OFFICIAL MANUFACTURER DOCUMENT PACKAGE

Manufacturer's Manual

8237-1246

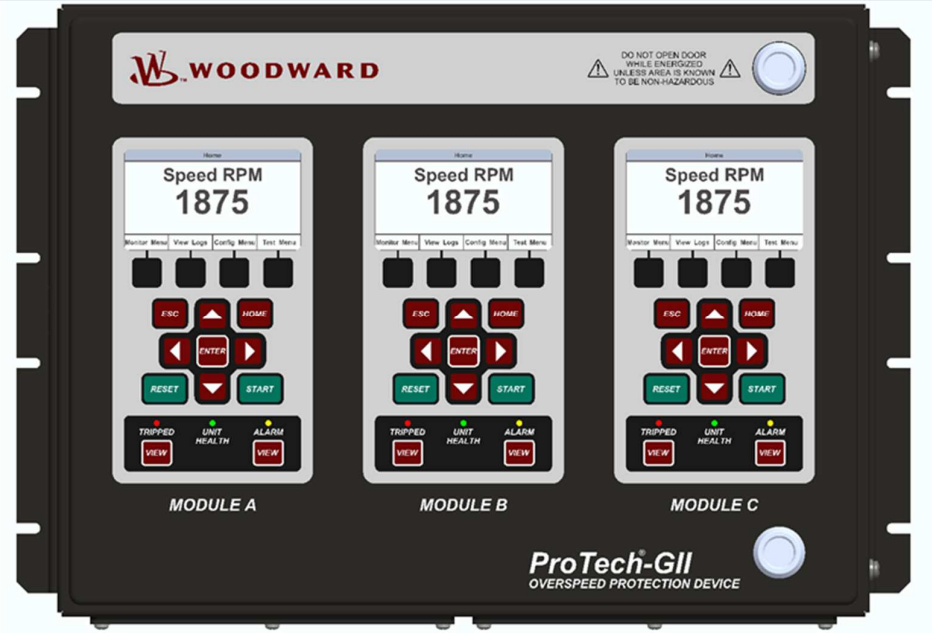
Woodward official documentation applicable to this exact model

Source file: 8237-1246.pdf

Applicable official manufacturer pages follow this Amikon cover without alteration.

Released

Product Manual 26545
(Revision G, 10/2020)
Original Instructions



Product Line
Overspeed Protection Device

Installation and Operation Manual

General Precautions

Read this entire manual and all other publications pertaining to the work to be performed before installing, operating, or servicing this equipment.

Practice all plant and safety instructions and precautions.

Failure to follow instructions can cause personal injury and/or property damage.

Revisions

This publication may have been revised or updated since this copy was produced. To verify that you have the latest revision, check manual *26455*, *Customer Publication Cross Reference and Revision Status & Distribution Restrictions*, on the *publications page* of the Woodward website:

http://www.woodward.com/

The latest version of most publications is available on the *publications page*. If your publication is not there, please contact your customer service representative to get the latest copy.

Proper Use

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

Translated Publications

If the cover of this publication states "Translation of the Original Instructions" please note:

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 Out-of-date translations are marked with ⚠.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

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

Manual 26545

Contents

Illustrations and Tables

Warnings and Notices

Important Definitions

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

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

⚠WARNING

Overspeed / Overtemperature / Overpressure

The engine, turbine, or other type of prime mover should be equipped with an overspeed shutdown device to protect against runaway or damage to the prime mover with possible personal injury, loss of life, or property damage.

The overspeed shutdown device must be totally independent of the prime mover control system. An overtemperature or overpressure shutdown device may also be needed for safety, as appropriate.

⚠WARNING

Personal Protective Equipment

The products described in this publication may present risks that could lead to personal injury, loss of life, or property damage. Always wear the appropriate personal protective equipment (PPE) for the job at hand. Equipment that should be considered includes but is not limited to:

- **Eye Protection**
- **Hearing Protection**
- **Hard Hat**
- **Gloves**
- **Safety Boots**
- **Respirator**

Always read the proper Material Safety Data Sheet (MSDS) for any working fluid(s) and comply with recommended safety equipment.

⚠WARNING

Start-up

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

Electrostatic Discharge Awareness

NOTICE

Electrostatic Precautions

Electronic controls contain static-sensitive parts. Observe the following precautions to prevent damage to these parts:

- **Discharge body static before handling the control (with power to the control turned off, contact a grounded surface and maintain contact while handling the control).**
- **Avoid all plastic, vinyl, and Styrofoam (except antistatic versions) around printed circuit boards.**
- **Do not touch the components or conductors on a printed circuit board with your hands or with conductive devices.**

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

Follow these precautions when working with or near the control.

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

Regulatory Compliance

European Compliance for CE Marking

EMC Directive: Declared to Directive 2014/30/EU of the European Parliament and of the Council of 26 February 2014 on the harmonization of the laws of the Member States relating to electromagnetic compatibility (EMC).

Low Voltage Directive: Directive 2014/35/EU on the harmonisation of the laws of the Member States relating to the making available on the market of electrical equipment designed for use within certain voltage limits.

ATEX – Potentially Explosive Atmospheres Directive: Directive 2014/34/EU on the harmonisation of the laws of the Member States relating to equipment and protective systems intended for use in potentially explosive atmospheres
II 3 G, Ex nA IIC T4

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

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

North American Compliance

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

Other International Compliance

Australia (& New Zealand) RCM: Compliance is limited to application for those units bearing the Regulatory Compliance Mark (RCM). Only EMC is applicable in virtually all Woodward intended applications. RCM on WWD products is very limited due to allowed exemptions from applying the RCM or having a DoC.
EMC: Electromagnetic Compatibility (EMC) Declaration of Conformity (DoC) RCM requirements for the Australian (& New Zealand) Radiocommunications Act is a separate document only created for products applying the RCM to the label.

Products with a RCM on the label have an EMC Declaration of Conformity available: Woodward products typically comply with at least CISPR11 Group1, Class A emissions limits, Electromagnetic Interference (EMI) testing, even if not marked with the RCM: as long as the “CE mark” is on the label.

TÜV: TÜV certified for SIL-3 per IEC 61508 Parts 1-7, Functional Safety of Electrical / Electronic / Programmable Electronic Safety Related Systems

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

Other Compliance

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

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

Special Conditions for Safe Use

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

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

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

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

Protective Earth Grounding is required by the input PE terminal.

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

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

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

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

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

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

Control is suitable for installation in pollution degree 2 environments.

⚠WARNING

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

⚠WARNING

Explosion Hazard—Do not connect or disconnect while circuit is live unless area is known to be non-hazardous.

Substitution of components may impair suitability for Class I, Division 2 or Zone 2 applications.

⚠AVERTISSEMENT

Risque d'explosion—Ne pas raccorder ni débrancher tant que l'installation est sous tension, sauf en cas l'ambiance est décidément non dangereuse.

La substitution de composants peut rendre ce matériel inacceptable pour les emplacements de Classe I, applications Division 2 ou Zone 2.

Safety Symbols


Both direct and alternating current


Alternating current


Direct current


Caution, risk of electrical shock


Caution, refer to accompanying documents


Protective conductor terminal


Frame or chassis terminal

Acronyms and Definitions

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

Chapter 1.
General Information

Description

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

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

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

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

*—Modbus is a trademark of Schneider Automation Inc.

