WOODWARD

Product Manual 82343
(Revision D)
Original Instructions

Digital Reference Unit

8272-221 Direct Acting, 0–6 V Output
8272-468 Inverse Acting, 6–0 V Output

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:

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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 Out-of-date translations are marked with ⚠.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.

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

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Warnings and Notices

Important Definitions

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

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

⚠WARNING

Overspeed / Overtemperature / Overpressure

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

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

⚠WARNING

Personal Protective Equipment

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

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

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

⚠WARNING

Start-up

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

⚠WARNING

Automotive Applications

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

NOTICE

Battery Charging Device

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

Electrostatic Discharge Awareness

NOTICE

Electrostatic Precautions

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

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

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

Follow these precautions when working with or near the control.

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

Chapter 1.
General Information

Description

The Digital Reference Unit (Figure 1-1) consists of two printed circuit boards (PCBs) housed in a steel chassis. Potentiometers for adjusting reference levels and for meter calibration are on the front of the top PCB (A1) and are accessed through the front cover. All other adjustments and test points are on the back of PCB A1 or on the front of the bottom PCB (A2) and are accessed by removal of the cover. See Figure 1-2 for PCB locations.

Terminal blocks are mounted directly on the PCBs, eliminating unnecessary wiring and connections. A ribbon cable connects the two PCBs.

Function

The Digital Reference Unit generates a precise voltage that may be used wherever a reference signal is required. Typical uses include control of speed, load, pressure, and voltage. The level of the output voltage can be raised or lowered at one of four rates. Six reference selections also are available.

⚠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.

