WOODWARD

Product Manual 82429
(Revision NEW)
Original Instructions

Export Controls

8271-571 & 8271-572

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 Out-of-date translations are marked with ⚠.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

Contents

Illustrations and Tables

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Important Definitions

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

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

⚠WARNING

Overspeed / Overtemperature / Overpressure

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

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

⚠WARNING

Personal Protective Equipment

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

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

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

⚠WARNING

Start-up

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

⚠WARNING

Automotive Applications

On- and off-highway Mobile Applications: Unless Woodward's control functions as the supervisory control, 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

These Export Controls are used with Woodward 2301, 2500, and EPG load sharing controls to regulate generators on a local bus system to produce a fixed excess of power above that required by the local load. The excess power is exported to the utility or infinite bus. Only one control is required for each local bus system. The level of power exported to the utility is set with the level adjustment. On Export Control part number 8271-571, this adjustment is an internal potentiometer. On control part number 8271-572, it is an external potentiometer connected to the control. The power level adjustment is automatic and programmable if a signal converter is used in place of the external potentiometers on control 8271-572.

The Export Control controls the voltage on the paralleling lines connecting all the load sharing controls. This regulates generator output to the required power level.

The control's printed circuit board is mounted in a sheet steel housing. All adjustment potentiometers, load signal jacks, and terminal screw connections are accessible from the front of' the housing.

References

Manual 25070, *Electronic Control Installation Guide*, may be useful, and is available on the Woodward website (www.woodward.com).

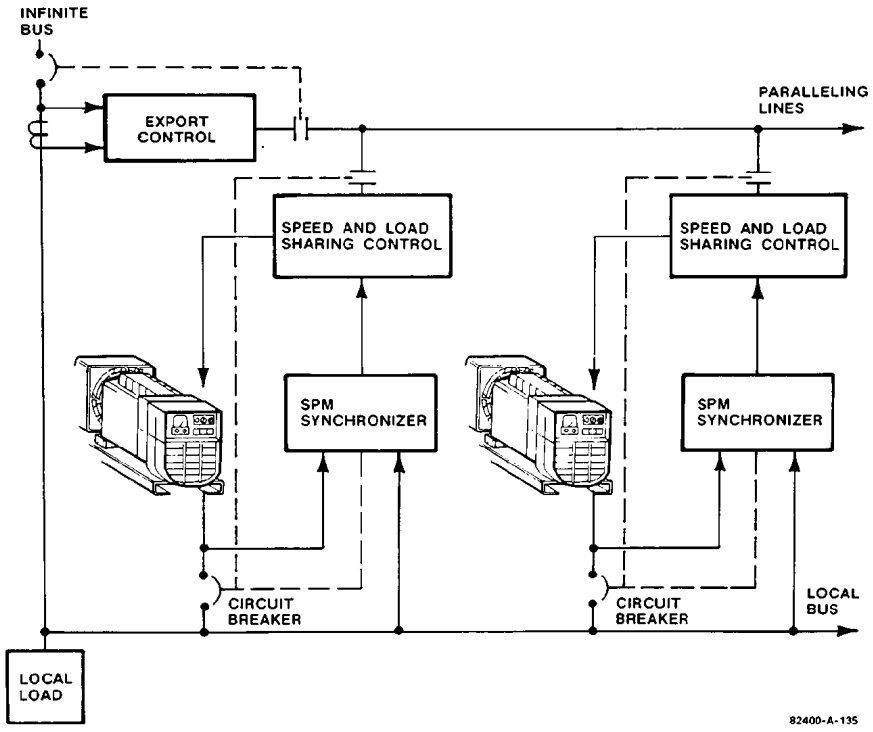

Figure 1-1. System Block Diagram

Chapter 2.
Installation

Physical Installation

Refer to Figure 2-1 for mounting information. The control is designed for switchgear mounting. Ambient temperature must be between –40 and +160 °F (–40 and +71 °C). Provide adequate ventilation for cooling and space for installation and servicing.

Electrical Installation

Figure 2-2 provides typical wiring instructions, however, a plant wiring diagram for your specific control part number must be used for actual installation.

⚠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.

