Service Manual

Controller

PowerCommand® 2.2
PowerCommand® 2.3

English
Original Instructions 3-2020 0900-0666 (Issue 12)

Table of Contents

1 IMPORTANT SAFETY INSTRUCTIONS

SAVE THESE INSTRUCTIONS. This manual contains important instructions that should be followed during installation and maintenance of the generator set and batteries.

Safe and efficient operation can be achieved only if the equipment is properly operated and maintained. Many accidents are caused by failure to follow fundamental rules and precautions.

1.1 Warning, Caution, and Note Styles Used in This Manual

The following safety styles and symbols found throughout this manual indicate potentially hazardous conditions to the operator, service personnel, or equipment.

⚠ DANGER
Indicates a hazardous situation that, if not avoided, will result in death or serious injury.

⚠ WARNING
Indicates a hazardous situation that, if not avoided, could result in death or serious injury.

⚠ CAUTION
Indicates a hazardous situation that, if not avoided, could result in minor or moderate injury.

NOTICE
Indicates information considered important, but not hazard-related (e.g., messages relating to property damage).

1.2 General Information

This manual should form part of the documentation package supplied by Cummins with specific generator sets. In the event that this manual has been supplied in isolation, please contact your authorized distributor.

NOTICE
It is in the operator's interest to read and understand all warnings and cautions contained within the documentation relevant to the generator set, its operation and daily maintenance.

1.2.1 General Safety Precautions

⚠ WARNING

Hot Pressurized Liquid

Contact with hot liquid can cause severe burns.

Do not open the pressure cap while the engine is running. Let the engine cool down before removing the cap. Turn the cap slowly and do not open it fully until the pressure has been relieved.

⚠ WARNING

Moving Parts

Moving parts can cause severe personal injury.

Use extreme caution around moving parts. All guards must be properly fastened to prevent unintended contact.

⚠ WARNING

Toxic Hazard

Used engine oils have been identified by some state and federal agencies to cause cancer or reproductive toxicity.

Do not ingest, breathe the fumes, or contact used oil when checking or changing engine oil. Wear protective gloves and face guard.

⚠ WARNING

Electrical Generating Equipment

Incorrect operation can cause severe personal injury or death.

Do not operate equipment when fatigued, or after consuming any alcohol or drug.

⚠ WARNING

Toxic Gases

Substances in exhaust gases have been identified by some state and federal agencies to cause cancer or reproductive toxicity.

Do not breathe in or come into contact with exhaust gases.

⚠ WARNING

Combustible Liquid

Ignition of combustible liquids is a fire or explosion hazard which can cause severe burns or death.

Do not store fuel, cleaners, oil, etc., near the generator set.

⚠ WARNING

High Noise Level

Generator sets in operation emit noise, which can cause hearing damage.

Wear appropriate ear protection at all times.

⚠ WARNING

Hot Surfaces

Contact with hot surfaces can cause severe burns.

The unit is to be installed so that the risk of hot surface contact by people is minimized. Wear appropriate PPE when working on hot equipment and avoid contact with hot surfaces.

⚠ WARNING

Electrical Generating Equipment

Incorrect operation and maintenance can result in severe personal injury or death.

Make sure that only suitably trained and experienced service personnel perform electrical and/or mechanical service.

⚠ WARNING

Toxic Hazard

Ethylene glycol, used as an engine coolant, is toxic to humans and animals.

Wear appropriate PPE. Clean up coolant spills and dispose of used coolant in accordance with local environmental regulations.

⚠ WARNING

Combustible Liquid

Ignition of combustible liquids is a fire or explosion hazard which can cause severe burns or death.

Do not use combustible liquids like ether.

⚠ WARNING

Automated Machinery

Accidental or remote starting of the generator set can cause severe personal injury or death.

Isolate all auxiliary supplies and use an insulated wrench to disconnect the starting battery cables (negative [–] first).

⚠ WARNING

Fire Hazard

Materials drawn into the generator set are a fire hazard. Fire can cause severe burns or death.

Make sure the generator set is mounted in a manner to prevent combustible materials from accumulating under the unit.

⚠ WARNING

Fire Hazard

Accumulated grease and oil are a fire hazard. Fire can cause severe burns or death.

Keep the generator set and the surrounding area clean and free from obstructions. Repair oil leaks promptly.

⚠ WARNING

Fall Hazard

Falls can result in severe personal injury or death.

Make sure that suitable equipment for performing tasks at height are used in accordance with local guidelines and legislation.

⚠ WARNING

Fire Hazard

Materials drawn into the generator set are a fire hazard. Fire can cause severe burns or death.

Keep the generator set and the surrounding area clean and free from obstructions.

⚠ WARNING

Pressurized System

Pressurized systems can rupture/leak which can result in severe personal injury or death.

Use appropriate lock out/tag out safety procedures to isolate from all energy sources before performing any service tasks. Use PPE.

⚠ WARNING

Confined Areas

Confined spaces or areas with restricted access or potential to entrap can cause severe personal injury or death.

Use appropriate lock out/tag out safety procedures to isolate from all energy sources. Use PPE. Follow site specific lone worker protocols/permits to work.

⚠ CAUTION

Manual Handling Heavy Objects

Handling heavy objects can cause severe personal injury.

Use appropriate lifting equipment and perform tasks with two people where doing so would make completion of the task safe.

⚠ CAUTION

Power Tools and Hand Tools

Tools can cause cuts, abrasions, bruising, puncture injuries.

Only trained and experienced personnel should use power tools and hand tools. Use PPE.

⚠ CAUTION

Sharp Edges and Sharp Points

Projecting corners/parts may cause cuts, abrasions and other personal injury.

Use PPE. Be aware of sharp edges and corners/sharp points. Cover/protect them.

NOTICE

Keep multi-type ABC fire extinguishers close by. Class A fires involve ordinary combustible materials such as wood and cloth. Class B fires involve combustible and flammable liquid fuels and gaseous fuels. Class C fires involve live electrical equipment. (Refer to NFPA No. 10 in the applicable region.)

NOTICE

Before performing maintenance and service procedures on enclosed generator sets, make sure the service access doors are secured open.

NOTICE

Stepping on the generator set can cause parts to bend or break, leading to electrical shorts, or to fuel leaks, coolant leaks, or exhaust leaks. Do not step on the generator set when entering or leaving the generator set room.

NOTICE

Remove fuel from subbase fuel tank before conducting any hot work.

1.3 Generator Set Safety Code

Before operating the generator set, read the manuals and become familiar with them and the equipment. Safe and efficient operation can be achieved only if the equipment is properly operated and maintained. Many accidents are caused by failure to follow fundamental rules and precautions.

⚠ WARNING

Electrical Generating Equipment

Incorrect operation and maintenance can result in severe personal injury or death.

Read and follow all Safety Precautions, Warnings, and Cautions throughout this manual and the documentation supplied with the generator set.

1.3.1 Moving Parts Can Cause Severe Personal Injury or Death

- Keep hands, clothing, and jewelry away from moving parts.
- Before starting work on the generator set, disconnect the battery charger from its AC source, then disconnect the starting batteries using an insulated wrench, negative (**–**) cable first. This will prevent accidental starting.
- Make sure that fasteners on the generator set are secure. Tighten supports and clamps; keep guards in position over fans, drive belts, etc.
- Do not wear loose clothing or jewelry in the vicinity of moving parts or while working on electrical equipment. Loose clothing and jewelry can become caught in moving parts.
- If any adjustments must be made while the unit is running, use extreme caution around hot manifolds, moving parts, etc.

1.3.2 Positioning of Generator Set

The generator set should be placed on level ground with adequate open space around it. The immediate area around the generator set should be free of any flammable material.

NOTICE

Access or service doors must be closed and locked before repositioning, and they must remain locked during transportation and siting.

NOTICE
The generator set is capable of operating at inclines of up to +/– 2.5 degrees.

1.3.3 Positioning of Generator Set - Open Sets

The area for positioning the set should be adequate and level, and the area immediately around the set must be free of any flammable material.

1.4 Electrical Shocks and Arc Flashes Can Cause Severe Personal Injury or Death

⚠ WARNING
Electric Shock Hazard
Voltages and currents present an electrical shock hazard that can cause severe burns or death.
Contact with exposed energized circuits with potentials of 50 Volts AC or 75 Volts DC or higher can cause electrical shock and electrical arc flash. Refer to standard NFPA 70E or equivalent safety standards in corresponding regions for details of the dangers involved and for the safety requirements.

Guidelines to follow when working on de-energized electrical systems:

- Use proper PPE. Do not wear jewelry and make sure that any conductive items are removed from pockets as these items can fall into equipment and the resulting short circuit can cause shock or burning. Refer to standard NFPA 70E for PPE standards.
- De-energize and lockout/tagout electrical systems prior to working on them. Lockout/Tagout is intended to prevent injury due to unexpected start-up of equipment or the release of stored energy. Please refer to *Locking the Generator Set Out of Service* section for more information.
- De-energize and lockout/tagout all circuits and devices before removing any protective shields or making any measurements on electrical equipment.
- Follow all applicable regional electrical and safety codes.

Guidelines to follow when working on energized electrical systems:

NOTICE
It is the policy of Cummins Inc. to perform all electrical work in a de-energized state. However, employees or suppliers may be permitted to occasionally perform work on energized electrical equipment only when qualified and authorized to do so and when troubleshooting, or if de-energizing the equipment would create a greater risk or make the task impossible and all other alternatives have been exhausted.

NOTICE
Exposed energized electrical work is only allowed as per the relevant procedures and must be undertaken by a Cummins authorized person with any appropriate energized work permit for the work to be performed while using proper PPE, tools and equipment.

In summary:

- Do not tamper with or bypass interlocks unless you are authorized to do so.

- Understand and assess the risks - use proper PPE. Do not wear jewelry and make sure that any conductive items are removed from pockets as these items can fall into equipment and the resulting short circuit can cause shock or burning. Refer to standard NFPA 70E for PPE standards.
- Make sure that an accompanying person who can undertake a rescue is nearby.

1.4.1 AC Supply and Isolation

NOTICE

Local electrical codes and regulations (for example, _BS EN 12601:2010 Reciprocating internal combustion engine driven generating sets)_ may require the installation of a disconnect means for the generator set, either on the generator set or where the generator set conductors enter a facility.

NOTICE

The AC supply must have the correct over current and earth fault protection according to local electrical codes and regulations. This equipment must be earthed (grounded).

It is the sole responsibility of the customer to provide AC power conductors for connection to load devices and the means to isolate the AC input to the terminal box; these must comply with local electrical codes and regulations. Refer to the wiring diagram supplied with the generator set.

The disconnecting device is not provided as part of the generator set, and Cummins accepts no responsibility for providing the means of isolation.

1.4.2 Medium Voltage Equipment (601 V to 15 kV - U.S. and Canada)

- Medium voltage acts differently than low voltage. Special equipment and training is required to work on or around medium voltage equipment. Operation and maintenance must be done only by persons trained and experienced to work on such devices. Improper use or procedures will result in severe personal injury or death.
- Do not work on energized equipment. Unauthorized personnel must not be permitted near energized equipment. Due to the nature of medium voltage electrical equipment, induced voltage remains even after the equipment is disconnected from the power source. Plan the time for maintenance with authorized personnel so that the equipment can be de-energized and safely grounded.

1.5 Fuel and Fumes Are Flammable

Fire, explosion, and personal injury or death can result from improper practices.

- Do not fill fuel tanks while the engine is running unless the tanks are outside the engine compartment. Fuel contact with hot engine or exhaust is a potential fire hazard.
- Do not permit any flame, cigarette, pilot light, spark, arcing equipment, or other ignition source near the generator set or fuel tank.
- Fuel lines must be adequately secured and free of leaks. Fuel connection at the engine should be made with an approved flexible line. Do not use copper piping on flexible lines as copper will become brittle if continuously vibrated or repeatedly bent.
- Make sure all fuel supplies have a positive shutoff valve.
- Make sure the battery area has been well-ventilated prior to servicing near it. Lead-acid batteries emit a highly explosive hydrogen gas that can be ignited by arcing, sparking, smoking, etc.

1.5.1 Gaseous Fuels

Natural gas is lighter than air, and will tend to gather under covered areas.

1.5.2 Spillage

Any spillage that occurs during fueling, oil top-off, or oil change must be cleaned up before starting the generator set.

1.5.3 Fluid Containment

NOTICE

Where spillage containment is not part of a Cummins supply, it is the responsibility of the installer to provide the necessary containment to prevent contamination of the environment, especially water courses and sources.

If fluid containment is incorporated into the bedframe, it must be inspected at regular intervals. Any liquid present should be drained out and disposed of in line with local health and safety regulations. Failure to perform this action may result in spillage of liquids which could contaminate the surrounding area.

Any other fluid containment area must also be checked and emptied, as described above.

1.5.4 Do Not Operate in Flammable and Explosive Environments

Flammable vapor can cause an engine to over speed and become difficult to stop, resulting in possible fire, explosion, severe personal injury, and death. Do not operate a generator set where a flammable vapor environment can be created, unless the generator set is equipped with an automatic safety device to block the air intake and stop the engine. The owners and operators of the generator set are solely responsible for operating the generator set safely. Contact your authorized Cummins distributor for more information.

1.6 Exhaust Gases Are Deadly

- Provide an adequate exhaust system to properly expel discharged gases away from enclosed or sheltered areas, and areas where individuals are likely to congregate. Visually and audibly inspect the exhaust system daily for leaks per the maintenance schedule. Make sure that exhaust manifolds are secured and not warped. Do not use exhaust gases to heat a compartment.
- Make sure the unit is well ventilated.

1.6.1 Exhaust Precautions

⚠ WARNING

Hot Exhaust Gases

Contact with hot exhaust gases can cause severe burns.

Wear personal protective equipment when working on equipment.

⚠ WARNING

Hot Surfaces

Contact with hot surfaces can cause severe burns.

The unit is to be installed so that the risk of hot surface contact by people is minimized. Wear appropriate PPE when working on hot equipment and avoid contact with hot surfaces.

⚠ WARNING

Toxic Gases

Inhalation of exhaust gases can cause asphyxiation and death.

Pipe exhaust gas outside and away from windows, doors, or other inlets to buildings. Do not allow exhaust gas to accumulate in habitable areas.

⚠ WARNING

Fire Hazard

Contaminated insulation is a fire hazard. Fire can cause severe burns or death.

Remove any contaminated insulation and dispose of it in accordance with local regulations.

The exhaust outlet may be sited at the top or bottom of the generator set. Make sure that the exhaust outlet is not obstructed. Personnel using this equipment must be made aware of the exhaust position. Position the exhaust away from flammable materials - in the case of exhaust outlets at the bottom, make sure that vegetation is removed from the vicinity of the exhaust.

The exhaust pipes may have some insulating covers fitted. If these covers become contaminated they must be replaced before the generator set is run.

To minimize the risk of fire, make sure the following steps are observed:

- Make sure that the engine is allowed to cool thoroughly before performing maintenance or operation tasks.
- Clean the exhaust pipe thoroughly.

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2 Schedule of Abbreviations

This list is not exhaustive. For example, it does not identify units of measure or acronyms that appear only in parameters, event/fault names, or part/accessory names.

ABBR.	DESCRIPTION	ABBR.	DESCRIPTION
AC	Alternating Current	LED	Light-emitting Diode
AMP	AMP, Inc., part of Tyco Electronics	LTS	Long Term Storage
ANSI	American National Standards Institute	LVRT	Low Voltage Ride Through
ASOV	Automatic Shut Off Valve	MFM	Multifunction Monitor
ASTM	American Society for Testing and Materials (ASTM International)	Mil Std	Military Standard
ATS	Automatic Transfer Switch	MLD	Masterless Load Demand
AVR	Automatic Voltage Regulator	NC	Normally Closed
AWG	American Wire Gauge	NC	Not Connected
CAN	Controlled Area Network	NFPA	National Fire Protection Agency
CB	Circuit Breaker	NO	Normally Open
CE	Conformité Européenne	NWF	Network Failure
CFM	Cubic Feet per Minute	OEM	Original Equipment Manufacturer
CGT	Cummins Generator Technologies	OOR	Out of Range
CMM	Cubic Meters per Minute	OORH / ORH	Out of Range High
CT	Current Transformer	OORL / ORL	Out of Range Low
D-AVR	Digital Automatic Voltage Regulator	PB	Push Button
DC	Direct Current	PCC	PowerCommand® Control
DEF	Diesel Exhaust Fluid	PGI	Power Generation Interface
DPF	Diesel Particulate Filter	PGN	Parameter Group Number
ECM	Engine Control Module	PI	Proportional/Integral
ECS	Engine Control System	PID	Proportional / Integral / Derivative
EMI	Electromagnetic interference	PLC	Programmable Logic Controller
EN	European Standard	PMG	Permanent Magnet Generator
EPS	Engine Protection System	PPE	Personal Protective Equipment
E-Stop	Emergency Stop	PT	Potential Transformer
FAE	Full Authority Electronic	PTC	Power Transfer Control
FMI	Failure Mode Identifier	PWM	Pulse-width Modulation
FRT	Fault Ride Through	RFI	Radio Frequency Interference

ABBR.	DESCRIPTION	ABBR.	DESCRIPTION
FSO	Fuel Shutoff	RH	Relative Humidity
Genset	Generator Set	RMS	Root Mean Square
GCP	Generator Control Panel	RTU	Remote Terminal Unit
GND	Ground	SAE	Society of Automotive Engineers
LCT	Low Coolant Temperature	SCR	Selective Catalytic Reduction
HMI	Human-machine Interface	SPN	Suspect Parameter Number
IC	Integrated Circuit	SWL	Safe Working Load
ISO	International Organization for Standardization	SW_B+	Switched B+
LBNG	Lean-burn Natural Gas	UL	Underwriters Laboratories
LCD	Liquid Crystal Display	UPS	Uninterruptible Power Supply
		VPS	Valve Proving System

3 Glossary

Term	Definition
Accessory Part	A part comes standard with the product. An accessory is optional and provides additional interfaces or functionality.
Active Inactive	General terms to describe the states for inputs, signals, or outputs that have only two states (like true/false or 1/0). For example, a low coolant level switch is either on (active) or off (inactive). The Ready to Load output is either on (active) or off (inactive). Usually, the expected state is inactive. For events/faults, this term describes the time the PCC generates the event/fault through the time the event/fault is cleared.
Active-closed Active-open	Some inputs and outputs use resistance to distinguish between active and inactive. If an input or output is active-closed, the input or output is active if there is no resistance between two pins. If an input or output is active-open, the input or output is active if there is infinite resistance between two pins.
Active-high Active-low	Some inputs and outputs use voltage differential to distinguish between active and inactive. If an input or output is active-high, a high voltage differential means the input or output is active, and a low voltage differential means the input or output is inactive. If an input or output is active-low, a low voltage differential means the input or output is active, and a high voltage differential means the input or output is inactive.
Configurable analog input Configurable input	"Configurable input" refers to discrete inputs (for example, open or closed). "Configurable analog input" refers to analog inputs (for example, 0-5 VDC).
Configurable analog output Configurable output	"Configurable output" refers to discrete outputs (for example, open or closed). "Configurable analog input" refers to analog outputs (for example, 0-5 VDC).
Connection	A connection between two devices. A connection might be as simple as one pin-to-pin connection, or it might require several pins as well as additional components such as relays, fuses, etc. This term also includes some settings that refer to the physical (for example, normally-closed vs. normally-open) or electrical (for example, active-high vs. active-low) characteristics of the connection.
Connector	This term has no meaning if you do not have access to the PCC control board or the back panel of the Operator Panel. One or more pins that are in the same housing. Many times, the pins are related by function (for example, pins that are connected to the engine) or by electrical characteristics (for example, relay outputs). This term also refers to the end of a wire or harness that is plugged into the housing.
Event Fault	Used to notify the operator or external devices whether or not certain conditions are true. Each event or fault has two sets of conditions. When the first set of conditions becomes true, the event or fault becomes active. This might turn on or turn off a light or LED, display a warning on the PCC, shut down the generator set, or so on. When the second set of conditions becomes true, the event or fault becomes inactive and can be cleared. The PCC generates a fault when the conditions indicate a more serious problem; the PCC generates an event only for information purposes.
Low-side driver	When this output is active, it provides a path to ground. When this output is inactive, it blocks the path to ground.

Term	Definition
Mode Mode of operation	A term to describe certain states that affect the PCC's behavior. The PCC is either in a particular mode or not in a particular mode, and the PCC's behavior changes accordingly. Sometimes, the PCC is always in one mode out of a set of two or more modes. For example, the PCC is always in one of the modes of operation: Off mode, Auto mode, or Manual mode.
Mounting	The physical placement and installation of the PCC or the Operator Panel.
Normally-closed Normally-open	Some inputs and outputs use open circuits and short circuits to distinguish between active and inactive. If an input or output is normally-closed, an open circuit means the input or output is active, and a short circuit means the input or output is inactive. If an input or output is normally-open, a short circuit means the input or output is active, and an open circuit means the input or output is inactive.
Parameter	Refers to monitored values or settings in the PCC or the Operator Panel that can be looked at and, in some cases, adjusted. Some parameters are protected by passwords. In this manual, italics are used to identify a specific parameter by name.
Pin	A specific point on the PCC or the Operator Panel to which it is acceptable to connect a specific point on an external device. For example, a B+ pin might be connected to the positive terminal on the battery. It takes more than one pin to connect an external device to the PCC. For example, it takes B+ and Ground to connect the battery to the PCC. Depending on the access you have to the controller, you might see a specific pin on the PCC control board, the terminal at the end of a harness, a wire that runs between the PCC and the external device, or nothing at all.
Sensor	Refers to a device that measures something and reports one of many (or unlimited) values. For example, a coolant level sensor reports the current level of coolant.
Sequence of operation	A term used to describe the steps the PCC follows when it starts the generator set or when it stops the generator set.
Signal	A term used for convenience to talk about two or more connections as a single input. Usually, all of these connections have the same effect on the PCC's behavior, and it does not matter which connection is active. For example, the term remote start signal" is used frequently. In Auto mode, the PCC starts the generator set when the remote start signal is active. The remote start signal may come from any of several connections: a switch connected to the remote start pin, the Operator Panel, a PLC (programmable logic controller) connected on Modbus, InPower, etc. It is not important between these connections when explaining the way the remote start signal affects the PCC's decisions to start and stop the generator set. It is only important whether or not any of them are active.
Switch	Refers to a device that measures something and reports one of two states, active or inactive, about something. For example, a low coolant level switch is active when the coolant level is too low, but the low coolant level switch does not report what the coolant level really is. In some cases, this may refer to a physical switch (similar to a light switch) instead.
Trim	Refers to the subset of parameters that can be adjusted, as opposed to parameters that can only be monitored.

4 System Overview

Read ***Safety Precautions***, and carefully observe all of the instructions and precautions in this manual. Keep this manual with the other genset and/or controller manuals.

4.1 About this Manual

You should have a basic understanding of generators and power generation before you read this manual.

This is the Service Manual for the generator set control. It is not the Service Manual for the generator set (“genset") or any accessories.

Masterless Load Demand (MLD) specific information will NOT be present on Non-MLD equipped hardware.

4.2 Components (PC 2.2)

The PowerCommand 2.2 consists of these parts.

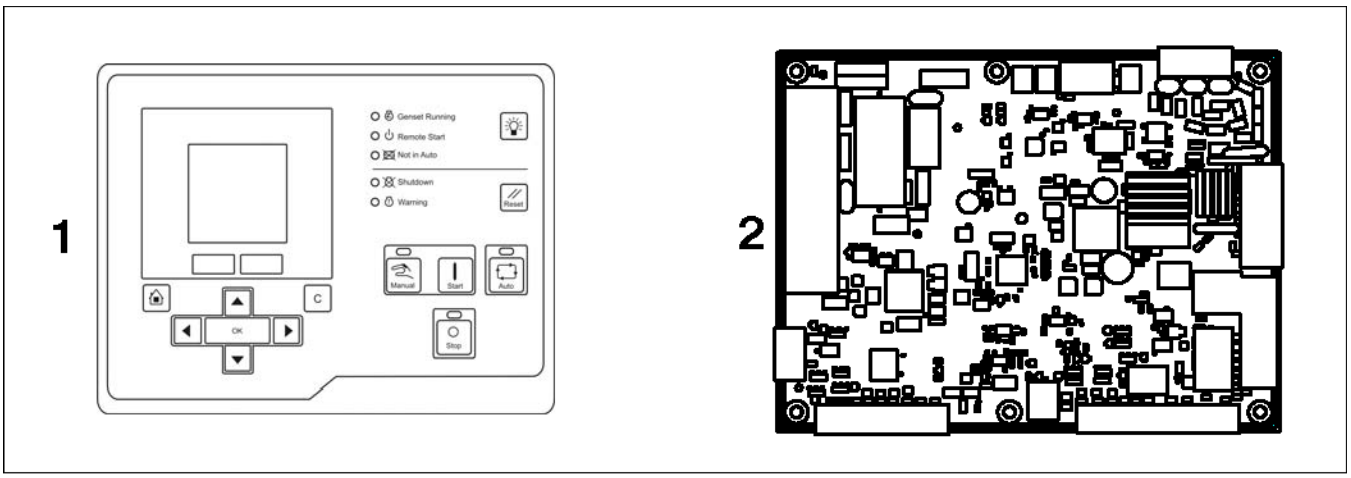


FIGURE 1. POWERCOMMAND 2.2

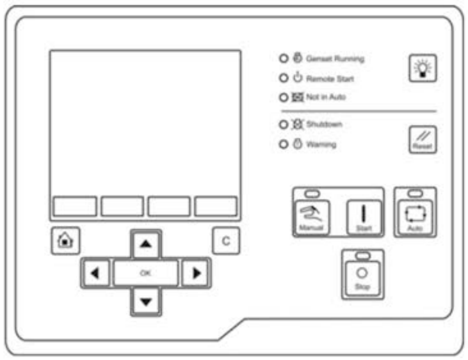
TABLE 1. POWERCOMMAND 2.2

PART DESCRIPTION	PART NUMBER
1: HMI 220 ("Operator Panel")	0300-6314-01
2: PCC 2300 Controller ("PCC")	0327-1636

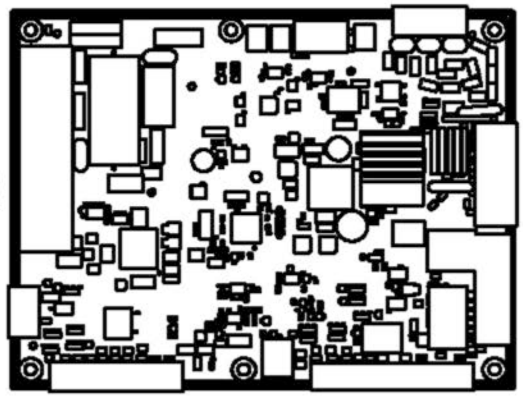
4.3 Components (PC 2.3)

The PowerCommand 2.3 consists of the following parts:

1



2



No.	Description	No.	Description
1	HMI 320 ("Operator Panel") (Part Number 0300-6315-01)	2	PCC 2300 Controller ("PCC") (A053T067)

FIGURE 2. PC 2.3 COMPONENTS

4.4 PowerCommand 2.x

The PowerCommand 2.x is suitable for non-paralleling generator sets in standby or prime-power applications.

The PCC is a microprocessor-based controller that has these abilities:

- Controls the generator set to maintain a specified generator set voltage and frequency
- Warns the operator when unsafe conditions are occurring
- Shuts down the generator set to prevent damage
- Provides a way for other devices (such as the operator panel) to monitor, manage, and control the generator set

NOTICE
The PCC should be installed where it can be accessed only by authorized service representatives. Unauthorized personnel, including an operator, should not have access to it.

4.5 Operator Panel

The Operator Panel is one way to monitor, manage, and control the generator set. An operator can use the Operator Panel to do these things:

- Look at the status of the generator set
- Adjust settings that affect generator set behavior
- Start and stop the generator set

NOTICE

In addition to the Operator Panel, other devices can monitor, manage, and control the generator set too. Such devices might be as simple as a switch or a push button or as sophisticated as other controllers or computers. This manual introduces the ways the PCC can interact with other devices, but this manual cannot identify all of the devices that might be used in every application.

4.6 Remote HMI Operator Panel (Optional)

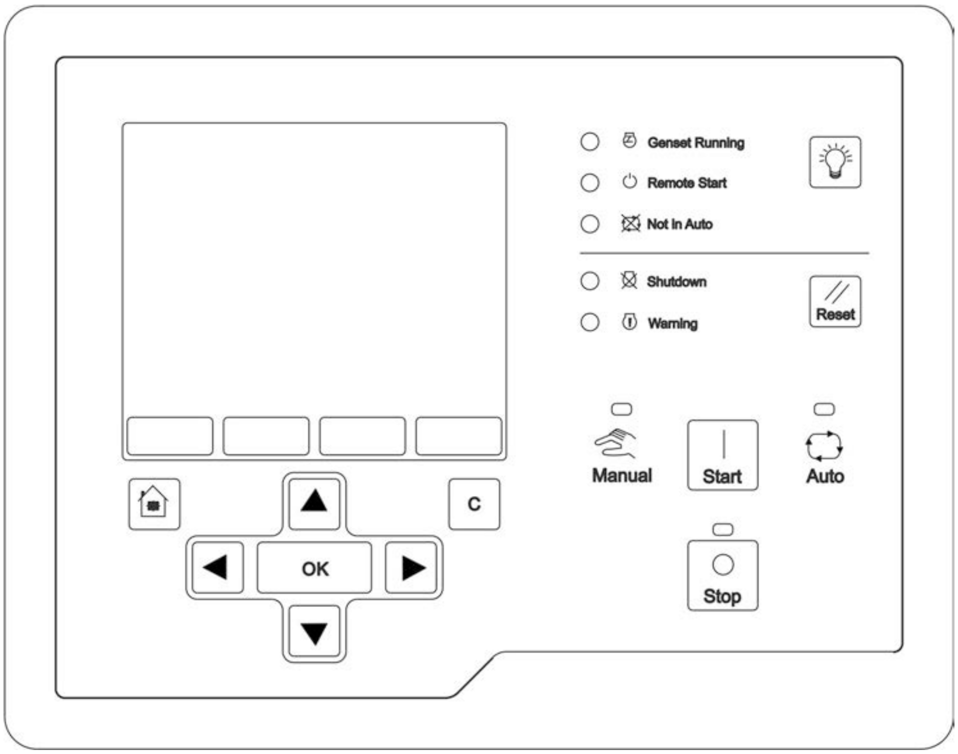


FIGURE 3. REMOTE HMI 320 OPERATOR PANEL (PART #0300-6315-03) (OPTIONAL)

4.7 Genset Specifications

TABLE 2. GENSET SPECIFICATIONS

CATEGORY	CHARACTERISTIC
Genset Output	Single-phase or three-phase operation 50 Hz or 60 Hz operation 190-45,000 VAC line-to-line (genset) 110-600 VAC line-to-line (PCC input from genset; if the genset voltage is 600-45,000 VAC line-to-line, potential transformers are required) 5-10,000 A (external CTs required)
Alternator	Reconnectable or non-reconnectable alternator (voltage selectable) PMG or self-excitation

CATEGORY	CHARACTERISTIC
Engine	Diesel 12-V or 24-V battery (operating range: 8-30 VDC) Battery-charging alternator (IC type and non-IC type) Controlled Area Network (CAN) J1939 communication (limited) Power Generation Interface (PGI)-compliant engine control module (ECM). PGI is Cummins' implementation of SAE J1939.
Communication	PCCNet Modbus PC-based service tool
Connector Seals	J11: AMP 794758-1 J12: AMP 794275-1 interface seal and AMP 794276-1 wire seal
Wires/Cables	0.8 sq. mm. (18 AWG) wires (except where specified otherwise)
Other	Up to four HMI 113 (daisy-chain)

4.8 Certifications

The PCC meets or exceeds the requirements of these codes and standards:

- UL 508 Recognized
- CSA marked
- C282 compliant
- 22.2 compliant
- NFPA 99 compliant
- NFPA 110 compliant

  Requires HMI 113
- MS 202C, Method 101 compliant
- IEEE C62.41 compliant
- IEEE C37.90 compliant
- BS ISO 8528-4:2005
- BS EN 50081-1:1992
- BS EN 61000-6-2:2001
- BS EN 61000-6-3:2001
- BS EN 61000-6-4:2001
- CE Marking: The control system is suitable for use on generator sets to be CE-marked.

The Operator Panel is UL508 listed.

5 Hardware

This section refers to the control panel hardware, not the hardware for the rest of the generator set.

⚠ WARNING

Incorrect service or replacement of parts can result in severe personal injury, death, and/or equipment damage. Service personnel must be trained and experienced to perform electrical and mechanical service. Read the Safety Precautions, and carefully observe all of the instructions and precautions in this manual.

5.1 Safety Precautions

⚠ CAUTION

Electrostatic discharge will damage circuit boards. To prevent this damage, always wear a grounding wrist strap when handling circuit boards or socket-mounted Integrated Circuits (ICs).

⚠ CAUTION

Always disconnect a battery charger from its AC source before disconnecting the battery cables. Otherwise, disconnecting the battery cables can result in voltage spikes high enough to damage the DC control circuits of the set.

⚠ WARNING

Accidental starting of the generator set while working on it can cause severe personal injury or death. Prevent accidental starting by disconnecting the starting battery cables (negative (-) first).

⚠ WARNING

Arcing can ignite explosive hydrogen gas given off by batteries, causing severe personal injury. Arcing can occur when cable is removed or reconnected, or when negative (-) battery cable is connected and a tool used to connect or disconnect positive (+) battery cable touches frame or other grounded metal part of the set. Always remove negative (-) cable first, and reconnect it last. Make certain hydrogen from battery, engine fuel, and other explosive fumes are fully dissipated. This is especially important if battery has been connected to battery charger. Make certain the battery area has been well-ventilated before servicing battery.

⚠ WARNING

AC power presents a shock hazard that can cause severe personal injury or death. Before servicing the generator set, disconnect all power when multiple disconnection sources are used.

5.2 PCC Base Board

The PCC 2300 controller (Part Number 0327-1636) circuit board (shown in the figure below) contains the microprocessor and the operational software for the PCC.

This circuit board is potted to provide resistance to dust and moisture. It is specifically designed and tested for resistance to RFI/EMI. In addition, it includes transient voltage surge suppression to provide compliance with referenced standards.

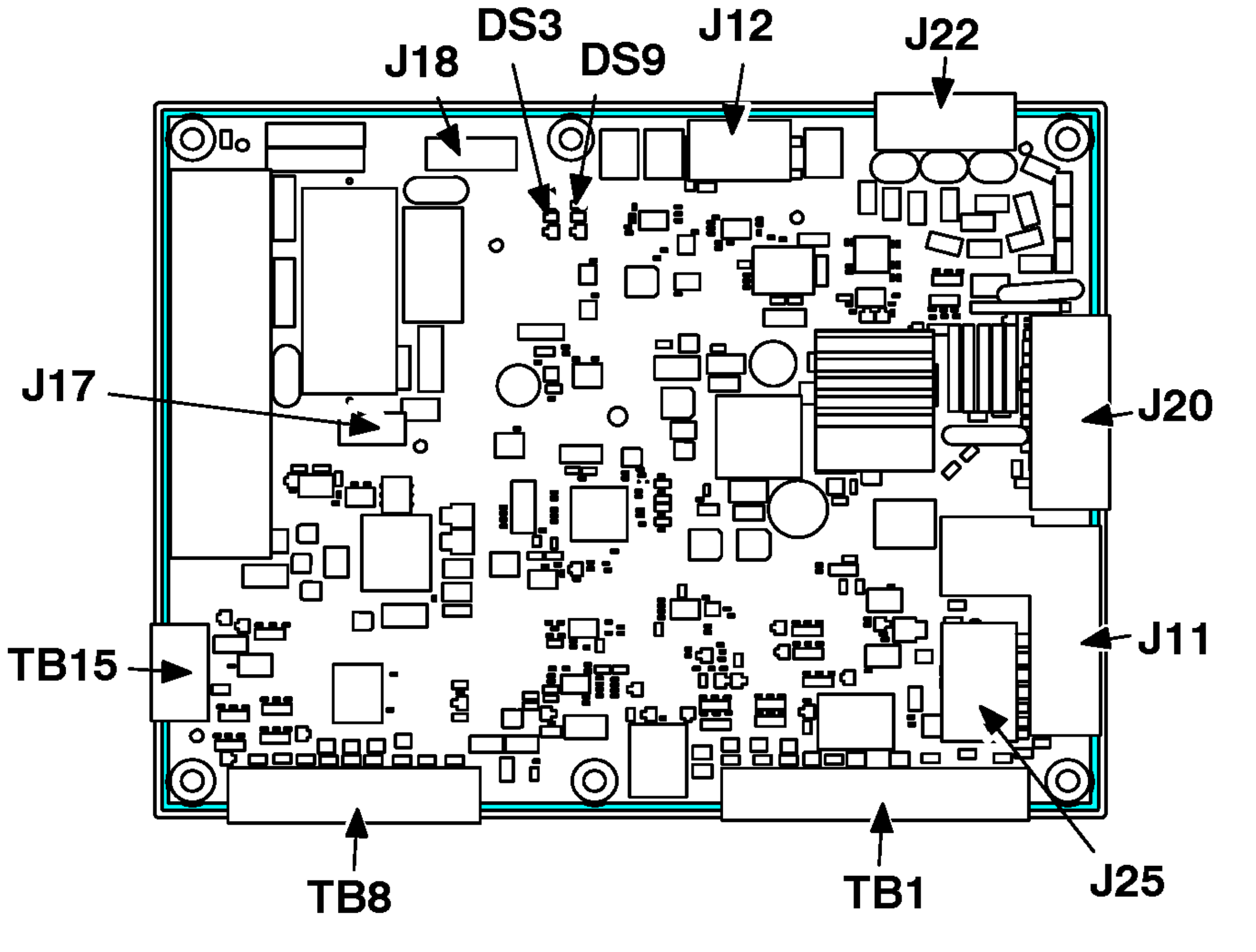


FIGURE 4. PCC BASE BOARD

5.2.1 LEDs

NOTICE
DSx, where x is a number, is the typical way to indicate that a hardware component is a light (LED or incandescent).

TABLE 3. PCC BASE BOARD LEDS

LED	Color	Description
DS3 (Heartbeat)	Green	This LED blinks regularly (once every two seconds) when the PCC has power and is not in power-down mode.

LED	Color	Description
DS9	Green	This LED is on while the PCC is changing between MON protocol and Modbus protocol on TB15. If *Protocol Mode* is Modbus, this LED is on when the PCC is receiving or transmitting data through the Modbus connection. If *Protocol Mode* is MON, this LED is off. If the PCC is using Modbus on TB15, this LED is on when the PCC is receiving or transmitting data through the Modbus connection. If the PCC is using MON on TB15, this LED is off.

5.2.2 Connections

The table below provides an overview of the connections on this circuit board.

TABLE 4. PCC CONNECTIONS OVERVIEW

Connection	Description	Housing	Pins
J11	Engine input and output	0323-2161	0323-2466
J12	CT input	0323-1932	0323-1200
J17	AVR control	0323-2098	0323-1200
J18	AVR input	0323-2444	0323-1200
J20	Genset input and output	0323-2446	0323-2466
J22	PT input	0323-2226-03	
J25	Accessories input and output	0323-2445	0323-2466
TB1	Customer input and output	0323-1678-15	
TB8	Customer input and output	0323-2325-03	
TB15	Modbus, PC-based service tool interface	0323-2192-04	

Configurable Inputs

The table below identifies all of the configurable inputs.

TABLE 5. CONFIGURABLE INPUT CONNECTIONS

Description	PCC
Configurable Input #1	TB1-12, TB1-13
Configurable Input #2	TB1-14. TB1-15
Configurable Input #5	J20-17, J20-5
Configurable Input #6	J20-18, J20-6
Configurable Input #10	TB8-5, TB8-1
Configurable Input #11	TB8-6, TB8-2
Configurable Input #12	J20-19, J20-8
Configurable Input #13	TB8-7, TB8-12

Description	PCC
Configurable Input #14	TB8-8, TB8-13

Configurable Outputs

The table below identifies all of the configurable outputs.

TABLE 6. CONFIGURABLE OUTPUT CONNECTIONS

Description	PCC
Configurable Output #1 Relay	TB1-6, TB1-7
Configurable Output #2 Relay	TB1-8, TB1-9
Customer Fused B+	TB1-5
Configurable Output #3	TB8-10
Configurable Output #4	TB8-9
Configurable Output #5	TB1-4
Relay B+	J11-6, J20-13
Configurable Output #6	J20-16
Configurable Output #7	J25-1
Configurable Output #8	J11-7
Configurable Output #10	TB8-3
Configurable Output #11	TB8-11

5.2.3 J11 Connections

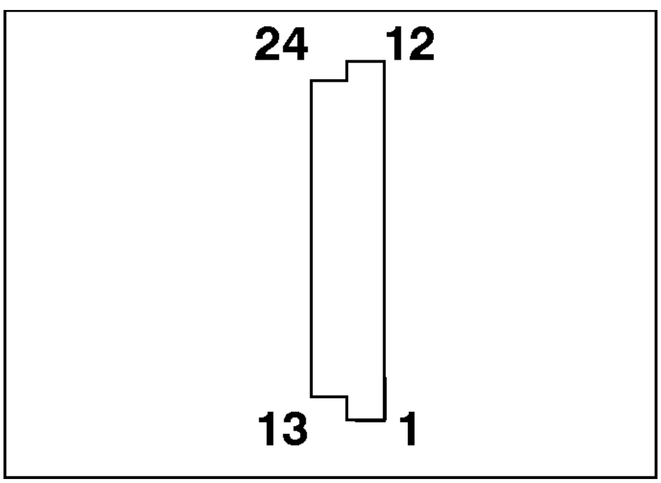


FIGURE 5. J11 PINS

This connector is oriented the same way it is oriented in **Figure 4**.

NOTICE

If the PCC is connected to a Full Authority Electronic (FAE) engine, the PCC only uses J11-17, J11-19, J11-20, and J11-21. J11-6 and J11-7 can also be used as a configurable output.

TABLE 7. J11 PIN ASSIGNMENTS: ENGINE CONNECTIONS

Pin	Description	Function / Connects to
J11-1	Oil Pressure Sender (active) +5 V	+5 V available for 3-wire pressure sender
J11-2	Oil Pressure Sender or Switch Return	
J11-3	Oil Pressure Sender or Switch Signal	
J11-4	Governor Drive -	Governor PWM low-side driver
J11-5	Governor Drive +	Governor Drive + (for low-side driver)
J11-6	Relay Coil B+	Coil of Glow Plug Relay
J11-7	Glow Plug / Ignition Control Relay Driver	Low side of the relay coil
J11-8	Magnetic Pick Up Shield	Magnetic pick-up shield connection
J11-9	Magnetic Pick Up Supply	Magnetic pick-up
J11-10	Magnetic Pick Up Return	Magnetic pick-up
J11-11	Coolant Temp Sender	
J11-12	Coolant Temp Sender Return	
J11-13	Oil Temp Sensor	
J11-14	Oil Temp Sensor Return	
J11-15	Intake Manifold Temp	
J11-16	Intake Manifold Temp Return	
J11-17	ECM CAN Shield	CAN-Link shield connection
J11-18	B+ Return for ECM	Battery (-) negative
J11-19	ECM CAN Low	To be used with FAE engines ECM J1939 (-) and (+) with 120-ohm terminating resistor
J11-20	ECM CAN High	To be used with FAE engines ECM J1939 (-) and (+) with 120-ohm terminating resistor
J11-21	Keyswitch Out	Low-side driver
J11-22	N/A	
J11-23	N/A	
J11-24	N/A	

J11-6 and J20-13 are internally fused together at 1.85 A.

J11-7 is Configurable Output #8. It is a low-side driver. Its specifications are shown in **Table 15**.

Engine Control Module (ECM) Connections

ECM CAN Enable specifies whether or not the PCC uses an ECM.

J11-21 is a low-side driver. It can handle 20 mA.

J11-21 should be connected with Emergency Stop B+ Power so that the ECM keyswitch is physically interrupted when an emergency stop button is pressed.

See **PCC-ECM Communication** for more information about the connections and communication (CAN-Link) between the PCC and the ECM.

5.2.4 J12 Connections

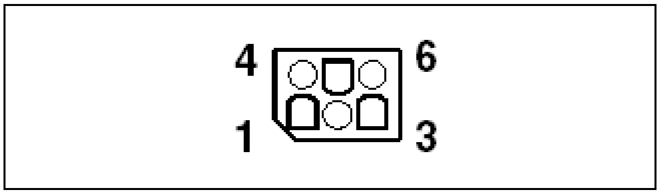


FIGURE 6. J12 PINS

This connector is oriented the same way it is oriented in **Figure 4**.

TABLE 8. J12 PIN ASSIGNMENTS: CT CONNECTIONS

Pin	Description	Function / Connects to
J12-1	CT1	CT1-X1
J12-2	CT2	CT2-X1
J12-3	CT3	CT3-X1
J12-4	CT1 COMMON	CT1-X2/X3
J12-5	CT2 COMMON	CT2-X2/X3
J12-6	CT3 COMMON	CT3-X2/X3

Genset Delta/Wye Connection and *Single/3 Phase Connection* specify the alternator configuration.

See Appendix **A** for detailed examples of these connections with various alternator configurations.

CT connections should use three wires, minimum 1 sq. mm. (16 AWG).

Use the CT ratio calculator to determine the proper CT specifications for the genset.

Set the CT ratio in *Genset Primary CT Current* (actual genset current) and *Genset CT Secondary Current* (reduced genset current). If the PCC is connected to the main alternator, set these parameters to the same value. (Set the CT ratio to one.)

NOTICE
If Genset Nominal Voltage is less than 300 VAC, the PCC assumes the genset is using the center tap on the CT and automatically doubles the CT ratio.

Genset Current Transformer Installation

Follow these guidelines to install a CT:

Each CT has a polarity dot on one side. Polarity refers to the instantaneous direction the CT primary current has the respect to the CT secondary current. It is important to install the CT polarity dot in the correct orientation to assure correct current metering and prevent control errors.

- Normal practice is to have the CT installed around each alternator phase load-side leads; in this case, the polarity dot faces towards the alternator.
- In some cases, the CT is installed on the alternator neutral leads due to space limitations; in this case the polarity dot faces the neutral terminal or bur bar.

It is important to refer to the genset reconnection diagram(s) to make sure you install CTs properly for various alternator configurations.

CT labeling:

- CT1 senses the current in “U” (A phase) leads.
- CT2 senses the current in “V” (B phase) leads.
- CT3 senses the current in “w” (C phase) leads.

There are two types of CTs used on gensets. These types are referred to as two-terminal secondary CTs and three-terminal secondary CTs.

Two-terminal CTs (X1, X2) are used on non-reconnectable alternators.

Three-terminal CTs (X1, X2, X3) are used on reconnectable alternators, and, in some cases, also on non-reconnectable alternators.

X1 and X2 are used for line to line voltages greater than 300 volts. X1 and X3 are used for line to line voltages less than 300 volts.

5.2.5 J17 Connections

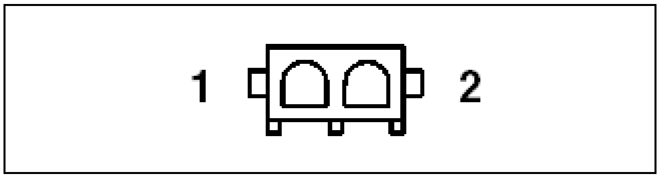


FIGURE 7. J17 PINS

This connector is oriented the same way it is oriented in **Figure 4**.

TABLE 9. J17 PIN ASSIGNMENTS: FIELD WINDING CONNECTIONS

Pin	Description	Function / Connects to
J17-1	Field +	Alternator Field X+ (F1)
J17-2	Field -	Alternator Field XX- (F2)

The PCC driver for the field windings in the exciter has a rating of 4 A continuous and 6 A for 10 seconds.

If the field windings are connected backwards, the genset does not produce any voltage.

If you make these connections and disable the automatic voltage regulator (AVR), the genset does not produce any voltage.

5.2.6 J18 Connections

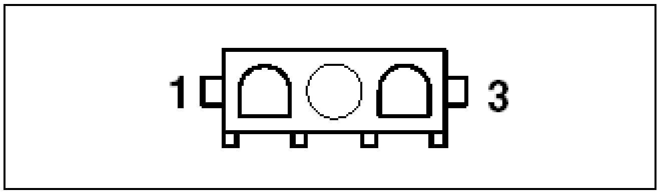


FIGURE 8. J18 PINS

This connector is oriented the same way it is oriented in **Figure 4**.

TABLE 10. J18 PIN ASSIGNMENTS: FIELD POWER CONNECTIONS

Pin	Description	Function / Connects to
J18-1	PMG 1 / Main Alternator L1	See Appendix **A** for schematics.
J18-2	PMG 2 / Main Alternator L2	See Appendix **A** for schematics.
J18-3	PMG 3	See Appendix **A** for schematics.

Genset Delta/Wye Connection and Single/3 Phase Connection specify the alternator configuration.

Excitation Source specifies which excitation source the genset uses.

A PMG provides better performance than self-excitation does when one or more of these circumstances apply:

- There are nonlinear loads. (For example, the genset is starting motors.)
- The genset has to have better transient performance in voltage regulation.

NOTICE
The term “shunt" refers to self-excitation, even though no actual shunt may be involved.

In either application, a fast-acting, UL-certified, ceramic fuse with a rating of 10 A should be placed inline with J18-1 and J18-2. In PMG applications, it is not necessary to place a fuse inline with J18-3.

The input voltage on J18 must be less than 240 VAC line-to-line. In self-excitation applications, if the line-to-line voltage is less than 240 VAC, connect the PCC directly to the genset output. If the line-to-line voltage is greater than 240 VAC but less than 480 VAC, connect the PCC to the alternator center taps or a potential transformer. If the line-to-line voltage is greater than 480 VAC, connect the PCC to a potential transformer. See Appendix **A** for wiring diagrams.

5.2.7 J20 Connections

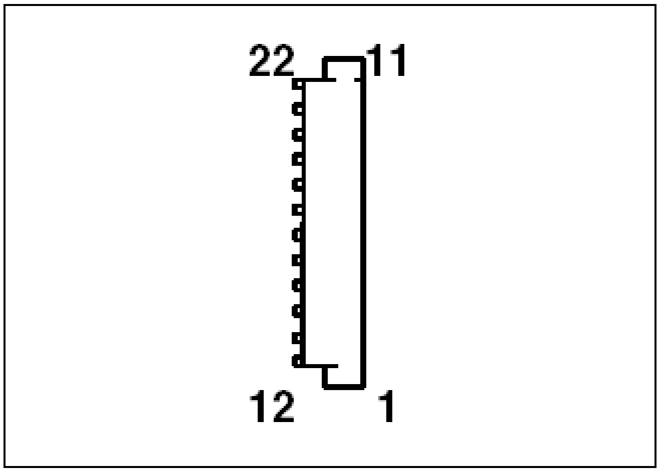


FIGURE 9. J20 PINS

This connector is oriented the same way it is oriented in Figure 4.

NOTICE

If the PCC is connected to a CM850 engine control module (ECM), J20-13, J20-14, and J20-16 are controlled by the ECM, not the PCC.

TABLE 11. J20 PIN ASSIGNMENTS: GENSET CONNECTIONS

Pin	Description	Function / Connects to
J20-1	Chassis Ground	
J20-2	B+ Return	Battery (-) negative
J20-3	Switched B+ Low-side Driver	
J20-4	B+ Return	Battery (-) negative
J20-5	Discrete Input Return	Return for configurable input #5 J20-17
J20-6	Discrete Input Return	Return for configurable input #6 J20-18
J20-7	B+ Return	Battery (-) negative
J20-8	Discrete Input Return	Return for configurable input #12 J20-19
J20-9	B+ Input (Fused B+)	Battery (+) positive
J20-10	B+ Input (Fused B+)	Battery (+) positive
J20-11	Starter Disconnect Input	Charging Alternator
J20-12	B+ Return	Battery (-) negative
J20-13	Relay Coil B+ Supply	Switched B+
J20-14	FSO Relay Driver	Low side of Fuel Shutoff Relay Coil
J20-15	Starter Relay Driver	Low side of Starter Relay Coil

Pin	Description	Function / Connects to
J20-16	Oil Priming Pump Driver	Low side of Oil Priming Pump Relay Coil
J20-17	Configurable Input #5	Defaults to Low Coolant Level Switch (wake-up)
J20-18	Configurable Input #6	Defaults to Low Fuel Level Switch (wake-up)
J20-19	Configurable Input #12	Defaults to Rupture Basin Switch (wake-up)
J20-20	B+ Input (Fused B+)	Battery (+) positive (power to control module)
J20-21	B+ Input (Fused B+)	Battery (+) positive (power to control module)
J20-22	Alt Flash Input	Charging Alternator

J20-1 or the flying lead should be connected to the engine ground.

J20-5 and J20-17 are Configurable Input #5. You can specify the active state of this input.

J20-6 and J20-18 are Configurable Input #6. You can specify the active state of this input.

J20-8 and J20-19 are Configurable Input #12. You can specify the active state of this input.

J11-6 and J20-13 are internally fused together at 1.85 A.

J20-16 is Configurable Output #6. It is a low-side driver. Its specifications are shown in **Table 15**.

Configurable Input #5, #6, and #12 Connections

The PCC leaves power-down mode if the configurable input is closed. It does not matter what the function of the configurable input is or if this makes the configurable input active or inactive.

Switched B+ (Run) Control Connections

J20-3 is a low-side driver. Its specifications are shown in **Table 15**.

J20-3 may be connected with J20-13 or TB1-5. Alternatively, J20-3 may be connected with Emergency Stop B+ Power (**Appendix A**) so that the output is physically interrupted when an emergency stop button is pressed.

The PCC turns on J20-3 when the PCC runs Start Engine. The PCC turns off J20-3 when the stop sequence has finished.

Battery Connections

There should be a 20-A fuse inline with the positive (+) terminal of the battery.

Nominal Battery Voltage specifies the battery voltage in the genset.

Battery-charging Alternator Connections

J20-22 is internally fused at 1.5 A.

See Appendix **A** for detailed examples of these connections with various types of battery-charging alternators.

Fuel Solenoid Connections

J20-14 is a low-side driver. Its specifications are shown in **Table 15**.

J20-14 should be connected with Emergency Stop B+ Power (Appendix **A**) so that the starter is physically interrupted when an emergency stop button is pressed.

Connections to the FSO control should use the appropriate wire size for the current drawn by the fuel solenoid.

If *ECM CAN Enable* is set to Enable, J20-14 is on unless one of these conditions is met:

- Any shutdown fault is active.
- The PCC is in Setup mode.

Starter Connections

J20-15 is a low-side driver. Its specifications are shown in **Table 15**.

J20-15 should be connected in series with Emergency Stop B+ Power (Appendix **A**) so that the starter is physically interrupted when an emergency stop button is pressed.

Connections to the starter solenoid should use the appropriate wire size for the current drawn by the starter solenoid.

5.2.8 J22 Connections

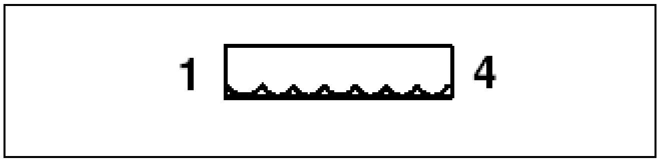


FIGURE 10. J22 PINS

This connector is oriented the same way it is oriented in **Figure 4**.

TABLE 12. J22 PIN ASSIGNMENTS: VOLTAGE SENSING CONNECTIONS

Pin	Description	Function / Connects to
J22-1	L1	Alternator Terminal U (R)
J22-2	L2	Alternator Terminal V (Y)
J22-3	L3	Alternator Terminal W (B)
J22-4	N	Alternator Terminal Neutral

Genset Delta/Wye Connection and *Single/3 Phase Connection* specify the alternator configuration.

See **Appendix A** for detailed examples of these connections with various alternator configurations.

If the genset line-to-line voltage is greater than 600 VAC, potential transformers (PTs) are required to reduce the genset voltage before it enters the PCC.

If the genset line-to-line voltage is less than 600 VAC, connect the PCC to the main alternator.

NOTICE

The PCC ignores the *Genset PT Primary Voltage* and *Genset PT Secondary Voltage* if *Genset Nominal Voltage* is less than 600 VAC.

Potential Transformer (PT) Sizing Rules

The PT primary connections should be connected to the alternator. The PT primary voltage must be 601-45,000 VAC line-to-line.

The PT secondary connections should be connected to the PCC. The PT secondary voltage must be 110-600 VAC line-to-line and no more than 750 VAC line-to-line (full scale).

Use the PT sizing rules in table below if the PT secondary voltage is less than 300 VAC.

$$\frac{300}{\text{genset nominal voltage}} < \frac{\text{PT secondary voltage}}{\text{PT primary voltage}} < \frac{9}{\text{genset nominal voltage}}$$

FIGURE 11. POTENTIAL TRANSFORMER SIZING RULES (PT SECONDARY VOLTAGE < 300 VAC)

Use the PT sizing rules in table below if the PT secondary voltage is greater than 300 VAC.

$$\frac{600}{\text{genset nominal voltage}} < \frac{\text{PT secondary voltage}}{\text{PT primary voltage}} < \frac{18}{\text{genset nominal voltage}}$$

FIGURE 12. POTENTIAL TRANSFORMER SIZING RULES (PT SECONDARY VOLTAGE > 300 VAC)

5.2.9 J25 Connections

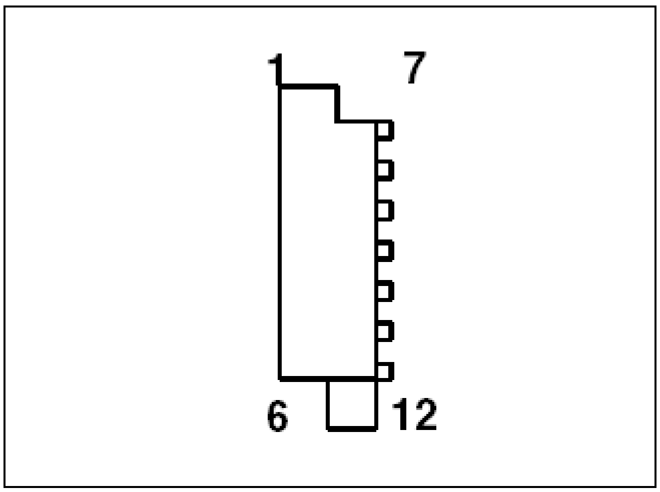


FIGURE 13. J25 PINS

This connector is oriented the same way it is oriented in **Figure 4**.

TABLE 13. J25 PIN ASSIGNMENTS: DISPLAY CONNECTIONS

Pin	Description	Function / Connects to
J25-1	Local Status	For future
J25-2	Local E-Stop	Local E-Stop Switch
J25-3	PCCNet B	Network Data B
J25-4	PCCNet A	Network Data A
J25-5	System Wakeup	
J25-6	Discrete Input Return	
J25-7	Discrete Input Return	

Pin	Description	Function / Connects to
J25-8	B+ Return	Battery (-) negative, available for Operator Panel or bargraph
J25-9	B+ Return / PCCNet Shield	PCCNet harness shield
J25-10	Manual	Manual Run command.
J25-11	Auto	Auto command.
J25-12	B+ Input (Fused B+)	Battery (+) positive, not used

J25-1 is Configurable Output #7. It is a low-side driver. Its specifications are shown in **Table 15**.

Emergency Stop Connections

See Appendix **A** for detailed examples of these connections.

Use *Local E-stop Active State Selection* (This parameter is not available in the Operator Panel) to set up the active state of the connection between J25-2 and J25-6.

Mode of Operations Connections

Manual Switch Active State (This parameter is not available in the Operator Panel) specifies the active state of the connection between J25-10 and J25-8.

Auto Switch Active State Selection (This parameter is not available in the Operator Panel) specifies the active state of the connection between J25-11 and J25-8.

System Wakeup Connections

Ground any System Wakeup pin on the PCC to prevent the PCC and any connected devices from entering power-down mode.

Each System Wakeup pin is part of a separate System Wakeup line. Several devices can be connected to the same System Wakeup line. All of the devices on the same System Wakeup line enter and leave power-down mode simultaneously.

When any device in this connection is unable to enter power-down mode (for any reason other than the System Wakeup connection being active), it sends a signal on its System Wakeup line(s). This signal prevents the other devices on the System Wakeup line(s) from entering power-down mode.

If a device is connected to more than one System Wakeup line and one of the System Wakeup lines is active, the device sends a signal on all of the other System Wakeup lines as well.

PCCNet Connections

NOTICE
The PCCNet connection in J25 shares the same electrical connection as the PCCNet connection in TB1. If one of the connections is set up incorrectly, the other connection does not work either. For example, if a customer PCCNet device is set up incorrectly on TB1, the Operator Panel on J25 stops working.

PCCNet devices that are connected to J25 should connect to Fused B+ (Appendix **A**) for power.

NOTICE
When using any PCCNet device on a genset control application, the wiring used to connect ALL devices in the network must be Belden 9729 Two Pair, Stranded, Shielded Twisted Pair Cable (24 AWG).

See the PCCNet Spec Sheet for information about network specifications. Contact your local distributor to get this document.

5.2.10 TB1 Connections

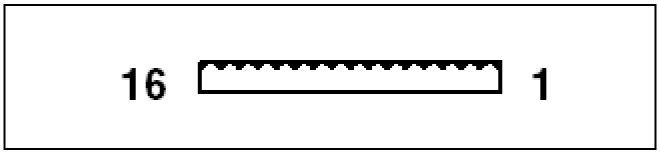


FIGURE 14. TB1 PINS

This connector is oriented the same way it is oriented in Figure 4.

TABLE 14. TB1 PIN ASSIGNMENTS: CUSTOMER CONNECTIONS

Pin	Description	Function / Connects to
TB1-1	PCCNet A	Network data A
TB1-2	PCCNet B	Network data B
TB1-3	PCCNet Shield / B+ Return	
TB1-4	Ready To Load	250-mA Low-side Relay Driver
TB1-5	B+ Output (3 A)	
TB1-6	Configurable Output 1-A	Relay contacts of rating 3.5 A @ 30 VDC
TB1-7	Configurable Output 1-B	Relay contacts of rating 3.5 A @ 30 VDC
TB1-8	Configurable Output 2-A	Relay contacts of rating 3.5 A @ 30 VDC
TB1-9	Configurable Output 2-B	Relay contacts of rating 3.5 A @ 30 VDC
TB1-10	Remote Start Return	Works with TB1-11, active open or active close
TB1-11	Remote Start	Works with TB1-10, active open or active close
TB1-12	Configurable Input 1	Works with TB1-13, active open or active close
TB1-13	Configurable Input 1	Common for TB1-12, active open or active close
TB1-14	Configurable Input 2	Works with TB1-13, active open or active close
TB1-15	Configurable Input 2 / Remote ESTOP Return	Common for TB1-14 and TB1-16, active open or active close
TB1-16	Remote ESTOP	Remote ESTOP switch

TB1-4 is Configurable Output #5. It is a low-side driver. Its specifications are shown in the table below.

TABLE 15. LOW-SIDE DRIVER SPECIFICATIONS

Description	Specification
Maximum Voltage	30 VDC
Maximum Current	250 mA
Maximum Inrush	3 A

Description	Specification
Leakage Current (off-state)	100 uA

TB1-5 is internally fused at 3 A.

TB1-6 and TB1-7 are Configurable Output #1. It is connected to a relay. The relay specifications are shown in the table below.

TABLE 16. CONFIGURABLE OUTPUT #1/#2 RELAY SPECIFICATIONS

Description	Specification
Maximum Voltage	30 VDC
Maximum Current	3.5 A

TB1-8 and TB1-9 are Configurable Output #1. It is connected to a relay. The relay specifications are shown in the table above.

TB1-12 and TB1-13 are Configurable Input #1. You can specify the active state of this input.

TB1-14 and TB1-15 are Configurable Input #2. You can specify the active state of this input.

Remote Start Connections

Use *Remote Start Switch Active State Selection* (This parameter is not available in the Operator Panel) to set up the active state of the connection between TB1-10 and TB1-11.

The PCC leaves power-down mode if the connection between TB1-11 and TB1-10 becomes active.

Emergency Stop Connections

See Appendix A for detailed examples of these connections.

Use *Remote E-stop Active State Selection* (This parameter is not available in the Operator Panel) to set up the active state of the connection between TB1-16 and TB1-15.

PCCNet Connections

NOTICE
The PCCNet connection in J25 shares the same electrical connection as the PCCNet connection in TB1. If one of the connections is set up incorrectly, the other connection does not work either. For example, if a customer PCCNet device is set up incorrectly on TB1, the Operator Panel on J25 stops working.

NOTICE
When using any PCCNet device on a genset control application, the wiring used to connect ALL devices in the network must be Belden 9729 Two Pair, Stranded, Shielded Twisted Pair Cable (24 AWG).

See the PCCNet Spec Sheet for information about network specifications. Contact your local distributor to get this document.

5.2.11 TB8 Connections

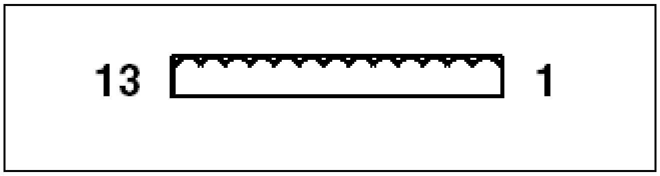


FIGURE 15. TB8 PINS

This connector is oriented the same way it is oriented in **Figure 4**.

TABLE 17. TB8 PIN ASSIGNMENTS: CUSTOMER CONNECTIONS

Pin	Description	Function / Connects to
TB8-1	Discrete Return	Works with TB8-5, active open or active close
TB8-2	Discrete Return	Works with TB8-6, active open or active close
TB8-3	Delayed Off	Low-side driver
TB8-4	SW_B+ relay ctrl 2	Low-side driver
TB8-5	Remote Fault Reset (wake-up)	Works with TB8-1, active open or active close
TB8-6	Start Type	Emergency / Non-emergency start type. Ground for non-emergency type.
TB8-7	Configurable Input 13	Works with TB8-12, active open or active close
TB8-8	Configurable Input 14	Works with TB8-13, active open or active close
TB8-9	Configurable Output 4	250-mA low-side driver
TB8-10	Configurable Output 3	250-mA low-side driver
TB8-11	Load Dump	250-mA low-side driver, works with TB1-5
TB8-12	Discrete Input Return	Works with TB8-7, active open or active close
TB8-13	Discrete Input Return	Works with TB8-8, active open or active close

TB8-1 and TB8-5 are Configurable Input #10. You can specify the active state of this input.

The PCC leaves power-down mode if this configurable input is closed. It does not matter what the function of the configurable input is or if this makes the configurable input active or inactive.

TB8-2 and TB8-6 are Configurable Input #11. You can specify the active state of this input.

TB8-3 is Configurable Output #10. It is a low-side driver. Its specifications are shown in **Table 15**.

TB8-4 is a low-side driver. Its specifications are shown in **Table 15**.

TB8-4 is on as long as the engine speed is greater than zero.

TB8-7 and TB8-12 are Configurable Input #13. You can specify the active state of this input.

TB8-8 and TB8-13 are Configurable Input #14. You can specify the active state of this input.

TB8-9 is Configurable Output #4. It is a low-side driver. Its specifications are shown in **Table 15**.

TB8-10 is Configurable Output #3. It is a low-side driver. Its specifications are shown in **Table 15**.

TB8-11 is Configurable Output #11. It is a low-side driver. Its specifications are shown in **Table 15**.

5.2.12 TB15 Connections

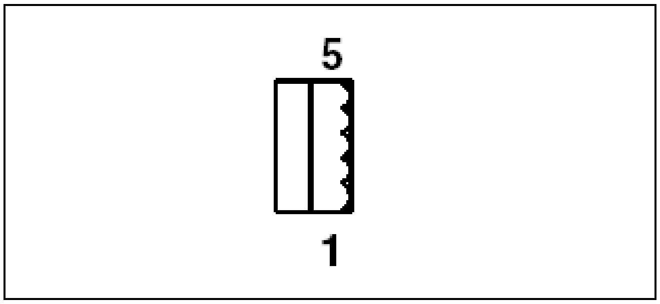


FIGURE 16. TB15 PINS

This connector is oriented the same way it is oriented in **Figure 4**.

TABLE 18. TB15 PIN ASSIGNMENTS: TOOLS INTERFACE CONNECTIONS

Pin	Description	Function / Connects to
TB15-1	RS485 Shield	Network Shield
TB15-2	NA	
TB15-3	RS485_DATA_A/MODBUS	Network Data A
TB15-4	RS485_DATA_B/MODBUS	Network Data B
TB15-5	System Wakeup	

TB15-5 is a System Wakeup pin.

This RS-485 connection can be used by Modbus or PC-based service tools (MON).

If the PCC is using Modbus on the RS-485 connection, the PCC changes to MON if all of these conditions are met:

- The PCC receives 5 consecutive 3.5 character delays, or the receiver buffer is full.
- The PCC does not receive any valid Modbus packets for five seconds.

If the PCC is using MON on the RS-485 connection, the PCC changes to Modbus if all of these conditions are met:

- The PCC receives 5 consecutive bad MON packets.
- The PCC does not receive any valid MON packets for five seconds.

PC-based service tools should use harness 0541-1199 to connect to this RS-485 connection.

Modbus Connections

NOTICE
See http://www.modbus.org for more information about Modbus and up-to-date wire specifications.

The PCC should be connected to external devices via Modbus RTU (Remote Terminal Unit) protocol on a two-wire RS-485 master/slave bus. In this arrangement, the external device is the master, and the PCC is the slave.

A Modbus over Serial Line Cable must be shielded. One end of the shield must be connected to protective ground.

A four-wire RS-485 communications cable can be converted to a two-wire RS-485 communications cable by shorting the RX/TX pairs of wires together as shown in the figure below.

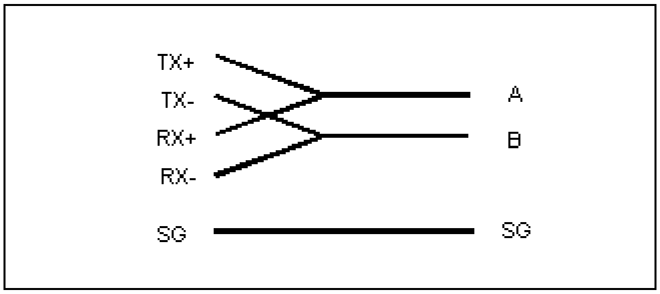


FIGURE 17. CONVERTING FOUR-WIRE RS-485 COMMUNICATIONS CABLE TO TWO-WIRE RS-485 COMMUNICATIONS CABLE

If a connectorized 4 pairs Category 5 Cable is used, connection of a crossed cable in a two-wire Modbus system may cause damage.

If you convert a four-wire RS-485 communications cable to a two-wire RS-485 communications cable, you have to make the sure the start bit, stop bit, speed, and flow control are synchronized. See **http://www.modbus.org** for more information.

5.3 AUX101

The PowerCommand AUX101 provides additional inputs and additional outputs for auxiliary control and monitoring of the power system.

5.3.1 AUX101 Inputs and Outputs

TABLE 19. NUMBER OF INPUTS AND OUTPUTS ON THE AUX101

Description	Value
Number of Inputs	8
Number of Outputs	8

5.3.2 AUX101 Inputs

An AUX101 input can be associated with a fault code. When the input is active, the fault is active. When the input is inactive, the fault is inactive, though the fault might have to be reset.

Alternatively, some AUX101 inputs can be assigned specific input functions instead of a fault code. These functions have a variety of effects and vary by controller.

5.3.3 AUX101 Outputs

Each AUX101 output is associated with a fault code. When the fault is active, the output is active. When the fault is inactive, the output is inactive.

5.3.4 AUX101 Board

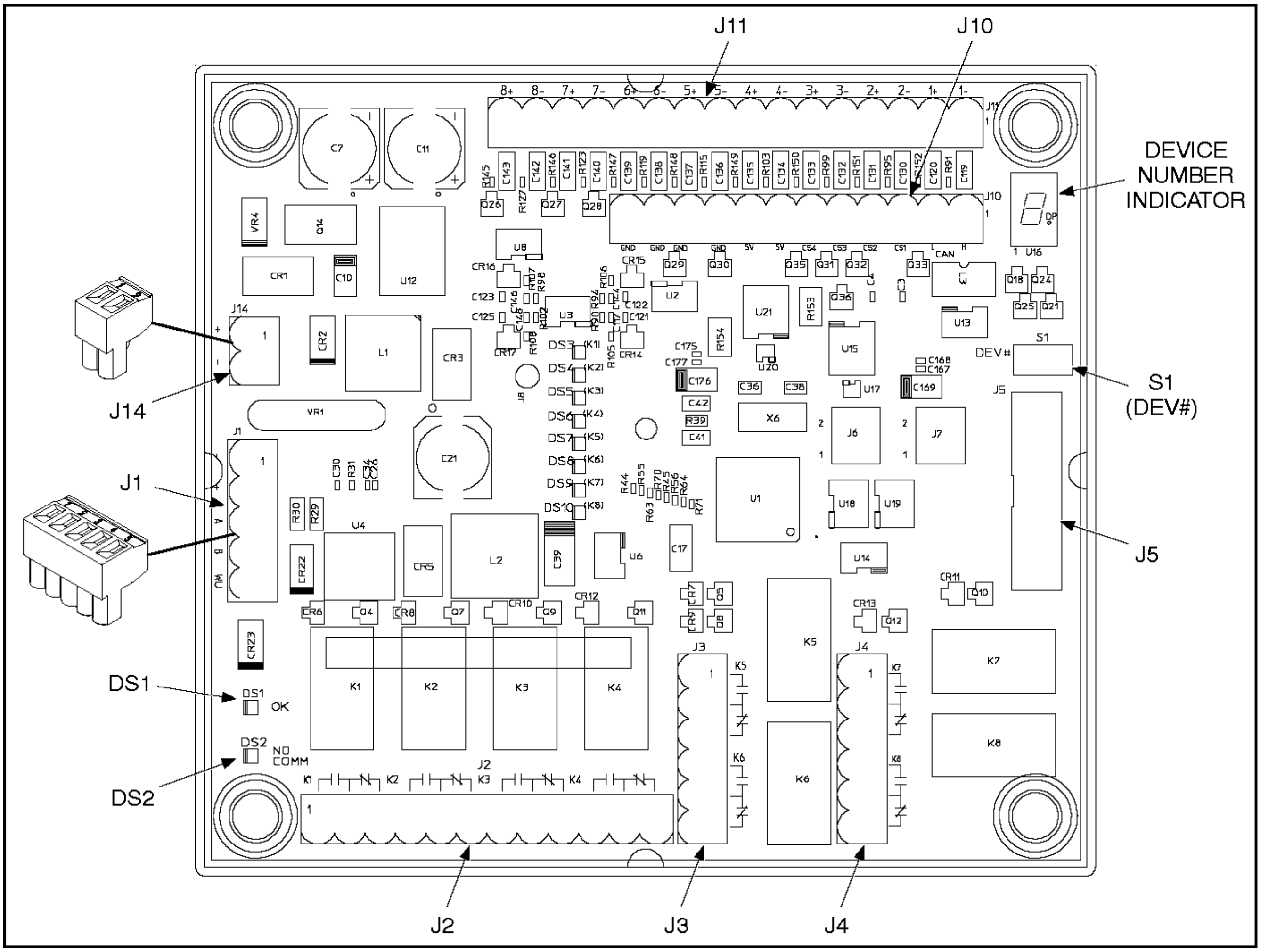


FIGURE 18. AUX101 BOARD

5.3.4.1 AUX101 S1

The S1 button can be used to change the AUX101 device number.

5.3.4.2 AUX101 Device Number Indicator

The AUX101 device number indicator displays the device number of this particular AUX101 in a PCCNet network.

If there is only one AUX101 in the PCCNet network, the device number must be zero (0).

If there is more than one AUX101 in the PCCNet network, the device number of the first AUX101 must be zero (0). The device number of any other AUX101 cannot be zero, and it must be unique in the PCCNet network.

5.3.4.2.1 Changing the AUX101 Device Number

1. Press and hold S1 for at least five seconds. On the AUX101 device number indicator, a small dot should appear next to the current device number.
2. Press and release S1 until the desired number is displayed.

3. Wait five seconds. After five seconds of inactivity, the new device number is set, and the small dot should disappear.
4. Disconnect and reconnect J14 to cycle power to the AUX101.

5.3.4.3 AUX101 Indicators

TABLE 20. AUX101 INDICATORS

Indicator	Description
DS1	This is on if the AUX101 is connected to a PCCNet network and is operating normally.
DS2	This is on if the AUX101 is not connected to the PCCNet network.
DS3	This is on if AUX101 output 1 is active.
DS4	This is on if AUX101 output 2 is active.
DS5	This is on if AUX101 output 3 is active.
DS6	This is on if AUX101 output 4 is active.
DS7	This is on if AUX101 output 5 is active.
DS8	This is on if AUX101 output 6 is active.
DS9	This is on if AUX101 output 7 is active.
DS10	This is on if AUX101 output 8 is active.

5.3.4.4 AUX101 Connectors

TABLE 21. AUX101 CONNECTORS

Connector	Description
J1	Connection to controller
J2	AUX101 outputs 1-4
J3	AUX101 outputs 5-6
J4	AUX101 outputs 7-8
J5	Connection to AUX102
J10	Voltage sources, current sources
J11	AUX101 inputs 1-8
J14	Power supply

5.3.4.4.1 AUX101 J1

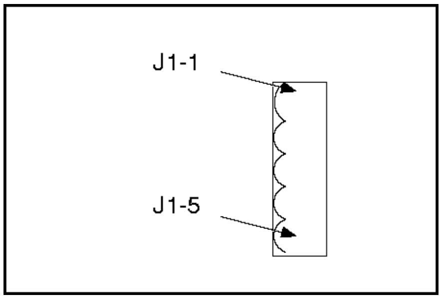


FIGURE 19. AUX101 J1

TABLE 22. AUX101 J1

Pin	Description
J1-1	Output power B-
J1-2	Output power B+
J1-3	PCCNet A
J1-4	PCCNet B
J1-5	System wakeup

5.3.4.4.2 AUX101 J2

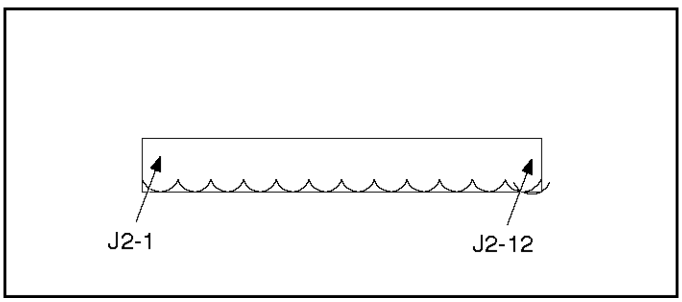


FIGURE 20. AUX101 J2

TABLE 23. AUX101 J2

Pin	Description
J2-1	AUX101 output 1, normally-open contact
J2-2	AUX101 output 1, common contact
J2-3	AUX101 output 1, normally-closed contact
J2-4	AUX101 output 2, normally-open contact
J2-5	AUX101 output 2, common contact
J2-6	AUX101 output 2, normally-closed contact
J2-7	AUX101 output 3, normally-open contact

Pin	Description
J2-8	AUX101 output 3, common contact
J2-9	AUX101 output 3, normally-closed contact
J2-10	AUX101 output 4, normally-open contact
J2-11	AUX101 output 4, common contact
J2-12	AUX101 output 4, normally-closed contact

5.3.4.4.2.1 AUX101 Output 1-8 Specifications

TABLE 24. AUX101 OUTPUT 1-8 SPECIFICATIONS

Description	Value
Output Type	Non-latching relay
Maximum Output Voltage	250 VAC or 30 VDC
Maximum Output Current from Normally-open Contact	3 A
Maximum Output Current from Normally-closed Contact	3 A

5.3.4.4.3 AUX101 J3

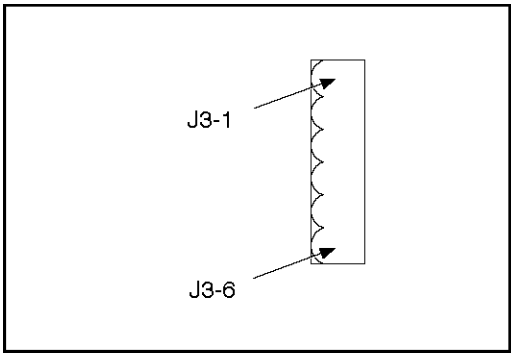


FIGURE 21. AUX101 J3

TABLE 25. AUX101 J3

Pin	Description
J3-1	AUX101 output 5, normally-open contact
J3-2	AUX101 output 5, common contact
J3-3	AUX101 output 5, normally-closed contact
J3-4	AUX101 output 6, normally-open contact
J3-5	AUX101 output 6, common contact
J3-6	AUX101 output 6, normally-closed contact

5.3.4.4.3.1 AUX101 Output 1-8 Specifications

TABLE 26. AUX101 OUTPUT 1-8 SPECIFICATIONS

Description	Value
Output Type	Non-latching relay
Maximum Output Voltage	250 VAC or 30 VDC
Maximum Output Current from Normally-open Contact	3 A
Maximum Output Current from Normally-closed Contact	3 A

5.3.4.4.4 AUX101 J4

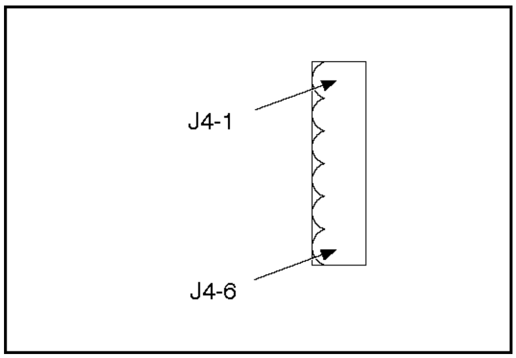


FIGURE 22. AUX101 J4

TABLE 27. AUX101 J4

Pin	Description
J4-1	AUX101 output 7, normally-open contact
J4-2	AUX101 output 7, common contact
J4-3	AUX101 output 7, normally-closed contact
J4-4	AUX101 output 8, normally-open contact
J4-5	AUX101 output 8, common contact
J4-6	AUX101 output 8, normally-closed contact

5.3.4.4.4.1 AUX101 Output 1-8 Specifications

TABLE 28. AUX101 OUTPUT 1-8 SPECIFICATIONS

Description	Value
Output Type	Non-latching relay
Maximum Output Voltage	250 VAC or 30 VDC
Maximum Output Current from Normally-open Contact	3 A
Maximum Output Current from Normally-closed Contact	3 A

5.3.4.4.5 AUX101 J5

If the AUX101 is connected to an AUX102, this is connected to J6 on the AUX102.

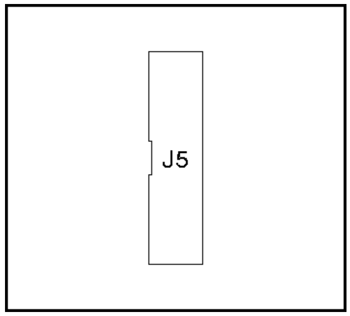


FIGURE 23. AUX101 J5

There is no pin description for AUX101 J5.

5.3.4.4.6 AUX101 J10

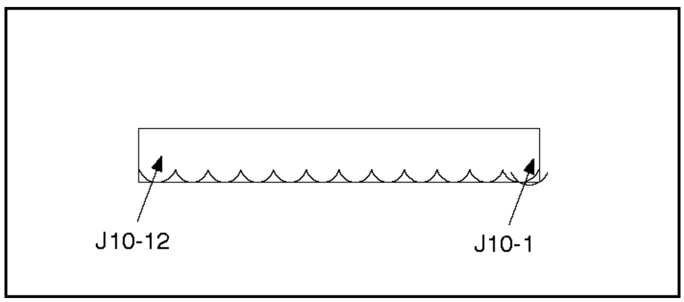


FIGURE 24. AUX101 J10

TABLE 29. AUX101 J10

Pin	Description
J10-1	CAN H
J10-2	CAN L
J10-3	Current source 1
J10-4	Current source 2
J10-5	Current source 3
J10-6	Current source 4
J10-7	Voltage source 1
J10-8	Voltage source 2
J10-9	Ground for current source or voltage source
J10-10	Ground for current source or voltage source
J10-11	Ground for current source or voltage source
J10-12	Ground for current source or voltage source

5.3.4.4.6.1 AUX101 Current Source Specifications

TABLE 30. AUX101 CURRENT SOURCE SPECIFICATIONS

Description	Value
Maximum Output Current	20 mA

5.3.4.4.6.2 AUX101 Voltage Source Specifications

TABLE 31. AUX101 VOLTAGE SOURCE SPECIFICATIONS

Description	Value
Output Voltage	5 VDC
Maximum Output Current	20 mA

5.3.4.4.7 AUX101 J11

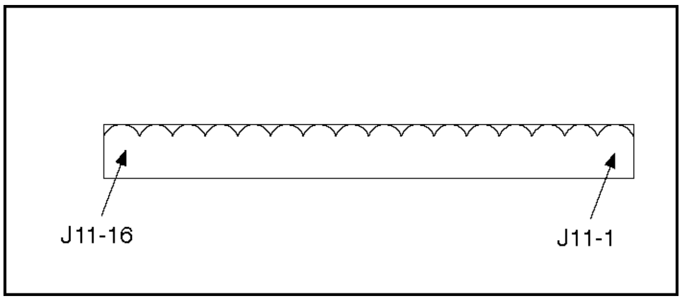


FIGURE 25. AUX101 J11

TABLE 32. AUX101 J11

Pin	Description
J11-1	AUX101 input 1, reference input
J11-2	AUX101 input 1, switch input
J11-3	AUX101 input 2, reference input
J11-4	AUX101 input 2, switch input
J11-5	AUX101 input 3, reference input
J11-6	AUX101 input 3, switch input
J11-7	AUX101 input 4, reference input
J11-8	AUX101 input 4, switch input
J11-9	AUX101 input 5, reference input
J11-10	AUX101 input 5, switch input
J11-11	AUX101 input 6, reference input
J11-12	AUX101 input 6, switch input
J11-13	AUX101 input 7, reference input

Pin	Description
J11-14	AUX101 input 7, switch input
J11-15	AUX101 input 8, reference input
J11-16	AUX101 input 8, switch input

5.3.4.4.7.1 AUX101 Input 1-2 Specifications

TABLE 33. AUX101 INPUT 1-2 SPECIFICATIONS

Description	Value
Input Type	Discrete or analog
Maximum Input Voltage	24 VDC
Differential Voltage Range	-5~5 VDC

5.3.4.4.7.2 AUX101 Input 3-6 Specifications

TABLE 34. AUX101 INPUT 3-6 SPECIFICATIONS

Description	Value
Input Type	Discrete or analog
Maximum Input Voltage	24 VDC
Differential Voltage Range	0~5 VDC

5.3.4.4.7.3 AUX101 Input 7-8 Specifications

TABLE 35. AUX101 INPUT 7-8 SPECIFICATIONS

Description	Value
Input Type	Discrete or analog
Maximum Input Voltage	40 VDC
Differential Voltage Range	0~38 VDC

5.3.4.4.8 AUX101 J14

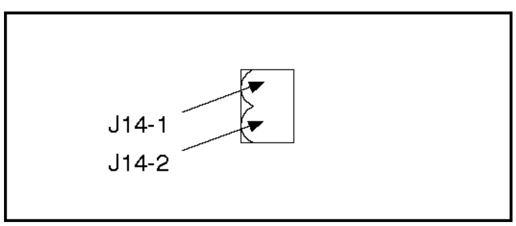


FIGURE 26. AUX101 J14

TABLE 36. AUX101 J14

Pin	Description
J14-1	Input power B+
J14-2	Input power B-

5.3.4.4.8.1 AUX101 and AUX102 Power Specifications

TABLE 37. AUX101 AND AUX102 POWER SPECIFICATIONS

Description	Value
Input Voltage	5-40 VDC
Operating Voltage	12 VDC or 24 VDC
Current Consumption	900 mA (12 VDC) 450 mA (24 VDC)

5.3.5 Pin Connections for AUX101 Inputs 1-8

TABLE 38. PIN CONNECTIONS FOR AUX101 INPUTS 1-8

Input	Pins
1	J11-1, J11-2
2	J11-3, J11-4
3	J11-5, J11-6
4	J11-7, J11-8
5	J11-9, J11-10
6	J11-11, J11-12
7	J11-13, J11-14
8	J11-15, J11-16

5.3.6 Pin Connections for AUX101 Outputs 1-8

TABLE 39. PIN CONNECTIONS FOR AUX101 OUTPUTS 1-8

Output	Pins
1	J2-1, J2-2, J2-3
2	J2-4, J2-5, J2-6
3	J2-7, J2-8, J2-9
4	J2-10, J2-11, J2-12
5	J3-1, J3-2, J3-3
6	J3-4, J3-5, J3-6

Output	Pins
7	J4-1, J4-2, J4-3
8	J4-4, J4-5, J4-6

5.4 AUX102

The PowerCommand AUX102 provides additional inputs and additional configurable outputs for auxiliary control and monitoring of the power system.