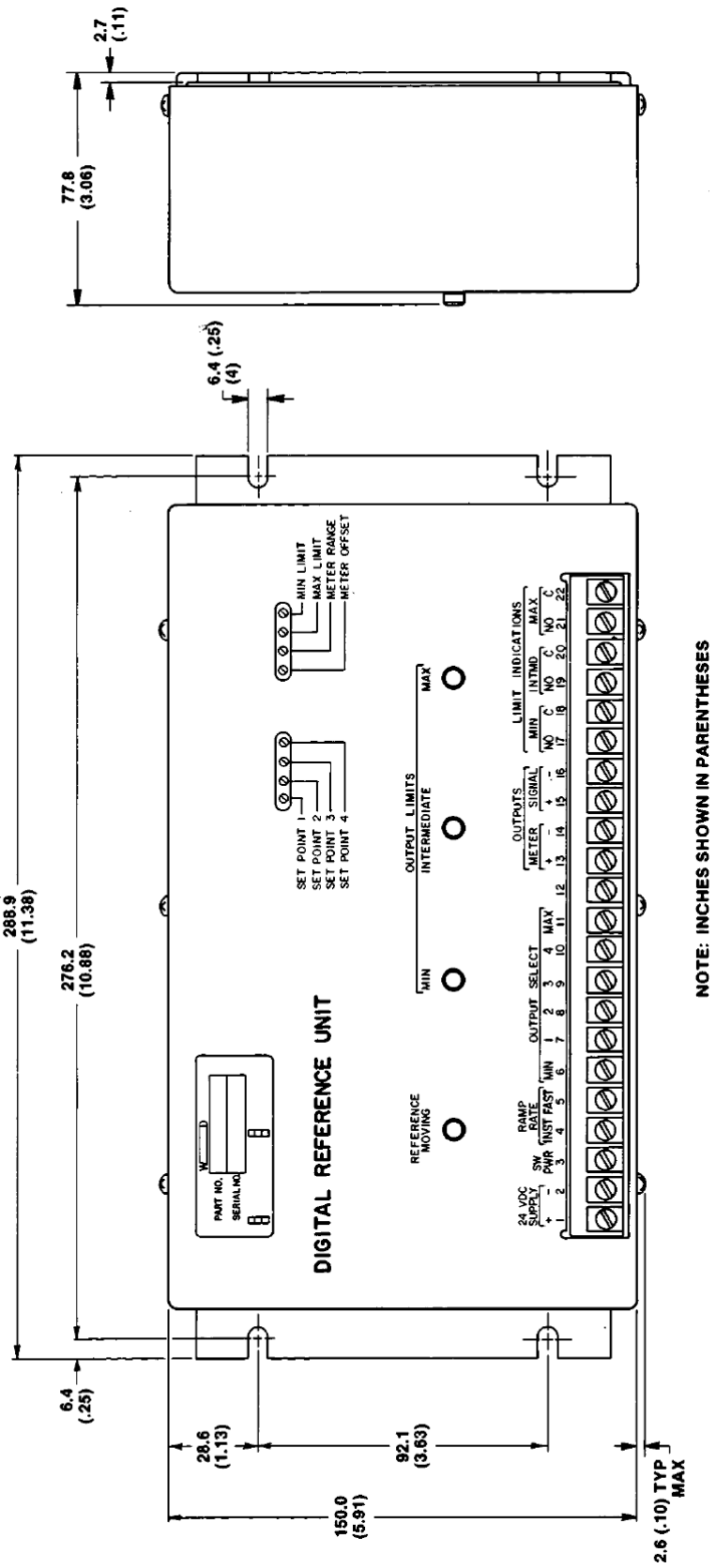

Figure 1-1. Digital Reference Unit Outline Drawing

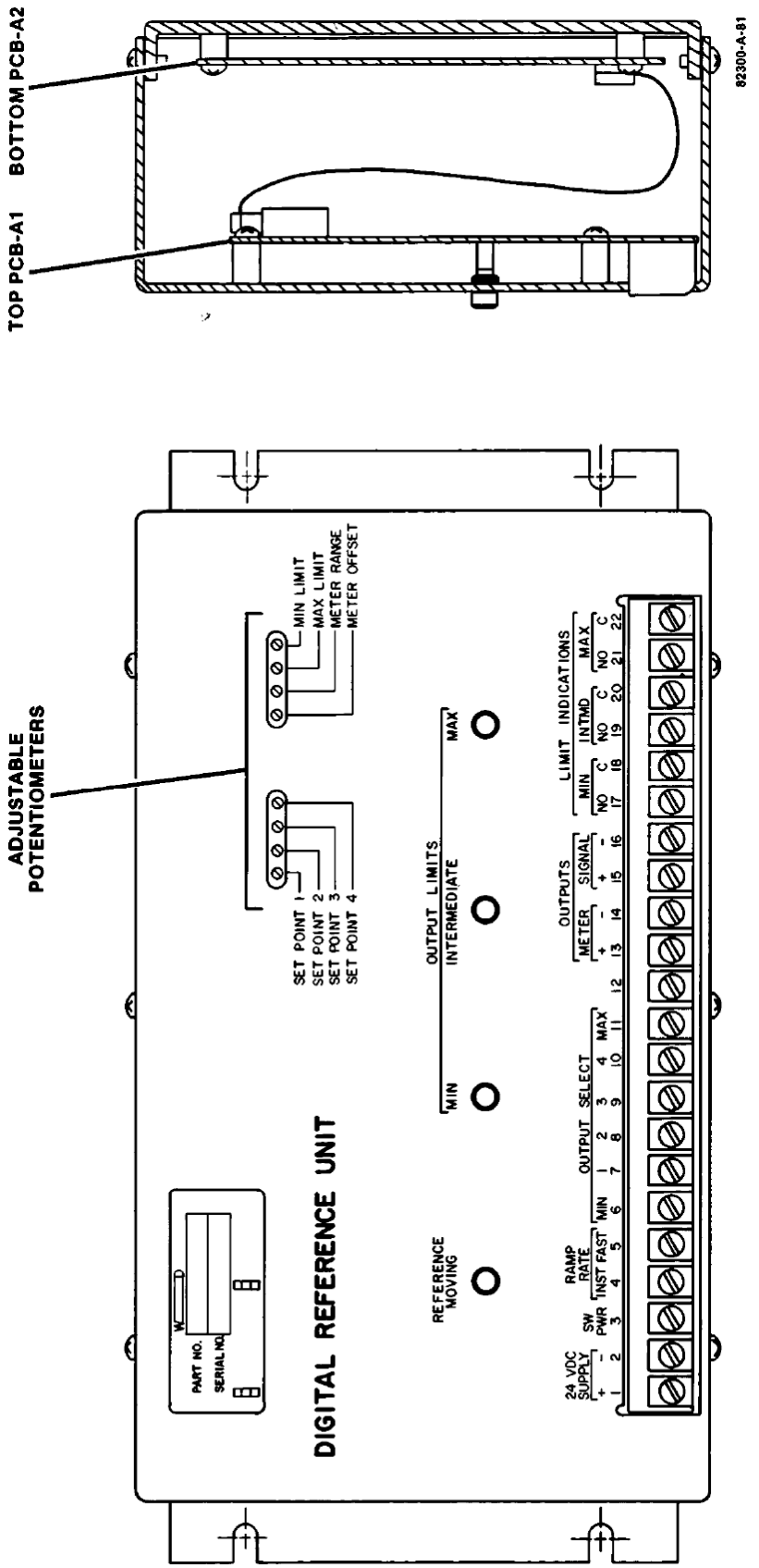

Figure 1-2. Digital Reference Unit Assembly Drawing

Chapter 2.
Installation and Adjustment

Unpacking and Inspection

Before handling the control, read page ii, “Electrostatic Discharge Awareness.” After carefully unpacking the control, visually inspect it for damage such as bent or dented panels, and loose or broken components. If any damage is found, immediately notify the shipper.

Application Information

Power Requirements

The Digital Reference Unit will operate with input power of 18 to 4 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 40 Vdc.

NOTICE

To prevent damage to the control, make sure that the alternator or other battery-charging device is turned off or disconnected before disconnecting the battery from the control.

Environmental Cautions

The Digital Reference Unit operates within a temperature range of –40 to +160 °F (–40 to +71 °C).

Location Considerations

The unit can be mounted in any position that provides adequate ventilation and space for servicing.

Electrical Connections

The plant wiring diagram (Figure 2-1) shows the wiring connections for the Digital Reference Unit. Connect the ramp-rate and reference terminals (terminals 4 through 11) to the +24 Vdc of terminal 3 as shown.

Reference Output Connections

Connect the reference output to terminals 15 and 16. For systems that use positive ramps, connect the system reference input to terminal 15 and the system circuit common to terminal 16. For systems that require negative ramps, connect the system circuit common to terminal 15 and the system reference input to terminal 16.

Recommended Test Equipment

The following test equipment is recommended for the checkout procedure in this chapter. Equipment having equivalent specifications may be substituted.

Digital Multimeter (DMM):	DC voltage accuracy of ±0.3% (Hewlett Packard 3476B or Fluke 8020A)
Volt-Ohmmeter (VOM):	20 kΩ/V ±0.2% (Simpson 260)
Power Supply:	24 Vdc

Checkout Procedure