Current and Potential Transformer Connections

If the potential transformer (PT) secondary line-to-line voltage is between 95 and 130 Vac rms, install jumpers connecting terminal 1 to 2 and 3 to 4. If the PT secondary line-to-line voltage is between 190 and 260 Vac rms, install a jumper joining terminal 2 to 3. The PT ratio must be selected to provide a voltage within either of these ranges. If the bus voltage is within either range, PTs need not be used. Bus frequency must be between 50 and 500 Hz. Connect the infinite bus PT secondary leads to the following terminals: AØ to 1, BØ to 4. CØ to 5.

⚠WARNING

HIGH VOLTAGE—Measure bus voltage before connecting PT leads to ensure that both infinite and generator busses are de-energized.

Connect the infinite bus current transformer (CT) leads to the following terminals: AØ to 6 (dot) and 7, BØ to 8 (dot) and 9, and CØ to 10 (dot) and 11. The CT ratio must be chosen so that maximum current through the infinite bus breaker causes the CT current to be 5 A; but it must not be above 5 A. If maximum CT current is significantly below 5 A, Export Control performance can worsen.

⚠WARNING

HIGH VOLTAGE—These controls contain internal burden resistors. These burden resistors must be connected across the current transformers whenever energized, to prevent lethal high CT voltages from developing.

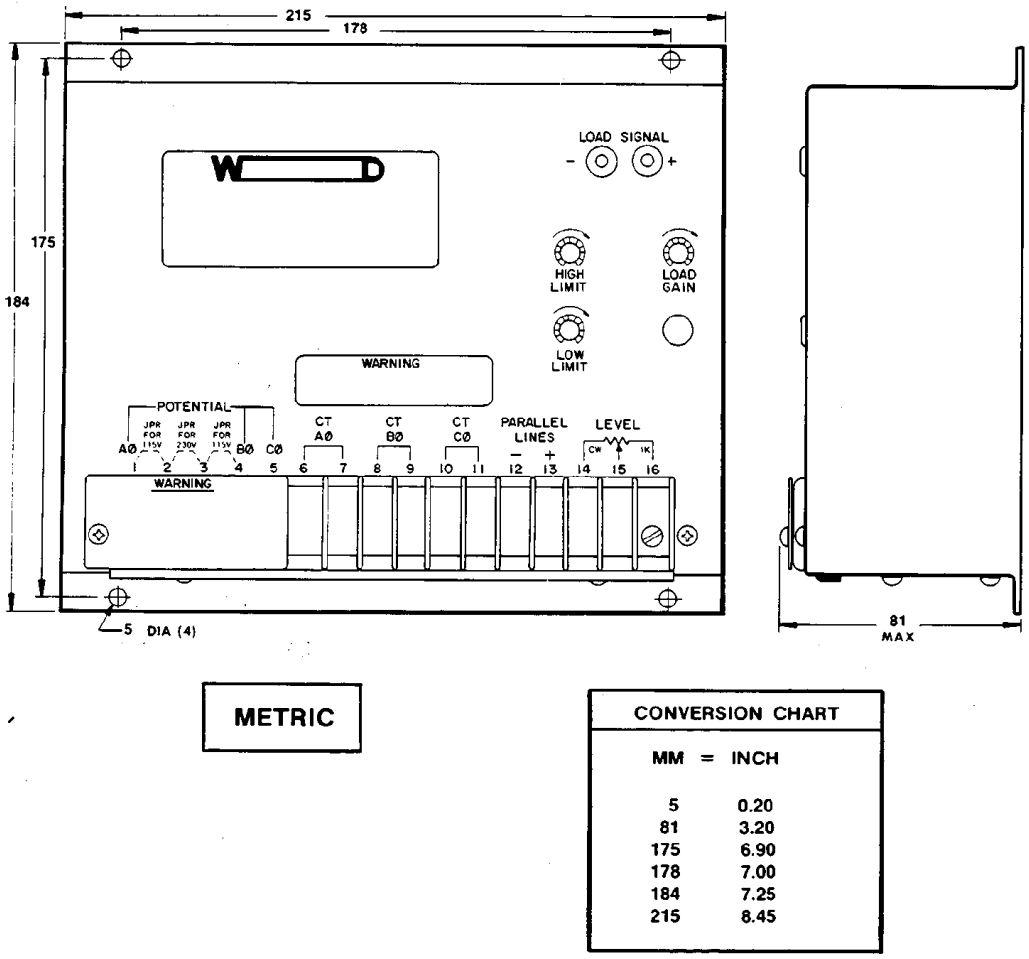

Figure 2-1. Outline Drawing

Terminal 14, 15, and 16 Connections

The 8271-571 has an internal level potentiometer for setting the desired power level. In this case there must be no connections to terminals 14, 15, or 16.

