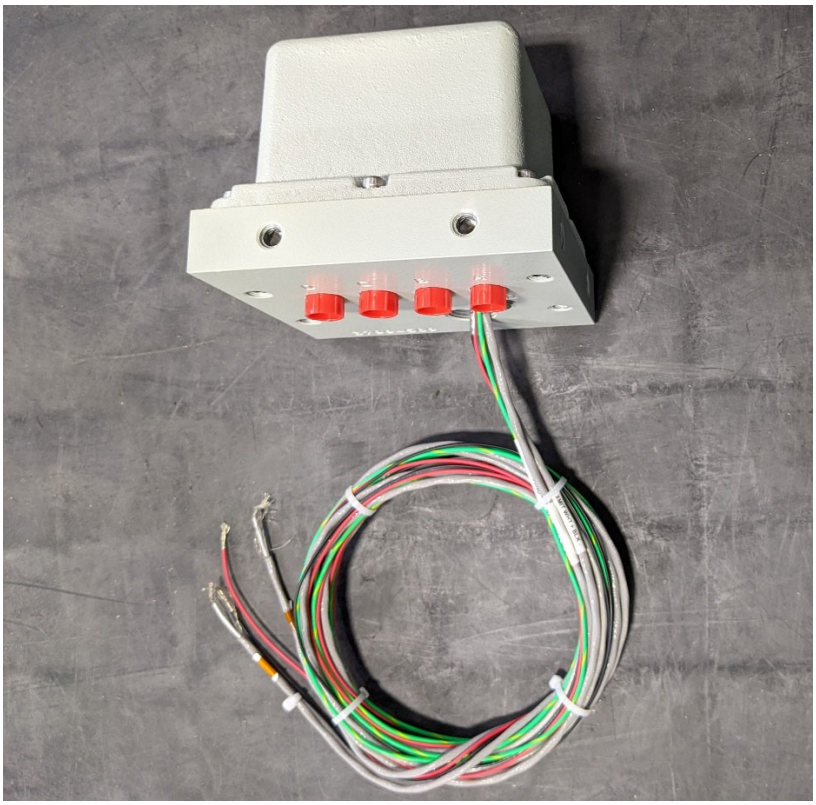
WOODWARD

Product Manual 85555
(Revision C, 2/2023)
Original Instructions



Smart Pressure Transducer for NetCon® Controls

9907-331, 9907-332

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. The latest version of most publications is available on the Woodward website.

http://www.woodward.com

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. The latest version of most publications is available on the Woodward website.

www.woodward.com/publications

Always compare with the original for technical specifications and for proper and safe installation and operation procedures.

If your publication is not on the Woodward website, please contact your customer service representative to get the latest copy.

Revisions—Changes in this publication since the last revision are indicated by a black line alongside the text.

Contents

Illustrations and Tables

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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, the customer should install a system completely 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

North American Compliance:
These listings are limited only to those units bearing the CSA agency identification.

CSA: CSA Certified for Class I, Division 1, Groups C & D, and Class I, Division 2, Groups B, C, & D, T4 at 125 °C Ambient for use in Canada and the United States. Certificate 1006295 (LR79726-5)

The Smart Pressure Transducer is suitable for use in Class I, Division 1, Groups C & D, and Class I, Division 2, Groups B, C, & D per CSA for Canada and the Unites States or non-hazardous locations only.

Wiring must be in accordance with North American Class I, Division 1 or 2 wiring methods as applicable, and in accordance with the authority having jurisdiction.

Input power must be supplied from an NEC or CEC class 2 power source.

Field Wiring must be suitable for at least 125 °C.

⚠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 1 or 2 or Zone 1 or 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 1 ou 2 ou Zone 1 ou 2.

Chapter 1. Description

General

This smart pressure transducer manual covers the pressure transducers themselves, the assembly in which they are housed, and the wiring to connect them to the Woodward NetCon® control.

