



Installation and Operation Manual

Digital Speed Reference Unit

8271-651

Manual 82442 (Revision A)

WARNING—DANGER OF DEATH OR PERSONAL INJURY



WARNING—FOLLOW INSTRUCTIONS

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.



WARNING—OUT-OF-DATE PUBLICATION

This publication may have been revised or updated since this copy was produced. To verify that you have the latest revision, be sure to check the Woodward website:

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WARNING—OVERSPEED PROTECTION

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—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.

CAUTION—POSSIBLE DAMAGE TO EQUIPMENT OR PROPERTY



CAUTION—BATTERY CHARGING

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.



CAUTION—ELECTROSTATIC DISCHARGE

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.

IMPORTANT DEFINITIONS

- A **WARNING** indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.
- A **CAUTION** indicates a potentially hazardous situation which, if not avoided, could result in damage to equipment or property.
- A **NOTE** provides other helpful information that does not fall under the warning or caution categories.

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Electrostatic Discharge Awareness

All electronic equipment is static-sensitive, some components more than others. To protect these components from static damage, you must take special precautions to minimize or eliminate electrostatic discharges.

Follow these precautions when working with or near the control.

1. Before doing maintenance on the electronic control, discharge the static electricity on your body to ground by touching and holding a grounded metal object (pipes, cabinets, equipment, etc.).
2. 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.
3. Keep plastic, vinyl, and Styrofoam materials (such as plastic or Styrofoam cups, cup holders, cigarette packages, cellophane wrappers, vinyl books or folders, plastic bottles, and plastic ash trays) away from the control, the modules, and the work area as much as possible.
4. 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.



CAUTION—ELECTROSTATIC DISCHARGE

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*.

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

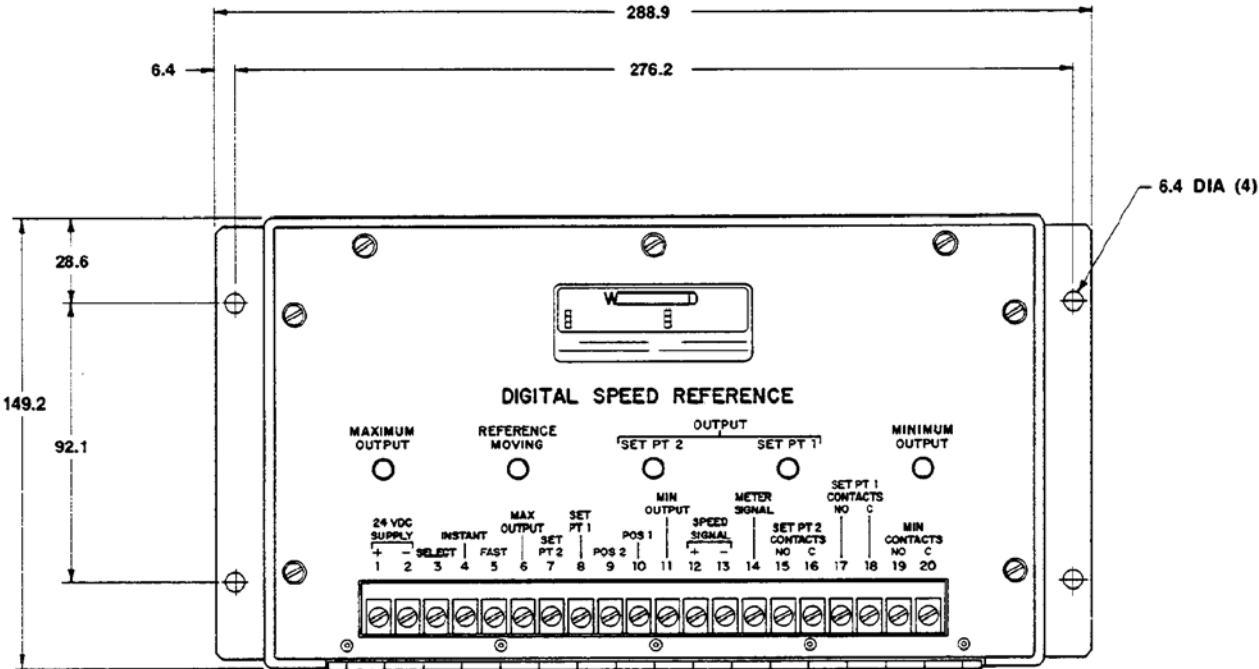
The function of the Digital Speed Reference Unit is to give a speed reference voltage to other units in the system. The output reference level can be raised or lowered at one of four rates. Three set reference settings can be selected. The unit also gives a 4–20 mA readout signal to a meter.