The 8271-572 is for external level setting in either of two ways: (1) A potentiometer or motor operated potentiometer is wired as shown in Figure 2-2, or (2) an external controller or transducer may be used to program the desired power level. In the latter case, the user supplied device provides an input to a Woodward signal converter. The signal converter output is connected to the Export Control terminals 12(–) and 15(+). In both cases twisted, shielded wire should be used.

If the 8271-572 is used, install a 1 kΩ level potentiometer as shown in Figure 2-2. If the power level is to be controlled by a transducer and signal converter, the 1 kΩ potentiometer will be replaced after the Installation Check.

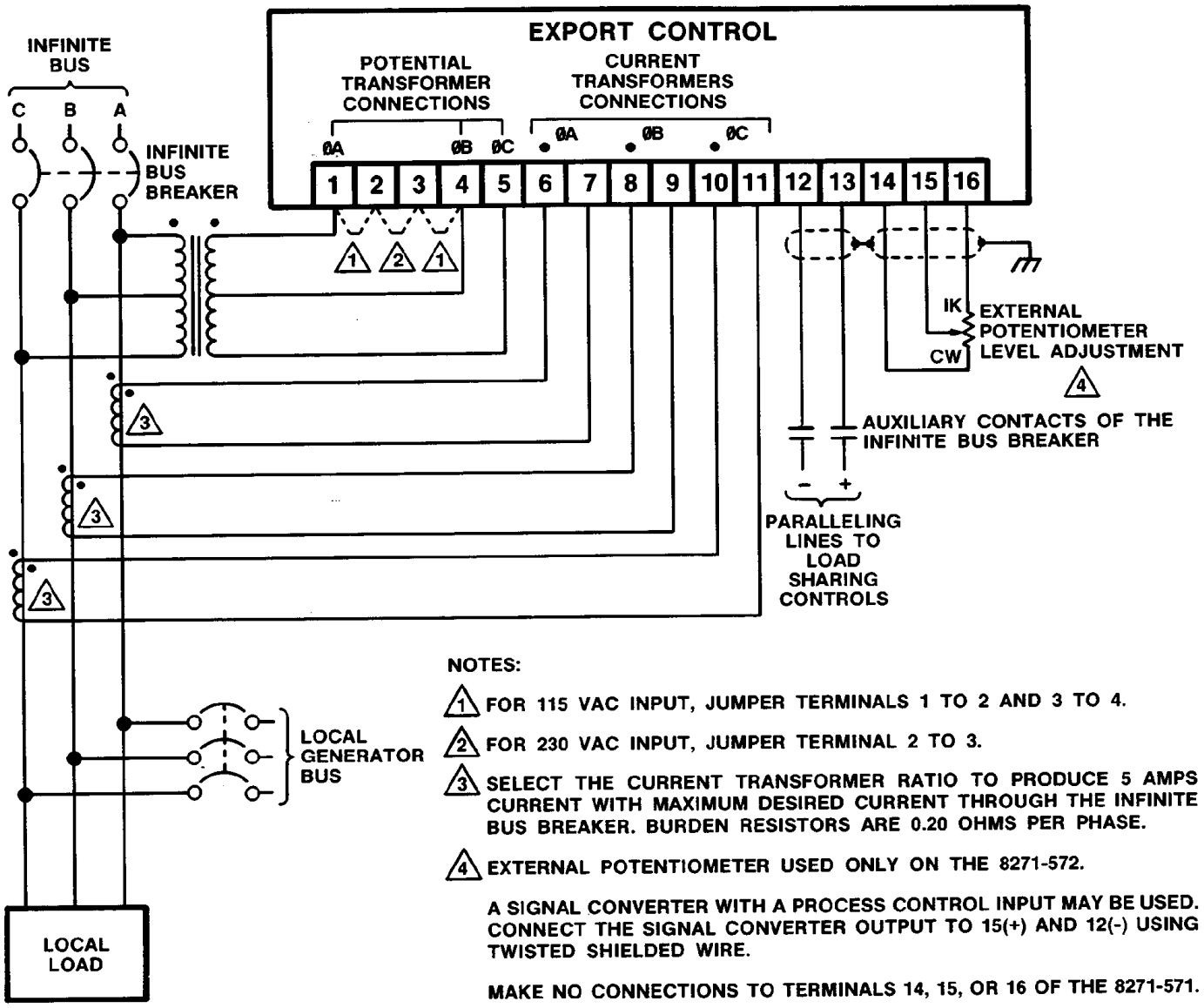

Figure 2-2. Typical Wiring Diagram

Paralleling Line Connections

Use twisted, shielded wire to connect terminals 12(–) and 13(+), through auxiliary contacts of the infinite bus breaker, to the paralleling lines of the load sharing controls of the local generators.

Installation Check

Before operating the Export Control, check for correct single unit operation of each governor and generator. Then synchronize the generators and isochronously share load. Complete the LOAD GAIN operating adjustment on each governor according to instructions in the applicable manual. Once this adjustment is made, do not change the load gain setting of any governor.

IMPORTANT

Do not confuse the load gain potentiometer adjustment of the governor with the load gain potentiometer of the Export Control.

A. The signal converter, if used, must be temporarily replaced with a 1 kΩ potentiometer.

B. Turn the EXPORT LEVEL potentiometer to zero, fully counterclockwise.

C. Label and temporarily disconnect the paralleling wires at Export Control terminals 12 and 13. Tape the wire ends to prevent accidental electrical contact during the following checks. Set the load sharing controls from the isochronous mode to the droop mode.

D. Synchronize and parallel the local generators to the utility bus.

E. Adjust the RATED SPEED potentiometer of each load sharing control for maximum generator loading and maximum power export from the local system. CT current at this time must be between 3 and 5 A.

Make the following checks and adjustments:

1. Power Supply Check

A. Measure voltage at terminals 12(+) and 14(–). Voltage must be +2.7 ±0.5 Vdc.

B. Measure voltage at terminals 16(–) and 12(+). Voltage must be 0.0 ±0.1 Vdc.

