Test” screen.
7. Issue a RESET command from either the module’s front panel, discrete input, or Modbus communications port to reset the module’s output Trip Relay back to its non-tripped state. This command will also switch the module’s input speed channel back to sensing actual rotating equipment speed and the module’s display to its “Home screen”.
8. Users can alternatively use/view the “Overspeed/Acceleration Log” screen to verify sensed tripped speed, maximum speed sensed during the event, sensed acceleration at trip point, and maximum acceleration sensed during event.

See “General Testing Notes” below for information on related messages and their meaning.

Auto Simulated Speed Test

Auto Simulated Speed Test			
Test Mode	AUTO MODE		
Actual Speed	0 RPM		
Overspeed Trip Setpoint	100 RPM		
Start Test			

Figure 6-6. Auto Simulated Speed Test Screen

- **Test Mode:** This gauge displays the test mode (AUTO MODE).
- **Actual Speed:** This gauge displays sensed actual speed.
- **Overspeed Trip Setpoint:** This gauge displays the Configured Overspeed Trip setpoint.

This test switches the module's internal frequency generator into the module's input speed channel and sets the frequency to 100 rpm below the module's "Overspeed Trip" level setting. This test then automatically raises the module's frequency generator's simulated speed at a rate of 10 rpm/second until the Overspeed Trip function issues a trip command to step the module to its trip state. This test validates operation of the module's input speed sensing circuitry, overspeed trip function, and output trip relay.

If the frequency generator's simulated speed level does not reach the module's "Overspeed Trip" setting within 12 seconds, this test will be aborted and the module's speed sensor input signal will be switched back into the module's speed channel.

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

Auto Simulated Speed Active—This message indicates the Auto Simulated Speed Test is active.

Test Time Expired—This message indicates the 12-second timer has reached zero before the simulated speed level was raised above the Overspeed Trip setpoint.

Test Ended by Modbus—This message indicates the test was ended by a Modbus command.

Auto Simulated Speed Test Procedure

1. Verify no modules are in their Tripped or Alarmed state (depends on the configured Test Mode Permissive setting).
2. From the module's Auto Simulated Speed Test Screen, press the "Start Test" soft key or from Modbus communications (if write commands have been configured/enabled) give an "Initiate Auto Speed Test" command then a "Confirm Auto Speed Test" command.
 - a. Note: This test routine can also be initiated by the Auto Sequence Test routine (periodically or manually).
3. If the module's front panel is used to initiate this test then the "Enter Password" screen will appear. From this screen enter the "Test Level" password.
4. If the front panel is used to initiate this test then press the "Apply" soft key to initiate this test or press the "Cancel" soft key to exit the screen.
5. When this test routine is started (from front panel or Modbus) the module's input speed channel is then switched from sensing actual rotating equipment speed to sensing the module's internal frequency generator which is automatically set to a simulated speed of 100 rpm below the module's "Overspeed Trip" level setting.
 - a. The internal frequency generator will then automatically ramp its simulated speed signal at a rate of 10 rpm/second up to and above the module's Overspeed Trip level setting.
 - b. A 12-second timeout timer will start running.
6. If the modules frequency generator's simulated speed signal increases up to or above the module's Overspeed Trip level, the module's output "Trip Relay" will step to its tripped state and the module's display will switch to its "Home screen".
 - a. If the screen's "End Test" soft key is pressed before the simulated speed is taken up to or above the Overspeed Trip setpoint, the module will revert back to the "Start Test" screen.
 - b. If the 12-second timer expires before the simulated speed is taken up to or above the Overspeed Trip setpoint, the module will display a message "Test Time Expired and revert back to the "Start Test" screen.
 - c. If a Modbus communications "Abort Auto Speed Test" command is given before the simulated speed is increased up to or above the Overspeed Trip setpoint, the module will revert back to the "Start Test" screen.
7. Issue a RESET command from either the module's front panel, discrete input, or Modbus communications port to reset the module's output Trip Relay back to its non-tripped state. This command will also switch the module's input speed channel back to sensing actual rotating equipment speed and the module's display to its "Home screen".
8. Users can alternatively use/view the "Overspeed/Acceleration Log" screen to verify sensed tripped speed, maximum speed sensed during the event, sensed acceleration at trip point, and maximum acceleration sensed during event.

See "General Testing Notes" below for information on related messages and their meaning.

Auto-Sequence Test

Auto-Sequence Test			
Time Remaining Until Next Test 7 days 0 hours 0 mins			
Result Of Last Test TEST NOT STARTED			
Start Test			Disable Auto-Seq Test

Figure 6-7. Auto Sequence Test

- **Time Remaining Until Next Test:** This gauge displays the time until the next Auto Sequence test will be started.
- **Result Of Last Test:** This gauge displays the result of last Auto Sequence test. Result of Last Test can be:
 - **TEST NOT STARTED**
 - **TEST PASSED**
 - **TEST FAILED**
 - **TEST NOT COMPLETED**

This test routine tests modules A, B, & C in sequence by initiating each module's "Auto Simulated Speed Test" routine, starting with module A, then resetting each module back to its normal non-tripped state. Refer to the "Auto Simulated Speed Test" above for details regarding the "Auto Simulated Speed Test" routine. This test validates operation of all modules' input speed sensing circuitry, overspeed trip function, and output trip relay.

Since module A initiates the test sequence, this test can only be configured and initiated from module A. Optionally this test can be initiated from module A's front panel or periodically if the Periodic Test Timer function is enabled.

Auto Sequence Test Procedure

To configure this test, see Configure Auto Sequence Test Procedure in the section above.

1. Verify no modules are in their Tripped or Alarmed state. (The Test Mode Permissive setting does not apply to this test.)
2. From module A's Auto Sequence Test Screen, press the "Start Test" soft key.
 - a. Note: This test routine can also be initiated periodically if the Periodic Test Timer function is configured/enabled.
3. If the module's front panel is used to initiate this test then the "Enter Password" screen will appear. From this screen enter the "Test Level" password.

4. If the front panel is used to initiate this test then press the “Start Test” soft key to initiate this test or press the “Cancel” soft key to exit the screen.
5. Module A will then perform an Auto Simulated Speed Test.
6. Module A will be reset back to its non-tripped state.
7. If all test permissives are met (no module in a tripped or alarmed state), then module B will perform an Auto Simulated Speed Test.
8. Module B will be reset back to its non-tripped state.
9. If all test permissives are met (no module in a tripped or alarmed state), then module C will perform an Auto Simulated Speed Test.
10. Module C will be reset back to its non-tripped state.
11. If at any point the permissives are not met (any module in a tripped or alarmed state), one of the following messages will be displayed on the affected module: TEST NOT STARTED, TEST FAILED, or TEST NOT COMPLETED.
12. If this test was initiated by the “Periodic Test Timer” function, the “Time Remaining Until Next Test” time will be reset and start counting down once again.

Alternatively an operator can disable or re-enable the Periodic Test Timer function from the front panel of module A. When this function is disabled, or if any module is in trip, alarm, 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 the Periodic Test Timer function is re-enabled and no modules are tripped, in alarm, or in a test mode, the Periodic Test Timer function will continue to operate as normal.

See “General Testing Notes” below for information on related messages and their meaning.

Lamp Test

Lamp Test			
Start Lamp Test?			
Start Test			Cancel

Figure 6-8. Lamp Test

This test provides a way for users to verify the front panel's LED functionality. When initiated this test routine cycles each front panel LED on and off and through the provided color combinations (listed below). The test can be repeated as needed. A cancel function is also available to halt this routine if desired. No password entry is required to run the test.

Lamp Test Procedure

1. From module's Lamp Test Screen, press the "Start Test" soft key.
 - a. The Tripped, Unit Health, and Alarm LEDs are turned off for 1 second.
 - b. Next the Tripped LED is on and red, Unit Health LED is on and red, and Alarm LED is on and yellow for 1 second.
 - c. Next the Unit Health LED turns green for 1 second.
 - d. Next the Tripped, Unit Health, and Alarm LEDs are turned off for 1 second.
2. When this test routine is complete, all LEDs return to their normal state.

General Testing Notes

With the exception of "Temporary Overspeed Trip Setpoint Test" and "Lamp Test", the above tests cannot be initiated if any module is in its tripped or alarmed state (user configurable except for Auto-Sequence Test). If a user tries to initiate one of the above tests with any module in a tripped, alarmed, or test state, one of the following messages may be displayed:

Module Already Tripped! Test Aborted—This message indicates that the test cannot be started because the module is already tripped.

Module In Alarm! Test Aborted—This message indicates that the test cannot be started because the module is in an alarm condition.

Test in Progress—This message indicates that the test cannot be started because the module is already in a test mode.

Other Module Tripped! Test Aborted—This message indicates that the test cannot be started or that a running test was aborted because another module is tripped.

Other Module In Alarm! Test Aborted—This message indicates that the test cannot be started or that a running test was aborted because another module is in an alarm condition.

Other Module In Test Mode! Test Aborted—This message indicates that the test cannot be started because another module is in a test mode.

NOTICE

The Test Mode Permissive setting is used to prevent any of the module's overspeed test modes/routines from being initiated when another module is in a tripped or alarm state. Valid choices are: None, Module Not Tripped, Module Not In Alarm.

Chapter 7.

Programming and Configuration Tool

General

Users can configure the ProTech-GII using the following methods:

- Configure each module separately from its front panel keypad.
- Configure one module from its front panel keypad and copy the saved configuration file to the other two modules.
- Use the provided Programming and Configuration Tool software program installed on a computer to create a configuration settings file then connect to one or all of the modules and upload the configuration settings file to one module or all of the modules. Alternatively if the configuration settings file is uploaded to only one module, the module-to-module “COPY” function can be used to copy the file to the other two modules.
- For safety purposes a module must be in its “tripped” state to allow any configuration settings to be changed or uploaded.

Each ProTech-GII module includes preset overspeed, over-acceleration, alarm latch, and trip latch functionality. Users must then custom configure each module to meet the required application’s functionality 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.
- 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.



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.

Comm Type	RS-232
Baud Rate	115200
Isolation	Non-isolated
Signal Cable Length	Must be limited to 10 ft / 3 m
Cable Type	Standard off the shelf RS-232 cable

Table 7-1. Service Port Specifications

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 uploaded 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 the PCT 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 upload 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 uploaded program to the other two ProTech-GII modules.

IMPORTANT

When uploading a configuration ".wset file" into a module, it is important to confirm that the correct settings file was loaded into the correct module.

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.

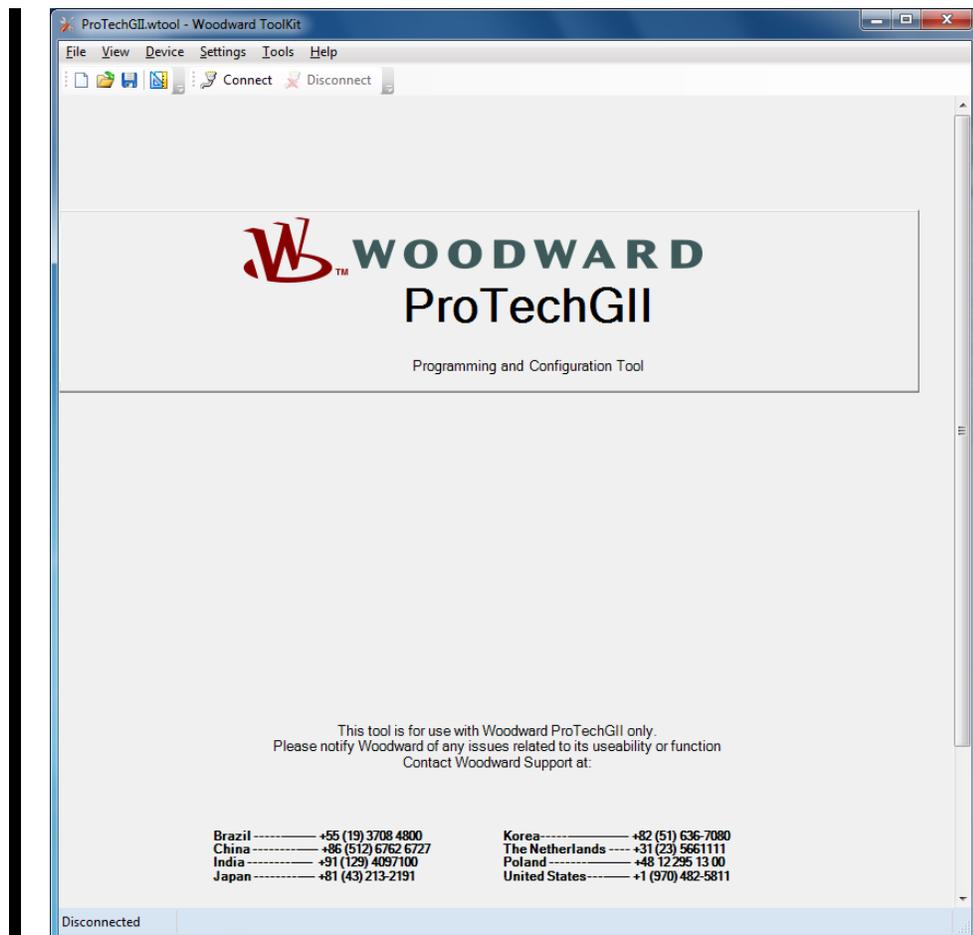
Config Level:

- 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)

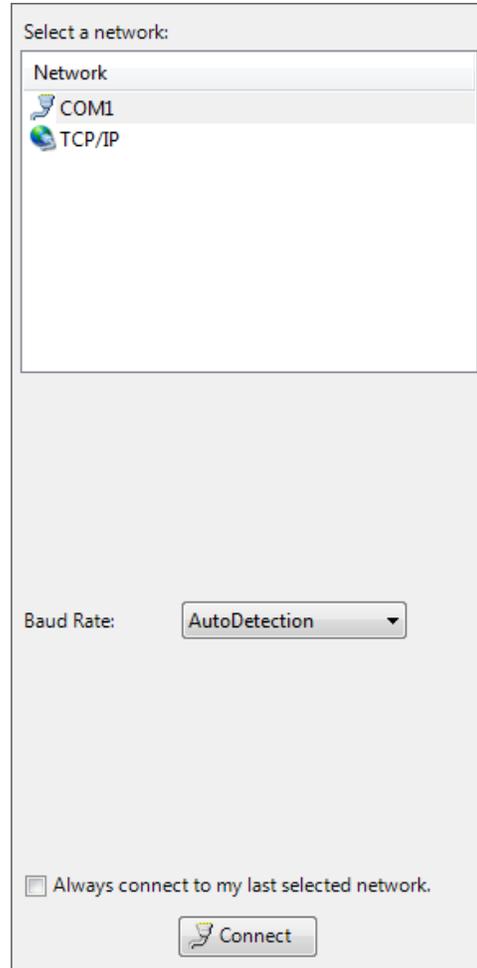
In order to use the ProTech-GII Programming and Configuration Tool (PCT), the following actions must be executed:

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.

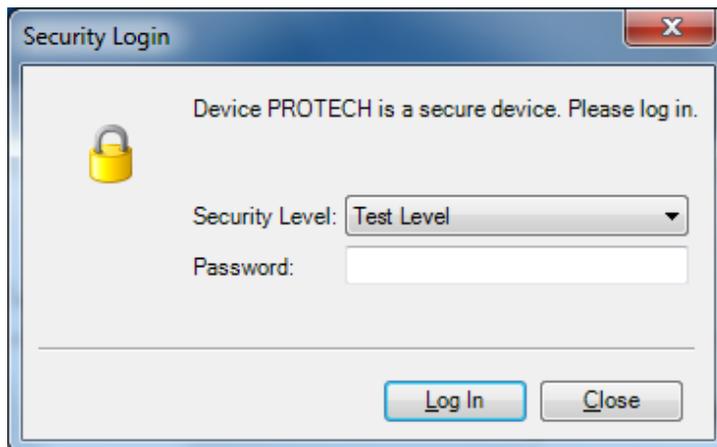


The PCT is ready to be used in isolated level. In order to use the PCT in either Test or Config level, the following actions must be executed:

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:

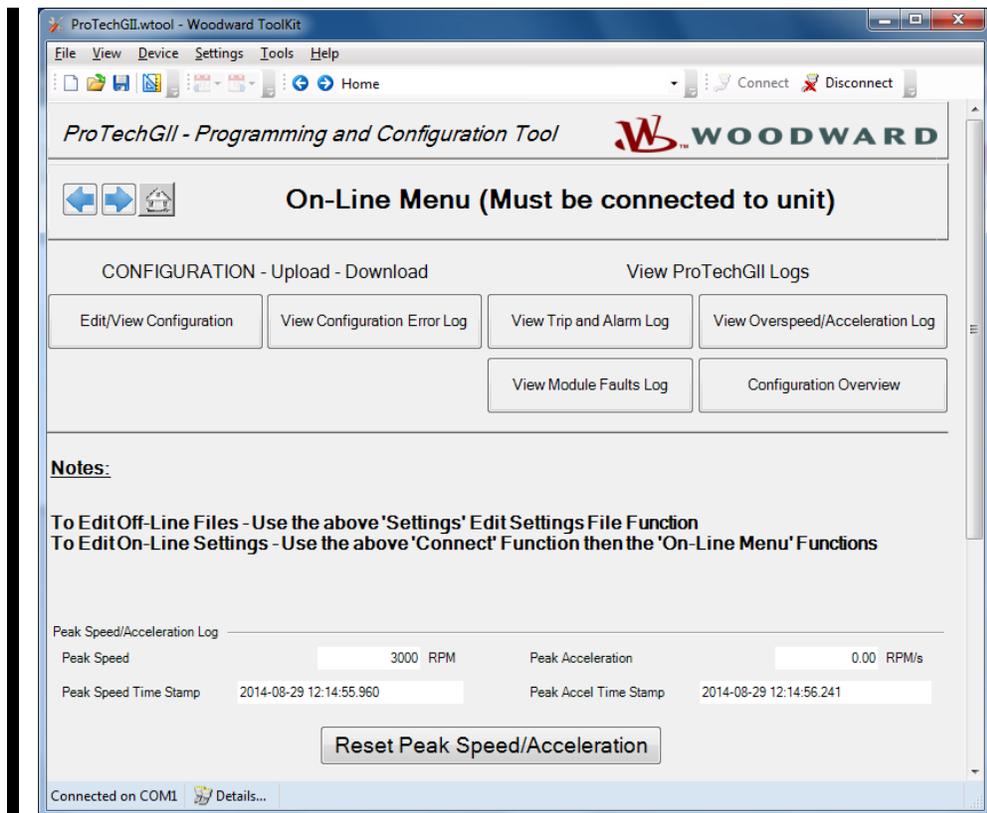


5. Select the Communication port that the serial interface cable is connected to and click on the Connect button in the pop-up window.
6. When the communication link is established, the following pop-up window appears:



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:
 - On-Line Menu
 - 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.

