WOODWARD

**Product Manual 82442**
**(Revision A)**
**Original Instructions**

# Digital Speed Reference Unit

**8271-651**

**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 *26311* , *Revision Status & Distribution Restrictions of Woodward Technical Publications*, on the *publications page* of the Woodward website:**

**www.woodward.com/publications**

**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 *26311* , *Revision Status & Distribution Restrictions of Woodward Technical Publications*, 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 Out-of-date translations are marked with ⚠.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.**

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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, 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.

# Chapter 1.
# General Information

## Description

The Digital Speed Reference Unit (see Figure 1-1) gives a speed reference level output voltage. The unit is in a sheet steel chassis containing two printed circuit boards (PCBs). The terminal blocks are mounted directly on the PCBs. The PCBs have circuit paths on both sides with the components mounted on one side. The two PCBs are connected by a ribbon cable. All potentiometers are accessible from the front of the chassis under the cover.

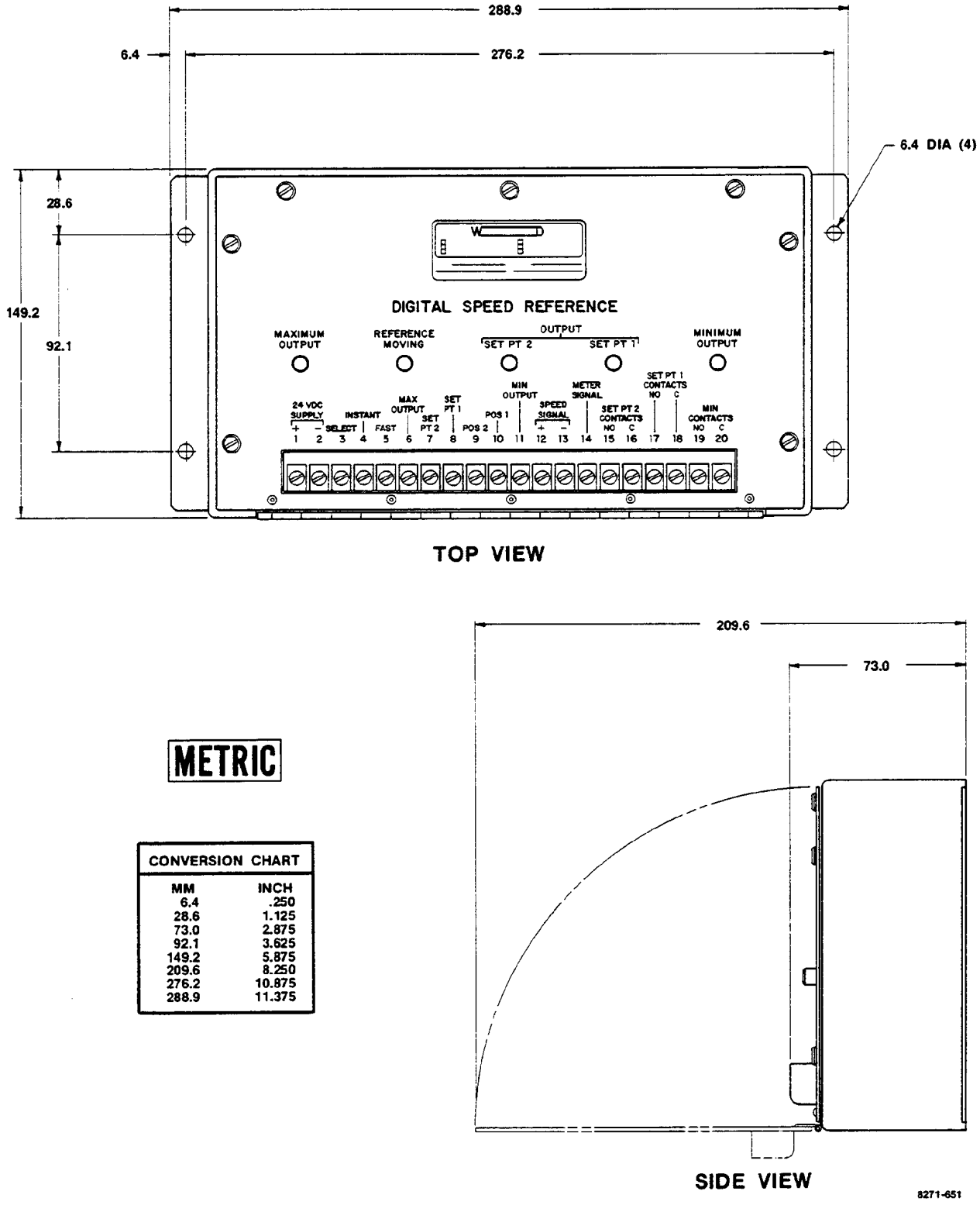
## Function

The function of the Digital Speed Reference Unit is to give a speed reference voltage to other units in the system. The output reference level can be raised or lowered at one of four rates. Three set reference settings can be selected. The unit also gives a 4–20 mA readout signal to a meter.