NOTICE
The AUX102 requires the AUX101.

5.4.1 AUX102 Inputs and Outputs

TABLE 40. NUMBER OF INPUTS AND OUTPUTS ON THE AUX102

Description	Value
Number of Inputs	4
Number of Outputs	8

5.4.2 AUX102 Inputs

An AUX102 input can be associated with a fault code. When the input is active, the fault is active. When the input is inactive, the fault is inactive, though the fault might have to be reset.

Alternatively, some AUX102 inputs can be assigned specific input functions instead of a fault code. These functions have a variety of effects and vary by controller.

5.4.3 AUX102 Outputs

Each AUX102 output is associated with a fault code. When the fault is active, the output is active. When the fault is inactive, the output is inactive.

5.4.4 Numbering of AUX102 Inputs and Outputs

The AUX102 requires the AUX101. As a result, many operator panels and software programs start numbering AUX102 inputs and outputs at 9 instead of 1. For example, AUX102 output 1 may be referred to as AUX102 output 9, output 9, or even AUX101 output 9. All of these expressions refer to the same output.

5.4.5 AUX102 Board

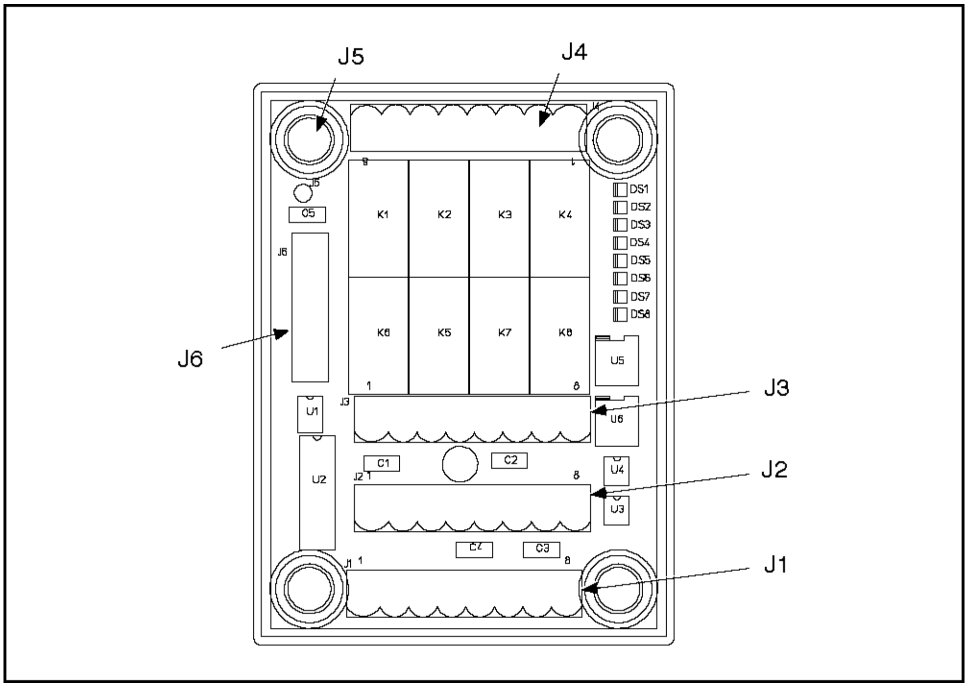


FIGURE 27. AUX102 BOARD

5.4.5.1 AUX102 Indicators

TABLE 41. AUX102 INDICATORS

Indicator	Description
DS1	This is on if AUX102 output 9 is active.
DS2	This is on if AUX102 output 10 is active.
DS3	This is on if AUX102 output 11 is active.
DS4	This is on if AUX102 output 12 is active.
DS5	This is on if AUX102 output 13 is active.
DS6	This is on if AUX102 output 14 is active.
DS7	This is on if AUX102 output 15 is active.
DS8	This is on if AUX102 output 16 is active.

5.4.5.2 AUX102 Connectors

TABLE 42. AUX102 CONNECTORS

Connector	Description
J1	AUX102 outputs 1-8, normally-open contacts
J2	AUX102 outputs 1-8, common contacts
J3	AUX102 outputs 1-8, normally-closed contacts

Connector	Description
J4	AUX102 inputs 9-12
J5	Chassis ground
J6	Connection to AUX101

5.4.5.2.1 AUX102 J1

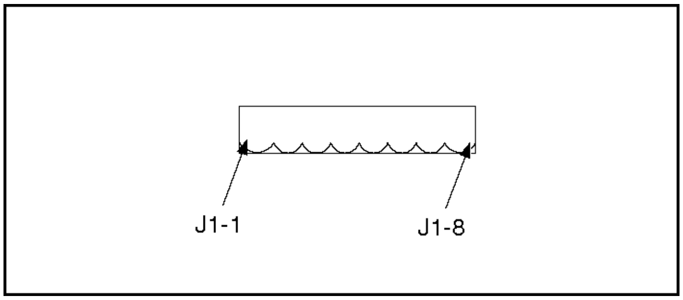


FIGURE 28. AUX102 J1

TABLE 43. AUX102 J1

Pin	Description
J1-1	AUX102 output 9, normally-open contact
J1-2	AUX102 output 10, normally-open contact
J1-3	AUX102 output 11, normally-open contact
J1-4	AUX102 output 12, normally-open contact
J1-5	AUX102 output 13, normally-open contact
J1-6	AUX102 output 14, normally-open contact
J1-7	AUX102 output 15, normally-open contact
J1-8	AUX102 output 16, normally-open contact

5.4.5.2.2 AUX102 J2

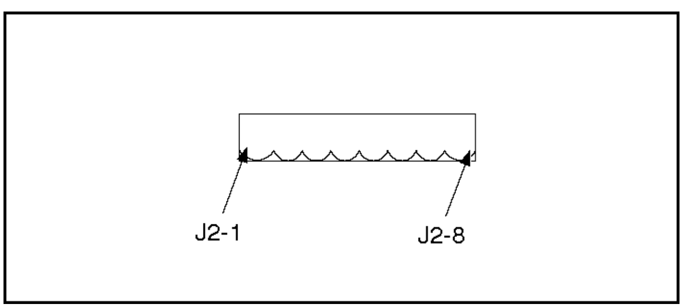


FIGURE 29. AUX102 J2

TABLE 44. AUX102 J2

Pin	Description
J2-1	AUX102 output 9, common contact
J2-2	AUX102 output 10, common contact
J2-3	AUX102 output 11, common contact
J2-4	AUX102 output 12, common contact
J2-5	AUX102 output 13, common contact
J2-6	AUX102 output 14, common contact
J2-7	AUX102 output 15, common contact
J2-8	AUX102 output 16, common contact

5.4.5.2.3 AUX102 J3

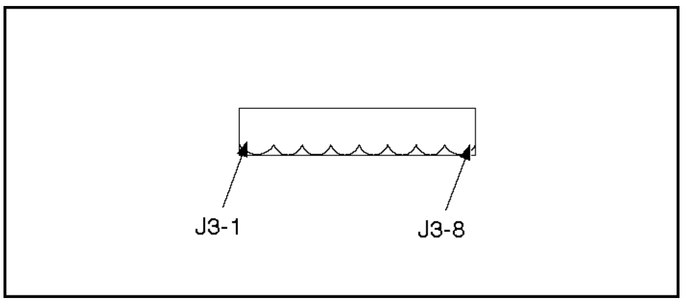


FIGURE 30. AUX102 J3

TABLE 45. AUX102 J3

Pin	Description
J3-1	AUX102 output 9, normally-closed contact
J3-2	AUX102 output 10, normally-closed contact
J3-3	AUX102 output 11, normally-closed contact
J3-4	AUX102 output 12, normally-closed contact
J3-5	AUX102 output 13, normally-closed contact
J3-6	AUX102 output 14, normally-closed contact
J3-7	AUX102 output 15, normally-closed contact
J3-8	AUX102 output 16, normally-closed contact

5.4.5.2.4 AUX102 J4

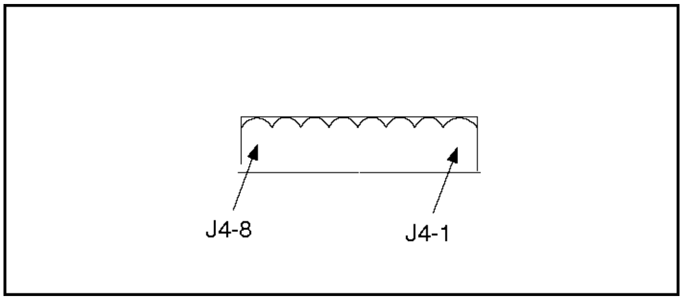


FIGURE 31. AUX102 J4

TABLE 46. AUX102 J4

Pin	Description
J4-1	AUX102 input 9, switch input
J4-2	AUX102 input 9, reference input
J4-3	AUX102 input 10, switch input
J4-4	AUX102 input 10, reference input
J4-5	AUX102 input 11, switch input
J4-6	AUX102 input 11, reference input
J4-7	AUX102 input 12, switch input
J4-8	AUX102 input 12, reference input

5.4.5.2.5 AUX102 J5

J5 is connected to a good earth ground.

5.4.5.2.6 AUX102 J6

This is connected to J5 on the AUX101.

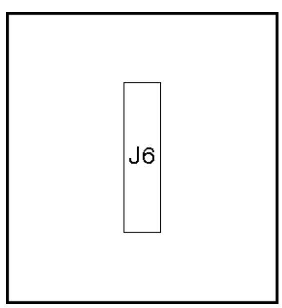


FIGURE 32. AUX102 J6

There is no pin description for AUX102 J6.

5.4.6 Pin Connections for AUX102 Inputs 9-12

TABLE 47. PIN CONNECTIONS FOR AUX102 INPUTS 9-12

Input	Pins
9	J4-1, J4-2
10	J4-3, J4-4
11	J4-5, J4-6
12	J4-7, J4-8

5.4.7 Pin Connections for AUX102 Outputs 9-16

TABLE 48. PIN CONNECTIONS FOR AUX102 OUTPUTS 9-16

Output	Pins
9	J1-1, J2-1, J3-1
10	J1-2, J2-2, J3-2
11	J1-3, J2-3, J3-3
12	J1-4, J2-4, J3-4
13	J1-5, J2-5, J3-5
14	J1-6, J2-6, J3-6
15	J1-7, J2-7, J3-7
16	J1-8, J2-8, J3-8

5.5 HMI113

The HMI113 is the Universal Annunciator Module. It provides visible and audible indication of generator set alarms and status based on discrete relay or network inputs.

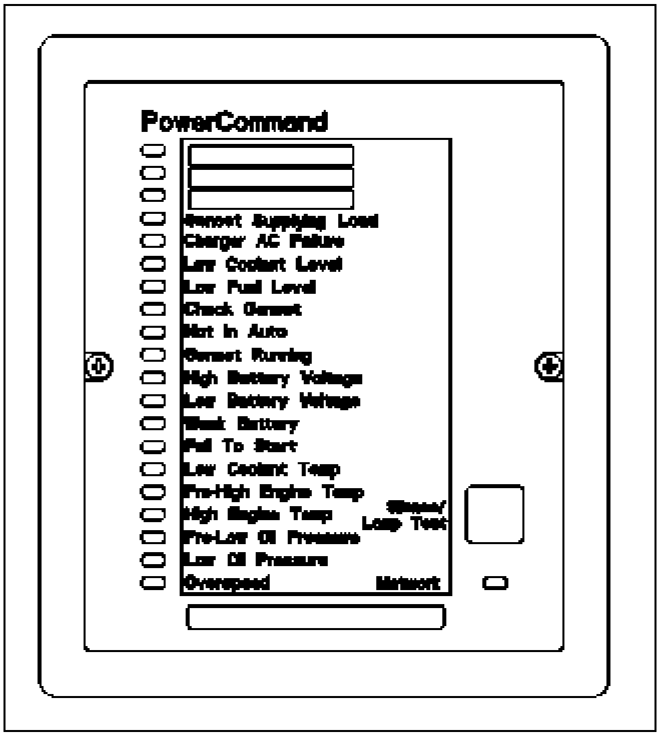


FIGURE 33. EXAMPLE OF HMI113

The HMI113 supports different overlays.

Generator Set Supplying Load

The annunciator LED is on when the generator set is connected to the load. The LED is activated for any of the following conditions:

- A ground signal from an Automatic Transfer Switch (ATS) position switch connected TB1-4 on the universal annunciator.
- A signal from the connected PCC3.3 control via PCCNet, when the parameter "Genset CB Position Status" is "Closed".
- A signal from the connected PCC3.3 control via PCCNet, when the generator set current is above the parameter value of "Breaker Closed Current Threshold" (Default of 5%).

5.5.1 PCC Support for HMI113

The PCC supports up to four HMI113 on each PCCNet network.

5.5.2 HMI113 Part Numbers

TABLE 49. HMI113 PART NUMBERS

Part Description	Part Number
No enclosure	0300-5929-01
Enclosure	0300-5929-02

5.6 HMI114

The HMI114 is the Bargraph Meter. It provides visible indication of generator set voltage, generator set current, and generator set power.

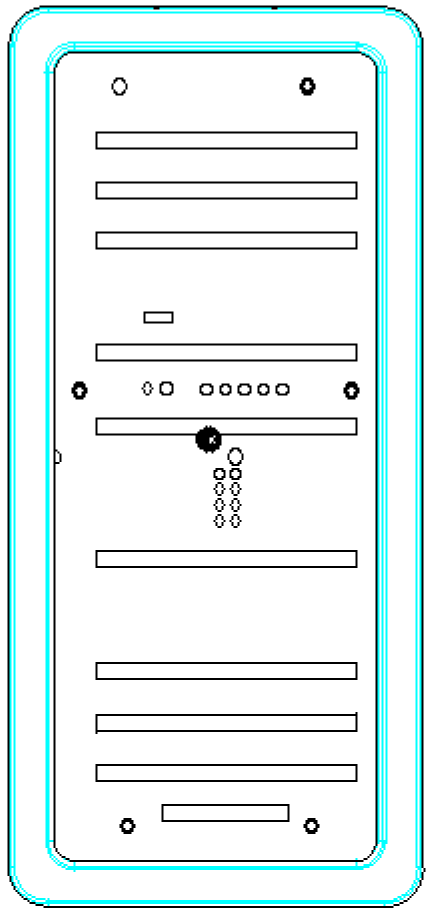


FIGURE 34. HMI114

5.6.1 PCC Support for HMI114

The PCC supports an unlimited number of HMI114 on each PCCNet network, but each PCCNet network is limited to twenty PCCNet devices.

5.6.2 HMI114 Part Numbers

TABLE 50. HMI114 PART NUMBERS

Part Description	Part Number
Bargraph	0300-6366-02
Bargraph software	0326-7431

5.6.3 HMI114 Modes

The HMI114 can run in four modes. Press and hold the push button near TB15 to switch between modes.

5.7 Operator Panel

TABLE 51. OPERATOR PANEL PART NUMBERS

Part Description	Part Number
HMI 220 (Operator Panel)	0300-6314-01
HMI 220 Operator Panel software	0326-7330
HMI 220 Operator Panel language software	0326-7447 0326-7448
HMI 320 (Operator Panel)	0300-6315-01 0300-6315-02
HMI 320 Operator Panel software	0326-7431
HMI 320 Operator Panel language software	0326-7449 0326-7450
Remote HMI 320 (Operator Panel)	0300-6315-03
Remote HMI 320 Operator Panel software	0326-7431
Remote HMI 320 Operator Panel language software	0326-7449 0326-7450

This is the Operator Panel for the PCC. Its environmental specifications are identified in table below.

TABLE 52. OPERATOR PANEL ENVIRONMENTAL SPECIFICATIONS

Description	Specification
Operating temperature	-20 ~ 70 C (-4 ~ 158 °F)
Storage temperature	-40 ~ 70 C (-40 ~ 158 °F)
Operating humidity	0 ~ 85% (non-condensing)
Storage humidity	0 ~ 95% (non-condensing)
Vibration tolerance ...	
at 20 ~ 100 Hz	0.15 mm displacement
at 100 ~ 500 Hz	6 g

The Operator Panel has a membrane that is impervious to the effects of dust, moisture, oil, and exhaust fumes.

The front panel of the Operator Panel is also called the control panel.

The HMI 220 graphical display is 160 x 160 pixels. The HMI 320 graphical display is 320 x 320 pixels.

The rear panel contains LEDs and the connections to the Operator Panel.

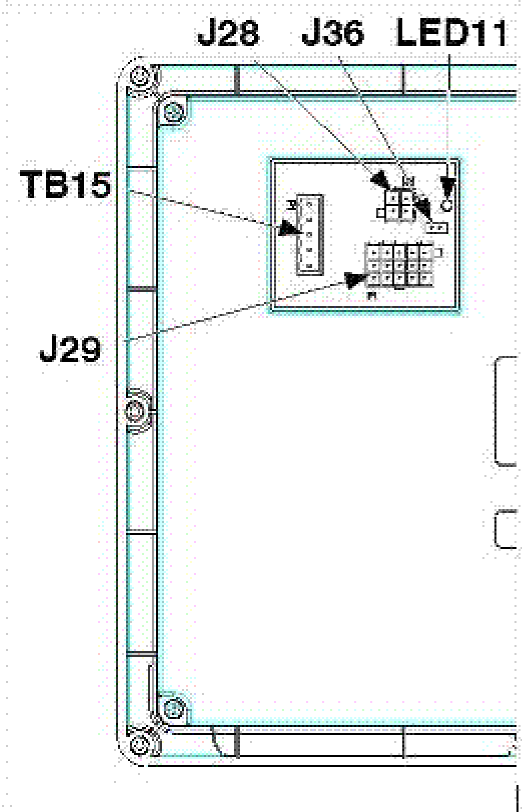


FIGURE 35. OPERATOR PANEL CONNECTIONS

5.7.1 LEDs

NOTICE
DSx, where x is a number, is the typical way to indicate a hardware component is a light (LED or incandescent).

TABLE 53. OPERATOR PANEL LEDS (REAR PANEL)

LED	Color	Description
LED11	Green	This LED blinks regularly when the Operator Panel has power and is not in power-down mode.

5.7.2 Connections

Table 54 provides an overview of the connections for this module.

TABLE 54. OPERATOR PANEL CONNECTIONS OVERVIEW

Connection	Description	Housing	Pins
J28	Power	0323-2091	0323-2466
J29	Local installations	0323-2456	0323-2466

Connection	Description	Housing	Pins
J36	Power-down mode disable		
TB15	Remote installations, PC-based service tool	0323-2191-04 0323-2192-04	

NOTICE
Internally, J29 and TB15 use the same connection, so J29 must be disconnected to connect the PC-based service tool on TB15.

5.7.3 J28 Connections

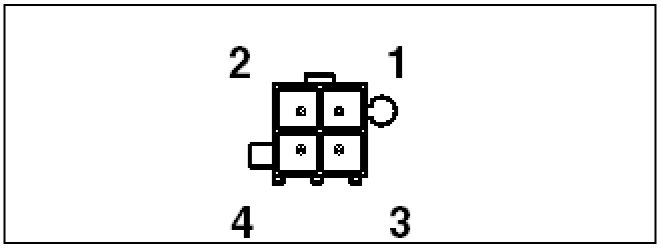


FIGURE 36. J28 PINS

This connector is oriented the same way it is oriented in the Operator Panel Connections.

TABLE 55. J28 PIN ASSIGNMENTS: POWER CONNECTIONS

Pin	Description	Function / Connects to
J28-1	Fused B+	B+ supply to HMI
J28-2	N/A	
J28-3	B+ Return	Return / GND to HMI
J28-4	N/A	

5.7.4 J29 Connections

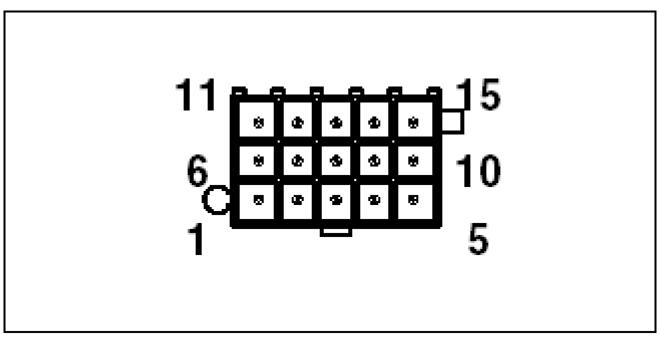


FIGURE 37. J29 PINS

This connector is oriented the same way it is oriented in the Operator Panel Connections.

TABLE 56. J29 PIN ASSIGNMENTS: LOCAL INSTALLATION CONNECTIONS

Pin	Description	Function / Connects to
J29-1	PCCNet A (+)	Network Data A
J29-2	PCCNet B (-)	Network Data B
J29-3	System Wakeup	
J29-4	Auto	Configurable as Wakeup; not available on remote HMI
J29-5	B+ Return	
J29-6	Run/Remote Start	Manual command; on remote HMI, this is controlled by Remote Start buttons and connected to PCC Remote Start pin.
J29-7	N/A	
J29-8	N/A	
J29-9	External Lamp Driver	A ground signal is available on pressing the Lamp Test button.
J29-10	Fault Reset	A ground signal is available on pressing Reset.
J29-11	N/A	
J29-12	N/A	
J29-13	N/A	
J29-14	N/A	
J29-15	N/A	

Internally, PCCNet (J29) and the PC-based service tool (TB15) use the same connection, so only one of these connections can be active at the same time.

NOTICE

Internally, J29 and TB15 use the same connection, so J29 must be disconnected to connect the PC-based service tool on TB15.

J29-9 provides a path to ground. It can handle 500 mA.

J29-9 is toggled when the Lamp Test button is pushed and held for three seconds.

J29-10 is active when the Reset button is pushed.

System Wakeup Connections

J29-3 is a System Wakeup pin.

Ground any System Wakeup pin on the Operator Panel to prevent the Operator Panel and any connected devices from entering power-down mod.

5.7.5 J36 Connections

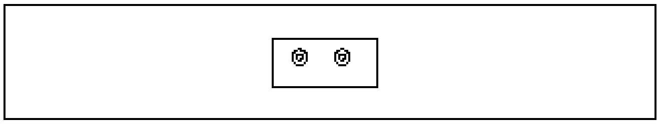


FIGURE 38. J36 PINS

Put a jumper across J36 to prevent the Operator Panel and any connected devices from entering power-down mode.

5.7.6 TB15 Connections

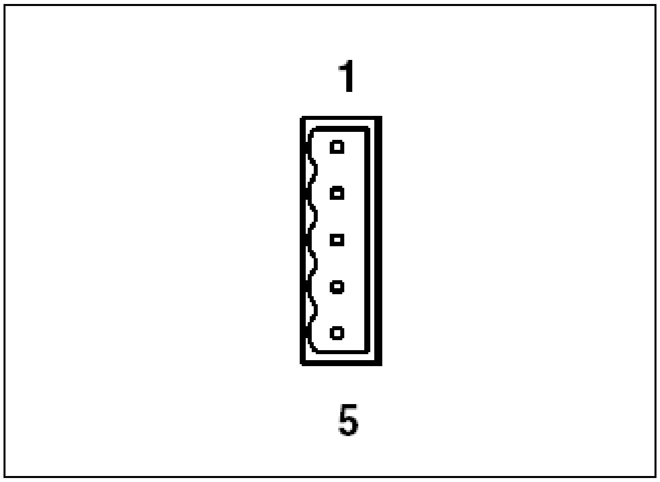


FIGURE 39. TB15 PINS

This connector is oriented the same way it is oriented in the Operator Panel Connections.

TABLE 57. TB15 PIN ASSIGNMENTS: REMOTE INSTALLATION OR PC-BASED SERVICE TOOL CONNECTIONS

Pin	Description	Function / Connects to
TB15-1	RETURN	Network Power Supply Return
TB15-2	NA	
TB15-3	RS-485 DATA A	Network Data A
TB15-4	RS-485 DATA B	Network Data B
TB15-5	System Wakeup	

Internally, PCCNet (J29) and the PC-based service tool (TB15) use the same connection, so only one of these connections can be active at the same time.

NOTICE

Internally, J29 and TB15 use the same connection, so J29 must be disconnected to connect the PC-based service tool on TB15.

System Wakeup Connections

TB15-5 is a System Wakeup pin.

Ground any System Wakeup pin on the Operator Panel to prevent the Operator Panel and any connected devices from entering power-down mode.

5.8 Circuit Board Replacement Procedure

Read ***Safety Precautions***, and carefully observe all of the instructions and precautions in this chapter and in this manual.

1. Create a capture file to save the current settings.
2. Turn off or remove AC power from the battery charger.
3. Press the Emergency stop button, and wait 30 seconds.
4. Remove the negative (-) battery cable from the generator set starting battery.
5. Attach the grounding wrist strap clip to an unpainted surface that is connected to the same ground to which the PCC is connected, and place the strap around your wrist.
6. Disconnect the cables that are connected to the circuit board.
7. Remove the circuit board.
8. Install the replacement circuit board.
9. Reconnect the cables to the replacement circuit board.
10. Connect the negative (-) battery cable to the generator set starting battery.
11. Turn on or connect AC power to the battery charger.
12. Restore the capture file.
13. Calibrate the PCC.

5.9 CT Ratio Calculator

InPower has a built-in CT ratio calculator which allow you to determine the required CT size and CT ratio.

The following generator set information is required to calculate the CT ratio:

- Generator set power ratings
- Frequency range
- Nominal frequency
- Nominal voltage Limits
- Secondary CT ratio value

Follow these steps to use the CT ratio calculator in InPower.

1. Connect to the PCC and highlight any of the folders under the PCC connection (such as Advanced Status). Right click on the folder, and click on Genset OEM Setup...

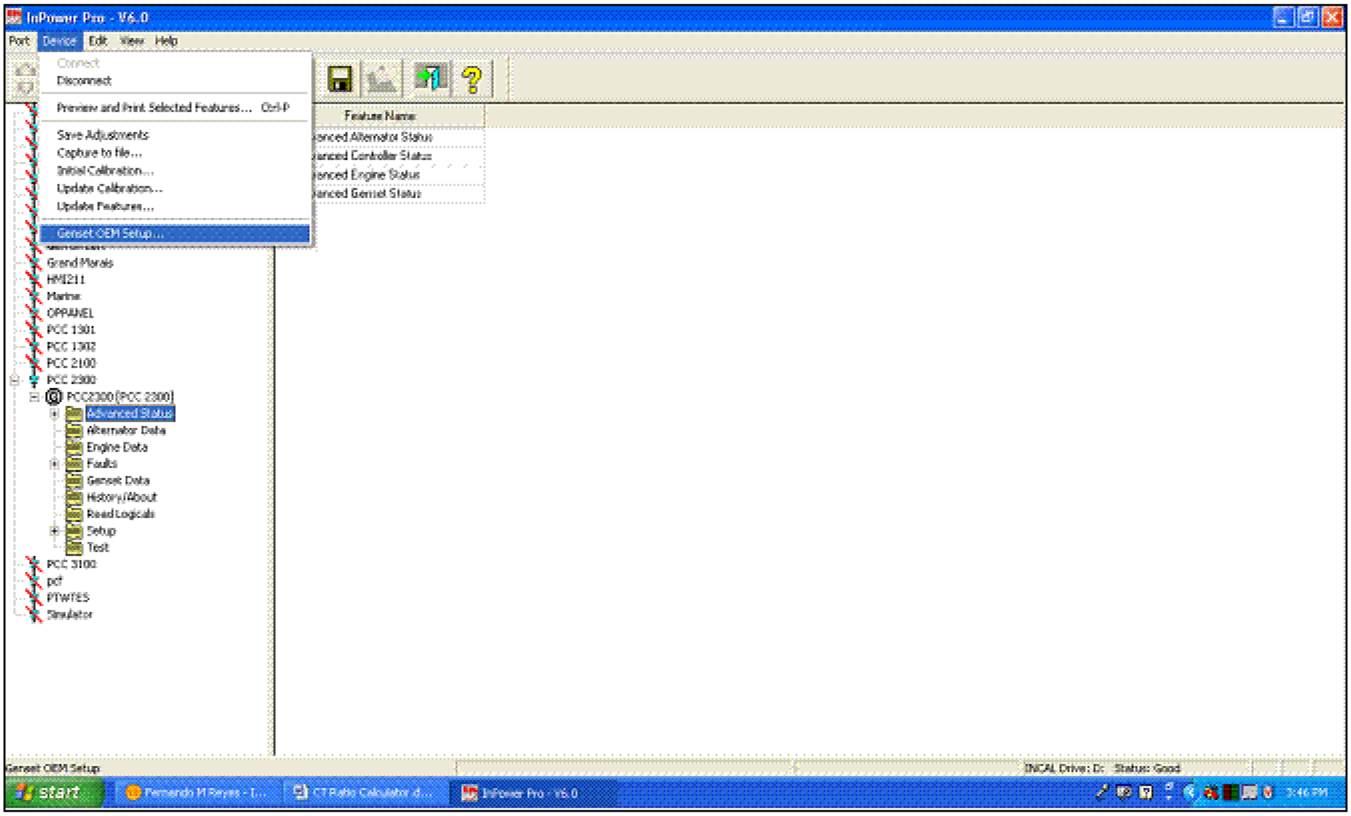


FIGURE 40. INPOWER - GENSET OEM SETUP SELECTION

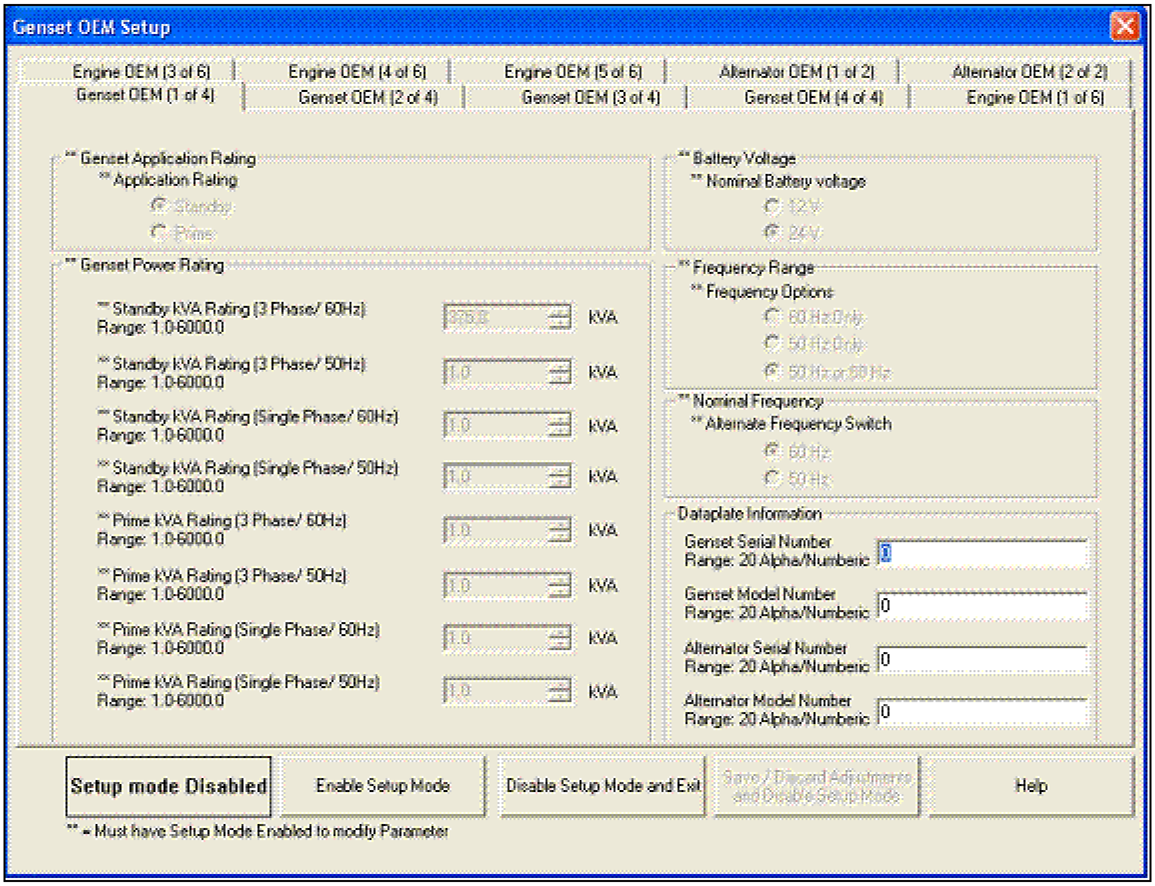


FIGURE 41. GENSET OEM SETUP WINDOW

2. Click on Enable Setup Mode in order to enable the menu.
3. Enter the generator set information under Genset Power Ratings, Frequency Range, and Nominal Frequency.
4. Click on Save/Discard Adjustments and Disable Setup Mode in order to save the generator set settings. This step is required.

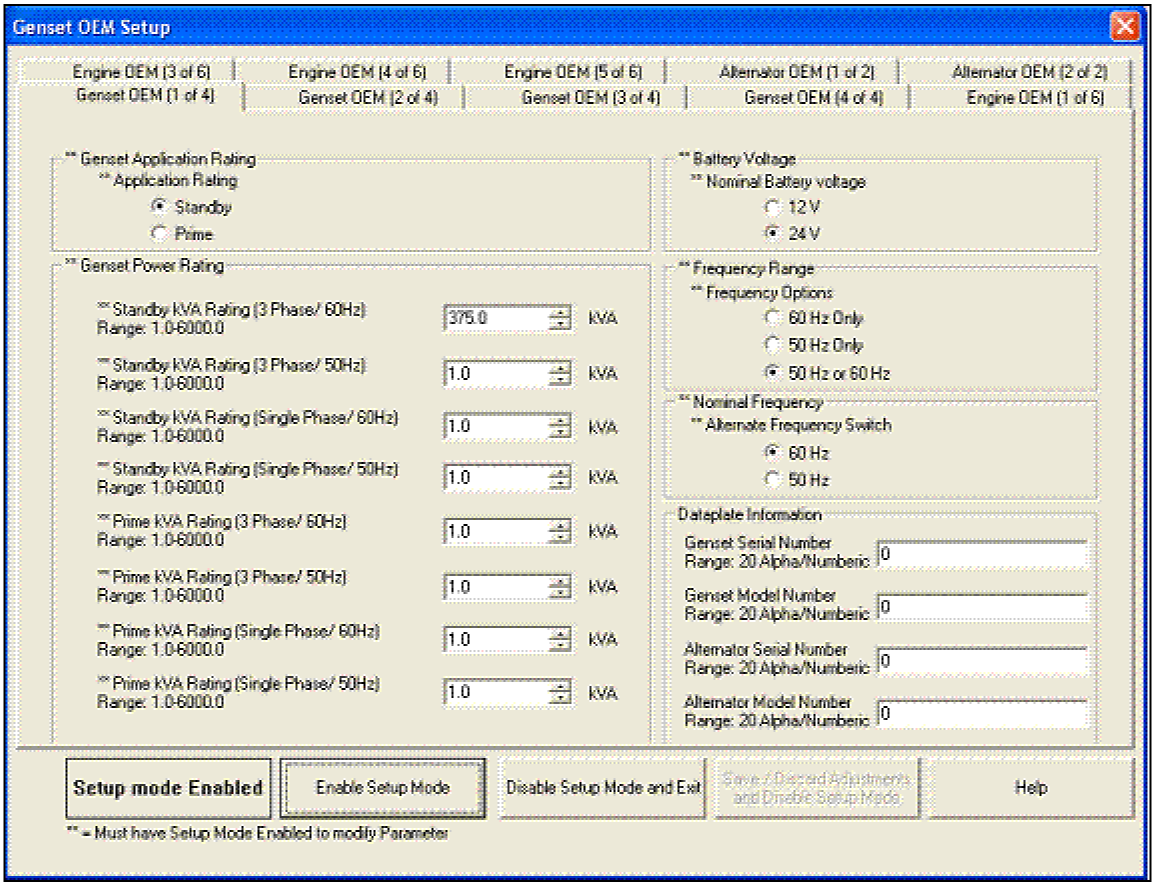


FIGURE 42. GENSET OEM SETUP WINDOW - ENABLE SETUP MODE

5. Open the Genset OEM Setup again.
6. Click on the Alternator OEM (1 of 2) tab to display the settings below.

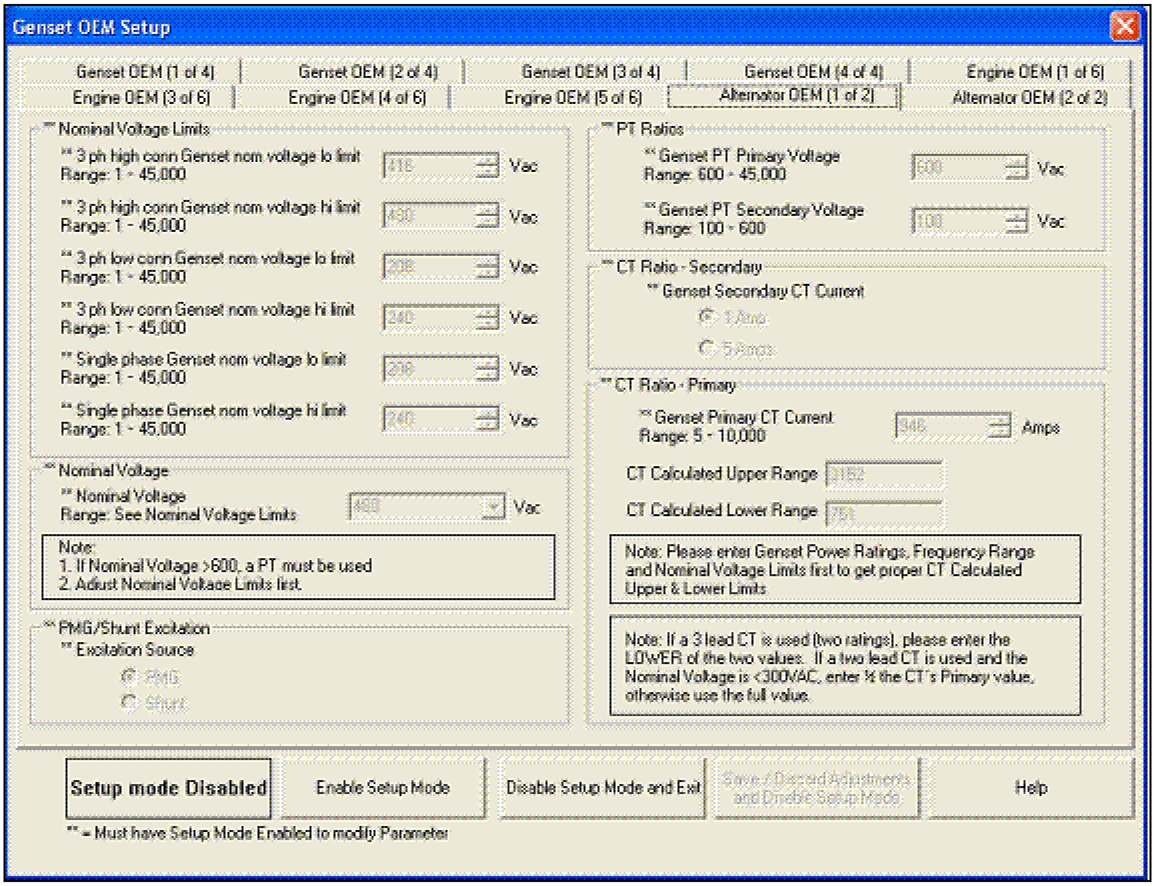


FIGURE 43. GENSET OEM SETUP WINDOW - OEM (1 OF 2)

7. Click on Enable Setup Mode in order to enable the menu.

8. Enter the generator set information under Nominal Voltage Limits and CT Ratio –Secondary. After all the information is entered, InPower will calculate the required Genset Primary CT Ratio limits. The primary CT Ratio needs to be between the CT Calculated Upper Range and the CT Calculated Lower Range.

   The CTs and the CT ratio setting in the PCC require a primary CT ratio between the CT Calculated Upper Range and the CT Calculated Lower Range.

   The alternator CT ratio is required to have a secondary CT Ratio equal to the setting under the CT Ratio – Secondary.

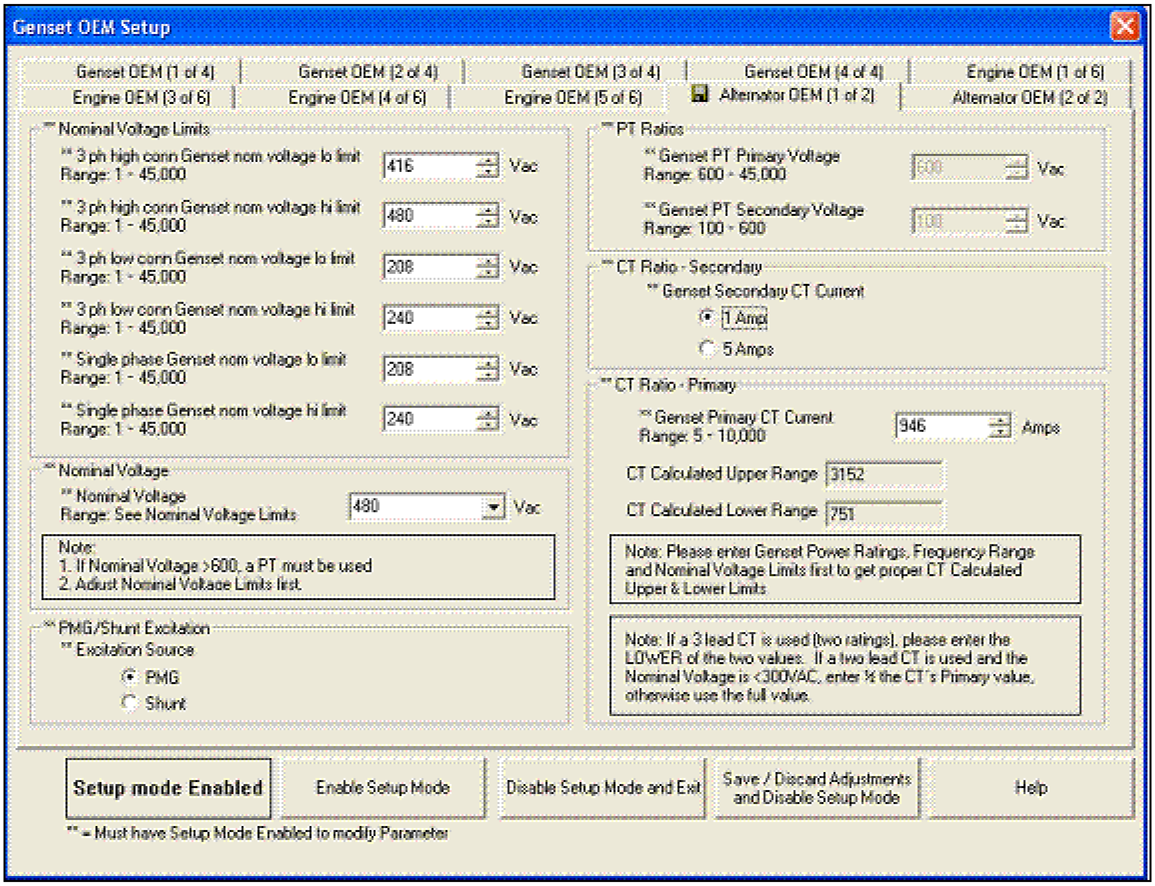


FIGURE 44. OEM (1 OF 2) NOMINAL VOLTAGES

9. To exit the setup mode and save changes, click on Save / Discard Adjustments and Disable Setup Mode.

   To exit the setup mode without saving changes, click on Disable Setup Mode and Exit. Then, click on Discard when the Save Adjustments Screen pops up.

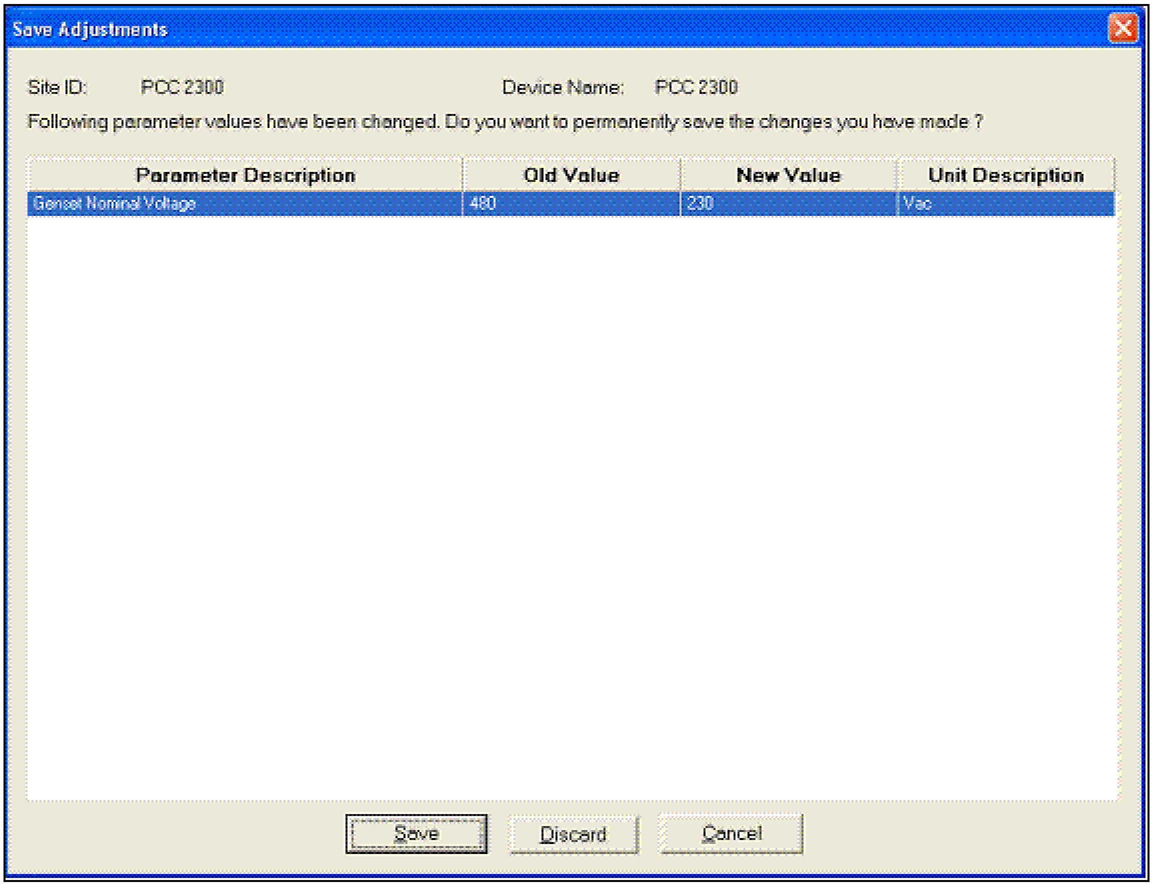


FIGURE 45. SAVE ADJUSTMENTS WINDOW

5.10 RTDs - About Four-wire Connections

When measuring the resistance of a RTD (resistance temperature detector or resistive thermal device) located a significant distance away, the resistance in the wire can reduce the accuracy of the measurement. In this case, a four-wire connection can provide a more accurate measurement.

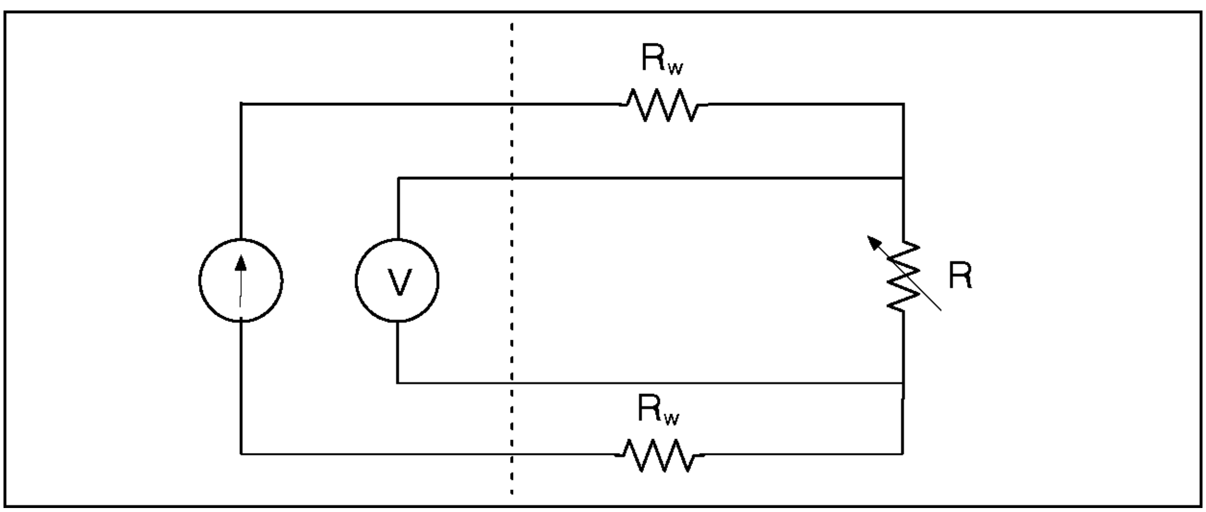


FIGURE 46. FOUR-WIRE CONNECTION

In a four-wire connection, one set of wires provides a fixed current to the component, and a second set of wires measures the voltage drop across the component. The resistance is calculated by dividing the voltage drop by the fixed current.

While there is resistance in the wires that measure the voltage drop, the voltmeter produces much less current than the current source, so the voltage drop due to resistance in the voltmeter wires is significantly smaller.

5.10.1 How to Convert a Four-wire Connection Into a Two-wire Connection

If you want to make a two-wire connection to a device that provides a four-wire connection, connect a jumper between each pair of pins.

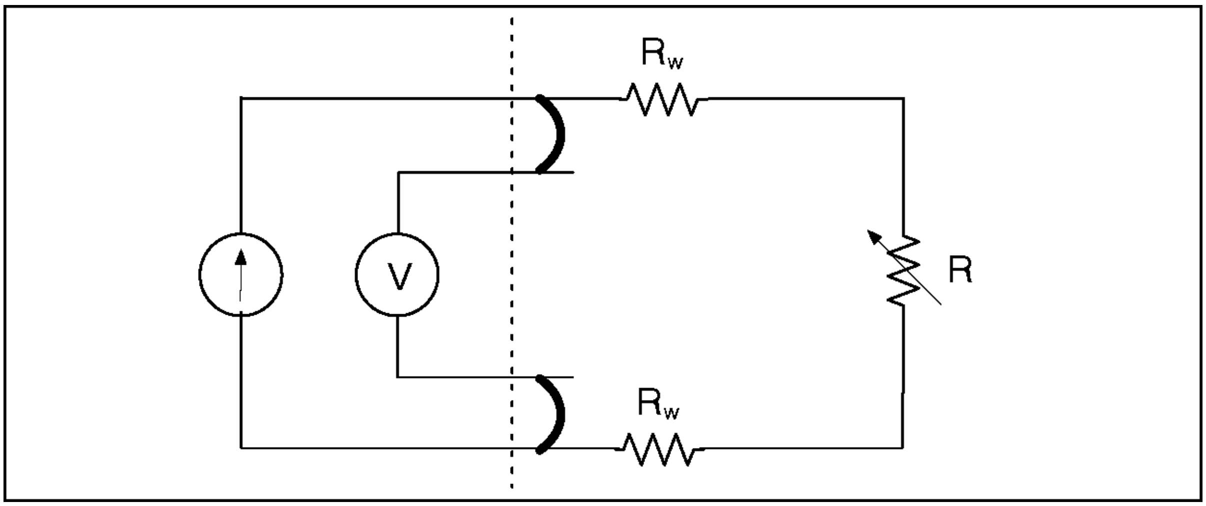


FIGURE 47. HOW TO CONVERT A FOUR-WIRE CONNECTION INTO A TWO-WIRE CONNECTION

In this type of connection, the voltmeter measures the voltage drop across the component and the voltage drop due to resistance in the wire. As a result, the longer the wires, the more inaccurate the measurement.

If you want to make a three-wire connection, connect a jumper between one pair of pins. The accuracy of a three-wire connection is better than that of a two-wire connection but worse than that of a four-wire connection.

6 Control Operation

In this section, italics are used to identify a specific parameter by name.

6.1 Modes of Operation

The mode of operation determines the ways the generator set can be started and stopped.

The mode of operation is controlled by the PCC's Mode of Operation connection. Typically, the device to which the PCC is connected is the Operator Panel or a keyswitch.

In applications where the Operator Panel controls the mode of operation, the buttons on the Operator Panel are used to change the mode of operation.

In applications where a keyswitch controls the mode of operation, please contact whoever installed your generator set to understand the purpose of each position in the keyswitch.

The Mode of Operation connection consists of a Manual signal and an Auto signal.

TABLE 58. AUTO SIGNALS, MANUAL SIGNALS, AND THE MODE OF OPERATION

MANUAL	AUTO	MODE OF OPERATION
Inactive	Inactive	Off mode
Inactive	Active	Auto mode
Active	Any	Manual mode

If the manual signal is inactive, the auto signal determines whether or not the PCC is in Auto mode.

If the manual signal is active, the auto signal starts and stops the generator set. When the auto signal becomes inactive, the PCC initiates a Manual Start sequence. When the auto signal becomes active, the PCC initiates a Manual Stop sequence.

If the generator set is running when the PCC enters Manual mode, the PCC keeps running the generator set if the auto signal is inactive within the first 250 ms. Otherwise, the PCC initiates a Shutdown Without Cooldown sequence.

The PCC runs in one of these modes at any given time.

6.1.1 Off Mode

In this mode, the PCC does not allow the generator set to start. You have to change the mode of operation if you want to start the generator set.

If the generator set is running when the PCC enters this mode, the PCC initiates a Shutdown Without Cooldown sequence. If the generator set was running at 10% or more of its rated load, the PCC generates warning fault 611 (Engine Hot Shut Down).

In applications where the Operator Panel controls the mode of operation, you can put the PCC in Off mode one of these ways:

- If the generator set is running in Manual mode, press the Stop button, and wait for the generator set to stop; or press the Stop button twice.
- If the generator set is not running or in any other mode, press the Stop button once.
- Do not push the Start button after pressing the Manual button.

6.1.2 Auto Mode

In this mode, the genset is controlled by the exercise signal and the remote start signal.

⚠ WARNING
In Auto mode, the genset can start at any time. NEVER service the genset in Auto mode. Accidental starting of the genset during troubleshooting can cause severe personal injury or death. Disable the genset before troubleshooting.

If the genset is running when the PCC enters this mode, the PCC keeps running the genset if the remote start signal is active. Otherwise, the PCC initiates a Shutdown with Cooldown sequence.

When the exercise signal or the remote start signal becomes active, the PCC initiates the appropriate start sequence to start the genset. The PCC continues to run as long as either signal is active.

When neither signal is active anymore, the PCC initiates a Shutdown with Cooldown sequence.

In applications where the Operator Panel controls the mode of operation, press the Auto button to put the PCC in Auto mode.

6.1.2.1 Exercise Signal

This signal has no effect unless all of these conditions are met:

- The PCC is in Auto mode.
- There are no active shutdown faults.

If the generator set is running, this signal has no effect until the remote start signal becomes inactive. Then, this signal keeps the generator set running.

This signal may come from any of these sources:

- PCC's Exercise Switch connection
- Operator Panel
- Modbus networks
- PC-based service tool, such as InPower
- Exercise scheduler (internal function; no hardware connection)

This signal becomes active when one of the sources changes from inactive to active while all of the other sources remain inactive.

NOTICE
There can be multiple sources for this signal. The generator set keeps running if any source is active. You have to make all of the sources inactive to make the signal inactive.

When this signal becomes active, the PCC initiates a Non-emergency Start sequence if the generator set is not running already (for example, if the remote start signal was active).

NOTICE
This signal does not become active if the PCC is not in Auto mode when this change occurs.

This signal remains active until the PCC leaves Auto mode or for a length of time that depends on which source changed from inactive to active.

- If the source is the exercise scheduler, this signal remains active as long as the scheduler program is running.
- If the source is one of the other sources, this signal remains active until the source becomes inactive or for *Genset Exercise Time*, whichever occurs first. (If the remote start signal becomes active or there is a shutdown fault, *Genset Exercise Time* is reset.)

If two or more sources are active at the same time, the logic is more complicated. This signal becomes inactive when one of these conditions is met:

- All of the sources become inactive.
- *Genset Exercise Time* after the first source other than the exercise scheduler changed from inactive to active. However, the PCC resets the timer if all of the sources other than the exercise scheduler are ever inactive at the same time.

NOTICE
The logic is even more complicated if the PCC leaves Auto mode or there is a shutdown fault. Please contact your local distributor if you have questions about specific scenarios.

When this signal becomes inactive, the PCC initiates a Shutdown with Cooldown sequence if the remote start signal is inactive too.

6.1.2.2 Remote Start Signal

This signal has no effect unless all of these conditions are met:

- The PCC is in Auto mode.
- There are no active shutdown faults.

This signal may come from any of these sources:

- PCC Remote Start connection (typically, to a transfer switch or a remote Operator Panel)
- Modbus networks
- PC-based service tool, such as InPower

This signal becomes active when any of these sources is active. It remains active until all of the sources are inactive. If there are no sources (in other words, no connections), this signal is inactive.

NOTICE
There can be multiple sources for this signal. The generator set keeps running if any source is active. You have to make all of the sources inactive to make the signal inactive.

When this signal becomes active, the PCC starts the generator set if the generator set is not running already. If the start type signal is active, the PCC initiates a Non-emergency Start sequence. If the start type signal is inactive, the PCC initiates an Emergency Start sequence.

When this signal becomes inactive, the PCC initiates a Shutdown with Cooldown sequence if the exercise signal is inactive too.

6.1.2.3 Start Type Signal

This signal has no effect until the PCC starts the generator set because the remote start signal becomes active.

This signal may come from any of these sources:

- PCC Start Type connection
- Modbus networks

This signal is active when any of these sources is active. It remains active until all of the sources are inactive. If there are no sources (in other words, no connections), this signal is inactive.

NOTICE
There can be multiple sources for this signal. The generator set keeps running if any source is active. You have to make all of the sources inactive to make the signal inactive.

You can look at the current status of this signal in Start Type Command Inputs. If this parameter is zero, this signal is inactive. If this parameter is non-zero, this signal is active.

If this signal is active, the PCC initiates a Non-emergency Start sequence when the remote start signal becomes active.

If this signal is inactive, the PCC initiates an Emergency Start sequence when the remote start signal becomes active.

⚠ CAUTION
The Emergency Start sequence wears out the engine sooner than the Non-emergency Start sequence. If it is not necessary to start the generator set as quickly as possible (for example, when exercising or servicing the generator set), the Non-emergency Start sequence is preferred. In some applications, however, you might not have any control over this.

6.1.3 Manual Mode

In this mode, the generator set is controlled manually. Signals, such as the remote start signal, have no effect.

In applications where the Operator Panel controls the mode of operation, press the Manual button to put the PCC in Manual mode.

If the generator set is running when the PCC enters this mode, the PCC keeps running the generator set if the Start button is pressed simultaneously (within 250 ms). Otherwise, the PCC initiates a Shutdown without Cooldown sequence.

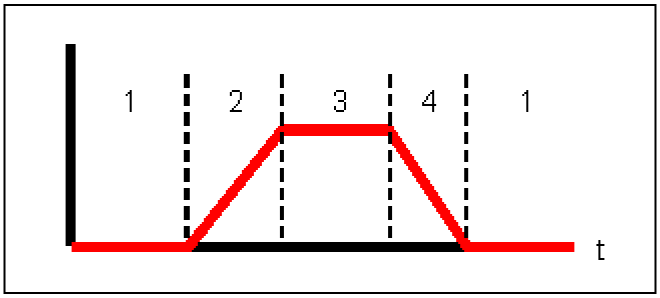
Press the Start button to initiate a Manual Start sequence.

NOTICE
If you do not press the Start button in ten seconds, the Operator Panel puts the PCC in the "previous mode". If PCC was in Auto and then "Manual" was pressed and then "Start" was not pressed for ten seconds, the PCC would go back to Auto. Similarly, if PCC was in OFF and then "Manual" was pressed and then "Start" was not pressed in ten seconds, the PCC would go back to OFF.

Press the Stop button to initiate a Manual Stop sequence. When the Manual Stop sequence is done, the Operator Panel puts the PCC in **Off Mode**.

6.2 Sequences of Operation

Sequences of operation describe the way the PCC starts and stops the generator set. This concept is illustrated below.



#	DESCRIPTION
1	Stopped
2	Start Sequence
3	Rated Speed and Voltage
4	Stop Sequence

FIGURE 48. SEQUENCES OF OPERATION

6.3 Stopped

The PCC is stopped when the generator set is not running, there is a shutdown fault, or the PCC is waiting for the conditions to change so that the PCC can initiate a start sequence.

6.3.1 Power-down Mode

The PCC and the Operator Panel can enter power-down mode, or sleep mode, to reduce power consumption when they are not being used.

Other devices in the generator set consume additional current when the PCC and the Operator Panel are in power-down mode.

6.3.1.1 PCC Power-down Mode

The following table shows how much current the PCC consumes in normal operation and in power-down mode.

TABLE 59. PCC CURRENT CONSUMPTION

PCC Mode	Current
Normal operation	750 mA
Power-down mode	5 mA

The PCC enters power-down mode when all of these conditions are met:

- Power Down Mode Enable is set to Enable.
- The Power Down Mode Time Delay has expired.

- The PCC is in Off mode or Auto mode.
- If the PCC is in Auto mode, Auto Sleep Enable is set to Sleep in Auto.

NOTICE
This trim must be set to Awake in Auto for the generator set to meet NFPA 110 requirements.

- The genset is not running.
- *Prelube Cycle Enable* is set to Disabled.
- There are no active shutdown faults.
- There are no active warning faults.
- All of the wakeup signals (see below) are inactive.

In power-down mode, the microprocessor stops running. The real-time clock remains on, but the exercise scheduler is off.

In addition, CAN datalink, PCCNet, Modbus, and PC-based service tool communications stop. If a connected device does not go into power-down mode with the PCC, this device might display a warning or error message.

The PCC leaves power-down mode when any of these conditions, called wakeup signals, is met:

- The Local Emergency Stop button is pressed.
- The Remote Emergency Stop button is pressed.
- The PCC's Manual signal is active.
- The PCC's Auto signal is active (configurable using Auto Sleep Enable).
- The PCC's Remote Start connection is closed. This is typically connected to a transfer switch.
- Configurable Input #5 is closed. By default, this is the PCC's Low Coolant Level (LCL) Switch connection.
- Configurable Input #6 is closed. By default, this is the PCC's Low Fuel Level Switch connection.
- Configurable Input #10 is closed. By default, this is the PCC's Fault Reset connection, which is typically controlled by the Reset button on the Operator Panel.
- Configurable Input #12 is closed. By default, this is the PCC's Rupture Basin Switch connection.
- Any System Wakeup connection is active.
- Any shutdown fault is active.

NOTICE
If a wakeup signal is active when a connection is closed, it does not matter what the active state of the connection is or what the function of the connection (in the case of configurable inputs) is. The PCC wakes up when the connection is closed.

When the PCC leaves power-down mode, it resets *Power Down Mode Time Delay*.

For example, the PCC is in power-down mode. It receives a warning fault and exits power-down mode. The operator addresses the condition that caused the warning fault and acknowledges the fault. After *Power Down Mode Time Delay* expires, the PCC enters power-down mode again (assuming it does not receive any other wakeup signals).

6.3.1.2 Operator Panel Power-down Mode

The following table shows how much current the Operator Panel consumes in normal operation and in power-down mode.

TABLE 60. OPERATOR PANEL CURRENT CONSUMPTION

Operator Panel Mode	Current
Normal operation	150 mA (12 V) 100 mA (24 V)
Power-down mode	1 mA

The Operator Panel enters power-down mode when all of these conditions are met:

- The Operator Panel's *Sleep Mode* is set to Enable.
- The Operator Panel's *Sleep Timer* has expired.
- All of the wakeup signals (see below) are inactive.

The Operator Panel's *Sleep Mode* and *Sleep Timer* are available in the Display Options screen. These parameters are different than the PCC's parameters.

The Operator Panel leaves power-down mode when any of these wakeup signals becomes active:

- Pressing any button on the control panel.
- Any System Wakeup connection.

6.3.2 Setup Mode

This mode allows for setting up the PCC without starting the generator set accidentally. In Setup mode, the PCC does not allow the generator set to start and forces all outputs into off (de-energized) states.

NOTICE
This mode is required to set up some parameters in the PCC.

The PCC enters Setup mode when all of the following conditions are met:

- *Setup Mode Enable* is set to Enable.
- The generator set is not running.

When the PCC enters Setup mode, the *Setup Mode Timer* is initialized to *Max Setup Mode Time*. This timer is reset each time a change to a parameter is saved. The PCC exits Setup mode when the timer expires or when *Setup Mode Enable* is set to Disable. (*Setup Mode Timer* and *Max Setup Mode Time* are not available in the Operator Panel.)

NOTICE
The Operator Panel handles Setup mode automatically.

If the Operator Panel is used to adjust a parameter that has to be modified in Setup mode, the Operator Panel automatically tries to put the PCC in Setup mode before it saves the change. If the PCC cannot enter Setup mode (for example, the generator set is running), the Operator Panel displays an error message. Otherwise, the PCC saves the change, and the Operator Panel tells the PCC to leave Setup mode.

6.3.3 Prelube Cycle

This is similar to Prelube Engine, except that this occurs when the generator set is not running, instead of in a start sequence.

This feature is active if these conditions are met:

- The generator set is not running.
- *Prelube Function Enable* is set to Enabled.
- *Prelube Cycle Enable* is set to Enabled.

If this feature is active, the PCC waits *Prelube Cycle Time*. Then, it turns on the oil-priming pump. The PCC turns off the oil-priming pump when one of these conditions is met:

- *Prelube Timeout Period* expires.
- The oil pressure is greater than or equal to *Prelube Oil Pressure Threshold*.

This process repeats as long as the feature is active.

6.4 Start Sequences

The PCC follows different start sequences depending on the current conditions, including the current value of certain parameters.

When the start sequence has finished, the generator set is running at rated speed and voltage.

If a start sequence is interrupted for any reason except a shutdown fault (for example, the remote start signal becomes inactive), the PCC considers these guidelines to stop the generator set:

- If the PCC has not started the engine yet, the PCC keeps the engine off.
- If the engine is running at idle speed or is ramping up to idle speed, the PCC stops the generator set and deactivates any output signals that are connected to the fuel system.
- If the engine is running at rated speed or is ramping up to rated speed, the PCC follows the appropriate stop sequence.

6.4.1 Emergency Start

⚠ CAUTION
The Emergency Start sequence wears out the engine sooner than the Non-emergency Start sequence. If it is not necessary to start the generator set as quickly as possible (for example, when exercising or servicing the generator set), the Non-emergency Start sequence is preferred. In some applications, however, you might not have any control over this.

This sequence begins when all of these conditions are met:

- The PCC is in Auto mode.
- The remote start signal is active.
- The start type signal is inactive.
- There are no active shutdown faults.

6.4.1.1 Two Steps in Parallel

In this step, the PCC starts Prelube Engine, but it does not wait until Prelube Engine finishes. It continues when Start Time Delay finishes.

6.4.1.1.1 Start Delay Timer

The Start Delay Timer indicates the time remaining before the next generator set is allowed to start. The Start Delay Timer is set by Load Demand Start Delay.

6.4.1.1.2 Prelube Engine

If *Prelube Function Enable* is Enabled, the PCC turns on the oil-priming pump. The PCC turns off the oil-priming pump when one of these conditions is met:

- *Prelube Timeout Period* expires.
- The oil pressure is greater than or equal to *Prelube Oil Pressure Threshold*.

6.4.1.2 Start Engine

If *Starter Owner* is set to GCS (Genset Control System), the PCC turns on the starter for up to two seconds.

If the engine speed remains zero, the PCC turns off the starter, waits two seconds, and turns on the starter again.

If the engine speed remains zero two consecutive times, the PCC generates shutdown fault 1438 (Fail To Crank).

If the engine speed becomes greater than zero, this step is complete.

If *Starter Owner* is set to ECS (Engine Control System), the PCC does not control the starter but still checks the engine speed. If the engine control module (ECM) or another device does not turn on the starter, the generator set does not start, and there is no fault code. The PCC waits indefinitely for the engine to start.

6.4.1.3 Crank Engine

This step begins when the engine speed becomes greater than zero.

If *Starter Owner* is set to GCS (Genset Control System), the starter follows these rules:

- If *Cycle / Cont Crank Select* is Continuous, the starter remains on for *Continuous Crank Engage Time*.
- If *Cycle / Cont Crank Select* is Cycle, the starter turns on for *Cycle Crank Engage Time* and turns off for *Cycle Crank Rest Time*. The starter repeats this process up to *Crank Attempts* times.

At the same time, the PCC checks these conditions:

- The engine speed is greater than *Starter Disconnect Speed*.
- The PCC's Backup Start Disconnect connection is active.

If any of these conditions are met, the PCC stops cranking the engine. This step is completed.

If none of these conditions are met, the PCC continues cranking the engine. If none of these conditions are met when the PCC finishes cranking, the PCC generates shutdown fault 359 (Fail To Start).

If *Starter Owner* is set to ECS (Engine Control System), the PCC does not control the starter but still checks the engine speed. If the engine speed is greater than Starter Disconnect Speed, this step is completed.

6.4.1.4 Starting to Rated Ramp Time

The PCC raises the engine speed from starting to rated speed linearly during Starting to Rated Ramp Time.

6.4.1.5 Start Automatic Voltage Regulator (AVR)

The automatic voltage regulator (AVR) is enabled when all of these conditions are met:

- *AVR Enable* is set to Enable. (This parameter is not available in the Operator Panel.)
- The PCC is in Auto mode; or the PCC is in Manual mode, and *Excitation Disable Override* is Excitation On.

If all of these conditions are met, the PCC starts driving the field windings in the exciter when the engine speed reaches *Governor Enable Engine Speed*. Then, it raises the voltage to rated voltage linearly during *Voltage Ramp Time*.

If any of these conditions is not met, the PCC does not drive the field windings in the exciter.

6.4.2 Non-emergency Start

This sequence begins when all of these conditions are met:

- The PCC is in Auto mode.
- The remote start signal is active, and the start type signal is active; or the exercise signal is active, and the remote start signal is inactive.
- There are no active shutdown faults.

6.4.2.1 With Idle Warmup

The PCC runs this sequence if none of these conditions is met:

- The coolant temperature is already greater than *Idle Warmup Coolant Temp*.
- *Genset Idle Enable* is set to Disabled.

6.4.2.1.1 Multiple Steps in Parallel

In this step, the PCC begins multiple steps at the same time and does not continue until every one has finished.

6.4.2.1.1.1 Start Delay Timer

The Start Delay Timer indicates the time remaining before the next generator set is allowed to start. The Start Delay Timer is set by Load Demand Start Delay.

6.4.2.1.1.2 Prelube Engine

If *Prelube Function Enable* is Enabled, the PCC turns on the oil-priming pump. The PCC turns off the oil-priming pump when one of these conditions is met:

- *Prelube Timeout Period* expires.
- The oil pressure is greater than or equal to *Prelube Oil Pressure Threshold*.

6.4.2.1.2 Start Engine

If *Starter Owner* is set to GCS (Genset Control System), the PCC turns on the starter for up to two seconds.

If the engine speed remains zero, the PCC turns off the starter, waits two seconds, and turns on the starter again.

If the engine speed remains zero two consecutive times, the PCC generates shutdown fault 1438 (Fail To Crank).

If the engine speed becomes greater than zero, this step is complete.

If *Starter Owner* is set to ECS (Engine Control System), the PCC does not control the starter but still checks the engine speed. If the engine control module (ECM) or another device does not turn on the starter, the generator set does not start, and there is no fault code. The PCC waits indefinitely for the engine to start.

6.4.2.1.3 Crank Engine

This step begins when the engine speed becomes greater than zero.

If *Starter Owner* is set to GCS (Genset Control System), the starter follows these rules:

- If *Cycle / Cont Crank Select* is Continuous, the starter remains on for *Continuous Crank Engage Time*.
- If *Cycle / Cont Crank Select* is Cycle, the starter turns on for *Cycle Crank Engage Time* and turns off for *Cycle Crank Rest Time*. The starter repeats this process up to *Crank Attempts* times.

At the same time, the PCC checks these conditions:

- The engine speed is greater than *Starter Disconnect Speed*.
- The PCC's Backup Start Disconnect connection is active.

If any of these conditions are met, the PCC stops cranking the engine. This step is completed.

If none of these conditions are met, the PCC continues cranking the engine. If none of these conditions are met when the PCC finishes cranking, the PCC generates shutdown fault 359 (Fail To Start).

If *Starter Owner* is set to ECS (Engine Control System), the PCC does not control the starter but still checks the engine speed. If the engine speed is greater than Starter Disconnect Speed, this step is completed.

6.4.2.1.4 Idle Warmup

The PCC runs the engine at idle speed until one of these conditions is met:

- *Idle Warmup Time* expires.
- The coolant temperature reaches *Idle Warmup Coolant Temp*.

6.4.2.1.5 Idle to Rated Ramp Time

The PCC raises the engine speed from idle speed to rated speed linearly during *Idle to Rated Ramp Time*.

6.4.2.1.6 Start Automatic Voltage Regulator (AVR)

The automatic voltage regulator (AVR) is enabled when all of these conditions are met:

- *AVR Enable* is set to Enable. (This parameter is not available in the Operator Panel.)
- The PCC is in Auto mode; or the PCC is in Manual mode, and *Excitation Disable Override* is Excitation On.

If all of these conditions are met, the PCC starts driving the field windings in the exciter when the engine speed reaches *Governor Enable Engine Speed*. Then, it raises the voltage to rated voltage linearly during *Voltage Ramp Time*.

If any of these conditions is not met, the PCC does not drive the field windings in the exciter.

6.4.2.2 Without Idle Warmup

The PCC runs this sequence if either of these conditions is met:

- The coolant temperature is already greater than *Idle Warmup Coolant Temp*.
- *Genset Idle Enable* is set to Disabled.

6.4.2.2.1 Multiple Steps in Parallel

In this step, the PCC begins multiple steps at the same time and does not continue until every one has finished.

6.4.2.2.1.1 Start Delay Timer

The Start Delay Timer indicates the time remaining before the next generator set is allowed to start. The Start Delay Timer is set by Load Demand Start Delay.

6.4.2.2.1.2 Prelube Engine

If *Prelube Function Enable* is Enabled, the PCC turns on the oil-priming pump. The PCC turns off the oil-priming pump when one of these conditions is met:

- *Prelube Timeout Period* expires.
- The oil pressure is greater than or equal to *Prelube Oil Pressure Threshold*.

6.4.2.2.2 Start Engine

If *Starter Owner* is set to GCS (Genset Control System), the PCC turns on the starter for up to two seconds.

If the engine speed remains zero, the PCC turns off the starter, waits two seconds, and turns on the starter again.

If the engine speed remains zero two consecutive times, the PCC generates shutdown fault 1438 (Fail To Crank).

If the engine speed becomes greater than zero, this step is complete.

If *Starter Owner* is set to ECS (Engine Control System), the PCC does not control the starter but still checks the engine speed. If the engine control module (ECM) or another device does not turn on the starter, the generator set does not start, and there is no fault code. The PCC waits indefinitely for the engine to start.

6.4.2.2.3 Crank Engine

This step begins when the engine speed becomes greater than zero.

If *Starter Owner* is set to GCS (Genset Control System), the starter follows these rules:

- If *Cycle / Cont Crank Select* is Continuous, the starter remains on for *Continuous Crank Engage Time*.
- If *Cycle / Cont Crank Select* is Cycle, the starter turns on for *Cycle Crank Engage Time* and turns off for *Cycle Crank Rest Time*. The starter repeats this process up to *Crank Attempts* times.

At the same time, the PCC checks these conditions:

- The engine speed is greater than *Starter Disconnect Speed*.
- The PCC's Backup Start Disconnect connection is active.

If any of these conditions are met, the PCC stops cranking the engine. This step is completed.

If none of these conditions are met, the PCC continues cranking the engine. If none of these conditions are met when the PCC finishes cranking, the PCC generates shutdown fault 359 (Fail To Start).

If *Starter Owner* is set to ECS (Engine Control System), the PCC does not control the starter but still checks the engine speed. If the engine speed is greater than Starter Disconnect Speed, this step is completed.

6.4.2.2.4 Starting to Rated Ramp Time

The PCC raises the engine speed from starting to rated speed linearly during Starting to Rated Ramp Time.

6.4.2.2.5 Start Automatic Voltage Regulator (AVR)

The automatic voltage regulator (AVR) is enabled when all of these conditions are met:

- *AVR Enable* is set to Enable. (This parameter is not available in the Operator Panel.)
- The PCC is in Auto mode; or the PCC is in Manual mode, and *Excitation Disable Override* is Excitation On.

If all of these conditions are met, the PCC starts driving the field windings in the exciter when the engine speed reaches *Governor Enable Engine Speed*. Then, it raises the voltage to rated voltage linearly during *Voltage Ramp Time*.

If any of these conditions is not met, the PCC does not drive the field windings in the exciter.

6.4.3 Manual Start

This sequence begins when all of these conditions are met:

- The PCC is in Manual mode.
- The auto signal is inactive.
- In applications where the Operator Panel controls the mode of operation, the Start button is pressed.
- There are no active shutdown faults.

6.4.3.1 With Idle Warmup

The PCC runs this sequence if these conditions are met:

- *Genset Idle Enable* is set to Enabled.
- *Rated/Idle Switch (PCCnet)* is Rated.
- The coolant temperature is not already greater than *Idle Warmup Coolant Temp*.
- *Manual Warmup Bypass* is not set to Bypass Warmup. (This parameter is not available in the Operator Panel.)

6.4.3.1.1 Prelube Engine

If *Prelube Function Enable* is Enabled, the PCC turns on the oil-priming pump. The PCC turns off the oil-priming pump when one of these conditions is met:

- *Prelube Timeout Period* expires.
- The oil pressure is greater than or equal to *Prelube Oil Pressure Threshold*.

6.4.3.1.2 Start Engine

If *Starter Owner* is set to GCS (Genset Control System), the PCC turns on the starter for up to two seconds.

If the engine speed remains zero, the PCC turns off the starter, waits two seconds, and turns on the starter again.

If the engine speed remains zero two consecutive times, the PCC generates shutdown fault 1438 (Fail To Crank).

If the engine speed becomes greater than zero, this step is complete.

If *Starter Owner* is set to ECS (Engine Control System), the PCC does not control the starter but still checks the engine speed. If the engine control module (ECM) or another device does not turn on the starter, the generator set does not start, and there is no fault code. The PCC waits indefinitely for the engine to start.

6.4.3.1.3 Crank Engine

This step begins when the engine speed becomes greater than zero.

If *Starter Owner* is set to GCS (Genset Control System), the starter follows these rules:

- If *Cycle / Cont Crank Select* is Continuous, the starter remains on for *Continuous Crank Engage Time*.
- If *Cycle / Cont Crank Select* is Cycle, the starter turns on for *Cycle Crank Engage Time* and turns off for *Cycle Crank Rest Time*. The starter repeats this process up to *Crank Attempts* times.

At the same time, the PCC checks these conditions:

- The engine speed is greater than *Starter Disconnect Speed*.
- The PCC's Backup Start Disconnect connection is active.

If any of these conditions are met, the PCC stops cranking the engine. This step is completed.

If none of these conditions are met, the PCC continues cranking the engine. If none of these conditions are met when the PCC finishes cranking, the PCC generates shutdown fault 359 (Fail To Start).

If *Starter Owner* is set to ECS (Engine Control System), the PCC does not control the starter but still checks the engine speed. If the engine speed is greater than Starter Disconnect Speed, this step is completed.

6.4.3.1.4 Idle Warmup

The PCC runs the engine at idle speed until one of these conditions is met:

- *Idle Warmup Time* expires.
- The coolant temperature reaches *Idle Warmup Coolant Temp*.

6.4.3.1.5 Idle to Rated Ramp Time

The PCC raises the engine speed from idle speed to rated speed linearly during *Idle to Rated Ramp Time*.

6.4.3.1.6 Start Automatic Voltage Regulator (AVR)

The automatic voltage regulator (AVR) is enabled when all of these conditions are met:

- *AVR Enable* is set to Enable. (This parameter is not available in the Operator Panel.)
- The PCC is in Auto mode; or the PCC is in Manual mode, and *Excitation Disable Override* is Excitation On.

If all of these conditions are met, the PCC starts driving the field windings in the exciter when the engine speed reaches *Governor Enable Engine Speed*. Then, it raises the voltage to rated voltage linearly during *Voltage Ramp Time*.

If any of these conditions is not met, the PCC does not drive the field windings in the exciter.

6.4.3.2 Without Idle Warmup

The PCC runs this sequence if *Genset Idle Enable* is Disabled.

The PCC also runs this sequence if these conditions are met:

- *Genset Idle Enable* is Enabled.
- *Rated/Idle Switch (PCCnet)* is Rated.

- The coolant temperature is already greater than *Idle Warmup Coolant Temp*, or *Manual Warmup Bypass* is set to Bypass Warmup. (*Manual Warmup Bypass* is not available in the Operator Panel.)

6.4.3.2.1 Prelube Engine

If *Prelube Function Enable* is Enabled, the PCC turns on the oil-priming pump. The PCC turns off the oil-priming pump when one of these conditions is met:

- *Prelube Timeout Period* expires.
- The oil pressure is greater than or equal to *Prelube Oil Pressure Threshold*.

6.4.3.2.2 Start Engine

If *Starter Owner* is set to GCS (Genset Control System), the PCC turns on the starter for up to two seconds.

If the engine speed remains zero, the PCC turns off the starter, waits two seconds, and turns on the starter again.

If the engine speed remains zero two consecutive times, the PCC generates shutdown fault 1438 (Fail To Crank).

If the engine speed becomes greater than zero, this step is complete.

If *Starter Owner* is set to ECS (Engine Control System), the PCC does not control the starter but still checks the engine speed. If the engine control module (ECM) or another device does not turn on the starter, the generator set does not start, and there is no fault code. The PCC waits indefinitely for the engine to start.

6.4.3.2.3 Crank Engine

This step begins when the engine speed becomes greater than zero.

If *Starter Owner* is set to GCS (Genset Control System), the starter follows these rules:

- If *Cycle / Cont Crank Select* is Continuous, the starter remains on for *Continuous Crank Engage Time*.
- If *Cycle / Cont Crank Select* is Cycle, the starter turns on for *Cycle Crank Engage Time* and turns off for *Cycle Crank Rest Time*. The starter repeats this process up to *Crank Attempts* times.

At the same time, the PCC checks these conditions:

- The engine speed is greater than *Starter Disconnect Speed*.
- The PCC's Backup Start Disconnect connection is active.

If any of these conditions are met, the PCC stops cranking the engine. This step is completed.

If none of these conditions are met, the PCC continues cranking the engine. If none of these conditions are met when the PCC finishes cranking, the PCC generates shutdown fault 359 (Fail To Start).

If *Starter Owner* is set to ECS (Engine Control System), the PCC does not control the starter but still checks the engine speed. If the engine speed is greater than Starter Disconnect Speed, this step is completed.

6.4.3.2.4 Starting to Rated Ramp Time

The PCC raises the engine speed from starting to rated speed linearly during Starting to Rated Ramp Time.

6.4.3.2.5 Start Automatic Voltage Regulator (AVR)

The automatic voltage regulator (AVR) is enabled when all of these conditions are met:

- *AVR Enable* is set to Enable. (This parameter is not available in the Operator Panel.)

- The PCC is in Auto mode; or the PCC is in Manual mode, and *Excitation Disable Override* is Excitation On.

If all of these conditions are met, the PCC starts driving the field windings in the exciter when the engine speed reaches *Governor Enable Engine Speed*. Then, it raises the voltage to rated voltage linearly during *Voltage Ramp Time*.

If any of these conditions is not met, the PCC does not drive the field windings in the exciter.

6.5 Rated Speed and Voltage

Rated speed is based on the speed reference. Rated voltage is based on the voltage setpoint.

6.5.1 Speed Reference

The PCC follows these steps to calculate the speed reference.

1. Add these frequencies together.
    - Alternate Frequency Switch
    - Frequency Adjust
2. Limit the sum of these values to 60%-110% of Alternate Frequency Switch.
3. Multiply this value by Frequency to Speed Gain Select.

If *ECM CAN Enable* is set to Enable, the PCC sends the speed bias reference to the ECM. The speed bias reference is the percent difference between the speed reference and the base speed (*Alternate Frequency Switch* multiplied by Frequency to Speed Gain Select).

6.5.2 Voltage Setpoint

The PCC follows these steps to calculate the voltage setpoint.

1. Add these percentages together.
    - 100% (for *Genset Nominal Voltage*)
    - *Voltage Adjust*
    - Watt Sentry
2. Subtract the V/Hz Curve reductions.

The voltage setpoint is expressed as a percentage of *Genset Nominal Voltage*.

If *External Bias Commands Enable* is set to Disabled, The PCC tries to keep the following voltages at the voltage setpoint:

- *Genset Average Voltage%*
- *Genset 3 Phase Fast Average Voltage Percent*

If the genset current reaches 300% of its rated value, the PCC stops regulating voltage and starts regulating current to 300% of its rated value. It continues to regulate current until the current becomes less than 150% of its rated value or the PCC generates a shutdown fault.

6.6 Stop Sequences

The PCC follows different stop sequences depending on the current conditions, including the current value of certain parameters.

NOTICE

The stop sequences are delayed if the PCC is in Battle Short mode or if Delayed Shutdown is active.

When the stop sequence has finished, the generator set is stopped.

If a stop sequence is interrupted, the PCC considers these guidelines to restart the generator set:

- If the engine is still running at rated speed, the PCC keeps running the generator set at rated speed and voltage.
- If the engine is running at idle speed or is ramping down to idle speed, the PCC raises the engine speed from the current speed to rated speed linearly during Idle to Rated Ramp Time. The PCC also starts the automatic voltage regulator (AVR), if applicable.

6.6.1 Shutdown with Cooldown

This sequence begins or when all of the following conditions are met:

- The PCC is in Auto mode.
- The generator set is running at rated speed and voltage.
- The remote start signal is inactive.
- The exercise signal is inactive.
- There are no active shutdown faults.

6.6.1.1 With Idle Cooldown

The PCC runs this sequence if *Genset Idle Enable* is set to Enabled.

6.6.1.1.1 Multiple Steps in Parallel

In this step, the PCC begins multiple steps at the same time and does not continue until every one has finished.

6.6.1.1.1.1 Time Delay to Stop

The PCC runs the genset at rated speed and voltage for Time Delay to Stop.

6.6.1.1.1.2 Rated Cooldown Time

The PCC runs the genset at rated speed and voltage until the genset runs at less than 10% of the rated load for Rated Cooldown Time.

NOTICE

If Rated Cooldown Time is greater than zero, the PCC waits indefinitely for the load to drop below 10%.

6.6.1.1.2 Rated to Idle Transition Delay

The PCC runs the engine at rated speed for Rated to Idle Transition Delay.

If Rated to Idle Transition Delay is greater than zero, event 1122 (Rated to Idle Delay) is active until the PCC finishes Idle Cooldown Time. (If this is an idle request, this event is active until the PCC finishes Idle Warmup.)

6.6.1.1.3 Stop Automatic Voltage Regulator (AVR)

The PCC stops driving the field windings in the exciter when the PCC stops running the engine at rated speed.

6.6.1.1.4 Rated to Idle Ramp Time

NOTICE
If *ECM CAN Enable* is Enable, the ECM, not the PCC, actually controls the transition from rated speed to idle speed.

The PCC reduces the engine speed from rated speed to idle speed linearly during *Rated to Idle Ramp Time*.