Selecting the **Reset Peak Speed/Acceleration** button will clear the Peak Speed/Acceleration. The Reset Peak Speed/Acceleration 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).

Home

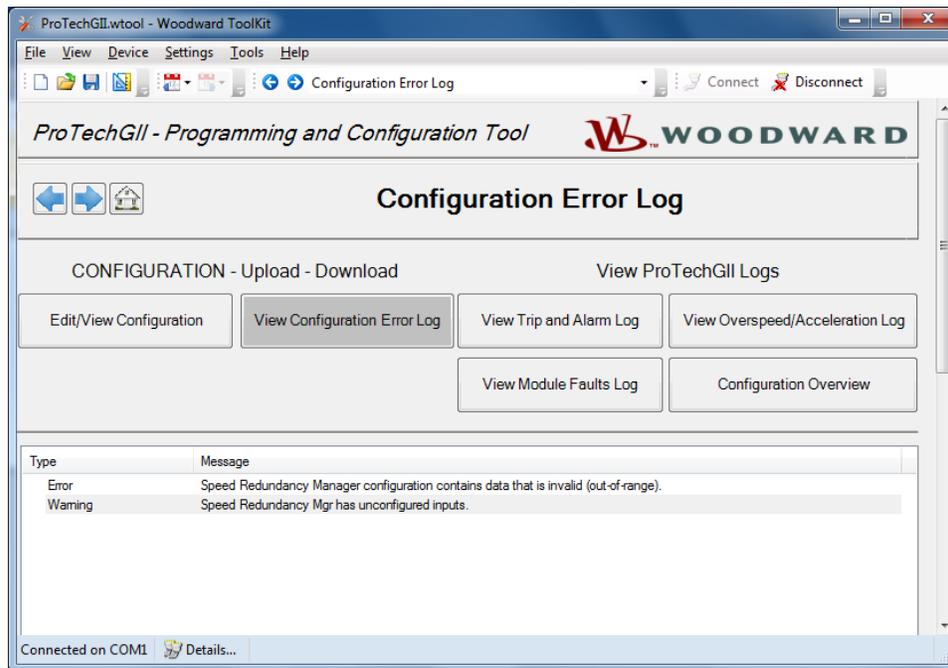


The “Home” button  is used to return to the On-Line Menu after any one of the four logs has been opened.

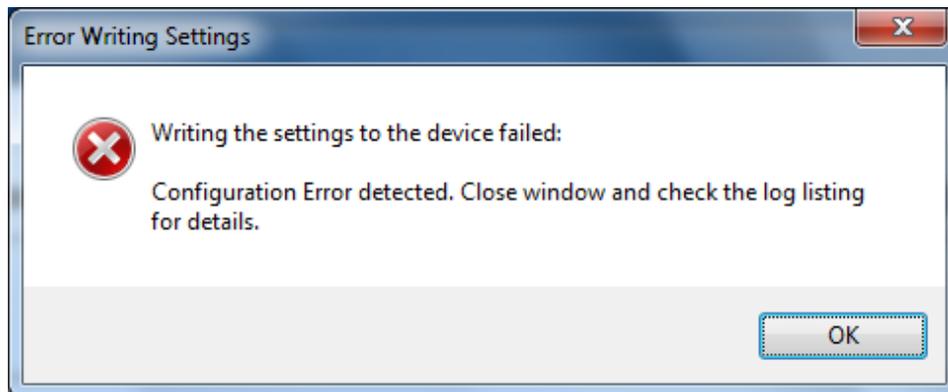
View Configuration Error Log

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.



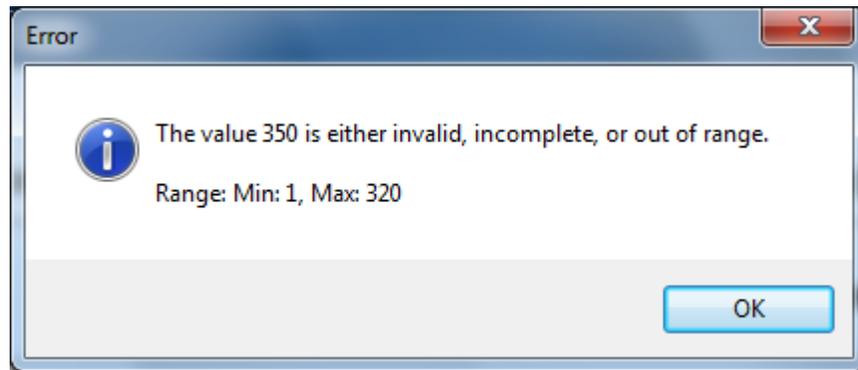
If a configuration error exists, the configuration is not saved and the following screen appears when trying to upload the settings file to the ProTech-GII.



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

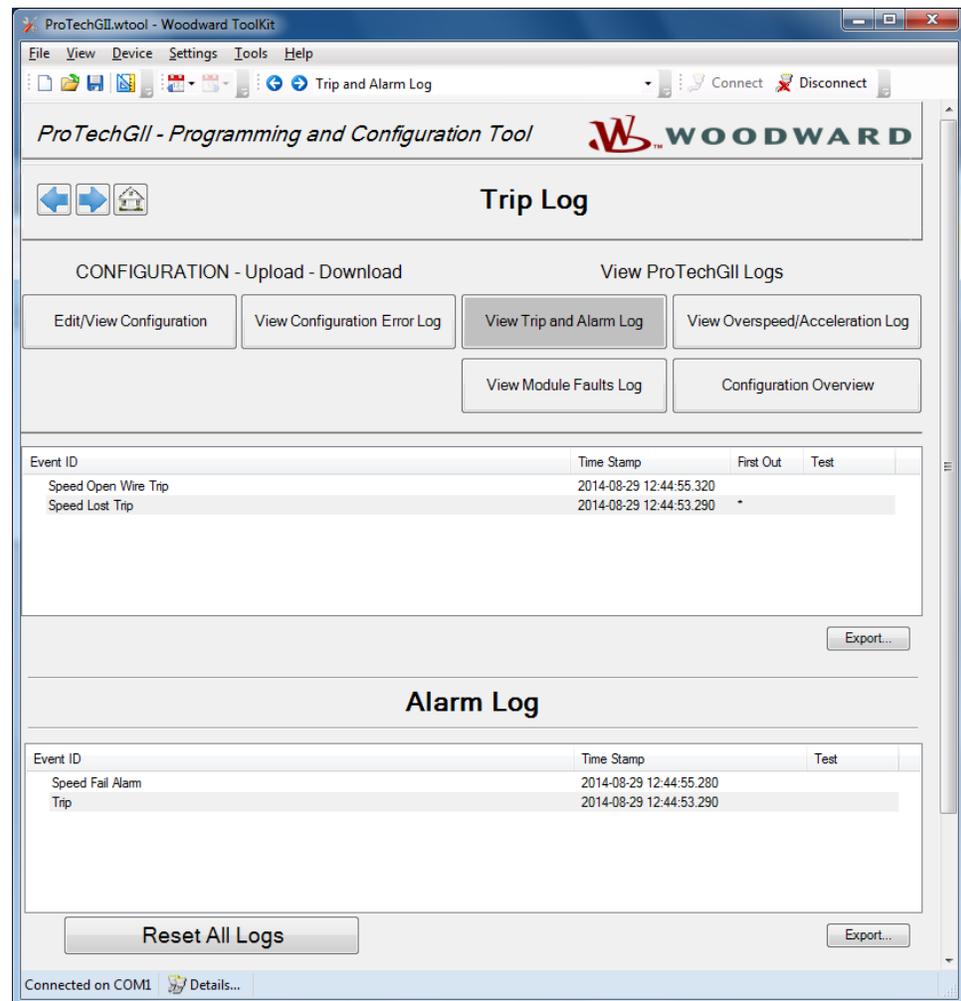
Data Entry Errors

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.

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

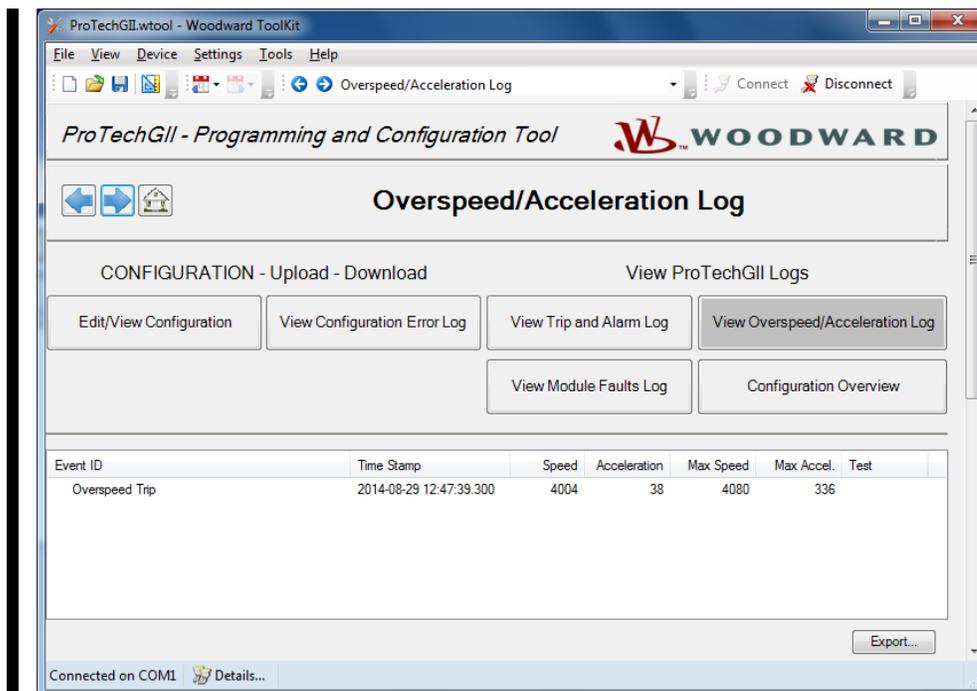
The time stamps in the logs are based on the internal clock at the time of the event. Time stamps are not changed when the internal clock time is modified (i.e. time/date is set).

View Overspeed/Acceleration Log

After selecting “View Overspeed/Acceleration Log”, one list is displayed:

- A list of all recent overspeed trips 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 (after trip).

The log can be saved to an html file using the Export button.



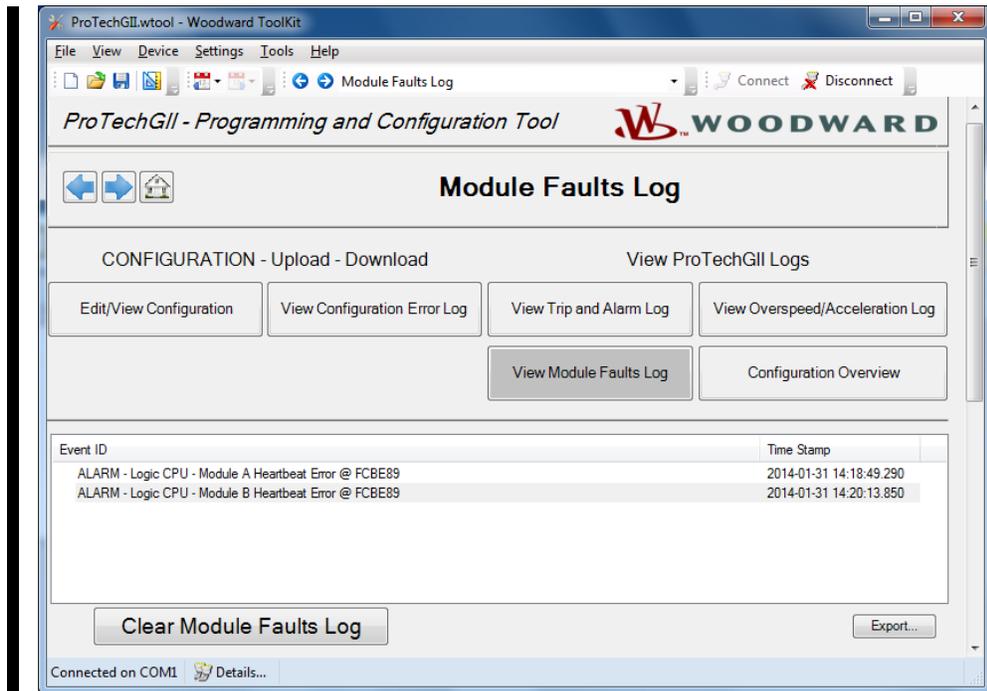
View Module Faults Log

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 when logged in with Test Level permissions or higher.

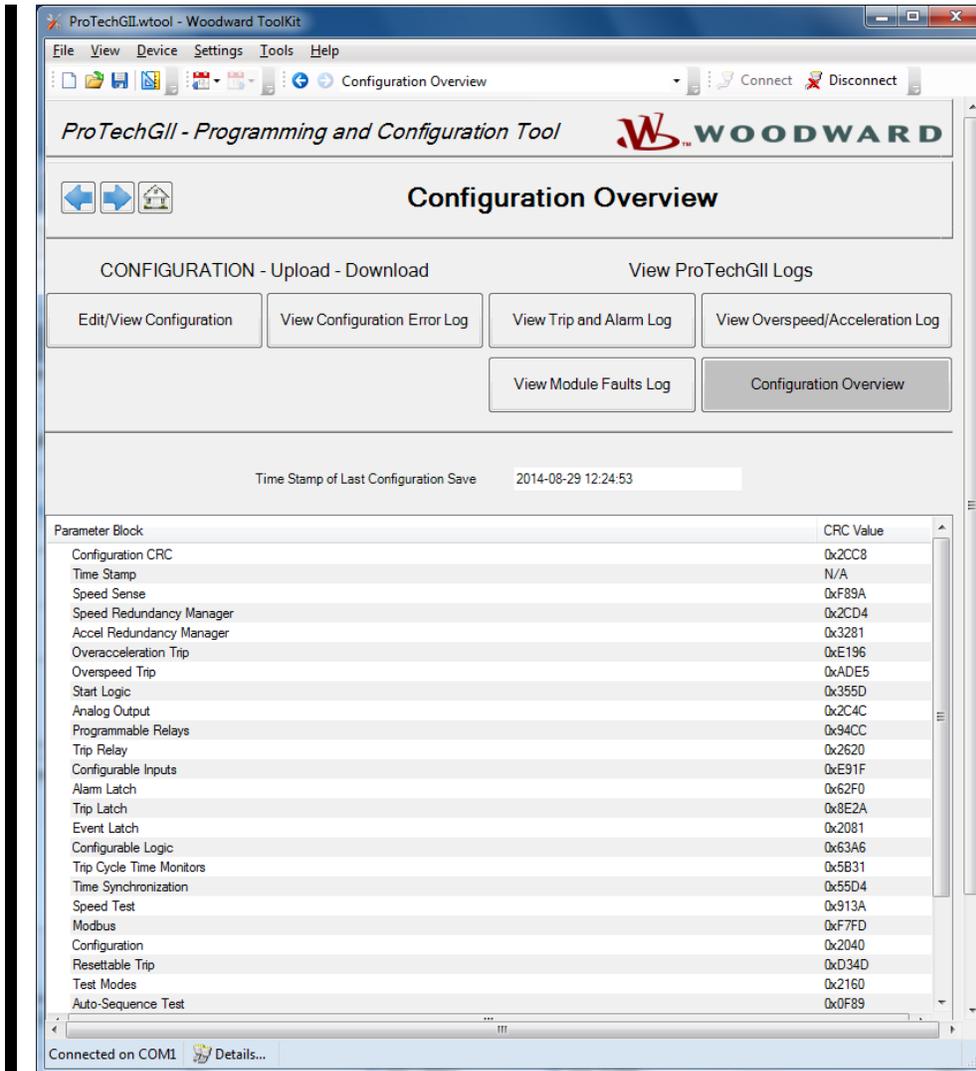
The Module Faults Log is only available from the Programming and Configuration Tool (PCT) and is not displayed on the front panel user interface.

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

The log can be saved to an html file using the Export button.