2. Phase Check

A. Set the system to export the maximum desired power as described previously.

B. Connect the dc voltmeter leads to the LOAD SIGNAL test jacks. Observe the correct polarity.

C. Check the phase wiring by momentarily shorting phase A current transformer secondary (jumper terminal 6 to 7). The LOAD SIGNAL voltage must drop by 1/3 if load is evenly divided among the three phases. Repeat this procedure for phases B (8 to 9) and C (10 to 11), one phase at a time. Plant load must remain constant at each phase check.

⚠WARNING

HIGH VOLTAGE—Never disconnect current transformers from the control's internal burden resistors (terminals 6 through 11) when the CTs are energized. The current transformers can develop dangerously high voltages when open circuited while energized.

If the load signal drops by 1/3 and local load remained constant for each phase, the phasing is correct. Proceed to step 3—performing the Phasing Procedure is not required.

If the load signal does not drop by 1/3 and local load remained constant, perform the Phasing Procedure below to correct the phase relationships between the current transformers and potential transformer connections.

3. Power Sensor Check

Set the Export Control LOAD GAIN fully clockwise. Vary the load by adjusting the RATED SPEED potentiometer and measure the load signal. Observe the polarity. Check that the load signal is always positive and increases as load increases.

4. Load Gain Adjustment

This adjustment on the Export Control compensates for incorrect CT ratios. Make the speed setting adjustments described previously so the maximum desired power is being exported. Measure the LOAD SIGNAL, observing the labeled polarity. Adjust the LOAD GAIN so the LOAD SIGNAL is 7 Vdc or, if 7 volts is unattainable, set the LOAD GAIN fully clockwise. After this, the Export Control LOAD GAIN should not be changed.

5. Power Controller Check

Measure the output voltage at 13(+) and 12(–). Set the LOW LIMIT potentiometer fully counterclockwise. Set the HIGH LIMIT potentiometer fully clockwise. Set the IMPORT LEVEL potentiometer fully clockwise. The voltage should go the between –1 and 0. Quickly turn the IMPORT LEVEL potentiometer fully counterclockwise. The voltage should go to 8 ±1 Vdc and take a few seconds to get there. Leave the limit potentiometer settings at these positions until final settings are made in Chapter 3.