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

IMPORTANT

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

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

Table 1-1. Available ProTech-GII Models

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

Applications

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

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

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

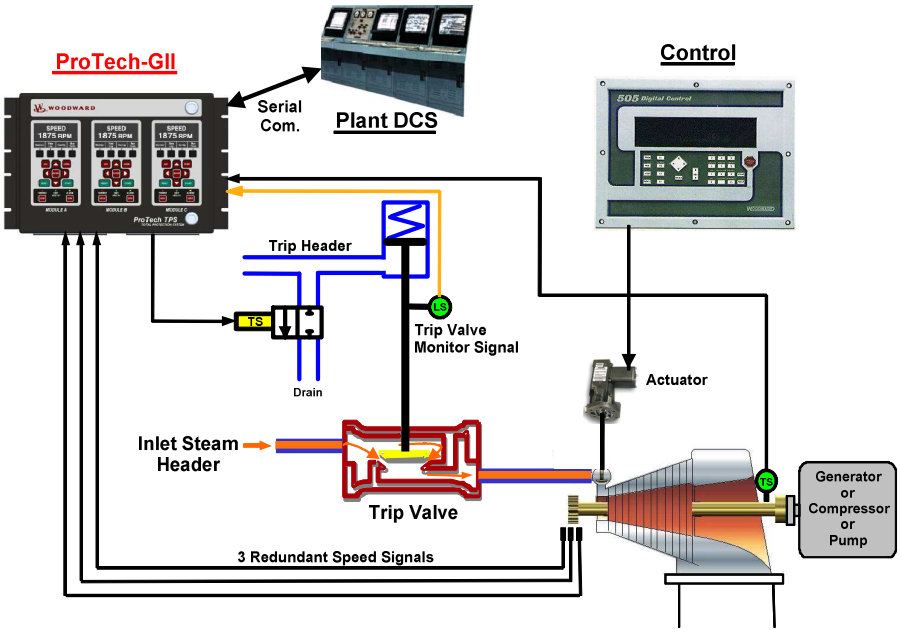


Figure 1-1. Typical ProTech-GII Application (Voted Trip Relay Models)

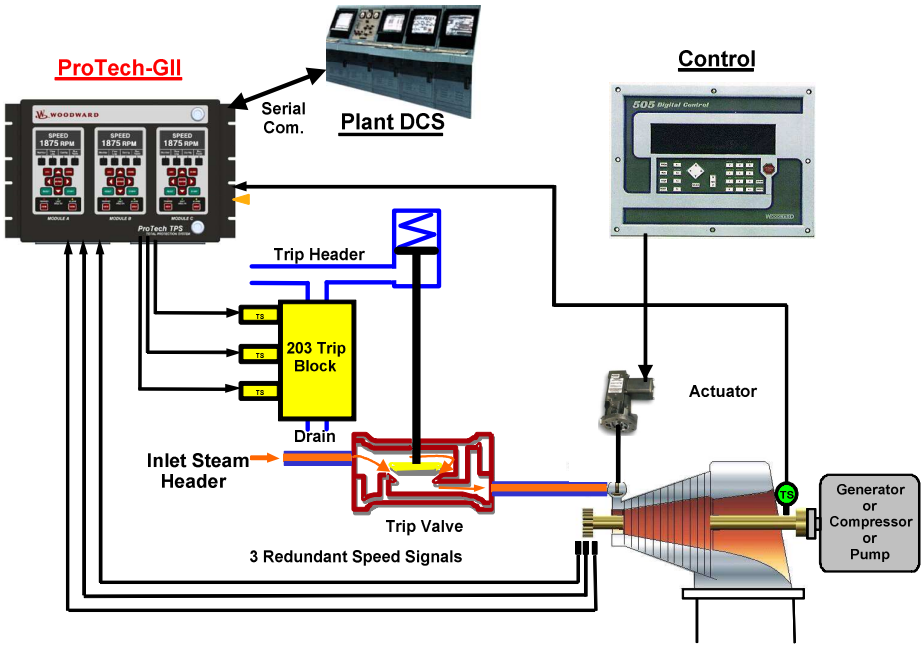


Figure 1-2. Typical ProTech-GII Application (Independent Trip Relay Models)

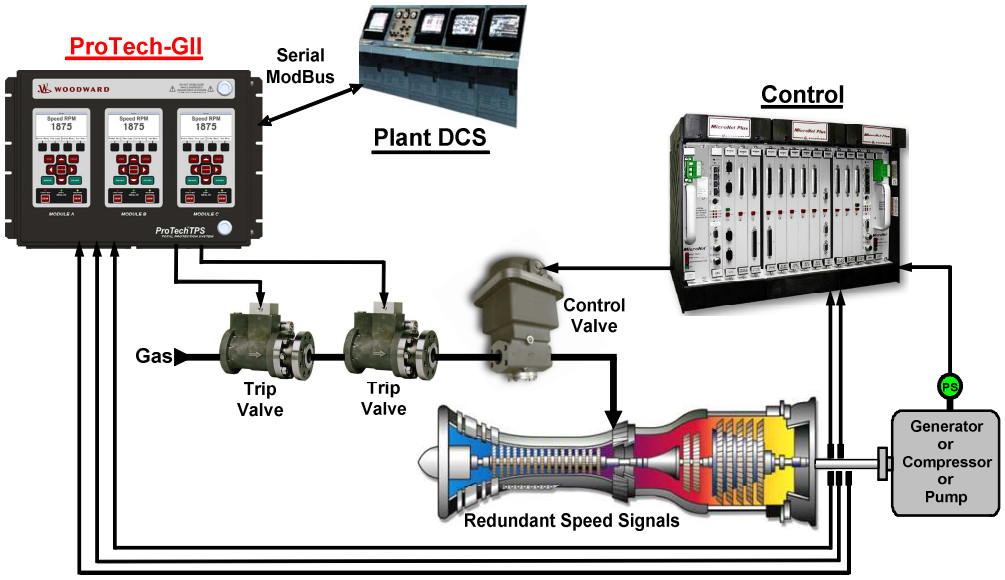


Figure 1-3. Typical Gas Turbine Application (Voted Trip Relay Models)