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

Parameter Block Definitions

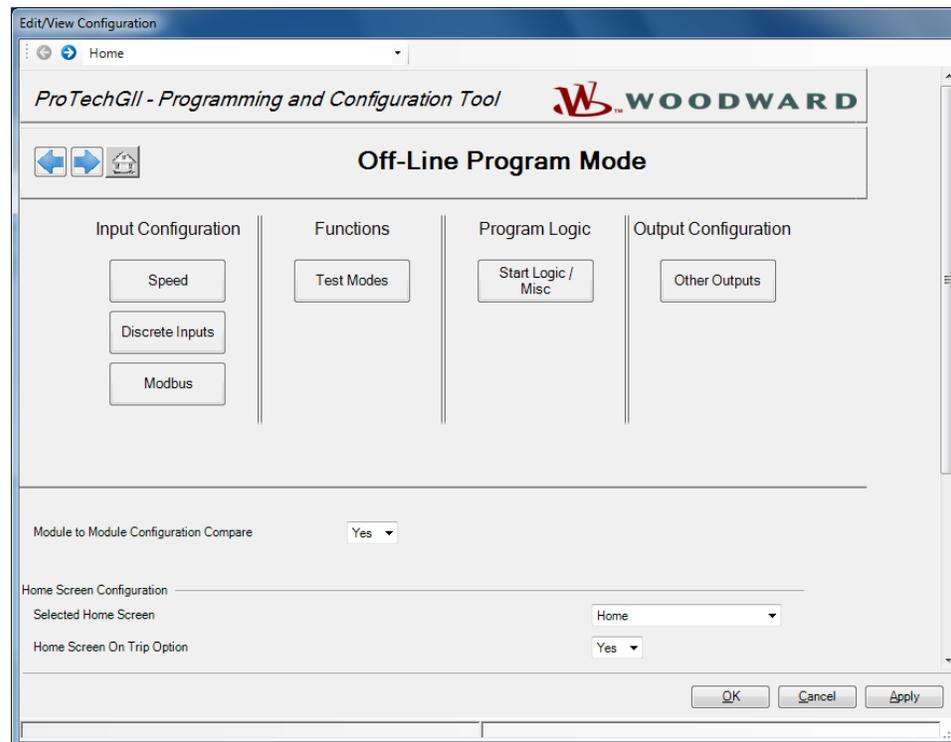
- **Configuration CRC:** CRC code for the entire configuration listed below.
- **Time Stamp:** No CRC is calculated. Time of the last configuration save.
- **Speed Sense:** CRC code of the following settings in the Configure Speed Input section on the Speed page: Probe Type, Nr of Gear Teeth, Gear Ratio, and Sudden Speed Loss.
- **Speed Redundancy Manager:** CRC code of the Speed Redundancy Manager on the Speed page.
- **Acceleration Redundancy Manager:** CRC code of the Acceleration Redundancy Manager on the Speed page.
- **Overaccel Trip:** CRC code of the Configure Acceleration section on the Speed page.
- **Overspeed Trip:** CRC code of the Overspeed Trip setting in the Configure Speed Input section on the Speed page.
- **Start Logic:** CRC code of the Configure Start Logic section on the Speed page.
- **Analog Output:** CRC code of the Configure Analog Output settings on the Other Outputs page.
- **Programmable Relays (Not available on ProTech-GII models):** CRC code of the Configure Discrete Outputs settings on the Other Outputs page.
- **Trip Relay:** CRC code of the Configure Trip Latch setting on the Trip Latch page.
- **Configurable Inputs (Not available on ProTech-GII models):** CRC code of the Configurable Inputs settings on the Inputs page. This CRC does not include the user-definable input names or units.
- **Alarm Latch(Not available on ProTech-GII models):** CRC code of the Alarm Latch settings (1-75) on the Alarm Latch page. This CRC does not include the user-definable input names.
- **Trip Latch(Not available on ProTech-GII models):** CRC code of the 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(Not available on ProTech-GII models):** CRC code of the Event Latch settings on the Event Latch page. This CRC codes does not include the user-definable input names.
- **Configurable Logic (Not available on ProTech-GII models):** CRC code of the entire configurable logic (Gates, Latches, Delays, Unit Delays, Comparators, Timers, Lags, Difference Detection and User Defined Tests). This includes:
 - Gate settings (1-50) on the Logic Gates page.
 - Latch settings (1-10) on the Latches page.
 - Delay settings (1-25) on the Delays page.
 - Unit Delay settings (1-10) on the Unit Delays page.
 - Comparator settings (1-15) on the Comparators page.
 - Timer settings (1-5) on the Timers page.
 - Lag settings (1-10) on the Lags page.
 - Difference Detection settings (1-15) on the Difference Detection page.
 - User-defined Test settings (1-3) on the Test Modes page.
- **Trip Cycle Time Monitors (Not available on ProTech-GII models):** CRC code of the settings on the Trip Cycle Timers page.
- **Time Synchronization (Not available on ProTech-GII models):** CRC code of the settings on the Time Synchronization page.
- **Speed Test:** CRC code 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 Permissive setting.
- **Modbus:** CRC code of the Configure Modbus settings on the Modbus page, excluding the Slave Address setting which has a separate CRC.

- **Configuration:** CRC code of the Module to Module Configuration Compare settings on the Home page of the Program Mode.
- **Resettable Trip(Not available on ProTech-GII models):** CRC code of the Resettable Trip settings on the Reset Logic page.
- **Test Modes:** CRC code of the Test Mode Permissive setting on the Test Modes page.
- **Auto Sequence Test:** CRC code of the Configure Auto Sequence Test settings on the Test Modes page.
- **Modbus Slave Address:** CRC code of the Modbus Slave Address setting on the Modbus page. This setting, when used, will typically be unique for each module A, B, or C. 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 code of the Configurable Reset Source settings on the Reset Logic page.
- **Power Supply Alarms:** CRC code of the Power Supply Alarms settings on the Start Logic / Misc page.
- **Display Configuration:** CRC code of the Display Configuration settings on the Home page of the Program Mode. These settings, when used, will typically be unique for each module A, B, or C. As a result, these settings are included in the overall CRC but not used in the configuration compare function (not copied or compared).
- **Shared Dedicated Disc In:** CRC code of the Shared Dedicated Disc In settings on the Discrete Inputs page.

Off-Line Menu

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 after OK or Apply is clicked. 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
- Discrete Inputs
- Modbus

Functions:

- Test Modes

Program Logic

- Start Logic/Misc

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 – PCT

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, the configuration save will ask if a trip is desired. A trip will only be allowed if the other modules are not tripped.

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 [Not Used/Passive/Active]
- Number of Gear Teeth[1-320]
- Gear Ratio[0.10-10.0]
- Overspeed Trip Setpoint [RPM]
- Sudden Speed Loss [Alarm/Trip]
- Enable Acceleration Trip [No/Yes]
- Acceleration Trip Enabled Speed [RPM]
- Acceleration Trip Setpoint [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
- Speed Redundancy Manager
- Acceleration Redundancy Manager
- Trip Latch [De-energize/Energize to Trip]

- Trip Latch [Latching/Non-Latching]
- Trip is Alarm [No/Yes]
- Reset Input Sharing
- Start Input Sharing
- Speed Fail Override Input Sharing
- Analog Output [4 mA and 20 mA settings]
- Test Modes
- Auto Sequence Test
- Modbus Communications
- Power Supply 1 & 2 Alarm [No/Yes]
- Home Screen on Trip Option [No/Yes]
- Selected Home Screen
- Configuration Compare and Copy Features
- Passwords

All configurations that can be configured by the front panel can also 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 screen buttons are available:

Input Configuration:

- Speed
- Discrete Inputs
- Modbus

Functions:

- Test Modes

Program Logic:

- Start Logic/Misc

Output Configuration:

- Other Outputs

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

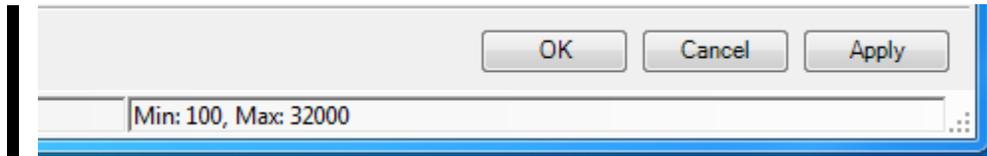
After selecting one of the buttons, a sub-screen is displayed in which particular parameters for the selected function can be checked and modified if necessary.

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 sub-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:

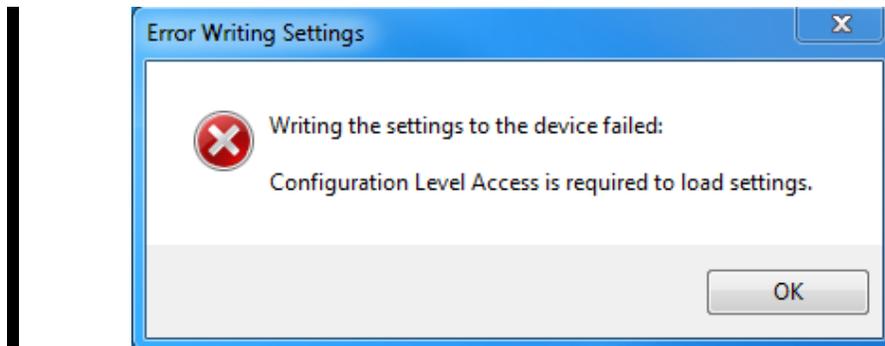
- After the OK or Apply button is pressed, the new configuration setting will immediately be uploaded to the ProTech-GII.

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 a trip condition.

Test Level was selected

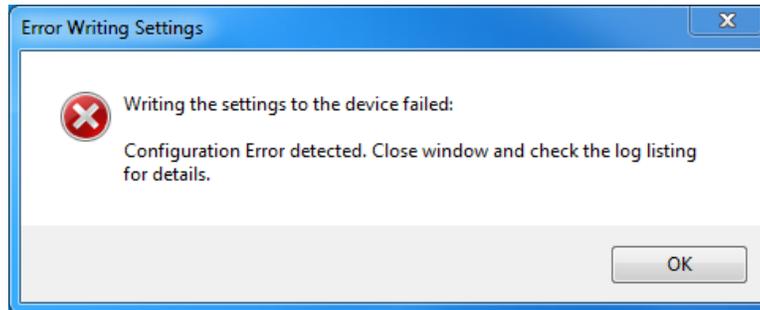
If Test Level was selected, the following pop-up window appears:



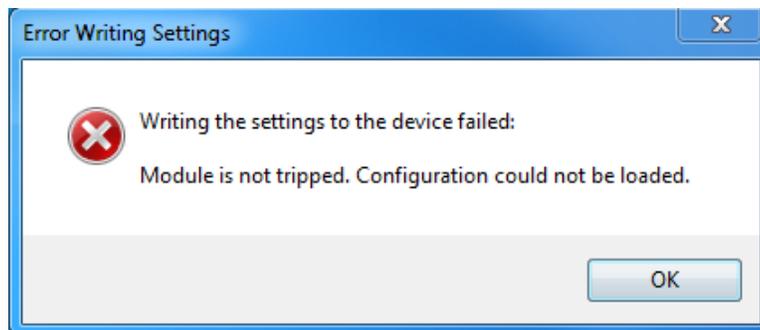
Communications must be stopped and restarted using Config Level. Once logged in at the Config Level, configuration settings can be changed.

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 a trip condition, uploading is inhibited. If no trip condition is present, the configuration save will ask if a trip is desired. A trip will only be allowed if the other modules are not tripped.

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.

Creating the configuration settings in the ProTech-GII:

1. Create the settings file.
2. Modify the settings file.
3. Save the settings file on the PC.
4. Load the settings file from the 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 from the PC to the ProTech-GII.

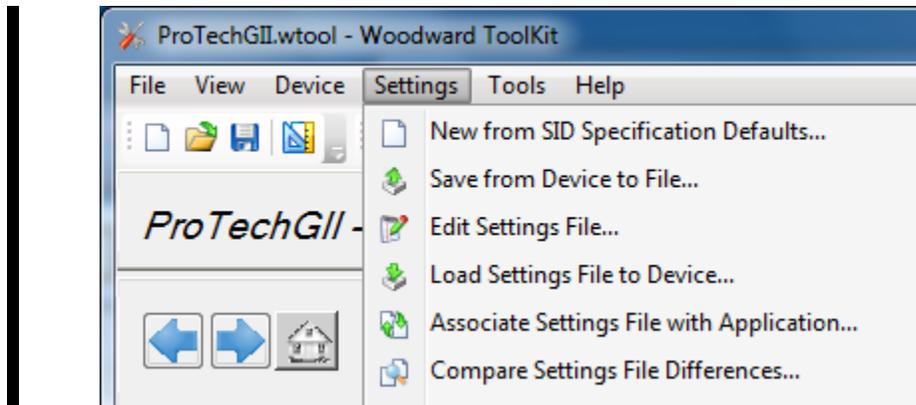
See **Drop-down Menu “Settings”** for information on how to create and modify configuration files.

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

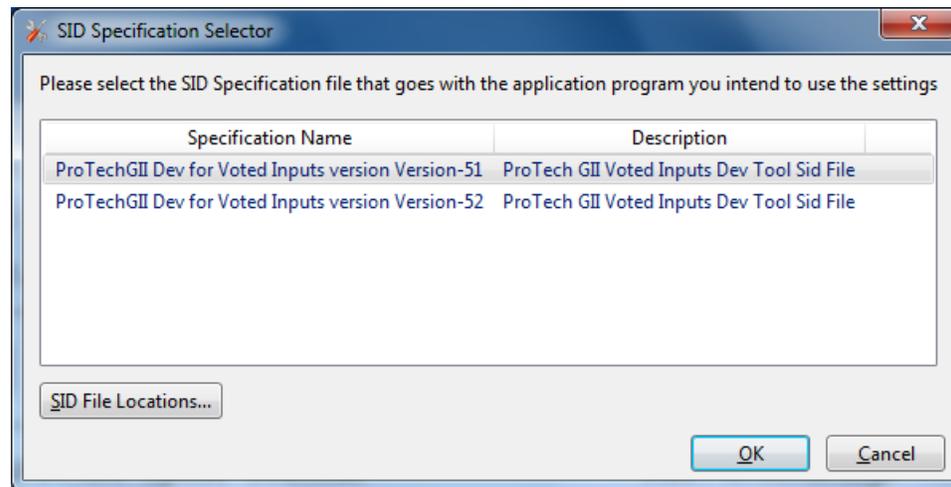
When using the ProTech-GII Programming and Configuration Tool (PCT) in Config Level, the management of log files is active, and the following selections from the settings pull down menu can be used:

- 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.

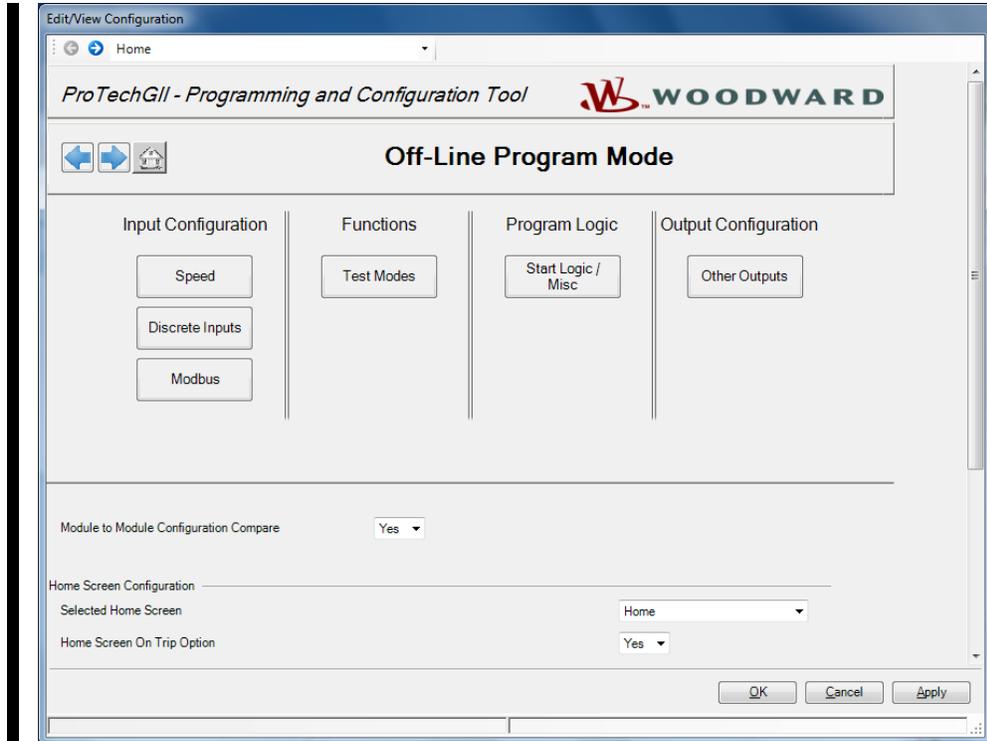
After clicking this selection, the following sub-window appears with a list of applications:



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 or Alarm 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.

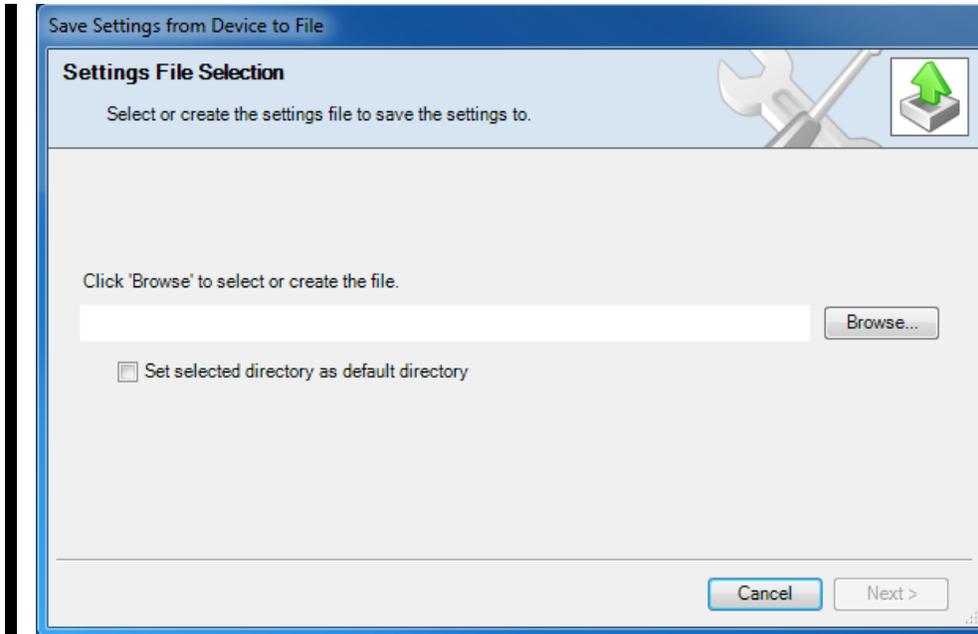
Once the file is saved, it can be uploaded to the ProTech-GII by using pull down menu “Settings” followed by sub-selection “Load settings file to Device”.