6.6.1.1.5 Idle Cooldown Time

The PCC runs the engine at idle speed for *Idle Cooldown Time*.

6.6.1.1.6 Stop Engine

The PCC stops the engine when the engine has finished running at rated speed and idle speed.

6.6.1.2 Without Idle Cooldown

The PCC runs this sequence if *Genset Idle Enable* is set to Disabled.

6.6.1.2.1 Multiple Steps in Parallel

In this step, the PCC begins multiple steps at the same time and does not continue until every one has finished.

6.6.1.2.1.1 Time Delay to Stop

The PCC runs the genset at rated speed and voltage for Time Delay to Stop.

6.6.1.2.1.2 Rated Cooldown Time

The PCC runs the genset at rated speed and voltage until the genset runs at less than 10% of the rated load for Rated Cooldown Time.

NOTICE
If Rated Cooldown Time is greater than zero, the PCC waits indefinitely for the load to drop below 10%.

6.6.1.2.2 Stop Automatic Voltage Regulator (AVR)

The PCC stops driving the field windings in the exciter when the PCC stops running the engine at rated speed.

6.6.1.2.3 Stop Engine

The PCC stops the engine when the engine has finished running at rated speed and idle speed.

6.6.2 Manual Stop

This sequence begins when all of these conditions are met:

- The PCC is in Manual mode.

- The genset is running at rated speed and voltage.
- The auto signal is inactive.
- There are no active shutdown faults.

6.6.2.1 With Idle Cooldown

The PCC runs this sequence if *Genset Idle Enable* is set to Enabled.

6.6.2.1.1 Rated Cooldown Time

The PCC runs the genset at rated speed and voltage until the genset runs at less than 10% of the rated load for Rated Cooldown Time.

NOTICE
If Rated Cooldown Time is greater than zero, the PCC waits indefinitely for the load to drop below 10%.

6.6.2.1.2 Rated to Idle Transition Delay

The PCC runs the engine at rated speed for Rated to Idle Transition Delay.

If Rated to Idle Transition Delay is greater than zero, event 1122 (Rated to Idle Delay) is active until the PCC finishes Idle Cooldown Time. (If this is an idle request, this event is active until the PCC finishes Idle Warmup.)

6.6.2.1.3 Rated to Idle Ramp Time

NOTICE
If *ECM CAN Enable* is Enable, the ECM, not the PCC, actually controls the transition from rated speed to idle speed.

The PCC reduces the engine speed from rated speed to idle speed linearly during *Rated to Idle Ramp Time*.

6.6.2.1.4 Idle Cooldown Time

The PCC runs the engine at idle speed for *Idle Cooldown Time*.

6.6.2.1.5 Stop Automatic Voltage Regulator (AVR)

The PCC stops driving the field windings in the exciter when the PCC stops running the engine at rated speed.

6.6.2.1.6 Stop Engine

The PCC stops the engine when the engine has finished running at rated speed and idle speed.

6.6.2.2 Without Idle Cooldown

The PCC runs this sequence if *Genset Idle Enable* is set to Disabled.

6.6.2.2.1 Rated Cooldown Time

The PCC runs the genset at rated speed and voltage until the genset runs at less than 10% of the rated load for Rated Cooldown Time.

NOTICE

If Rated Cooldown Time is greater than zero, the PCC waits indefinitely for the load to drop below 10%.

6.6.2.2.2 Stop Automatic Voltage Regulator (AVR)

The PCC stops driving the field windings in the exciter when the PCC stops running the engine at rated speed.

6.6.2.2.3 Stop Engine

The PCC stops the engine when the engine has finished running at rated speed and idle speed.

6.6.3 Shutdown Without Cooldown

This sequence begins when one of these conditions is met:

- A shutdown fault with a response of Shutdown Without Cooldown initiates it.
- The genset is running when the PCC enters Off mode.
- The genset is running when the PCC enters Manual mode.

In this sequence, the PCC ignores timers and loads and stops the genset immediately.

6.7 Idle Requests

Idle requests make the PCC run the genset at idle speed, instead of rated speed and voltage.

An idle request becomes active when all of these conditions are met:

- The PCC is in Manual mode.
- *Genset Idle Enable* is set to Enabled.
- *Rated/Idle Switch (PCCnet)* is set to Idle. (*Rated/Idle Switch (PCCnet)* is available in the Operator Panel.)
- There are no active shutdown faults.

If *Genset Idle Enable* is set to Disabled while an idle request is active, the idle request remains active. If any of the other conditions become untrue while an idle request is active, the idle request becomes inactive.

The PCC's response depends on the initial state of the genset and the final state of the genset.

6.7.1 Stop to Idle Speed

6.7.1.1 Prelube Engine

If *Prelube Function Enable* is Enabled, the PCC turns on the oil-priming pump. The PCC turns off the oil-priming pump when one of these conditions is met:

- *Prelube Timeout Period* expires.
- The oil pressure is greater than or equal to *Prelube Oil Pressure Threshold*.

6.7.1.2 Start Engine

If *Starter Owner* is set to GCS (Genset Control System), the PCC turns on the starter for up to two seconds.

If the engine speed remains zero, the PCC turns off the starter, waits two seconds, and turns on the starter again.

If the engine speed remains zero two consecutive times, the PCC generates shutdown fault 1438 (Fail To Crank).

If the engine speed becomes greater than zero, this step is complete.

If *Starter Owner* is set to ECS (Engine Control System), the PCC does not control the starter but still checks the engine speed. If the engine control module (ECM) or another device does not turn on the starter, the generator set does not start, and there is no fault code. The PCC waits indefinitely for the engine to start.

6.7.1.3 Crank Engine

This step begins when the engine speed becomes greater than zero.

If *Starter Owner* is set to GCS (Genset Control System), the starter follows these rules:

- If *Cycle / Cont Crank Select* is Continuous, the starter remains on for *Continuous Crank Engage Time*.
- If *Cycle / Cont Crank Select* is Cycle, the starter turns on for *Cycle Crank Engage Time* and turns off for *Cycle Crank Rest Time*. The starter repeats this process up to *Crank Attempts* times.

At the same time, the PCC checks these conditions:

- The engine speed is greater than *Starter Disconnect Speed*.
- The PCC's Backup Start Disconnect connection is active.

If any of these conditions are met, the PCC stops cranking the engine. This step is completed.

If none of these conditions are met, the PCC continues cranking the engine. If none of these conditions are met when the PCC finishes cranking, the PCC generates shutdown fault 359 (Fail To Start).

If *Starter Owner* is set to ECS (Engine Control System), the PCC does not control the starter but still checks the engine speed. If the engine speed is greater than Starter Disconnect Speed, this step is completed.

6.7.2 Idle Speed to Stop

The PCC stops the generator set.

6.7.3 Rated Speed to Idle Speed

6.7.3.1 Rated to Idle Transition Delay

The PCC runs the engine at rated speed for Rated to Idle Transition Delay.

If Rated to Idle Transition Delay is greater than zero, event 1122 (Rated to Idle Delay) is active until the PCC finishes Idle Cooldown Time. (If this is an idle request, this event is active until the PCC finishes Idle Warmup.)

6.7.3.2 Rated to Idle Ramp Time

NOTICE
If *ECM CAN Enable* is Enable, the ECM, not the PCC, actually controls the transition from rated speed to idle speed.

The PCC reduces the engine speed from rated speed to idle speed linearly during *Rated to Idle Ramp Time*.

6.7.3.3 Stop Automatic Voltage Regulator (AVR)

The PCC stops driving the field windings in the exciter when the PCC stops running the engine at rated speed.

6.7.4 Idle Speed to Rated Speed

The PCC waits until one of these conditions is met:

- The generator set was running at rated speed and voltage before it started running at idle speed. In other words, the PCC made a rated-speed-to-idle-speed transition to get to idle speed.
- The engine has been running at idle speed for Idle Warmup Time.
- The coolant temperature is already greater than Idle Warmup Coolant Temp.
- Manual Warmup Bypass is set to Bypass Warmup. (This parameter is not available in the Operator Panel.)

6.7.4.1 Idle to Rated Ramp Time

The PCC raises the engine speed from idle speed to rated speed linearly during *Idle to Rated Ramp Time*.

6.7.4.2 Start Automatic Voltage Regulator (AVR)

The automatic voltage regulator (AVR) is enabled when all of these conditions are met:

- *AVR Enable* is set to Enable. (This parameter is not available in the Operator Panel.)
- The PCC is in Auto mode; or the PCC is in Manual mode, and *Excitation Disable Override* is Excitation On.

If all of these conditions are met, the PCC starts driving the field windings in the exciter when the engine speed reaches *Governor Enable Engine Speed*. Then, it raises the voltage to rated voltage linearly during *Voltage Ramp Time*.

If any of these conditions is not met, the PCC does not drive the field windings in the exciter.

6.8 AmpSentry Protective Relay

The AmpSentry protective relay protects the alternator from thermal damage caused by overloads and short circuits. The AmpSentry protective relay is shown in **Figure 49**.

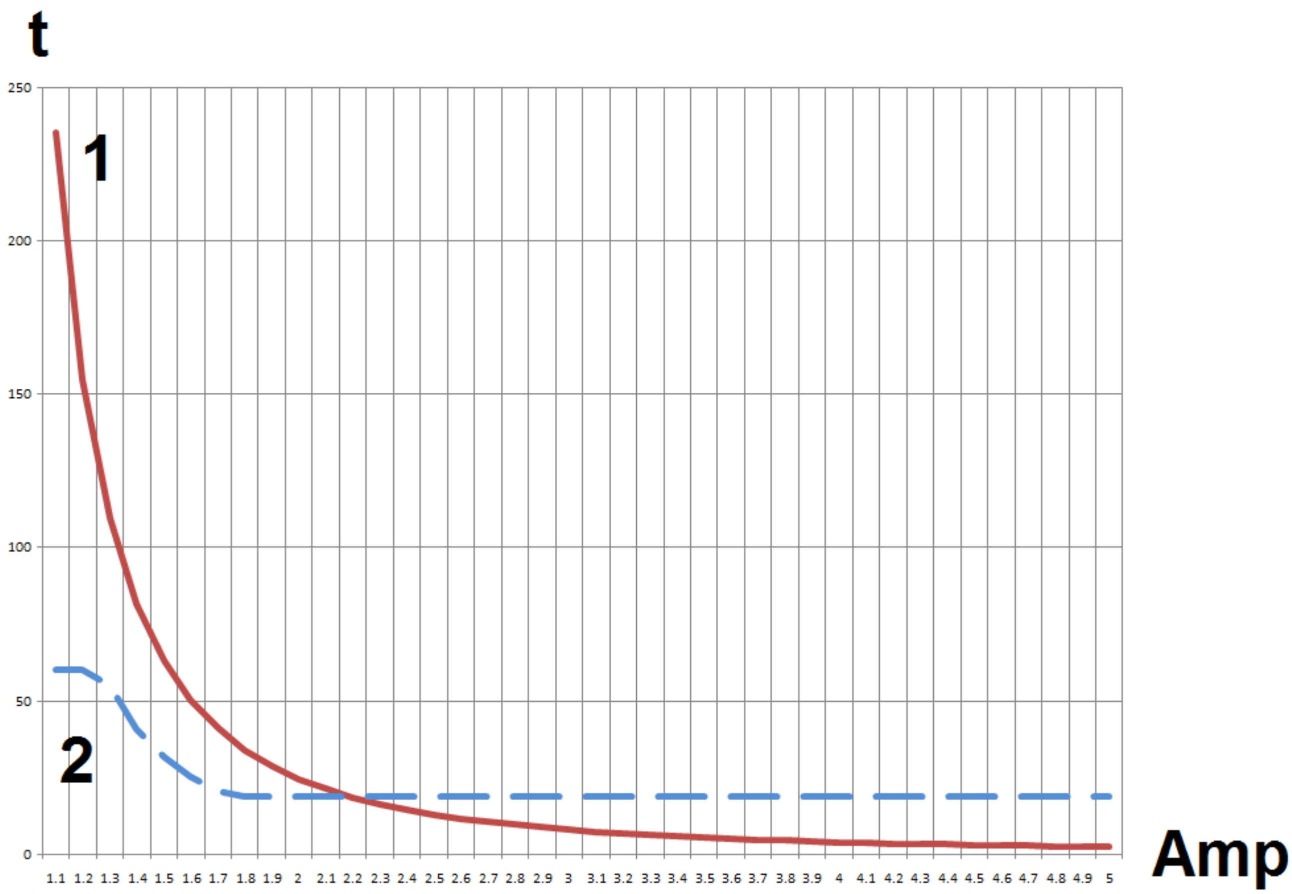


FIGURE 49. AMPSENTRY PROTECTIVE RELAY

TABLE 61. AMPSENTRY PROTECTIVE RELAY

LABEL	DESCRIPTION
t	Time
Amp	Current
1	Alternator Damage Trip Curve (AmpSentry Protective Relay Trip Curve)
2	High Current Warning Threshold

The AmpSentry protective relay takes anywhere from six minutes (if the generator set is running at 110% of its rated standby current) to one second (if the generator set is running at greater than 450% of its rated standby current) to trip. Between 110% of its rated standby current and 450% of its rated standby current, the AmpSentry protective relay trips in 43.5 / ((% Rated Current - 0.67) ^ 2) seconds.

When the AmpSentry protective relay is tripped, the event/fault code depends on the current.

- If one or more phases is greater than 175% of its rated standby current, the PCC generates shutdown fault 1445 (Short Circuit).
- If one or more phases is between 110% and 175% of its rated standby current, the PCC generates shutdown fault 1472 (Over Current).

The PCC generates warning fault 1471 (Over Current) when the high current warning threshold is reached.

- When one or more phases is less than 128% of rated current, the high current warning threshold is 60 seconds.
- When the generator set output is between 128% and 175% of rated current, the high current warning threshold is one-half of the alternator damage trip curve.
- When the generator set is greater than 175% of rated current, the high current warning threshold is 19 seconds.

6.9 Watt Sentry

This feature may be enabled by the factory for specific applications. It is disabled by default.

The main purpose of this feature is to prevent excessive buildups of intake manifold pressure from a turbocharger in gas-fueled engines.

The PCC reduces the voltage setpoint to reduce the kW output of the engine and, in turn, the intake manifold pressure. If the kW output remains high, the PCC keeps lowering the voltage setpoint until the PCC generates shutdown fault 1447 (Low AC Voltage) to protect the engine.

6.10 PCC-ECM Communication

This communication is based on PGI (Power Generation Interface). PGI is Cummins' implementation of SAE J1939. In PGI, the generator set has two controllers, the ECM and the PCC. The ECM manages fueling, engine protection, and other engine-specific tasks.

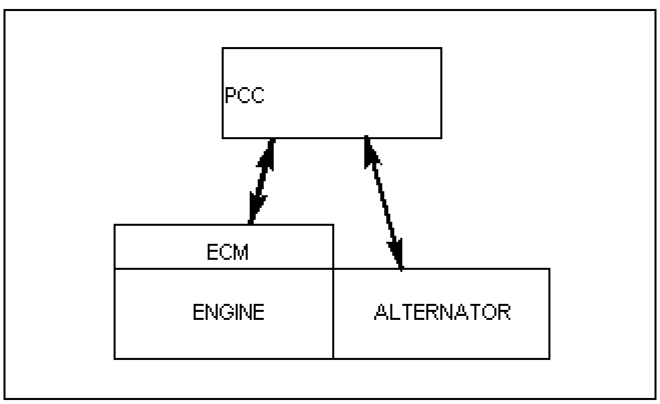


FIGURE 50. PGI OVERVIEW

This approach reduces the number of wires to the PCC by combining several signals from the engine into a single cable from the ECM.

6.10.1 ECM Keyswitch

The PCC uses the ECM keyswitch to allow the engine to start fueling and to turn fuel off on the engine. In addition, the CAN datalink is maintained as long as the ECM keyswitch is on or the engine speed is non-zero.

6.10.2 CAN Datalink

The PCC and ECM communicate over a CAN (controlled area network) datalink. The CAN datalink is based on a main trunk (no more than 40 meters long) that is terminated by 120-Ohm resistors on each end. Stubs (no longer than 1 meter) extend from the main trunk to each module in the bus.

The connection between the PCC and the ECM is shown in **Figure 51**.

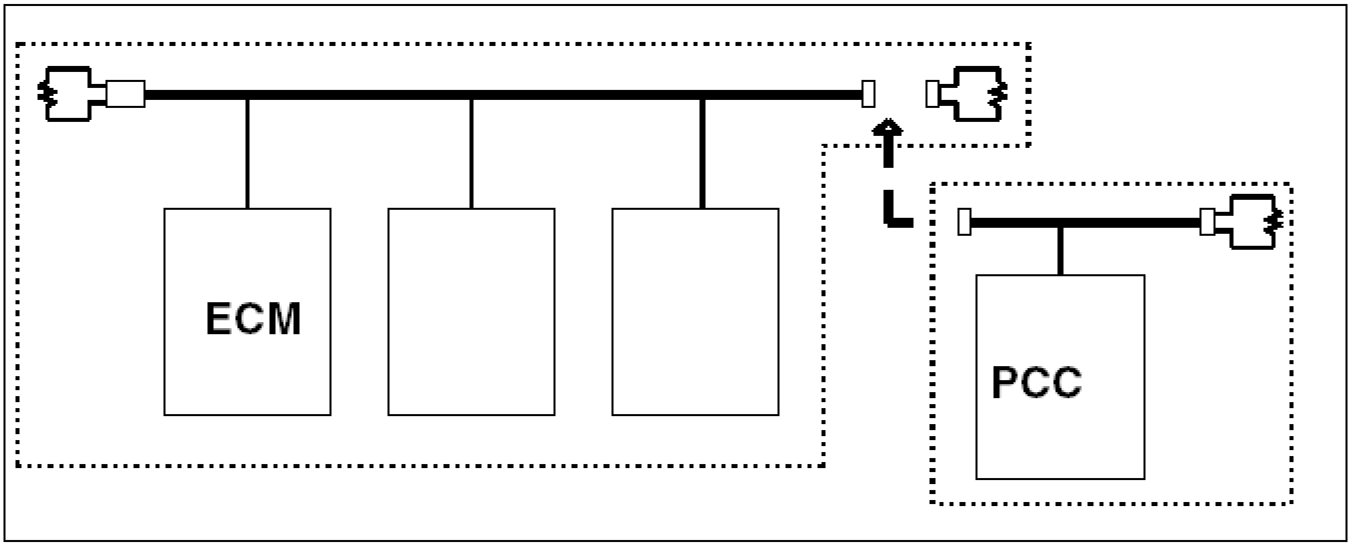


FIGURE 51. CAN DATALINK

The PCC's engine harness for PGI generator sets is a CAN datalink with only one termination resistor. To connect the PCC to the ECM, remove the termination resistors from one end of the main trunk (with the ECM), and connect this end to the open end of the PCC's engine harness. The termination resistor in the PCC's engine harness completes the new CAN datalink.

6.10.3 PGI Generator Set Cable and Signals

The cable for PGI generator sets is shown in **Figure 52**.

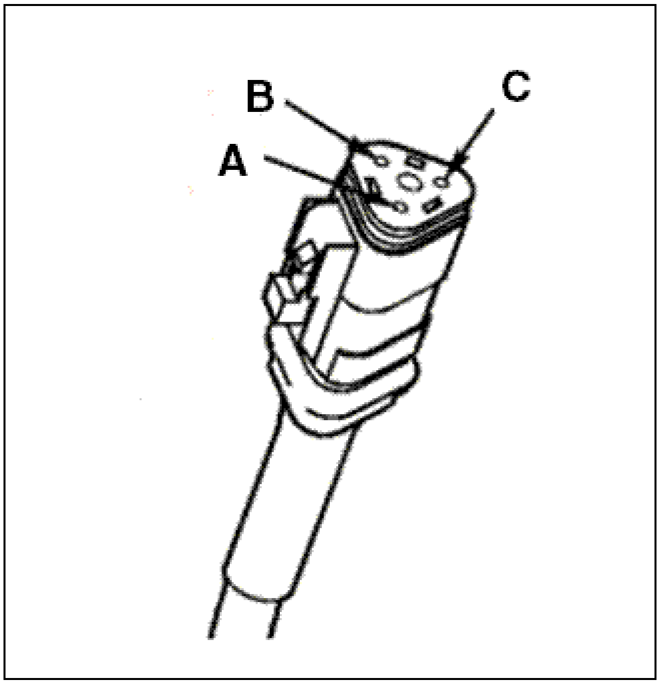


FIGURE 52. CABLE FOR PGI GENERATOR SETS

Each wire is identified in Table 62.

TABLE 62. CABLE FOR PGI GENERATOR SETS

PIN	SIGNAL
A	CAN H
B	CAN L
C	J1939 Datalink (Shield)

NOTICE
See Section 10.9 and Chapter 4 for additional details on available PC 3.3 CAN Networks, including signal descriptions and troubleshooting information.

6.10.4 Parameter Group Numbers (PGNs)

In SAE J1939, the parameter group number (PGN) identifies the function and data in each message. You can check the status of these PGN input messages in InPower.

TABLE 63. PGN INPUT FUNCTIONS

PGN	FUNCTION
61419	Aux 101 Information PGN
61420	Aux 101 Information PGN
61421	Aux 101 Information PGN

PGN	FUNCTION
61444	Average Engine Speed Percent Engine Torque Engine Torque Limiting
64913	AC Switching Device Status
65170	Pre-Filter Oil Pressure
65171	Engine Electrical System
65183	Exhaust Port 17-20 Temperature
65184	Exhaust Port 13-16 Temperature
65185	Exhaust Port 9-12 Temperature
65186	Exhaust Port 5-8 Temperature
65187	Exhaust Port 1-4 Temperature
65189	Intake Manifold 2-4 Temperature
65190	Turbocharger 2 Boost Pressure
65243	Injector Metering Rail 1 Pressure (Fuel Outlet Pressure)
65245	Turbocharger 1 Speed
65252	EPS has Shutdown Engine EPS Shutdown Timer Override
65253	Engine Running Time
65257	Fuel Consumption Since Reset Total Fuel Consumption
65262	Coolant Temperature Fuel Temperature Oil Temperature Aftercooler Temperature
65263	Fuel Supply Pressure Engine Oil Pressure Crankcase Pressure Coolant Pressure
65266	Fuel Rate
65269	Barometric Absolute Pressure
65271	Net Battery Current Alternator Current Charging System Potential (Voltage) Battery Potential / Power Input 1 Keyswitch Battery Potential
65279	Water In Fuel Indicator
65288	Post-Filter Oil Pressure
65295	Keep Alive

PGN	FUNCTION
65380	Final Torque PTO Filtered Angle Engine Speed PTO Filtered Time Engine Speed
65390	Average Engine Speed Estimated Torque
65395	Genset Control Parameters
65400	Keyswitch on for Keyswitch Minimum On Time Normal Shutdown Request Derate Request Engine State
65420	Maximum Torque

6.11 Witness Testing Procedure Menus

Witness testing on the generator sets is required by some municipalities, counties, or customers to verify that the generator set complies with NFPA (National Fire Protection Agency) 110.

These procedures require this equipment:

- InPower service tool (PC-based service tool)
- Inline 4 / Inline 5 adapter or newer (Cummins Inc. Part number 0491-8416).
- Inline 4 / Inline 5 drivers (available via kit or online at **www.cumminspower.com**).

Some faults require connection to the PCC, while other faults require connection to the ECM.

- Faults under **Genset Alarms** require InPower to connect to the PCC.
- Faults under **ECM Alarms** require InPower to connect to the ECM.

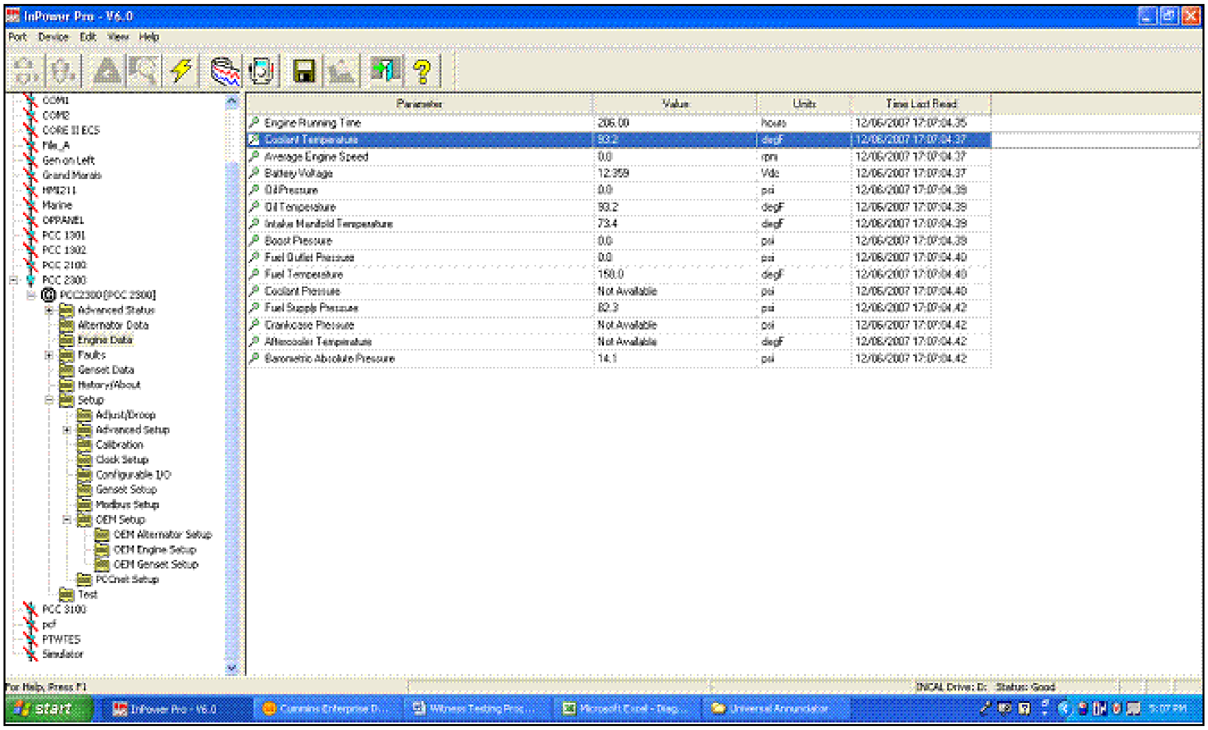
After each fault is simulated, return the values of the parameters to the pre-witness test values.

6.11.1 Genset Alarms

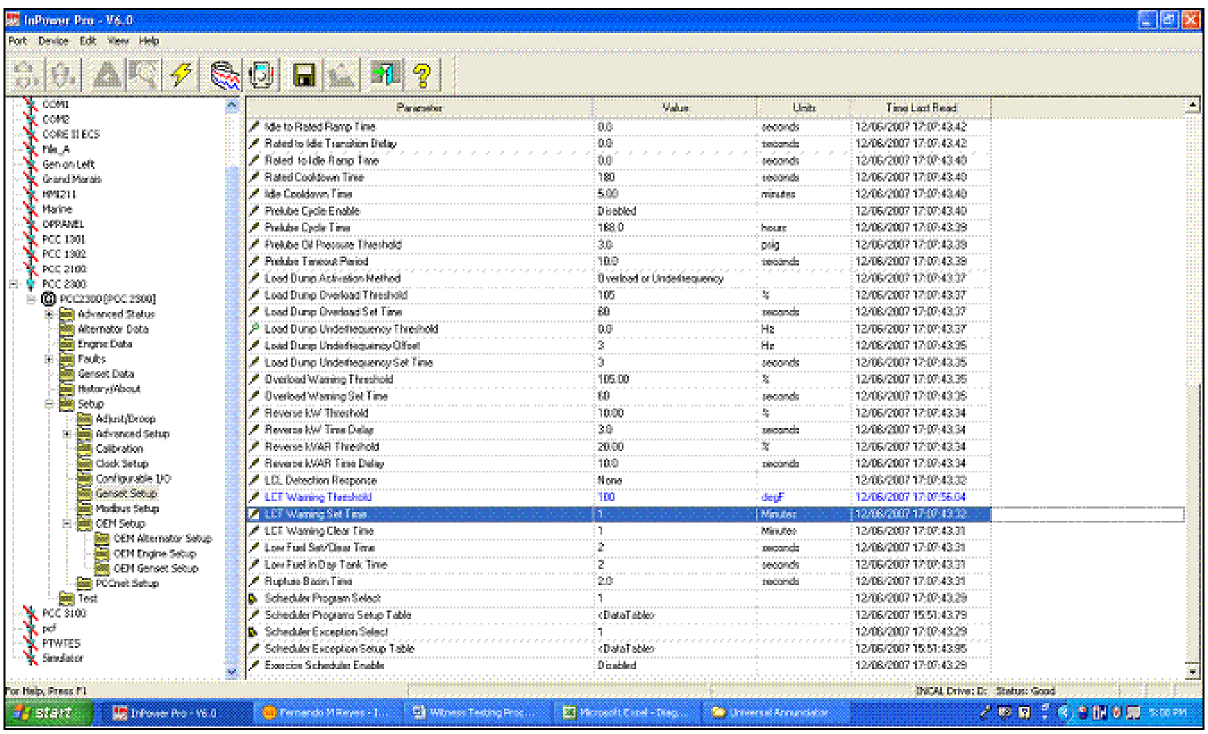
Low Coolant/Engine Temperature

In order to activate this alarm, the engine coolant temperature has to be below 100 deg F. If a lot of testing will be done with the genset running, it is recommended that this fault be simulated first before the engine gets too hot due to extended running time.

In the Engine Data folder, check the value of the Coolant Temperature.

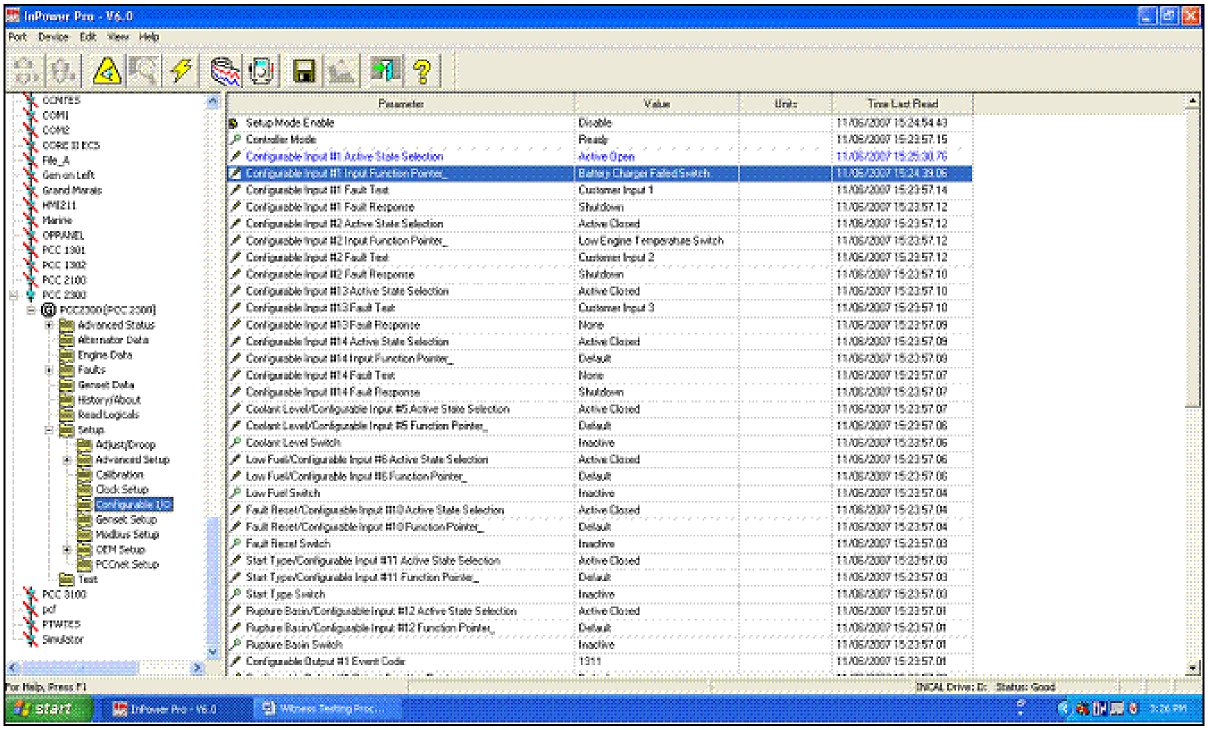


Under Setup > Genset Setup, change the value of the LCT Warning Threshold to a number greater than the Coolant Temperature of the engine. Then wait for the amount of time in the LCT Warning Set Time to allow the genset to active the Low Coolant Temperature alarm.



Charger AC Failure

Under Setup > Configurable I/O, set the Configurable Input Function Pointer that is configured to Battery Charger Failed Switch to Active Open to activate the Charger AC Failure alarm.



Check Genset/Common Alarm

Engage the Emergency Stop button.

Not In Auto

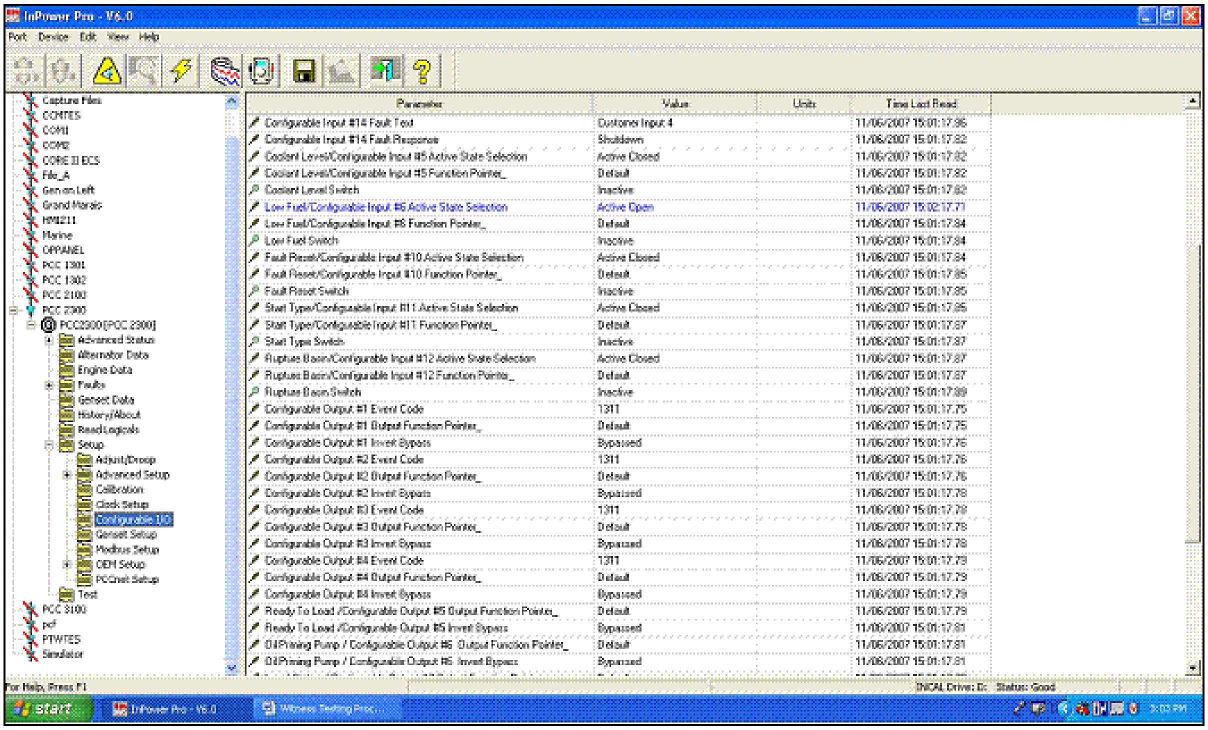
On the Operator Panel, press the Stop or Manual button to take the control out of Auto mode.

Genset Running

Start the genset by putting the genset in Manual mode and pressing Start.

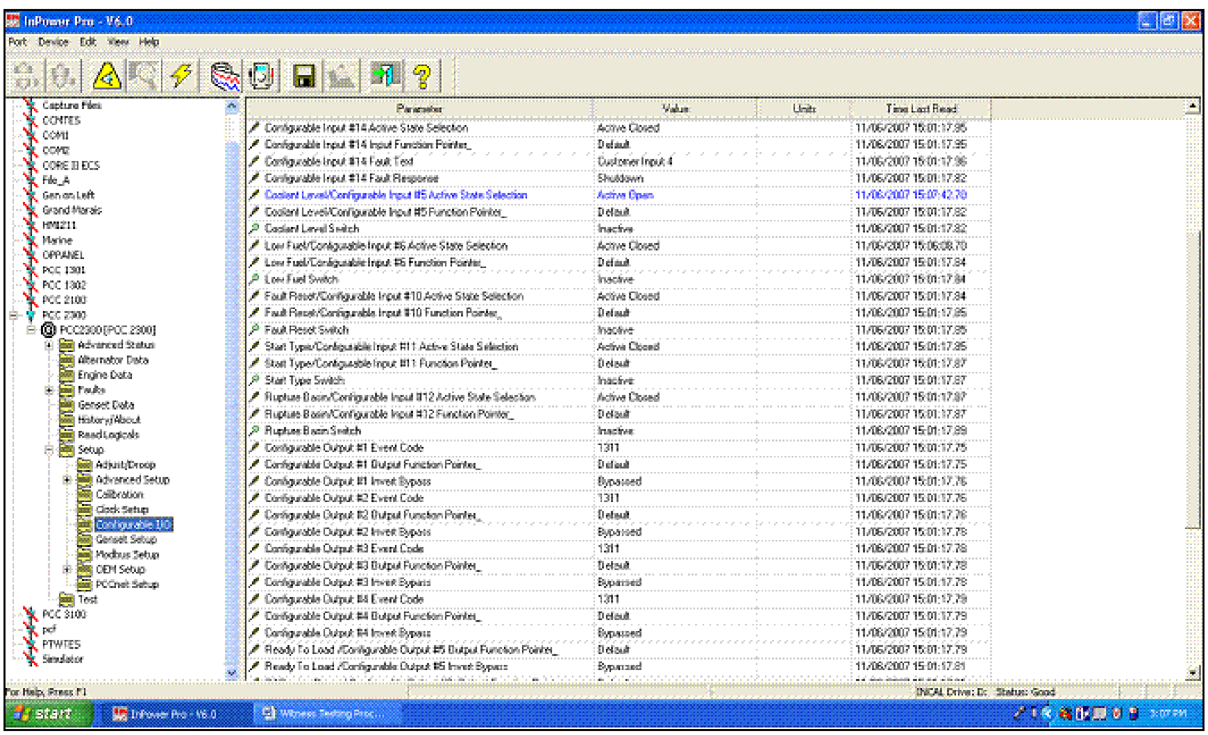
Low Fuel Level

Under Setup > Configurable I/O, set the Low Fuel/Configurable Input #6 Active State Selection to Active Open to activate the Low Fuel Level alarm.



Low Coolant Level

Under Setup > Configurable I/O, set the Coolant Level/Configurable Input #5 Active State Selection to Active Open in order to activate the Low Coolant Level alarm.



High Battery Voltage

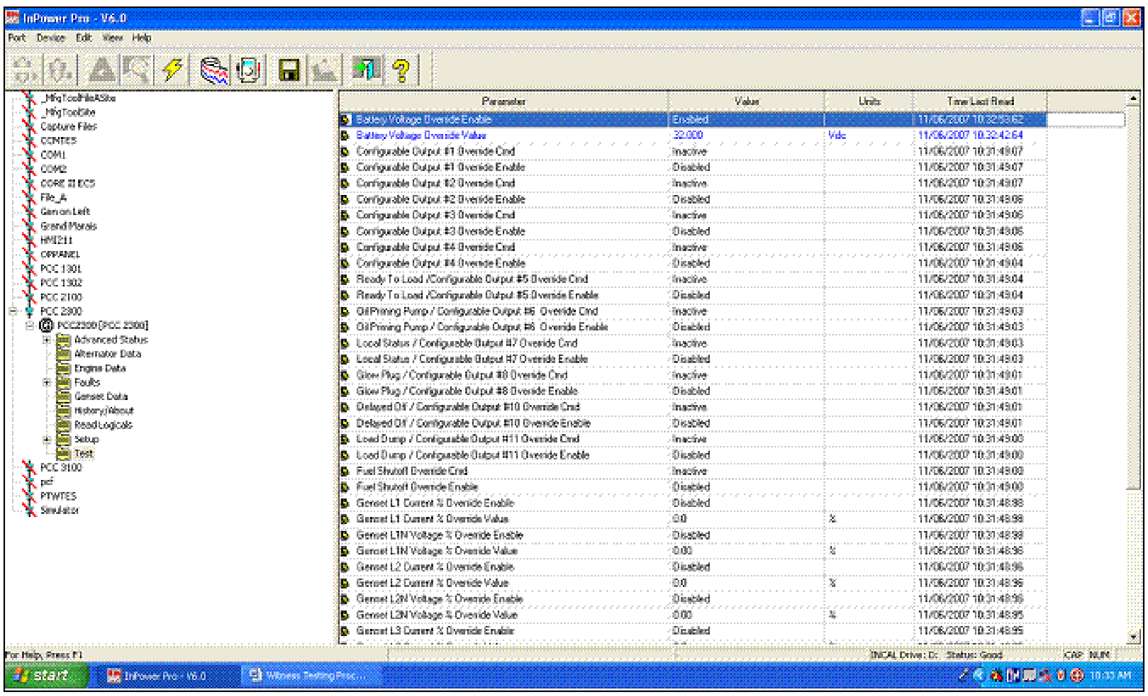
Take note of the following battery voltage setting under Setup > OEM Setup > OEM Engine Setup.

Note the following parameters:

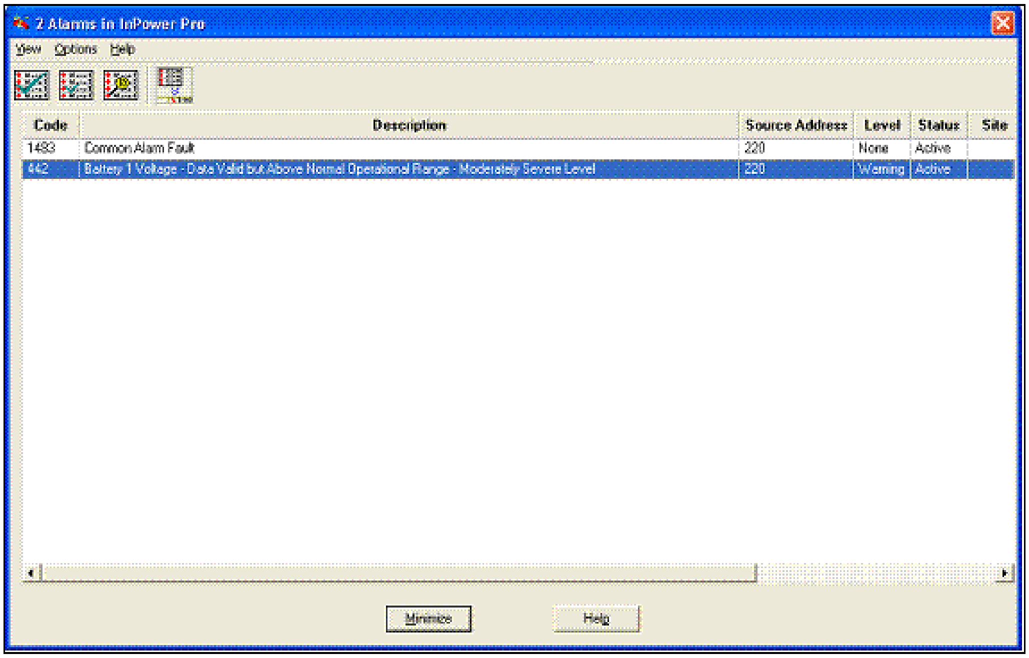
- Nominal Battery Voltage (12 or 24 VDC)
- 24 V High Battery Voltage Threshold
- 12 V High Battery Voltage Threshold
- High Battery Voltage Set Time

Under Test, follow these steps.

1. Set the Battery Voltage Override to Enable.
2. Set the "Battery Voltage Override Value" to the following:
   - If the Nominal Battery Voltage Threshold is set to 12 V, then set the Battery Voltage Override Value to a number that is greater than the 12 V High Battery Voltage Threshold.
   - If the Nominal Battery Voltage Threshold is set to 24 V, then set the Battery Voltage Override Value to a number that is greater than the 24 V High Battery Voltage Threshold.
3. Patiently wait for the amount of time that is set in the High Battery Voltage Set Time to allow the alarm to activate.



Click on Save, and wait.



Low Battery Voltage

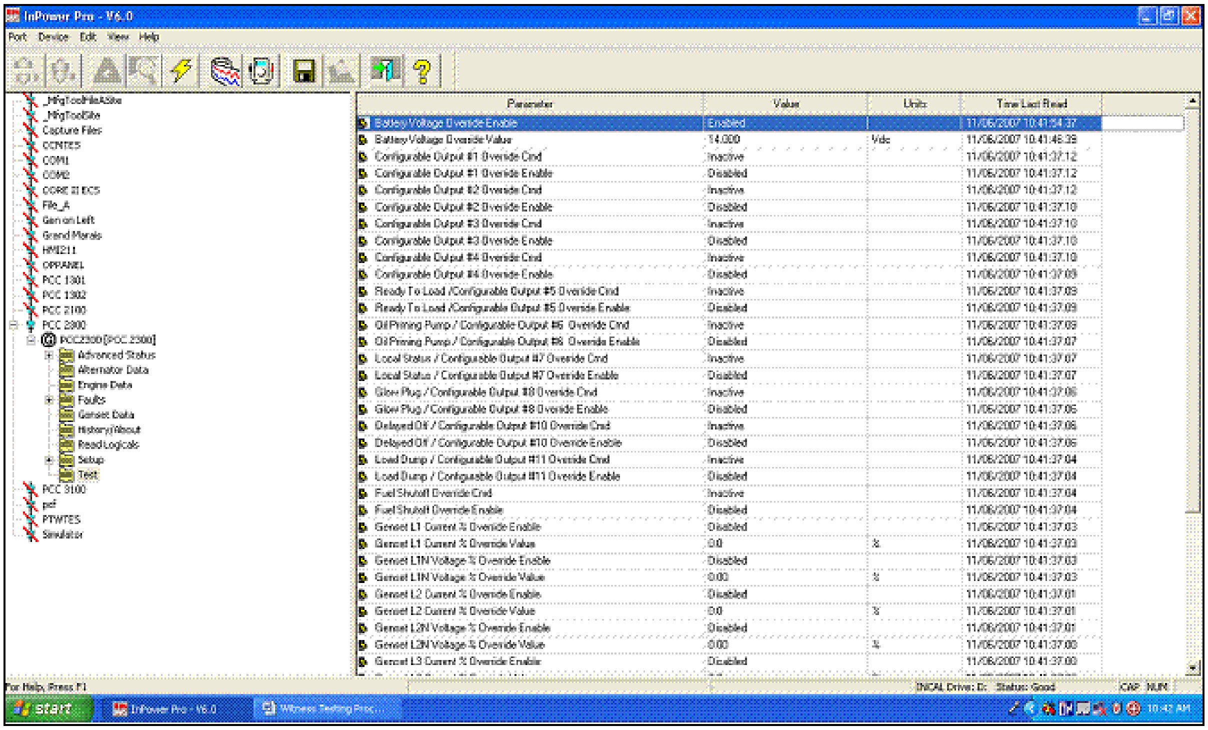
Take note of the following battery voltage settings under Setup > OEM Setup > OEM Engine Setup.

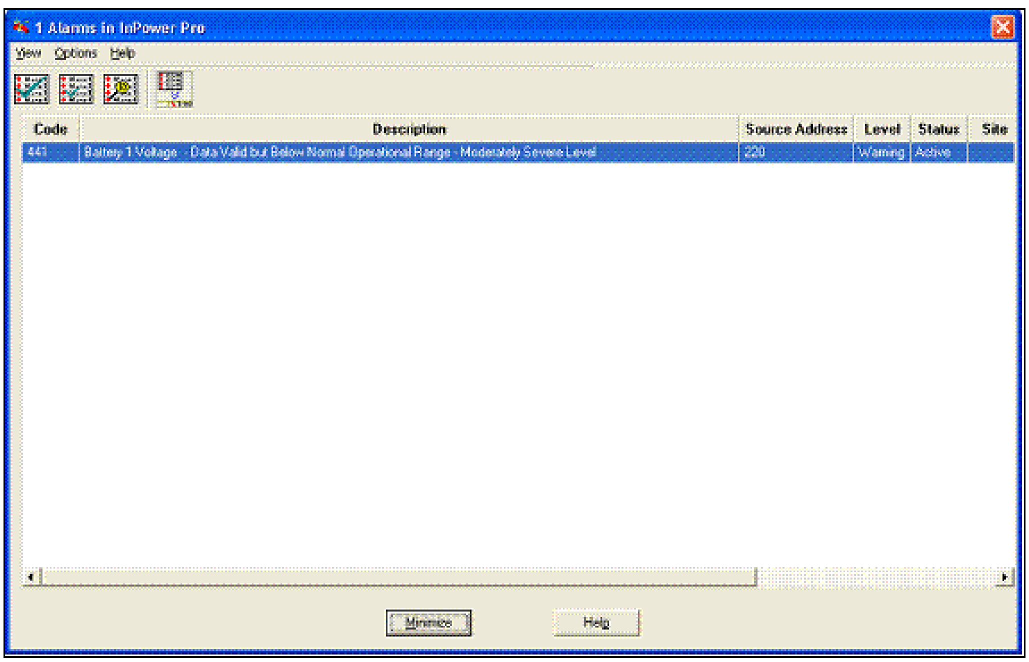
Note the following parameters:

- Nominal Battery Voltage (12 or 24 VDC)
- 24 V Low Battery Voltage Running Threshold
- 24 V Low Battery Voltage Stopped Threshold
- 12 V Low Battery Voltage Running Threshold
- 12 V Low Battery Voltage Stopped Threshold
- Low Battery Voltage Set Time

Under Test, follow these steps.

1. Set the Battery Voltage Override to Enable.
2. Set the Battery Voltage Override Value to the following:
    - If the Nominal Battery Voltage Threshold is set to 12 V, then set the Battery Voltage Override Value to a number that is less than the 12 V Low Battery Voltage Stopped Threshold and the 12 V Low Battery Voltage Running Threshold.
    - If the Nominal Battery Voltage Threshold is set to 24 V, then set the Battery Voltage Override Value to a number that is less than the 24 V Low Battery Voltage Running Threshold and the 24 V Low Battery Voltage Stopped Threshold.
3. Patiently wait for the amount of time that is set in the Low Battery Voltage Set Time to allow the alarm to activate.





Weak Battery Voltage

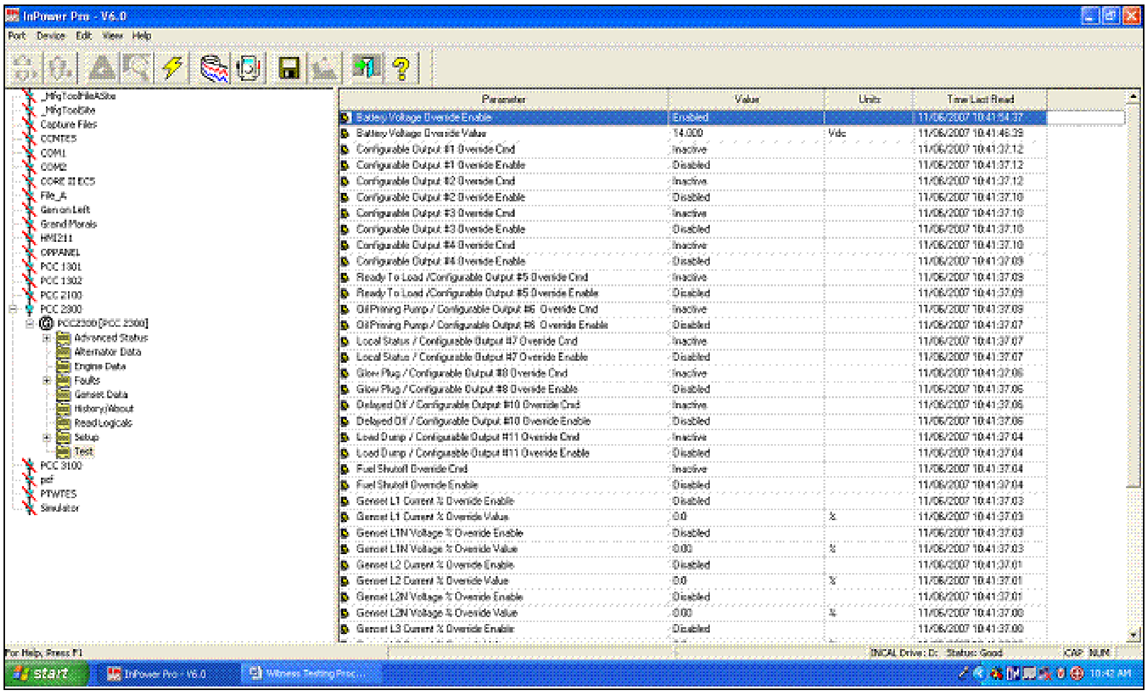
Take note of the following battery voltage settings under Setup > OEM Setup > OEM Engine Setup.

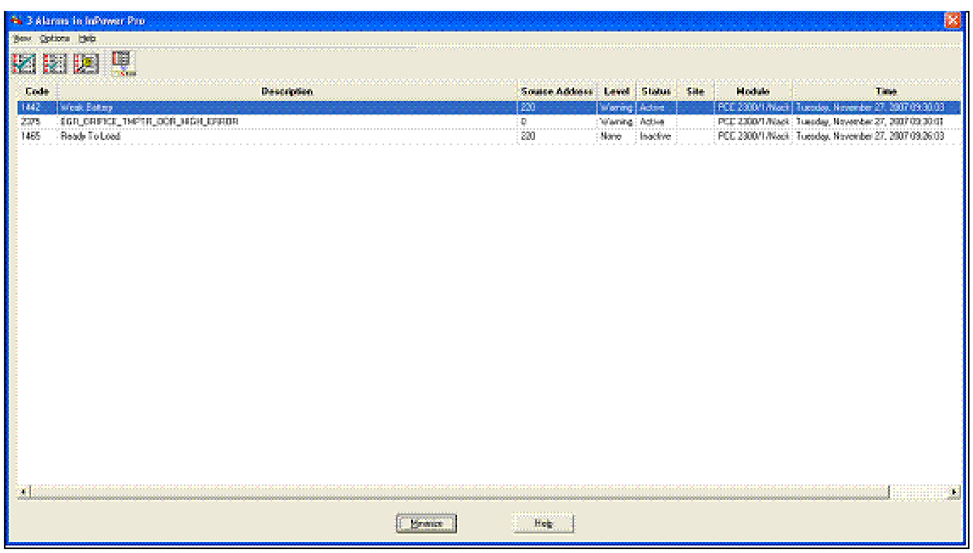
Note the following parameters:

- Nominal Battery Voltage (12 or 24 VDC)
- 24 V Weak Battery Voltage Threshold
- 12 V Weak Battery Voltage Threshold
- Weak Battery Voltage Set Time

Under Test, follow these steps.

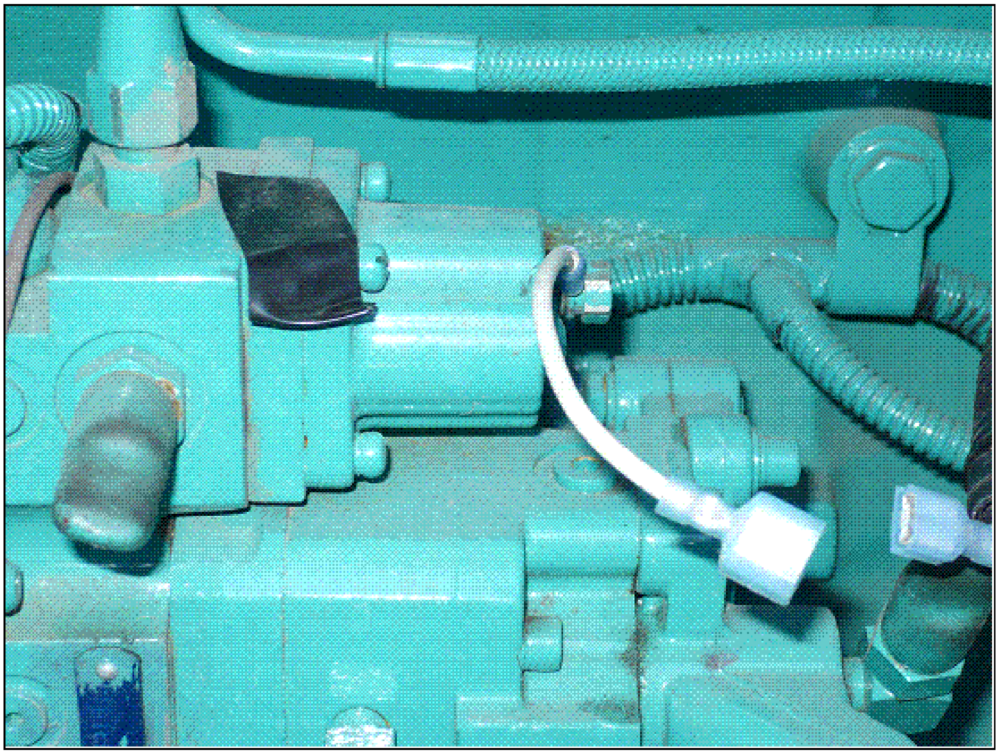
1. Set the Battery Voltage Override to Enable.
2. Set the Battery Voltage Override Value to the following:
   - If the Nominal Battery Voltage Threshold is set to 12 V, then set the Battery Voltage Override Value to a number that is less than the 12 V Weak Battery Voltage Threshold value.
   - If the Nominal Battery Voltage Threshold is set to 24 V, then set the Battery Voltage Override Value to a number that is less than the 24 V Weak Battery Voltage Threshold value.
3. Set the Weak Battery Voltage Set Time to 1 second.
4. Start the genset by putting the genset in Manual mode and pressing Start.





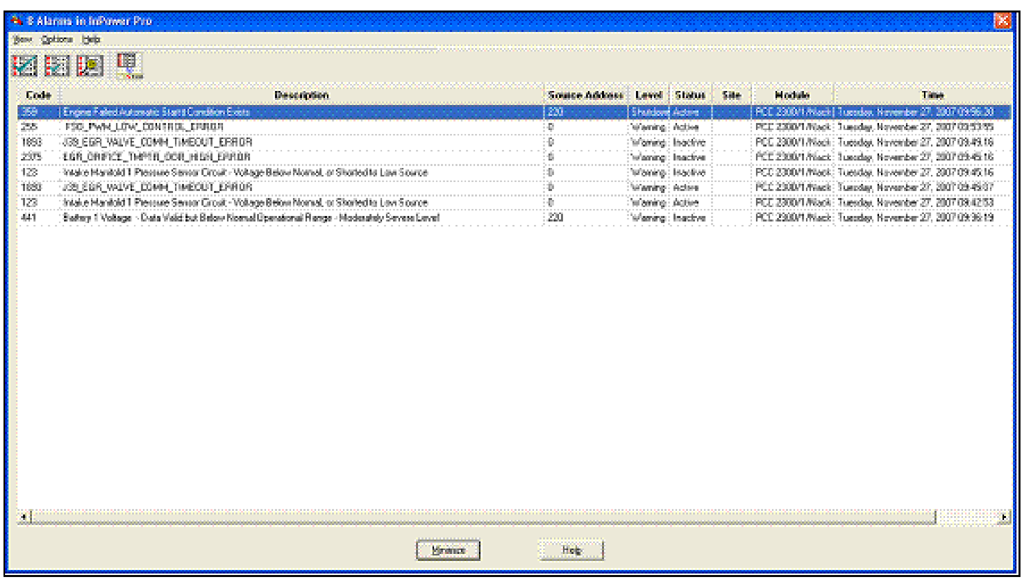
Fail to Start/Crank

In order to simulate this fault, first disconnect the FSO relay or the connection to the fuel injectors or fuel control valve to prevent the engine from fueling while cranking.



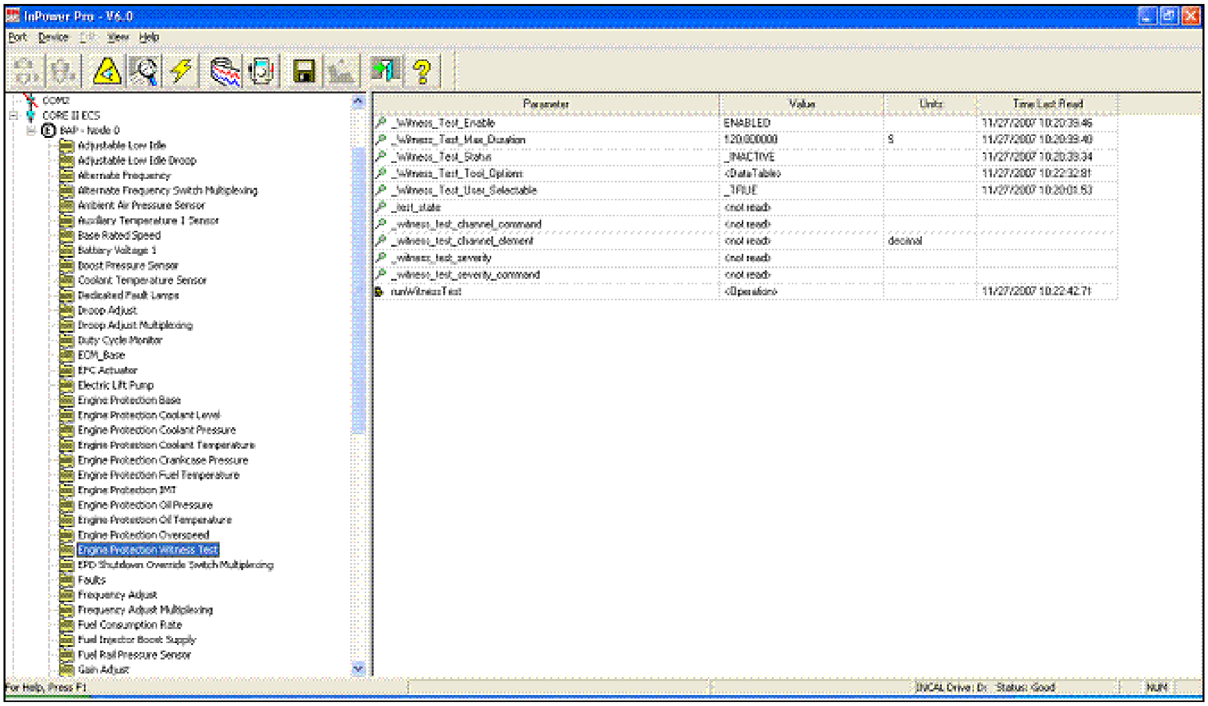
Start the genset by putting the genset in Manual mode and pressing Start.

This will allow the genset to crank without turning on and to shut down when this fault is generated.

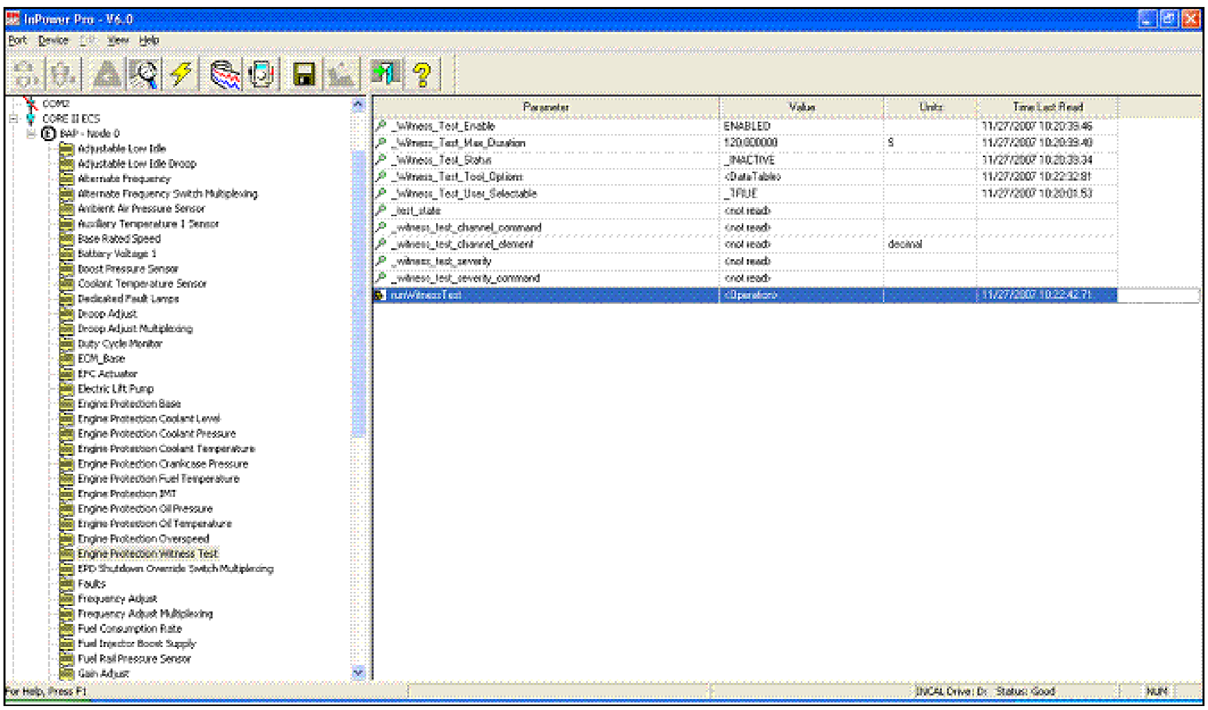


6.11.2 ECM Alarms

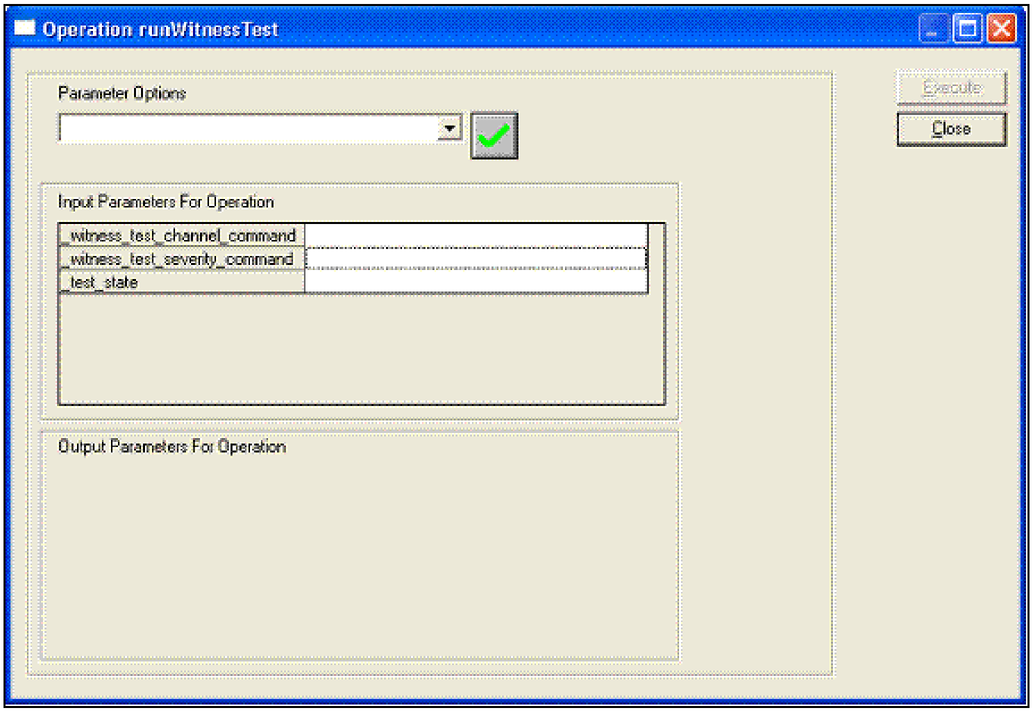
Connect to the ECM with InPower through the Inline 4 or 5 adapter, and click on the CORE II ECS connection. Click on the Engine Protection Witness Test folder as shown below.



Click on the runWitness Test parameter to highlight it. Then, double-click on <Operation> in the runWitness Test row.

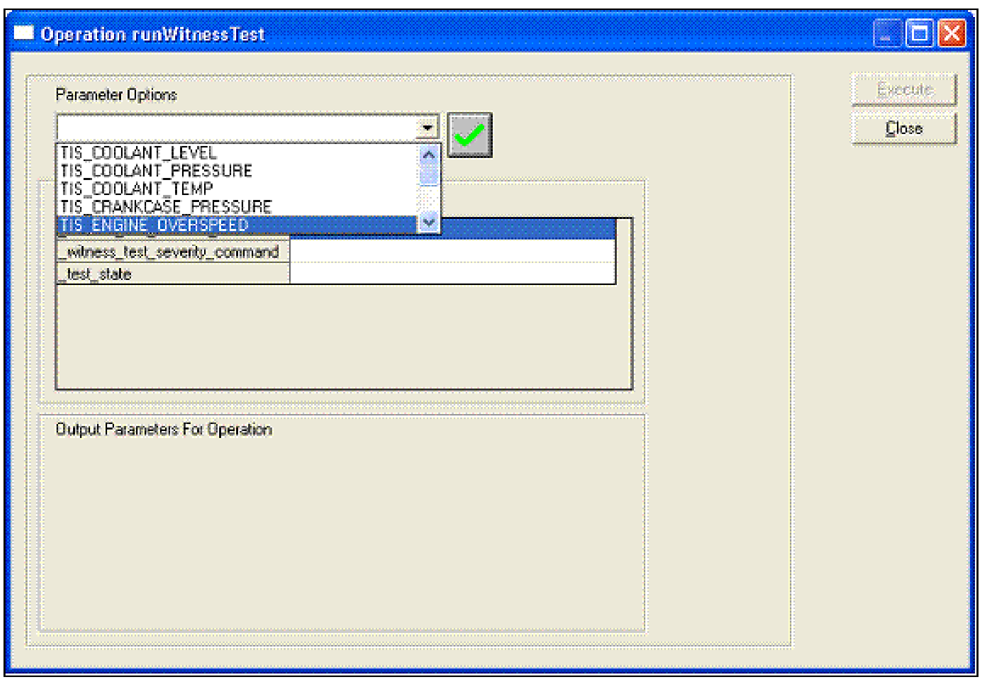


The following screen should appear.

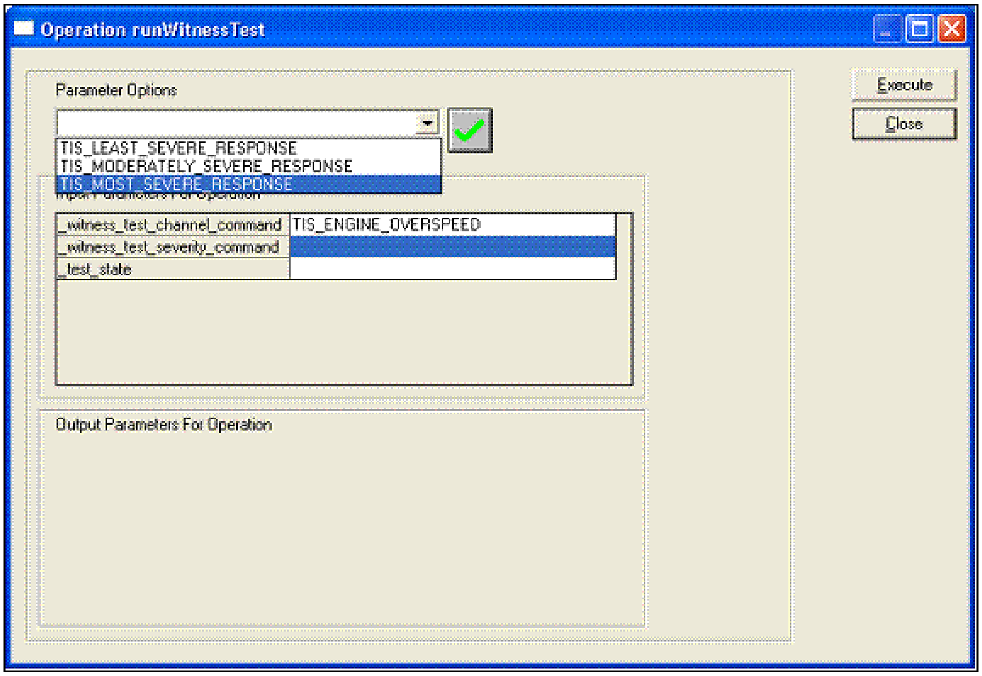


Overspeed

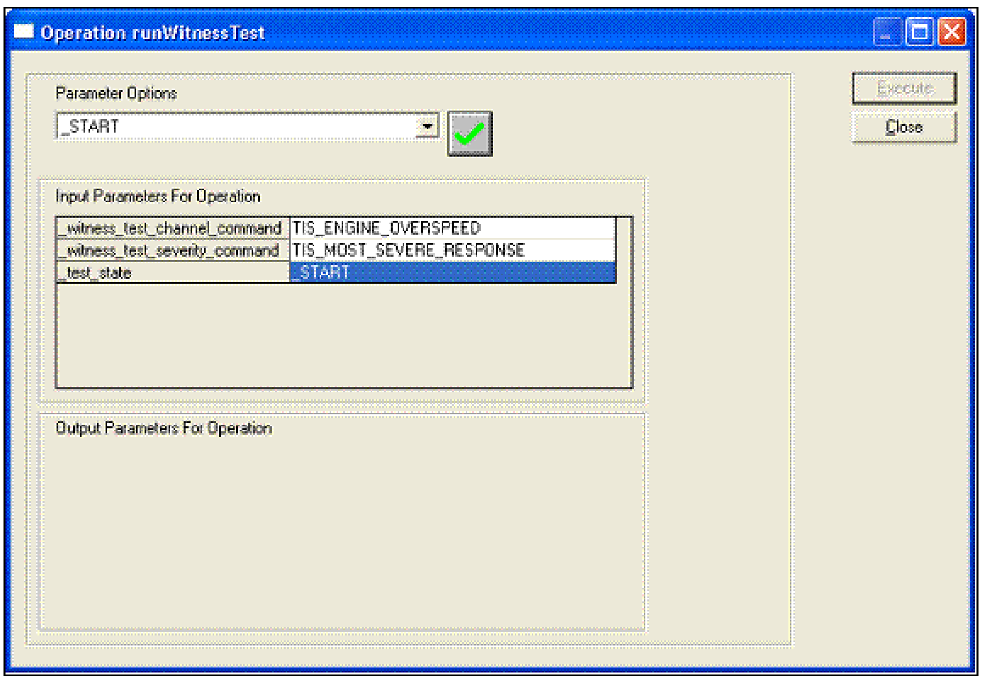
1. Start the generator set by putting the generator set in Manual mode and pressing Start.
2. Follow the instructions under **ECM Alarms** to open the Operation runWitness Test screen.
3. Select TIS_ENGINE_OVERSPEED, and click on the Green Check mark, as shown below.



4. Select TIS_MOST_SEVERE_RESPONSE, and click on the Green Check mark.



5. Select _START, and click on the Green Check mark.



- Click on Execute to simulate.

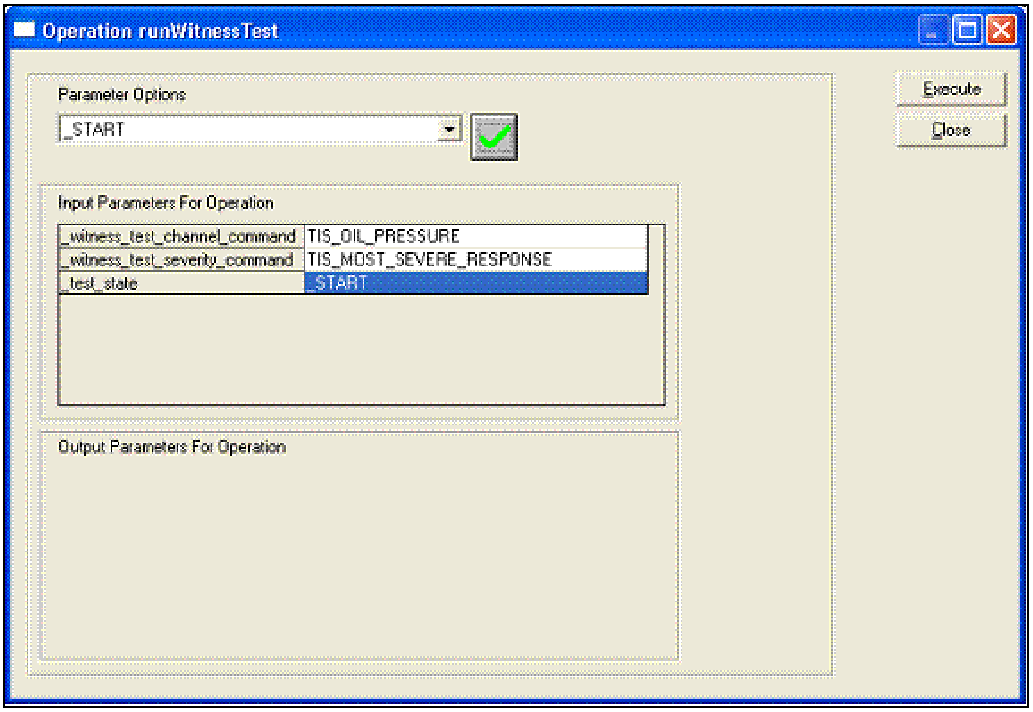
Low Oil Pressure

Start the generator set by putting the generator set in Manual mode and pressing Start.

Select the following parameters in the Operation runWitness Test to simulate a Low Oil Pressure alarm:

- _witness_test_channel_command: **TIS_OIL_PRESSURE**
- _witness_test_severity_command: **TIS_MOST_SEVERE_RESPONSE**
- _test_state: _**START**

Then click on Execute.

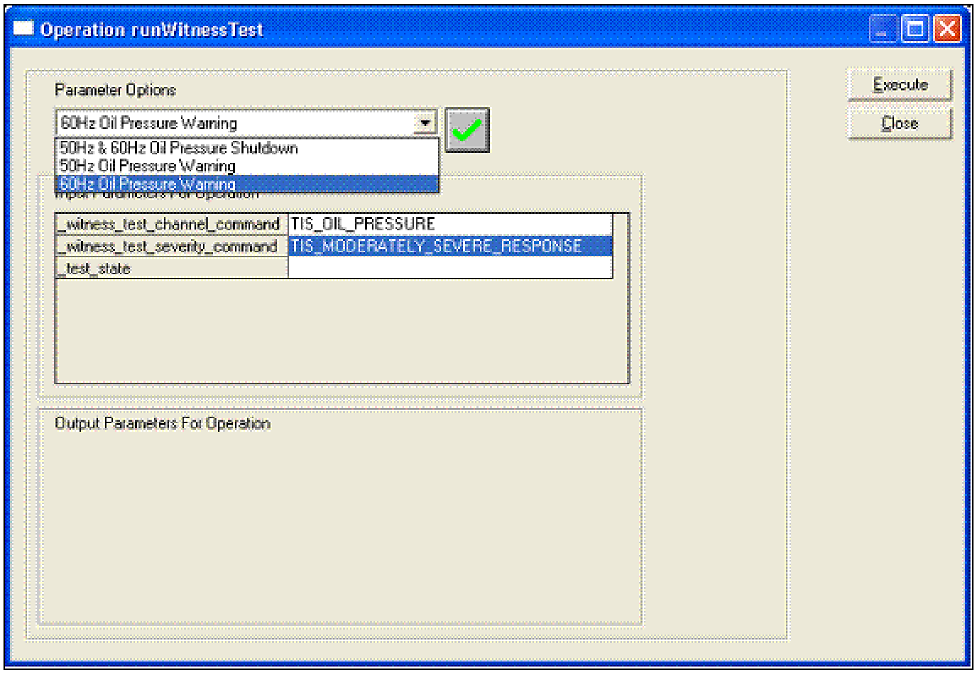


Pre-Low Oil Pressure

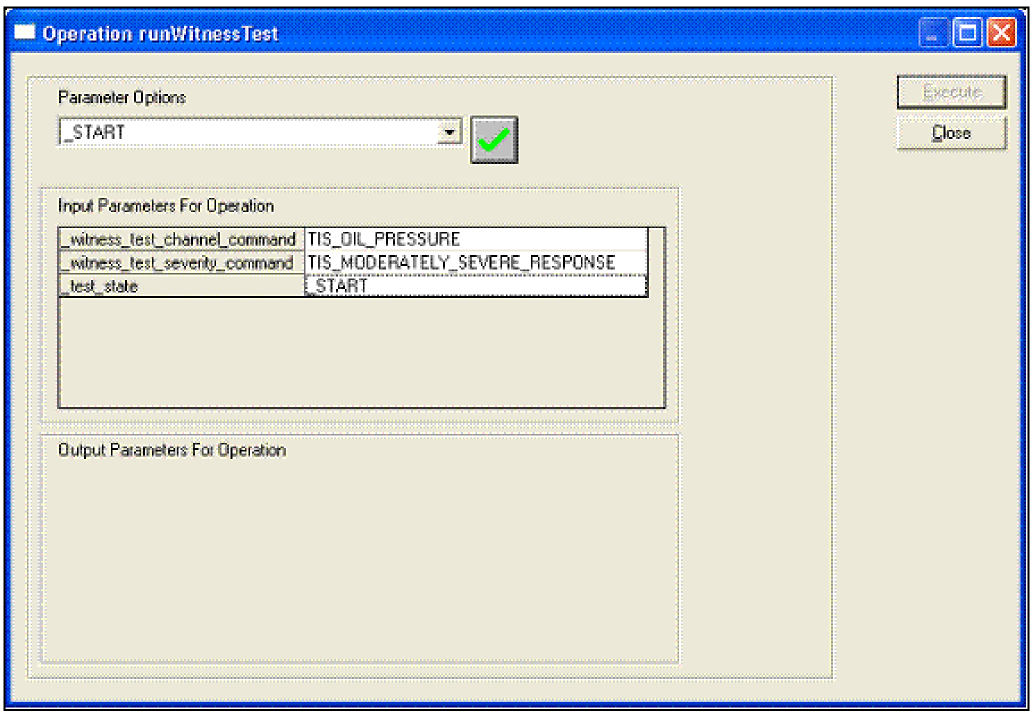
Start the generator set by putting the generator set in Manual mode and pressing Start.

Select the following parameters in the Operation runWitness Test to simulate a Pre-Low Oil Pressure alarm:

- _witness_test_channel_command: **TIS_OIL_PRESSURE**
- _witness_test_severity_command: **(50 or 60) Hz Oil Pressure Warning** (choose the operating frequency of the generator set; 50 or 60 Hz)
- _test_state: **_START**



Then click on Execute.



High Engine Temperature

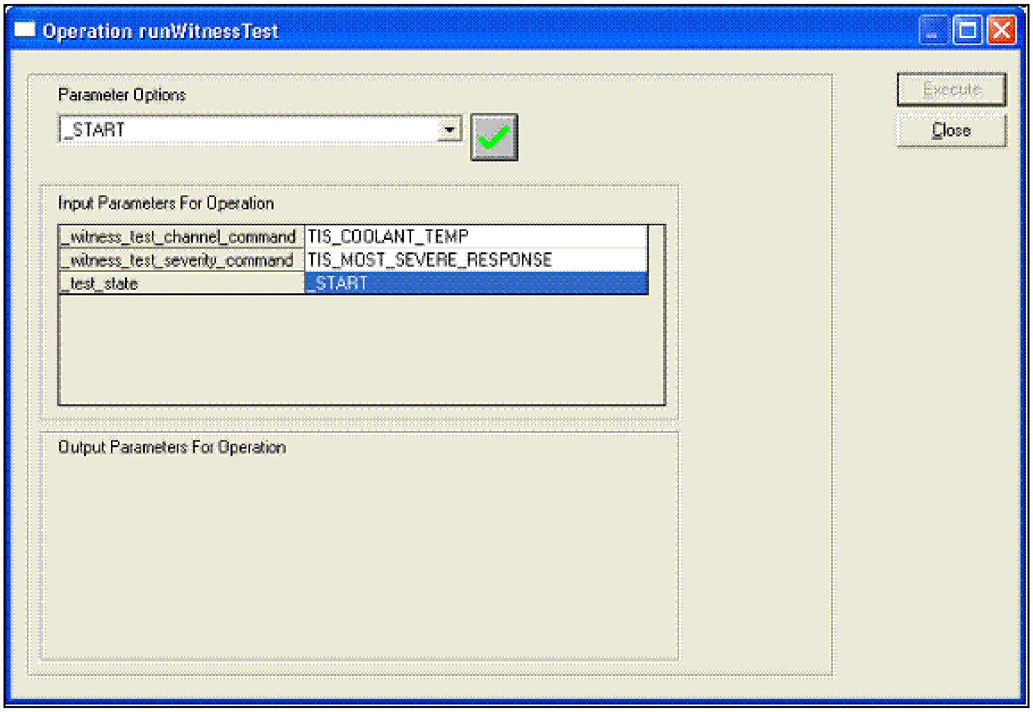
Start the generator set by putting the generator set in Manual mode and pressing Start.

Select the following parameters in the Operation runWitness Test to simulate a High Engine Temperature alarm:

- _witness_test_channel_command: **TIS_COOLANT_TEMP**
- _witness_test_severity_command: **TIS_MOST_SEVERE_RESPONSE**

- _test_state: **_START**

Then click on Execute.



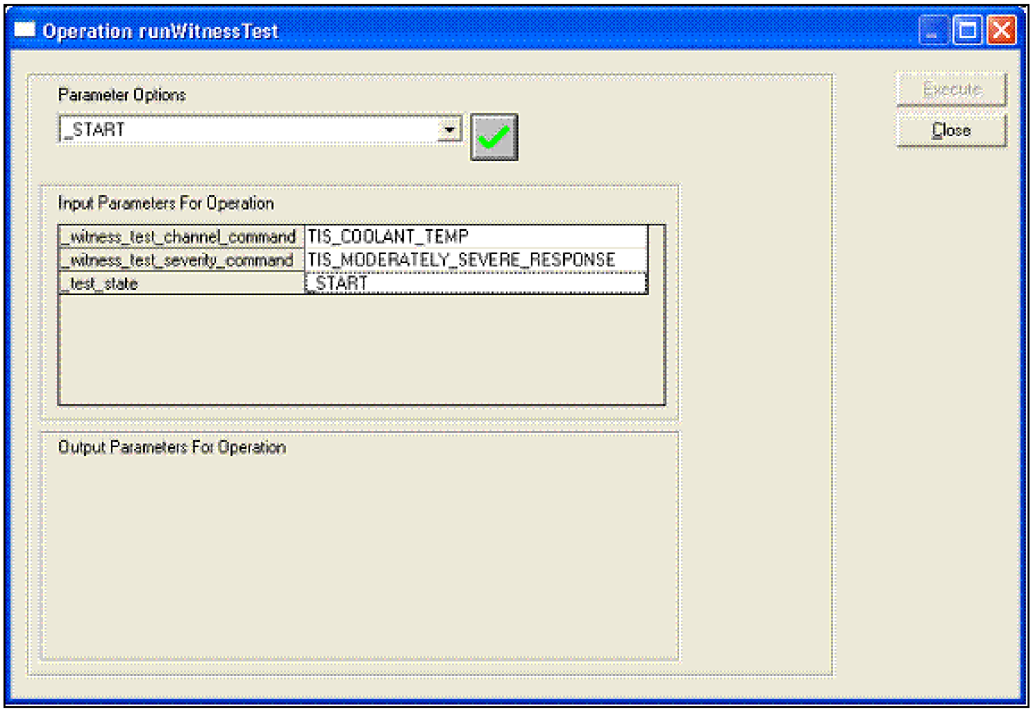
Pre-High Engine Temperature

Start the generator set by putting the generator set in Manual mode and pressing Start.

Select the following parameters in the Operation runWitness Test to simulate a Pre-High Engine Temperature alarm:

- _witness_test_channel_command: **TIS_COOLANT_TEMP**
- _witness_test_severity_command: **TIS_MODERATELY_SEVERE_RESPONSE**
- _test_state: **_START**

Then click on Execute.


Operation runWitnessTest
Parameter Options
_START
Execute
Close
Input Parameters For Operation
_witness_test_channel_command
TIS_COOLANT_TEMP
_witness_test_severity_command
TIS_MODERATELY_SEVERE_RESPONSE
_test_state
_START
Output Parameters For Operation

This page is intentionally blank.