**⚠WARNING**

**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.**




METRIC

| CONVERSION CHART | |
|---|---|
| MM | INCH |
| 6.4 | .250 |
| 28.6 | 1.125 |
| 73.0 | 2.875 |
| 92.1 | 3.625 |
| 149.2 | 5.875 |
| 209.6 | 8.250 |
| 276.2 | 10.875 |
| 288.9 | 11.375 |

Figure 1-1. Digital Reference Unit

# Chapter 2. Installation

## Application Information

### Power Requirements

The Digital Reference Unit is powered by 18 to 32 Vdc. The power input is connected to terminal 1(+) and 2(–). A battery can be used to supply the operating power. With a battery charger connected, the voltage must stay between 18 and 32 Vdc.

### Environmental Cautions

The Digital Reference Unit operates within a temperature range of –40 to +160 °F (–40 to +71 °C). The unit can be mounted in any position with adequate ventilation and space for servicing.

## Electrical Connections

The plant wiring diagram (Figure 2-1) shows alt wiring connections of the Digital Reference Unit. Use the voltage on terminal 3 for connecting to the Instant, Fast, Max Output, Set PT 2, Set PT 1, Pos 2, Pos 1, and Min Output terminals.

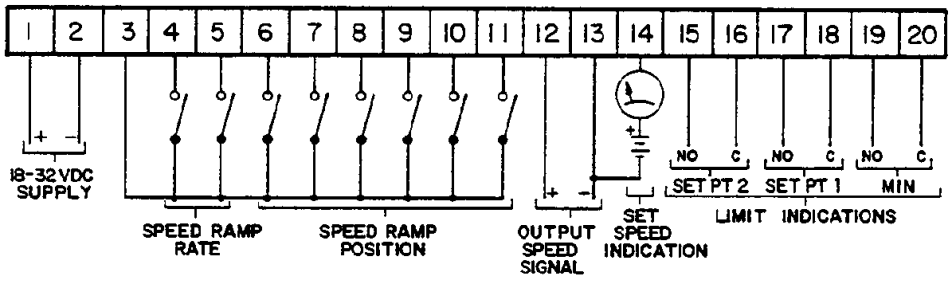



Figure 2-1. Plant Wiring Diagram

### Reference Output

The reference output is between terminals 12 and 13. Terminal 12 is to be connected to the system reference input, and terminal 13 is to be connected to the system circuit common for systems that use positive ramps. For systems that need negative ramps, connect terminal 12 to the system circuit common and terminal 13 to the system reference input.

### Readout Output

The readout output is terminal 14. A current supply and readout meter can be connected to terminal 14. The negative terminal of the readout meter must be connected to terminal 14. The negative terminal of the current supply must be connected to terminal 13. The positive terminals of the readout meter and current supply must be connected together.

# Static Checks

## Visual Inspection

Before beginning the checkout procedure, visually inspect the Digital Reference Unit for damage such as bent or dented panels, loose or broken components. If any damage is found, return the unit for repair.

## Checkout Procedure

The plant wiring diagram (Figure 2-1) and the block schematic (Figure 2-2) show all the input and output connections to the unit. The following gives the recommended test equipment for testing and troubleshooting the Digital Reference Unit.

- Digital Multimeter (DMM): dc voltage accuracy of ±0.3% (Hewlett Packard 3476B or Fluke 8020A)
- Volt-Ohmmeter (VOM): 20 kΩ/V. ±2% accuracy (Simpson 260)
- Power Supply: 24 Vdc
- Current Supply: 25 mA

1. With no wires connected to the unit, measure the resistance between each terminal and the chassis of the unit. The correct resistance reading is 10 MΩ minimum.

2. Connect the readout meter and current supply to terminals 13(–) and 14(+).

3. Connect the input power between terminals 1(+) and 2(–).

4. Check that the voltage on terminal 3 is 25 ±1.5 Vdc when the reference is at the lower limit with the Lower LED illuminated and the Lower relay energized.

5. With no input terminal connected to terminal 3, check the resistance between terminals 15 and 16, terminals 17 and 18, and terminals 19 and 20. The resistance must be greater than 10 MΩ.

