WOODWARD

Product Manual 26122
(Revision J, 7/2017)
Original Instructions

EGCP-3
Engine Generator Control Package

8406-113 & 8406-114

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 *26455*, *Customer Publication Cross Reference and Revision Status & Distribution Restrictions*, on the *publications page* of the Woodward website:

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The latest version of most publications is available on the *publications page*. If your publication is not there, please contact your customer service representative to get the latest copy.

Proper Use

Any unauthorized modifications to or use of this equipment outside its specified mechanical, electrical, or other operating limits may cause personal injury and/or property damage, including damage to the equipment. Any such unauthorized modifications: (i) constitute "misuse" and/or "negligence" within the meaning of the product warranty thereby excluding warranty coverage for any resulting damage, and (ii) invalidate product certifications or listings.

Translated Publications

If the cover of this publication states "Translation of the Original Instructions" please note:

The original source of this publication may have been updated since this translation was made. Be sure to check manual *26455*, *Customer Publication Cross Reference and Revision Status & Distribution Restrictions*, 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 Out-of-date translations are marked with ⚠.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— A bold, black line alongside the text identifies changes in this publication since the last revision.

Manual 26122

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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

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.

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.

Regulatory Compliance

North American Compliance:

UL: UL Listed for use in Class I, Division 2, Groups A, B, C, D and non-hazardous locations for the United States and Canada

Note—Wiring must be in accordance with the applicable electric codes with the authority having jurisdiction

Marine Compliance:

American Bureau of Shipping: ABS Rules 2003 SVR 4-2-1/7.3, 7.5.1/17, 4-9-4/23, 4-9-7/Table 9

Det Norske Veritas: Standard for Certification No. 2.4, 2001: Temp. Class B, Humidity Class B, Vibration Class C, EMC Class A

Lloyd's Register of Shipping: LR Type Approval System, Test Specification No. 1, 2002 for Environmental Categories ENV1, ENV2, and ENV3.

The EGCP-3 is suitable for use in Class I, Division 2, Groups A, B, C, D per UL for Canada and US or non-hazardous locations only.

Wiring must be in accordance with North American Class I, Division 2 wiring methods as applicable, and in accordance with the authority having jurisdiction.

Field Wiring must be suitable for at least 90 °C. Grounding is required by the input PE terminal. These listings are limited only to those units bearing the UL or cUL, logos.

⚠WARNING

EXPLOSION HAZARD—Do not remove covers or connect/disconnect electrical connectors unless power has been switched off or the area is known to be non-hazardous.

Substitution of components may impair suitability for Class I, Division 2.

Do not use any test points on the power supply or control boards unless the area is known to be non-hazardous.

⚠AVERTISSEMENT

RISQUE D'EXPLOSION—Ne pas enlever les couvercles, ni raccorder / débrancher les prises électriques, sans vous en assurez auparavant que le système a bien été mis hors tension; ou que vous vous situez bien dans une zone non explosive.

La substitution de composants peut rendre ce matériel inacceptable pour les emplacements de Classe I, Division 2.

Ne pas utiliser les bornes d'essai du block d'alimentation ou des cartes de commande à moins de se trouver dans un emplacement non dangereux.

WARNING

Protective Earth (PE) must be connected to the termination point on the back side of the unit next to the label with the  symbol (or 1 of 3 other like termination points without label) to reduce the risk of electric shock. This connection will be made using a thread-forming screw. The conductor providing the connection must have a properly sized ring lug and wire larger than or equal to 4 mm² (12 AWG).

The calibration and checkout procedure should only be performed by authorized personnel knowledgeable of the risks posed by live electrical equipment.

The installation must include the following:

- **The power supply mains should be properly fused according to the installation instructions and the appropriate wiring requirements.**
- **A switch or circuit breaker must be included in the building installation in close proximity to the equipment and within easy reach of the operator, and must be clearly marked as the disconnecting device for the equipment. The switch or circuit breaker will only remove power to the unit—hazardous voltages may still be connected to other terminals on the unit.**

Chapter 1.
General Information

Introduction

This manual describes the installation procedures for the Woodward EGCP-3 Engine Generator Control Package, models LS (Load Share) and MC (Master Control).

- The **EGCP-3 LS** is used in systems where generator sets operate in parallel on a common bus and may be tied to the utility mains.
- The **EGCP-3 MC** will communicate with other EGCP-3 controls to arbitrate starting and stopping of generator sets, and supervise the utility mains paralleling.

The EGCP-3 (depending on model and configuration) can perform engine start/stop sequence and automatic transfer switch (ATS) control. For isolated bus operation the control will operate in isochronous, and can close the generator to a dead bus. In mains or bus parallel operation, the unit can operate in BaseLoad, peak shaving, or process control modes.

Input/Output Arrangement

Table 1-1. Standard I/O (Input/Output)

Type of Input	# of Inputs	Options/Details
DC Power Input		
Low Voltage dc input	1	18–32 Vdc, protected from reverse polarity
Analog Inputs		
Function Configurable Inputs	4	Current or Voltage
MPU Speed Sensor	1	100–20 000 Hz
Bus PT Input	1	3-phase ac input
Generator PT Input	1	3-phase ac input
Bus CT Input	1	3-phase ac input
Generator CT Input	1	3-phase ac input
Analog Outputs		
Speed Bias	1	±3 Vdc, 1–5 Vdc, 500 Hz, PWM, 4–20 mA
Voltage Bias	1	±1 Vdc, ±3 Vdc, ±9 Vdc, 4–20 mA
Function Configurable outputs	4	Current
Discrete Inputs		
Configurable Switch or Contact inputs	16	Switch to + to activate, Isolated from input power
Discrete Outputs		
Relay Driver Outputs	12	Low side drivers
Communication Ports		
Serial Ports	3	(1)—RS-232, (2)—RS-232/422/485

Control Specifications

The EGCP-3 power metering accuracies are listed to Appendix C, and the environmental specifications are listed inside the back cover.

Compliance Specifications

The EGCP-3 control is certified to the following standards. A compliance mark is applied to each unit.

Table 1-2. Compliance Certification Standards

Agency	Standard	Name	Mark
Underwriters Laboratories (UL)	UL508	Industrial Control Equipment	UL
	UL1604	Electrical Equipment for Use in Class I, Division 2 Hazardous Locations	
	CSA C22.2 No. 142-M1987	Process Control Equipment	cUL
	CSA C22.2 No. 213-M1987	Non-Incendive Electrical Equipment for Use in Class I, Division 2 Hazardous Locations	
Marine	LR	LR Type Approval System Test Specification No. 1, 1996	
	DNV	Standard for Certification No. 2.4–Environmental Test Specification for Instrumentation and Automation Equipment	
	ABS	ABS Rules for Building and Classing Steel Vessels, 2003–Part 4	

Application and Functions

The EGCP-3 control is a microprocessor-based generator load control designed for use with a separate speed control and an automatic voltage regulator to provide synchronizing, paralleling, loading and unloading, and automatic load transfer switching. All transitions between EGCP-3 functions are coordinated to provide smooth operation.

EGCP-3 functions include:

LS MODEL, 8406-113

The Load Sharing (LS) model is used in systems where generator sets operate in parallel on a common bus and may be tied to the utility mains.

- Display/Keypad Interface, local setup/monitoring or remote HMI
- Engine Start/Stop Sequence Control
- Master/Slave unit sequencing, individual unit protection
- Engine Protection and Monitoring
- Synchronizer with speed, phase, voltage matching, token passing for dead bus closure, and multiple unit synchronizing
- KW Control with automatic generator loading and unloading for bumpless load transfer
- Droop, BaseLoad, and isochronous load sharing control capability
- Frequency Trimming in Isochronous mode
- LON Communication with Master Control and other LS units
- Master/Slave Process control for cogeneration, import/export, pressure control, or other processes
- KVAR/PF Control and bus KVAR/PF sharing
- Individual generator stable timing
- Built in diagnostics
- Generator and Bus Protective Relaying
- Generator and Utility Power and Energy Metering
- Modbus® * and Servlink communications

*—Modbus is a trademark of Schneider Automation Inc.

LS Operation Manual 26194 gives a detailed description of all the features and options.

MC MODEL, 8406-114

The Master Control (MC) model will communicate with other EGCP-3 controls to arbitrate starting and stopping of generator sets, and oversee the utility mains paralleling.

- Display/Keypad Interface, local setup/monitoring or remote HMI
- Master/Slave up to 16 unit sequencing, individual unit protection
- Synchronizer with speed, phase, voltage matching, token passing for dead bus closure, and multiple unit synchronizing
- KW Control with automatic generator loading and unloading for bumpless load transfer
- BaseLoad, and isochronous load control capability
- Master/Slave Import/export, pressure control, or other processes
- KVAR/PF Control
- ATS control, open or closed transition
- Peak Shaving/Sharing control with Automatic Start/Stop based on Time/Day of Week, or Demand Level
- Built in diagnostics
- Generator and Utility Protective Relaying
- Generator and Utility Power & Energy Metering
- Modbus and Servlink communications

MC Operation Manual 26195 gives a detailed description of all the features and options.

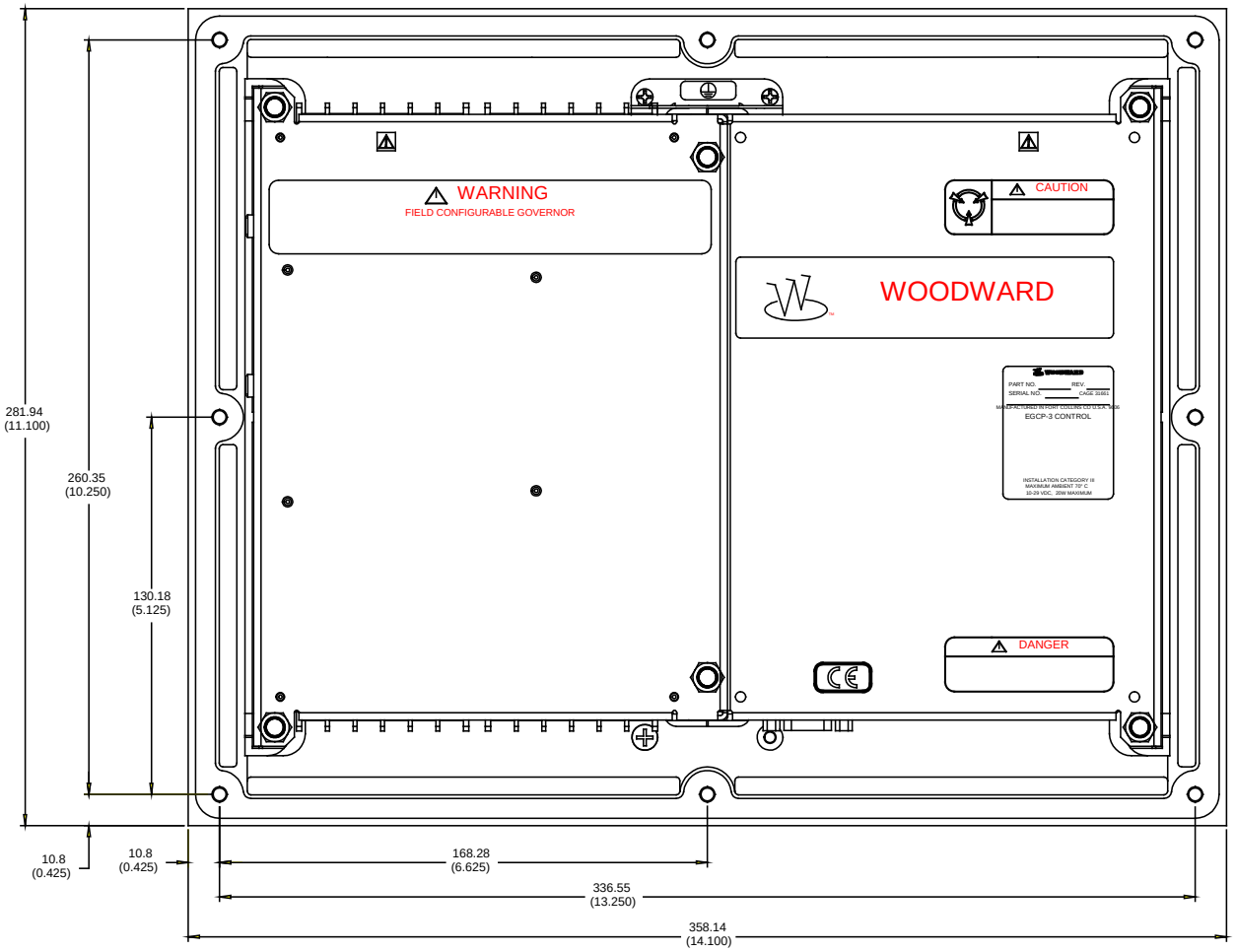


Figure 1-1a. EGCP-3 Outline Drawing (back view)
(Dimensions are shown in mm with inches in parentheses below)

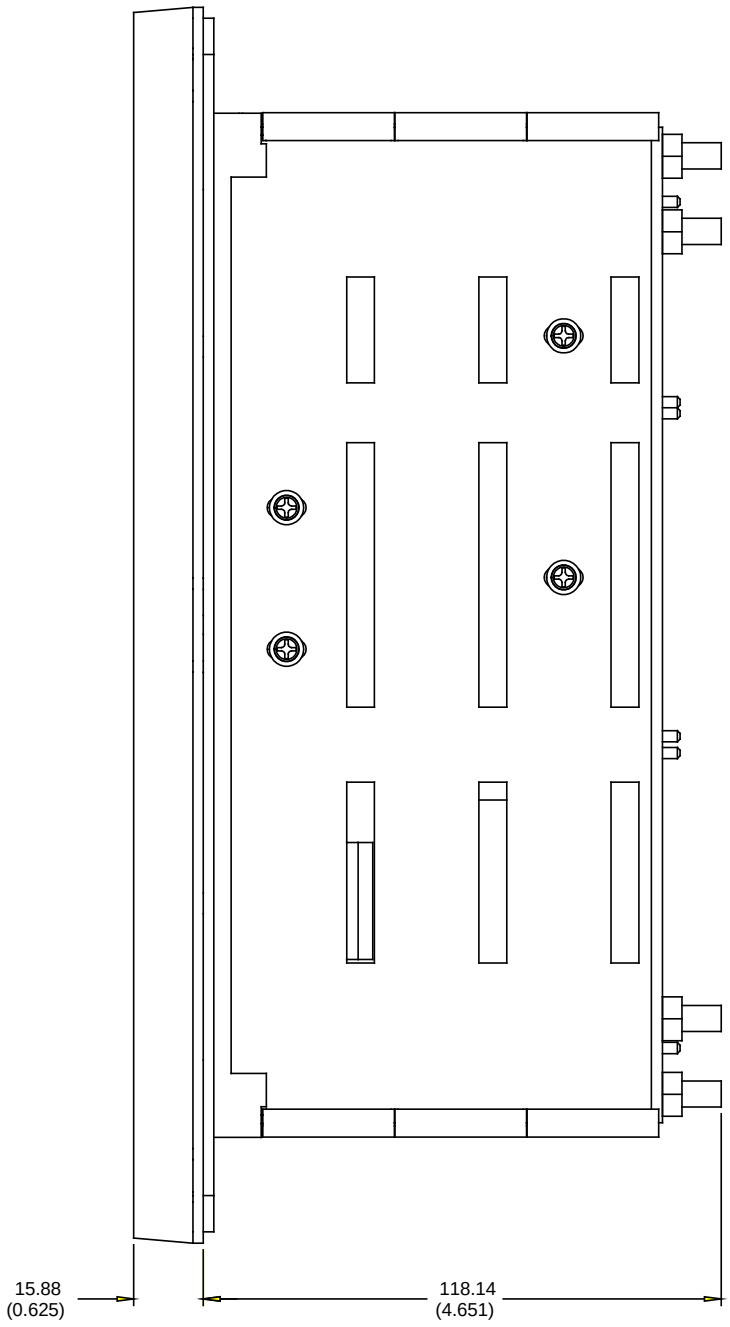


Figure 1-1b. EGCP-3 Outline Drawing (side view)
(Dimensions are shown in mm with inches in parentheses below)

Chapter 2.
Installation

This chapter provides the general information for mounting location selection, installation, and wiring of the EGCP-3 control. Hardware dimensions for mounting, and electrical ratings, and requirements are given for wiring the EGCP-3 in a specific application.

Unpacking the Shipping Carton

Before unpacking the control, refer to the inside front cover and page iv of this manual for WARNINGS and CAUTIONS. Be careful when unpacking the control. Check for signs of damage such as bent or dented panels, scratches, and loose or broken parts. If any damage is found, immediately notify the shipper.

The EGCP-3 was shipped from the factory in an anti-static foam-lined carton. This carton should always be used for transport of the EGCP-3 when it is not installed. Read page iii, Electrostatic Discharge Awareness, before handling the EGCP-3 Control.

Check for and remove all manuals, connectors, mounting screws, and other items before discarding the shipping box.

General Installation Notes and Warnings

When selecting a location for mounting the EGCP-3 control, consider the following:

- Protect the unit from direct exposure to water or to a condensation-prone environment.
- The operating range of the EGCP-3 control is –20 to +70 °C (–4 to +158 °F).
- Provide adequate ventilation for cooling. Shield the unit from radiant heat sources.
- Do not install near high-voltage or high-current devices.
- Allow adequate space around the unit for servicing.
- Do not install where objects can be dropped on the terminals.
- Ground the chassis for proper safety and shielding.
- When installing on a generator set package, provide vibration isolation.

Mounting

The EGCP-3 is an integrated control package. All control hardware is contained in one compact enclosure. All field wiring connects to the EGCP-3 through terminal blocks located on the top and bottom surfaces. Placement of the EGCP-3 must allow sufficient room for wiring access. The EGCP-3 weighs approximately 4.3 kg (9.5 pounds).

To mount the EGCP-3 panel, use type M5 x 12 mm thread-forming screws. The EGCP-3 is factory shipped with mounting screws included in the box. Eight screws are required for secure mounting (Woodward part number 1029-529). The screws are inserted from behind the panel, through a hole in the panel, and into the cast aluminum flange of the EGCP-3. The 12 mm screw length assumes a panel thickness of 1.2—4.2 mm (0.047—0.164 inches).

The EGCP-3 is shipped with mating connectors for all terminals. However, for service and convenience, Woodward also carries an EGCP-3 connector kit (P/N 8928-178) that contains all of the mating terminal blocks used on the EGCP-3. See Appendix A for mating connector information.

The EGCP-3 must be mounted in an appropriate enclosure for the installed environment. This equipment is designed for installation within a control room panel or cabinet or in a vibration damped enclosure on a generator package. The EGCP-3 is equipped with a sealing gasket behind the front flange. When properly installed within a NEMA 4X panel or cabinet, the seal and front panel of the EGCP-3 will meet NEMA 4X ratings.

IMPORTANT

When mounting into an enclosure, make sure the enclosure is vented to atmosphere through a Type 4 vent tube or unsealed conduit.

Figure 1-1 shows a physical outline drawing with dimensions of the EGCP-3 for reference during the construction of mounting panels, etc. The enclosure size is 282 mm high x 358 mm wide x 134 mm deep (11.1 inches H x 14.1 inches W x 5.3 inches D).

Figure 2-1 is a panel cutout template that may be used to locate and size the cutout and through holes to be made when installing the EGCP-3.

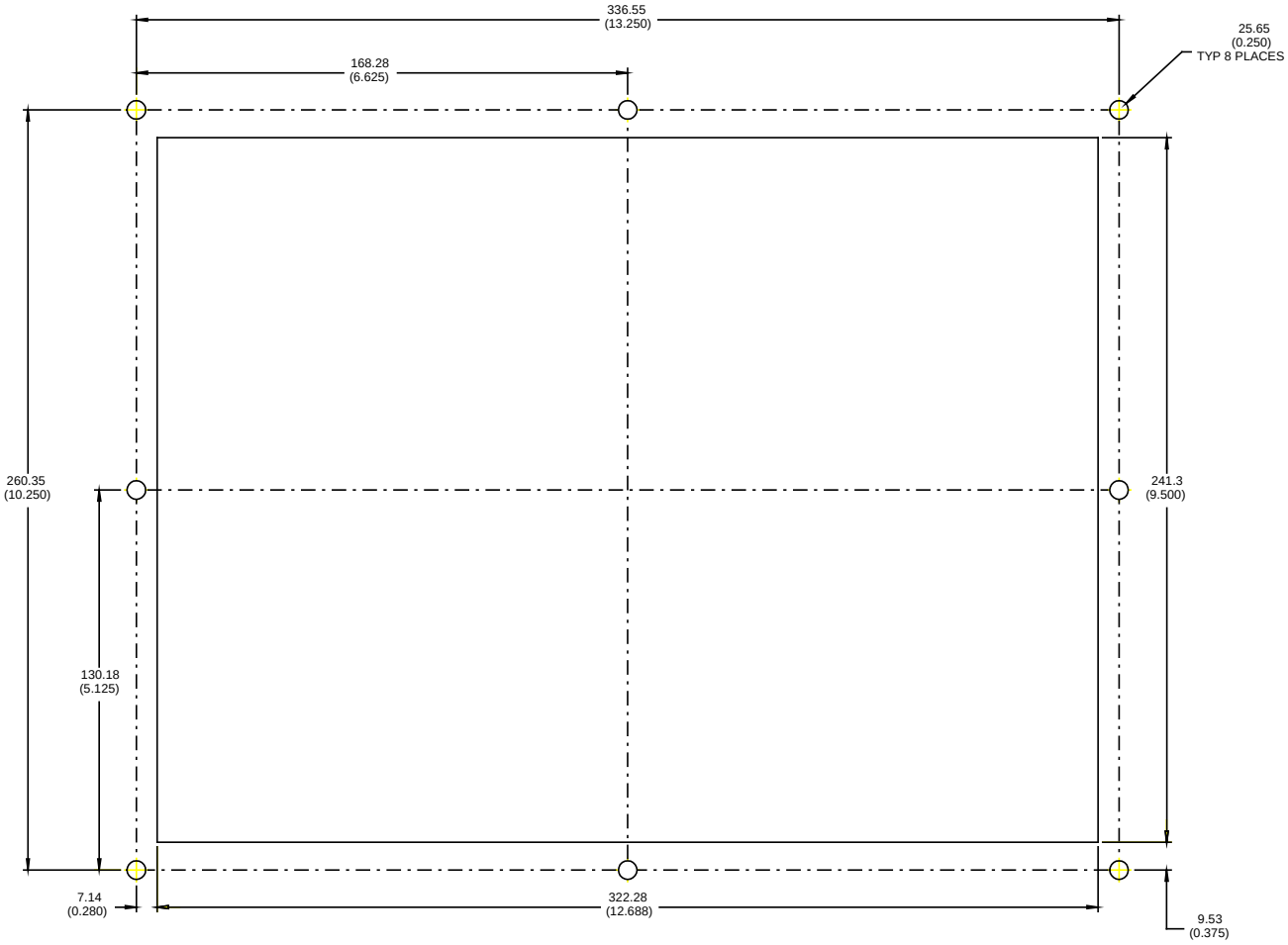


Figure 2-1. EGCP-3 Panel Layout Template

Environmental Specifications

Please refer to Technical Specifications in Appendix C and inside the back cover of this manual for environmental characteristics. When installed on a generator package, the EGCP-3 should be mounted in a suitable enclosure where the entire enclosure is isolated from engine and generator vibrations above 30 Hz.

Electrical Connections

Most inputs and outputs to the EGCP-3 are made through “CageClamp” terminal blocks.

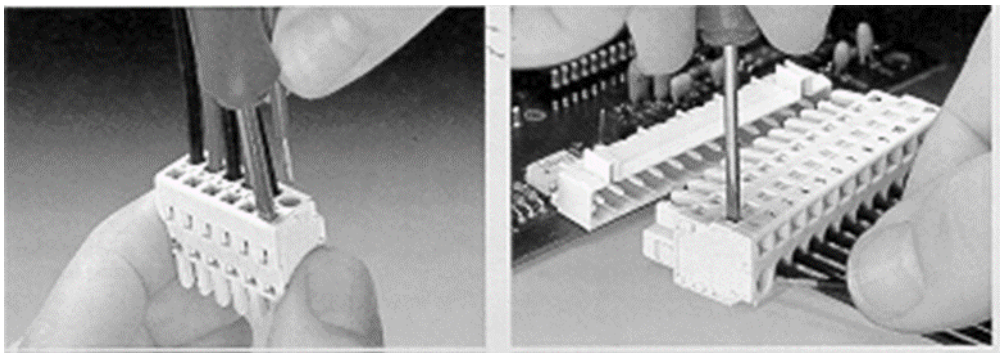
For noise suppression, it is recommend that all low-current wires be separated from all high-current wire.

See Appendix A for additional information on connector wiring.

Most of the EGCP-3 control’s terminal blocks are designed for removal by hand. After EGCP-3 input power is disconnected, the pluggable terminal blocks can be removed one at a time by pulling them straight out. Be careful not to pull the plug out at an angle, as this will fracture the end terminal.

Each Terminal block has a label (PS, PSEN, SCOR) to indicate which board it is used with, and terminal numbering to indicate which terminal block on that board to plug into. The board assemblies also are marked with a label to match with terminal block labels.

The pluggable terminal blocks are screwless CageClamp-style blocks. The spring clamp can be opened with a standard 2.5 mm (3/32 inch) flat bladed screwdriver (see Figure 2-2). The EGCP-3 pluggable terminal blocks accept wire 28 to 18 AWG (0.08 to 0.8 mm²). One 18 AWG (0.8 mm²) wire, or two 20 AWG (0.5 mm²) wires, or three 22 AWG (0.3 mm²) wires can be easily installed in each terminal. Wires for the pluggable I/O terminals should be stripped 8 mm (0.3 inch).



Method #1
Free Hand (holds spring open)

Method #2
Bench (opens spring while force is applied)

Figure 2-2. Wiring of Pluggable Spring Clamp Terminals

The EGCP-3 fixed terminal blocks used for the power supply input accept wires from 28 to 18 AWG (0.08 to 0.8 mm²). One 18 AWG (0.8 mm²) wire, or two 20 AWG (0.5 mm²) wires, or three 22 AWG (0.3 mm²) wires can be easily installed in each terminal. Wires for the fixed mounted power terminals should be stripped 5 mm (0.2 inch).

Figure 2-3. Wiring of Fixed Terminal

IMPORTANT

Do not tin (solder) the wires that terminate at the EGCP-3 terminal blocks. The spring-loaded CageClamp terminal blocks are designed to flatten stranded wire, and if those strands are tinned together, the connection loses surface area and is degraded.

All ac wiring for voltages and currents is done with fixed screw barrier blocks rather than pluggable terminal blocks. The fixed screw barrier blocks accept wires terminated into terminal lugs for #6 screws.

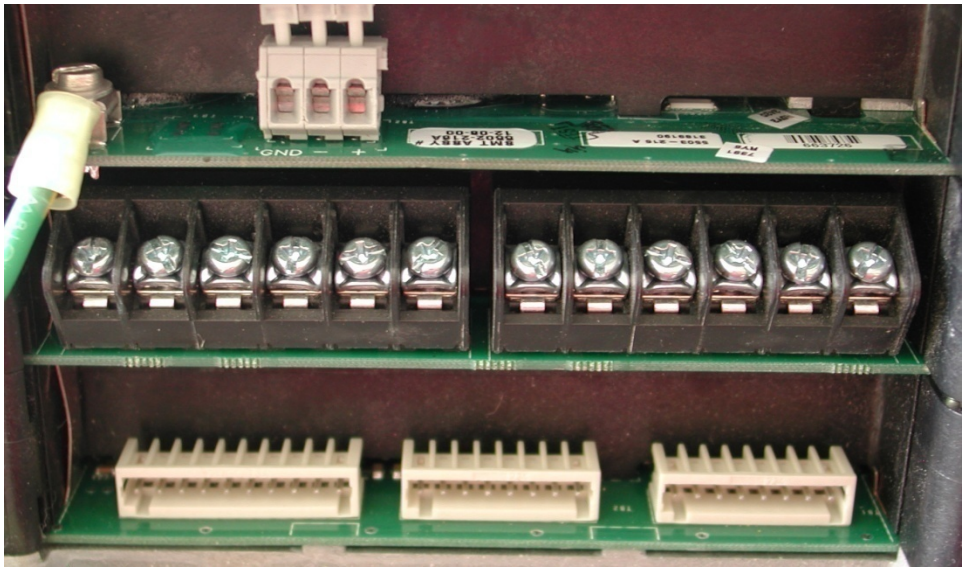


Figure 2-4. Fixed Ring Terminals

Grounding for Protection Against Electrical Shock

Protective Earth (PE) must be connected to the termination point on the backside of the unit next to the label with the symbol ⏚ (or 1 of 3 other like termination points without label) to reduce the risk of electric shock. This connection will be made using a thread-forming screw (M4 x 6 mm). The conductor providing the connection must have a properly sized ring lug and wire larger than or equal to 3.3 mm² (12 AWG).

Recommended Grounding Practices

Providing the proper ground for the EGCP-3 is important. Improper connection of the EGCP-3 chassis to the ground plane may lead to stray currents between the reference point for the ac signal sources (current and voltage transformers), and the reference point for the sensing inputs on the EGCP-3. Differences in potential between these two points results in equalizing current flow which then produces unacceptably high common mode voltages. Common mode voltages may result in improper readings for the sensed ac inputs, or even damage to the EGCP-3 in extreme cases. To minimize this problem, it is necessary to provide a low resistance path between the ac signal reference point, and the chassis of the EGCP-3. Typically, this point is the designated ground for the generator set and related instrument transformers.

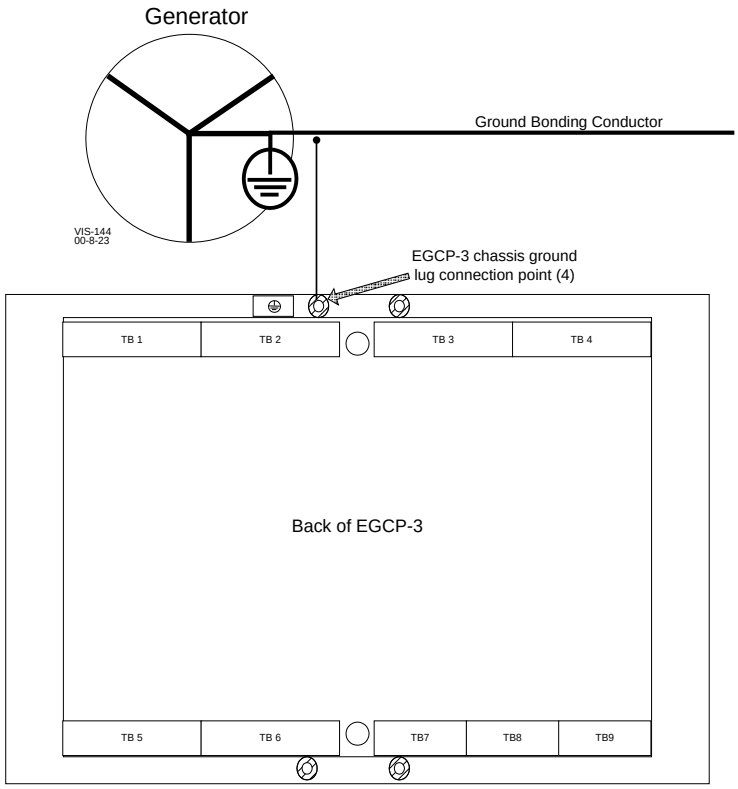


Figure 2-5. Recommended Single Point Grounding Scheme

Shields and Grounding

An individual shield termination is provided at the terminal block for each of the signals requiring shielding. These include all sensor wiring and ac signal inputs. Relay outputs, contact inputs, ac power inputs, and power supply wiring does not normally require shielding, but can be shielded if desired. All shielded cable must be a twisted conductor pair. Do not attempt to tin (solder) the braided shield. All signal lines should be shielded to prevent picking up stray signals from adjacent equipment. Wire exposed beyond the shield should be as short as possible, not exceeding 50 mm (2 inches). The other end of the shields must be left open and insulated from any other conductor.

The EGCP-3 is designed for shield termination to earth ground at the EGCP-3. If intervening terminal blocks are used in routing a signal, the shield should be continued through the terminal block. If shield grounding is desired at the terminal block, it should be ac coupled to earth. All other shield terminations except at the EGCP-3 should be ac coupled to earth through a capacitor. A 1000 pF, 500 V capacitor is sufficient. The intent is to provide a low impedance path to earth for the shield at frequencies of 150 kHz and up. Multiple direct connections of a shield to earth risk high levels of current to flow within the shield. See Woodward application note 50532, *Interference Control in 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.

1. Strip outer insulation from both ends, exposing the braided or spiral wrapped shield. Do not cut the shield.
2. Using a sharp, pointed tool carefully spread the strands of the shield.
3. Pull inner conductor(s) out of the shield. If the shield is the braided type, twist it to prevent fraying.
4. Remove 6 mm (1/4 inch) of insulation from the inner conductors.
5. Connect wiring and shield as shown in plant wiring diagram.

For noise suppression reasons, it is recommend that all low-current wires be separated from all high-current wires. Input power ground terminal should also be wired to earth ground. Installations with severe electromagnetic interference (EMI) may require additional shielding precautions, such as wire run in conduit or double shielding. Contact Woodward for more information.

Shields can be grounded at both ends (EGCP-3 and load) if the cable length is sufficiently short (within a cabinet) to prevent ground loop current in the shield.

Cabinet Installations: If the EGCP-3 is installed in a cabinet, shielded I/O can be terminated directly to the cabinet (earth ground) at the entry to the cabinet, as well as at the EGCP-3.

Isolation

Figure 2-6 shows how the I/O is isolated with regard the main system power supply and other I/O types. Each input wiring diagram also shows how an input type is isolated in more detail.

Figure 2-6 uses numerals to indicate isolation grouping. Power and Ground isolation groups are indicated with a P# and G#. Every instance of the same P# and G# indicates that the item is part of the same group and not isolated from the other members of the same group. For example, all analog inputs, analog outputs, and CPUs use P9 for power and G9 for ground.

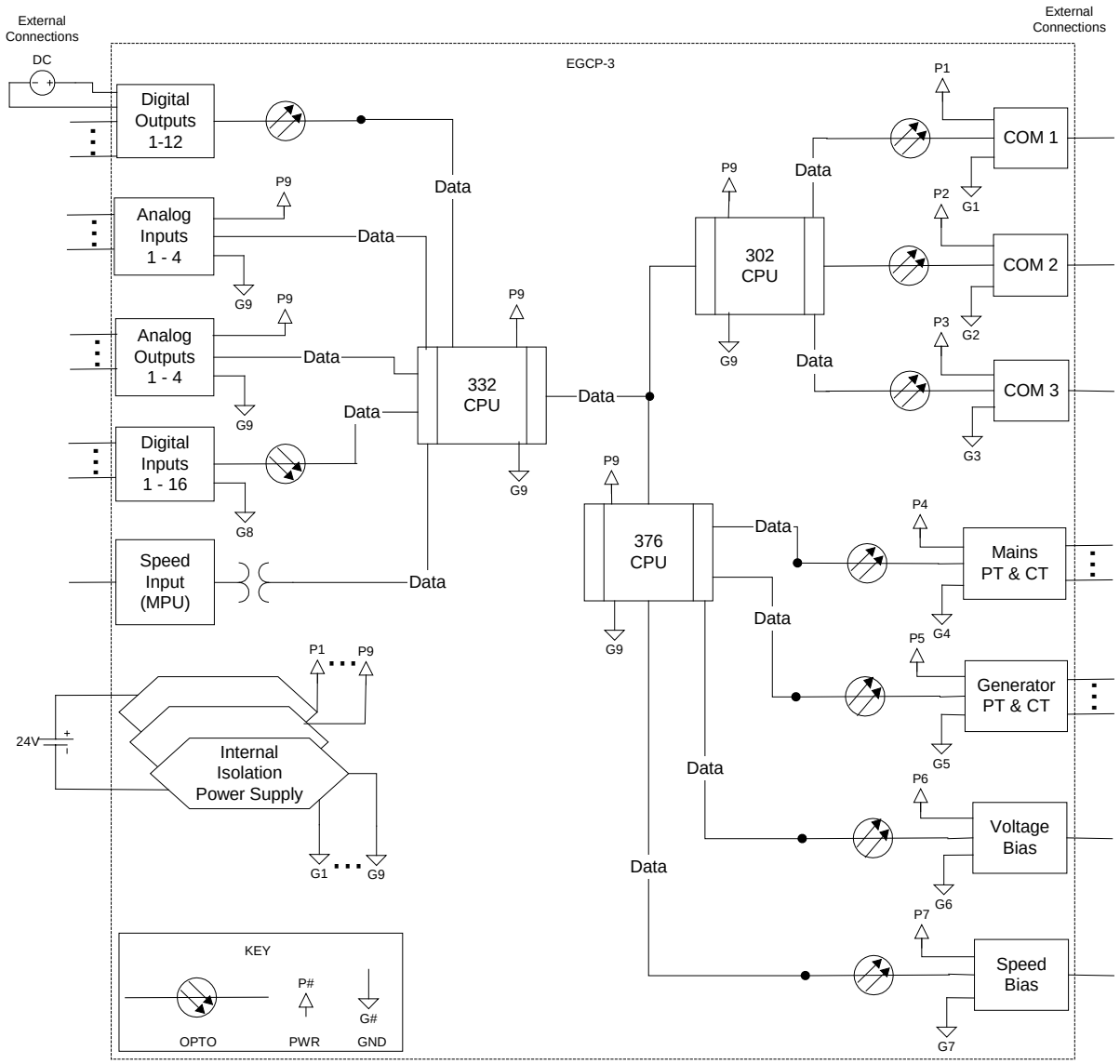
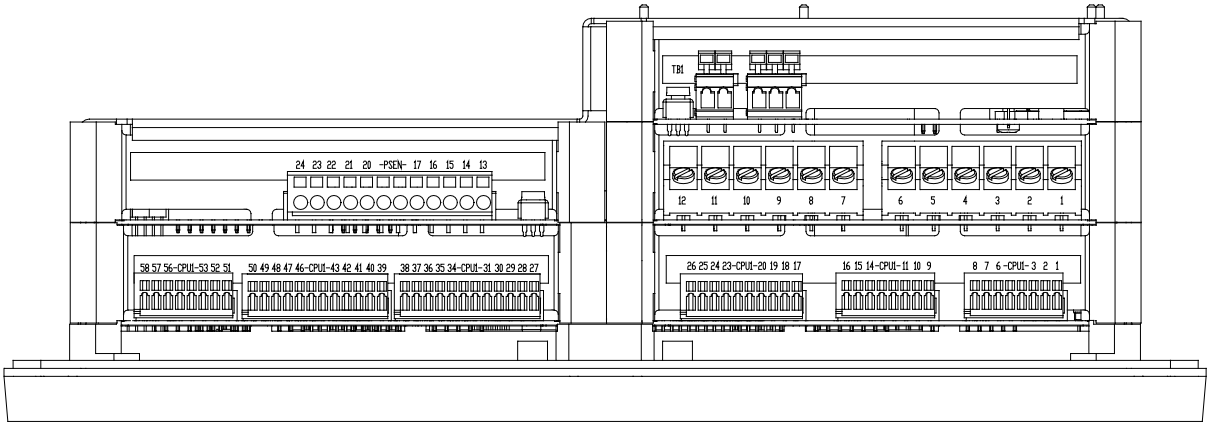


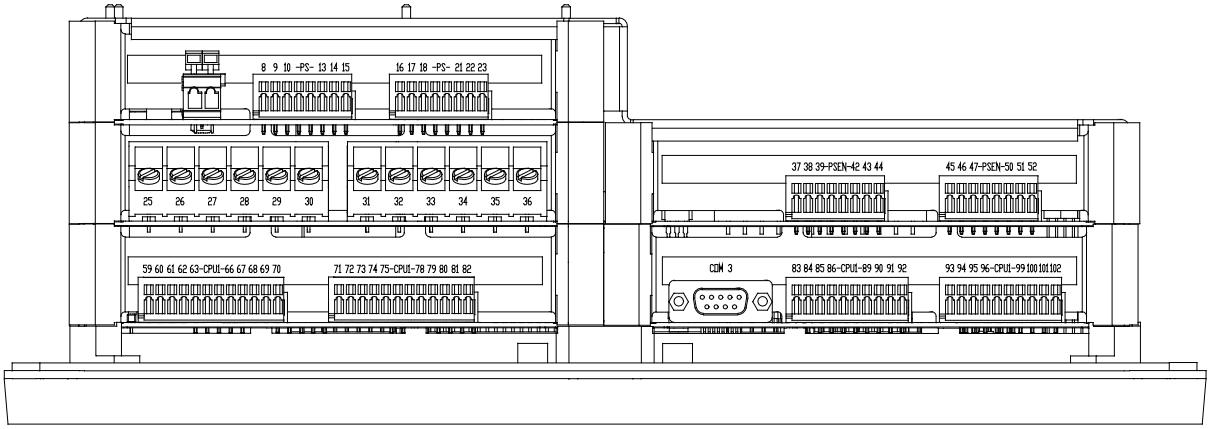
Figure 2-6. I/O Isolation

Terminal Locations

All terminals are located on the top and bottom of the EGCP-3. All but the PT and CT use either a cage clamp or a pluggable terminal strip for ease of connection. Figure 3-8 shows top and bottom views of the EGCP-3 to help orient each of the three board positions within the control. Each boards Wiring Diagram is shown immediately following the top and bottom terminal views.