Chapter 2. Installation

Introduction

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

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

Unpacking

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

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

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

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

Hardware Installation Procedure

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

Enclosures

NOTICE

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

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

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

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

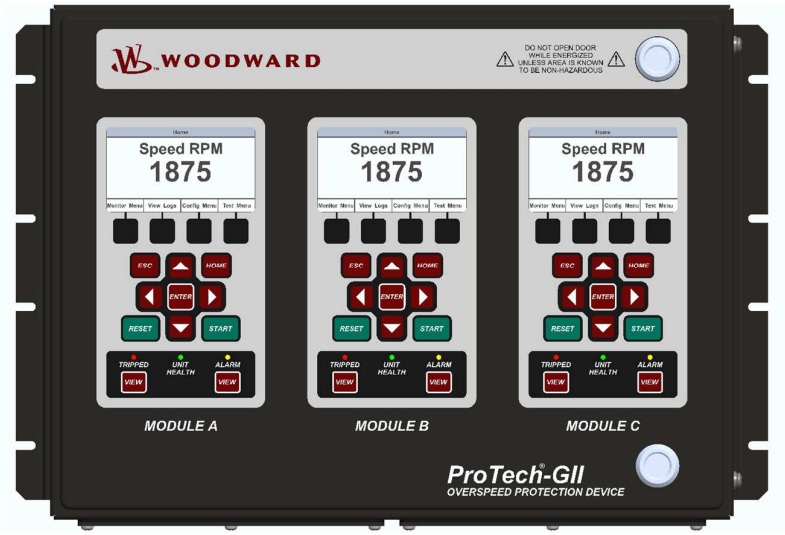


Figure 2-1. Typical ProTech-GII Bulkhead Package—Front View

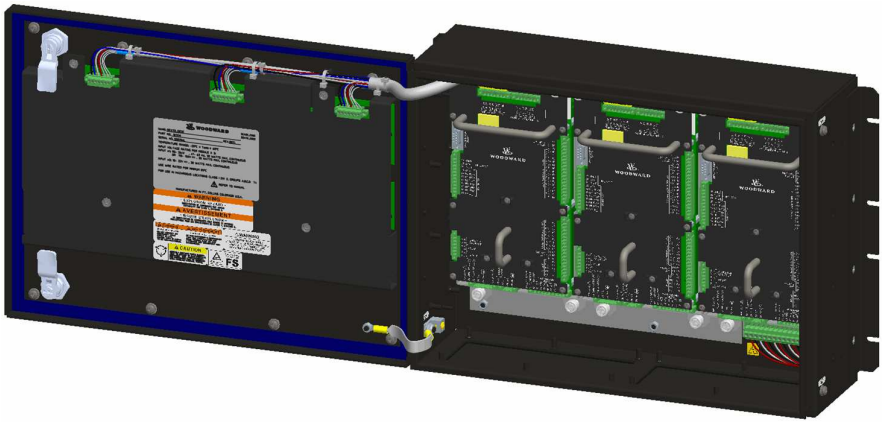


Figure 2-2a. Typical ProTech-GII Bulkhead Package—Front Door Open

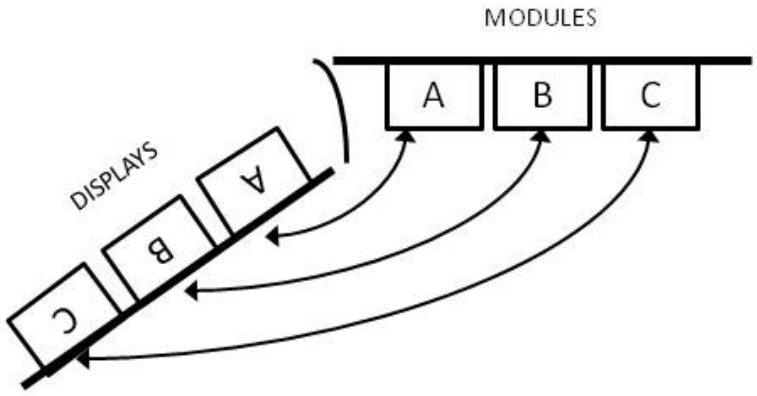


Figure 2-2b. Bulkhead Schematic Showing Front Panel A Connection to Module A and Front Panel C Connection to Module C—Top View

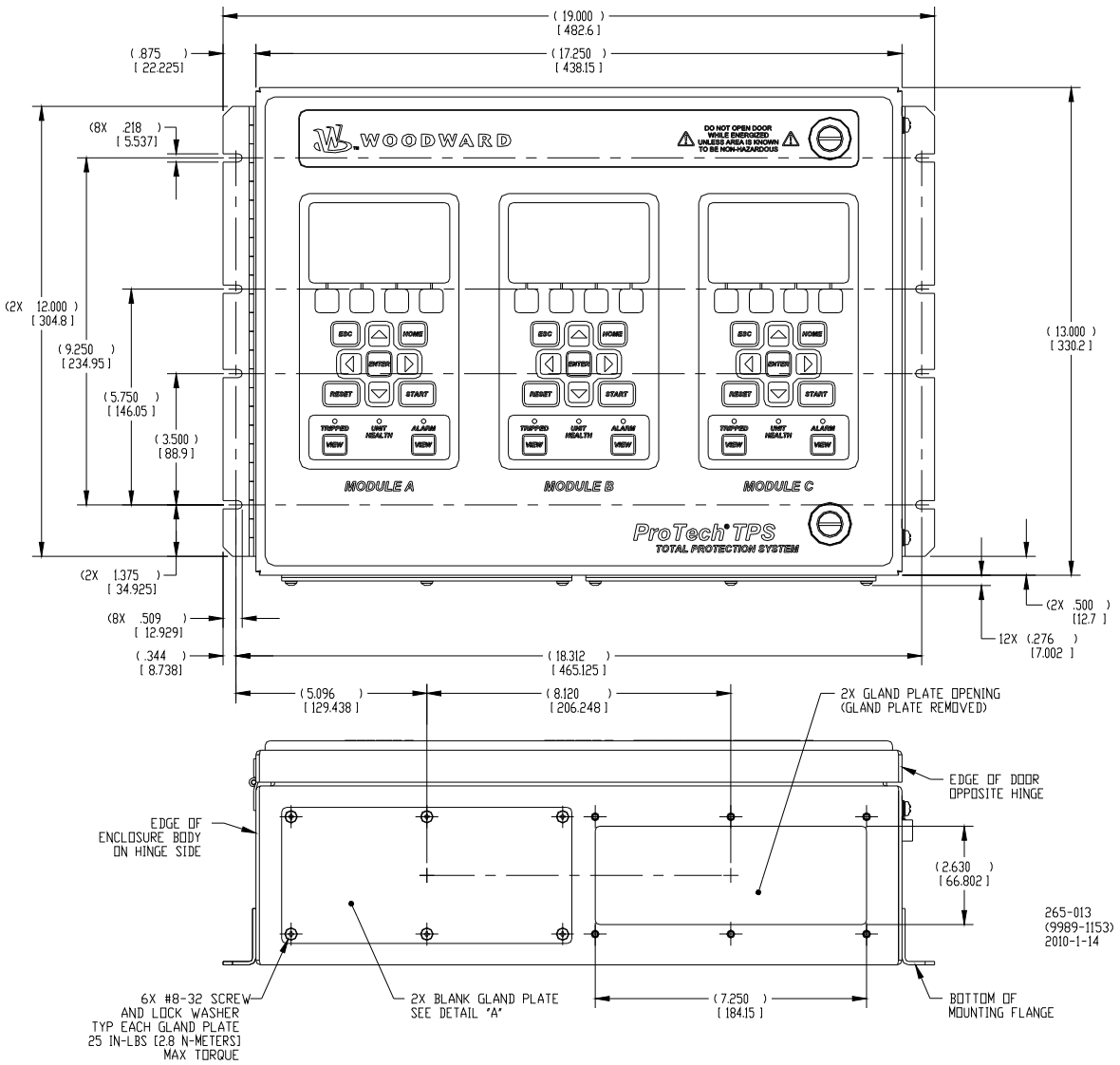


Figure 2-3. Mounting Outline Diagram for Bulkhead-Mounted Models

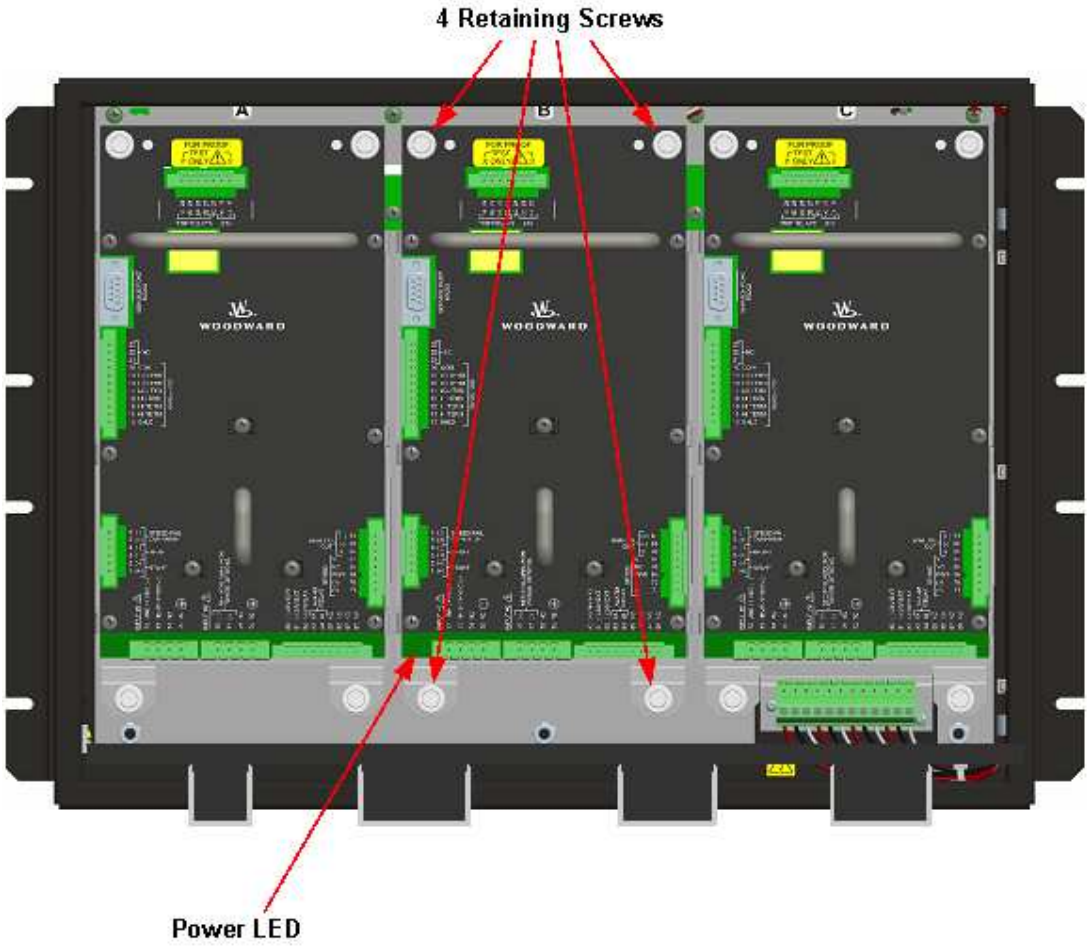
Note: The outline drawings for the TPS and GII are identical. The TPS is shown for reference.