7 Setup and Calibration (PC 2.2)

Read ***Safety Precautions***, and carefully observe all of the instructions and precautions in this manual.

⚠ CAUTION
Only qualified technicians should adjust the parameters described in this section. Failure to follow this may affect genset operation and may cause damage to the genset or to equipment connected to the genset.

In this section, *italics* are used to identify a specific parameter by name.

7.1 Safety Considerations

AC power is present when the generator set is running. Do not open the generator output box while the generator set is running.

⚠ WARNING
Contacting high-voltage components can cause electrocution, resulting in severe personal injury or death. Do not open the generator output box while the generator set is running. Read and observe all WARNINGS and CAUTIONS in your generator set manuals.

The PCC cabinet must be opened only by technically qualified personnel.

⚠ WARNING
The PCC cabinet must be opened only by qualified personnel. High-level voltages (up to 600 VAC) are present in the PCC cabinet. These voltages can cause electrical shock, resulting in personal injury or death.

⚠ CAUTION
Even with the power removed, improper handling of components can cause electrostatic discharge and damage to circuit components.

Read ***Safety Precautions***, and carefully observe all of the instructions and precautions in this manual.

7.2 Operator Panel

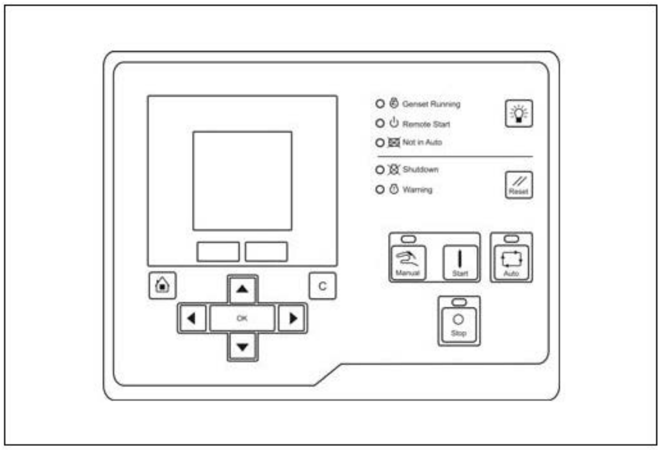


FIGURE 53. OPERATOR PANEL (POWER COMMAND 2.2)

7.2.1 Operator Panel (Remote)

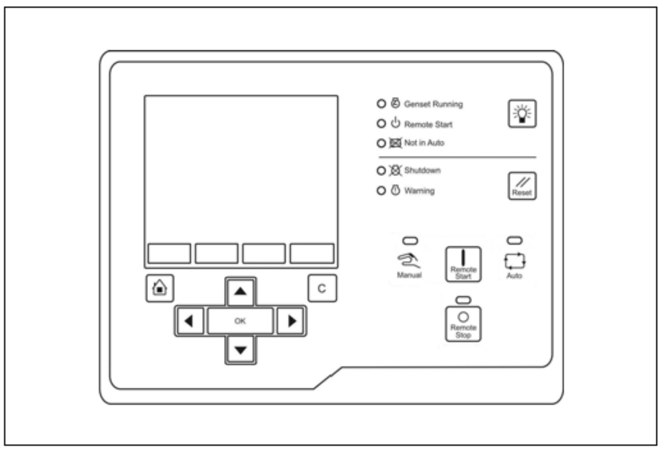


FIGURE 54. OPERATOR PANEL (REMOTE)

7.2.2 Operator Panel Description

This section introduces the Operator Panel.

NOTICE
The examples in this section use the remote Operator Panel.

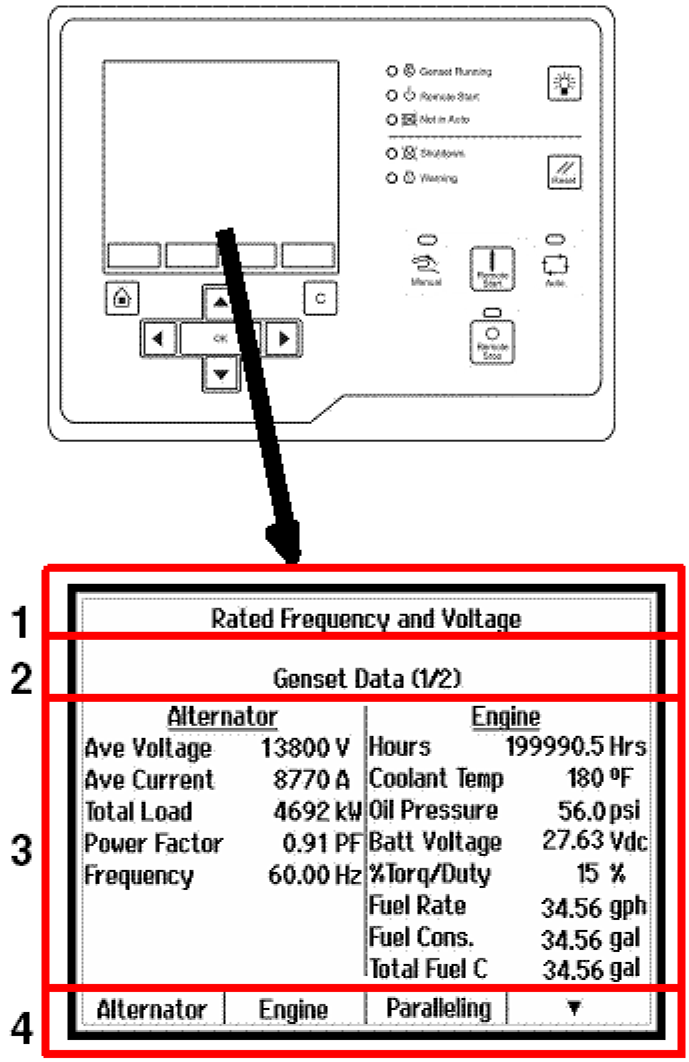


FIGURE 55. GRAPHICAL DISPLAY (AND TYPICAL SCREENSHOT)

TABLE 64. GRAPHICAL DISPLAY (AND TYPICAL SCREENSHOT)

LABEL	DESCRIPTION
1	PCC status
2	Active fault or screen name
3	Interactive screen or menu
4	Functions for selection buttons

Use the graphical display to look at event/fault information, status, screens, and parameters.

Use the Display Options screen to adjust display settings, such as contrast, language, or unit of measure.

Section **1** in the graphical display displays the status of the PCC.

TABLE 65. PCC STATUS IN THE GRAPHICAL DISPLAY

STATUS	DESCRIPTION
Ready	This is the default state. The PCC is ready to start the genset, or the PCC is getting ready to start the engine. If the PCC is getting ready to start the engine, this status corresponds to the Start Time Delay step or the Prelube Engine step in the start sequences.
Starting	The PCC is starting the engine, and the engine speed is greater than zero. This status corresponds to the Start Engine step in the start sequences.
Idle Warmup	The engine is running at idle speed in one of the start sequences. This status corresponds to the Idle Warmup step in the start sequences.
Rated Frequency and Voltage	The engine is running at rated speed. This status corresponds to the Idle to Rated Ramp Time step or the Starting to Rated Ramp Time step in the start sequences; rated speed and voltage; and the Time Delay Stop, the Rated Cooldown Time step, or the Rated to Idle Transition Delay step in the stop sequences.
Idle Cooldown	The engine is running at idle speed in one of the stop sequences. This status corresponds to the Rated to Idle Ramp Time step or the Idle Cooldown step in the stop sequences.
Stopping	The PCC is stopping the engine, and the engine speed is still greater than zero. There are no active shutdown faults.
Emergency Stop	There is an active shutdown fault.
Setup Mode	The PCC is in Setup mode.
Wait to Powerdown	The PCC is ready to enter power-down mode, but another device, such as the Operator Panel, is sending a System Wakeup signal.
Off	The PCC is in the process of entering power-down mode. The PCC is performing some last-second checks.
Demo Mode	The PCC is running a demonstration. Every screen is available in the demonstration, and any changes you make in the demonstration have no effect on the PCC. You have to turn off the Operator Panel to end the demonstration.

Section **2** in the graphical display displays the screen name and information about the last active shutdown fault. If there are no active shutdown faults, it displays the last active warning fault.

If there is an active fault, the Operator Panel displays this information about it:

- Fault type (see table below)
- Event/fault code
- Name of the controller that detected the fault (for example, many engine faults are detected by the engine control module). This is blank if the PCC detected the fault.
- Fault name

If you press the Reset button, the Operator Panel stops displaying active warning faults, even if the condition(s) that caused the fault(s) has not been corrected. The Warning LED remains on, however.

The Operator Panel always displays any active shutdown faults, even if you press the Reset button.

TABLE 66. FAULT TYPE IN THE GRAPHICAL DISPLAY

TYPE	DESCRIPTION
Warning	This is a warning fault.
Derate	This is a derate event.
Shutdown	This is a shutdown fault that initiated a Shutdown Without Cooldown sequence.

Section **3** in the graphical display is interactive. You can look at operating values for the genset, navigate through screens, and adjust parameters.

The default screen is the Genset Data screen.

The table below explains how the Operator Panel displays when the value of a specific parameter is missing, unexpected, or outside the range allowed for the parameter.

TABLE 67. UNAVAILABLE PARAMETERS IN THE OPERATOR PANEL

OPERATOR PANEL	DESCRIPTION
NWF	Network Failure. There is a PCCNet network failure or a CAN (ECM) failure.
OORL	Out of Range Low. The value is less than the lowest allowed value for this parameter.
OORH	Out of Range High. This value is greater than the highest allowed value for this parameter.
---	The value is not applicable.

Section **4** in the graphical display identifies additional functions that are available by pressing one of the selection buttons beneath the graphical display. If the box above the selection button is empty, that particular selection button has no function at this time.

For example, if the graphical display is not big enough to display the screen at one time, press the appropriate selection button to look at the previous or next page of information in that screen.

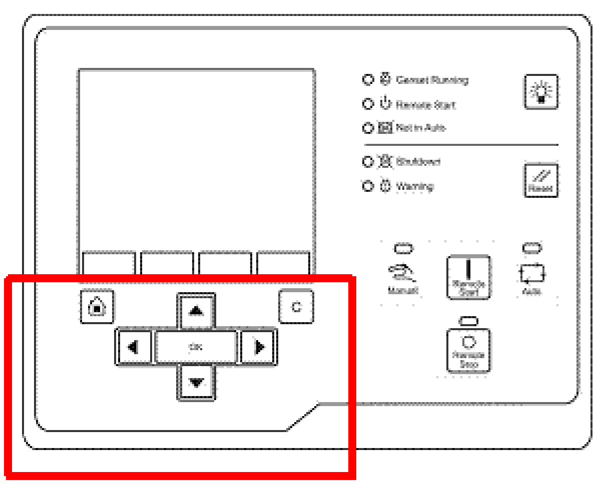
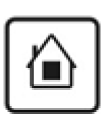


FIGURE 56. MENU NAVIGATION BUTTONS

The  button is called the Home button.

If the PCCNet connection between the PCC and the Operator Panel is not active, press the Home button and the C button at the same time for three seconds to start a demonstration of the Operator Panel. Every screen is available in the demonstration, and any changes you make in the demonstration have no effect on the PCC. You have to remove power from the Operator Panel to end the demonstration.

TABLE 68. MENU NAVIGATION BUTTONS

LED/BUTTON	DESCRIPTION
Home	Press this to return to the main menu.
C	Press this to return to the previous menu. ***NOTICE*** **If you have not pressed OK, the control panel does not save the changes when you press the C button.**
Up, Down, Left, Right	Press these to change the selection in the graphical display.
OK	Press this to select the item that is currently highlighted in the graphical display. If the selected item is a menu item, this opens a sub-menu or screen. If the selected item is a parameter, this lets you adjust the parameter (if possible) or prompts you for a password. If the selected item is a value you have just adjusted, this saves the change. If the selected item is an action, the Operator Panel runs the action or prompts you for a password.

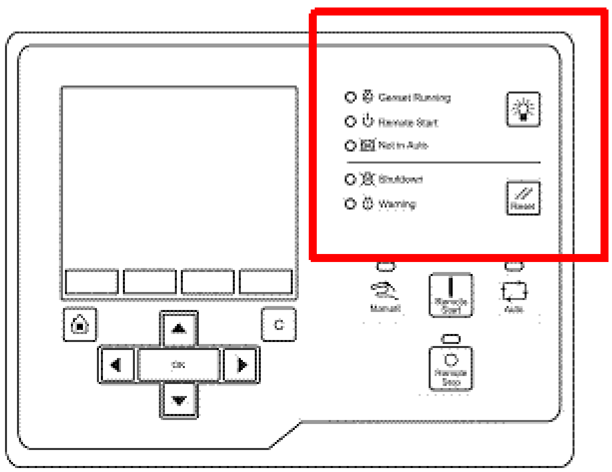


FIGURE 57. LED INDICATORS AND BUTTONS

The  button is called the Lamp Test button.

If the PCCNet connection between the PCC and the Operator Panel is not active, the LEDs in the table below remain off (unless you press the Lamp Test button).

TABLE 69. LED INDICATORS AND BUTTONS

LED/BUTTON	DESCRIPTION
Genset Running	This green LED is lit when event 1465 (Ready to Load) is active. The genset is running at or near rated speed and voltage. This is not lit while the genset is warming up or cooling down.
Remote Start	This green LED is lit when the remote start signal is active. This signal has no effect unless the PCC is in Auto mode.
Not in Auto	This red LED blinks when event 1463 (Not In Auto) is active. The PCC is not in Auto mode.
Shutdown	This red LED is lit when event 1541 (Common Shutdown) is active. There is an active shutdown fault.
Warning	This amber LED is lit when event 1540 (Common Warning) is active. There is an active warning fault.
Lamp Test	Press this to test the LEDs. All of the LEDs should turn on for five seconds. Press and hold this for three seconds to turn on or turn off (to toggle) a panel lamp.
Reset	Press this to generate a fault reset signal. The Operator Panel's Fault Reset is active as long as this button is pressed, and the Operator Panel sends the fault reset through the PCCNet connection between the PCC and the Operator Panel. If the condition(s) that caused an existing shutdown fault still exists, the PCC generates the fault again. If the condition(s) that caused an existing warning fault still exists, the PCC generates the fault again, but the Operator Panel stops displaying it in the graphical display.

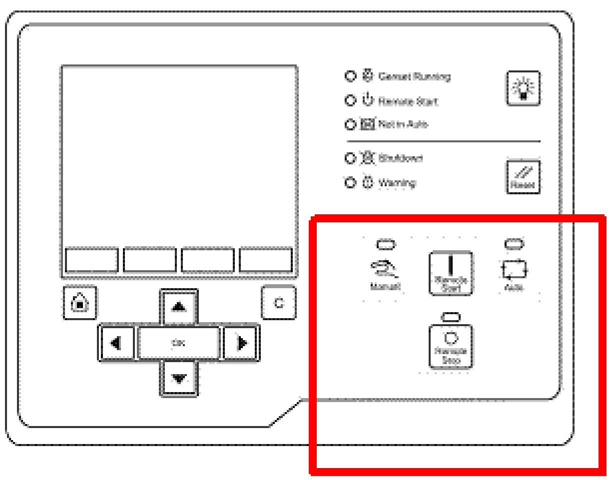


FIGURE 58. MODE OF OPERATION BUTTONS

If Mode Change is Enabled in the Display Options screen , you have to enter the password 121 when you use these buttons to change the mode of operation.

If there is a keyswitch, the LEDs in the table below still work properly.

TABLE 70. MODE OF OPERATION BUTTONS

LED/BUTTON	DESCRIPTION
	These buttons are available only on the remote Operator Panel.

LED/BUTTON	DESCRIPTION
Remote Start	In Auto mode, press this to start the genset. ***NOTICE*** **The Operator Panel is connected to the PCC's Remote Start connection. The genset does not start if the conditions for the remote start signal are not met.**
Remote Stop	In Auto mode, press this to stop the genset. ***NOTICE*** **There can be multiple sources for the remote start signal. The genset will not stop if any of the other sources for this signal are still active. You have to make all of the sources inactive to stop the genset.**
	These buttons are not available on the remote Operator Panel, but the **Manual** LED and the **Auto** LED are available.
Manual	Press this to put the PCC in Manual mode. If you do not press the Start button in ten seconds, the Operator Panel automatically puts the PCC in Off mode. The green LED above this button is lit when the PCC is in Manual mode. If the LED above this button is blinking, there is a problem with the Mode of Operation connection between the PCC and the Operator Panel. Please contact your local distributor.
Start	In Manual mode, press this to initiate a Manual Start sequence. In other modes, this button has no effect.
Auto	Press this to put the PCC in Auto mode. The green LED above this button is lit when the PCC is in Auto mode. If the LED above this button is blinking, there is a problem with the Mode of Operation connection between the PCC and the Operator Panel. Please contact your local distributor.
Stop	In Manual mode, press this one time to initiate a Manual Stop sequence if the genset is running. The green LED above this button blinks while the PCC shuts down the genset. When the Manual Stop sequence is done, the Operator Panel puts the PCC in Off mode. ***NOTICE*** **While the Manual Stop sequence is running, press this button a second time to shut down the genset immediately. The PCC initiates a Shutdown Without Cooldown sequence.** If the genset is running in Auto mode, press this to initiate a Shutdown Without Cooldown sequence. If the genset is not running, press this to put the PCC in Off mode. If the genset is running and the PCCNet connection is not active, press this to initiate a Shutdown Without Cooldown sequence. The LED above this button is lit when the PCC is in Off mode. If the LED above this button is blinking when the PCC is not shutting down the genset in Manual mode, there is a problem with the Mode of Operation connection between the PCC and the Operator Panel. Please contact your local distributor.

7.3 Passwords

You can look at the value of every parameter in the Operator Panel. If you want to adjust a parameter, the PCC might prompt you for a password.

The PCC supports the password levels in the following table.

TABLE 71. PASSWORD LEVELS

LEVEL	DESCRIPTION	VALUE
0	No password	None
1	Operator password	574
2	Service password	1209
3	Engineering password	Restricted

When the PCC prompts you for a password, it tells you what level password is required. You should provide the password for the requested level or for a higher level. For example, the PCC accepts the level-2 password even if it only requires the level-1 password.

If the password is shorter than the number of digits in the Operator Panel, enter the password on the right side of this field. For example, if the password is 456 and the Operator Panel requests five digits, enter “00456".

When you provide a valid password, the PCC unlocks all of the parameters at the level of the provided password and lower. For example, if you enter a level-2 password, the PCC unlocks all parameters in level 0, 1, or 2. The parameters remain unlocked until the Operator Panel is inactive for five minutes.

7.4 Mode Change Password

If Mode Change is Enabled in the Display Options screen, you have to enter the password 121 when you use the Operator Panel to change the mode of operation.

7.5 Capture File

Use InPower to save the current settings in a capture file on a PC or network. You can use the capture file to look at the current settings while you are away from the PCC or to restore settings if you have to reset the PCC for any reason. See the InPower User Guide for more information.

7.6 Menu Description

This section shows a summary of the menus in the PCC.

TABLE 72. MENU DESCRIPTION FOR THE POWERCOMMAND 2.2

MENU	DESCRIPTION
Genset Data	Use this screen to look at the status of the genset.
Engine Data	Use this screen to look at the status of the engine.
Alternator Data	Use this screen to look at the status of the alternator.
Faults	

MENU		DESCRIPTION
	Active Shutdowns	Use this screen to look at active shutdown faults.
	Active Warning	Use this screen to look at active warning faults.
	History	Use this screen to look at faults that have been cleared.
Help		Use this screen to get more information about each component in the Operator Panel.
Display Options		Use this screen to configure the Operator Panel.
Clock Setup		Use this screen to configure the real-time clock.
Modbus Setup		Use this screen to set up the PCC for Modbus networks.
Adjust		Use this screen to configure certain adjustments, overrides, and gains.
Calibration		Use this screen to calibrate the PCC.
Configurable I/O		Use this screen to set up the configurable inputs and the configurable outputs.
Genset Setup		Use this screen to configure sequences of operation, genset-related faults, and the exercise scheduler.
PCCnet Setup		Use this screen to set up the PCC for PCCNet devices.
OEM Setup		
	Alternator	Use this screen to configure voltage limits, main alternator connections, alternator-related faults, AVR coefficients, and other detailed alternator settings.
	Engine	Use this screen to configure battery-related faults and other detailed engine settings.
	Genset	Use this screen to configure application ratings, factory locks, and other detailed genset settings.
Save/Restore		Use this screen to save changes to permanent memory in the PCC. This is reserved for future use.
History-About		Use this screen to look at historical information about the genset.
Advanced Status		
	Genset	Use this screen to look at power, energy, phase differences, and other detailed genset information.
	Controller	Use this screen to look at sequences of operation, configurable inputs, configurable outputs, and other detailed PCC information.
	Engine	Use this screen to look at pressures, voltages, temperatures, and other detailed engine information.
Basic		
AUX 101 Setup		Use this screen to setup the AUX 101 and AUX 102.

7.7 Generator Set Data

Each parameter is described in the following table:

TABLE 73. GENERATOR SET DATA

PARAMETER	DESCRIPTION
Alternator	
Genset LL Average Voltage	Generator set Line to Line average voltage
Genset Average Current	Generator set average current
Genset Total kW	Generator set total kW
Genset Total Power Factor	Generator set L1 power factor
Genset Frequency	Generator set frequency
Engine	
Engine Running Time	Total engine run time
Coolant Temperature	Monitor point for the Coolant Temperature
Oil Pressure	Monitor point for the Oil Pressure Allowed values: 0~145 psi.
Battery Voltage	Battery voltage value.
Percent Engine Torque/Duty Cycle	Monitor point for the percent engine torque output and the governor percent duty cycle output when used with the HM ECM Allowed values: -125~125 %.
Fuel Rate	Monitor point for the Fuel Rate Allowed values: 0~845 gal/hr.
Fuel Consumption Since Reset	Fuel consumption since last reset.
Total Fuel Consumption	Total fuel consumption since start of engine.
Genset Application	
Genset Application kW rating	The generator set KW rating.
Genset Application kVA rating	The generator set KVA rating.
Genset Application Nominal Current	The value of the generator set application nominal current.
Genset Standby	
Genset Standby kW rating	KW rating for the generator set in Standby configuration.
Genset Standby kVA rating	KVA rating for the generator set in Standby configuration.
Genset Standby Nominal Current	The value of the generator set standby nominal current.

7.8 Engine Data

Each label is described in the following table.

TABLE 74. ENGINE DATA

NAME	DESCRIPTION
Pressure	
Oil Pressure	Monitor point for the Oil Pressure Allowed values: 0~145 psi.
Boost Pressure	Monitor point for the Boost Absolute Pressure Allowed values: 0~148 psi.
Coolant Pressure	Monitor point for the Coolant Pressure. Allowed values: 0~145 psi.
Fuel Supply Pressure	Monitor point for the Fuel Supply Pressure Allowed values: 0~145 psi.
Fuel Outlet Pressure	Monitor point for the Fuel Outlet Pressure Allowed values: 0~36404 psi.
Crankcase Pressure	Monitor point for the Crankcase Pressure. Allowed values: -35.67~38 psi.
Barometric Absolute Pressure	Monitor point for the Barometric Absolute Pressure Allowed values: 0~37 psi.
Temperature	
Coolant Temperature	Monitor point for the Coolant Temperature
Oil Temperature	Monitor point for the Oil Temperature Allowed values: -40~410 degF.
Intake Manifold Temperature	Monitor point for the Intake Manifold Temperature Allowed values: -40~410 degF.
Fuel Temperature	Monitor point for the Fuel Temperature Allowed values: -40~410 degF.
Aftercooler Temperature	Monitor point for the Aftercooler Temperature. Allowed values: -40~410 degF.
Battery Voltage	Battery voltage value.
Average Engine Speed	Monitor point for the Average Engine Speed
Engine Running Time	Total engine run time

7.9 Alternator Data

NOTICE

When the PCC is stopped, *Zero Speed Voltage Measurement Floor* sets the threshold beneath which the Operator Panel displays zero voltage, even if the PCC is measuring a non-zero voltage. This parameter is not available in the Operator Panel.

Each label is described in the following table.

TABLE 75. ALTERNATOR DATA

NAME	DESCRIPTION
Genset L1L2 Voltage	Genset L1L2 voltage
Genset L1N Voltage	Genset L1N voltage
Genset L1 Current	Monitors the genset L1 current value.
Genset L1 kW	Genset L1 kW
Genset L1 KVA	Genset L1 kVA
Genset L1 Power Factor	Genset L1 power factor
Genset L2L3 Voltage	Genset L2L3 voltage
Genset L2N Voltage	Genset L2N voltage
Genset L2 Current	Genset L2 current
Genset L2 kW	Genset L2 kW Allowed values: -32768~32762 kW.
Genset L2 KVA	Genset L2 kVA
Genset L2 Power Factor	Genset L2 power factor Allowed values: -1.28~1.27 PF.
Genset L3L1 Voltage	Genset L3L1 voltage
Genset L3N Voltage	Genset L3N voltage
Genset L3 Current	Genset L3 current
Genset L3 kW	Genset L3 kW Allowed values: -32768~32762 kW.
Genset L3 KVA	Genset L3 kVA Allowed values: 0~4294967.29 kVA.
Genset L3 Power Factor	Genset L3 power factor Allowed values: -1.28~1.22 PF.
Genset Total kW	Genset total kW
Genset Total KVA	Genset total kVA
Genset Total Power Factor	Genset L1 power factor
Genset Frequency	Genset frequency
AVR PWM Command	The AVR PWM software command. Linear relationship between counts and % duty cycle with 10000 counts=100% duty cycle
Genset Neutral Current	Genset neutral current ***NOTICE*** **This is not displayed if the neutral current is not available.**

7.10 Shutdown Faults (Active Shutdowns)

This screen displays up to five faults.

The same event/fault code appears multiple times if it comes from different sources; for example, some generator sets have multiple engine control modules (ECMs), or the same event/fault code can come from the PCC and ECM.

Each label is described in the following table:

TABLE 76. ACTIVE SHUTDOWN FAULTS

NAME	DESCRIPTION
Index	This is the index number of the fault
Fault	This is the fault code
SA	Source Address This is the controller that identified the fault, it is blank if the PCC identified the fault
Eng Hrs	This is how many hours the engine had run (not necessarily continuously) when the fault was generated
hh:mm:ss	This is the time the fault was generated
Response	This is the type of fault that was generated
	The name of the fault appears below the rest of the information

7.11 Warning Faults (Active Warnings)

This screen displays up to 32 faults.

The same event/fault code appears multiple times if it comes from different sources.

Each label is described in the following table:

TABLE 77. ACTIVE WARNING FAULTS

NAME	DESCRIPTION
Index	This is the index number of the fault
Fault	This is the fault code
SA	Source Address This is the controller that identified the fault, it is blank if the PCC identified the fault
Eng Hrs	This is how many hours the engine had run (not necessarily continuously) when the fault was generated
hh:mm:ss	This is the time the fault was generated
Response	This is the type of fault that was generated
	The name of the fault appears below the rest of the information

7.12 Fault History

This screen displays up to 32 faults.

The same event/fault code appears multiple times if it comes from different sources.

Each label is described in the following table:

TABLE 78. FAULT HISTORY

NAME	DESCRIPTION
Index	This is the index number of the fault
Fault	This is the fault code
SA	Source Address This is the controller that identified the fault, it is blank if the PCC identified the fault
Eng Hrs	This is how many hours the engine had run (not necessarily continuously) when the fault was generated
hh:mm:ss	This is the time the fault was generated
Response	This is the type of fault that was generated
	The name of the fault appears below the rest of the information

7.13 Help

Use this screen to get more information about each component in the Operator Panel.

7.14 Display Options

Each label is described in the following table.

TABLE 79. DISPLAY OPTIONS

NAME	DESCRIPTION
Power mgmt	This controls how the Operator Panel uses and conserves power. For example, if this is set to Max, the backlight turns off after a specified period of inactivity.
Language	This is the language used in the Operator Panel.
Backlight timer	This is how long the Operator Panel remains backlit when there is no activity with the control panel. **Power Mgmt** must be set to Max.
Sleep timer	This is how many minutes the Operator Panel waits when there is no activity with the control panel before it can enter power-down mode. The Operator Panel does not enter power-down mode until the PCC enters power-down mode.
Sleep mode	This indicates whether or not power-down mode is enabled in the Operator Panel.
Contrast	This controls the contrast in the graphical display.

NAME	DESCRIPTION
Mode Change	This indicates whether or not a password is required to use the buttons on the Operator Panel to change the mode of operation. If this is set to Enabled, the password is required. If this is set to Disabled, the password is not required. This has no effect if a keyswitch controls the mode of operation.
Units	
Temperature	This controls the unit of measure for temperature used in the Operator Panel.
Fluid Pressure	This controls the unit of measure for fluid pressure used in the Operator Panel.
Gas Pressure	This controls the unit of measure for gas pressure used in the Operator Panel.
Fluid Flow	This controls the unit of measure fluid flow used in the Operator Panel.
Fluid Volume	This controls the unit of measure fluid volume used in the Operator Panel.

7.15 Clock Setup

Each label is described in the following table .

TABLE 80. CLOCK SETUP

NAME	DESCRIPTION
Clock	
Clock Hour	Use to set or read the current hour. (Password level: 1.) Allowed values: 0~23.
Clock Minute	Use to set or read the current minute. (Password level: 1.) Allowed values: 0~59.
Clock Second	Use to set or read the current second. (Password level: 1.) Allowed values: 0~59.
Clock Date	Use to set or read the current date. (Password level: 1.) Allowed values: 1~31.
Clock Month	Use to set or read the current month. (Password level: 1.) Allowed values: 1~12.
Clock Year	Use to set or read the current year. (Password level: 1.) Allowed values: 0~99.
Daylight saving time	
Daylight Savings Time Enable	Use to enable the daylight savings time feature. (Password level: 1.) Allowed values: Disabled, Enabled. (Default: Disabled.)
Daylight Savings Time Adjustment	Use to set the amount of daylight savings time adjustment applied. (Password level: 1.) Allowed values: 0~120 Minutes. (Default: 60 Minutes.)
Start	
Daylight Savings Start Month	Use to set the month when daylight savings time starts. (Password level: 1.) Allowed values: 1~12. (Default: 3.)

NAME	DESCRIPTION
Daylight Savings Start Week	Use to set the week of the month when daylight savings time starts. (Password level: 1.) Allowed values: First Week, Second Week, Third Week, Fourth Week, Last Week. (Default: Third Week.)
Daylight Savings Start Day	Use to set the day of the week when daylight savings time starts. (Password level: 1.) Allowed values: Sunday, Monday, Tuesday, Wednesday, Thursday, Friday, Saturday. (Default: Sunday.)
Daylight Savings Start Hour	Use to set the hour of the day when daylight savings time starts. (Password level: 1.) Allowed values: 0~23. (Default: 2.)
End	
Daylight Savings End Month	Use to set the month when daylight savings time ends. (Password level: 1.) Allowed values: 1~12. (Default: 11.)
Daylight Savings End Week	Use to set the week of the month when daylight savings time ends. (Password level: 1.) Allowed values: First Week, Second Week, Third Week, Fourth Week, Last Week. (Default: Second Week.)
Daylight Savings End Day	Use to set the day of the week when daylight savings time ends. (Password level: 1.) Allowed values: Sunday, Monday, Tuesday, Wednesday, Thursday, Friday, Saturday. (Default: Sunday.)
Daylight Savings End Hour	Use to set the hour of the day when daylight savings time ends. (Password level: 1.) Allowed values: 0~23. (Default: 2.)

7.15.1 Real-time Clock

The PCC has a real-time clock that is used to calculate how long the controller has been on, to create the timestamp on faults, and to support the schedulers. The clock displays time in 24-hour format and recognizes dates until 2100.

You can also set up daylight saving time. When daylight saving time begins, the PCC adds *Daylight Savings Time Adjustment* to the clock. If you disable daylight saving time before daylight saving time ends, the PCC does not automatically subtract *Daylight Savings Time Adjustment* from the clock. You have to adjust the clock manually.

If the battery is disconnected from the PCC, the real-time clock continues to run for about one hour. Afterwards, the PCC generates warning fault 1689 (Real Time Clock Power), and the clock has to be reset.

7.16 Modbus Setup (Setup/MODBUS)

Each label is described in the following table.

TABLE 81. MODBUS SETUP

NAME	DESCRIPTION
Modbus Node Address	Sets the Modbus address for this node (Password level: 1.) Allowed values: 1~247. (Default: 2.)
Modbus Baud Rate	Sets the Modbus baud rate. (Password level: 1.) Allowed values: 2400 Baud, 4800 Baud, 9600 Baud, 19200 Baud, 38400 Baud. (Default: 9600.)
Modbus Parity	Sets the Modbus parity for this node (Password level: 1.) Allowed values: Even, Odd, None. (Default: None.)
Modbus Stop Bits	Sets the Modbus number of stop bits for this node Limited to 1 bit if parity = Odd or Even. (Password level: 1.) Allowed values: 1, 2 (Default: 2.)
Modbus Failure Time Delay	Time delay before the control activates the Modbus failure fault after the master is sensed as no longer present. (Password level: 1.) Allowed values: 0~10 seconds. (Default: 4 seconds.)
Modbus Communications Lost Response Method	When set to Reset Commands will reset the Modbus control logicals to an inactive state when Modbus communications are lost (Password level: 1.) Allowed values: Do Nothing, Reset Commands. (Default: Do Nothing.)
Reset Modbus Commands	Resets all Modbus volatile commands (Password level: 1.) Allowed values: Inactive, Active. (Default: Inactive.)
Counters	
Modbus Bus Message Count	Modbus bus message count
Modbus Slave Message Count	Modbus slave message count
Modbus No Response Count	Modbus no response count
Modbus CRC Errors Count	Modbus CRC errors count
Modbus Exception Count	Modbus exception count
Modbus Clear Counters	Resets all Modbus counters (Password level: 1.) Allowed values: Do Nothing, Clear Counters. (Default: Do Nothing.)

7.16.1 Modbus

NOTICE
See http://www.modbus.org for more information about Modbus.

Connect the PCC via Modbus RTU (Remote Terminal Unit) protocol on a two-wire RS-485 master/slave bus. In this arrangement, the external device is the master, and the PCC is the slave.

The external device can use the Modbus connection to perform these tasks on the PCC:

- Monitor basic read-only parameters
- Write any parameter that is not considered a factory-setup or one-time-use parameter.
- Start and stop the genset.

The external device cannot access any information in tables.

The PCC uses eight data bits and one stop bit in Modbus connections. You can set up these parameters for Modbus connections:

- *Modbus Node Address*: This depends on the Modbus network to which the PCC is connected.
- *Modbus Baud Rate*: 2400 bps, 4800 bps, 9600 bps, 19200 bps, or 38400 bps.
- *Modbus Parity*: none, odd, or even.

For example, if you use WinTech's ModScan to verify Modbus communications, check these settings in ModScan:

- The **Device Id** should be *Modbus Node Address*.
- The **Baud Rate** should be *Modbus Baud Rate*.
- The **Word Length** should be 8.
- The **Parity** should be *Modbus Parity*.
- The **Stop Bits** should be 1.
- The **Transmission Mode** should be RTU.

The external device can read 1-40 contiguous registers, write 1-40 contiguous registers, or read diagnostic counters.

7.17 Adjust

Each label is described in the following table.

TABLE 82. ADJUST

NAME	DESCRIPTION
Voltage Calibration	
Genset LL Average Voltage	Genset Line to Line average voltage
Voltage Adjust	Set to a positive or negative adjustment to the nominal voltage. Allowed values: -5~5 %. (Default: 0 %.)
Rated/Idle Switch (PCCnet)	Volatile to store PCCnet device generated Rated/Idle Switch commands. Allowed values: Rated, Idle. (Default: Rated.)
Exercise Switch (PCCnet)	Temporary parameter to store PCCnet device generated Exercise Switch command. Allowed values: Inactive, Active. (Default: Inactive.)
Keyswitch	

NAME	DESCRIPTION
Keyswitch Status	Indicates if the output's status is Inactive or Active Allowed values: Inactive, Active. ***NOTICE*** **If the genset is stopped, select this parameter, and press OK on the Operator Panel to change the state of the ECM keyswitch connection. For example, if Keyswitch Status is inactive, select Keyswitch Status, and press OK to change the ECM keyswitch to active. You have to enter a level-1 password. The state remains changed until you press the Home button, C button, or OK button on the Operator Panel.**
Frequency Calibration	
Final Frequency Reference	The frequency scaled version of the final speed reference Allowed values: 0~100 Hz.
Frequency Adjust	A method of adding in a frequency offset to the base frequency subject to high and low limit calibrations Allowed values: -6~6 Hz. (Default: 0 Hz.)
AVR Gain Adjust Trim	A trim that allows the user to modify the overall gains of the AVR. Allowed values: 0.05~10. (Default: 1.)
Governor Gain Adjust	A trim that allows the user to modify the overall gain of the governor Allowed values: 0.05~10. (Default: 1.)
Start Time Delay	Time delay from receipt of a valid start command to initiation of cranking. (Password level: 1.) Allowed values: 0~300 seconds. (Default: 0 seconds.)
Time Delay to Stop	Sets time to run at rated speed before going to cooldown at idle. Does not apply to manual runs (Password level: 1.) Allowed values: 0~600 seconds. (Default: 0 seconds.)
Manual Warmup Bypass	Use to command idle speed or to bypass idle warmup during a manual run (Password level: 1.) Allowed values: Normal, Bypass Warmup.

7.18 Calibration

Each label is described in the following table.

TABLE 83. CALIBRATION

NAME	DESCRIPTINO
Genset 3 Phase Voltage Cal	
Genset L1L2 Voltage	Genset L1L2 voltage
Genset L12 Voltage Adjust	Genset L12 voltage Calibration trim (Password level: 1.) Allowed values: 90~110 %. (Default: 100 %.)

NAME	DESCRIPTINO
Genset L2L3 Voltage	Genset L2L3 voltage
Genset L23 Voltage Adjust	Genset L23 voltage Calibration trim (Password level: 1.) Allowed values: 90~110 %. (Default: 100 %.)
Genset L3L1 Voltage	Genset L3L1 voltage
Genset L31 Voltage Adjust	Genset L31 voltage Calibration trim (Password level: 1.) Allowed values: 90~110 %. (Default: 100 %.)
Genset 1 Phase Voltage Cal	
Genset L1N Voltage	Genset L1N voltage
Genset Single Phase L1N Voltage Adjust	Genset Single Phase L1N voltage Calibration trim. (Password level: 1.) Allowed values: 90~110 %. (Default: 100 %.)
Genset L2N Voltage	Genset L2N voltage
Genset Single Phase L2N Voltage Adjust	Genset Single Phase L2N voltage Calibration trim. (Password level: 1.) Allowed values: 90~110 %. (Default: 100 %.)
Genset Current Cal	
Genset L1 Current	Monitors the genset L1 current value.
Genset L1 Current Adjust	Genset L1 current Calibration trim in percentage. (Password level: 1.) Allowed values: 90~110 %. (Default: 100 %.)
Genset L2 Current	Genset L2 current
Genset L2 Current Adjust	Genset L2 current Calibration trim (Password level: 1.) Allowed values: 90~110 %. (Default: 100 %.)
Genset L3 Current	Genset L3 current
Genset L3 Current Adjust	Genset L3 current Calibration trim (Password level: 1.) Allowed values: 90~110 %. (Default: 100 %.)

7.19 Configurable I/O

Each label is described in the following table.

TABLE 84. CONFIGURABLE I/O

NAME	DESCRIPTION
Configurable Input Fault #1	
Configurable Input #1 Input Function Pointer	Configurable Input #1 Input function pointer. Feeds input signal to alternate function input if value not set to default (Password level: 1.) Allowed values: Default, Do Nothing, Low Fuel in Day Tank Switch, Low Coolant Switch #2, High Alt Temperature Switch, Ground Fault Switch, Exercise Switch, Battle Short Switch, Battery Charger Failed Switch, Low Engine Temperature Switch, Speed Droop Enable Switch, Voltage Droop Enable Switch, Rated/Idle Switch, AMM In Auto, Low Fuel pressure Switch, Start Signal Integrity Switch. (Default: Default.)
Configurable Input #1 Fault Response	If the configurable input #1 is configured as a fault input, this sets the fault level (Password level: 1.) Allowed values: None, Warning, Shutdown. (Default: None.)
Configurable Input #1 Active State Selection	Trim which allows Input #1 to be inverted logically in the software. (Password level: 1.) Allowed values: Active Closed, Active Open. (Default: Active Closed.)
Configurable Input #1 Fault Text	Trim to define the 16 character string for use by the Operator panel when this fault becomes active. (Password level: 1.)
Configurable Input Fault #2	
Configurable Input #2 Input Function Pointer	Configurable Input #2 Input function pointer. Feeds input signal to alternate function input if value not set to default. (Password level: 1.) Allowed values: Default, Do Nothing, Low Fuel in Day Tank Switch, Low Coolant Switch #2, High Alt Temperature Switch, Ground Fault Switch, Exercise Switch, Battle Short Switch, Battery Charger Failed Switch, Low Engine Temperature Switch, Speed Droop Enable Switch, Voltage Droop Enable Switch, Rated/Idle Switch, AMM In Auto, Low Fuel Pressure Switch, Start Signal Integrity Switch. (Default: Default.)
Configurable Input #2 Fault Response	If the configurable input #2 is configured as a fault input, this sets the fault level (Password level: 1.) Allowed values: None, Warning, Shutdown. (Default: None.)
Configurable Input #2 Active State Selection	Trim which allows Input #2 to be inverted logically in the software. (Password level: 1.) Allowed values: Active Closed, Active Open. (Default: Active Closed.)
Configurable Input #2 Fault Text	Trim to define the 16 character string for use by the Operator panel when this fault becomes active. (Password level: 1.)

NAME	DESCRIPTION
Configurable Input Fault #13	
Configurable Input #13 Input Function Pointer	Configurable Input #13 Input function pointer. Feeds input signal to alternate function input if value not set to default. (Password level: 1.) Allowed values: Default, Do Nothing, Low Fuel in Day Tank Switch, Low Coolant Switch #2, High Alt Temperature Switch, Ground Fault Switch, Exercise Switch, Battle Short Switch, Battery Charger Failed Switch, Low Engine Temperature Switch, Speed Droop Enable Switch, Voltage Droop Enable Switch, Rated/Idle Switch, AMM In Auto, Low Fuel Pressure Switch, Start Signal Integrity Switch. (Default: Default.)
Configurable Input #13 Fault Response	If the configurable input #3 is configured as a fault input, this sets the fault level (Password level: 1.) Allowed values: None, Warning, Shutdown. (Default: Event.)
Configurable Input #13 Active State Selection	Trim which allows Input #13 to be inverted logically in the software. (Password level: 1.) Allowed values: Active Closed, Active Open. (Default: Active Closed.)
Configurable Input #13 Fault Text	Trim to define the 16 character string for use by the Operator panel when this fault becomes active. (Password level: 1.)
Configurable Input Fault #14	
Configurable Input #14 Input Function Pointer	Configurable Input #14 Input function pointer. Feeds input signal to alternate function input if value not set to default (Password level: 1.) Allowed values: Default, Do Nothing, Low Fuel in Day Tank Switch, Low Coolant Switch #2, High Alt Temperature Switch, Ground Fault Switch, Exercise Switch, Battle Short Switch, Battery Charger Failed Switch, Low Engine Temperature Switch, Speed Droop Enable Switch, Voltage Droop Enable Switch, Rated/Idle Switch, AMM In Auto, Low Fuel Pressure Switch, Start Signal Integrity Switch. (Default: Default.)
Configurable Input #14 Fault Response	If the configurable input #4 is configured as a fault input, this sets the fault level (Password level: 1.) Allowed values: None, Warning, Shutdown. (Default: Event.)
Configurable Input #14 Active State Selection	Trim which allows Input #14 to be inverted logically in the software. (Password level: 1.) Allowed values: Active Closed, Active Open. (Default: Active Closed.)
Configurable Input #14 Fault Text	Trim to define the 16 character string for use by the Operator panel when this fault becomes active. (Password level: 1.)
Coolant Level/Input #5	

NAME	DESCRIPTION
Coolant Level/Configurable Input #5 Function Pointer	Coolant Level Input function pointer. Feeds input signal to alternate function input if value not set to default (Password level: 1.) Allowed values: Default, Do Nothing, Low Fuel in Day Tank Switch, Low Coolant Switch #2, High Alt Temperature Switch, Ground Fault Switch, Exercise Switch, Battle Short Switch, Battery Charger Failed Switch, Low Engine Temperature Switch, Speed Droop Enable Switch, Voltage Droop Enable Switch, Rated/Idle Switch, AMM In Auto, Low Fuel Pressure Switch, Start Signal Integrity Switch. (Default: Default.)
Coolant Level/Configurable Input #5 Active State Selection	Coolant Level input software logic state inversion bypass control (Password level: 1.) Allowed values: Active Closed, Active Open. (Default: Active Closed.)
Low Fuel/Input #6	
Low Fuel/Configurable Input #6 Function Pointer	Low Fuel Input function pointer. Feeds input signal to alternate function input if value not set to default (Password level: 1.) Allowed values: Default, Do Nothing, Low Fuel in Day Tank Switch, Low Coolant Switch #2, High Alt Temperature Switch, Ground Fault Switch, Exercise Switch, Battle Short Switch, Battery Charger Failed Switch, Low Engine Temperature Switch, Speed Droop Enable Switch, Voltage Droop Enable Switch, Rated/Idle Switch, AMM In Auto, Low Fuel Pressure Switch, Start Signal Integrity Switch. (Default: Default.)
Low Fuel FC 1441 Genset Response	Sets the genset response for fault code 1441. (Password level: 1.) Allowed values: None, Warning, Shutdown. (Default: Warning.)
Low Fuel/Configurable Input #6 Active State Selection	Low Fuel input software logic state inversion bypass control (Password level: 1.) Allowed values: Active Closed, Active Open. (Default: Active Closed.)
Fault Reset/Input #10	
Fault Reset/Configurable Input #10 Function Pointer	Fault Reset Input function pointer. Feeds input signal to alternate function input if value not set to default (Password level: 1.) Allowed values: Default, Do Nothing, Low Fuel in Day Tank Switch, Low Coolant Switch #2, High Alt Temperature Switch, Ground Fault Switch, Exercise Switch, Battle Short Switch, Battery Charger failed Switch, Low Engine Temperature Switch, Speed Droop Enable Switch, Voltage Droop Enable Switch, Rated/Idle Switch, AMM In Auto, Low Fuel Pressure Switch, Start Signal Integrity Switch. (Default: Default.)

NAME	DESCRIPTION
Fault Reset/Configurable Input #10 Active State Selection	Fault Reset input software logic state inversion bypass control. (Password level: 1.) Allowed values: Active Closed, Active Open. (Default: Active Closed.)
Start Type/Input #11	
Start Type/Configurable Input #11 Function Pointer	Start Type Input function pointer. Feeds input signal to alternate function input if value not set to default (Password level: 1.) Allowed values: Default, Do Nothing, Low Fuel in Day Tank Switch, Low Coolant Switch #2, High Alt Temperature Switch, Ground Fault Switch, Exercise Switch, Battle Short Switch, Battery Charger Failed Switch, Low Engine Temperature Switch, Speed Droop Enable Switch, Voltage Droop Enable Switch, Rated/Idle Switch, AMM In Auto, Low Fuel Pressure Switch, Start Signal Integrity Switch. (Default: Default.)
Start Type/Configurable Input #11 Active State Selection	Start Type input software logic state inversion bypass control (Password level: 1.) Allowed values: Active Closed, Active Open. (Default: Active Closed.)
Rupture Basin/Input #12	
Rupture Basin/Configurable Input #12 Function Pointer	Rupture Basin Input function pointer. Feeds input signal to alternate function input if value not set to default (Password level: 1.) Allowed values: Default, Do Nothing, Low Fuel in Day Tank Switch, Low Coolant Switch #2, High Alt Temperature Switch, Ground Fault Switch, Exercise Switch, Battle Short Switch, Battery Charger Failed Switch, Low Engine Temperature Switch, Speed Droop Enable Switch, Voltage Droop Enable Switch, Rated/Idle Switch, AMM In Auto, Low Fuel pressure Switch, Start Signal Integrity Switch. (Default: Default.)
Rupture Basin Level Response	Sets rupture basin fault response to None, Warning or Shutdown. (Password level: 1.) Allowed values: None, Warning, Shutdown. (Default: Warning.)
Rupture Basin/Configurable Input #12 Active State Selection	Rupture Basin input software logic state inversion bypass control (Password level: 1.) Allowed values: Active Closed, Active Open. (Default: Active closed.)
Configurable Output #1	
Configurable Output #1 Event Code	The event code for this output. (Password level: 1.) Allowed values: 0~65530. (Default: 1540.)

NAME	DESCRIPTION
Configurable Output #1 Output Function Pointer	Points to the function that controls the output (Password level: 1.) Allowed values: Default, Do Nothing, Common Warning, Common Shutdown, Rated to Idle Transition Event, Fault Code Function #1, Fault Code Function #2, Fault Code Function #3, Fault Code Function #4, Fault Code Function #5. (Default: Default.)
Configurable Output #1 Invert Bypass	Controls whether the output function is inverted or not. Bypassed = function not inverted (Password level: 1.) Allowed values: Not Bypassed, Bypassed. (Default: Bypassed.)
Configurable Output #2	
Configurable Output #2 Event Code	The event code for this output. (Password level: 1.) Allowed values: 0~65530. (Default: 1541.)
Configurable Output #2 Output Function Pointer	Points to the function that controls the output (Password level: 1.) Allowed values: Default, Do Nothing, Common Warning, Common Shutdown, Rated to Idle Transition Event, Fault Code Function #1, Fault Code Function #2, Fault Code Function #3, Fault Code Function #4, Fault Code Function #5. (Default: Default.)
Configurable Output #2 Invert Bypass	Controls whether the output function is inverted or not. Bypassed = function not inverted (Password level: 1.) Allowed values: Not Bypassed, Bypassed. (Default: Bypassed.)
Fault Code Function #1 Fault/Event Code	The fault/event code for this configurable function output. (Password level: 1.) Allowed values: 0~65530. (Default: 0.)
Fault Code Function #2 Fault/Event Code	The fault/event code for this configurable function output. (Password level: 1.) Allowed values: 0~65530. (Default: 0.)
Fault Code Function #3 Fault/Event Code	The fault/event code for this configurable function output. (Password level: 1.) Allowed values: 0~65530. (Default: 0.)
Configurable Output #3	
Configurable Output #3 Event Code	The event code for this output. (Password level: 1.) Allowed values: 0~65530. (Default: 1463.)
Configurable Output #3 Output Function Pointer	Points to the function that controls the output (Password level: 1.) Allowed values: Default, Do Nothing, Common Warning, Common Shutdown, Rated to Idle Transition Event, Fault Code Function #1, Fault Code Function #2, Fault Code Function #3, Fault Code Function #4, Fault Code Function #5. (Default: Default.)

NAME	DESCRIPTION
Configurable Output #3 Invert Bypass	Controls whether the output function is inverted or not. Bypassed = function not inverted (Password level: 1.) Allowed values: Not Bypassed, Bypassed. (Default: Bypassed.)
Configurable Output #4	
Configurable Output #4 Event Code	The event code for this output. (Password level: 1.) Allowed values: 0~65530. (Default: 1465.)
Configurable Output #4 Output Function Pointer	Points to the function that controls the output (Password level: 1.) Allowed values: Default, Do Nothing, Common Warning, Common Shutdown, Rated to Idle Transition Event, Fault Code Function #1, Fault Code Function #2, Fault Code Function #3, Fault Code Function #4, Fault Code Function #5. (Default: Default.)
Configurable Output #4 Invert Bypass	Controls whether the output function is inverted or not. Bypassed = function not inverted (Password level: 1.) Allowed values: Not Bypassed, Bypassed. (Default: Bypassed.)
Fault Code Function #4 Fault/Event Code	The fault/event code for this configurable function output. (Password level: 1.) Allowed values: 0~65530. (Default: 0.)
Fault Code Function #5 Fault/Event Code	The fault/event code for this configurable function output. (Password level: 1.) Allowed values: 0~65530. (Default: 0.)
Ready to Load/Output #5	
Ready To Load /Configurable Output #5 Output Function Pointer	Points to the function that controls the output (Password level: 1.) Allowed values: Default, Do Nothing, Common Warning, Common Shutdown, Rated to Idle Transition Event, Fault Code Function #1, Fault Code Function #2, Fault Code Function #3, Fault Code Function #4, Fault Code Function #5. (Default: Default.)
Ready To Load /Configurable Output #5 Invert Bypass	Controls whether the output function is inverted or not. Bypassed = function not inverted (Password level: 1.) Allowed values: Not Bypassed, Bypassed. (Default: Bypassed.)
Oil Priming Pump/Output #6	
Oil Priming Pump / Configurable Output #6 Output Function Pointer	Points to the function that controls the output (Password level: 1.) Allowed values: Default, Do Nothing, Common Warning, Common Shutdown, Rated to Idle Transition Event, Fault Code Function #1, Fault Code Function #2, Fault Code Function #3, Fault Code Function #4, Fault Code Function #5. (Default: Default.)

NAME	DESCRIPTION
Oil Priming Pump / Configurable Output #6 Invert Bypass	Controls whether the output function is inverted or not. If bypassed, the function is not inverted (Password level: 1.) Allowed values: Not Bypassed, Bypassed. (Default: bypassed.)
Local Status/Output #7	
Local Status / Configurable Output #7 Output Function Pointer	Points to the function that controls the output (Password level: 1.) Allowed values: Default, Do Nothing, Common Warning, Common Shutdown, Rated to Idle Transition Event, Fault Code Function #1, Fault Code Function #2, Fault Code Function #3, Fault Code Function #4, Fault Code Function #5. (Default: Default.)
Local Status / Configurable Output #7 Invert Bypass	Controls whether the output function is inverted or not. Bypassed = function not inverted (Password level: 1.) Allowed values: Not Bypassed, Bypassed. (Default: Bypassed.)
Glow Plug/Output #8	**NOTE: This input is reserved for future use.**
Glow Plug / Configurable Output #8 Output Function Pointer	Points to the function that controls the output (Password level: 1.) Allowed values: Default, Do Nothing, Common Warning, Common Shutdown, Rated to Idle Transition Event, Fault Code Function #1, Fault Code Function #2, Fault Code Function #3, Fault Code Function #4, Fault Code Function #5. (Default: Default.)
Glow Plug / Configurable Output #8 Invert Bypass	Controls whether the output function is inverted or not. Bypassed = function not inverted (Password level: 1.) Allowed values: Not Bypassed, Bypassed. (Default: Bypassed.)
Delayed Off/Output #10	
Delayed Off / Configurable Output #10 Output Function Pointer	Points to the function that controls the output (Password level: 1.) Allowed values: Default, Do Nothing, Common Warning, Common Shutdown, Rated to Idle Transition Event, Fault Code Function #1, Fault Code Function #2, Fault Code Function #3, Fault Code Function #4, Fault Code Function #5. (Default: Default.)
Delayed Off / Configurable Output #10 Invert Bypass	Controls whether the output function is inverted or not. Bypassed = function not inverted (Password level: 1.) Allowed values: Not Bypassed, Bypassed. (Default: Bypassed.)
Load Dump/Output #11	

NAME	DESCRIPTION
Load Dump / Configurable Output #11 Output Function Pointer	Points to the function that controls the output (Password level: 1.) Allowed values: Default, Do Nothing, Common Warning, Common Shutdown, Rated to Idle Transition Event, Fault Code Function #1, Fault Code Function #2, Fault Code Function #3, Fault Code Function #4, Fault Code Function #5. (Default: Default.)
Load Dump / Configurable Output #11 Invert Bypass	Controls whether the output function is inverted or not. Bypassed = function not inverted (Password level: 1.) Allowed values: Not Bypassed, Bypassed. (Default: Bypassed.)

7.19.1 Configurable Inputs

Each configurable input has a default function. These default functions are identified in the following table.

TABLE 85. DEFAULT FUNCTIONS FOR CONFIGURABLE INPUTS

INPUT	DEFAULT FUNCTIONS FOR CONFIGURABLE INPUTS
1	Event/fault Input
2	Event/fault Input
5	Low Coolant Level Switch
6	Low Fuel Level Switch
10	Remote Fault Reset Switch
11	Start Type
12	Rupture Basin Switch
13	Event/fault Input
14	Event/fault Input

Default functions are available only on the indicated inputs. For example, Configurable Input #6 can be a Low Fuel Level Switch but not an event/fault Input.

Each configurable input can also be mapped to one of these functions, instead of their default function:

- Low Fuel in Day Tank Switch
- Low Coolant Switch #2
- High Alt Temperature Switch
- Ground/Earth Fault Switch
- Exercise Switch
- Battle Short Switch
- Battery Charger Failed Switch
- Low Engine Temperature Switch
- Speed Droop Enable Switch
- Voltage Droop Enable Switch

- Rated/Idle Switch
- AMM In Auto
- Low Fuel Pressure Switch
- Start Signal Integrity Switch

NOTICE
Currently, Speed Droop Enable Switch and Voltage Droop Enable Switch are not available, but they appear in the Operator Panel.

NOTICE
You can only map one configurable input to each of these functions. For example, there cannot be two Battle Short Switches.

You can also set up a configurable input to do nothing at all.

You can specify the function of each configurable input if this ability is not locked. For example, if *Configurable Input #1 Factory Lock* is Not Locked, use *Configurable Input #1 Input Function Pointer_* to specify the function of Configurable Input #1. If *Configurable Input #1 Factory Lock* is Locked, you can still look at *Configurable Input #1 Input Function Pointer_* to see what the current function of Configurable Input #1 is.

You can specify the active state for each configurable input. For example, *Configurable Input #1 Active State Selection* specifies the active state for Configurable Input #1.

7.19.2 Configurable Outputs

Each configurable output has a default function. These default functions are identified in the following table.

TABLE 86. DEFAULT FUNCTIONS FOR CONFIGURABLE OUTPUTS

OUTPUT	DEFAULT FUNCTIONS
1	Event/fault Output
2	Event/fault Output
3	Event/fault Output
4	Event/fault Output
5	Ready To Load
6	Oil Priming Pump
7	Local Status
8	Glow Plug
10	Delayed Off
11	Load Dump

Default functions are available only on the indicated outputs. For example, Configurable Output #5 can generate a Ready To Load signal but not a Delayed Off signal.

Each configurable output can also be mapped to one of these functions, instead of their default function:

- Event code 1540 (Common Warning)
- Event code 1541 (Common Shutdown)
- Event code 1122 (Rated to Idle Delay)
- *Fault Code Function #1*
- *Fault Code Function #2*
- *Fault Code Function #3*
- *Fault Code Function #4*
- *Fault Code Function #5*

You can map each Fault Code Function parameter to a specific event/fault code.

You can only map one configurable output to each of these functions. For example, there cannot be two Common Shutdown outputs.

You can also set up a configurable output to do nothing at all.

In addition, you can specify the function of each configurable output if this ability is not locked. For example, use *Configurable Output #1 Output Function Pointer* to specify the function of Configurable Output #1 if *Configurable Output #1 Factory Lock* is Not Locked. If *Configurable Output #1 Factory Lock* is Locked, you can still look at *Configurable Output #1 Output Function Pointer* to see what the current function of Configurable Output #1 is.

You can specify whether or not the PCC should invert the output signal. For example, *Configurable Output #1 Invert Bypass* is set to Not Bypassed if Configurable Output #1 should be inverted.

Event/fault Outputs (Default Function for Configurable Outputs #1, #2, #3, #4, #20, #21, and #22)

Use one of these parameters to map a configurable output to a specific event/fault code:

- *Configurable Output #1 Event Code*
- *Configurable Output #2 Event Code*
- *Configurable Output #3 Event Code*
- *Configurable Output #4 Event Code*

The configurable output follows the status of the event. If the event is active, the configurable output is active. If the event is inactive, the configurable output is inactive.

Ready To Load (Default Function for Configurable Output #5)

The PCC may notify a device when event 1465 (Ready to Load) is active.

Event 1465 (Ready to Load) is active when these conditions are met.

- The genset is running at 90% rated voltage.
- The genset is running at 90% rated frequency.
- The PCC is in Auto mode; or the PCC is in Manual mode, and *Excitation Disable Override* is Excitation On.

This event can be active when the genset is running at rated speed and voltage and when the PCC is running the Time Delay to Stop step, the Rated Cooldown Time step, or the Rated to Idle Transition Delay step in the stop sequence.

Oil Priming Pump (Default Function for Configurable Output #6)

The PCC may be connected to the oil-priming pump to prelube the engine. This reduces wear and damage to moving parts in the engine after long periods of inactivity.

Local Status (Default Function for Configurable Output #7)

This default function is reserved for future use. You can map this configurable input to a different function, however.

Glow Plug (Default Function for Configurable Output #8)

This default function is reserved for future use. You can map this configurable input to a different function, however.

Delayed Off (Default Function for Configurable Output #10)

The PCC may notify a device when the PCC runs Start Engine. The connection remains active for *Delayed Off FSO Relay Time* after the stop sequence has finished.

The PCC may notify a device when warning fault code 1464 (Load Dump Fault) is active when one of these conditions applies.

- A derate event is active.
- A delayed shutdown is active.
- Load dump overload and underfrequency protection.

7.20 Genset Setup (Setup/Genset)

Each label is described in the following table.

TABLE 87. GENSET SETUP

NAME	DESCRIPTION
Setup Mode Enable	Volatile to allow into Setup Mode.
Genset Nominal Voltage	Genset nominal line-line voltage (Password level: 1.) Allowed values: 1~45000 Vac. (Default: 1 Vac.)
Genset Delta/Wye Connection	Delta or Wye for Genset connection (Password level: 1.) Allowed values: Delta, Wye. (Default: Wye.)
Single/3 Phase Connection	Setup mode interlocked. Genset's single phase/3 phase metering setup configuration. (Password level: 1.) Allowed values: Single Phase, Three Phase. (Default: Three Phase.)
Application Rating Select	Selects genset's standby/prime/base application rating. (Password level: 1.) Allowed values: Standby, Prime, Base. (Default: Standby.)
Alternate Frequency Switch	Sets the genset nominal frequency. (Password level: 1.) Allowed values: 50 Hz, 60 Hz. (Default: 60Hz.)
Idle Speed	Sets the speed at which the engine will idle subject to high and low limit calibrations (Password level: 1.) Allowed values: 700~1100 rpm. (Default: 800 rpm.)

NAME	DESCRIPTION
Power Down Mode Enable	Trim to enable sleep mode (Password level: 1.) Allowed values: Disable, Enable. (Default: Enable.)
Power Down Mode Time Delay	Timer setting for the Power Down delay feature (Password level: 1.) Allowed values: 0~600 seconds. (Default: 600 seconds.)
Auto Sleep Enable	Trim that determines if the control will Stay Awake in Auto mode or Fall asleep in Auto mode. (Password level: 1.) ***NOTICE*** **This trim must be set to Awake in Auto for the generator set to meet NFPA 110 requirements.** Allowed values: Awake in Auto, Sleep in Auto.
Genset Exercise Time	Sets the total exercise time not including warmup at idle or idle cooldown time (Password level: 1.) Allowed values: 0~25 hours. (Default: 0 hours.)
AVR Gain Adjust Trim	A trim that allows the user to modify the overall gains of the AVR. (Password level: 1.) Allowed values: 0.05~10. (Default: 1.)
Governor Gain Adjust	A trim that allows the user to modify the overall gain of the governor (Password level: 1.) Allowed values: 0.05~10. (Default: 1.)
Voltage Ramp Time	The time period over which the voltage setpoint command should rise from 0% to the target voltage (Password level: 2.) Allowed values: 0~5 seconds. (Default: 1.25 seconds.)
AVR Damping Effect (50 Hz)	Increases or decreases the output response of the AVR. A lower input value will increase the transient response. A higher value will decrease the transient response. (Password level: 2.) Allowed values: 0~99.99. (Default: 78.)
AVR Damping Effect (60 Hz)	Increases or decreases the output response of the AVR. A lower input value will increase the transient response. A higher value will decrease the transient response. (Password level: 2.) Allowed values: 0~99.99. (Default: 79.)
V/Hz Rolloff Slope (50Hz) V/Hz Rolloff Slope (60Hz)	The amount of voltage roll off when the frequency is below the knee frequency (Password level: 1.) Allowed values: 0~10 % / Hz. (Default: 2.2 % / Hz.)
V/Hz Knee Frequency (50Hz) V/Hz Knee Frequency (60Hz)	The voltage will roll off (decrease) proportionally to the V/Hz setup, once the frequency drops below the set point in the V/Hz Knee Frequency. This allows the genset to recover faster when the frequency drops. (Password level: 1.) Allowed values: 0~10 Hz. (Default: 1 Hz.)
Genset Source Name	Name for the genset source. (Password level: 1.)
Site ID	name of site (Password level: 1.)
Cycle crank	

Cycle / Cont Crank Select	Selects whether to use continuous cranking or cycle cranking when attempting to start engine (Password level: 1.) Allowed values: Cycle, Continuous. (Default: Cycle.)
Crank Attempts	Sets the maximum number of times to engage the starter when attempting to start engine using the cycle cranking method (Password level: 1.) Allowed values: 1~7. (Default: 3.)
Continuous Crank Engage Time	Sets the maximum amount of time to engage the starter when using the continuous cranking method (Password level: 1.) Allowed values: 40~100 seconds. (Default: 75 seconds.)
Cycle Crank Engage Time	Sets the maximum amount of time to engage the starter during a single crank attempt when using the cycle cranking method (Password level: 1.) Allowed values: 2~20 seconds. (Default: 15 seconds.)
Cycle Crank Rest Time	Rest time between start attempts for cycle crank mode. (Password level: 1.) Allowed values: 0~60 seconds. (Default: 30 seconds.)
Starter Disconnect Speed	Sets the engine speed at which the cranking algorithm disconnects the starter. (Password level: 1.) Allowed values: 100~1100 rpm. (Default: 450 rpm.)
Start Time Delay	Time delay from receipt of a valid start command to initiation of cranking. (Password level: 1.) Allowed values: 0~300 seconds. (Default: 0 seconds.)
Time Delay to Stop	Sets time to run at rated speed before going to cooldown at idle. Does not apply to manual runs (Password level: 1.) Allowed values: 0~600 seconds. (Default: 0 seconds.)
Delayed Off FSO Relay Time	Time delay between when the Delayed Off Command turns off and Run Command turns off (Password level: 1.) Allowed values: 0~120 seconds. (Default: 0 seconds.)
Idle Warmup Coolant Temp	Coolant temperature threshold to end idle warmup time (Password level: 1.) Allowed values: -40~300 degF. (Default: 100 degF.)
Idle Warmup Time	Sets maximum idle warmup time. Warmup time may be less if coolant temperature exceeds threshold (Password level: 1.) Allowed values: 0~3600 seconds. (Default: 0 seconds.)
Max Idle Time	Sets the fault time for the Too Long in Idle fault. (Password level: 2.) Allowed values: 0~20 minutes. (Default: 10 minutes.)
Idle to Rated Ramp Time	The time over which the speed reference is to ramp from idle speed to rated speed (Password level: 1.) Allowed values: 0~30 seconds. (Default: 0 seconds.)
Rated to Idle Transition Delay	Sets the delay time for transitioning from Rated to Idle speed. 0 seconds = feature is disabled. (Password level: 1.) Allowed values: 0~10 seconds. (Default: 0 seconds.)
Rated to Idle Ramp Time	The time over which the speed reference is to ramp from rated speed to idle speed (Password level: 1.) Allowed values: 0~30 seconds. (Default: 2 seconds.)

Rated Cooldown Time	Minimum time to spend at rated speed less than 10% load before normal shutdown is allowed (Password level: 1.) Allowed values: 0~600 seconds. (Default: 180 seconds.)
Idle Cooldown Time	Sets time to run at idle before shutting down genset on normal stops (Password level: 1.) Allowed values: 0~60 minutes. (Default: 2 minutes.)
Rupture Basin Time	Rupture Basin fault time delay (Password level: 1.) Allowed values: 0~20 seconds. (Default: 2 seconds.)
Prelube	
Prelube Cycle Enable	Enables Or Disables the cyclic mode of prelube operation (Password level: 1.) Allowed values: Disabled, Enabled. (Default: Disabled.)
Prelube Cycle Time	Sets the period of the Prelube Cycle Iteration (Password level: 1.) Allowed values: 1~1000 hours. (Default: 168 hours.)
Prelube Oil Pressure Threshold	The oil pressure value which when reached the prelube driver will turn off (Password level: 1.) Allowed values: 0~10 psig. (Default: 3 psig.)
Prelube Timeout Period	Sets the maximum time for which the Prelube Driver will Remain ON (Password level: 1.) Allowed values: 0~30 seconds. (Default: 10 seconds.)
Reverse Power	
Reverse kW Threshold	Sets the Reverse kW fault trip threshold as percentage of Standby kW rating. (Password level: 1.) Allowed values: 5~30 %. (Default: 10 %.)
Reverse kW Time Delay	Sets the Reverse kW fault trip time delay (Password level: 1.) Allowed values: 1~15 seconds. (Default: 3 seconds.)
Reverse kVAR Threshold	Sets the Reverse kVAR fault trip threshold as percentage of Standby kW rating. (Password level: 1.) Allowed values: 15~50 %. (Default: 20 %.)
Reverse kVAR Time Delay	Sets the Reverse kVAR fault trip time delay (Password level: 1.) Allowed values: 1~60 seconds. (Default: 10 seconds.)
Load Dump	
Load Dump Activation Method	Enables the load dump output as a function of the overload and underfrequency conditions (Password level: 1.) Allowed values: Overload, Underfrequency, Overload or Underfrequency, Disabled. (Default: Overload or Underfrequency.)
Load Dump Overload Threshold	The load dump overload threshold as a percentage of the genset application rating (Password level: 1.) Allowed values: 80~140 %. (Default: 105 %.)
Load Dump Overload Set Time	The time delay until the load dump overload condition is set active (Password level: 1.) Allowed values: 0~120 seconds. (Default: 60 seconds.)
Load Dump Underfrequency Threshold	The frequency trip threshold for the load dump underfrequency condition Allowed values: 0~90 Hz.

Load Dump Underfrequency Offset	The frequency amount which the load dump underfrequency threshold is below the final frequency reference (Password level: 1.) Allowed values: 0~10 Hz. (Default: 3 Hz.)
Load Dump Underfrequency Set Time	The time delay until the load dump underfrequency condition is set active (Password level: 1.) Allowed values: 0~20 seconds. (Default: 3 seconds.)
Overload Warning	
Overload Warning Threshold	Sets the Overload Warning fault trip threshold as percentage of genset application kW rating. (Password level: 1.) Allowed values: 80~140 %. (Default: 105 %.)
Overload Warning Set Time	The time delay until an overload condition is reported as a fault (Password level: 1.) Allowed values: 1~120 seconds. (Default: 60 seconds.)
Low Coolant Temp Warning	
LCT Warning Threshold	Sets threshold for the low coolant temp fault warning. (Password level: 1.) Allowed values: -20~100 degF. (Default: 70 degF.)
LCT Warning Set Time	Sets time to set the low coolant temp fault. (Password level: 1.) Allowed values: 0~30 Minutes. (Default: 1 Minutes.)
LCT Warning Clear Time	Sets time to clear the low coolant temp fault. (Password level: 1.) Allowed values: 0~30 Minutes. (Default: 1 min.)
LCL Detection Response	Sets low coolant level fault response to None, Warning or Shutdown. (Password level: 2.) Allowed values: None, Warning, Shutdown. (Default: None.)
Low Fuel Set/Clear Time	A trim that sets the delay time for generating the inactive and active faults. (Password level: 1.) Allowed values: 2~60 seconds. (Default: 2 seconds.)
Low Fuel in Day Tank Time	Low Fuel in Day Tank Fault time delay from switch input. (Password level: 1.) Allowed values: 0~20 seconds. (Default: 2 seconds.)
Delayed Shutdown	
Delayed Shutdown Enable	Enables the Delayed Shutdown feature. (Password level: 1.) Allowed values: Disabled, Enabled. (Default: Disabled.)
Delayed Shutdown Time Delay	Sets the shutdown fault delayed time delay for the Delayed Shutdown feature. (Password level: 1.) Allowed values: 0~3 seconds. (Default: 2 seconds.)
Controlled Shutdown	
Controlled Shutdown Max Ramp Unload Time	Maximum ramp unload time during a shutdown with cooldown (Password level: 1.) Allowed values: 0~300 seconds. (Default: 60 seconds.)
Controlled Shutdown Advance Notice Delay	Delay allowed for a shutdown with cooldown fault prior to shutting down the genset (Password level: 1.) Allowed values: 0~300 seconds. (Default: 60 seconds.)

Genset Neutral CT Primary Current	Genset Neutral CT primary current. 0 = Disable amperage metering. (Password level: 1.) Allowed values: 0~10000 Amps. (Default: 0 Amps.)
Exercise Scheduler Enable	Enables the exercise scheduler. (Password level: 1.) Allowed values: Disabled, Enabled. (Default: Disabled.)
Scheduler Program	
Scheduler Program Select	Used to select a program to adjust. Allowed values: 1~12. (Default: 1.)
Scheduler Program x Enable	Used to enable or disable the selected program. Allowed values: Disable, Enable. (Default: Disable.)
Scheduler Program x Run Mode	Used to adjust the run mode for the selected program. Allowed values: No Load, With Load. (Default: Once.)
Scheduler Program x Start Day	Used to adjust the start day of the week for the selected program. Allowed values: Sunday, Monday, Tuesday, Wednesday, Thursday, Friday, Saturday. (Default: Sunday.)
Scheduler Program x Start Hour	Used to adjust the start hour for the selected program. Allowed values: 0~23. (Default: 0.)
Scheduler Program x Start Minute	Used to adjust the start minute for the selected program. Allowed values: 0~59. (Default: 0.)
Scheduler Program x Duration Hours	Used to adjust the length in hours for the selected program. Allowed values: 0~23. (Default: 0.)
Scheduler Program x Duration Minutes	Used to adjust the length in minutes for the selected program. Allowed values: 1~59. (Default: 1.)
Scheduler Program x Repeat Interval	Used to adjust the repeat interval for the selected program. Allowed values: Once, Every Week, Every 2 Weeks, Every 3 Weeks, Every 4 Weeks, Every 5 Weeks, First Week of Month, Second Week of Month, Third Week of Month, Fourth Week of Month, Last Week of Month. (Default: Once.)
Exception Program	
Scheduler Exception Select	Used to select an exception to adjust. Allowed values: 1~6. (Default: 1.)
Scheduler Exception x Enable	Used to enable or disable the selected exception. Allowed values: Disable, Enable. (Default: Disable.)
Scheduler Exception x Month	Used to adjust the starting month for the selected exception. Allowed values: 1~12. (Default: 1.)
Scheduler Exception x Date	Used to adjust the date for the selected exception. Allowed values: 1~31. (Default: 1.)
Scheduler Exception x Hour	Used to adjust the starting hour for the selected exception. Allowed values: 0~23. (Default: 0.)
Scheduler Exception x Minute	Used to adjust the starting minute for the selected exception. Allowed values: 0~59. (Default: 0.)

Scheduler Exception x Duration Days	Used to adjust the length in days for the selected exception. Allowed values: 0~44. (Default: 0.)
Scheduler Exception x Duration Hours	Used to adjust the length in hours for the selected exception. Allowed values: 0~23. (Default: 0.)
Scheduler Exception x Duration Minutes	Used to adjust the length in minutes for the selected exception. Allowed values: 0~59. (Default: 0.)
Scheduler Exception x Repeat	Used to adjust the repeat interval for the selected exception. Allowed values: Once Only, Every Year. (Default: Once Only.)
Aux 101 Settings	
Fuel Tank Capacity (Aux101)	Trim to set the fuel tank capacity. (Password level: 1) Allowed values: 0~15000 Gallons (Default: 173 Gallons)

7.20.1 Application Rating

The PCC uses the application rating to protect the generator set against overload conditions. The rating is measured in kVA.

The PCC stores up to twelve kVA ratings. Use these parameters to specify the appropriate one:

- *Application Rating Select*
- *Alternate Frequency Switch*
- *Single/3 Phase Connection*

7.20.2 V/Hz Curve

Some non-linear loads demand high current when they start up or when they take on a large block load. This demand can cause significant voltage drops and frequency dips. The PCC can reduce the voltage setpoint proportionally with engine speed to reduce underspeed conditions or undervoltage conditions but not both.

Usually, the V/Hz curve is set up to optimize engine speed recovery under block loading. It may need to be adjusted in applications that have large non-linear loads. Some non-linear loads, such as motors and pumps, are more sensitive to underfrequency conditions. Other non-linear loads, such as fluorescent and incandescent lighting, are more sensitive to undervoltage conditions.

⚠ CAUTION
This feature is not intended to compensate for undersized generator sets. Failure to follow this may affect generator set operation and may cause damage to the generator set or to equipment connected to the generator set.

This feature is active when the generator set is running at rated speed and voltage.

This behavior is controlled by these parameters:

- Target frequency: This determines on what the target frequency depends.

  If *V/Hz Method* is Relative Knee Frequency, the target frequency is the speed reference.

  If *V/Hz Method* is Fixed Knee Frequency, the target frequency is *Alternate Frequency Switch*.

  (This parameter is not available in the Operator Panel).

NOTICE

Fixed Knee Frequency is usually used in paralleling applications with generator sets that have non-PowerCommand external voltage regulators.

- Knee frequency: This is how far below the target frequency the PCC begins reducing the output voltage.

  If *V/Hz Method* is Relative Knee Frequency, The knee frequency is *V/Hz Knee Frequency*.

  If *V/Hz Method* is Fixed Knee Frequency, the knee frequency is *External AVR Knee Frequency*.

- *V/Hz Rolloff Slope*: This specifies how quickly (V/Hz) the PCC reduces the voltage setpoint once the frequency drops below the knee frequency.

  (This parameter is not available in the Operator Panel).

This behavior is illustrated in the following figure.

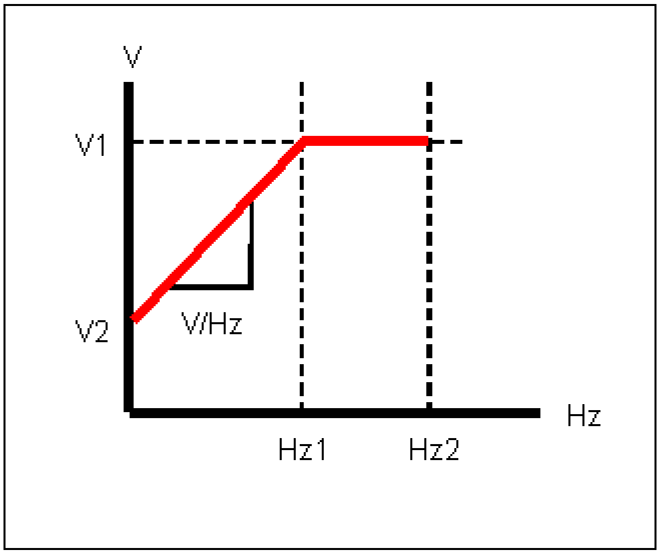


FIGURE 59. V/HZ CURVE

TABLE 88. V/HZ CURVE

LABEL	DESCRIPTION
Hz1	Target frequency - knee frequency
Hz2	Target frequency
V1	Voltage setpoint (without the V/Hz curve adjustment)
V2	Voltage setpoint (with the V/Hz curve adjustment)
V/Hz	V/Hz Rolloff Slope

For example, a generator set has these settings:

- *Genset Nominal Voltage* is 480 VAC, and the voltage setpoint is 100%, or 480 VAC, without the V/Hz curve adjustment.
- *Genset Frequency* is 60 Hz, and the speed reference is 3600 rpm.
- *V/Hz Method* is set to Relative Knee Frequency.

  (This parameter is not available in the Operator Panel).

- *V/Hz Knee Frequency* is 1.0 Hz.
- *V/Hz Rolloff Slope* is 2.2 %V/Hz.

Suppose the actual generator set frequency is 56.5 Hz. This is 3.5 Hz (60 Hz - 56.5 Hz) below the speed reference. The PCC reduces the voltage setpoint by (3.5 Hz - 1.0 Hz) * 2.2 %V/Hz. The reduction is 5.5%, or 26.4 VAC (5.5% * 480 VAC). The voltage setpoint is 454 VAC (480 VAC - 26 VAC) with the V/Hz curve adjustment.

7.20.3 Exercise Scheduler

The PCC can run the generator set regularly to prevent the generator set from being inactive for long periods of time.

The PCC generates an exercise signal when these conditions are met:

- The PCC is in Auto mode.
- The PCC is not in power-down mode.
- There are no active shutdown faults.
- *Exercise Scheduler Enable* is set to Enable.
- A scheduler program is beginning.
- There are no scheduled exceptions.

If the generator set is running, this signal has no effect unless the remote start signal becomes inactive. Then, the exercise signal keeps the generator set running.

If the PCC is unable to start the generator set for any reason, the scheduler program is skipped, even if the PCC later becomes able to start.

The PCC removes the exercise signal when the scheduler program finishes.

7.20.3.1 Scheduler Programs

You can set up 12 scheduler programs. For each program, specify the day of the week and the time the PCC starts the generator set, how long the PCC runs the generator set, and how often the program repeats. Each scheduler program has these parameters:

- *Scheduler Program Enable*
- *Scheduler Program Start Day*: Sunday, Monday, ..., Saturday
- *Scheduler Program Start Hour*: 0-23
- *Scheduler Program Start Minute*: 0-59
- *Scheduler Program Duration Hours*: 0-23
- *Scheduler Program Duration Minutes*: 0-59
- *Scheduler Program Repeat Interval*: Once, every 1-5 weeks, first/second/third/fourth/last week of month
- *Scheduler Program Run Mode*: If *Genset Application Type* is set to Power Transfer Control, the PCC can run the generator set with a load, in parallel with the utility, or without a load.

  Otherwise, this has no effect unless an external device reads *Scheduler Run Command* and responds accordingly.
- *Scheduler Program Run Mode*: This has no effect unless an external device reads *Scheduler Run Command* and responds accordingly.

Scheduler programs follow these guidelines.

1. If two or more scheduler programs begin at the same time, the PCC runs the scheduler program with the lowest number and ignores the other scheduler programs, even after the first scheduler program ends.
2. If one scheduler program begins before another scheduled program ends, the PCC ignores the second program, even after the first scheduler program ends.
3. If the PCC loses power while a scheduler program is running, the PCC does not restart the scheduler program when power returns.

7.20.3.2 Scheduler Exceptions

You can also set up 6 scheduler exceptions. Scheduler exceptions prevent scheduler programs from running during specific intervals, such as holidays. Each scheduler exception has these parameters:

- *Scheduler Exception Enable*
- *Scheduler Exception Month*: 1-12
- *Scheduler Exception Date*: 1-31
- *Scheduler Exception Hour*: 0-23
- *Scheduler Exception Minute*: 0-59
- *Scheduler Exception Duration Days*: 0-44
- *Scheduler Exception Duration Hours*: 0-23
- *Scheduler Exception Duration Minutes*: 0-59
- *Scheduler Exceptions Repeat Interval*: One-time only or annual.

Scheduler programs and scheduler exceptions follow these guidelines.

1. The PCC ignores scheduler programs that start during scheduler exceptions.
2. If a scheduler program and a scheduler exception begin at the same time, the PCC ignores the scheduler program.
3. If two or more scheduler exceptions begin at the same time, the PCC runs the scheduler exception with the lowest number and ignores the other scheduler exceptions, even after the first scheduler exception ends.
4. If a scheduler exception begins before a scheduler program ends, the PCC ignores the scheduler exception, even after the scheduler program ends.
5. If one scheduler exception begins before another scheduler exception ends, the PCC ignores the second scheduler exception, even after the first scheduler exception ends.
6. If the PCC loses power while a scheduler exception is running, the PCC does not restart the scheduler exception when power returns.

7.20.4 Load Dump Overload and Underfrequency Protection

The PCC generates warning fault 1464 (Load Dump Fault) when one of these conditions applies, based on Load Dump Activation Method:

- The generator set is overloaded by *Load Dump Overload Threshold* for *Load Dump Overload Set Time*.
- The generator set is running underfrequency by *Load Dump Underfrequency Offset* for *Load Dump Underfrequency Set Time*, and Ready to Load is active. The Ready to Load output does not have to be used.

7.21 PCCNet Setup

Each label is described in the following table.

TABLE 89. PCCNET SETUP

NAME	DESCRIPTION
HMI220 PCCnet Failure Response Type	Selects the genset reaction to a loss of an HMI220 Operator Panel as critical or non-critical. A critical response will shutdown the genset when PCCnet communication is lost. (Password level: 1.) Allowed values: Critical Device Response, Non-Critical Device Response. (Default: Non-Crit Device Resp.)
HMI320 PCCnet Failure Response Type	Selects the genset reaction to a loss of an HMI320 Operator Panel as critical or non-critical. A critical response will shutdown the genset when PCCnet communication is lost. (Password level: 1.) Allowed values: Critical Device Response, Non-Critical Device Response. (Default: Non-Crit Device Resp.)
HMI113 Annunciator PCCnet Failure Response Type	Selects the genset reaction to a loss of an Annunciator as critical or non-critical. Selecting Critical will cause a shutdown when the Annunciator loses communication. (Password level: 1.) Allowed values: Critical Device Response, Non-Critical Device Response. (Default: Non-Crit Device Resp.)
Aux101 Device 0 PCCnet Failure Response Type	Selects the genset reaction to a loss of a Device 0 I/O Module as critical (Shutdown) or non-critical (Warning). (Password level: 1.) Allowed values: Critical Device Response, Non-Critical Device Response. (Default: Non-Crit Device Resp.)
Aux101 Device 1 PCCnet Failure Response Type	Selects the genset reaction to a loss of a Device 1 I/O Module as critical (Shutdown) or non-critical (Warning). (Password level: 1.) Allowed values: Critical Device Response, Non-Critical Device Response. (Default: Non-Crit Device Resp.)
PCCnet Device Failure Time Delay	Selects the time allowed for arbitration to occur before a PCCnet failure fault is generated. (Password level: 2.) Allowed values: 0~250 seconds. (Default: 60 seconds.)
Active PCCnet HMI220 Operator Panels	Used to monitor the number of connected HMI220 Operator Panels. Allowed values: 0~255.
Expected PCCnet HMI220 Operator Panels	The number of HMI220 Operator Panels that should be connected. (Password level: 1.) Allowed values: 0~250. (Default: 0.)
Active PCCnet HMI320 Operator Panels	Used to monitor the number of connected HMI320 Operator Panels. Allowed values: 0~255.
Expected PCCnet HMI320 Operator Panels	The number of HMI320 Operator Panels that should be connected. (Password level: 1.) Allowed values: 0~250. (Default: 0.)
Active PCCnet AUX101 Device 0 Modules	AUX101 with Device number 0 is connected and active. Allowed values: 0~255.

NAME	DESCRIPTION
Expected PCCnet AUX101 Device 0 Modules	The number of AUX101 Device 0 modules that should be connected. (Password level: 1.) Allowed values: 0~250. (Default: 0.)
Active PCCnet AUX101 Device 1 Modules	AUX101 with Device number 1 is connected and active. Allowed values: 0~255.
Expected PCCnet AUX101 Device 1 Modules	The number of AUX101 Device 1 modules that should be connected. (Password level: 1.) Allowed values: 0~250. (Default: 0.)
Active PCCnet HMI113 Annunciators	Used to monitor the number of connected HMI113 Annunciators. Allowed values: 0~255.
Expected PCCnet HMI113 Annunciators	The number of HMI113 Annunciators that should be connected. (Password level: 1.) Allowed values: 0~250. (Default: 0.)
HMI113 Outputs	
HMI113 Output 1 Fault/Event	Parameter to allow for the entry of the fault/event code which will turn the output relay on and off. (Password level: 1.) Allowed values: 0~65530. (Default: 0.)
HMI113 Output 1 Signal Status	Parameter to monitor the logic output to the Annunciator relay. Allowed values: Inactive, Active.
HMI113 Output 2 Fault/Event	Parameter to allow for the entry of the fault/event code which will turn the output relay on and off. (Password level: 1.) Allowed values: 0~65530. (Default: 0.)
HMI113 Output 2 Signal Status	Parameter to monitor the logic output to the Annunciator relay. Allowed values: Inactive, Active.
HMI113 Output 3 Fault/Event	Parameter to allow for the entry of the fault/event code which will turn the output relay on and off. (Password level: 1.) Allowed values: 0~65530. (Default: 0.)
HMI113 Output 3 Signal Status	Parameter to monitor the logic output to the Annunciator relay. Allowed values: Inactive, Active.
HMI113 Output 4 Fault/Event	Parameter to allow for the entry of the fault/event code which will turn the output relay on and off. (Password level: 1.) Allowed values: 0~65530. (Default: 0.)
HMI113 Output 4 Signal Status	Parameter to monitor the logic output to the Annunciator relay. Allowed values: Inactive, Active.
HMI113 Faults	
HMI113 Fault 1 Status	Monitor point for input #1 from the Annunciator. Allowed values: Inactive, Active.
HMI113 Fault 1 Text	Twenty (20) character text string to enter the configurable fault text for this fault. (Password level: 1.)
HMI113 Fault 2 Status	Monitor point for input #2 from the Annunciator. Allowed values: Inactive, Active.