(Top View)



(Bottom View)

Figure 2-7. EGCP-3 Terminal Strip Location View

EGCP-3 Wiring Diagrams

Power Supply Board Wiring Pinout

Figure 2-9 shows the power supply board in the EGCP-3—it is the smaller board mounted away from the display. This board contains the power supply and twelve discrete output driver channels. The discrete outputs are low-side drivers having short circuit and thermal shutdown protection. The discrete output drivers are not isolated from each other, and are powered by an external +12 Vdc or +24 Vdc. They are isolated from the internal power supplies of the EGCP-3 Control platform.

PowerSense Board Wiring Pinout

The PowerSense board is mounted between the Power Supply and the SmartCore board. The PowerSense Board inputs are the Mains and Generator power monitoring. Each PowerSense board contains the circuitry for two sets of three phase ac voltage (PT) and ac current (CT) inputs, as well as a speed bias output, a voltage bias output, and a LON communications port.

Features

- On-board processor for automatic calibration of the I/O channels
- PT and CT inputs provide fundamental as well as harmonic information
- PT and CT inputs are updated after 3 cycles, which is 50 ms at 60 Hz
- PT and CT inputs and bias outputs have 12 bit resolution
- PT inputs are software configurable for 70 V, 120 V, or 240 V ranges
- Each set of PT and CT inputs is isolated from the rest of the board and chassis
- Speed bias output is software configurable for 4–20 mA, 0–5 V, PWM, or ±3 V output
- Voltage Bias output is software configurable for 4–20 mA, ±1 V, ±3 V, and ±9 V
- Speed Bias and Voltage bias outputs are isolated from the rest of the board
- LON communication port (MC only)

⚠WARNING

HIGH VOLTAGE—Do not contact the above inputs and outputs during system operation when such circuits are live. Possible serious personal injury or death could result.

⚠WARNING

HIGH VOLTAGE—Before disconnecting the secondary terminals of the current transformer or the connections of the current transformer at the control, ensure that the transformer is short-circuited.

⚠WARNING

HIGH VOLTAGE—To prevent risk of electric shock, make sure that the terminal block covers are installed on the above inputs before operation (see Figure 2-8).

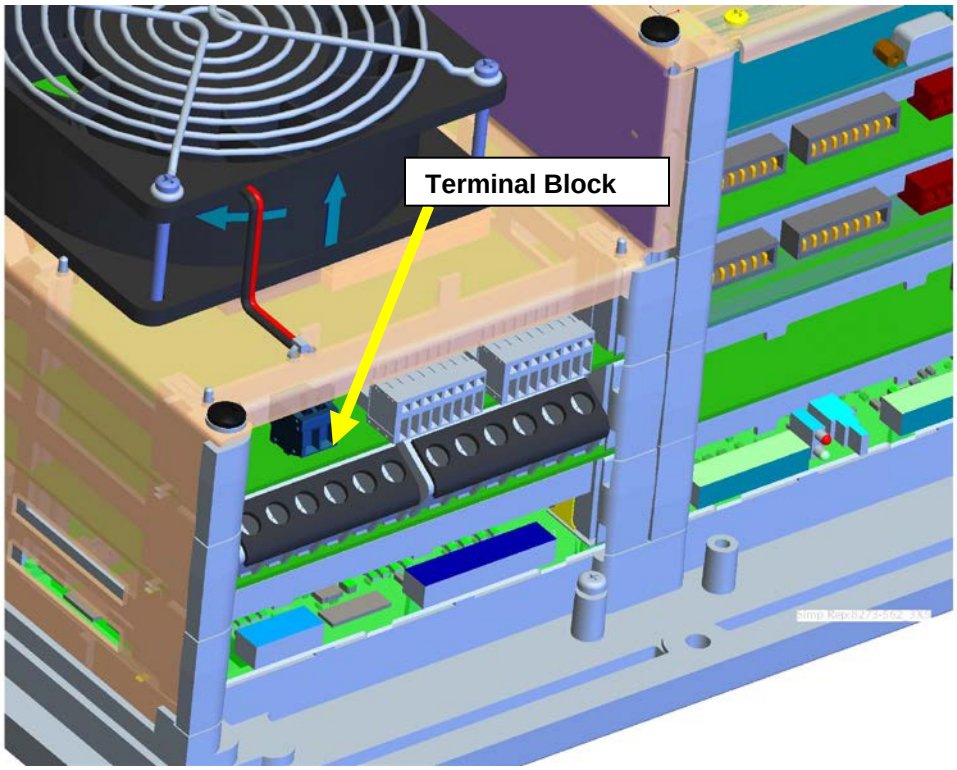


Figure 2-8. Terminal Block Covers

SmartCore Board Wiring Pinout

The SmartCore board is mounted next to the display; The SmartCore board contains circuitry for the speed sensor input, four analog inputs, four analog outputs, 3 serial ports, and 16 discrete inputs. The speed sensor input is from a magnetic pick-up, each Analog input may be 4–20 mA or 0–5 V, and two of the serial ports, may be RS-232, RS-422, or RS-485. The other serial port is a dedicated RS-232 port.

Features

- On-board processor for automatic calibration of the I/O channels
- Analog inputs have 14-bit resolution
- Analog outputs have 12-bit resolution
- Serial Ports are configurable

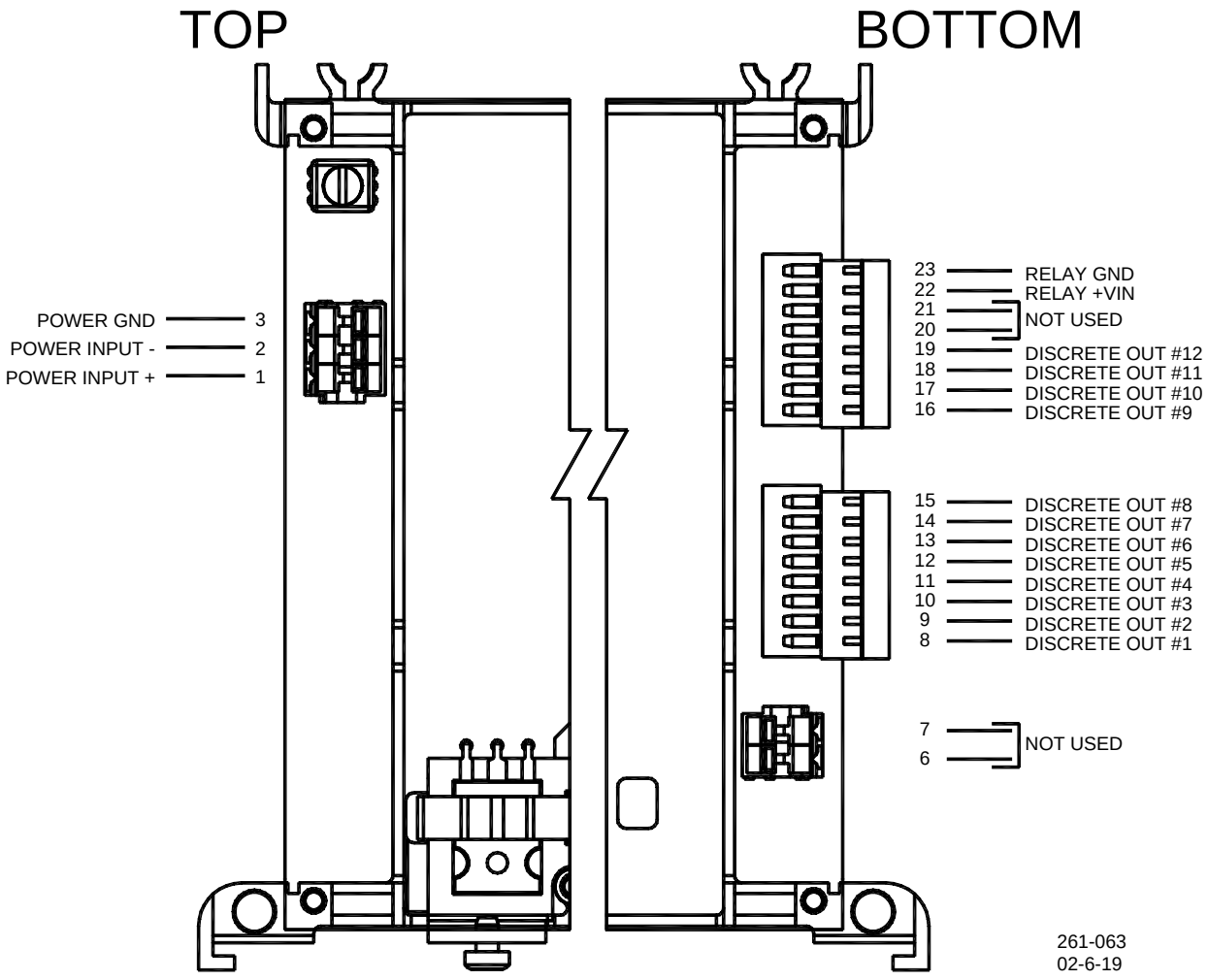


Figure 2-9. EGCP-3 Power Supply Board Wiring

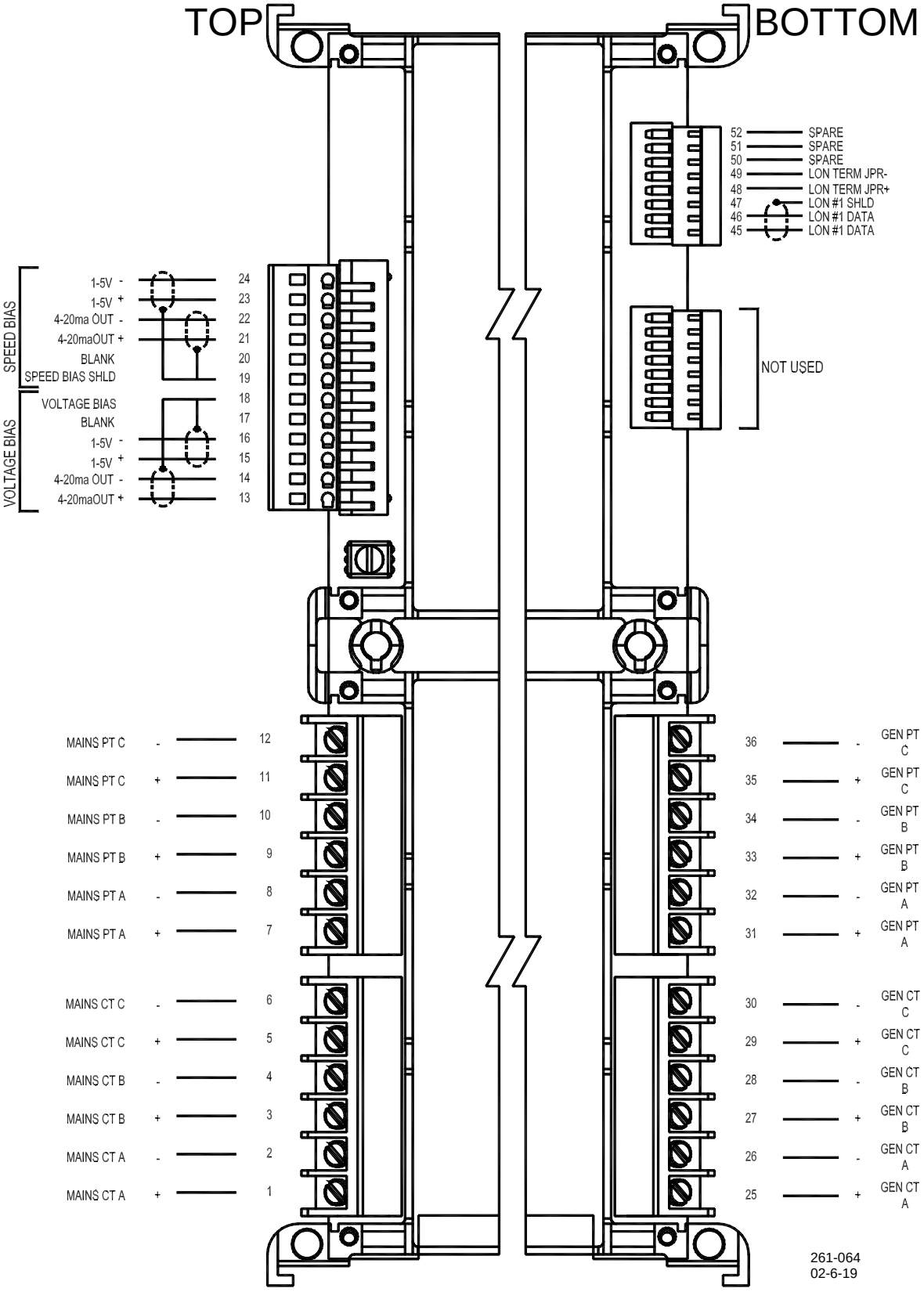


Figure 2-10. EGCP-3 PowerSense Board Wiring

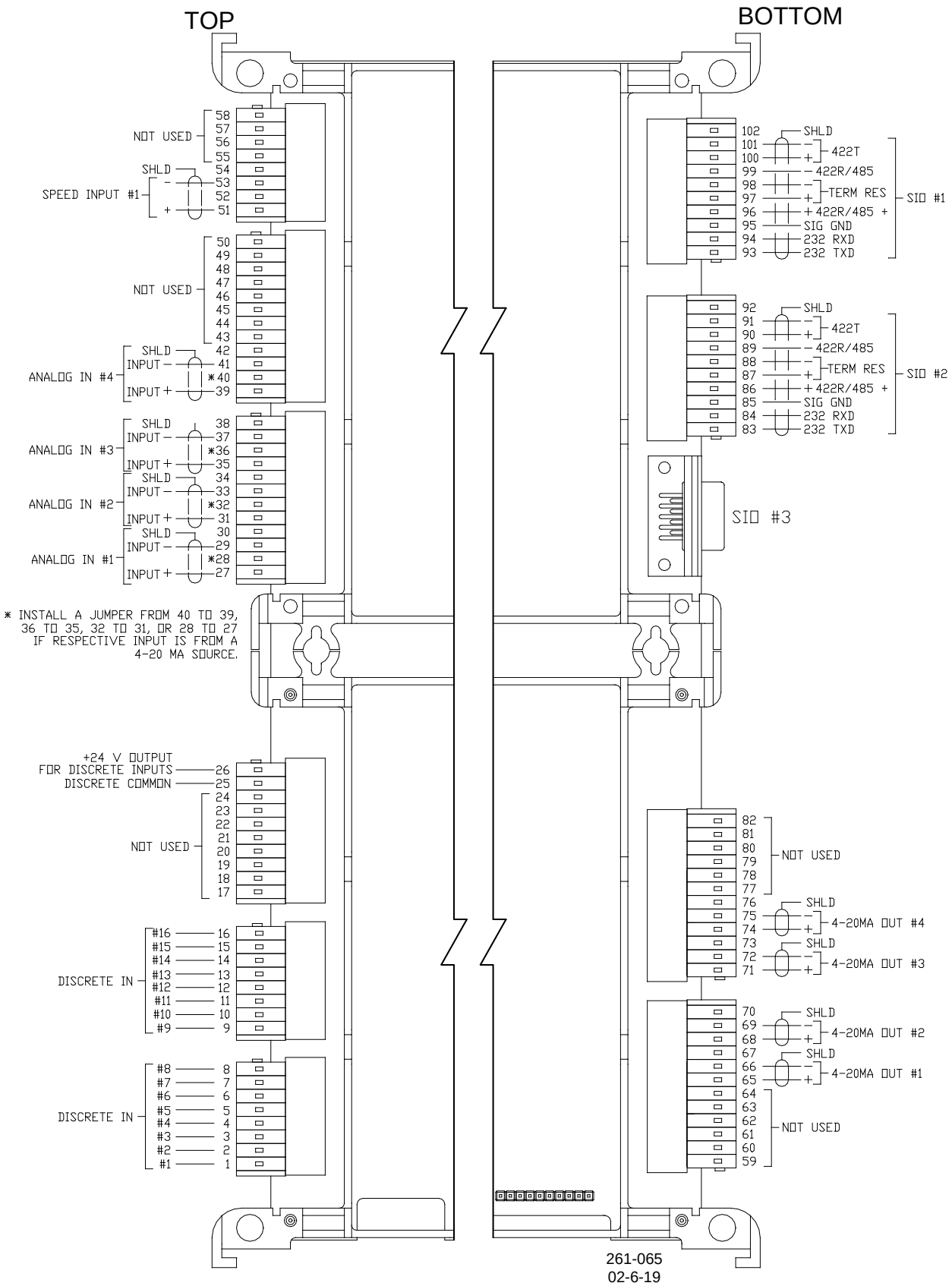


Figure 2-11. EGCP-3 SmartCore Board Wiring

Input Power

The EGCP-3 control requires a nominal voltage source of 18 to 32 Vdc, 22 W. Power to the control should be maintained whenever the generator set is available for service. The control will remain active when connected to engine cranking batteries during cranking.

NOTICE

Power must be applied to the EGCP-3 control at least 60 seconds prior to expected use. The control must have time to do its power up diagnostics to become operational. Failure of the diagnostics will disable control function.

⚠WARNING

The EGCP-3 power supply board must have the input power removed before installing or removing any connectors or wiring.

This equipment is suitable for use in Class 1, Division 2, Groups A, B, C, and D, or non-hazardous locations only.

Wiring must be in accordance with Class I, Division 2 wiring methods and in accordance with the authority having jurisdiction.

Do not connect more than one main power supply to any one fuse or circuit breaker.

The input to the Power supply must be of a low impedance type for proper operation of the control. DO NOT power a control from a high voltage source containing dropping resistors and zener diodes. If batteries are used for operating power, an alternator or other battery-charging device is necessary to maintain a stable supply voltage.

Table 2-2. Input Power Ratings

Voltage Range	18–32 Vdc
Maximum Voltage	40 Vdc
Minimum Voltage	9 Vdc (engine cranking only)
Input Current	0.9 A @ 24 Vdc
	1.1 A @ 18 Vdc
Maximum Input Power	22 W
Typical Input Power	20 W @ 24 Vdc
Interrupt Time Holdup	8 ms @ >= 24 Vdc input voltage
Efficiency	70% minimum over operating input voltage range
Reverse Polarity Protection	100 Vdc
Input Wiring Constraints	The EGCP-3 must be wired such that no other device receives power from the wiring between the EGCP-3 and the power supply source.
Input Wire Size	12 AWG (2.5 mm²)
Fuse Rating	3 A (time delay with melting $I^2t \geq 100A^2$ sec)@@@@

Significant inrush currents are possible when current is applied to the EGCP-3 control. The magnitude of the inrush current depends on the power source impedance, so Woodward cannot specify the maximum inrush current. Time-delay fuses or circuit breakers must be used to avoid nuisance trips.

Table 2-3. Power Supply Monitoring Circuit

Maximum voltage measured	35 Vdc
Resolution in volts	0.15 Vdc
Maximum error due to temperature change	1.0 Vdc
Maximum error due to load change	1.0 Vdc
Total maximum error at 25 °C	1.2 Vdc

Input Power Wiring

Protective earth ground (PE) must be connected to the chassis at the ⏚ labeled termination point on the back of the display. See Figure 3-6 The power supply grounding terminals should also be connected to earth to ensure grounding of the power supply printed circuit boards. The grounding conductor must be the same size as the main supply conductors or the PT wires, whichever is larger.

Note that the control's power supplies are not equipped with input power switches. For this reason, some means of disconnecting input power to each main power supply must be provided for installation and servicing.

It is expected that the installation of this equipment will include overcurrent protection between the power source and the EGCP-3. This overcurrent protection may be accomplished by series connection of properly rated fuses or circuit breakers. Branch circuit protection of no more than 250% of the maximum EGCP-3 power supply input current rating must be provided. Maximum fuse rating must meet the 250% UL listing requirements. The use of properly sized UL class CC, J, T, G, RK1, or RK5 fuses meet the requirements for branch circuit protection. Do not connect more than one EGCP-3 to any one fuse. Use only the wire size specified above, or equivalent, that meets local code requirements. Time delay fuses should be used to prevent nuisance trips.

The power supply holdup time specification is the time the supply will continue to operate within specification after its input power is interrupted. This information may be useful in specifying uninterruptible power supply (UPS) systems.

IMPORTANT

2.5 mm² (12 AWG) is the largest wire gauge size that can be connected to the control power input terminal blocks.

The minimum continuous input voltage allowed is 18 V at the power input of the control. The length, size of wire, and load current will determine the minimum supply output voltage. The minimum supply voltage measured at the source should always be greater than 18 V. Example: two (source and return) 20 foot (6 m) lengths of 14 AWG (2.5 mm²) wire carrying 1.2 A (maximum rated current) will result in a voltage drop from source output to control power input of approx. 0.16 volts. The resulting supply voltage from the example must be greater than 18.16 volts.

The EGCP-3 will remain in operation when an electrical starter is engaged, if input power drops to no less than 9.0 V.

The power supply and ground connections are located on the top of the EGCP-3 on the power supply board. The power supply board is the board on the top of the stack (furthest away from the display area).

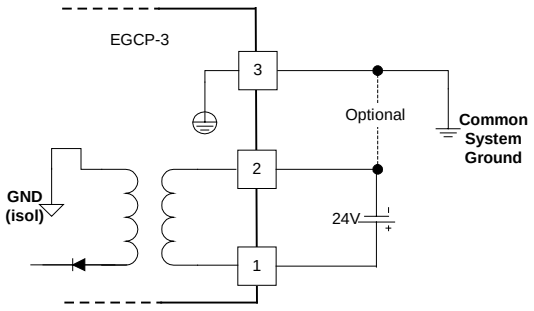


Figure 2-12. Input Power Wiring Diagram

Potential Transformer (PT) Inputs

The Generator and Mains ac voltage inputs can accept voltages up to 300 Vac RMS maximum between the positive and negative terminals of each input. The inputs may be connected line-to-line or line-to-neutral. For example, if the inputs are connected line-to-neutral, each input A-N, B-N, and C-N may have up to 300 Vac. Therefore, a 480 Vac generator may be wired to the EGCP-3 using line-to-neutral connections resulting in 277 Vac at the inputs.

Table 2-4. PT Input Specifications

Input Voltage Range Selections	70, 120, 240 Vac RMS
Max. Input Voltage	300 Vac
Input Current	3 mA maximum
Input Frequency	40–70 Hz
Common Mode Rejection Voltage	±450 Vdc minimum
Common Mode Rejection Ratio	-63 dB minimum

The EGCP-3 must be configured for a voltage range relative to the input (Potential Transformer secondary) provided. For example, if a phase (+) to phase (–) input to the EGCP-3 is to be a nominal of 70 Vac, set the range to the 70 volt range. No change in wiring is necessary. This configuration setting maximizes the accuracy for the voltage level being sensed. There is also a voltage floor below which a voltage cannot be detected so setting the correct range is important for more than just accuracy. See the table below for the voltage floor at each range.

Table 2-5. Voltage Floor Ranges

Configured Range	Dead bus Voltage Detected	Maximum Voltage Detected
70	27 Vac	100 Vac
120	40 Vac	150 Vac
240	80 Vac	300 Vac

If potential transformers are used, be careful to select an accurate transformer. The largest source of inaccuracy in the system will be the transformer, since even the most accurate transformer is less accurate than the ac voltage inputs to the EGCP-3. The calibration menu contains turns ratio compensation factors for each PT input. Follow the calibration procedure to negate much of the transformer error.

The Bus PT inputs are required for the synchronization function. At least a single phase connection must be made if the EGCP-3 is intended for synchronizing.

When the PT input to the control is conditioned with a transformer the generator and mains transformer ratio is entered into the EGCP-3. This is described in the Configuration section of the Operation Manual. The EGCP-3 will use the PT ratio and the entered configured Range to calculate the actual system voltage(s).

EXAMPLE:

Hwd range = 120
PT ratio = 4
Measured PT secondary (input at terminals) = 112.5 Vac

The EGCP-3 will display 450 Vac for this input voltage.

Hazardous Live

The following circuits are classified as Hazardous Live because they carry potential shock hazardous voltages during normal operation or under single fault conditions:

- Potential transformer (PT) inputs
- Current transformer (CT) inputs
- Voltage bias outputs

WARNING

HIGH VOLTAGE/HIGH CURRENT—Do not touch or make contact with the above inputs and outputs during system operation when such circuits are live. Possible serious personal injury or death could result.

These inputs and outputs are provided with 500 V of dielectric isolation from chassis ground. In addition, these inputs/outputs are isolated from safety extra-low voltage (SELV) circuits (such as serial communication, PC/104 circuits) by optoisolators or transformers provided with double insulation and 3 000 Vac of dielectric isolation.

PT—3∅ Wye, L-N, No Transformers

No transformers are necessary if the voltage input to the EGCP-3 is less than 300 Vac at a given phase input. This diagram shows a system where both the generator and bus are less than 300 Vac measured line-to-neutral. Each is connected to the EGCP-3 in a L-N mode without transformers (PT Ratio = 1:1). It is not required that both the mains and the generator inputs be connected in the same manner. One could be L-L and the other L-N if preferred. Also, one could use transformers and the other not. The diagram shown is simply an example of a typical system.

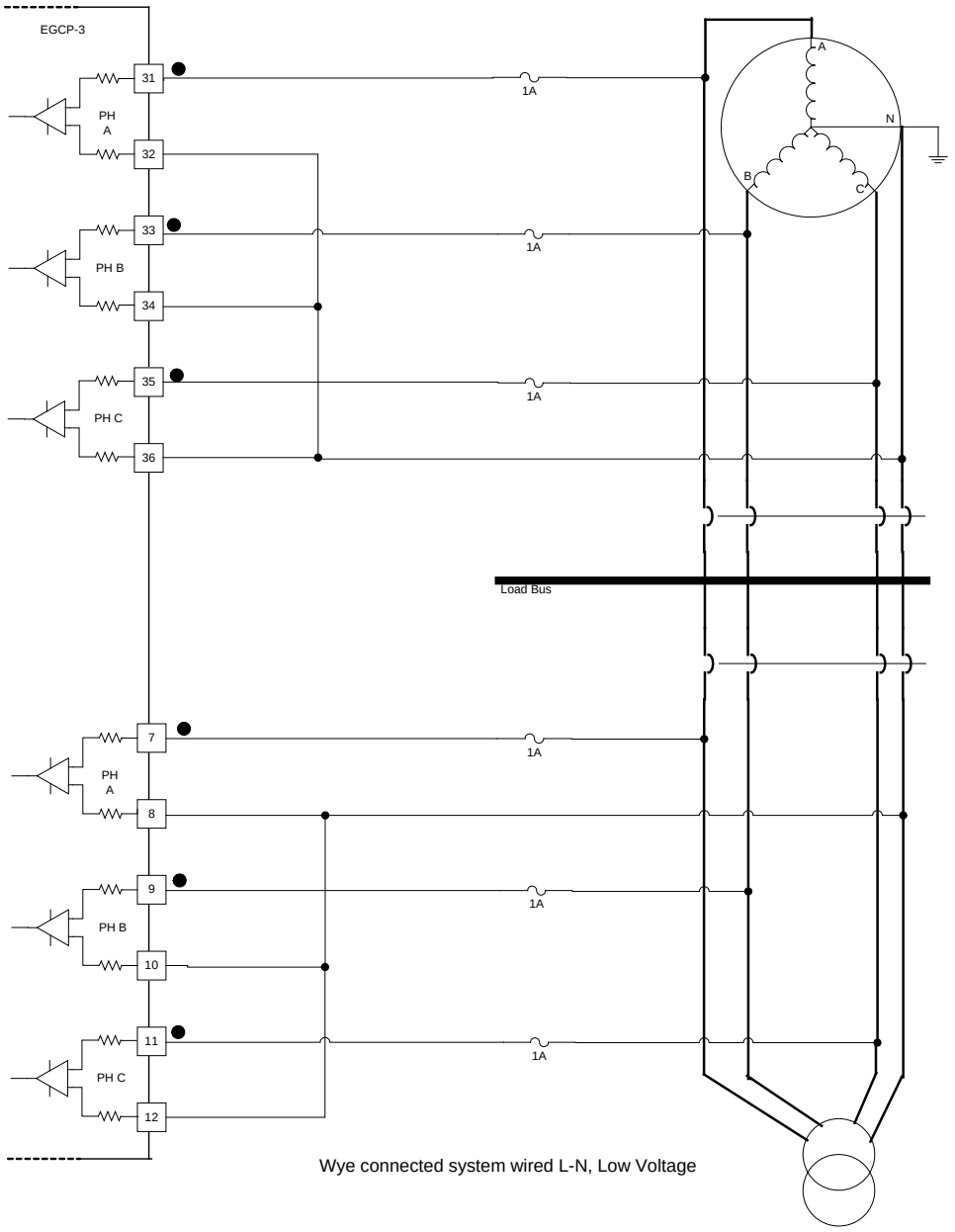
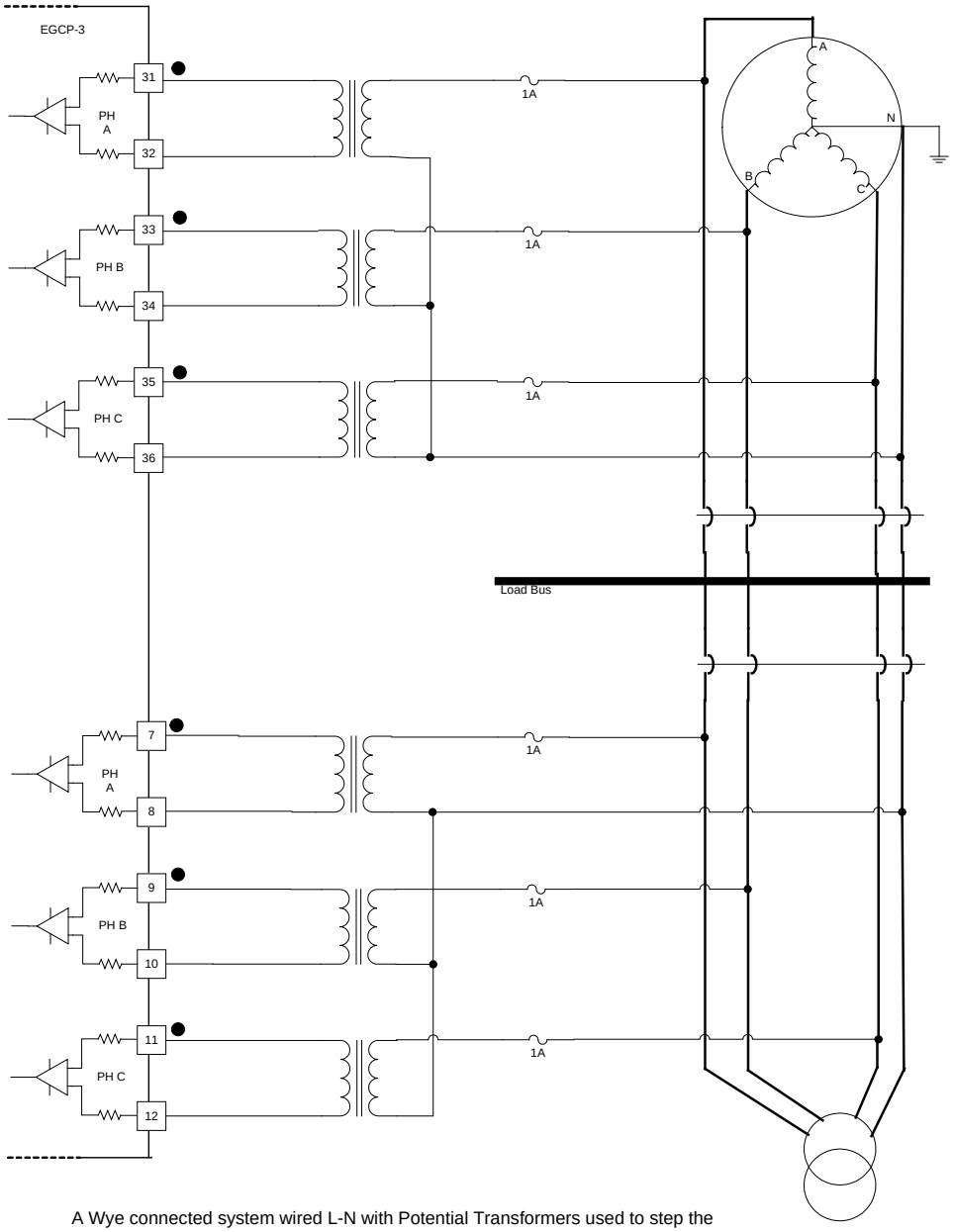


Figure 2-13. PT Wiring—3Ø Wye, L-N, without Transformer

PT—3∅ Wye, L-N, with Transformers

Transformers are necessary if the voltage input to the EGCP-3 is greater than 300 Vac at a given phase input or a customer preference. This diagram shows a system where both the generator and bus utilize potential transformers. Each is connected to the EGCP-3 in a L-N mode. It is not required that both the mains and the generator inputs be connected in the same manner. One could be L-L and the other L-N if preferred. Also, one could use transformers and the other not. The diagram shown is simply an example of a typical system.



A Wye connected system wired L-N with Potential Transformers used to step the voltage down.

Figure 2-14. PT Wiring—3Ø, Wye, L-N, with Transformer

PT—3∅ Wye, L-L, with Transformers

Transformers are necessary if the voltage input to the EGCP-3 is greater than 300 Vac at a given phase input or a customer preference. This diagram shows a system where both the generator and bus utilize potential transformers. Each is connected to the EGCP-3 in a L-L mode utilizing open delta wired transformers. It is not required that both the mains and the generator inputs be connected in the same manner. One could be L-L and the other L-N if preferred. Also, one could use transformers and the other not. The diagram shown is simply an example of a typical system. Notice for this configuration that the generator is a Wye, but the potential transformers are connected in a L-L fashion, so the EGCP-3 should be configured as a Delta L-L.

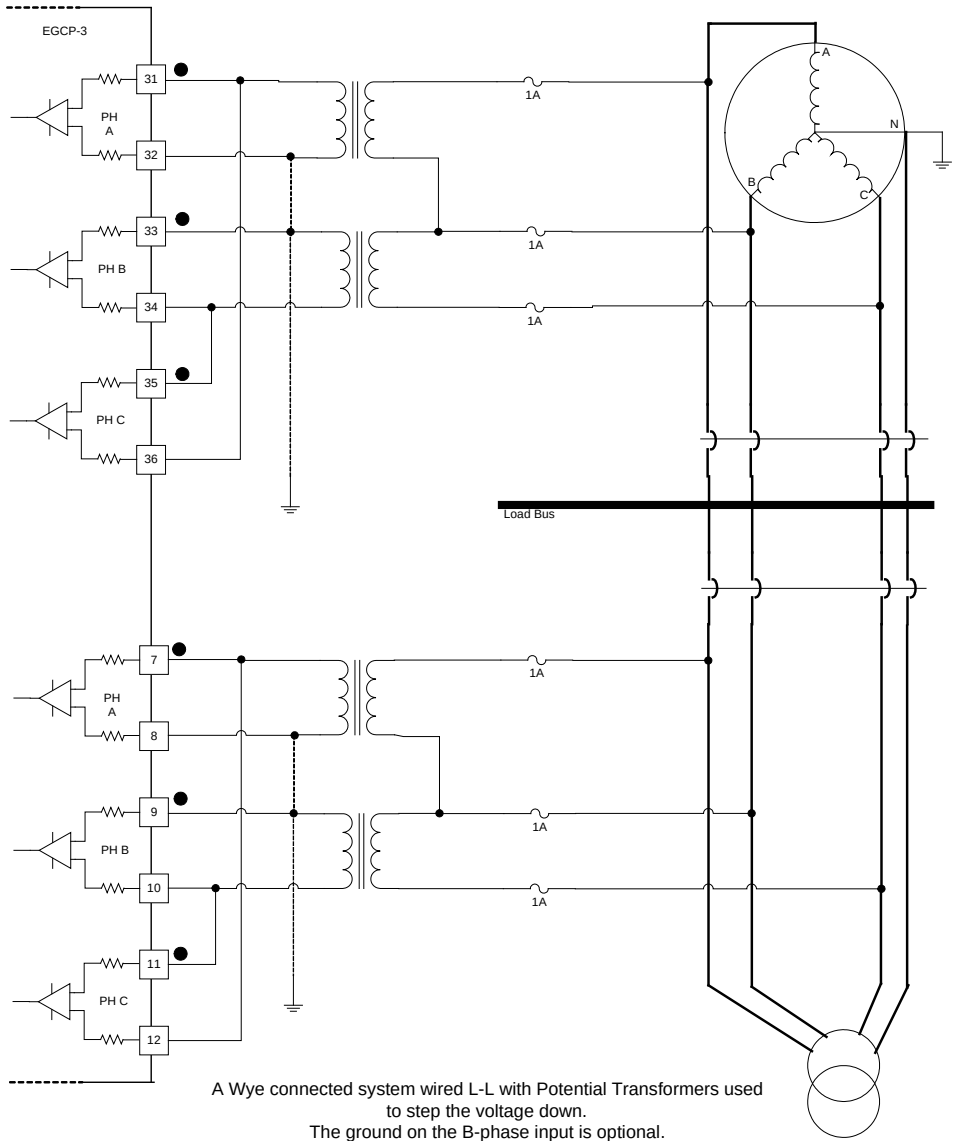


Figure 2-15. PT Wiring—3∅ Wye, L-L, with Transformers

PT—3∅ & 1∅ Inputs, Wye, L-L with Transformers

Transformers are necessary if the voltage input to the EGCP-3 is greater than 300 Vac at a given phase input or a customer preference. A single phase monitoring system may be wired either L-L or L-N. The B and C phase inputs will be ignored and do not need to be wired. Single phase mode must then be selected in the software configuration.

The generator and mains do not have to be configured identically. One can use single phase and the other can use three phase if preferred. The below wiring diagram example shows the generator wired 3∅ with open delta transformers from a Wye system. It also shows the mains wired 1∅ with a step down transformer wired L-L.

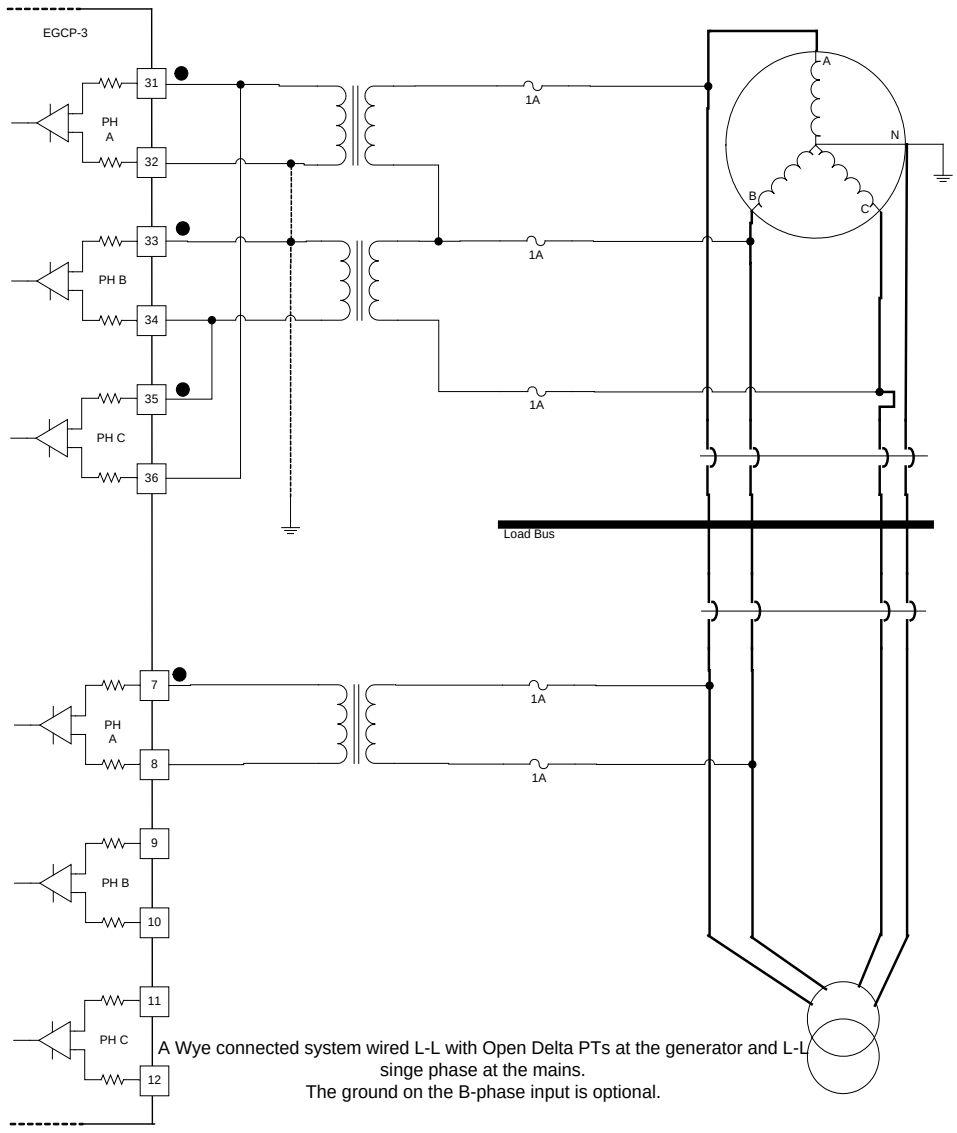


Figure 2-16. PT Wiring—3∅ Wye, & 1∅ Wye, L-L, with Transformers

PT—3∅ Input, Delta, L-L Connection with Transformers

Transformers are necessary if the voltage input to the EGCP-3 is greater than 300 Vac at a given phase input or transformers may be used per customer preference. This diagram shows a system where both the generator and bus utilize potential transformers. Each is connected to the EGCP-3 in a L-L mode utilizing open delta wired transformers. It is not required that both the mains and the generator inputs be connected in the same manner. One could use transformers and the other not. The diagram shown is simply an example of a typical system.