Two, three, or four pressure transducers are mounted on the pressure transducer motherboard which is housed in a manifold assembly. The pressure transducer motherboard is wired directly to a NetCon field termination module which is then connected by cable to the pressure transducer interface module in the NetCon control.

The transducer motherboard is hard wired to the field termination module using two shielded, low capacitance, twisted-pair wires for communication and up to four discrete wires for 15 volt power. The pressure transducers can be wired up to 1000 feet (305 m) away from the NetCon field termination module. The pressure transducer interface module in the NetCon control is a two-channel device, so a total of up to eight pressure transducers may be employed.

The pressure transducers communicate with the pressure transducer interface module using the standard universal asynchronous receiver transmitter (UART) protocol operating at 375 Kbaud. Communication errors are detected via parity checking and status information. The pressure data is shared with the main CPU module through the dual-port RAM on the VME bus.

Specifications

Accuracy
±0.03% of full scale (0 to 1000 psia [0 to 6895 kPa]), over operating temperature range (includes errors due to hysteresis, non-linearity, temperature, and non-repeatability)

Power
0.25 W typical per transducer

Resolution
16 bits (0.015 psi [0.103 kPa])

Communications
RS-422, @ 375 Kbaud

Response
20 Hz frequency response with 6 ms latency

Overpressure
1500 psia (1.5 x full scale pressure)

Communication Wiring
Controlled impedance, low capacitance shielded wire similar to Belden P/N 89207, or Level 4 cabling

Power Wiring
Use one of the following:
(1 pair) 20 AWG (0.5 mm²) minimum if < 500 feet (152 m)
(2 pair) 20 AWG (0.5 mm²) minimum if < 1000 feet (305 m)
(1 pair) 16 AWG (1.0 mm²) minimum if < 1000 feet (305 m)

Manifold Size

5.346 x 6.124 x 4.791 inches (135.79 x 155.55 x 121.69 mm)

Pressure fittings

Flareless compression fittings for 1/4 inch (6.35 mm) stainless tubing

Max Storage Temperature

150 °C (302 °F)

Operating Temperature Range

–40 to +125 °C (–40 to +257 °F)

Hazardous Location Rating

CSA with North American certification to:

Class I, Division 1, Groups C & D

Class I, Division 2, Groups B, C, & D

Shock

US MIL-STD-810C, Figure 5 15.2-1 procedure 1(20g, 11 ms sawtooth)

Vibration

US MIL-STD-810C, Figure 514.2-2 Curve H (10 G, 2 kHz) with at least a four point mount; mounts using less than four points only rated to 2 G

EMC

The pressure transducer manifold assembly must meet the following international EMC standards:

Emissions

ENSSO11 (same as CISPR 11), Class A, Group 1

ESD Immunity

IEC 801-2m (1991) 8 kV air and 6 kV contact, HCP and VCP tests

Radiated RF Immunity

JEC 801-3, 10 V/m ±80% 1 kHz AM, 80–1000 MHz

Fast Transient Immunity

IEC 801-4 (1988) 2kV directly coupled onto power lines and 2 kV capacitively coupled onto communication lines

Surge Immunity

JEC 801-5, 0.5 kV common and differential mode on power lines

Conducted RF Immunity

JEC 801-6, 10 V emf ± 80% 1 kHz AM, 0. 15-100 MHz, on power and communication lines

Chapter 2.
Installation

⚠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 1 or 2 or Zone 1 or 2 applications.

⚠WARNING

External fire protection is not provided in the scope of this product. It is the responsibility of the user to satisfy any applicable requirements for their system.

⚠CAUTION

Due to typical noise levels in turbine environments, hearing protection should be worn when working on or around the Smart Pressure Transducer.

⚠CAUTION

The surface of this product can become hot or cold enough to be a hazard. Use protective gear for product handling in these circumstances. Temperature ratings are included in the specification section of this manual.

IMPORTANT

For Zone 1 / Division 1 products: Proper torque is very important to ensure that the unit is sealed properly. Cover bolt torque is 9.2 N·m (81 lb-in).