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 Level or Config Level login is required.

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



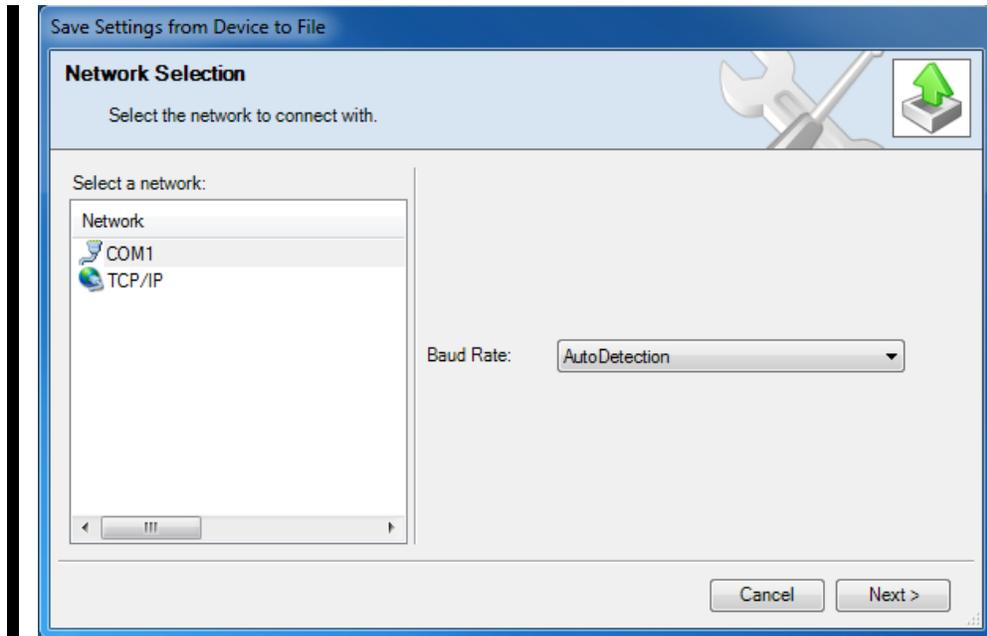
1. Use the Browse button to select the location and name of the settings file to be created or to be modified. The settings files have a *.wset extension.
2. Saving settings from device to file requires either the Test Level or Config Level login. There are two valid conditions:
 - Serial communication 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

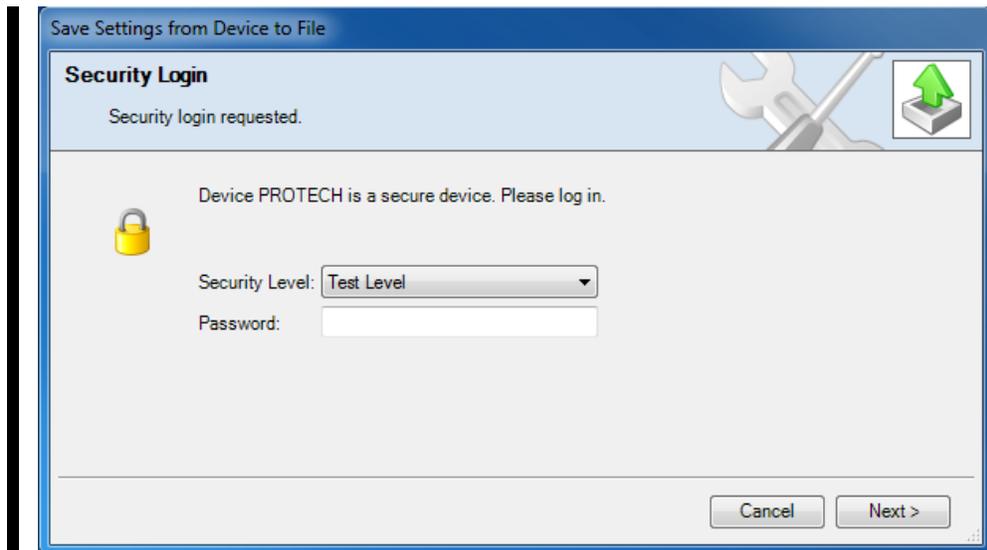
3. If serial communication was already established, and Test Level or Config Level was selected, the transfer of the configuration file from the ProTech-GII starts immediately.
4. The configuration file is ready to be modified by the ProTech-GII Programming and Configuration Tool (PCT). See “Edit Setting 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:



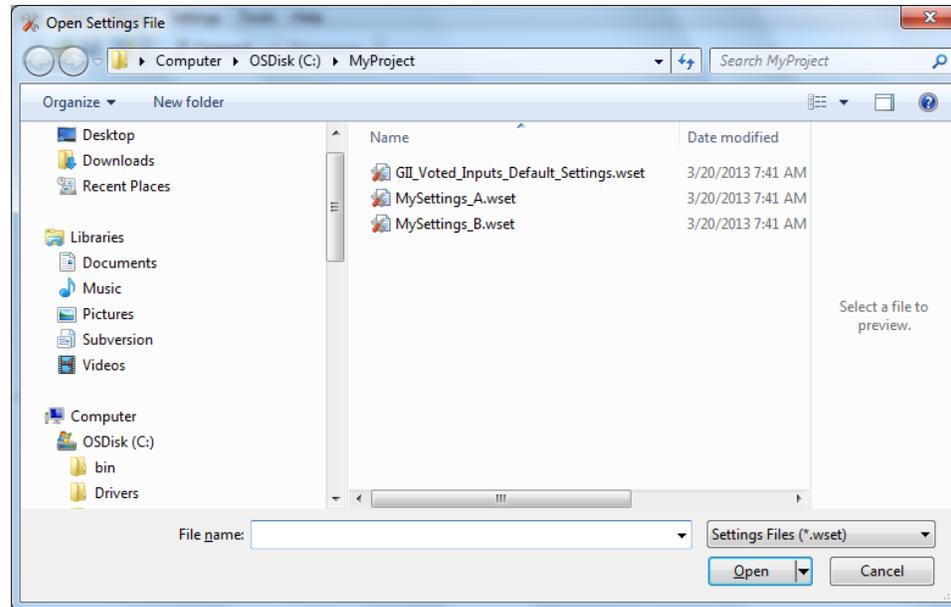
8. Select "Config Level" in the drop down menu and enter the associated password for the selected level. After the password is entered, click on the Next button and the transfer of the configuration file from the ProTech-GII to the PC file starts immediately.
9. The configuration file is ready to be 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.

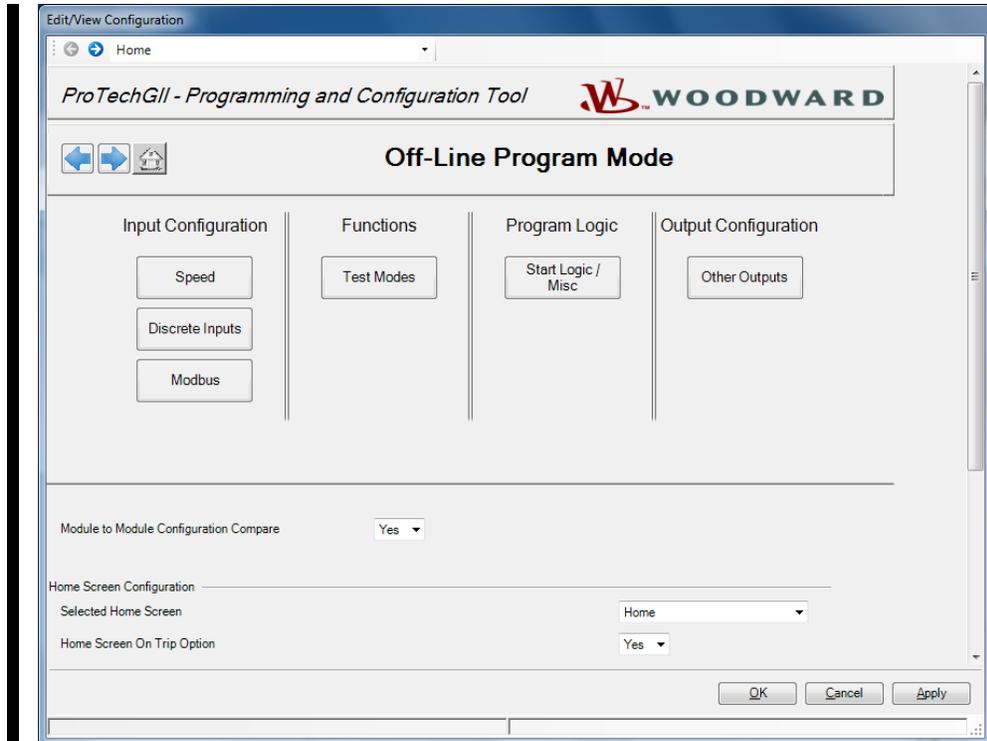
In order to modify the configuration in the ProTech-GII, a file must be created (see “Save from Device to File” section), then modified (instructions in this section), and then re-loaded to the ProTech-GII (see Load Settings File to Device).

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.

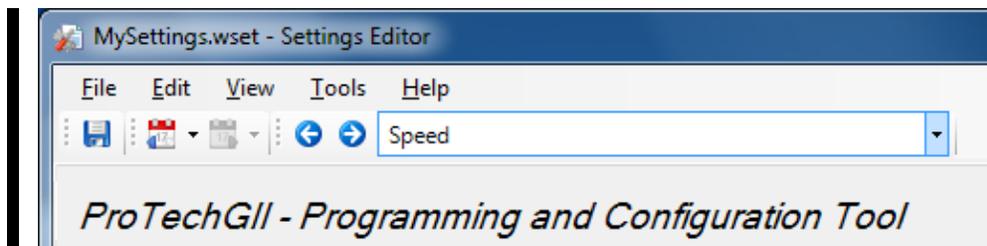


If no settings files are available, a settings file must be created (New from SID Specification Defaults), or a settings file must be loaded from the ProTech-GII to a PC (Save from Device to File).

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
- Discrete Inputs
- Modbus

Functions:

- Test Modes

Program Logic:

- Start Logic/Misc

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.

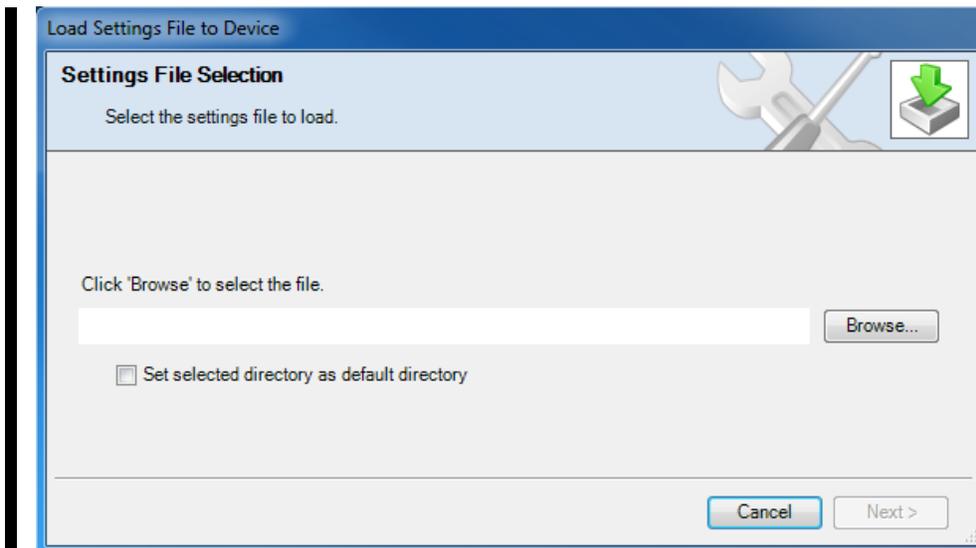
With the selection "Load Settings File to Device", a configuration file can be loaded from the PC to the ProTech-GII.

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, the configuration save will ask if a trip is desired. A trip will only be allowed if the other modules are not tripped.

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 Level was selected.
 - Serial communication was already established, and Test Level was selected.
 - Serial communication was not yet established.

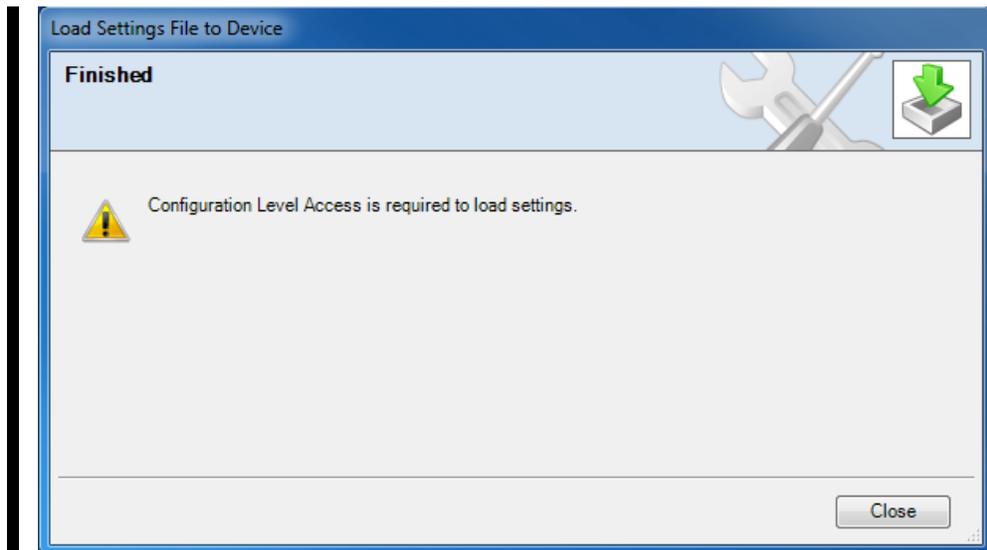
Serial communication was already established, and Config Level was selected

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; Test Level is not sufficient. If no trip condition exists, transfer is inhibited. The configuration save will ask if a trip is desired. A trip will only be allowed if the other modules are not tripped.

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 Level was selected

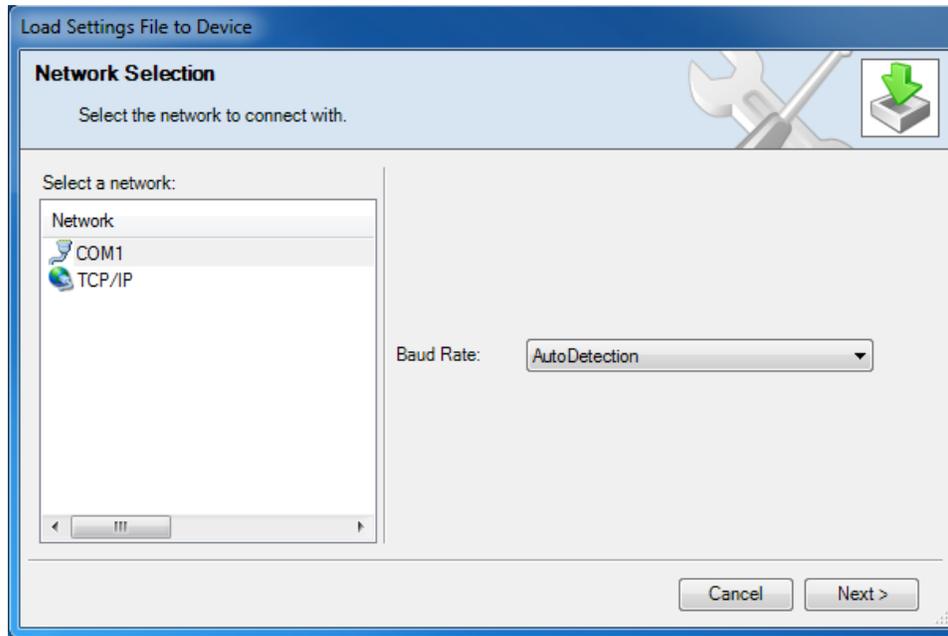
4. If serial communication was already established, and Test Level was selected, then the transfer of the configuration file to the ProTech-GII cannot be established. For uploads, Config Level is required. Test Level is not sufficient. The following sub-window appears:



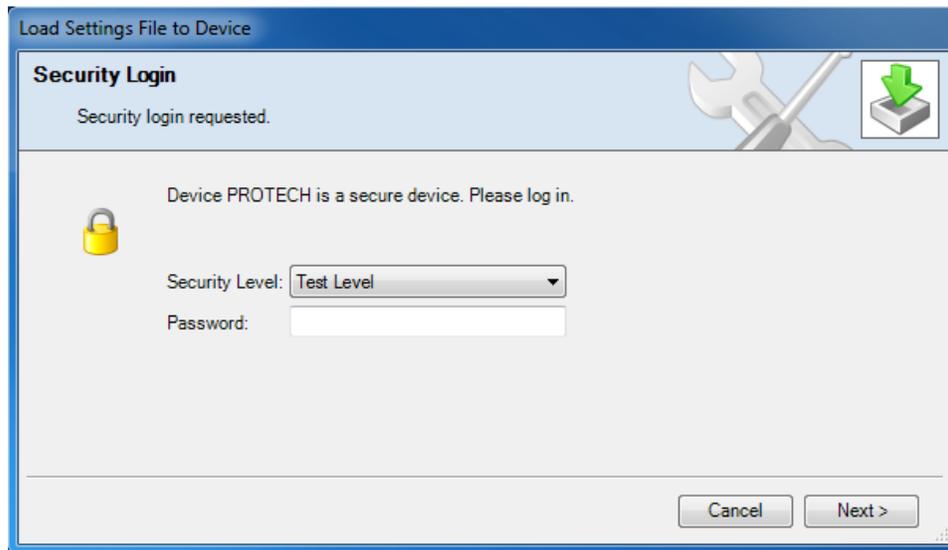
5. Use the disconnect button and reconnect utilizing the password for Config Level and restart the “Load Settings File to Device” procedure.