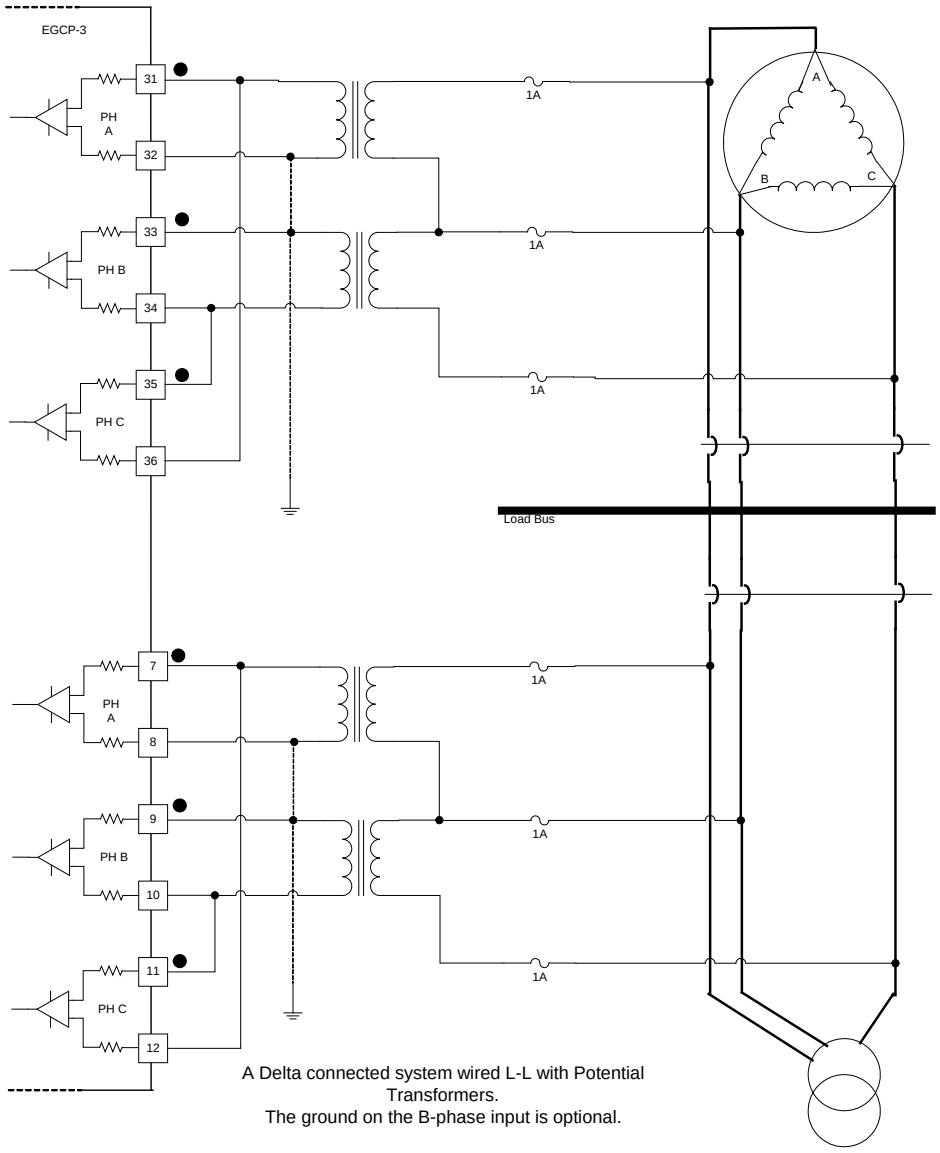


Figure 2-17. PT Wiring—3∅ Delta, L-L, with Transformers

PT—3∅ Input, Delta, L-L Connection without Transformers

Transformers are necessary if the voltage input to the EGCP-3 is greater than 300 Vac at a given phase input or a customer preference. This diagram shows a system where the generator and the bus do not utilize potential transformers. Each is connected to the EGCP-3 in a L-L mode. It is not required that both the mains and the generator inputs be connected in the same manner. One could use transformers and the other not. The diagram shown is simply an example of a typical system.

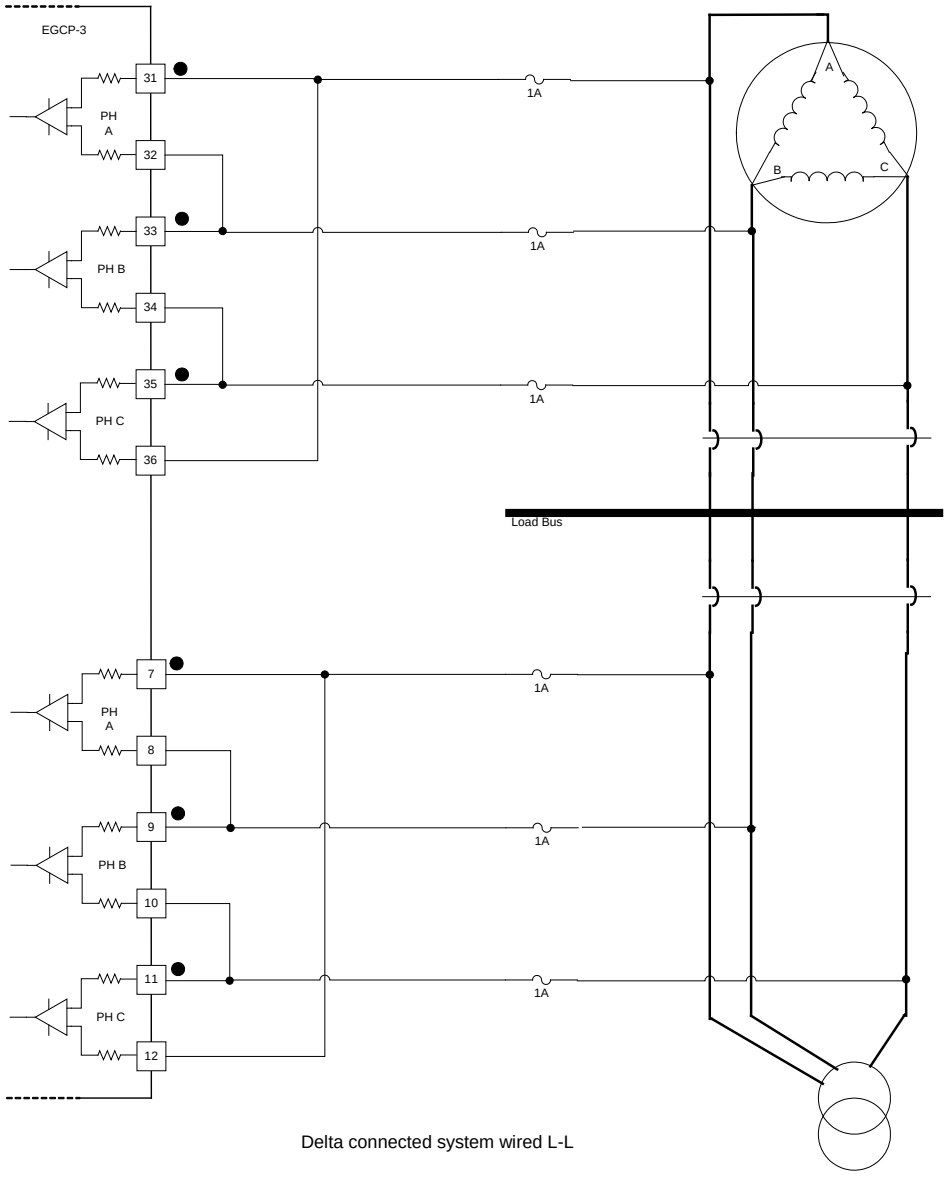


Figure 2-18. PT Wiring—3∅ Delta, L-L, without Transformers

PT—1∅ Input, Zig Zag Connection with Transformers

Transformers are necessary if the voltage input to the EGCP-3 is greater than 300 Vac at a given phase input or a customer preference. This diagram shows a system where the generator and the bus do utilize potential transformers. Each is connected to the EGCP-3 in a single phase zigzag mode. It is not required that both the mains and the generator inputs be connected in the same manner. One could use transformers and the other not. The diagram shown is simply an example of a typical system.

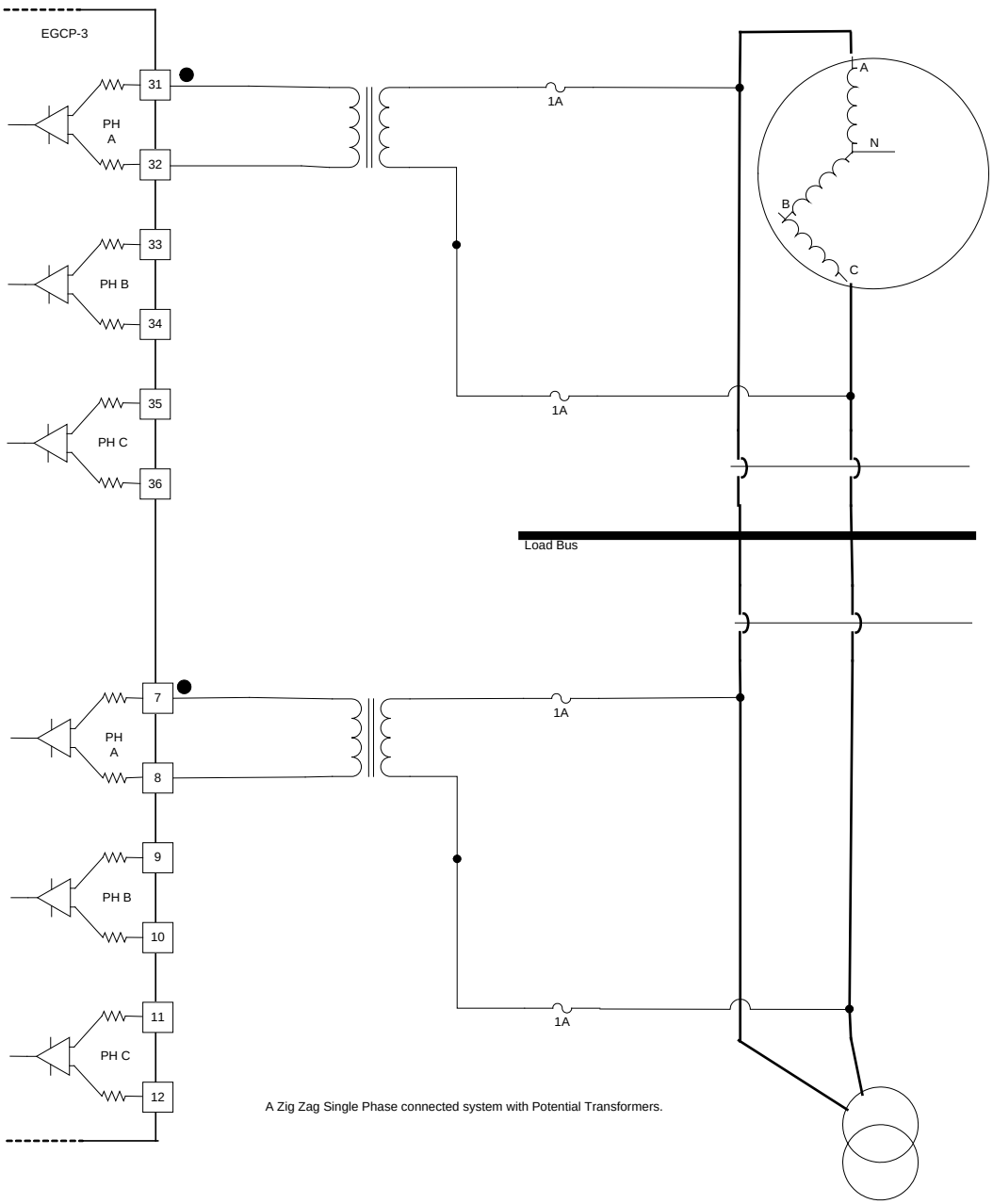


Figure 2-19. PT Wiring—1∅ Zig Zag

Current Transformer (CT) Inputs

The Generator and Mains ac current inputs can accept currents up to 7 A ac RMS maximum between the positive and negative terminals of each input. The CT inputs are rated at 5 A ac RMS nominal and function down to 50 mA. For optimum accuracy in the usable range, it is recommended to use 5 A secondary CTs (Do not use 1 A secondary CTs).

Table 2-5. CT Input Specifications

Input Current	5 A RMS full scale
Max. Transient Input Current (continuous)	7.07 Aac-rms
Max. Transient Input Current (1 sec.)	50 Aac-rms *
Input Burden	0.15 VA
Input Frequency	40–70 Hz
Common Mode Voltage	±250 Vdc minimum
Common Mode Rejection Ratio	–63 dB minimum

**—EGCP-3 versions 8406-113 Rev E and 8406-114 Rev D or later*

Be careful to select an accurate current transformer. The largest source of inaccuracy in the system will be the transformer since even the most accurate transformer is less accurate than the AC current inputs to the EGCP-3. The calibration menu contains turns ratio compensation factors for each CT input. Follow the calibration procedure to negate much of the transformer linear error.

The EGCP-3 does not require three phases for current calculations. The user can configure the EGCP-3 for single phase, and all functionality will be modified accordingly. The phase input that must be provided is the A phase.

The Bus CT inputs are not required for operation. The Bus CT inputs are used for alarm functions only and are not used for any control functions.

The generator and mains Current Transformer ratio is entered into the EGCP-3. This is described in the Configuration section of the Operators Manual (26137). The EGCP-3 will use the CT ratio to calculate the actual system current(s).

EXAMPLE:

CT ratio = 500

Measured CT secondary (input at terminals) = 3.9 A

The EGCP-3 will display 1950 A ac for this input current.

For a full wiring connection, combine the Current Transformer (CT) wiring below with the Potential Transformer (PT) section above.

CT—3∅ Wye

This diagram shows the generator and mains in a wye configuration. The current transformers are placed on the leads connecting to the load. The diagram shown is simply an example of a typical system.

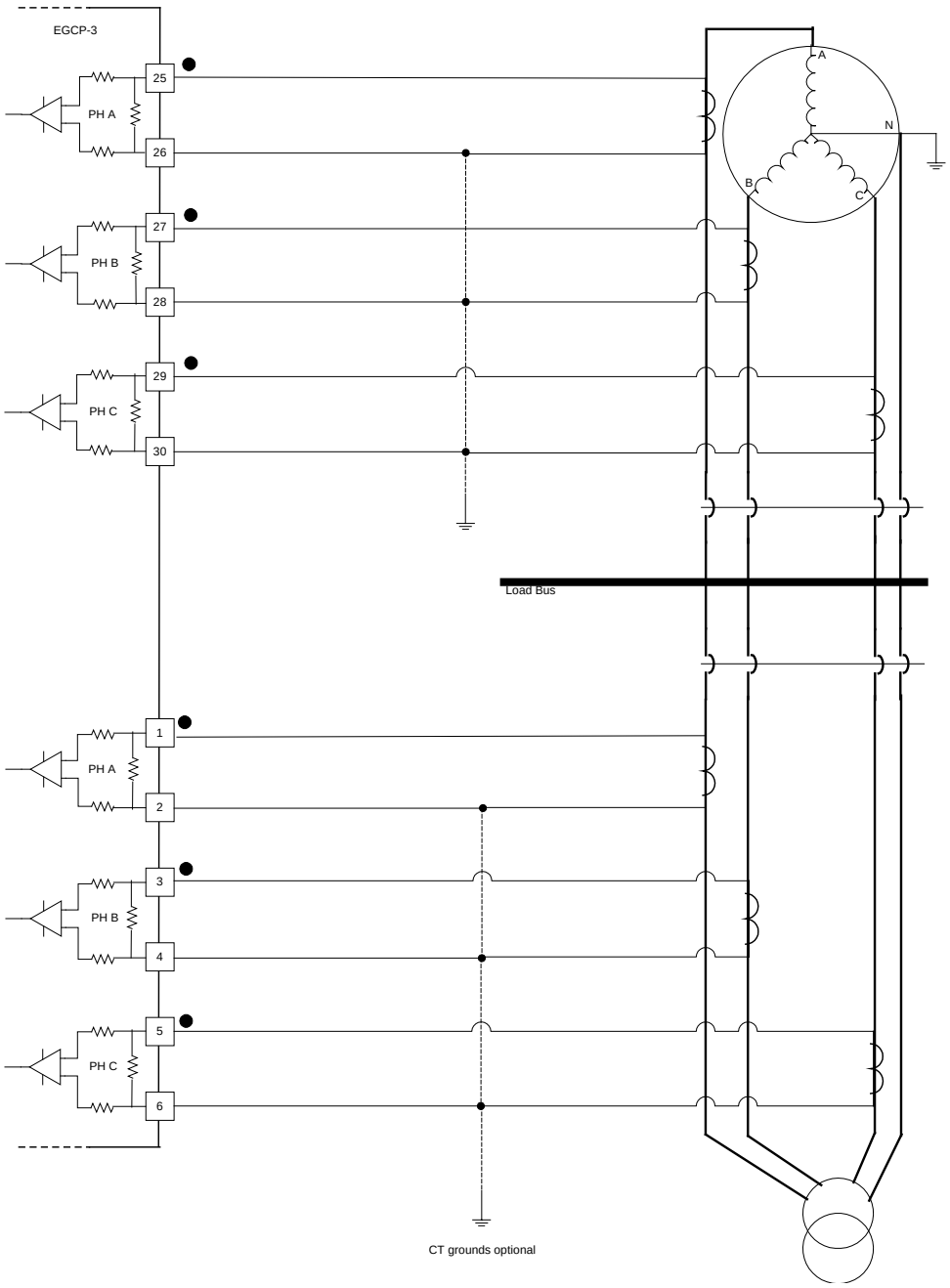


Figure 2-20. CT Wiring—3∅ Wye

CT—3∅ Delta

This diagram shows the generator and mains in a delta configuration. The current transformers are placed on the leads connecting to the load. The diagram shown is simply an example of a typical system.

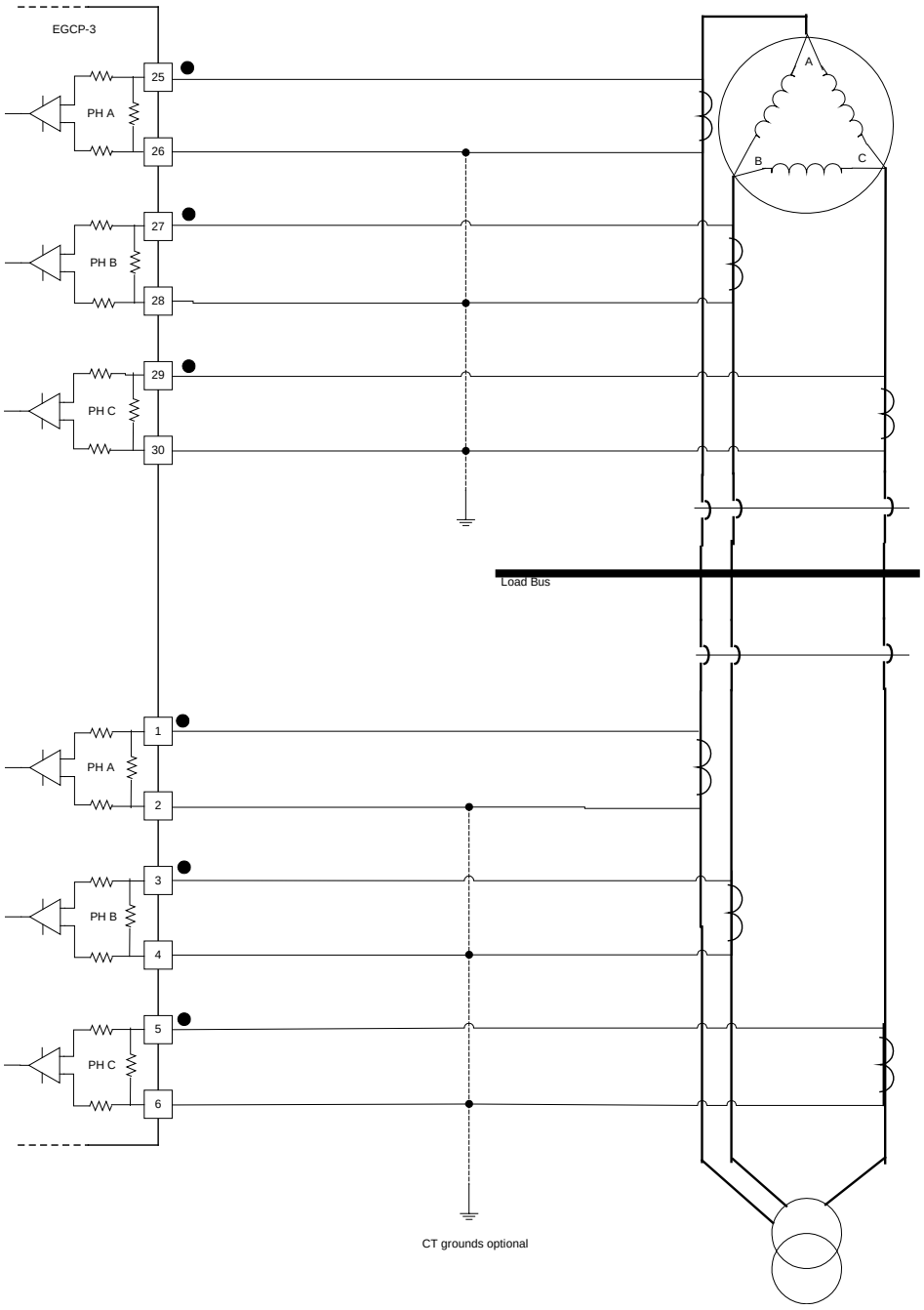


Figure 2-21. CT Wiring—3Ø Delta

CT—1∅ Zig Zag

This diagram shows the generator and mains in a delta configuration. The current transformers are placed on the leads connecting to the load. The diagram shown is simply an example of a typical system.

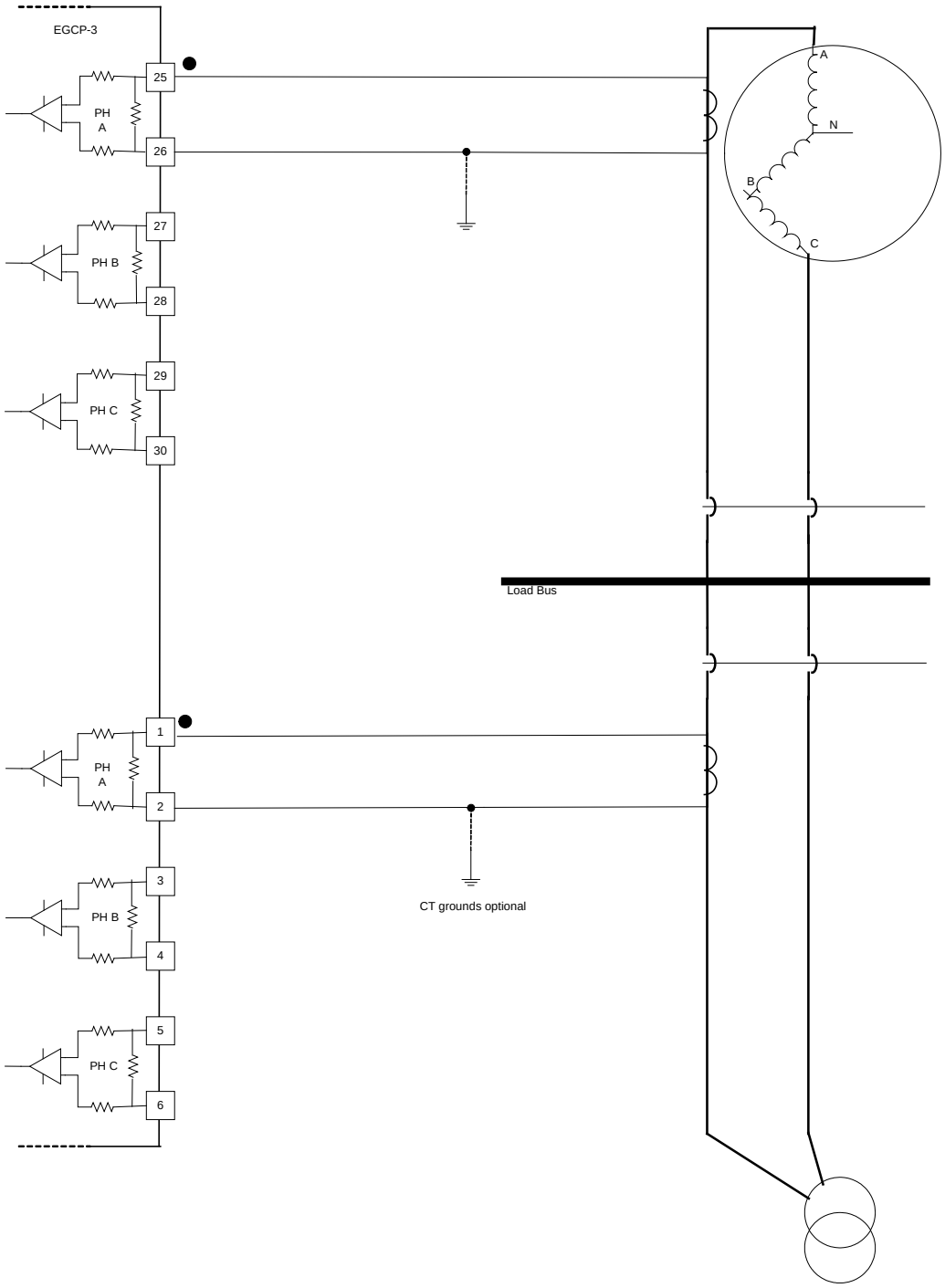


Figure 2-22. CT Wiring—1∅ Zig Zag

Single Phase Monitoring

In a single phase monitoring system, the EGCP-3 will only use the A phase CT input. Anything connected to the B and C phase inputs will be ignored. The current transformer is placed on the A phase leads connecting to the load. See the appropriate diagram above and ignore the B and C phase inputs. For a single phase input, the PT and CT must be monitoring the same phase. During control Configuration the software must be selected to use Single Phase. The single phase monitoring is applied to 3 phase machines, it is not intended for single phase machines.

IMPORTANT

The EGCP-3 power calculations are based on a per-phase calculation. When a single phase input is used the displayed values will be 1/3 of the total device levels. Therefore the entered CT ratio or the total power level(s) for the mains or generator will have to be adjusted to display actual 3∅ device power levels.

MPU (Speed) Input

The EGCP-3 accepts passive magnetic pickup (MPU) inputs for speed sensing. It is not recommended that gears mounted on an auxiliary shaft be used to sense speed. Auxiliary shafts tend to turn more slowly than the rotor or crankshaft (reducing speed sensing resolution) and have coupling gear backlash, resulting in less than optimum speed detection. For safety purposes, it is also not recommended that the speed sensing device sense speed from a gear coupled to a generator or mechanical drive side of a system.

Table 2-6. MPU (Speed) Input Specifications

Input frequency	100–24 950 Hz
Input amplitude	1–25 Vrms
Input impedance	2 k Ω
Isolation voltage	500 Vac minimum, each channel is isolated from all other channels
Resolution	Dependent on frequency, 13 bit minimum at maximum speed
Accuracy	Better than ±0.08% full scale from –40 to +85 °C internal temperature

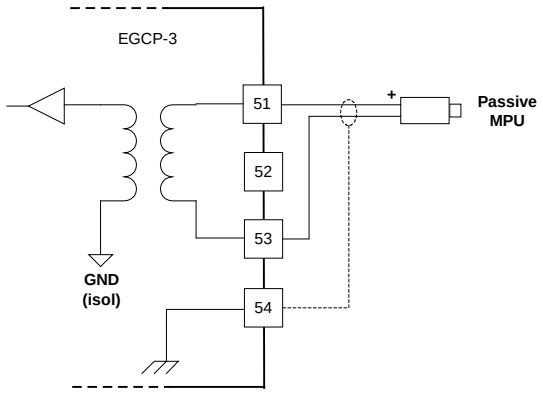


Figure 2-23. MPU Wiring Diagram

Analog Inputs

The Analog Inputs may be current or voltage type. If a current input is used, a jumper is installed at the terminal block, and the software must be selected for current. This allows the EGCP-3 to use the applicable hardware calibration values. If a voltage input is needed, the jumper must be removed, and the software must be selected for voltage.

When the EGCP-3 inputs are configured (see Operator Manual), the engineering unit values are entered for the sensor at minimum (1 v or 4 mA) and at maximum (5 V or 20 mA).

All analog inputs are calibrated using the entered engineering unit, and are not affected by the American or Metric selection.

The Analog Inputs may be used with a two-wire ungrounded (loop powered) transducer or isolated (self-powered) transducer. See transducer wiring below for typical wiring. If interfacing to a non-isolated device that may have the potential of reaching over 10 Vdc with respect to the control's common, the use of a loop isolator is recommended to break any return current paths, which could produce erroneous readings. Loop power must be provided from an external source.

Table 2-7. Analog Input Specifications

Input type	4–20 mA or 1–5 V
Max. Input current	25 mA ±5% if configured for 4–20 mA
Max. Input voltage	5.0 V ±5% if configured for 1–5 V
Common mode rejection	80 dB minimum
Input common mode range	±11 V minimum
Safe input common mode volt	±40 V minimum
Input impedance	200 Ω (±1%) if configured for 4–20 mA >260 kΩ if configured for 1–5 V
Anti-aliasing filter	2 poles at 10 ms
Resolution	14 bits
Accuracy @ 25 °C	Better than ±0.1% of full scale, 0.025 mA
Temp Drift	171 ppm/°C, maximum (1.1% of full scale, 0.275 mA) 30 ppm/°C, typical (0.20% of full scale, 0.05 mA)

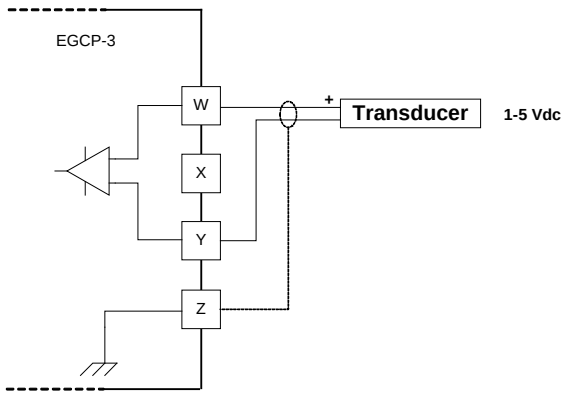


Figure 2-24. Analog Input Wiring Diagram, 1–5 V

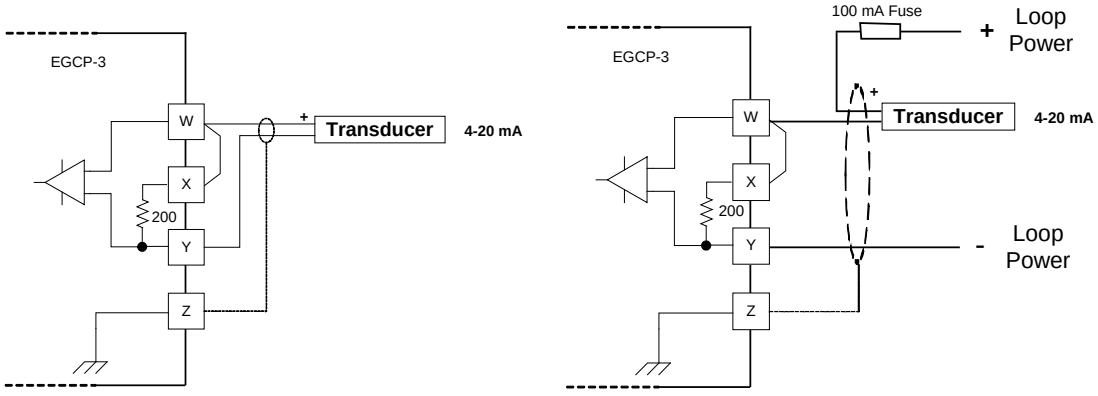


Figure 2-25. Analog Input Wiring Diagram; 4–20 mA

Table 2-8. Terminal Channel References

Terminal Reference	Analog In 1	Analog in 2	Analog In 3	Analog In 4
W	27	31	35	39
X	28	32	36	40
Y	29	33	37	41
Z	30	34	38	42

The following table shows the function (pre-assigned or optional) of the four Analog Inputs:

Table 2-9. Analog Input Functions

Analog Input Channel #	LS Input	MC Input
AI #1	Coolant Temperature	O, D = 1
AI #2	Oil Pressure	O, D = 1
AI #3	O, D = 4	O, D = 4
AI #4	O, D = 6	O, D = 6

“O” indicates an input can be configured for an item from the list below.
“D= x” indicates the default menu item(as shipped).

Table 2-10. LS and MC Menu Item Definitions

Menu Item	LS	MC
7	Remote Analog Alarm	Remote Analog Alarm
6	Remote VAR Reference	Remote VAR Reference
5	Remote PF Reference	Remote PF Reference
4	Remote Process, Import/Export Reference	Remote Process, Import/Export Reference
3	Process Control Input	Process Control Input
2	Remote Baseload Reference	Remote Baseload Reference
1	Not Used	Not Used

Speed Bias Output

The Speed Bias output allows the EGCP-3 to control the speed and load of the generator. The Speed Bias output is not used on the MC model. The Speed Bias can be configured for one of four types of outputs: 4–20 mA, 0–5 V, ±3 V, PWM. Full range of the selected speed bias output should be approximately ±10% or less change in rated speed. The amount of speed change is a function of the speed control used. The ±3 V output works with Woodward speed controls and others designed for a bipolar reference bias. The 0–5 V output works with Detroit Diesel (DDEC) speed controls and others designed for a unipolar reference bias. The 4–20 mA output is a standard current driver output for speed controls like the Caterpillar Gas Engine control system and others. The PWM output is 5 V and 500 Hz and will work with Caterpillar ADEM speed controls. Both the configuration and the wiring must be changed to switch between current and voltage outputs. Only the configuration must be changed to switch between the voltage outputs and the PWM output.

Table 2-11. Speed Bias Output Specifications

PWM frequency	
Current and voltage outputs	3 kHz
PWM output	500 Hz
Current output	4–20 mA selected by software switch and wiring
Max current output	
4–20 mA output	25 mA ±5%
Max voltage output	
±3 V	±3 V limit ±5%
0–5 V output	5 V maximum ±5%
500 Hz PWM	5 V maximum ±5%
Max load resistance	
4–20 mA output	300 Ω at 24 mA
PWM and voltage outputs	No maximum
Min load resistance	
4–20 mA output	0 Ω
±3 V output	450 Ω
0–5 V output	1 k Ω
PWM output	1 k Ω
Accuracy	Better than ±0.1% of full scale @ 25 °C
4–20 mA	±0.025 mA
±3 V output	±0.006 V
0–5 V output	±0.005 V
PWM output	±0.005% Duty Cycle
Resolution	16 bits for PWM output, 11 bits for all others
Isolation	See HAZARDOUS LIVE isolation requirement
Temperature Drift	
Voltage outputs	330 ppm/°C, maximum
4–20 mA output	140 ppm/°C, maximum
PWM output	Negligible

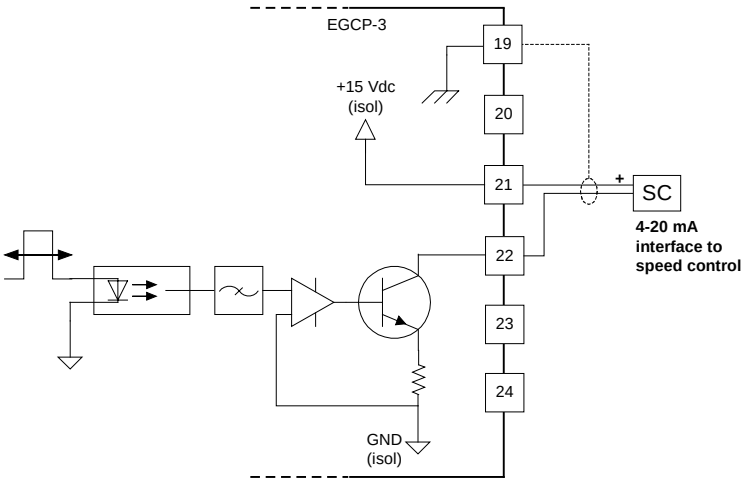


Figure 2-26. Speed Bias Wiring Diagram, 4–20 mA Output

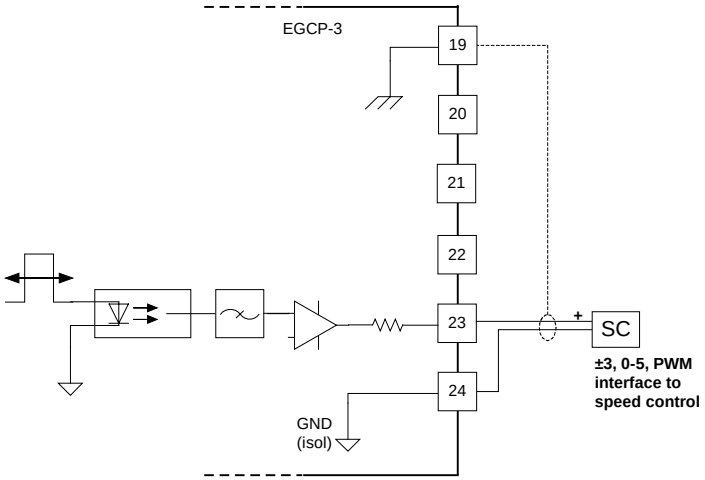


Figure 2-27. Speed Bias Wiring Diagram, PWM or Voltage Output

Voltage Bias Output

The Voltage Bias allows the EGCP-3 to vary the generator voltage level to control the reactive load on the generator. The MC model does not use the voltage bias output. The Voltage Bias can be configured for one of four types of outputs: 4–20 mA, ±1 V, ±3 V, ±9 V. The output mode selected should be determined based on the voltage regulator specifications. Minimum to maximum voltage bias output change from the EGCP-3 should be approximately ±10% change in rated generator voltage. Both the configuration and the wiring must be changed to switch between current and voltage outputs. Only the configuration must be changed to switch between the differing voltage outputs.