Connect the field termination module cable to the terminal block located on the motherboard of the manifold. Using a tie wrap, secure this cable to a spacer, which runs from the base of the module to the motherboard (refer to Figure 2-1). Also, secure the connection at the motherboard's terminal block by running a tie wrap around the connectors and through the nearest hole in the motherboard.

NOTICE

Four-point mounting and adequate wiring stress relief are necessary to meet the 10 G vibration specification. All pressure transducer assemblies mounted with only two points have a vibration rating of 2 G. If the vibration level at the pressure transducers exceeds this level, the pressure transducer could fail, resulting in a loss of communications between the NetCon® controller and the pressure transducer module.

⚠WARNING

To protect against a communications failure, for any installation, Woodward recommends that the prime mover be equipped with a separate overspeed (overtemperature, or overpressure, where applicable) shutdown device(s), to protect against runaway or damage to the prime mover with possible personal injury or loss of life.

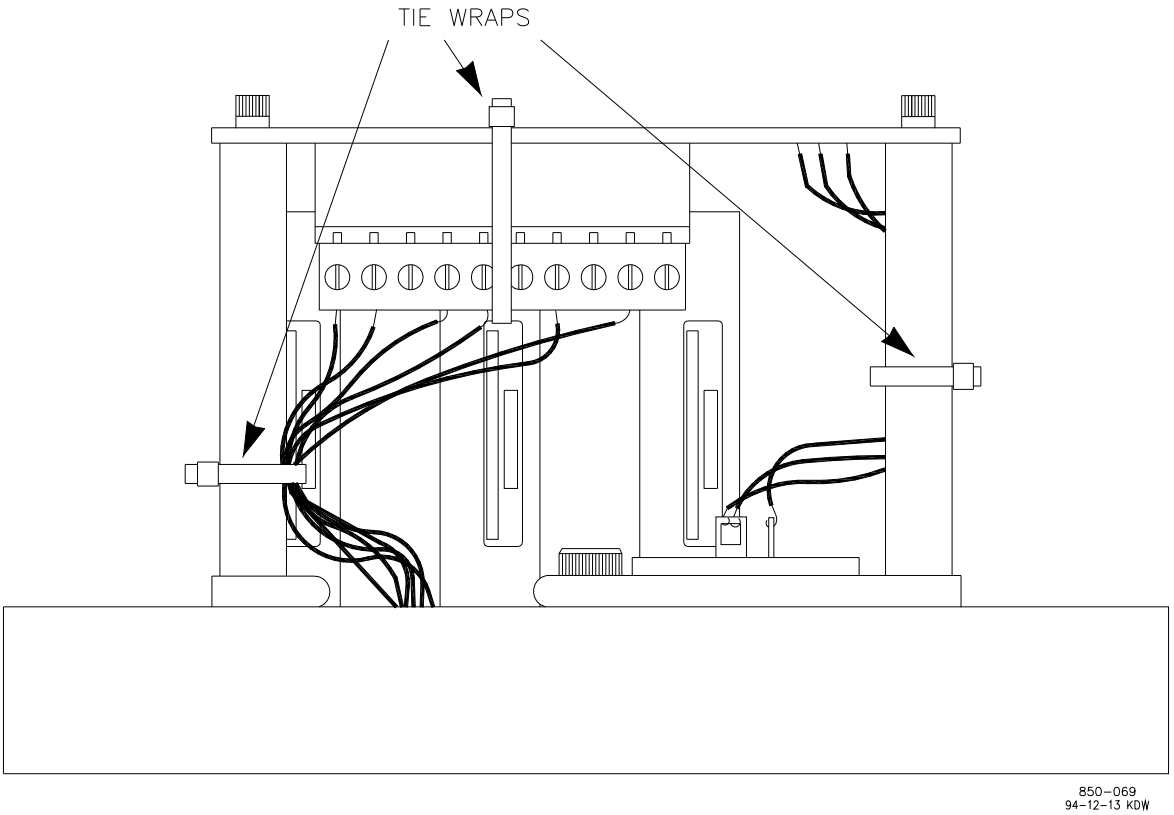

Figure 3-1. Tie Wrap Locations (as shown on 9905-911)

