WOODWARD

Product Manual 26049
(Revision NEW)
Original Instructions

Real Power Sensor for use with 9140 RF LOCOP

8272-848

Installation and Operation Manual

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

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.

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.

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 *publications page* on the Woodward website:

www.woodward.com/publications

The current revision and distribution restriction of all publications are shown in manual *26311*.

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.

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.

NOTICE

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.

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*.

Contents

Illustrations and Tables

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.

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*.

Chapter 1.
General Information

The 8272-848 Real Power Sensor uses three-phase CT and PT inputs from a balanced power bus to calculate the real component of power on the bus. It produces a 4–20 mA current output (kW Readout), proportional to the measured real power, which can be used either for driving a readout device or as a kW-control feedback signal. A 4–20 mA current-output signal (Load Share output) proportional to the difference between the sensed load and the load requested by the voltage on the load sharing lines is also provided. The Load Share output produces a current of 12 mA when the difference is zero. The current increases when the load-sharing lines request more power then that being sensed, and decreases when the power being sensed is greater than the requested load. The Load Share output is intended to be used as a speed-bias input to a speed control for load sharing and synchronization.

On the 8272-848, synchronizing is accomplished by connecting the Synch output voltage signal from a Woodward SPM-A synchronizer to the Synchronizer (low impedance) input on the Real Power Sensor. The synchronizer biases the Load Share output above and below 12 mA to speed up or slow down the turbine as required.

This load sensor may be used to sense load in any three-phase circuit. Some examples of its use include sensing the load on a generator, the plant load on a utility, or other power exported to a utility.

Power is measured in kilowatts and is calculated as follows:

For three-phase power, assuming balanced phases (applies to either delta or wye connected):

$$P = \frac{3\ V\ I\ \text{Cos}\ \Theta}{1000}$$

P = power (in kilowatts)
V = rms phase voltage (in volts)
I = phase current (in amps)
Θ = angle between phase voltage and phase current (in degrees)
(or Cos Θ = Power Factor)

To calculate the power from measurements at the terminals of the Real Power Sensor, again assuming balanced phases, use the following formula:

$$P = \frac{\sqrt{3}\ V_{pt}\ I_L\ R_{ct}\ \text{Cos}\ \Theta}{1000}$$

P = power (in kilowatts)
V_L = rms line voltage between two potential transformer secondary connections)
R_{pt} = Ratio of potential transformer
I_L = rms line current in series with one current transformer secondary connections (in amps)
R_{ct} = Ratio of current transformer
Θ = Angle between phase voltage and phase current (in degrees)
(or Cos Θ = Power Factor)

