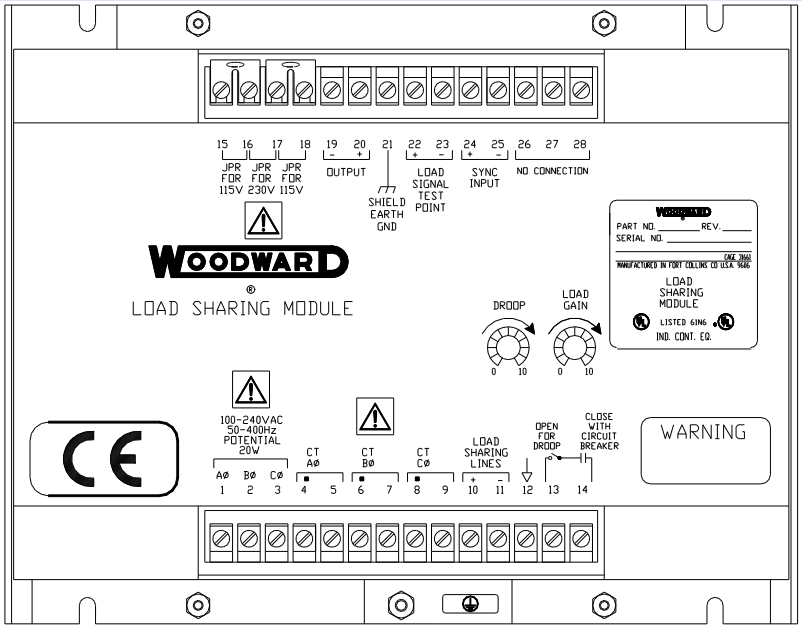
WOODWARD

Product Manual 26011
(Revision F, 04/2024)
Original Instructions



260-013a
99-01-07 skw

Load Sharing Module
Analog Output 9907-173, 9903-773

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.



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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.



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Warnings and Notices

Important Definitions

This is the safety alert symbol 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

Lockout/Tagout LOTO

Ensure that personnel are fully trained on LOTO procedures prior to attempting to replace or service equipment on a "live" running engine. All safety protective systems (overspeed, over temperature, overpressure, etc.) must be in proper operational condition prior to the start or operation of a running engine. Personnel should be equipped with appropriate personal protective equipment to minimize the potential for injury due to release of hot hydraulic fluids, exposure to hot surfaces and/or moving parts, or any moving parts that may be activated and are located in the area of control of the unit.

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.

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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.

WARNING

IOLOCK

IOLOCK: driving I/O into a known state condition. When a control fails to have all the conditions for normal operation, watchdog logic drives it into an IOLOCK condition where all output circuits and signals will default to their de-energized state as described below. *The system MUST be applied such that IOLOCK and power OFF states will result in a SAFE condition of the controlled device.*

- **Microprocessor failures will send the module into an IOLOCK state.**
- **Discrete outputs / relay drivers will be non-active and de-energized.**
- **Analog and actuator outputs will be non-active and de-energized with zero voltage or zero current.**

Network connections like CAN stay active during IOLOCK. This is up to the application to drive actuators controlled over network into a safe state.

The IOLOCK state is asserted under various conditions, including:

- **Watchdog detected failures**
- **Microprocessor failure**
- **PowerUp and PowerDown conditions**
- **System reset and hardware/software initialization**
- **PC tool initiated**

NOTE—Additional watchdog details and any exceptions to these failure states are specified in the related section of the product manual.

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.

Released

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. Touch your finger to a grounded surface to discharge any potential before touching the control, smart valve, or valve driver, or installing cabling connectors. Alternatively, ESD mitigation may be used as well: ESD smocks, ankle or wrist straps and discharging to a reference grounds surface like chassis or earth are examples of ESD mitigation.
    - ESD build up can be substantial in some environments: the unit has been designed for immunity deemed to be satisfactory for most environments. ESD levels are extremely variable and, in some situations, may exceed the level of robustness designed into the control. Follow all ESD precautions when handling the unit or any electronics.
        - I/O pins within connectors have had ESD testing to a significant level of immunity to ESD, however do not touch these pins if it can be avoided.
            - Discharge yourself after picking up the cable harness before installing it as a precaution.
        - The unit is capable of not being damaged or improper operation when installed to a level of ESD immunity for most installation as described in the EMC specifications. Mitigation is needed beyond these specification levels.

IMPORTANT

External wiring connections for reverse-acting controls are identical to those for direct-acting controls.

Released

Regulatory Compliance

European Compliance for CE Marking:

These listings are limited only to those units bearing the CE Marking.

EMC Directive: Declared to Directive 2014/30/EU of the European Parliament and of the Council of 26 February 2014 on the harmonization of the laws of the Member States relating to electromagnetic compatibility (EMC).

Low Voltage Directive: Directive 2014/35/EU on the harmonization of the laws of the Member States relating to the making available on the market of electrical equipment designed for use within certain voltage limits.

***RoHS Directive:** Declared to 2011/65/EU COUNCIL DIRECTIVE of the European Parliament and of the Council of 8 June 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment. Includes amendment to Annex II per Delegated Directive 2015/863/EU.
Exemption in use: 6(c), 7(a), 7(c)-I

****** Restriction of Hazardous Substances 2011/65/EU:

This product is intended to be sold and used only as equipment which is specifically designed, and is to be installed, as part of another type of equipment that is excluded or does not fall within the scope of this Directive, which can fulfil its function only if it is part of that equipment, and which can be replaced only by the same specifically designed equipment and therefore fulfills the requirements stated in Art.2.4(c) and as such is excluded from the scope of the Directive

United Kingdom Compliance for UKCA Marking:

These listings are limited only to those units bearing the UKCA Marking.

EMC: S.I. 2016 No. 1091: Electromagnetic Compatibility Regulations 2016.

LVD: S.I. 2016 No. 1101: Electrical Equipment (Safety) Regulations 2016.

***Hazardous Substances and Packaging:** S.I. 2012 No. 3032: The Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations 2012.
Exemption in use: 6 (c), 7 (a), 7(c)-I

****** S.I. 2020 No. 1647: The Hazardous Substances and Packaging (Legislative Functions and Amendments) (EU Exit) Regulations 2020

This product is intended to be sold and used only as repair, updating or upgrading of EEE (as defined in part 3 of schedule 1) that either was excluded from the scope of the Directive at the time of placing on the market (as defined in Schedule 1, part 2) or which benefited from an exemption and which was placed on the market before that exemption expired (per schedule 1 part 3).

North American Compliance:

These listings are limited only to those units bearing the UL identification.

UL: UL Listed for Ordinary Locations For use in Canada and the United States.
UL File E97763

(*) P/N 9907-173

(**) P/N 9903-773

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Special Conditions for Safe Use

Wiring for the Load Sharing Module must be suitable for at least 90 °C (194 °F) and also be suitable for the maximum installed operating temperature.

The Load Sharing Module must be permanently connected and employ fuses or circuit breakers in each of the PT lines to limit current to the LSM PT inputs to no more than 5 A.

All terminal block screws must be tightened to 0.56 to 0.79 N·m (5.0 to 7.0 lb-in).

To maintain compliance with CE and UKCA marking requirements, the EMC Directive requires that all shields be connected to the terminals provided per the plant wiring diagram, Figure 1-3.

Access to the Load Sharing Module must be restricted to qualified personnel.

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Chapter 1.
General Information

Introduction

The Woodward Load Sharing Module is made for use with engines equipped with speed controls that accept a ±3 Vdc speed setting. The Load Sharing Module allows use of Woodward power generation accessories and allows load sharing between engines equipped with speed controls that are not manufactured by Woodward and engines controlled with Woodward electronic controls, or controls using other Woodward load sharing modules.

Description

The Load Sharing Module provides isochronous and droop load-sharing capability for engines in generator set applications. Additional equipment in the control system can include the Woodward SPM-A Synchronizer, Paralleling Phase Switch, Import/Export Control, Precision Frequency Control, Automatic Generator Loading Control, and Automatic Power Transfer and Loading Control.

Figure 1-1 shows a typical system using a Load Sharing Module.