Table 2-12. Voltage Bias Output Specifications

PWM frequency	3 kHz for current and voltage outputs
Current output	4–20 mA selected by software switch and wiring
Voltage output	±1, ±3, ±9 Vdc selectable by software switch and wiring
Max current output	
4–20 mA output	25 mA ±5%
Max voltage output	
±1, ±3, ±9 Vdc	±9 V limit ±5%
Isolation	See HAZARDOUS LIVE isolation requirement
Max load resistance	
4–20 mA	300 Ω at 24 mA
±1, ±3, ±9 Vdc	No maximum
Min load resistance	
4–20 mA	0 Ω
±1, ±3, ±9 Vdc output	7 kΩ
Resolution	
4–20 mA	12 bits
±1 V output	>7 bits
±3 V output	>9 bits
±9 V output	12 bits
Accuracy	Better than ±0.1% of full scale @ 25 °C
4–20 mA	±0.025 mA
±1 V, ±3 V, ±9 V output	±0.018 V
Temperature Drift	
Voltage outputs	330 ppm/°C, maximum
4–20 mA output	140 ppm/°C, maximum

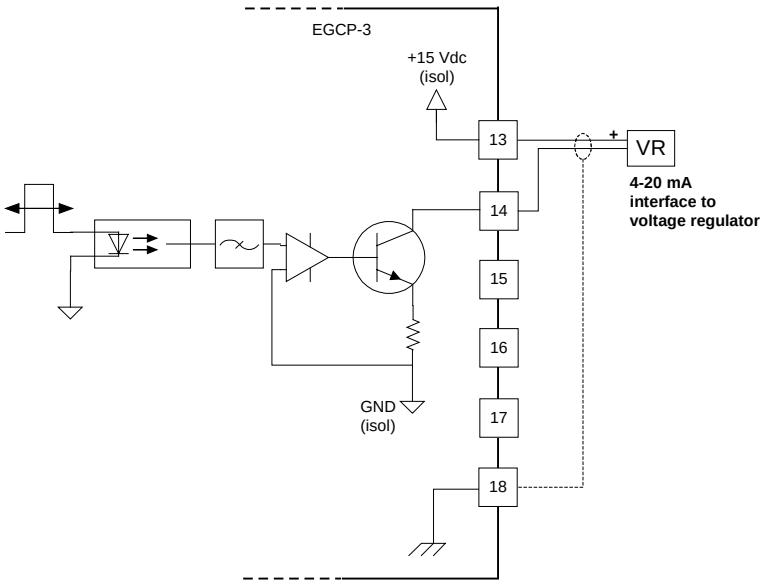


Figure 2-28. Voltage Bias Wiring Diagram, 4–20 mA Output

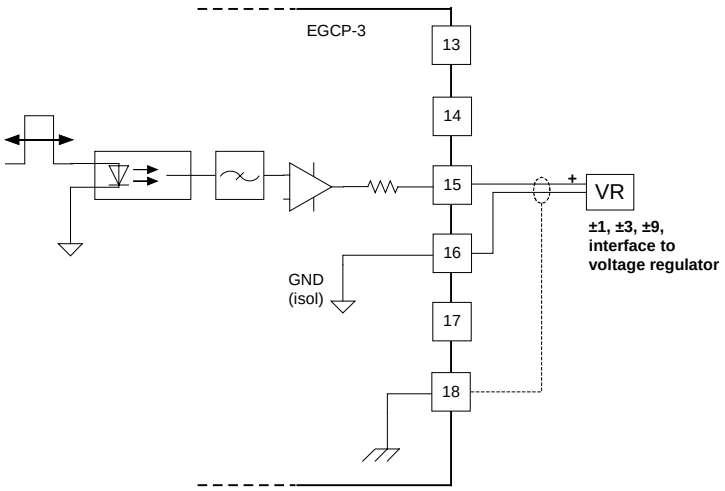


Figure 2-29. Voltage Bias Wiring Diagram, Bi-polar Voltage Output

Analog Outputs

There are four analog outputs that may be assigned to a number of functions. Each output is a 4–20 mA current source. The Analog Outputs may be used with a two-wire ungrounded device or isolated device. If interfacing to a non-isolated device, the use of a loop isolator is required. The chart below give the parameters that may be configured for analog output, The scale or range of each parameter can also be changed, i.e. a frequency read out may be set for 57 to 63 Hz, or 30 to 65 Hz.

Table 2-13. Analog Output Specifications

Number of channels	4, PWM outputs
Output type	4–20 mA outputs, non-isolated
PWM frequency	1.5 kHz
Common Mode Voltage	15 Vdc ±10%
Current output	4–20 mA
Max current output	25 mA ±5%
Min. load resistance	0 Ω
Max load resistance	300 Ω at 22 mA
Resolution	12 bits
Accuracy @ 25 °C	Better than ±0.1% of full scale, 0.025 mA
Temperature Drift	140 ppm/°C, 0.23 mA maximum 70 ppm/°C, typical (0.45% of full scale, 0.11375 mA)

Each analog output has identical circuitry. There is no isolation between outputs and no isolation to the digital circuitry of the EGCP-3. Wiring for each is shown below but only the terminal numbers change for each output.

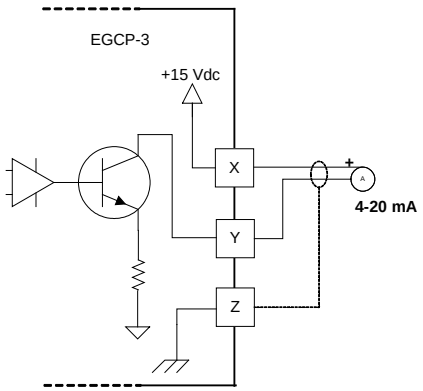


Figure 2-30. Analog Output Wiring Diagram

Table 2-14. Analog Output Terminal Channel References

Analog Output Terminal	Analog Out 1	Analog Out 2	Analog Out 3	Analog Out 4
X	65	68	71	74
Y	66	69	72	75
Z	67	70	73	76

All four Analog Outputs are user configurable. The following table shows the function options available.

Table 2-15. Analog Output Function Options

Menu Item	LS	MC
18	System Load	Not Used
17	Unit Load	System Load
16	Bus Power Factor*	Mains Power Factor*
15	Bus Frequency	Mains Frequency
14	Bus KVAR*	Mains KVAR*
13	Bus KVA*	Mains KVA*
12	Bus KW*	Mains KW*
11	Bus Current*	Mains Current*
10	Bus Voltage*	Mains Voltage*
9	Generator Power Factor*	Bus Power Factor*
8	Generator Frequency	Bus Frequency
7	Generator KVAR*	Bus KVAR*
6	Generator KVA*	Bus KVA*
5	Generator KW*	Bus KW*
4	Generator Current*	Bus Current*
3	Generator Voltage*	Bus Voltage*
2	Synchroscope	Synchroscope
1	Not Used	Not Used

* Depending on the Discrete Input for Meter Phase Select, the output of these elements will display a phase value, or total/average of the phases. The chart below shows the meter phase select logic and what the output will represent. If the discrete inputs for Phase Select are not used, the output will always be the average/total value.

Table 2-16. Meter Phase Select Logic Outputs

Meter Phase Select A	Meter Phase Select B	Meter Output
1	0	Phase A
0	1	Phase B
1	1	Phase C
0	0	Average/Total

Discrete Inputs

There are 16 discrete inputs; five are preconfigured for a fixed function and the remaining eleven may be configured as needed. All sixteen inputs are individually optically isolated; however, all sixteen share a common power supply return. The inputs expect 24 Vdc for an asserted state.

Table 2-16. Discrete Inputs Specifications

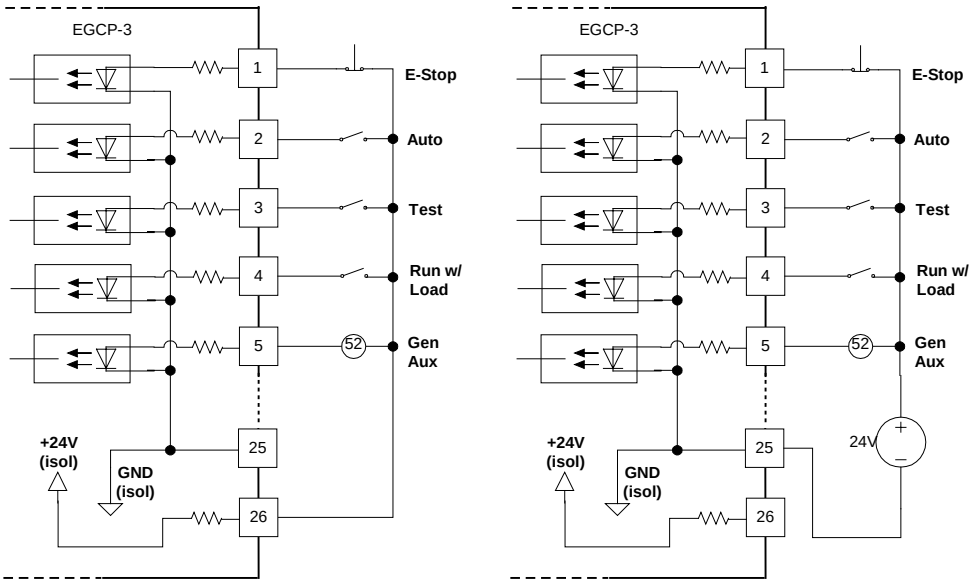
Number of channels	16
Input type	Optically isolated discrete input
Input thresholds	< 8 Vdc = “OFF”
	> 16 Vdc = “ON”
Input current	3 mA @ 24 Vdc
Contact voltage	24 Vdc isolated
Max input voltage	28 Vdc
Isolation voltage	500 Vac, all channels are isolated from the other I/O

An external 18–28 Vdc power source can be used to source the circuit wetting voltage for the discrete inputs. Due to circuit isolation, the external power supply common must be connected to the EGCP-3 terminal 25 as shown in the wiring diagrams below. However, for EMC Compliance, the on board, isolated, +24 Vdc supply is recommended for use as the contact wetting voltage. The internal supply should only be used for the discrete inputs as shown in the diagrams; use in other, unrelated, circuits could overload the supply or create ground loops. The internal, isolated, supply is limited to approximately 300 mA maximum.

Pre-configured Inputs

The first five discrete inputs are pre-configured for a fixed function. They cannot be reprogrammed to another function. The operation of each is described in the appropriate section of the EGCP-3 Operation manual. Two diagrams are shown; the one on the left shows use the internal wetting supply voltage, and the other uses an external supply. The two are mutually exclusive.

The E-stop input is Active Low, normally closed. It will generate an E-stop alarm if the connection is broken. The other inputs are Active High, normally open.



Channel #1 of the MC model is configurable.
Channel #5 of the MC model is the Mains Aux contact (52).

Figure 2-31. Discrete Input Wiring Diagram, Pre-configured

Configurable Inputs

The function of eleven discrete inputs may be d. The operation of each configurable function is described briefly in the table below and in more detail in appropriate section of the EGCP-3 Operation manual for the model being installed. The diagram below shows the typical connections of contactors, switches, etc for the default configuration. The actual configuration may be different. If using an external supply for the wetting voltage, see above diagram for connections. ALL discrete inputs must be connected to the wetting voltage in the same manner. Inputs that are configured for Remote Alarm input may also be configured to be active high or active low (Normally open or normally closed). The configuration check requires that only one input channel may be configured for a function selection.

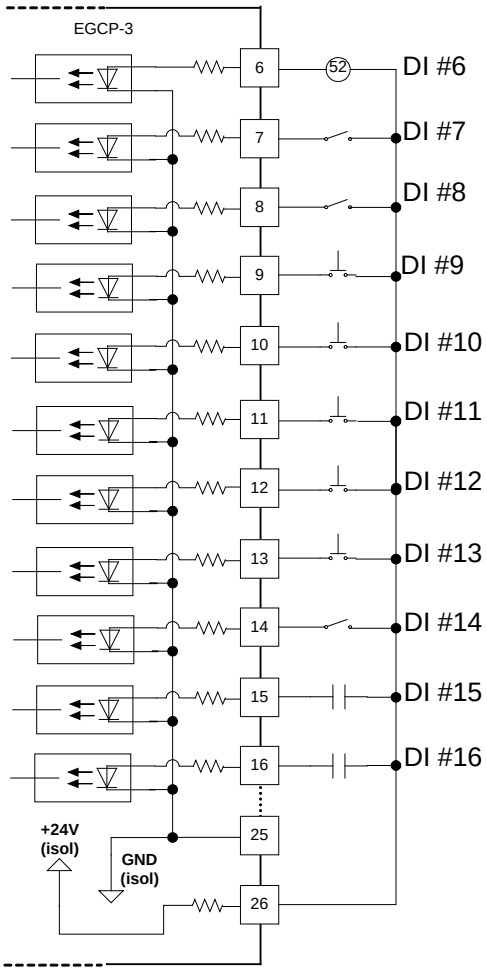


Figure 2-32. Discrete Input Wiring Diagram, Configurable

The following table shows the function (pre-assigned or optional) of the 16 discrete Inputs:

Table 2-16. Discrete Inputs Functions

Discrete Input Channel # / Terminal	LS Input	MC Input
DI #1/1	Emergency Stop	O, D= 17
DI #2/2	Control Auto / Manual	Control Auto / Manual
DI #3/3	Control Test / Normal	Control Test / Normal
DI #4/4	Control Run / Normal	Control Run / Normal
DI #5/5	Generator Breaker Aux Contact	Mains Breaker Aux Contact
DI #6/6	O, D= 2	O, D= 2
DI #7/7	O, D= 11	O, D= 11
DI #8/8	O, D= 12	O, D= 12
DI #9/9	O, D= 3	O, D= 3
DI #10/10	O, D= 4	O, D= 4
DI #11/11	O, D= 5	O, D= 5
DI #12/12	O, D= 6	O, D= 6
DI #13/13	O, D= 7	O, D= 7
DI #14/14	O, D= 8	O, D= 8
DI #15/15	O, D= 9	O, D= 9
DI #16/16	O, D= 10	O, D= 10

“O” indicates an input can be configured for an item from the list below.
“D= x” indicates the default function (as shipped).

Table 2-17. Discrete Inputs LS and MC Definitions

Menu Item	LS	MC
1	Not Used	Not Used
2	Mains Breaker Aux Contact	Group Breaker Aux Contact
3	Voltage/PF/VAR Raise Command	Voltage/PF/VAR Raise Command
4	Voltage/PF/VAR Lower Command	Voltage/PF/VAR Lower Command
5	Load / Speed Raise Command	Load / Speed Raise Command
6	Load / Speed Lower Command	Load / Speed Lower Command
7	Load Ramp Pause	Load Ramp Pause
8	Enable Process Control	Enable Process Control
9	Meter Phase Select A	Meter Phase Select A
10	Meter Phase Select B	Meter Phase Select B
11	Remote Alarm #1	Remote Alarm #1
12	Remote Alarm #2	Remote Alarm #2
13	Remote Alarm #3	Remote Alarm #3
14	Remote Alarm #4	Remote Alarm #4
15	Remote Alarm #5	Remote Alarm #5
16	Remote Alarm #6	Remote Alarm #6
17	Reset Alarm/Fault	Reset Alarm/Fault
18	Enable VAR/PF Control	Enable VAR/PF Control
19	Unload Command	Unload Command
20	W Breaker Aux Contact	W Breaker Aux Contact
21	X Breaker Aux Contact	X Breaker Aux Contact
22	Y Breaker Aux Contact	Y Breaker Aux Contact
23	Z Breaker Aux Contact	Z Breaker Aux Contact
24	BaseLoad Select	Reset to Internal Load Setting
25	Reset to Internal Load Setting	Bus Segment A
26	Skip Idle Timer	Bus Segment B
27	Bus Segment A	Bus Segment C
28	Bus Segment B	Bus Segment D
29	Bus Segment C	-
30	Bus Segment D	-
31	Droop Track Select	-
32	KW De-Rate Select	-

Discrete Outputs

There are 12 discrete outputs. Some of which are preconfigured for a fixed function but the remaining may be configured as needed, depending on the EGCP-3 model. All twelve outputs are individually optically isolated. However, all twelve share a common power supply and return circuit. Each output uses a thermally protected MOSFET that will pulse the circuit if the current limit is exceeded. An over-current condition on one output will not affect the other outputs. The output will be pulsed continuously until the current requirement is reduced, allowing the output to operate normally again.

Table 2-18. Discrete Output Specifications

Number of channels	12
Output type	Low-side driver with short circuit and over voltage protection
Current drive rating	<200 mA
Discrete Output supply voltage	9-32 Vdc
Isolation voltage	500 Vac, all channels are isolated from the other I/O

An external 9–32 Vdc power source must be provided to source the circuit voltage switched by the EGCP-3. Due to circuit isolation, the external power supply common must be connected to the EGCP-3 terminal 23 as shown in the wiring diagrams below.

Preconfigured Outputs

The preconfigured outputs are set for a fixed function. They cannot be reprogrammed to another function. The operation of each is described in the appropriate section of the EGCP-3 Operation manual All the functions shown are energized to activate the function.

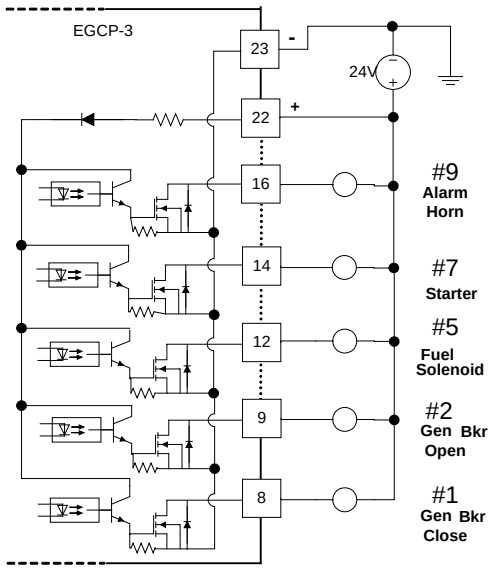


Figure 2-33. Discrete Output Wiring Diagram, Preconfigured

Configurable Outputs

The remaining discrete outputs may be reprogrammed to a function dependent on the application. The operation of each configurable function is described in the appropriate section of the EGCP-3 Operation manual. The diagram below shows the connection of indicator lamps, contactors, etc for the default configuration. The actual configuration may be different. All of the configurable discrete outputs may also be configured for normally energized or normally de-energized operation.

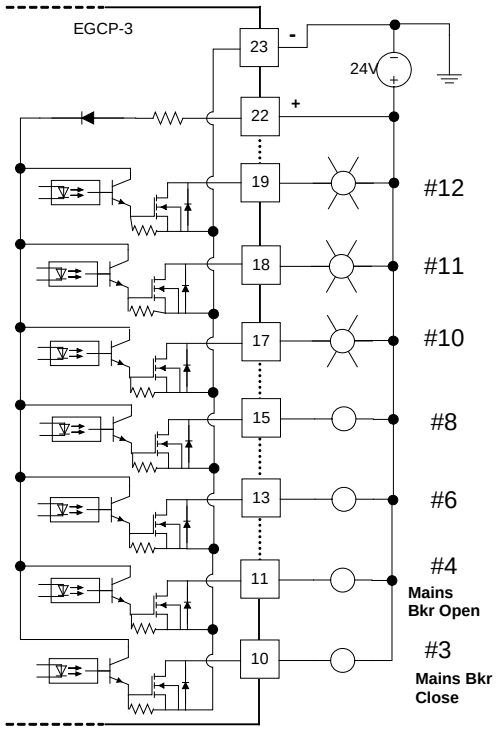


Figure 2-34. Discrete Output Wiring Diagram, Configurable

The following table shows the function (pre-assigned or optional) of the 12 Discrete Outputs:

Table 2-19. Discrete Output Functions

Discrete Output Channel # / Terminal	LS Output	MC Output
DO #1/8	Gen Breaker Close	O, D= 2
DO #2/9	Gen Breaker Open	O, D= 3
DO #3/10	O, D = 1	Mains Breaker Close Cmd
DO #4/11	O, D = 2	Mains Breaker Shunt Trip
DO #5/12	Fuel Valve Solenoid	O, D= 13
DO #6/13	O, D= 3	O, D= 4
DO #7/14	Starter Solenoid	O, D= 5
DO #8/15	O, D= 4	O, D= 12
DO #9/16	Alarm Horn	Alarm Horn
DO #10/17	O, D= 19	O, D= 18
DO #11/18	O, D= 20	O, D= 21
DO #12/19	O, D= 21	O, D= 22

“O” indicates an input can be configured for an item from the list below.
“D= x” indicates the default menu item (as shipped).

Table 2-20. Discrete Output LS and MC Definitions

Menu Item	LS	MC
1	Not Used	Not Used
2	Bus Bkr Shunt Trip	Group Breaker Close Command
3	Pre-Glow Command	Group Breaker Shunt Trip or Contactor Open/Close Command
4	Idle/Rated Command	Loss of Mains Detected
5	Air Shutoff Solenoid	KW-hr pulse
6	Spark Ignition Command	KVA-hr pulse
7	Speed Bias Raise	KVAR-hr pulse
8	Speed Bias Lower	Analog Alarm 1 Occurred
9	Voltage Bias Raise	Analog Alarm 2 Occurred
10	Voltage Bias Lower	Analog Alarm 3 Occurred
11	Engine Running	Analog Alarm 4 Occurred
12	KW-hr pulse	EPS Supplying Load
13	Analog Alarm 3 Occurred	KVA Switch
14	Analog Alarm 4 Occurred	Analog Pre-Alarm 1 Occurred
15	EPS Supplying Load	Analog Pre-Alarm 2 Occurred
16	KVA Switch	Analog Pre-Alarm 3 Occurred
17	Analog Pre-Alarm 3 Occurred	Analog Pre-Alarm 4 Occurred
18	Analog Pre-Alarm 4 Occurred	Visual Alarm
19	Visual Alarm	Soft Shutdown Initiated
20	Soft Shutdown Initiated	Hard Shutdown Initiated
21	Hard Shutdown Initiated	Load Shed Priority #1
22	LON Node Number Mismatch	Load Shed Priority #2
23	Loss Of Power (EGCP-3 is operational)	Load Shed Priority #3
24	—	Loss Of Power (EGCP-3 is operational)
25	—	LON Node Number Mismatch

Communication Ports

There are three serial ports on the EGCP-3. They may all be used simultaneously and may all be configured independently. Performance of any one port will depend on how many ports are in use and the port traffic. Ports 1 and 2 may be configured as RS-232, RS-422, or RS-485 to match the intended application. All ports are optically isolated from each other.

Any port configured as RS-232 will meet the RS-232C standard for communications. The wiring shall meet the requirements of EIA RS-232. This standard states a maximum cable length of 15 m (50 ft) with a total capacitance less than 2500 pF and a data rate not exceeding 56 kbps. All EGCP-3 serial ports may be configured for data rates up to 115 200 bps but may not function properly at this high data rate when a full 15 meters of cable length is used. Do not leave an RS-232 null modem cable attached to the EGCP-3 if it is removed from the PC, to avoid the possibility of EMC noise being introduced to the EGCP-3.

Any port configured as RS-422 or RS-485 meets the ANSI standards for this type of communications. The wiring shall be one continuous cable between nodes and shall meet the requirements of EIA RS-422 or EIA RS-485 for 500 kbps. However, one half of the cable length limits is recommended due to harsh environments typical of prime mover installations as follows:

Table 2-21. Communications Cable Specifications

Cable	Length	Example
Standard shielded twisted pair cable	30 m (100 ft)	
24 AWG, low-capacitance cable	75 m (250 ft)	Belden 9841
22 AWG, low-capacitance cable	120 m (400 ft)	Belden 3105A
20 AWG, low-capacitance cable	150 m (500 ft)	Belden 89207
Fiber optic cable with optical repeaters	> 150 m (500 ft)	

The last unit in the network chain, and only the last unit, should have its receiver terminated with a resistor. If the EGCP-3 is the last unit, installing jumpers as shown on the following diagrams may use the internal resistors

Configurable Port (Serial 1)

This port may be configured to use the Modbus RTU protocol or Woodward's Servlink protocol. If it is configured as a Modbus RTU port, it will have the same address as the port 2 Modbus port described below. However, although they share the same address, all messaging is independent and they are physically and electrically isolated.

The RS-232 port configuration is defaulted at 57.6 kbps, no parity, eight data bits, and one stop bit. The RS-422 and RS-485 port baud rate is shared with the RS-232 configuration and hence also defaults to 57.6 kbps.

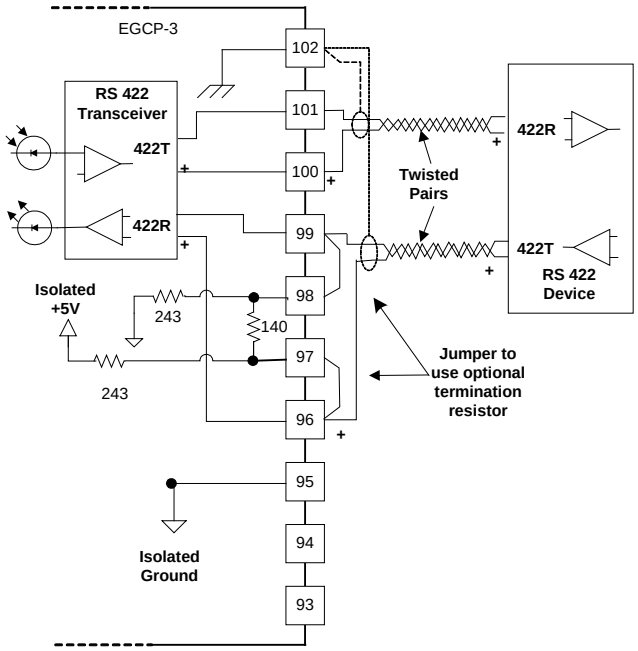


Figure 2-35. Serial 1 Wiring Diagrams, RS-422

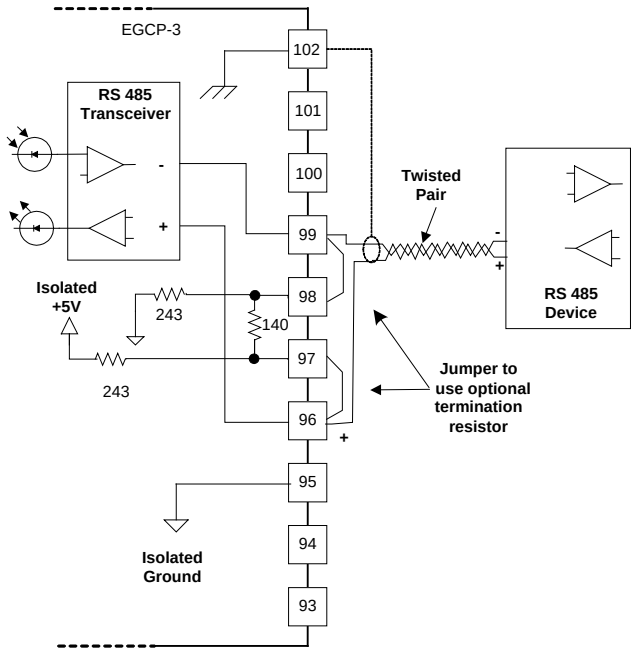


Figure 2-36. Serial 1 Wiring Diagrams, RS-485

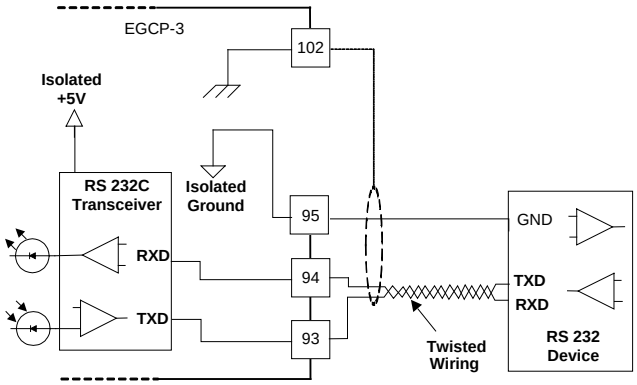


Figure 2-37. Serial 1 Wiring Diagrams, RS-232

Modbus Port (Serial 2)

This port may only be used as a Modbus RTU port. It will have the same address as the Serial 1 Modbus port described above, if that port is also configured to use Modbus. However, although they share the same address, all messaging is independent and they are physically and electrically isolated.

The port may be configured for RS-232, RS-422, or RS-485 by using the correct wiring connections and selecting the correct protocol mode. The RS-232 port configuration is defaulted at 9600 bps, no parity, 8 data bits, and 1 stop bit. The RS-422 and RS-485 port baud rate is shared with the RS-232 configuration and hence also defaults to 9600 kbps.

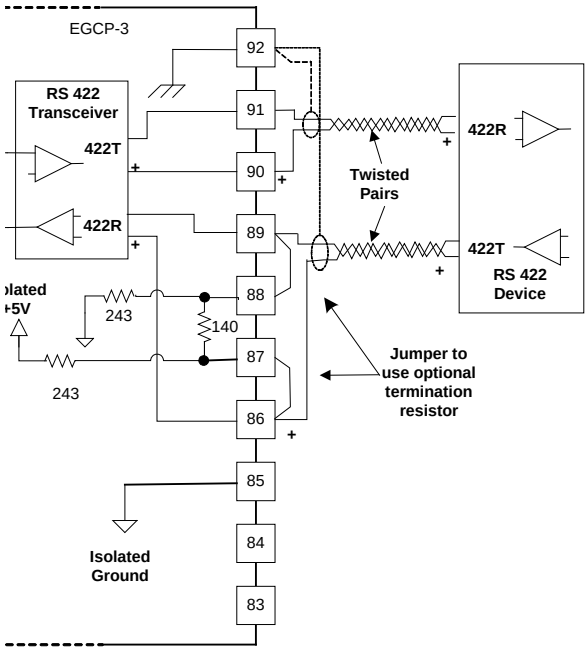


Figure 2-38. Serial 2 Wiring Diagrams, RS-422

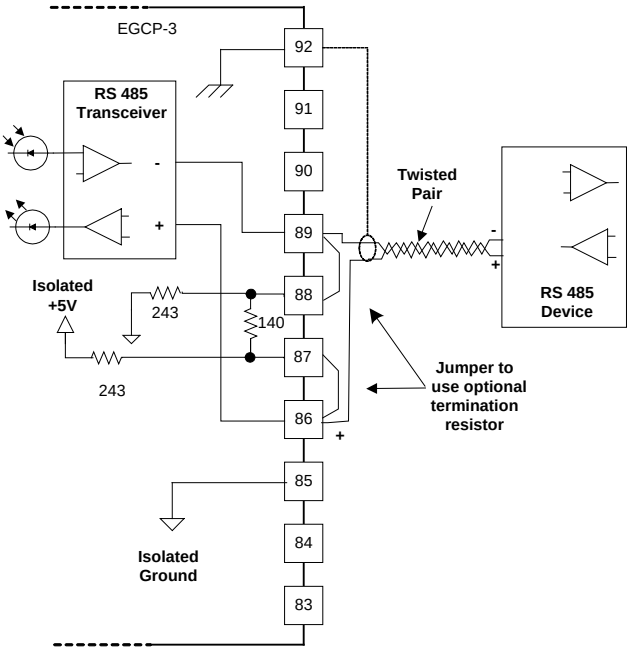


Figure 2-39. Serial 2 Wiring Diagrams, RS-485

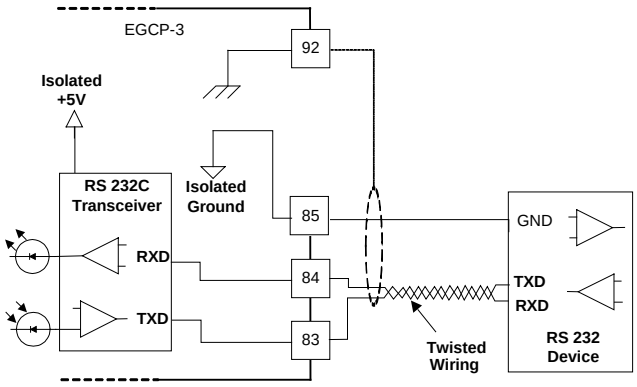


Figure 2-40. Serial 2 Wiring Diagrams, RS-232

RS-232 Configuration Port (Serial 3)

This port may only be used as a Woodward Servlink port. Its primary purpose is for configuration using a PC with Woodward's Watch Window. However, it may also be connected to a PC based HMI for local configuration and monitoring.

The port is fixed as an RS-232 port only. The RS-232 port configuration is defaulted at 115200 bps, no parity, 8 data bits, and 1 stop bit. A Null Modem cable must be used to connect to this port. The EGCP-3 has a standard DB-9 Female receptacle. It is best to use a metal shell connector at both ends with the shell connected to the cable shield but isolated from the ground signal wire. The shell of the 9-pin D-sub on the EGCP-3 is chassis grounded.

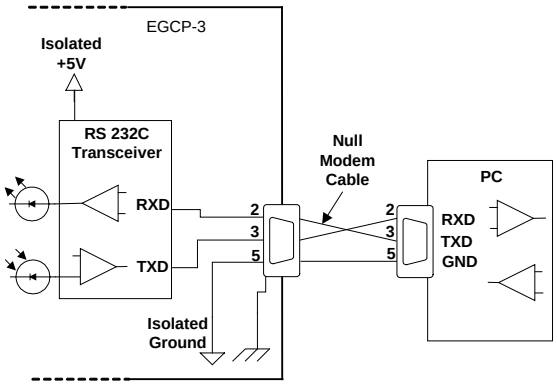


Figure 2-41. Serial 3 Wiring Diagram, RS-232

LON Communication Port

The LON port is used to communicate with up to 16 other EGCP-3 devices. The LON allows controls to share start/stop sequencing, breaker status, and load share information between generator sets. When connected to an optional Master Control (MC) the LON is used to control the operation and sequencing of the LS units. The LON communication is also compatible with Digital Synchronizer and Load Control (DSLC™) devices. When an EGCP-3 is the last device of the LON string, the termination jumper at 48 and 49 should be installed.

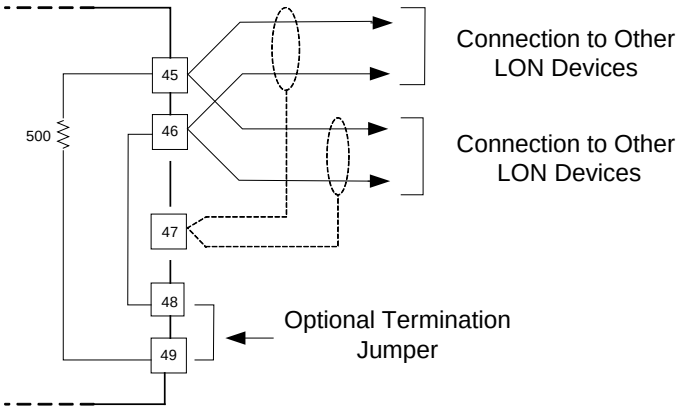


Figure 2-42. LON Connections

Use only recommended shielded cabling for LON network. Correct cable is available from Woodward, Belden, or other suppliers providing an equivalent cable.

Woodward part number 2008-349

Belden
PO Box 1980
Richmond IN 47375
Telephone (317) 983-5200

Belden Part Number	Description
• 9207	PVC 20 AWG shielded. NEC Type CL2, CSA Cert. PCC FT 1.
• 89207	Teflon 20 AWG shielded, Plenum version. NEC Type CMP, CSA Cert. FT 4.
• YR28867	PVC 22 AWG shielded.
• YQ28863	Plenum 22 AWG shielded.

Table 2-22. Recommended Cable Length and Stub Length of LON Network Wiring.

System Ambient Temperature Range:	0 to 55 °C	–20 to +55 °C	–40 to +55 °C
Maximum Network Cable Length:	150 m	150 m	50 m
Maximum Stub Length:	300 mm	300 mm	300 mm

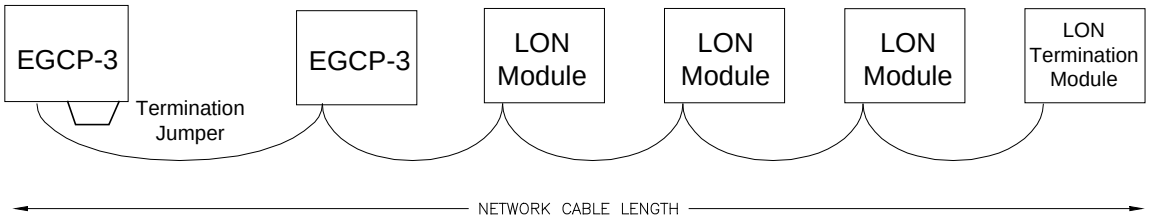


Figure 2-43. Direct Wired LON Network

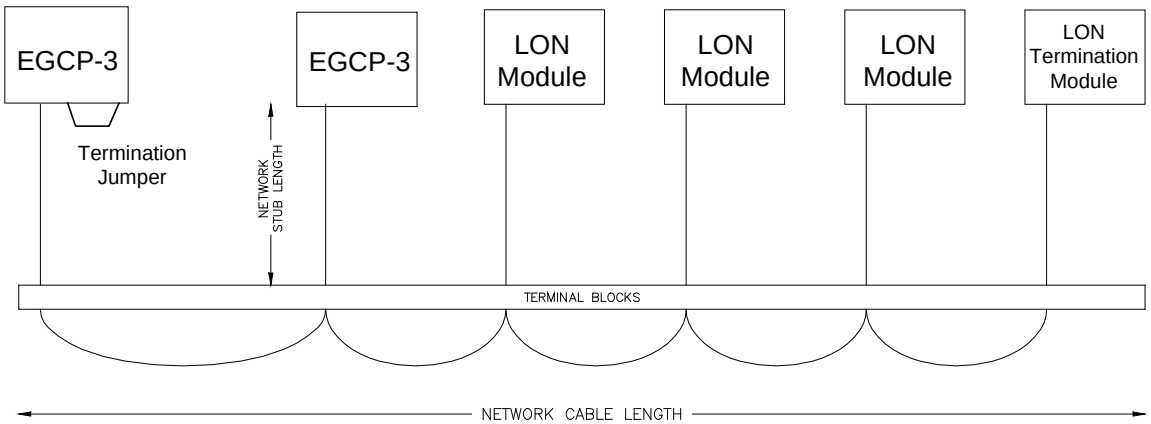


Figure 2-44. Stub Wired LON Network

Chapter 3.
Modbus Communications

General Information

The Serial 1 port is open to customer use for a variety of applications. It will communicate with the MODBUS RTU protocol or the Woodward Servlink protocol, and may be configured to do so using RS-232, RS-422, or RS-485 to match the customer's hardware. The Serial 2 port will only communicate with the MODBUS RTU protocol and may be configured to do so using RS-232, RS-422, or RS-485 to match the customer's hardware. This chapter addresses the Modbus functionality of serial port 1 and 2.

The Modbus ID (node address) may be configured to suit the customer's application. It is adjustable from 1 to 247. This address identifies the Modbus Slave to the Modbus Master. The Modbus address chosen for any particular EGCP-3 panel should be unique from any other devices on the Modbus network. This address is also used as the Modbus address when Serial 1 is configured as a Modbus port.

A Modbus Time-out is configurable from Watch Window. This item is the time, in seconds, which the EGCP-3 panel will wait before either receiving a valid message from the Modbus master, or indicating a Modbus failure. If Serial 1 is configured as a Modbus port, it will use the same timeout. An alarm can be configured to give an indication or shutdown when a Port Failure (failure to receive a valid message from the master) occurs. The Port Failure is a latching-type indication, and requires the Modbus Reset menu item to be toggled from True to False in order to reset. The Modbus Reset is located in the Communications service menu. It is used to reset any failures indicated on the Modbus serial communications, and also to restart the Modbus Time-out timer. The Modbus Reset should be left at FALSE, and only turned to TRUE to provide a reset action on the Modbus. Once the reset is accomplished, the Modbus Reset must be taken back to False once again. Reply Time-out, Delay, and Number of Retries for the Modbus Master must be configured to meet the requirements of the entire Modbus network and the devices communicating on that network. Both Serial 2 and Serial 1 will be reset (if Serial 1 is configured for Modbus) when a Reset is performed.

Both Serial 2 and Serial 1 ports will have access to the same data. The timeout, reset, and Modbus ID configurations are shared between Serial 1 and Serial 2.

All serial ports have independently configurable baud rates. They may only be configured from Watch Window. They support baud rates from 4800 baud to 115 200 baud. However, no two ports should be set to 115 200 simultaneously. Two or more ports may be set to 57 600 simultaneously.

The sections below describe what is found in the Modbus tables. The actual tables are found in Appendix D and E for the EGCP-3 LS and MC respectfully.

Communication Configuration

The configuration elements for the serial ports capable of Modbus are shown in the tables below.

Table 3-1. Configuration Elements for the Serial Ports Capable of Modbus

Item	Semantics	Min	Max	Default
Serial 1 Type	RS-232, RS-422, RS-485			RS-422
Serial 1 Mode	Modbus, Servlink	Modbus	Servlink	Modbus
Serial 1 Baud Rate	See table below	7	12	11
Serial 2 Type	RS-232, RS-422, RS-485			RS-485
Serial 2 Baud Rate	See table below	7	12	8
Serial Modbus ID	Module ID	1	247	1
Modbus Timeout	Seconds	0.1	20.0	3.0
Modbus Reset	True, False	True	False	False

Table 3-2. Configuration Elements for the Serial Ports Capable of Modbus (Continued)

Value	Baud Rate
12	115,200
11	57,600
10	38,400
9	19,200
8	9600
7	4800

Boolean Write

Using Modbus, it is possible for the master to send commands to the EGCP-3 slave. The commands that are allowed are shown in the Boolean Write table below. For safety, when changing the Mode Switch position over Modbus, the physical switch must be in the auto position; otherwise the EGCP-3 will not relinquish control to Modbus. All BW data are Boolean data types.

A physical discrete input will always take precedence over the Modbus command for that same function. The exception here is the Auto input of the mode switch must be maintained and the Modbus can select a different mode. When a Control mode or Load mode is selected, the last command will remain active until the disable command is received. The control will select the OFF mode, until the external switch is moved, or another mode is enabled through Modbus. The last synchronizer mode selected from the HMI or Modbus will remain the active mode.

A command to raise or lower voltage/speed will be treated as if it were a physical digital input. A raise/lower command is given as long as the switch input is “True”, and turned off when the next Modbus write indicates a “False”. If another Modbus write is not seen within 1 second, the command is considered “False”.