Input and output connections to the control are shown in the plant wiring diagram, Figure 2-1. Potentiometers for setting minimum, maximum, and intermediate set points, along with meter range and meter offset are on PCB A1 and are accessed through the front cover. All other settings and adjustments require removal of the front cover. (Refer to Figures 3-1 and 3-2 for potentiometer arid switch locations.)

1. With no wires connected to the unit, measure the resistance between each terminal and the chassis. Resistance should be a minimum of 10 MΩ.

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

IMPORTANT

All adjustments are turned clockwise to increase the output level.

When the limit indication contacts are closed (zero resistance), the relays are energized.

Signal Output Checks

1. Connect a voltmeter to terminals 15 (+) and 16 (–).

2. Turn on the power and verify that the signal output at terminals 15 (+) and 16 (–) is less than 7 Vdc.

Minimum Output Limit

3. Issue a MIN Output Select command. Verify that the MIN Output LED illuminates, and that the system is controlling at the level specified. If necessary, adjust the Mm Limit (Offset) potentiometer (R8) until the system is controlling at the desired control point. Verify with an ohmmeter that the MIN Limit Indication contacts at terminals 17 and 18 close.

Maximum Output Limit

4. Without disconnecting the MIN Output, issue a MAX Output Select command. Verify that the reference-output level does not change and that the REFERENCE MOVING indicator is not illuminated.

5. Disconnect the MIN Output Select. Verify that the reference now moves toward the Maximum control point. Make sure the REFERENCE MOVING indicator is illuminated until the Max limit is reached. When the Max limit is reached, verify that the REFERENCE MOVING indicator turns off and the MAX Output Limit indicator turns on. Make sure that the MAX Output level is at the desired point. If necessary, adjust the Max Limit (Range) potentiometer (R7). Verify with an ohmmeter that the MAX Limit Indication contacts at terminals 21 and 22 close.