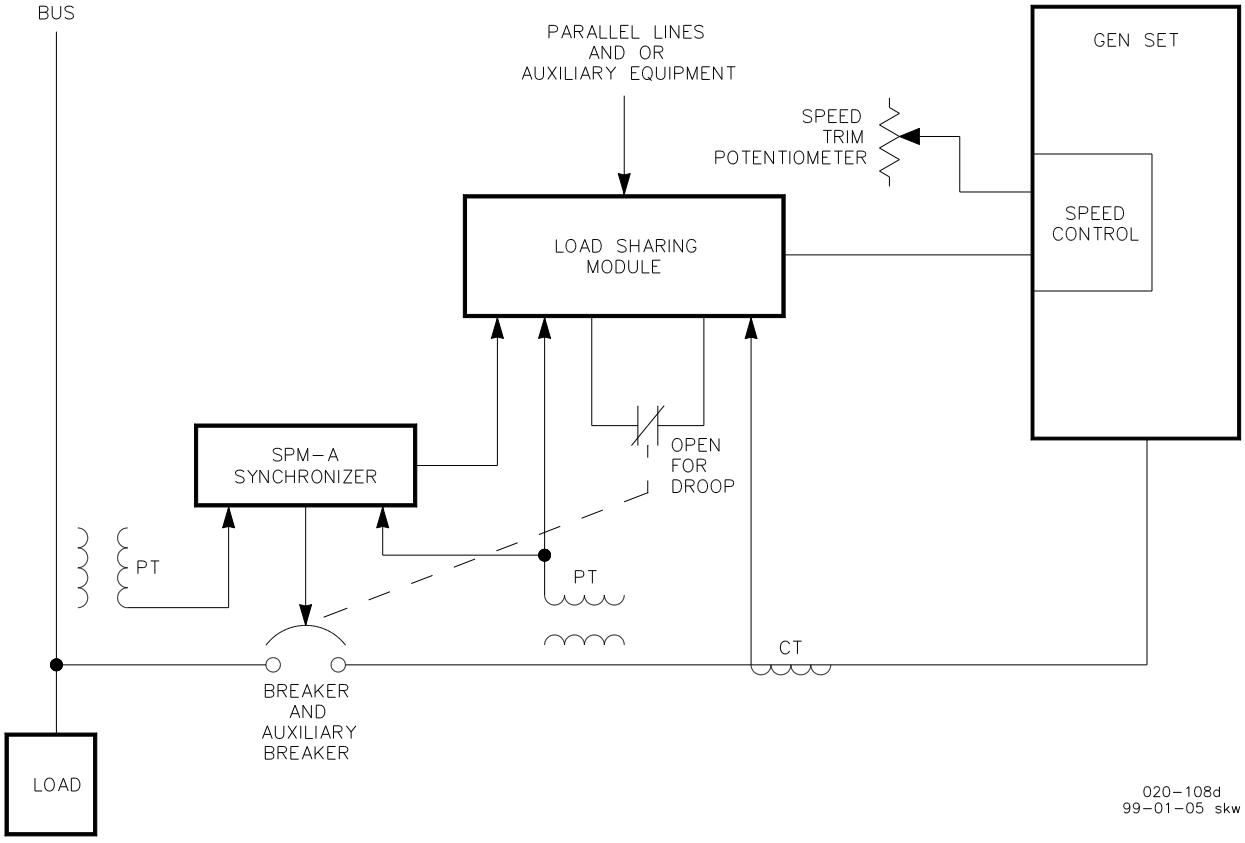


Figure 1-1. Typical System Using a Load Sharing Module

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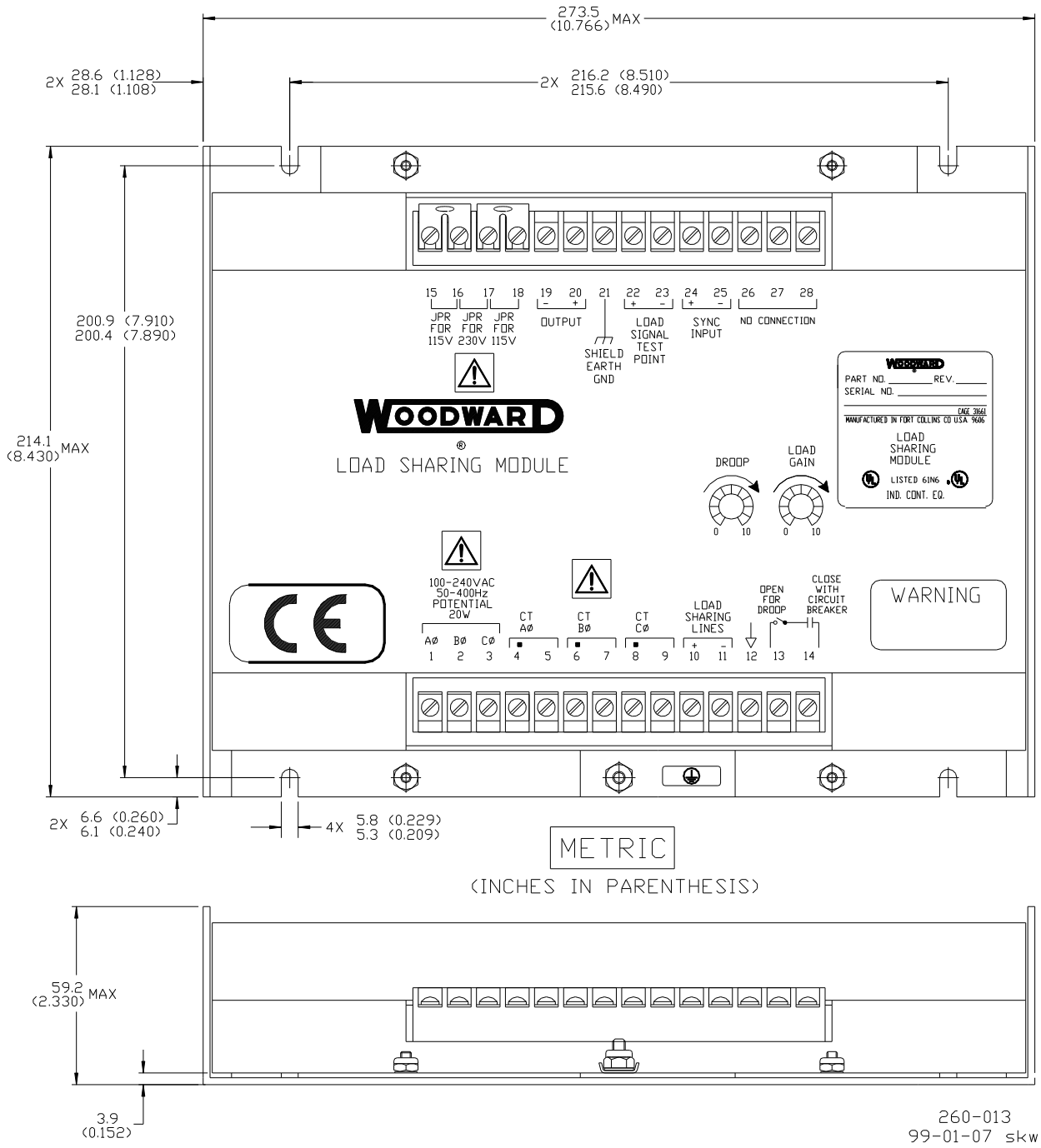
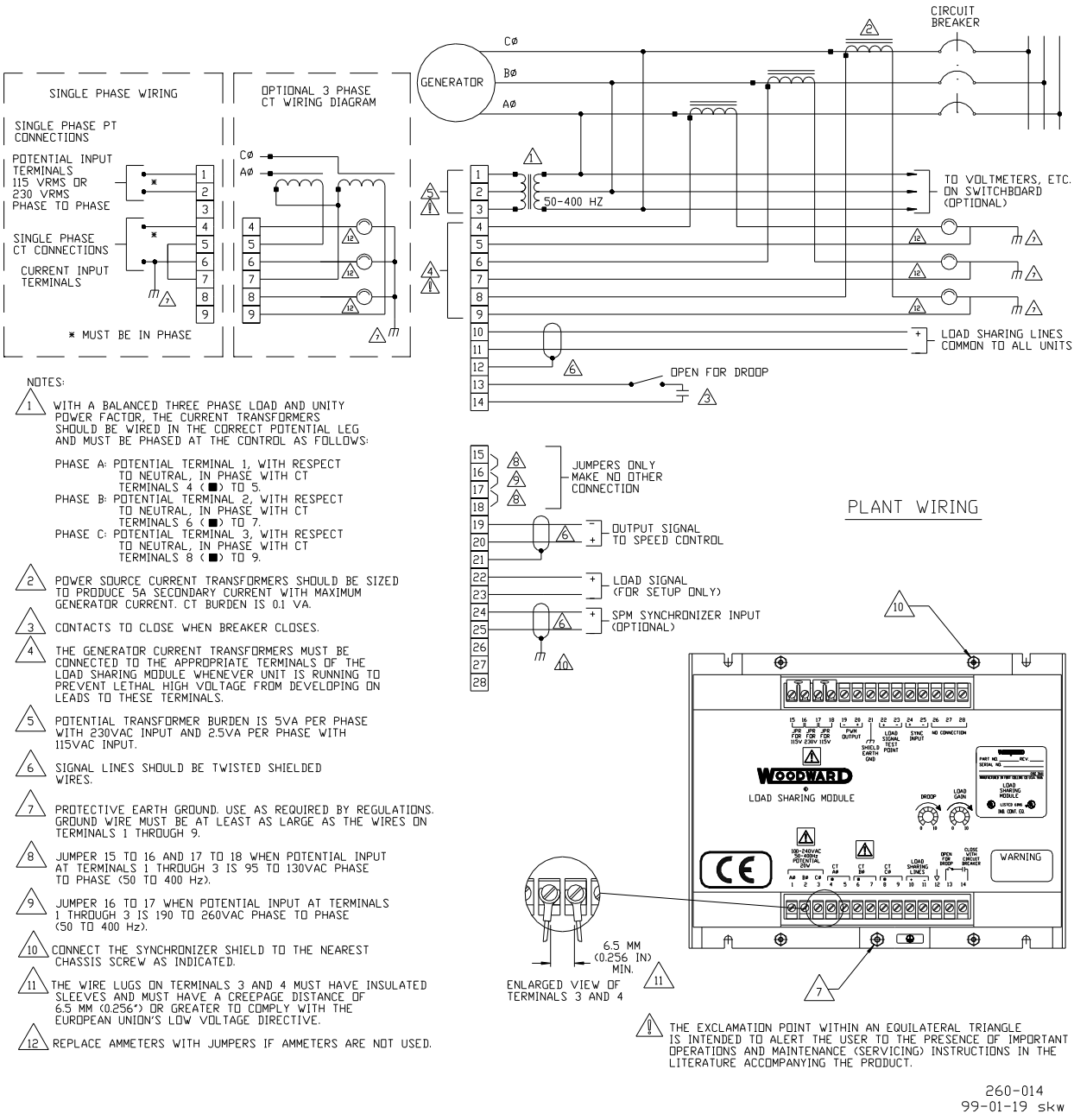