Boolean Read

The Boolean read table contains Boolean values such as alarm states, digital inputs status, etc. The interpretation of a 0 or 1 in response is indicated in the semantics field. Functions that appear to indicate a physical switch position will indicate the functional position even if not mapped to a physical I/O point. All BR data is Boolean data type.

Alarm states indicate ‘Active’ when the alarm conditions have been met unless that alarm is configured for “disabled”. An alarm condition could become active and deactivate again within a single Modbus update time depending on the frequency at which the master is polling. Therefore, to avoid confusion, all alarm conditions will be latched for one second or one Modbus poll cycle after the occurrence of the alarm (whichever comes first) as seen from Modbus. If the alarm condition no longer exists after this poll cycle, the Modbus alarm indication will reset to ‘Not Active’ as the alarm condition is no longer true.

Analog Read

The analog read table contains integer values such as Voltages, Currents, etc that are scaled to eliminate decimal places. The scaling (if any) is described in the scale field. Minimum and maximum values indicated are shown with scaling. Values with scaling have been multiplied by the value indicated before being transmitted, and should be divided by the same scale value (by the receiving device) in order to represent the actual value. A blank in this column is a scale of 1.0. Some scaled values are scaled by the value in another parameter, and flagged by “Note A” through “Note F”. The Notes at the end of the table gives the address (30xxx) of the scale to use for the flagged values. Those special cases are individually described or described in the Units section following the table. All AR data is integer data type (16-bits, signed).

The definitions of values used to communicate the Mode, State and Alarm Action of the EGCP-3 are also described. The semantics column will flag the table containing the applicable definition.

Analog Write

The analog write table contains integer values such as load references or process references that are scaled to eliminate decimal places. The scaling (if any) is described in the scale field. Minimum and maximum values indicated are shown with scaling. All AW data is integer data type (16-bits, signed) and must be sent as such. Data sent to a scaled address must first be multiplied by the indicated amount because the EGCP-3 will divide the value by the indicated amount upon receipt.

Enumerated Lists

The following lists and tables define the enumerated values and their respective definition. These values are used by an HMI for display of representative wording for the function, mode, or state being displayed.

Units

All metered voltage, current, and power values are provided without scaling and need to be multiplied by a scaling value. The scaling is dependent on the units for the measured parameter. For example, if the units are ‘kilo’, the parameter should be multiplied by 1000 to represent the actual value (KW, KV, KA). If the units are ‘Mega’, the parameter should be multiplied by 1 000 000 to represent the actual value.

All values that report voltage will use the same units as defined by the voltage units.

All values that report current will use the same units as defined by the current units.

All power values (Watts, VAR, VA) will use the same units as defined by the power units.

Table 3-3. Units Value, Modifier, and Definition

Unit Value	Unit Modifier	Units Definition
1	None	No scaling
2	Kilo	Multiply by 1000
3	Mega	Multiply by 1 000 000
4	Giga	Multiply by 1 000 000 000

Alarm Action Definition (LS)

The alarm actions are simply the selected action or response for the given alarm. The action can be configured by the front panel or Servlink/WW. The actions cannot be changed through Modbus, but its configuration may be read.

Table 3-4. LS Value, Definition, and Display

Value	Alarm Actions Definition	Display	Notes
8	Loss of Mains With Alarm	LOM w/Alarm	Initiates LOM engine start, adds an event to the alarm list.
7	Loss of Mains	LOM	Initiates an LOM start, no alarm is added to the alarm list
6	Hard Shutdown	Hard Shutdown	Engine is shutdown immediately, same as an Emergency Shutdown
5	Soft Shutdown	Soft Shutdown	Non-critical shutdown, smooth unload, cooldown, then shutdown
4	Audible Alarm	Audible Alarm	A discrete output will be given, connected to an external audible device, An acknowledge from ALARM CLEAR will turn this output off.
3	Visual Alarm	Visual Alarm	A discrete output will be given, connected to an external visual indication device. This is not effected by an Acknowledge
2	Warning	Warning	An event will be shown on the alarm list only
1	Disabled	Disabled	No Action will be taken

Alarm Action Definition (MC)

The alarm actions are simply the selected action or response for the given alarm. The action can be configured by the front panel or Servlink/WW. The actions cannot be changed through Modbus, but its configuration may be read.

Table 3-5. MC Value, Definition, and Display

Value	Alarm Actions Definition	Display	Notes
8	Loss of Mains With Alarm	LOM w/Alarm	Initiates LOM engine start, adds an event to the alarm list.
7	Loss of Mains	LOM	Initiates an LOM start, no alarm is added to the alarm list
6	Trip Mains Breaker	Trip Mains Breaker	Mains breaker is immediately opened
5	Stop All Engines	Stop All Engines	A Stop All command is sent to all LS units that are Stop Ready
4	Audible Alarm	Audible Alarm	A discrete output will be given, connected to an external audible device, An acknowledge from ALARM CLEAR will turn this output off.
3	Visual Alarm	Visual Alarm	A discrete output will be given, connected to an external visual indication device. This is not effected by an Acknowledge
2	Warning	Warning	An event will be shown on the alarm list only
1	Disabled	Disabled	No Action will be taken

Synchroscope Definition

Phase Angle: The Phase Angle reading is a value from 0 (phase matched at 12:00 on a synchroscope) to ±180 degrees. Negative degree measurements occur in the right half of the synchroscope, while positive degree measurements occur in the left half of the synchroscope. Therefore, a generator with a positive slip frequency (clockwise synchroscope rotation) would display a sequence of numbers such as ….0, –30, –60, –90, –120, –150, –180, 150, 120, 90, 60, 30, 0....

Synchronizer Mode Definition

The Synchronizer has a selected mode for how it will operate. In order to communicate to a user and to external equipment, the mode will be provided in an enumerated list.

Table 3-6. Sync Mode Definition

Value	Sync Mode Definition
0	Error
1	Off
2	Permissive
3	Check
4	Run

Error = This state should not occur. If it does, there is a problem.
Off-Permissive-Check-Run = This is the selected operation mode of the synchronizer. See the Synchronizer section in the Operation Manual for details.

Synchronizer State Definition

During genset operation, the synchronizer will perform numerous actions. Each action is a state. In order to communicate to a user and to external equipment, the state will be provided in an enumerated list. The display will show the words, but communication links will provide the values.

Table 3-7. Sync State Definition

Value	Sync State Definition
0	Error
1	Off
2	In Synch
3	Synchronizing Generator
4	Synchronizing Mains
5	Gen Stable Timer
6	Mains Stable Timer

- Error = This state should not occur. If it does, there is a problem.
- Off = The generator is off or the breaker is closed so synchronization is not needed.
- In Sync = Gen Breaker/Mains Breaker Closed Successfully, and held for synch timer.
- Synchronizing Generator = The generator is being actively synchronized to the bus/mains.
- Synchronizing Mains = The generator is being actively synchronized to a returned mains.
- Gen Stable Timer = Waiting for timer to expire.
- Main Stable Timer = Waiting for timer to expire.

Genset State Definition

The genset mode represents the present selected operation of the system.
The mode will represent why or what the genset is presently doing.

Table 3-8. Genset State Definition

Value	Genset State	Displayed State
0	Error	ERROR
1	Off	OFF
2	Test Engine	TEST ENGINE
3	Test ATS	TEST ATS
4	Run with Load	RUN WITH LOAD
5	Auto	AUTO
6	Mains Demand	MAINS DEMAND
7	Peak Timer	PEAK TIMER
8	Loss of Mains	LOM START
9	Network Start	NET START

- Off = The Test/Run/Auto switches are all off.
- Test Engine = The Test switch (only) was asserted and the engine is running in Droop.
- Test ATS = The Test and Auto switches were asserted so the ATS is performing a test either OT or CT depending on its configuration.
- Run with Load = The Run switch (only) was asserted and the engine is running either in Droop (gen breaker only is closed) or Baseload/Process (the mains breaker was manually closed) or Load Share if an LS with other units present.
- Auto = The Auto switch (only) is asserted and the EGCP-3 is waiting for a LOM, Demand, or the Demand timer.
- Mains Demand = The engine started due to a high load demand.
- Peak Timer = The engine started due to a configured peaking time.
- Loss of Mains = The engine started due to a Loss of Mains condition.
- Network Start = The engine started due to a start command from another EGCP-3

Engine Control State Definition

The Engine Controller goes through multiple states when starting or stopping the engine. In order to communicate to a user and to external equipment, these states will be provided in an enumerated list.

Table 3-9. Engine Control State Definition

Value	State	Displayed State
0	Error	ERROR
1	Disabled	DISABLED
2	Off	OFF
3	Preglow	PREGLOW
4	Crank	CRANK
5	Run	RUN
6	Cooldown	COOLDOWN
7	Spindown	SPINDOWN
8	Retry	RETRY
9	Idle	IDLE

- Error = This state should not occur. If it does, there is a problem.
- Disabled = The engine controller is disabled in the configuration, Start/Stop logic is external to the EGCP-3.
- Off = The engine is off (can be due to an alarm, the control switch, or Modbus).
- Preglow = During a start routine, the preglow prior to crank is active.
- Crank = The starter motors are being engaged.
- Run = The starter motors are disengaged and the engine is running at rated speed.
- Cooldown = The cooldown timer is running.
- Spindown = The fuel solenoid is “off” and the engine is coasting to a stop.
- Retry = The engine controller is waiting for the crank retry timer to expire before attempting another start. The last start failed.
- Idle = The engine is waiting at idle for the idle timer to expire before going to rated. This state only occurs during start. If the engine is told to idle during cooldown, the state will show cooldown.

Real Load Mode Definition

The Real Load Controller has a configured mode for how it will control load, as do the Process Controller, the ATS controller, and the Peaking Controller. Since the resulting load mode is dependent on all of these, the Load Mode reported to the user has more definition than just the Load Mode Configuration setting by itself. In order to communicate to a user and to external equipment, the combined mode will be provided in an enumerated list.

Table 3-10. Real Load Mode Definition

Value	Load Control Mode Definition
0	Error
1	Off
2	Droop
3	Isochronous
4	BaseLoad
5	Import/Export Process
6	Temp/Press Process
7	Remote Process
8	Peaking
9	Remote BaseLoad
10	Remote Import/Export Process
11	Load Share
12	Process Slave

- Error = This mode should not occur. If it does, there is a problem.
- Off = The load controller is off because the engine is off.
- Droop = Droop Load Control Setpoint Selected and Generator on load.
- Isochronous = Normal or Soft Transfer Load Control Setpoint Selected, and Gen CB is closed, but not in parallel with mains.
- Baseload = Gen on load and in parallel with mains at the internal configured kW level.
- Import/Export Process = Controlling KW and KVAR in Import/Export mode.
- Temp/Press Process = Controlling using Temperature or Pressure Process input.
- Remote Process = Controlling based on Temperature/Pressure process input and a process reference from elsewhere.
- Peaking = Controlling based on demand level.
- Remote BaseLoad = Controlling in parallel with the mains to a reference provided on an analog input.
- Remote Import/Export Process = Controlling based on calculated Import/Export levels and a process reference from elsewhere.
- Load Share = 2 or more units are sharing real load, not paralleled to mains. Not used in MC.
- Process Slave = An LS unit is closed to the same bus as another EGCP-3 in the process mode. The first unit on the bus is the process master, it's Load Control mode is Process Control.

Reactive Load Mode Definition

The Reactive Load Controller has a configured mode for how it will operate. However, the process controller and load share controllers may override this with a mode of their own. In order to communicate to a user and to external equipment, the mode will be provided in an enumerated list. The display will show the words, but communication links will provide the values.

Table 3-11. Reactive Load Mode Definition

Value	Load Control Mode Definition
0	Error
1	Off
2	Voltage Trim
3	PF Sharing (not used)
4	PF Control
5	KVAR Control
6	Remote KVAR/PF Control
7	Manual
8	Import/Export PF
9	Import/Export VAR

- Error = This mode should not occur. If it does, there is a problem.
- Off = The reactive load controller is off, voltage bias output is zero.
- Voltage Trim = The EGCP-3 is trimming voltage to rated. The regulator is assumed to be using Droop if in parallel.
- PF Sharing = This state is not used in this version of the EGCP-3.
- PF Control = Gen in parallel with mains and EGCP-3 is biasing to control PF.
- KVAR Control = Gen in parallel with mains and EGCP-3 is biasing to control KVAR.
- Remote Control = EGCP-3 is responsible for biasing the regulator but another device is doing the control.
- Manual = A manual override is selected so the user controls voltage bias using panel raise/lower switches.
- Import/Export PF = The process controller is actively controlling imp/exp levels and the mode was configured for PF control.
- Import/Export VAR = The process controller is actively controlling imp/exp levels and the mode was configured for VAR control.

Load Control State Definition

Both the Real and Reactive Load Controllers have a selected mode of operation. During operation, the controllers will perform numerous actions regardless of the controlling mode. Each action is a state. In order to communicate to a user and to external equipment, the state will be provided in an enumerated list. There is a separate state for the Real and Reactive load controllers but both uses the same enumeration.

Table 3-12. Load Control State Definition

Value	Load Control State Definition
0	Error
1	Ramping Up
2	Pause
3	Ramping Down
4	At Reference
5	Off / Auto
6	Manual

- Error = This state should not occur. If it does, there is a problem.
- Off / Auto = The engine is stopped so the load controller does not need to function.
- Ramping Up = The load is being automatically or manually increased at the configured ramp rate.
- Pause = A user has manually (or through Modbus) stopped a load ramp.
- Ramping Down = The load is being automatically or manually decreased at the configured ramp rate.
- At Reference = The load has reached the configured level and is tracking.
- Manual = The load controller was placed in a manual mode and load is being controlled by external inputs.

ATS State Definition

The ATS has a configured mode for how it will transfer load. During the transfer of load, the ATS controller will perform numerous actions. Each action is a state. In order to communicate to a user and to external equipment, the state will be provided in an enumerated list.

Table 3-13. ATS State Definition

Value	ATS State Definition
0	Error
1	LOM Delay
2	Starting
3	Gen Delay
4	Fast Delay
5	Mains Delay
6	Running
7	Stopping
8	Synchronizing
9	Off / Auto

- Error = This state should not occur. If it does, there is a problem.
- LOM Delay = currently waiting for the LOM delay timer to expire.
- Starting = currently starting the engine.
- Gen Delay = currently waiting for the Gen Stable delay timer to expire.
- Fast Delay = currently waiting for the Fast Transfer delay timer to expire.
- Mains Delay = currently waiting for the Mains Stable delay timer to expire.
- Running = Genset supplying the load.
- Stopping = Engine has been told to stop – may be in cooldown.
- Synchronizing = Delay timers may be expired but synchronism is not achieved yet.
- Off / Auto = Waiting for a reason to start or configured Off.

Chapter 4.
Servlink Server

General Information

The EGCP-3 has two ports that may be used as Woodward Servlink servers. Serial 3 port is fixed as a Servlink only port. This is the port that is intended to be used for configuration and must be used for downloading an application or saved configuration. It is also fixed as a RS-232 port since configuration and download are done from a PC. A standard DB-9 serial connection is provided.

The Serial 1 port is open to a variety of applications. It will communicate with the Modbus RTU protocol or the Woodward Servlink protocol and may be configured to do so using RS-232, RS-422, or RS-485 to match the customer's hardware. This port can be used to communicate with a PC, PLC, an HMI, or distributed I/O. This chapter addresses only the Servlink functionality.

Configuration through Servlink

Watch Window is the PC based configuration program that is used to configure the EGCP-3. Watch Window Standard is shipped with the EGCP-3. All configurable parameters that may be configured through the front panel are also available in Watch Window. There are also additional configurable parameters available in Watch Window that are not present on the front panel display.

The organization of tunable parameters is important because of their large number and because of the front panel display. Parameters are separated into Configure and Service blocks. All parameters that should not be changed while the engine is running are placed in Configure blocks. Configure blocks require IO lock to be set in order to allow changes in a parameter. IO Lock is a state of the EGCP-3 processor that causes all of the outputs to be in their "off" condition, and inputs are not monitored. The Front panel display "First Time Startup" menu items require that the engine speed be zero before allowing items to be tuned. The EGCP-3 does not need to be in IO Lock to tune items in this menu from the front panel. All other Watch Window menu tunable parameters are provided in Service Blocks.

NOTICE

Servlink allows access to its parameters through a serial port without password or security restrictions. Access to the Servlink connected devices should be limited as necessary for the individual installation.

The Service and Configure blocks are designed to mimic the front panel display menu structure as much as possible. This structure allows you to use the Quick Configure feature of Watch Window to create logical and manageable sheets (tabs) of parameters. The grouping of items in a Watch Window sheet is the same as the grouping on the front panel display menus. The table below indicates the sheets that are created by a Quick Configure agent.

The order of the sheet names is important to match the front panel order, which is why all menus are preceded with a symbol and letter. These allow Watch Window to use an alphabetical order to sort the sheets logically.

Table 4-1. Sheet Names

Sheet Names	Comments / Function
A# FIRST TIME CONFIG ##	System Configuration values
B# DIGITAL INPUTS ##	Define Function of Configurable Discrete Inputs
C# RELAY OUTPUTS ##	Define Function of Configurable Relay Driver Outputs

Table 4-2. Service Sheet Names

Service Sheet Names	Comments / Function
A ENGINE PROTECTION	Engine Protection Setup
B SHUTDOWN AND ALARMS	Define Alarm Thresholds
C GENERATOR PROTECTION	Define Generator Trip Levels
D MAINS (BUS) PROTECTION	Define Mains (or Bus) Trip Levels
E ENGINE CONTROL	Setup Engine Start Sequence
F SYNCHRONIZER	Define Synchronizer operating Parameters
G REAL LOAD CONTROL	Set Load Control Parameters
H REACTIVE LOAD CNTRL	Set Reactive Load Control Parameters
I PROCESS CONTROL	Define Process Control Function, Parameters
J TRANSFER SWITCH	Define ATS Mode and Timing
K SEQUENCING	Setup Auto Start/Stop parameters (LS Only)
L COMMUNICATIONS	Serial Port Setup Values
M CALIBRATION	Set Clock and Hardware Input/Output Calibration
N REMOTE ALARM INPUTS	Set Remote Discrete Input Alarm Functions and Labels
O FORCE RELAYS	Enables test and manual operation of Discrete Outputs
P ANALOG OUTPUTS	Define Function and Scaling of Analog Outputs
Q ANALOG INPUTS	Define Function and Scaling of Analog Inputs
R STATUS STRING LANGUAGE	User Entered Labels for Status Screens (2nd Language)
S ALARM STRING LANGUAGE	User Entered Labels for Alarm Screens (2nd Language)
T REMOTE CONTROL	Monitor Servlink Parameters
U SEQUENCE STATES	Use to Observe the State of the EGCP-3 Sequence
V UNITS	Displays the Units (KW, MW) of the System
STATUS01- SYSTEM	Displays the System Operating Status and Values
STATUS02- ENGINE	Display the Engine Operating Status
STATUS03- GENERATOR	Displays the Generator Operation Values
STATUS04- MAINS	Observe the Mains Operation Values
STATUS05- I/O	Displays EGCP-3 Inputs and Outputs
STATUS06- SYNCHRONIZER	Displays Synchronizer States
STATUS07- KW LOAD	Displays Load Control Values and Status
STATUS08- PF / KVAR	Displays VAR/PF control Values and Status
STATUS09- ATS	Displays Breakers Position and Bus Status (Not in LS units)
STATUS09- SEQUENCE	Displays Genset Auto Start/Stop Status
STATUS10- ALARMS	Displays Order of Alarm Occurrence and Times

Due to the nature of how parameters are configured through Watch Window, some parameters will be configured by changing a value from an enumerated list as seen in the previous chapter. In these cases there will also be a monitor-only text string returned directly below the tunable parameter showing the action selected. The Watch Window string will be the same string as shown on the EGCP-3 display when this parameter is configured from the front keypad. In some cases, an appropriate monitored data value is also included on the same sheet. Monitored parameters to assist with troubleshooting are available on the status screens in Watch Window. These status parameters are also available from the EGCP-3 front display panel.

The front panel and Watch Window menus will not be presented in this chapter. See the appropriate chapters in the Operation Manual for configuration and monitoring details.

Servlink Data

Note: Information in this section is NOT required to use Woodward Watch Window software for configuration and monitoring.

When the application requires monitoring and tuning of the genset parameters by an external computer device, Servlink is required for that communication. When serial 1 port is used as a Servlink port, it will serve monitoring data to a local HMI that can be used as the main user interface. Since these applications may have the front panel display hidden, all front panel data are available through the Servlink port as well as other useful data. This port will also allow remote start/stop control provided the EGCP-3 control switch is in the Auto position.

Serial port 3 may also be used to drive a local HMI, but it is generally recommended to leave serial port 3 available for configuration.

The available data is provided below in tables split by data type and read/write status. The Woodward Servlink server must be running on the connected PC in order for this data to be available to an application on the same PC. The server provides the data in DDE format. The Servlink ID in the tables below is the DDE address for the data.

Table 4-3. Boolean Status Data

Item	Semantics	Servlink ID
PF Leading/Lagging Indicator	0=Lag, 1=Lead	MBUS_BR.BR_V_71.B_NAME
Gen Sensing Type	0=1phase, 1=3phase	MBUS_BR.BR_V_76.B_NAME
Generator Sense Configuration	0=Wye (L-N), 1=Delta (L-L)	MBUS_BR.BR_V_70.B_NAME
Mains Sensing Type	0=1phase, 1=3phase	MBUS_BR.BR_V_77.B_NAME
Mains Sense Configuration	0=Wye (L-N), 1=Delta (L-L)	MBUS_BR.BR_V_78.B_NAME
KVA-hr pulse	0=Not Active, 1=Active	MBUS_BR.BR_V_151.B_NAME
KVAR-hr pulse	0=Not Active, 1=Active	MBUS_BR.BR_V_152.B_NAME
KW-hr pulse	0=Not Active, 1=Active	MBUS_BR.BR_V_150.B_NAME
KVA Switch Status	0=Off, 1=On	MBUS_BR.BR_V_163.B_NAME
Generator Output Stable	0=False (wait for timeout), 1=True	MBUS_BR.BR_V_69.B_NAME
Mains Stable Indication	0=Not stable (waiting for timeout), 1=Stable	MBUS_BR.BR_V_2.B_NAME
Visual Alarm Status	0=No Alarms, 1=Active Alarm	MBUS_BR.BR_V_11.B_NAME
Loss of Mains Alarm Status	0=Mains OK, 1=LOM detected	MBUS_BR.BR_V_5.B_NAME
Voltage Range Alarm Status	0=No Alarm, 1=Active Alarm	MBUS_BR.BR_V_37.B_NAME
Speed Range Alarm Status	0=No Alarm, 1=Active Alarm	MBUS_BR.BR_V_72.B_NAME
Load Surge Status	0=No Alarm, 1=Active Alarm	MBUS_BR.BR_V_63.B_NAME
Process Low Limit Status	0=No Alarm, 1=Active Alarm	MBUS_BR.BR_V_56.B_NAME
Process High Limit Status	0=No Alarm, 1=Active Alarm	MBUS_BR.BR_V_55.B_NAME
Load Low Limit Status	0=No Alarm, 1=Active Alarm	MBUS_BR.BR_V_54.B_NAME
Load High Limit Status	0=No Alarm, 1=Active Alarm	MBUS_BR.BR_V_53.B_NAME
Speed/Freq Mismatch Status	0=No Alarm, 1=Active Alarm	MBUS_BR.BR_V_42.B_NAME
Over Speed Status	0=No Alarm, 1=Active Alarm	MBUS_BR.BR_V_38.B_NAME
Sync Reclose Status	0=Not Active, 1=Active Alarm	MBUS_BR.BR_V_35.B_NAME
Sync Timeout Status	0=No Alarm, 1=Active Alarm	MBUS_BR.BR_V_34.B_NAME
Phase Rotation Mismatch	0=No Alarm, 1=Active Alarm	MBUS_BR.BR_V_161.B_NAME
Sanity Check Error	0=No Alarm, 1=Active Alarm	MBUS_BR.BR_V_162.B_NAME
Discrete Input 1	State of hardware input	IO.DI_01.B_NAME

Item	Semantics	Servlink ID
Discrete Input 2	State of hardware input	IO.DI_02.B_NAME
Discrete Input 3	State of hardware input	IO.DI_03.B_NAME
Discrete Input 4	State of hardware input	IO.DI_04.B_NAME
Discrete Input 5	State of hardware input	IO.DI_05.B_NAME
Discrete Input 6	State of hardware input	IO.DI_06.B_NAME
Discrete Input 7	State of hardware input	IO.DI_07.B_NAME
Discrete Input 8	State of hardware input	IO.DI_08.B_NAME
Discrete Input 9	State of hardware input	IO.DI_09.B_NAME
Discrete Input 10	State of hardware input	IO.DI_10.B_NAME
Discrete Input 11	State of hardware input	IO.DI_11.B_NAME
Discrete Input 12	State of hardware input	IO.DI_12.B_NAME
Discrete Input 13	State of hardware input	IO.DI_13.B_NAME
Discrete Input 14	State of hardware input	IO.DI_14.B_NAME
Discrete Input 15	State of hardware input	IO.DI_15.B_NAME
Discrete Input 16	State of hardware input	IO.DI_16.B_NAME
Discrete Output 1	State of hardware output	IO.DO_01.B_NAME
Discrete Output 2	State of hardware output	IO.DO_02.B_NAME
Discrete Output 3	State of hardware output	IO.DO_03.B_NAME
Discrete Output 4	State of hardware output	IO.DO_04.B_NAME
Discrete Output 5	State of hardware output	IO.DO_05.B_NAME
Discrete Output 6	State of hardware output	IO.DO_06.B_NAME
Discrete Output 7	State of hardware output	IO.DO_07.B_NAME
Discrete Output 8	State of hardware output	IO.DO_08.B_NAME
Discrete Output 9	State of hardware output	IO.DO_09.B_NAME
Discrete Output 10	State of hardware output	IO.DO_10.B_NAME
Discrete Output 11	State of hardware output	IO.DO_11.B_NAME
Discrete Output 12	State of hardware output	IO.DO_12.B_NAME
Test DI Status	0=Floating/Grounded, 1=Active	MBUS_BR.BR_V_19.B_NAME
Run DI Status	0=Floating/Grounded, 1=Active	MBUS_BR.BR_V_20.B_NAME
Auto DI Status	0=Floating/Grounded, 1=Active	MBUS_BR.BR_V_18.B_NAME
Process Control DI Status	0=Floating/Grounded, 1=Active	MBUS_BR.BR_V_27.B_NAME
Emergency Stop DI Status	0=No Alarm, 1=Active Alarm	MBUS_BR.BR_V_137.B_NAME
Enable VAR/PF Control DI Status	0=Floating/Grounded, 1=Active	MBUS_BR.BR_V_142.B_NAME
Gen Breaker Aux. DI Status	0=Open, 1=Closed	MBUS_BR.BR_V_25.B_NAME
Load Ramp Pause DI Status	0=Floating/Grounded, 1=Active	MBUS_BR.BR_V_138.B_NAME
Mains Breaker Aux. DI Status	0=Open, 1=Closed	MBUS_BR.BR_V_26.B_NAME
Meter Phase Select A DI Status	0=Floating/Grounded, 1=Active	MBUS_BR.BR_V_139.B_NAME
Meter Phase Select B DI Status	0=Floating/Grounded, 1=Active	MBUS_BR.BR_V_140.B_NAME
Reset Alarm/Fault DI Status	0=Floating/Grounded, 1=Active	MBUS_BR.BR_V_141.B_NAME
Unload Command DI Status	0=Floating/Grounded, 1=Active	MBUS_BR.BR_V_143.B_NAME
Speed Lower DI Status	0=Floating/Grounded, 1=Active	MBUS_BR.BR_V_24.B_NAME
Speed Raise DI Status	0=Floating/Grounded, 1=Active	MBUS_BR.BR_V_23.B_NAME
Voltage Lower DI Status	0=Floating/Grounded, 1=Active	MBUS_BR.BR_V_22.B_NAME
Voltage Raise DI Status	0=Floating/Grounded, 1=Active	MBUS_BR.BR_V_21.B_NAME
Remote Fault #1 DI Status	0=Floating/Grounded, 1=Active	MBUS_BR.BR_V_28.B_NAME
Remote Fault #2 DI Status	0=Floating/Grounded, 1=Active	MBUS_BR.BR_V_29.B_NAME

Item	Semantics	Servlink ID
Remote Fault #3 DI Status	0=Floating/Grounded, 1=Active	MBUS_BR.BR_V_30.B_NAME
Remote Fault #4 DI Status	0=Floating/Grounded, 1=Active	MBUS_BR.BR_V_31.B_NAME
Remote Fault #5 DI Status	0=Floating/Grounded, 1=Active	MBUS_BR.BR_V_32.B_NAME
Remote Fault #6 DI Status	0=Floating/Grounded, 1=Active	MBUS_BR.BR_V_33.B_NAME
Remote Fault1 Status	0=No Alarm (or waiting for timeout), 1=Active Alarm	MBUS_BR.BR_V_57.B_NAME
Remote Fault2 Status	0=No Alarm (or waiting for timeout), 1=Active Alarm	MBUS_BR.BR_V_58.B_NAME
Remote Fault3 Status	0=No Alarm (or waiting for timeout), 1=Active Alarm	MBUS_BR.BR_V_59.B_NAME
Remote Fault4 Status	0=No Alarm (or waiting for timeout), 1=Active Alarm	MBUS_BR.BR_V_60.B_NAME
Remote Fault5 Status	0=No Alarm (or waiting for timeout), 1=Active Alarm	MBUS_BR.BR_V_61.B_NAME
Remote Fault6 Status	0=No Alarm (or waiting for timeout), 1=Active Alarm	MBUS_BR.BR_V_62.B_NAME
Air Shutoff DO Status	0=Not Active, 1=Active	MBUS_BR.BR_V_148.B_NAME
Alarm Horn DO Status	0=Not Active, 1=Active	MBUS_BR.BR_V_145.B_NAME
Engine Crank DO Status (Starter)	0=Not Active, 1=Active	MBUS_BR.BR_V_10.B_NAME
Engine Preglow DO Status	0=Not Active, 1=Active	MBUS_BR.BR_V_8.B_NAME
Engine Running DO Status	0=Not Active, 1=Active	MBUS_BR.BR_V_149.B_NAME
Fuel Solenoid DO Status	0=Not Active, 1=Active	MBUS_BR.BR_V_9.B_NAME
Gen Breaker Close DO Status	0=Open, 1=Closed	MBUS_BR.BR_V_7.B_NAME
Gen Breaker Shunt Trip DO Status	0=Not tripped, 1=Tripped	MBUS_BR.BR_V_15.B_NAME
Hard Shutdown DO Status	0=Not Active, 1=Active	MBUS_BR.BR_V_147.B_NAME
Idle/Rated DO Status	0=Idle, 1=Rated	MBUS_BR.BR_V_17.B_NAME
Ignition Command DO Status	0=Not Active, 1=Active	MBUS_BR.BR_V_144.B_NAME
Mains Breaker Close DO Status	0=Open, 1=Closed	MBUS_BR.BR_V_6.B_NAME
Mains Breaker Shunt Trip DO Status	0=Not tripped, 1=Tripped	MBUS_BR.BR_V_14.B_NAME
Soft Shutdown DO Status	0=Not Active, 1=Active	MBUS_BR.BR_V_146.B_NAME
Alarm Status	0=No Alarms, 1=Active Alarm	MBUS_BR.BR_V_4.B_NAME
Audible Alarm Status	0=Not Active, 1=Active	MBUS_BR.BR_V_16.B_NAME
Battery Volt High Alarm Status	0=No Alarm, 1=Active Alarm	MBUS_BR.BR_V_48.B_NAME
Battery Volt Low Alarm Status	0=No Alarm, 1=Active Alarm	MBUS_BR.BR_V_47.B_NAME
Coolant Temp. High Alarm Status	0=No Alarm, 1=Active Alarm	MBUS_BR.BR_V_43.B_NAME
Coolant Temp. High Pre-Alarm Status	0=No Alarm, 1=Active Alarm	MBUS_BR.BR_V_73.B_NAME
Coolant Temp. Low Alarm Status	0=No Alarm, 1=Active Alarm	MBUS_BR.BR_V_44.B_NAME
Coolant Temp. Low Pre-Alarm Status	0=No Alarm, 1=Active Alarm	MBUS_BR.BR_V_74.B_NAME
Idle Oil Press High Alarm Status	0=No Alarm, 1=Active Alarm	MBUS_BR.BR_V_80.B_NAME
Idle Oil Press Low Alarm Status	0=No Alarm, 1=Active Alarm	MBUS_BR.BR_V_81.B_NAME
Rated Oil Press Low Pre-Alarm Status	0=No Alarm, 1=Active Alarm	MBUS_BR.BR_V_75.B_NAME
Rated Oil Press Low Alarm Status	0=No Alarm, 1=Active Alarm	MBUS_BR.BR_V_46.B_NAME

Item	Semantics	Servlink ID
Rated Oil Press High Alarm Status	0=No Alarm, 1=Active Alarm	MBUS_BR.BR_V_45.B_NAME
Spare Analog 3 Low Alarm	0=No Alarm, 1=Active Alarm	MBUS_BR.BR_V_132.B_NAME
Spare Analog 3 Low Pre-Alarm	0=No Alarm, 1=Active Alarm	MBUS_BR.BR_V_131.B_NAME
Spare Analog 3 High Alarm	0=No Alarm, 1=Active Alarm	MBUS_BR.BR_V_130.B_NAME
Spare Analog 3 High Pre-Alarm	0=No Alarm, 1=Active Alarm	MBUS_BR.BR_V_129.B_NAME
Spare Analog 4 Low Pre-Alarm	0=No Alarm, 1=Active Alarm	MBUS_BR.BR_V_135.B_NAME
Spare Analog 4 Low Alarm	0=No Alarm, 1=Active Alarm	MBUS_BR.BR_V_136.B_NAME
Spare Analog 4 High Alarm	0=No Alarm, 1=Active Alarm	MBUS_BR.BR_V_134.B_NAME
Spare Analog 4 High Pre-Alarm	0=No Alarm, 1=Active Alarm	MBUS_BR.BR_V_133.B_NAME
Crank Fail Status	0=No Alarm, 1=Active Alarm	MBUS_BR.BR_V_36.B_NAME
EPS Supplying Load Status	0=No Alarm, 1=Active Alarm	MBUS_BR.BR_V_79.B_NAME
Fail to Start Error	0=No Alarm, 1=Active Alarm	MBUS_BR.BR_V_159.B_NAME
Fail to Synchronize	0=No Alarm, 1=Active Alarm	MBUS_BR.BR_V_160.B_NAME
Gen Breaker Close Error	0=No Alarm, 1=Active Alarm	MBUS_BR.BR_V_153.B_NAME
Gen Breaker Feedback Error	0=No Alarm, 1=Active Alarm	MBUS_BR.BR_V_157.B_NAME
Gen Breaker Shunt Trip Error	0=No Alarm, 1=Active Alarm	MBUS_BR.BR_V_155.B_NAME
Mains Breaker Close Error	0=No Alarm, 1=Active Alarm	MBUS_BR.BR_V_154.B_NAME
Mains Breaker Feedback Error	0=No Alarm, 1=Active Alarm	MBUS_BR.BR_V_158.B_NAME
Mains Breaker Shunt Trip Error	0=No Alarm, 1=Active Alarm	MBUS_BR.BR_V_156.B_NAME
Gen Neg. Phase Sequence Over Current Alarm Status	0=No Alarm, 1=Active Alarm	MBUS_BR.BR_V_95.B_NAME
Gen Neg. Phase Sequence Over Current Pre-Alarm Status	0=No Alarm, 1=Active Alarm	MBUS_BR.BR_V_96.B_NAME
Gen Neg. Phase Sequence Over Voltage Alarm Status	0=No Alarm, 1=Active Alarm	MBUS_BR.BR_V_97.B_NAME
Gen Neg. Phase Sequence Over Voltage Pre-Alarm Status	0=No Alarm, 1=Active Alarm	MBUS_BR.BR_V_98.B_NAME
Gen Over Freq Alarm Status	0=No Alarm, 1=Active Alarm	MBUS_BR.BR_V_51.B_NAME
Gen Over Freq Pre-Alarm Status	0=No Alarm, 1=Active Alarm	MBUS_BR.BR_V_84.B_NAME
Gen Over Power Alarm Status	0=No Alarm, 1=Active Alarm	MBUS_BR.BR_V_87.B_NAME
Gen Over Power Pre-Alarm Status	0=No Alarm, 1=Active Alarm	MBUS_BR.BR_V_88.B_NAME
Gen Over VAR Alarm Status	0=No Alarm, 1=Active Alarm	MBUS_BR.BR_V_90.B_NAME
Gen Over VAR Pre-Alarm Status	0=No Alarm, 1=Active Alarm	MBUS_BR.BR_V_91.B_NAME
Gen Over Volt Alarm Status	0=No Alarm, 1=Active Alarm	MBUS_BR.BR_V_50.B_NAME
Gen Over Volt Pre-Alarm Status	0=No Alarm, 1=Active Alarm	MBUS_BR.BR_V_83.B_NAME
Gen Phase Current Differential Alarm	0=No Alarm, 1=Active Alarm	MBUS_BR.BR_V_93.B_NAME
Gen Phase Current Differential Pre-Alarm	0=No Alarm, 1=Active Alarm	MBUS_BR.BR_V_94.B_NAME
Gen Phase Over Current Alarm Status	0=No Alarm, 1=Active Alarm	MBUS_BR.BR_V_39.B_NAME
Gen Phase Over Current Pre-Alarm Status	0=No Alarm, 1=Active Alarm	MBUS_BR.BR_V_92.B_NAME
Gen Reverse Power Alarm Status	0=No Alarm, 1=Active Alarm	MBUS_BR.BR_V_40.B_NAME

Item	Semantics	Servlink ID
Gen Reverse Power Pre-Alarm Status	0=No Alarm, 1=Active Alarm	MBUS_BR.BR_V_86.B_NAME
Gen Reverse VAR Alarm Status	0=No Alarm, 1=Active Alarm	MBUS_BR.BR_V_41.B_NAME
Gen Reverse VAR Pre-Alarm Status	0=No Alarm, 1=Active Alarm	MBUS_BR.BR_V_89.B_NAME
Gen Under Freq Alarm Status	0=No Alarm, 1=Active Alarm	MBUS_BR.BR_V_52.B_NAME
Gen Under Freq Pre-Alarm Status	0=No Alarm, 1=Active Alarm	MBUS_BR.BR_V_85.B_NAME
Gen Under Volt Alarm Status	0=No Alarm, 1=Active Alarm	MBUS_BR.BR_V_49.B_NAME
Gen Under Volt Pre-Alarm Status	0=No Alarm, 1=Active Alarm	MBUS_BR.BR_V_82.B_NAME
Mains Export Power Alarm Status	0=No Alarm, 1=Active Alarm	MBUS_BR.BR_V_105.B_NAME
Mains Export Power Pre-Alarm Status	0=No Alarm, 1=Active Alarm	MBUS_BR.BR_V_106.B_NAME
Mains Export VAR Alarm Status	0=No Alarm, 1=Active Alarm	MBUS_BR.BR_V_109.B_NAME
Mains Export VAR Pre-Alarm Status	0=No Alarm, 1=Active Alarm	MBUS_BR.BR_V_110.B_NAME
Mains Import Power Alarm Status	0=No Alarm, 1=Active Alarm	MBUS_BR.BR_V_103.B_NAME
Mains Import Power Pre-Alarm Status	0=No Alarm, 1=Active Alarm	MBUS_BR.BR_V_104.B_NAME
Mains Import VAR Alarm Status	0=No Alarm, 1=Active Alarm	MBUS_BR.BR_V_107.B_NAME
Mains Import VAR Pre-Alarm Status	0=No Alarm, 1=Active Alarm	MBUS_BR.BR_V_108.B_NAME
Mains Neg. Phase Sequence Over Current Alarm Status	0=No Alarm, 1=Active Alarm	MBUS_BR.BR_V_115.B_NAME
Mains Neg. Phase Sequence Over Current Pre-Alarm S	0=No Alarm, 1=Active Alarm	MBUS_BR.BR_V_116.B_NAME
Mains Neg. Phase Sequence Over Voltage Alarm Status	0=No Alarm, 1=Active Alarm	MBUS_BR.BR_V_117.B_NAME
Mains Neg. Phase Sequence Over Voltage Pre-Alarm S	0=No Alarm, 1=Active Alarm	MBUS_BR.BR_V_118.B_NAME
Mains Over Freq Alarm Status	0=No Alarm, 1=Active Alarm	MBUS_BR.BR_V_66.B_NAME
Mains Over Freq Pre-Alarm Status	0=No Alarm, 1=Active Alarm	MBUS_BR.BR_V_101.B_NAME
Mains Over Volt Alarm Status	0=No Alarm, 1=Active Alarm	MBUS_BR.BR_V_65.B_NAME
Mains Over Volt Pre-Alarm Status	0=No Alarm, 1=Active Alarm	MBUS_BR.BR_V_100.B_NAME
Mains Phase Current Differential Alarm	0=No Alarm, 1=Active Alarm	MBUS_BR.BR_V_113.B_NAME
Mains Phase Current Differential Pre-Alarm	0=No Alarm, 1=Active Alarm	MBUS_BR.BR_V_114.B_NAME
Mains Phase Over Current Alarm Status	0=No Alarm, 1=Active Alarm	MBUS_BR.BR_V_111.B_NAME
Mains Phase Over Current Pre-Alarm Status	0=No Alarm, 1=Active Alarm	MBUS_BR.BR_V_112.B_NAME
Mains Under Freq Alarm Status	0=No Alarm, 1=Active Alarm	MBUS_BR.BR_V_67.B_NAME
Mains Under Freq Pre-Alarm Status	0=No Alarm, 1=Active Alarm	MBUS_BR.BR_V_102.B_NAME
Mains Under Volt Alarm Status	0=No Alarm, 1=Active Alarm	MBUS_BR.BR_V_64.B_NAME
Mains Under Volt Pre-Alarm Status	0=No Alarm, 1=Active Alarm	MBUS_BR.BR_V_99.B_NAME