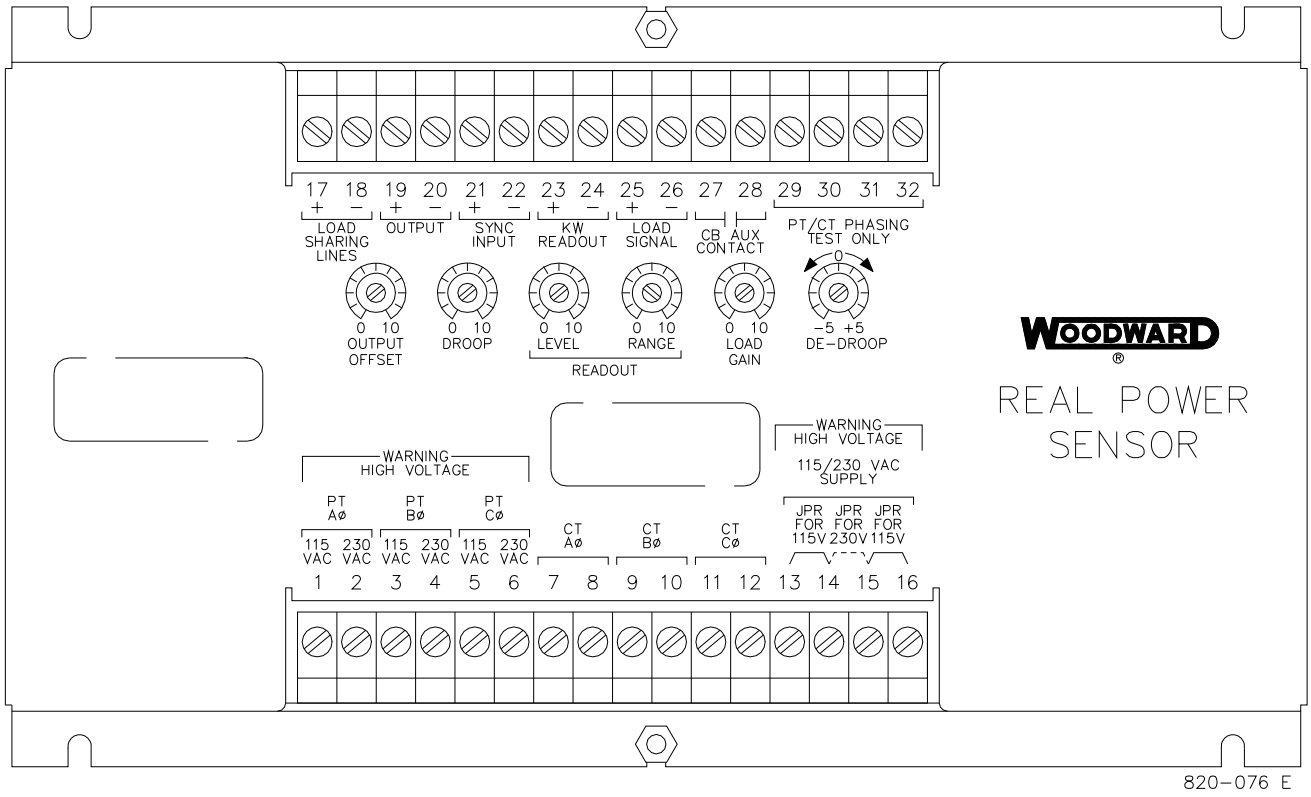

Figure 1-1. 8272-848 Real Power Sensor

Chapter 2.
Theory of Operation

Introduction

This chapter describes the operation of the circuits of the Real Power Sensor. Figure 2-1 shows a block diagram of the Real Power Sensor.

Power Supply

Input power for the Real Power Sensor can be either 115 Vac or 230 Vac. Terminals 13 through 16 are jumpered differently to accommodate the different input voltages. Input power is connected to terminals 13 and 16. For 115 Vac operation, terminals 13 and 14 are jumpered together, also jumper terminals 15 and 16 together. For 230 Vac operation, terminals 14 and 15 are jumpered together.

The power supply steps the input ac voltage down and rectifies it to dc power. It is then regulated and filtered to provide both a +12 and –12 Vdc supply and a +R and –R (reference) supply to be used by the circuitry of the Real Power Sensor.

Phase Voltage Sensors

Each of the phase voltage sensors in the Real Power Sensor is connected to either a 115 Vac or a 230 Vac tap on a three-phase potential transformer (PT), which in turn is connected to the circuit being monitored. For 115 Vac operation, Phase A is connected to Terminal 1, Phase B is connected to Terminal 3, and Phase C is connected to Terminal 5. For 230 Vac operation, Phase A is connected to Terminal 2, Phase B is connected to Terminal 4, and Phase C is connected to Terminal 6.

The phase voltage sensors step down the input potential voltages to a lower voltage. The output to the summing amplifier is determined by the phase current sensor circuit output.

Phase Current Sensors

Each of the phase current sensors in the Real Power Sensor is connected to the output of a current transformer (CT), which in turn, is placed around one conductor of one phase of the circuit being monitored.

For proper operation, it is important that the current transformers be connected correctly. This means that the Phase-A current transformer and the Phase-A potential transformer must be connected to the Phase-A Terminals on the Real Power Sensor, and that the correct polarity must also be observed. The same applies for Phases B and C.

The phase-current sensors step down the current and provide a burden resistance to prevent lethal voltage buildup (as long as the current transformers are connected to the Real Power Sensor). This reduced current is converted to a voltage signal and controls the amount of the potential voltage signal that is allowed to pass to the summing amplifier. The resulting signal is proportional to current amplitude and phase relation of voltage input and current.