WARNING—OVERSPEED PROTECTION

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.

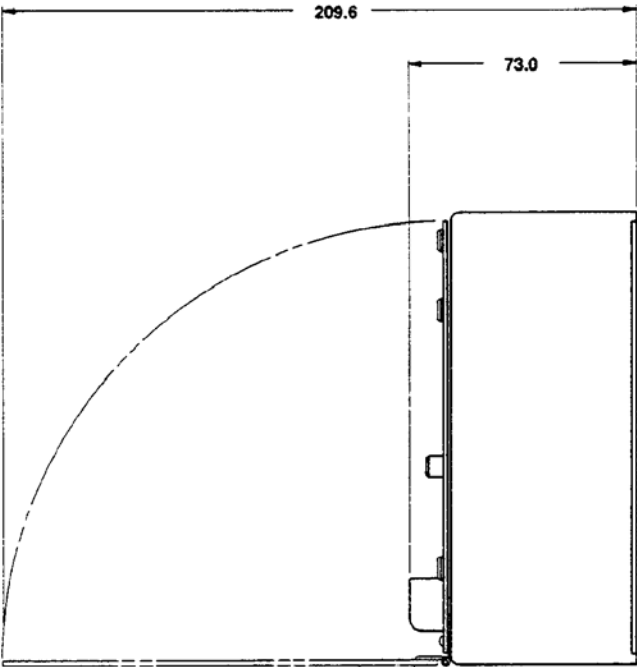
The overspeed shutdown device must be totally independent of the prime mover control system. An overtemperature or overpressure shutdown device may also be needed for safety, as appropriate.



TOP VIEW

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



SIDE VIEW

8271-651

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.

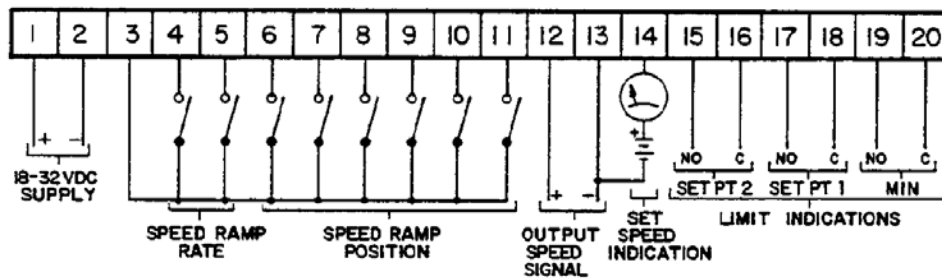


Figure 2-1. Plant Wiring Diagram

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 $\pm 0.3\%$ (Hewlett Packard 3476B or Fluke 8020A)
 - Volt-Ohmmeter (VOM): 20 k Ω /V. $\pm 2\%$ 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 M Ω 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 M Ω .

**NOTE**

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.