Item	Semantics	Servlink ID
Mains Volt Restrained Phase Over Current Alarm Status	0=No Alarm, 1=Active Alarm	MBUS_BR.BR_V_119.B_NAME
Mains Volt Restrained Phase Over Current Pre-Alarm	0=No Alarm, 1=Active Alarm	MBUS_BR.BR_V_120.B_NAME

Table 4-4. Integer Status Data

Item	Semantics	Units	Servlink ID
Number of Unacknowledged Alarms			ALARMS.ALM_ORDER.NUM_EVENTS
LOM Timer	Countdown from LOM to start	Seconds	ATS.LOM_TIMER.I_NAME
Gen Stable Timer	Countdown to stable	Seconds	ATS.GEN_TIMER.I_NAME
Mains Stable Timer	Countdown to stable	Seconds	ATS.MNS_TIMER.I_NAME
Demand Timer	Countdown timer	Seconds	KW_LOAD.TIMER.I_NAME
Fast Timer	Countdown for fast transfer	Seconds	ATS.FAST_TIMER.I_NAME

Table 4-5. Real Status Data

Item	Units	Scale	Servlink ID
Synchroscope	Degrees		MBUS_AR.AR_V_73.A_NAME
Battery Voltage	Vdc	10	MBUS_AR.AR_V_1.A_NAME
Engine Run Time	Hrs		STORE_HR.ENG_RUN_H.OUT_1
Generator KW-Hours	KW-Hrs		L_WATT_ACC.TOTAL_MWHR.A_NAME
Filtered Demand Level #1	KW	Gen Pwr	MBUS_AR.AR_V_214.A_NAME
Maximum Demand #1 Tattletale	KW	Gen Pwr	MBUS_AR.AR_V_213.A_NAME
Generator Output Frequency	Hz	10	MBUS_AR.AR_V_18.A_NAME
Gen Average Voltage	Volts	Gen Volt	MBUS_AR.AR_V_75.A_NAME
Gen Phase A L-L Volts	Volts	Gen Volt	MBUS_AR.AR_V_7.A_NAME
Gen Phase B L-L Volts	Volts	Gen Volt	MBUS_AR.AR_V_8.A_NAME
Gen Phase C L-L Volts	Volts	Gen Volt	MBUS_AR.AR_V_9.A_NAME
Generator Phase A-N Volts	Volts	Gen Volt	MBUS_AR.AR_V_55.A_NAME
Generator Phase B-N Volts	Volts	Gen Volt	MBUS_AR.AR_V_56.A_NAME
Generator Phase C-N Volts	Volts	Gen Volt	MBUS_AR.AR_V_57.A_NAME
Gen Average Current	Amps	Gen Amps	MBUS_AR.AR_V_76.A_NAME
Gen Phase A current	Amps	Gen Amps	MBUS_AR.AR_V_59.A_NAME
Gen Phase B current	Amps	Gen Amps	MBUS_AR.AR_V_60.A_NAME
Gen Phase C current	Amps	Gen Amps	MBUS_AR.AR_V_61.A_NAME
Gen Total KW	KW	Gen Pwr	MBUS_AR.AR_V_10.A_NAME
Gen Phase A KW	KW	Gen Pwr	MBUS_AR.AR_V_77.A_NAME
Gen Phase B KW	KW	Gen Pwr	MBUS_AR.AR_V_78.A_NAME
Gen Phase C KW	KW	Gen Pwr	MBUS_AR.AR_V_79.A_NAME
Gen Total KVA	KVA	Gen Pwr	MBUS_AR.AR_V_11.A_NAME
Gen Phase A KVA	KVA	Gen Pwr	MBUS_AR.AR_V_62.A_NAME
Gen Phase B KVA	KVA	Gen Pwr	MBUS_AR.AR_V_63.A_NAME
Gen Phase C KVA	KVA	Gen Pwr	MBUS_AR.AR_V_64.A_NAME
Gen Total KVAR	KVAR	Gen Pwr	MBUS_AR.AR_V_16.A_NAME
Gen Phase A KVAR	KVAR	Gen Pwr	MBUS_AR.AR_V_13.A_NAME
Gen Phase B KVAR	KVAR	Gen Pwr	MBUS_AR.AR_V_14.A_NAME

Item	Units	Scale	Servlink ID
Gen Phase C KVAR	KVAR	Gen Pwr	MBUS_AR.AR_V_15.A_NAME
Generator Power Factor	PF	1000	MBUS_AR.AR_V_12.A_NAME
Generator Phase A Angle	Degrees	10	MBUS_AR.AR_V_82.A_NAME
Generator Phase B Angle	Degrees	10	MBUS_AR.AR_V_83.A_NAME
Generator Phase C Angle	Degrees	10	MBUS_AR.AR_V_84.A_NAME
Gen Voltage THD	%	10	MBUS_AR.AR_V_86.A_NAME
Generator 11th Voltage Harmonic	%	10	MBUS_AR.AR_V_103.A_NAME
Generator 13th Voltage Harmonic	%	10	MBUS_AR.AR_V_104.A_NAME
Generator 2nd Voltage Harmonic	%	10	MBUS_AR.AR_V_96.A_NAME
Generator 3rd Voltage Harmonic	%	10	MBUS_AR.AR_V_97.A_NAME
Generator 4th Voltage Harmonic	%	10	MBUS_AR.AR_V_98.A_NAME
Generator 5th Voltage Harmonic	%	10	MBUS_AR.AR_V_99.A_NAME
Generator 6th Voltage Harmonic	%	10	MBUS_AR.AR_V_100.A_NAME
Generator 7th Voltage Harmonic	%	10	MBUS_AR.AR_V_101.A_NAME
Generator 9th Voltage Harmonic	%	10	MBUS_AR.AR_V_102.A_NAME
Gen Current THD	%	10	MBUS_AR.AR_V_85.A_NAME
Generator 11th Current Harmonic	%	10	MBUS_AR.AR_V_94.A_NAME
Generator 13th Current Harmonic	%	10	MBUS_AR.AR_V_95.A_NAME
Generator 2nd Current Harmonic	%	10	MBUS_AR.AR_V_87.A_NAME
Generator 3rd Current Harmonic	%	10	MBUS_AR.AR_V_88.A_NAME
Generator 4th Current Harmonic	%	10	MBUS_AR.AR_V_89.A_NAME
Generator 5th Current Harmonic	%	10	MBUS_AR.AR_V_90.A_NAME
Generator 6th Current Harmonic	%	10	MBUS_AR.AR_V_91.A_NAME
Generator 7th Current Harmonic	%	10	MBUS_AR.AR_V_92.A_NAME
Generator 9th Current Harmonic	%	10	MBUS_AR.AR_V_93.A_NAME
Gen Neg. Phase Sequence Volts	Volts	Gen Volt	MBUS_AR.AR_V_80.A_NAME
Gen Neg. Phase Sequence Current	Amps	Gen Amps	MBUS_AR.AR_V_81.A_NAME
Mains Frequency	Hz	10	MBUS_AR.AR_V_17.A_NAME
Mains Average Voltage	Volts	Mns Volt	MBUS_AR.AR_V_111.A_NAME
Mains Phase A L-L Volts	Volts	Mns Volt	MBUS_AR.AR_V_107.A_NAME
Mains Phase B L-L Volts	Volts	Mns Volt	MBUS_AR.AR_V_108.A_NAME
Mains Phase C L-L Volts	Volts	Mns Volt	MBUS_AR.AR_V_109.A_NAME
Mains Phase A-N Volts	Volts	Mns Volt	MBUS_AR.AR_V_58.A_NAME
Mains Phase B-N Volts	Volts	Mns Volt	MBUS_AR.AR_V_105.A_NAME
Mains Phase C-N Volts	Volts	Mns Volt	MBUS_AR.AR_V_106.A_NAME
Mains Average Current	Amps	Mns Amps	MBUS_AR.AR_V_115.A_NAME
Mains Phase A current	Amps	Mns Amps	MBUS_AR.AR_V_112.A_NAME
Mains Phase B current	Amps	Mns Amps	MBUS_AR.AR_V_113.A_NAME
Mains Phase C current	Amps	Mns Amps	MBUS_AR.AR_V_114.A_NAME
Mains Total KW	KW	Mns Pwr	MBUS_AR.AR_V_123.A_NAME
Mains Phase A KW	KW	Mns Pwr	MBUS_AR.AR_V_120.A_NAME
Mains Phase B KW	KW	Mns Pwr	MBUS_AR.AR_V_121.A_NAME
Mains Phase C KW	KW	Mns Pwr	MBUS_AR.AR_V_122.A_NAME
Mains Total KVA	KVA	Mns Pwr	MBUS_AR.AR_V_119.A_NAME
Mains Phase A KVA	KVA	Mns Pwr	MBUS_AR.AR_V_116.A_NAME
Mains Phase B KVA	KVA	Mns Pwr	MBUS_AR.AR_V_117.A_NAME

Item	Units	Scale	Servlink ID
Mains Phase C KVA	KVA	Mns Pwr	MBUS_AR.AR_V_118.A_NAME
Mains Total KVAR	KVAR	Mns Pwr	MBUS_AR.AR_V_128.A_NAME
Mains Phase A KVAR	KVAR	Mns Pwr	MBUS_AR.AR_V_125.A_NAME
Mains Phase B KVAR	KVAR	Mns Pwr	MBUS_AR.AR_V_126.A_NAME
Mains Phase C KVAR	KVAR	Mns Pwr	MBUS_AR.AR_V_127.A_NAME
Mains Power Factor	PF	1000	MBUS_AR.AR_V_124.A_NAME
Mains Phase A Angle	Degrees	10	MBUS_AR.AR_V_131.A_NAME
Mains Phase B Angle	Degrees	10	MBUS_AR.AR_V_132.A_NAME
Mains Phase C Angle	Degrees	10	MBUS_AR.AR_V_133.A_NAME
Mains Neg. Phase Sequence Volts	Volts	Mns Volt	MBUS_AR.AR_V_129.A_NAME
Mains Neg. Phase Sequence Current	Amps	Mns Amps	MBUS_AR.AR_V_130.A_NAME
Mains Voltage THD	%	10	MBUS_AR.AR_V_135.A_NAME
Mains 11th Voltage Harmonic	%	10	MBUS_AR.AR_V_152.A_NAME
Mains 13th Voltage Harmonic	%	10	MBUS_AR.AR_V_153.A_NAME
Mains 2nd Voltage Harmonic	%	10	MBUS_AR.AR_V_145.A_NAME
Mains 3rd Voltage Harmonic	%	10	MBUS_AR.AR_V_146.A_NAME
Mains 4th Voltage Harmonic	%	10	MBUS_AR.AR_V_147.A_NAME
Mains 5th Voltage Harmonic	%	10	MBUS_AR.AR_V_148.A_NAME
Mains 6th Voltage Harmonic	%	10	MBUS_AR.AR_V_149.A_NAME
Mains 7th Voltage Harmonic	%	10	MBUS_AR.AR_V_150.A_NAME
Mains 9th Voltage Harmonic	%	10	MBUS_AR.AR_V_151.A_NAME
Mains Current THD	%	10	MBUS_AR.AR_V_134.A_NAME
Mains 11th Current Harmonic	%	10	MBUS_AR.AR_V_143.A_NAME
Mains 13th Current Harmonic	%	10	MBUS_AR.AR_V_144.A_NAME
Mains 2nd Current Harmonic	%	10	MBUS_AR.AR_V_136.A_NAME
Mains 3rd Current Harmonic	%	10	MBUS_AR.AR_V_137.A_NAME
Mains 4th Current Harmonic	%	10	MBUS_AR.AR_V_138.A_NAME
Mains 5th Current Harmonic	%	10	MBUS_AR.AR_V_139.A_NAME
Mains 6th Current Harmonic	%	10	MBUS_AR.AR_V_140.A_NAME
Mains 7th Current Harmonic	%	10	MBUS_AR.AR_V_141.A_NAME
Mains 9th Current Harmonic	%	10	MBUS_AR.AR_V_142.A_NAME
Load Reference	KW	Gen Pwr	MBUS_AR.AR_V_215.A_NAME
Process Reference	EU	10	MBUS_AR.AR_V_216.A_NAME
Engine RPM	RPM		MBUS_AR.AR_V_6.A_NAME
Analog Input 1 Level	mA/Vdc	100	MBUS_AR.AR_V_217.A_NAME
Engine Coolant Temperature	DegF/DegC		MBUS_AR.AR_V_3.A_NAME
Analog Input 2 Level	mA/Vdc	100	MBUS_AR.AR_V_218.A_NAME
Engine Oil Pressure	PSI//KPA	10	MBUS_AR.AR_V_2.A_NAME
Analog Input 3	EU		C_ANIN3.ANIN3_O.A_NAME
Analog Input 3 Level	mA/Vdc	100	MBUS_AR.AR_V_219.A_NAME
Analog Input 4	EU		C_ANIN4.ANIN4_O.A_NAME
Analog Input 4 Level	mA/Vdc	100	MBUS_AR.AR_V_220.A_NAME
Analog Output 1	EU		IO.EU_OUT1.A_NAME
Analog Output 2	EU		IO.EU_OUT2.A_NAME
Analog Output 3	EU		IO.EU_OUT3.A_NAME

Item	Units	Scale	Servlink ID
Analog Output 4	EU		IO.EU_OUT4.A_NAME
Speed Bias Analog Output	%		MBUS_AR.AR_V_66.A_NAME
Voltage Bias Analog Output	%		MBUS_AR.AR_V_65.A_NAME

Values with scaling should be divided by the indicated scale value in order to represent the actual value. Some scaled values are scaled by a value in the enumeration table below. Generator and Mains measured values that are scaled by an enumeration parameter must be multiplied by that parameter or have a text modifier based on the Units variables in order to show the correct value.

Table 4-6. String Status Data

Item	Semantics	Servlink ID
Most Recent Alarm	The last alarm stored	ALARMS.ALM_ORDER.MSG_O_1

Table 4-7. Enumerations (States & Modes) Status Data

Item	Data Type	Servlink ID
ATS State	Integer	SEQ_ATS.STATE.MSG_SEL
ATS State	String	SEQ_ATS.STATE.B_TO_STR
Engine State	Integer	SEQ_ID_RTD.ENG_STATE1.I_NAME
Engine State	String	SEQ_ID_RTD.ENG_STATE.B_TO_STR
Gen Power Units	Real	MBUS_AR.AR_V_74.A_NAME
Gen Power Units	String	A2_PS_CONF.GPWR_UNIT.I_TO_STR
Generator Current Units	Real	MBUS_AR.AR_V_223.A_NAME
Generator Current Units	String	A2_PS_CONF.GAMP_UNIT.I_TO_STR
Generator Voltage Units	Real	MBUS_AR.AR_V_222.A_NAME
Generator Voltage Units	String	A2_PS_CONF.GVLT_UNIT.I_TO_STR
Genset State	Integer	STRT_STATE.GEN_STATE.MSG_SEL
Genset State	String	STRT_STATE.GEN_STATE.B_TO_STR
Load Control State	Integer	LOAD_MODE.LDRMP_STAT.MSG_SEL
Load Control State	String	LOAD_MODE.LDRMP_STAT.B_TO_STR
Mains Current Units	Real	MBUS_AR.AR_V_225.A_NAME
Mains Current Units	String	A2_PS_CONF.UAMP_UNIT.I_TO_STR
Mains Power Units	Real	MBUS_AR.AR_V_110.A_NAME
Mains Power Units	String	A2_PS_CONF.UPWR_UNIT.I_TO_STR
Mains Voltage Units	Real	MBUS_AR.AR_V_224.A_NAME
Mains Voltage Units	String	A2_PS_CONF.UVLT_UNIT.I_TO_STR
Reactive Load Control Mode	Integer	C_VAR_SRV.PFVAR_MODE.MSG_SEL
Reactive Load Control Mode	String	C_VAR_SRV.PFVAR_MODE.B_TO_STR
Reactive Load Control State	Integer	C_VAR_SRV.STATE.MSG_SEL
Reactive Load Control State	String	C_VAR_SRV.STATE.B_TO_STR
Real Load Mode	Integer	LOAD_MODE.LD_MODE.I_NAME
Real Load Mode	String	LOAD_MODE.LD_STATE.B_TO_STR
Synchronizer Mode	Integer	SYNC.SYNC_MODE.I_NAME
Synchronizer Mode	String	
Synchronizer State	Integer	S_MODE.SYNC_STATE.MSG_SEL
Synchronizer State	String	S_MODE.SYNC_STATE.B_TO_STR

All enumerations are identical to the enumeration definitions provided in Chapter 4 (Modbus Communications). Integer or Real data types provide the numerical value of the enumeration (see Modbus Communications chapter for relationship between numerical value and text descriptions). The String data types provide the text message that also appears on the front panel display.

Tunable Address Data

The tunable data is split into two categories for your convenience. The first is Boolean (on / off) configurations and the second is Analog configuration.

Table 4-8. Boolean Writable Addresses:

Item	Semantics	Servlink ID
Enable Control Test	0=Not Asserted, 1=Asserted	MBUS_BW.BW_V_2.B_NAME
Disable Control Test	0=Not Asserted, 1=Asserted	MBUS_BW.BW_V_31.B_NAME
Enable Control Run with Load	0=Not Asserted, 1=Asserted	MBUS_BW.BW_V_3.B_NAME
Disable Control Run	0=Not Asserted, 1=Asserted	MBUS_BW.BW_V_32.B_NAME
Enable Control Auto	0=Not Asserted, 1=Asserted	MBUS_BW.BW_V_1.IN
Disable Control Auto	0=Not Asserted, 1=Asserted	MBUS_BW.BW_V_30. IN
Enable Process Control	0=False, 1=True	MBUS_BW.BW_V_8. IN
Disable Process Control	0=False, 1=True	MBUS_BW.BW_V_33. IN
Enable VAR/PF Control	0=False, 1=True	MBUS_BW.BW_V_21. IN
Disable VAR/PF Control	0=False, 1=True	MBUS_BW.BW_V_34. IN
Unload Command	0=False, 1=True	MBUS_BW.BW_V_22. IN
Load Ramp Pause	0=False, 1=True	MBUS_BW.BW_V_17. IN
Load / Speed Raise Command	0=False, 1=True	MBUS_BW.BW_V_6. IN
Load / Speed Lower Command	0=False, 1=True	MBUS_BW.BW_V_7. IN
Voltage/PF/VAR Raise Command	0=False, 1=True	MBUS_BW.BW_V_4. IN
Voltage/PF/VAR Lower Command	0=False, 1=True	MBUS_BW.BW_V_5. IN
Meter Phase Select A	0=Not Asserted, 1=Asserted	MBUS_BW.BW_V_18. IN
Meter Phase Select B	0=Not Asserted, 1=Asserted	MBUS_BW.BW_V_19. IN
Reset Demand #1	0=Normal, 1=Reset now	MBUS_BW.BW_V_23. IN
Acknowledge All Alarms	Commit / Acknowledge without reset	MBUS_BW.BW_V_16. IN
Reset Alarm/Fault	0=False, 1=True	MBUS_BW.BW_V_20. IN
Remote Configurable Input #1	0=Off, 1=On	MBUS_BW.BW_V_9. IN
Remote Configurable Input #2	0=Off, 1=On	MBUS_BW.BW_V_10. IN
Remote Configurable Input #3	0=Off, 1=On	MBUS_BW.BW_V_11. IN
Remote Configurable Input #4	0=Off, 1=On	MBUS_BW.BW_V_12. IN
Remote Configurable Input #5	0=Off, 1=On	MBUS_BW.BW_V_13. IN
Remote Configurable Input #6	0=Off, 1=On	MBUS_BW.BW_V_14. IN
Return to default load/process setpoint	0=Not Asserted, 1=Asserted	MBUS_BW.BW_V_25. IN
Synchronizer Check Mode	0=Not Asserted, 1=Asserted	MBUS_BW.BW_V_27. IN
Synchronizer Permissive Mode	0=Not Asserted, 1=Asserted	MBUS_BW.BW_V_28. IN
Synchronizer Run Mode	0=Not Asserted, 1=Asserted	MBUS_BW.BW_V_29. IN
Synchronizer Off Mode	0=Not Asserted, 1=Asserted	MBUS_BW.BW_V_26. IN

Table 4-9. Analog writable addresses:

Item	Semantics	Units	Servlink ID
Remote Process Control Reference	% Process	%	MBUS_AW.PROC_REF.IN
Remote Base Load Reference	In kW fixed units	KW	MBUS_AW.BASLD_REF.IN
Remote PF Reference	In PF where -500=0.5Lag, 500=0.5Lead, & 1000=unity	PF	MBUS_AW.PF_BIAS.IN
Remote VAR Reference	In KVAR fixed units	KVAR	MBUS_AW.VAR_BIAS.IN

Data sent to a scaled address must first be multiplied by the indicated amount because the EGCP-3 will divide the value by the indicated amount upon receipt.

Chapter 5.
Product Support and Service Options

Product Support Options

If you are experiencing problems with the installation, or unsatisfactory performance of a Woodward product, the following options are available:

- 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 Turbine Retrofitter (RTR)** is an independent company that does both steam and gas turbine control retrofits and upgrades globally, and can provide the full line of Woodward systems and components for the retrofits and overhauls, long term service contracts, emergency repairs, etc.

A current list of Woodward Business Partners is available at **www.woodward.com/directory**.

Product Service Options

The following factory options for servicing Woodward products are available through your local Full-Service Distributor or the OEM or Packager of the equipment system, based on the standard Woodward Product and Service Warranty (5-01-1205) that is in effect at the time the product is originally shipped from Woodward or a service is performed:

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

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.

Charges for the Replacement/Exchange service are based on a flat rate plus shipping expenses. You are invoiced the flat rate replacement/exchange charge plus a core charge at the time the replacement unit is shipped. If the core (field unit) is returned within 60 days, a credit for the core charge will be issued.

Flat Rate Repair: Flat Rate Repair is available for the majority of standard products in the field. This program offers you repair service for your products with the advantage of knowing in advance what the cost will be. All repair work carries the standard Woodward service warranty (Woodward Product and Service Warranty 5-01-1205) on replaced parts and labor.

Flat Rate Remanufacture: Flat Rate Remanufacture is very similar to the Flat Rate Repair option with the exception that the unit will be returned to you in “like-new” condition and carry with it the full standard Woodward product warranty (Woodward Product and Service Warranty 5-01-1205). This option is applicable to mechanical products only.

Returning Equipment for Repair

If a control (or any part of an electronic control) is to be returned 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 authorization 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 offers various Engineering Services for our products. For these services, you can contact us by telephone, by email, or through the Woodward website.

- 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. Emergency assistance is also available during non-business hours by phoning Woodward and stating the urgency of your problem.

Product Training is available as standard classes at many of our worldwide locations. We also offer customized classes, which can be tailored to your needs and can be held at one of our locations or at your site. This training, conducted by experienced personnel, will assure that you will be able to maintain system reliability and availability.

Field Service engineering on-site support is available, depending on the product and location, from many of our worldwide locations or 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 us via telephone, email us, or use our website: **www.woodward.com**.

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/directory**, 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) 6762 6727
Germany:	
Kempen	+49 (0) 21 52 14 51
Stuttgart	+49 (711) 78954-510
India	+91 (124) 4399500
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 (124) 4399500
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 (124) 4399500
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

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 _____

Turbine Model Number _____

Type of Fuel (gas, steam, 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 _____

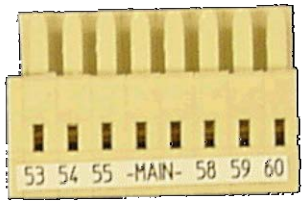
_____

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.

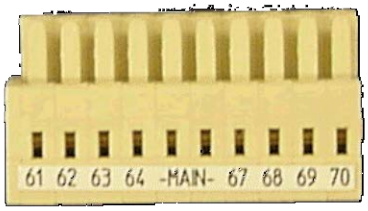
Appendix A.
Connector Information

Wago pluggable style terminal blocks are used on the EGCP-3 to connect the field wiring to the control. These connectors are included with the EGCP-3. Woodward also carries an EGCP-3 connector kit, which contains all of the terminal blocks used on the EGCP-3 as part number 8928-178. This kit is provided for the case where service parts are needed or wiring harnesses must be created prior to receiving the EGCP-3.

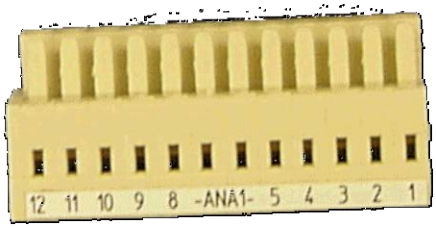
EGCP-3 Connector Kit



8 pole connectors (quantity of 6)
(Used on SmartCore, PowerSense, and Power Supply boards)

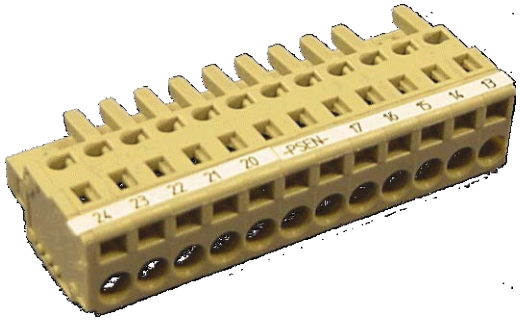


10 pole connectors (quantity of 3)
(Used on SmartCore board)



12 pole connector (quantity of 4)
(Used on SmartCore board)

Woodward provides labels already installed on the connectors as part of the connector kit. Separate labels are not available.



A larger 12 pole connector
(Used on PowerSense)
(Quantity of 1)

Table A-1. Recommended Wire Size and Types

Gauge (AWG)	Minimum Insulation	Type	Use
12	600 V	Multiple conductor, stranded, unshielded	Power Supply input
16–18	600 V	Multiple conductor, stranded, unshielded	PT inputs CT inputs
18-22	600 V	Stranded, unshielded	Discrete I/O,
18–22	300 V	Two conductor, shielded	Speed Bias, Voltage Bias, MPU, Oil and Water Sensors
22	30 V	Two or three conductor stranded, twisted, shielded, 124 Ω impedance	RS-232 RS-485 RS-422 (TX and RX)

Table A-2. Wire Gauge—AWG to Metric Comparison

Circ. Mils	Equivalent Circ. Mils	AWG Size	Metric Wire Size mm2	Stranding/ Wire Dia. per Strand		Approximate Overall Diameter	
				in	mm	in	mm
-	987	-	0.50	1/.032	1/.813	.032	0.81
1020	-	20	-	7/.0121	7/.307	.036	0.91
-	1480	-	0.75	1/.039	1/.991	.039	0.99
1620	-	18	-	1/.0403	1/1.02	.040	1.02
1620	-	18	-	7/.0152	7/.386	.046	1.16
-	1974	-	1.0	1/.045	1/1.14	.045	1.14
-	1974	-	1.0	7/.017	7/.432	.051	1.30
2580	-	16	-	1/.0508	1/1.29	.051	1.29
2580	-	16	-	7/.0192	7/.488	.058	1.46
-	2960	-	1.5	1/.055	1/1.40	.055	1.40
-	2960	-	1.5	7/.021	7/5.33	.063	1.60
4110	-	14	-	1/.0641	1/1.63	.064	1.63
4110	-	14	-	7/.0242	7/.615	.073	1.84
-	4934	-	2.5	1/.071	1/1.80	.071	1.80
-	4934	-	2.5	7/.027	7/.686	.081	2.06
6530	-	12	-	1/.0808	1/2.05	.081	2.05
6530	-	12	-	7/.0305	7/.775	.092	2.32
-	7894	-	4	1/.089	1/2.26	.089	2.26
-	7894	-	4	7/.034	7/.864	.102	2.59

This conversion table is intended as a guide for determining the wire size that will fit into the EGCP-3 connector(s). The wire size must also be evaluated for the maximum current rating for each connection.

Appendix B. Specifications

Table B-1. Accuracy Specifications

Element	Accuracy	Description
Voltage Metering	0.25% at rated voltage	At 23±5 °C and any PF between 0.5 lead and 0.5 lag
Current Metering	0.25% at 5 A	At 23±5 °C and any PF between 0.5 lead and 0.5 lag
Power Metering	0.5% at rated V & I	At 23±5 °C and any PF between 0.5 lead and 0.5 lag
Energy Metering	0.5 kW·h / month	At 23±5 °C
PF Metering	±0.003 PF	Across entire range of 0.5 lead to 0.5 lag
Frequency Metering	±0.05 Hz	Between 40 and 70 Hz
Speed Metering	±0.08% of 100 Hz–25 kHz	At any stable temperature within the operating range
Analog Inputs	±0.1% of 0–25 mA (±0.025 mA) ±0.1% of 1–5 V (±0.018 V)	At 23±5 °C
Analog Outputs	±0.1% of 0–25 mA (±0.025 mA)	At 23±5 °C
Voltage Bias Output	±0.1% of ±9 V (±0.018 V) ±0.1% of 0–25 mA (±0.025 mA)	At 23±5 °C
Speed Bias Output	±0.006 V for ±3 V setting ±0.005 V for ±5 V setting ±0.1% of 0–25 mA (±0.025 mA) ±0.1% of 0–100% duty cycle for PWM	At 23±5 °C
Typical Temperature Drift for AC inputs	0.3% for any 40 °C change	Within the operating range
Harmonics 2–7	1%	For each harmonic measured
Harmonics 9, 11, 13	2%	For each harmonic measured
Time / Date Clock	1 minute / month	At 23±5 °C

Table B-2. Environment Specifications

Environment	Details
Temperature	
Operating	–20 to +70 °C (–4 to +158 °F)
Storage	–30 to +80 °C (–22 to +176 °F)
Humidity	
Operating	95% at +60 °C (140 °F)
Mechanical Vibration	
Random Test	10–2000 Hz at 0.04 G^2/Hz and 8.2Grms PSD
Sine Test	5–2000 Hz at 2.5 g
Mechanical Shock	
Non-Operating	30 g peak, 11 ms duration
Enclosure Rating	
Ingress Protection	Meets IP54 per EN60529 when properly installed in an enclosure rated IP54 or greater
NEMA	Meets Type 4 requirements from the front panel and properly installed in an equivalent enclosure
Pollution Degree	2

Appendix C.
EGCP-3 LS Modbus List

Table C-1. Boolean Writes

Modbus ID	Item Function	Semantics
00001	ENABLE AUTO	Sets control mode to AUTO, 0=False, 1=True (Momentary)
00002	ENABLE TEST	Sets control mode to TEST, 0=False, 1=True (Momentary)
00003	ENABLE RUN W/ LOAD	Sets control mode to RUN, 0=False, 1=True (Momentary)
00004	VOLT/PF/VAR RAISE	0=False, 1=True
00005	VOLT/PF/VAR LOWER	0=False, 1=True
00006	LOAD/SPEED RAISE	0=False, 1=True
00007	LOAD/SPEED LOWER	0=False, 1=True
00008	ENABLE PROCESS	Sets Load mode to PROCESS control 0=False, 1=True (Momentary)
00009	REMOTE ALARM #1	0=Off, 1=On
00010	REMOTE ALARM #2	0=Off, 1=On
00011	REMOTE ALARM #3	0=Off, 1=On
00012	REMOTE ALARM #4	0=Off, 1=On
00013	REMOTE ALARM #5	0=Off, 1=On
00014	REMOTE ALARM #6	0=Off, 1=On
00015	RESET VAR/PF	0=False, 1=True
00016	COMMIT ALARM	Only performs horn silence
00017	LOAD RAMP PAUSE	0=False, 1=True
00018	METER PHASE SELECT A	0=Not Asserted, 1=Asserted
00019	METER PHASE SELECT B	0=Not Asserted, 1=Asserted
00020	RESET ALARM/FAULT	0=False, 1=True
00021	ENABLE VAR/PF CONTROL	Sets Load mode to VAR/PF control, 0=False, 1=True (Momentary)
00022	UNLOAD COMMAND	0=False, 1=True
00023	NOT USED	0=Normal, 1=Reset now
00024	NOT USED	
00025	RESET LOAD	0=False, 1=True (Momentary)
00026	SYNCHRONIZER OFF MODE	Sets sync mode to OFF, 0=False, 1=True (Momentary)
00027	SYNCHRONIZER CHECK MODE	Sets sync mode to CHECK, 0=False, 1=True (Momentary)
00028	SYNCHRONIZER PERMISSIVE MODE	Sets sync mode to PERMISSIVE, 0=False, 1=True (Momentary)
00029	SYNCHRONIZER RUN MODE	Sets sync mode to RUN, 0=False, 1=True (Momentary)
00030	DISABLE AUTO	Removes AUTO control mode, 0=False, 1=True (Momentary)
00031	DISABLE TEST	Removes TEST control mode, 0=False, 1=True (Momentary)
00032	DISABLE RUN W/ LOAD	Removes RUN control mode, 0=False, 1=True (Momentary)
00033	DISABLE PROCESS	Removes PROCESS Load control mode, 0=False, 1=True (Momentary)
00034	DISABLE VAR/PF	Removes VAR/PF Load control mode,

Modbus ID	Item Function	Semantics
		0=False, 1=True (Momentary)
00035	ENABLE BASELOAD	Sets Load control mode to BaseLoad, 0=False, 1=True (Momentary)
00036	DISABLE BASELOAD	Removes BaseLoad control mode, 0=False, 1=True (Momentary)
00037	ENABLE DROOP	Sets Load control mode to Droop, 0=False, 1=True (Momentary)
00038	DISABLE DROOP	Removes Droop control mode, 0=False, 1=True (Momentary)
00039	SERVICE HOURS RESET	Will reset the service hours back to the internal setting
00040	RESET OPERATION VOLTAGE	Trigger to make a new operation voltage setting active
00041	ENABLE KW DE-RATE	Sets Rated kW to a de-rated setting, 0=False, 1=True (Momentary)
00042	DISABLE KW DE-RATE	Sets Rated kW back to the Rated W setting, 0=False, 1=True (Momentary)

Table C-2. Boolean Reads

Modbus ID	Item	Semantics
10001	NOT USED	
10002	NOT USED	
10003	BUS STABLE INDICATION	0=Not stable, 1=Stable
10004	ALARM STATUS	0=No Alarms, 1=Active Alarm
10005	TRIP TIE BREAKER	0=No Alarms, 1=Active Alarm
10006	NOT USED	
10007	GEN BREAKER CLOSE DO STATUS	0=Open, 1=Closed
10008	ENGINE PREGLOW DO STATUS	0=Not Active, 1=Active
10009	FUEL SOLENOID DO STATUS	0=Not Active, 1=Active
10010	ENGINE CRANK DO STATUS	0=Not Active, 1=Active
10011	VISUAL ALARM STATUS	0=Not Active, 1=Active
10012	NOT USED	Reserved for EGCP-2
10013	NOT USED	Reserved for EGCP-2
10014	TIE BREAKER SHUNT TRIP DO STATUS	0=Not tripped, 1=Tripped
10015	GEN BREAKER SHUNT TRIP DO STATUS	0=Tripped, 1=Not Tripped
10016	AUDIBLE ALARM STATUS	0=Not Active, 1=Active
10017	IDLE/RATED DO STATUS	0=Idle, 1=Rated
10018	AUTO STATUS	0=False, 1=True
10019	TEST STATUS	0=False, 1=True
10020	RUN W/ LOAD STATUS	0=False, 1=True
10021	VOLT/PF/VAR RAISE STATUS	0=False, 1=True
10022	VOLT/PF/VAR LOWER STATUS	0=False, 1=True
10023	SPEED/LOAD RAISE STATUS	0=False, 1=True
10024	SPEED/LOAD LOWER STATUS	0=False, 1=True
10025	GEN BREAKER AUX DI STATUS	0=Open, 1=Closed
10026	MAINS BREAKER AUX DI STATUS	0=Open, 1=Closed
10027	PROCESS STATUS	0=False, 1=True

Modbus ID	Item	Semantics
10028	REMOTE ALARM #1 STATUS	0=False, 1=True
10029	REMOTE ALARM #2 STATUS	0=False, 1=True
10030	REMOTE ALARM #3 STATUS	0=False, 1=True
10031	REMOTE ALARM #4 STATUS	0=False, 1=True
10032	REMOTE ALARM #5 STATUS	0=False, 1=True
10033	REMOTE ALARM #6 STATUS	0=False, 1=True
10034	SYNC TIMEOUT STATUS	0=No Alarm, 1=Active Alarm
10035	SYNC RECLOSE STATUS	0=No Alarm, 1=Active Alarm
10036	CRANK FAIL STATUS	0=No Alarm, 1=Active Alarm
10037	VOLTAGE RANGE ALARM STATUS	0=No Alarm, 1=Active Alarm
10038	OVERSPEED STATUS	0=No Alarm, 1=Active Alarm
10039	GEN PHASE OVER CURR ALM STATUS	0=No Alarm, 1=Active Alarm
10040	GEN REVERSE POWER ALM STATUS	0=No Alarm, 1=Active Alarm
10041	GEN REVERSE VAR ALM STATUS	0=No Alarm, 1=Active Alarm
10042	SPEED/FREQ MISMATCH STATUS	0=No Alarm, 1=Active Alarm
10043	COOLANT TEMP HIGH ALM STATUS	0=No Alarm, 1=Active Alarm
10044	COOLANT TEMP LOW ALM STATUS	0=No Alarm, 1=Active Alarm
10045	RATED OIL PRESS HIGH ALM STATUS	0=No Alarm, 1=Active Alarm
10046	RATED OIL PRESS LOW ALM STATUS	0=No Alarm, 1=Active Alarm
10047	BATTERY VOLT LOW ALM STATUS	0=No Alarm, 1=Active Alarm
10048	BATTERY VOLT HIGH ALM STATUS	0=No Alarm, 1=Active Alarm
10049	GEN UNDER VOLT ALM STATUS	0=No Alarm, 1=Active Alarm
10050	GEN OVER VOLT ALM STATUS	0=No Alarm, 1=Active Alarm
10051	GEN OVER FREQ ALM STATUS	0=No Alarm, 1=Active Alarm
10052	GEN UNDER FREQ ALM STATUS	0=No Alarm, 1=Active Alarm
10053	GEN LOAD HIGH LIMIT STATUS	0=No Alarm, 1=Active Alarm
10054	GEN LOAD LOW LIMIT STATUS	0=No Alarm, 1=Active Alarm
10055	PROCESS HIGH LIMIT STATUS	0=No Alarm, 1=Active Alarm
10056	PROCESS LOW LIMIT STATUS	0=No Alarm, 1=Active Alarm
10057	REMOTE ALARM #1 STATUS	0=No Alarm, 1=Active Alarm
10058	REMOTE ALARM #2 STATUS	0=No Alarm, 1=Active Alarm
10059	REMOTE ALARM #3 STATUS	0=No Alarm, 1=Active Alarm
10060	REMOTE ALARM #4 STATUS	0=No Alarm, 1=Active Alarm
10061	REMOTE ALARM #5 STATUS	0=No Alarm, 1=Active Alarm
10062	REMOTE ALARM #6 STATUS	0=No Alarm, 1=Active Alarm
10063	LOAD SURGE ALM STATUS	0=No Alarm, 1=Active Alarm
10064	BUS UNDER VOLT ALM STATUS	0=No Alarm, 1=Active Alarm
10065	BUS OVER VOLT ALM STATUS	0=No Alarm, 1=Active Alarm
10066	BUS OVER FREQ ALM STATUS	0=No Alarm, 1=Active Alarm
10067	BUS UNDER FREQ ALM STATUS	0=No Alarm, 1=Active Alarm
10068	NOT USED	
10069	GEN STABLE INDICATION	0=False (wait for timeout), 1=True
10070	GEN VOLT SENSE CONFIG (T=L-L)	0=Wye (L-N), 1=Delta (L-L)
10071	PF INDICATOR (T=LAG)	0=Lag, 1=Lead
10072	SPEED RANGE ALM STATUS	0=No Alarm, 1=Active Alarm