The 8272-848 Real Power Sensor requires CTs that are sized to provide a 5 A secondary current at maximum generator output.

Power Sensing Circuit

The magnitude of each of the A, B, and C phase current transformer inputs control the width of a constant-frequency pulse, which is multiplied by its respective potential-transformer input magnitude to create a composite signal whose net area is proportional to real power. The vector sum of the three composite signals is a dc signal representing real power. The sum is produced by a summing amplifier which also provides a lag function (necessary for control-loop stability). The summing point can be offset to calibrate out any errors at zero power by means of a factory-adjusted null potentiometer. The output of the amplifier is then passed on to the kW readout driver circuit and is scaled (Load Gain) and sent back to the load-sharing-bridge circuit.

Load Sharing Bridge

A Wheatstone bridge circuit is used to produce a signal proportional to the error between the percentage of maximum system load carried by the power system (all units connected to the load-sharing lines) and the percentage of maximum generator load carried by the local generator. The error signal is used to drive the Load Share output at Terminals 19 and 20. Zero error is represented by a 12 mA output. When the percentage of maximum load carried by the system is greater than the percentage of maximum load carried by the local generator, the output current increases. The current decreases for the opposite condition.

One leg of the bridge contains the Droop potentiometer which unbalances the bridge an amount proportional to the local load for droop operation. The potentiometer is shorted out during isochronous operation. The other leg contains the de-droop potentiometer, which is used for calibrating the balance of the bridge.

Droop/ Isochronous Operation

The 8272-848 the Real Power Sensor is set for isochronous operation when 20–45 Vdc is applied at Terminals 27(+) and 28(–); the Droop potentiometer is shorted and the load-sharing lines are connected internally to the load-share bridge. If the voltage is removed from Terminals 27 and 28, the Real Power Sensor is set for Droop operation, the short circuit is removed from the Droop potentiometer, and the load-share lines are disconnected internally from the bridge circuit.

Readout Meter Drive Circuit

The readout-meter circuit uses the output of the summing amplifier (the real power signal) to produce a drive signal for an external meter. This meter will indicate the real power of the circuit being monitored, and has an adjustment to zero the meter and an adjustment for output range. The Real Power Sensor may be ordered with a readout-meter output of either 1 to 5 Vdc or 4 to 20 mAdc.

This output also may be used as input to the Woodward 511 control.

8272-848 Synchronizer Circuit

On the 8272-848, the synchronizer circuit receives input from the SPM (speed and phase matching) synchronizer. This signal indicates whether to increase or decrease speed to match the frequency and phase of this generator with either the utility bus or another generator in use. After the circuit breaker is closed and this generator is "on line" the output signal from the SPM synchronizer is usually disconnected or disabled.

Output Driver

The output driver combines the real-power signal from the droop circuit with the synchronizer signal to produce the current-output signal at terminals 19 and 20. It also acts as a buffer for the output signal and provides the drive current necessary for the signal to the speed control.