**IMPORTANT** **All adjustments are turned clockwise to increase the output level.**

6. Select the Min Output selection. The Minimum Output LED must be illuminated and the resistance between terminals 19 and 20 must be zero. Check that the system is controlling at the level specified. If the control point is not correct, adjust R5.

7. Select the Max Output selection. The reference output level must not change and the Reference Moving LED must not be illuminated until the Min Output selection is disconnected.

8. Disconnect the Min Output selection. The Reference Moving LED is illuminated until the Max Output LED is illuminated. Check that the system is controlling at the level specified. If the control point is not correct, adjust R8.

9. Repeat steps 6 and 8 until no adjustments are needed.

10. Disconnect the Min Output and Max Output selections.

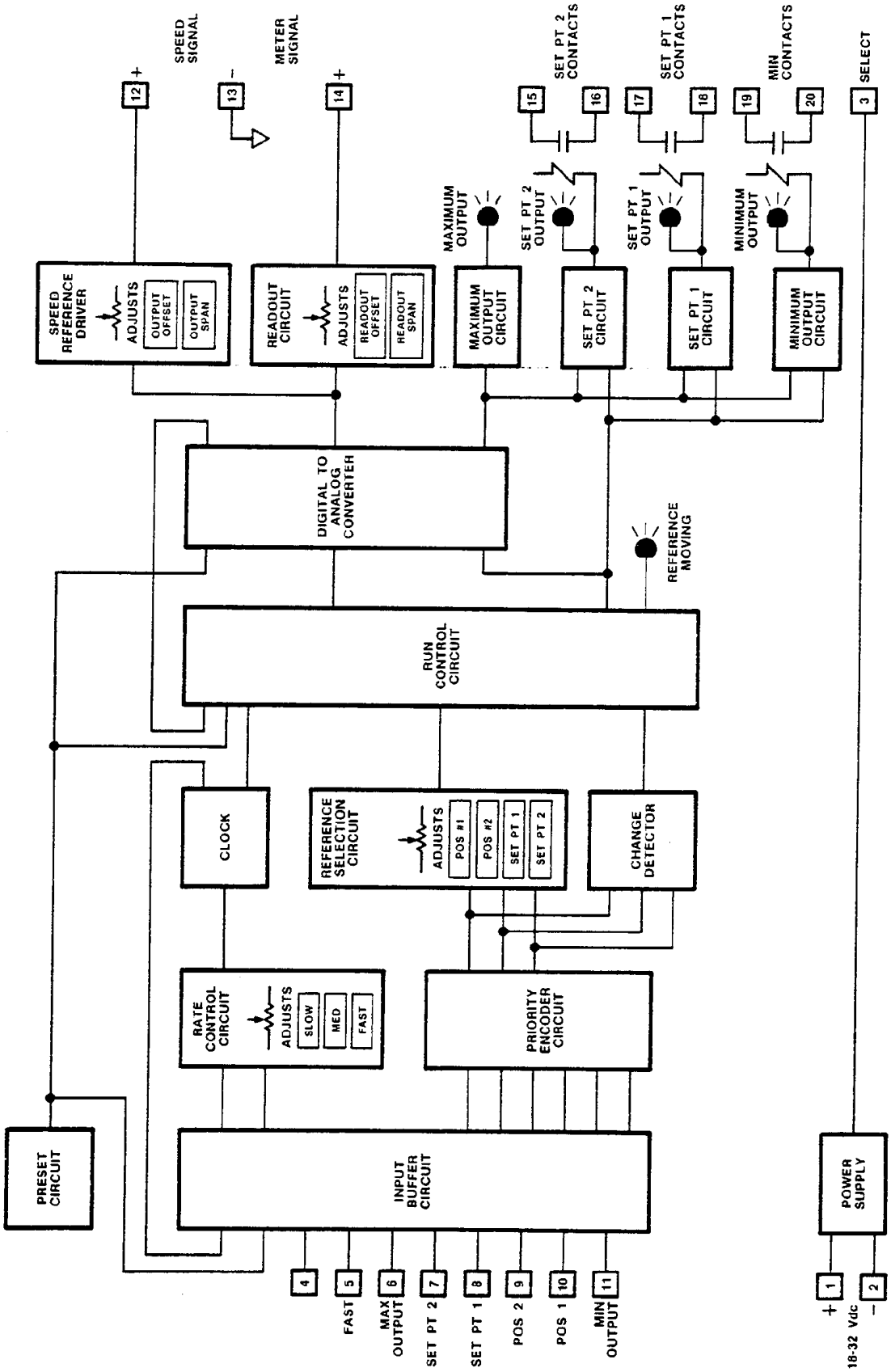



Figure 2-2. Block Schematic

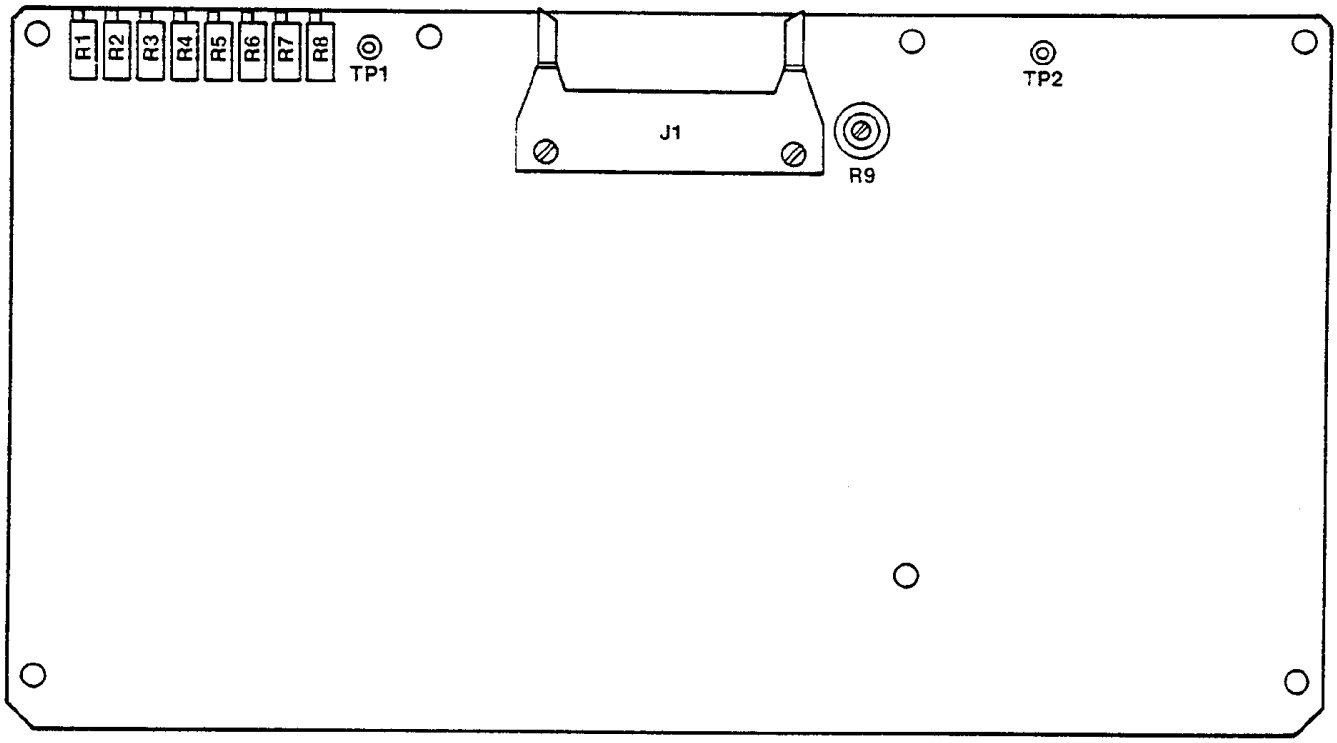



Figure 2-3. Front Board Potentiometer Location

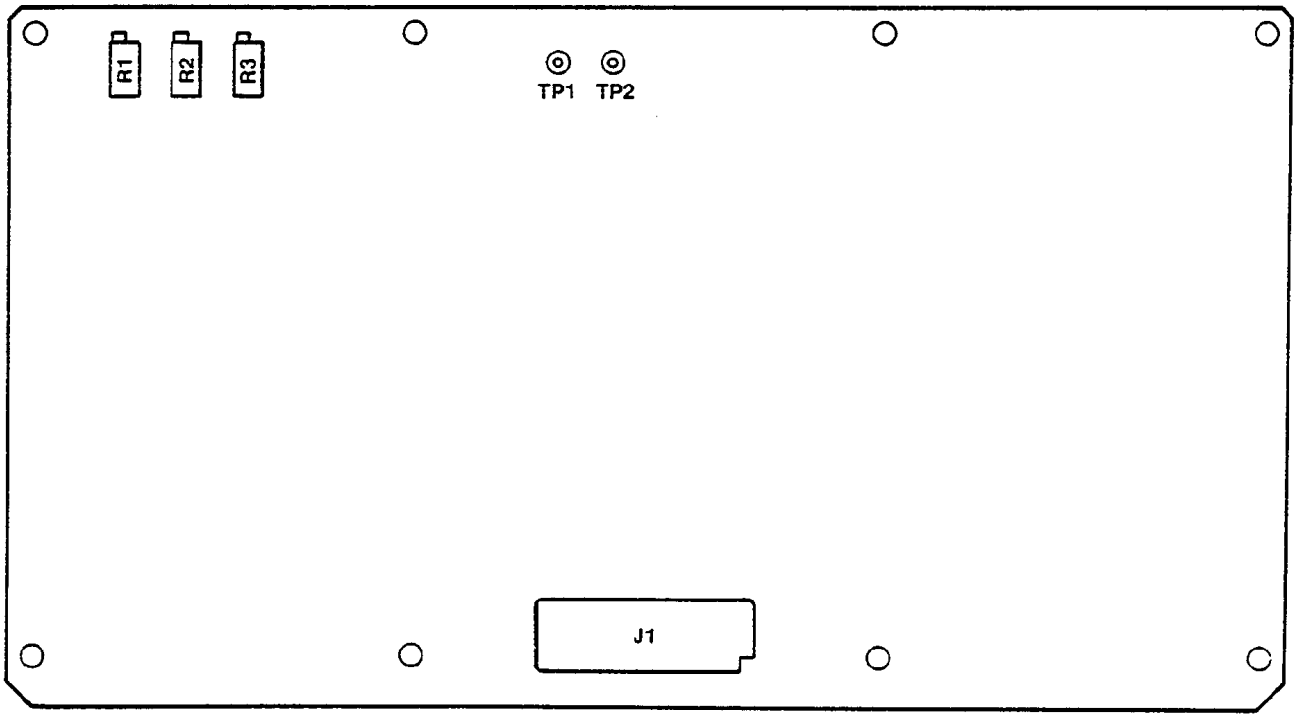



Figure 2-4. Back Board Potentiometer Location

**IMPORTANT** **In the following steps, if an adjustment is made, the selection must be momentarily disconnected.**

11. Select the Pos 1 selection. The Reference Moving LED is illuminated and the reference output level goes to the Pos 1 reference level. When the Reference Moving LED is not illuminated, the reference level is at the Pos 1 level. If the reference output is not as specified, adjust R4.