Module Removal and Installation—Bulkhead Mount Package

Follow this procedure for module removal and installation:

Removal:

1. Disconnect power from the module to be removed.
2. Verify power removed by observing power LED is OFF.
3. Remove terminal blocks from module terminals.
4. Loosen four module retention screws.
5. Remove module by pulling the two handles simultaneously.



Installation:

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

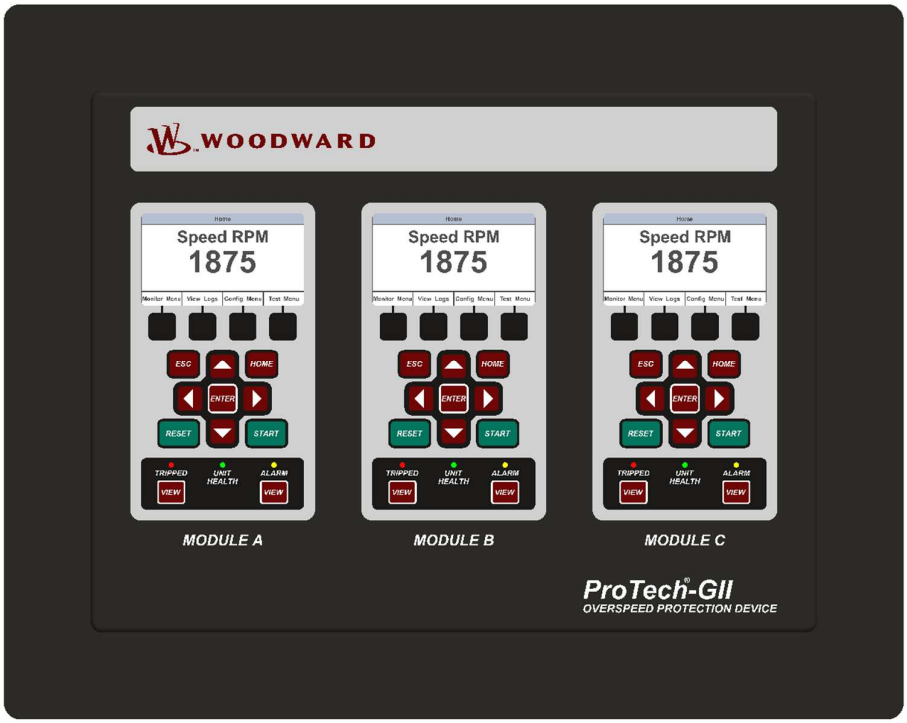


Figure 2-4a. Typical ProTech-GII Panel Mount Package—Front View

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

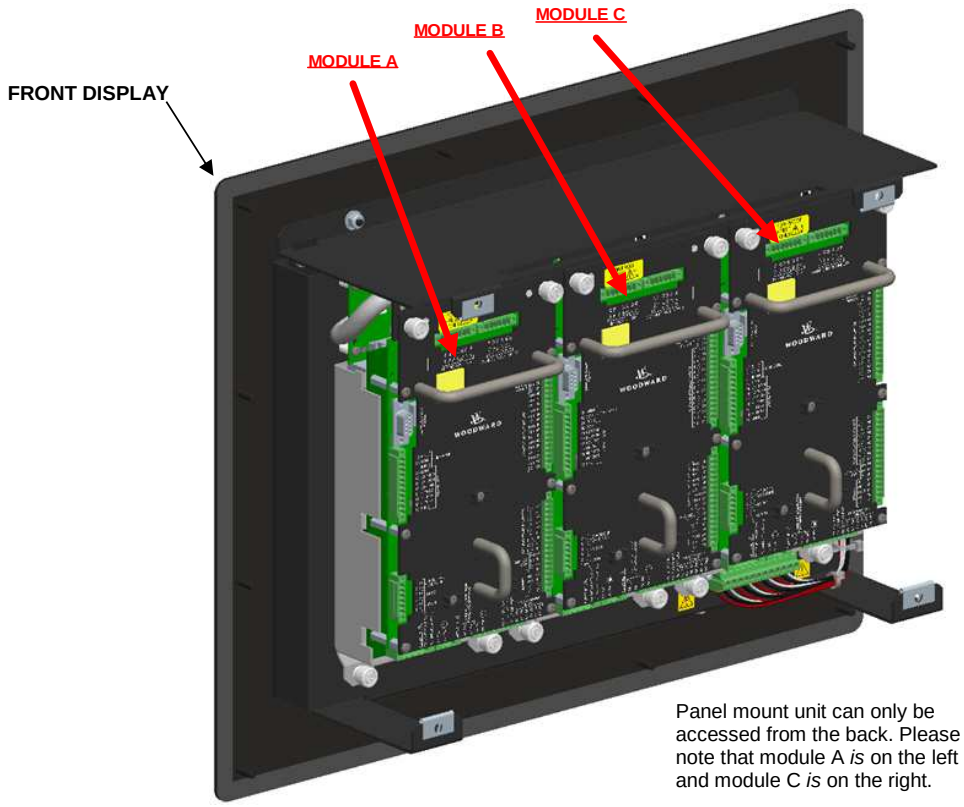


Figure 2-4c. Typical ProTech-GII Panel Mount Package—Rear View without Cover Showing Module Orientation

NOTICE

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

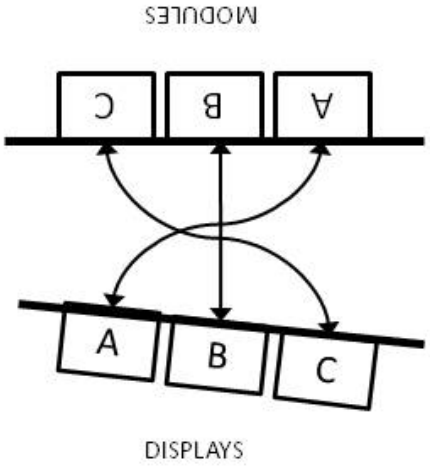


Figure 2-4d. Panel Mount Schematic Showing Front Panel A Connection to Module A and Front Panel C Connection to Module C—Top View