NAME	DESCRIPTION
HMI113 Fault 2 Text	Twenty (20) character text string to enter the configurable fault text for this fault. (Password level: 1.)
HMI113 Fault 3 Status	Monitor point for the input #3 from the Annunciator. Allowed values: Inactive, Active.
HMI113 Fault 3 Text	Twenty (20) character text string to enter the configurable fault text for this fault. (Password level: 1.)

7.21.1 PCCNet Faults

If the PCC loses communication with a HMI113, the PCC generates shutdown fault 2896 (Critical PCCnet Dev Fail) or warning fault 2895 (PCCnet Device Failed) according to *HMI113 Annunciator PCCNet Failure Response Type*.

If the PCC loses communication with an Operator Panel, the PCC generates shutdown fault 2896 (Critical PCCnet Dev Fail) or warning fault 2895 (PCCnet Device Failed) according to *HMI220 PCCNet Failure Response Type*.

7.21.2 PCC-HMI113 Communication

The PCC and the HMI113 exchange four bytes, or thirty-two bits, of information on the PCCNet network. Each bit is identified in the following table .

TABLE 90. PCC-HMI113 COMMUNICATION

BIT	NAME	PCC READS/WRITES
1	Annunciator Fault 1	R
2	Annunciator Fault 2	R
3	Annunciator Fault 3	R
4	Genset Supplying Load	R
5	Charger AC Failure	R / W
6	Low Coolant Level	R / W
7	Low Fuel Level	R / W
8	Check Genset	W
9	Not in Auto	W
10	Genset Running	W
11	High Battery Voltage	W
12	Low Battery Voltage	W
13	Weak Battery	W
14	Fail to Start	W
15	Low Coolant Temp	W
16	Pre-High Engine Temp	W
17	High Engine Temp	W

BIT	NAME	PCC READS/WRITES
18	Pre-Low Oil Pressure	W
19	Low Oil Pressure	W
20	Overspeed	W
21	Annunciator Fault Relay 1 Status	R / W
22	Annunciator Fault Relay 2 Status	R / W
23	Annunciator Fault Relay 3 Status	R / W
24	Annunciator Fault Relay 4 Status	R / W
25	Audible Alarm Status	R
26	Silence Button Status	R
27	Network Error Status	R
28	Not Used	Not Used
29	Not Used	Not Used
30	Not Used	Not Used
31	Not Used	Not Used
32	Not Used	Not Used

Genset Running is active when event 1465 (Ready To Load) is active.

7.21.2.1 PCC Information to the HMI113

The following table explains the information the PCC sends to the HMI113.

TABLE 91. HMI113 STATUS INFORMATION

EVENT/FAULT	DESCRIPTION
2993	Battery Charger Sw Fail
197 or 235	Low Coolant Level
1441	Low Fuel Level
1483	Common Alarm (Check Genset)
1463	Not In Auto
1465	Genset Running (Ready to Load)
442	High Battery 1 Voltage
441	Low Battery 1 Voltage
1442	Weak Battery
359	Fail To Start
1435	Low Coolant Temperature
146	Pre-High Engine Coolant Temperature
151 or 1847	High Coolant Temp

EVENT/FAULT	DESCRIPTION
143	Low Oil Rifle Pressure
415	Low Oil Rifle Press
234 or 1992	Crankshaft Speed High

Genset Running is active when event 1465 (Ready to Load) is active.

The PCC can control up to four relays on the HMI113.

Use *HMI113 Output 1-4 Fault/Event* to specify the event/fault codes that control HMI113 custom relays 1-4.

The PCC generates warning fault 1944 (HMI113 Out Config Error) if more than one source is controlling one of the HMI113 custom relays.

7.21.2.2 HMI113 Information to the PCC

The PCC also receives these inputs from the HMI113:

- *Battery Charger AC Failure (HMI113)*
- *Low Coolant Level (HMI113)*
- *Low Fuel Level (HMI113)*
- HMI customer faults 1-3

An input is active if any HMI113 sends an active signal. An input is inactive if all of the HMI113 send an inactive signal.

The PCC generates warning fault 2993 (Battery Charger Sw Fail) as soon as *Battery Charger AC Failure (HMI113)* is active.

When *Low Coolant Level (HMI113)* becomes active, the PCC generates shutdown fault 235 (Low Coolant Level), warning fault 197 (Low Coolant Level), or no response at all, depending on *LCL Detection Response*.

The PCC generates warning fault 1441 (Low Fuel Level) when *Low Fuel Level (HMI113)* is active for *Low Fuel Set/Clear Time*.

HMI113 customer faults 1-3 generate warning fault 1853 (Annunciator Input 1 Fault), warning fault 1854 (Annunciator Input 2 Fault), and warning fault 1855 (Annunciator Input 3 Fault), respectively. Use HMI113 Fault 1-3 Text to identify these signals on the Operator Panel.

7.22 Alternator (OEM Alternator Setup)

Each label is described in the following table.

TABLE 92. OEM ALTERNATOR SETUP

NAME	DESCRIPTION
Nominal Voltage Limits	
3 ph high conn Genset nom voltage hi limit	High voltage setpoint limit for the high connection on a reconnectable alternator (Password level: 2.) Allowed values: 1~45000 Vac. (Default: 480 Vac.)

NAME	DESCRIPTION
3 ph high conn Genset nom voltage lo limit	Low voltage setpoint limit for the high connection on a reconnectable alternator (Password level: 2.) Allowed values: 1~45000 Vac. (Default: 416 Vac.)
3 ph low conn Genset nom voltage hi limit	High voltage setpoint limit for the low connection on a reconnectable alternator (Password level: 2.) Allowed values: 1~45000 Vac. (Default: 240 Vac.)
3 ph low conn Genset nom voltage lo limit	Low voltage setpoint limit for the low connection on a reconnectable alternator (Password level: 2.) Allowed values: 1~45000 Vac. (Default: 208 Vac.)
Single phase Genset nom voltage hi limit	High voltage setpoint limit for the single phase connected alternator (Password level: 2.) Allowed values: 1~600 Vac. (Default: 240 Vac.)
Single phase Genset nom voltage lo limit	Low voltage setpoint limit for the single phase connected alternator (Password level: 2.) Allowed values: 1~600 Vac. (Default: 208 Vac.)
Excitation Source	The type of excitation power source PMG or Shunt (Password level: 2.) Allowed values: Shunt, PMG. (Default: PMG.)
Excitation Disable Override	Use to turn off AVR while running in Manual for troubleshooting (Password level: 1.) Allowed values: Excitation Off, Excitation On. (Default: Excitation On.)
AVR Enable	Enables or disables the AVR (Password level: 2.) Allowed values: Disable, Enable. (Default: Enable.)
Genset PT/CT setup	
Genset PT Primary Voltage	Genset PT primary voltage (Password level: 2.) Allowed values: 600~45000 Vac. (Default: 600 Vac.)
Genset PT Secondary Voltage	Genset PT secondary voltage (Password level: 2.) Allowed values: 100~600 Vac. (Default: 100 Vac.)
Genset Primary CT Current	Genset CT primary current (Password level: 2.) Allowed values: 5~10000 Amps. (Default: 5 Amps.)
Genset CT Secondary Current	Genset CT secondary current (Password level: 2.) Allowed values: 1 Amp, 5 Amp. (Default: 1 Amp.)
AVR 60Hz Gains	
K1 (60 Hz)	This gain affects the overall regulator gain in 60 Hz applications. Similar to proportional gain. PCF scale factor = 0.01 (Password level: 2.) Allowed values: 0~100 %DC / %Volts. (Default: 4 %DC / %Volts.)
K2 (60 Hz)	This is gain 2 in 60 Hz applications. (1-K2) is z plane zero location. PCF scale factor = 0.01 (Password level: 2.) Allowed values: 0.02~99.99. (Default: 1.)

NAME	DESCRIPTION
K3 (60 Hz)	This is gain 3 in 60 Hz applications. K3 is z plane pole location. (K3+K4) is z plane zero location. PCF scale factor = 0.01 (Password level: 2.) Allowed values: 0~100. (Default: 86.)
AVR Damping Effect (60 Hz)	Increases or decreases the output response of the AVR. A lower input value will increase the transient response. A higher value will decrease the transient response. (Password level: 2.) Allowed values: 0~99.99. (Default: 79.)
AVR 50Hz Gains	
K1 (50 Hz)	This gain affects the overall regulator gain in 50 Hz applications. Similar to proportional gain. PCF scale factor = 0.01 (Password level: 2.) Allowed values: 0~100 %DC / %Volts. (Default: 4 %DC / %Volts.)
K2 (50 Hz)	This is gain 2 in 50 Hz applications. (1-K2) is z plane zero location. PCF scale factor = 0.01 (Password level: 2.) Allowed values: 0.02~99.99. (Default: 1.)
K3 (50 Hz)	This is gain 3 in 50 Hz applications. K3 is z plane pole location. (K3+K4) is z plane zero location. PCF scale factor = 0.01 (Password level: 2.) Allowed values: 0~100. (Default: 84.)
AVR Damping Effect (50 Hz)	Increases or decreases the output response of the AVR. A lower input value will increase the transient response. A higher value will decrease the transient response. (Password level: 2.) Allowed values: 0~99.99. (Default: 78.)
AC Voltage Faults	
High AC Voltage Threshold	Percent of desired voltage at which High AC Voltage fault becomes active. (Password level: 1.) Allowed values: 105~125 %. (Default: 110 %.)
High AC Voltage Trip Characteristic	Fixed Time" setup allows a greater time delay until shutdown when voltage overshoots (good for starting motors). When the control is set up to operate as Inverse Time", the fault will be more sensitive to voltage spikes and will trip more rapidly. (Password level: 1.) Allowed values: Inverse Time, Fixed Time.
High AC Voltage Delay	Time delay before High AC Voltage fault becomes active. (Password level: 1.) Allowed values: 0.1~10 seconds. (Default: 10 seconds.)
Low AC Voltage Threshold	Percent of desired voltage at which Low AC Voltage fault becomes active. (Password level: 1.) Allowed values: 50~95 %. (Default: 85 %.)

NAME	DESCRIPTION
Low AC Voltage Delay	Time delay before Low AC Voltage fault becomes active (Password level: 1.) Allowed values: 2~20 seconds. (Default: 10 seconds.)
Lost AC Voltage Threshold	Sets average voltage threshold for Loss of AC Voltage sensing fault. (Password level: 2.) Allowed values: 0~25 %. (Default: 10 %.)
Lost AC Time Delay	Sets the time delay for the Loss of AC Voltage Sensing fault. (Password level: 1.) Allowed values: 0~2 seconds. (Default: 1 second.)
Underfrequency Fault	
Underfrequency Threshold	Number of Hertz Alternator Line Frequency may be under nominal frequency before Underfrequency fault becomes active. (Password level: 1.) Allowed values: 2~10 Hz. (Default: 6 Hz.)
Underfrequency Delay	Time delay before the Underfrequency fault becomes active. (Password level: 1.) Allowed values: 5~20 seconds. (Default: 10 seconds.)
Overfrequency Fault	
Overfrequency Enable	Enables overfrequency diagnostic witness test. (Password level: 1.) Allowed values: Disabled, Enabled. (Default: Disabled.)
Overfrequency Threshold	Number of Hertz Alternator Line Frequency may be over nominal frequency before Overfrequency fault becomes active. (Password level: 1.) Allowed values: 2~10 Hz. (Default: 6 Hz.)
Overfrequency Delay	Time delay before Overfrequency fault becomes active. (Password level: 1.) Allowed values: 1~20 seconds. (Default: 20 seconds.)
Speed/Frequency Fault	
Speed/Frequency Threshold	Sets the threshold for generating the Speed/Frequency mismatch fault (Password level: 1.) Allowed values: 0.5~20 Hz. (Default: 1.5 Hz.)
Speed/Frequency Delay	Sets the delay time for generating the Speed/Frequency mismatch fault (Password level: 1.) Allowed values: 0.5~10 seconds. (Default: 1 seconds.)
Max Field Time	The maximum allowed time at Max Field Duty Cycle. (Password level: 1.) Allowed values: 3~30 seconds. (Default: 15 seconds.)

7.22.1 Generator Set Tuning

The automatic voltage regulator (AVR) uses a four-coefficient PID algorithm that runs five hundred times each second.

K1 sets the overall AVR gain. It is a true proportional gain which is multiplied against the voltage error signal.

- K1 should be adjusted to meet the specification for percent off rated voltage during load acceptance and to prevent large voltage overshoots during offloads and generator set startup.
- In general, K1 increases in value with increasing generator set size.

K2 controls the recovery shape of voltage transients during large-load acceptance and rejection. This is a true integral gain which is multiplied against the sum of all previous errors.

- If K2 is too high, the voltage performance is unstable. If K2 is too low, the voltage performance is slow or has steady-state voltage-offset errors.
- In general, K2 decreases in value with increasing generator size.

K3 affects high-frequency characteristics of the AVR algorithm. It is set for basic stability. In general, it should not need to be adjusted.

K4 is a calculated value. You cannot adjust it. It is set for basic stability.

The damping term is used to calculate K4. It affects high-frequency characteristics of the AVR algorithm. It is set for basic stability. In general, it should not need to be adjusted.

The tables below provide the standard values for K1-K4 and damping terms for Cummins Generator Technologies (CGT) alternators at 50-Hz and 60-Hz operation.

TABLE 93. STANDARD VALUES FOR K1-K4 AND DAMPING TERMS FOR CGT ALTERNATORS (50-HZ OPERATION)

Output Power	< 200 kW	200 kW - 400 kW	> 400 kW
Open-circuit Time Constant	<=1.2 sec	1.3 sec - 2.2 sec	>= 2.3 sec
K1	3.50	4.5	5.0
K2	1.00	0.80	0.50
K3	84.0	84.0	84.0
K4	12.48 (calculated)	12.48 (calculated)	12.48 (calculated)
Damping	78.0	78.0	78.0
Shunt Gain Multiplier	1.5	1.5	1.5

TABLE 94. STANDARD VALUES FOR K1-K4 AND DAMPING TERMS FOR CGT ALTERNATORS (60-HZ OPERATION)

Output Power	< 200 kW	200 kW - 400 kW	> 400 kW
Open-circuit Time Constant	<=1.2 sec	1.3 sec - 2.2 sec	>= 2.3 sec
K1	3.50	4.5	5.0
K2	1.00	0.80	0.50
K3	86.0	86.0	86.0
K4	11.06 (calculated)	11.06 (calculated)	11.06 (calculated)
Damping	79.0	79.0	79.0
Shunt Gain Multiplier	1.5	1.5	1.5

7.22.2 Genset Voltage

Set the *Genset Nominal Voltage* to the voltage rating of the alternator. *Genset Nominal Voltage* is restricted to these ranges.

Single phase connections:

- *Single phase Genset nom voltage lo limit* <

  Genset Nominal Voltage <

  Single phase Genset nom voltage hi limit

Three phase connections:

- *3 ph high conn Genset nom voltage lo limit* <

  Genset Nominal Voltage <

  3 ph high conn Genset nom voltage hi limit

- *3 ph low conn Genset nom voltage lo limit* <

  Genset Nominal Voltage <

  3 ph low conn Genset nom voltage hi limit

NOTICE
The PCC ignores the potential transformer (PT) ratio if Genset Nominal Voltage is less than 600 VAC.

Use *High AC Voltage Trip Characteristic* to specify how quickly the PCC generates shutdown fault 1446 (High AC Voltage).

If *High AC Voltage Trip Characteristic* is Fixed Time, the PCC generates this fault when one or more phase voltages is greater than *High AC Voltage Threshold* for *High AC Voltage Delay*. This is often suitable when the genset is starting motors.

If *High AC Voltage Trip Characteristic* is Inverse Time, the PCC generates this fault more quickly or more slowly depending on the voltage. The more one or more phase voltages is greater than *High AC Voltage Threshold*, the sooner the PCC generates this fault.

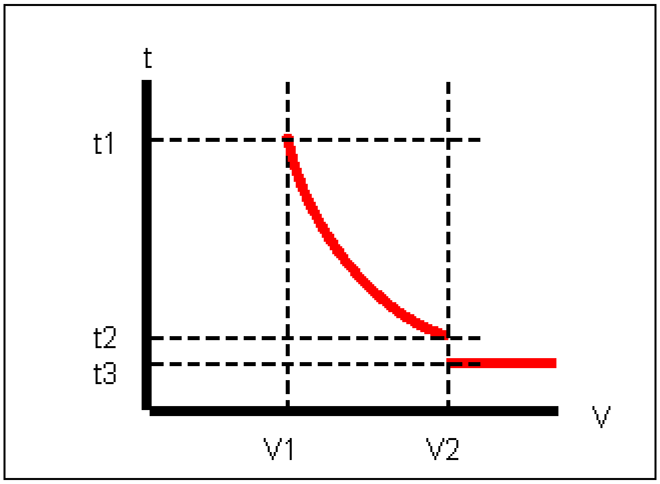


FIGURE 60. HIGH AC VOLTAGE FAULT WHEN TRIP CHARACTERISTIC IS INVERSE TIME

TABLE 95. HIGH AC VOLTAGE FAULT WHEN TRIP CHARACTERISTIC IS INVERSE TIME

LABEL	DESCRIPTION
t1	*High AC Voltage Delay*
t2	1 second
t3	0.6 seconds
V1	*High AC Voltage Threshold*
V2	*Instantaneous High AC Voltage Threshold*

If the maximum phase voltage is greater than *High AC Voltage Threshold* and less than *Instantaneous High AC Voltage Threshold* (This parameter is not available in the *Operator Panel*. The PCC generates shutdown fault 1446 (High AC Voltage) increasingly quickly, from *High AC Voltage Delay* to 1 second.

If the maximum phase voltage is greater than or equal to *Instantaneous High AC Voltage Threshold*, the PCC generates this fault in 0.6 seconds.

The PCC generates shutdown fault 1447 (Low AC Voltage) if one or more phase voltages is less than *Low AC Voltage Threshold* for *Low AC Voltage Delay*.

7.22.3 Pulse-width Modulation (PWM) in the Automatic Voltage Regulator (AVR)

The PCC uses pulse-width modulation (PWM) to drive the field windings in the exciter. The PWM duty cycle can be 0% or any value between *AVR Min Duty Cycle Limit* and *Max Field Duty Cycle*.

The default value for *Max Field Duty Cycle* depends on *Excitation Source*.

- If *Excitation Source* is PMG, the default *Max Field Duty Cycle* is 60%.
- If *Excitation Source* is Shunt, the default *Max Field Duty Cycle* is 68%.

The PCC generates shutdown fault 2972 (Field Overload) if the PCC drives the field windings in the exciter at the maximum PWM duty cycle for *Max Field Time*.

7.23 Engine (OEM Engine Setup)

Note: If you change Starter Owner to ECS, the PCC does not control the starter. If the engine control module (ECM) or another device does not turn on the starter, the genset does not start, and there is no fault code.

Each label is described in the following table.

TABLE 96. OEM ENGINE SETUP

ECM CAN Enable	Set to Disabled if there is no ECM (HMECM or otherwise) connected to the control. (Password level: 2.) Allowed values: Disabled, Enabled.
ECM Datasave Time Delay	A trim that sets the delay time for the ECM Dataplate saves (Password level: 2.) Allowed values: 0~60 seconds. (Default: 30 seconds.)
CAN Failure Retries	Sets the maximum number of CAN communication retries (Password level: 1.) Allowed values: 0~10. (Default: 3.)

Keyswitch Minimum On Time	Minimum time the keyswitch driver command needs to be on before CAN datalink health will be checked (Password level: 2.) Allowed values: 0.1~5 seconds. (Default: 4 seconds.)
Fault Code 1117 Enable	Used to Enable/Disable fault 1117 on the genset control. Fault will be ignored with a disabled setting. (Password level: 1.) Allowed values: Disabled, Enabled. (Default: Enabled.)
Starter Owner	Tells the GCS which control system has starter control (Password level: 2.) Allowed values: GCS, ECS. (Default: 0.)
Prelube Function Enable	Selects whether the Prelube function is enabled or disabled. This is Setup mode interlocked (Password level: 1.) Allowed values: Disabled, Enabled. (Default: Disabled.)
Nominal Battery Voltage	Selects the genset's nominal battery operating voltage (Password level: 2.) Allowed values: 12V, 24V. (Default: 24V.)
24V Battery Fault	
24 V High Battery Voltage Threshold	Sets 24V high battery voltage fault threshold (Password level: 1.) Allowed values: 28~34 Vdc. (Default: 32 Vdc.)
24 V Weak Battery Voltage Threshold	Sets 24V weak battery voltage fault threshold (Password level: 1.) Allowed values: 12~16 Vdc. (Default: 14.4 Vdc.)
24 V Low Battery Voltage Running Threshold	Sets 24V low battery voltage fault threshold for genset operation in all modes except rated (Password level: 1.) Allowed values: 22~26 Vdc. (Default: 24 Vdc.)
24 V Low Battery Voltage Stopped Threshold	Sets 24V low battery voltage fault threshold for genset operation in all modes except rated (Password level: 1.) Allowed values: 22~26 Vdc. (Default: 24 Vdc.)
12V Battery Fault	
12 V High Battery Voltage Threshold	Sets 12V high battery voltage fault threshold. (Password level: 1.) Allowed values: 14~17 Vdc. (Default: 16 Vdc.)
12 V Weak Battery Voltage Threshold	Sets 12V weak battery voltage fault threshold (Password level: 1.) Allowed values: 6~10 Vdc. (Default: 8 Vdc.)
12 V Low Battery Voltage Running Threshold	Sets 12V low battery voltage fault threshold for genset operation while in rated mode (Password level: 1.) Allowed values: 12~16 Vdc. (Default: 12 Vdc.)
12 V Low Battery Voltage Stopped Threshold	Sets 12V low battery voltage fault threshold for genset operation in all modes except rated (Password level: 1.) Allowed values: 11~13 Vdc. (Default: 12 Vdc.)

High Battery Voltage Set Time	The time delay until a high battery voltage condition is reported as a fault. (Password level: 1.) Allowed values: 2~60 seconds. (Default: 60 seconds.)
Low Battery Voltage Set Time	The time delay until a low battery voltage condition is reported as a fault (Password level: 1.) Allowed values: 2~60 seconds. (Default: 60 seconds.)
Weak Battery Voltage Set Time	The time delay until a weak battery condition is reported as a fault (Password level: 1.) Allowed values: 1~5 seconds. (Default: 2 seconds.)
Charging Alternator Fault Time Delay	Sets the time delay for the charging alt failure fault (Password level: 1.) Allowed values: 2~300 seconds. (Default: 120 seconds.)
Alternate Frequency Switch	Sets the genset nominal frequency. (Password level: 1.) Allowed values: 50 Hz, 60 Hz. (Default: 60Hz.)
Frequency to Speed Gain Select	Sets the rpm/Hz conversion factor which is a function of the poles of the alternator and/or any gearboxes (Password level: 2.) Allowed values: 60 rpm/Hz, 30 rpm/Hz, 20 rpm/Hz, 36 rpm/Hz, Adjustable Freq/Speed Gain. (Default: 30 rpm/Hz.)
Frequency to Speed Gain Select	Sets the rpm/Hz conversion factor which is a function of the poles of the alternator and/or any gearboxes (Password level: 2.) Allowed values: 60 rpm/Hz, 30 rpm/Hz, 20 rpm/Hz, 36 rpm/Hz, Adjustable Freq/Speed Gain. (Default: 30 rpm/Hz.)
Adjustable Freq/Speed Gain	Sets the rpm/Hz conversion factor when the Freq to Speed Gain Select trim is set to this trim (Password level: 2.) Allowed values: 0~240 rpm/Hz. (Default: 30 rpm/Hz.)
V/Hz Knee Frequency (50 Hz) V/Hz Knee Frequency (60 Hz)	**Note: The parameter depends on *Alternate Frequency Switch*.** The voltage will roll off (decrease) proportionally to the V/Hz setup, once the frequency drops below the set point in the V/Hz Knee Frequency. This allows the genset to recover faster when the frequency drops. (Password level: 1.) Allowed values: 0~10 Hz. (Default: 1 Hz.)
V/Hz Rolloff Slop (50 Hz) V/Hz Rolloff Slop (60 Hz)	**Note: The parameter depends on *Alternate Frequency Switch*.** The amount of voltage roll off when the frequency is below the knee frequency (Password level: 1.) Allowed values: 0~10 % / Hz.(Default: 2.2 % / Hz.)

Starting to Rated Ramp Time	The time over which the speed reference is to ramp from starting speed to rated speed. This parameter is available only in applications with engine control modules. (Password level: 1.) Allowed values: 0~30 seconds. (Default: 1 seconds.)

7.24 Genset (OEM Genset Setup)

Each label is described in the following table.

TABLE 97. OEM GENSET SETUP

Genset Numbers	
Genset Serial Number	Serial number of identifying this genset. (Password level: 2.)
Alternator Serial Number	Unique number identifying this gensets alternator serial number. (Password level: 2.)
Engine Serial Number	Unique number identifying this genset's engine serial number. (Password level: 2.)
Model Numbers	
Alternator Model Number	Number identifying this gensets alternator model number. (Password level: 2.)
Genset Model Number	Number identifying the model of this genset. (Password level: 2.)
Application Rating Select	Selects genset's standby/prime/base application rating. (Password level: 1.) Allowed values: Standby, Prime, Base. (Default: Standby.)
Frequency Options	Sets the allowed options for the Alternate Frequency Switch (Password level: 2.) Allowed values: 50 Hz or 60 Hz, 50 Hz Only, 60 Hz Only. (Default: 60Hz or 50Hz.)
Genset Idle Enable	Enables or Disable idling of genset with external governor. Allowed values: Disabled, Enabled. (Default: Enabled.)
Standby kVA Rating	
Standby kVA rating (3 phase/ 50Hz)	KVA rating of genset when operating in Standby mode, at 50 Hz, and 3 phase. (Password level: 2.) Allowed values: 1~6000 kVA. (Default: 1 kVA.)
Standby kVA rating (3 phase/ 60Hz)	KVA rating of genset when operating in Standby mode, at 60 Hz, and 3 phase. (Password level: 2.) Allowed values: 1~6000 kVA. (Default: 1 kVA.)
Standby kVA rating (single phase/ 50Hz)	KVA rating of genset when operating in Standby mode, at 50 Hz, and single phase. (Password level: 2.) Allowed values: 1~6000 kVA. (Default: 1 kVA.)

Standby kVA rating (single phase/ 60Hz)	KVA rating of genset when operating in Standby mode, at 60 Hz, and single phase. (Password level: 2.) Allowed values: 1~6000 kVA. (Default: 1 kVA.)
Prime kVA Rating	
Prime kVA rating (3 phase/ 50Hz)	KVA rating of genset when operating in Prime Power mode, at 50 Hz, and 3 phase. (Password level: 2.) Allowed values: 1~6000 kVA. (Default: 1 kVA.)
Prime kVA rating (3 phase/ 60Hz)	KVA rating of genset when operating in Prime Power mode, at 60 Hz, and 3 phase. (Password level: 2.) Allowed values: 1~6000 kVA. (Default: 1 kVA.)
Prime kVA rating (single phase/ 50Hz)	KVA rating of genset when operating in Prime Power mode, at 50 Hz, and single phase. (Password level: 2.) Allowed values: 1~6000 kVA. (Default: 1 kVA.)
Prime kVA rating (single phase/ 60Hz)	KVA rating of genset when operating in Standby mode, at 60 Hz, and single phase. (Password level: 2.) Allowed values: 1~6000 kVA. (Default: 1 kVA.)
Remote Fault Reset Enabled	Trim to enable Remote Fault Reset. Can only reset "Warning" Faults (Password level: 1.) Allowed values: Disable, Enable. (Default: Disabled.)
Battle Short Enable	Trim to enable Battle Short. (Password level: 1.) Allowed values: Disable, Enable. (Default: Disabled.)
Fail To Shutdown Delay	Trim to set the time for a shutdown fault to be active and the genset not shutting down before the Fail to Shutdown fault occurs. (Password level: 2.) Allowed values: 0~30 seconds. (Default: 5 seconds.)
Delayed Shutdown Enable	Enables the Delayed Shutdown feature. (Password level: 1.) Allowed values: Disabled, Enabled. (Default: Disabled.)
Delayed Shutdown Time Delay	Sets the shutdown fault delayed time delay for the Delayed Shutdown feature. Allowed values: 0~3 seconds. (Default: 2 seconds.)
Reset Fuel Consumption	The reset trip fuel consumption command. (Password level: 1.) Allowed values: Inactive, Active. (Default: Inactive.)
Reset Runs	The reset runs command. (Password level: 1.) Allowed values: Inactive, Active.
Reset Start Attempts	The reset start attempts command. (Password level: 1.) Allowed values: Inactive, Active.
Reset Genset Energy Meter	
Genset Reset All Energy Meters	Use to permanently clear all genset energy meter values (Password level: 1.) Allowed values: Do Nothing, Clear Counters. (Default: Do Nothing.)

Genset Reset All Energy Meters Timestamp - Hour	Timestamp of when energy meters were last reset Allowed values: 0~23. (Default: 0.)
Genset Reset All Energy Meters Timestamp - Minute	Timestamp of when energy meters were last reset Allowed values: 0~59. (Default: 0.)
Genset Reset All Energy Meters Timestamp - Second	Timestamp of when energy meters were last reset Allowed values: 0~59. (Default: 0.)
Genset Reset All Energy Meters Timestamp - Day	Timestamp of when energy meters were last reset Allowed values: 1~31. (Default: 1.)
Genset Reset All Energy Meters Timestamp - Month	Timestamp of when energy meters were last reset Allowed values: 1~12. (Default: 1.)
Genset Reset All Energy Meters Timestamp - Year	Timestamp of when energy meters were last reset Allowed values: 0~99. (Default: 0.)
Input Factory Lock	
Configurable Input #1 Factory Lock	Locks this input for Factory use, can only be unlocked with InPower service tool. (Password level: 2.) Allowed values: Not Locked, Locked. (Default: Not Locked.)
Configurable Input #2 Factory Lock	Locks this input for Factory use, can only be unlocked with InPower service tool. (Password level: 2.) Allowed values: Not Locked, Locked. (Default: Not Locked.)
Coolant Level/Configurable Input #5 Factory Lock	Prevents Output Function Pointer and Invert Bypass from being modified unless in Factory mode (Password level: 2.) Allowed values: Not Locked, Locked. (Default: Locked.)
Low Fuel/Configurable Input #6 Factory Lock	Prevents Active State Selection and Function Pointer from being modified unless in Factory mode. (Password level: 2.) Allowed values: Not Locked, Locked. (Default: Locked.)
Fault Reset/Configurable Input #10 Factory Lock	Prevents Output Function Pointer and Invert Bypass from being modified unless in Factory mode. (Password level: 2.) Allowed values: Not Locked, Locked. (Default: Not Locked.)
Start Type/Configurable Input #11 Factory Lock	Start Type Factory Lock (Password level: 2.) Allowed values: Not Locked, Locked. (Default: Not Locked.)
Rupture Basin/Configurable Input #12 Factory Lock	Rupture Basin Factory Lock (Password level: 2.) Allowed values: Not Locked, Locked. (Default: Not Locked.)
Configurable Input #13 Factory Lock	Locks this input for Factory use, can only be unlocked with InPower service tool. (Password level: 2.) Allowed values: Not Locked, Locked. (Default: Not Locked.)

Configurable Input #14 Factory Lock	Locks this input for Factory use, can only be unlocked with InPower service tool. (Password level: 2.) Allowed values: Not Locked, Locked. (Default: Not Locked.)
Output Factory Lock	
Configurable Output #1 Factory Lock	Prevents Output Function Pointer and Invert Bypass from being modified unless in Factory mode (Password level: 2.) Allowed values: Not Locked, Locked. (Default: Not Locked.)
Configurable Output #2 Factory Lock	Prevents Output Function Pointer and Invert Bypass from being modified unless in Factory mode (Password level: 2.) Allowed values: Not Locked, Locked. (Default: Not Locked.)
Configurable Output #3 Factory Lock	Prevents Output Function Pointer and Invert Bypass from being modified unless in Factory mod (Password level: 2.) Allowed values: Not Locked, Locked. (Default: Not Locked.)
Configurable Output #4 Factory Lock	Prevents Output Function Pointer and Invert Bypass from being modified unless in Factory mode (Password level: 2.) Allowed values: Not Locked, Locked. (Default: Not Locked.)
Ready To Load / Configurable Output #5 Factory Lock	Controls whether the output function is inverted or not. If bypassed the function is not inverted (Password level: 2.) Allowed values: Not Locked, Locked. (Default: Not Locked.)
Oil Priming Pump / Configurable Output #6 Factory Lock	Prevents Output Function Pointer and Invert Bypass from being modified unless in Factory mode (Password level: 2.) Allowed values: Not Locked, Locked. (Default: Not Locked.)
Local Status / Configurable Output #7 Factory Lock	Prevents Output Function Pointer and Invert Bypass from being modified unless in Factory mode (Password level: 2.) Allowed values: Not Locked, Locked. (Default: Not Locked.)
Glow Plug / Configurable Output #8 Factory Lock	Prevents Output Function Pointer and Invert Bypass from being modified unless in Factory mode (Password level: 2.) Allowed values: Not Locked, Locked. (Default: Not Locked.)
Delayed Off / Configurable Output #10 Factory Lock	Prevents Output Function Pointer and Invert Bypass from being modified unless in Factory mode (Password level: 2.) Allowed values: Not Locked, Locked. (Default: Not Locked.)

Load Dump / Configurable Output #11 Factory Lock	Prevents Output Function Pointer and Invert Bypass from being modified unless in Factory mode (Password level: 2.) Allowed values: Not Locked, Locked. (Default: Not Locked.)

7.24.1 Generator Set Frequency

Set the *Alternate Frequency Switch* to the desired generator set frequency. The *Alternate Frequency Switch* is restricted to the values allowed in *Frequency Options*.

You can monitor the generator set frequency in *Genset Frequency*. Use *Frequency Adjust* to calibrate the measured value.

The PCC generates shutdown fault 1448 (Under frequency) if the generator set frequency is *Underfrequency Threshold* under the *Alternate Frequency Switch* for *Underfrequency Delay*. The generator set must also be running at 90% rated voltage.

The PCC generates warning fault 1449 (Overfrequency) if the generator set frequency is *Overfrequency Threshold* over the *Alternate Frequency Switch* for *Overfrequency Delay*. The generator set must also be running at 90% rated voltage.

7.25 Save Restore

This is reserved for future use.

7.26 History-About (History/About)

TABLE 98. HISTORY/ABOUT

NAME	DESCRIPTION
Start Attempts (Starts)	Total number of start attempts Allowed values: 0~65535
Total Number of Runs (Runs)	Total number of generator set runs Allowed values: 0~65535
Engine Running Time (Engine Hours)	Total engine run time in hours
Controller On Time (Control Hours)	Controller ON time in hours, Upper limit is 136 years Allowed values: 0~4294967291 hours
Generator Set Total Net (Kw Hours)	Generator set total net kWh accumulation Allowed values: -2147483648~2147483643 kWh
Generator Set Model Number (Gen Mod #)	Number identifying the model of this generator set (Password level: 2)
Generator Set Serial Number (Gen Ser #)	Serial number identifying this generator set
Generator Set Nominal Voltage (Nominal Voltage)	Generator set nominal line-line voltage (Password level: 1) Allowed values: 1~45000 Vac (Default: 1 Vac)

NAME	DESCRIPTION
Generator Set Delta/Wye Connection (Wye/Delta)	Delta or Wye for generator set connection (Password level: 1) Allowed values: Delta, Wye (Default: Wye)
Application Rating Select (Rating Select)	Selects generator set's standby/prime/base application rating (Password level: 1) Allowed values: Standby, Prime, Base (Default: Standby)
Controller Device Type (Contr Type)	Used by the PC Tool Allowed values: PCC3300, PCC3300 with Masterless Load Demand (MLD)
Calibration Part Number (Calib Part)	The unique calibration part number loaded into this control (Password level: 3)
Calibration Revision Date (Calib Date)	The revision date of the calibration part number loaded into this control (Password level: 3)
Firmware Version Number (Contr H/ ver)	Version of S/W loaded into this control, obtained from PCC Filename

7.27 Genset Status (Advanced Genset Status)

Each label is described in the following table.

TABLE 99. ADVANCED GENSET STATUS

NAME	DESCRIPTION
Genset Application %Load	
Genset L1L2 Voltage%	Genset L1L2 voltage%
Genset L1N Voltage%	Genset L1N voltage%
Genset % Application L1 Current	Monitors the genset application L1 current percentage output.
Genset % Application L1 kW	Monitors the genset application L1 KW percentage output.
Genset % Application L1 kVA	Monitors the genset application L1 KVA percentage output.
Genset L2L3 Voltage%	Genset L2L3 voltage%
Genset L2N Voltage%	Genset L2N voltage% Allowed values: 0~655.3 %.
Genset % Application L2 Current	Monitors the genset application L2 current percentage output.
Genset % Application L2 kW	Monitors the genset application L2 KW percentage output.
Genset % Application L2 kVA	Monitors the genset application L2 KVA percentage output.
Genset L3L1 Voltage%	Genset L3L1 voltage% Allowed values: 0~655.3 %.
Genset L3N Voltage%	Genset L3N voltage%

NAME	DESCRIPTION
Genset % Application L3 Current	Monitors the genset application L3 current percentage output.
Genset % Application L3 kW	Monitors the genset application L3 KW percentage output.
Genset % Application L3 kVA	Monitors the genset application L3 KVA percentage output.
Genset Average Voltage%	Genset average voltage percentage.
Genset % Application Total kW	Monitors the total genset application KW percentage output.
Genset % Application Total kVA	Monitors the total genset application KVA percentage output.
Standby %Load	
Genset % Standby Total kW	Monitors the total genset standby KW percentage output.
Genset % Standby Total kVA	Monitors the total genset standby KVA percentage output.
Genset Energy Metering	
Genset L1 Positive kWh	Genset L1 positive kWh accumulation Allowed values: 0~4294967290 kWh. (Default: 0 kWh.)
Genset L1 Negative kWh	Genset L1 negative kWh accumulation Allowed values: 0~4294967290 kWh. (Default: 0 kWh.)
Genset L1 Positive kVARh	Genset L1 positive kVARh accumulation Allowed values: 0~4294967290 kVARh. (Default: 0 kVARh.)
Genset L1 Negative kVARh	Genset L1 negative kVARh accumulation Allowed values: 0~4294967290 kVARh. (Default: 0 kVARh.)
Genset L2 Positive kWh	Genset L2 positive kWh accumulation Allowed values: 0~4294967290 kWh. (Default: 0 kWh.)
Genset L2 Negative kWh	Genset L2 negative kWh accumulation Allowed values: 0~4294967290 kWh. (Default: 0 kWh.)
Genset L2 Positive kVARh	Genset L2 positive kVARh accumulation Allowed values: 0~4294967290 kVARh. (Default: 0 kVARh.)
Genset L2 Negative kVARh	Genset L2 negative kVARh accumulation Allowed values: 0~4294967290 kVARh. (Default: 0 kVARh.)
Genset L3 Positive kWh	Genset L3 positive kWh accumulation Allowed values: 0~4294967290 kWh. (Default: 0 kWh.)
Genset L3 Negative kWh	Genset L3 negative kWh accumulation Allowed values: 0~4294967290 kWh. (Default: 0 kWh.)
Genset L3 Positive kVARh	Genset L3 positive kVARh accumulation Allowed values: 0~4294967290 kVARh. (Default: 0 kVARh.)

NAME	DESCRIPTION
Genset L3 Negative kVARh	Genset L3 negative kVARh accumulation Allowed values: 0~4294967290 kVARh. (Default: 0 kVARh.)
Genset L1 kVAh	Energy output of L1 in KVAH. Allowed values: 0~4294967290 kVAh. (Default: 0 kVAh.)
Genset L2 kVAh	Genset L2 kVAh accumulation Allowed values: 0~4294967290 kVAh. (Default: 0 kVAh.)
Genset L3 kVAh	Genset L3 kVAh accumulation Allowed values: 0~4294967290 kVAh. (Default: 0 kVAh.)
Genset Total Positive kWh	Genset total positive kWh accumulation Allowed values: 0~4294967290 kWh.
Genset Total Negative kWh	Genset total negative kWh accumulation
Genset Total Positive kVARh	Genset total positive kVARh accumulation Allowed values: 0~4294967290 kVARh.
Genset Total Negative kVARh	Genset total negative kVARh accumulation
Genset Total Net kWh	Genset total net kWh accumulation Allowed values: -2147483648~2147483643 kWh.
Genset Total Net kVARh	Genset total net kVARh accumulation Allowed values: -2147483648~2147483643 kVARh.
Genset Reset All Energy Meters Timestamp - Hour	Timestamp of when energy meters were last reset Allowed values: 0~23. (Default: 0.)
Genset Reset All Energy Meters Timestamp - Minute	Timestamp of when energy meters were last reset Allowed values: 0~59. (Default: 0.)
Genset Reset All Energy Meters Timestamp - Second	Timestamp of when energy meters were last reset Allowed values: 0~59. (Default: 0.)
Genset Reset All Energy Meters Timestamp - Day	Timestamp of when energy meters were last reset Allowed values: 1~31. (Default: 1.)
Genset Reset All Energy Meters Timestamp - Month	Timestamp of when energy meters were last reset Allowed values: 1~12. (Default: 1.)
Genset Reset All Energy Meters Timestamp - Year	Timestamp of when energy meters were last reset Allowed values: 0~99. (Default: 0.)
% Standby Current	
Genset % Standby L1 Current	Monitors the genset standby L1 current percentage output.
Genset % Standby L2 Current	Monitors the genset standby L2 current percentage output.
Genset % Standby L3 Current	Monitors the genset standby L3 current percentage output.
Genset kVAR	

NAME	DESCRIPTION
Genset L1 kVAR	Genset L1 KVAR
Genset L2 kVAR	Genset L2 Kvar Allowed values: -32768~32762 kVAR.
Genset L3 kVAR	Genset L3 Kvar
Genset Total kVAR	Genset total kVAR
Genset kVAh	
Genset L1 kVAh	Genset L1 KVAh
Genset L2 kVAh	Genset L2 KVAh
Genset L3 kVAh	Genset L3 KVAh
Genset Total kVAh	Genset total kVAh accumulation
Genset 3 Phase Fast Average Voltage Percent	Monitor point for Genset 3 Phase Fast Average Voltage Percent
Prelube Mode	Set to a required mode based on the type of starting requirement Allowed values: Crank After Prelube, Crank With Prelube, Prelube Only.
Number of Connected Bargraph Modules	Used to monitor the amount of connected Bargraph modules. Allowed values: 0~255.
Phase Difference	
Genset L1L2 Phase Difference	Genset L1L2 voltage phase angle
Genset L2L3 Phase Difference	Genset L2L3 voltage phase angle Allowed values: 0~655.3 Degrees.
Genset L3L1 Phase Difference	Genset L3L1 voltage phase angle Allowed values: 0~655.3 Degrees.
Genset Phase Rotation	Genset phase rotation Allowed values: L1-L2-L3, L1-L3-L2, Not Available.

7.28 Controller Status (Advanced Control Status)

TABLE 100. ADVANCED CONTROLLER STATUS

NAME	DESCRIPTION
Timers	
Start Countdown	Time remaining until start is initiated Allowed values: 0~300 seconds.
Stop Countdown	Time remaining until genset stops Allowed values: 0~5000 seconds.
Time At No Load	Amount of time the genset has run at no load Allowed values: 0~600 seconds.

NAME	DESCRIPTION
Time at Rated Cooldown	Amount of time spend in Rated Cooldown Allowed values: 0~5000 seconds.
Exercise Time Remaining	Time remaining until exercise stop sequence begins Allowed values: 0~25 hours.
Underfrequency Threshold	Number of Hertz Alternator Line Frequency may be under nominal frequency before Underfrequency fault becomes active. (Password level: 1.) Allowed values: 2~10 Hz. (Default: 6 Hz.)
Switch Inputs	
Configurable Input #1 Switch	Configurable Input #1 input software state status. Gives software Inactive/Active state Allowed values: Inactive, Active.
Configurable Input #2 Switch	Configurable Input #2 input software state status. Gives software Inactive/Active state Allowed values: Inactive, Active.
Configurable Input #13 Switch	Configurable Input #13 input software state status. Gives software Inactive/Active state Allowed values: Inactive, Active.
Configurable Input #14 Switch	Configurable Input #14 input software state status. Gives software Inactive/Active state Allowed values: Inactive, Active.
Coolant Level/Configurable Input #5 Switch	This is the status of the Configurable Input #5. Allowed values: Inactive, Active.
Low Fuel/Configurable Input #6 Switch	This is the status of the Configurable Input #6. Allowed values: Inactive, Active.
Fault Reset/Configurable Input #10 Switch	This is the status of the Configurable Input #10. Allowed values: Inactive, Active.
Start Type/Configurable Input #11 Switch	This is the status of the Configurable Input #11. Allowed values: Inactive, Active.
Rupture Basin/Configurable Input #12 Switch	This is the status of the Configurable Input #12. Allowed values: Inactive, Active.
Auto Switch	Status of the Auto Switch Input Allowed values: Inactive, Active.
Manual Switch	Manual input software state status. Gives software Inactive/Active state Allowed values: Inactive, Active.
Battery Charger Failed Switch	Battery Charger Failed Switch function output status; gives software Inactive/Active state Allowed values: Inactive, Active.
High Alt Temp Switch	High Alt Temp Switch function output status. Gives software Inactive/Active state Allowed values: Inactive, Active.
Low Coolant #2 Switch	Low Coolant #2 Switch function output status. Gives software Inactive/Active state Allowed values: Inactive, Active.

NAME	DESCRIPTION
Low Fuel In Day Tank Switch	Low Fuel In Day Tank Switch function output status. Gives software Inactive/Active state Allowed values: Inactive, Active.
Command Input Bitmasks	Some signals can come from multiple sources. Use the *Command Inputs* parameter to determine which source(s) is(are) active at any time. The *Command Inputs parameters are bitmasks. Each bit represents each type of source.* BIT 0 = Hardware Input BIT 1 = Configurable Input
Remote Start Command Inputs	Bitmask to show the inputs to the Command output which are currently on
Fault Reset Command Inputs	Bitmask to show the inputs to the Command output which are currently on
Start Type Command Inputs	Bitmask to show the inputs to the Command output which are currently on
Battle Short Command Inputs	Indicates which of the battle short inputs are active.
Outputs	
Configurable Output #1 Status	Indicates if the output's status is Inactive or Active Allowed values: Inactive, Active.
Configurable Output #2 Status	Indicates if the output's status is Inactive or Active Allowed values: Inactive, Active.
Configurable Output #3 Status	Indicates if the output's status is Inactive or Active Allowed values: Inactive, Active.
Configurable Output #4 Status	Indicates if the output's status is Inactive or Active Allowed values: Inactive, Active.
Ready To Load /Configurable Output #5 Status	Indicates if the output's status is Inactive or Active Allowed values: Inactive, Active.
Oil Priming Pump / Configurable Output #6 Status	Indicates if the output's status is Inactive or Active Allowed values: Inactive, Active.
Local Status / Configurable Output #7 Status	Indicates if the output's status is Inactive or Active Allowed values: Inactive, Active.
Glow Plug / Configurable Output #8 Status	Indicates if the output's status is Inactive or Active Allowed values: Inactive, Active.
Delayed Off / Configurable Output #10 Status	Indicates if the output's status is Inactive or Active Allowed values: Inactive, Active.
Load Dump / Configurable Output #11 Status	Indicates if the output's status is Inactive or Active Allowed values: Inactive, Active.

7.29 Engine Status (Advanced Engine Status)

Each label is described in the following table .

TABLE 101. ADVANCED ENGINE STATUS

NAME	DESCRIPTION
Water in Fuel Indicator	Water in Fuel Indication Allowed values: No, Yes.
Turbocharger 1 Speed	Monitor point for the Turbocharger 1 Speed Allowed values: 0~257000 rpm.
Turbocharger 2 Boost Pressure	Monitor point for the Turbocharger 2 Boost Pressure Allowed values: 0~1160 psi.
Speed Ramp State	The state of the speed reference ramp Allowed values: Ramp Off, Ramp On.
Prelube State	The monitor point for the prelube state. Allowed values: Complete, Armed, Prelube Output ON, Prelube Output OFF, Enable Crank.
Pre-Filter Oil Pressure	Monitor point for the Pre-Filter Oil Pressure Allowed values: 0~145 psi.
Post-Filter Oil Pressure	Monitor point for the Post-Filter Oil Pressure Allowed values: 0~145 psi.
Battery Charger Alternator Flash Voltage	The Battery Charger Alternator Flash Voltage after all scaling and validity checks.
Manifold Temperatures	
Intake Manifold 2 Temperature	Monitor point for the Intake Manifold 2 Temperature Allowed values: -40~410 degF.
Intake Manifold 3 Temperature	Monitor point for the Intake Manifold 3 Temperature Allowed values: -40~410 degF.
Intake Manifold 4 Temperature	Monitor point for the Intake Manifold 4 Temperature Allowed values: -40~410 degF.
Exhaust Port Temps	
Exhaust Port 1 Temperature	Monitor point for the Exhaust Port 1 Temperature Allowed values: -459~3155 degF.
Exhaust Port 2 Temperature	Monitor point for the Exhaust Port 2 Temperature Allowed values: -460~3155 degF.
Exhaust Port 3 Temperature	Monitor point for the Exhaust Port 3 Temperature Allowed values: -460~3155 degF.
Exhaust Port 4 Temperature	Monitor point for the Exhaust Port 4 Temperature Allowed values: -460~3155 degF.
Exhaust Port 5 Temperature	Monitor point for the Exhaust Port 5 Temperature Allowed values: -460~3155 degF.
Exhaust Port 6 Temperature	Monitor point for the Exhaust Port 6 Temperature Allowed values: -460~3155 degF.

NAME	DESCRIPTION
Exhaust Port 7 Temperature	Monitor point for the Exhaust Port 7 Temperature Allowed values: -460~3155 degF.
Exhaust Port 8 Temperature	Monitor point for the Exhaust Port 8 Temperature Allowed values: -460~3155 degF.
Exhaust Port 9 Temperature	Monitor point for the Exhaust Port 9 Temperature Allowed values: -460~3155 degF.
Exhaust Port 10 Temperature	Monitor point for the Exhaust Port 10 Temperature Allowed values: -460~3155 degF.
Exhaust Port 11 Temperature	Monitor point for the Exhaust Port 11 Temperature Allowed values: -460~3155 degF.
Exhaust Port 12 Temperature	Monitor point for the Exhaust Port 12 Temperature Allowed values: -460~3155 degF.
Exhaust Port 13 Temperature	Monitor point for the Exhaust Port 13 Temperature Allowed values: -460~3155 degF.
Exhaust Port 14 Temperature	Monitor point for the Exhaust Port 14 Temperature Allowed values: -460~3155 degF.
Exhaust Port 15 Temperature	Monitor point for the Exhaust Port 15 Temperature Allowed values: -460~3155 degF.
Exhaust Port 16 Temperature	Monitor point for the Exhaust Port 16 Temperature Allowed values: -460~3155 degF.
Exhaust Port 17 Temperature	Monitor point for the Exhaust Port 17 Temperature Allowed values: -460~3155 degF.
Exhaust Port 18 Temperature	Monitor point for the Exhaust Port 18 Temperature Allowed values: -460~3155 degF.
Exhaust Port 19 Temperature	Monitor point for the Exhaust Port 19 Temperature Allowed values: -460~3155 degF.
Exhaust Port 20 Temperature	Monitor point for the Exhaust Port 20 Temperature Allowed values: -460~3155 degF.

7.30 Basic

Each label is described in the following table.

TABLE 102. BASIC

NAME	DESCRIPTION
Load Share Speed Droop	
Isolated Bus Speed Control Method	Sets the speed control method for isolated bus paralleling. (Password level: 1.) Allowed values: Constant, Droop. (Default: Constant.)

NAME	DESCRIPTION
Speed Droop Percentage	Sets the speed droop percent from no load to full load. (Password level: 1.) Allowed values: 0~15 %. (Default: 5 %.)
Frequency Adjust	A method of adding in a frequency offset to the base frequency subject to high and low limit calibrations (Password level: 1.) Allowed values: -6~6 Hz. (Default: 0 Hz.)
Genset Total kW	Genset total kW
External Speed Bias	
Speed Bias OOR Check Enable	Enable for the Speed Bias OOR faults. (Password level: 1.) Allowed values: Disable, Enable. (Default: Disabled.)
Speed Bias OOR High Limit	High limit trim for the Speed Bias OOR fault. (Password level: 1.) Allowed values: -5~5 Vdc. (Default: 5 Vdc.)
Speed Bias OOR Low Limit	Low limit trim for the Speed Bias OOR fault. (Password level: 1.) Allowed values: -5~5 Vdc. (Default: -5 Vdc.)
Speed Bias OOR Time	Delay time for the Speed Bias OOR faults. (Password level: 1.) Allowed values: 0~10 seconds. (Default: 1 seconds.)
Speed Bias Scaling Table	This table displays how various input voltages correspond to speed bias adjustments.
Load Share Voltage Droop	
Isolated Bus Voltage Control Method	Sets the voltage control method for isolated bus paralleling. (Password level: 1.) Allowed values: Constant, Droop. (Default: Constant.)
Voltage Droop Percentage	Sets the voltage droop percent from no load to full load 0.8PF. (Password level: 1.) Allowed values: 0~15 %. (Default: 4 %.)
Voltage Adjust	Set to a positive or negative adjustment to the nominal voltage. (Password level: 1.) Allowed values: -5~5 %. (Default: 0 %.)
Genset Total kVAR	Genset total kVAR
External Voltage Bias	
Voltage Bias OOR Check Enable	Enable for the Voltage Bias Out of Range (OOR) faults. (Password level: 1.) Allowed values: Disable, Enable. (Default: Disabled.)
Voltage Bias OOR High Limit	High limit for the Voltage Bias Out of Range (OOR) fault. (Password level: 1.) Allowed values: -5~5 Vdc. (Default: 5 Vdc.)
Voltage Bias OOR Low Limit	Low limit for the Voltage Bias Out of Range (OOR) fault. (Password level: 1.) Allowed values: -5~5 Vdc. (Default: -5 Vdc.)
Voltage Bias OOR Time	Time limit for the Voltage Bias Out of Range (OOR) faults. (Password level: 1.) Allowed values: 0~10 seconds. (Default: 1 seconds.)
Voltage Bias Scaling Table	This table displays how various input voltages correspond to voltage bias adjustments.

7.31 AUX101 Setup

Each parameter is described in the following table :

NOTICE

The AUX101 1 and AUX102 1 parameters are similar to the AUX101 0 and AUX102 0 parameters, respectively, in the following table, so these parameters are not shown separately.

TABLE 103. AUX101 SETUP

PARAMETER	DESCRIPTION
Aux101 0 Analog Input 1 Sensor Type	Selects whether the input will be active open, active closed, or an analog input (Password level: 1) Allowed values: Analog Input, Switch Input - Active Closed, Switch Input - Active Open (Default: Sw In - Active Clsd)
Aux101 0 Analog Input 1 Function Pointer	Selects the type of analog input sensor. (Password level: 1) Allowed values: Default, Do Nothing (Default: Do Nothing)
Aux101 0 Input 1 Function Pointer	Selects discrete input fault/event for this input. (Password level: 1.) Allowed values: Default, Do Nothing, Low Fuel in Day Tank Switch, Low Coolant Switch #2, High Alt Temperature Switch, Ground Fault Switch, Exercise Switch, Battle Short Switch, Battery Charger Failed Switch, Low Engine Temperature Switch, Speed Droop Enable Switch, Voltage Droop Enable Switch, Rated/Idle Switch, AMM In Auto, Low Fuel Pressure Switch, Start Signal Integrity Switch (Default: Do Nothing.).
Aux101 0 Input 1 Fault Text	Twenty (20) character text field to allow for the entry of the displayed configurable fault text (Password level: 1) Allowed values: 0~20 characters (Default: AUX101 0 Fault 1)
Aux101 0 Analog Input 2 Sensor Type	Selects whether the input will be active open, active closed, or an analog input (Password level: 1) Allowed values: Analog Input, Switch Input - Active Closed, Switch Input - Active Open (Default: Sw In - Active Clsd)
Aux101 0 Analog Input 2 Function Pointer	Selects the type of analog input sensor (Password level: 1) Allowed values: Default, Do Nothing (Default: Do Nothing)
Aux101 0 Input 2 Function Pointer	Selects discrete input fault/event for this input (Password level: 1) Allowed values: Default, Do Nothing, Low Fuel in Day Tank Switch, Low Coolant Switch #2, High Alt Temperature Switch, Ground Fault Switch, Exercise Switch, Battle Short Switch, Battery Charger Failed Switch, Low Engine Temperature Switch, Speed Droop Enable Switch, Voltage Droop Enable Switch, Rated/Idle Switch, AMM In Auto, Low Fuel Pressure Switch, Start Signal Integrity Switch. (Default: Do Nothing)
Aux101 0 Input 2 Fault Text	Twenty (20) character text field to allow for the entry of the displayed configurable fault text (Password level: 1) Allowed values: 0~20 characters (Default: AUX101 0 Fault 2)

PARAMETER	DESCRIPTION
Aux101 0 Analog Input 3 Sensor Type	Selects whether the input will be active open, active closed, or an analog input (Password level: 1) Allowed values: Analog Input, Switch Input - Active Closed, Switch Input - Active Open (Default: Sw In - Active Clsd)
Aux101 0 Analog Input 3 Function Pointer	Selects the type of analog input sensor (Password level: 1) Allowed values: Do Nothing, Oil Temperature, Exhaust Stack Temperature 1, Exhaust Stack Temperature 2, Ambient Temperature, Fuel Level, Alternator Temperature 1, Alternator Temperature 2, Alternator Temperature 3, Intake Manifold Temperature 1, Drive End Bearing Temperature, Non-Drive End Bearing Temperature, LTA Temperature (Default: Do Nothing)
Aux101 0 Input 3 Function Pointer	Selects discrete input fault/event for this input (Password level: 1) Allowed values: Default, Do Nothing, Low Fuel in Day Tank Switch, Low Coolant Switch #2, High Alt Temperature Switch, Ground Fault Switch, Exercise Switch, Battle Short Switch, Battery Charger Failed Switch, Low Engine Temperature Switch, Speed Droop Enable Switch, Voltage Droop Enable Switch, Rated/Idle Switch, AMM In Auto, Low Fuel Pressure Switch, Start Signal Integrity Switch. (Default: Do Nothing)
Aux101 0 Input 3 Fault Text	Twenty (20) character text field to allow for the entry of the displayed configurable fault text (Password level: 1) Allowed values: 0~20 characters (Default: AUX101 0 Fault 3)
Aux101 0 Analog Input 4 Sensor Type	Selects whether the input will be active open, active closed, or an analog input (Password level: 1) Allowed values: Analog Input, Switch Input - Active Closed, Switch Input - Active Open (Default: Sw In - Active Clsd)
Aux101 0 Analog Input 4 Function Pointer	Selects the type of analog input sensor (Password level: 1) Allowed values: Do Nothing, Oil Temperature, Exhaust Stack Temperature 1, Exhaust Stack Temperature 2, Ambient Temperature, Fuel Level, Alternator Temperature 1, Alternator Temperature 2, Alternator Temperature 3, Intake Manifold Temperature 1, Drive End Bearing Temperature, Non-Drive End Bearing Temperature, LTA Temperature (Default: Do Nothing)
Aux101 0 Input 4 Function Pointer	Selects discrete input fault/event for this input (Password level: 1) Allowed values: Default, Do Nothing, Low Fuel in Day Tank Switch, Low Coolant Switch #2, High Alt Temperature Switch, Ground Fault Switch, Exercise Switch, Battle Short Switch, Battery Charger Failed Switch, Low Engine Temperature Switch, Speed Droop Enable Switch, Voltage Droop Enable Switch, Rated/Idle Switch, AMM In Auto, Low Fuel Pressure Switch, Start Signal Integrity Switch. (Default: Do Nothing)
Aux101 0 Input 4 Fault Text	Twenty (20) character text field to allow for the entry of the displayed configurable fault text (Password level: 1) Allowed values: 0~20 characters (Default: AUX101 0 Fault 4)
Aux101 0 Analog Input 5 Sensor Type	Selects whether the input will be active open, active closed, or an analog input (Password level: 1) Allowed values: Analog Input, Switch Input - Active Closed, Switch Input - Active Open (Default: Sw In - Active Clsd)

PARAMETER	DESCRIPTION
Aux101 0 Analog Input 5 Function Pointer	Selects the type of analog input sensor (Password level: 1) Allowed values: Do Nothing, Oil Temperature, Exhaust Stack Temperature 1, Exhaust Stack Temperature 2, Ambient Temperature, Fuel Level, Alternator Temperature 1, Alternator Temperature 2, Alternator Temperature 3, Intake Manifold Temperature 1, Drive End Bearing Temperature, Non-Drive End Bearing Temperature,LTA Temperature (Default: Do Nothing)
Aux101 0 Input 5 Function Pointer	Selects discrete input fault/event for this input (Password level: 1) Allowed values: Default, Do Nothing, Low Fuel in Day Tank Switch, Low Coolant Switch #2, High Alt Temperature Switch, Ground Fault Switch, Exercise Switch, Battle Short Switch, Battery Charger Failed Switch, Low Engine Temperature Switch, Speed Droop Enable Switch, Voltage Droop Enable Switch, Rated/Idle Switch, AMM In Auto, Low Fuel pressure Switch, Start Signal Integrity Switch. (Default: Do Nothing)
Aux101 0 Input 5 Fault Text	Twenty (20) character text field to allow for the entry of the displayed configurable fault text (Password level: 1) Allowed values: 0~20 characters (Default: AUX101 0 Fault 5)
Aux101 0 Analog Input 6 Sensor Type	Selects whether the input will be active open, active closed, or an analog input (Password level: 1) Allowed values: Analog Input, Switch Input - Active Closed, Switch Input - Active Open (Default: Sw In - Active Clsd)
Aux101 0 Analog Input 6 Function Pointer	Selects the type of analog input sensor (Password level: 1) Allowed values: Do Nothing, Oil Temperature, Exhaust Stack Temperature 1, Exhaust Stack Temperature 2, Ambient Temperature, Fuel Level, Alternator Temperature 1, Alternator Temperature 2, Alternator Temperature 3, Intake Manifold Temperature 1, Drive End Bearing Temperature, Non-Drive End Bearing Temperature, LTA Temperature (Default: Do Nothing)
Aux101 0 Input 6 Function Pointer	Selects discrete input fault/event for this input (Password level: 1) Allowed values: Default, Do Nothing, Low Fuel in Day Tank Switch, Low coolant Switch #2, High Alt Temperature Switch, Ground Fault Switch, Exercise Switch, Battle Short Switch, Battery Charger Failed Switch, Low Engine Temperature Switch, Speed Droop Enable Switch, Voltage Droop Enable Switch, Rated/Idle Switch, AMM In Auto, Low Fuel Pressure Switch, Start Signal Integrity Switch. (Default: Do Nothing)
Aux101 0 Input 6 Fault Text	Twenty (20) character text field to allow for the entry of the displayed configurable fault text (Password level: 1) Allowed values: 0~20 characters (Default: AUX101 0 Fault 6)
Aux101 0 Analog Input 7 Sensor Type	Selects whether the input will be active open, active closed, or an analog input (Password level: 1) Allowed values: Analog Input, Switch Input - Active Closed, Switch Input - Active Open (Default: Sw In - Active Clsd)
Aux101 0 Analog Input 7 Function Pointer	Selects the type of analog input sensor (Password level: 1) Allowed values: None (Default: None)

PARAMETER	DESCRIPTION
Aux101 0 Input 7 Function Pointer	Selects discrete input fault/event for this input. (Password level: 1.) Allowed values: Default, Do Nothing, Low Fuel in Day Tank Switch, Low Coolant Switch #2, High Alt Temperature Switch, Ground Fault Switch, Exercise Switch, Battle Short Switch, Battery Charger Failed Switch, Low Engine Temperature Switch, Speed Droop Enable Switch, Voltage Droop Enable Switch, Rated/Idle Switch, AMM In Auto, Low Fuel Pressure Switch, Start Signal Integrity Switch. (Default: Do Nothing)
Aux101 0 Input 7 Fault Text	Twenty (20) character text field to allow for the entry of the displayed configurable fault text (Password level: 1) Allowed values: 0~20 characters (Default: AUX101 0 Fault 7)
Aux101 0 Analog Input 8 Sensor Type	Selects whether the input will be active open, active closed, or an analog input (Password level: 1) Allowed values: Analog Input, Switch Input - Active Closed, Switch Input - Active Open (Default: Sw In - Active Clsd)
Aux101 0 Analog Input 8 Function Pointer	Selects the type of analog input sensor (Password level: 1) Allowed values: None (Default: None)
Aux101 0 Input 8 Function Pointer	Selects discrete input fault/event for this input (Password level: 1) Allowed values: Default, Do Nothing, Low Fuel in Day Tank Switch, Low Coolant Switch #2, High Alt Temperature Switch, Ground Fault Switch, Exercise Switch, Battle Short Switch, Battery Charger Failed Switch, Low Engine Temperature Switch, Speed Droop Enable Switch, Voltage Droop Enable Switch, Rated/Idle Switch, AMM In Auto, Low Fuel Pressure Switch, Start Signal Integrity Switch. (Default: Do Nothing)
Aux101 0 Input 8 Fault Text	Twenty (20) character text field to allow for the entry of the displayed configurable fault text (Password level: 1) Allowed values: 0~20 characters (Default: AUX101 0 Fault 8)
Aux101 0 Output 1 Fault/Event	Parameter to allow for the entry of the fault/event code which will turn the output relay on and off (Password level: 1) Allowed values: 0~65530 (Default: 415)
Aux101 0 Output 1 Function Pointer	Selects the discrete output function for this output (Password level: 1) Allowed values: Do Nothing, Common Warning, Common Shutdown, Rated to Idle Transition Event, Fault Code Function #1, Fault Code Function #2, Fault Code Function #3, Fault Code Function #4, Fault Code Function #5, LBNG Start-Enable Function, LBNG Idle Speed Event Function, Air Shutoff Valve Control, Load Demand Spare Capacity Available (Default: Do Nothing)
Aux101 0 Output 2 Fault/Event	Parameter to allow for the entry of the fault/event code which will turn the output relay on and off (Password level: 1) Allowed values: 0~65530 (Default: 1847)
Aux101 0 Output 2 Function Pointer	Selects the discrete output function for this output (Password level: 1) Allowed values: Do Nothing, Common Warning, Common Shutdown, Rated to Idle Transition Event, Fault Code Function #1, Fault Code Function #2, Fault Code Function #3, Fault Code Function #4, Fault Code Function #5, LBNG Start-Enable Function, LBNG Idle Speed Event Function, Air Shutoff Valve Control, Load Demand Spare Capacity Available (Default: Do Nothing)

PARAMETER	DESCRIPTION
Aux101 0 Output 3 Fault/Event	Parameter to allow for the entry of the fault/event code which will turn the output relay on and off (Password level: 1) Allowed values: 0~65530 (Default: 9516)
Aux101 0 Output 3 Function Pointer	Selects the discrete output function for this output (Password level: 1) Allowed values: Do Nothing, Common Warning, Common Shutdown, Rated to Idle Transition Event, Fault Code Function #1, Fault Code Function #2, Fault Code Function #3, Fault Code Function #4, Fault Code Function #5, LBNG Start-Enable Function, LBNG Idle Speed Event Function, Air Shutoff Valve Control, Load Demand Spare Capacity Available (Default: Do Nothing)
Aux101 0 Output 4 Fault/Event	Parameter to allow for the entry of the fault/event code which will turn the output relay on and off (Password level: 1) Allowed values: 0~65530 (Default: 441)
Aux101 0 Output 4 Function Pointer	Selects the discrete output function for this output (Password level: 1) Allowed values: Do Nothing, Common Warning, Common Shutdown, Rated to Idle Transition Event, Fault Code Function #1, Fault Code Function #2, Fault Code Function #3, Fault Code Function #4, Fault Code Function #5, LBNG Start-Enable Function, LBNG Idle Speed Event Function, Air Shutoff Valve Control,Load Demand Spare Capacity Available (Default: Do Nothing)
Aux101 0 Output 5 Fault/Event	Parameter to allow for the entry of the fault/event code which will turn the output relay on and off (Password level: 1) Allowed values: 0~65530 (Default: 234)
Aux101 0 Output 5 Function Pointer	Selects the discrete output function for this output (Password level: 1) Allowed values: Do Nothing, Common Warning, Common Shutdown, Rated to Idle Transition Event, Fault Code Function #1, Fault Code Function #2, Fault Code Function #3, Fault Code Function #4, Fault Code Function #5, LBNG Start-Enable Function, LBNG Idle Speed Event Function, Air Shutoff Valve Control,Load Demand Spare Capacity Available (Default: Do Nothing)
Aux101 0 Output 6 Fault/Event	Parameter to allow for the entry of the fault/event code which will turn the output relay on and off (Password level: 1) Allowed values: 0~65530 (Default: 359)
Aux101 0 Output 6 Function Pointer	Selects the discrete output function for this output (Password level: 1) Allowed values: Do Nothing, Common Warning, Common Shutdown, Rated to Idle Transition Event, Fault Code Function #1, Fault Code Function #2, Fault Code Function #3, Fault Code Function #4, Fault Code Function #5, LBNG Start-Enable Function, LBNG Idle Speed Event Function, Air Shutoff Valve Control,Load Demand Spare Capacity Available (Default: Do Nothing)
Aux101 0 Output 7 Fault/Event	Parameter to allow for the entry of the fault/event code which will turn the output relay on and off (Password level: 1) Allowed values: 0~65530 (Default: 1463)
Aux101 0 Output 7 Function Pointer	Selects the discrete output function for this output (Password level: 1) Allowed values: Do Nothing, Common Warning, Common Shutdown, Rated to Idle Transition Event, Fault Code Function #1, Fault Code Function #2, Fault Code Function #3, Fault Code Function #4, Fault Code Function #5, LBNG Start-Enable Function, LBNG Idle Speed Event Function, Air Shutoff Valve Control, Load Demand Spare Capacity Available (Default: Do Nothing)

PARAMETER	DESCRIPTION
Aux101 0 Output 8 Fault/Event	Parameter to allow for the entry of the fault/event code which will turn the output relay on and off (Password level: 1) Allowed values: 0~65530 (Default: 1465)
Aux101 0 Output 8 Function Pointer	Selects the discrete output function for this output (Password level: 1) Allowed values: Do Nothing, Common Warning, Common Shutdown, Rated to Idle Transition Event, Fault Code Function #1, Fault Code Function #2, Fault Code Function #3, Fault Code Function #4, Fault Code Function #5, LBNG Start-Enable Function, LBNG Idle Speed Event Function, Air Shutoff Valve Control, Load Demand Spare Capacity Available (Default: Do Nothing)
Aux102 0 Input 9 Active State Selection	Selects the type of switch response as either Active Closed or Active Open (Password level: 1) Allowed values: Active Closed, Active Open (Default: Active Closed)
Aux102 0 Input 9 Function Pointer	Selects discrete input fault/event for this input (Password level: 1) Allowed values: Default, Do Nothing, Low Fuel in Day Tank Switch, Low Coolant Switch #2, High Alt Temperature Switch, Ground Fault Switch, Exercise Switch, Battle Short Switch, Battery Charger Failed Switch, Low Engine Temperature Switch, Speed Droop Enable Switch, Voltage Droop Enable Switch, Rated/Idle Switch, AMM In Auto, Low Fuel Pressure Switch, Start Signal Integrity Switch. (Default: Do Nothing)
Aux102 0 Fault 9 Text	Twenty (20) character text string to enter the configurable fault text for this fault (Password level: 1) Allowed values: 0~20 characters (Default: AUX102 0 Fault 9)
Aux102 0 Input 10 Active State Selection	Selects the type of switch response as either Active Closed or Active Open (Password level: 1) Allowed values: Active Closed, Active Open (Default: Active Closed)
Aux102 0 Input 10 Function Pointer	Selects discrete input fault/event for this input (Password level: 1) Allowed values: Default, Do Nothing, Low Fuel in Day Tank Switch, Low Coolant Switch #2, High Alt Temperature Switch, Ground Fault Switch, Exercise Switch, Battle Short Switch, Battery Charger Failed Switch, Low Engine Temperature Switch, Speed Droop Enable Switch, Voltage Droop Enable Switch, Rated/Idle Switch, AMM In Auto, Low Fuel Pressure Switch, Start Signal Integrity Switch. (Default: Do Nothing)
Aux102 0 Fault 10 Text	Twenty (20) character text string to enter the configurable fault text for this fault (Password level: 1) Allowed values: 0~20 characters (Default: AUX102 0 Fault 10)
Aux102 0 Input 11 Active State Selection	Selects the type of switch response as either Active Closed or Active Open (Password level: 1) Allowed values: Active Closed, Active Open (Default: Active Closed)
Aux102 0 Input 11 Function Pointer	Selects discrete input fault/event for this input (Password level: 1) Allowed values: Default, Do Nothing, Low Fuel in Day Tank Switch, Low Coolant Switch #2, High Alt Temperature Switch, Ground Fault Switch, Exercise Switch, Battle Short Switch, Battery Charger Failed Switch, Low Engine Temperature Switch, Speed Droop Enable Switch, Voltage Droop Enable Switch, Rated/Idle Switch, AMM In Auto, Low Fuel Pressure Switch, Start Signal Itegrity Switch. (Default: Do Nothing)

PARAMETER	DESCRIPTION
Aux102 0 Fault 11 Text	Twenty (20) character text string to enter the configurable fault text for this fault (Password level: 1) Allowed values: 0~20 characters (Default: AUX102 0 Fault 11)
Aux102 0 Input 12 Active State Selection	Selects the type of switch response as either Active Closed or Active Open (Password level: 1) Allowed values: Active Closed, Active Open (Default: Active Closed)
Aux102 0 Input 12 Function Pointer	Selects discrete input fault/event for this input (Password level: 1) Allowed values: Default, Do Nothing, Low Fuel in Day Tank Switch, Low Coolant Switch #2, High Alt Temperature Switch, Ground Fault Switch, Exercise Switch, Battle Short Switch, Battery Charger Failed Switch, Low Engine Temperature Switch, Speed Droop Enable Switch, Voltage Droop Enable Switch, Rated/Idle Switch, AMM In Auto, Low Fuel Pressure Switch, Start Signal Integrity Switch. (Default: Do Nothing)
Aux102 0 Fault 12 Text	Twenty (20) character text string to enter the configurable fault text for this fault (Password level: 1) Allowed values: 0~20 characters (Default: AUX102 0 Fault 12)
Aux102 0 Output 9 Fault/Event	Parameter to allow for the entry of the fault/event code which will turn the output relay on and off (Password level: 1) Allowed values: 0~65530 (Default: 143)
Aux102 0 Output 9 Function Pointer	Selects the discrete output function for this output (Password level: 1) Allowed values: Do Nothing, Common Warning, Common Shutdown, Rated to Idle Transition Event, Fault Code Function #1, Fault Code Function #2, Fault Code Function #3, Fault Code Function #4, Fault Code Function #5, LBNG Start-Enable Function, LBNG Idle Speed Event Function, Air Shutoff Valve Control, Load Demand Spare Capacity Available (Default: Do Nothing)
Aux102 0 Output 10 Fault/Event	Parameter to allow for the entry of the fault/event code which will turn the output relay on and off (Password level: 1) Allowed values: 0~65530 (Default: 146)
Aux102 0 Output 10 Function Pointer	Selects the discrete output function for this output (Password level: 1) Allowed values: Do Nothing, Common Warning, Common Shutdown, Rated to Idle Transition Event, Fault Code Function #1, Fault Code Function #2, Fault Code Function #3, Fault Code Function #4, Fault Code Function #5, LBNG Start-Enable Function, LBNG Idle Speed Event Function, Air Shutoff Valve Control, Load Demand Spare Capacity Available (Default: Do Nothing)
Aux102 0 Output 11 Fault/Event	Parameter to allow for the entry of the fault/event code which will turn the output relay on and off (Password level: 1) Allowed values: 0~65530 (Default: 197)
Aux102 0 Output 11 Function Pointer	Selects the discrete output function for this output (Password level: 1) Allowed values: Do Nothing, Common Warning, Common Shutdown, Rated to Idle Transition Event, Fault Code Function #1, Fault Code Function #2, Fault Code Function #3, Fault Code Function #4, Fault Code Function #5, LBNG Start-Enable Function, LBNG Idle Speed Event Function, Air Shutoff Valve Control, Load Demand Spare Capacity Available (Default: Do Nothing)
Aux102 0 Output 12 Fault/Event	Parameter to allow for the entry of the fault/event code which will turn the output relay on and off (Password level: 1) Allowed values: 0~65530 (Default: 1439)

PARAMETER	DESCRIPTION
Aux102 0 Output 12 Function Pointer	Selects the discrete output function for this output (Password level: 1) Allowed values: Do Nothing, Common Warning, Common Shutdown, Rated to Idle Transition Event, Fault Code Function #1, Fault Code Function #2, Fault Code Function #3, Fault Code Function #4, Fault Code Function #5, LBNG Start-Enable Function, LBNG Idle Speed Event Function, Air Shutoff Valve Control, Load Demand Spare Capacity Available (Default: Do Nothing)
Aux102 0 Output 13 Fault/Event	Parameter to allow for the entry of the fault/event code which will turn the output relay on and off (Password level: 1) Allowed values: 0~65530 (Default: 1435)
Aux102 0 Output 13 Function Pointer	Selects the discrete output function for this output (Password level: 1) Allowed values: Do Nothing, Common Warning, Common Shutdown, Rated to Idle Transition Event, Fault Code Function #1, Fault Code Function #2, Fault Code Function #3, Fault Code Function #4, Fault Code Function #5, LBNG Start-Enable Function, LBNG Idle Speed Event Function, Air Shutoff Valve Control, Load Demand Spare Capacity Available (Default: Do Nothing)
Aux102 0 Output 14 Fault/Event	Parameter to allow for the entry of the fault/event code which will turn the output relay on and off (Password level: 1) Allowed values: 0~65530 (Default: 1483)
Aux102 0 Output 14 Function Pointer	Selects the discrete output function for this output (Password level: 1) Allowed values: Do Nothing, Common Warning, Common Shutdown, Rated to Idle Transition Event, Fault Code Function #1, Fault Code Function #2, Fault Code Function #3, Fault Code Function #4, Fault Code Function #5, LBNG Start-Enable Function, LBNG Idle Speed Event Function, Air Shutoff Valve Control, Load Demand Spare Capacity Available (Default: Do Nothing)
Aux102 0 Output 15 Fault/Event	Parameter to allow for the entry of the fault/event code which will turn the output relay on and off (Password level: 1) Allowed values: 0~65530 (Default: 442)
Aux102 0 Output 15 Function Pointer	Selects the discrete output function for this output (Password level: 1) Allowed values: Do Nothing, Common Warning, Common Shutdown, Rated to Idle Transition Event, Fault Code Function #1, Fault Code Function #2, Fault Code Function #3, Fault Code Function #4, Fault Code Function #5, LBNG Start-Enable Function, LBNG Idle Speed Event Function, Air Shutoff Valve Control, Load Demand Spare Capacity Available (Default: Do Nothing)
Aux102 0 Output 16 Fault/Event	Parameter to allow for the entry of the fault/event code which will turn the output relay on and off (Password level: 1) Allowed values: 0~65530 (Default: 1442)
Aux102 0 Output 16 Function Pointer	Selects the discrete output function for this output (Password level: 1) Allowed values: Do Nothing, Common Warning, Common Shutdown, Rated to Idle Transition Event, Fault Code Function #1, Fault Code Function #2, Fault Code Function #3, Fault Code Function #4, Fault Code Function #5, LBNG Start-Enable Function, LBNG Idle Speed Event Function, Air Shutoff Valve Control, Load Demand Spare Capacity Available (Default: Do Nothing)

7.31.1 Characteristics of the AUX101 and AUX102 with the PowerCommand 2.x and 3.x

7.31.1.1 Maximum Number of AUX101/102 for the PowerCommand 2.x and 3.x

TABLE 104. MAXIMUM NUMBER OF AUX101/102 FOR THE POWERCOMMAND 2.X AND 3.X

Description	Value
Maximum Number of AUX101	2
Maximum Number of AUX102	2

7.31.1.2 Required Part Numbers to Support the AUX101 for the PowerCommand 2.x

TABLE 105. REQUIRED PART NUMBERS TO SUPPORT THE AUX101 FOR THE POWERCOMMAND 2.X

Component	Part Number
PCC2300 base board	A026N036

NOTICE
PCC2300 base board 0327-1636 does not support the AUX101.

7.31.1.3 Possible Functions of AUX101 Inputs for PowerCommand 2.x and 3.x

TABLE 106. POSSIBLE FUNCTIONS OF AUX101 INPUTS FOR POWERCOMMAND 2.X AND 3.X

Input	Possible Functions
1-2	Switch (active-open or active-closed)
3-6	Switch (active-open or active-closed), additional functions for configurable inputs, additional functions for configurable analog inputs
7-8	Switch (active-open or active-closed)

7.31.1.3.1 Default Functions of AUX101 Inputs for PowerCommand 2.x and 3.x

All AUX101 inputs are disabled.

7.31.1.3.2 Additional Functions of Configurable Inputs on the PowerCommand 2.x

Each configurable input can be mapped to one of these functions, instead of their default function.

TABLE 107. ADDITIONAL FUNCTIONS OF CONFIGURABLE INPUTS ON THE POWERCOMMAND 2.X

Function	Related Settings
Low Fuel in Day Tank Switch	Low Fuel in Day Tank Time
Low Coolant Switch #2	None
High Alt Temperature Switch	High Alternator Temperature Shutdown Threshold (Aux101), High Alternator Temperature 1 Time (Aux101)
Ground Fault Switch	Ground Fault Current Delay, Ground Fault Current Threshold Percent
Exercise Switch	Genset Exercise Time
Battle Short Switch	Battle Short Enable
Battery Charger Failed Switch	None
Low Engine Temperature Switch	None
Speed Droop Enable Switch	Speed Droop Percentage
Voltage Droop Enable Switch	Voltage Droop Percentage

NOTICE

Currently, Speed Droop Enable Switch and Voltage Droop Enable Switch are not available, but they appear in the Operator Panel.

You can only map one configurable input to each of these functions. For example, there cannot be two Battle Short Switches.

You can also set up a configurable input to do nothing at all .

7.31.1.3.3 Additional Functions of Configurable Analog Inputs on the PowerCommand 2.x and 3.x

Each configurable input can be mapped to one of these functions, instead of their default function .

TABLE 108. ADDITIONAL FUNCTIONS OF CONFIGURABLE ANALOG INPUTS ON THE POWERCOMMAND 2.X AND 3.X

Function	Related Settings
Oil Temperature	High Oil Temperature Threshold (Aux101), High Oil Temperature Time (Aux101), Aux 101 Oil/Ambient/Intake Manifold Temp Input Scaling Table, Aux101 Oil Temp OOR Check Enable, Aux101 Oil/Ambient/Intake Manifold Temp OOR High Limit, Aux101 Oil/Ambient/Intake Manifold Temp OOR Low Limit, Aux101 Oil/Ambient/Intake Manifold Temp OOR Time
Exhaust Stack Temperature 1	Aux 101 Exhaust Stack Temp Input Scaling Table, High Exhaust Stack Temperature 1 Threshold (Aux101), High Exhaust Stack Temperature 1 Time (Aux101), Aux101 Exhaust Stack Temp 1 OOR Check Enable, Aux101 Exhaust Stack Temp OOR High Limit, Aux101 Exhaust Stack Temp OOR Low Limit, Aux101 Exhaust Stack Temp OOR Time
Exhaust Stack Temperature 2	Aux 101 Exhaust Stack Temp Input Scaling Table, High Exhaust Stack Temperature 2 Threshold (Aux101), High Exhaust Stack Temperature 2 Time (Aux101), Aux101 Exhaust Stack Temp 2 OOR Check Enable, Aux101 Exhaust Stack Temp OOR High Limit, Aux101 Exhaust Stack Temp OOR Low Limit, Aux101 Exhaust Stack Temp OOR Time
Ambient Temperature	Ambient Temp Fault Delay, Ambient Temp Fault Level, Ambient Temp Fault Threshold, Aux 101 Oil/Ambient/Intake Manifold Temp Input Scaling Table, Aux101 Ambient Temp OOR Check Enable, Aux101 Oil/Ambient/Intake Manifold Temp OOR High Limit, Aux101 Oil/Ambient/Intake Manifold Temp OOR Low Limit, Aux101 Oil/Ambient/Intake Manifold Temp OOR Time
Fuel Level	Fuel Level 100 Percent Resistance (Aux101), Fuel Level Zero Percent Resistance (Aux101), High Fuel Level Threshold (Aux101), High Fuel Level Time (Aux101), Low Fuel Level Threshold (Aux101), Low Fuel Level Time (Aux101), Low Fuel Set/Clear Time, Very Low Fuel Level Threshold (Aux101), Very Low Fuel Level Time (Aux101), Aux101 Fuel Level OOR Check Enable, Aux101 Fuel Level OOR High Limit, Aux101 Fuel Level OOR Low Limit, Aux101 Fuel Level OOR Time
Alternator Temperature 1	High Alternator Temperature 1 Threshold (Aux101), High Alternator Temperature 1 Time (Aux101), Aux101 Alternator Temperature OOR Check Enable, Aux101 Alternator Temperature OOR High Limit, Aux101 Alternator Temperature OOR Low Limit, Aux101 Alternator Temperature OOR Time

Function	Related Settings
Alternator Temperature 2	High Alternator Temperature 2 Threshold (Aux101), High Alternator Temperature 2 Time (Aux101), Aux101 Alternator Temperature OOR Check Enable, Aux101 Alternator Temperature OOR High Limit, Aux101 Alternator Temperature OOR Low Limit, Aux101 Alternator Temperature OOR Time
Alternator Temperature 3	High Alternator Temperature 3 Threshold (Aux101), High Alternator Temperature 3 Time (Aux101), Aux101 Alternator Temperature OOR Check Enable, Aux101 Alternator Temperature OOR High Limit, Aux101 Alternator Temperature OOR Low Limit, Aux101 Alternator Temperature OOR Time
Intake Manifold Temperature 1	High Intake Manifold Temperature 1 Threshold (Aux101), High Intake Temperature 1 Time (Aux101), Aux 101 Oil/Ambient/Intake Manifold Temp Input Scaling Table, Aux101 Intake Manifold Temp OOR Check Enable, Aux101 Oil/Ambient/Intake Manifold Temp OOR High Limit, Aux101 Oil/Ambient/Intake Manifold Temp OOR Low Limit, Aux101 Oil/Ambient/Intake Manifold Temp OOR Time
Drive End Bearing Temperature	High Drive End Bearing Temperature Threshold (Aux101), High Drive End Bearing Temperature Time (Aux101), Aux101 Drive End Bearing Temperature OOR Check Enable, Aux101 Drive/Non-Drive End Bearing Temp OOR High Limit, Aux101 Drive/Non-Drive End Bearing Temp OOR Low Limit, Aux101 Drive/Non-Drive End Bearing Temperature OOR Time
Non-Drive End Bearing Temperature	High Non-Drive End Bearing Temperature Threshold (Aux101), High Non-Drive End Bearing Temperature Time (Aux101), Aux101 Non-Drive End Bearing Temperature OOR Check Enable, Aux101 Drive/Non-Drive End Bearing Temp OOR High Limit, Aux101 Drive/Non-Drive End Bearing Temp OOR Low Limit, Aux101 Drive/Non-Drive End Bearing Temperature OOR Time
LTA Temperature	High LTA Temperature Threshold (Aux101), High LTA Temperature Time (Aux101), Aux101 LTA Temperature OOR Check Enable, Aux101 LTA Temperature OOR High Limit, Aux101 LTA Temperature OOR Low Limit, Aux101 LTA Temperature OOR Time.