Phasing Procedure

If the unit fails the current transformer phasing check, locate the fault by the following phasing procedure.

Most paralleling difficulties are due to improper wiring of the three-phase current and potential inputs. Common errors include either wiring the voltage of one phase with the current of another phase or wiring transformers backward.

1. Turn LOAD GAIN potentiometer FULLY counterclockwise.

2. Apply a constant load. If load varies, use two voltmeters to make simultaneous measurements of LOAD SIGNAL and CT input voltage.

3. Short out ØB and ØC CT inputs. It is important that the jumpers be no longer than 4 inches (10 cm) and 18 AWG (1.6 mm²) or heavier. Jumper terminal connections must be low resistance and should be made with spade lugs.

⚠WARNING

HIGH VOLTAGE—Never disconnect CT wires from the control's internal burden resistors (terminals 6 through 11) when CTs are energized. Disable the CT input by opening the breaker before installing and removing the jumper or by not unscrewing terminals and manually holding the jumper in place.

4. Read the ØA CT input in Vrms.

5. Read the LOAD SIGNAL voltage at the LOAD SIGNAL jacks. Observe the labeled polarity.

6. Find the ratio R:

$$R = \frac{\text{Load Signal (+ Vdc)}}{\text{ØA CT Signal (Vrms)}}$$

If R = +0.95. ØA is correctly wired.

If R = –0.95. ØA CT phasing is reversed.

If R = –0.5, ØA CT is interchanged with ØB or ØC. *

If R = +0.5, ØA CT is interchanged with ØB or ØC, and ØB or ØC CT is reversed. *

*— It cannot be determined which phase is interchanged with ØA by testing only ØA. Repeating the above tests using ØB and ØC should indicate which phase is interchanged with ØA. If all phases yield the same result (R=±0.5), then the system should be shut down and CT inputs rotated by one position (ØA to ØB, ØB to ØC, and ØC to ØA). If the same results are again observed, shut the system down and again rotate the CT inputs one position.

EXAMPLE 1 (ØA CT connection reversed)

A. Turn the LOAD GAIN potentiometer to mid position.

B. Short out ØB and ØC CT inputs. (Attach a jumper between terminals 8 and 9. and 10 and 11.)

C. Read the ØA CT input in Vrms. (Measuring between terminals 6 and 7, we get V = 1.25 Vac.)

D. Read the LOAD SIGNAL voltage at the test jacks (observe the polarity markings). V = –1.19 Vdc.

E. $$R = \frac{\text{Load Signal (Vdc)}}{\text{ØA CT (Vrms)}} = \frac{-1.19}{1.25} = -0.95$$

F. Since R = –0.95, we know that the CT connections to terminals 6 and 7 are reversed. After shutting the system down, simply disconnect 6 and 7 and reverse them.

EXAMPLE 2 (ØA interchanged with ØC, ØC reversed)

A. Turn the LOAD GAIN potentiometer to mid position.

B. Short out the ØB and ØC CT inputs. (Attach a jumper between terminals 8 and 9, and another between 10 an 11.)

C. Read the ØA CT input in Vrms. (Measuring between terminals 6 and 7, we get V = 1.25 Vac.)

D. Read the load signal voltage at the test jacks. V = +0.62 Vac.

E. $R = \frac{\text{Load Signal (Vdc)}}{\text{ØA CT (Vrms)}} = \frac{0.62}{1.25} = 0.5$

F. ØA CT is interchanged with Ø8 or ØC, and ØB or ØC CT is reversed.

G. Short out ØA and ØC CT inputs. (Attach a jumper between terminals 6 and 7, and another between 10 and 11.) Remove the jumper between terminals 8 and 9.

H. Read the ØB CT input in Vrms. (Measuring between terminals 8 and 9, we get V= 1.25 Vac).

I. Read the LOAD SIGNAL voltage at the test jacks. V = 1.18 Vdc.

J. $R = \frac{\text{Load Signal (Vdc)}}{\text{ØB CT (Vrms)}} = \frac{1.18}{1.25} = 0.94$

This indicates that ØB is properly connected. We now know that ØA and ØC are interchanged. We also know that ØC phasing is reversed because ØB was found to be correct.