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 and click on the Next button in the pop-up window.
8. If a communications link is established, the following pop-up window appears:

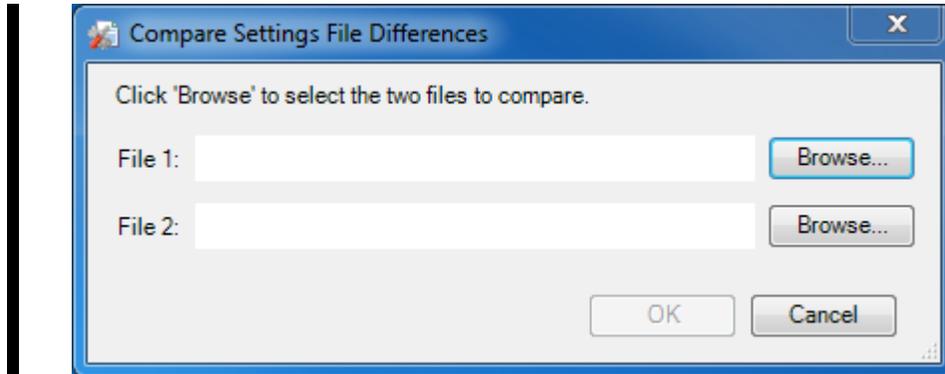


9. Select "Config Level", and enter the associated password for the selected security level. After the password is entered, the transfer of the configuration file to the ProTech-GII starts. For uploads, Config Level is required; Test Level is not sufficient. If no trip condition exists, transfer is inhibited. The configuration save will ask if a trip is desired. A trip will only be allowed if the other modules are not tripped.
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

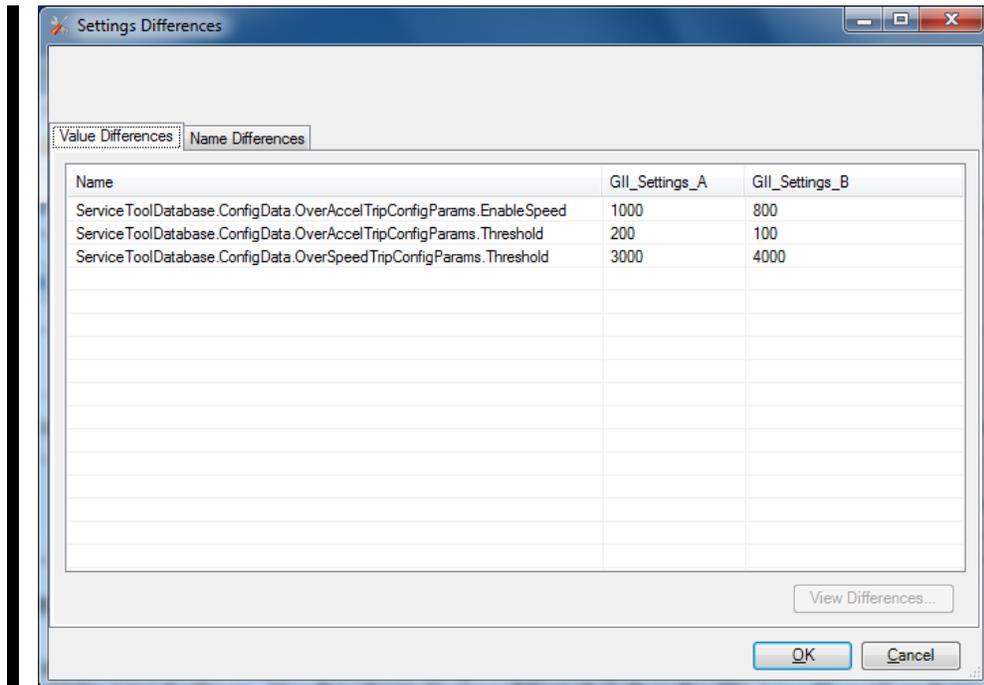
The ProTech-GII Programming and Configuration Tool can compare two configuration files. By selecting “Compare Settings File Differences”, the files can be compared for differences in either values and/or names.

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 – PCT

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
- Discrete Inputs
- Modbus

Functions:

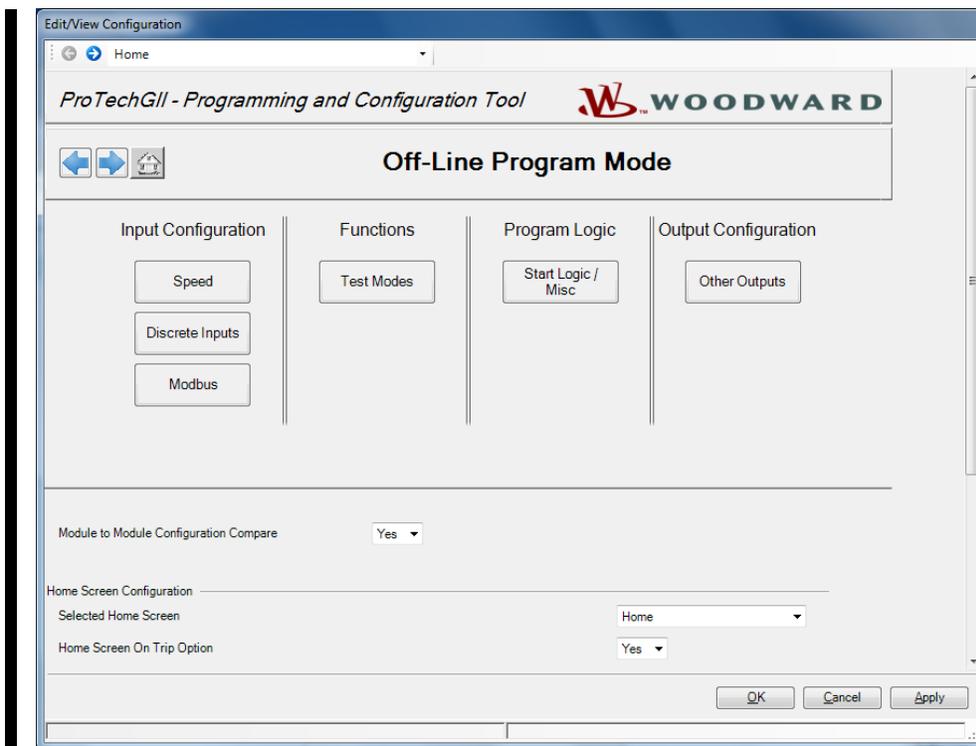
- Test Modes

Program Logic:

- Start Logic/Misc

Output Configuration:

- Other Outputs



The following parameters can be set:

Module Config Compare & Home Screen Functions

- **Module to Module Configuration Compare:** Set to “Yes” to have the module validate that its configuration file is identical to the other two modules’ configuration files.
- **Selected Home Screen:** Set the screen you want displayed when the “Home” screen button is pressed. Valid values:

Home	Modbus
Monitor Summary	Date & Time
Trip Latch, Alarm Latch	System Status
Dedicated Discrete Inputs	Module Information
Speed Input	Overspeed/Acceleration Log
Speed Redundancy Manager	Trip Log
Accel Redundancy Manager	Alarm Log
Speed Fail Timer	Peak Speed/Acceleration Log.
Analog Output	
- **Home Screen On Trip Option:** Set “Yes” to have the module switch to the “Home” screen on a sensing a trip condition. During system troubleshooting it may be useful to temporarily set this setting to “No” to allow other screens to be viewed during a trip event.

Speed and Redundancy Management

If the “Speed” button is selected, the following screen is displayed:

The screenshot shows the 'Edit/View Configuration' window for the 'Speed' mode. The title bar reads 'Edit/View Configuration' and the window title is 'Speed'. The main header includes 'ProTechGII - Programming and Configuration Tool' and the Woodward logo. Below the header is a navigation bar with buttons for 'Start Logic / Misc', 'Speed' (selected), 'Discrete Inputs', 'Modbus', 'Test Modes', and 'Other Outputs'. The main configuration area is divided into four sections:

- Configure Speed Input:**
 - Probe Type: Passive
 - Nr of Gear Teeth: 60
 - Gear Ratio: 1.0000
 - Overspeed Trip: 4000 RPM
 - Sudden Speed Loss: Trip
- Configure Acceleration:**
 - Enable Acceleration Trip: No
 - Acceleration Trip Enable Speed: 100 RPM
 - Acceleration Trip: 3000 RPM/s
- Speed Redundancy Management:**
 - Input 1: Not Used
 - Input 2: Not Used
 - Input 3: Not Used
 - Base Function (3 inputs): Median
 - Two Inputs Failed Action: Trip
 - Fallback Function (2 inputs): HSS
 - Difference Alarm Limit: 100 rpm
 - Difference Alarm Time: 500 ms
- Acceleration Redundancy Management:**
 - Input 1: Not Used
 - Input 2: Not Used
 - Input 3: Not Used
 - Base Function (3 inputs): Median
 - Fallback Function (2 inputs): HSS

At the bottom right, there are 'OK', 'Cancel', and 'Apply' buttons.

The following parameters can be set:

Configure Speed Input

- **Probe Type:** Select speed probe type. Valid values: Not Used, 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. A sudden speed loss is an instantaneous loss of speed to guarantee that it will be detected. The algorithm is: If the previous speed frequency (NOT RPM) was above 200 and the current speed frequency is 0 then Sudden Speed Loss. Speed is updated on every zero crossing, and 0 frequency is detected by no zero crossings on the speed input for 2 seconds.

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.

Speed Redundancy Management

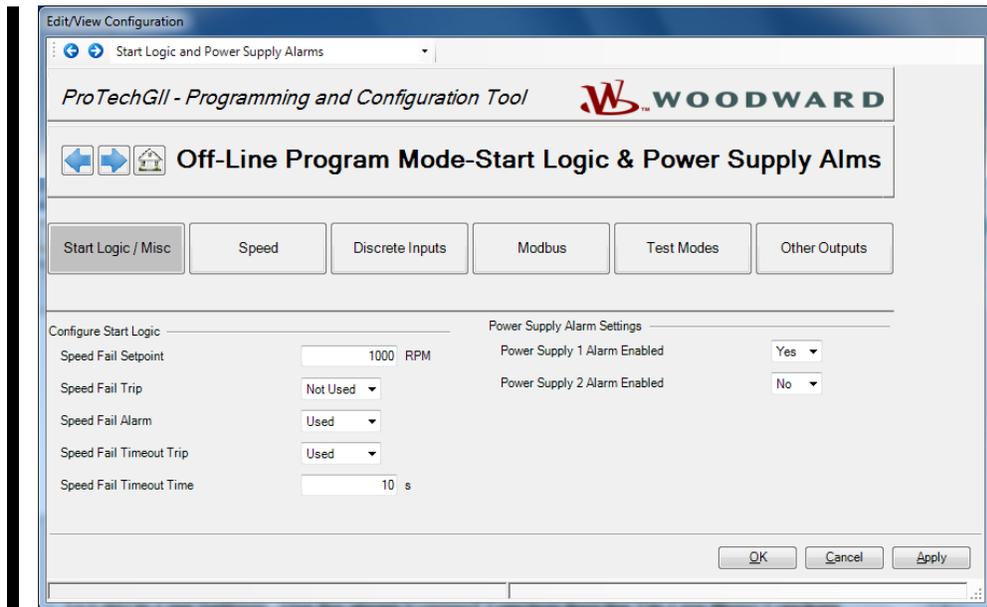
- **Input 1-3:** Select which modules will be supplying a speed signal to the redundancy manager. Selections are Module A Speed, Module B Speed, Module C Speed or Not Used.
- **Base Function (3 inputs valid):** Select the redundancy mode. Choices are Median, LSS (Low Signal Select), or HSS (High Signal Select).
- **Two Inputs Failed Action:** Selects the action when two speed signals have failed. Choices are Trip or No Trip.
- **Fallback Function (2 inputs valid):** Select the redundancy mode when only two of three speed signals are valid. Choices are HSS or LSS.
- **Difference Alarm Limit:** The amount the speeds are allowed to differ before the Difference Alarm is set. Valid values: 0-32000 rpm.
- **Difference Alarm Time:** The time the speed difference limit is allowed to exist before the Difference Alarm is set. Valid values: 4-10000 milliseconds.

Acceleration Redundancy Management

- **Input 1-3:** Select which modules will be supplying an acceleration signal to the redundancy manager. Selections are Module A Acceleration, Module B Acceleration, Module C Acceleration or Not Used.
- **Base Function (3 inputs valid):** Select the redundancy mode. Choices are Median, LSS (Low Signal Select), or HSS (high Signal Select).
- **Fallback Function (2 inputs valid):** Select the redundancy mode when only two of three speed signals are valid. Choices are HSS or LSS.

Start Logic & Power Supply Alarms

If the “Start Logic / Misc” button is selected, the following screen is displayed:



The following parameters can be set:

Configure Start Logic

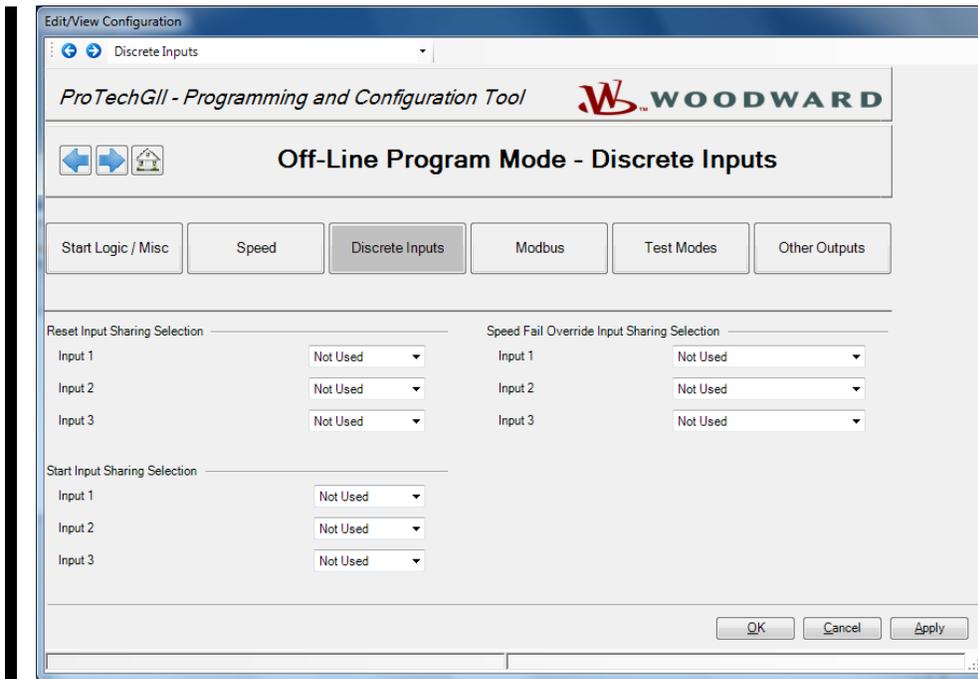
- **Speed Fail Setpoint:** Speed setpoint below which the speed signal is considered failed. Valid values: 0-25000 rpm.
- **Speed Fail Trip:** When Used, this trip is activated when speed is below the Speed Fail Setpoint and the Speed Fail Override discrete input is not closed. Valid values: Not Used 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.

Power Supply Alarm Settings

- **Power Supply 1 Alarm Enabled:** When used, this alarm is activated when power supply 1 output voltage is out of range. Valid values: No or Yes.
- **Power Supply 2 Alarm Enabled:** When used, this alarm is activated when power supply 2 output voltage is out of range. Valid values: No or Yes.

Discrete Inputs

If the “Discrete Input” button is selected, the following screen is displayed:



The following parameters can be set:

Reset Input Sharing Selection

- **Inputs 1-3:** This selection creates the “ORed” state for the dedicated discrete Reset input from each module. Selections are Module A Reset, Module B Reset, Module C Reset, or Not Used.

Start Input Sharing Selection

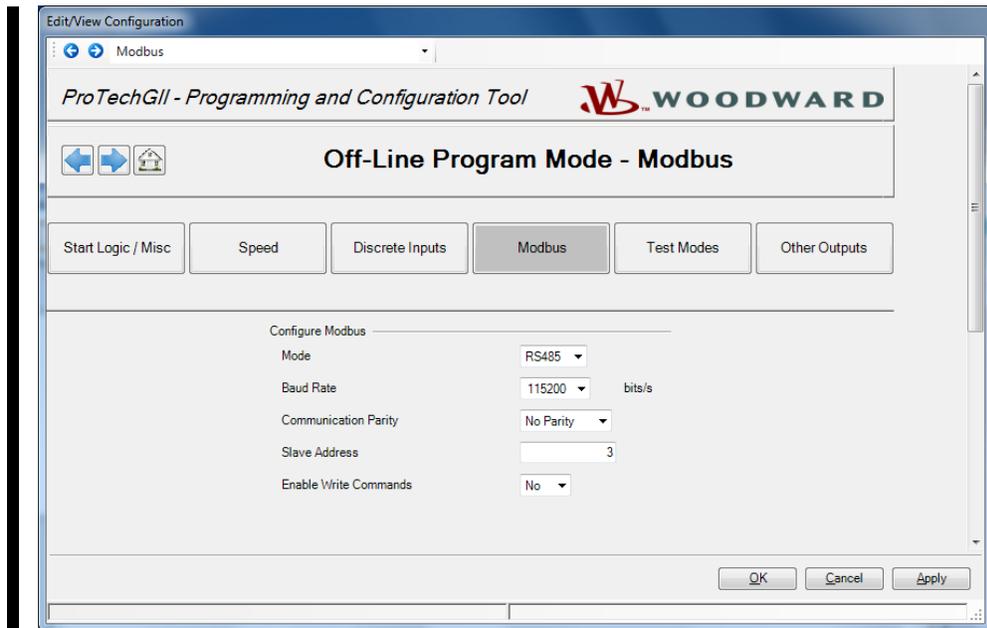
- **Inputs 1-3:** This selection creates the “ORed” state for the dedicated discrete Start input from each module. Selections are Module A Start, Module B Start, Module C Start, or Not Used.