12. Disconnect the Pos 1 selection and select the Pos 2 selection. The Reference Moving LED is illuminated and the reference output level goes to the Pos 2 reference level. When the Moving LED a not illuminated, the reference level is at the Pos 2 level. If the reference output is not as specified, adjust R2 on the front board.

13. Disconnect the Pos 2 selection and select the Set PT 1 selection. The Reference Moving LED is not illuminated and the reference output level goes to the Set PT 1 output reference level. The Set PT 1 Output LED is illuminated and the resistance between terminals 17 and 18 is zero when the reference level is at the Set PT 1 level. If the reference output is not as specified, adjust R3 on the front board.

14. Disconnect the Set PT 1 selection and select the Set PT 2 selection. The Reference Moving LED is illuminated, the Set PT 1 Output LED is not illuminated, the resistance between terminals 17 and 18 is greater than 10 MΩ and the reference output level goes to the Set PT 2 reference level. The Set PT 2 Output LED is illuminated and the resistance between terminals 15 and 16 is zero when the reference level is at the Set PT 2 level. If the reference output is not as specified, adjust R1 on the front board.

15. Repeat steps 6, 8, 11, 12, 13, and 14 until no adjustments are needed.

16. Select the Min Output selection. When the Minimum Output LED is illuminated, the readout meter must be indicating the minimum reference level. If the meter is not indicating the correct level, adjust R6.

17. Disconnect the Min Output selection and select the Max Output selection. When the Maximum Output LED is illuminated, the readout meter must be indicating the maximum reference level. If the meter is not indicating the correct level, adjust R7.

18. Repeat steps 16 and 17 until no adjustments are needed.

19. Select the Min Output and Max Output selections. The reference level must decrease to the Minimum Output level.

**IMPORTANT** **The Rate adjustments are turned clockwise for a faster rate.**

20. Disconnect the Min Output selection and determine if the time needed for the reference level to go from the minimum output level to the maximum output level is as specified for the slow rate. If the rate is not correct, adjust R1 on the back board.

21. Select the Min Output selection and check that the time needed for the reference level to go from maximum output level to the minimum output level is the same as the time needed to go from minimum output level to the maximum output level.

22. Select the Fast selection. Check that the time needed for the reference level to go from limit to limit at the fast rate is as specified. If the time is not correct, adjust R3 on the back board.