Figure 1-2. Outline Drawing of Load Sharing Module

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NOTES:

1. WITH A BALANCED THREE PHASE LOAD AND UNITY POWER FACTOR, THE CURRENT TRANSFORMERS SHOULD BE WIRED IN THE CORRECT POTENTIAL LEG AND MUST BE PHASED AT THE CONTROL AS FOLLOWS:
   PHASE A: POTENTIAL TERMINAL 1, WITH RESPECT TO NEUTRAL, IN PHASE WITH CT TERMINALS 4 (■) TO 5.
   PHASE B: POTENTIAL TERMINAL 2, WITH RESPECT TO NEUTRAL, IN PHASE WITH CT TERMINALS 6 (■) TO 7.
   PHASE C: POTENTIAL TERMINAL 3, WITH RESPECT TO NEUTRAL, IN PHASE WITH CT TERMINALS 8 (■) TO 9.
2. POWER SOURCE CURRENT TRANSFORMERS SHOULD BE SIZED TO PRODUCE 5A SECONDARY CURRENT WITH MAXIMUM GENERATOR CURRENT. CT BURDEN IS 0.1 VA.
3. CONTACTS TO CLOSE WHEN BREAKER CLOSES.
4. THE GENERATOR CURRENT TRANSFORMERS MUST BE CONNECTED TO THE APPROPRIATE TERMINALS OF THE LOAD SHARING MODULE WHENEVER UNIT IS RUNNING TO PREVENT LETHAL HIGH VOLTAGE FROM DEVELOPING ON LEADS TO THESE TERMINALS.
5. POTENTIAL TRANSFORMER BURDEN IS 5VA PER PHASE WITH 230VAC INPUT AND 2.5VA PER PHASE WITH 115VAC INPUT.
6. SIGNAL LINES SHOULD BE TWISTED SHIELDED WIRES.
7. PROTECTIVE EARTH GROUND. USE AS REQUIRED BY REGULATIONS. GROUND WIRE MUST BE AT LEAST AS LARGE AS THE WIRES ON TERMINALS 1 THROUGH 9.
8. JUMPER 15 TO 16 AND 17 TO 18 WHEN POTENTIAL INPUT AT TERMINALS 1 THROUGH 3 IS 95 TO 130VAC PHASE TO PHASE (50 TO 400 Hz).
9. JUMPER 16 TO 17 WHEN POTENTIAL INPUT AT TERMINALS 1 THROUGH 3 IS 190 TO 260VAC PHASE TO PHASE (50 TO 400 Hz).
10. CONNECT THE SYNCHRONIZER SHIELD TO THE NEAREST CHASSIS SCREW AS INDICATED.
11. THE WIRE LUGS ON TERMINALS 3 AND 4 MUST HAVE INSULATED SLEEVES AND MUST HAVE A CREEPAGE DISTANCE OF 6.5 MM (0.256") OR GREATER TO COMPLY WITH THE EUROPEAN UNION'S LOW VOLTAGE DIRECTIVE.
12. REPLACE AMMETERS WITH JUMPERS IF AMMETERS ARE NOT USED.

Figure 1-3. Plant Wiring Diagram of Load Sharing Module

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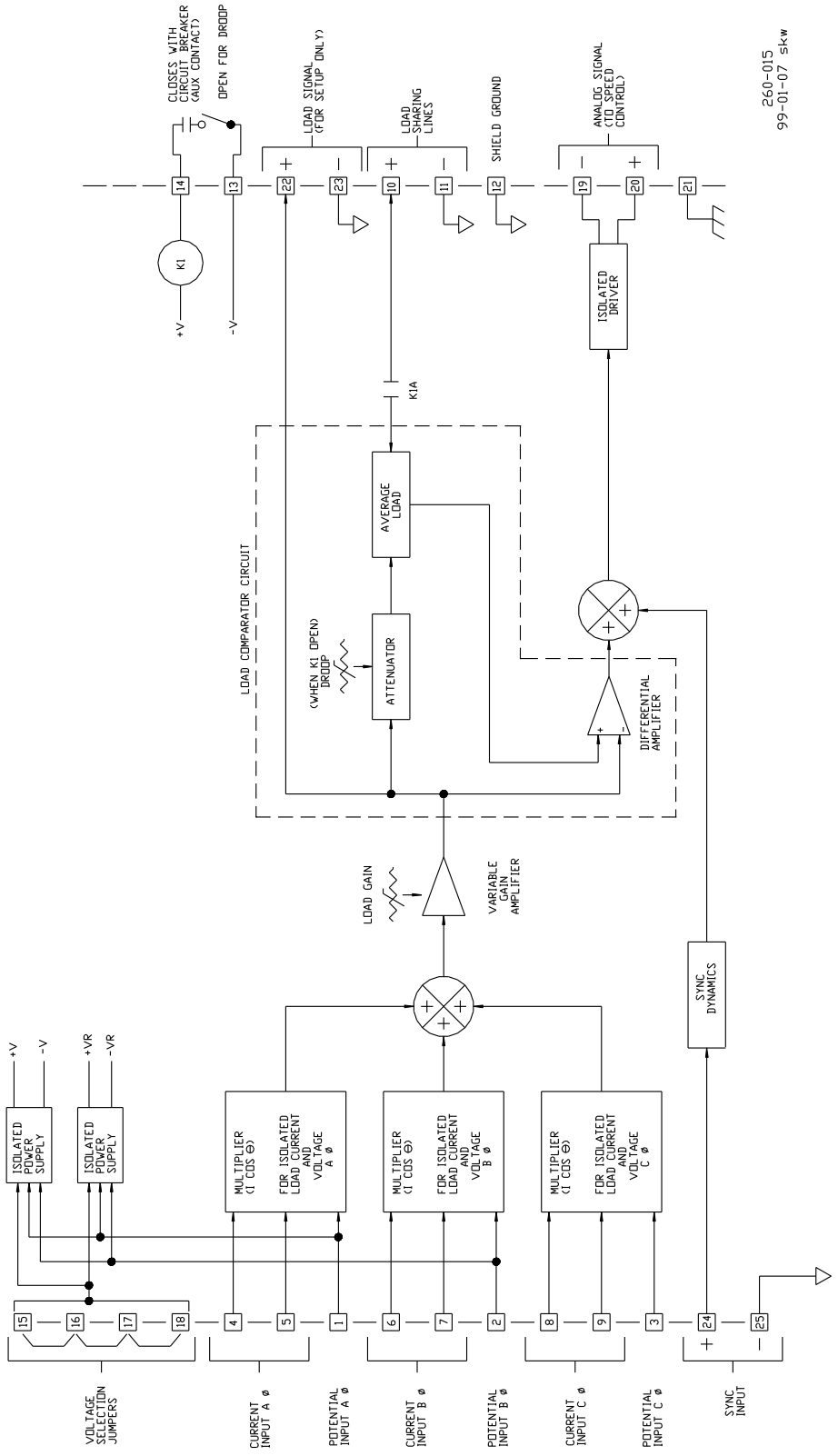


Figure 1-4. Block Diagram of Load Sharing Module

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Chapter 2. Installation

Introduction

This section contains general installation instructions for the Load Sharing Module. Environmental precautions and location considerations are included to determine the best location for the Load Sharing Module. Additional information includes unpacking instructions, electrical connections, and an installation check-out procedure.