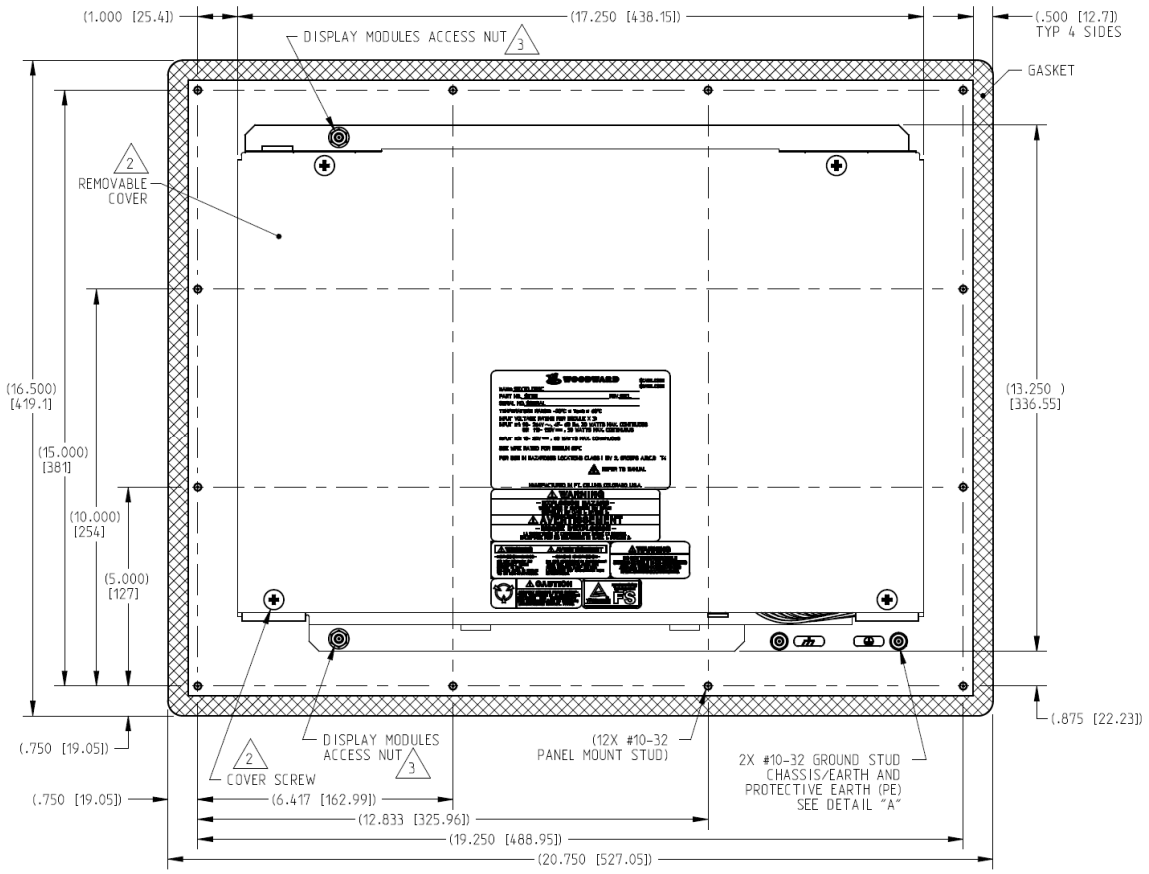


Figure 2-5a. Mounting Outline Diagram for Panel-Mount Models

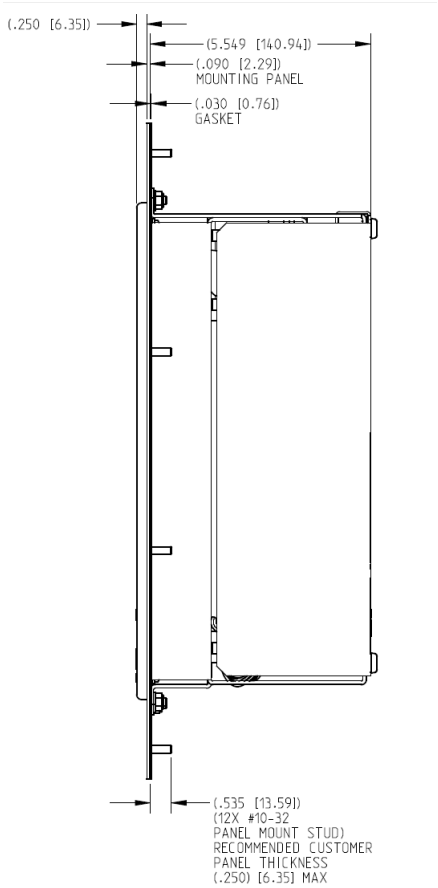


Figure 2-5b. Mounting Outline Diagram for Panel-Mount Models

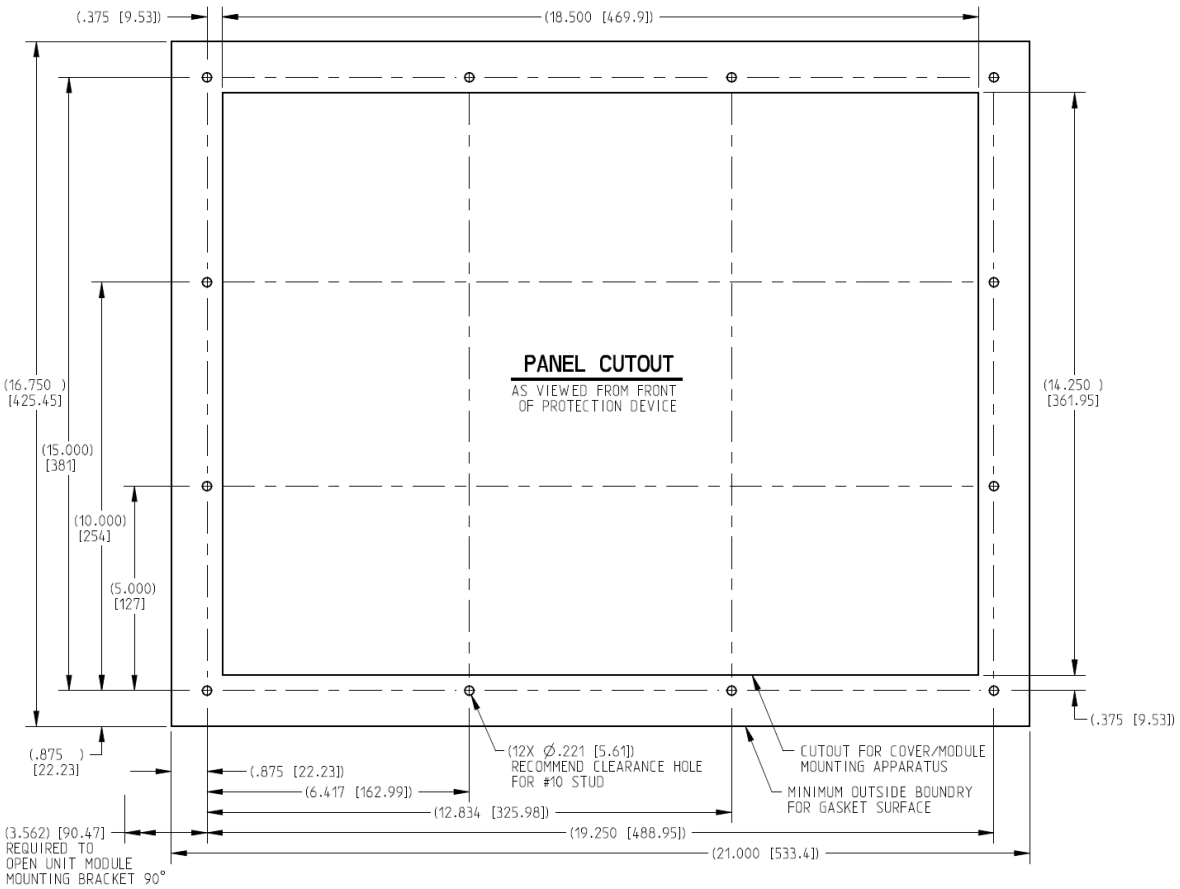


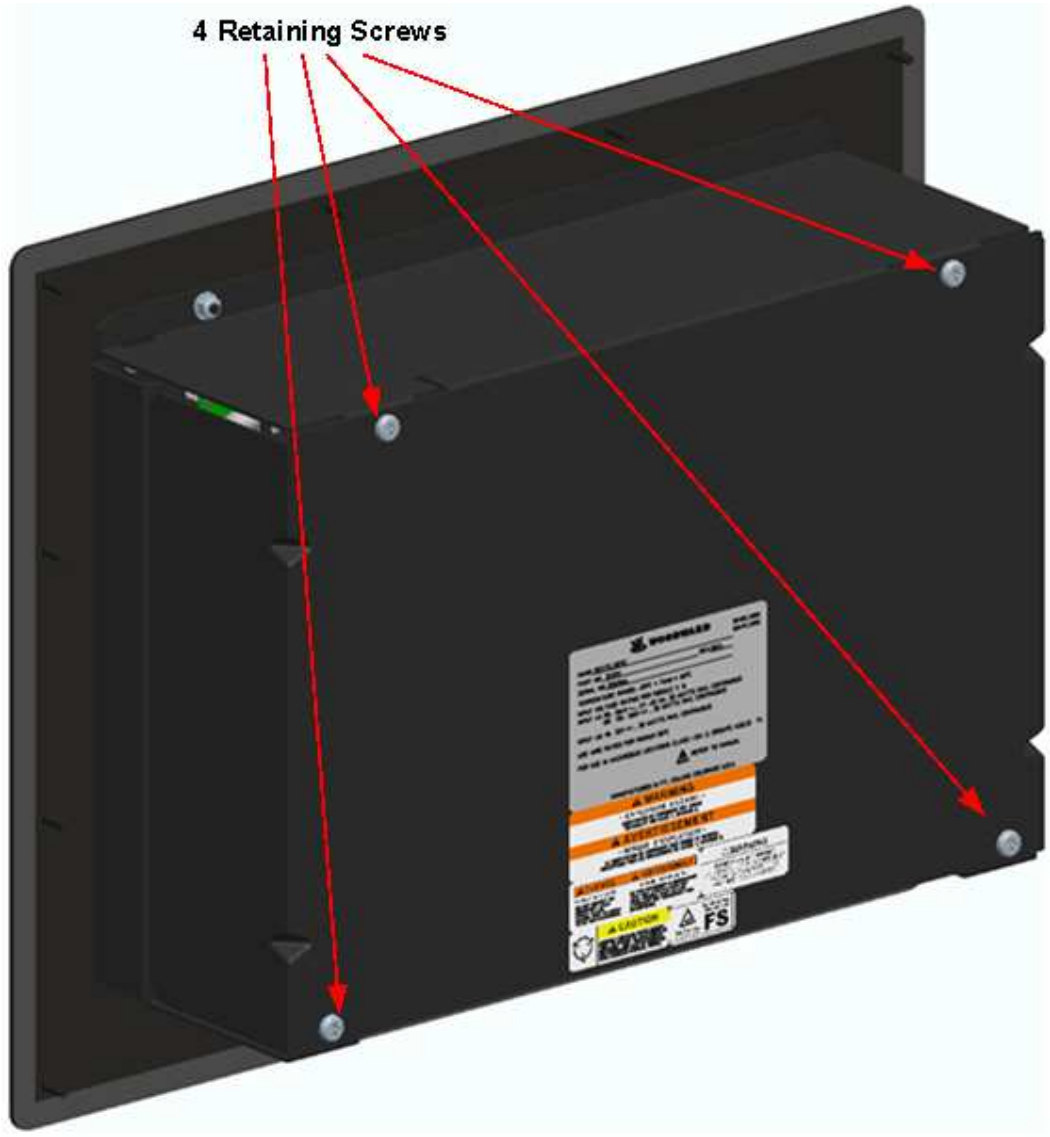
Figure 2-5c. Panel Cutout Diagram for Panel-Mount Models

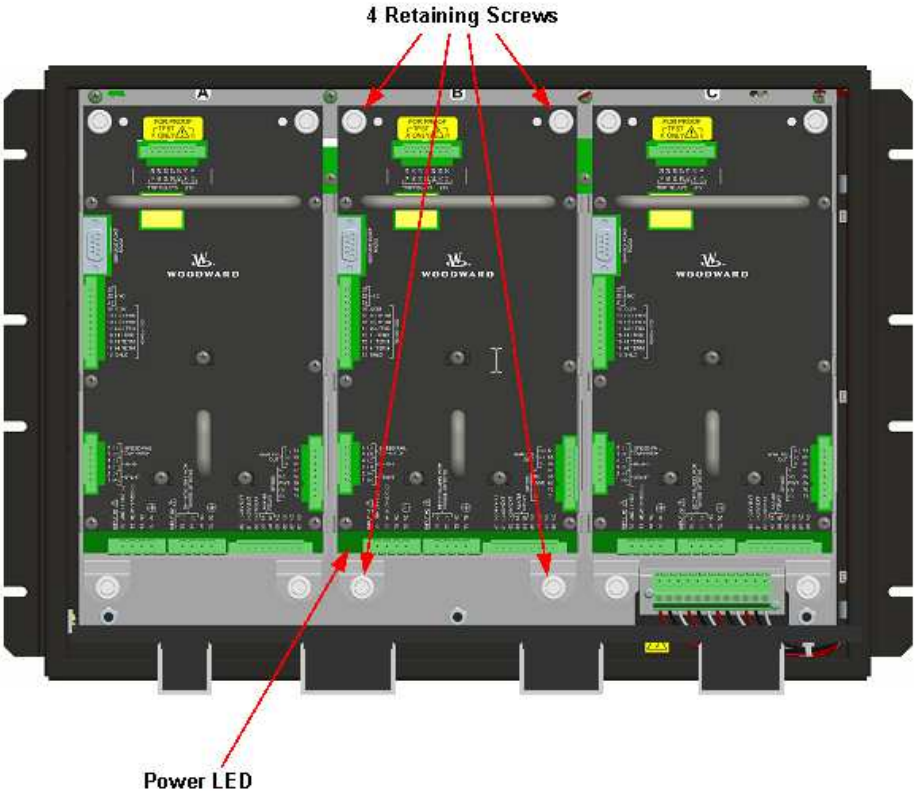
Module Removal and Installation—Panel Mount Package

Follow this procedure for module removal and installation:

Removal:

1. Disconnect power from the module to be removed.
2. Remove 4 back panel retaining screws.
3. Remove back panel.
4. Verify power removed by observing power LED is OFF.
5. Remove terminal blocks from module terminals.
6. Loosen 4 module retaining screws.
7. Remove module by pulling the two handles simultaneously.





Installation:

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

Mounting Location Considerations

Consider the following general requirements when selecting the mounting location:

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

Table 2-1. Environmental Specifications

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

Power Supply Requirements

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

Power Supply Specifications

Table 2-2. Low Voltage Input Specifications

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

High Voltage Input

Table 2-3. High Voltage Input Specifications

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

Low Voltage Input

Table 2-4. Low Voltage Input Specifications

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

NOTICE

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

Internally Generated Limited Power Supply

Table 2-5 Relay Output Power Supply Specifications

Relay Output Power Supply (24V_P)

Output Voltage	24 Vdc ±10%
Current Limit	500 mA

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

IMPORTANT

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

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

⚠WARNING

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

NOTICE

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

NOTICE

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

Input/Output Specifications

Speed Input Specifications

Table 2-6. General I/O Specifications

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

Table 2-7. Passive Probe (MPU) Specifications

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

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

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

⚠WARNING

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

IMPORTANT

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

IMPORTANT

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

IMPORTANT

Shielded cable is required when connecting to the speed input.