23. Select the Fast and Instant selections. Check that the time needed for the reference level to go from limit to limit at the medium rate is as specified. If the time is not correct, adjust R2 on the back board.

24. Disconnect the Fast selection. Check that the reference output level jumps from limit to limit instantly.

# Chapter 3.
# Principles of Operation

## Power Supply

The Digital Reference Unit has power supplies that change the 16 to 32 Vdc input voltage into the voltages needed by the unit. These voltages are regulated. The input voltage can be supplied by a battery and battery charger system but must not be greater than 32 Vdc.

## Input Buffer

The Input Buffer gives the connections between the Min Output, Pos 1, Pos 2, Set PT 1, Set PT 2, Max Output, Fast, and Instant input terminals and the reference circuits. The Input Buffer gives signals to the Priority Encoder and Rate Control circuits to control the reference output of the unit and the rate at which the reference changes.

## Priority Encoder Circuit

The Priority Encoder circuit uses the outputs from the Input Buffer to control the reference selected. If more than one input is selected, the input with the lowest reference level is selected by the Priority Encoder. The Priority Encoder generates a digital code for the reference selected. The digital code is used by the Reference Selection and Change Detector circuits.

## Reference Selection Circuit

The Reference Selection circuit uses the digital codes to connect a potentiometer to the Run Control circuit. Each code connects a different reference potentiometer. The reference levels are between the maximum and minimum counts of the Digital to Analog Converter (DAC) output.

## Rate Control and Clock Circuits

The Rate Control circuit uses the rate signals from the Input Buffer circuit to control the frequency of the Clock circuit output. The Clock circuit generates the pulses counted by the DAC circuit.

## Change Detector Circuit

The Change Detector circuit uses the digital codes from the Priority Encoder to control if the reference selection is changed. When a change a detected, the circuit gives a signal to the Run Control circuit.

## Run Control and Digital to Analog Converter Circuits

The Run Control circuit uses the signals from the Clock, Reference Selection, Change Detector, and DAC circuits. When the signal from the Change Detector indicates a change in reference level is needed, the clock pulses are given to the counters. The circuit compares the output level of the DAC with the reference selection output to control if the counters count up or down. When the DAC and reference selection signals are equal, the clock pulses are disconnected. When the Clock pulses are being counted, the Moving LED on the front is illuminated. The DAC circuit counts the clock pulses and gives an analog output that is proportional to the count. The DAC analog output is used for setting the size of the reference output. The DAC circuit gives digital signals to the Indication circuits.

## Switch Point Circuits

The Switch Point Circuits are Minimum Output, Set PT 1, Set PT 2, and Maximum Output. These circuits indicate when the counters in the DAC circuit are at the set limits or at the Maximum Output level. The Maximum Output circuit illuminates the Maximum Output LED and energizes the Minimum Output relay when the Run Control and DAC circuits indicate that the reference is at the Minimum Output level. The Set PT 1 circuit illuminates the Set PT 1 Output LED and energizes the Set PT 1 Output relay when the Run control and the DAC circuits indicate that the reference is at the Set PT 1 Output level. The Set PT 2 Output circuit illuminates the Set PT 2 Output LED and energizes the Set PT 2 Output relay when the Run Control and the DAC circuits indicate that the reference is at the Set PT 2 Output level. The Maximum Output circuit illuminates the Maximum Output LED when the counters in the DAC circuit reach the maximum count.

## Speed Reference Drive and Preset Circuits

The output of the DAC circuit is used by the Speed Reference Driver circuit. The Speed Reference Driver changes the DAC circuit output to the system reference needs. The Preset circuit sets the Run Control, Input Buffer, and the counters in the DAC circuit for the Minimum Output level when the power is first connected to the Digital Reference Unit.

## Readout Circuit

The Readout circuit uses the output of the DAC circuit and changes the voltage into a current proportional to the reference level. The circuit controls the amount of current flowing through the readout meter from the current supply. The circuit allows 4 mA at the lower reference level and 20 mA at the Overspeed reference level.

## Operation

The following gives the operating information on test points, adjustments, function indicators, selectable inputs, relays, and outputs.

The Digital Reference Unit can increase or decrease the reference output by selecting the Max Output or Min Output terminal. The reference rate of change

can be selected from four rates: Slow, Medium, Fast, or Instant. The reference levels can be selected by connecting the Min Output, Pos 1, Pos 2, Set PT 1, Set PT 2, or Max Output inputs to the select output (terminal 3). All selections can be selected manually and/or automatically depending on the system.