K. After shutting down the system, reverse the phasing of the ØC CT (10–11). Then interchange the ØA and ØC CT connections. Take care to maintain correct phasing once this phasing procedure is complete.

Chapter 3.
Operation and Adjustments

1. Complete the Installation Check in Chapter 2. If a temporary LEVEL potentiometer was used, do not replace it with the signal converter yet.

2. Attach the paralleling lines to the Export Control at terminals 12 and 13.

NOTICE **If the paralleling lines are not connected to the Export Control, generators under isochronous mode control can either motor or be overloaded.**

3. Set the load sharing controls from the droop mode to the isochronous mode.

4. Synchronize and parallel the local generators to the utility bus.

5. While there is constant load, turn the EXPORT LEVEL potentiometer clockwise to load the generators and increase the amount of power exported. Adjust the potentiometer for a small amount of power in excess of the maximum export level. Turn the HIGH LIMIT potentiometer counterclockwise until it returns the power level to maximum.

6. While there is a constant load, turn the EXPORT LEVEL potentiometer until the generators are providing slightly less than their minimum desired output or motoring slightly. Turn the LOW LIMIT potentiometer clockwise until it has increased the generators' output to the minimum power level.

7. If a level potentiometer was used to temporarily replace a signal converter, calibrate the sensor, transducer, and signal converter. Shut down the system, remove the temporary level potentiometer, and connect the signal converter. Check for correct operation and check the note after step 8. Skip step 8.

8. Adjust the LEVEL potentiometer so the desired amount of power is flowing through the infinite bus breaker.

IMPORTANT **If the LOAD GAIN of the Export Control is changed after the EXPORT LEVEL potentiometer is set or transducer and signal converter is calibrated, the Export Control load gain adjustment in Chapter 2 should be repeated.**

Chapter 4.
Principles of Operation

The basic circuits and adjustments of the Export Control are shown in Figure 4-1.

A power supply circuit is connected internally to the potential transformer voltage terminals. The power supply regulates a dc voltage for the circuits of the import control. It requires no additional, external power supply. Installation of jumpers to the control's terminals selects 115 or 230 Vac potential transformer voltage.

The level of power exported from the local system to the utility is measured by the power sensor circuit having connections to the potential and current transformers (PT and CT). A load signal that is proportional to load is made by the power sensor. The amplitude of this load signal is set with load gain potentiometer to compensate for variations in CT ratios. Typically, it is adjusted for 7 Vdc, measured at the load signal jacks during maximum power export to the utility. The load signal is filtered and used by the controller circuit.

The controller compares the load signal with a required power level signal. The level potentiometer, or an optional signal converter receiving input from a transducer or process control, determines the required power level setting. An error signal is produced and used to bias the speed setting of the load sharing controls through the paralleling lines. Output of the Export Control on the paralleling lines adjusts the speed of the generators so the level of power exported to the utility is constant. Increasing the paralleling line voltage increases the speed setting of the load sharing controls.

The controller circuit contains two adjustments, the high and low limit potentiometers which limit Export Control output to the paralleling lines. They determine a range of permitted load sharing control speed settings while the generator is paralleled and sharing load.

The low limit potentiometer determines the minimum speed resulting in a minimum power level on the local bus. It is normally set to keep the generator at a low power level without motoring. The high limit potentiometer is set at the maximum power limit of the local system generators and prevents overloading. When the local bus has reached this maximum power limit, additional load and power demand is met by the utility bus.