Unpacking

Before handling the Load Sharing Module, read page ii, Electrostatic Discharge Awareness. Be careful when unpacking the Load Sharing Module. Check the unit for signs of damage such as bent or dented panels, scratches, and loose or broken parts. Notify the shipper of any damage.

Location Considerations

Consider these requirements when selecting the mounting location:

- Adequate ventilation for cooling
- Space for servicing and repair
- Protection from direct exposure to water or to a condensation-prone environment
- Protection from high-voltage or high-current devices, or devices which produce electromagnetic interference
- Protection from excessive vibration
- An ambient operating temperature range of –40 to +70 °C (–40 to +158 °F)

Do not mount the Load Sharing Module on the engine.

Figure 1-2 is an outline drawing of the Load Sharing Module. Install the unit as close as practical to the electronic engine control, but *not* on the engine itself. It may be installed in any position.

To maintain compliance with CE and UKCA marking requirements, the European Union Low Voltage Directive requires that the Load Sharing Module (LSM) be mounted in an IP43 enclosure as defined in EN60529. Access to the Load Sharing Module must be restricted to qualified personnel.

General Wiring Requirements



The circled ground symbol identifies the Protective Earth Terminal. This terminal must be connected directly to protective earth using a grounding conductor at least as large as those used on terminals 1 through 9. The insulation of the grounding conductor must be of green and yellow color.



This symbol identifies functional or EMC earth. This terminal is to be used for cable shield connections only. It is not to be used as a protective earth terminal.

Released

External wiring connections and shielding requirements for a typical installation are shown in the plant wiring diagram, Figure 1-3. These wiring connections and shielding requirements are explained in more detail in this chapter.

To maintain compliance with CE and UKCA marking requirements, the Low Voltage Directive requires that the Load Sharing Module must only be connected to Class III equipment.

Wiring for the Load Sharing Module must be suitable for at least 90 °C (194 °F) and also be suitable for the maximum installed operating temperature.

The Load Sharing Module must be permanently connected and employ fuses or circuit breakers in each of the PT lines to limit current to the LSM PT inputs to no more than 5 A.

All terminal block screws must be tightened to 0.56 to 0.79 N·m (5.0 to 7.0 lb-in).

To maintain compliance with CE and UKCA marking requirements, the EMC Directive requires that all shields be connected to the terminals provided per the plant wiring diagram, Figure 1-3.

Power Requirements

The Load Sharing Module is powered from the potential transformer connections. Jumpers are used to set the module for the voltage being produced by the generator. Jumper terminals 15 to 16 and 17 to 18 when the generator is producing 95 to 130 Vac. Jumper terminal 16 to 17 when the generator is producing 190 to 260 Vac. Potential transformer burden is 1.6 W per phase with 230 Vac input and 0.4 W per phase with 115 Vac input.

NOTICE

Make only jumper connections to terminals 15 through 18. DO NOT MAKE ANY ELECTRICAL CONNECTIONS to these terminals.

The unit is shipped with terminals 15–16 and 17–18 jumpered for 95 to 130-volt generation. To change to 190–260-volt generation, remove both jumpers and install one of the jumpers across terminals 16–17. The other jumper is then not used.

Shielded Wiring

All shielded cable must be twisted conductors with either a foil or braided shield. Do not attempt to tin (put solder on) the braided shield. All signal lines should be shielded to prevent picking up stray signals from adjacent equipment. Connect the shields to the terminals indicated in the plant wiring diagram. Wire exposed beyond the shield must be as short as possible.

The other end of the shields must be left open and insulated from any other conductor. Do not run shielded signal wires with other wires carrying large currents. See Application Note 50532, *EMI Control for Electronic Governing Systems*, for more information.

Where shielded cable is required, cut the cable to the desired length and prepare the cable as instructed below and shown in Figure 2-1.

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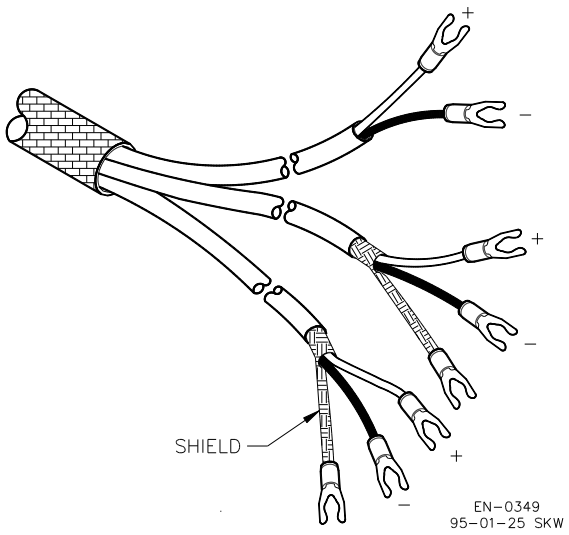


Figure 2-1. Preparation of Shielded Cables

1. Strip outer insulation from both ends, exposing the braided or spiral wrapped shield. Do not cut the shield on the end nearest to the Load Sharing Module. Cut off the shield on the end away from the unit.
2. Use a sharp, pointed tool to carefully spread the strands of the shield.
3. Pull the inner conductors out of the shield. Twist braided shields to prevent fraying.
4. Connect lugs to the shield and to the control wires. Number 6 slotted or round crimp-on terminals are used for most installations. Connect the wires to the appropriate terminals on the module.

Installations with severe electromagnetic interference (EMI) may require shielded wire run in conduit, double shielded wire, or other precautions.

Generator Connections

IMPORTANT

Use 1 mm² (18 AWG) or larger wire for all PT and CT connections.

The spacing between the lugs on terminals 3 and 4 must be 6.5 mm (0.256 inch) or greater to comply with the European Union Low Voltage Directive (see Figure 1-3). The lugs must have insulated sleeves.

IMPORTANT

Connections from the potential transformers and current transformers must be made correctly regarding the three phases for the Load Sharing Module to operate correctly. Sorting out the three phases at the module is tedious and requires numerous generator starts and stops. If possible, make sure that the wiring is correctly done at the time of installation and the phases correctly and permanently identified at the generator and at the module.

Connect the PT output from the A leg to terminal 1. Connect the PT output from the B leg to terminal 2. Connect the PT output from the C leg to terminal 3. Size the potential transformers to produce 100–240 Vac.

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Current Transformers

Power source current transformers should be sized to produce 5 A secondary current with maximum generator current (3–7 A secondary current at full load is acceptable). CT burden is 0.1 VA. To prevent lethal high voltage from developing on leads to the terminals, the Load Sharing Module contains internal burden which must be connected across the power source current transformers whenever the unit is running. Ammeters may be installed on the leads from the current transformers.

Connect phase “A” CT to terminals 4 and 5. Connect phase “B” CT to terminals 6 and 7. Connect Phase “C” CT to terminals 8 and 9. Observe correct phasing as shown in the plant wiring diagram, Figure 1-3.

Load Sharing Lines, Droop, and Auxiliary Contacts

The droop contact for selecting droop or isochronous operation is wired in series with the circuit breaker auxiliary contact between terminals 13 and 14. When both the droop contact and circuit breaker auxiliary contact are closed, the Load Sharing Module is in the isochronous load sharing mode. In this mode the internal load-sharing-line relay is energized, the droop signal is disabled, and the load matching circuit is connected to the load-sharing lines, permitting isochronous load sharing.