You can only map one configurable analog input to each of these functions. For example, there cannot be two Fuel Level inputs.

You can also set up a configurable analog input to do nothing at all.

7.31.1.3.4 PowerCommand 2.x and 3.x Fault Codes Generated by AUX101 Switch Inputs

TABLE 109. POWERCOMMAND 2.X AND 3.X FAULT CODES GENERATED BY AUX101 SWITCH INPUTS

Input	Fault Code	
	Device 0	Device 1
1	2619	2882
2	2621	2883
3	2622	2884
4	2623	2885
5	2624	2886
6	2625	2887
7	2626	2888
8	2627	2889

7.31.1.4 Default Functions of AUX101 Outputs with the PowerCommand 2.x and 3.x

TABLE 110. DEFAULT FUNCTIONS OF AUX101 OUTPUTS WITH THE POWERCOMMAND 2.X AND 3.X

Output	Default Function
1	Low oil pressure
2	High engine temperature
3	Charger AC failure
4	Low battery voltage
5	Overspeed
6	Fail to start
7	Not in auto
8	Ready to load

7.31.1.5 Possible Functions of AUX102 Inputs for PowerCommand 2.x and 3.x

TABLE 111. POSSIBLE FUNCTIONS OF AUX102 INPUTS FOR POWERCOMMAND 2.X AND 3.X

Input	Possible Functions
9-12	Switch (active-open or active-closed), additional functions for configurable inputs

7.31.1.5.1 Default Functions of AUX102 Inputs for PowerCommand 2.x and 3.x

All AUX102 inputs are disabled.

7.31.1.5.2 PowerCommand 2.x and 3.x Fault Codes Generated by AUX102 Switch Inputs

TABLE 112. POWERCOMMAND 2.X AND 3.X FAULT CODES GENERATED BY AUX102 SWITCH INPUTS

Input	Fault Code	
	Device 0	Device 1
9	2628	2891
10	2629	2892
11	2631	2893
12	2632	2894

7.31.1.6 Default Functions of AUX102 Outputs with the PowerCommand 2.x and 3.x

TABLE 113. DEFAULT FUNCTIONS OF AUX102 OUTPUTS WITH THE POWERCOMAND 2.X AND 3.X

Output	Default Function
9	Pre-low oil pressure
10	Pre-high engine temperature
11	Low coolant level
12	Low fuel in day tank
13	Low coolant temperature
14	Common alarm
15	High battery voltage
16	Weak battery

7.31.2 Tools to Configure a PowerCommand 2.x or 3.x AUX101/102

You must use one of these tools to configure the AUX101 and AUX102 settings in the controller.

- Operator panel
- InPower service tool
- Modbus connection

7.31.2.1 How to Find the AUX101 Setup Screens in the Operator Panel

The AUX101 Setup screens are available on the main menu.

1. Go to the Home screen.
2. Change the selection in the graphical display until "AUX 101 Setup" is selected. Use the selection buttons to change page, if necessary.
3. Press OK.

7.31.2.2 How to Configure a Switch on the PowerCommand 2.x or 3.x

1. Set "AUX 101 Analog Input Sensor Type" to "Switch Input - Active Closed" or "Switch Input - Active Open" for the input that will be a switch.
2. Enter a brief description of the event in "AUX 101 Input Fault Text" for the input that will be a switch.
3. Set "AUX 101 Input Function Pointer" to "Default" for the input that will be a switch.
4. Save your changes.

7.31.2.3 How to Configure an Additional Function for AUX101 Inputs on the PowerCommand 2.x or 3.x

1. Set "AUX 101 Analog Input Sensor Type" to "Switch Input - Active Closed" or "Switch Input - Active Open" for the input that will be a switch.
2. Set "AUX 101 Input Function Pointer" to the desired function for the input that will be a switch. If the selection is rejected, the desired function is already used by another input.
3. Set the appropriate settings for the desired function. The related settings vary by function.
4. Save your changes.

7.31.2.3.1 Example: Configure AUX101 Input #3 as a Low Fuel in Day Tank Switch on the PowerCommand 2.x or 3.x

In this example, the Low Fuel in Day Tank Switch is active-closed, and the switch must be active for five seconds before the controller generates a fault.

1. Set "AUX101 0 Analog Input 3 Sensor Type" to "Switch Input - Active Closed".
2. Set "AUX101 0 Input 3 Function Pointer" to "Low Fuel in Day Tank Switch".
3. Set "Low Fuel in Day Tank Time" to 5 seconds.
4. Save your changes.

7.31.2.4 How to Configure an Analog Input on the PowerCommand 2.x or 3.x

1. Set "AUX 101 Analog Input Sensor Type" to "Analog Input" for the input that will be an analog input.
2. Set "AUX 101 Analog Input Function Pointer" to the desired function.
3. Set the appropriate settings for the desired function. The related settings vary by function.
4. Save your changes.

7.31.2.4.1 Example: Configure AUX101 Input #4 as an Alternator Temperature Sensor on the PowerCommand 2.x or 3.x

In this example, the alternator temperature sensor must be at least 300 degrees F for five seconds before the controller generates a fault. The out-of-range check is active, and the sensor must be outside 0.2-4.8 VDC for two seconds before the controller generates a fault.

1. Set "AUX101 0 Analog Input 4 Sensor Type" to "Analog Input".
2. Set "AUX101 0 Analog Input 4 Function Pointer" to "Alternator Temperature 1".
3. Set "High Alternator Temperature 1 Threshold (Aux101)" to 300 degrees F.
4. Set "High Alternator Temperature 1 Time (Aux101)" to 5 seconds.
5. Set "Aux101 Alternator Temperature OOR High Limit" to 4.8 VDC.
6. Set "Aux101 Alternator Temperature OOR Low Limit" to 0.2 VDC.

7. Set "Aux101 Alternator Temperature OOR Time" to 2 seconds.
8. Set "Aux101 Alternator Temperature OOR Check Enable" to "Enable".
9. Save your changes.

7.31.2.4.2 Typical Electrical Characteristics of Various Sensors

This table provides information for reference only. It should not be used to configure any devices that will be connected to the sensors.

NOTICE
Use the documentation provided with a sensor to configure any device that will be connected to the sensor. Failure to do so may result in equipment damage.

TABLE 114. TYPICAL ELECTRICAL CHARACTERISTICS OF VARIOUS SENSORS

Type of Sensor	Typical Characteristics
Oil temperature	600-2200 ohms
Exhaust temperature	80-400 ohms
Ambient air temperature	600-2200 ohms
Fuel level	600-2500 ohms
Alternator temperature	PT 100 RTD 100 ohms @ 0 C (32 F), 0.385 ohms/C (0.214 ohms/F)

7.31.2.5 How to Configure an Output on the PowerCommand 2.x or 3.x

1. Set "AUX 101 Output Function Pointer" to the desired function for the output.
2. If the desired function is "Default", set "Aux 101 Output Fault/Event" to the fault code that should be associated with the output.
3. Save your changes.

7.31.2.5.1 Example: Configure AUX101 Output #1 as a Low Coolant Level #2 Output on the PowerCommand 2.x or 3.x

Low Coolant Level #2 is event/fault code 2977.

1. Set "Aux101 0 Output 1 Function Pointer" to "Default".
2. Set "Aux101 0 Output 1 Fault/Event" to 2977.
3. Save your changes.

7.32 Calibration Procedures

⚠ WARNING
Contacting high-voltage components can cause electrocution, resulting in severe personal injury or death. Calibration and adjustment must be performed by technically qualified personnel only. Read and observe all WARNINGs and CAUTIONs in your generator set manuals.

⚠ CAUTION
Improper calibration or adjustment of the PCC can cause equipment malfunction or damage. Calibration and adjustment must be performed by technically qualified personnel only.

One or more of the PCC's internal circuits may need to be calibrated, in which case you should calibrate the internal circuits in the following order.

NOTICE
You must use a true (calibrated) RMS meter to check the actual genset output.

7.32.1 Voltage Measurement for Display and Regulation

Calibrate the PCC so that it displays the correct generator set voltage and regulates the generator set at the desired nominal voltage.

With the Operator Panel

1. Start the generator set, and monitor the voltage with a calibrated voltage meter. It is not necessary to load the generator set.
2. Select Setup, and press OK.
3. Select Calibration Setup, and press OK.
4. In three-phase applications, select L12 Voltage, and press OK. In single-phase applications, select L1N Voltage, and press OK.
5. If the PCC prompts you for a password, use the arrow keys to enter the appropriate password, and press OK. Then, press OK a second time.
6. Use the up and down keys to adjust the voltage so that the value displayed in the Operator Panel corresponds to the actual voltage being produced, and press OK.
7. Repeat this procedure for all phases (L12 Voltage, L23 Voltage, and L31 Voltage in three-phase applications; or L1N Voltage and L2N Voltage in single-phase applications).

With a PC-based Service Tool

1. Start the generator set, and monitor the voltage with a calibrated voltage meter. It is not necessary to load the generator set.
2. Connect your PC-based service tool to the PCC.
3. Verify the *Nominal Voltage Trim* is set to the desired value.
4. In three-phase applications, adjust the parameter *Genset L12 Voltage Adjust* so that the value read by the PC-based service tool corresponds to the actual voltage being produced. In single-phase applications, adjust the parameter *Genset Single Phase L1N Voltage Adjust* instead.
5. Do Save Trims to save the adjustments.
6. Repeat this procedure for all three phases (*Genset L12 Voltage Adjust*, *Genset L23 Voltage Adjust*, and *Genset L31 Voltage Adjust* in three-phase applications; *Genset Single Phase L1N Voltage Adjust* and *Genset Single Phase L2N Voltage Adjust* in single-phase applications).

7.32.2 Current Measurement for Display

Calibrate the PCC so that it displays the correct generator set current.

With the Operator Panel

1. Apply a load to the generator set, and monitor the current with a calibrated current meter.
2. Select Setup, and press OK.
3. Select Calibration Setup, and press OK.
4. Select L1 current, and press OK.
5. If the PCC prompts you for a password, use the arrow keys to enter the appropriate password, and press OK. Then, press OK a second time.
6. Use the up and down keys to adjust the current so that the value displayed in the Operator Panel matches the current read by the current meter, and press OK.
7. Repeat this procedure for all three phases (L1, L2, and L3).

With a PC-based Service Tool

1. Apply a load to the generator set, and monitor the current with a calibrated current meter.
2. Connect your PC-based service tool to the PCC.
3. Verify that the CT ratio settings and power ratings are correct for your application.
4. Adjust the parameter *Genset L1 Current Adjust* so that the PCC's measured current matches the current read by the current meter.
5. Do Save Trims to save the adjustments.
6. Repeat this procedure for all three phases (*Genset L1 Current Adjust*, *Genset L2 Current Adjust*, and *Genset L3 Current Adjust*).

8 Setup and Calibration (PC 2.3)

Read ***Safety Precautions***, and carefully observe all of the instructions and precautions in this manual.

⚠ CAUTION
Only qualified technicians should adjust the parameters described in this section. Failure to follow this may affect genset operation and may cause damage to the genset or to equipment connected to the genset.

In this section, *italics* are used to identify a specific parameter by name.

8.1 Safety Considerations

AC power is present when the generator set is running. Do not open the generator output box while the generator set is running.

⚠ WARNING
Contacting high-voltage components can cause electrocution, resulting in severe personal injury or death. Do not open the generator output box while the generator set is running. Read and observe all WARNINGS and CAUTIONS in your generator set manuals.

The PCC cabinet must be opened only by technically qualified personnel.

⚠ WARNING
The PCC cabinet must be opened only by qualified personnel. High-level voltages (up to 600 VAC) are present in the PCC cabinet. These voltages can cause electrical shock, resulting in personal injury or death.

⚠ CAUTION
Even with the power removed, improper handling of components can cause electrostatic discharge and damage to circuit components.

Read ***Safety Precautions***, and carefully observe all of the instructions and precautions in this manual.

8.2 Operator Panel

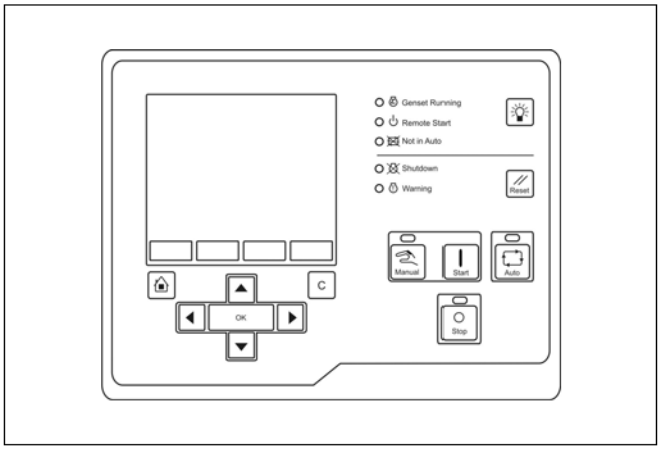


FIGURE 61. OPERATOR PANEL (POWER COMMAND 2.3)

8.2.1 Operator Panel (Remote)

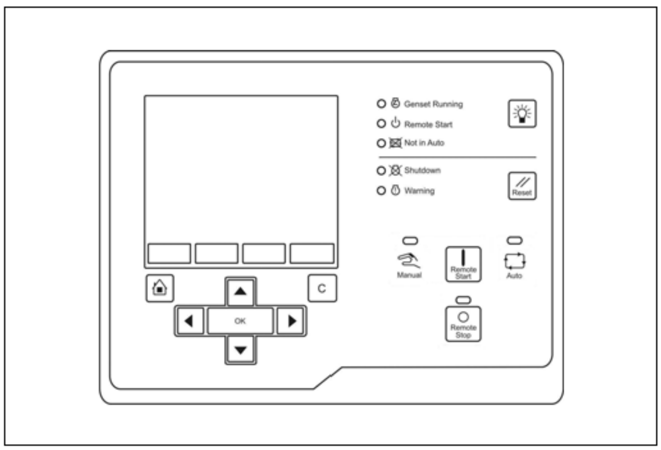


FIGURE 62. OPERATOR PANEL (REMOTE)

8.2.2 Operator Panel Description

This section introduces the Operator Panel.

NOTICE
The examples in this section use the remote Operator Panel.

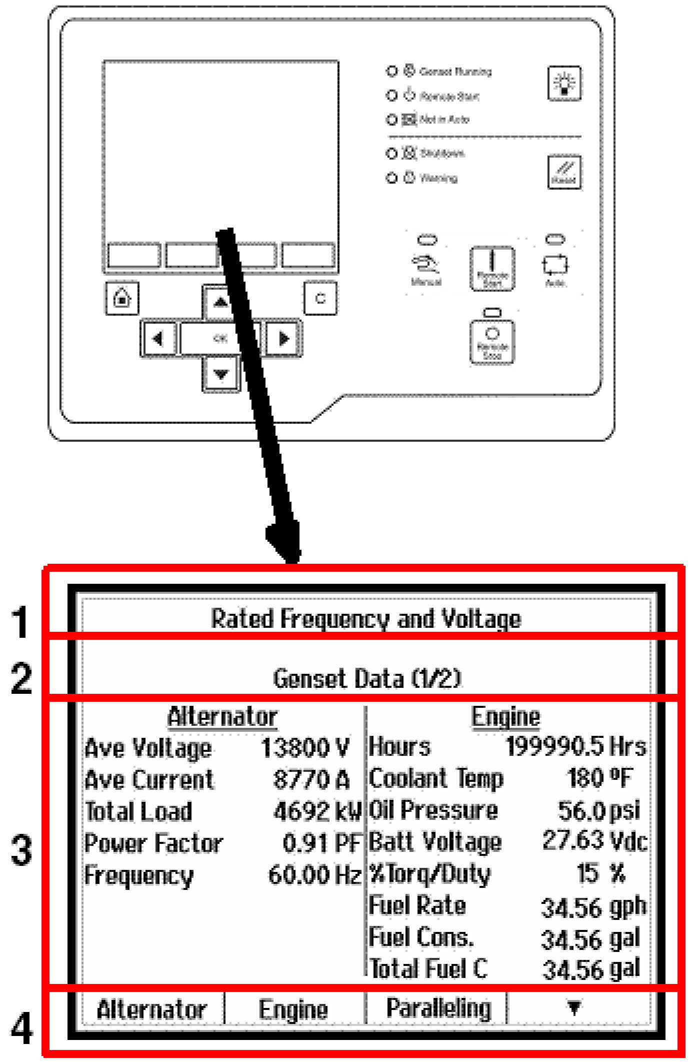


FIGURE 63. GRAPHICAL DISPLAY (AND TYPICAL SCREENSHOT)

TABLE 115. GRAPHICAL DISPLAY (AND TYPICAL SCREENSHOT)

LABEL	DESCRIPTION
1	PCC status
2	Active fault or screen name
3	Interactive screen or menu
4	Functions for selection buttons

Use the graphical display to look at event/fault information, status, screens, and parameters.

Use the Display Options screen to adjust display settings, such as contrast, language, or unit of measure.

Section **1** in the graphical display displays the status of the PCC.

TABLE 116. PCC STATUS IN THE GRAPHICAL DISPLAY

STATUS	DESCRIPTION
Ready	This is the default state. The PCC is ready to start the genset, or the PCC is getting ready to start the engine. If the PCC is getting ready to start the engine, this status corresponds to the Start Time Delay step or the Prelube Engine step in the start sequences.
Starting	The PCC is starting the engine, and the engine speed is greater than zero. This status corresponds to the Start Engine step in the start sequences.
Idle Warmup	The engine is running at idle speed in one of the start sequences. This status corresponds to the Idle Warmup step in the start sequences.
Rated Frequency and Voltage	The engine is running at rated speed. This status corresponds to the Idle to Rated Ramp Time step or the Starting to Rated Ramp Time step in the start sequences; rated speed and voltage; and the Time Delay Stop, the Rated Cooldown Time step, or the Rated to Idle Transition Delay step in the stop sequences.
Idle Cooldown	The engine is running at idle speed in one of the stop sequences. This status corresponds to the Rated to Idle Ramp Time step or the Idle Cooldown step in the stop sequences.
Stopping	The PCC is stopping the engine, and the engine speed is still greater than zero. There are no active shutdown faults.
Emergency Stop	There is an active shutdown fault.
Setup Mode	The PCC is in Setup mode.
Wait to Powerdown	The PCC is ready to enter power-down mode, but another device, such as the Operator Panel, is sending a System Wakeup signal.
Off	The PCC is in the process of entering power-down mode. The PCC is performing some last-second checks.
Demo Mode	The PCC is running a demonstration. Every screen is available in the demonstration, and any changes you make in the demonstration have no effect on the PCC. You have to turn off the Operator Panel to end the demonstration.

Section **2** in the graphical display displays the screen name and information about the last active shutdown fault. If there are no active shutdown faults, it displays the last active warning fault.

If there is an active fault, the Operator Panel displays this information about it:

- Fault type (see table below)
- Event/fault code
- Name of the controller that detected the fault (for example, many engine faults are detected by the engine control module). This is blank if the PCC detected the fault.
- Fault name

If you press the Reset button, the Operator Panel stops displaying active warning faults, even if the condition(s) that caused the fault(s) has not been corrected. The Warning LED remains on, however.

The Operator Panel always displays any active shutdown faults, even if you press the Reset button.

TABLE 117. FAULT TYPE IN THE GRAPHICAL DISPLAY

TYPE	DESCRIPTION
Warning	This is a warning fault.
Derate	This is a derate event.
Shutdown	This is a shutdown fault that initiated a Shutdown Without Cooldown sequence.

Section **3** in the graphical display is interactive. You can look at operating values for the genset, navigate through screens, and adjust parameters.

The default screen is the Genset Data screen.

The table below explains how the Operator Panel displays when the value of a specific parameter is missing, unexpected, or outside the range allowed for the parameter.

TABLE 118. UNAVAILABLE PARAMETERS IN THE OPERATOR PANEL

OPERATOR PANEL	DESCRIPTION
NWF	Network Failure. There is a PCCNet network failure or a CAN (ECM) failure.
OORL	Out of Range Low. The value is less than the lowest allowed value for this parameter.
OORH	Out of Range High. This value is greater than the highest allowed value for this parameter.
---	The value is not applicable.

Section **4** in the graphical display identifies additional functions that are available by pressing one of the selection buttons beneath the graphical display. If the box above the selection button is empty, that particular selection button has no function at this time.

For example, if the graphical display is not big enough to display the screen at one time, press the appropriate selection button to look at the previous or next page of information in that screen.

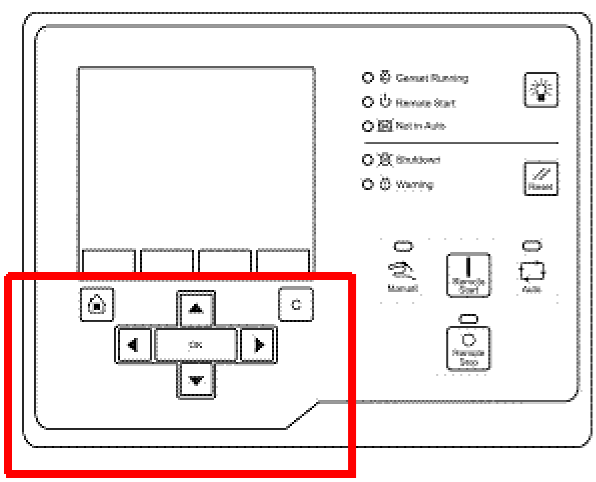
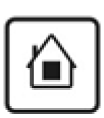


FIGURE 64. MENU NAVIGATION BUTTONS

The  button is called the Home button.

If the PCCNet connection between the PCC and the Operator Panel is not active, press the Home button and the C button at the same time for three seconds to start a demonstration of the Operator Panel. Every screen is available in the demonstration, and any changes you make in the demonstration have no effect on the PCC. You have to remove power from the Operator Panel to end the demonstration.

TABLE 119. MENU NAVIGATION BUTTONS

LED/BUTTON	DESCRIPTION
Home	Press this to return to the main menu.
C	Press this to return to the previous menu. ***NOTICE*** **If you have not pressed OK, the control panel does not save the changes when you press the C button.**
Up, Down, Left, Right	Press these to change the selection in the graphical display.
OK	Press this to select the item that is currently highlighted in the graphical display. If the selected item is a menu item, this opens a sub-menu or screen. If the selected item is a parameter, this lets you adjust the parameter (if possible) or prompts you for a password. If the selected item is a value you have just adjusted, this saves the change. If the selected item is an action, the Operator Panel runs the action or prompts you for a password.

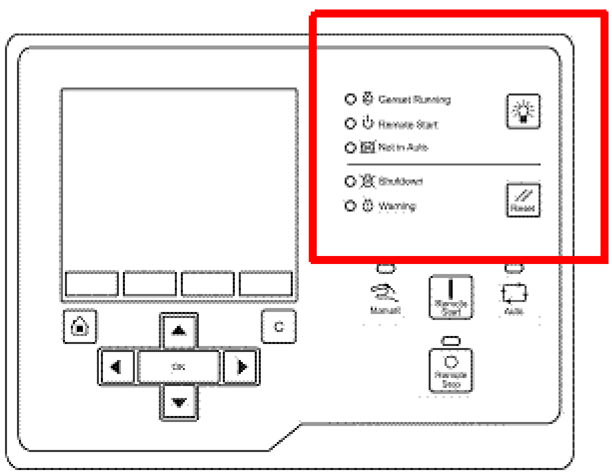


FIGURE 65. LED INDICATORS AND BUTTONS

The  button is called the Lamp Test button.

If the PCCNet connection between the PCC and the Operator Panel is not active, the LEDs in the table below remain off (unless you press the Lamp Test button).

TABLE 120. LED INDICATORS AND BUTTONS

LED/BUTTON	DESCRIPTION
Genset Running	This green LED is lit when event 1465 (Ready to Load) is active. The genset is running at or near rated speed and voltage. This is not lit while the genset is warming up or cooling down.
Remote Start	This green LED is lit when the remote start signal is active. This signal has no effect unless the PCC is in Auto mode.
Not in Auto	This red LED blinks when event 1463 (Not In Auto) is active. The PCC is not in Auto mode.
Shutdown	This red LED is lit when event 1541 (Common Shutdown) is active. There is an active shutdown fault.
Warning	This amber LED is lit when event 1540 (Common Warning) is active. There is an active warning fault.
Lamp Test	Press this to test the LEDs. All of the LEDs should turn on for five seconds. Press and hold this for three seconds to turn on or turn off (to toggle) a panel lamp.
Reset	Press this to generate a fault reset signal. The Operator Panel's Fault Reset is active as long as this button is pressed, and the Operator Panel sends the fault reset through the PCCNet connection between the PCC and the Operator Panel. If the condition(s) that caused an existing shutdown fault still exists, the PCC generates the fault again. If the condition(s) that caused an existing warning fault still exists, the PCC generates the fault again, but the Operator Panel stops displaying it in the graphical display.

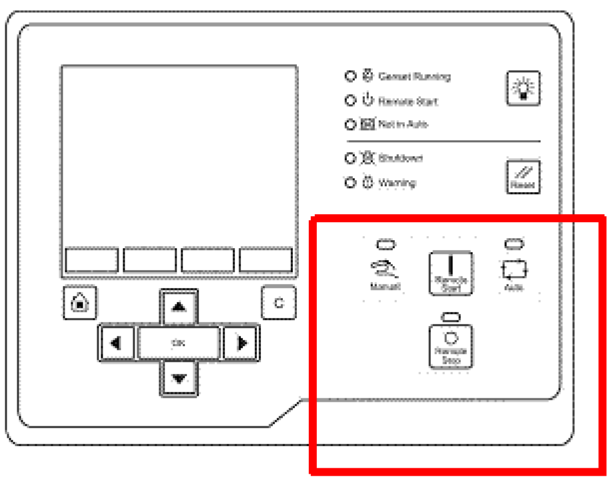


FIGURE 66. MODE OF OPERATION BUTTONS

If Mode Change is Enabled in the Display Options screen , you have to enter the password 121 when you use these buttons to change the mode of operation.

If there is a keyswitch, the LEDs in the table below still work properly.

TABLE 121. MODE OF OPERATION BUTTONS

LED/BUTTON	DESCRIPTION
	These buttons are available only on the remote Operator Panel.

LED/BUTTON	DESCRIPTION
Remote Start	In Auto mode, press this to start the genset. ***NOTICE*** **The Operator Panel is connected to the PCC's Remote Start connection. The genset does not start if the conditions for the remote start signal are not met.**
Remote Stop	In Auto mode, press this to stop the genset. ***NOTICE*** **There can be multiple sources for the remote start signal. The genset will not stop if any of the other sources for this signal are still active. You have to make all of the sources inactive to stop the genset.**
	These buttons are not available on the remote Operator Panel, but the **Manual** LED and the **Auto** LED are available.
Manual	Press this to put the PCC in Manual mode. If you do not press the Start button in ten seconds, the Operator Panel automatically puts the PCC in Off mode. The green LED above this button is lit when the PCC is in Manual mode. If the LED above this button is blinking, there is a problem with the Mode of Operation connection between the PCC and the Operator Panel. Please contact your local distributor.
Start	In Manual mode, press this to initiate a Manual Start sequence. In other modes, this button has no effect.
Auto	Press this to put the PCC in Auto mode. The green LED above this button is lit when the PCC is in Auto mode. If the LED above this button is blinking, there is a problem with the Mode of Operation connection between the PCC and the Operator Panel. Please contact your local distributor.
Stop	In Manual mode, press this one time to initiate a Manual Stop sequence if the genset is running. The green LED above this button blinks while the PCC shuts down the genset. When the Manual Stop sequence is done, the Operator Panel puts the PCC in Off mode. ***NOTICE*** **While the Manual Stop sequence is running, press this button a second time to shut down the genset immediately. The PCC initiates a Shutdown Without Cooldown sequence.** If the genset is running in Auto mode, press this to initiate a Shutdown Without Cooldown sequence. If the genset is not running, press this to put the PCC in Off mode. If the genset is running and the PCCNet connection is not active, press this to initiate a Shutdown Without Cooldown sequence. The LED above this button is lit when the PCC is in Off mode. If the LED above this button is blinking when the PCC is not shutting down the genset in Manual mode, there is a problem with the Mode of Operation connection between the PCC and the Operator Panel. Please contact your local distributor.

8.3 Passwords

You can look at the value of every parameter in the Operator Panel. If you want to adjust a parameter, the PCC might prompt you for a password.

The PCC supports the password levels in the following table.

TABLE 122. PASSWORD LEVELS

LEVEL	DESCRIPTION	VALUE
0	No password	None
1	Operator password	574
2	Service password	1209
3	Engineering password	Restricted

When the PCC prompts you for a password, it tells you what level password is required. You should provide the password for the requested level or for a higher level. For example, the PCC accepts the level-2 password even if it only requires the level-1 password.

If the password is shorter than the number of digits in the Operator Panel, enter the password on the right side of this field. For example, if the password is 456 and the Operator Panel requests five digits, enter “00456".

When you provide a valid password, the PCC unlocks all of the parameters at the level of the provided password and lower. For example, if you enter a level-2 password, the PCC unlocks all parameters in level 0, 1, or 2. The parameters remain unlocked until the Operator Panel is inactive for five minutes.

8.4 Mode Change Password

If Mode Change is Enabled in the Display Options screen, you have to enter the password 121 when you use the Operator Panel to change the mode of operation.

8.5 Capture File

Use InPower to save the current settings in a capture file on a PC or network. You can use the capture file to look at the current settings while you are away from the PCC or to restore settings if you have to reset the PCC for any reason. See the InPower User Guide for more information.

8.6 Menu Description

This section shows a summary of the menus in the PCC.

TABLE 123. MENU DESCRIPTION FOR THE POWERCOMMAND 2.3

MENU		DESCRIPTION
History-About		Use this screen to look at historical information about the genset.
Faults		
	Active Shutdowns	Use this screen to look at active shutdown faults.
	Active Warning	Use this screen to look at active warning faults.

MENU		DESCRIPTION
	History	Use this screen to look at faults that have been cleared.
Genset Data		Use this screen to look at the status of the genset.
Alternator Data		Use this screen to look at the status of the alternator.
Advanced Status		
	Genset	Use this screen to look at power, energy, phase differences, and other detailed genset information.
	Controller	Use this screen to look at sequences of operation, configurable inputs, configurable outputs, and other detailed PCC information.
	Engine	Use this screen to look at pressures, voltages, temperatures, and other detailed engine information.
Help		Use this screen to get more information about each component in the Operator Panel.
Adjust		Use this screen to configure certain adjustments, overrides, and gains.
Genset Setup		Use this screen to configure sequences of operation, genset-related faults, and the exercise scheduler.
Basic		
OEM Setup		
	Genset	Use this screen to configure application ratings, factory locks, and other detailed genset settings.
	Engine	Use this screen to configure battery-related faults and other detailed engine settings.
	Alternator	Use this screen to configure voltage limits, main alternator connections, alternator-related faults, AVR coefficients, and other detailed alternator settings.
PCCnet Setup		Use this screen to set up the PCC for PCCNet devices.
Modbus Setup		Use this screen to set up the PCC for Modbus networks.
Display Options		Use this screen to configure the Operator Panel.
Clock Setup		Use this screen to configure the real-time clock.
Configurable IO		Use this screen to set up the configurable inputs and the configurable outputs.
Calibration		Use this screen to calibrate the PCC.
Save/Restore		Use this screen to save changes to permanent memory in the PCC. This is reserved for future use.
AUX 101 Setup		Use this screen to setup the AUX 101 and AUX 102.

8.7 History-About (History/About)

TABLE 124. HISTORY/ABOUT

NAME	DESCRIPTION
Start Attempts (Starts)	Total number of start attempts Allowed values: 0~65535
Total Number of Runs (Runs)	Total number of generator set runs Allowed values: 0~65535
Engine Running Time (Engine Hours)	Total engine run time in hours
Controller On Time (Control Hours)	Controller ON time in hours, Upper limit is 136 years Allowed values: 0~4294967291 hours
Generator Set Total Net (Kw Hours)	Generator set total net kWh accumulation Allowed values: -2147483648~2147483643 kWh
Generator Set Model Number (Gen Mod #)	Number identifying the model of this generator set (Password level: 2)
Generator Set Serial Number (Gen Ser #)	Serial number identifying this generator set
Generator Set Nominal Voltage (Nominal Voltage)	Generator set nominal line-line voltage (Password level: 1) Allowed values: 1~45000 Vac (Default: 1 Vac)
Generator Set Delta/Wye Connection (Wye/Delta)	Delta or Wye for generator set connection (Password level: 1) Allowed values: Delta, Wye (Default: Wye)
Application Rating Select (Rating Select)	Selects generator set's standby/prime/base application rating (Password level: 1) Allowed values: Standby, Prime, Base (Default: Standby)
Controller Device Type (Contr Type)	Used by the PC Tool Allowed values: PCC3300, PCC3300 with Masterless Load Demand (MLD)
Calibration Part Number (Calib Part)	The unique calibration part number loaded into this control (Password level: 3)
Calibration Revision Date (Calib Date)	The revision date of the calibration part number loaded into this control (Password level: 3)
Firmware Version Number (Contr H/ ver)	Version of S/W loaded into this control, obtained from PCC Filename

8.8 Shutdown Faults (Active Shutdowns)

This screen displays up to five faults.

The same event/fault code appears multiple times if it comes from different sources; for example, some generator sets have multiple engine control modules (ECMs), or the same event/fault code can come from the PCC and ECM.

Each label is described in the following table:

TABLE 125. ACTIVE SHUTDOWN FAULTS

NAME	DESCRIPTION
Index	This is the index number of the fault
Fault	This is the fault code
SA	Source Address This is the controller that identified the fault, it is blank if the PCC identified the fault
Eng Hrs	This is how many hours the engine had run (not necessarily continuously) when the fault was generated
hh:mm:ss	This is the time the fault was generated
Response	This is the type of fault that was generated
	The name of the fault appears below the rest of the information

8.9 Warning Faults (Active Warnings)

This screen displays up to 32 faults.

The same event/fault code appears multiple times if it comes from different sources.

Each label is described in the following table:

TABLE 126. ACTIVE WARNING FAULTS

NAME	DESCRIPTION
Index	This is the index number of the fault
Fault	This is the fault code
SA	Source Address This is the controller that identified the fault, it is blank if the PCC identified the fault
Eng Hrs	This is how many hours the engine had run (not necessarily continuously) when the fault was generated
hh:mm:ss	This is the time the fault was generated
Response	This is the type of fault that was generated
	The name of the fault appears below the rest of the information

8.10 Fault History

This screen displays up to 32 faults.

The same event/fault code appears multiple times if it comes from different sources.

Each label is described in the following table:

TABLE 127. FAULT HISTORY

NAME	DESCRIPTION
Index	This is the index number of the fault
Fault	This is the fault code
SA	Source Address This is the controller that identified the fault, it is blank if the PCC identified the fault
Eng Hrs	This is how many hours the engine had run (not necessarily continuously) when the fault was generated
hh:mm:ss	This is the time the fault was generated
Response	This is the type of fault that was generated
	The name of the fault appears below the rest of the information

8.11 Generator Set Data

Each parameter is described in the following table:

TABLE 128. GENERATOR SET DATA

PARAMETER	DESCRIPTION
Alternator	
Genset LL Average Voltage	Generator set Line to Line average voltage
Genset Average Current	Generator set average current
Genset Total kW	Generator set total kW
Genset Total Power Factor	Generator set L1 power factor
Genset Frequency	Generator set frequency
Engine	
Engine Running Time	Total engine run time
Coolant Temperature	Monitor point for the Coolant Temperature
Oil Pressure	Monitor point for the Oil Pressure Allowed values: 0~145 psi.
Battery Voltage	Battery voltage value.
Percent Engine Torque/Duty Cycle	Monitor point for the percent engine torque output and the governor percent duty cycle output when used with the HM ECM Allowed values: -125~125 %.
Fuel Rate	Monitor point for the Fuel Rate Allowed values: 0~845 gal/hr.
Fuel Consumption Since Reset	Fuel consumption since last reset.
Total Fuel Consumption	Total fuel consumption since start of engine.
Genset Application	

PARAMETER	DESCRIPTION
Genset Application kW rating	The generator set KW rating.
Genset Application kVA rating	The generator set KVA rating.
Genset Application Nominal Current	The value of the generator set application nominal current.
Genset Standby	
Genset Standby kW rating	KW rating for the generator set in Standby configuration.
Genset Standby kVA rating	KVA rating for the generator set in Standby configuration.
Genset Standby Nominal Current	The value of the generator set standby nominal current.

8.12 Alternator Data

NOTICE
When the PCC is stopped, *Zero Speed Voltage Measurement Floor* sets the threshold beneath which the Operator Panel displays zero voltage, even if the PCC is measuring a non-zero voltage. This parameter is not available in the Operator Panel.

Each label is described in the following table.

TABLE 129. ALTERNATOR DATA

NAME	DESCRIPTION
Genset L1L2 Voltage	Genset L1L2 voltage
Genset L1N Voltage	Genset L1N voltage
Genset L1 Current	Monitors the genset L1 current value.
Genset L1 kW	Genset L1 kW
Genset L1 KVA	Genset L1 kVA
Genset L1 Power Factor	Genset L1 power factor
Genset L2L3 Voltage	Genset L2L3 voltage
Genset L2N Voltage	Genset L2N voltage
Genset L2 Current	Genset L2 current
Genset L2 kW	Genset L2 kW Allowed values: -32768~32762 kW.
Genset L2 KVA	Genset L2 kVA
Genset L2 Power Factor	Genset L2 power factor Allowed values: -1.28~1.27 PF.
Genset L3L1 Voltage	Genset L3L1 voltage
Genset L3N Voltage	Genset L3N voltage

NAME	DESCRIPTION
Genset L3 Current	Genset L3 current
Genset L3 kW	Genset L3 kW Allowed values: -32768~32762 kW.
Genset L3 KVA	Genset L3 kVA Allowed values: 0~4294967.29 kVA.
Genset L3 Power Factor	Genset L3 power factor Allowed values: -1.28~1.22 PF.
Genset Total kW	Genset total kW
Genset Total KVA	Genset total kVA
Genset Total Power Factor	Genset L1 power factor
Genset Frequency	Genset frequency
AVR PWM Command	The AVR PWM software command. Linear relationship between counts and % duty cycle with 10000 counts=100% duty cycle
Genset Neutral Current	Genset neutral current ***NOTICE*** **This is not displayed if the neutral current is not available.**

8.13 Engine Data

Each label is described in the following table.

TABLE 130. ENGINE DATA

NAME	DESCRIPTION
Pressure	
Oil Pressure	Monitor point for the Oil Pressure Allowed values: 0~145 psi.
Boost Pressure	Monitor point for the Boost Absolute Pressure Allowed values: 0~148 psi.
Coolant Pressure	Monitor point for the Coolant Pressure. Allowed values: 0~145 psi.
Fuel Supply Pressure	Monitor point for the Fuel Supply Pressure Allowed values: 0~145 psi.
Fuel Outlet Pressure	Monitor point for the Fuel Outlet Pressure Allowed values: 0~36404 psi.
Crankcase Pressure	Monitor point for the Crankcase Pressure. Allowed values: -35.67~38 psi.

NAME	DESCRIPTION
Barometric Absolute Pressure	Monitor point for the Barometric Absolute Pressure Allowed values: 0~37 psi.
Temperature	
Coolant Temperature	Monitor point for the Coolant Temperature
Oil Temperature	Monitor point for the Oil Temperature Allowed values: -40~410 degF.
Intake Manifold Temperature	Monitor point for the Intake Manifold Temperature Allowed values: -40~410 degF.
Fuel Temperature	Monitor point for the Fuel Temperature Allowed values: -40~410 degF.
Aftercooler Temperature	Monitor point for the Aftercooler Temperature. Allowed values: -40~410 degF.
Battery Voltage	Battery voltage value.
Average Engine Speed	Monitor point for the Average Engine Speed
Engine Running Time	Total engine run time

8.14 Genset Status (Advanced Genset Status)

Each label is described in the following table.

TABLE 131. ADVANCED GENSET STATUS

NAME	DESCRIPTION
Genset Application %Load	
Genset L1L2 Voltage%	Genset L1L2 voltage%
Genset L1N Voltage%	Genset L1N voltage%
Genset % Application L1 Current	Monitors the genset application L1 current percentage output.
Genset % Application L1 kW	Monitors the genset application L1 KW percentage output.
Genset % Application L1 kVA	Monitors the genset application L1 KVA percentage output.
Genset L2L3 Voltage%	Genset L2L3 voltage%
Genset L2N Voltage%	Genset L2N voltage% Allowed values: 0~655.3 %.
Genset % Application L2 Current	Monitors the genset application L2 current percentage output.
Genset % Application L2 kW	Monitors the genset application L2 KW percentage output.

NAME	DESCRIPTION
Genset % Application L2 kVA	Monitors the genset application L2 KVA percentage output.
Genset L3L1 Voltage%	Genset L3L1 voltage% Allowed values: 0~655.3 %.
Genset L3N Voltage%	Genset L3N voltage%
Genset % Application L3 Current	Monitors the genset application L3 current percentage output.
Genset % Application L3 kW	Monitors the genset application L3 KW percentage output.
Genset % Application L3 kVA	Monitors the genset application L3 KVA percentage output.
Genset Average Voltage%	Genset average voltage percentage.
Genset % Application Total kW	Monitors the total genset application KW percentage output.
Genset % Application Total kVA	Monitors the total genset application KVA percentage output.
Standby %Load	
Genset % Standby Total kW	Monitors the total genset standby KW percentage output.
Genset % Standby Total kVA	Monitors the total genset standby KVA percentage output.
Genset Energy Metering	
Genset L1 Positive kWh	Genset L1 positive kWh accumulation Allowed values: 0~4294967290 kWh. (Default: 0 kWh.)
Genset L1 Negative kWh	Genset L1 negative kWh accumulation Allowed values: 0~4294967290 kWh. (Default: 0 kWh.)
Genset L1 Positive kVARh	Genset L1 positive kVARh accumulation Allowed values: 0~4294967290 kVARh. (Default: 0 kVARh.)
Genset L1 Negative kVARh	Genset L1 negative kVARh accumulation Allowed values: 0~4294967290 kVARh. (Default: 0 kVARh.)
Genset L2 Positive kWh	Genset L2 positive kWh accumulation Allowed values: 0~4294967290 kWh. (Default: 0 kWh.)
Genset L2 Negative kWh	Genset L2 negative kWh accumulation Allowed values: 0~4294967290 kWh. (Default: 0 kWh.)
Genset L2 Positive kVARh	Genset L2 positive kVARh accumulation Allowed values: 0~4294967290 kVARh. (Default: 0 kVARh.)
Genset L2 Negative kVARh	Genset L2 negative kVARh accumulation Allowed values: 0~4294967290 kVARh. (Default: 0 kVARh.)
Genset L3 Positive kWh	Genset L3 positive kWh accumulation Allowed values: 0~4294967290 kWh. (Default: 0 kWh.)

NAME	DESCRIPTION
Genset L3 Negative kWh	Genset L3 negative kWh accumulation Allowed values: 0~4294967290 kWh. (Default: 0 kWh.)
Genset L3 Positive kVARh	Genset L3 positive kVARh accumulation Allowed values: 0~4294967290 kVARh. (Default: 0 kVARh.)
Genset L3 Negative kVARh	Genset L3 negative kVARh accumulation Allowed values: 0~4294967290 kVARh. (Default: 0 kVARh.)
Genset L1 kVAh	Energy output of L1 in KVAH. Allowed values: 0~4294967290 kVAh. (Default: 0 kVAh.)
Genset L2 kVAh	Genset L2 kVAh accumulation Allowed values: 0~4294967290 kVAh. (Default: 0 kVAh.)
Genset L3 kVAh	Genset L3 kVAh accumulation Allowed values: 0~4294967290 kVAh. (Default: 0 kVAh.)
Genset Total Positive kWh	Genset total positive kWh accumulation Allowed values: 0~4294967290 kWh.
Genset Total Negative kWh	Genset total negative kWh accumulation
Genset Total Positive kVARh	Genset total positive kVARh accumulation Allowed values: 0~4294967290 kVARh.
Genset Total Negative kVARh	Genset total negative kVARh accumulation
Genset Total Net kWh	Genset total net kWh accumulation Allowed values: -2147483648~2147483643 kWh.
Genset Total Net kVARh	Genset total net kVARh accumulation Allowed values: -2147483648~2147483643 kVARh.
Genset Reset All Energy Meters Timestamp - Hour	Timestamp of when energy meters were last reset Allowed values: 0~23. (Default: 0.)
Genset Reset All Energy Meters Timestamp - Minute	Timestamp of when energy meters were last reset Allowed values: 0~59. (Default: 0.)
Genset Reset All Energy Meters Timestamp - Second	Timestamp of when energy meters were last reset Allowed values: 0~59. (Default: 0.)
Genset Reset All Energy Meters Timestamp - Day	Timestamp of when energy meters were last reset Allowed values: 1~31. (Default: 1.)
Genset Reset All Energy Meters Timestamp - Month	Timestamp of when energy meters were last reset Allowed values: 1~12. (Default: 1.)
Genset Reset All Energy Meters Timestamp - Year	Timestamp of when energy meters were last reset Allowed values: 0~99. (Default: 0.)
% Standby Current	
Genset % Standby L1 Current	Monitors the genset standby L1 current percentage output.

NAME	DESCRIPTION
Genset % Standby L2 Current	Monitors the genset standby L2 current percentage output.
Genset % Standby L3 Current	Monitors the genset standby L3 current percentage output.
Genset kVAR	
Genset L1 kVAR	Genset L1 KVAR
Genset L2 kVAR	Genset L2 Kvar Allowed values: -32768~32762 kVAR.
Genset L3 kVAR	Genset L3 Kvar
Genset Total kVAR	Genset total kVAR
Genset kVAh	
Genset L1 kVAh	Genset L1 KVAh
Genset L2 kVAh	Genset L2 KVAh
Genset L3 kVAh	Genset L3 KVAh
Genset Total kVAh	Genset total kVAh accumulation
Genset 3 Phase Fast Average Voltage Percent	Monitor point for Genset 3 Phase Fast Average Voltage Percent
Prelube Mode	Set to a required mode based on the type of starting requirement Allowed values: Crank After Prelube, Crank With Prelube, Prelube Only.
Number of Connected Bargraph Modules	Used to monitor the amount of connected Bargraph modules. Allowed values: 0~255.
Phase Difference	
Genset L1L2 Phase Difference	Genset L1L2 voltage phase angle
Genset L2L3 Phase Difference	Genset L2L3 voltage phase angle Allowed values: 0~655.3 Degrees.
Genset L3L1 Phase Difference	Genset L3L1 voltage phase angle Allowed values: 0~655.3 Degrees.
Genset Phase Rotation	Genset phase rotation Allowed values: L1-L2-L3, L1-L3-L2, Not Available.

8.15 Controller Status (Advanced Control Status)

TABLE 132. ADVANCED CONTROLLER STATUS

NAME	DESCRIPTION
Timers	

NAME	DESCRIPTION
Start Countdown	Time remaining until start is initiated Allowed values: 0~300 seconds.
Stop Countdown	Time remaining until genset stops Allowed values: 0~5000 seconds.
Time At No Load	Amount of time the genset has run at no load Allowed values: 0~600 seconds.
Time at Rated Cooldown	Amount of time spend in Rated Cooldown Allowed values: 0~5000 seconds.
Exercise Time Remaining	Time remaining until exercise stop sequence begins Allowed values: 0~25 hours.
Underfrequency Threshold	Number of Hertz Alternator Line Frequency may be under nominal frequency before Underfrequency fault becomes active. (Password level: 1.) Allowed values: 2~10 Hz. (Default: 6 Hz.)
Switch Inputs	
Configurable Input #1 Switch	Configurable Input #1 input software state status. Gives software Inactive/Active state Allowed values: Inactive, Active.
Configurable Input #2 Switch	Configurable Input #2 input software state status. Gives software Inactive/Active state Allowed values: Inactive, Active.
Configurable Input #13 Switch	Configurable Input #13 input software state status. Gives software Inactive/Active state Allowed values: Inactive, Active.
Configurable Input #14 Switch	Configurable Input #14 input software state status. Gives software Inactive/Active state Allowed values: Inactive, Active.
Coolant Level/Configurable Input #5 Switch	This is the status of the Configurable Input #5. Allowed values: Inactive, Active.
Low Fuel/Configurable Input #6 Switch	This is the status of the Configurable Input #6. Allowed values: Inactive, Active.
Fault Reset/Configurable Input #10 Switch	This is the status of the Configurable Input #10. Allowed values: Inactive, Active.
Start Type/Configurable Input #11 Switch	This is the status of the Configurable Input #11. Allowed values: Inactive, Active.
Rupture Basin/Configurable Input #12 Switch	This is the status of the Configurable Input #12. Allowed values: Inactive, Active.
Auto Switch	Status of the Auto Switch Input Allowed values: Inactive, Active.
Manual Switch	Manual input software state status. Gives software Inactive/Active state Allowed values: Inactive, Active.

NAME	DESCRIPTION
Battery Charger Failed Switch	Battery Charger Failed Switch function output status; gives software Inactive/Active state Allowed values: Inactive, Active.
High Alt Temp Switch	High Alt Temp Switch function output status. Gives software Inactive/Active state Allowed values: Inactive, Active.
Low Coolant #2 Switch	Low Coolant #2 Switch function output status. Gives software Inactive/Active state Allowed values: Inactive, Active.
Low Fuel In Day Tank Switch	Low Fuel In Day Tank Switch function output status. Gives software Inactive/Active state Allowed values: Inactive, Active.
Command Input Bitmasks	Some signals can come from multiple sources. Use the *Command Inputs* parameter to determine which source(s) is(are) active at any time. The *Command Inputs parameters are bitmasks. Each bit represents each type of source.* BIT 0 = Hardware Input BIT 1 = Configurable Input
Remote Start Command Inputs	Bitmask to show the inputs to the Command output which are currently on
Fault Reset Command Inputs	Bitmask to show the inputs to the Command output which are currently on
Start Type Command Inputs	Bitmask to show the inputs to the Command output which are currently on
Battle Short Command Inputs	Indicates which of the battle short inputs are active.
Outputs	
Configurable Output #1 Status	Indicates if the output's status is Inactive or Active Allowed values: Inactive, Active.
Configurable Output #2 Status	Indicates if the output's status is Inactive or Active Allowed values: Inactive, Active.
Configurable Output #3 Status	Indicates if the output's status is Inactive or Active Allowed values: Inactive, Active.
Configurable Output #4 Status	Indicates if the output's status is Inactive or Active Allowed values: Inactive, Active.
Ready To Load /Configurable Output #5 Status	Indicates if the output's status is Inactive or Active Allowed values: Inactive, Active.
Oil Priming Pump / Configurable Output #6 Status	Indicates if the output's status is Inactive or Active Allowed values: Inactive, Active.
Local Status / Configurable Output #7 Status	Indicates if the output's status is Inactive or Active Allowed values: Inactive, Active.
Glow Plug / Configurable Output #8 Status	Indicates if the output's status is Inactive or Active Allowed values: Inactive, Active.
Delayed Off / Configurable Output #10 Status	Indicates if the output's status is Inactive or Active Allowed values: Inactive, Active.

NAME	DESCRIPTION
Load Dump / Configurable Output #11 Status	Indicates if the output's status is Inactive or Active Allowed values: Inactive, Active.

8.16 Engine Status (Advanced Engine Status)

Each label is described in the following table .

TABLE 133. ADVANCED ENGINE STATUS

NAME	DESCRIPTION
Water in Fuel Indicator	Water in Fuel Indication Allowed values: No, Yes.
Turbocharger 1 Speed	Monitor point for the Turbocharger 1 Speed Allowed values: 0~257000 rpm.
Turbocharger 2 Boost Pressure	Monitor point for the Turbocharger 2 Boost Pressure Allowed values: 0~1160 psi.
Speed Ramp State	The state of the speed reference ramp Allowed values: Ramp Off, Ramp On.
Prelube State	The monitor point for the prelube state. Allowed values: Complete, Armed, Prelube Output ON, Prelube Output OFF, Enable Crank.
Pre-Filter Oil Pressure	Monitor point for the Pre-Filter Oil Pressure Allowed values: 0~145 psi.
Post-Filter Oil Pressure	Monitor point for the Post-Filter Oil Pressure Allowed values: 0~145 psi.
Battery Charger Alternator Flash Voltage	The Battery Charger Alternator Flash Voltage after all scaling and validity checks.
Manifold Temperatures	
Intake Manifold 2 Temperature	Monitor point for the Intake Manifold 2 Temperature Allowed values: -40~410 degF.
Intake Manifold 3 Temperature	Monitor point for the Intake Manifold 3 Temperature Allowed values: -40~410 degF.
Intake Manifold 4 Temperature	Monitor point for the Intake Manifold 4 Temperature Allowed values: -40~410 degF.
Exhaust Port Temps	
Exhaust Port 1 Temperature	Monitor point for the Exhaust Port 1 Temperature Allowed values: -459~3155 degF.
Exhaust Port 2 Temperature	Monitor point for the Exhaust Port 2 Temperature Allowed values: -460~3155 degF.

NAME	DESCRIPTION
Exhaust Port 3 Temperature	Monitor point for the Exhaust Port 3 Temperature Allowed values: -460~3155 degF.
Exhaust Port 4 Temperature	Monitor point for the Exhaust Port 4 Temperature Allowed values: -460~3155 degF.
Exhaust Port 5 Temperature	Monitor point for the Exhaust Port 5 Temperature Allowed values: -460~3155 degF.
Exhaust Port 6 Temperature	Monitor point for the Exhaust Port 6 Temperature Allowed values: -460~3155 degF.
Exhaust Port 7 Temperature	Monitor point for the Exhaust Port 7 Temperature Allowed values: -460~3155 degF.
Exhaust Port 8 Temperature	Monitor point for the Exhaust Port 8 Temperature Allowed values: -460~3155 degF.
Exhaust Port 9 Temperature	Monitor point for the Exhaust Port 9 Temperature Allowed values: -460~3155 degF.
Exhaust Port 10 Temperature	Monitor point for the Exhaust Port 10 Temperature Allowed values: -460~3155 degF.
Exhaust Port 11 Temperature	Monitor point for the Exhaust Port 11 Temperature Allowed values: -460~3155 degF.
Exhaust Port 12 Temperature	Monitor point for the Exhaust Port 12 Temperature Allowed values: -460~3155 degF.
Exhaust Port 13 Temperature	Monitor point for the Exhaust Port 13 Temperature Allowed values: -460~3155 degF.
Exhaust Port 14 Temperature	Monitor point for the Exhaust Port 14 Temperature Allowed values: -460~3155 degF.
Exhaust Port 15 Temperature	Monitor point for the Exhaust Port 15 Temperature Allowed values: -460~3155 degF.
Exhaust Port 16 Temperature	Monitor point for the Exhaust Port 16 Temperature Allowed values: -460~3155 degF.
Exhaust Port 17 Temperature	Monitor point for the Exhaust Port 17 Temperature Allowed values: -460~3155 degF.
Exhaust Port 18 Temperature	Monitor point for the Exhaust Port 18 Temperature Allowed values: -460~3155 degF.
Exhaust Port 19 Temperature	Monitor point for the Exhaust Port 19 Temperature Allowed values: -460~3155 degF.
Exhaust Port 20 Temperature	Monitor point for the Exhaust Port 20 Temperature Allowed values: -460~3155 degF.

8.17 Help

Use this screen to get more information about each component in the Operator Panel.

8.18 Adjust

Each label is described in the following table.

TABLE 134. ADJUST

NAME	DESCRIPTION
Voltage Calibration	
Genset LL Average Voltage	Genset Line to Line average voltage
Voltage Adjust	Set to a positive or negative adjustment to the nominal voltage. Allowed values: -5~5 %. (Default: 0 %.)
Rated/Idle Switch (PCCnet)	Volatile to store PCCnet device generated Rated/Idle Switch commands. Allowed values: Rated, Idle. (Default: Rated.)
Exercise Switch (PCCnet)	Temporary parameter to store PCCnet device generated Exercise Switch command. Allowed values: Inactive, Active. (Default: Inactive.)
Keyswitch	
Keyswitch Status	Indicates if the output's status is Inactive or Active Allowed values: Inactive, Active. ***NOTICE*** **If the genset is stopped, select this parameter, and press OK on the Operator Panel to change the state of the ECM keyswitch connection. For example, if Keyswitch Status is inactive, select Keyswitch Status, and press OK to change the ECM keyswitch to active. You have to enter a level-1 password. The state remains changed until you press the Home button, C button, or OK button on the Operator Panel.**
Frequency Calibration	
Final Frequency Reference	The frequency scaled version of the final speed reference Allowed values: 0~100 Hz.
Frequency Adjust	A method of adding in a frequency offset to the base frequency subject to high and low limit calibrations Allowed values: -6~6 Hz. (Default: 0 Hz.)
AVR Gain Adjust Trim	A trim that allows the user to modify the overall gains of the AVR. Allowed values: 0.05~10. (Default: 1.)
Governor Gain Adjust	A trim that allows the user to modify the overall gain of the governor Allowed values: 0.05~10. (Default: 1.)
Start Time Delay	Time delay from receipt of a valid start command to initiation of cranking. (Password level: 1.) Allowed values: 0~300 seconds. (Default: 0 seconds.)
Time Delay to Stop	Sets time to run at rated speed before going to cooldown at idle. Does not apply to manual runs (Password level: 1.) Allowed values: 0~600 seconds. (Default: 0 seconds.)

Manual Warmup Bypass	Use to command idle speed or to bypass idle warmup during a manual run (Password level: 1.) Allowed values: Normal, Bypass Warmup.

8.19 Genset Setup (Setup/Genset)

Each label is described in the following table.

TABLE 135. GENSET SETUP

NAME	DESCRIPTION
Setup Mode Enable	Volatile to allow into Setup Mode.
Genset Nominal Voltage	Genset nominal line-line voltage (Password level: 1.) Allowed values: 1~45000 Vac. (Default: 1 Vac.)
Genset Delta/Wye Connection	Delta or Wye for Genset connection (Password level: 1.) Allowed values: Delta, Wye. (Default: Wye.)
Single/3 Phase Connection	Setup mode interlocked. Genset's single phase/3 phase metering setup configuration. (Password level: 1.) Allowed values: Single Phase, Three Phase. (Default: Three Phase.)
Application Rating Select	Selects genset's standby/prime/base application rating. (Password level: 1.) Allowed values: Standby, Prime, Base. (Default: Standby.)
Alternate Frequency Switch	Sets the genset nominal frequency. (Password level: 1.) Allowed values: 50 Hz, 60 Hz. (Default: 60Hz.)
Idle Speed	Sets the speed at which the engine will idle subject to high and low limit calibrations (Password level: 1.) Allowed values: 700~1100 rpm. (Default: 800 rpm.)
Power Down Mode Enable	Trim to enable sleep mode (Password level: 1.) Allowed values: Disable, Enable. (Default: Enable.)
Power Down Mode Time Delay	Timer setting for the Power Down delay feature (Password level: 1.) Allowed values: 0~600 seconds. (Default: 600 seconds.)
Auto Sleep Enable	Trim that determines if the control will Stay Awake in Auto mode or Fall asleep in Auto mode. (Password level: 1.) ***NOTICE*** **This trim must be set to Awake in Auto for the generator set to meet NFPA 110 requirements.** Allowed values: Awake in Auto, Sleep in Auto.
Genset Exercise Time	Sets the total exercise time not including warmup at idle or idle cooldown time (Password level: 1.) Allowed values: 0~25 hours. (Default: 0 hours.)
AVR Gain Adjust Trim	A trim that allows the user to modify the overall gains of the AVR. (Password level: 1.) Allowed values: 0.05~10. (Default: 1.)

Governor Gain Adjust	A trim that allows the user to modify the overall gain of the governor (Password level: 1.) Allowed values: 0.05~10. (Default: 1.)
Voltage Ramp Time	The time period over which the voltage setpoint command should rise from 0% to the target voltage (Password level: 2.) Allowed values: 0~5 seconds. (Default: 1.25 seconds.)
AVR Damping Effect (50 Hz)	Increases or decreases the output response of the AVR. A lower input value will increase the transient response. A higher value will decrease the transient response. (Password level: 2.) Allowed values: 0~99.99. (Default: 78.)
AVR Damping Effect (60 Hz)	Increases or decreases the output response of the AVR. A lower input value will increase the transient response. A higher value will decrease the transient response. (Password level: 2.) Allowed values: 0~99.99. (Default: 79.)
V/Hz Rolloff Slope (50Hz) V/Hz Rolloff Slope (60Hz)	The amount of voltage roll off when the frequency is below the knee frequency (Password level: 1.) Allowed values: 0~10 % / Hz. (Default: 2.2 % / Hz.)
V/Hz Knee Frequency (50Hz) V/Hz Knee Frequency (60Hz)	The voltage will roll off (decrease) proportionally to the V/Hz setup, once the frequency drops below the set point in the V/Hz Knee Frequency. This allows the genset to recover faster when the frequency drops. (Password level: 1.) Allowed values: 0~10 Hz. (Default: 1 Hz.)
Genset Source Name	Name for the genset source. (Password level: 1.)
Site ID	name of site (Password level: 1.)
Cycle crank	
Cycle / Cont Crank Select	Selects whether to use continuous cranking or cycle cranking when attempting to start engine (Password level: 1.) Allowed values: Cycle, Continuous. (Default: Cycle.)
Crank Attempts	Sets the maximum number of times to engage the starter when attempting to start engine using the cycle cranking method (Password level: 1.) Allowed values: 1~7. (Default: 3.)
Continuous Crank Engage Time	Sets the maximum amount of time to engage the starter when using the continuous cranking method (Password level: 1.) Allowed values: 40~100 seconds. (Default: 75 seconds.)
Cycle Crank Engage Time	Sets the maximum amount of time to engage the starter during a single crank attempt when using the cycle cranking method (Password level: 1.) Allowed values: 2~20 seconds. (Default: 15 seconds.)
Cycle Crank Rest Time	Rest time between start attempts for cycle crank mode. (Password level: 1.) Allowed values: 0~60 seconds. (Default: 30 seconds.)
Starter Disconnect Speed	Sets the engine speed at which the cranking algorithm disconnects the starter. (Password level: 1.) Allowed values: 100~1100 rpm. (Default: 450 rpm.)
Start Time Delay	Time delay from receipt of a valid start command to initiation of cranking. (Password level: 1.) Allowed values: 0~300 seconds. (Default: 0 seconds.)

Time Delay to Stop	Sets time to run at rated speed before going to cooldown at idle. Does not apply to manual runs (Password level: 1.) Allowed values: 0~600 seconds. (Default: 0 seconds.)
Delayed Off FSO Relay Time	Time delay between when the Delayed Off Command turns off and Run Command turns off (Password level: 1.) Allowed values: 0~120 seconds. (Default: 0 seconds.)
Idle Warmup Coolant Temp	Coolant temperature threshold to end idle warmup time (Password level: 1.) Allowed values: -40~300 degF. (Default: 100 degF.)
Idle Warmup Time	Sets maximum idle warmup time. Warmup time may be less if coolant temperature exceeds threshold (Password level: 1.) Allowed values: 0~3600 seconds. (Default: 0 seconds.)
Max Idle Time	Sets the fault time for the Too Long in Idle fault. (Password level: 2.) Allowed values: 0~20 minutes. (Default: 10 minutes.)
Idle to Rated Ramp Time	The time over which the speed reference is to ramp from idle speed to rated speed (Password level: 1.) Allowed values: 0~30 seconds. (Default: 0 seconds.)
Rated to Idle Transition Delay	Sets the delay time for transitioning from Rated to Idle speed. 0 seconds = feature is disabled. (Password level: 1.) Allowed values: 0~10 seconds. (Default: 0 seconds.)
Rated to Idle Ramp Time	The time over which the speed reference is to ramp from rated speed to idle speed (Password level: 1.) Allowed values: 0~30 seconds. (Default: 2 seconds.)
Rated Cooldown Time	Minimum time to spend at rated speed less than 10% load before normal shutdown is allowed (Password level: 1.) Allowed values: 0~600 seconds. (Default: 180 seconds.)
Idle Cooldown Time	Sets time to run at idle before shutting down genset on normal stops (Password level: 1.) Allowed values: 0~60 minutes. (Default: 2 minutes.)
Rupture Basin Time	Rupture Basin fault time delay (Password level: 1.) Allowed values: 0~20 seconds. (Default: 2 seconds.)
Prelube	
Prelube Cycle Enable	Enables Or Disables the cyclic mode of prelube operation (Password level: 1.) Allowed values: Disabled, Enabled. (Default: Disabled.)
Prelube Cycle Time	Sets the period of the Prelube Cycle Iteration (Password level: 1.) Allowed values: 1~1000 hours. (Default: 168 hours.)
Prelube Oil Pressure Threshold	The oil pressure value which when reached the prelube driver will turn off (Password level: 1.) Allowed values: 0~10 psig. (Default: 3 psig.)
Prelube Timeout Period	Sets the maximum time for which the Prelube Driver will Remain ON (Password level: 1.) Allowed values: 0~30 seconds. (Default: 10 seconds.)
Reverse Power	

Reverse kW Threshold	Sets the Reverse kW fault trip threshold as percentage of Standby kW rating. (Password level: 1.) Allowed values: 5~30 %. (Default: 10 %.)
Reverse kW Time Delay	Sets the Reverse kW fault trip time delay (Password level: 1.) Allowed values: 1~15 seconds. (Default: 3 seconds.)
Reverse kVAR Threshold	Sets the Reverse kVAR fault trip threshold as percentage of Standby kW rating. (Password level: 1.) Allowed values: 15~50 %. (Default: 20 %.)
Reverse kVAR Time Delay	Sets the Reverse kVAR fault trip time delay (Password level: 1.) Allowed values: 1~60 seconds. (Default: 10 seconds.)
Load Dump	
Load Dump Activation Method	Enables the load dump output as a function of the overload and underfrequency conditions (Password level: 1.) Allowed values: Overload, Underfrequency, Overload or Underfrequency, Disabled. (Default: Overload or Underfrequency.)
Load Dump Overload Threshold	The load dump overload threshold as a percentage of the genset application rating (Password level: 1.) Allowed values: 80~140 %. (Default: 105 %.)
Load Dump Overload Set Time	The time delay until the load dump overload condition is set active (Password level: 1.) Allowed values: 0~120 seconds. (Default: 60 seconds.)
Load Dump Underfrequency Threshold	The frequency trip threshold for the load dump underfrequency condition Allowed values: 0~90 Hz.
Load Dump Underfrequency Offset	The frequency amount which the load dump underfrequency threshold is below the final frequency reference (Password level: 1.) Allowed values: 0~10 Hz. (Default: 3 Hz.)
Load Dump Underfrequency Set Time	The time delay until the load dump underfrequency condition is set active (Password level: 1.) Allowed values: 0~20 seconds. (Default: 3 seconds.)
Overload Warning	
Overload Warning Threshold	Sets the Overload Warning fault trip threshold as percentage of genset application kW rating. (Password level: 1.) Allowed values: 80~140 %. (Default: 105 %.)
Overload Warning Set Time	The time delay until an overload condition is reported as a fault (Password level: 1.) Allowed values: 1~120 seconds. (Default: 60 seconds.)
Low Coolant Temp Warning	
LCT Warning Threshold	Sets threshold for the low coolant temp fault warning. (Password level: 1.) Allowed values: -20~100 degF. (Default: 70 degF.)
LCT Warning Set Time	Sets time to set the low coolant temp fault. (Password level: 1.) Allowed values: 0~30 Minutes. (Default: 1 Minutes.)
LCT Warning Clear Time	Sets time to clear the low coolant temp fault. (Password level: 1.) Allowed values: 0~30 Minutes. (Default: 1 min.)

LCL Detection Response	Sets low coolant level fault response to None, Warning or Shutdown. (Password level: 2.) Allowed values: None, Warning, Shutdown. (Default: None.)
Low Fuel Set/Clear Time	A trim that sets the delay time for generating the inactive and active faults. (Password level: 1.) Allowed values: 2~60 seconds. (Default: 2 seconds.)
Low Fuel in Day Tank Time	Low Fuel in Day Tank Fault time delay from switch input. (Password level: 1.) Allowed values: 0~20 seconds. (Default: 2 seconds.)
Delayed Shutdown	
Delayed Shutdown Enable	Enables the Delayed Shutdown feature. (Password level: 1.) Allowed values: Disabled, Enabled. (Default: Disabled.)
Delayed Shutdown Time Delay	Sets the shutdown fault delayed time delay for the Delayed Shutdown feature. (Password level: 1.) Allowed values: 0~3 seconds. (Default: 2 seconds.)
Controlled Shutdown	
Controlled Shutdown Max Ramp Unload Time	Maximum ramp unload time during a shutdown with cooldown (Password level: 1.) Allowed values: 0~300 seconds. (Default: 60 seconds.)
Controlled Shutdown Advance Notice Delay	Delay allowed for a shutdown with cooldown fault prior to shutting down the genset (Password level: 1.) Allowed values: 0~300 seconds. (Default: 60 seconds.)
Genset Neutral CT Primary Current	Genset Neutral CT primary current. 0 = Disable amperage metering. (Password level: 1.) Allowed values: 0~10000 Amps. (Default: 0 Amps.)
Exercise Scheduler Enable	Enables the exercise scheduler. (Password level: 1.) Allowed values: Disabled, Enabled. (Default: Disabled.)
Scheduler Program	
Scheduler Program Select	Used to select a program to adjust. Allowed values: 1~12. (Default: 1.)
Scheduler Program x Enable	Used to enable or disable the selected program. Allowed values: Disable, Enable. (Default: Disable.)
Scheduler Program x Run Mode	Used to adjust the run mode for the selected program. Allowed values: No Load, With Load. (Default: Once.)
Scheduler Program x Start Day	Used to adjust the start day of the week for the selected program. Allowed values: Sunday, Monday, Tuesday, Wednesday, Thursday, Friday, Saturday. (Default: Sunday.)
Scheduler Program x Start Hour	Used to adjust the start hour for the selected program. Allowed values: 0~23. (Default: 0.)
Scheduler Program x Start Minute	Used to adjust the start minute for the selected program. Allowed values: 0~59. (Default: 0.)
Scheduler Program x Duration Hours	Used to adjust the length in hours for the selected program. Allowed values: 0~23. (Default: 0.)

Scheduler Program x Duration Minutes	Used to adjust the length in minutes for the selected program. Allowed values: 1~59. (Default: 1.)
Scheduler Program x Repeat Interval	Used to adjust the repeat interval for the selected program. Allowed values: Once, Every Week, Every 2 Weeks, Every 3 Weeks, Every 4 Weeks, Every 5 Weeks, First Week of Month, Second Week of Month, Third Week of Month, Fourth Week of Month, Last Week of Month. (Default: Once.)
Exception Program	
Scheduler Exception Select	Used to select an exception to adjust. Allowed values: 1~6. (Default: 1.)
Scheduler Exception x Enable	Used to enable or disable the selected exception. Allowed values: Disable, Enable. (Default: Disable.)
Scheduler Exception x Month	Used to adjust the starting month for the selected exception. Allowed values: 1~12. (Default: 1.)
Scheduler Exception x Date	Used to adjust the date for the selected exception. Allowed values: 1~31. (Default: 1.)
Scheduler Exception x Hour	Used to adjust the starting hour for the selected exception. Allowed values: 0~23. (Default: 0.)
Scheduler Exception x Minute	Used to adjust the starting minute for the selected exception. Allowed values: 0~59. (Default: 0.)
Scheduler Exception x Duration Days	Used to adjust the length in days for the selected exception. Allowed values: 0~44. (Default: 0.)
Scheduler Exception x Duration Hours	Used to adjust the length in hours for the selected exception. Allowed values: 0~23. (Default: 0.)
Scheduler Exception x Duration Minutes	Used to adjust the length in minutes for the selected exception. Allowed values: 0~59. (Default: 0.)
Scheduler Exception x Repeat	Used to adjust the repeat interval for the selected exception. Allowed values: Once Only, Every Year. (Default: Once Only.)
Aux 101 Settings	
Fuel Tank Capacity (Aux101)	Trim to set the fuel tank capacity. (Password level: 1) Allowed values: 0~15000 Gallons (Default: 173 Gallons)

8.19.1 Application Rating

The PCC uses the application rating to protect the generator set against overload conditions. The rating is measured in kVA.

The PCC stores up to twelve kVA ratings. Use these parameters to specify the appropriate one:

- *Application Rating Select*
- *Alternate Frequency Switch*
- *Single/3 Phase Connection*

8.19.2 V/Hz Curve

Some non-linear loads demand high current when they start up or when they take on a large block load. This demand can cause significant voltage drops and frequency dips. The PCC can reduce the voltage setpoint proportionally with engine speed to reduce underspeed conditions or undervoltage conditions but not both.

Usually, the V/Hz curve is set up to optimize engine speed recovery under block loading. It may need to be adjusted in applications that have large non-linear loads. Some non-linear loads, such as motors and pumps, are more sensitive to underfrequency conditions. Other non-linear loads, such as fluorescent and incandescent lighting, are more sensitive to undervoltage conditions.

⚠ CAUTION
This feature is not intended to compensate for undersized generator sets. Failure to follow this may affect generator set operation and may cause damage to the generator set or to equipment connected to the generator set.

This feature is active when the generator set is running at rated speed and voltage.

This behavior is controlled by these parameters:

- Target frequency: This determines on what the target frequency depends.

  If *V/Hz Method* is Relative Knee Frequency, the target frequency is the speed reference.

  If *V/Hz Method* is Fixed Knee Frequency, the target frequency is *Alternate Frequency Switch*.

  (This parameter is not available in the Operator Panel).

NOTICE
Fixed Knee Frequency is usually used in paralleling applications with generator sets that have non-PowerCommand external voltage regulators.

- Knee frequency: This is how far below the target frequency the PCC begins reducing the output voltage.

  If *V/Hz Method* is Relative Knee Frequency, The knee frequency is *V/Hz Knee Frequency*.

  If *V/Hz Method* is Fixed Knee Frequency, the knee frequency is *External AVR Knee Frequency*.

- *V/Hz Rolloff Slope*: This specifies how quickly (V/Hz) the PCC reduces the voltage setpoint once the frequency drops below the knee frequency.

  (This parameter is not available in the Operator Panel).

This behavior is illustrated in the following figure.

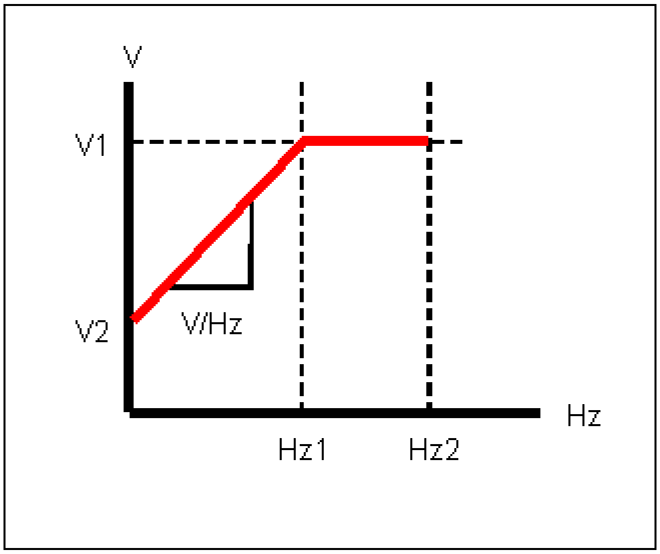


FIGURE 67. V/HZ CURVE

TABLE 136. V/HZ CURVE

LABEL	DESCRIPTION
Hz1	Target frequency - knee frequency
Hz2	Target frequency
V1	Voltage setpoint (without the V/Hz curve adjustment)
V2	Voltage setpoint (with the V/Hz curve adjustment)
V/Hz	V/Hz Rolloff Slope

For example, a generator set has these settings:

- *Genset Nominal Voltage* is 480 VAC, and the voltage setpoint is 100%, or 480 VAC, without the V/Hz curve adjustment.
- *Genset Frequency* is 60 Hz, and the speed reference is 3600 rpm.
- *V/Hz Method* is set to Relative Knee Frequency.

  (This parameter is not available in the Operator Panel).
- *V/Hz Knee Frequency* is 1.0 Hz.
- *V/Hz Rolloff Slope* is 2.2 %V/Hz.

Suppose the actual generator set frequency is 56.5 Hz. This is 3.5 Hz (60 Hz - 56.5 Hz) below the speed reference. The PCC reduces the voltage setpoint by (3.5 Hz - 1.0 Hz) * 2.2 %V/Hz. The reduction is 5.5%, or 26.4 VAC (5.5% * 480 VAC). The voltage setpoint is 454 VAC (480 VAC - 26 VAC) with the V/Hz curve adjustment.

8.19.3 Exercise Scheduler

The PCC can run the generator set regularly to prevent the generator set from being inactive for long periods of time.

The PCC generates an exercise signal when these conditions are met:

- The PCC is in Auto mode.

- The PCC is not in power-down mode.
- There are no active shutdown faults.
- *Exercise Scheduler Enable* is set to Enable.
- A scheduler program is beginning.
- There are no scheduled exceptions.

If the generator set is running, this signal has no effect unless the remote start signal becomes inactive. Then, the exercise signal keeps the generator set running.

If the PCC is unable to start the generator set for any reason, the scheduler program is skipped, even if the PCC later becomes able to start.

The PCC removes the exercise signal when the scheduler program finishes.

8.19.3.1 Scheduler Programs

You can set up 12 scheduler programs. For each program, specify the day of the week and the time the PCC starts the generator set, how long the PCC runs the generator set, and how often the program repeats. Each scheduler program has these parameters:

- *Scheduler Program Enable*
- *Scheduler Program Start Day*: Sunday, Monday, ..., Saturday
- *Scheduler Program Start Hour*: 0-23
- *Scheduler Program Start Minute*: 0-59
- *Scheduler Program Duration Hours*: 0-23
- *Scheduler Program Duration Minutes*: 0-59
- *Scheduler Program Repeat Interval*: Once, every 1-5 weeks, first/second/third/fourth/last week of month
- *Scheduler Program Run Mode*: If *Genset Application Type* is set to Power Transfer Control, the PCC can run the generator set with a load, in parallel with the utility, or without a load.

  Otherwise, this has no effect unless an external device reads *Scheduler Run Command* and responds accordingly.
- *Scheduler Program Run Mode*: This has no effect unless an external device reads *Scheduler Run Command* and responds accordingly.

Scheduler programs follow these guidelines.

1. If two or more scheduler programs begin at the same time, the PCC runs the scheduler program with the lowest number and ignores the other scheduler programs, even after the first scheduler program ends.
2. If one scheduler program begins before another scheduled program ends, the PCC ignores the second program, even after the first scheduler program ends.
3. If the PCC loses power while a scheduler program is running, the PCC does not restart the scheduler program when power returns.

8.19.3.2 Scheduler Exceptions

You can also set up 6 scheduler exceptions. Scheduler exceptions prevent scheduler programs from running during specific intervals, such as holidays. Each scheduler exception has these parameters:

- *Scheduler Exception Enable*
- *Scheduler Exception Month*: 1-12

- *Scheduler Exception Date*: 1-31
- *Scheduler Exception Hour*: 0-23
- *Scheduler Exception Minute*: 0-59
- *Scheduler Exception Duration Days*: 0-44
- *Scheduler Exception Duration Hours*: 0-23
- *Scheduler Exception Duration Minutes*: 0-59
- *Scheduler Exceptions Repeat Interval*: One-time only or annual.

Scheduler programs and scheduler exceptions follow these guidelines.

1. The PCC ignores scheduler programs that start during scheduler exceptions.
2. If a scheduler program and a scheduler exception begin at the same time, the PCC ignores the scheduler program.
3. If two or more scheduler exceptions begin at the same time, the PCC runs the scheduler exception with the lowest number and ignores the other scheduler exceptions, even after the first scheduler exception ends.
4. If a scheduler exception begins before a scheduler program ends, the PCC ignores the scheduler exception, even after the scheduler program ends.
5. If one scheduler exception begins before another scheduler exception ends, the PCC ignores the second scheduler exception, even after the first scheduler exception ends.
6. If the PCC loses power while a scheduler exception is running, the PCC does not restart the scheduler exception when power returns.

8.19.4 Load Dump Overload and Underfrequency Protection

The PCC generates warning fault 1464 (Load Dump Fault) when one of these conditions applies, based on Load Dump Activation Method:

- The generator set is overloaded by *Load Dump Overload Threshold* for *Load Dump Overload Set Time*.
- The generator set is running underfrequency by *Load Dump Underfrequency Offset* for *Load Dump Underfrequency Set Time*, and Ready to Load is active. The Ready to Load output does not have to be used.

8.20 Basic

Each label is described in the following table.

TABLE 137. BASIC

NAME	DESCRIPTION
Load Share Speed Droop	
Isolated Bus Speed Control Method	Sets the speed control method for isolated bus paralleling. (Password level: 1.) Allowed values: Constant, Droop. (Default: Constant.)
Speed Droop Percentage	Sets the speed droop percent from no load to full load. (Password level: 1.) Allowed values: 0~15 %. (Default: 5 %.)

NAME	DESCRIPTION
Frequency Adjust	A method of adding in a frequency offset to the base frequency subject to high and low limit calibrations (Password level: 1.) Allowed values: -6~6 Hz. (Default: 0 Hz.)
Genset Total kW	Genset total kW
External Speed Bias	
Speed Bias OOR Check Enable	Enable for the Speed Bias OOR faults. (Password level: 1.) Allowed values: Disable, Enable. (Default: Disabled.)
Speed Bias OOR High Limit	High limit trim for the Speed Bias OOR fault. (Password level: 1.) Allowed values: -5~5 Vdc. (Default: 5 Vdc.)
Speed Bias OOR Low Limit	Low limit trim for the Speed Bias OOR fault. (Password level: 1.) Allowed values: -5~5 Vdc. (Default: -5 Vdc.)
Speed Bias OOR Time	Delay time for the Speed Bias OOR faults. (Password level: 1.) Allowed values: 0~10 seconds. (Default: 1 seconds.)
Speed Bias Scaling Table	This table displays how various input voltages correspond to speed bias adjustments.
Load Share Voltage Droop	
Isolated Bus Voltage Control Method	Sets the voltage control method for isolated bus paralleling. (Password level: 1.) Allowed values: Constant, Droop. (Default: Constant.)
Voltage Droop Percentage	Sets the voltage droop percent from no load to full load 0.8PF. (Password level: 1.) Allowed values: 0~15 %. (Default: 4 %.)
Voltage Adjust	Set to a positive or negative adjustment to the nominal voltage. (Password level: 1.) Allowed values: -5~5 %. (Default: 0 %.)
Genset Total kVAR	Genset total kVAR
External Voltage Bias	
Voltage Bias OOR Check Enable	Enable for the Voltage Bias Out of Range (OOR) faults. (Password level: 1.) Allowed values: Disable, Enable. (Default: Disabled.)
Voltage Bias OOR High Limit	High limit for the Voltage Bias Out of Range (OOR) fault. (Password level: 1.) Allowed values: -5~5 Vdc. (Default: 5 Vdc.)
Voltage Bias OOR Low Limit	Low limit for the Voltage Bias Out of Range (OOR) fault. (Password level: 1.) Allowed values: -5~5 Vdc. (Default: -5 Vdc.)
Voltage Bias OOR Time	Time limit for the Voltage Bias Out of Range (OOR) faults. (Password level: 1.) Allowed values: 0~10 seconds. (Default: 1 seconds.)
Voltage Bias Scaling Table	This table displays how various input voltages correspond to voltage bias adjustments.

8.21 Genset (OEM Genset Setup)

Each label is described in the following table.

TABLE 138. OEM GENSET SETUP

Genset Numbers	
Genset Serial Number	Serial number of identifying this genset. (Password level: 2.)
Alternator Serial Number	Unique number identifying this gensets alternator serial number. (Password level: 2.)
Engine Serial Number	Unique number identifying this genset's engine serial number. (Password level: 2.)
Model Numbers	
Alternator Model Number	Number identifying this gensets alternator model number. (Password level: 2.)
Genset Model Number	Number identifying the model of this genset. (Password level: 2.)
Application Rating Select	Selects genset's standby/prime/base application rating. (Password level: 1.) Allowed values: Standby, Prime, Base. (Default: Standby.)
Frequency Options	Sets the allowed options for the Alternate Frequency Switch (Password level: 2.) Allowed values: 50 Hz or 60 Hz, 50 Hz Only, 60 Hz Only. (Default: 60Hz or 50Hz.)
Genset Idle Enable	Enables or Disable idling of genset with external governor. Allowed values: Disabled, Enabled. (Default: Enabled.)
Standby kVA Rating	
Standby kVA rating (3 phase/ 50Hz)	KVA rating of genset when operating in Standby mode, at 50 Hz, and 3 phase. (Password level: 2.) Allowed values: 1~6000 kVA. (Default: 1 kVA.)
Standby kVA rating (3 phase/ 60Hz)	KVA rating of genset when operating in Standby mode, at 60 Hz, and 3 phase. (Password level: 2.) Allowed values: 1~6000 kVA. (Default: 1 kVA.)
Standby kVA rating (single phase/ 50Hz)	KVA rating of genset when operating in Standby mode, at 50 Hz, and single phase. (Password level: 2.) Allowed values: 1~6000 kVA. (Default: 1 kVA.)
Standby kVA rating (single phase/ 60Hz)	KVA rating of genset when operating in Standby mode, at 60 Hz, and single phase. (Password level: 2.) Allowed values: 1~6000 kVA. (Default: 1 kVA.)
Prime kVA Rating	
Prime kVA rating (3 phase/ 50Hz)	KVA rating of genset when operating in Prime Power mode, at 50 Hz, and 3 phase. (Password level: 2.) Allowed values: 1~6000 kVA. (Default: 1 kVA.)

Prime kVA rating (3 phase/ 60Hz)	KVA rating of genset when operating in Prime Power mode, at 60 Hz, and 3 phase. (Password level: 2.) Allowed values: 1~6000 kVA. (Default: 1 kVA.)
Prime kVA rating (single phase/ 50Hz)	KVA rating of genset when operating in Prime Power mode, at 50 Hz, and single phase. (Password level: 2.) Allowed values: 1~6000 kVA. (Default: 1 kVA.)
Prime kVA rating (single phase/ 60Hz)	KVA rating of genset when operating in Standby mode, at 60 Hz, and single phase. (Password level: 2.) Allowed values: 1~6000 kVA. (Default: 1 kVA.)
Remote Fault Reset Enabled	Trim to enable Remote Fault Reset. Can only reset "Warning" Faults (Password level: 1.) Allowed values: Disable, Enable. (Default: Disabled.)
Battle Short Enable	Trim to enable Battle Short. (Password level: 1.) Allowed values: Disable, Enable. (Default: Disabled.)
Fail To Shutdown Delay	Trim to set the time for a shutdown fault to be active and the genset not shutting down before the Fail to Shutdown fault occurs. (Password level: 2.) Allowed values: 0~30 seconds. (Default: 5 seconds.)
Delayed Shutdown Enable	Enables the Delayed Shutdown feature. (Password level: 1.) Allowed values: Disabled, Enabled. (Default: Disabled.)
Delayed Shutdown Time Delay	Sets the shutdown fault delayed time delay for the Delayed Shutdown feature. Allowed values: 0~3 seconds. (Default: 2 seconds.)
Reset Fuel Consumption	The reset trip fuel consumption command. (Password level: 1.) Allowed values: Inactive, Active. (Default: Inactive.)
Reset Runs	The reset runs command. (Password level: 1.) Allowed values: Inactive, Active.
Reset Start Attempts	The reset start attempts command. (Password level: 1.) Allowed values: Inactive, Active.
Reset Genset Energy Meter	
Genset Reset All Energy Meters	Use to permanently clear all genset energy meter values (Password level: 1.) Allowed values: Do Nothing, Clear Counters. (Default: Do Nothing.)
Genset Reset All Energy Meters Timestamp - Hour	Timestamp of when energy meters were last reset Allowed values: 0~23. (Default: 0.)
Genset Reset All Energy Meters Timestamp - Minute	Timestamp of when energy meters were last reset Allowed values: 0~59. (Default: 0.)
Genset Reset All Energy Meters Timestamp - Second	Timestamp of when energy meters were last reset Allowed values: 0~59. (Default: 0.)