Speed Fail Override Input Sharing Selection

- **Inputs 1-3:** This selection creates the “ORed” state for the dedicated discrete Speed Fail Override input from each module. Selections are Module A Speed Fail Override, Module B Speed Fail Override, Module C Speed Fail Override, or Not Used.

Modbus

If the “Modbus” button is selected, the following screen is displayed:



The following parameters can be set:

Configure Modbus

- **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 Auto Speed Test). See Monitor and Control section in the Modbus chapter. When set to no, Modbus becomes a monitor-only interface. Valid values: Yes or No.

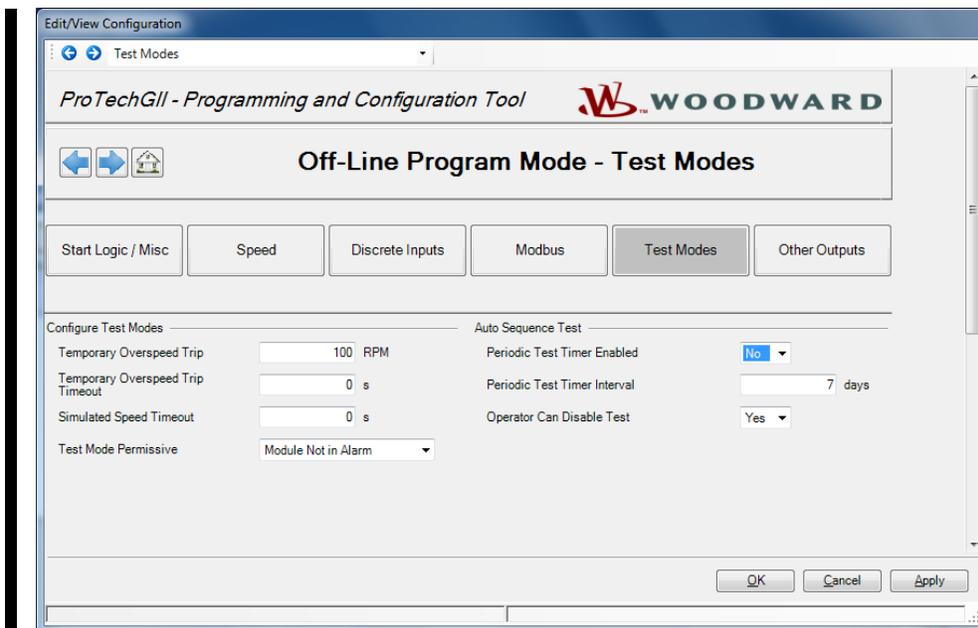
Test Modes

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 contains following tests:

- **Temporary Overspeed Setpoint Test**
This is an overspeed test with an adjusted test speed setpoint. The test is 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 the 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 a simulated speed signal from an internal frequency generator. The simulated speed signal starts at the overspeed setpoint minus 100 rpm and must be manually raised within the allowed time span above the overspeed setpoint 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 a simulated speed signal from an internal frequency generator. The simulated speed signal starts 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.
- Auto Sequence Test**
 This test function will automatically run the Auto Simulated Speed Test on all three modules at a configured test interval. Since module A initiates the test sequence, the Auto Sequence Test can only be configured on module A.
- Lamp Test**
 The lamp test verifies the front panel LED functionality by cycling through the color combinations. The test can be repeated as needed and a cancel option is 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 parameters can be set:

Configure Test Modes

- **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 Permissive:** This permissive function is used to prevent a test routine from running when another module is tripped, in alarm, or in a Test Mode. Selection choices are:
 - **No Inter-module Permissive:** Test will run even if another module is tripped, in alarm, or in a test mode.
 - **Module Not Tripped:** Test will only run if other modules are not tripped and not in a test mode.
 - **Module Not In Alarm:** Test will only run if other modules are not tripped, not in alarm, and not in a test mode.

Auto Sequence Test

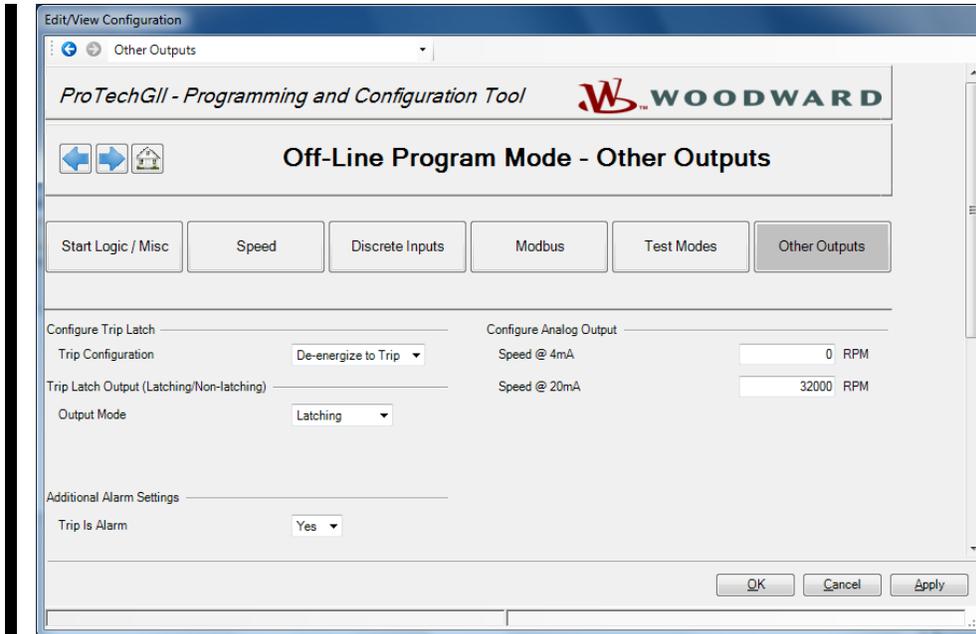
- **Periodic Test Timer Enabled:** Set to yes to use the function. Valid values: Yes or No.
- **Periodic Test Timer Interval:** Interval time for the Auto Sequence test (how often it runs). Valid values: 1-999 days.
- **Operator can disable test:** Set to yes to permit test intervention. Test disable 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 the “Other Outputs” button is selected, the following screen is displayed:



The following parameters can be set:

Configure Trip Latch

- **Trip Configuration:** Select the voter relay action when a trip occurs. Valid values: De-energize to Trip or Energize to Trip.

Trip Latch Output

- **Output Mode:** Select the trip latch functionality. Valid values: Latching or Non Latching.

Additional Alarm Settings

- **Trip is Alarm:** Select if a trip will also be an alarm. Valid values: No or Yes.

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.

Configuration Check Message Summary

1. Warning—*<block identifier>* has unconfigured inputs.
2. Error—*<block identifier>* is not used but has outputs connected.
3. Error—*<block identifier>* is set to an invalid or out-of-range value.
4. Error—*<block identifier>* configuration contains data that is invalid (out-of-range).

Configuration Check Definitions

1

Text:	Warning – <i><block identifier></i> has unconfigured inputs.
Condition:	The identified block has inputs that are not configured. The following configurations will trigger this error: <ol style="list-style-type: none"> 1. Speed Redundancy Manager with less than two inputs configured. 2. Acceleration Redundancy Manager with less than two inputs configured.
Example:	<i>Warning - Speed Redundancy Mgr has unconfigured inputs.</i> The Speed Redundancy Manager block but has only 1 input configured. This is valid but could be a configuration mistake.

2

Text:	Error – <i><block identifier></i> is not used but has outputs connected.
Condition:	The identified function is configured as 'Not Used' but has connected outputs. This error applies to the Speed Input.
Example:	<i>Error – Speed Sense is not used but has outputs connected.</i> The Speed Sense block is connected to the Speed Redundancy Manager but Speed Sense is configured as 'Not Used'.

3

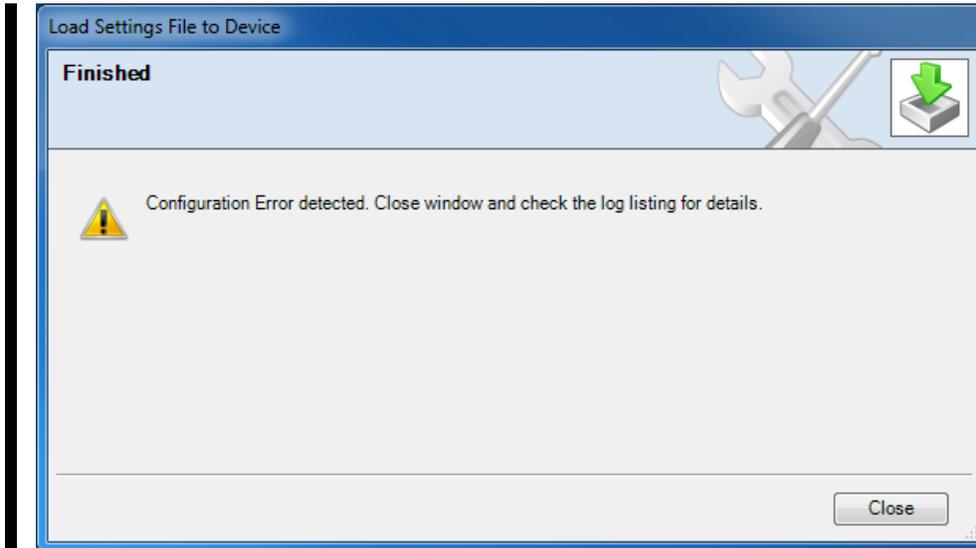
Text:	Error – <i><block identifier></i> is set to an invalid or out-of-range value.
Condition:	The identified block has inputs that are configured to values that are not allowed or are out of range. This error applies to the Overspeed Trip Setting and the Temporary Overspeed Trip Setting. The calculated frequency equivalent of the RPM setting [i.e., $(\text{RPM} \times \text{GearTeeth} \times \text{GearRatio}) / 60$] is greater than 32000.

4

Text:	Error – <i><block identifier></i> configuration contains data that is invalid (out-of-range).
Condition:	A setting has been detected that is out of the range allowed. This error condition needs to be corrected in the Programming and Configuration Tool (PCT) and should be reported to Woodward for correction.

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 while a settings file is loaded to the ProTech. If there is an error, the settings are not changed. 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 8.

Modbus Communications

Introduction

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.

Each module's Modbus port is fully isolated from the other modules and provides all module-based information (Input/Output channel state information, alarm and trip relay information, first-out indication, etc.). However, it can also be used to sense the following information from the other two modules:

- Sensed speed – other two modules
- Acceleration – other two modules
- Alarm Latch State – other two modules
- Trip Latch State – other two modules

Note: Modbus-based write commands (for test purposes) to each module can only be given to the module via its respective Modbus port.

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, depending on the specific application's requirements. 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 to "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, not in a test mode, and optionally not in alarm.

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:

Code	Definition	Reference Address
02	Boolean Read (Read Input Status) (Status of Alarms/Shutdowns, Discrete input/outputs)	1XXXX
04	Analog Read (Read Input Registers) (Speed, Acceleration, etc)	3XXXX
05	Boolean Write (Force Single Coil) (Reset and Test Initiate Commands)	0XXXX
08	Loopback Diagnostic Test – Diagnostic code 0 only	

Table 8-1. Supported Modbus Function Codes

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.

Modbus 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

Table 8-2. Modbus Serial Communication Port Settings

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 nor available with this device. Reserved address ranges can be read, but they are undefined for ProTech-GII.

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. No password is required when issuing a command using Modbus. The available write commands are listed in Table 8-3.

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. Depending on the "Test Mode Permissive" setting, attempts to start a test may be ignored when another test mode is active, another module is tripped, another module is in a test mode, or another module is in alarm.

Speed/user tests must be requested by first setting the Initiate bit, followed by 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 that 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 8-4.

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 8-5.

Heartbeat indication (1:1501)

The Heartbeat indication provides an indication that toggles every 1 second between logic 1 and logic 0.

Last Trip time and date indication (3:1001 - 1007)

Last Trip Date/Time represents the Date/Time of the most recent first out trip.

Unit Health indication (3:1101)

This register indicates the state of the internal fault trip (if known) as follows:

- 0 = internal fault trip is TRUE (Unit Health LED is red)
- 1 = internal fault trip is FALSE (Unit Health LED is green)
- 2 = state of the internal fault trip is unknown because of a communication fault (Unit Health LED is off)

Auto-Sequence Test Status (3:1201)

This register indicates the state of the Auto Sequence Test as follows:

- 0 = Not Started
- 1 = Passed
- 2 = Failed
- 3 = Not Completed

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

Table 8-3. Boolean Write Addresses (Code 05)

ADDRESS	DESCRIPTION
1:0001	Internal Fault Trip
1:0002	Power Up Trip
1:0003	Configuration Trip
1:0004	Parameter Error Trip
1:0005	Over Speed Trip
1:0006	Over Accel Trip
1:0007	Speed Redundancy Manager Trip
1:0008	Speed Probe Open Wire Trip
1:0009	Speed Lost Trip
1:0010	Speed Fail Trip
1:0011	Speed Fail Timeout Trip
1:0012 to 1:0039	Reserved
1:0101	First Out - Internal Fault Trip
1:0102	First Out - Power Up Trip
1:0103	First Out - Configuration Trip
1:0104	First Out - Parameter Error Trip
1:0105	First Out - Over Speed Trip
1:0106	First Out - Over Accel Trip
1:0107	First Out - Speed Redundancy Manager Trip
1:0108	First Out - Open Wire Detected Trip
1:0109	First Out - Speed Lost Trip
1:0110	First Out - Speed Fail Trip
1:0111	First Out - Speed Fail Timeout Trip
1:0112 to 1:0137	Reserved
1:0201	Internal Fault Alarm
1:0202	Module Config Mismatch Alarm
1:0203	Power Supply 1 Fault Alarm
1:0204	Power Supply 2 Fault Alarm
1:0205	Speed Fail Alarm
1:0206	Speed Lost Alarm
1:0207	Speed Probe Open Wire Alarm
1:0208	Speed Red Mgr Input Difference Alarm
1:0209	Speed Red Mgr Input 1 Invalid Alarm
1:0210	Speed Red Mgr Input 2 Invalid Alarm
1:0211	Speed Red Mgr Input 3 Invalid Alarm
1:0212	Temp Overspeed SP is Active Alarm
1:0213	Simulated Speed Test in Progress Alarm
1:0214	Auto Speed Test Active Alarm
1:0215	Auto Speed Test Failed Alarm
1:0216	Auto Sequence Test Active Alarm
1:0217 to 1:0222	Reserved
1:0223	Trip Latch Output Alarm
1:0224 to 1:298	Reserved
1:1001	Speed Fail Override
1:1002	Overspeed
1:1003	Over-acceleration
1:1004	Speed Fail Trip Non-Latched

ADDRESS	DESCRIPTION
1:1005	Speed Fail Timeout
1:1006	Speed Lost Alarm Non-Latched
1:1007	Speed Lost Trip Non-Latched
1:1008	Speed Probe Open Wire Trip Non-Latched
1:1009	Tmp Ovrspd Setpoint On
1:1010	Simulated Speed Active
1:1011	Auto Speed Test Active
1:1012	Auto Speed Test Failed
1:1013	Auto Sequence Test Active
1:1014 to 1:1017	Reserved
1:1018	Configuration Mismatch
1:1019	Speed Fail Alarm Non-Latched
1:1020	Trip Latch Output
1:1021	Alarm Latch Output
1:1022 to 1:1205	Reserved
1:1206	Internal Fault Trip Non-Latched
1:1207	Internal Fault Alarm Non-Latched
1:1208	Configuration Error
1:1209	Reserved
1:1210	Power Supply 1 Fault
1:1211	Power Supply 2 Fault
1:1212	Parameter Error
1:1213 to 1:1333	Reserved
1:1334	Speed Red Mgr Input 1 Invalid
1:1335	Speed Red Mgr Input 2 Invalid
1:1336	Speed Red Mgr Input 3 Invalid
1:1337	Speed Red Mgr Input Difference
1:1338	Accel Red Mgr Input 1 Invalid
1:1339	Accel Red Mgr Input 2 Invalid
1:1340	Accel Red Mgr Input 3 Invalid
1:1341	Speed Probe Open Wire Alarm Non-Latched
1:1342	Speed Red Mgr Trip Non-Latched
1:1343 to 1:1345	Reserved
1:1401 to 1:1430	Reserved
1:1431	Module A Trip Latch Out
1:1432	Module A Alarm Latch Out
1:1433	Module B Trip Latch Out
1:1434	Module B Alarm Latch Out
1:1435	Module C Trip Latch Out
1:1436	Module C Alarm Latch Out
1:1501	Heartbeat

Table 8-4. Boolean Read Addresses (Code 02)

ADDRESS	DESCRIPTION	UNITS	RANGE
3:0001	Speed (after Speed Red Mgr, if used)	RPM	0 to 32500
3:0002	Acceleration (after Accel Red Mgr, if used)	RPM/Sec	-32500 to 32500
3:0003	Module A Speed	RPM	0 to 32500
3:0004	Module A Acceleration	RPM/Sec	-32500 to 32500
3:0005	Module B Speed	RPM	0 to 32500
3:0006	Module B Acceleration	RPM/Sec	-32500 to 32500
3:0007	Module C Speed	RPM	0 to 32500
3:0008	Module C Acceleration	RPM/Sec	-32500 to 32500
3:0009	Overspeed Setpoint (Local)	RPM	0 to 32500
3:0601	Test Mode Time Remaining	seconds	0 to 65535
3:0701	Speed Fail Time Remaining	seconds	0 to 65535
3:0901	Temp Overspeed Setpoint	RPM	0 to 65535
3:0902	Simulated Speed RPM	RPM	0 to 65535
3:1001	Last Trip Month	Months	1 to 12
3:1002	Last Trip Day	Days	1 to 31
3:1003	Last Trip Year	Years	2000 to 2099
3:1004	Last Trip Hour	Hours	0 to 23
3:1005	Last Trip Minute	Minutes	0 to 59
3:1006	Last Trip Second	seconds	0 to 59
3:1007	Last Trip Milli-Second	milliseconds	0 to 999
3:1101	Unit Health Status	E num	0 to 2
3:1201	Auto-Sequence Test Status	E num	0 to 3

Table 8-5. Analog Read Addresses (Code 04)

Note:

The Last Trip time and date indication registers (3:1001 - 1007) are provided for use as a way to time-stamp when a trip condition occurs. With this logic, when a trip condition occurs, the first sensed trip condition will be indicated by one of the registers (1:0101 - 0111) changing to a true state. When one of those registers change to a true state, then the Last Trip time and date indication registers (3:1001 - 1007) will indicate the sensed date and time of the event. This Date/Time will remain locked in these registers until the next trip condition occurs.