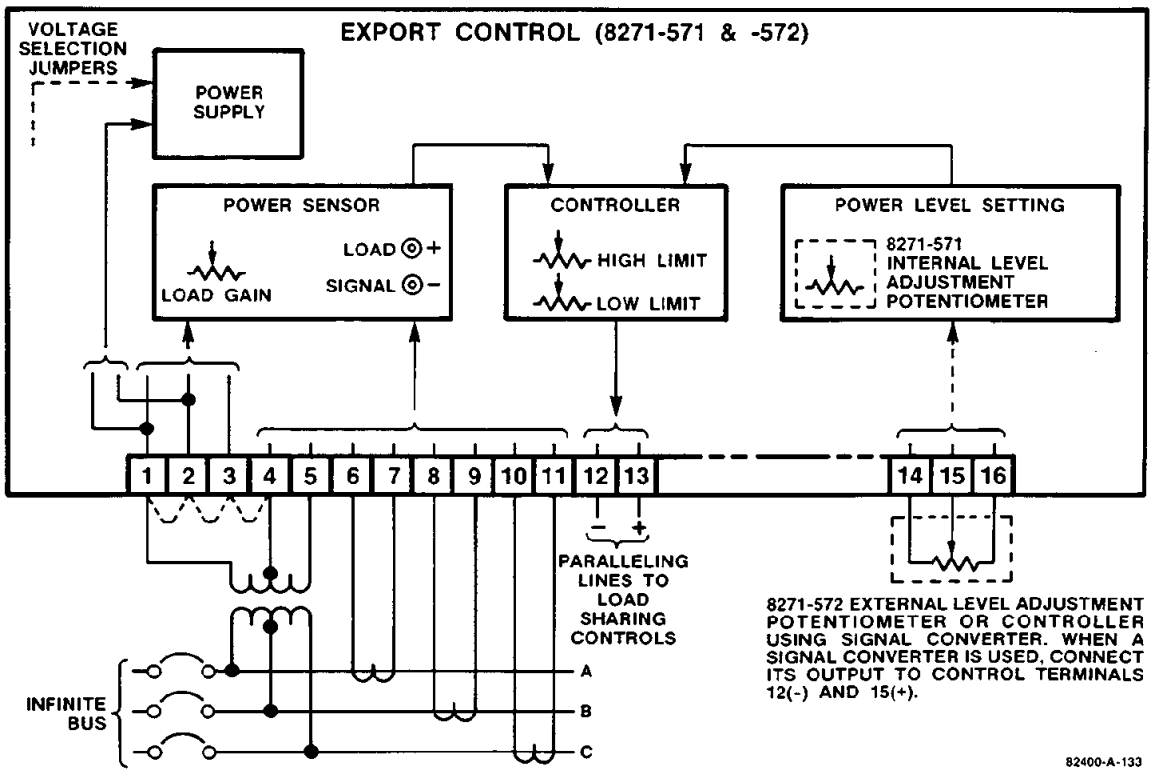

Figure 4-1. Export Control Block Schematic Diagram

Chapter 5. Troubleshooting

Generators that are motoring or are overloaded can be caused by open paralleling lines. Check and repair the paralleling line wiring and the infinite bus breaker auxiliary contacts.

If a signal converter is used, temporarily replace the signal converter with a 1 kΩ potentiometer and check system operation. Check the operation and calibration of the signal converter and transducer or process controlled signal.

If a spare Export Control is available, try it in place of the questionable unit. This is the simplest way to determine whether the installed unit is defective.

⚠WARNING **Shut down the system before disconnecting any Export Control wires.**

The troubleshooting table below was chosen so that the defective unit may be replaced or wiring corrected. This is done by establishing known conditions and testing for expected inputs, outputs, and output change corresponding to a changing input.

The tests assume that the system wiring, solder connections, switch and relay contacts, and input and output connections are correct and in good order. Start at the beginning of the table and make the checks in the order indicated. If acceptable values or results are observed, proceed to the next measurement.

If repair becomes necessary, all work must be done by personnel thoroughly trained in the proper procedures.

NOTICE **Unqualified personnel who adjust or repair a Woodward control can cause damage to it and related equipment.**

When requesting additional information or service help from Woodward or an authorized service shop, it is important to include in your correspondence the part numbers and serial numbers of all Woodward components and complete description of problems or symptoms.

To perform these checks, it is necessary to temporarily switch the load sharing controls to the droop mode. The paralleling lines must also be disconnected from Export Control terminals 12 and 13. When called for in the troubleshooting table, the load is varied by adjusting the rated speed potentiometer.