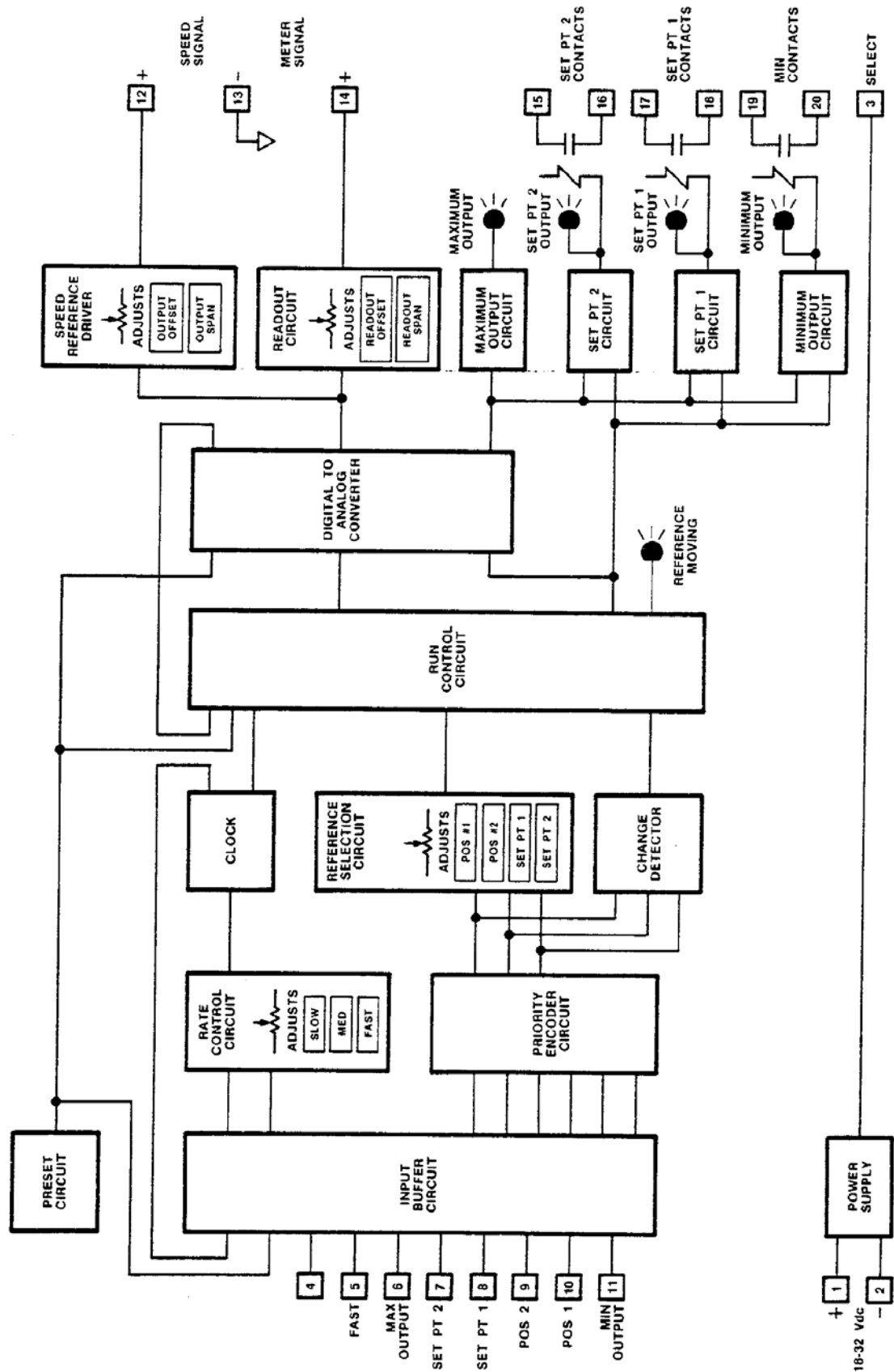


Figure 2-2. Block Schematic

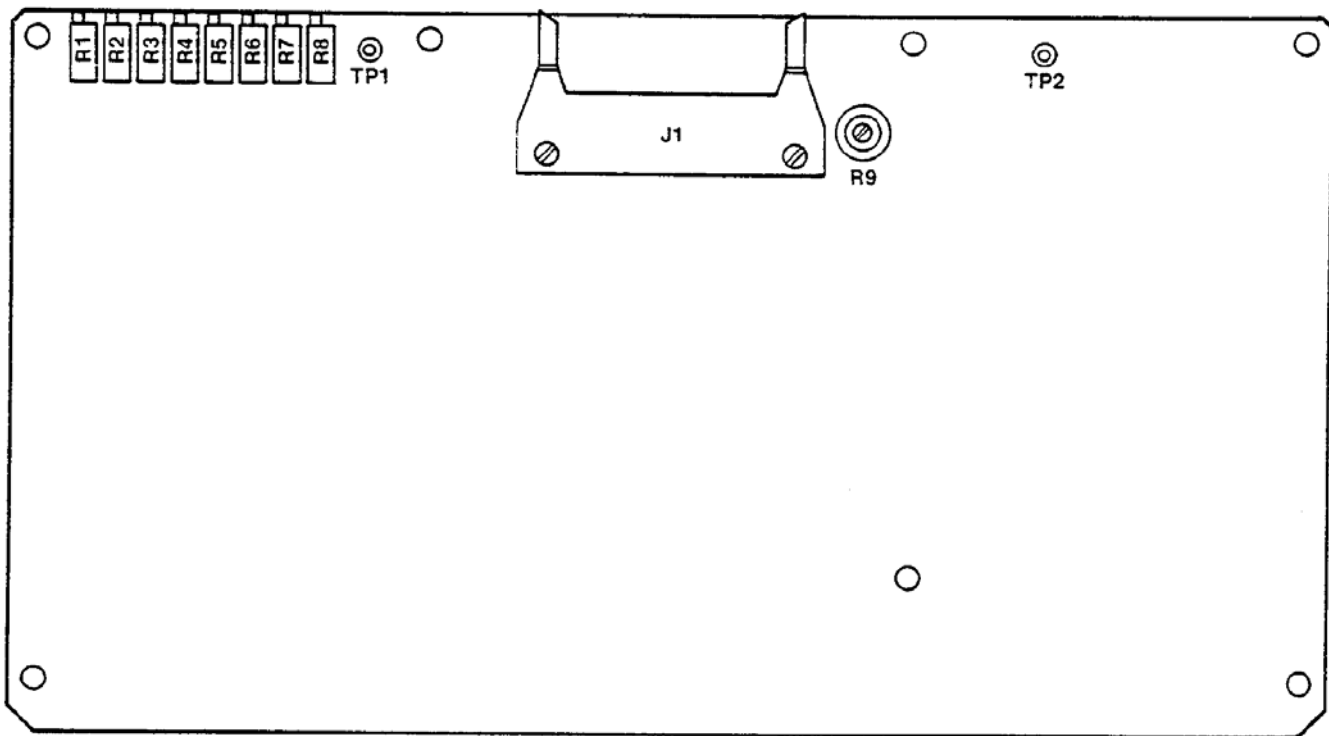


Figure 2-3. Front Board Potentiometer Location

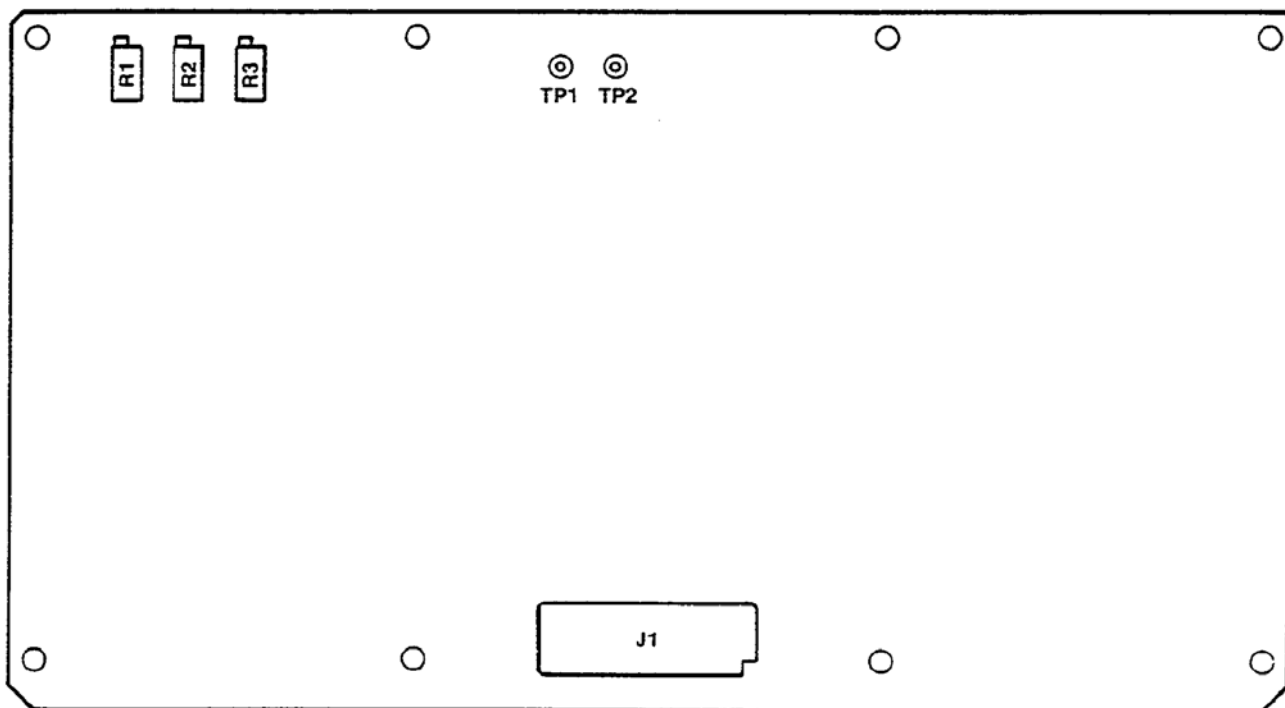


Figure 2-4. Back Board Potentiometer Location

**NOTE**

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 is 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.

**NOTE**

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 is 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

**NOTE**

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.



NOTE

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.



NOTE

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.	If 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. Service Options

Product Service Options

The following factory options are available for servicing Woodward equipment, based on the standard Woodward Product and Service Warranty (5-01-1205) that is in effect at the time the product is purchased from Woodward or the service is performed:

- Replacement/Exchange (24-hour service)
- Flat Rate Repair
- Flat Rate Remanufacture

If you are experiencing problems with installation or unsatisfactory performance of an installed system, the following options are available:

- Consult the troubleshooting guide in the manual.
- Contact Woodward technical assistance (see “How to Contact Woodward” later in this chapter) and discuss your problem. In most cases, your problem can be resolved over the phone. If not, you can select which course of action you wish to pursue based on the available services listed in this section.