6. Repeat steps 3 through 5 until MIN and MAX set points are at the desired level.

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

Intermediate Output Set Points

7. Connect an ohmmeter between terminals 19 and 20.

8. Make sure that switch S1-1 is closed, and that S1-2, S1-3, and S1-4 are open.

9. Issue an Output Select 1 command. Verify that after the REFERENCE MOVING indicator turns off, the INTERMEDIATE OUTPUT LIMIT indicator turns on. Verify zero resistance between terminals 19 and 20. If the reference output of Output Select 1 is not at the desired level, adjust the Set Point 1 potentiometer (R1).

10. Open switch S1-1 and close S2-2. Verify that the INTERMEDIATE OUTPUT LIMIT indicator turns off and that the ohmmeter indicates terminals 19 and 20 are open (infinite resistance).

11. Issue an Output Select 2 command. Verify that, after the REFERENCE MOVING indicator turns off, the INTERMEDIATE OUTPUT LIMIT indicator turns on. Verify zero resistance between terminals 19 and 20. If the reference output of Output Select 2 is not at the desired level, adjust the Set Point 2 potentiometer (R2).

12. Open switch S1-2 and close S1-3. Verify that the INTERMEDIATE OUTPUT LIMIT indicator turns off and that the ohmmeter indicates terminals 19 and 20 are open.

13. Issue an Output Select 3 command. Verify that after the REFERENCE MOVING indicator turns off, the INTERMEDIATE OUTPUT LIMIT indicator turns on. Verify zero resistance between terminals 19 and 20. If the reference output of Output Select 3 is not at the desired level, adjust the Set Point 3 potentiometer (R3).

14. Open switch S1-3 and close S1-4. Verify that the INTERMEDIATE OUTPUT LIMIT indicator turns off and that the ohmmeter indicates terminals 19 and 20 are open.

15. Issue an Output Select It command. Verify that after the REFERENCE MOVING indicator turns off, the INTERMEDIATE OUTPUT LIMIT indicator turns on. Verify zero resistance between terminals 19 and 20. If the reference output of Output Select It is not at the desired level, adjust the Set Point 4 potentiometer (R4).

16. Make sure all set point switches are opened except the one connecting the desired Intermediate Output Select contact.

Meter Output Signal Check

1. Connect either a 0 to 1 mA meter or a 4 to 20 mA meter to terminals 13 (+) and 14 (–).

2. Issue a MIN Output Select command and wait until the REFERENCE MOVING indicator turns off. Verify that the meter indicates 0 mA for the 0 to 1 mA meter. For the 4 to 20 mA meter, adjust the Meter Offset potentiometer (R5) as necessary to obtain a zero indication for the 4 mA input.

3. Issue a MAX Output Select command and wait until the REFERENCE MOVING indicator turns off. Verify that the meter indicates 1 mA for the 0 to 1 mA meter or full scale for the 4 to 20 mA meter. If necessary, adjust the Meter Range potentiometer (R6).

4. Repeat steps 2 and 3 until no further adjustment is required to calibrate the output to read 0 mA at MIN output and 1 mA at MAX output for a 0 to 1 mA meter, or zero at 4 mA and full scale at 20 mA for a 4 to 20 mA meter.

Ramp Rate Adjustments

Of the four ramp rates available, three are adjustable as indicated below. Potentiometers for setting ramp times are located on PCB A2. PCB A2 is accessed by removal of the cover.

Ramp Rate	Potentiometer	Range
SLOW	A2-R1	25–440 seconds
MEDIUM	A2-R2	25–440 seconds
FAST	A2-R3	4.8–98 seconds
INSTANT	None	70ms

A SLOW ramp rate is automatically selected if no other rate command is issued. For a MEDIUM ramp rate both INST and FAST rates must be selected. Select each rate and set the ramp time desired by adjusting the corresponding potentiometer.