The Load Sharing Module is in the droop mode when EITHER the droop contact or the circuit breaker auxiliary contact is open. If the droop contact is open, the Load Sharing Module remains in the droop mode even when the circuit breaker auxiliary contact is closed. If droop is not desired when the auxiliary contact is open, turn the droop potentiometer fully counterclockwise.

Use a single pole, single-throw switch with a 0.1 A minimum rating for the “open for droop” switch.

Output to the Engine Speed Control

Use twisted 0.5 mm² (20 AWG) or larger shielded wire to connect the output signal from terminals 19, 20, and 21 to the engine speed control. Connect the shield to the closest chassis screw only. Do not connect the shield at the speed control end of the wiring.

Synchronization Connections

If an SPM-A synchronizer is used, connect twisted-pair 0.5 mm² (20 AWG) or larger shielded wire from the synchronizer to terminals 24(+) and 25(–). Tie the shield to the closest chassis screw. Do not connect the shield at the synchronizer end of the wiring.

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Chapter 3.
Setup and Calibration

Introduction

Use this calibration procedure after a Load Sharing Module is installed on a generator set, to obtain the needed operating characteristics during load sharing.

1. Check that the correct jumpers are installed on terminals 15, 16, 17, and 18 to match your potential transformer secondary voltage. See the plant wiring diagram (Figure 1-3).

2. Remove wires from load sharing line terminals 10 and 11, and from the SPM-A Synchronizer (if used) at terminals 24 and 25.

3. Select isochronous operation by shorting terminals 13 and 14.

⚠WARNING

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.

4. Start the engine according to the engine manufacturer's instructions. Adjust the engine for rated speed. Apply full load to the generator set.

IMPORTANT

The most accurate calibration is made at full load. However, if it is not possible to run the generator set at full load, run it at less than full load, and reduce the voltage readings given in this calibration procedure proportionally. For example: run a 200 kW generator set at 100 kW and divide all voltages given in this calibration procedure by 2. If you reduce the load in this manner, be sure to reduce it by the same amount throughout the calibration procedure.

5. Set the LOAD GAIN potentiometer fully clockwise.

6. Check the load signal voltage between terminals 22 and 23. Adjust the LOAD GAIN potentiometer for 6.0 Vdc signal. If this voltage is not obtainable, set the load signal as close as possible to 6 Vdc.

7. Remove the load from the generator set.

8. Check the voltage between terminals 22 and 23. This voltage should be 0.0 ± 0.25 Vdc. If this voltage is not correct, the Load Sharing Module is faulty or there may still be load on the generator.

Phasing Check

⚠WARNING

HIGH VOLTAGE—A high voltage across open CTs (current transformers) can cause death or serious injury. Do not disconnect a CT from the Load Sharing Module while the engine is running. The CTs can develop dangerously high voltages and may explode if open circuited while the engine is running.

Released

For the phasing check, the generator set must be running isochronously, not paralleled, and with a power factor greater than 0.8.

9. Check that the potential connections are made as follows and correct them if they are not.
   - Phase A to terminal 1
   - Phase B to Terminal 2
   - Phase C to Terminal 3

IMPORTANT

The most accurate calibration is made at full load. However, if it is not possible to run the generator set at full load, run it at less than full load, and reduce the voltage readings given in this calibration procedure proportionally. For example: run a 200-kW generator set at 100 kW and divide all voltages given in this calibration procedure by 2. If you reduce the load in this manner, be sure to reduce it the same amount throughout this calibration procedure.

10. Start the engine and apply full load to the generator set.

11. Using a dc voltmeter, measure the load signal at terminals 22 and 23. Adjust the load gain potentiometer to give a 6 Vdc load signal. If 6 Vdc is not obtainable, set the load signal as close as possible to 6 Vdc. Record this voltage.

12. Shut down the generator set.

⚠WARNING

HIGH VOLTAGE—A high voltage across open CTs (current transformers) can cause death or serious injury. Do not disconnect a CT from the Load Sharing Module while the engine is running. The CTs can develop dangerously high voltages and may explode if open circuited while the engine is running.

13. Disconnect the wire from terminal 5 that comes from the phase “A” CT and connect both wires from this CT to terminal 4.

14. Start the generator set and apply full load.

15. Measure the load signal at terminals 22 and 23. If the phase “B” and “C” current transformers are connected correctly, this voltage will be 1/3 lower than the voltage recorded in step 13. For example: if the reading was 6 volts in step 13, the reading in this step should be approximately 4 volts.

16. Shut down the generator set.

17. Reconnect the phase “A” CT wire to terminal 5.

18. If the reading in step 15 was correct, proceed to Load Gain Adjustment later in this chapter. Otherwise, perform the following Phase Correction Procedure.

Phase Correction Procedure

If this procedure is followed, the correct connection of the current transformers is assured; the correct CT will be connected to the correct input on the Load Sharing Module with the correct polarity. Use this procedure only if the Phasing Check indicates that the phasing is incorrect.

A CT for any phase (A, B, or C), will produce the most positive load signal voltage when it is connected, in the proper polarity, to the terminals on the Load Sharing Module which correspond to the same phase. Any other connections of this CT will produce a less positive load signal voltage. This procedure makes

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trial connections of the first CT to all three CT inputs on the Load Sharing Module, polarized both ways on each CT input. The load signal voltage is recorded for each connection, and the CT is then connected to the CT input terminals that produced the most positive load signal voltage and with the polarity that produced the most positive load signal voltage.

In a like manner, the second CT is tried on each of the two remaining CT input terminals in each polarity, then connected, in the correct polarity, to the terminals which produced the most positive load signal voltage.

The remaining CT is then connected to the remaining CT input and the load signal checked for each polarity. This CT is then connected to the CT input, polarized so that it produces the most positive load signal voltage.

When the procedure is completed, all three CTs are connected to the proper CT inputs on the Load Sharing Module, with the correct polarity, and are now labeled with their correct designations.

The procedure for correcting phase wiring requires that the generator set be shut down and the current transformers disconnected many times. For convenience during the phasing check, the temporary method of connecting the current transformers shown in Figure 3-1 is recommended. By connecting a burden resistor (a 0.5 Ω, 20 W resistor), across each current transformer, that current transformer can be disconnected from the Load Sharing Module after removing all load. The connections between the terminal strip and the Load Sharing Module can be changed with the generator set running; however, remove all load before any changes in connections are made. *Do not disconnect a wire from a current transformer with load on the system.* After completion of the procedure remove the terminal strip and the resistors.

⚠WARNING

HIGH VOLTAGE—A high voltage across open CTs (current transformers) can cause death or serious injury. Do not disconnect a CT from the Load Sharing Module while the engine is running. The CTs can develop dangerously high voltages and may explode if open circuited while the engine is running.

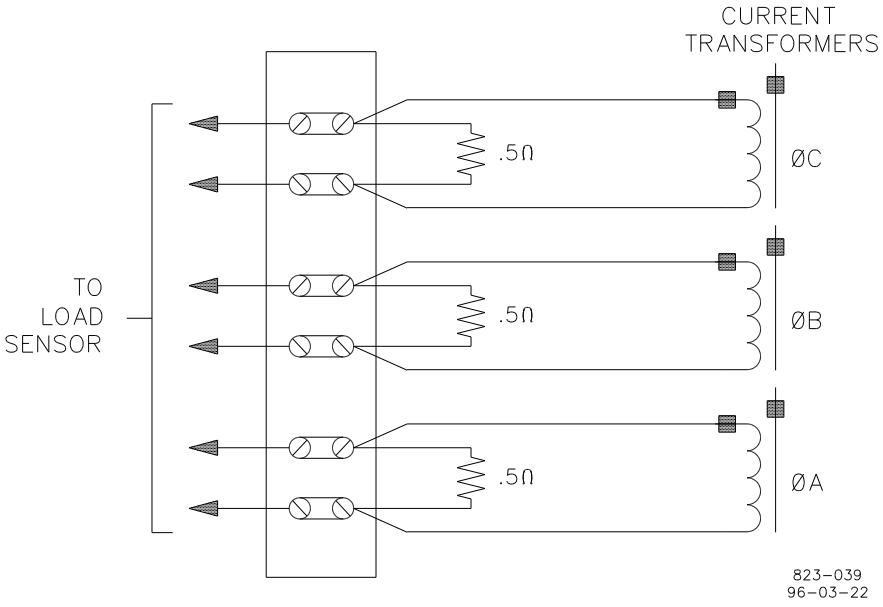


Figure 3-1. Temporary CT Connections

For this procedure, the generator set must be running isochronously, not paralleled, and with a power factor greater than 0.8.