Chapter 9. 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.

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.

Table 9-1. Trip Relay Safe State Configuration

SIL Specifications

PFD = Probability of Failure to perform a safety function on Demand

PFH = Probability of a dangerous Failure per Hour (High Demand or Continuous mode of operation)

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

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	1 year
Safe Failure Fraction	
SFF > 90%	
Diagnostic Coverage	
DC > 90%	

Table 9-2. SIL Specifications

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.

MTTF
> 54 000 years

Table 9-3. Failure Rate

Because of the nature of the 2oo3 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 in this manual. Refer to Chapter 3 of this manual and Figures 3-14 to 3-18 for ProTech-GII based response time information.

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 and configuration.

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 12 (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 2oo3 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 over 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 multi-meter 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. 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).
5. 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 100Ω .
 - b. With module tripped, resistance measurement from 1A—1B, or 2A—2B must be greater than $1 M\Omega$.
6. 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.
7. If possible, compare external speed with measured speed reading on the ProTech-GII display.
8. 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.
9. Chassis isolation checks using resistance measurement. Measure from terminals 66, 67 to a point on the ProTech-GII chassis (the grounding braid is a good place for this measurement): $< 1 \Omega$.
10. Perform a lamp test from front panel Test Menu.

Chapter 10.

Troubleshooting

Introduction

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

Problem or Diagnostic Indication	Possible Cause	Suggested Actions
Power Supply Inputs not working properly. Power supply input alarm present.	<p>Wiring fault, terminal block loose.</p> <p>Power source breaker or fuse open.</p> <p>Only one power supply is connected.</p> <p>Power supply input out of range or insufficient rating.</p>	<p>Verify the wiring and terminal block connections.</p> <p>Verify breaker or fuse.</p> <p>On the front panel, press the VIEW button under the ALARM LED and check for Power Supply 1 or 2 Fault.</p> <p>Check input voltage level and verify it is within acceptable range per electrical specifications. Also check that the power supply has appropriate rating to power the ProTech-GII.</p>
Speed Input not working	<p>Wiring fault, terminal block loose.</p> <p>Configuration</p> <p>Alarms and Faults</p> <p>Signal level</p> <p>Active Probe Power</p>	<p>Verify the wiring and terminal block connections.</p> <p>On the front panel, check the Speed Input Configure Menu and verify that all proper configuration options are selected.</p> <p>Verify there are no alarms or faults that may indicate a setup problem (open wire trip, speed lost, speed fail, etc.)</p> <p>Verify the input signal levels are within the electrical specifications. Also verify shield connections.</p> <p>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 \pm10%. Attach probe and measure again to verify the probe is not overloading the voltage provided by the ProTech-GII.</p>
Dedicated discrete input not working (Start, Reset or Speed Fail Override)	<p>Wiring fault, terminal block loose.</p> <p>Configuration</p> <p>Signal source not working correctly or not within acceptable electrical specifications.</p> <p>Internally supplied wetting voltage fault.</p>	<p>Verify the wiring and terminal block connections.</p> <p>On the front panel, check the Dedicated Discrete Inputs Monitor Menu and verify the logic state is correct.</p> <p>Check signal level and verify it is within acceptable range per electrical specifications.</p> <p>Measure voltage from terminal 1 to terminal 81 and verify it is 23 V \pm2 V. If out of range, return unit to Woodward.</p>

Problem or Diagnostic Indication	Possible Cause	Suggested Actions
Trip relays not working	<p>Wiring fault, terminal block loose.</p> <p>Configuration</p> <p>External supplies</p>	<p>Verify the wiring and terminal block connections.</p> <p>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.</p> <p>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 \pm10%. 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.</p>
Alarm relay output not working	<p>Wiring fault, terminal block loose.</p> <p>External supplies</p>	<p>Verify the wiring and terminal block connections.</p> <p>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 \pm10%. 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.</p>
Analog Output not working	<p>Wiring fault, terminal block loose.</p> <p>Configuration</p>	<p>Verify the wiring and terminal block connections.</p> <p>On the front panel, check the Monitor Analog Output Menu and verify that the analog output is reading an expected output value.</p> <p>Measure the current from terminal 64 and verify it corresponds to the previous step.</p> <p>Verify the load on the analog output is within the electrical specifications.</p> <p>Using the PCT or front panel, verify the scaling is correct.</p>
MODBUS not working	<p>Wiring fault, terminal block loose.</p> <p>Configuration</p>	<p>Verify the wiring and terminal block connections. In particular, verify the HI and LO wires are terminated to the correct terminals for RS-485 and likewise for TXD and RXD for RS-232. Also verify the terminations jumpers are installed for RS-485 mode</p> <p>Using the PCT or front panel, verify the correct settings are selected.</p>

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

Table 10-1. I/O Troubleshooting

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 (if configured for De-energize to 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	The trip was issued from the front panel to enter configuration mode or issued internally to keep module in a tripped state while saving a configuration.	The module is actively being configured or a configuration is being saved.	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 12 of this manual.

Problem or Diagnostic Indication	Description	Possible Cause	Suggested Actions
Overspeed Trip (if speed redundancy or the speed probe is used)	The module tripped on an overspeed event.	Turbine or equipment overspeed Configuration	Check trip system prior to operating turbine or equipment, including ProTech-GII built-in simulated speed tests to verify ProTech-GII functionality. Using the PCT or front panel, verify the correct settings are selected.
Over-acceleration Trip (if speed redundancy or the speed probe is used)	The over-acceleration function is enabled and the module tripped on an over-acceleration event.	Rapid turbine or equipment acceleration Configuration	Check trip system prior to operating turbine or equipment, including ProTech-GII built-in simulated speed tests to verify ProTech-GII functionality. Using the PCT or front panel, verify the correct settings are selected.
Speed Probe Open Wire Trip (if speed redundancy is not used)	The module 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 Redundancy Manager Trip (if speed redundancy is used)	This trip will indicate that the ProTech has too many failed probes to run.	Can be configured to trip on loss of 1 or 2 probes	Check wiring continuity and probe integrity.
Speed Lost Trip (if the speed probe is used)	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 (if speed redundancy or the speed probe is used)	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 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 to verify proper configuration settings.
Speed Fail Timeout (if speed redundancy or the speed probe is used)	Start logic—Speed Fail Timer is enabled and the module has not detected speed within the time set by the Speed Fail Timeout setting.	Wiring fault, speed probe fault Incorrect speed fail timeout time configured	Check wiring continuity and probe integrity. See manual for description of function. Use PCT to verify proper configuration settings.

Table 10-2. Trip Indications

Alarm Indications

Problem or Diagnostic Indication	Description	Possible Cause	Suggested Actions
Internal Fault Alarm	The module has an internal fault that 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 Compare is enabled and 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 the Programming and Configuration Tool.
Power Supply 1 Fault	Power supply 1 fault is enabled and 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	Power supply 2 fault is enabled and 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 (if the speed probe is used)	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.
Speed Probe Open Wire Alarm (if speed redundancy is used)	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 RM Difference (if speed redundancy is used)	One of the speed probes is reading different from the others.	Wiring fault, speed probe fault. Incorrect speed gear ratio or number of teeth configured,	Check wiring continuity and probe integrity, replace probe. Check speed sensor configuration.

Problem or Diagnostic Indication	Description	Possible Cause	Suggested Actions
Speed RM In 1 Invalid (if speed redundancy is used)	The Input 1 signal to the speed redundancy manager block is failed –(may be from other module).	Wiring fault or probe fault.	Verify which module speed input is connect to input #1, then check wiring continuity and probe integrity, replace probe.
Speed RM In 2 Invalid (if speed redundancy is used)	The Input 2 signal to the speed redundancy manager block is failed –(may be from other module).	Wiring fault or probe fault.	Verify which module speed input is connect to input #2, then check wiring continuity and probe integrity, replace probe.
Speed RM In 3 Invalid (if speed redundancy is used)	The Input 3 signal to the speed redundancy manager block is failed –(may be from other module).	Wiring fault or probe fault.	Verify which module speed input is connect to input #3, then check wiring continuity and probe integrity, replace probe.
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.
Auto Sim. Speed Test	Indicates the automated simulated overspeed test has been activated.	User initiated simulated speed test.	See manual for description and limitations.
Auto Sim Spd Test Failed	Indicates the automated simulated overspeed test failed.	Internal problem with the unit.	Return unit to Woodward.
Auto Sequence Test	Indicates the automated Auto Sequence Test has been activated.	User enabled the auto sequence 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.

Table 10-3. Alarm Indications

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.

	Parameter	Option/Range	Default	User Setting
SPEED INPUTS	Probe Type	Not Used / 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
SPEED REDUNDANCY MANAGER	Input 1	Not Used / Module A Speed / Module B Speed / Module C Speed	Not Used	
	Input 2	Not Used / Module A Speed / Module B Speed / Module C Speed	Not Used	
	Input 3	Not Used / Module A Speed / Module B Speed / Module C Speed	Not Used	
	Base Function (3 inputs)	Median / HSS / LSS	Median	
	Two Inputs Failed Action	Trip / No Trip	No Trip	
	Fallback Function (2 inputs)	HSS / LSS	HSS	
	Difference Alarm Limit	0-32000 rpm	100	
	Difference Alarm Time	4-10000 ms	500	

	Parameter	Option/Range	Default	User Setting
ACCELERATION REDUNDANCY MANAGER	Input 1	Not Used / Module A Accel / Module B Accel / Module C Accel	Not Used	
	Input 2	Not Used / Module A Accel / Module B Accel / Module C Accel	Not Used	
	Input 3	Not Used / Module A Accel / Module B Accel / Module C Accel	Not Used	
	Base Function (3 inputs)	Median / HSS / LSS	Median	
	Fallback Function (2 inputs)	HSS / LSS	HSS	

	Parameter	Option/Range	Default	User Setting
DISCRETE INPUTS	Reset Input Sharing	Not Used / Module A Reset / Module B Reset / Module C Reset	Not Used	
	Start Input Sharing	Not Used / Module A Start / Module B Start / Module C Start	Not Used	
	Speed Fail Override Input Sharing	Not Used / Module A SFO / Module B SFO / Module C SFO	Not Used	

	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)	

	Parameter	Option/Range	Default	User Setting
TRIP LATCH	Trip Configuration	De-Energize to Trip / Energize to Trip	De-Energize to Trip	
	Trip Latch Output	Latching / Non- Latching	Latching	

	Parameter	Option/Range	Default	User Setting
ALARM LATCH	Trip is Alarm	Yes/No	Yes	

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

	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 Permissive	No Inter-module Permissive / Module Not Tripped / Module Not In Alarm	Module Not In Alarm	

	Parameter	Option/Range	Default	User Setting
AUTO SEQUENCE TEST (Module A)	Periodic Test Timer Enabled	Yes/No	0	
	Periodic Test Timer Interval	1 to 999 days	7	
	Operator Can Disable Test	Yes/No	Yes	

	Parameter	Option/Range	Default	User Setting
MODBUS	Mode	RS-232 / RS-485	RS-232	
	Baud Rate	19200 38400 57600 115200	19200	
	Parity	No Parity / Even Parity / Odd Parity	No Parity	
	Slave Address	1-247	1	
	Enable Write Commands	Yes / No	No	

	Parameter	Option/Range	Default	User Setting
POWER SUPPLY ALARMS	Enable Power Supply #1 Alarm	Yes / No	Yes	
	Enable Power Supply #2 Alarm	Yes / No	Yes	

	Parameter	Option/Range	Default	User Setting
DISPLAY	Selected Home Screen	All Pages	Home	
	Home Screen On Trip Option	Yes / No	Yes	

	Parameter	Option/Range	Default	User Setting
CONFIGURATION COMPARE	Enable Configuration Compare	Yes / No	Yes	

PASSWORD CHANGE –

Test Level Password _____

Config Level Password _____

Chapter 12.

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 **Recognized Turbine Retrofitter (RTR)** is an independent company that does both steam and gas turbine control retrofits and upgrades globally, and can provide the full line of Woodward systems and components for the retrofits and overhauls, long term service contracts, emergency repairs, etc.

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 (129) 4097100
Kempen	+49 (0) 21 52 14 51	India	+91 (129) 4097100	Japan	+81 (43) 213-2191
Stuttgart	+49 (711) 78954-510	Japan	+81 (43) 213-2191	Korea	+82 (51) 636-7080
India	+91 (129) 4097100	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 13. 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 to 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.



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

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

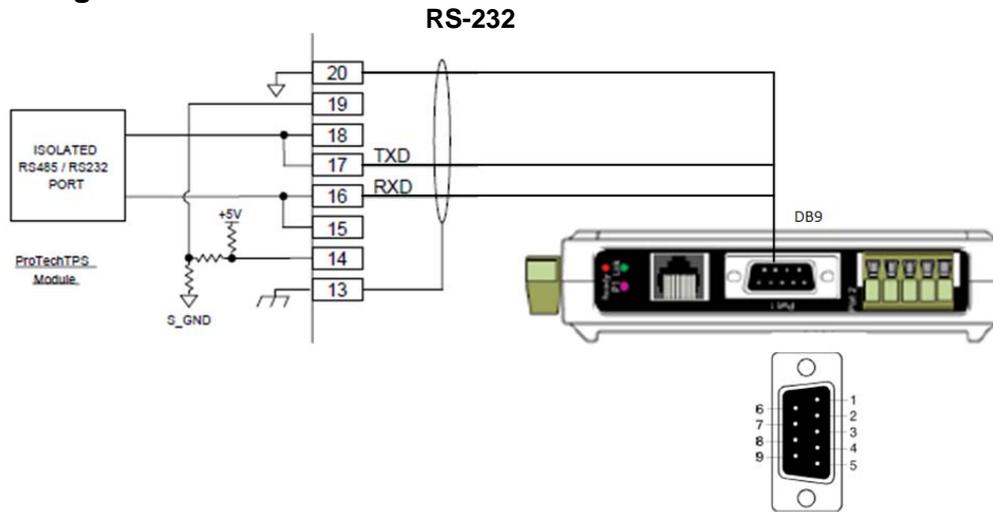
Phone: 1-800-422-7055
 Email: sales@lantronix.com
 Web: www.lantronix.com



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

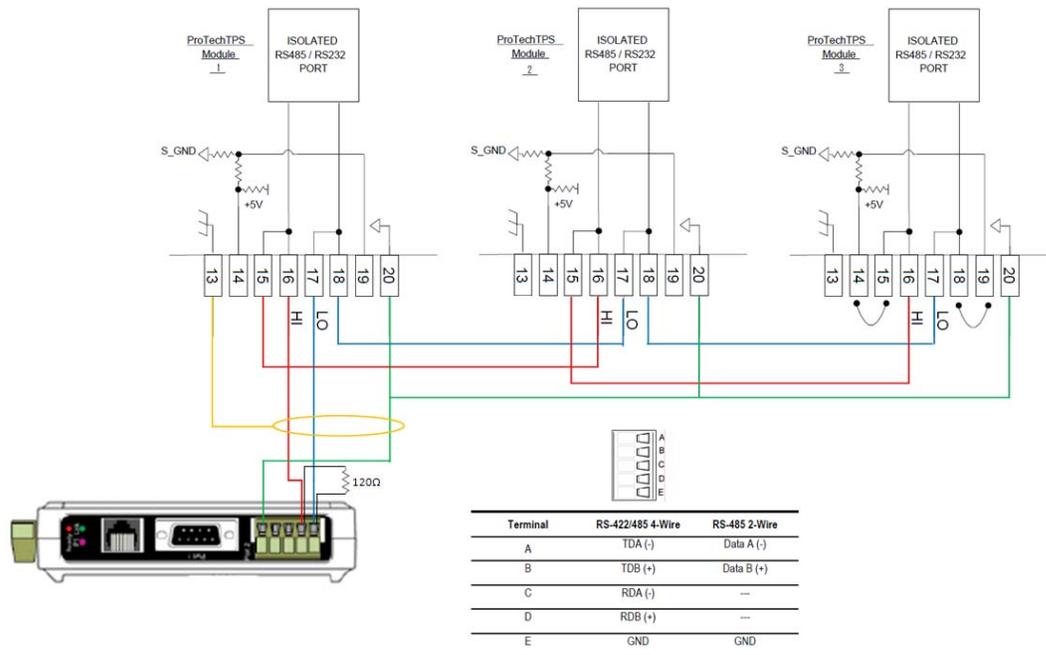


DB9 M Pin	Direction	RS-232
1	Input	DCD
2	Input	RXD
3	Output	TXD
4	Output	DTR
5	—	GND
6	Input	DSR
7	Output	RTS
8	Input	CTS
9	Input	RI

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 Ω) 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

Vlinx Modbus Gateway Manager 1.3.0

Open Save Search Upgrade Diagnostic Monitor About

Which device do you want to configure? Choose the device by clicking on one of the devices in the list below.

Server Name Connection Mac-Address

MESR901-000EBE000C38 192.168.1.2 00:0E:0E:00:0C:38

VLINX™ Modbus Gateway

MESR901-000EBE000C38 (192.168.1.2)

Contents

- General
- Network**
- Modbus TCP
- Port 1 Serial
- Port 1 Modbus
- Port 1 ID Remap
- Modbus ID Routing
- Modbus Priority
- Save
- Logout

Network

I want DHCP to setup the network.