Modbus ID	Item	Semantics
10073	COOLANT TEMP HIGH PRE-ALM STATUS	0=No Alarm, 1=Active Alarm
10074	COOLANT TEMP LOW PRE-ALM STATUS	0=No Alarm, 1=Active Alarm
10075	RATED OIL PRESS LOW PRE-ALM STATUS	0=No Alarm, 1=Active Alarm
10076	GEN SENSING TYPE (3PH)	0=1 phase, 1=3 phase
10077	BUS SENSING TYPE (3PH)	0=1 phase, 1=3 phase
10078	BUS SENSING CONFIG (T=L-L)	0=Wye (L-N), 1=Delta (L-L)
10079	NOT USED	
10080	IDLE OIL PRESS HIGH ALM STATUS	0=No Alarm, 1=Active Alarm
10081	IDLE OIL PRESS LOW ALM STATUS	0=No Alarm, 1=Active Alarm
10082	GEN UNDER VOLT PRE-ALM STATUS	0=No Alarm, 1=Active Alarm
10083	GEN OVER VOLT PRE-ALM STATUS	0=No Alarm, 1=Active Alarm
10084	GEN OVER FREQ PRE-ALM STATUS	0=No Alarm, 1=Active Alarm
10085	GEN UNDER FREQ PRE-ALM STATUS	0=No Alarm, 1=Active Alarm
10086	GEN REVERSE VAR PRE-ALM STATUS	0=No Alarm, 1=Active Alarm
10087	GEN OVER POWER ALM STATUS	0=No Alarm, 1=Active Alarm
10088	GEN OVER POWER PRE-ALM STATUS	0=No Alarm, 1=Active Alarm
10089	GEN REVERSE VAR PRE-ALM STATUS	0=No Alarm, 1=Active Alarm
10090	GEN OVER VAR ALM STATUS	0=No Alarm, 1=Active Alarm
10091	GEN OVER VAR PRE-ALM STATUS	0=No Alarm, 1=Active Alarm
10092	GEN PHASE OVER CURR PRE-ALM STATUS	0=No Alarm, 1=Active Alarm
10093	GEN PHASE CURR DIFF ALM STATUS	0=No Alarm, 1=Active Alarm
10094	GEN PHASE CURR DIFF PRE-ALM STATUS	0=No Alarm, 1=Active Alarm
10095	GEN NEG PHASE SEQ OVER CURR ALM STATUS	0=No Alarm, 1=Active Alarm
10096	GEN NEG PHASE SEQ OC PRE-ALM STATUS	0=No Alarm, 1=Active Alarm
10097	GEN NEG PHASE SEQ OVER VOLT ALM STATUS	0=No Alarm, 1=Active Alarm
10098	GEN NEG PHASE SEQ OV PRE-ALM STATUS	0=No Alarm, 1=Active Alarm
10099	BUS UNDER VOLT PRE-ALM STATUS	0=No Alarm, 1=Active Alarm
10100	BUS OVER VOLT PRE-ALM STATUS	0=No Alarm, 1=Active Alarm
10101	BUS OVER FREQ PRE-ALM STATUS	0=No Alarm, 1=Active Alarm
10102	BUS UNDER FREQ PRE-ALM STATUS	0=No Alarm, 1=Active Alarm
10103	BUS IMPORT POWER ALM STATUS	0=No Alarm, 1=Active Alarm
10104	BUS IMPORT PWR PRE-ALM STATUS	0=No Alarm, 1=Active Alarm
10105	BUS EXPORT POWER ALM STATUS	0=No Alarm, 1=Active Alarm
10106	BUS EXPORT PWR PRE-ALM STATUS	0=No Alarm, 1=Active Alarm
10107	BUS IMPORT VAR ALM STATUS	0=No Alarm, 1=Active Alarm
10108	BUS IMPORT VAR PRE-ALM STATUS	0=No Alarm, 1=Active Alarm
10109	BUS EXPORT VAR ALM STATUS	0=No Alarm, 1=Active Alarm
10110	BUS EXPORT VAR PRE-ALM STATUS	0=No Alarm, 1=Active Alarm
10111	BUS PHASE OVER CURR ALM STATUS	0=No Alarm, 1=Active Alarm
10112	BUS PHASE OVER CURR PRE-ALM STATUS	0=No Alarm, 1=Active Alarm
10113	BUS PHASE CURR DIFF ALM STATUS	0=No Alarm, 1=Active Alarm
10114	BUS PHASE CURR DIFF PRE-ALM STATUS	0=No Alarm, 1=Active Alarm
10115	BUS NEG PHASE SEQ OVER CURR ALM STATUS	0=No Alarm, 1=Active Alarm
10116	BUS NEG PHASE SEQ OC PRE-ALM STATUS	0=No Alarm, 1=Active Alarm
10117	BUS NEG PHASE SEQ OVER VOLT ALM STATUS	0=No Alarm, 1=Active Alarm

Modbus ID	Item	Semantics
10118	BUS NEG PHASE SEQ OV PRE-ALM STATUS	0=No Alarm, 1=Active Alarm
10119	BUS VOLT RES PHASE OC ALM STATUS	0=No Alarm, 1=Active Alarm
10120	BUS VOLT RES PHASE OC PRE-ALM STATUS	0=No Alarm, 1=Active Alarm
10121	ANALOG IN 1 HIGH PRE-ALM	0=No Alarm, 1=Active Alarm
10122	ANALOG IN 1 HIGH ALM	0=No Alarm, 1=Active Alarm
10123	ANALOG IN 1 LOW PRE-ALM	0=No Alarm, 1=Active Alarm
10124	ANALOG IN 1 LOW ALM	0=No Alarm, 1=Active Alarm
10125	ANALOG IN 2 HIGH PRE-ALM	0=No Alarm, 1=Active Alarm
10126	ANALOG IN 2 HIGH ALM	0=No Alarm, 1=Active Alarm
10127	ANALOG IN 2 LOW PRE-ALM	0=No Alarm, 1=Active Alarm
10128	ANALOG IN 2 LOW ALM	0=No Alarm, 1=Active Alarm
10129	ANALOG IN 3 HIGH PRE-ALM	0=No Alarm, 1=Active Alarm
10130	ANALOG IN 3 HIGH ALM	0=No Alarm, 1=Active Alarm
10131	ANALOG IN 3 LOW PRE-ALM	0=No Alarm, 1=Active Alarm
10132	ANALOG IN 3 LOW ALM	0=No Alarm, 1=Active Alarm
10133	ANALOG IN 4 HIGH PRE-ALM	0=No Alarm, 1=Active Alarm
10134	ANALOG IN 4 HIGH ALM	0=No Alarm, 1=Active Alarm
10135	ANALOG IN 4 LOW PRE-ALM	0=No Alarm, 1=Active Alarm
10136	ANALOG IN 4 LOW ALM	0=No Alarm, 1=Active Alarm
10137	EMERGENCY STOP LOGIC STATUS	0=No Alarm, 1=Active Alarm
10138	LOAD RAMP PAUSE LOGIC STATUS	0=False, 1=True
10139	METER PHASE SELECT A LOGIC STATUS	0=False, 1=True
10140	METER PHASE SELECT B LOGIC STATUS	0=False, 1=True
10141	RESET ALARM/FAULT LOGIC STATUS	0=False, 1=True
10142	ENABLE VAR/PF LOGIC STATUS	0=False, 1=True
10143	UNLOAD COMMAND LOGIC STATUS	0=False, 1=True
10144	IGNITION COMMAND DO STATUS	0=Not Active, 1=Active
10145	ALARM HORN DO STATUS	0=Not Active, 1=Active
10146	SOFT SHUTDOWN DO STATUS	0=Not Active, 1=Active
10147	HARD SHUTDOWN DO STATUS	0=Not Active, 1=Active
10148	AIR SHUTOFF DO STATUS	0=Not Active, 1=Active
10149	ENGINE RUNNING DO STATUS	0=Not Active, 1=Active
10150	KW-HR PULSE	0=Not Active, 1=Active
10151	VA-HR PULSE	0=Not Active, 1=Active
10152	VAR-HR PULSE	0=Not Active, 1=Active
10153	NOT USED	
10154	NOT USED	
10155	GEN BREAKER SHUNT TRIP ERROR	0=No Alarm, 1=Active Alarm
10156	NOT USED	
10157	GEN BREAKER FEEDBACK ERROR	0=No Alarm, 1=Active Alarm
10158	NOT USED	
10159	FAIL TO START ERROR	0=No Alarm, 1=Active Alarm
10160	FAIL TO SYNCHRONIZE	0=No Alarm, 1=Active Alarm
10161	PHASE ROTATION MISMATCH	0=No Alarm, 1=Active Alarm
10162	CONFIGURATION CHECK ERROR	0=No Alarm, 1=Active Alarm

Modbus ID	Item	Semantics
10163	KVA SWITCH STATUS	0=Off, 1=On
10164	CRANK DENIED ALARM	CRANK DENIED
10165	FAIL TO REACH IDLE	RAIL TO REACH IDLE
10166	FAIL TO REACH RATED	RAIL TO REACH RATED
10167	MODBUS LINK 1 ERROR	Slave response timeout
10168	MODBUS LINK 2 ERROR	Slave response timeout
10169	NOT USED	
10170	NOT USED	
10171	ANALOG IN 1 OUT OF RANGE	0=OK, 1=Fault
10172	ANALOG IN 2 OUT OF RANGE	0=OK, 1=Fault
10173	ANALOG IN 3 OUT OF RANGE	0=OK, 1=Fault
10174	ANALOG IN 4 OUT OF RANGE	0=OK, 1=Fault
10175	POWERSENSE BOARD FAULT	0=OK, 1=Fault
10176	DIGITAL INPUT #1 STATUS	0=Floating/Grounded, 1=Active
10177	DIGITAL INPUT #2 STATUS	0=Floating/Grounded, 1=Active
10178	DIGITAL INPUT #3 STATUS	0=Floating/Grounded, 1=Active
10179	DIGITAL INPUT #4 STATUS	0=Floating/Grounded, 1=Active
10180	DIGITAL INPUT #5 STATUS	0=Floating/Grounded, 1=Active
10181	DIGITAL INPUT #6 STATUS	0=Floating/Grounded, 1=Active
10182	DIGITAL INPUT #7 STATUS	0=Floating/Grounded, 1=Active
10183	DIGITAL INPUT #8 STATUS	0=Floating/Grounded, 1=Active
10184	DIGITAL INPUT #9 STATUS	0=Floating/Grounded, 1=Active
10185	DIGITAL INPUT #10 STATUS	0=Floating/Grounded, 1=Active
10186	DIGITAL INPUT #11 STATUS	0=Floating/Grounded, 1=Active
10187	DIGITAL INPUT #12 STATUS	0=Floating/Grounded, 1=Active
10188	DIGITAL INPUT #13 STATUS	0=Floating/Grounded, 1=Active
10189	DIGITAL INPUT #14 STATUS	0=Floating/Grounded, 1=Active
10190	DIGITAL INPUT #15 STATUS	0=Floating/Grounded, 1=Active
10191	DIGITAL INPUT #16 STATUS	0=Floating/Grounded, 1=Active
10192	BASELOAD CONTROL STATUS	0=Not Active, 1=Active
10193	NOT USED	
10194	NOT USED	
10195	AUTO START SEQUENCE ALARM STATUS	0=Not Active, 1=Active
10196	AUTO STOP SEQUENCE ALARM STATUS	0=Not Active, 1=Active
10197	SERVICE HOURS EXPIRED ALM STATUS	0=Not Active, 1=Active
10198	LON ERROR FLAG	0=Not Active, 1=Active

Table C-3. Analog Reads

Modbus ID	Item	Semantics	Min	Max	Scale or Note
30001	BATTERY VOLTAGE	Ex: 240=24.0 Vdc	0	500	10
30002	ENGINE OIL PRESSURE	Ex: 128=12.8	0	1000	10
30003	ENGINE COOLANT TEMPERATURE	Units per configuration	-100	300	1
30004	ENGINE RUN TIME	Hours	0	32000	1

Modbus ID	Item	Semantics	Min	Max	Scale or Note
30005	NOT USED	MW hours	0	32000	1
30006	ENGINE RPM	RPM	0	5000	1
30007	GEN A PHASE VOLTS (L-L)	Volts	0	32767	Note A
30008	GEN B PHASE VOLTS (L-L)	Volts	0	32767	Note A
30009	GEN C PHASE VOLTS (L-L)	Volts	0	32767	Note A
30010	GEN TOTAL WATTS	KW	-32768	32767	Note E
30011	GEN TOTAL VA	KVA	-32768	32767	Note E
30012	GEN PF	-500=0.5 Lead, 500=0.5 Lag, 0=1.0	-500	500	1000
30013	GEN A PHASE VAR	KVAR	-32768	32767	Note E
30014	GEN B PHASE VAR	KVAR	-32768	32767	Note E
30015	GEN C PHASE VAR	KVAR	-32768	32767	Note E
30016	GEN TOTAL VAR	KVAR	-32768	32767	Note E
30017	BUS FREQUENCY	Hertz x 10	0	700	10
30018	GEN FREQUENCY	Hertz x 10	0	700	10
30019	UNIT NODE NUMBER	LON Communication Bus	1	16	1
30020	SYNC TIMEOUT ACTION	See Alarm Action Def	0	7	1
30021	SYNC RECLOSE ACTION	See Alarm Action Def	0	7	1
30022	CRANK FAIL ACTION	See Alarm Action Def	0	7	1
30023	VOLTAGE RANGE ACTION	See Alarm Action Def	0	7	1
30024	OVERSPEED ACTION	See Alarm Action Def	0	7	1
30025	OVER CURRENT ACTION	See Alarm Action Def	0	7	1
30026	GEN REVERSE POWER ALM ACTION	See Alarm Action Def	0	7	1
30027	GEN REVERSE VAR ALM ACTION	See Alarm Action Def	0	7	1
30028	SPEED FREQ MISMATCH ACTION	See Alarm Action Def	0	7	1
30029	COOLANT TEMP HIGH ALM ACTION	See Alarm Action Def	0	7	1
30030	COOLANT TEMP LOW ALM ACTION	See Alarm Action Def	0	7	1
30031	OIL PRESS HIGH ALM ACTION	See Alarm Action Def	0	7	1
30032	OIL PRESS LOW ALM ACTION	See Alarm Action Def	0	7	1
30033	BATTERY VOLT LOW ALM ACTION	See Alarm Action Def	0	7	1
30034	BATTERY VOLT HIGH ALM ACTION	See Alarm Action Def	0	7	1
30035	GEN UNDER VOLT ALM ACTION	See Alarm Action Def	0	7	1
30036	GEN OVER VOLT ALM ACTION	See Alarm Action Def	0	7	1
30037	GEN OVER FREQ ALM ACTION	See Alarm Action Def	0	7	1
30038	GEN UNDER FREQ ALM ACTION	See Alarm Action Def	0	7	1
30039	GEN LOAD HIGH LIMIT ALM ACTION	See Alarm Action Def	0	7	1
30040	GEN LOAD LOW LIMIT ALM ACTION	See Alarm Action Def	0	7	1

Modbus ID	Item	Semantics	Min	Max	Scale or Note
30041	PROCESS HIGH LIMIT ALM ACTION	See Alarm Action Def	0	7	1
30042	PROCESS LOW LIMIT ALM ACTION	See Alarm Action Def	0	7	1
30043	REMOTE ALARM #1 ACTION	See Alarm Action Def	0	7	1
30044	REMOTE ALARM #2 ACTION	See Alarm Action Def	0	7	1
30045	REMOTE ALARM #3 ACTION	See Alarm Action Def	0	7	1
30046	REMOTE ALARM #4 ACTION	See Alarm Action Def	0	7	1
30047	REMOTE ALARM #5 ACTION	See Alarm Action Def	0	7	1
30048	REMOTE ALARM #6 ACTION	See Alarm Action Def	0	7	1
30049	NOT USED	See Alarm Action Def	0	7	1
30050	BUS UNDER VOLT ALM ACTION	See Alarm Action Def	0	7	1
30051	BUS OVER VOLT ALM ACTION	See Alarm Action Def	0	7	1
30052	BUS OVER FREQ ALM ACTION	See Alarm Action Def	0	7	1
30053	BUS UNDER FREQ ALM ACTION	See Alarm Action Def	0	7	1
30054	TRIP TIE BREAKER ALM ACTION				
30055	GEN A PHASE VOLTS (L-N)	Always Line-Neutral	0	32767	Note A
30056	GEN B PHASE VOLTS (L-N)	Always Line-Neutral	0	32767	Note A
30057	GEN C PHASE VOLTS (L-N)	Always Line-Neutral	0	32767	Note A
30058	BUS A PHASE VOLTS (L-N)	Always Line-Neutral	0	32767	Note C
30059	GEN A PHASE CURRENT	Amps	-32768	32767	Note B
30060	GEN B PHASE CURRENT	Amps	-32768	32767	Note B
30061	GEN C PHASE CURRENT	Amps	-32768	32767	Note B
30062	GEN A PHASE VA	KVA	-32768	32767	Note E
30063	GEN B PHASE VA	KVA	-32768	32767	Note E
30064	GEN C PHASE VA	KVA	-32768	32767	Note E
30065	VOLTAGE BIAS ANALOG INPUT	% Output where 0=0 bias, 100=100% raise, -100=100% lower	0	100	1
30066	SPEED BIAS ANALOG INPUT	% Output where 0=0 bias, 100=100% raise, -100=100% lower	0	100	1
30067	REAL LOAD CONTROL STATE	See Load Control State Def	0	6	1
30068	SYNCHRONIZER STATE	See Synchronizer State Def	0	6	1
30069	NUM UNACKNOWLEDGED ALARMS		0	99	1
30070	NOT USED	Reserved for EGCP-2			
30071	NOT USED	Reserved for EGCP-2			
30072	ENGINE STATE	See Engine State Def	0	9	1
30073	SYNCHROSCOPE	See Synchroscope Def	-180	180	1
30074	GEN POWER UNITS	See Units Def	0	2	Note E
30075	GEN AVERAGE VOLTAGE	Volts	0	32767	Note A
30076	GEN AVERAGE CURRENT	Amps	-32768	32767	Note B
30077	GEN A PHASE WATTS	KW	-32768	32767	Note E

Modbus ID	Item	Semantics	Min	Max	Scale or Note
30078	GEN B PHASE WATTS	KW	-32768	32767	Note E
30079	GEN C PHASE WATTS	KW	-32768	32767	Note E
30080	GEN NEG PHASE SEQ VOLTAGE	Volts	-32768	32767	Note A
30081	GEN NEG PHASE SEQ CURRENT	Amps	-32768	32767	Note B
30082	GEN A PHASE ANGLE	Degrees	0	3600	10
30083	GEN B PHASE ANGLE	Degrees	0	3600	10
30084	GEN C PHASE ANGLE	Degrees	0	3600	10
30085	GEN CURRENT THD	% THD	0	100	10
30086	GEN VOLTAGE THD	% THD	0	100	10
30087	GEN 2ND CURRENT HARMONIC	Percent	0	100	10
30088	GEN 3RD CURRENT HARMONIC	Percent	0	100	10
30089	GEN 4TH CURRENT HARMONIC	Percent	0	100	10
30090	GEN 5TH CURRENT HARMONIC	Percent	0	100	10
30091	GEN 6TH CURRENT HARMONIC	Percent	0	100	10
30092	GEN 7TH CURRENT HARMONIC	Percent	0	100	10
30093	GEN 9TH CURRENT HARMONIC	Percent	0	100	10
30094	GEN 11TH CURRENT HARMONIC	Percent	0	100	10
30095	GEN 13TH CURRENT HARMONIC	Percent	0	100	10
30096	GEN 2ND VOLTAGE HARMONIC	Percent	0	100	10
30097	GEN 3RD VOLTAGE HARMONIC	Percent	0	100	10
30098	GEN 4TH VOLTAGE HARMONIC	Percent	0	100	10
30099	GEN 5TH VOLTAGE HARMONIC	Percent	0	100	10
30100	GEN 6TH VOLTAGE HARMONIC	Percent	0	100	10
30101	GEN 7TH VOLTAGE HARMONIC	Percent	0	100	10
30102	GEN 9TH VOLTAGE HARMONIC	Percent	0	100	10
30103	GEN 11TH VOLTAGE HARMONIC	Percent	0	100	10
30104	GEN 13TH VOLTAGE HARMONIC	Percent	0	100	10
30105	BUS B PHASE VOLTS (L-N)	Volts	0	32767	Note C
30106	BUS C PHASE VOLTS (L-N)	Volts	0	32767	Note C

Modbus ID	Item	Semantics	Min	Max	Scale or Note
30107	BUS A PHASE VOLTS (L-L)	Volts	0	32767	Note C
30108	BUS B PHASE VOLTS (L-L)	Volts	0	32767	Note C
30109	BUS C PHASE VOLTS (L-L)	Volts	0	32767	Note C
30110	BUS POWER UNITS	See Units Def	0	2	Note F
30111	BUS AVERAGE VOLTAGE	Volts	0	32767	Note C
30112	BUS AVERAGE CURRENT	Amps	-32768	32767	Note D
30113	BUS A PHASE CURRENT	Amps	-32768	32767	Note D
30114	BUS B PHASE CURRENT	Amps	-32768	32767	Note D
30115	BUS C PHASE CURRENT	Amps	-32768	32767	Note D
30116	BUS A PHASE VA	KVA	-32768	32767	Note F
30117	BUS B PHASE VA	KVA	-32768	32767	Note F
30118	BUS C PHASE VA	KVA	-32768	32767	Note F
30119	BUS TOTAL VA	KVA	-32768	32767	Note F
30120	BUS A PHASE WATTS	KW	-32768	32767	Note F
30121	BUS B PHASE WATTS	KW	-32768	32767	Note F
30122	BUS C PHASE WATTS	KW	-32768	32767	Note F
30123	BUS TOTAL WATTS	KW	-32768	32767	Note F
30124	BUS PF	-500=0.5 Lead, 500=0.5 Lag, 0=1.0	-0.5	0.5	1000
30125	BUS A PHASE VAR	KVAR	-32768	32767	Note F
30126	BUS B PHASE VAR	KVAR	-32768	32767	Note F
30127	BUS C PHASE VAR	KVAR	-32768	32767	Note F
30128	BUS TOTAL VAR	KVAR	-32768	32767	Note F
30129	BUS NEG PHASE SEQ VOLTS	Volts	-32768	32767	Note C
30130	BUS NEG PHASE SEQ CURRENT	Amps	-32768	32767	Note D
30131	BUS A PHASE ANGLE	Degrees	0	360	10
30132	BUS B PHASE ANGLE	Degrees	0	360	10
30133	BUS C PHASE ANGLE	Degrees	0	360	10
30134	BUS CURRENT THD	% THD	0	100	10
30135	BUS VOLTAGE THD	% THD	0	100	10
30136	BUS 2ND CURRENT HARMONIC	Percent	0	100	10
30137	BUS 3RD CURRENT HARMONIC	Percent	0	100	10
30138	BUS 4TH CURRENT HARMONIC	Percent	0	100	10
30139	BUS 5TH CURRENT HARMONIC	Percent	0	100	10
30140	BUS 6TH CURRENT HARMONIC	Percent	0	100	10
30141	BUS 7TH CURRENT HARMONIC	Percent	0	100	10
30142	BUS 9TH CURRENT HARMONIC	Percent	0	100	10
30143	BUS 11TH CURRENT HARMONIC	Percent	0	100	10

Modbus ID	Item	Semantics	Min	Max	Scale or Note
30144	BUS 13TH CURRENT HARMONIC	Percent	0	100	10
30145	BUS 2ND VOLTAGE HARMONIC	Percent	0	100	10
30146	BUS 3RD VOLTAGE HARMONIC	Percent	0	100	10
30147	BUS 4TH VOLTAGE HARMONIC	Percent	0	100	10
30148	BUS 5TH VOLTAGE HARMONIC	Percent	0	100	10
30149	BUS 6TH VOLTAGE HARMONIC	Percent	0	100	10
30150	BUS 7TH VOLTAGE HARMONIC	Percent	0	100	10
30151	BUS 9TH VOLTAGE HARMONIC	Percent	0	100	10
30152	BUS 11TH VOLTAGE HARMONIC	Percent	0	100	10
30153	BUS 13TH VOLTAGE HARMONIC	Percent	0	100	10
30154	IDLE OIL PRESS HIGH ALM ACTION	See Alarm Action Def	0	7	1
30155	IDLE OIL PRESS LOW ALM ACTION	See Alarm Action Def	0	7	1
30156	GEN UNDER VOLT PRE-ALM ACTION	See Alarm Action Def	0	7	1
30157	GEN OVER VOLT PRE-ALM ACTION	See Alarm Action Def	0	7	1
30158	GEN OVER FREQ PRE-ALM ACTION	See Alarm Action Def	0	7	1
30159	GEN UNDER FREQ PRE-ALM ACTION	See Alarm Action Def	0	7	1
30160	GEN REVERSE POWER PRE-ALM ACTION	See Alarm Action Def	0	7	1
30161	GEN OVER POWER ALM ACTION	See Alarm Action Def	0	7	1
30162	GEN OVER POWER PRE-ALM ACTION	See Alarm Action Def	0	7	1
30163	GEN REVERSE VAR PRE-ALM ACTION	See Alarm Action Def	0	7	1
30164	GEN OVER VAR ALM ACTION	See Alarm Action Def	0	7	1
30165	GEN OVER VAR PRE-ALM ACTION	See Alarm Action Def	0	7	1
30166	GEN PHASE OVER CURR PRE-ALM ACTION	See Alarm Action Def	0	7	1
30167	GEN PHASE CURR DIFF ALM ACTION	See Alarm Action Def	0	7	1
30168	GEN PHASE CURR DIFF PRE-ALM ACTION	See Alarm Action Def	0	7	1

Modbus ID	Item	Semantics	Min	Max	Scale or Note
30169	GEN NEG PHASE SEQ OC ALM ACTION	See Alarm Action Def	0	7	1
30170	GEN NEG PHASE SEQ OC PRE-ALM ACTION	See Alarm Action Def	0	7	1
30171	GEN NEG PHASE SEQ OV ALM ACTION	See Alarm Action Def	0	7	1
30172	GEN NEG PHASE SEQ OV PRE-ALM ACTION	See Alarm Action Def	0	7	1
30173	BUS UNDER VOLT PRE-ALM ACTION	See Alarm Action Def	0	7	1
30174	BUS OVER VOLT PRE-ALM ACTION	See Alarm Action Def	0	7	1
30175	BUS OVER FREQ PRE-ALM ACTION	See Alarm Action Def	0	7	1
30176	BUS UNDER FREQ PRE-ALM ACTION	See Alarm Action Def	0	7	1
30177	BUS IMPORT POWER ALM ACTION	See Alarm Action Def	0	7	1
30178	BUS IMPORT POWER PRE-ALM ACTION	See Alarm Action Def	0	7	1
30179	BUS EXPORT POWER ALM ACTION	See Alarm Action Def	0	7	1
30180	BUS EXPORT POWER PRE-ALM ACTION	See Alarm Action Def	0	7	1
30181	BUS IMPORT VAR ALM ACTION	See Alarm Action Def	0	7	1
30182	BUS IMPORT VAR PRE-ALM ACTION	See Alarm Action Def	0	7	1
30183	BUS EXPORT VAR ALM ACTION	See Alarm Action Def	0	7	1
30184	BUS EXPORT VAR PRE-ALM ACTION	See Alarm Action Def	0	7	1
30185	BUS PHASE OVER CURRENT ALM ACTION	See Alarm Action Def	0	7	1
30186	BUS PHASE OVER CURR PRE-ALM ACTION	See Alarm Action Def	0	7	1
30187	BUS PHASE CURR DIFF ALM ACTION	See Alarm Action Def	0	7	1
30188	BUS PHASE CURR DIFF PRE-ALM ACTION	See Alarm Action Def	0	7	1
30189	BUS NEG PHASE SEQ OC ALM ACTION	See Alarm Action Def	0	7	1
30190	BUS NEG PHASE SEQ OC PRE-ALM ACTION	See Alarm Action Def	0	7	1
30191	BUS NEG PHASE SEQ OV ALM ACTION	See Alarm Action Def	0	7	1
30192	BUS NEG PHASE SEQ OV PRE-ALM ACTION	See Alarm Action Def	0	7	1
30193	BUS VOLT RES PHASE OC ALM ACTION	See Alarm Action Def	0	7	1

Modbus ID	Item	Semantics	Min	Max	Scale or Note
30194	BUS VOLT RES PHASE OC PRE-ALM ACTION	See Alarm Action Def	0	7	1
30195	NOT USED	See Alarm Action Def	0	7	1
30196	ANALOG 1 HIGH ALM ACTION	See Alarm Action Def	0	7	1
30197	NOT USED	See Alarm Action Def	0	7	1
30198	ANALOG 1 LOW ALM ACTION	See Alarm Action Def	0	7	1
30199	NOT USED	See Alarm Action Def	0	7	1
30200	ANALOG 2 HIGH ALM ACTION	See Alarm Action Def	0	7	1
30201	NOT USED	See Alarm Action Def	0	7	1
30202	ANALOG 2 LOW ALM ACTION	See Alarm Action Def	0	7	1
30203	ANALOG 3 HIGH PRE-ALM ACTION	See Alarm Action Def	0	7	1
30204	ANALOG 3 HIGH ALM ACTION	See Alarm Action Def	0	7	1
30205	ANALOG 3 LOW PRE-ALM ACTION	See Alarm Action Def	0	7	1
30206	ANALOG 3 LOW ALM ACTION	See Alarm Action Def	0	7	1
30207	ANALOG 4 HIGH PRE-ALM ACTION	See Alarm Action Def	0	7	1
30208	ANALOG 4 HIGH ALM ACTION	See Alarm Action Def	0	7	1
30209	ANALOG 4 LOW PRE-ALM ACTION	See Alarm Action Def	0	7	1
30210	ANALOG 4 LOW ALM ACTION	See Alarm Action Def	0	7	1
30211	EMERGENCY STOP DI ACTION	See Alarm Action Def	0	7	1
30212	SPEED/FREQ MISMATCH ACTION	See Alarm Action Def	0	7	1
30213	NOT USED				
30214	NOT USED				
30215	LOAD REFERENCE	Rounded to integer	-32768	32767	Note E
30216	PROCESS REFERENC	Customer units rounded to integer	-1000	1000	10
30217	ANALOG INPUT 1 LEVEL	MA or VDC depending on config	0	25	100
30218	ANALOG INPUT 2 LEVEL	MA or VDC depending on config	0	25	100
30219	ANALOG INPUT 3 LEVEL	MA or VDC depending on config	0	25	100
30220	ANALOG INPUT 4 LEVEL	MA or VDC depending on config	0	25	100
30221	REACTIVE LOAD CONTROL MODE	See Reactive Load Control Mode	0	11	1
30222	GEN VOLTAGE UNITS	See Units Def	0	2	Note A
30223	GEN CURRENT UNITS	See Units Def	0	2	Note B
30224	BUS VOLTAGE UNITS	See Units Def	0	2	Note C
30225	BUS CURRENT UNITS	See Units Def	0	2	Note D
30226	SYNCHRONIZER MODE	See Synchronizer Mode Def	0	4	1
30227	UNIT LOAD	% of rating	-168	168	10
30228	SYSTEM LOAD	% of rating	-168	168	10
30229	PF REFERENCE	-500=0.5 Lead, 500=0.5 Lag, 0=1.0	-500	500	1000
30230	VAR REFERENCE	VAR	0	32767	Note E
30231	REAL LOAD MODE	See Real Load Mode Def	0	11	1

Modbus ID	Item	Semantics	Min	Max	Scale or Note
30232	REACTIVE LOAD CONTROL STATE	See Reactive Load Control State Def	0	6	1
30233	NOT USED	See ATS State Def	0	9	1
30234	GENSET STATE	See Genset State Def	0	8	1
30235	PRODUCT PART NUMBER (FAMILY)	Application Code	0000	9999	
30236	PRODUCT PART NUMBER (SUFFIX)	Application Code	0000	9999	
30237	PRODUCT APPLICATION REVISION	New=0, A=1, B=2, etc	0	26	
30238	LS NODES	Load share nodes on active bus	1	16	
30239	NET NODES	Net nodes on LON	1	16	
30240	SERVICE HOUSE REMAINING	Count down timer	-32767	32767	
30241	NOT USED	See Alarm Action Def	1	6	
30242	NOT USED	See Alarm Action Def	1	6	
30243	GEN W-HR UNITS	See Units Def	1	4	
30244	GEN W-HR (HUNDREDS)	000,000,000.00	1	4	
30245	GEN W-HR (THOUSANDS)	000,000,000.00	1	4	
30246	GEN W-HR (MILLIONS)	000,000,000.00	1	4	
30247	BUS W-HR UNITS	See Units Def	1	4	
30248	BUS W-HR (HUNDREDS)	000,000,000.00	1	4	
30249	BUS W-HR (THOUSANDS)	000,000,000.00	0	999.99	
30250	BUS W-HR (MILLIONS)	000,000,000.00	0	999	
30251	OPERATION VOLTAGE	Volts	0	32767	Note A
30252	BASELOAD REFERENCE SETPOINT	KW	0	32767	Note E
30253	PROCESS REFERENCE SETPOINT	Customer units rounded to integer	-1000	1000	10
30254	PF REFERENCE SETPOINT	500=0.5 Lead, 500=0.5 Lag, 0=1.0	-500	500	1000
30255	VAR REFERENCE SETPOINT	VAR	0	32767	Note E
30256	LON BUS ONLINE DEMAND	Units based on 30257	0	32767	Note E
30257	LON BUS ONLINE DEMAND UNITS	See Units Def	1	4	
30258	LON ONLINE CAPACITY	Units based on 30259	0	32767	Note E
30259	LON ONLINE CAPACITY UNITS	See Units Def	1	4	
30260	LON NEXT UNIT TO START	Unit Number	1	16	
30261	LON NEXT UNIT TO STOP	Unit Number	1	16	
30262	LON ERROR MESSAGE NUMBER	Number of Lon error message	1	255	

Table C-4. Analog Writes

Modbus ID	Item Function	Semantics	Min	Max	Scale
40001	NOT USED				
40002	PROCESS REFERENCE	% Process x 10	-1000	1000	10
40003	BASELOAD REFERENCE	In KW units	0	30,000	1
40004	NOT USED				
40005	PF REFERENCE	In PF where –500=0.5Lag, 500=0.5Lead and 1000=unity PF	-500	500	1000
40006	NOT USED				
40007	VAR REFERENCE	In KVAR units	0	30,000	10
40008	NOT USED				
40009	OPERATION VOLTAGE SETPOINT	Volts	0	32767	Note A
40010	SERVICE HOURS PRESET	Hours	-32767	32767	

Table C-5. LS Modbus Table Note Explanation

Modbus Note	Type of value	Comment	Multiplier Communication Menu
Note A	Gen Voltage	Primary unit in Volts or Kilovolts X MBUS Voltage Multiplier	38 MBUS MULT - GEN VOLT
Note B	Gen Current	Primary unit in Amps or kiloamps X MBUS Multiplier	40 MBUS MULT - GEN CURRENT
Note C	Bus Voltage	Primary unit in Volts or Kilovolts X MBUS Voltage Multiplier	44 MBUS MULT - BUS VOLT
Note D	Bus Current	Primary unit in Amps or kiloamps X MBUS Multiplier	46 MBUS MULT - BUS CURRENT
Note E	GEN W, VAR, VA	Primary units in W,VAR,VA or KW, KVAR, KVA or MW, MVAR, MVA or GW, GVAR, GVA X MBUS Multiplier	42 MBUS MULT - GEN POWER
Note F	Bus W, VAR, VA	Primary units in W,VAR,VA or KW, KVAR, KVA or MW, MVAR, MVA or GW, GVAR, GVA X MBUS Multiplier	48 MBUS MULT - BUS POWER

Appendix D.
EGCP-3 MC Modbus List

Table D-1. Boolean Writes

Modbus ID	Item Function	Semantics
00001	ENABLE AUTO	Sets control mode to AUTO, 0=False, 1=True (Momentary)
00002	ENABLE TEST	Sets control mode to TEST, 0=False, 1=True (Momentary)
00003	ENABLE RUN W/ LOAD	Sets control mode to RUN, 0=False, 1=True (Momentary)
00004	VOLT/PF/VAR RAISE	0=False, 1=True
00005	VOLT/PF/VAR LOWER	0=False, 1=True
00006	LOAD/SPEED RAISE	0=False, 1=True
00007	LOAD/SPEED LOWER	0=False, 1=True
00008	ENABLE PROCESS	Sets Load mode to PROCESS control 0=False, 1=True (Momentary)
00009	REMOTE ALARM #1	0=Off, 1=On
00010	REMOTE ALARM #2	0=Off, 1=On
00011	REMOTE ALARM #3	0=Off, 1=On
00012	REMOTE ALARM #4	0=Off, 1=On
00013	REMOTE ALARM #5	0=Off, 1=On
00014	REMOTE ALARM #6	0=Off, 1=On
00015	VAR/PF RESET	0=False, 1=True
00016	COMMIT ALARM	Only performs horn silence
00017	LOAD RAMP PAUSE	0=False, 1=True
00018	METER PHASE SELECT A	0=Not Asserted, 1=Asserted
00019	METER PHASE SELECT B	0=Not Asserted, 1=Asserted
00020	RESET ALARM/FAULT	0=False, 1=True
00021	ENABLE VAR/PF CONTROL	Sets Load mode to VAR/PF control, 0=False, 1=True (Momentary)
00022	UNLOAD COMMAND	0=False, 1=True
00023	RESET MC DEMAND	0=Normal, 1=Reset now
00024	NOT USED	
00025	LOAD RESET	0=False, 1=True (Momentary)
00026	SYNCHRONIZER OFF	Sets sync mode to OFF, 0=False, 1=True (Momentary)
00027	SYNCHRONIZER CHECK	Sets sync mode to CHECK, 0=False, 1=True (Momentary)
00028	SYNCHRONIZER PERMISSIVE	Sets sync mode to PERMISSIVE, 0=False, 1=True (Momentary)
00029	SYNCHRONIZER RUN	Sets sync mode to RUN, 0=False, 1=True (Momentary)
00030	DISABLE AUTO	Removes AUTO control mode, 0=False, 1=True (Momentary)
00031	DISABLE TEST	Removes TEST control mode, 0=False, 1=True (Momentary)
00032	DISABLE RUN W LOAD	Removes RUN control mode, 0=False, 1=True (Momentary)
00033	DISABLE PROCESS	Removes PROCESS Load control mode, 0=False, 1=True (Momentary)
00034	DISABLE VAR/PF	Removes VAR/PF Load control mode,

Modbus ID	Item Function	Semantics
		0=False, 1=True (Momentary)
00035	NOT USED	
00036	NOT USED	
00037	NOT USED	
00038	NOT USED	
00039	RESET TOTAL MAINS DEMAND	0=False, 1=True (Momentary)

Table D-2. Boolean Reads

Modbus ID	Item	Semantics
10001	NOT USED	
10002	MAINS STABLE INDICATION	0=Not stable, 1=Stable
10003	BUS STABLE INDICATION	0=Not stable, 1=Stable
10004	ALARM STATUS	0=No Alarms, 1=Active Alarm
10005	LOM STATUS	0=No Alarms, 1=Active Alarm
10006	MAINS BREAKER CLOSE CMD	0=Open, 1=Closed
10007	GROUP BREAKER CLOSE CMD	0=Open, 1=Closed
10008	NOT USED	0=Not Active, 1=Active
10009	NOT USED	0=Not Active, 1=Active
10010	NOT USED	0=Not Active, 1=Active
10011	VISUAL ALARM STATUS	0=Not Active, 1=Active
10012	NOT USED	
10013	NOT USED	
10014	MAINS BREAKER SHUNT TRIP	0=Not tripped, 1=Tripped
10015	GROUP BREAKER SHUNT TRIP	0=Tripped, 1=Not Tripped
10016	AUDIBLE ALARM STATUS	0=Not Active, 1=Active
10017	NOT USED	0=Idle, 1=Rated
10018	AUTO STATUS	0=False, 1=True
10019	TEST STATUS	0=False, 1=True
10020	RUN W/ LOAD STATUS	0=False, 1=True
10021	VOLT/PF/VAR RAISE	0=False, 1=True
10022	VOLT/PF/VAR LOWER	0=False, 1=True
10023	LOAD/SPEED RAISE	0=False, 1=True
10024	LOAD/SPEED LOWER	0=False, 1=True
10025	GROUP BREAKER AUX STATUS	0=Open, 1=Closed
10026	MAINS BREAKER AUX STATUS	0=Open, 1=Closed
10027	PROCESS MODE STATUS	0=False, 1=True
10028	REMOTE ALARM #1 DI STATUS	0=False, 1=True
10029	REMOTE ALARM #2 DI STATUS	0=False, 1=True
10030	REMOTE ALARM #3 DI STATUS	0=False, 1=True
10031	REMOTE ALARM #4 DI STATUS	0=False, 1=True
10032	REMOTE ALARM #5 DI STATUS	0=False, 1=True
10033	REMOTE ALARM #6 DI STATUS	0=False, 1=True
10034	SYNCH TIMEOUT STATUS	0=No Alarm, 1=Active Alarm
10035	SYNCH RECLOSE STATUS	0=No Alarm, 1=Active Alarm
10036	NOT USED	0=No Alarm, 1=Active Alarm