1. Start with the generator shut down.

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2. Label each CT wire with the phase and polarity that you think it should be. Even though this identification may prove to be wrong during this procedure, this step is necessary so that the individual wires may be identified during the description of the procedure.

3. Disconnect the phase “B” CT wires from terminals 6 and 7 and connect these two wires together. Use a small screw and nut and tape the connection.

4. Disconnect the phase “C” CT wires from terminals 8 and 9 and connect these two wires together. Use a small screw and nut and tape the connection.

5. Connect the two wires from the phase “A” CT to phase “A” input terminals 4 and 5.

⚠WARNING

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.

6. Start the engine and apply full load.

7. Measure the load signal voltage between terminals 22 and 23 and record this voltage.

8. Shut the generator set down and reverse the phase “A” wires on terminals 4 and 5.

9. Start the engine and apply full load.

10. Measure the load signal voltage between terminals 22 and 23 and record this voltage.

11. Shut the generator set down.

12. Remove the phase “A” CT wires from terminal 4 and 5 and connect the phase “A” CT wires to the phase “B” input terminals 6 and 7.

13. Start the engine and apply full load.

14. Measure the load signal voltage between terminals 22 and 23 and record this voltage.

15. Shut the generator set down and reverse the phase “A” CT wires on terminals 6 and 7.

16. Start the engine and apply full load.

17. Measure the load signal voltage between terminals 22 and 23 and record this voltage.

18. Shut down the generator set.

19. Remove the phase “A” CT wires from terminal 6 and 7 and connect the phase “A” CT wires to the phase “C” input terminals 8 and 9.

20. Start the engine and apply full load.

21. Measure the load signal voltage between terminals 22 and 23 and record this voltage.

22. Shut the generator set down and reverse the phase “A” wires on terminals 8 and 9.

23. Start the engine and apply full load.

24. Measure the load signal voltage between terminals 22 and 23 and record this voltage.

25. Shut down the generator set.

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26. Remove the phase “A” CT wires from terminal 8 and 9 and connect the wires to the pair of terminals, in the same polarity, that produced the most positive load signal voltage.
27. Remove tape and disconnect the Phase “B” CT wires. Connect the phase “B” CT wires to one pair of the two remaining CT input terminals on the Load Sharing Module.
28. Start the generator set and apply full load.
29. Measure the load signal voltage at terminals 22 and 23 and record this voltage.
30. Shut the generator set down and reverse the phase “B” wires on the CT input terminals.
31. Start the engine and apply full load.
32. Measure the load signal voltage between terminals 22 and 23 and record this voltage.
33. Shut down the generator set.
34. Remove the phase “B” CT wires from the terminals they are connected to and connect them to the remaining pair of CT input terminals on the Load Sharing Module.
35. Start the generator set and apply full load.
36. Measure the load signal at terminals 22 and 23 and record this voltage.
37. Shut the generator set down and reverse the phase “B” wires on the CT input terminals.
38. Start the engine and apply full load.
39. Measure the load signal voltage between terminals 22 and 23 and record this voltage.
40. Shut down the generator set.
41. Remove the phase “B” CT wires from the CT input terminals and connect the wires to the pair of terminals, in the same polarity, that produced the most positive load signal voltage.
42. Remove tape and disconnect the Phase “C” CT wires. Connect the phase “C” CT wires to remaining pair of CT input terminals on the Load Sharing Module.
43. Start the generator set and apply full load.
44. Measure the load signal voltage at terminals 22 and 23 and record this voltage.
45. Shut the generator set down and reverse the phase “C” wires on the CT input terminals.
46. Start the engine and apply full load.
47. Measure the load signal voltage between terminals 22 and 23 and record this voltage.
48. Shut down the generator set.
49. Remove the phase “C” CT wires from the CT input terminals and connect the wires to the pair of terminals, in the same polarity that produced the most positive load signal voltage.
50. Label each wire with the designation of the terminal to which it is now connected. Be sure and remove the original designations to avoid future confusion.

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Load Gain Adjustment

For this procedure, the generator set must be running isochronously, not paralleled, and with a power factor greater than 0.8.

1. Start the generator set and run at full load.

2. Measure the load signal voltage and adjust the LOAD GAIN potentiometer for 6 ± 0.1 Vdc.

If the load signal voltage cannot be raised to 6 volts, and the phasing has been checked and is correct, it will be necessary to use a lower load signal voltage. Set the full load signal voltages of all generator sets in the system to the same voltage.

When paralleled, adjustment of a generator set's LOAD GAIN potentiometer clockwise will cause that generator set to carry less load. If stability problems occur when paralleled at a particular load signal voltage, reduce the load signal voltage by adjusting the LOAD GAIN potentiometer counterclockwise and set the load signal voltage of all other generator sets in the system to the same voltage (NOTE—Adjust the LOAD GAIN with the generator running isochronously and not paralleled). When the load signal voltages of all generator sets in a system are reduced, the load sharing gain will be reduced. This may result in some loss of load-sharing sensitivity but will increase load sharing stability. It may be necessary to reduce the load signal voltage of each unit in the system to as low as three volts in cases of extremely poor system dynamics.

Droop Adjustment

Droop is usually expressed as a percentage. Droop percentage is calculated by dividing the difference between the no load speed and the full load speed by the rated speed.

The DROOP potentiometer only needs to be adjusted when the generator set is to be operated in droop mode. The method of setting droop depends on whether the load on the generator set is an isolated load or an infinite bus. Once adjusted, the droop potentiometer will not have to be readjusted unless a different droop percentage is desired.

Setting Droop for an Isolated Load

1. Open the OPEN FOR DROOP switch (or disconnect the wires from terminals 13 and 14).

2. Start the engine and adjust the speed for rated with no load.

3. Apply full load.

4. Adjust the DROOP potentiometer to give the desired speed.
   Example: Operating at 60 Hz, 57 Hz at full load indicates 5 percent droop.
   If only 50 percent loading is possible, 58.5 Hz would indicate 5 percent droop (see Figure 3-2).

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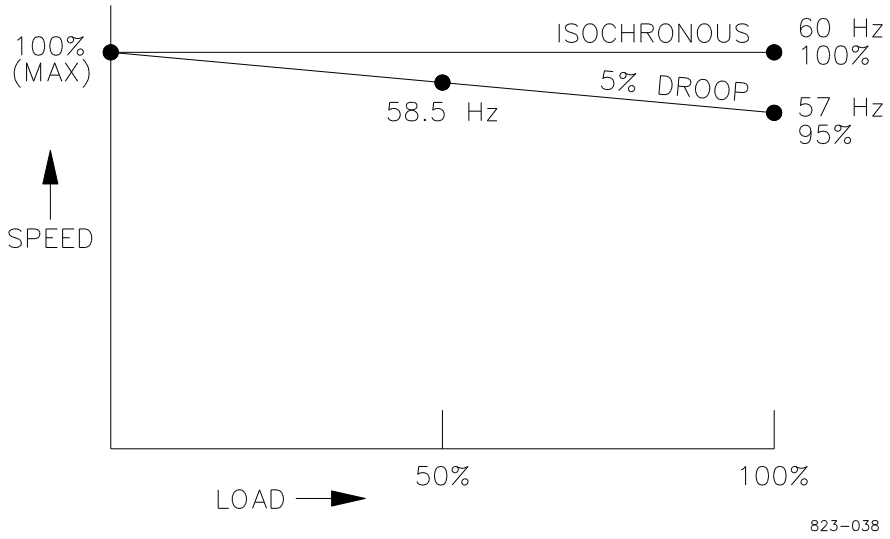


Figure 3-2. Droop Adjustment

Setting Droop for an Infinite Bus

1. With the generator not paralleled, adjust the speed above rated frequency by the percent droop required (set engine at 63 Hz for 5 percent droop on a 60 Hz system).
2. Mark the speed setting potentiometer position or measure dc voltage on TB27(+) and TB26(–) and re-adjust the engine speed for rated frequency.
3. Turn the DROOP potentiometer fully clockwise for maximum droop.
4. Synchronize the generator with the bus and parallel it with the bus.
5. Increase the speed setting potentiometer to the position marked in step 2, increasing load.
6. Slowly adjust the DROOP potentiometer counterclockwise, decreasing droop, until 100 percent load is obtained.

If it is necessary to set the droop without pulling 100 percent load, set the engine speed accordingly for the desired percent of droop at the load to be pulled. For example: Five percent droop at 50 percent load will require a no-load rated speed of 61.5 Hz, not 63 Hz, on a 60 Hz system.

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Chapter 4.
Theory of Operation

Introduction

This chapter describes the operation of the Load Sharing Module and its internal circuits. Figure 1-4 is a block diagram of the circuits in the module.