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 also a flat rate structured program and includes the full standard Woodward product warranty (Woodward Product and Service Warranty 5-01-1205).

This option allows you to call 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 Woodward facility as explained below (see “Returning Equipment for Repair” later in this chapter).

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 to Woodward within 60 days, Woodward will issue a credit for the core charge. [The core charge is the average difference between the flat rate replacement/exchange charge and the current list price of a new unit.]

Return Shipment Authorization Label. To ensure prompt receipt of the core, and avoid additional charges, the package must be properly marked. A return authorization label is included with every Replacement/Exchange unit that leaves Woodward. The core should be repackaged and the return authorization label affixed to the outside of the package. Without the authorization label, receipt of the returned core could be delayed and cause additional charges to be applied.

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 to Woodward for repair, please contact Woodward in advance to obtain a Return Authorization Number. When shipping the item(s), attach a tag with the following information:

- 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.



CAUTION—ELECTROSTATIC DISCHARGE

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*.

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.

Return Authorization Number

When returning equipment to Woodward, please telephone and ask for the Customer Service Department [1 (800) 523-2831 in North America or +1 (970) 482-5811]. They will help expedite the processing of your order through our distributors or local service facility. To expedite the repair process, contact Woodward in advance to obtain a Return Authorization Number, and arrange for issue of a purchase order for the item(s) to be repaired. No work can be started until a purchase order is received.



NOTE

We highly recommend that you make arrangement in advance for return shipments. Contact a Woodward customer service representative at 1 (800) 523-2831 in North America or +1 (970) 482-5811 for instructions and for a Return Authorization Number.

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.

How to Contact Woodward

In North America use the following address when shipping or corresponding:

Woodward Governor Company
PO Box 1519
1000 East Drake Rd
Fort Collins CO 80522-1519, USA

Telephone—+1 (970) 482-5811 (24 hours a day)
Toll-free Phone (in North America)—1 (800) 523-2831
Fax—+1 (970) 498-3058

For assistance outside North America, call one of the following international 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.

<u>Facility</u>	<u>Phone Number</u>
Brazil	+55 (19) 3708 4800
India	+91 (129) 230 7111
Japan	+81 (476) 93-4661
The Netherlands	+31 (23) 5661111

You can also contact the Woodward Customer Service Department or consult our worldwide directory on Woodward's website (www.woodward.com) for the name of your nearest Woodward distributor or service facility.

Engineering Services

Woodward Industrial Controls Engineering Services offers the following after-sales support for Woodward products. For these services, you can contact us by telephone, by email, or through the Woodward website.

- Technical Support
- Product Training
- Field Service

Contact information:

Telephone—+1 (970) 482-5811

Toll-free Phone (in North America)—1 (800) 523-2831

Email—icinfo@woodward.com

Website—www.woodward.com

Technical Support is available through our many worldwide locations or our authorized distributors, depending upon the product. This service can assist you with technical questions or problem solving during normal business hours. Emergency assistance is also available during non-business hours by phoning our toll-free number and stating the urgency of your problem. For technical support, please contact us via telephone, email us, or use our website and reference **Customer Services** and then **Technical Support**.

Product Training is available at many of our worldwide locations (standard classes). 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. For information concerning training, please contact us via telephone, email us, or use our website and reference **Customer Services** and then **Product Training**.

Field Service engineering on-site support is available, depending on the product and location, from one of our many worldwide locations or from one of our authorized 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 field service engineering assistance, please contact us via telephone, email us, or use our website and reference **Customer Services** and then **Technical Support**.

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:

General

Your Name _____
Site Location _____
Phone Number _____
Fax Number _____

Prime Mover Information

Engine/Turbine Model Number _____
Manufacturer _____
Number of Cylinders (if applicable) _____
Type of Fuel (gas, gaseous, steam, etc) _____
Rating _____
Application _____

Control/Governor Information

Please list all Woodward governors, actuators, and electronic controls in your system:

Woodward Part Number and Revision Letter _____

Control Description or Governor Type _____

Serial Number _____

Woodward Part Number and Revision Letter _____

Control Description or Governor Type _____

Serial Number _____

Woodward Part Number and Revision 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.

We appreciate your comments about the content of our publications.

Send comments to: icinfo@woodward.com

Please include the manual number from the front cover of this publication.



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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.