Table 2-1. Pinouts

TERMINAL BLOCK									
1	2	3	4	5	6	7	8	9	10
REC+	REC-	SHLD	XMIT+	XMIT-	SHLD	15 Vdc	15 Vdc	15 GND	15 GND
20	21	2	22	23	4	24	25	26	27
FIELD TERMINATION MODULE									

Pinout for Port #1

TERMINAL BLOCK									
1	2	3	4	5	6	7	8	9	10
REC+	REC-	SHLD	XMIT+	XMIT-	SHLD	15 Vdc	15 Vdc	15 GND	15 GND
28	29	10	30	31	12	32	33	34	35
FIELD TERMINATION MODULE									

Pinout for Port #2

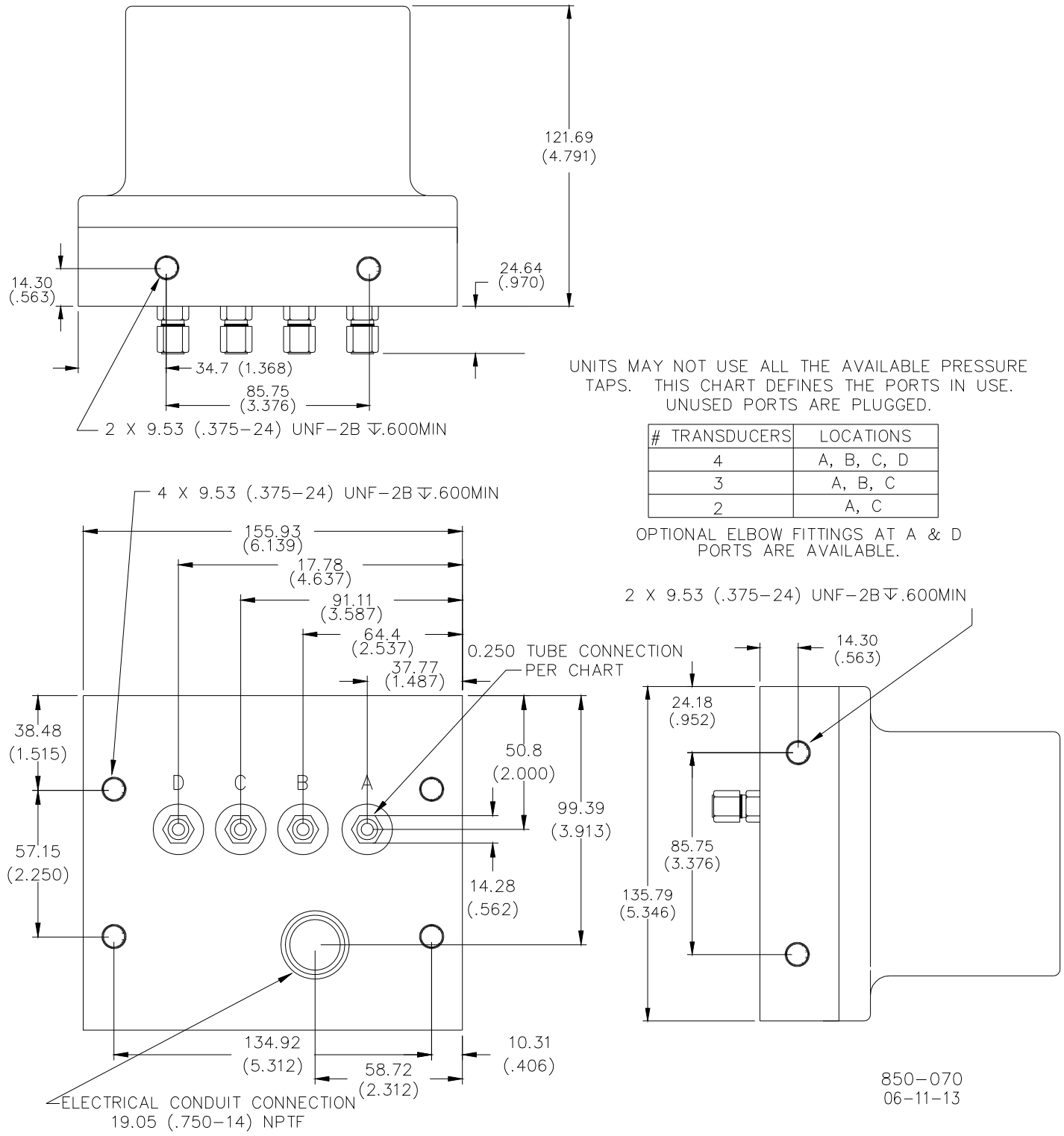

Figure 3-2. Outline Drawing of Pressure Transducer Manifold

Chapter 3.
Field Servicing

Replacing a Transducer in the Field

In the event of a transducer failure, the following steps can be taken to replace it in the field. These steps must be followed exactly in order to ensure that the integrity of the system is maintained.

WARNING

Ensure that the pressure transducer assembly is reading only ambient pressures and that any pressure at each of the ports has been relieved. Faulty pressure transducers may not communicate properly with the NetCon®. Failure to remove residual pressures may cause personal injury or damage to the equipment. Be sure to follow proper grounding procedures as explained on page 3, "Electrostatic Discharge Awareness".

1. Remove the eight fasteners used to secure the cover to the assembly. Remove the cover itself.

2. Disconnect the terminal block at the motherboard.

3. Using a 3/16" (~5 mm) Allen wrench, remove the three fasteners located in the base plate. These can be easily accessed by placing the Allen wrench through the holes in the motherboard to loosen each fastener. Removing these will allow for the removal of the inner assembly and provide access to the fasteners which hold the transducers in place on the inner plate.