The Load Sharing Module senses the power output of a generator and provides a ±3 Vdc signal to the speed control to adjust the power output of the engine-generator set to match the reference power level. The Load Sharing Module can also produce a droop condition (instead of isochronous load-sharing), making it possible to connect the generator set in parallel with either a generator set which is running isochronously, or with an infinite bus.

Power Supply

The power supply generates a regulated dc voltage for the operation of the circuits in the Load Sharing Module. The power supply gets its power from two of the three phase-potential connections which are made to the output of the generator set being controlled. Jumper wires on terminals 15 through 18 provide for selection of input voltages of either 95 to 130 Vac or 190 to 260 Vac. The plant wiring diagram (Figure 1-3) shows these connections and jumpers. Do not connect inputs to terminals 15 through 18.

Power Sensor

Generator load is measured by the power-sensor circuit of the Load Sharing Module. The power-sensor circuit senses current amplitude and produces a load signal proportional to the current amplitude times the power factor. The potential input comes from potential transformers (PTs) and the current input comes from the current transformers (CTs). The circuit uses these two inputs to generate a load signal which is then filtered and sent to the controller circuit. The load signal voltage of each generator set will be proportional to the percentage of rated load on the generator set.

Ammeters and voltmeters may be driven with the same PT and CT wires.

Load Comparator Circuit

In the load comparator circuit, the load signal voltage is balanced with the other generator sets in the system via the load sharing lines. The comparator circuit of each Load Sharing Module includes a load gain potentiometer to adjust each generator set's load signal so that the load signal voltage of each is the same at full load. This compensates for varying CT ratios or different generator set sizes. The load sharing voltage will be one-half the measured voltage of the load signal test point.

Isochronous Load Sharing

Each comparator circuit compares the load signal voltage for its generator set to two times the voltage on the load sharing lines and produces an error voltage proportional to the difference. This error voltage is used to generate a pulse width modulated signal which is output to the speed control. This output biases the speed loop of the speed control until the load signal voltage is equal to that of other generators on the load sharing lines.

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Droop Operation

In droop operation, a portion of the load signal voltage is fed to the controller circuit. This voltage is used by the comparator circuit to reduce the control output by a percentage determined by the DROOP potentiometer. The output is reduced, and the speed control reduces engine power output according to the desired droop percentage.

When a generator set using the Load Sharing Module is paralleled in droop with other generator sets, the common load signal on the paralleling lines is not used. The frequency of the generator set will therefore vary with load, so it must be determined by a different means. In an isolated system with two or more generator sets paralleled, if isochronous speed control is required, one of the generator sets must be running in the isochronous (constant speed) mode. This generator set maintains the frequency of the system. If a generator set is in droop and is paralleled with an infinite bus, the bus determines and maintains the frequency. The DROOP percentage and the speed setting on the engine speed control determine the amount of the load that is carried by the generator, when running in droop.

Auxiliary Equipment

The Woodward SPM-A synchronizer functions by biasing the output of the Load Sharing Module. All other Woodward auxiliary generating control equipment functions by biasing the voltage on the load-sharing lines.

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Chapter 5.
Troubleshooting

The following trouble-shooting guide is an aid in isolating trouble to the Load Sharing Module, engine control, plant wiring, or elsewhere. The guide assumes that the system wiring, soldered connections, switch and relay contacts, and input and output connections are correct and in good working order. Make the checks in the order indicated.

NOTICE

To prevent possible serious damage to the Load Sharing Module, do not attempt to service the unit beyond that described in the operating instructions. All other servicing should be referred to qualified service personnel.

Table 5-1. Troubleshooting Guide

SYMPTOMS	CAUSE	TEST/REMEDY
Undesirable speed decrease with load increase	Droop mode switch is open or auxiliary contact is open. Load Sharing Module is in droop mode.	Jumper Load Sharing Module terminals 13 and 14. If this corrects the problem, replace wiring or switch as required. The module will not go into droop with the terminals connected.
	Improper engine operation. Operate the engine and observe speed while applying load.	If droop occurs near the full load point only, it is possible the engine is not producing the horsepower called for or is being overloaded.
	Faulty engine control. Disconnect the Load Sharing Module and load the engine as a single, isolated unit.	If speed continues to decrease with load, engine operation may be faulty.
Erratic Load Sharing Module operation	Open or intermittent wire.	Check all wiring for continuity and tight connections. Repair if necessary.
	EMI (Electromagnetic Interference).	Remove ground loops. Shield all wiring (load sharing lines, output to the speed control, speed trim pot, and SPM-A synchronizer input. Route wiring away from noise sources.
	Unstable system.	Check system for proper operation.
	Unstable voltage regulator.	Consult voltage regulator manufacturer’s manual for proper adjustment.
	Poor system stability.	Reduce the load signal voltage of each unit in the system to three volts.
Load Signal voltage is low. Adjusting LOAD Gain won't raise it.	Incorrect phasing of CT and PT wiring.	Perform phasing check. If phasing check indicates need, perform procedure for correct phase wiring.
	Insufficient CT output.	Check for 5-amp CT output at full load. Change to a lower primary current CT if necessary.
Load Signal voltage is too high. Adjusting LOAD GAIN will not lower it.	CT output too high.	Check for 5-amp CT output at full load. (CT output must be between 3 and 7 amps at full load.) Change to a higher primary current CT if necessary.

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Table 5-1. Troubleshooting Guide (cont'd.)

SYMPTOMS	CAUSE	TEST/REMEDY
Engine does not properly share load with other units.	Engine not responding to signal from Load Sharing Module.	Check for maximum voltage from terminals 22 to 23. If possible, check the voltage from terminal 20 to 19. If the Load Sharing Module is putting out a maximum signal, the problem is either in the wiring to the engine control, the engine control, or the engine.
	Unequal speed settings.	Be sure the speed settings of all off-line units at no load are identical. Adjust as necessary. Resynchronize.
	Unequal load gain voltages.	Check that load gain settings of all load sharing units are correct. See load gain adjustment in Chapter 3. Adjust as necessary.
	Improper load sensing phasing.	Perform the transformer phasing check in Chapter 3. Correct as necessary.
	Circulating currents between generators. (Noted by unequal power factors between generators.)	Properly adjust the generator voltage regulators.
	Terminals 13 and 14 not shorted. Load sharing module is in droop.	Jumper Load Sharing Module terminals 13 and 14. Observe engine operation. Replace wiring or switch as required.

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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:

- Consult the troubleshooting guide in the manual.
- Contact the manufacturer or packager of your system.
- Contact the Woodward Full Service Distributor serving your area.
- Contact Woodward technical assistance (see “How to Contact Woodward” later in this chapter) and discuss your problem. In many cases, your problem can be resolved over the phone. If not, you can select which 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/find-a-local-partner.**

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

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Replacement/Exchange: Replacement/Exchange is a premium program designed for the user who needs 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/find-a-local-partner.**

Contacting Woodward's Support Organization

For the name of your nearest Woodward Full-Service Distributor or service facility, please consult our worldwide directory at **www.woodward.com/support**, which also contains the most current product support and contact information.

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) 8818 5515
Germany	+49 (711) 78954-510
India	+91 (124) 4399500
Japan	+81 (43) 213-2191
Korea	+82 (32) 422-5551
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) 8818 5515
Germany	+49 (711) 78954-510
India	+91 (124) 4399500
Japan	+81 (43) 213-2191
Korea	+ 82 (32) 422-5551
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) 8818 5515
India	+91 (124) 4399500
Japan	+81 (43) 213-2191
Korea	+ 82 (32) 422-5551
The Netherlands	+31 (23) 5661111
Poland	+48 (12) 295 13 00
United States	+1 (970) 482-5811

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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.