IP Address:

Subnet Mask:

Default Gateway:

Save Back Next

Help

DHCP controls whether or not a DHCP server is used to set the IP address, subnet mask and default gateway of the Modbus Gateway.

When DHCP option is enabled but the DHCP server is not found, the Modbus Gateway will automatically configure an IP address in the range of 169.254.0.0 through 169.254.255.255 with a subnet mask 255.255.0.0.

IP Address field contains static internet protocol address of the Modbus Gateway.

Subnet Mask field contains mask that is used to define sub-network.

For Class A network (IP address: 0.0.0.0 through 127.255.255.255), the default subnet mask is 255.0.0.0.

For Class B network (IP address: 128.0.0.0 through 191.255.255.255), the default subnet mask is 255.255.0.0.

For Class C network (IP address: 192.0.0.0 through 223.255.255.255), the default subnet mask is 255.255.255.0.

For Class D network (IP address: 224.0.0.0 through 239.255.255.255) and Class E network (IP address: 240.0.0.0 through 255.255.255.255), the subnet mask is ignored.

Default Gateway field contains default route to remote networks.

Modbus TCP Settings

Vlinx Modbus Gateway Manager 1.3.0

Open Save Search Upgrade Diagnostic Monitor About

Which device do you want to configure? Choose the device by clicking on one of the devices in the list below.

Server Name Connection Mac-Address

MESR901-000EBE000C38 192.168.1.2 00:0E:0E:00:0C:38

VLINX™ Modbus Gateway

MESR901-000EBE000C38 (192.168.1.2)

Contents

- General
- Network
- Modbus TCP**
- Port 1 Serial
- Port 1 Modbus
- Port 1 ID Remap
- Modbus ID Routing
- Modbus Priority
- Save
- Logout

Modbus TCP

TCP Client Settings

Connect to Port:

Response Timeout:

TCP Server Settings

Listen on Port:

Limit the number of connections to:

and allow everyone to connect

and allow a specific IP address to connect

and allow a specific range of IP addresses to connect

Save Back Next

Help

Connect to port identifies TCP port to be used by the Modbus Gateway in TCP client mode. Valid value range is from 1 to 65535.

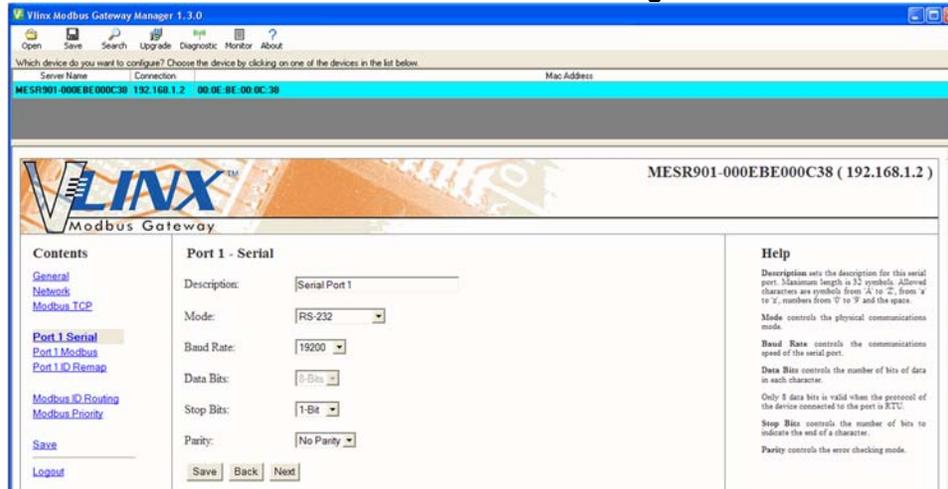
Response timeout is the maximum amount of time to wait for a response to request that is sent to the device connected through TCP. Valid value range is from 1 to 65535.

Listen on port identifies TCP port to be used by the Modbus Gateway in TCP server mode. Valid value range is from 1 to 65535.

Maximum Clients controls the number of simultaneous TCP clients that can be connected.

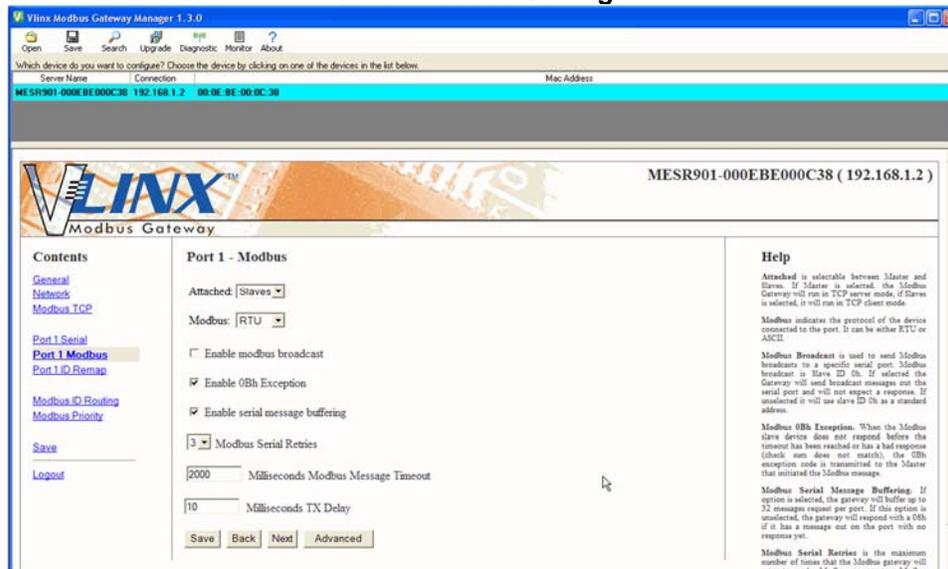
Connection Filter Mode controls which TCP clients can connect.

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

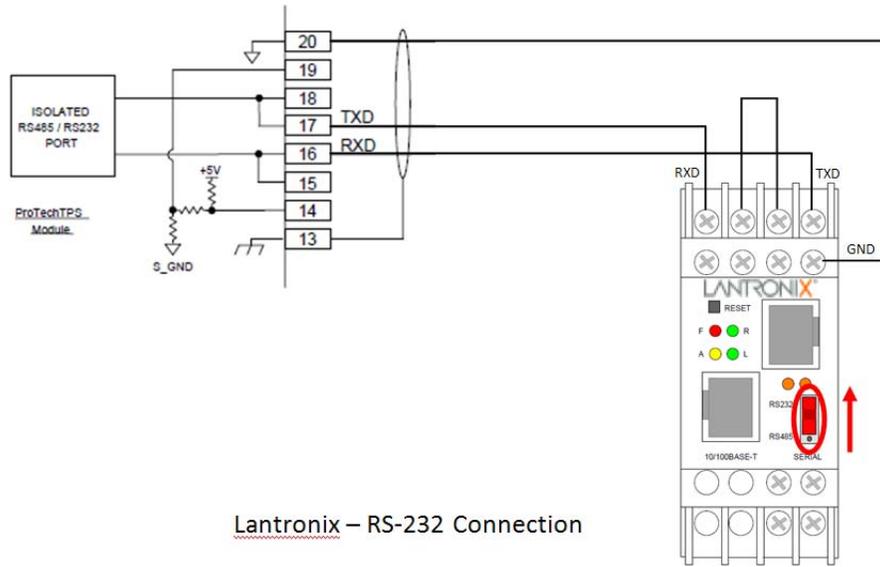


Lantronix Setup

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 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

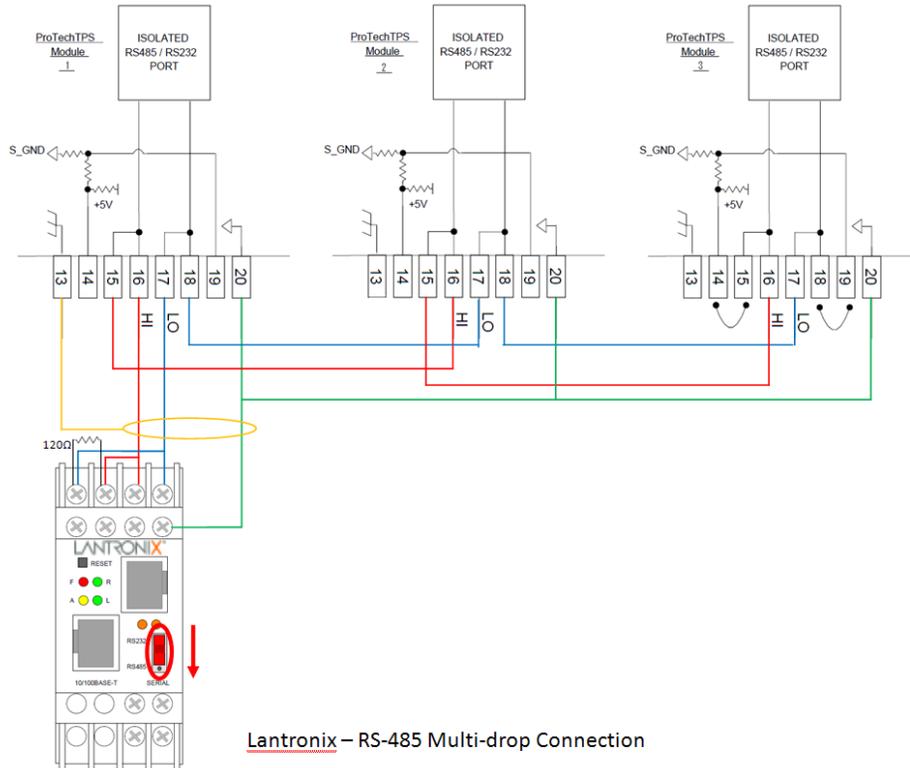
RS-232



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



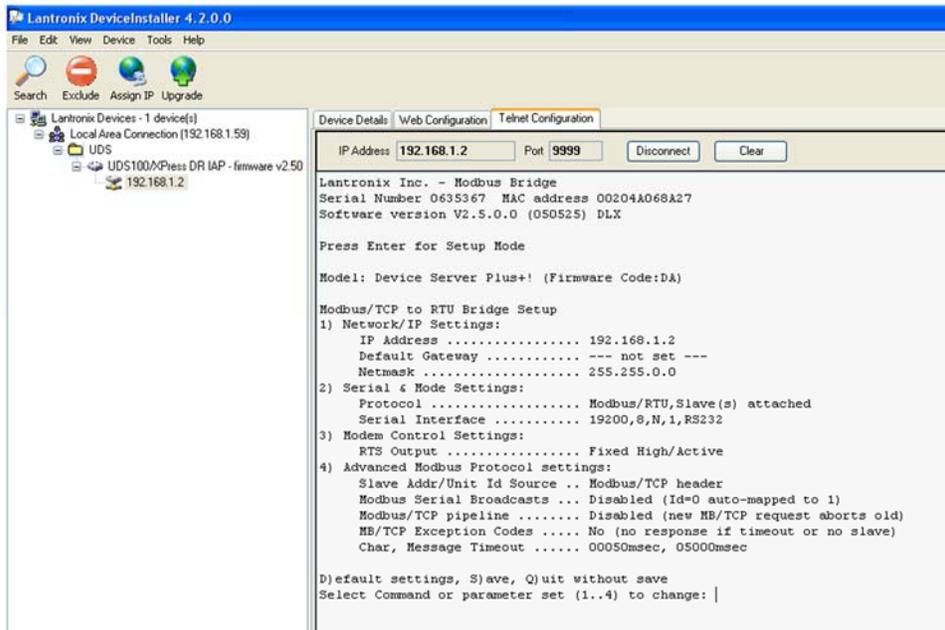
Lantronix – RS-485 Multi-drop Connection

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 Ω) 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.

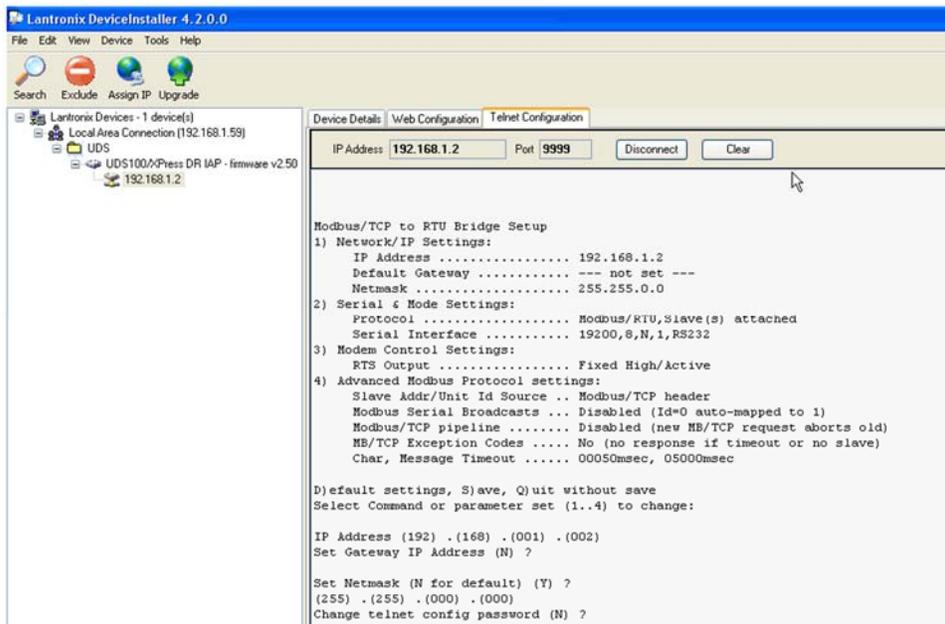
Configuration

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

Overview



Network Menu

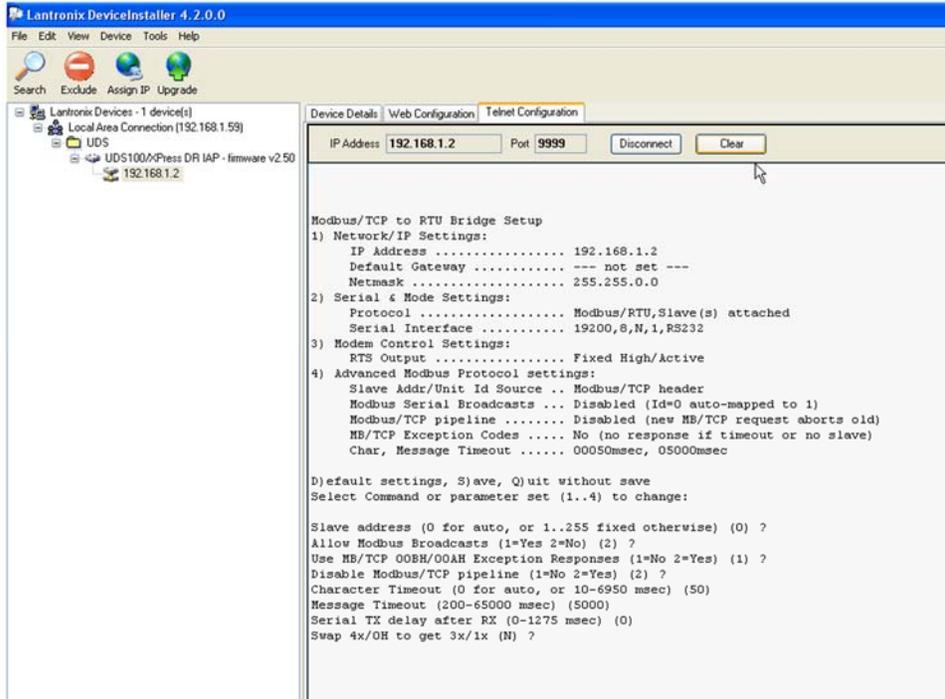


Serial Settings Menu

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 E—

- Updated screen shots and Configure Language information

Changes in Revision D—

- Expanded/clarified Module Removal & Installation section (Chapter 2)

Changes in Revision C—

- Updates throughout

Changes in Revision B—

- Major updates throughout

Changes in Revision A—

- Added new part number (8237-1660)
- Updated information on PN 8237-1656 (Table 1-1)

Declarations

DECLARATION OF CONFORMITY

Manufacturer's Name: WOODWARD GOVERNOR COMPANY (WGC)

Manufacturer's Address: 1000 E. Drake Rd.
Fort Collins, CO, USA, 80525

Model Name(s)/Number(s): ProTech®-GII, ProTech® TPS, and the MicroNet® Safety Module

Conformance to Directive(s): 2004/108/EC COUNCIL DIRECTIVE of 15 December 2004 on the approximation of the laws of the Member States relating to electromagnetic compatibility and all applicable amendments.

94/9/EC COUNCIL DIRECTIVE of 23 March 1994 on the approximation of the laws of the Member States concerning equipment and protective systems intended for use in potentially explosive atmospheres

2006/95/EC COUNCIL DIRECTIVE of 12 December 2006 on the harmonization of the laws of Member States relating to electrical equipment designed for use within certain voltage limits.

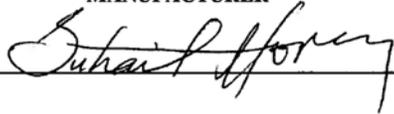
Marking(s):  Category 3 Group II G, Ex nA IIC T4 X

Applicable Standards: EN61000-6-2, 2005: EMC Part 6-2: Generic Standards - Immunity for Industrial Environments
EN61000-6-4, 2007: EMC Part 6-4: Generic Standards - Emissions for Industrial Environments
EN60079-15, 2005: Electrical apparatus for explosive gas atmospheres – Part 15: Type of protection 'n'
EN60079-0, 2004: 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

We, the undersigned, hereby declare that the equipment specified above conforms to the above Directive(s).

MANUFACTURER

Signature



Suhail Horan

Full Name

Quality Manager

Position

WGC, Fort Collins, CO, USA

Place

05/17/2010

Date

We appreciate your comments about the content of our publications.

Send comments to: icinfo@woodward.com

Please reference publication **26709E**.



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Complete address / phone / fax / email information for all locations is available on our website.