4. Turn this assembly over to view the fasteners which hold each pressure transducer. Remove the fasteners holding the transducers using a 3/32" (~2.5 mm) Allen wrench. Remove the fasteners under the spacers using a 7/64" (~3 mm) Allen wrench. This will virtually free the inner plate, although it will still be attached by the wires of the voltage regulator.

5. Turn the motherboard portion back so that the small screws are up. Remove the transducer(s) to be replaced by turning the two corresponding screws. This should be accomplished by alternately turning one screw approximately 5 turns then the other 5 turns to loosen the assembly gradually. When completely loosened, the transducer will be free of the assembly. Remove the O-ring in the bottom and place it in the new transducer.

6. To install the new transducer, perform the above steps in the reverse order (5 to 1). Ensure that the cover bolts are tightened to a torque of 9.2 N·m (81 lb-in).

7. Check to ensure that all transducers are communicating and are reading approximately the same values before applying any pressure to the transducers.

8. When initializing the transducers, be sure that they are not pressurized above 500 psi (3448 kPa) before being energized.

Replacing the Motherboard in the Field

In the event of a motherboard failure, the following steps can be taken to replace it in the field. These steps must be followed exactly in order to ensure that the integrity of the system is maintained.

WARNING

Ensure that the pressure transducer assembly is reading only ambient pressures and that any pressure at each of the ports has been relieved. Faulty pressure transducers may not communicate properly with the NetCon®. Failure to remove residual pressures may cause personal injury or damage to the equipment. Be sure to follow proper grounding procedures as explained on page 3, "Electrostatic Discharge Awareness".