Condition	Measurement	Acceptable Value	Diagnosis of Unacceptable Value
Check Input Voltages			
Operate the load sharing controls in droop mode. Remove the paralleling lines from terminals 12 and 13.	AC voltage from 1 to 4, 1 to 5, and 4 to 5.	1. Only if jumpers 1 to 2 and 3 to 4 are installed: 95 to 130 Vac rms, all 3 phases. 2. Only if jumper 2 to 3 is installed: 190 to 260 Vac rms, all 3 phases.	If voltages are zero or if all 3 voltages are not equal, measure voltages at the bus. If bus voltage is correct, repair wiring between infinite bus and Export Control. If voltages are out of limits, change jumpers or PT ratio as required.
Check Internal Power Supply			
Operate as above.	DC voltage from 12(+) to 14 (–). DC voltage from 12 (+) to 16 (–).	2.7 ±0.1 Vdc 0.0 ±0.1 Vdc	8271-571: Wires connected to terminals 14, 15, or 16 (remove wires) or defective Export Control 8271-572: Verify level pot is 1 kΩ. If not, replace and re-measure. If so, Export Control is defective.
Check CT Inputs			
As above, vary droop settings or load.	AC voltage from 6 to 7, 8 to 9, 10 to 11.	Proportional to bus current of corresponding phase.	Shut system down and check CT wiring.
As above, but set load or droop settings for maximum desired power from or to the infinite bus. Maintain constant load.	AC voltage from 6 to 7, 8 to 9, 10 to 11.	Between 1/2 and 1 Vac rms.	Shut system down and change CT ratio.
Check Internal Power Sensor			
As above, set LOAD GAIN fully CW. **IMPORTANT** Repeat LOAD GAIN adjustment in Chapter 2 before putting Export Control back into service.	DC voltage at LOAD SIGNAL test points. Observe polarity.	Between 4 and 9 Vdc.	If zero or above 9 Vdc, Export Control is defective. If less than 4 Vdc (including negative voltages), perform CT phasing check on page 8 and re-measure voltage. If still unacceptable, Export Control is defective.
As above, vary load or droop settings.	DC voltage at LOAD SIGNAL test points. Observe polarity.	Proportional to load.	Defective Export Control.
As above. Slowly turn LOAD GAIN CCW, then CW. Leave pot fully CW.	DC voltage at LOAD SIGNAL test points. Observe polarity.	Decrease while turning CCW, increase while turning CW.	Defective Export Control.

Condition	Measurement	Acceptable Value	Diagnosis of Unacceptable Value
Check Desired Level Setting			
As above, set LEVEL fully CW.	DC voltage at 12(+) and 15(–).	Between 2 and 4 Vdc.	8271-571: Defective Export Control 8271-572: Detective or improperly wired external level potentiometer (repair or replace) or defective Export Control.
As above turn LEVEL potentiometer slowly CCW. Leave potentiometer fully CCW.	DC voltage at 12(+) and 15(–).	Decrease to zero and become negative. Continue decreasing to between –2 and –4 Vdc.	8271-571: Defective Export Control. 8271-572: Defective or improperly wired external level potentiometer (repair or replace) or defective Export Control.
Check Controller			
As above, turn HIGH LIMIT fully CW and LOW LIMIT fully CCW.	DC voltage at 13(+) and 12(–).	Between 7 and 9 Vdc.	Wires connected to terminals 12 and 13 (remove wires), or defective Export Control.
Check High Limit Adjustment			
As above, slowly turn HIGH LIMIT fully CCW, then fully CW.	DC voltage at 13(+) and 12(–).	Decrease as potentiometer turned CW. Between 1.5 and 3 Vdc as potentiometer is turned CW.	Defective Export Control.
Check Controller Integrator			
As above, quickly turn LEVEL fully CW.	DC voltage at 13(+) and 12(–).	It normally takes a few seconds to decrease to between –1 and 0 Vdc.	Defective Export Control.
Check Low Limit Adjustment			
As above, slowly turn LOW LIMIT CW, then fully CCW.	DC voltage at 13(+) and 12(–).	Increase as potentiometer is turned CW. Between 1.5 and 3 Vdc when fully CW. Decrease as potentiometer is turned CCW.	Defective Export Control.
Check System Operation without Export Control			
Shut the system down. Remove the paralleling operation lines from each of the generator governors. Set the governors in the droop mode, adjust them for a nominal amount of droop. Check operation of each generator. Parallel them and parallel them with the infinite bus.	Observe correct operation.	When paralleled with the infinite bus, each generator must produce a fixed power level independent of load changes.	Defective or incorrect CTs or PTs or wiring, defective governor, voltage regulator breakers, generator or engine. Correct operation must be obtained before the Export Control is used.

Chapter 6.
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 82429.

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Email and Website—www.woodward.com

**Woodward has company-owned plants, subsidiaries, and branches,
as well as authorized distributors and other authorized service and sales facilities throughout the world.**

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

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