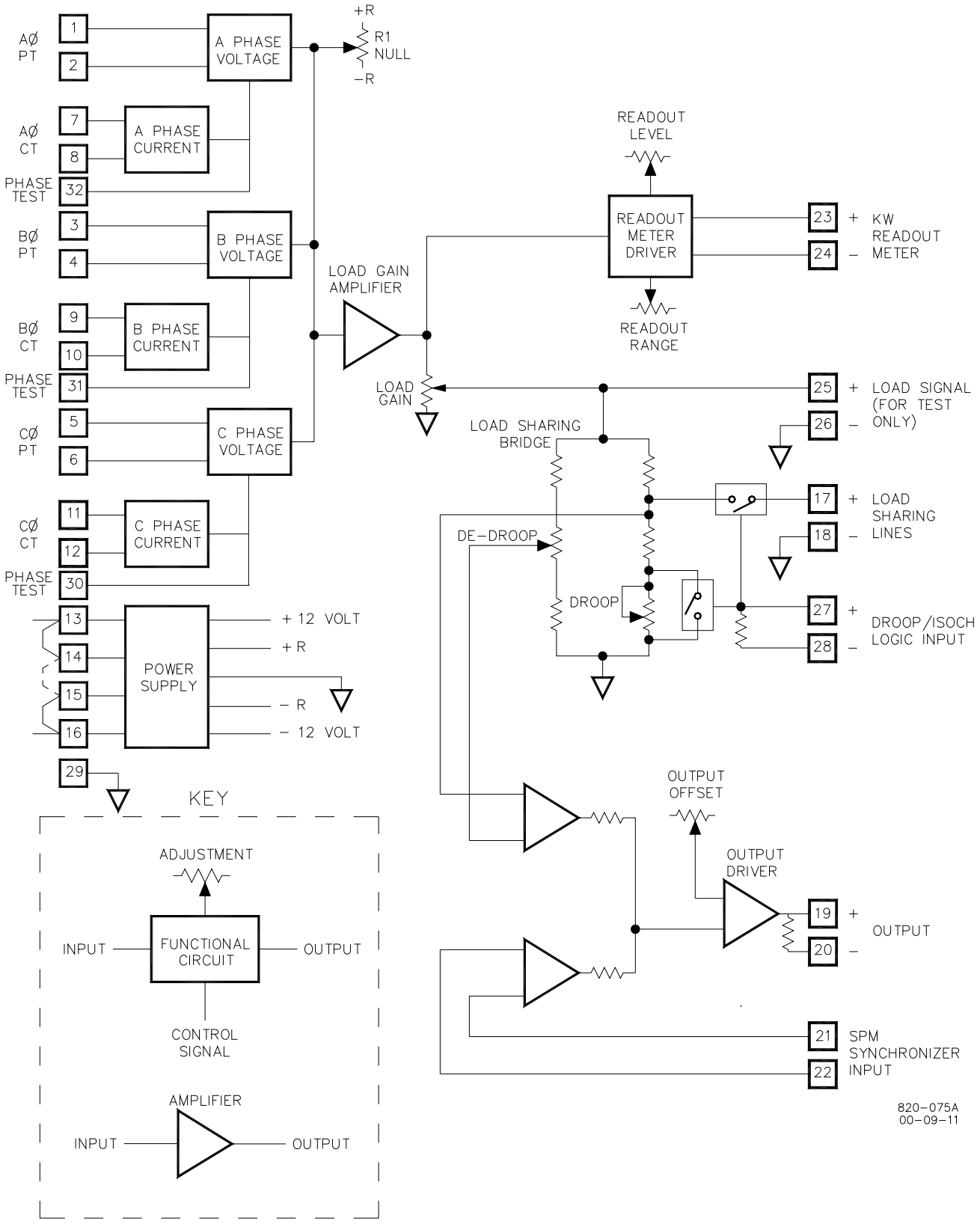

Figure 2-1. 8272-848 Read Power Sensor Block Diagram

Chapter 3.
Installation

Unpacking

Be careful when unpacking the Real Power Sensor. Check the unit for signs of damage such as bent or dented panels, scratches, and loose or broken parts. If any damage is found, immediately notify the shipper.

NOTICE

Before unwrapping the Real Power Sensor from the protective plastic bag, read the instructions inside the front cover of this manual about the handling precautions and read page ii, Electrostatic Discharge Awareness.

Location

When selecting a location for mounting the Real Power Sensor, consider the following:

- Protect the unit from direct exposure to water or to a condensation-prone environment.
- The operating range of the unit is –40 to +70 °C (–40 to +158 °F). For best operation, maintain the ambient air temperature between +10 and +30 °C (+50 to +86 °F).
- Provide adequate ventilation for cooling. Shield the unit from radiant heat sources.
- Do not install the unit near high-voltage/high-current devices.
- Allow adequate space around the unit for servicing.
- Ground the unit for proper shielding.

Installation and Wiring

Mount the Real Power Sensor using the four mounting holes provided on the flanges of the enclosure (see Figure 3-1).