# Test Points and Adjustments

The test points and adjustments are located under the cover of the unit. For each test point and adjustment, the function is given in the following list. For the location of the test points and adjustments, see Figures 2-3 and 2-4.

## Test Points

| Back Board | Function |
|---|---|
| TP1 | Clock Output |
| TP2 | Up/Down Logic Output |

| Front Board | Function |
|---|---|
| TP1 | DAC Output |
| TP2 | Circuit Common |

## Adjustments

| Back Board | Function |
|---|---|
| R1 | Slow Rate Adjustment |
| R2 | Medium Rate Adjustment |
| R3 | Fast Rate Adjustment |

| Front Board | Function |
|---|---|
| R1 | Set PT 2 Adjust |
| R2 | Pos 2 Adjust |
| R3 | Set PT 1 Adjust |
| R4 | Pos 1 Adjust |
| R5 | Output Offset Adjust |
| R6 | Readout Offset Adjust |
| R7 | Readout Span Adjust |
| R8 | Output Span Adjust |
| R9 | Factory Adjustment of +12 Vdc |

## Reference Adjustments

Pos 1 Adjust—Sets the Position 1 reference output level between the Minimum Output and Maximum Output levels.
Pos 2 Adjust—Sets the Position 2 reference output level between the Minimum Output and Maximum Output levels.
Set PT 1 Adjust—Sets the Set PT 1 reference output level between the Minimum Output and Maximum Output levels.
Set PT 2 Adjust—Sets the Set PT 2 reference output level between the Minimum Output and Maximum Output levels.

## Output Adjustments

Output Offset—Sets the minimum reference output level at the minimum output.
Output Span—Sets the maximum reference output level at maximum output.

### Readout Adjustments

Readout Offset—Sets the minimum readout output current.
Readout Span—Sets the maximum readout output current.

### Rate Adjustments

The Rate Adjustments set the rates of change in the reference output.

### Function Indicators

The function indicators are the Light Emitting Diodes (LEDs) located on the front of the Digital Reference Unit.

Maximum Output—Illuminates when the reference reaches the maximum output level.
Set PT 2 Output—Illuminates when the reference reaches the Set PT 2 output level.
Set PT 1 Output—Illuminates when the reference reaches the Set PT 1 output level.
Minimum Output—Illuminates when the reference reaches the minimum output level.
Reference Moving—Illuminates while the reference level is changing.

## Selectable Inputs

### Rate Selection

Slow—Not connecting terminal 3 to the Instant or Fast terminals selects the Slow Rate.
Med—Connecting terminal 3 to both the Instant and Fast terminals selects the Medium Rate.
Fast—Connecting terminal 3 to the Fast Terminal selects the Fast Rate.
Instant—Connecting terminal 3 to the Instant Terminal selects the Instant Rate.

### Reference Selections

**IMPORTANT** **The lowest reference selection controls the output of the Digital Reference Unit.**

Min Output—Connecting terminal 3 to the Min Output terminal selects the minimum reference level.
Pos 1—Connecting terminal 3 to the Pos 1 terminal selects the Position 1 reference level.
Pos 2—Connecting terminal 3 to the Pos 2 terminal selects the Position 2 reference level.
Set PT 1—Connecting terminal 3 to the Set PT 1 terminal selects the Set PT 1 reference level.
Set PT 2—connecting terminal 3 to the Set PT 2 terminal selects the Set PT 2 reference level.
Max Output—Connecting terminal 3 to the Max Output terminal selects the maximum reference level.

## Relays

Set PT 2—Energizes when the Set PT 2 Output LED is illuminated.
Set PT 1—Energizes when the Set PT 1 Output LED is illuminated.
Min Output—Energizes when the Minimum Output LED is illuminated.

**IMPORTANT** **The resistance between the relay terminals is zero when the relays are energized.**

## Outputs

Speed Signal—Reference output connected to terminals 12(+) and 13(–) for a positive ramp. Reference output connected to terminals 13(+) and 12(–) for a negative ramp.
4–20 mA—Readout meter and current supply are connected in series across terminals 14(+) and 13(–). Negative of the Readout meter and current supply must not be connected to circuit common.

# Chapter 4. Troubleshooting

The troubleshooting information is for only checking if the unit is not functioning correctly. Before troubleshooting the Digital Reference Unit, visually inspect the unit for burned or broken parts, bad wire connections, or bad solder joints. A burned resistor often indicates a shorted transistor or a shorted wire. Be sure all connections are tight and making good contact. If nothing is found, proceed with the troubleshooting.