Relay Specifications

Table 2-9. Independent Trip Relay Output Specifications

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

Table 2-10. Voted Trip Relay Output Specifications

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

Table 2-11. Alarm Relay Specifications

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

Dedicated Discrete Input Specifications

Table 2-12. Dedicated Discrete Input Specifications

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

Analog Output Specifications

Table 2-13. Analog Output Specifications

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

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

Table 2-14. Serial Port Specifications

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

Shielded Wiring

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

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

Control Wiring Guidelines

Electrical Connections

⚠WARNING

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

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

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

IMPORTANT

The screw lug terminal blocks are designed to flatten stranded wire. Do not tin (solder) the wire's strands that terminate at the ProTech Terminal Blocks. If the wire strands are soldered together, the solder will cold flow and shrink over time causing the connection to become intermittent or disconnected.

Woodward recommends the following for ProTech-GII:

- **Stranded bare copper wire (unless gaseous Sulfur compounds are present) at the wire ends**
- **Stranded copper wire with individually tin plated strands at the wire ends**
- **Hollow ferrules at the wire ends**
- **Use single wire per terminal. There are enough terminals provided for all I/O wiring**

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

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

Figure 2-6. Screw Connection Terminal Block

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

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

NOTICE

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

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

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

⚠WARNING

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

IMPORTANT

All input and output wiring must be in accordance with Class I Division 2 wiring methods, and in accordance with the authority having jurisdiction.

All peripheral equipment must be suitable for the location in which it is being used.

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

IMPORTANT

When wiring to each ProTech module, in order to allow hot replacement of a module in the event of a failure, it is important to make connections such that any single module's terminal blocks and power supplies can be completely disconnected without affecting the rest of the system.