Connect the external wiring to the Real Power Sensor as shown in Figure 3-2. When making these wiring connections, observe the following wiring recommendations:

- Use 0.5 mm² (20 AWG) or larger stranded, twisted shielded wire for all signal-carrying wires.
- Use 0.8 mm² (18 AWG) or larger stranded wire for all potential and current transformer connections.
- Make sure that all wires shown on the Plant Wiring Diagram as shielded, are shielded.
- Do not place shielded wires in the same cable conduits with high-voltage or high-current carrying cables.
- Do not connect the cable shields to any external grounds. The cable shield is grounded at the power-sensor end only.
- Make sure that cable shields are connected through all intermediate terminal blocks from the signal source to the signal termination. (Do not leave any floating grounds)

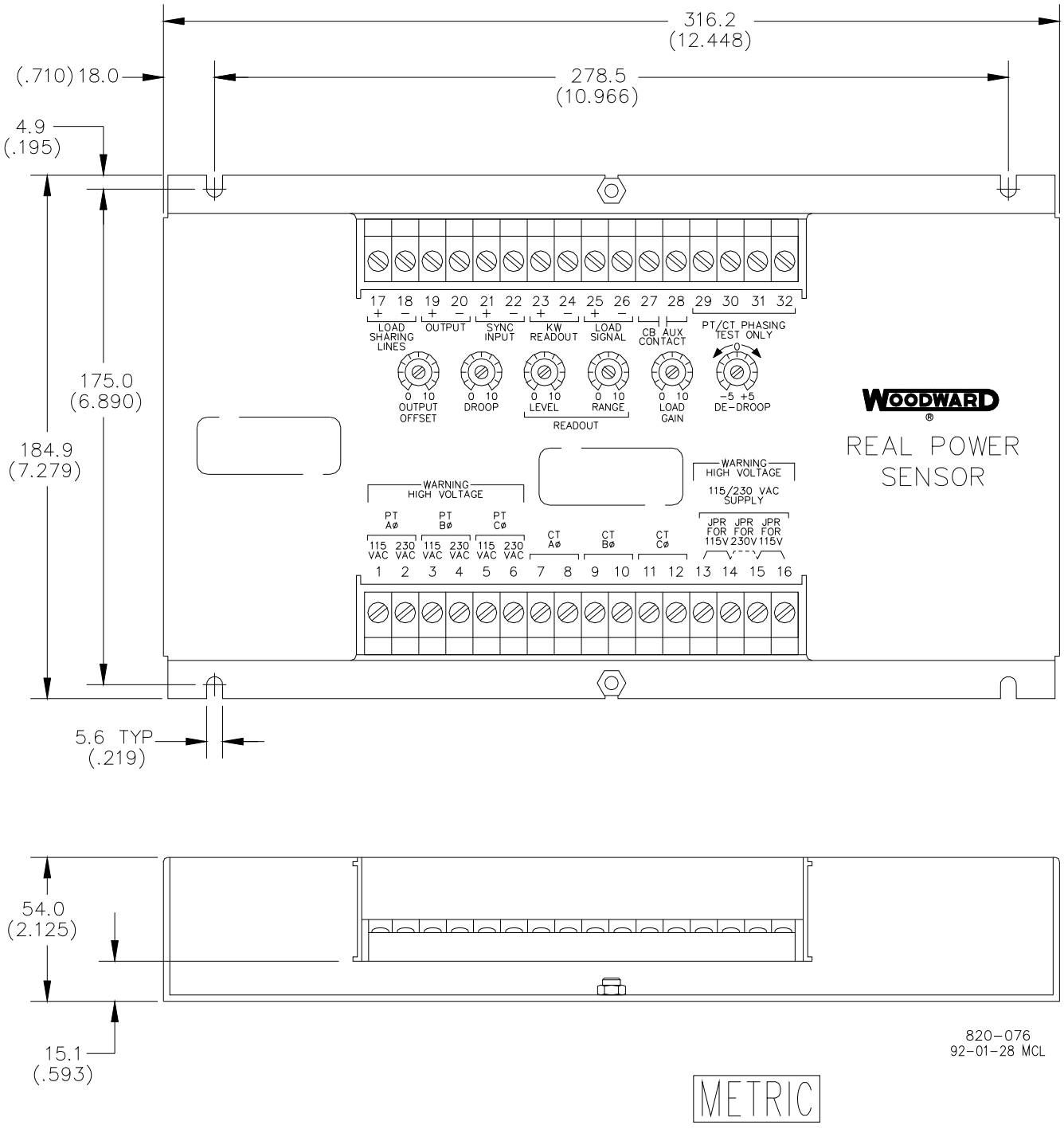

Figure 3-1. Real Power Sensor Outline Drawing

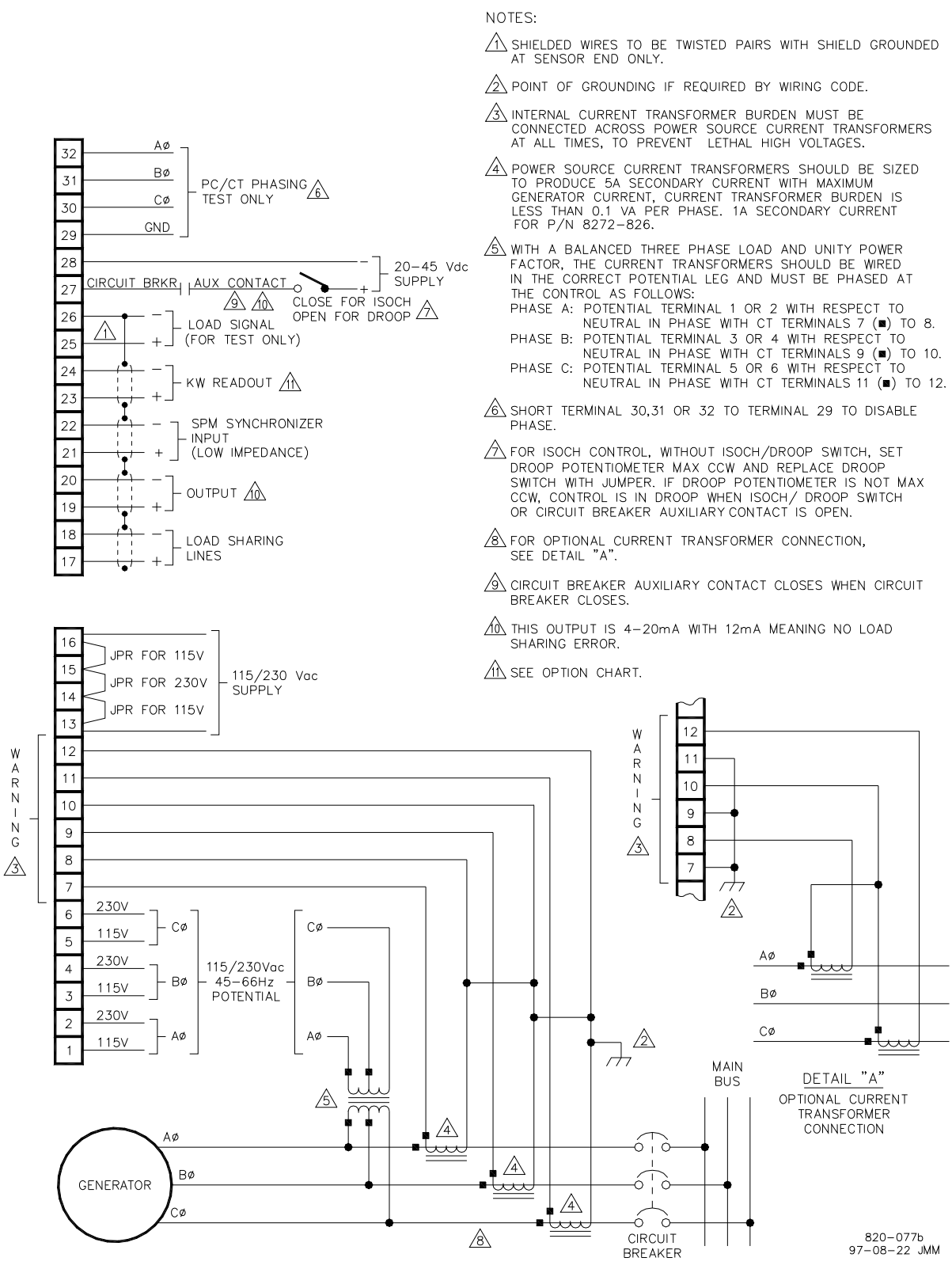

Figure 3-2. 8272-848 Plant Wiring Diagram

Chapter 4.
Calibration Procedure

Introduction

This chapter covers the calibration procedure for the 8272-848 Real Power Sensor.