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Appendix.
LSM Control Specifications

POWER SUPPLY	Power to operate Load Sharing Module circuitry is obtained from the PT connections. Selectable by jumper for 95 to 130 Vac or 190 to 260 Vac operation. Approximately 10 W.
INPUTS	
3-phase PT Inputs	100–120 or 200–240 Vac line-to-line, 50–400 Hz. PT input burden is 1.6 W per phase at 240 Vac, 0.4 W per phase at 120 Vac.
3-phase CT Inputs	3–7 Arms at full load, CT input burden at full load is 0.1 VA per phase.
Load Sharing Input	0–3 Vdc into 25 kΩ impedance in isochronous mode, open circuit in droop mode.
Sync Input	Compatible with optional Woodward SPM-A Synchronizer, 0.5% speed change* per volt input.
Droop Switch	The external droop switch is to be wired in series with the auxiliary circuit breaker contact between terminals 13 and 14. Droop mode is selected when either the droop switch or the auxiliary circuit breaker is open.
OUTPUTS	
Load Signal	DC signal proportional to total real current measured by the Load Sharing Module. Load Gain adjustable over minimum range of 0.86 to 2.0 Vdc/Arms.
Analog Output	Minimum dc output range: ±3 Vdc Zero error output = +0.0±0.05 Vdc
ADJUSTMENTS	
Droop	Provides 0 to 10% speed reduction* between no load and full load conditions.
Load Gain	Provides adjustment of the load on an individual generator when two or more generators are paralleled. Adjusts specified full load condition from 3 to 7 Arms.
ENVIRONMENTAL	
Operating Temperature	–40 to +70 °C (–40 to +158 °F).
Salt Fog	Tested at 5% NaCl, 35 °C, 48 hrs wet, 48 hrs dry.
Humidity	Tested at 95% RH, 65 °C, non-condensing, 5 cycles at 24 hr/cycle.
Vibration	Swept sine: 4 G, 5 mm, 5–2000 Hz, 3 hr min/axis, including four 30-minute dwells at resonant frequencies.
Shock	40 G, 11 ms sawtooth pulse.
Installation / Overvoltage Category	Category III.
Air Quality	Pollution Degree 2.
DIMENSIONS	
Linear (maximum)	Length: 273.6 mm (10.77 in) Width: 214.1 mm (8.43 in) Height: 59.2 mm (2.33 in)
Weight	1488 g (52.5 oz) approximate.

(*) When used with a speed control having a gain of 3.3% speed change/volt

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Revision History

Changes in Revision F—

- Added LOTO and I/OLOCK warnings to Warnings and Notices section
- Updated Electrostatic Discharge Awareness section
- Updated Regulatory Compliance section
- Updated manual to include UKCA marking requirements
- Updated Chapter 6 - Product Support and Service Options
- Replaced Declarations of Conformity and added UKCA Declarations of Conformity

Changes in Revision E—

- Replaced the Declaration of Conformity

Changes in Revision D—

- Replaced the Declaration of Conformity

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Declarations

EU DECLARATION OF CONFORMITY

EU DoC No.:	**00121-04-CE-02-02**
Manufacturer's Name:	WOODWARD INC.
Manufacturer's Contact Address:	Skarbowa 32 32-005 Niepolomice, Poland
Model Name/ Numbers:	**Load Sharing Module** 9907-173 - 120VAC, (ANALOG); 9907-252 - 24VDC, (0-5V); 9908-501 - 24VDC, (ANALOG); 9907-838 – 24VDC, PWM Output
The object of the declaration described above is in conformity with the following relevant Union harmonization legislation:	**DIRECTIVE 2014/30/EU** OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 26 February 2014 on the harmonization of the laws of the Member States relating to electromagnetic compatibility. **DIRECTIVE 2014/35/EU** OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 26 February 2014 on the harmonization of the laws of the Member States relating to the making available on the market of electrical equipment designed for use within certain voltage limits. **DIRECTIVE 2011/65/EU** OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 8 June 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment (including amendments introduced by Delegated Directive 2015/863/EU) **Exemption in use: 6(c), 7(a), 7(c)-I**
Applicable Standards:	
EMC:	**EN 61000-6-2:2005/AC:2005** Electromagnetic compatibility (EMC) – Part 6-2: Generic standards - Immunity for industrial environments **EN 61000-6-4:2007/A1:2011** Electromagnetic compatibility (EMC) - Part 6-4: Generic standards - Emission standard for industrial environments
LVD:	**EN 61010-1:2010, EN 61010-1-2010/A1:2019/AC:2019-04, EN 61010-1:2010/A1:2019:** Safety requirements for electrical equipment for measurement, control, and laboratory use - Part 1: General Requirements

This declaration of conformity is issued under the sole responsibility of the manufacturer.
We, the undersigned, hereby declare that the equipment specified above conforms to the above Directive(s) and applicable standards.

MANUFACTURER

Annette Lynch

Signature

Annette Lynch

Full Name

Engineering Manager

Position

Woodward, Fort Collins, CO USA

Place

27 February 2024

Date

5-09-1183 Rev 39 00121-04-CE-02-02

Released

EU DECLARATION OF CONFORMITY

EU DoC No.:	**00121-04-CE-02-03**
Manufacturer's Name:	WOODWARD INC.
Manufacturer's Contact Address:	Skarbowa 32 32-005 Niepolomice, Poland
Model Name(s) / Number(s):	**Load Sharing Module** 9903-773 - 120VAC, (ANALOG)
The object of the declaration described above is in conformity with the following relevant Union harmonization legislation:	**DIRECTIVE 2014/30/EU** OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 26 February 2014 on the harmonization of the laws of the Member States relating to electromagnetic compatibility. **DIRECTIVE 2014/35/EU** OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 26 February 2014 on the harmonization of the laws of the Member States relating to the making available on the market of electrical equipment designed for use within certain voltage limits.
Applicable Standards:	
EMC:	**EN 61000-6-2:2005/AC:2005** Electromagnetic compatibility (EMC) – Part 6-2: Generic standards - Immunity for industrial environments **EN 61000-6-4:2007/A1:2011** Electromagnetic compatibility (EMC) - Part 6-4: Generic standards - Emission standard for industrial environments
LVD:	**EN 61010-1:2010, EN 61010-1-2010/A1:2019/AC:2019-04, EN 61010-1:2010/A1:2019:** Safety requirements for electrical equipment for measurement, control, and laboratory use - Part 1: General Requirements

This declaration of conformity is issued under the sole responsibility of the manufacturer.
We, the undersigned, hereby declare that the equipment specified above conforms to the above Directives and applicable standards.

MANUFACTURER

Annette Lynch

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Engineering Manager

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UKCA DECLARATION OF CONFORMITY

UKCA DoC No.: 00121-04-UKCA-02-02
Manufacturer's Name: WOODWARD INC.

Manufacturer's Contact Address: Skarbowa 32
32-005 Niepolomice, Poland

Model Name/Numbers: **Load Sharing Module**
9907-173 - 120VAC, (ANALOG); 9907-252 - 24VDC, (0-5V); 9908-501 - 24VDC, (ANALOG); 9907-838 – 24VDC, PWM Output

The object of this Declaration is in full conformity with the following UK Statutory Instruments (and their amendments):

S.I. 2016 No. 1091	Electromagnetic Compatibility Regulations 2016
S.I. 2016 No. 1101	Electrical Equipment (Safety) Regulations 2016
S.I. 2012 No. 3032	The Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations 2012.

The Object of this Declaration is in conformity with the applicable requirements of the following designated standards and technical specifications.

EN 61000-6-2:2005, EN 61000-6-2:2005/AC:2005	Electromagnetic compatibility (EMC) - Part 6-2: Generic standards - Immunity for industrial environments
EN 61000-6-4:2007, EN 61000-6-4:2007/A1:2011	Electromagnetic compatibility (EMC) - Part 6-4: Generic standards - Emission standard for industrial environments
EN 61010-1:2010, EN 61010-1-2010/A1:2019/AC:2019-04, EN 61010-1:2010/A1:2019	Safety requirements for electrical equipment for measurement, control, and laboratory use - Part 1: General Requirements

This declaration of conformity is issued under the sole responsibility of the manufacturer
We, the undersigned, hereby declare that the equipment specified above conforms to the above Regulations(s).

MANUFACTURER

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Annette Lynch
Full Name

Engineering Manager
Position

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Place

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Date

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UKCA DECLARATION OF CONFORMITY

UKCA DoC No.: 00121-04-UKCA-02-03
Manufacturer's Name: WOODWARD INC.

Manufacturer's Contact Address: Skarbowa 32
32-005 Niepolomice, Poland

Model Name(s)/Number(s): **Load Sharing Module**
9903-773 - 120VAC, (ANALOG)

The object of this Declaration is in full conformity with the following UK Statutory Instruments (and their amendments):

S.I. 2016 No. 1091	Electromagnetic Compatibility Regulations 2016
S.I. 2016 No. 1101	Electrical Equipment (Safety) Regulations 2016

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We appreciate your comments about the content of our publications.

Send comments to: icinfo@woodward.com

Please reference publication 26011.

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PO Box 1519, Fort Collins CO 80522-1519, USA
1041 Woodward Way, Fort Collins CO 80524, USA
Phone +1 (970) 482-5811

Email and Website—www.woodward.com

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