Genset Reset All Energy Meters Timestamp - Day	Timestamp of when energy meters were last reset Allowed values: 1~31. (Default: 1.)
Genset Reset All Energy Meters Timestamp - Month	Timestamp of when energy meters were last reset Allowed values: 1~12. (Default: 1.)
Genset Reset All Energy Meters Timestamp - Year	Timestamp of when energy meters were last reset Allowed values: 0~99. (Default: 0.)
Input Factory Lock	
Configurable Input #1 Factory Lock	Locks this input for Factory use, can only be unlocked with InPower service tool. (Password level: 2.) Allowed values: Not Locked, Locked. (Default: Not Locked.)
Configurable Input #2 Factory Lock	Locks this input for Factory use, can only be unlocked with InPower service tool. (Password level: 2.) Allowed values: Not Locked, Locked. (Default: Not Locked.)
Coolant Level/Configurable Input #5 Factory Lock	Prevents Output Function Pointer and Invert Bypass from being modified unless in Factory mode (Password level: 2.) Allowed values: Not Locked, Locked. (Default: Locked.)
Low Fuel/Configurable Input #6 Factory Lock	Prevents Active State Selection and Function Pointer from being modified unless in Factory mode. (Password level: 2.) Allowed values: Not Locked, Locked. (Default: Locked.)
Fault Reset/Configurable Input #10 Factory Lock	Prevents Output Function Pointer and Invert Bypass from being modified unless in Factory mode. (Password level: 2.) Allowed values: Not Locked, Locked. (Default: Not Locked.)
Start Type/Configurable Input #11 Factory Lock	Start Type Factory Lock (Password level: 2.) Allowed values: Not Locked, Locked. (Default: Not Locked.)
Rupture Basin/Configurable Input #12 Factory Lock	Rupture Basin Factory Lock (Password level: 2.) Allowed values: Not Locked, Locked. (Default: Not Locked.)
Configurable Input #13 Factory Lock	Locks this input for Factory use, can only be unlocked with InPower service tool. (Password level: 2.) Allowed values: Not Locked, Locked. (Default: Not Locked.)
Configurable Input #14 Factory Lock	Locks this input for Factory use, can only be unlocked with InPower service tool. (Password level: 2.) Allowed values: Not Locked, Locked. (Default: Not Locked.)
Output Factory Lock	

Configurable Output #1 Factory Lock	Prevents Output Function Pointer and Invert Bypass from being modified unless in Factory mode (Password level: 2.) Allowed values: Not Locked, Locked. (Default: Not Locked.)
Configurable Output #2 Factory Lock	Prevents Output Function Pointer and Invert Bypass from being modified unless in Factory mode (Password level: 2.) Allowed values: Not Locked, Locked. (Default: Not Locked.)
Configurable Output #3 Factory Lock	Prevents Output Function Pointer and Invert Bypass from being modified unless in Factory mod (Password level: 2.) Allowed values: Not Locked, Locked. (Default: Not Locked.)
Configurable Output #4 Factory Lock	Prevents Output Function Pointer and Invert Bypass from being modified unless in Factory mode (Password level: 2.) Allowed values: Not Locked, Locked. (Default: Not Locked.)
Ready To Load / Configurable Output #5 Factory Lock	Controls whether the output function is inverted or not. If bypassed the function is not inverted (Password level: 2.) Allowed values: Not Locked, Locked. (Default: Not Locked.)
Oil Priming Pump / Configurable Output #6 Factory Lock	Prevents Output Function Pointer and Invert Bypass from being modified unless in Factory mode (Password level: 2.) Allowed values: Not Locked, Locked. (Default: Not Locked.)
Local Status / Configurable Output #7 Factory Lock	Prevents Output Function Pointer and Invert Bypass from being modified unless in Factory mode (Password level: 2.) Allowed values: Not Locked, Locked. (Default: Not Locked.)
Glow Plug / Configurable Output #8 Factory Lock	Prevents Output Function Pointer and Invert Bypass from being modified unless in Factory mode (Password level: 2.) Allowed values: Not Locked, Locked. (Default: Not Locked.)
Delayed Off / Configurable Output #10 Factory Lock	Prevents Output Function Pointer and Invert Bypass from being modified unless in Factory mode (Password level: 2.) Allowed values: Not Locked, Locked. (Default: Not Locked.)
Load Dump / Configurable Output #11 Factory Lock	Prevents Output Function Pointer and Invert Bypass from being modified unless in Factory mode (Password level: 2.) Allowed values: Not Locked, Locked. (Default: Not Locked.)

8.21.1 Generator Set Frequency

Set the *Alternate Frequency Switch* to the desired generator set frequency. The *Alternate Frequency Switch* is restricted to the values allowed in *Frequency Options*.

You can monitor the generator set frequency in *Genset Frequency*. Use *Frequency Adjust* to calibrate the measured value.

The PCC generates shutdown fault 1448 (Under frequency) if the generator set frequency is *Underfrequency Threshold* under the *Alternate Frequency Switch* for *Underfrequency Delay*. The generator set must also be running at 90% rated voltage.

The PCC generates warning fault 1449 (Overfrequency) if the generator set frequency is *Overfrequency Threshold* over the *Alternate Frequency Switch* for *Overfrequency Delay*. The generator set must also be running at 90% rated voltage.

8.22 Engine (OEM Engine Setup)

Note: If you change Starter Owner to ECS, the PCC does not control the starter. If the engine control module (ECM) or another device does not turn on the starter, the genset does not start, and there is no fault code.

Each label is described in the following table.

TABLE 139. OEM ENGINE SETUP

ECM CAN Enable	Set to Disabled if there is no ECM (HMECM or otherwise) connected to the control. (Password level: 2.) Allowed values: Disabled, Enabled.
ECM Datasave Time Delay	A trim that sets the delay time for the ECM Dataplate saves (Password level: 2.) Allowed values: 0~60 seconds. (Default: 30 seconds.)
CAN Failure Retries	Sets the maximum number of CAN communication retries (Password level: 1.) Allowed values: 0~10. (Default: 3.)
Keyswitch Minimum On Time	Minimum time the keyswitch driver command needs to be on before CAN datalink health will be checked (Password level: 2.) Allowed values: 0.1~5 seconds. (Default: 4 seconds.)
Fault Code 1117 Enable	Used to Enable/Disable fault 1117 on the genset control. Fault will be ignored with a disabled setting. (Password level: 1.) Allowed values: Disabled, Enabled. (Default: Enabled.)
Starter Owner	Tells the GCS which control system has starter control (Password level: 2.) Allowed values: GCS, ECS. (Default: 0.)
Prelube Function Enable	Selects whether the Prelube function is enabled or disabled. This is Setup mode interlocked (Password level: 1.) Allowed values: Disabled, Enabled. (Default: Disabled.)

Nominal Battery Voltage	Selects the genset's nominal battery operating voltage (Password level: 2.) Allowed values: 12V, 24V. (Default: 24V.)
24V Battery Fault	
24 V High Battery Voltage Threshold	Sets 24V high battery voltage fault threshold (Password level: 1.) Allowed values: 28~34 Vdc. (Default: 32 Vdc.)
24 V Weak Battery Voltage Threshold	Sets 24V weak battery voltage fault threshold (Password level: 1.) Allowed values: 12~16 Vdc. (Default: 14.4 Vdc.)
24 V Low Battery Voltage Running Threshold	Sets 24V low battery voltage fault threshold for genset operation in all modes except rated (Password level: 1.) Allowed values: 22~26 Vdc. (Default: 24 Vdc.)
24 V Low Battery Voltage Stopped Threshold	Sets 24V low battery voltage fault threshold for genset operation in all modes except rated (Password level: 1.) Allowed values: 22~26 Vdc. (Default: 24 Vdc.)
12V Battery Fault	
12 V High Battery Voltage Threshold	Sets 12V high battery voltage fault threshold. (Password level: 1.) Allowed values: 14~17 Vdc. (Default: 16 Vdc.)
12 V Weak Battery Voltage Threshold	Sets 12V weak battery voltage fault threshold (Password level: 1.) Allowed values: 6~10 Vdc. (Default: 8 Vdc.)
12 V Low Battery Voltage Running Threshold	Sets 12V low battery voltage fault threshold for genset operation while in rated mode (Password level: 1.) Allowed values: 12~16 Vdc. (Default: 12 Vdc.)
12 V Low Battery Voltage Stopped Threshold	Sets 12V low battery voltage fault threshold for genset operation in all modes except rated (Password level: 1.) Allowed values: 11~13 Vdc. (Default: 12 Vdc.)
High Battery Voltage Set Time	The time delay until a high battery voltage condition is reported as a fault. (Password level: 1.) Allowed values: 2~60 seconds. (Default: 60 seconds.)
Low Battery Voltage Set Time	The time delay until a low battery voltage condition is reported as a fault (Password level: 1.) Allowed values: 2~60 seconds. (Default: 60 seconds.)
Weak Battery Voltage Set Time	The time delay until a weak battery condition is reported as a fault (Password level: 1.) Allowed values: 1~5 seconds. (Default: 2 seconds.)
Charging Alternator Fault Time Delay	Sets the time delay for the charging alt failure fault (Password level: 1.) Allowed values: 2~300 seconds. (Default: 120 seconds.)
Alternate Frequency Switch	Sets the genset nominal frequency. (Password level: 1.) Allowed values: 50 Hz, 60 Hz. (Default: 60Hz.)

Frequency to Speed Gain Select	Sets the rpm/Hz conversion factor which is a function of the poles of the alternator and/or any gearboxes (Password level: 2.) Allowed values: 60 rpm/Hz, 30 rpm/Hz, 20 rpm/Hz, 36 rpm/Hz, Adjustable Freq/Speed Gain. (Default: 30 rpm/Hz.)
Frequency to Speed Gain Select	Sets the rpm/Hz conversion factor which is a function of the poles of the alternator and/or any gearboxes (Password level: 2.) Allowed values: 60 rpm/Hz, 30 rpm/Hz, 20 rpm/Hz, 36 rpm/Hz, Adjustable Freq/Speed Gain. (Default: 30 rpm/Hz.)
Adjustable Freq/Speed Gain	Sets the rpm/Hz conversion factor when the Freq to Speed Gain Select trim is set to this trim (Password level: 2.) Allowed values: 0~240 rpm/Hz. (Default: 30 rpm/Hz.)
V/Hz Knee Frequency (50 Hz) V/Hz Knee Frequency (60 Hz)	**Note: The parameter depends on *Alternate Frequency Switch*.** The voltage will roll off (decrease) proportionally to the V/Hz setup, once the frequency drops below the set point in the V/Hz Knee Frequency. This allows the genset to recover faster when the frequency drops. (Password level: 1.) Allowed values: 0~10 Hz. (Default: 1 Hz.)
V/Hz Rolloff Slop (50 Hz) V/Hz Rolloff Slop (60 Hz)	**Note: The parameter depends on *Alternate Frequency Switch*.** The amount of voltage roll off when the frequency is below the knee frequency (Password level: 1.) Allowed values: 0~10 % / Hz.(Default: 2.2 % / Hz.)
Starting to Rated Ramp Time	The time over which the speed reference is to ramp from starting speed to rated speed. This parameter is available only in applications with engine control modules. (Password level: 1.) Allowed values: 0~30 seconds. (Default: 1 seconds.)

8.23 Alternator (OEM Alternator Setup)

Each label is described in the following table.

TABLE 140. OEM ALTERNATOR SETUP

NAME	DESCRIPTION
Nominal Voltage Limits	
3 ph high conn Genset nom voltage hi limit	High voltage setpoint limit for the high connection on a reconnectable alternator (Password level: 2.) Allowed values: 1~45000 Vac. (Default: 480 Vac.)

NAME	DESCRIPTION
3 ph high conn Genset nom voltage lo limit	Low voltage setpoint limit for the high connection on a reconnectable alternator (Password level: 2.) Allowed values: 1~45000 Vac. (Default: 416 Vac.)
3 ph low conn Genset nom voltage hi limit	High voltage setpoint limit for the low connection on a reconnectable alternator (Password level: 2.) Allowed values: 1~45000 Vac. (Default: 240 Vac.)
3 ph low conn Genset nom voltage lo limit	Low voltage setpoint limit for the low connection on a reconnectable alternator (Password level: 2.) Allowed values: 1~45000 Vac. (Default: 208 Vac.)
Single phase Genset nom voltage hi limit	High voltage setpoint limit for the single phase connected alternator (Password level: 2.) Allowed values: 1~600 Vac. (Default: 240 Vac.)
Single phase Genset nom voltage lo limit	Low voltage setpoint limit for the single phase connected alternator (Password level: 2.) Allowed values: 1~600 Vac. (Default: 208 Vac.)
Excitation Source	The type of excitation power source PMG or Shunt (Password level: 2.) Allowed values: Shunt, PMG. (Default: PMG.)
Excitation Disable Override	Use to turn off AVR while running in Manual for troubleshooting (Password level: 1.) Allowed values: Excitation Off, Excitation On. (Default: Excitation On.)
AVR Enable	Enables or disables the AVR (Password level: 2.) Allowed values: Disable, Enable. (Default: Enable.)
Genset PT/CT setup	
Genset PT Primary Voltage	Genset PT primary voltage (Password level: 2.) Allowed values: 600~45000 Vac. (Default: 600 Vac.)
Genset PT Secondary Voltage	Genset PT secondary voltage (Password level: 2.) Allowed values: 100~600 Vac. (Default: 100 Vac.)
Genset Primary CT Current	Genset CT primary current (Password level: 2.) Allowed values: 5~10000 Amps. (Default: 5 Amps.)
Genset CT Secondary Current	Genset CT secondary current (Password level: 2.) Allowed values: 1 Amp, 5 Amp. (Default: 1 Amp.)
AVR 60Hz Gains	
K1 (60 Hz)	This gain affects the overall regulator gain in 60 Hz applications. Similar to proportional gain. PCF scale factor = 0.01 (Password level: 2.) Allowed values: 0~100 %DC / %Volts. (Default: 4 %DC / %Volts.)
K2 (60 Hz)	This is gain 2 in 60 Hz applications. (1-K2) is z plane zero location. PCF scale factor = 0.01 (Password level: 2.) Allowed values: 0.02~99.99. (Default: 1.)

NAME	DESCRIPTION
K3 (60 Hz)	This is gain 3 in 60 Hz applications. K3 is z plane pole location. (K3+K4) is z plane zero location. PCF scale factor = 0.01 (Password level: 2.) Allowed values: 0~100. (Default: 86.)
AVR Damping Effect (60 Hz)	Increases or decreases the output response of the AVR. A lower input value will increase the transient response. A higher value will decrease the transient response. (Password level: 2.) Allowed values: 0~99.99. (Default: 79.)
AVR 50Hz Gains	
K1 (50 Hz)	This gain affects the overall regulator gain in 50 Hz applications. Similar to proportional gain. PCF scale factor = 0.01 (Password level: 2.) Allowed values: 0~100 %DC / %Volts. (Default: 4 %DC / %Volts.)
K2 (50 Hz)	This is gain 2 in 50 Hz applications. (1-K2) is z plane zero location. PCF scale factor = 0.01 (Password level: 2.) Allowed values: 0.02~99.99. (Default: 1.)
K3 (50 Hz)	This is gain 3 in 50 Hz applications. K3 is z plane pole location. (K3+K4) is z plane zero location. PCF scale factor = 0.01 (Password level: 2.) Allowed values: 0~100. (Default: 84.)
AVR Damping Effect (50 Hz)	Increases or decreases the output response of the AVR. A lower input value will increase the transient response. A higher value will decrease the transient response. (Password level: 2.) Allowed values: 0~99.99. (Default: 78.)
AC Voltage Faults	
High AC Voltage Threshold	Percent of desired voltage at which High AC Voltage fault becomes active. (Password level: 1.) Allowed values: 105~125 %. (Default: 110 %.)
High AC Voltage Trip Characteristic	Fixed Time" setup allows a greater time delay until shutdown when voltage overshoots (good for starting motors). When the control is set up to operate as Inverse Time", the fault will be more sensitive to voltage spikes and will trip more rapidly. (Password level: 1.) Allowed values: Inverse Time, Fixed Time.
High AC Voltage Delay	Time delay before High AC Voltage fault becomes active. (Password level: 1.) Allowed values: 0.1~10 seconds. (Default: 10 seconds.)
Low AC Voltage Threshold	Percent of desired voltage at which Low AC Voltage fault becomes active. (Password level: 1.) Allowed values: 50~95 %. (Default: 85 %.)

NAME	DESCRIPTION
Low AC Voltage Delay	Time delay before Low AC Voltage fault becomes active (Password level: 1.) Allowed values: 2~20 seconds. (Default: 10 seconds.)
Lost AC Voltage Threshold	Sets average voltage threshold for Loss of AC Voltage sensing fault. (Password level: 2.) Allowed values: 0~25 %. (Default: 10 %.)
Lost AC Time Delay	Sets the time delay for the Loss of AC Voltage Sensing fault. (Password level: 1.) Allowed values: 0~2 seconds. (Default: 1 second.)
Underfrequency Fault	
Underfrequency Threshold	Number of Hertz Alternator Line Frequency may be under nominal frequency before Underfrequency fault becomes active. (Password level: 1.) Allowed values: 2~10 Hz. (Default: 6 Hz.)
Underfrequency Delay	Time delay before the Underfrequency fault becomes active. (Password level: 1.) Allowed values: 5~20 seconds. (Default: 10 seconds.)
Overfrequency Fault	
Overfrequency Enable	Enables overfrequency diagnostic witness test. (Password level: 1.) Allowed values: Disabled, Enabled. (Default: Disabled.)
Overfrequency Threshold	Number of Hertz Alternator Line Frequency may be over nominal frequency before Overfrequency fault becomes active. (Password level: 1.) Allowed values: 2~10 Hz. (Default: 6 Hz.)
Overfrequency Delay	Time delay before Overfrequency fault becomes active. (Password level: 1.) Allowed values: 1~20 seconds. (Default: 20 seconds.)
Speed/Frequency Fault	
Speed/Frequency Threshold	Sets the threshold for generating the Speed/Frequency mismatch fault (Password level: 1.) Allowed values: 0.5~20 Hz. (Default: 1.5 Hz.)
Speed/Frequency Delay	Sets the delay time for generating the Speed/Frequency mismatch fault (Password level: 1.) Allowed values: 0.5~10 seconds. (Default: 1 seconds.)
Max Field Time	The maximum allowed time at Max Field Duty Cycle. (Password level: 1.) Allowed values: 3~30 seconds. (Default: 15 seconds.)

8.23.1 Generator Set Tuning

The automatic voltage regulator (AVR) uses a four-coefficient PID algorithm that runs five hundred times each second.

K1 sets the overall AVR gain. It is a true proportional gain which is multiplied against the voltage error signal.

- K1 should be adjusted to meet the specification for percent off rated voltage during load acceptance and to prevent large voltage overshoots during offloads and generator set startup.
- In general, K1 increases in value with increasing generator set size.

K2 controls the recovery shape of voltage transients during large-load acceptance and rejection. This is a true integral gain which is multiplied against the sum of all previous errors.

- If K2 is too high, the voltage performance is unstable. If K2 is too low, the voltage performance is slow or has steady-state voltage-offset errors.
- In general, K2 decreases in value with increasing generator size.

K3 affects high-frequency characteristics of the AVR algorithm. It is set for basic stability. In general, it should not need to be adjusted.

K4 is a calculated value. You cannot adjust it. It is set for basic stability.

The damping term is used to calculate K4. It affects high-frequency characteristics of the AVR algorithm. It is set for basic stability. In general, it should not need to be adjusted.

The tables below provide the standard values for K1-K4 and damping terms for Cummins Generator Technologies (CGT) alternators at 50-Hz and 60-Hz operation.

TABLE 141. STANDARD VALUES FOR K1-K4 AND DAMPING TERMS FOR CGT ALTERNATORS (50-HZ OPERATION)

Output Power	< 200 kW	200 kW - 400 kW	> 400 kW
Open-circuit Time Constant	<=1.2 sec	1.3 sec - 2.2 sec	>= 2.3 sec
K1	3.50	4.5	5.0
K2	1.00	0.80	0.50
K3	84.0	84.0	84.0
K4	12.48 (calculated)	12.48 (calculated)	12.48 (calculated)
Damping	78.0	78.0	78.0
Shunt Gain Multiplier	1.5	1.5	1.5

TABLE 142. STANDARD VALUES FOR K1-K4 AND DAMPING TERMS FOR CGT ALTERNATORS (60-HZ OPERATION)

Output Power	< 200 kW	200 kW - 400 kW	> 400 kW
Open-circuit Time Constant	<=1.2 sec	1.3 sec - 2.2 sec	>= 2.3 sec
K1	3.50	4.5	5.0
K2	1.00	0.80	0.50
K3	86.0	86.0	86.0
K4	11.06 (calculated)	11.06 (calculated)	11.06 (calculated)
Damping	79.0	79.0	79.0
Shunt Gain Multiplier	1.5	1.5	1.5

8.23.2 Genset Voltage

Set the *Genset Nominal Voltage* to the voltage rating of the alternator. *Genset Nominal Voltage* is restricted to these ranges.

Single phase connections:

- *Single phase Genset nom voltage lo limit* <

  Genset Nominal Voltage <

  Single phase Genset nom voltage hi limit

Three phase connections:

- *3 ph high conn Genset nom voltage lo limit* <

  Genset Nominal Voltage <

  3 ph high conn Genset nom voltage hi limit

- *3 ph low conn Genset nom voltage lo limit* <

  Genset Nominal Voltage <

  3 ph low conn Genset nom voltage hi limit

NOTICE
The PCC ignores the potential transformer (PT) ratio if Genset Nominal Voltage is less than 600 VAC.

Use *High AC Voltage Trip Characteristic* to specify how quickly the PCC generates shutdown fault 1446 (High AC Voltage).

If *High AC Voltage Trip Characteristic* is Fixed Time, the PCC generates this fault when one or more phase voltages is greater than *High AC Voltage Threshold* for *High AC Voltage Delay*. This is often suitable when the genset is starting motors.

If *High AC Voltage Trip Characteristic* is Inverse Time, the PCC generates this fault more quickly or more slowly depending on the voltage. The more one or more phase voltages is greater than *High AC Voltage Threshold*, the sooner the PCC generates this fault.

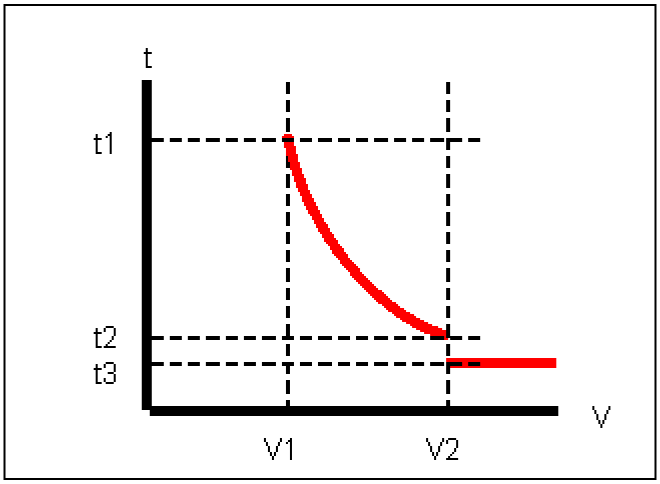


FIGURE 68. HIGH AC VOLTAGE FAULT WHEN TRIP CHARACTERISTIC IS INVERSE TIME

TABLE 143. HIGH AC VOLTAGE FAULT WHEN TRIP CHARACTERISTIC IS INVERSE TIME

LABEL	DESCRIPTION
t1	*High AC Voltage Delay*
t2	1 second
t3	0.6 seconds
V1	*High AC Voltage Threshold*
V2	*Instantaneous High AC Voltage Threshold*

If the maximum phase voltage is greater than *High AC Voltage Threshold* and less than *Instantaneous High AC Voltage Threshold* (This parameter is not available in the *Operator Panel*. The PCC generates shutdown fault 1446 (High AC Voltage) increasingly quickly, from *High AC Voltage Delay* to 1 second.

If the maximum phase voltage is greater than or equal to *Instantaneous High AC Voltage Threshold*, the PCC generates this fault in 0.6 seconds.

The PCC generates shutdown fault 1447 (Low AC Voltage) if one or more phase voltages is less than *Low AC Voltage Threshold* for *Low AC Voltage Delay*.

8.23.3 Pulse-width Modulation (PWM) in the Automatic Voltage Regulator (AVR)

The PCC uses pulse-width modulation (PWM) to drive the field windings in the exciter. The PWM duty cycle can be 0% or any value between *AVR Min Duty Cycle Limit* and *Max Field Duty Cycle*.

The default value for *Max Field Duty Cycle* depends on *Excitation Source*.

- If *Excitation Source* is PMG, the default *Max Field Duty Cycle* is 60%.
- If *Excitation Source* is Shunt, the default *Max Field Duty Cycle* is 68%.

The PCC generates shutdown fault 2972 (Field Overload) if the PCC drives the field windings in the exciter at the maximum PWM duty cycle for *Max Field Time*.

8.24 PCCNet Setup

Each label is described in the following table.

TABLE 144. PCCNET SETUP

NAME	DESCRIPTION
HMI220 PCCnet Failure Response Type	Selects the genset reaction to a loss of an HMI220 Operator Panel as critical or non-critical. A critical response will shutdown the genset when PCCnet communication is lost. (Password level: 1.) Allowed values: Critical Device Response, Non-Critical Device Response. (Default: Non-Crit Device Resp.)
HMI320 PCCnet Failure Response Type	Selects the genset reaction to a loss of an HMI320 Operator Panel as critical or non-critical. A critical response will shutdown the genset when PCCnet communication is lost. (Password level: 1.) Allowed values: Critical Device Response, Non-Critical Device Response. (Default: Non-Crit Device Resp.)

NAME	DESCRIPTION
HMI113 Annunciator PCCnet Failure Response Type	Selects the genset reaction to a loss of an Annunciator as critical or non-critical. Selecting Critical will cause a shutdown when the Annunciator loses communication. (Password level: 1.) Allowed values: Critical Device Response, Non-Critical Device Response. (Default: Non-Crit Device Resp.)
Aux101 Device 0 PCCnet Failure Response Type	Selects the genset reaction to a loss of a Device 0 I/O Module as critical (Shutdown) or non-critical (Warning). (Password level: 1.) Allowed values: Critical Device Response, Non-Critical Device Response. (Default: Non-Crit Device Resp.)
Aux101 Device 1 PCCnet Failure Response Type	Selects the genset reaction to a loss of a Device 1 I/O Module as critical (Shutdown) or non-critical (Warning). (Password level: 1.) Allowed values: Critical Device Response, Non-Critical Device Response. (Default: Non-Crit Device Resp.)
PCCnet Device Failure Time Delay	Selects the time allowed for arbitration to occur before a PCCnet failure fault is generated. (Password level: 2.) Allowed values: 0~250 seconds. (Default: 60 seconds.)
Active PCCnet HMI220 Operator Panels	Used to monitor the number of connected HMI220 Operator Panels. Allowed values: 0~255.
Expected PCCnet HMI220 Operator Panels	The number of HMI220 Operator Panels that should be connected. (Password level: 1.) Allowed values: 0~250. (Default: 0.)
Active PCCnet HMI320 Operator Panels	Used to monitor the number of connected HMI320 Operator Panels. Allowed values: 0~255.
Expected PCCnet HMI320 Operator Panels	The number of HMI320 Operator Panels that should be connected. (Password level: 1.) Allowed values: 0~250. (Default: 0.)
Active PCCnet AUX101 Device 0 Modules	AUX101 with Device number 0 is connected and active. Allowed values: 0~255.
Expected PCCnet AUX101 Device 0 Modules	The number of AUX101 Device 0 modules that should be connected. (Password level: 1.) Allowed values: 0~250. (Default: 0.)
Active PCCnet AUX101 Device 1 Modules	AUX101 with Device number 1 is connected and active. Allowed values: 0~255.
Expected PCCnet AUX101 Device 1 Modules	The number of AUX101 Device 1 modules that should be connected. (Password level: 1.) Allowed values: 0~250. (Default: 0.)
Active PCCnet HMI113 Annunciators	Used to monitor the number of connected HMI113 Annunciators. Allowed values: 0~255.
Expected PCCnet HMI113 Annunciators	The number of HMI113 Annunciators that should be connected. (Password level: 1.) Allowed values: 0~250. (Default: 0.)
HMI113 Outputs	

NAME	DESCRIPTION
HMI113 Output 1 Fault/Event	Parameter to allow for the entry of the fault/event code which will turn the output relay on and off. (Password level: 1.) Allowed values: 0~65530. (Default: 0.)
HMI113 Output 1 Signal Status	Parameter to monitor the logic output to the Annunciator relay. Allowed values: Inactive, Active.
HMI113 Output 2 Fault/Event	Parameter to allow for the entry of the fault/event code which will turn the output relay on and off. (Password level: 1.) Allowed values: 0~65530. (Default: 0.)
HMI113 Output 2 Signal Status	Parameter to monitor the logic output to the Annunciator relay. Allowed values: Inactive, Active.
HMI113 Output 3 Fault/Event	Parameter to allow for the entry of the fault/event code which will turn the output relay on and off. (Password level: 1.) Allowed values: 0~65530. (Default: 0.)
HMI113 Output 3 Signal Status	Parameter to monitor the logic output to the Annunciator relay. Allowed values: Inactive, Active.
HMI113 Output 4 Fault/Event	Parameter to allow for the entry of the fault/event code which will turn the output relay on and off. (Password level: 1.) Allowed values: 0~65530. (Default: 0.)
HMI113 Output 4 Signal Status	Parameter to monitor the logic output to the Annunciator relay. Allowed values: Inactive, Active.
HMI113 Faults	
HMI113 Fault 1 Status	Monitor point for input #1 from the Annunciator. Allowed values: Inactive, Active.
HMI113 Fault 1 Text	Twenty (20) character text string to enter the configurable fault text for this fault. (Password level: 1.)
HMI113 Fault 2 Status	Monitor point for input #2 from the Annunciator. Allowed values: Inactive, Active.
HMI113 Fault 2 Text	Twenty (20) character text string to enter the configurable fault text for this fault. (Password level: 1.)
HMI113 Fault 3 Status	Monitor point for the input #3 from the Annunciator. Allowed values: Inactive, Active.
HMI113 Fault 3 Text	Twenty (20) character text string to enter the configurable fault text for this fault. (Password level: 1.)

8.24.1 PCCNet Faults

If the PCC loses communication with a HMI113, the PCC generates shutdown fault 2896 (Critical PCCnet Dev Fail) or warning fault 2895 (PCCnet Device Failed) according to *HMI113 Annunciator PCCNet Failure Response Type*.

If the PCC loses communication with an Operator Panel, the PCC generates shutdown fault 2896 (Critical PCCnet Dev Fail) or warning fault 2895 (PCCnet Device Failed) according to *HMI220 PCCNet Failure Response Type*.

8.24.2 PCC-HMI113 Communication

The PCC and the HMI113 exchange four bytes, or thirty-two bits, of information on the PCCNet network. Each bit is identified in the following table .

TABLE 145. PCC-HMI113 COMMUNICATION

BIT	NAME	PCC READS/WRITES
1	Annunciator Fault 1	R
2	Annunciator Fault 2	R
3	Annunciator Fault 3	R
4	Genset Supplying Load	R
5	Charger AC Failure	R / W
6	Low Coolant Level	R / W
7	Low Fuel Level	R / W
8	Check Genset	W
9	Not in Auto	W
10	Genset Running	W
11	High Battery Voltage	W
12	Low Battery Voltage	W
13	Weak Battery	W
14	Fail to Start	W
15	Low Coolant Temp	W
16	Pre-High Engine Temp	W
17	High Engine Temp	W
18	Pre-Low Oil Pressure	W
19	Low Oil Pressure	W
20	Overspeed	W
21	Annunciator Fault Relay 1 Status	R / W
22	Annunciator Fault Relay 2 Status	R / W
23	Annunciator Fault Relay 3 Status	R / W
24	Annunciator Fault Relay 4 Status	R / W
25	Audible Alarm Status	R
26	Silence Button Status	R
27	Network Error Status	R
28	Not Used	Not Used
29	Not Used	Not Used
30	Not Used	Not Used

BIT	NAME	PCC READS/WRITES
31	Not Used	Not Used
32	Not Used	Not Used

Genset Running is active when event 1465 (Ready To Load) is active.

8.24.2.1 PCC Information to the HMI113

The following table explains the information the PCC sends to the HMI113.

TABLE 146. HMI113 STATUS INFORMATION

EVENT/FAULT	DESCRIPTION
2993	Battery Charger Sw Fail
197 or 235	Low Coolant Level
1441	Low Fuel Level
1483	Common Alarm (Check Genset)
1463	Not In Auto
1465	Genset Running (Ready to Load)
442	High Battery 1 Voltage
441	Low Battery 1 Voltage
1442	Weak Battery
359	Fail To Start
1435	Low Coolant Temperature
146	Pre-High Engine Coolant Temperature
151 or 1847	High Coolant Temp
143	Low Oil Rifle Pressure
415	Low Oil Rifle Press
234 or 1992	Crankshaft Speed High

Genset Running is active when event 1465 (Ready to Load) is active.

The PCC can control up to four relays on the HMI113.

Use *HMI113 Output 1-4 Fault/Event* to specify the event/fault codes that control HMI113 custom relays 1-4.

The PCC generates warning fault 1944 (HMI113 Out Config Error) if more than one source is controlling one of the HMI113 custom relays.

8.24.2.2 HMI113 Information to the PCC

The PCC also receives these inputs from the HMI113:

- *Battery Charger AC Failure (HMI113)*
- *Low Coolant Level (HMI113)*
- *Low Fuel Level (HMI113)*

- HMI customer faults 1-3

An input is active if any HMI113 sends an active signal. An input is inactive if all of the HMI113 send an inactive signal.

The PCC generates warning fault 2993 (Battery Charger Sw Fail) as soon as *Battery Charger AC Failure (HMI113)* is active.

When *Low Coolant Level (HMI113)* becomes active, the PCC generates shutdown fault 235 (Low Coolant Level), warning fault 197 (Low Coolant Level), or no response at all, depending on *LCL Detection Response*.

The PCC generates warning fault 1441 (Low Fuel Level) when *Low Fuel Level (HMI113)* is active for *Low Fuel Set/Clear Time*.

HMI113 customer faults 1-3 generate warning fault 1853 (Annunciator Input 1 Fault), warning fault 1854 (Annunciator Input 2 Fault), and warning fault 1855 (Annunciator Input 3 Fault), respectively. Use HMI113 Fault 1-3 Text to identify these signals on the Operator Panel.

8.25 Modbus Setup (Setup/MODBUS)

Each label is described in the following table.

TABLE 147. MODBUS SETUP

NAME	DESCRIPTION
Modbus Node Address	Sets the Modbus address for this node (Password level: 1.) Allowed values: 1~247. (Default: 2.)
Modbus Baud Rate	Sets the Modbus baud rate. (Password level: 1.) Allowed values: 2400 Baud, 4800 Baud, 9600 Baud, 19200 Baud, 38400 Baud. (Default: 9600.)
Modbus Parity	Sets the Modbus parity for this node (Password level: 1.) Allowed values: Even, Odd, None. (Default: None.)
Modbus Stop Bits	Sets the Modbus number of stop bits for this node Limited to 1 bit if parity = Odd or Even. (Password level: 1.) Allowed values: 1, 2 (Default: 2.)
Modbus Failure Time Delay	Time delay before the control activates the Modbus failure fault after the master is sensed as no longer present. (Password level: 1.) Allowed values: 0~10 seconds. (Default: 4 seconds.)
Modbus Communications Lost Response Method	When set to Reset Commands will reset the Modbus control logicals to an inactive state when Modbus communications are lost (Password level: 1.) Allowed values: Do Nothing, Reset Commands. (Default: Do Nothing.)
Reset Modbus Commands	Resets all Modbus volatile commands (Password level: 1.) Allowed values: Inactive, Active. (Default: Inactive.)
Counters	
Modbus Bus Message Count	Modbus bus message count
Modbus Slave Message Count	Modbus slave message count
Modbus No Response Count	Modbus no response count
Modbus CRC Errors Count	Modbus CRC errors count

NAME	DESCRIPTION
Modbus Exception Count	Modbus exception count
Modbus Clear Counters	Resets all Modbus counters (Password level: 1.) Allowed values: Do Nothing, Clear Counters. (Default: Do Nothing.)

8.25.1 Modbus

NOTICE
See http://www.modbus.org for more information about Modbus.

Connect the PCC via Modbus RTU (Remote Terminal Unit) protocol on a two-wire RS-485 master/slave bus. In this arrangement, the external device is the master, and the PCC is the slave.

The external device can use the Modbus connection to perform these tasks on the PCC:

- Monitor basic read-only parameters
- Write any parameter that is not considered a factory-setup or one-time-use parameter.
- Start and stop the genset.

The external device cannot access any information in tables.

The PCC uses eight data bits and one stop bit in Modbus connections. You can set up these parameters for Modbus connections:

- *Modbus Node Address*: This depends on the Modbus network to which the PCC is connected.
- *Modbus Baud Rate*: 2400 bps, 4800 bps, 9600 bps, 19200 bps, or 38400 bps.
- *Modbus Parity*: none, odd, or even.

For example, if you use WinTech's ModScan to verify Modbus communications, check these settings in ModScan:

- The **Device Id** should be *Modbus Node Address*.
- The **Baud Rate** should be *Modbus Baud Rate*.
- The **Word Length** should be 8.
- The **Parity** should be *Modbus Parity*.
- The **Stop Bits** should be 1.
- The **Transmission Mode** should be RTU.

The external device can read 1-40 contiguous registers, write 1-40 contiguous registers, or read diagnostic counters.

8.26 Display Options

Each label is described in the following table.

TABLE 148. DISPLAY OPTIONS

NAME	DESCRIPTION
Power mgmt	This controls how the Operator Panel uses and conserves power. For example, if this is set to Max, the backlight turns off after a specified period of inactivity.

NAME	DESCRIPTION
Language	This is the language used in the Operator Panel.
Backlight timer	This is how long the Operator Panel remains backlit when there is no activity with the control panel. **Power Mgmt** must be set to Max.
Sleep timer	This is how many minutes the Operator Panel waits when there is no activity with the control panel before it can enter power-down mode. The Operator Panel does not enter power-down mode until the PCC enters power-down mode.
Sleep mode	This indicates whether or not power-down mode is enabled in the Operator Panel.
Contrast	This controls the contrast in the graphical display.
Mode Change	This indicates whether or not a password is required to use the buttons on the Operator Panel to change the mode of operation. If this is set to Enabled, the password is required. If this is set to Disabled, the password is not required. This has no effect if a keyswitch controls the mode of operation.
Units	
Temperature	This controls the unit of measure for temperature used in the Operator Panel.
Fluid Pressure	This controls the unit of measure for fluid pressure used in the Operator Panel.
Gas Pressure	This controls the unit of measure for gas pressure used in the Operator Panel.
Fluid Flow	This controls the unit of measure fluid flow used in the Operator Panel.
Fluid Volume	This controls the unit of measure fluid volume used in the Operator Panel.

8.27 Clock Setup

Each label is described in the following table .

TABLE 149. CLOCK SETUP

NAME	DESCRIPTION
Clock	
Clock Hour	Use to set or read the current hour. (Password level: 1.) Allowed values: 0~23.
Clock Minute	Use to set or read the current minute. (Password level: 1.) Allowed values: 0~59.
Clock Second	Use to set or read the current second. (Password level: 1.) Allowed values: 0~59.
Clock Date	Use to set or read the current date. (Password level: 1.) Allowed values: 1~31.
Clock Month	Use to set or read the current month. (Password level: 1.) Allowed values: 1~12.
Clock Year	Use to set or read the current year. (Password level: 1.) Allowed values: 0~99.
Daylight saving time	

NAME	DESCRIPTION
Daylight Savings Time Enable	Use to enable the daylight savings time feature. (Password level: 1.) Allowed values: Disabled, Enabled. (Default: Disabled.)
Daylight Savings Time Adjustment	Use to set the amount of daylight savings time adjustment applied. (Password level: 1.) Allowed values: 0~120 Minutes. (Default: 60 Minutes.)
Start	
Daylight Savings Start Month	Use to set the month when daylight savings time starts. (Password level: 1.) Allowed values: 1~12. (Default: 3.)
Daylight Savings Start Week	Use to set the week of the month when daylight savings time starts. (Password level: 1.) Allowed values: First Week, Second Week, Third Week, Fourth Week, Last Week. (Default: Third Week.)
Daylight Savings Start Day	Use to set the day of the week when daylight savings time starts. (Password level: 1.) Allowed values: Sunday, Monday, Tuesday, Wednesday, Thursday, Friday, Saturday. (Default: Sunday.)
Daylight Savings Start Hour	Use to set the hour of the day when daylight savings time starts. (Password level: 1.) Allowed values: 0~23. (Default: 2.)
End	
Daylight Savings End Month	Use to set the month when daylight savings time ends. (Password level: 1.) Allowed values: 1~12. (Default: 11.)
Daylight Savings End Week	Use to set the week of the month when daylight savings time ends. (Password level: 1.) Allowed values: First Week, Second Week, Third Week, Fourth Week, Last Week. (Default: Second Week.)
Daylight Savings End Day	Use to set the day of the week when daylight savings time ends. (Password level: 1.) Allowed values: Sunday, Monday, Tuesday, Wednesday, Thursday, Friday, Saturday. (Default: Sunday.)
Daylight Savings End Hour	Use to set the hour of the day when daylight savings time ends. (Password level: 1.) Allowed values: 0~23. (Default: 2.)

8.27.1 Real-time Clock

The PCC has a real-time clock that is used to calculate how long the controller has been on, to create the timestamp on faults, and to support the schedulers. The clock displays time in 24-hour format and recognizes dates until 2100.

You can also set up daylight saving time. When daylight saving time begins, the PCC adds *Daylight Savings Time Adjustment* to the clock. If you disable daylight saving time before daylight saving time ends, the PCC does not automatically subtract *Daylight Savings Time Adjustment* from the clock. You have to adjust the clock manually.

If the battery is disconnected from the PCC, the real-time clock continues to run for about one hour. Afterwards, the PCC generates warning fault 1689 (Real Time Clock Power), and the clock has to be reset.

8.28 Configurable I/O

Each label is described in the following table.

TABLE 150. CONFIGURABLE I/O

NAME	DESCRIPTION
Configurable Input Fault #1	
Configurable Input #1 Input Function Pointer	Configurable Input #1 Input function pointer. Feeds input signal to alternate function input if value not set to default (Password level: 1.) Allowed values: Default, Do Nothing, Low Fuel in Day Tank Switch, Low Coolant Switch #2, High Alt Temperature Switch, Ground Fault Switch, Exercise Switch, Battle Short Switch, Battery Charger Failed Switch, Low Engine Temperature Switch, Speed Droop Enable Switch, Voltage Droop Enable Switch, Rated/Idle Switch, AMM In Auto, Low Fuel pressure Switch, Start Signal Integrity Switch. (Default: Default.)
Configurable Input #1 Fault Response	If the configurable input #1 is configured as a fault input, this sets the fault level (Password level: 1.) Allowed values: None, Warning, Shutdown. (Default: None.)
Configurable Input #1 Active State Selection	Trim which allows Input #1 to be inverted logically in the software. (Password level: 1.) Allowed values: Active Closed, Active Open. (Default: Active Closed.)
Configurable Input #1 Fault Text	Trim to define the 16 character string for use by the Operator panel when this fault becomes active. (Password level: 1.)
Configurable Input Fault #2	
Configurable Input #2 Input Function Pointer	Configurable Input #2 Input function pointer. Feeds input signal to alternate function input if value not set to default. (Password level: 1.) Allowed values: Default, Do Nothing, Low Fuel in Day Tank Switch, Low Coolant Switch #2, High Alt Temperature Switch, Ground Fault Switch, Exercise Switch, Battle Short Switch, Battery Charger Failed Switch, Low Engine Temperature Switch, Speed Droop Enable Switch, Voltage Droop Enable Switch, Rated/Idle Switch, AMM In Auto, Low Fuel Pressure Switch, Start Signal Integrity Switch. (Default: Default.)

NAME	DESCRIPTION
Configurable Input #2 Fault Response	If the configurable input #2 is configured as a fault input, this sets the fault level (Password level: 1.) Allowed values: None, Warning, Shutdown. (Default: None.)
Configurable Input #2 Active State Selection	Trim which allows Input #2 to be inverted logically in the software. (Password level: 1.) Allowed values: Active Closed, Active Open. (Default: Active Closed.)
Configurable Input #2 Fault Text	Trim to define the 16 character string for use by the Operator panel when this fault becomes active. (Password level: 1.)
Configurable Input Fault #13	
Configurable Input #13 Input Function Pointer	Configurable Input #13 Input function pointer. Feeds input signal to alternate function input if value not set to default. (Password level: 1.) Allowed values: Default, Do Nothing, Low Fuel in Day Tank Switch, Low Coolant Switch #2, High Alt Temperature Switch, Ground Fault Switch, Exercise Switch, Battle Short Switch, Battery Charger Failed Switch, Low Engine Temperature Switch, Speed Droop Enable Switch, Voltage Droop Enable Switch, Rated/Idle Switch, AMM In Auto, Low Fuel Pressure Switch, Start Signal Integrity Switch. (Default: Default.)
Configurable Input #13 Fault Response	If the configurable input #3 is configured as a fault input, this sets the fault level (Password level: 1.) Allowed values: None, Warning, Shutdown. (Default: Event.)
Configurable Input #13 Active State Selection	Trim which allows Input #13 to be inverted logically in the software. (Password level: 1.) Allowed values: Active Closed, Active Open. (Default: Active Closed.)
Configurable Input #13 Fault Text	Trim to define the 16 character string for use by the Operator panel when this fault becomes active. (Password level: 1.)
Configurable Input Fault #14	
Configurable Input #14 Input Function Pointer	Configurable Input #14 Input function pointer. Feeds input signal to alternate function input if value not set to default (Password level: 1.) Allowed values: Default, Do Nothing, Low Fuel in Day Tank Switch, Low Coolant Switch #2, High Alt Temperature Switch, Ground Fault Switch, Exercise Switch, Battle Short Switch, Battery Charger Failed Switch, Low Engine Temperature Switch, Speed Droop Enable Switch, Voltage Droop Enable Switch, Rated/Idle Switch, AMM In Auto, Low Fuel Pressure Switch, Start Signal Integrity Switch. (Default: Default.)

NAME	DESCRIPTION
Configurable Input #14 Fault Response	If the configurable input #4 is configured as a fault input, this sets the fault level (Password level: 1.) Allowed values: None, Warning, Shutdown. (Default: Event.)
Configurable Input #14 Active State Selection	Trim which allows Input #14 to be inverted logically in the software. (Password level: 1.) Allowed values: Active Closed, Active Open. (Default: Active Closed.)
Configurable Input #14 Fault Text	Trim to define the 16 character string for use by the Operator panel when this fault becomes active. (Password level: 1.)
Coolant Level/Input #5	
Coolant Level/Configurable Input #5 Function Pointer	Coolant Level Input function pointer. Feeds input signal to alternate function input if value not set to default (Password level: 1.) Allowed values: Default, Do Nothing, Low Fuel in Day Tank Switch, Low Coolant Switch #2, High Alt Temperature Switch, Ground Fault Switch, Exercise Switch, Battle Short Switch, Battery Charger Failed Switch, Low Engine Temperature Switch, Speed Droop Enable Switch, Voltage Droop Enable Switch, Rated/Idle Switch, AMM In Auto, Low Fuel Pressure Switch, Start Signal Integrity Switch. (Default: Default.)
Coolant Level/Configurable Input #5 Active State Selection	Coolant Level input software logic state inversion bypass control (Password level: 1.) Allowed values: Active Closed, Active Open. (Default: Active Closed.)
Low Fuel/Input #6	
Low Fuel/Configurable Input #6 Function Pointer	Low Fuel Input function pointer. Feeds input signal to alternate function input if value not set to default (Password level: 1.) Allowed values: Default, Do Nothing, Low Fuel in Day Tank Switch, Low Coolant Switch #2, High Alt Temperature Switch, Ground Fault Switch, Exercise Switch, Battle Short Switch, Battery Charger Failed Switch, Low Engine Temperature Switch, Speed Droop Enable Switch, Voltage Droop Enable Switch, Rated/Idle Switch, AMM In Auto, Low Fuel Pressure Switch, Start Signal Integrity Switch. (Default: Default.)
Low Fuel FC 1441 Genset Response	Sets the genset response for fault code 1441. (Password level: 1.) Allowed values: None, Warning, Shutdown. (Default: Warning.)
Low Fuel/Configurable Input #6 Active State Selection	Low Fuel input software logic state inversion bypass control (Password level: 1.) Allowed values: Active Closed, Active Open. (Default: Active Closed.)

NAME	DESCRIPTION
Fault Reset/Input #10	
Fault Reset/Configurable Input #10 Function Pointer	Fault Reset Input function pointer. Feeds input signal to alternate function input if value not set to default (Password level: 1.) Allowed values: Default, Do Nothing, Low Fuel in Day Tank Switch, Low Coolant Switch #2, High Alt Temperature Switch, Ground Fault Switch, Exercise Switch, Battle Short Switch, Battery Charger failed Switch, Low Engine Temperature Switch, Speed Droop Enable Switch, Voltage Droop Enable Switch, Rated/Idle Switch, AMM In Auto, Low Fuel Pressure Switch, Start Signal Integrity Switch. (Default: Default.)
Fault Reset/Configurable Input #10 Active State Selection	Fault Reset input software logic state inversion bypass control. (Password level: 1.) Allowed values: Active Closed, Active Open. (Default: Active Closed.)
Start Type/Input #11	
Start Type/Configurable Input #11 Function Pointer	Start Type Input function pointer. Feeds input signal to alternate function input if value not set to default (Password level: 1.) Allowed values: Default, Do Nothing, Low Fuel in Day Tank Switch, Low Coolant Switch #2, High Alt Temperature Switch, Ground Fault Switch, Exercise Switch, Battle Short Switch, Battery Charger Failed Switch, Low Engine Temperature Switch, Speed Droop Enable Switch, Voltage Droop Enable Switch, Rated/Idle Switch, AMM In Auto, Low Fuel Pressure Switch, Start Signal Integrity Switch. (Default: Default.)
Start Type/Configurable Input #11 Active State Selection	Start Type input software logic state inversion bypass control (Password level: 1.) Allowed values: Active Closed, Active Open. (Default: Active Closed.)
Rupture Basin/Input #12	
Rupture Basin/Configurable Input #12 Function Pointer	Rupture Basin Input function pointer. Feeds input signal to alternate function input if value not set to default (Password level: 1.) Allowed values: Default, Do Nothing, Low Fuel in Day Tank Switch, Low Coolant Switch #2, High Alt Temperature Switch, Ground Fault Switch, Exercise Switch, Battle Short Switch, Battery Charger Failed Switch, Low Engine Temperature Switch, Speed Droop Enable Switch, Voltage Droop Enable Switch, Rated/Idle Switch, AMM In Auto, Low Fuel pressure Switch, Start Signal Integrity Switch. (Default: Default.)
Rupture Basin Level Response	Sets rupture basin fault response to None, Warning or Shutdown. (Password level: 1.) Allowed values: None, Warning, Shutdown. (Default: Warning.)

NAME	DESCRIPTION
Rupture Basin/Configurable Input #12 Active State Selection	Rupture Basin input software logic state inversion bypass control (Password level: 1.) Allowed values: Active Closed, Active Open. (Default: Active closed.)
Configurable Output #1	
Configurable Output #1 Event Code	The event code for this output. (Password level: 1.) Allowed values: 0~65530. (Default: 1540.)
Configurable Output #1 Output Function Pointer	Points to the function that controls the output (Password level: 1.) Allowed values: Default, Do Nothing, Common Warning, Common Shutdown, Rated to Idle Transition Event, Fault Code Function #1, Fault Code Function #2, Fault Code Function #3, Fault Code Function #4, Fault Code Function #5. (Default: Default.)
Configurable Output #1 Invert Bypass	Controls whether the output function is inverted or not. Bypassed = function not inverted (Password level: 1.) Allowed values: Not Bypassed, Bypassed. (Default: Bypassed.)
Configurable Output #2	
Configurable Output #2 Event Code	The event code for this output. (Password level: 1.) Allowed values: 0~65530. (Default: 1541.)
Configurable Output #2 Output Function Pointer	Points to the function that controls the output (Password level: 1.) Allowed values: Default, Do Nothing, Common Warning, Common Shutdown, Rated to Idle Transition Event, Fault Code Function #1, Fault Code Function #2, Fault Code Function #3, Fault Code Function #4, Fault Code Function #5. (Default: Default.)
Configurable Output #2 Invert Bypass	Controls whether the output function is inverted or not. Bypassed = function not inverted (Password level: 1.) Allowed values: Not Bypassed, Bypassed. (Default: Bypassed.)
Fault Code Function #1 Fault/Event Code	The fault/event code for this configurable function output. (Password level: 1.) Allowed values: 0~65530. (Default: 0.)
Fault Code Function #2 Fault/Event Code	The fault/event code for this configurable function output. (Password level: 1.) Allowed values: 0~65530. (Default: 0.)
Fault Code Function #3 Fault/Event Code	The fault/event code for this configurable function output. (Password level: 1.) Allowed values: 0~65530. (Default: 0.)
Configurable Output #3	
Configurable Output #3 Event Code	The event code for this output. (Password level: 1.) Allowed values: 0~65530. (Default: 1463.)

NAME	DESCRIPTION
Configurable Output #3 Output Function Pointer	Points to the function that controls the output (Password level: 1.) Allowed values: Default, Do Nothing, Common Warning, Common Shutdown, Rated to Idle Transition Event, Fault Code Function #1, Fault Code Function #2, Fault Code Function #3, Fault Code Function #4, Fault Code Function #5. (Default: Default.)
Configurable Output #3 Invert Bypass	Controls whether the output function is inverted or not. Bypassed = function not inverted (Password level: 1.) Allowed values: Not Bypassed, Bypassed. (Default: Bypassed.)
Configurable Output #4	
Configurable Output #4 Event Code	The event code for this output. (Password level: 1.) Allowed values: 0~65530. (Default: 1465.)
Configurable Output #4 Output Function Pointer	Points to the function that controls the output (Password level: 1.) Allowed values: Default, Do Nothing, Common Warning, Common Shutdown, Rated to Idle Transition Event, Fault Code Function #1, Fault Code Function #2, Fault Code Function #3, Fault Code Function #4, Fault Code Function #5. (Default: Default.)
Configurable Output #4 Invert Bypass	Controls whether the output function is inverted or not. Bypassed = function not inverted (Password level: 1.) Allowed values: Not Bypassed, Bypassed. (Default: Bypassed.)
Fault Code Function #4 Fault/Event Code	The fault/event code for this configurable function output. (Password level: 1.) Allowed values: 0~65530. (Default: 0.)
Fault Code Function #5 Fault/Event Code	The fault/event code for this configurable function output. (Password level: 1.) Allowed values: 0~65530. (Default: 0.)
Ready to Load/Output #5	
Ready To Load /Configurable Output #5 Output Function Pointer	Points to the function that controls the output (Password level: 1.) Allowed values: Default, Do Nothing, Common Warning, Common Shutdown, Rated to Idle Transition Event, Fault Code Function #1, Fault Code Function #2, Fault Code Function #3, Fault Code Function #4, Fault Code Function #5. (Default: Default.)
Ready To Load /Configurable Output #5 Invert Bypass	Controls whether the output function is inverted or not. Bypassed = function not inverted (Password level: 1.) Allowed values: Not Bypassed, Bypassed. (Default: Bypassed.)
Oil Priming Pump/Output #6	

NAME	DESCRIPTION
Oil Priming Pump / Configurable Output #6 Output Function Pointer	Points to the function that controls the output (Password level: 1.) Allowed values: Default, Do Nothing, Common Warning, Common Shutdown, Rated to Idle Transition Event, Fault Code Function #1, Fault Code Function #2, Fault Code Function #3, Fault Code Function #4, Fault Code Function #5. (Default: Default.)
Oil Priming Pump / Configurable Output #6 Invert Bypass	Controls whether the output function is inverted or not. If bypassed, the function is not inverted (Password level: 1.) Allowed values: Not Bypassed, Bypassed. (Default: bypassed.)
Local Status/Output #7	
Local Status / Configurable Output #7 Output Function Pointer	Points to the function that controls the output (Password level: 1.) Allowed values: Default, Do Nothing, Common Warning, Common Shutdown, Rated to Idle Transition Event, Fault Code Function #1, Fault Code Function #2, Fault Code Function #3, Fault Code Function #4, Fault Code Function #5. (Default: Default.)
Local Status / Configurable Output #7 Invert Bypass	Controls whether the output function is inverted or not. Bypassed = function not inverted (Password level: 1.) Allowed values: Not Bypassed, Bypassed. (Default: Bypassed.)
Glow Plug/Output #8	**NOTE: This input is reserved for future use.**
Glow Plug / Configurable Output #8 Output Function Pointer	Points to the function that controls the output (Password level: 1.) Allowed values: Default, Do Nothing, Common Warning, Common Shutdown, Rated to Idle Transition Event, Fault Code Function #1, Fault Code Function #2, Fault Code Function #3, Fault Code Function #4, Fault Code Function #5. (Default: Default.)
Glow Plug / Configurable Output #8 Invert Bypass	Controls whether the output function is inverted or not. Bypassed = function not inverted (Password level: 1.) Allowed values: Not Bypassed, Bypassed. (Default: Bypassed.)
Delayed Off/Output #10	
Delayed Off / Configurable Output #10 Output Function Pointer	Points to the function that controls the output (Password level: 1.) Allowed values: Default, Do Nothing, Common Warning, Common Shutdown, Rated to Idle Transition Event, Fault Code Function #1, Fault Code Function #2, Fault Code Function #3, Fault Code Function #4, Fault Code Function #5. (Default: Default.)
Delayed Off / Configurable Output #10 Invert Bypass	Controls whether the output function is inverted or not. Bypassed = function not inverted (Password level: 1.) Allowed values: Not Bypassed, Bypassed. (Default: Bypassed.)

NAME	DESCRIPTION
Load Dump/Output #11	
Load Dump / Configurable Output #11 Output Function Pointer	Points to the function that controls the output (Password level: 1.) Allowed values: Default, Do Nothing, Common Warning, Common Shutdown, Rated to Idle Transition Event, Fault Code Function #1, Fault Code Function #2, Fault Code Function #3, Fault Code Function #4, Fault Code Function #5. (Default: Default.)
Load Dump / Configurable Output #11 Invert Bypass	Controls whether the output function is inverted or not. Bypassed = function not inverted (Password level: 1.) Allowed values: Not Bypassed, Bypassed. (Default: Bypassed.)

8.28.1 Configurable Inputs

Each configurable input has a default function. These default functions are identified in the following table.

TABLE 151. DEFAULT FUNCTIONS FOR CONFIGURABLE INPUTS

INPUT	DEFAULT FUNCTIONS FOR CONFIGURABLE INPUTS
1	Event/fault Input
2	Event/fault Input
5	Low Coolant Level Switch
6	Low Fuel Level Switch
10	Remote Fault Reset Switch
11	Start Type
12	Rupture Basin Switch
13	Event/fault Input
14	Event/fault Input

Default functions are available only on the indicated inputs. For example, Configurable Input #6 can be a Low Fuel Level Switch but not an event/fault Input.

Each configurable input can also be mapped to one of these functions, instead of their default function:

- Low Fuel in Day Tank Switch
- Low Coolant Switch #2
- High Alt Temperature Switch
- Ground/Earth Fault Switch
- Exercise Switch
- Battle Short Switch
- Battery Charger Failed Switch
- Low Engine Temperature Switch
- Speed Droop Enable Switch
- Voltage Droop Enable Switch
- Rated/Idle Switch
- AMM In Auto
- Low Fuel Pressure Switch
- Start Signal Integrity Switch

NOTICE
Currently, Speed Droop Enable Switch and Voltage Droop Enable Switch are not available, but they appear in the Operator Panel.

NOTICE
You can only map one configurable input to each of these functions. For example, there cannot be two Battle Short Switches.

You can also set up a configurable input to do nothing at all.

You can specify the function of each configurable input if this ability is not locked. For example, if *Configurable Input #1 Factory Lock* is Not Locked, use *Configurable Input #1 Input Function Pointer_* to specify the function of Configurable Input #1. If *Configurable Input #1 Factory Lock* is Locked, you can still look at *Configurable Input #1 Input Function Pointer_* to see what the current function of Configurable Input #1 is.

You can specify the active state for each configurable input. For example, *Configurable Input #1 Active State Selection* specifies the active state for Configurable Input #1.

8.28.2 Configurable Outputs

Each configurable output has a default function. These default functions are identified in the following table.

TABLE 152. DEFAULT FUNCTIONS FOR CONFIGURABLE OUTPUTS

OUTPUT	DEFAULT FUNCTIONS
1	Event/fault Output
2	Event/fault Output
3	Event/fault Output

OUTPUT	DEFAULT FUNCTIONS
4	Event/fault Output
5	Ready To Load
6	Oil Priming Pump
7	Local Status
8	Glow Plug
10	Delayed Off
11	Load Dump

Default functions are available only on the indicated outputs. For example, Configurable Output #5 can generate a Ready To Load signal but not a Delayed Off signal.

Each configurable output can also be mapped to one of these functions, instead of their default function:

- Event code 1540 (Common Warning)
- Event code 1541 (Common Shutdown)
- Event code 1122 (Rated to Idle Delay)
- *Fault Code Function #1*
- *Fault Code Function #2*
- *Fault Code Function #3*
- *Fault Code Function #4*
- *Fault Code Function #5*

You can map each Fault Code Function parameter to a specific event/fault code.

You can only map one configurable output to each of these functions. For example, there cannot be two Common Shutdown outputs.

You can also set up a configurable output to do nothing at all.

In addition, you can specify the function of each configurable output if this ability is not locked. For example, use *Configurable Output #1 Output Function Pointer* to specify the function of Configurable Output #1 if *Configurable Output #1 Factory Lock* is Not Locked. If *Configurable Output #1 Factory Lock* is Locked, you can still look at *Configurable Output #1 Output Function Pointer* to see what the current function of Configurable Output #1 is.

You can specify whether or not the PCC should invert the output signal. For example, *Configurable Output #1 Invert Bypass* is set to Not Bypassed if Configurable Output #1 should be inverted.

Event/fault Outputs (Default Function for Configurable Outputs #1, #2, #3, #4, #20, #21, and #22)

Use one of these parameters to map a configurable output to a specific event/fault code:

- *Configurable Output #1 Event Code*
- *Configurable Output #2 Event Code*
- *Configurable Output #3 Event Code*
- *Configurable Output #4 Event Code*

The configurable output follows the status of the event. If the event is active, the configurable output is active. If the event is inactive, the configurable output is inactive.

Ready To Load (Default Function for Configurable Output #5)

The PCC may notify a device when event 1465 (Ready to Load) is active.

Event 1465 (Ready to Load) is active when these conditions are met.

- The genset is running at 90% rated voltage.
- The genset is running at 90% rated frequency.
- The PCC is in Auto mode; or the PCC is in Manual mode, and *Excitation Disable Override* is Excitation On.

This event can be active when the genset is running at rated speed and voltage and when the PCC is running the Time Delay to Stop step, the Rated Cooldown Time step, or the Rated to Idle Transition Delay step in the stop sequence.

Oil Priming Pump (Default Function for Configurable Output #6)

The PCC may be connected to the oil-priming pump to prelube the engine. This reduces wear and damage to moving parts in the engine after long periods of inactivity.

Local Status (Default Function for Configurable Output #7)

This default function is reserved for future use. You can map this configurable input to a different function, however.

Glow Plug (Default Function for Configurable Output #8)

This default function is reserved for future use. You can map this configurable input to a different function, however.

Delayed Off (Default Function for Configurable Output #10)

The PCC may notify a device when the PCC runs Start Engine. The connection remains active for *Delayed Off FSO Relay Time* after the stop sequence has finished.

The PCC may notify a device when warning fault code 1464 (Load Dump Fault) is active when one of these conditions applies.

- A derate event is active.
- A delayed shutdown is active.
- Load dump overload and underfrequency protection.

8.29 Calibration

Each label is described in the following table.

TABLE 153. CALIBRATION

NAME	DESCRIPTINO
Genset 3 Phase Voltage Cal	
Genset L1L2 Voltage	Genset L1L2 voltage
Genset L12 Voltage Adjust	Genset L12 voltage Calibration trim (Password level: 1.) Allowed values: 90~110 %. (Default: 100 %.)
Genset L2L3 Voltage	Genset L2L3 voltage

NAME	DESCRIPTINO
Genset L23 Voltage Adjust	Genset L23 voltage Calibration trim (Password level: 1.) Allowed values: 90~110 %. (Default: 100 %.)
Genset L3L1 Voltage	Genset L3L1 voltage
Genset L31 Voltage Adjust	Genset L31 voltage Calibration trim (Password level: 1.) Allowed values: 90~110 %. (Default: 100 %.)
Genset 1 Phase Voltage Cal	
Genset L1N Voltage	Genset L1N voltage
Genset Single Phase L1N Voltage Adjust	Genset Single Phase L1N voltage Calibration trim. (Password level: 1.) Allowed values: 90~110 %. (Default: 100 %.)
Genset L2N Voltage	Genset L2N voltage
Genset Single Phase L2N Voltage Adjust	Genset Single Phase L2N voltage Calibration trim. (Password level: 1.) Allowed values: 90~110 %. (Default: 100 %.)
Genset Current Cal	
Genset L1 Current	Monitors the genset L1 current value.
Genset L1 Current Adjust	Genset L1 current Calibration trim in percentage. (Password level: 1.) Allowed values: 90~110 %. (Default: 100 %.)
Genset L2 Current	Genset L2 current
Genset L2 Current Adjust	Genset L2 current Calibration trim (Password level: 1.) Allowed values: 90~110 %. (Default: 100 %.)
Genset L3 Current	Genset L3 current
Genset L3 Current Adjust	Genset L3 current Calibration trim (Password level: 1.) Allowed values: 90~110 %. (Default: 100 %.)

8.30 Save Restore

This is reserved for future use.

8.31 AUX101 Setup

Each parameter is described in the following table :

NOTICE
The AUX101 1 and AUX102 1 parameters are similar to the AUX101 0 and AUX102 0 parameters, respectively, in the following table, so these parameters are not shown separately.

TABLE 154. AUX101 SETUP

PARAMETER	DESCRIPTION
Aux101 0 Analog Input 1 Sensor Type	Selects whether the input will be active open, active closed, or an analog input (Password level: 1) Allowed values: Analog Input, Switch Input - Active Closed, Switch Input - Active Open (Default: Sw In - Active Clsd)
Aux101 0 Analog Input 1 Function Pointer	Selects the type of analog input sensor. (Password level: 1) Allowed values: Default, Do Nothing (Default: Do Nothing)
Aux101 0 Input 1 Function Pointer	Selects discrete input fault/event for this input. (Password level: 1.) Allowed values: Default, Do Nothing, Low Fuel in Day Tank Switch, Low Coolant Switch #2, High Alt Temperature Switch, Ground Fault Switch, Exercise Switch, Battle Short Switch, Battery Charger Failed Switch, Low Engine Temperature Switch, Speed Droop Enable Switch, Voltage Droop Enable Switch, Rated/Idle Switch, AMM In Auto, Low Fuel Pressure Switch, Start Signal Integrity Switch (Default: Do Nothing.).
Aux101 0 Input 1 Fault Text	Twenty (20) character text field to allow for the entry of the displayed configurable fault text (Password level: 1) Allowed values: 0~20 characters (Default: AUX101 0 Fault 1)
Aux101 0 Analog Input 2 Sensor Type	Selects whether the input will be active open, active closed, or an analog input (Password level: 1) Allowed values: Analog Input, Switch Input - Active Closed, Switch Input - Active Open (Default: Sw In - Active Clsd)
Aux101 0 Analog Input 2 Function Pointer	Selects the type of analog input sensor (Password level: 1) Allowed values: Default, Do Nothing (Default: Do Nothing)
Aux101 0 Input 2 Function Pointer	Selects discrete input fault/event for this input (Password level: 1) Allowed values: Default, Do Nothing, Low Fuel in Day Tank Switch, Low Coolant Switch #2, High Alt Temperature Switch, Ground Fault Switch, Exercise Switch, Battle Short Switch, Battery Charger Failed Switch, Low Engine Temperature Switch, Speed Droop Enable Switch, Voltage Droop Enable Switch, Rated/Idle Switch, AMM In Auto, Low Fuel Pressure Switch, Start Signal Integrity Switch. (Default: Do Nothing)
Aux101 0 Input 2 Fault Text	Twenty (20) character text field to allow for the entry of the displayed configurable fault text (Password level: 1) Allowed values: 0~20 characters (Default: AUX101 0 Fault 2)
Aux101 0 Analog Input 3 Sensor Type	Selects whether the input will be active open, active closed, or an analog input (Password level: 1) Allowed values: Analog Input, Switch Input - Active Closed, Switch Input - Active Open (Default: Sw In - Active Clsd)
Aux101 0 Analog Input 3 Function Pointer	Selects the type of analog input sensor (Password level: 1) Allowed values: Do Nothing, Oil Temperature, Exhaust Stack Temperature 1, Exhaust Stack Temperature 2, Ambient Temperature, Fuel Level, Alternator Temperature 1, Alternator Temperature 2, Alternator Temperature 3, Intake Manifold Temperature 1, Drive End Bearing Temperature, Non-Drive End Bearing Temperature, LTA Temperature (Default: Do Nothing)

PARAMETER	DESCRIPTION
Aux101 0 Input 3 Function Pointer	Selects discrete input fault/event for this input (Password level: 1) Allowed values: Default, Do Nothing, Low Fuel in Day Tank Switch, Low Coolant Switch #2, High Alt Temperature Switch, Ground Fault Switch, Exercise Switch, Battle Short Switch, Battery Charger Failed Switch, Low Engine Temperature Switch, Speed Droop Enable Switch, Voltage Droop Enable Switch, Rated/Idle Switch, AMM In Auto, Low Fuel Pressure Switch, Start Signal Integrity Switch. (Default: Do Nothing)
Aux101 0 Input 3 Fault Text	Twenty (20) character text field to allow for the entry of the displayed configurable fault text (Password level: 1) Allowed values: 0~20 characters (Default: AUX101 0 Fault 3)
Aux101 0 Analog Input 4 Sensor Type	Selects whether the input will be active open, active closed, or an analog input (Password level: 1) Allowed values: Analog Input, Switch Input - Active Closed, Switch Input - Active Open (Default: Sw In - Active Clsd)
Aux101 0 Analog Input 4 Function Pointer	Selects the type of analog input sensor (Password level: 1) Allowed values: Do Nothing, Oil Temperature, Exhaust Stack Temperature 1, Exhaust Stack Temperature 2, Ambient Temperature, Fuel Level, Alternator Temperature 1, Alternator Temperature 2, Alternator Temperature 3, Intake Manifold Temperature 1, Drive End Bearing Temperature, Non-Drive End Bearing Temperature, LTA Temperature (Default: Do Nothing)
Aux101 0 Input 4 Function Pointer	Selects discrete input fault/event for this input (Password level: 1) Allowed values: Default, Do Nothing, Low Fuel in Day Tank Switch, Low Coolant Switch #2, High Alt Temperature Switch, Ground Fault Switch, Exercise Switch, Battle Short Switch, Battery Charger Failed Switch, Low Engine Temperature Switch, Speed Droop Enable Switch, Voltage Droop Enable Switch, Rated/Idle Switch, AMM In Auto, Low Fuel Pressure Switch, Start Signal Integrity Switch. (Default: Do Nothing)
Aux101 0 Input 4 Fault Text	Twenty (20) character text field to allow for the entry of the displayed configurable fault text (Password level: 1) Allowed values: 0~20 characters (Default: AUX101 0 Fault 4)
Aux101 0 Analog Input 5 Sensor Type	Selects whether the input will be active open, active closed, or an analog input (Password level: 1) Allowed values: Analog Input, Switch Input - Active Closed, Switch Input - Active Open (Default: Sw In - Active Clsd)
Aux101 0 Analog Input 5 Function Pointer	Selects the type of analog input sensor (Password level: 1) Allowed values: Do Nothing, Oil Temperature, Exhaust Stack Temperature 1, Exhaust Stack Temperature 2, Ambient Temperature, Fuel Level, Alternator Temperature 1, Alternator Temperature 2, Alternator Temperature 3, Intake Manifold Temperature 1, Drive End Bearing Temperature, Non-Drive End Bearing Temperature,LTA Temperature (Default: Do Nothing)
Aux101 0 Input 5 Function Pointer	Selects discrete input fault/event for this input (Password level: 1) Allowed values: Default, Do Nothing, Low Fuel in Day Tank Switch, Low Coolant Switch #2, High Alt Temperature Switch, Ground Fault Switch, Exercise Switch, Battle Short Switch, Battery Charger Failed Switch, Low Engine Temperature Switch, Speed Droop Enable Switch, Voltage Droop Enable Switch, Rated/Idle Switch, AMM In Auto, Low Fuel pressure Switch, Start Signal Integrity Switch. (Default: Do Nothing)

PARAMETER	DESCRIPTION
Aux101 0 Input 5 Fault Text	Twenty (20) character text field to allow for the entry of the displayed configurable fault text (Password level: 1) Allowed values: 0~20 characters (Default: AUX101 0 Fault 5)
Aux101 0 Analog Input 6 Sensor Type	Selects whether the input will be active open, active closed, or an analog input (Password level: 1) Allowed values: Analog Input, Switch Input - Active Closed, Switch Input - Active Open (Default: Sw In - Active Clsd)
Aux101 0 Analog Input 6 Function Pointer	Selects the type of analog input sensor (Password level: 1) Allowed values: Do Nothing, Oil Temperature, Exhaust Stack Temperature 1, Exhaust Stack Temperature 2, Ambient Temperature, Fuel Level, Alternator Temperature 1, Alternator Temperature 2, Alternator Temperature 3, Intake Manifold Temperature 1, Drive End Bearing Temperature, Non-Drive End Bearing Temperature, LTA Temperature (Default: Do Nothing)
Aux101 0 Input 6 Function Pointer	Selects discrete input fault/event for this input (Password level: 1) Allowed values: Default, Do Nothing, Low Fuel in Day Tank Switch, Low coolant Switch #2, High Alt Temperature Switch, Ground Fault Switch, Exercise Switch, Battle Short Switch, Battery Charger Failed Switch, Low Engine Temperature Switch, Speed Droop Enable Switch, Voltage Droop Enable Switch, Rated/Idle Switch, AMM In Auto, Low Fuel Pressure Switch, Start Signal Integrity Switch. (Default: Do Nothing)
Aux101 0 Input 6 Fault Text	Twenty (20) character text field to allow for the entry of the displayed configurable fault text (Password level: 1) Allowed values: 0~20 characters (Default: AUX101 0 Fault 6)
Aux101 0 Analog Input 7 Sensor Type	Selects whether the input will be active open, active closed, or an analog input (Password level: 1) Allowed values: Analog Input, Switch Input - Active Closed, Switch Input - Active Open (Default: Sw In - Active Clsd)
Aux101 0 Analog Input 7 Function Pointer	Selects the type of analog input sensor (Password level: 1) Allowed values: None (Default: None)
Aux101 0 Input 7 Function Pointer	Selects discrete input fault/event for this input. (Password level: 1.) Allowed values: Default, Do Nothing, Low Fuel in Day Tank Switch, Low Coolant Switch #2, High Alt Temperature Switch, Ground Fault Switch, Exercise Switch, Battle Short Switch, Battery Charger Failed Switch, Low Engine Temperature Switch, Speed Droop Enable Switch, Voltage Droop Enable Switch, Rated/Idle Switch, AMM In Auto, Low Fuel Pressure Switch, Start Signal Integrity Switch. (Default: Do Nothing)
Aux101 0 Input 7 Fault Text	Twenty (20) character text field to allow for the entry of the displayed configurable fault text (Password level: 1) Allowed values: 0~20 characters (Default: AUX101 0 Fault 7)
Aux101 0 Analog Input 8 Sensor Type	Selects whether the input will be active open, active closed, or an analog input (Password level: 1) Allowed values: Analog Input, Switch Input - Active Closed, Switch Input - Active Open (Default: Sw In - Active Clsd)
Aux101 0 Analog Input 8 Function Pointer	Selects the type of analog input sensor (Password level: 1) Allowed values: None (Default: None)

PARAMETER	DESCRIPTION
Aux101 0 Input 8 Function Pointer	Selects discrete input fault/event for this input (Password level: 1) Allowed values: Default, Do Nothing, Low Fuel in Day Tank Switch, Low Coolant Switch #2, High Alt Temperature Switch, Ground Fault Switch, Exercise Switch, Battle Short Switch, Battery Charger Failed Switch, Low Engine Temperature Switch, Speed Droop Enable Switch, Voltage Droop Enable Switch, Rated/Idle Switch, AMM In Auto, Low Fuel Pressure Switch, Start Signal Integrity Switch. (Default: Do Nothing)
Aux101 0 Input 8 Fault Text	Twenty (20) character text field to allow for the entry of the displayed configurable fault text (Password level: 1) Allowed values: 0~20 characters (Default: AUX101 0 Fault 8)
Aux101 0 Output 1 Fault/Event	Parameter to allow for the entry of the fault/event code which will turn the output relay on and off (Password level: 1) Allowed values: 0~65530 (Default: 415)
Aux101 0 Output 1 Function Pointer	Selects the discrete output function for this output (Password level: 1) Allowed values: Do Nothing, Common Warning, Common Shutdown, Rated to Idle Transition Event, Fault Code Function #1, Fault Code Function #2, Fault Code Function #3, Fault Code Function #4, Fault Code Function #5, LBNG Start-Enable Function, LBNG Idle Speed Event Function, Air Shutoff Valve Control, Load Demand Spare Capacity Available (Default: Do Nothing)
Aux101 0 Output 2 Fault/Event	Parameter to allow for the entry of the fault/event code which will turn the output relay on and off (Password level: 1) Allowed values: 0~65530 (Default: 1847)
Aux101 0 Output 2 Function Pointer	Selects the discrete output function for this output (Password level: 1) Allowed values: Do Nothing, Common Warning, Common Shutdown, Rated to Idle Transition Event, Fault Code Function #1, Fault Code Function #2, Fault Code Function #3, Fault Code Function #4, Fault Code Function #5, LBNG Start-Enable Function, LBNG Idle Speed Event Function, Air Shutoff Valve Control, Load Demand Spare Capacity Available (Default: Do Nothing)
Aux101 0 Output 3 Fault/Event	Parameter to allow for the entry of the fault/event code which will turn the output relay on and off (Password level: 1) Allowed values: 0~65530 (Default: 9516)
Aux101 0 Output 3 Function Pointer	Selects the discrete output function for this output (Password level: 1) Allowed values: Do Nothing, Common Warning, Common Shutdown, Rated to Idle Transition Event, Fault Code Function #1, Fault Code Function #2, Fault Code Function #3, Fault Code Function #4, Fault Code Function #5, LBNG Start-Enable Function, LBNG Idle Speed Event Function, Air Shutoff Valve Control, Load Demand Spare Capacity Available (Default: Do Nothing)
Aux101 0 Output 4 Fault/Event	Parameter to allow for the entry of the fault/event code which will turn the output relay on and off (Password level: 1) Allowed values: 0~65530 (Default: 441)
Aux101 0 Output 4 Function Pointer	Selects the discrete output function for this output (Password level: 1) Allowed values: Do Nothing, Common Warning, Common Shutdown, Rated to Idle Transition Event, Fault Code Function #1, Fault Code Function #2, Fault Code Function #3, Fault Code Function #4, Fault Code Function #5, LBNG Start-Enable Function, LBNG Idle Speed Event Function, Air Shutoff Valve Control,Load Demand Spare Capacity Available (Default: Do Nothing)

PARAMETER	DESCRIPTION
Aux101 0 Output 5 Fault/Event	Parameter to allow for the entry of the fault/event code which will turn the output relay on and off (Password level: 1) Allowed values: 0~65530 (Default: 234)
Aux101 0 Output 5 Function Pointer	Selects the discrete output function for this output (Password level: 1) Allowed values: Do Nothing, Common Warning, Common Shutdown, Rated to Idle Transition Event, Fault Code Function #1, Fault Code Function #2, Fault Code Function #3, Fault Code Function #4, Fault Code Function #5, LBNG Start-Enable Function, LBNG Idle Speed Event Function, Air Shutoff Valve Control,Load Demand Spare Capacity Available (Default: Do Nothing)
Aux101 0 Output 6 Fault/Event	Parameter to allow for the entry of the fault/event code which will turn the output relay on and off (Password level: 1) Allowed values: 0~65530 (Default: 359)
Aux101 0 Output 6 Function Pointer	Selects the discrete output function for this output (Password level: 1) Allowed values: Do Nothing, Common Warning, Common Shutdown, Rated to Idle Transition Event, Fault Code Function #1, Fault Code Function #2, Fault Code Function #3, Fault Code Function #4, Fault Code Function #5, LBNG Start-Enable Function, LBNG Idle Speed Event Function, Air Shutoff Valve Control,Load Demand Spare Capacity Available (Default: Do Nothing)
Aux101 0 Output 7 Fault/Event	Parameter to allow for the entry of the fault/event code which will turn the output relay on and off (Password level: 1) Allowed values: 0~65530 (Default: 1463)
Aux101 0 Output 7 Function Pointer	Selects the discrete output function for this output (Password level: 1) Allowed values: Do Nothing, Common Warning, Common Shutdown, Rated to Idle Transition Event, Fault Code Function #1, Fault Code Function #2, Fault Code Function #3, Fault Code Function #4, Fault Code Function #5, LBNG Start-Enable Function, LBNG Idle Speed Event Function, Air Shutoff Valve Control, Load Demand Spare Capacity Available (Default: Do Nothing)
Aux101 0 Output 8 Fault/Event	Parameter to allow for the entry of the fault/event code which will turn the output relay on and off (Password level: 1) Allowed values: 0~65530 (Default: 1465)
Aux101 0 Output 8 Function Pointer	Selects the discrete output function for this output (Password level: 1) Allowed values: Do Nothing, Common Warning, Common Shutdown, Rated to Idle Transition Event, Fault Code Function #1, Fault Code Function #2, Fault Code Function #3, Fault Code Function #4, Fault Code Function #5, LBNG Start-Enable Function, LBNG Idle Speed Event Function, Air Shutoff Valve Control, Load Demand Spare Capacity Available (Default: Do Nothing)
Aux102 0 Input 9 Active State Selection	Selects the type of switch response as either Active Closed or Active Open (Password level: 1) Allowed values: Active Closed, Active Open (Default: Active Closed)
Aux102 0 Input 9 Function Pointer	Selects discrete input fault/event for this input (Password level: 1) Allowed values: Default, Do Nothing, Low Fuel in Day Tank Switch, Low Coolant Switch #2, High Alt Temperature Switch, Ground Fault Switch, Exercise Switch, Battle Short Switch, Battery Charger Failed Switch, Low Engine Temperature Switch, Speed Droop Enable Switch, Voltage Droop Enable Switch, Rated/Idle Switch, AMM In Auto, Low Fuel Pressure Switch, Start Signal Integrity Switch. (Default: Do Nothing)

PARAMETER	DESCRIPTION
Aux102 0 Fault 9 Text	Twenty (20) character text string to enter the configurable fault text for this fault (Password level: 1) Allowed values: 0~20 characters (Default: AUX102 0 Fault 9)
Aux102 0 Input 10 Active State Selection	Selects the type of switch response as either Active Closed or Active Open (Password level: 1) Allowed values: Active Closed, Active Open (Default: Active Closed)
Aux102 0 Input 10 Function Pointer	Selects discrete input fault/event for this input (Password level: 1) Allowed values: Default, Do Nothing, Low Fuel in Day Tank Switch, Low Coolant Switch #2, High Alt Temperature Switch, Ground Fault Switch, Exercise Switch, Battle Short Switch, Battery Charger Failed Switch, Low Engine Temperature Switch, Speed Droop Enable Switch, Voltage Droop Enable Switch, Rated/Idle Switch, AMM In Auto, Low Fuel Pressure Switch, Start Signal Integrity Switch. (Default: Do Nothing)
Aux102 0 Fault 10 Text	Twenty (20) character text string to enter the configurable fault text for this fault (Password level: 1) Allowed values: 0~20 characters (Default: AUX102 0 Fault 10)
Aux102 0 Input 11 Active State Selection	Selects the type of switch response as either Active Closed or Active Open (Password level: 1) Allowed values: Active Closed, Active Open (Default: Active Closed)
Aux102 0 Input 11 Function Pointer	Selects discrete input fault/event for this input (Password level: 1) Allowed values: Default, Do Nothing, Low Fuel in Day Tank Switch, Low Coolant Switch #2, High Alt Temperature Switch, Ground Fault Switch, Exercise Switch, Battle Short Switch, Battery Charger Failed Switch, Low Engine Temperature Switch, Speed Droop Enable Switch, Voltage Droop Enable Switch, Rated/Idle Switch, AMM In Auto, Low Fuel Pressure Switch, Start Signal Itegrity Switch. (Default: Do Nothing)
Aux102 0 Fault 11 Text	Twenty (20) character text string to enter the configurable fault text for this fault (Password level: 1) Allowed values: 0~20 characters (Default: AUX102 0 Fault 11)
Aux102 0 Input 12 Active State Selection	Selects the type of switch response as either Active Closed or Active Open (Password level: 1) Allowed values: Active Closed, Active Open (Default: Active Closed)
Aux102 0 Input 12 Function Pointer	Selects discrete input fault/event for this input (Password level: 1) Allowed values: Default, Do Nothing, Low Fuel in Day Tank Switch, Low Coolant Switch #2, High Alt Temperature Switch, Ground Fault Switch, Exercise Switch, Battle Short Switch, Battery Charger Failed Switch, Low Engine Temperature Switch, Speed Droop Enable Switch, Voltage Droop Enable Switch, Rated/Idle Switch, AMM In Auto, Low Fuel Pressure Switch, Start Signal Integrity Switch. (Default: Do Nothing)
Aux102 0 Fault 12 Text	Twenty (20) character text string to enter the configurable fault text for this fault (Password level: 1) Allowed values: 0~20 characters (Default: AUX102 0 Fault 12)
Aux102 0 Output 9 Fault/Event	Parameter to allow for the entry of the fault/event code which will turn the output relay on and off (Password level: 1) Allowed values: 0~65530 (Default: 143)

PARAMETER	DESCRIPTION
Aux102 0 Output 9 Function Pointer	Selects the discrete output function for this output (Password level: 1) Allowed values: Do Nothing, Common Warning, Common Shutdown, Rated to Idle Transition Event, Fault Code Function #1, Fault Code Function #2, Fault Code Function #3, Fault Code Function #4, Fault Code Function #5, LBNG Start-Enable Function, LBNG Idle Speed Event Function, Air Shutoff Valve Control, Load Demand Spare Capacity Available (Default: Do Nothing)
Aux102 0 Output 10 Fault/Event	Parameter to allow for the entry of the fault/event code which will turn the output relay on and off (Password level: 1) Allowed values: 0~65530 (Default: 146)
Aux102 0 Output 10 Function Pointer	Selects the discrete output function for this output (Password level: 1) Allowed values: Do Nothing, Common Warning, Common Shutdown, Rated to Idle Transition Event, Fault Code Function #1, Fault Code Function #2, Fault Code Function #3, Fault Code Function #4, Fault Code Function #5, LBNG Start-Enable Function, LBNG Idle Speed Event Function, Air Shutoff Valve Control, Load Demand Spare Capacity Available (Default: Do Nothing)
Aux102 0 Output 11 Fault/Event	Parameter to allow for the entry of the fault/event code which will turn the output relay on and off (Password level: 1) Allowed values: 0~65530 (Default: 197)
Aux102 0 Output 11 Function Pointer	Selects the discrete output function for this output (Password level: 1) Allowed values: Do Nothing, Common Warning, Common Shutdown, Rated to Idle Transition Event, Fault Code Function #1, Fault Code Function #2, Fault Code Function #3, Fault Code Function #4, Fault Code Function #5, LBNG Start-Enable Function, LBNG Idle Speed Event Function, Air Shutoff Valve Control, Load Demand Spare Capacity Available (Default: Do Nothing)
Aux102 0 Output 12 Fault/Event	Parameter to allow for the entry of the fault/event code which will turn the output relay on and off (Password level: 1) Allowed values: 0~65530 (Default: 1439)
Aux102 0 Output 12 Function Pointer	Selects the discrete output function for this output (Password level: 1) Allowed values: Do Nothing, Common Warning, Common Shutdown, Rated to Idle Transition Event, Fault Code Function #1, Fault Code Function #2, Fault Code Function #3, Fault Code Function #4, Fault Code Function #5, LBNG Start-Enable Function, LBNG Idle Speed Event Function, Air Shutoff Valve Control, Load Demand Spare Capacity Available (Default: Do Nothing)
Aux102 0 Output 13 Fault/Event	Parameter to allow for the entry of the fault/event code which will turn the output relay on and off (Password level: 1) Allowed values: 0~65530 (Default: 1435)
Aux102 0 Output 13 Function Pointer	Selects the discrete output function for this output (Password level: 1) Allowed values: Do Nothing, Common Warning, Common Shutdown, Rated to Idle Transition Event, Fault Code Function #1, Fault Code Function #2, Fault Code Function #3, Fault Code Function #4, Fault Code Function #5, LBNG Start-Enable Function, LBNG Idle Speed Event Function, Air Shutoff Valve Control, Load Demand Spare Capacity Available (Default: Do Nothing)
Aux102 0 Output 14 Fault/Event	Parameter to allow for the entry of the fault/event code which will turn the output relay on and off (Password level: 1) Allowed values: 0~65530 (Default: 1483)

PARAMETER	DESCRIPTION
Aux102 0 Output 14 Function Pointer	Selects the discrete output function for this output (Password level: 1) Allowed values: Do Nothing, Common Warning, Common Shutdown, Rated to Idle Transition Event, Fault Code Function #1, Fault Code Function #2, Fault Code Function #3, Fault Code Function #4, Fault Code Function #5, LBNG Start-Enable Function, LBNG Idle Speed Event Function, Air Shutoff Valve Control, Load Demand Spare Capacity Available (Default: Do Nothing)
Aux102 0 Output 15 Fault/Event	Parameter to allow for the entry of the fault/event code which will turn the output relay on and off (Password level: 1) Allowed values: 0~65530 (Default: 442)
Aux102 0 Output 15 Function Pointer	Selects the discrete output function for this output (Password level: 1) Allowed values: Do Nothing, Common Warning, Common Shutdown, Rated to Idle Transition Event, Fault Code Function #1, Fault Code Function #2, Fault Code Function #3, Fault Code Function #4, Fault Code Function #5, LBNG Start-Enable Function, LBNG Idle Speed Event Function, Air Shutoff Valve Control, Load Demand Spare Capacity Available (Default: Do Nothing)
Aux102 0 Output 16 Fault/Event	Parameter to allow for the entry of the fault/event code which will turn the output relay on and off (Password level: 1) Allowed values: 0~65530 (Default: 1442)
Aux102 0 Output 16 Function Pointer	Selects the discrete output function for this output (Password level: 1) Allowed values: Do Nothing, Common Warning, Common Shutdown, Rated to Idle Transition Event, Fault Code Function #1, Fault Code Function #2, Fault Code Function #3, Fault Code Function #4, Fault Code Function #5, LBNG Start-Enable Function, LBNG Idle Speed Event Function, Air Shutoff Valve Control, Load Demand Spare Capacity Available (Default: Do Nothing)

8.31.1 Characteristics of the AUX101 and AUX102 with the PowerCommand 2.x and 3.x

8.31.1.1 Maximum Number of AUX101/102 for the PowerCommand 2.x and 3.x

TABLE 155. MAXIMUM NUMBER OF AUX101/102 FOR THE POWERCOMMAND 2.X AND 3.X

Description	Value
Maximum Number of AUX101	2
Maximum Number of AUX102	2

8.31.1.2 Required Part Numbers to Support the AUX101 for the PowerCommand 2.x

TABLE 156. REQUIRED PART NUMBERS TO SUPPORT THE AUX101 FOR THE POWERCOMMAND 2.X

Component	Part Number
PCC2300 base board	A026N036

NOTICE
PCC2300 base board 0327-1636 does not support the AUX101.