⚠WARNING

HIGH VOLTAGE—High voltage is used in the operation on this equipment. Death on contact may result if personnel fail to observe safety precautions. Learn the areas containing high-voltage in each piece of equipment. Be careful not to contact high voltage connections when operating this equipment. Before working around the equipment, turn off power and ground points of high potential before touching them.

Remove rings, watched, and all other jewelry while working on or near this equipment. These items could cause injury or death to personnel, or damage to equipment.

Recommended Test Equipment

The following test equipment is recommended for the checkout and calibration of the Real Power Sensor. This is only a recommended list and you should not feel required to purchase this exact equipment. Equipment having equivalent specifications or better may be substituted.

Quantity	Description	Specifications	
1	Digital Multimeter (Fluke 8021B or equivalent)	DC Voltage accuracy:	±0.25% +1 digit
		DC Current accuracy:	±0.75% +1 digit
		Resistance accuracy:	±0.2% +I digit (less than 2000KW)
		AC Voltage accuracy:	45–450 Hz ±1% (200 mV to 200 V)
		AC Current accuracy:	45–450 Hz ±1.5% +2 digits (2 mA – 2 A)

General Information

Read, then follow these instructions when checking or calibrating the real power sensor.

⚠WARNING

HIGH VOLTAGE—High voltage is present at the conductors and on the circuit board of the real power sensor. Death or injury may result from contacting these areas. Use care while working around the unit.

NOTICE

Before handling any electronic components, read Manual 82715, *Guide for Handling and Protection of Electronic Controls, Printed Circuit Boards, and Modules*.

- **Follow the guidelines on page ii, "Electrostatic Discharge Awareness".**
- **Use battery-operated test equipment whenever possible.**
- **Isolate the test equipment from all grounds, including the chassis.**
- **The values presented in the following calibrations procedures are values used by Woodward for the calibration of a new unit. Before recalibrating your unit, check with Woodward for any changes in the equipment that will change these values. If changes have been made, mark the changes in this manual.**

IMPORTANT

When the 8272-848 is installed in a 9140 RF LOCOP, there will be CT burden resistors installed outside the LOCOP cabinet (JB7). To correctly calibrate this unit, these external burden resistors must be in place.

Operational Test

This test uses the actual generator load or utility power flow to calibrate and test the real power sensor.

Before continuing with this test, double check all wiring and jumpers on the unit against the plant wiring diagram (Figure 3-2).

1. Prepare either the generator set for starting (follow the set manufacturer's instructions) or the utility load source for loading.

2. Set the Load Gain control (R6) fully clockwise.

3. If you're sensing the power on a generator, start the generator (following the manufacturer's instructions), synchronize, and close the breaker.

   If you're sensing the power of a utility, close the utility breaker.

   In either case, make sure that no power (load) is applied.

4. Verify that the supply and potential transfer voltages are present at the real power sensor and are connected to the proper terminals (power supply at 13 and 16 and PT signal at 1-6).

5. With no load, verify that the voltage at Terminals 25(+) and 26(–) is *_____ (0.0 ±0.1) Vdc. If the voltage is not correct, check for circulating currents (KVARS) and proper phasing, then adjust R1 (Null).

IMPORTANT

The R1 adjustment potentiometer is located on the top surface of the circuit board, under the chassis. The chassis must be removed to make this adjustment. Before making this adjustment (which was factory-set), check your equipment for circulating currents and proper phasing.

⚠WARNING

HIGH VOLTAGE—High voltage is present at some terminals in the real power sensor. It can cause injury and death if proper precautions are not followed. To work safely, heed all warnings in this chapter.