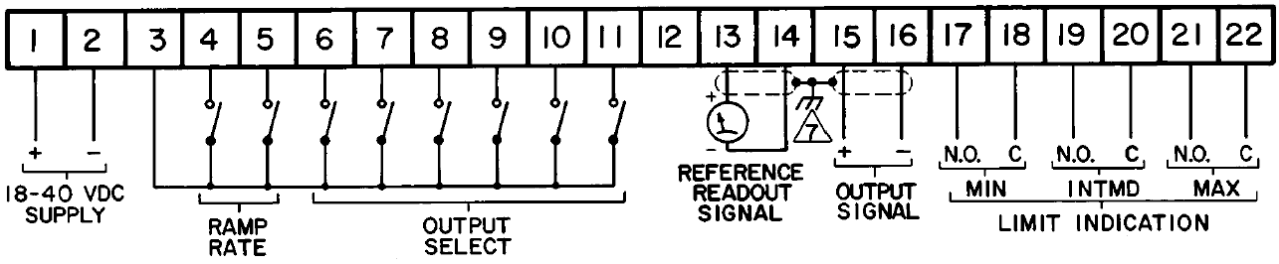

Figure 2-1. Typical Plant Wiring Diagram

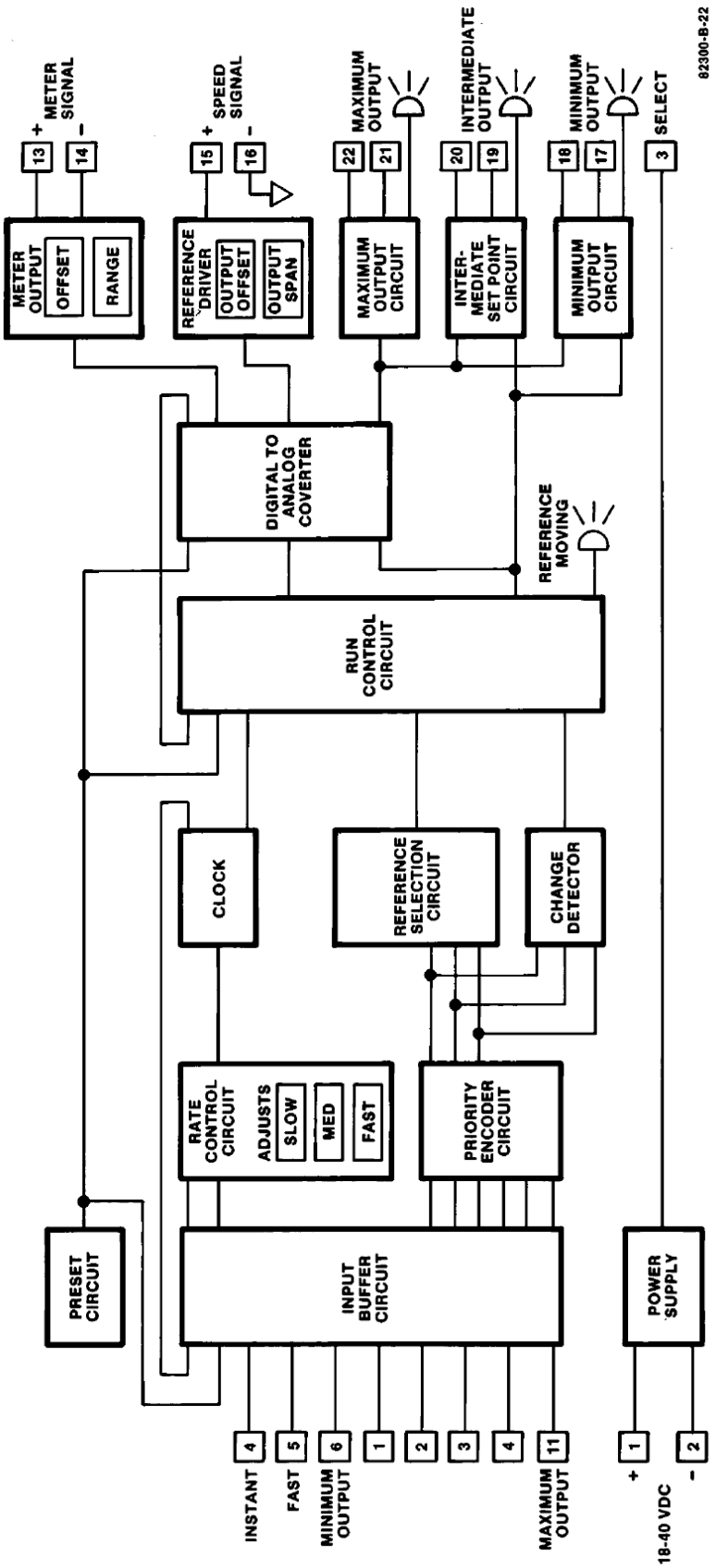

Figure 2-2. Block Diagram

Chapter 3.
Principles of Operation

Power Supply

The power supply of the Digital Reference Unit changes the 18 to 40 Vdc input voltage into the regulated voltages needed by the unit. Input voltages can be supplied by a battery and battery charger system, but must not be greater than 40 Vdc.