**IMPORTANT** **A difference in the color of the potting compound on the power resistors is common and does not indicate a burned-out condition.**

1. Connect all wires to the terminals as needed.
2. Connect the power input.
3. Using a digital voltmeter, check the voltage on terminal 3 for 25.0 ±1.5 Vdc with the Lower LED illuminated and the Lower relay energized.
4. Connect a voltmeter between terminals 12(+) and 13(–).

| Symptom | Procedure | Results |
|---|---|---|
| 1. Not able to select a new reference level. | A. Check that when the new level is selected, the Reference Moving LED is illuminated. | If the Reference Moving LED is not illuminated, go to the next step. |
| | B. Check that the new level is lower than the old level. | It OK, return the circuit for repair. |
| 2. The reference level cannot be raised or lowered. (The voltage on terminals 12(+) and 13(–) will not change.) | A. Check that the lower terminal is not selected. | If the Lower terminal is not selected, go to the next step. |
| | B. Check that the Output Span adjustment is not counterclockwise. | If correct, return the unit for repair. |
| 3. Limit LEDs or relays are not working. | Check that the input terminals are correct. | If the inputs are correct, return the unit for repair. |
| 4. Not able to change the rate. | A. Check that the input voltages on the Instant and Fast terminals are correct. | No voltage on both for Slow Rate. Select voltage on both for Medium Rate. Select voltage on Fast for Fast Rate. Select voltage on Instant for Instant Rate. |
| | B. Connect a scope or counter to TP1 on the back board. With Slow selected, vary the Slow adjustment (R1 on back board). The clock rate must change. Repeat the procedure for the Fast and Medium adjustments. | If an adjustment has no effect or the instant is not instant, return the unit for repair. |

# Chapter 5.
# 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:

1. Consult the troubleshooting guide in the manual.
2. Contact the **OE Manufacturer or Packager** of your system.
3. Contact the **Woodward Business Partner** serving your area.
4. Contact Woodward technical assistance via email (**EngineHelpDesk@Woodward.com**) with detailed information on the product, application, and symptoms. Your email will be forwarded to an appropriate expert on the product and application to respond by telephone or return email.
5. If the issue cannot be resolved, you can select a further 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 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 current list of Woodward Business Partners is available at **www.woodward.com/directory**.

## Product Service Options

Depending on the type of product, the following options for servicing Woodward products may be available through your local Full-Service Distributor or the OEM or Packager of the equipment system.

- 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 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.

**Flat Rate Repair**: Flat Rate Repair is available for many of the standard mechanical products and some of the electronic 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.

**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. 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 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's Full-Service Distributors offer various Engineering Services for our products. For these services, you can contact the Distributor by telephone or by email.

- 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.

**Product Training** is available as standard classes at many Distributor locations. Customized classes are also available, which can be tailored to your needs and held at one of our Distributor 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 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 one of the Full-Service Distributors listed at **www.woodward.com/directory**.

# Contacting Woodward's Support Organization

For the name of your nearest Woodward Full-Service Distributor or service facility, please consult our worldwide directory published at **www.woodward.com/directory**.

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

| Facility | Phone Number |
|---|---|
| Brazil | +55 (19) 3708 4800 |
| China | +86 (512) 6762 6727 |
| Germany: | |
| Kempen | +49 (0) 21 52 14 51 |
| Stuttgart | +49 (711) 78954-510 |
| India | +91 (129) 4097100 |
| Japan | +81 (43) 213-2191 |
| Korea | +82 (51) 636-7080 |
| 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) 6762 6727 |
| Germany | +49 (711) 78954-510 |
| India | +91 (129) 4097100 |
| Japan | +81 (43) 213-2191 |
| Korea | +82 (51) 636-7080 |
| 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) 6762 6727 |
| India | +91 (129) 4097100 |
| Japan | +81 (43) 213-2191 |
| Korea | +82 (51) 636-7080 |
| The Netherlands | +31 (23) 5661111 |
| Poland | +48 12 295 13 00 |
| United States | +1 (970) 482-5811 |

For the most current product support and contact information, please visit our website directory at **www.woodward.com/directory**.

# 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 _____

Engine Model Number _____

Number of Cylinders _____

Type of Fuel (gas, gaseous, diesel, dual-fuel, 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.*

**We appreciate your comments about the content of our publications.**

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

**Please reference publication 82442A.**

WOODWARD

PO Box 1519, Fort Collins CO 80522-1519, USA
1000 East Drake Road, Fort Collins CO 80525, USA
Phone +1 (970) 482-5811 • Fax +1 (970) 498-3058

**Email and Website—www.woodward.com**

**Woodward has company-owned plants, subsidiaries, and branches,
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.**

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