1. Remove the eight fasteners used to secure the cover to the assembly. Remove the cover itself.
2. Disconnect the terminal block at the motherboard.
3. Using a 3/16" (~5 mm) Allen wrench, remove the three fasteners located in the base plate These can be easily accessed by placing the Allen wrench through the holes in the motherboard to loosen each fastener. Removing these will allow for the removal of the inner assembly and provide access to the fasteners which hold the transducers in place on the inner plate.
4. Turn this assembly over to view the fasteners which hold the voltage regulator. Using a 7/64" (~3 mm) Allen wrench, remove the two fasteners at the voltage regulator.
5. Pull the voltage regulator apart at the inner plate being careful not to bend the leads.
6. Disconnect the spacers from the motherboard using a 7/64" (~3 mm) Allen wrench.
7. Separate all transducers from the motherboard using the small screws on the top of the motherboard. This should be accomplished by alternately turning one screw approximately 5 turns then the other 5 turns to loosen the assembly gradually. When completely loosened, the transducers will be free of the mother board.
8. Install the new motherboard by reconnecting the transducers and the spacers.
9. Before installing the voltage regulator, be sure that there is an even coat of heat sink compound (WGC P/N 2000~021) on its flats. Then carefully press the two parts together making sure that they are properly aligned to one another.
10. To complete the installation, follow steps 4 to 1 in descending order. Ensure that the cover bolts are tightened to a torque of 9.2 N·m (81 lb-in).
11. Check to ensure that all transducers are communicating and are reading approximately the same values before applying any pressures.
12. When initializing the transducers, be sure that they are not pressurized above 500 psi (3448 kPa) before being energized.

Chapter 4.
Service Options

Product Service 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 and 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 Engine Retrofitter (RER)** is an independent company that does retrofits and upgrades on reciprocating gas engines and dual-fuel conversions, and can provide the full line of Woodward systems and components for the retrofits and overhauls, emission compliance upgrades, long term service contracts, emergency repairs, etc.
- 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.

You can locate your nearest Woodward distributor, AISF, RER, or RTR on our website at:
www.woodward.com/directory

Woodward Factory Servicing 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**.

How to Contact Woodward

For assistance, call one of the following Woodward facilities to obtain the address and phone number of the facility nearest your location where you will be able to get information and service.

Products Used in Electrical Power Systems

Facility	Phone Number
Brazil	+55 (19) 3708 4800
China	+86 (512) 8818 5515
Germany:	+49 (711) 78954-510
India	+91 (124) 4399500
Japan	+81 (43) 213-2191
Korea	+82 (32) 422-5551
Poland	+48 (12) 295 13 00
United States	+1 (970) 482-5811

Products Used in Engine Systems

Facility	Phone Number
Brazil	+55 (19) 3708 4800
China	+86 (512) 8818 5515
Germany	+49 (711) 78954-510
India	+91 (124) 4399500
Japan	+81 (43) 213-2191
Korea	+ 82 (32) 422-5551
The Netherlands	+31 (23) 5661111
United States	+1 (970) 482-5811

Products Used in Industrial Turbomachinery Systems

Facility	Phone Number
Brazil	+55 (19) 3708 4800
China	+86 (512) 8818 5515
India	+91 (124) 4399500
Japan	+81 (43) 213-2191
Korea	+ 82 (32) 422-5551
The Netherlands	+31 (23) 5661111
Poland	+48 (12) 295 13 00
United States	+1 (970) 482-5811

You can also locate your nearest Woodward distributor or service facility on our website at:
www.woodward.com/directory

Technical Assistance

If you need to telephone for technical assistance, you will need to provide the following information. Please write it down here before phoning:

Your Name	
Site Location	
Phone Number	
Fax Number	
Engine/Turbine Model Number	
Manufacturer	
Number of Cylinders (if applicable)	
Type of Fuel (gas, gaseous, steam, etc)	
Rating	
Application	
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	

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.

Released

We appreciate your comments about the content of our publications.

Send comments to: industrial.support@woodward.com

Please reference publication 85555.

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as well as authorized distributors and other authorized service and sales facilities throughout the world.**

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