Input Buffer

The terminals for MIN, MAX, and INTERMEDIATE Output Selects and FAST and INST Ramp Rates are connected to the reference circuits by the Input Buffer. The Input Buffer gives signals to the Priority Encoder and Rate Control circuits to control the reference output of the Digital Reference Unit and the rate at which the reference changes.

Circuits

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 which is used by the Reference Selection circuit and the Change Detector circuit.

Reference Selection Circuit

The Reference Selection circuit uses the digital codes from the Priority Encoder to connect the intermediate Set Point Selections (1 through 4) to the Run Control circuit. 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 modified by the slow-, medium-, and fast-rate potentiometers 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 is detected, the circuit sends 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 determine whether to 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 REFERENCE MOVING indicator on the cover 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 also sends digital signals to the indication circuits.

Switch Point Circuits

The Switch Point Indication circuits are the Minimum Output, Intermediate Output, or Maximum Output indication circuits. These circuits indicate when the counters in the DAC circuit are at the intermediate, minimum, or maximum output level. The Maximum Output circuit illuminates the MAX Output indicator when the Run Control and DAC circuits indicate that the reference is at the maximum output level. The Set Point circuits illuminate the INTERMEDIATE indicator when the Run Control and the DAC circuits indicate that the reference is at the intermediate level. The Minimum Output circuit illuminates the MIN Output indicator when the counters in the DAC circuit reach the maximum count.

Reference Driver and Preset Circuits

The Reference Driver circuit changes the output of the DAC circuit into a reference signal usable by the system. The Preset circuit sets the Run Control, Input Buffer, and the counters in the DAC circuit, to the Minimum Output level when the power is Digital Reference Unit.

Meter Output Circuit

The Meter Circuit provides an output for use of a remote meter of either 0 to 1 mA or 4 to 20 mA.

Operation

Reference

The reference generated by the Digital Reference Unit can be increased or decreased by connecting the appropriate output selections to terminal 3. Maximum, Minimum, or one of four Output Select (intermediate set point) contacts can be manually or automatically selected. The intermediate set point must be preset by closing one of four switches (there is one switch for each of the four intermediate set points) located on PCB A2. See Figure 2-2 for switch locations. The switches are accessible by removing the cover of the control. The potentiometers for adjusting the levels of the reference set points are accessible through the front cover.

Ramp Rate

The rate of change from one reference level to another can be selected from four rates: Slow, Medium, Fast, and Instant. The Fast and Instant rates are selected by connecting their respective terminal to terminal 3. The Medium rate is selected by connecting BOTH the Fast and Instant terminals to terminal 3. When neither the Fast nor Instant rates are connected to terminal 3, the Slow rate is automatically selected.

Test Points and Adjustments

Removal of the cover allows access to the test points and adjustments that are not accessible through the front cover. Of the two circuit boards in the control, the front (or top) board is attached to the cover and the rear (or bottom) board is attached to the chassis, All internal test points and adjustments are mounted on the side of the circuit board that is visible when the cover removed. The function and location of the test points and adjustments are listed below and shown in Figures 3-1 and 3-2.

Test Point Locations and Functions

Top Board (A1)
TP1 DAC Output
TP2 Circuit Common

Bottom Board (A2)
TP1 Clock Output
TP2 Circuit Common

Adjustment Locations and Functions

Top Board (A1)
S1-1 Switch for intermediate Set Point 1
S1-2 Switch for intermediate Set Point 2
S1-3 Switch fir intermediate Set Point 3
S1-4 Switch for intermediate Set Point 4

Bottom Board (A2)
R1 Slow Ramp Rate
R2 Medium Ramp Rate
R3 Fast Ramp Rate

Output Adjustments

Top Board (A1) (***Adjustment does not require removal of the control cover***)
R1 Set Point 1
R2 Set Point 2
R3 Set Point 3
R4 Set Point 4
R5 Meter Offset
R6 Meter Range
R7 Max Limit
R8 Min Limit

Function Indicators

The function indicators are Light Emitting Diodes (LEDs) on the control cover. They illuminate to indicate the status of the reference.

MAX	Illuminates when the reference reaches the maximum output level.
INTERMEDIATE	Illuminates when the reference reaches the intermediate set point level.
MIN	Illuminates when the reference reaches the minimum output level.
REFERENCE MOVING	Illuminates while the reference level is changing.