6. If you're sensing the power on a generator, start the generator (following the manufacturer's instructions), synchronize, and close the breaker.

   If you're sensing the power of a utility, close the utility breaker.

7. Increase the load to 50%.

   Adjust the Load Gain control (R6) so that the voltage between Terminals 26(–) and 25(+) is 3.0 Vdc.

8. Shut down the generator or open the utility breaker so that there is no power applied to the real power sensor. Disable the A phase current transformer (CT) momentarily by shorting Terminal 32 to Terminal 29.

9. If you're sensing the power on a generator, start the generator (following the manufacturer's instructions), synchronize, and close the breaker.

   If you're sensing the power of a utility, close the utility breaker.

   Increase load to 50%. Measure and record the voltage at Terminals 25(+) and 26(–) *_____.

IMPORTANT

In steps 9, 11, and 13 it doesn't matter whether the load is exactly 50%. However, the load must be as identical as possible in each of the three steps. If it's not the same, you won't be able to satisfactorily perform step 15.

10. Shut down the generator or open the utility breaker so that there is no power applied to the real power sensor. Remove the short of the A phase CT. Disable the B phase CT momentarily by shorting Terminal 31 to Terminal 29.

11. If you're sensing the power on a generator, start the generator (following the manufacturer's instructions), synchronize, and close the breaker.

    If you're sensing the power of a utility, close the utility breaker.

    Increase load to 50%. Measure and record the voltage at Terminals 25(+) and 26(–) *_____.

12. Shut down the generator or open the utility breaker so that there is no power applied to the real power sensor. Remove the short of the B phase CT. Disable the C phase CT momentarily by shorting Terminal 30 to 29.

13. If you're sensing the power on a generator, start the generator (following the manufacturer's instructions), synchronize, and close the breaker.

    If you're sensing the power of a utility, close the utility breaker.

    Increase load to 50%. Measure and record the voltage at Terminals 25(+) and 26(–) *_____.

14. Shut down the generator or open the utility breaker so that there is no power applied to the real power sensor. Remove the short of the C phase CT.

15. Compare your recorded values from steps 9, 11, and 13. These values should be the same (±10%). If they are not, recheck for crossed phases (CTs not matched to PTs). Recheck for phasing, and correct any problems.

16. Start the generator set (according to manufacturer's instructions) or close the utility breaker. Keep the load at zero. Verify that the KW Readout Meter current [Terminals 23(+) and 24(–)] is *_____ (4.0 ±0.2) mA. If necessary, adjust R5 (Watt Readout Level).

17. Load to 100% load.

18. Verify that the KW Readout Meter current [Terminals 23(+) and 24(–)] is *_____ (20.0 ±0.2) mA. If necessary, adjust R6 (Watt Readout Range) and repeat steps 16 and 17 until no further adjustment is required.

IMPORTANT

Note that Woodward can calibrate the kW meter readout drive at the factory before shipping if provided with these specifications:

- **The kind of generator**
- **The PT winding ratio**
- **The CT winding ratio**

19. Reduce the load to zero, open the utility breaker, or shut the generator set down.

20. Operating in isochronous mode and with no load, note the operating speed of the generator *_____ rpm or (Hz).

21. Apply 100% load; note the generator speed *_____ rpm (or Hz). The speed should be the same as in step 20. If it is not, adjust R4 (De-droop) and repeat steps 20 and 21 until no further adjustment is required.

22. Operating in droop mode, in single generator operation with no load, note the speed the generator is operating at *_____ rpm (or Hz).

23. Apply 100% load and note the generator speed *_____ rpm (or Hz). The speed decrease from step 22 is the amount of system droop. To change this droop, adjust R3 (Droop) and repeat steps 22 and 23 until the desired droop is set.

24. Select isochronous operation.

25. Parallel this generator with the other generators in your system (following the set manufacturer's instructions). Apply load.

26. Adjust R2 (Output Offset) until the generator sets share load equally.

This completes the operational test.

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 26049.

B26049:NEW

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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.

2012/9/Colorado