Modbus ID	Item	Semantics
10037	NOT USED	0=No Alarm, 1=Active Alarm
10038	NOT USED	0=No Alarm, 1=Active Alarm
10039	BUS PHASE OVER CURRENT ALARM	0=No Alarm, 1=Active Alarm
10040	BUS REVERSE POWER ALARM	0=No Alarm, 1=Active Alarm
10041	BUS REVERSE VAR ALARM	0=No Alarm, 1=Active Alarm
10042	NOT USED	
10043	NOT USED	
10044	NOT USED	
10045	NOT USED	
10046	NOT USED	
10047	BATTERY VOLT LOW ALARM	0=No Alarm, 1=Active Alarm
10048	BATTERY VOLT HIGH ALARM	0=No Alarm, 1=Active Alarm
10049	BUS UNDER VOLT ALARM	0=No Alarm, 1=Active Alarm
10050	BUS OVER VOLT ALARM	0=No Alarm, 1=Active Alarm
10051	BUS OVER FREQUENCY ALARM	0=No Alarm, 1=Active Alarm
10052	BUS UNDER FREQUENCY ALARM	0=No Alarm, 1=Active Alarm
10053	BUS HIGH LOAD LIMIT ALARM	0=No Alarm, 1=Active Alarm
10054	BUS LOW LOAD LIMIT ALARM	0=No Alarm, 1=Active Alarm
10055	PROCESS HIGH LIMIT ALARM	0=No Alarm, 1=Active Alarm
10056	PROCESS LOW LIMIT ALARM	0=No Alarm, 1=Active Alarm
10057	REMOTE ALARM #1	0=No Alarm, 1=Active Alarm
10058	REMOTE ALARM #2	0=No Alarm, 1=Active Alarm
10059	REMOTE ALARM #3	0=No Alarm, 1=Active Alarm
10060	REMOTE ALARM #4	0=No Alarm, 1=Active Alarm
10061	REMOTE ALARM #5	0=No Alarm, 1=Active Alarm
10062	REMOTE ALARM #6	0=No Alarm, 1=Active Alarm
10063	LOAD SURGE ALARM	0=No Alarm, 1=Active Alarm
10064	MAINS UNDER VOLT ALARM	0=No Alarm, 1=Active Alarm
10065	MAINS OVER VOLT ALARM	0=No Alarm, 1=Active Alarm
10066	MAINS OVER FREQUENCY ALARM	0=No Alarm, 1=Active Alarm
10067	MAINS UNDER FREQUENCY ALARM	0=No Alarm, 1=Active Alarm
10068	NOT USED	
10069	NOT USED	
10070	BUS VOLTAGE CONFIGURATION (T=L-L)	0=Wye (L-N), 1=Delta (L-L)
10071	BUS PF INDICATOR	0=Lag, 1=Lead
10072	NOT USED	
10073	NOT USED	
10074	NOT USED	
10075	NOT USED	
10076	BUS SENSING TYPE	0=1 phase, 1=3 phase
10077	MAINS SENSING TYPE	0=1 phase, 1=3 phase
10078	MAINS VOLTAGE CONFIGURATION (T=L-L)	0=Wye (L-N), 1=Delta (L-L)
10079	EPS SUPPLYING LOAD ALARM	0=No Alarm, 1=Active Alarm
10080	NOT USED	
10081	NOT USED	

Modbus ID	Item	Semantics
10082	BUS UNDER VOLT PRE-ALARM	0=No Alarm, 1=Active Alarm
10083	BUS OVER VOLT PRE-ALARM	0=No Alarm, 1=Active Alarm
10084	BUS OVER FREQUENCY PRE-ALARM	0=No Alarm, 1=Active Alarm
10085	BUS UNDER FREQUENCY PRE-ALARM	0=No Alarm, 1=Active Alarm
10086	BUS REVERSE POWER PRE-ALARM	0=No Alarm, 1=Active Alarm
10087	BUS OVER POWER ALARM	0=No Alarm, 1=Active Alarm
10088	BUS OVER POWER PRE-ALARM	0=No Alarm, 1=Active Alarm
10089	BUS REVERSE VAR PRE-ALARM	0=No Alarm, 1=Active Alarm
10090	BUS OVER VAR ALARM	0=No Alarm, 1=Active Alarm
10091	BUS OVER VAR PRE-ALARM	0=No Alarm, 1=Active Alarm
10092	BUS PHASE OVER CURRENT PRE-ALARM	0=No Alarm, 1=Active Alarm
10093	BUS PHASE CURRENT DIFF ALARM	0=No Alarm, 1=Active Alarm
10094	BUS PHASE CURRENT DIFF PRE-ALARM	0=No Alarm, 1=Active Alarm
10095	BUS NEG PHASE SEQ OVER CURR ALM	0=No Alarm, 1=Active Alarm
10096	BUS NEG PHASE SEQ OVER CURR PRE-ALM	0=No Alarm, 1=Active Alarm
10097	BUS NEG PHASE SEQ OVER VOLT ALM	0=No Alarm, 1=Active Alarm
10098	BUS NEG PHASE SEQ OVER VOLT PRE-ALM	0=No Alarm, 1=Active Alarm
10099	MAINS UNDER VOLT PRE-ALARM	0=No Alarm, 1=Active Alarm
10100	MAINS OVER VOLT PRE-ALARM	0=No Alarm, 1=Active Alarm
10101	MAINS OVER FREQ PRE-ALARM	0=No Alarm, 1=Active Alarm
10102	MAINS UNDER FREQ PRE-ALARM	0=No Alarm, 1=Active Alarm
10103	MAINS IMPORT POWER ALARM	0=No Alarm, 1=Active Alarm
10104	MAINS IMPORT POWER PRE-ALARM	0=No Alarm, 1=Active Alarm
10105	MAINS EXPORT POWER ALARM	0=No Alarm, 1=Active Alarm
10106	MAINS EXPORT POWER PRE-ALARM	0=No Alarm, 1=Active Alarm
10107	MAINS IMPORT VAR ALARM	0=No Alarm, 1=Active Alarm
10108	MAINS IMPORT VAR PRE-ALARM	0=No Alarm, 1=Active Alarm
10109	MAINS EXPORT VAR ALARM	0=No Alarm, 1=Active Alarm
10110	MAINS EXPORT VAR PRE-ALARM	0=No Alarm, 1=Active Alarm
10111	MAINS PHASE OVER CURR ALARM	0=No Alarm, 1=Active Alarm
10112	MAINS PHASE OVER CURR PRE-ALARM	0=No Alarm, 1=Active Alarm
10113	MAINS PHASE CURR DIFF ALARM	0=No Alarm, 1=Active Alarm
10114	MAINS PHASE CURR DIFF PRE-ALARM	0=No Alarm, 1=Active Alarm
10115	MAINS NEG PHASE SEQ OVER CURR ALM	0=No Alarm, 1=Active Alarm
10116	MAINS NEG PHASE SEQ OVER CURR PRE-ALM	0=No Alarm, 1=Active Alarm
10117	MAINS NEG PHASE SEQ OVER VOLT ALM	0=No Alarm, 1=Active Alarm
10118	MAINS NEQ PHASE SEQ OVER VOLT PRE-ALM	0=No Alarm, 1=Active Alarm
10119	MAINS VOLT RES PHASE OVER CURR ALM	0=No Alarm, 1=Active Alarm
10120	MAINS VOLT RES PHASE OVER CURR PRE-ALM	0=No Alarm, 1=Active Alarm
10121	ANALOG IN 1 HIGH PRE-ALARM	0=No Alarm, 1=Active Alarm
10122	ANALOG IN 1 HIGH ALARM	0=No Alarm, 1=Active Alarm
10123	ANALOG IN 1 LOW PRE-ALARM	0=No Alarm, 1=Active Alarm
10124	ANALOG IN 1 LOW ALARM	0=No Alarm, 1=Active Alarm
10125	ANALOG IN 2 HIGH PRE-ALARM	0=No Alarm, 1=Active Alarm
10126	ANALOG IN 2 HIGH ALARM	0=No Alarm, 1=Active Alarm

Modbus ID	Item	Semantics
10127	ANALOG IN 2 LOW PRE-ALARM	0=No Alarm, 1=Active Alarm
10128	ANALOG IN 2 LOW ALARM	0=No Alarm, 1=Active Alarm
10129	ANALOG IN 3 HIGH PRE-ALARM	0=No Alarm, 1=Active Alarm
10130	ANALOG IN 3 HIGH ALARM	0=No Alarm, 1=Active Alarm
10131	ANALOG IN 3 LOW PRE-ALARM	0=No Alarm, 1=Active Alarm
10132	ANALOG IN 3 LOW ALARM	0=No Alarm, 1=Active Alarm
10133	ANALOG IN 4 HIGH PRE-ALARM	0=No Alarm, 1=Active Alarm
10134	ANALOG IN 4 HIGH ALARM	0=No Alarm, 1=Active Alarm
10135	ANALOG IN 4 LOW PRE-ALARM	0=No Alarm, 1=Active Alarm
10136	ANALOG IN 4 LOW ALARM	0=No Alarm, 1=Active Alarm
10137	NOT USED	
10138	LOAD RAMP PAUSE STATUS	0=False, 1=True
10139	METER PHASE SELECT A STATUS	0=False, 1=True
10140	METER PHASE SELECT B STATUS	0=False, 1=True
10141	RESET ALARM/FAULT STATUS	0=False, 1=True
10142	ENABLE VAR/PF STATUS	0=False, 1=True
10143	UNLOAD COMMAND STATUS	0=False, 1=True
10144	NOT USED	
10145	AUDIBLE ALARM STATUS	0=Not Active, 1=Active
10146	STOP ALL ALARM STATUS	0=Not Active, 1=Active
10147	TRIP MAINS ALARM STATUS	0=Not Active, 1=Active
10148	NOT USED	
10149	NOT USED	
10150	KW-HR PULSE	0=Not Active, 1=Active
10151	KVA-HR PULSE	0=Not Active, 1=Active
10152	KVAR-HR PULSE	0=Not Active, 1=Active
10153	NOT USED	
10154	NOT USED	
10155	GROUP BKR SHUNT TRIP ERROR	0=No Alarm, 1=Active Alarm
10156	MAINS BKR SHUNT TRIP ERROR	0=No Alarm, 1=Active Alarm
10157	GROUP BKR FEEDBACK ERROR	0=No Alarm, 1=Active Alarm
10158	MAINS BKR FEEDBACK ERROR	0=No Alarm, 1=Active Alarm
10159	NOT USED	
10160	NOT USED	
10161	PHASE ROTATION MISMATCH	0=No Alarm, 1=Active Alarm
10162	CONFIGURATION CHECK ERROR	0=No Alarm, 1=Active Alarm
10163	KVA SWITCH STATUS	0=Off, 1=On
10164	NOT USED	
10165	NOT USED	
10166	NOT USED	
10167	MODBUS LINK 1 ERROR	0=No Alarm, 1=Active Alarm
10168	MODBUS LINK 2 ERROR	0=No Alarm, 1=Active Alarm
10169	NOT USED	
10170	NOT USED	
10171	ANALOG INPUT 1 OUT OF RANGE	0=OK, 1=Fault

Modbus ID	Item	Semantics
10172	ANALOG INPUT 2 OUT OF RANGE	0=OK, 1=Fault
10173	ANALOG INPUT 3 OUT OF RANGE	0=OK, 1=Fault
10174	ANALOG INPUT 4 OUT OF RANGE	0=OK, 1=Fault
10175	POWERSENSE BOARD FAULT	0=OK, 1=Fault
10176	DIGITAL INPUT #1 STATUS	0=Floating/Grounded, 1=Active
10177	DIGITAL INPUT #2 STATUS	0=Floating/Grounded, 1=Active
10178	DIGITAL INPUT #3 STATUS	0=Floating/Grounded, 1=Active
10179	DIGITAL INPUT #4 STATUS	0=Floating/Grounded, 1=Active
10180	DIGITAL INPUT #5 STATUS	0=Floating/Grounded, 1=Active
10181	DIGITAL INPUT #6 STATUS	0=Floating/Grounded, 1=Active
10182	DIGITAL INPUT #7 STATUS	0=Floating/Grounded, 1=Active
10183	DIGITAL INPUT #8 STATUS	0=Floating/Grounded, 1=Active
10184	DIGITAL INPUT #9 STATUS	0=Floating/Grounded, 1=Active
10185	DIGITAL INPUT #10 STATUS	0=Floating/Grounded, 1=Active
10186	DIGITAL INPUT #11 STATUS	0=Floating/Grounded, 1=Active
10187	DIGITAL INPUT #12 STATUS	0=Floating/Grounded, 1=Active
10188	DIGITAL INPUT #13 STATUS	0=Floating/Grounded, 1=Active
10189	DIGITAL INPUT #14 STATUS	0=Floating/Grounded, 1=Active
10190	DIGITAL INPUT #15 STATUS	0=Floating/Grounded, 1=Active
10191	DIGITAL INPUT #16 STATUS	0=Floating/Grounded, 1=Active
10192	NOT USED	
10193	NOT USED	
10194	NOT USED	
10195	AUTO START SEQUENCE ALARM	0=No Alarm, 1=Active Alarm
10196	AUTO STOP SEQUENCE ALARM	0=No Alarm, 1=Active Alarm
10197	NOT USED	
10198	RESET LOAD STATUS	0=Not Active, 1=Active
10199	MAINS TIMEOUT ALARM	0=No Alarm, 1=Active Alarm
10200	MAINS RECLOSE ALARM	0=No Alarm, 1=Active Alarm
10201	BUS VOLT RES PHASE OVER CURR ALM	0=No Alarm, 1=Active Alarm
10202	BUS VOLT RES PHASE OVER CURR PRE-ALM	0=No Alarm, 1=Active Alarm

Table D-3. Analog Reads

Modbus ID	Item	Semantics	Min	Max	Scale or Note
30001	BATTERY VOLTAGE	Ex: 240=24.0 Vdc	0	500	10
30002	NOT USED	Ex: 128=12.8	0	1000	10
30003	NOT USED	Units per configuration	-100	300	1
30004	NOT USED	Hours	0	32000	1
30005	NOT USED	MW hours	0	32000	1
30006	NOT USED	RPM	0	5000	1
30007	BUS A PHASE VOLTAGE (L-L)	Volts	0	32767	Note A
30008	BUS B PHASE VOLTAGE (L-L)	Volts	0	32767	Note A
30009	BUS C PHASE VOLTAGE (L-L)	Volts	0	32767	Note A
30010	BUS TOTAL WATTS	KW	-32768	32767	Note E

Modbus ID	Item	Semantics	Min	Max	Scale or Note
30011	BUS TOTAL VA	KVA	-32768	32767	Note E
30012	BUS TOTAL PF	-500=0.5 Lead, 500=0.5 Lag, 0=1.0	-500	500	1000
30013	BUS A PHASE VAR	KVAR	-32768	32767	Note E
30014	BUS B PHASE VAR	KVAR	-32768	32767	Note E
30015	BUS C PHASE VAR	KVAR	-32768	32767	Note E
30016	BUS TOTAL VAR	KVAR	-32768	32767	Note E
30017	MAINS FREQUENCY	Hertz x 10	0	700	10
30018	BUS FREQUENCY	Hertz x 10	0	700	10
30019	UNIT NODE NUMBER	LON Communication Bus	1	16	1
30020	MAINS SYNCH TIMEOUT ACTION	See Alarm Action Def	0	7	1
30021	MAINS SYNCH RECLOSE ACTION	See Alarm Action Def	0	7	1
30022	NOT USED	See Alarm Action Def	0	7	1
30023	NOT USED	See Alarm Action Def	0	7	1
30024	NOT USED	See Alarm Action Def	0	7	1
30025	BUS PHASE OVER CURRENT ALM ACTION	See Alarm Action Def	0	7	1
30026	BUS REVERSE POWER ALM ACTION	See Alarm Action Def	0	7	1
30027	BUS REVERSE VAR ALM ACTION	See Alarm Action Def	0	7	1
30028	NOT USED	See Alarm Action Def	0	7	1
30029	NOT USED	See Alarm Action Def	0	7	1
30030	NOT USED	See Alarm Action Def	0	7	1
30031	NOT USED	See Alarm Action Def	0	7	1
30032	NOT USED	See Alarm Action Def	0	7	1
30033	BATTERY LOW ALM ACTION	See Alarm Action Def	0	7	1
30034	BATTERY HIGH ALM ACTION	See Alarm Action Def	0	7	1
30035	BUS UNDER VOLT ALM ACTION	See Alarm Action Def	0	7	1
30036	BUS OVER VOLT ALM ACTION	See Alarm Action Def	0	7	1
30037	BUS OVER FREQ ALM ACTION	See Alarm Action Def	0	7	1
30038	BUS UNDER FREQ ALM ACTION	See Alarm Action Def	0	7	1
30039	BUS LOAD HIGH LIMIT ACTION	See Alarm Action Def	0	7	1
30040	BUS LOAD LOW LIMIT ACTION	See Alarm Action Def	0	7	1
30041	PROCESS HIGH LIMIT ACTION	See Alarm Action Def	0	7	1
30042	PROCESS LOW LIMIT ACTION	See Alarm Action Def	0	7	1
30043	REMOTE ALARM #1 ACTION	See Alarm Action Def	0	7	1
30044	REMOTE ALARM #2 ACTION	See Alarm Action Def	0	7	1
30045	REMOTE ALARM #3 ACTION	See Alarm Action Def	0	7	1
30046	REMOTE ALARM #4 ACTION	See Alarm Action Def	0	7	1
30047	REMOTE ALARM #5 ACTION	See Alarm Action Def	0	7	1
30048	REMOTE ALARM #6 ACTION	See Alarm Action Def	0	7	1
30049	LOAD SURGE ALARM ACTION	See Alarm Action Def	0	7	1

Modbus ID	Item	Semantics	Min	Max	Scale or Note
30050	MAINS UNDER VOLT ALARM ACTION	See Alarm Action Def	0	7	1
30051	MAINS OVER VOLT ALARM ACTION	See Alarm Action Def	0	7	1
30052	MAINS OVER FREQ ALARM ACTION	See Alarm Action Def	0	7	1
30053	MAINS UNDER FREQ ALARM ACTION	See Alarm Action Def	0	7	1
30054	LOSS OF MAINS ALARM ACTION				
30055	BUS A PHASE VOLTAGE (L-N)	Always Line-Neutral	0	32767	Note A
30056	BUS B PHASE VOLTAGE (L-N)	Always Line-Neutral	0	32767	Note A
30057	BUS C PHASE VOLTAGE (L-N)	Always Line-Neutral	0	32767	Note A
30058	MAINS A PHASE VOLTAGE (L-N)	Always Line-Neutral	0	32767	Note C
30059	BUS A PHASE CURRENT	Amps	-32768	32767	Note B
30060	BUS B PHASE CURRENT	Amps	-32768	32767	Note B
30061	BUS C PHASE CURRENT	Amps	-32768	32767	Note B
30062	BUS A PHASE VA	KVA	-32768	32767	Note E
30063	BUS B PHASE VA	KVA	-32768	32767	Note E
30064	BUS C PHASE VA	KVA	-32768	32767	Note E
30065	NOT USED	% Output where 0=0 bias, 100=100% raise, -100=100% lower	0	100	1
30066	NOT USED	% Output where 0=0 bias, 100=100% raise, -100=100% lower	0	100	1
30067	LOAD CONTROL STATE	See Load Control State Def	0	6	1
30068	SYNCHRONIZER STATE	See Synchronizer State Def	0	6	1
30069	NUMBER OF UNACKNOWLEGED ALMS		0	99	1
30070	NOT USED	Reserved for EGCP-2			
30071	NOT USED	Reserved for EGCP-2			
30072	NOT USED	See Engine State Def	0	9	1
30073	SYNCHROSCOPE	See Synchroscope Def	-180	180	1
30074	BUS POWER UNIT	See Units Def	0	2	Note E
30075	BUS AVERAGE VOLTAGE	Volts	0	32767	Note A
30076	BUS AVERAGE CURRENT	Amps	-32768	32767	Note B
30077	BUS A PHASE WATTS	KW	-32768	32767	Note E
30078	BUS B PHASE WATTS	KW	-32768	32767	Note E
30079	BUS C PHASE WATTS	KW	-32768	32767	Note E
30080	BUS NEG PHASE SEQ VOLT	Volts	-32768	32767	Note A
30081	BUS NEG PHASE SEQ CURRENT	Amps	-32768	32767	Note B
30082	BUS A PHASE ANGLE	Degrees	0	3600	10
30083	BUS B PHASE ANGLE	Degrees	0	3600	10
30084	BUS C PHASE ANGLE	Degrees	0	3600	10
30085	BUS CURRENT THD	% THD	0	100	10

Modbus ID	Item	Semantics	Min	Max	Scale or Note
30086	BUS VOLTAGE THD	% THD	0	100	10
30087	BUS 2ND CURRENT HARMONIC	Percent	0	100	10
30088	BUS 3RD CURRENT HARMONIC	Percent	0	100	10
30089	BUS 4TH CURRENT HARMONIC	Percent	0	100	10
30090	BUS 5TH CURRENT HARMONIC	Percent	0	100	10
30091	BUS 6TH CURRENT HARMONIC	Percent	0	100	10
30092	BUS 7TH CURRENT HARMONIC	Percent	0	100	10
30093	BUS 9TH CURRENT HARMONIC	Percent	0	100	10
30094	BUS 11TH CURRENT HARMONIC	Percent	0	100	10
30095	BUS 13TH CURRENT HARMONIC	Percent	0	100	10
30096	BUS 2ND VOLTAGE HARMONIC	Percent	0	100	10
30097	BUS 3RD VOLTAGE HARMONIC	Percent	0	100	10
30098	BUS 4TH VOLTAGE HARMONIC	Percent	0	100	10
30099	BUS 5TH VOLTAGE HARMONIC	Percent	0	100	10
30100	BUS 6TH VOLTAGE HARMONIC	Percent	0	100	10
30101	BUS 7TH VOLTAGE HARMONIC	Percent	0	100	10
30102	BUS 9TH VOLTAGE HARMONIC	Percent	0	100	10
30103	BUS 11TH VOLTAGE HARMONIC	Percent	0	100	10
30104	BUS 13TH VOLTAGE HARMONIC	Percent	0	100	10
30105	MAINS B PHASE VOLTAGE (L-N)	Volts	0	32767	Note C
30106	MAINS C PHASE VOLTAGE (L-N)	Volts	0	32767	Note C
30107	MAINS A PHASE VOLTAGE (L-L)	Volts	0	32767	Note C
30108	MAINS B PHASE VOLTAGE (L-L)	Volts	0	32767	Note C
30109	MAINS C PHASE VOLTAGE (L-L)	Volts	0	32767	Note C
30110	MAINS POWER UNITS	See Units Def	0	2	Note F
30111	MAINS AVERAGE VOLTAGE	Volts	0	32767	Note C
30112	MAINS A PHASE CURRENT	Amps	-32768	32767	Note D

Modbus ID	Item	Semantics	Min	Max	Scale or Note
30113	MAINS B PHASE CURRENT	Amps	-32768	32767	Note D
30114	MAINS C PHASE CURRENT	Amps	-32768	32767	Note D
30115	MAINS AVERAGE CURRENT	Amps	-32768	32767	Note D
30116	MAINS A PHASE VA	KVA	-32768	32767	Note F
30117	MAINS B PHASE VA	KVA	-32768	32767	Note F
30118	MAINS C PHASE VA	KVA	-32768	32767	Note F
30119	MAINS TOTAL VA	KVA	-32768	32767	Note F
30120	MAINS A PHASE WATTS	KW	-32768	32767	Note F
30121	MAINS B PHASE WATTS	KW	-32768	32767	Note F
30122	MAINS C PHASE WATTS	KW	-32768	32767	Note F
30123	MAINS TOTAL WATTS	KW	-32768	32767	Note F
30124	MAINS AVERAGE PF	-500=0.5 Lead, 500=0.5 Lag, 0=1.0	-0.5	0.5	1000
30125	MAINS A PHASE VAR	KVAR	-32768	32767	Note F
30126	MAINS B PHASE VAR	KVAR	-32768	32767	Note F
30127	MAINS C PHASE VAR	KVAR	-32768	32767	Note F
30128	MAINS TOTAL VAR	KVAR	-32768	32767	Note F
30129	MAINS NEG PHASE SEQ VOLTS	Volts	-32768	32767	Note C
30130	MAINS NEG PHASE SEQ CURRENT	Amps	-32768	32767	Note D
30131	MAINS A PHASE ANGLE	Degrees	0	360	10
30132	MAINS B PHASE ANGLE	Degrees	0	360	10
30133	MAINS C PHASE ANGLE	Degrees	0	360	10
30134	MAINS CURRENT THD	% THD	0	100	10
30135	MAINS VOLTAGE THD	% THD	0	100	10
30136	MAINS 2ND CURRENT HARMONIC	Percent	0	100	10
30137	MAINS 3RD CURRENT HARMONIC	Percent	0	100	10
30138	MAINS 4TH CURRENT HARMONIC	Percent	0	100	10
30139	MAINS 5TH CURRENT HARMONIC	Percent	0	100	10
30140	MAINS 6TH CURRENT HARMONIC	Percent	0	100	10
30141	MAINS 7TH CURRENT HARMONIC	Percent	0	100	10
30142	MAINS 9TH CURRENT HARMONIC	Percent	0	100	10
30143	MAINS 11TH CURRENT HARMONIC	Percent	0	100	10
30144	MAINS 13TH CURRENT HARMONIC	Percent	0	100	10
30145	MAINS 2ND VOLTAGE HARMONIC	Percent	0	100	10
30146	MAINS 3RD VOLTAGE HARMONIC	Percent	0	100	10

Modbus ID	Item	Semantics	Min	Max	Scale or Note
30147	MAINS 4TH VOLTAGE HARMONIC	Percent	0	100	10
30148	MAINS 5TH VOLTAGE HARMONIC	Percent	0	100	10
30149	MAINS 6TH VOLTAGE HARMONIC	Percent	0	100	10
30150	MAINS 7TH VOLTAGE HARMONIC	Percent	0	100	10
30151	MAINS 9TH VOLTAGE HARMONIC	Percent	0	100	10
30152	MAINS 11TH VOLTAGE HARMONIC	Percent	0	100	10
30153	MAINS 13TH VOLTAGE HARMONIC	Percent	0	100	10
30154	NOT USED	See Alarm Action Def	0	7	1
30155	NOT USED	See Alarm Action Def	0	7	1
30156	BUS UNDER VOLT PRE-ALM ACTION	See Alarm Action Def	0	7	1
30157	BUS OVER VOLT PRE-ALM ACTION	See Alarm Action Def	0	7	1
30158	BUS OVER FREQ PRE-ALM ACTION	See Alarm Action Def	0	7	1
30159	BUS UNDER FREQ PRE-ALM ACTION	See Alarm Action Def	0	7	1
30160	BUS REVERSE POWER PRE-ALM ACTION	See Alarm Action Def	0	7	1
30161	BUS OVER POWER ALM ACTION	See Alarm Action Def	0	7	1
30162	BUS OVER POWER PRE-ALM ACTION	See Alarm Action Def	0	7	1
30163	BUS REVERSE VAR PRE-ALM ACTION	See Alarm Action Def	0	7	1
30164	BUS OVER VAR ALM ACTION	See Alarm Action Def	0	7	1
30165	BUS OVER VAR PRE-ALM ACTION	See Alarm Action Def	0	7	1
30166	BUS PHASE OVER CURR PRE-ALM ACTION	See Alarm Action Def	0	7	1
30167	BUS PHASE CURR DIFF ALM ACTION	See Alarm Action Def	0	7	1
30168	BUS PHASE CURR DIFF PRE-ALM ACTION	See Alarm Action Def	0	7	1
30169	BUS NEG PHASE SEQ OVER CURR ALM ACTION	See Alarm Action Def	0	7	1
30170	BUS NEG PHASE SEQ OC PRE-ALM ACTION	See Alarm Action Def	0	7	1
30171	BUS NEG PHASE SEQ OVER VOLT ALM ACTION	See Alarm Action Def	0	7	1
30172	BUS NEG PHASE SEQ OV PRE-ALM ACTION	See Alarm Action Def	0	7	1

Modbus ID	Item	Semantics	Min	Max	Scale or Note
30173	MAINS UNDER VOLT PRE-ALM ACTION	See Alarm Action Def	0	7	1
30174	MAINS OVER VOLT PRE-ALM ACTION	See Alarm Action Def	0	7	1
30175	MAINS OVER FREQ PRE-ALM ACTION	See Alarm Action Def	0	7	1
30176	MAINS UNDER FREQ PRE-ALM ACTION	See Alarm Action Def	0	7	1
30177	MAINS IMPORT POWER ALM ACTION	See Alarm Action Def	0	7	1
30178	MAINS IMPORT POWER PRE-ALM ACTION	See Alarm Action Def	0	7	1
30179	MAINS EXPORT POWER ALM ACTION	See Alarm Action Def	0	7	1
30180	MAINS EXPORT POWER PRE-ALM ACTION	See Alarm Action Def	0	7	1
30181	MAINS IMPORT VAR ALM ACTION	See Alarm Action Def	0	7	1
30182	MAINS IMPORT VAR PRE-ALM ACTION	See Alarm Action Def	0	7	1
30183	MAINS EXPORT VAR ALM ACTION	See Alarm Action Def	0	7	1
30184	MAINS EXPORT VAR PRE-ALM ACTION	See Alarm Action Def	0	7	1
30185	MAINS PHASE OVER CURR ALM ACTION	See Alarm Action Def	0	7	1
30186	MAINS PHASE OVER CURR PRE-ALM ACTION	See Alarm Action Def	0	7	1
30187	MAINS PHASE CURR DIFF ALM ACTION	See Alarm Action Def	0	7	1
30188	MAINS PHASE CURR DIFF PRE-ALM ACTION	See Alarm Action Def	0	7	1
30189	MAINS NEG PHASE SEQ OC ALM ACTION	See Alarm Action Def	0	7	1
30190	MAINS NEG PHASE SEQ OC PRE-ALM ACTION	See Alarm Action Def	0	7	1
30191	MAINS NEG PHASE SEQ OV ALM ACTION	See Alarm Action Def	0	7	1
30192	MAINS NEG PHASE SEQ OV PRE-ALM ACTION	See Alarm Action Def	0	7	1
30193	MAINS VOLT RES PHASE OC ALM ACTION	See Alarm Action Def	0	7	1
30194	MAINS VOLT RES PHASE OC PRE-ALM ACTION	See Alarm Action Def	0	7	1
30195	ANALOG 1 HIGH PRE-ALM ACTION	See Alarm Action Def	0	7	1
30196	ANALOG 1 HIGH ALM ACTION	See Alarm Action Def	0	7	1
30197	ANALOG 1 LOW PRE-ALM ACTION	See Alarm Action Def	0	7	1
30198	ANALOG 1 LOW ALM ACTION	See Alarm Action Def	0	7	1

Modbus ID	Item	Semantics	Min	Max	Scale or Note
30199	ANALOG 2 HIGH PRE-ALM ACTION	See Alarm Action Def	0	7	1
30200	ANALOG 2 HIGH ALM ACTION	See Alarm Action Def	0	7	1
30201	ANALOG 2 LOW PRE-ALM ACTION	See Alarm Action Def	0	7	1
30202	ANALOG 2 LOW ALM ACTION	See Alarm Action Def	0	7	1
30203	ANALOG 3 HIGH PRE-ALM ACTION	See Alarm Action Def	0	7	1
30204	ANALOG 3 HIGH ALM ACTION	See Alarm Action Def	0	7	1
30205	ANALOG 3 LOW PRE-ALM ACTION	See Alarm Action Def	0	7	1
30206	ANALOG 3 LOW ALM ACTION	See Alarm Action Def	0	7	1
30207	ANALOG 4 HIGH PRE-ALM ACTION	See Alarm Action Def	0	7	1
30208	ANALOG 4 HIGH ALM ACTION	See Alarm Action Def	0	7	1
30209	ANALOG 4 LOW PRE-ALM ACTION	See Alarm Action Def	0	7	1
30210	ANALOG 4 LOW ALM ACTION	See Alarm Action Def	0	7	1
30211	NOT USED	See Alarm Action Def	0	7	1
30212	NOT USED	See Alarm Action Def	0	7	1
30213	MAXIMUM MC DEMAND	Rounded to integer	-32768	32767	Note E
30214	MC DEMAND	Rounded to integer	-32768	32767	Note E
30215	LOAD REFERENCE	Rounded to integer	-32768	32767	Note E
30216	PROCESS REFERENCE	Customer units rounded to integer	-1000	1000	10
30217	ANALOG INPUT 1 LEVEL	MA or VDC depending on config	0	25	100
30218	ANALOG INPUT 2 LEVEL	MA or VDC depending on config	0	25	100
30219	ANALOG INPUT 3 LEVEL	MA or VDC depending on config	0	25	100
30220	ANALOG INPUT 4 LEVEL	MA or VDC depending on config	0	25	100
30221	REACTIVE LOAD CONTROL MODE	See Reactive Load Control Mode	0	11	1
30222	BUS VOLTAGE UNITS	See Units Def	0	2	Note A
30223	BUS CURRENT UNITS	See Units Def	0	2	Note B
30224	MAINS VOLTAGE UNITS	See Units Def	0	2	Note C
30225	MAINS CURRENT UNITS	See Units Def	0	2	Note D
30226	SYNCHRONIZER MODE	See Synchronizer Mode Def	0	4	1
30227	NOT USED	% of rating	-168	168	10
30228	SYSTEM LOAD	% of rating	-168	168	10
30229	PF REFERENCE	-500=0.5 Lead, 500=0.5 Lag, 0=1.0	-500	500	1000
30230	VAR REFERENCE	VAR	0	32767	Note E
30231	REAL LOAD CONTROL MODE	See Real Load Mode Def	0	11	1
30232	REACTIVE LOAD CONTROL STATE	See Reactive Load Control State Def	0	6	1
30233	ATS STATE	See ATS State Def	0	9	1
30234	MC STATE	See Genset State Def	0	8	1

Modbus ID	Item	Semantics	Min	Max	Scale or Note
30235	PRODUCT PART NUMBER (FAMILY)	Application Code	0000	9999	
30236	PRODUCT PART NUMBER (SUFFIX)	Application Code	0000	9999	
30237	PRODUCT APPLICATION REVISION	New=0, A=1, B=2, etc	0	26	
30238	LS NODES	Load share nodes on active bus	1	16	
30239	NET NODES	Net nodes on LON	1	16	
30240	NOT USED	Count down timer	-32767	32767	
30241	GROUP SYNC TIMEOUT ACTION	See Alarm Action Def	1	6	
30242	GROUP SYNC RECLOSE ACTION	See Alarm Action Def	1	6	
30243	IMPORT W-HR UNITS	See Units Def	1	4	
30244	IMPORT VAR-HR UNITS	See Units Def	1	4	
30245	IMPORT VA-HR UNITS	See Units Def	1	4	
30246	EXPORT W-HR UNITS	See Units Def	1	4	
30247	EXPORT VAR-HR UNITS	See Units Def	1	4	
30248	EXPORT VA-HR UNITS	See Units Def	1	4	
30249	IMPORT W-HR (HUNDREDS)	000,000,000.00	0	999.99	
30250	IMPORT W-HR (THOUSANDS)	000,000,000.00	0	999	
30251	IMPORT W-HR (MILLIONS)	000,000,000.00	0	999	
30252	IMPORT VAR-HR (HUNDREDS)	000,000,000.00	0	999.99	
30253	IMPORT VAR-HR (THOUSANDS)	000,000,000.00	0	999	
30254	IMPORT VAR-HR (MILLIONS)	000,000,000.00	0	999	
30255	IMPORT VA-HR (HUNDREDS)	000,000,000.00	0	999.99	
30256	IMPORT VA-HR (THOUSANDS)	000,000,000.00	0	999	
30257	IMPORT VA-HR (MILLIONS)	000,000,000.00	0	999	
30258	EXPORT W-HR (HUNDREDS)	000,000,000.00	0	999.99	
30259	EXPORT W-HR (THOUSANDS)	000,000,000.00	0	999	
30260	EXPORT W-HR (MILLIONS)	000,000,000.00	0	999	
30261	EXPORT VAR-HR (HUNDREDS)	000,000,000.00	0	999.99	
30262	EXPORT VAR-HR (THOUSANDS)	000,000,000.00	0	999	
30263	EXPORT VAR-HR (MILLIONS)	000,000,000.00	0	999	
30264	EXPORT VA-HR (HUNDREDS)	000,000,000.00	0	999.99	
30265	EXPORT VA-HR (THOUSANDS)	000,000,000.00	0	999	
30266	EXPORT VA-HR (MILLIONS)	000,000,000.00	0	999	

Table D-4. Analog Writes

Modbus ID	Item Function	Semantics	Min	Max	Scale
40001	NOT USED				
40002	PROCESS REFERENCE	% Process x 10	-1000	1000	10
40003	BASELOAD REFERENCE	In KW units	0	30,000	1
40004	NOT USED				
40005	PF REFERENCE	In PF where –500=0.5Lag, 500=0.5Lead and 1000=unity PF	-500	500	1000
40006	NOT USED				
40007	VAR REFERENCE	In KVAR units	0	30,000	10
40008	NOT USED				

Table D-5. MC Modbus Table Note Explanation

Modbus Note	Type of value	Comment	Multiplier Communication Menu
Note A	Bus Voltage	Primary unit in Volts or Kilovolts X MBUS Voltage Multiplier	48 MBUS MULT - BUS VOLT
Note B	Bus Current	Primary unit in Amps or kiloamps X MBUS Multiplier	50 MBUS MULT - BUS AMPS
Note C	Mains Voltage	Primary unit in Volts or Kilovolts X MBUS Voltage Multiplier	42 MBUS MULT - MAINS VOLT
Note D	Mains Current	Primary unit in Amps or kiloamps X MBUS Multiplier	44 MBUS MULT - MAINS AMPS
Note E	Bus W, VAR, VA	Primary units in W,VAR,VA or KW, KVAR, KVA or MW, MVAR, MVA or GW, GVAR, GVA X MBUS Multiplier	46 MBUS MULT - BUS POWER
Note F	Mains W, VAR, VA	Primary units in W,VAR,VA or KW, KVAR, KVA or MW, MVAR, MVA or GW, GVAR, GVA X MBUS Multiplier	40 MBUS MULT - MAINS POWER

EGCP-3 Control Specifications

Woodward Part Numbers:	
8406-113	EGCP-3 Engine Generator Control Package, LS Model
8406-114	EGCP-3 Engine Generator Control Package, MC Model
Power Supply Rating	18–32 Vdc (SELV) Maximum input voltage range
Power Consumption	less than or equal 20 W nominal, 22 W maximum
Input Supply Voltage	24 V (nominal)
Input Supply Current	0.92 A dc
PT inputs	27–300 Vac
CT inputs	0–5 Aac-rms nominal, 7 Aac-rms maximum
Rated short-time current (1 sec)	10 X (I) rated (8406-113 Rev E, 8406-114 Rev D or later)
Generator Frequency Range	40–70 Hz
Magnetic Pickup	100–24 950 Hz
Discrete Inputs (16)	3 mA source current when CLOSED to Switch Common
Analog Inputs	4–20 mA, 1–5 Vdc
Analog Outputs	4–20 mA
Speed Bias Output	± 4.5 Vdc, 0.5 V peak 500 Hz PWM, 4–20 mA
Voltage Bias Output	± 4.5 Vdc, ± 3 Vdc, ± 9 Vdc, 4–20 mA
Discrete Outputs (12)	200 mA low-side drivers
Serial Communication Ports (3)	RS-485, RS-422, RS-232
Ambient Operating Temperature	–20 to +70 °C (–4 to +158 °F) (around outside of EGCP-3 Chassis)
Storage Temperature	–40 to +85 °C (–40 to +185°F)
Humidity	95% at +20 to +55 °C (+68 to +131 °F)
Mechanical Vibration	10–2000 Hz @ 0.04 G2/Hz and 8.2Grms PSD
Mechanical Shock	US MIL-STD 810C, Method 516.2, Procedure I (basic design test), Procedure II (transit drop test, packaged), Procedure V (bench handling)
Equipment Classification	1 (grounded equipment)
Air Quality	Pollution Degree II
Installation Over Voltage	Category III
Ingress Protection	Meets IP54 per EN60529 when properly installed in an enclosure rated IP54 or greater

Revision History

Changes in Revision J—

- Removed EMC, Low Voltage and ATEX Directives.
- Removed info regarding DEMKO and EEC certifications and CE logo
- Deleted Declaration and Appendix E

Released

We appreciate your comments about the content of our publications.

Send comments to: icinfo@woodward.com

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