Selectable Inputs

Ramp Rate Selection

Slow	Selected by not connecting terminal 3 to the INST or FAST terminals.
Medium	Selected by connecting terminal 3 to both the INST and FAST terminals.
Fast	Selected by connecting terminal 3 to the FAST terminal.
Instant	Selected by connecting terminal 3 to the INST terminal.

Reference Level Selection

MIN Output	The Minimum reference level is selected by connecting terminal 3 to the MIN terminal.
1, 2, 3, 4	The Intermediate reference level is selected by connecting terminal 3 to Output Selection 1, 2, 3, or 4. The corresponding S1 switch also must be closed. (See listing under Adjustments.)
MAX Output	The Maximum reference level is selected by connecting terminal 3 to the MAX terminal.

IMPORTANT

If more than one reference selection is connected, the LOWEST reference controls the output of the Digital Reference Unit.

Outputs

SIGNAL	Positive Ramp—Connect the Reference output to terminals 15 (+) and 16 (–). Negative Ramp—Connect the Reference output to terminals 16 (+) and 15 (–).
METER	0–1 mA or 4–20 mA Readout meter can be connected to terminals 13 (+) and 14 (–)

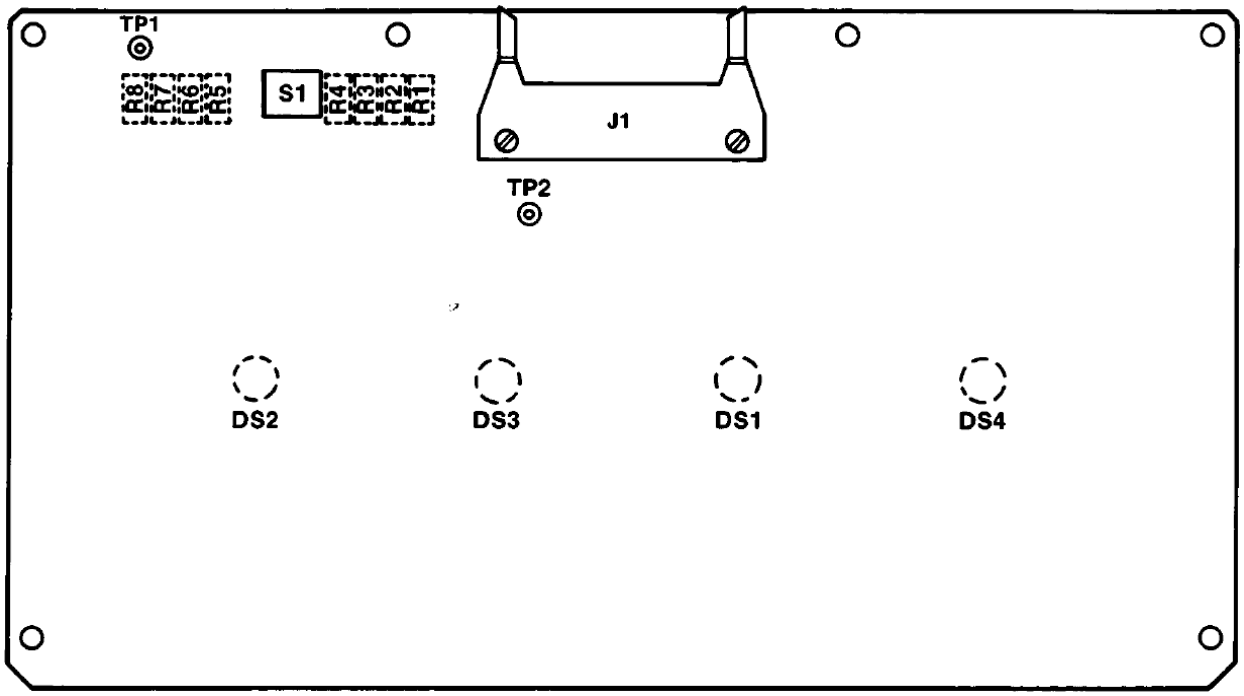

Figure 3-1. Top Board Potentiometers, Switches, and Test Points

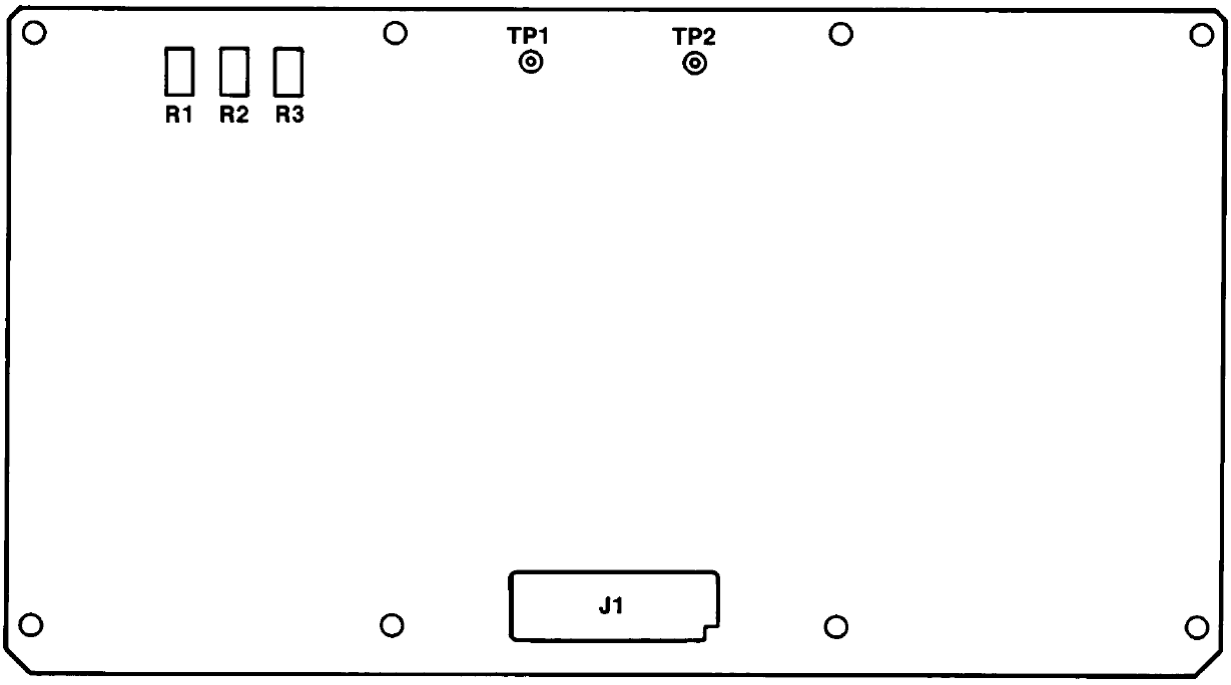

Figure 3-2. Bottom Board Potentiometers and Test Points

Chapter 4. Troubleshooting

Visual Inspection

Before troubleshooting the Digital Reference Unit, visually inspect it for burned or broken parts, faulty wire or wiring connections, or faulty 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 troubleshooting the unit.

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

Initial Troubleshooting Setup