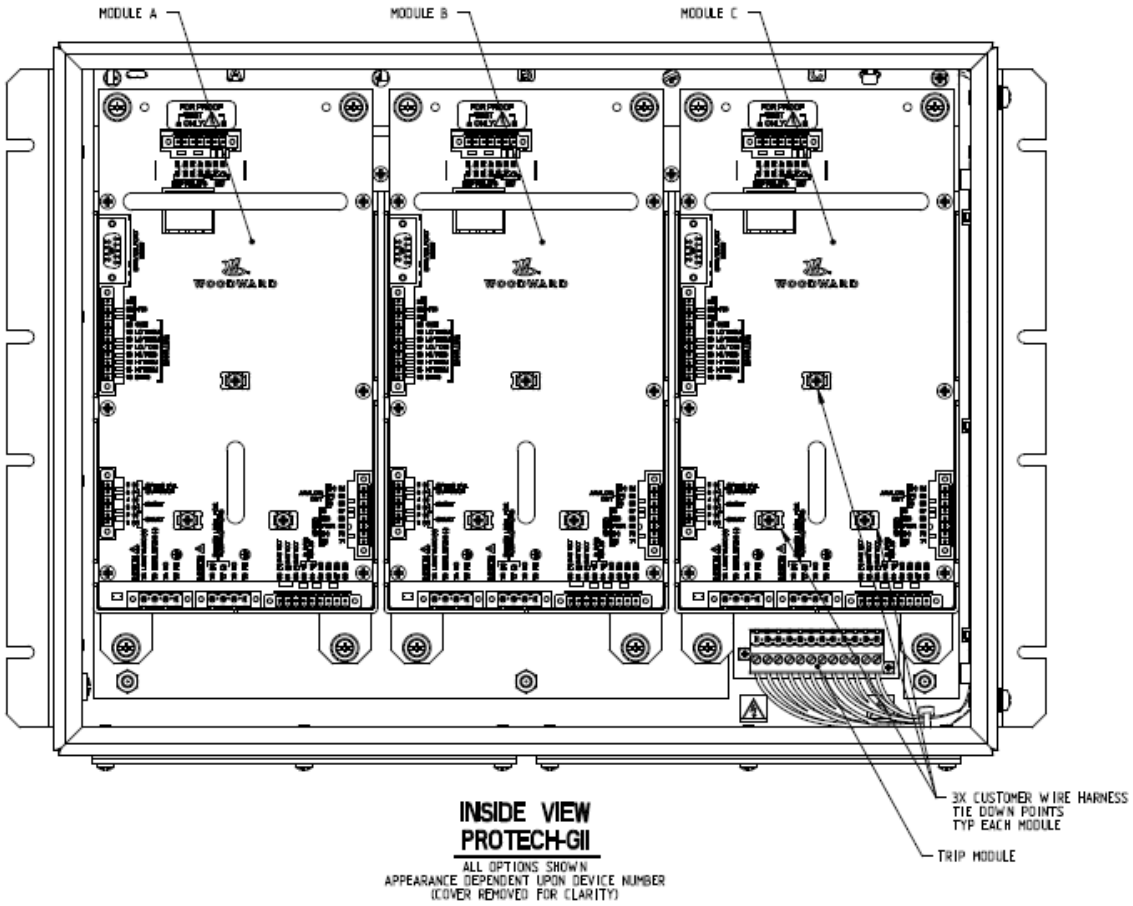


Figure 2-7. Inside View of ProTech-GII

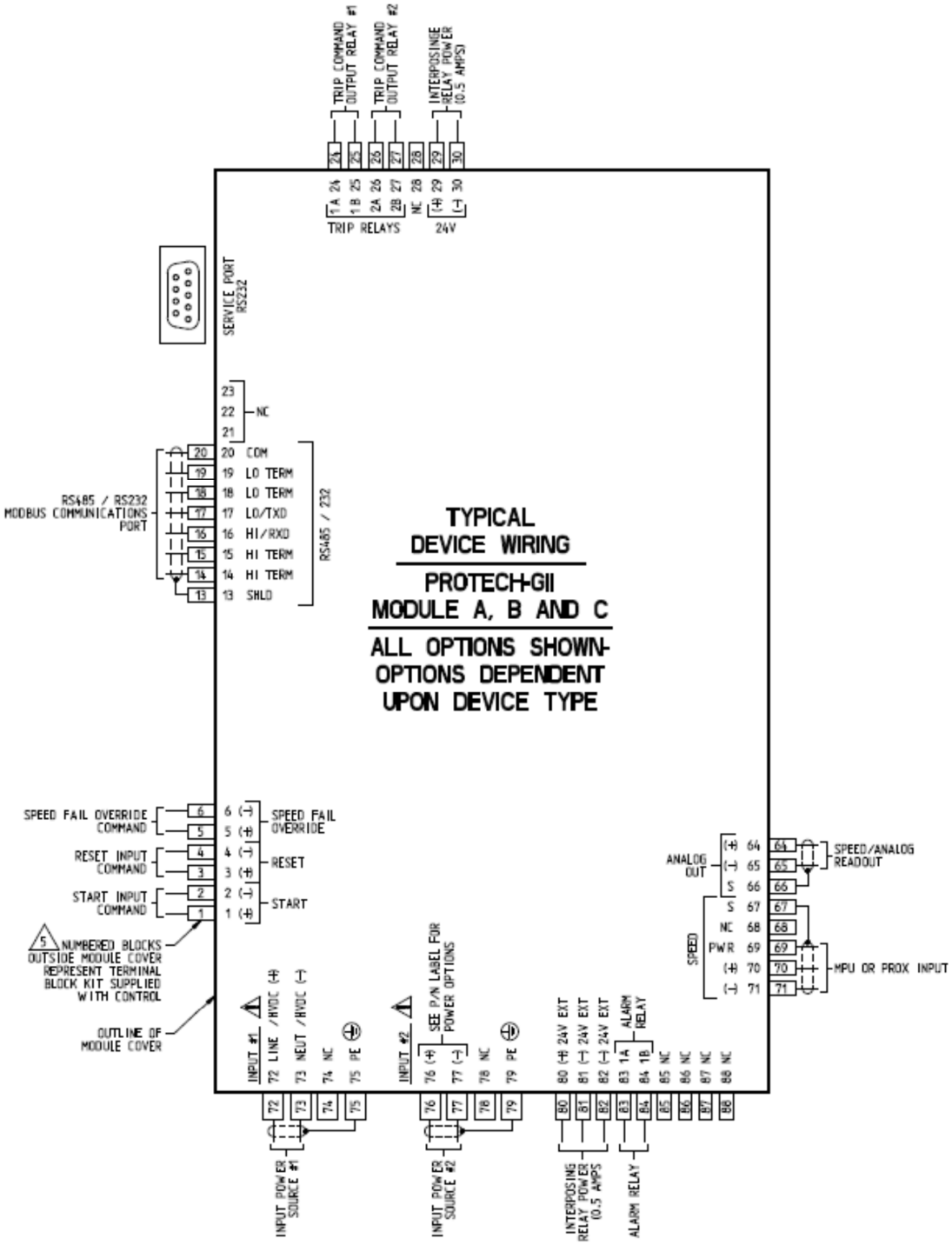


Figure 2-8. ProTech-GII Control Wiring Diagram

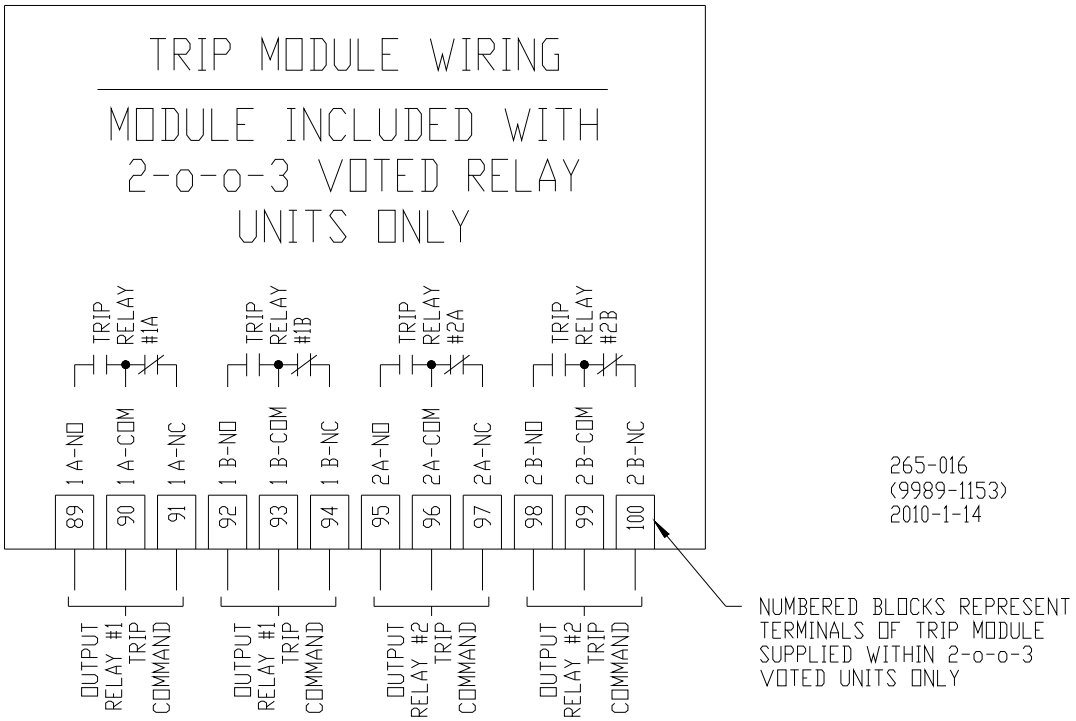


Figure 2-9. Trip Module – Included within Voted Trip Relay Units Only

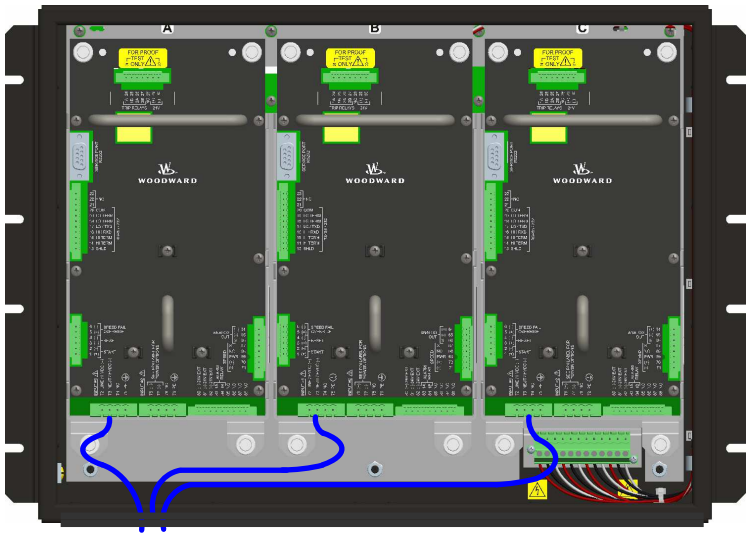


Figure 2-10. Power Supply Field Wiring Routing & Stress Relief Diagram

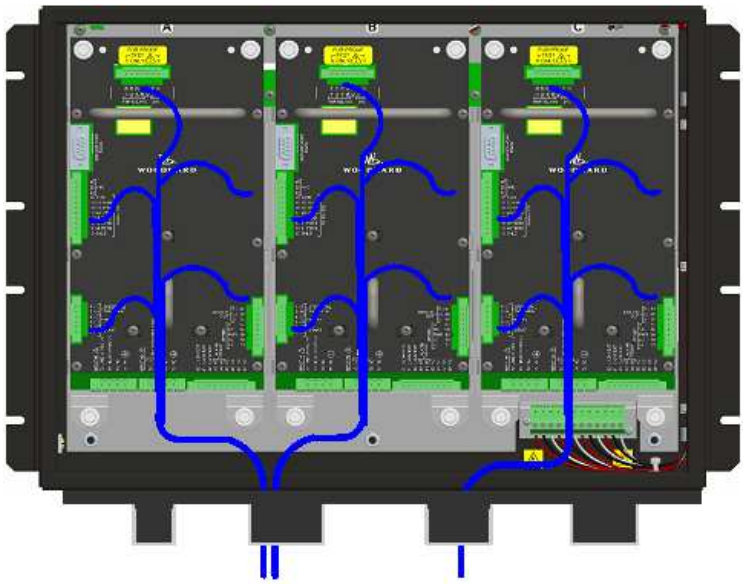


Figure 2-11. I/O Wiring Routing & Stress Relief Diagram

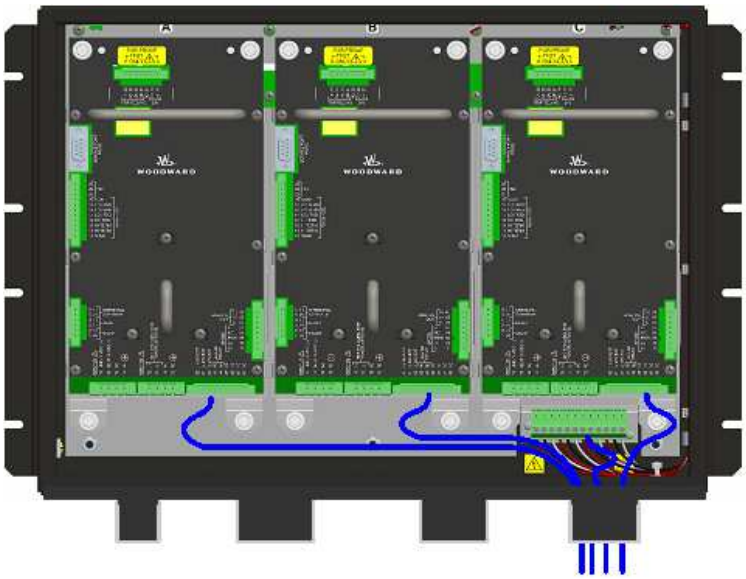


Figure 2-12. Relay Output Field Wiring Routing & Stress Relief Diagram