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 MIN indicator illuminated and the Minimum Output relay (K1) energized.
4. Connect a voltmeter between terminals 15 (+) and 16 (–).

Symptom	Procedure	Results
Not able to select a new reference level	Make sure the Reference Moving indicator is on when a new reference level is selected.	If the Reference Moving indicator is not illuminated, go to the next step.
	Make sure that the new level is lower than the old level if two are connected at the same time.	If A and B are OK, return the unit for repair.
	If selecting an intermediate level, make sure the proper S1 switch is closed.	
The Reference level cannot be raised or lowered. (The voltage on terminals 15 (+) and 16 (–) will not change.)	Make sure that the MIN terminal is not selected.	If the MIN terminal is not selected, go to the next step.
	Make sure the Output Span adjustment is not limiting level below desired point.	
Limit LED indicators are not working.	Make sure that the input terminals are correct.	If the inputs are correct, return the unit for repair.
Not able to change the rate.	Make sure that the input voltages on the Fast and instant terminals are correct.	No voltage on either for Slow rate. Voltage on both for Medium rate. Voltage on FAST for Fast rate, on INST for the Instant rate.
	Connect a scope or counter to TP1 on Board A2. With Slow selected; select Fast, then Slow, then Medium. The clock rate must change. Repeat the procedure for the Fast and Medium Adjustments.	If the switching has no effect, or the INST 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 82343D.

B82343:D

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**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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