8.31.1.3 Possible Functions of AUX101 Inputs for PowerCommand 2.x and 3.x

TABLE 157. POSSIBLE FUNCTIONS OF AUX101 INPUTS FOR POWERCOMMAND 2.X AND 3.X

Input	Possible Functions
1-2	Switch (active-open or active-closed)
3-6	Switch (active-open or active-closed), additional functions for configurable inputs, additional functions for configurable analog inputs
7-8	Switch (active-open or active-closed)

8.31.1.3.1 Default Functions of AUX101 Inputs for PowerCommand 2.x and 3.x

All AUX101 inputs are disabled.

8.31.1.3.2 Additional Functions of Configurable Inputs on the PowerCommand 2.x

Each configurable input can be mapped to one of these functions, instead of their default function.

TABLE 158. ADDITIONAL FUNCTIONS OF CONFIGURABLE INPUTS ON THE POWERCOMMAND 2.X

Function	Related Settings
Low Fuel in Day Tank Switch	Low Fuel in Day Tank Time
Low Coolant Switch #2	None
High Alt Temperature Switch	High Alternator Temperature Shutdown Threshold (Aux101), High Alternator Temperature 1 Time (Aux101)
Ground Fault Switch	Ground Fault Current Delay, Ground Fault Current Threshold Percent
Exercise Switch	Genset Exercise Time
Battle Short Switch	Battle Short Enable
Battery Charger Failed Switch	None
Low Engine Temperature Switch	None
Speed Droop Enable Switch	Speed Droop Percentage
Voltage Droop Enable Switch	Voltage Droop Percentage

NOTICE
Currently, Speed Droop Enable Switch and Voltage Droop Enable Switch are not available, but they appear in the Operator Panel.

You can only map one configurable input to each of these functions. For example, there cannot be two Battle Short Switches.

You can also set up a configurable input to do nothing at all .

8.31.1.3.3 Additional Functions of Configurable Analog Inputs on the PowerCommand 2.x and 3.x

Each configurable input can be mapped to one of these functions, instead of their default function .

TABLE 159. ADDITIONAL FUNCTIONS OF CONFIGURABLE ANALOG INPUTS ON THE POWERCOMMAND 2.X AND 3.X

Function	Related Settings
Oil Temperature	High Oil Temperature Threshold (Aux101), High Oil Temperature Time (Aux101), Aux 101 Oil/Ambient/Intake Manifold Temp Input Scaling Table, Aux101 Oil Temp OOR Check Enable, Aux101 Oil/Ambient/Intake Manifold Temp OOR High Limit, Aux101 Oil/Ambient/Intake Manifold Temp OOR Low Limit, Aux101 Oil/Ambient/Intake Manifold Temp OOR Time
Exhaust Stack Temperature 1	Aux 101 Exhaust Stack Temp Input Scaling Table, High Exhaust Stack Temperature 1 Threshold (Aux101), High Exhaust Stack Temperature 1 Time (Aux101), Aux101 Exhaust Stack Temp 1 OOR Check Enable, Aux101 Exhaust Stack Temp OOR High Limit, Aux101 Exhaust Stack Temp OOR Low Limit, Aux101 Exhaust Stack Temp OOR Time
Exhaust Stack Temperature 2	Aux 101 Exhaust Stack Temp Input Scaling Table, High Exhaust Stack Temperature 2 Threshold (Aux101), High Exhaust Stack Temperature 2 Time (Aux101), Aux101 Exhaust Stack Temp 2 OOR Check Enable, Aux101 Exhaust Stack Temp OOR High Limit, Aux101 Exhaust Stack Temp OOR Low Limit, Aux101 Exhaust Stack Temp OOR Time
Ambient Temperature	Ambient Temp Fault Delay, Ambient Temp Fault Level, Ambient Temp Fault Threshold, Aux 101 Oil/Ambient/Intake Manifold Temp Input Scaling Table, Aux101 Ambient Temp OOR Check Enable, Aux101 Oil/Ambient/Intake Manifold Temp OOR High Limit, Aux101 Oil/Ambient/Intake Manifold Temp OOR Low Limit, Aux101 Oil/Ambient/Intake Manifold Temp OOR Time
Fuel Level	Fuel Level 100 Percent Resistance (Aux101), Fuel Level Zero Percent Resistance (Aux101), High Fuel Level Threshold (Aux101), High Fuel Level Time (Aux101), Low Fuel Level Threshold (Aux101), Low Fuel Level Time (Aux101), Low Fuel Set/Clear Time, Very Low Fuel Level Threshold (Aux101), Very Low Fuel Level Time (Aux101), Aux101 Fuel Level OOR Check Enable, Aux101 Fuel Level OOR High Limit, Aux101 Fuel Level OOR Low Limit, Aux101 Fuel Level OOR Time

Function	Related Settings
Alternator Temperature 1	High Alternator Temperature 1 Threshold (Aux101), High Alternator Temperature 1 Time (Aux101), Aux101 Alternator Temperature OOR Check Enable, Aux101 Alternator Temperature OOR High Limit, Aux101 Alternator Temperature OOR Low Limit, Aux101 Alternator Temperature OOR Time
Alternator Temperature 2	High Alternator Temperature 2 Threshold (Aux101), High Alternator Temperature 2 Time (Aux101), Aux101 Alternator Temperature OOR Check Enable, Aux101 Alternator Temperature OOR High Limit, Aux101 Alternator Temperature OOR Low Limit, Aux101 Alternator Temperature OOR Time
Alternator Temperature 3	High Alternator Temperature 3 Threshold (Aux101), High Alternator Temperature 3 Time (Aux101), Aux101 Alternator Temperature OOR Check Enable, Aux101 Alternator Temperature OOR High Limit, Aux101 Alternator Temperature OOR Low Limit, Aux101 Alternator Temperature OOR Time
Intake Manifold Temperature 1	High Intake Manifold Temperature 1 Threshold (Aux101), High Intake Temperature 1 Time (Aux101), Aux 101 Oil/Ambient/Intake Manifold Temp Input Scaling Table, Aux101 Intake Manifold Temp OOR Check Enable, Aux101 Oil/Ambient/Intake Manifold Temp OOR High Limit, Aux101 Oil/Ambient/Intake Manifold Temp OOR Low Limit, Aux101 Oil/Ambient/Intake Manifold Temp OOR Time
Drive End Bearing Temperature	High Drive End Bearing Temperature Threshold (Aux101), High Drive End Bearing Temperature Time (Aux101), Aux101 Drive End Bearing Temperature OOR Check Enable, Aux101 Drive/Non-Drive End Bearing Temp OOR High Limit, Aux101 Drive/Non-Drive End Bearing Temp OOR Low Limit, Aux101 Drive/Non-Drive End Bearing Temperature OOR Time
Non-Drive End Bearing Temperature	High Non-Drive End Bearing Temperature Threshold (Aux101), High Non-Drive End Bearing Temperature Time (Aux101), Aux101 Non-Drive End Bearing Temperature OOR Check Enable, Aux101 Drive/Non-Drive End Bearing Temp OOR High Limit, Aux101 Drive/Non-Drive End Bearing Temp OOR Low Limit, Aux101 Drive/Non-Drive End Bearing Temperature OOR Time
LTA Temperature	High LTA Temperature Threshold (Aux101), High LTA Temperature Time (Aux101), Aux101 LTA Temperature OOR Check Enable, Aux101 LTA Temperature OOR High Limit, Aux101 LTA Temperature OOR Low Limit, Aux101 LTA Temperature OOR Time.

You can only map one configurable analog input to each of these functions. For example, there cannot be two Fuel Level inputs.

You can also set up a configurable analog input to do nothing at all.

8.31.1.3.4 PowerCommand 2.x and 3.x Fault Codes Generated by AUX101 Switch Inputs

TABLE 160. POWERCOMMAND 2.X AND 3.X FAULT CODES GENERATED BY AUX101 SWITCH INPUTS

Input	Fault Code	
	Device 0	Device 1
1	2619	2882
2	2621	2883
3	2622	2884
4	2623	2885
5	2624	2886
6	2625	2887
7	2626	2888
8	2627	2889

8.31.1.4 Default Functions of AUX101 Outputs with the PowerCommand 2.x and 3.x

TABLE 161. DEFAULT FUNCTIONS OF AUX101 OUTPUTS WITH THE POWERCOMMAND 2.X AND 3.X

Output	Default Function
1	Low oil pressure
2	High engine temperature
3	Charger AC failure
4	Low battery voltage
5	Overspeed
6	Fail to start
7	Not in auto
8	Ready to load

8.31.1.5 Possible Functions of AUX102 Inputs for PowerCommand 2.x and 3.x

TABLE 162. POSSIBLE FUNCTIONS OF AUX102 INPUTS FOR POWERCOMMAND 2.X AND 3.X

Input	Possible Functions
9-12	Switch (active-open or active-closed), additional functions for configurable inputs

8.31.1.5.1 Default Functions of AUX102 Inputs for PowerCommand 2.x and 3.x

All AUX102 inputs are disabled.

8.31.1.5.2 PowerCommand 2.x and 3.x Fault Codes Generated by AUX102 Switch Inputs

TABLE 163. POWERCOMMAND 2.X AND 3.X FAULT CODES GENERATED BY AUX102 SWITCH INPUTS

Input	Fault Code	
	Device 0	Device 1
9	2628	2891
10	2629	2892
11	2631	2893
12	2632	2894

8.31.1.6 Default Functions of AUX102 Outputs with the PowerCommand 2.x and 3.x

TABLE 164. DEFAULT FUNCTIONS OF AUX102 OUTPUTS WITH THE POWERCOMAND 2.X AND 3.X

Output	Default Function
9	Pre-low oil pressure
10	Pre-high engine temperature
11	Low coolant level
12	Low fuel in day tank
13	Low coolant temperature
14	Common alarm
15	High battery voltage
16	Weak battery

8.31.2 Tools to Configure a PowerCommand 2.x or 3.x AUX101/102

You must use one of these tools to configure the AUX101 and AUX102 settings in the controller.

- Operator panel
- InPower service tool
- Modbus connection

8.31.2.1 How to Find the AUX101 Setup Screens in the Operator Panel

The AUX101 Setup screens are available on the main menu.

1. Go to the Home screen.
2. Change the selection in the graphical display until "AUX 101 Setup" is selected. Use the selection buttons to change page, if necessary.
3. Press OK.

8.31.2.2 How to Configure a Switch on the PowerCommand 2.x or 3.x

1. Set "AUX 101 Analog Input Sensor Type" to "Switch Input - Active Closed" or "Switch Input - Active Open" for the input that will be a switch.
2. Enter a brief description of the event in "AUX 101 Input Fault Text" for the input that will be a switch.
3. Set "AUX 101 Input Function Pointer" to "Default" for the input that will be a switch.
4. Save your changes.

8.31.2.3 How to Configure an Additional Function for AUX101 Inputs on the PowerCommand 2.x or 3.x

1. Set "AUX 101 Analog Input Sensor Type" to "Switch Input - Active Closed" or "Switch Input - Active Open" for the input that will be a switch.
2. Set "AUX 101 Input Function Pointer" to the desired function for the input that will be a switch. If the selection is rejected, the desired function is already used by another input.
3. Set the appropriate settings for the desired function. The related settings vary by function.
4. Save your changes.

8.31.2.3.1 Example: Configure AUX101 Input #3 as a Low Fuel in Day Tank Switch on the PowerCommand 2.x or 3.x

In this example, the Low Fuel in Day Tank Switch is active-closed, and the switch must be active for five seconds before the controller generates a fault.

1. Set "AUX101 0 Analog Input 3 Sensor Type" to "Switch Input - Active Closed".
2. Set "AUX101 0 Input 3 Function Pointer" to "Low Fuel in Day Tank Switch".
3. Set "Low Fuel in Day Tank Time" to 5 seconds.
4. Save your changes.

8.31.2.4 How to Configure an Analog Input on the PowerCommand 2.x or 3.x

1. Set "AUX 101 Analog Input Sensor Type" to "Analog Input" for the input that will be an analog input.
2. Set "AUX 101 Analog Input Function Pointer" to the desired function.
3. Set the appropriate settings for the desired function. The related settings vary by function.
4. Save your changes.

8.31.2.4.1 Example: Configure AUX101 Input #4 as an Alternator Temperature Sensor on the PowerCommand 2.x or 3.x

In this example, the alternator temperature sensor must be at least 300 degrees F for five seconds before the controller generates a fault. The out-of-range check is active, and the sensor must be outside 0.2-4.8 VDC for two seconds before the controller generates a fault.

1. Set "AUX101 0 Analog Input 4 Sensor Type" to "Analog Input".
2. Set "AUX101 0 Analog Input 4 Function Pointer" to "Alternator Temperature 1".
3. Set "High Alternator Temperature 1 Threshold (Aux101)" to 300 degrees F.
4. Set "High Alternator Temperature 1 Time (Aux101)" to 5 seconds.
5. Set "Aux101 Alternator Temperature OOR High Limit" to 4.8 VDC.
6. Set "Aux101 Alternator Temperature OOR Low Limit" to 0.2 VDC.

7. Set "Aux101 Alternator Temperature OOR Time" to 2 seconds.
8. Set "Aux101 Alternator Temperature OOR Check Enable" to "Enable".
9. Save your changes.

8.31.2.4.2 Typical Electrical Characteristics of Various Sensors

This table provides information for reference only. It should not be used to configure any devices that will be connected to the sensors.

NOTICE
Use the documentation provided with a sensor to configure any device that will be connected to the sensor. Failure to do so may result in equipment damage.

TABLE 165. TYPICAL ELECTRICAL CHARACTERISTICS OF VARIOUS SENSORS

Type of Sensor	Typical Characteristics
Oil temperature	600-2200 ohms
Exhaust temperature	80-400 ohms
Ambient air temperature	600-2200 ohms
Fuel level	600-2500 ohms
Alternator temperature	PT 100 RTD 100 ohms @ 0 C (32 F), 0.385 ohms/C (0.214 ohms/F)

8.31.2.5 How to Configure an Output on the PowerCommand 2.x or 3.x

1. Set "AUX 101 Output Function Pointer" to the desired function for the output.
2. If the desired function is "Default", set "Aux 101 Output Fault/Event" to the fault code that should be associated with the output.
3. Save your changes.

8.31.2.5.1 Example: Configure AUX101 Output #1 as a Low Coolant Level #2 Output on the PowerCommand 2.x or 3.x

Low Coolant Level #2 is event/fault code 2977.

1. Set "Aux101 0 Output 1 Function Pointer" to "Default".
2. Set "Aux101 0 Output 1 Fault/Event" to 2977.
3. Save your changes.

8.32 Calibration Procedures

⚠ WARNING
Contacting high-voltage components can cause electrocution, resulting in severe personal injury or death. Calibration and adjustment must be performed by technically qualified personnel only. Read and observe all WARNINGs and CAUTIONs in your generator set manuals.

⚠ CAUTION

Improper calibration or adjustment of the PCC can cause equipment malfunction or damage. Calibration and adjustment must be performed by technically qualified personnel only.

One or more of the PCC's internal circuits may need to be calibrated, in which case you should calibrate the internal circuits in the following order.

NOTICE

You must use a true (calibrated) RMS meter to check the actual genset output.

8.32.1 Voltage Measurement for Display and Regulation

Calibrate the PCC so that it displays the correct generator set voltage and regulates the generator set at the desired nominal voltage.

With the Operator Panel

1. Start the generator set, and monitor the voltage with a calibrated voltage meter. It is not necessary to load the generator set.
2. Select Setup, and press OK.
3. Select Calibration Setup, and press OK.
4. In three-phase applications, select L12 Voltage, and press OK. In single-phase applications, select L1N Voltage, and press OK.
5. If the PCC prompts you for a password, use the arrow keys to enter the appropriate password, and press OK. Then, press OK a second time.
6. Use the up and down keys to adjust the voltage so that the value displayed in the Operator Panel corresponds to the actual voltage being produced, and press OK.
7. Repeat this procedure for all phases (L12 Voltage, L23 Voltage, and L31 Voltage in three-phase applications; or L1N Voltage and L2N Voltage in single-phase applications).

With a PC-based Service Tool

1. Start the generator set, and monitor the voltage with a calibrated voltage meter. It is not necessary to load the generator set.
2. Connect your PC-based service tool to the PCC.
3. Verify the *Nominal Voltage Trim* is set to the desired value.
4. In three-phase applications, adjust the parameter *Genset L12 Voltage Adjust* so that the value read by the PC-based service tool corresponds to the actual voltage being produced. In single-phase applications, adjust the parameter *Genset Single Phase L1N Voltage Adjust* instead.
5. Do Save Trims to save the adjustments.
6. Repeat this procedure for all three phases (*Genset L12 Voltage Adjust*, *Genset L23 Voltage Adjust*, and *Genset L31 Voltage Adjust* in three-phase applications; *Genset Single Phase L1N Voltage Adjust* and *Genset Single Phase L2N Voltage Adjust* in single-phase applications).

8.32.2 Current Measurement for Display

Calibrate the PCC so that it displays the correct generator set current.

With the Operator Panel

1. Apply a load to the generator set, and monitor the current with a calibrated current meter.
2. Select Setup, and press OK.
3. Select Calibration Setup, and press OK.
4. Select L1 current, and press OK.
5. If the PCC prompts you for a password, use the arrow keys to enter the appropriate password, and press OK. Then, press OK a second time.
6. Use the up and down keys to adjust the current so that the value displayed in the Operator Panel matches the current read by the current meter, and press OK.
7. Repeat this procedure for all three phases (L1, L2, and L3).

With a PC-based Service Tool

1. Apply a load to the generator set, and monitor the current with a calibrated current meter.
2. Connect your PC-based service tool to the PCC.
3. Verify that the CT ratio settings and power ratings are correct for your application.
4. Adjust the parameter *Genset L1 Current Adjust* so that the PCC's measured current matches the current read by the current meter.
5. Do Save Trims to save the adjustments.
6. Repeat this procedure for all three phases (*Genset L1 Current Adjust*, *Genset L2 Current Adjust*, and *Genset L3 Current Adjust*).

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9 Parameters

9.1 Parameters That Are Not Available in the Operator Panel

This section lists the parameters that may be mentioned in this manual but are not available in the Operator Panel. Many of these parameters can be viewed or adjusted using InPower or Modbus.

NOTICE
The default values might not be the same in your genset. The values shown are based on the original settings for the PCC and may be adjusted when the genset is designed, when the genset is installed, or by other operators after installation.

TABLE 166. PARAMETERS THAT ARE NOT AVAILABLE IN THE OPERATOR PANEL

Parameter	InPower	Modbus	Default Value	Description
Auto Switch Active State Selection			Active Closed	Auto switch input software logic state inversion bypass control
Battery Charger AC Failure (HMI113)		Yes		Monitor point for the battery charger failure input from the PCCNET Annunciator.
Battle Short Switch (Modbus)	Yes	Yes	Inactive	Trim to enable Battle Short via Modbus.
Derate Request		Yes		The requested % derate from the derate request logic.
Genset Voltage Measurement Floor Limit	Yes		9%	The Genset Voltage Measurement Floor Limit(trim) shall be a setup trim allowing the operating range floor % to be adjusted to a higher value removing the Genset PT Ratio Too Large fault at the cost of acknowledging that the measurement system is not optimal.
Instantaneous High AC Voltage Threshold	Yes		130%	Percent of desired voltage at which Instantaneous High AC Voltage fault becomes active.
Local E-Stop Active State Selection	Yes		Active Open	Local E-stop input software logic state inversion bypass control
Low Coolant Level (HMI113)	Yes	Yes		Monitor point for the Low Coolant Level input from the PCCnet Annunciator.
Low Fuel Level (HMI113)	Yes	Yes		Monitor point for the Low Fuel Level input from the PCCnet Annunciator.
Manual Switch Active State	Yes		Active Closed	Manual input software logic state inversion bypass control

Parameter	InPower	Modbus	Default Value	Description
Max Setup Mode Time	Yes	Yes	600 sec	Max time allowed in Setup Mode.
Remote E-Stop Active State Selection			Active Open	Remote E-stop input software logic state inversion bypass control.
Remote Start Switch Active State Selection			Active Closed	Remote Start input software logic state inversion bypass control.
Scheduler Run Command	Yes	Yes		Indicates the current run command coming from the scheduler.
Setup Mode Enable	Yes	Yes		Volatile to allow entry into Setup Mode.
Zero Speed Voltage Measurement Floor	Yes		8%	Allows adjustment of the voltage threshold (% of full-scale) where the genset reads 0 while stopped.

10 Troubleshooting

In this section, italics are used to identify a specific parameter by name.

⚠ WARNING
Incorrect service or replacement of parts can result in severe personal injury, death, and/or equipment damage. Service personnel must be trained and experienced to perform electrical and mechanical service. Read Safety Precautions , and carefully observe all of the instructions and precautions in this manual.

10.1 Safety Considerations

High voltages are present when the generator set is running. Do not open the generator output box while the generator set is running.

⚠ WARNING
Contacting high voltage components can cause electrocution, resulting in severe personal injury or death. Keep the output box covers in place during troubleshooting.

When troubleshooting a set that is shut down, make certain the generator set cannot be accidentally restarted. This includes, but is not limited to, these steps.

1. Put the PCC in Off mode.
2. Push one of the Emergency Stop buttons, and wait thirty seconds.
3. Isolate any power supplies (for example, for heaters or pumps) to the generator set. This does not include the starting battery or battery charger, which are isolated in the next steps.
4. Turn off and remove power from the battery charger, if there is one.
5. **MAKE CERTAIN EXPLOSIVE BATTERY GASES ARE DISPELLED FROM BATTERY COMPARTMENT**, and then remove the negative (-) battery cable from the starting battery (for electrical starters).
6. Disable the starter, if it is possible for the generator set to start without the battery (for example, an air starter). Isolate the starter air supply from the air start compressor to the engine. Secure the isolation tap in the Closed position.

⚠ CAUTION
The air in the compressor-to-engine air supply line is under pressure. If vented improperly, this air can cause personal injury or equipment damage when it is released. Release the air so that it does not damage equipment or injure anyone.

   Then, release the air in the compressor-to-engine air supply line so that it does not damage equipment or injure anyone.
7. Display a suitable “Maintenance In Progress" sign prominently.
8. Follow the appropriate lockout/tagout procedures.

⚠ WARNING

Accidental starting of the generator set during troubleshooting can cause severe personal injury or death. Disable the generator set (see above) before troubleshooting.

NOTICE

Before servicing the PCC, it is recommended that all settings be recorded. This makes sure of correct and complete readjustment of the PCC in the event that all previous entries are lost during servicing.

Read ***Safety Precautions***, and carefully observe all of the instructions and precautions in this manual.

⚠ WARNING

AC power presents a shock hazard that can cause severe personal injury or death. Before servicing the generator set, disconnect all power when multiple disconnection sources are used.

10.2 Types of Events/Faults

The PCC generates these types of events/faults.

10.2.1 Shutdown Faults

The PCC generates shutdown faults to prevent damage to the generator set. The PCC shuts down the generator set immediately.

When the PCC generates a shutdown fault, the shutdown fault becomes active. The PCC initiates a Shutdown Without Cooldown sequence.

Active shutdown faults appear in the Shutdown Faults screen. In addition, the PCC provides these indications as long as there is an active shutdown fault:

- The Shutdown LED on the Operator Panel is on.
- Event 1541 (Common Shutdown) is active.
- Event 1483 (Common Alarm) is active.

You cannot start the generator set until you clear the shutdown fault. Follow these steps to clear a shutdown fault.

1. Correct the condition(s) that caused the fault.
2. Make sure the emergency stop buttons are inactive, and change the PCC to Off mode.

NOTICE

If Remote Fault Reset Enabled is set to Enable, you can also clear shutdown faults in Auto mode. In this case, change the PCC to Auto mode , and make sure the exercise signal and the remote start signal are inactive. The PCC generates event 2941 (Remote Shutdown Fault Reset Occurrence) when shutdown faults are reset in Auto mode.

3. Activate the fault reset signal.

Faults that have been cleared appear in the Fault History screen.

10.2.1.1 Critical Shutdown Faults vs. Non-critical Shutdown Faults

The PCC always shuts down the generator set when a critical shutdown fault is generated. Non-critical shutdown faults do not prevent the PCC from starting or running the generator set when Battle Short mode is active. The PCC also responds to critical shutdown faults and non-critical shutdown faults differently if Delayed Shutdown is set up.

NOTICE
This discussion applies to shutdown with cooldown faults as well as shutdown faults.

The table below identifies the critical shutdown faults.

TABLE 167. CRITICAL SHUTDOWN FAULTS

Event/Fault Code	Description
115	Eng Crank Sensor Error
234	Crankshaft Speed High
236	Both Engine Speed Signals Lost
359	Fail To Start
781	CAN Data Link Failure
1245	Engine Shutdown Fault
1247	Unannounced Engine Shutdown
1336	Cooldown Complete
1433	Local Emergency Stop
1434	Remote Emergency Stop
1438	Fail To Crank
1992	Crankshaft Sensor High
2335	AC Voltage Sensing Lost (Excitation Fault)
2914	Genset AC Meter Failed

All other shutdown faults are non-critical shutdown faults. The PCC still provides the usual indications that a shutdown fault has occurred, even if it overrides a non-critical shutdown fault.

10.2.2 Warning Faults

The PCC generates warning faults to warn the operator when unsafe conditions are occurring.

When the PCC generates a warning fault, the warning fault becomes active. However, active warning faults have no effect on generator set operation. The generator set can start, continue running, and stop as usual.

Active warning faults appear in the Warning Faults screen. In addition, the PCC provides these indications as long as there is an active warning fault:

- The Warning LED on the Operator Panel is on.
- Event 1540 (Common Warning) is active.

- Event 1483 (Common Alarm) is active.

Follow these steps to clear a warning fault.

1. Correct the condition(s) that caused the fault.
2. Activate the fault reset signal.

Faults that have been cleared appear in the Fault History screen.

10.2.2.1 Derate Events

Derate events are warning faults in which the PCC also requests a reduction in the kW output level of the genset.

If a derate event is active, *Derate Request* (This Parameter is not available in the Operator Panel, refer to parameters table) is the percentage of the current kW output level the PCC would like to have removed. Each derate event has this percentage associated with it. If two or more derate events are active at the same time, the PCC considers only the maximum percentage requested by each derate event. The PCC does not add the percentages together. For example, if one derate event requests a 10% reduction and a second derate event requests a 20% reduction, *Derate Request (This Parameter is not available in the Operator Panel, refer to parameters table)* is 20%, not 30%.

If *Load Dump*/*Configurable Output #11 Output Function Pointer* is set to Default, the Load Dump connection is active. The PCC does not do anything else to reduce the kW output level. It is up to external devices to reduce the load.

10.2.2.2 Events

The PCC generates events to notify external devices when certain conditions are met. The PCC may send notifications any of these ways:

- Configurable outputs.
- PCCNet devices (For example, events might control a LED or a configurable output on a PCCNet device.)

It is up to the external devices to respond to an event when they are notified about one. Events do not appear in any screen in the Operator Panel.

10.3 Fault Reset Signal

This signal may come from any of these sources:

- PCC Fault Reset connection (typically, the Reset button on the Operator Panel)
- Reset button on the Operator Panel
- Modbus networks
- PC-based service tool, such as InPower

This signal becomes active for one second when any of these sources changes from inactive to active. Then, the signal remains inactive until any of these sources changes from inactive to active again.

10.4 Battle Short Mode

⚠ WARNING

Automated Machinery

Battle Short mode overrides some parameters of generator set control. Unmonitored generator sets can cause a fire or electrical hazard, resulting in severe personal injury or death.

Make sure that the operation of the set is supervised during Battle Short operation.

Battle Short mode is used to satisfy local code requirements. While Battle Short mode is active, the PCC ignores non-critical shutdown faults and non-critical shutdown with cooldown faults. It does not initiate a stop sequence and continues to run the generator set until Battle Short Mode is inactive. Otherwise, generator set operation remains the same.

Battle Short mode must be set up at the factory or by an authorized service representative. Contact your local distributor for assistance.

Battle Short mode is active only when all of these conditions are met:

- *Battle Short Enable* is set to Enable.
- The ECM is set to enable Battle Short mode (Core 2 ECMs only).
- The Battle Short Switch or *Battle Short Switch (Modbus)* is active. (*Battle Short Switch (Modbus*) is not available in the Operator Panel.)

The PCC generates warning fault 2942 (Shutdown Override Fail) if the Battle Short Switch is active but any of the other conditions are not met.

Battle Short mode is not a distinct mode of operation . The PCC is still in Off mode, Manual mode, or Auto mode while Battle Short mode is active. The PCC still follows the appropriate sequence of operation to start the generator set and to stop the generator set.

The PCC generates warning fault 1131 (Battle Short Active) as long as Battle Short mode is active.

While Battle Short mode is active, the PCC ignores most shutdown faults and only initiates a Shutdown Without Cooldown sequence if a critical shutdown fault occurs.

When the PCC overrides a shutdown fault, it generates warning fault 1416 (Fail To Shutdown) after *Fail To Shutdown Delay* as long as Battle Short mode remains active. It also turns on the Shutdown LED.

NOTICE

The faults that are overridden in Battle Short mode can affect generator set performance and might cause permanent engine, alternator, or connected equipment damage. All shutdown faults, including those overridden in Battle Short mode, must be acted upon immediately to ensure the safety and well-being of the operator and the generator set.

NOTICE

Any damage caused to the generator set as a direct result of running in Battle Short mode is not covered by the warranty.

10.5 Battle Short Mode Procedures

All of the following procedures are required to activate Battle Short mode.

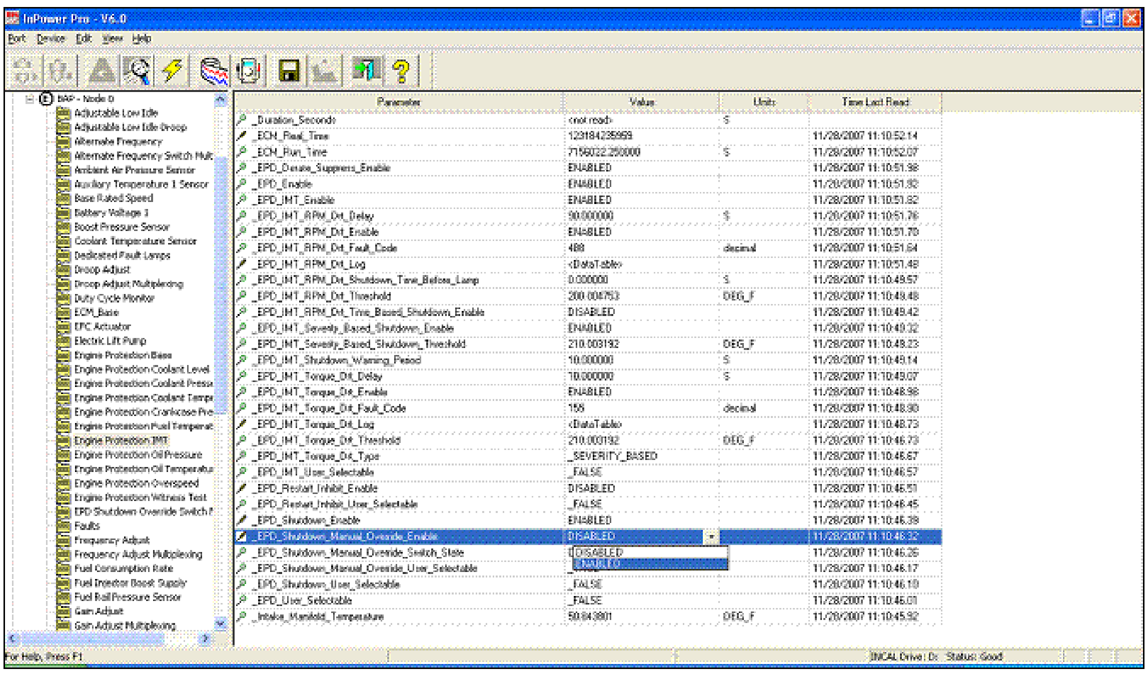
These procedures require the equipment identified in the table below.

TABLE 168. REQUIRED EQUIPMENT FOR BATTLE SHORT MODE PROCEDURES

Part Description	Part Number
InPower Pro service tool	0998-0077-02 (existing user) 0988-0077-04 (new user)
INLINE 4 product kit	4918190
INLINE 5 product kit	4918416
PC-based service tool harness	0541-1199

10.5.1 Enable Battle Short Mode in the ECM

1. Put the PCC in Off mode.
2. Connect the Inline 5 adapter to the engine control module (ECM), and connect the computer to the Inline 5 adapter.
3. Open InPower (make sure the security dongle is attached to the computer), and click on Core II ECS in the left side of the window.
4. Click on the Engine Protection IMT folder.
5. Set the EPD_Shutdown_Manual_Override_Enable parameter to Enable, as shown below.

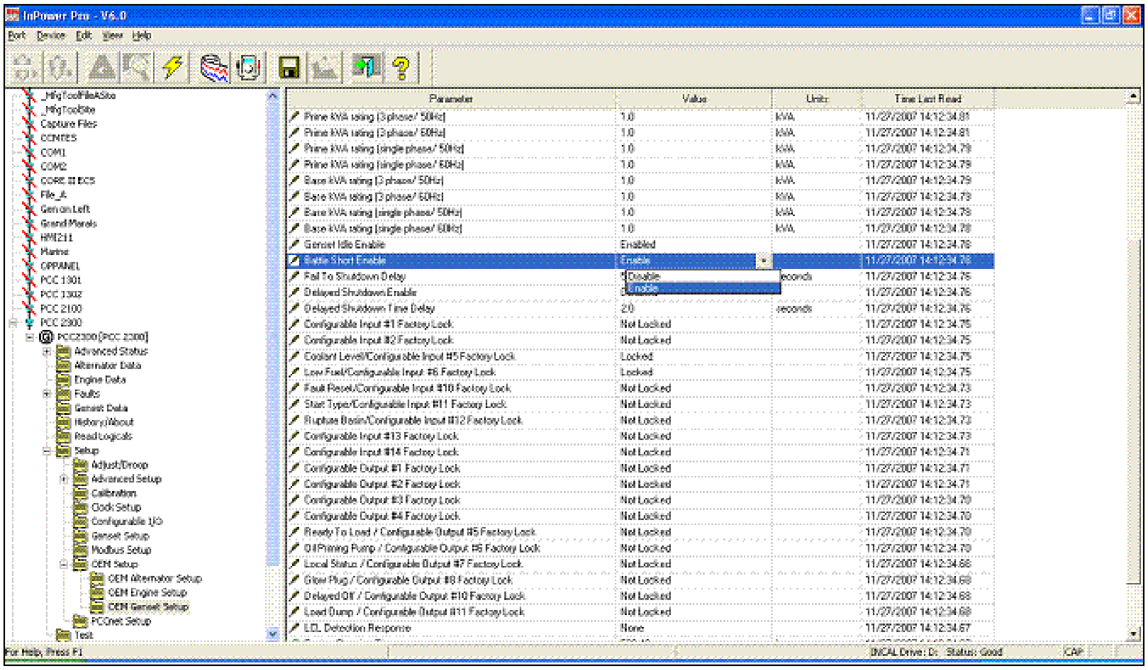


6. Click Save in order to save the changes.
7. Close InPower after the save is complete.
8. Engage/Activate the local emergency stop button, and wait 30-60 seconds for the ECM to complete the data save.
9. Remove power from the ECM, and wait 30-60 seconds.
10. Reapply power to the ECM, pull out/disengage the local emergency stop button, and press the Reset button on the Operator Panel.

11. Connect with InPower to verify that the EPD_Shutdown_Manual_Override_Enable parameter is set to Enable.

10.5.2 Enable Battle Short Mode in the PCC

1. Put the PCC in Off mode.
2. Use the PC-based service tool harness to connect the computer to TB15 on the PCC base board.
3. Open InPower (make sure that the security dongle is attached to the computer), and select the control in the left side of the window (Example: PCC 2300 shown).
4. Click on the Setup >OEM Setup > OEM Genset Setup folders.
5. Set the Battle Short Enable parameter to Enable, as shown below.

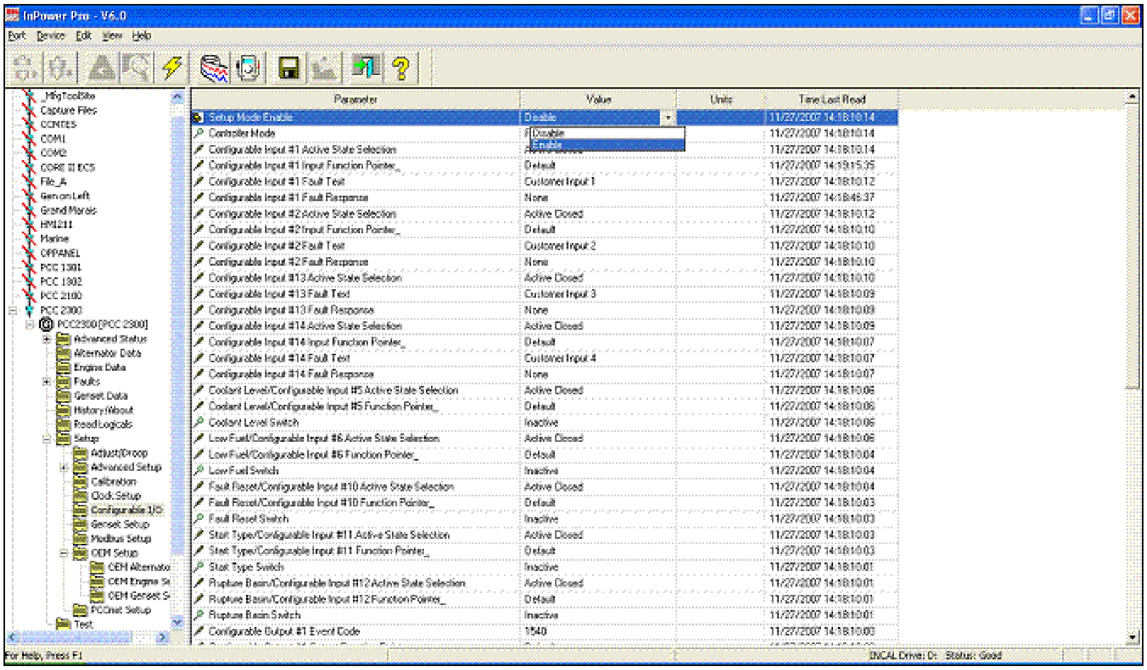


6. Click on Save in order to save the changes.

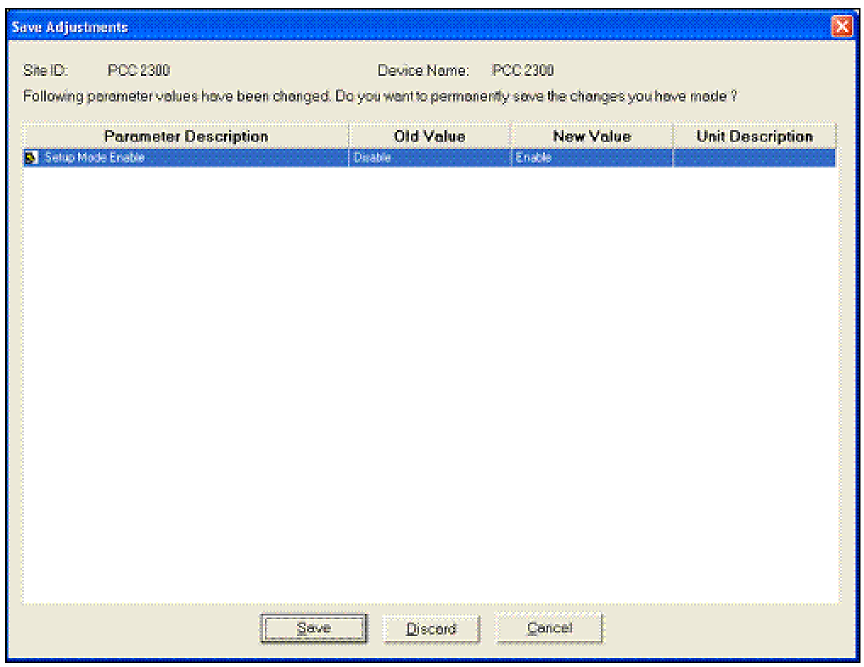
10.5.3 Map a Configurable Input to Battle Short Switch

After Battle Short mode is enabled in the ECM and the PCC, you have to map a configurable input to the Battle Short Switch.

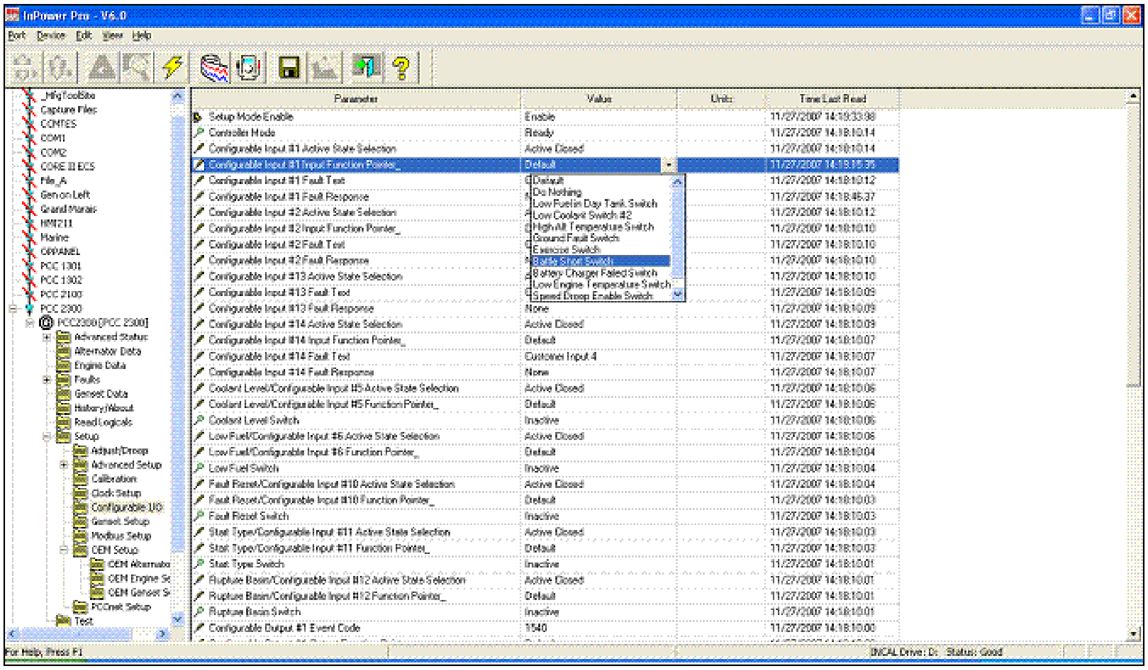
1. Put the PCC in Off mode.
2. Use the PC-based service tool harness to connect the computer to TB15 on the PCC base board.
3. Open InPower (make sure that the security dongle is attached to the computer) and click on the control (PCC 2300 in this example) in the left side of the window.
4. Click on the Setup >Configurable I/O folders.
5. Set the Setup Mode Enable parameter to Enable in order to enter Setup mode, as shown below.



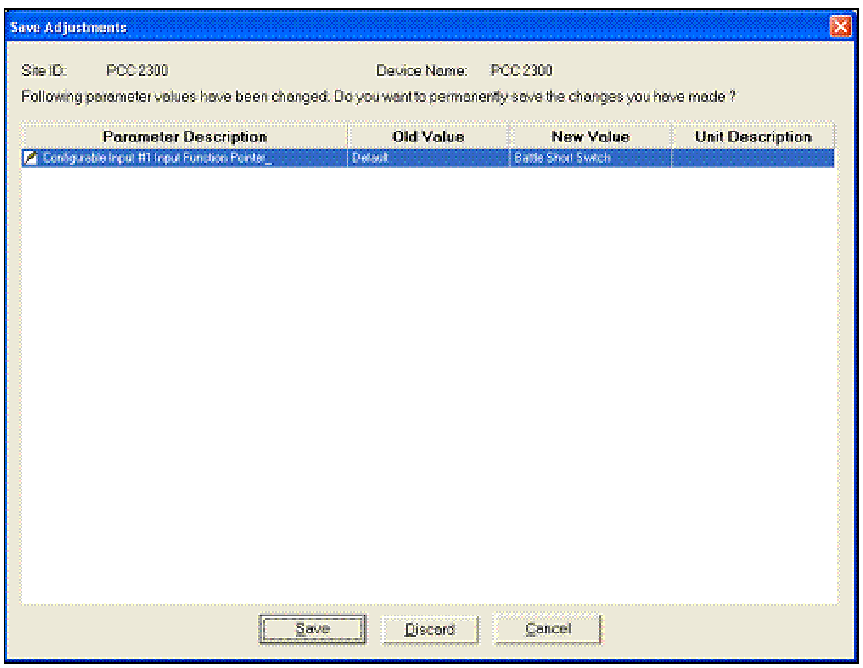
6. Click on Save, as shown below.



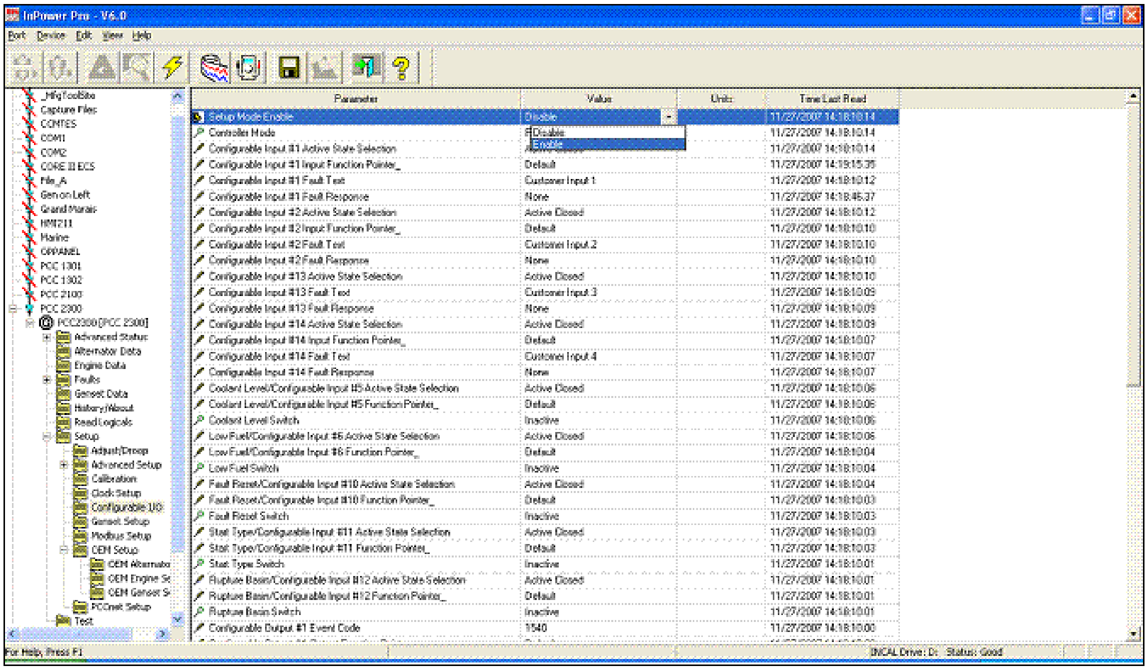
7. Any configurable input can be mapped to Battle Short Switch. Choose one of them. For example, set Configurable Input #1 Input Function Pointer parameter to Battle Short Switch, as shown below.



8. Click on Save, as shown below.



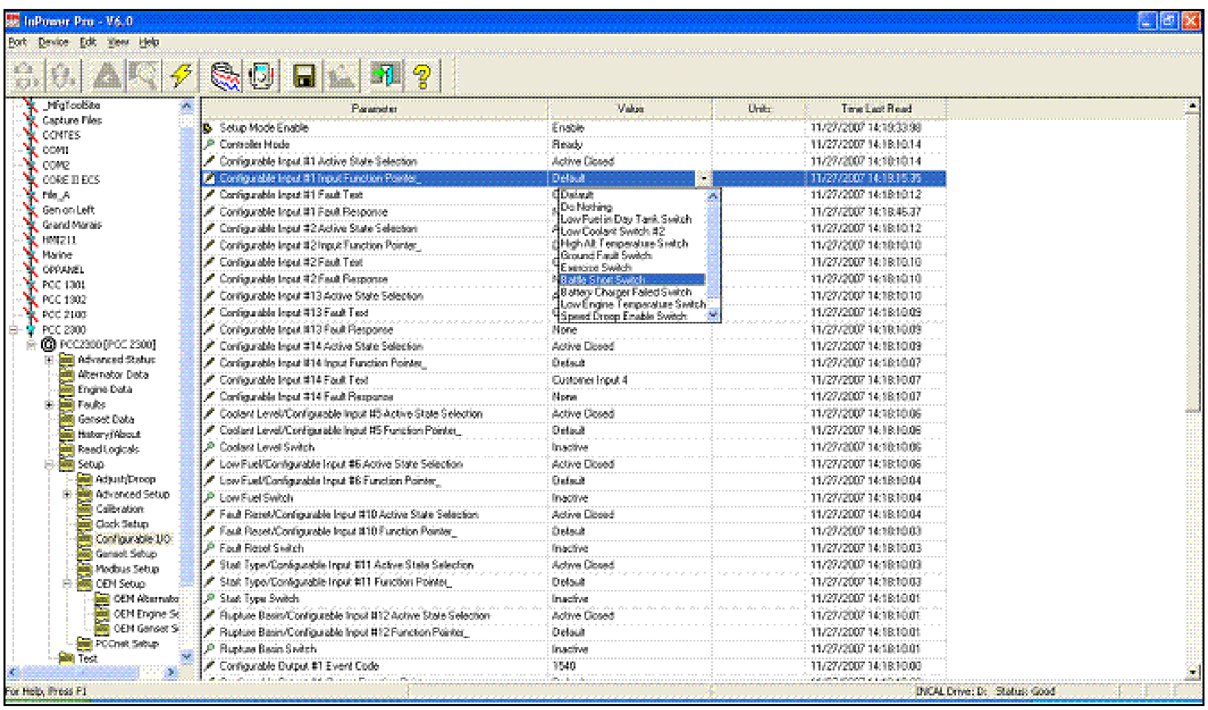
9. Set the Setup Mode Enable parameter to Disable, and click on Save in order to exit Setup mode.



10.5.4 Activate Battle Short Mode

Each configurable input can be Active Open or Active Closed. Check the value of the configurable input that was configured to Battle Short Switch, and activate the configurable input accordingly.

For example, Configurable Input #1 Active State Selection is set to Active Closed below. In order to activate Battle Short mode, Configurable Input #1 (TB-12 and TB13) has to be closed (connected together).



If Configurable Input #1 Active State Selection were set to Active Open, Configurable Input #1 (TB-12 and TB13) has to be an open contact (disconnected) to activate Battle Short mode.

10.6 Delayed Shutdown

The PCC provides advance warning of an impending shutdown if all of these conditions are met:

- *Delayed Shutdown Enable* is set to Enable.
- The ECM is set to enable Battle Short mode (Core 2 ECMs only).
- A non-critical shutdown fault occurs, and there are no critical shutdown faults.

When these conditions are met, the PCC generates warning fault 1124 (Delayed Shutdown) and waits *Delayed Shutdown Time Delay* before it initiates the stop sequence.

10.7 Event/Fault List

This table identifies the faults and events the PCC can generate.

NOTICE
Your generator set may not be able to generate some faults or events.

You can use InPower to raise the response/severity of an event or fault. For example, you can change an event to a warning fault or a warning fault to a shutdown fault. You cannot set the response/severity of an event or fault lower than its default value, and you cannot change the severity of any fault or event with an asterisk (*).

TABLE 169. EVENT/FAULT LIST

Event/Fault Code	Description	Severity
115	Eng Crank Sensor Error	Shutdown
122	Manifold 1 Press High	Warning
123	Manifold 1 Press Low	Warning
124	Manifold 1 Press High	Warning
135	High Oil Rifle 1 Pressure	Warning
141	Low Oil Rifle 1 Pressure	Warning
143	Low Oil Rifle Pressure	Warning
144	High Coolant 1 Temp	Warning
145	Low Coolant 1 Temp	Warning
146	Pre-High Engine Coolant Temperature	Derate
151	High Coolant Temp	Shutdown
153	High Intake Manf 1 Temp	Warning
154	Low Intake Manf 1 Temp	Warning
155	High Intake Manf 1 Temp	Shutdown
187	Sensor Supply 2 Low	Warning
195	High Coolant 1 Level	Warning
196	Low Coolant 1 Level	Warning

Event/Fault Code	Description	Severity
197	Low Coolant Level	Warning
212	High Oil 1 Temperature	Warning
213	Low Oil 1 Temperature	Warning
214	High Oil 1 Temp	Shutdown
219	Eng Oil Level Remote Reservoir: Least Severe Level	Warning
221	Air Pressure Sensor High	Warning
222	Air Pressure Sensor Low	Warning
223	Oil Burn Valve Sol Low	Warning
224	Oil Burn Valve Sol High	Warning
227	Sensor Supply 2 Low	Warning
228	Low Coolant Pressure	Shutdown
231	High Coolant Pressure	Warning
232	Low Coolant Pressure	Warning
233	HT Coolant Pressure Moderate Low	Warning
234	Crankshaft Speed High	Shutdown
235	Low Coolant Level	Shutdown
236	Both Engine Speed Signals Lost	Shutdown
238	Sensor Supply 3 Low	Warning
239	Main Supply High	Warning
245	Fan Control Low	Warning
254	FSO_PWM_HIGH_CONTROL_ERROR	Shutdown
261	High Fuel Temperature	Warning
263	High Fuel 1 Temperature	Warning
265	Low Fuel 1 Temperature	Warning
266	High Fuel Temperature	Shutdown
271	Low Fuel Pump Press	Warning
272	High Fuel Pump Press	Warning
281	Cylinder Press Imbalance	Warning
285	CAN Mux PGN Rate Err	Warning
286	CAN Mux Calibration Err	Warning
295	Key On Air Press Error	Warning
319	RTC PWR Intr:Data Erratic Intermittent or Wrong	Warning
322	Inj 1 Solenoid Low Curr	Warning
323	Inj 5 Solenoid Low Curr	Warning

Event/Fault Code	Description	Severity
324	Inj 3 Solenoid Low Curr	Warning
325	Inj 6 Solenoid Low Curr	Warning
331	Inj 2 Solenoid Low Curr	Warning
332	Inj 4 Solenoid Low Curr	Warning
342	Calibration Code Fail	Shutdown
343	ECM Hardware Failure	Warning
351	Injector Supply Failure	Warning
352	Sensor Supply 1 Low	Warning
359	Fail To Start	Shutdown
386	Sensor Supply 1 High	Warning
415	Low Oil Rifle Press	Shutdown
418	High H2O In Fuel	Warning
421	High Oil Temperature	Derate
422	Coolant Level Data Error	Warning
425	Oil Temperature Error	Warning
426	J1939 Datalink: Data Erratic/Intermittent/Wrong	Event
427	CAN Data Link Degraded	Warning
435	Oil Press Switch Error	Warning
441	Low Battery 1 Voltage	Warning
442	High Battery 1 Voltage	Warning
449	Inj Metering 1 Press High	Shutdown
451	Inj Metering 1 Press High	Warning
452	Inj Metering 1 Press Low	Warning
488	High Intake Manf 1 Temp	Derate
546	Fuel Delivery Press High	Warning
547	Fuel Delivery Press Low	Warning
553	APC Pressure High	Warning
554	APC Pressure Error	Warning
559	Inj Metering 1 Press Low	Warning
611	Engine Hot Shut Down	Warning
686	Turbo 1 Speed Incorrect	Warning
689	Crankshaft Speed Error	Warning
697	ECM Temperature High	Warning
698	ECM Temperature Low	Warning

Event/Fault Code	Description	Severity
731	Crankshaft Mech Misalign	Warning
781	CAN Data Link Failure	Shutdown
1117	Power Lost With Ignition On	Warning
1121	Fail To Disconnect	Warning
1122	Rated to Idle Delay	Event
1124	Delayed Shutdown	Warning
1131	Battle Short Active	Warning
1132	Controlled Shutdown In Process	Warning
1219	Utility Breaker Tripped	Warning
1223	Utility Frequency	Warning
1224	Genset Overvoltage	Warning
1225	Genset Undervoltage	Warning
1226	Genset Frequency	Warning
1243	Engine Derated	Derate
1244	Engine Normal Shutdown	Shutdown
1245	Engine Shutdown Fault	Shutdown
1246	Unknown Engine Fault	Warning
1247	Engine Quiet Shutdown	Shutdown
1248	Engine Warning	Warning
1256	Ctrl Mod ID In State Error	Warning
1257	Ctrl Mod ID In State Fail	Shutdown
1312	Configurable Input #2	Event
1317	Configurable Input #13	Event
1318	Configurable Input #14	Event
1328	Genset Breaker Tripped	Warning
1336	Cooldown Complete	Shutdown
1357	Oil Remote Level Low	Warning
1376	Camshaft Speed Error	Warning
1416	Fail To Shutdown	Warning
1417	Power Down Failure	Warning
1433	Local Emergency Stop	Shutdown
1434	Remote Emergency Stop	Shutdown
1435	Low Coolant Temperature	Warning
1438	Fail To Crank	Shutdown

Event/Fault Code	Description	Severity
1439	Low Day Tank Fuel Sw	Warning
1441	Low Fuel Level	Warning
1442	Weak Battery	Warning
1443	Dead Battery	Shutdown
1444	Overload	Warning
1445	Short Circuit	Shutdown
1446	High AC Voltage	Shutdown
1447	Low AC Voltage	Shutdown
1448	Underfrequency	Shutdown
1449	Overfrequency	Warning
1451	Gen/Bus Voltage Out of Calibration	Warning
1452	Genset Breaker Fail To Close	Warning
1453	Genset Breaker Fail to Open	Warning
1454	Genset Breaker Position Contact	Warning
1455	Utility Breaker Position Contact	Warning
1456	Bus Out Of Synchronizer Range	Warning
1457	Fail to Synchronize	Warning
1458	Sync Phase Rotation Mismatch	Warning
1459	Reverse Power	Shutdown
1461	Loss Of Field (Reverse kVAR)	Shutdown
1463*	Not In Auto	Event
1464*	Load Dump Fault	Warning
1465*	Ready To Load	Event
1469	Speed/Hz Mismatch	Shutdown
1471	Over Current	Warning
1472	Over Current	Shutdown
1475	First Start Backup	Warning
1483*	Common Alarm	Event
1540	Common Warning	Event
1541	Common Shutdown	Event
1548	Inj 7 Solenoid Low Curr	Warning
1549	Inj 8 Solenoid Low Curr	Warning
1551	Inj 10 Solenoid Low Curr	Warning
1552	Inj 11 Solenoid Low Curr	Warning

Event/Fault Code	Description	Severity
1553	Inj 12 Solenoid Low Curr	Warning
1554	Inj 13 Solenoid Low Curr	Warning
1555	Inj 14 Solenoid Low Curr	Warning
1556	Inj 15 Solenoid Low Curr	Warning
1557	Inj 16 Solenoid Low Curr	Warning
1573	Configurable Input #1	Event
1622	Inj 9 Solenoid Low Curr	Warning
1689	Real Time Clock Power	Warning
1695	Sensor Supply 5 High	Warning
1696	Sensor Supply 5 Low	Warning
1843	Crankcase Press High	Warning
1844	Crankcase Press Low	Warning
1845	H2O In Fuel Sens High	Warning
1846	H2O In Fuel Sens Low	Warning
1847	Eng Coolant Temp - Shutdown w/Cool	Shutdown
1852	Pre-High H2O In Fuel	Warning
1853	Annunciator Input 1 Fault	Warning
1854	Annunciator Input 2 Fault	Warning
1855	Annunciator Input 3 Fault	Warning
1891	Change Oil	Warning
1893	CAN EGR Valve Comm	Warning
1894	CAN VGT Comm Error	Warning
1896	EGR DL Valve Stuck	Warning
1899	Low EGR Dif Pressure	Warning
1912	Utility Loss Of Phase	Warning
1913	Genset Loss Of Phase	Warning
1914	Utility Phase Rotation	Warning
1915	Genset Phase Rotation	Warning
1917	Fuel Level High	Warning
1918	Fuel Level Low	Shutdown
1933	High EGR Data Link Volt	Warning
1934	Low EGR Data Link Volt	Warning
1935	EGR DL Cmd Source Err	Warning
1942	THD AZ Error	Warning

Event/Fault Code	Description	Severity
1943	CBR_DENSITY_DERATE_ERROR_ID	Event
1944	HMI 113 Out Config Error	Warning
1961	High EGR DL EDU Temp	Warning
1974	Crankcase Press High	Warning
1978	Speed Bias OOR High	Warning
1979	Speed Bias OOR Low	Warning
1992	Crankshaft Sensor High	Shutdown
1999	Maximum Parallel Time	Warning
2185	Sensor Supply 4 High	Warning
2186	Sensor Supply 4 Low	Warning
2215	Fuel Pump Press Low	Warning
2249	APC 2 Press Low	Warning
2261	Fuel Pump Press High	Warning
2262	Fuel Pump Press Low	Warning
2265	High Fuel Lift Pump Volt	Warning
2266	Low Fuel Lift Pump Volt	Warning
2292	APC Flow High	Warning
2293	APC Flow Low	Warning
2311	EFI Control Valve Fail	Warning
2331	Utility Undervoltage	Warning
2335	AC Voltage Sensing Lost (Excitation Fault)	Shutdown
2336	Checksum Fault	Shutdown
2342	Too Long In Idle	Warning
2358	Utility Overvoltage	Warning
2377	High Fan Control Voltage	Warning
2396	Utility Breaker Fail To Close	Warning
2397	Utility Breaker Fail to Open	Warning
2539	High Voltage Bias	Warning
2541	Low Voltage Bias	Warning
2545	Keyswitch Reset Required	Warning
2555	Low GHC 1 Voltage	Warning
2556	High GHC 1 Voltage	Warning
2619	Aux101 0 Input 1 Fault	Warning
2621	Aux101 0 Input 2 Fault	Warning

Event/Fault Code	Description	Severity
2622	Aux101 0 Input 3 Fault	Warning
2623	Aux101 0 Input 4 Fault	Warning
2624	Aux101 0 Input 5 Fault	Warning
2625	Aux101 0 Input 6 Fault	Warning
2626	Aux101 0 Input 7 Fault	Warning
2627	Aux101 0 Input 8 Fault	Warning
2628	Aux102 0 Expansion Input 9 Fault	Warning
2629	Aux102 0 Expansion Input 10 Fault	Warning
2631	Aux102 0 Expansion Input 11 Fault	Warning
2632	Aux102 0 Expansion Input 12 Fault	Warning
2653	Exhaust St 2 Temp High	Warning
2657	Exhaust St 1 Temp High	Warning
2661	At Least One Unacknowledged Most Severe Fault - Condition Exists	Shutdown
2662	At Least One Acknowledged Mod Server Fault	Warning
2678	Charging Alternator Fail	Warning
2814	Genset CT Ratio Low	Shutdown
2815	Genset CT Ratio High	Warning
2816	Genset PT Ratio Low	Shutdown
2817	Genset PT Ratio High	Warning
2818	Genset Bus PT Ratio Too Small	Shutdown
2819	Genset Bus PT Ratio Too Large	Warning
2821	Utility PT Ratio Too Small	Shutdown
2822	Utility PT Ratio Too Large	Warning
2882	Aux101 1 Input 1 Fault	Warning
2883	Aux101 1 Input 2 Fault	Warning
2884	Aux101 1 Input 3 Fault	Warning
2885	Aux101 1 Input 4 Fault	Warning
2886	Aux101 1 Input 5 Fault	Warning
2887	Aux101 1 Input 6 Fault	Warning
2888	Aux101 1 Input 7 Fault	Warning
2889	Aux101 1 Input 8 Fault	Warning
2891	Aux102 1 Expansion Input 9 Fault	Warning
2892	Aux102 1 Expansion Input 10 Fault	Warning

Event/Fault Code	Description	Severity
2893	Aux102 1 Expansion Input 11 Fault	Warning
2894	Aux102 1 Expansion Input 12 Fault	Warning
2895	PCCnet Device Failed	Warning
2896	Critical PCCnet Dev Fail	Shutdown
2914	Genset AC Meter Failed	Shutdown
2915	Genset Bus AC Meter Failed	Warning
2916	Utility AC Meter Failed	Warning
2917	Genset Bus Voltage OOR Warning	Warning
2918	Utility Voltage OOR Warning	Warning
2919	Utility Current OOR Warning	Warning
2921	Gesnet Bus Current OOR Warning	Warning
2922	Genset Neutral Current OOR Warning	Warning
2923	Genset Bus kW OOR Warning	Warning
2924	Gesnet Bus kVAR OOR Warning	Warning
2925	Genset Bus kVA OOR Warning	Warning
2926	Utility kW OOR Warning	Warning
2927	Utility kVAR OOR Warning	Warning
2928	Utility kVA OOR Warning	Warning
2931	AUX101 Device ID Fault	Shutdown
2932	AUX101 Oil Temp OOR Hi	Warning
2933	AUX101 Oil Temp OOR Low	Warning
2934	High Ambient Temp	Warning
2935	Low Ambient Temp	Warning
2936	Fuel Level High	Warning
2937	Fuel Level Low	Warning
2938	Earth/Ground Fault	Warning
2939	MODBUS Failure	Warning
2941	Remote Shutdown Fault Reset Occurrence	Event
2942	Shutdown Override Fail	Warning
2943	Manual Sw Config Fail	Warning
2944	Auto Switch Config Fail	Warning
2945	Rupture Basin Switch	Warning
2946	Exhaust St 2 Temp Low	Warning
2947	Exhaust St 1 Temp Low	Warning

Event/Fault Code	Description	Severity
2948	Exhaust St 2 Temp High	Warning
2949	Exhaust St 1 Temp High	Warning
2951	Alternator 1 Temp High	Warning
2952	Alternator 1 Temp Low	Warning
2953	Alternator 1 Temp High	Warning
2954	Alternator 2 Temp High	Warning
2955	Alternator 2 Temp Low	Warning
2956	Alternator 2 Temp High	Warning
2957	Alternator 3 Temp High	Warning
2958	Alternator 3 Temp Low	Warning
2959	Alternator 3 Temp High	Warning
2971	Test/Exercise Fault	Warning
2972	Field Overload	Shutdown
2973	Charge Press IR Error	Warning
2977	Low Coolant Level 2 Sw	Warning
2978	Low Intake Manf 1 Temp	Warning
2979	High Alternator Temp Sw	Warning
2981	High Drive Bearing Temp	Warning
2982	Low Drive Bearing Temp	Warning
2983	High Drive Bearing Temp	Warning
2984	High Free Bearing Temp	Warning
2985	Low Free Bearing Temp	Warning
2986	High Free Bearing Temp	Warning
2992	High Intake Manf 1 Temp	Warning
2993	Battery Charger Sw Fail	Warning
3397	Low Gearbox Oil Pressure - Condition Exists	Shutdown
3398	High Gearbox Oil Temperature - Condition Exists	Shutdown w/Cooldown
3399	Differential Fault - Condition Exists	Shutdown
3411	DC Power Supply Fault - Condition Exists	Warning
3412	GIB Isolator Open Fault - Condition Exists	Warning
3413	Radiator Fan Trip Fault - Condition Exists	Warning
3414	Ventilator Fan Trip Fault - Condition Exists	Warning
3415	Louvres Closed Fault - Condition Exists	Warning

Event/Fault Code	Description	Severity
3416	Start System Fault - Condition Exists	Warning
3417	Alternator Heater Trip Fault - Condition Exists	Warning
3457	Loss of Bus Voltage Sensing	Warning
3513	Negative Sequence Overcurrent	Warning
3611	Custom Overcurrent Fault	Warning
3629	Device Calibration Update Recommended	Warning
3631	Device Calibration Update Required	Shutdown
5134	Unknown Shutdown at Idle	Shutdown
5135	Genset Overload	Shutdown
5182	Aux101 0 Input 1 Fault	Event
5397	Short Circuit Occurred Between a Phase and Neutral/Ground	Shutdown
5398	Short Circuit Occurred Between Two Phases	Shutdown
5399*	AmpSentry Maintenance Mode Active	Event
5637	Unknown Shutdown at Startup	Shutdown
6598	At Least One Uncleared ECS Shutdown Fault Exists	Warning
7892	Start Signal Integrity Fail	Warning

10.8 Troubleshooting Procedures

Read ***Safety Precautions***, and carefully observe all of the instructions and precautions in this manual.

If you are troubleshooting the fault that appears in the graphical display, the source of the fault is displayed to the right of the event/fault code. If this area is blank, the source is the PCC.

NOTICE
The troubleshooting procedures for ECM-related faults and engine-related faults are in the engine service manual.

If you are troubleshooting a fault that does not appear in the graphical display, look at the SA field in the Faults screens to identify the source of the fault. If this field is blank, the PCC is the source of this fault.

10.8.1 Test Equipment

To perform the test procedures in this manual, the following test equipment must be available:

- True RMS digital multi-meter for accurate measurement of resistance, AC voltage (0-1000 VAC), and DC voltage.
- Current probe(s).
- Battery hydrometer.
- Jumper leads.
- Tachometer.

- Megger or insulation resistance meter.
- InPower service tool (PC-based service tool)
- InSite Tool
- Newest InPower InCal files (calibration for control) from the InCal web site (**power.cummins.com** under “Services", “Software Updates", “InCal Quick Links").
- PC-based service tool connector (Cummins Part number 0541-1199).
- Inline 4 / Inline 5 adapter or newer (Cummins Part number 0491-8416).
- Inline 4 / Inline 5 drivers (available via kit or online at **cummins.com/parts-and-service/electronic-service-tools/inline**).
- Basic electrical test lead set, with very small probe tips. Fluke test leads “TL80A" (part number 0541-1627) are recommended.
- 316289800 - Pressure/Temperature sensor breakout cable
- 382477400 - Pressure sensor breakout cable
- 382477600 - Pressure sensor breakout cable
- 316475200 - DanfossTM pressure sensor breakout cable TM pressure sensor breakout cable
- 382275800 - Male Deutsch/AMP/Metri-Pack test lead
- 382291700 - Female Deutsch/AMP/Metri-Pack test lead
- 382481200 - Deutsch socket pin test lead
- 382481100 - Deutsch pin test lead

10.8.2 HMI 220/320 troubleshooting recommendation

10.8.2.1 No Code - HMI not working

Logic:

HMI is not working accurately.

Possible Causes:

1. Incorrect calibration file in the HMI.

Diagnosis and Repair:

1. Perform an initial calibration on the HMI.
    a. Connect the HMI to InPower using connector TB15 on the back of the operator panel.

NOTICE
Connector J29 should be removed from the HMI to connect TB15 since they use the same connection internally.

    b. Perform an initial calibration on the HMI and update the HMI to the latest version available in InCal.

    c. Check to see if the issue was resolved. If the problem still exists, perform troubleshooting step based on the failure symptoms observed.

10.8.2.2 No Code - HMI screen does not wake up

Logic:

HMI screen does not wake up when one of the buttons is pressed after connectors J28 and J29 are plugged in.

Possible Causes:

1. Power is not present to the HMI.
2. Button pressed to wake up the HMI is faulty.

Diagnosis and Repair:

1. Check the power supply to the HMI:
   a. Inspect if the connectors J28 and J29 are plugged in properly.
   b. Measure the voltage between pins J28-1 and J28-3. This should be done with J28 connected to the HMI. To test the voltage, place multimeter probes on the pins through the back side of J28.
      i. If the voltage reading is 10–14 Vdc for a 12 Vdc system or 20–28 Vdc for a 24 Vdc system, the supply volatge is appropriate.
   c. If voltage value at J28 is out of specified range, check for voltage present at connector J25 pins J25-8 (B+ return for operator panels) and J25-12 (Fused B+). J25 is the other end of J28 connector harness which completes the connection to PCC.
      i. If this voltage lies between 10–14 Vdc for a 12 Vdc system or 20–28 Vdc for a 24 Vdc system, the connector J28 is faulty and needs to be replaced.
      ii. If the voltage value at J25 is out of the specified range, then the source battery voltage is low. Refer to troubleshooting for FC441 (Low battery volatge) if the FC is active. If FC441 is not active, relace the harness.
2. Buttor pressed to wake up the HMI is faulty:
   a. Refer to troubleshooting for the FC "Buttons on the membrane are not functioning".

10.8.2.3 No Code - Buttons on the membrane are not functioning

Logic:

Buttons on the membrane are not functioning or cannot naviagte through the screen menus.

Possible Causes:

1. Power is not present to the HMI.
2. Membrane navigation buttons are faulty.

Diagnosis and Repair:

1. Check the power supply to the HMI:
   a. Inspect if the connectors J28 and J29 are plugged in properly.
   b. Measure the voltage between pins J28-1 and J28-3. This should be done with J28 connected to the HMI. To test the voltage, place multimeter probes on the pins through the back side of J28.
      i. If the voltage reading is 10–14 Vdc for a 12 Vdc system or 20–28 Vdc for a 24 Vdc system, the supply volatge is appropriate.

c. If voltage value at J28 is out of specified range, check for voltage present at connector J25 pins J25-8 (B+ return for operator panels) and J25-12 (Fused B+). J25 is the other end of J28 connector harness which completes the connection to PCC.

   i. If this voltage lies between 10–14 Vdc for a 12 Vdc system or 20–28 Vdc for a 24 Vdc system, the connector J28 is faulty and needs to be replaced.

   ii. If the voltage value at J25 is out of the specified range, then the source battery voltage is low. Refer to troubleshooting for FC441 (Low battery volatge) if the FC is active. If FC441 is not active, relace the harness.

2. Membrane navigation buttons are faulty. Check the button functionality:

   a. Disconnect all connectors J28, J29 and TB15 from the back of the HMI.

   b. Reconnect connectors J28 and J29. This recycles power to the HMI.

   c. If the HMI has established communication with the PCC and the home menu is displayed, try to navigate through the menu using C, home, up, down left, right, OK and soft buttons.

   d. If the HMI is unable to establish communication with the PCC, disconnect connectors J28 and J29 from the HMI. Reconnect only J28. Test the HMI in demo model.

      To enable demo mode, press the "Home" and "C" buttons together for 3 seconds. Once this mode is activated, home menu comes up and "Demo Mode" is displayed at the top of the screen.

      Try to navigate through the menu using C, home, up, down left, right, OK and soft buttons.

      If this can be done successfully, the membrane buttons are not faulty.

      If the buttons still do not function, replace the HMI.

      (Any changes made in the demo mode will not affect the controller. Power must be removed from the HMI to end demo mode).

   e. If the demo mode cannot be enabled, the required buttons are not functioning. In this case, replace the HMI.

10.8.2.4 No Code - HMI is stuck in demo mode.

Logic:

HMI is tuck in demo mode.

Possible Causes:

1. Demo mode is not disabled.

Diagnosis and Repair:

1. Disconnect J28 from the HMI for 30 seconds and then reconnect it. This should end the demo mode. If the HMI is still stuck in demo mode after reconnecting J28, replace the HMI.

10.8.2.5 No Code - LEDs are not working

Logic:

One or more of the LEDs are not working.

Possible Causes:

1. Faulty HMI board.

Diagnosis and Repair:

1. Faulty HMI board. Perform lamp test to verify the board:

   In either regular mode with J28 and J29 connectors connected or in demo mode, press the lamp test button  . After pressing this button, all the LEDs present on the right half of the operator panel should turn on for 5 seconds (HMI 220 has 8 LEDs and HMI 320 has 10 LEDs that should light up).

   If all the LEDs stay on for five seconds, the HMI is not faulty.

   If all the LEDs do not turn on, replace the HMI.

10.8.2.6 No Code - HMI unable to communicate with PCC

Logic:

HMI cannot establish communication with the PCC.

Possible Causes:

1. J29 is not plugged in properly to the HMI.
2. Defective PCCNet interface at J25 of the PCC.
3. Another faulty device is present in the PCCNet network.

Diagnosis and Repair:

1. Inspect if the connector J29 is properly connected to the HMI. J29 connects the HMI to the PCC. Check the J29–J25 harness.
2. Defective PCCNet interface at J25 of the PCC. Troubleshoot the PCC by connecting it to InPower through TB15. Once connected, go to **Setup -> PCCNet** setup in Inpower. If the value of **"Active PCCNet HMI220 (or HMI320) Operator Panels"** is equal to the number of operator panels connected, the HMI is successfully communicating with the PCC.
   a. If you see the correct number of other PCCNet devices (ex. AUX101, annunciator, etc.) but not of operator panels, then the HMI is faulty and should be replaced.
   b. If the status of none of the PCCNet device is dispalyed correctly, then the PCC is not able to communicate the PCCNet signal. Troubleshoot the PCC and replace it if necessary.
3. Another PCCNet device is faulty in the network. Isolate each device and test for communication to find the root cause.

10.8.2.7 No Code - No text is visible on display

Logic:

Selective parts of the display are blank, and no text is visible in those parts.

Possible Causes:

1. Presence of dead pixel.

Diagnosis and Repair:

1. If the blank portion is not caused due to a defect on the external hardware it means that the screen has dead pixels. Replace the HMI.

10.8.3 No Code - The Operator Panel Is Unavailable After Changing the PCCNet Network

Logic:

The Operator Panel was working until a PCCNet device was added or removed from the PCCNet network.

Possible Causes:

1. Bad installation of PCCNet device.

Diagnosis and Repair:

1. Bad installation of PCCNet device.
    a. Check the installation of the PCCNet device, in particular the connection at TB1. J25 and TB1 share the same electrical connection. If the PCCNet device is installed incorrectly, the Operator Panel on J25 stops working. Make sure the PCCNet device is connected correctly and is functioning properly.

10.8.4 Code 135 - Oil Pressure Sensor OOR High

Logic:

Engine oil pressure sensor signal is out of range – shorted high.

NOTICE
This warning will only occur if the generator set is equipped with an oil pressure sensor.

Possible Causes:

1. Faulty oil pressure sensor connections.
2. Faulty oil pressure sensor.
3. Faulty engine harness.
4. Faulty extension harness.

NOTICE
Part Number 316289800 - Pressure/Temperature sensor breakout cable **Part Number 382477400 - Pressure sensor breakout cable** **Part Number 382477600 - Pressure sensor breakout cable** **Part Number 316475200 - Danfoss™ pressure sensor breakout cable** **Part Number 382275800 - Male Deutsch/AMP/Metri-Pack test lead** **Part Number 382291700 - Female Deutsch/AMP/Metri-Pack test lead** **Part Number 382481200 - Deutsch socket pin test lead** **Part Number 382481100 - Deutsch pin test lead**

Diagnosis and Repair:

1. Oil pressure sensor connections.

    Inspect the oil pressure sensor and the engine harness connector pins.

    a. Disconnect the engine harness connector from the oil pressure sensor.
    b. Inspect for corroded pins, bent or broken pins, and pushed back or expanded pins.

c. Inspect for evidence of moisture in or on the connector.

d. Inspect for missing or damaged connector seals.

e. Inspect for dirt or debris in or on the connector pins.

2. Faulty sensor/switch.

Active Sensor

a. Check the oil pressure sensor supply voltage.

i. Disconnect the engine harness connector from the oil pressure sensor.

ii. Install the pressure sensor breakout cable between the sensor and the sensor harness connector.

iii. Measure the supply voltage by connecting the breakout cable's supply and return connectors to the multimeter. If the reading is between 4.75 and 5.25 VDC, then the supply voltage is correct.

b. Check the oil pressure sensor signal (sense) voltage.

i. Disconnect the engine harness connector from the oil pressure sensor.

ii. Install the pressure sensor breakout cable between the sensor and the sensor harness connector.

iii. Measure the signal voltage by connecting the breakout cable's signal and return connectors to the multimeter. If the reading is between 0.46 and 4.56 V, then the signal voltage is correct. If not, the sensor is faulty.

Passive Sensor

Check the resistance of the sensor.

a. Disconnect the engine harness connector from the oil pressure sensor.

b. Measure the resistance between the oil pressure signal pin and the oil pressure return pin.

c. Refer to the troubleshooting and repair manual for the specific engine platform for oil pressure ranges.

Switch

a. Check generator set manual to determine if switch should be normally open or normally closed.

b. Ensure physical switch is of same type.

3. Faulty engine harness.

a. Inspect the engine harness and the connector pins.

i. Disconnect the engine harness connector from the extension harness.

ii. Inspect for corroded pins, bent or broken pins, and pushed back or expanded pins.

iii. Inspect for evidence of moisture in or on the connector.

iv. Inspect for missing or damaged connector seals.

v. Inspect for dirt or debris in or on the connector pin.

b. Check for a short circuit from pin to pin.

i. Disconnect the engine harness from the extension harness.

ii. Disconnect the engine harness connector from the oil pressure sensor.

iii. Disconnect the engine harness from all sensors that have a shared supply or return with the oil pressure sensor.

   iv. Measure the resistance from the oil pressure 5 VDC supply pin on the engine harness inline connector to all other pins in the engine harness inline connector.

   v. Measure the resistance from the oil pressure return pin on the engine harness inline connector to all other pins in the engine harness inline connector.

   vi. Measure the resistance from the oil pressure signal pin on the engine harness inline connector to all other pins in the engine harness inline connector.

   vii. If all measurements are greater than 100k ohms, then the resistance is correct.

 c. Check for an open circuit.

   i. Disconnect the engine harness from the extension harness.

   ii. Disconnect the engine harness connector from the oil pressure sensor.

   iii. Measure the resistance from the oil pressure return pin on the engine harness inline connector to the oil pressure return pin on the engine harness sensor connector.

   iv. If the measurement is less than 10 ohms, then the resistance is correct.

4. Faulty extension harness.

 a. Inspect the extension harness and the AUX105 connector pins.

   i. Disconnect the extension harness connector from the AUX105.

   ii. Inspect for corroded pins, bent or broken pins, and pushed back or expanded pins.

   iii. Inspect for evidence of moisture in or on the connector.

   iv. Inspect for missing or damaged connector seals.

   v. Inspect for dirt or debris in or on the connector pins.

 b. Check for an open circuit.

   i. Disconnect the extension harness connector from the AUX105.

   ii. Disconnect the extension harness from the engine harness.

   iii. Measure the resistance from the oil pressure return pin on the extension harness connector to the oil pressure return pin on the extension harness inline connection.

   iv. If the measurement is less than 10 ohms, then the resistance is correct.

 c. Check for a short circuit from pin to pin.

   i. Disconnect the extension harness connector from the AUX105.

   ii. Disconnect the extension harness from the engine harness.

   iii. Measure the resistance from the oil pressure 5 VDC supply pin on the extension harness connector to all other pins in the extension harness connector.

   iv. Measure the resistance from the oil pressure return pin on the extension harness connector to all other pins in the extension harness connector.

   v. Measure the resistance from the oil pressure signal pin on the extension harness connector to all other pins in the extension harness connector.

   vi. If all measurements are greater than 100k ohms, then the resistance is correct.

10.8.5 Code 141 - Oil Pressure Sensor OOR Low

Logic:

Engine oil pressure sensor signal is out of range – shorted low.

NOTICE

This warning will only occur if the generator set is equipped with an oil pressure sensor.

Possible Causes:

1. Fault simulation feature is enabled.
2. Faulty oil pressure sensor connections.
3. Faulty oil pressure sensor.
4. Faulty engine harness.
5. Faulty extension harness.

NOTICE

Part Number 316289800 - Pressure/Temperature sensor breakout cable
Part Number 382477400 - Pressure sensor breakout cable
Part Number 382477600 - Pressure sensor breakout cable
Part Number 316475200 - Danfoss™ pressure sensor breakout cable (Danfoss is a trademark of Danfoss A/S.)
Part Number 382275800 - Male Deutsch/AMP/Metri-Pack test lead
Part Number 382291700 - Female Deutsch/AMP/Metri-Pack test lead
Part Number 382481200 - Deutsch socket pin test lead
Part Number 382481100 - Deutsch pin test lead

Diagnosis and Repair:

1. Verify that the fault simulation feature for the sensor is not enabled.
   a. Connect InPower.
   b. Verify that the fault simulation is NOT enabled for the intake manifold temperature sensor by connecting to the PCC via InPower. If the fault simulation is disabled, there is no problem.
2. Oil pressure sensor connections.

   Inspect the oil pressure sensor and the engine harness connector pins.
   a. Disconnect the engine harness connector from the oil pressure sensor.
   b. Inspect for corroded, bent, broken, pushed back, expanded, or loose pins
   c. Inspect for evidence of moisture in or on the connector.
   d. Inspect for missing or damaged connector seals.
   e. Inspect for dirt or debris in or on the connector pins.
3. Faulty sensor/switch.

   Active Sensor
   a. Check the oil pressure sensor supply voltage.
      i. Disconnect the engine harness connector from the oil pressure sensor.
      ii. Install the pressure sensor breakout cable between the sensor and the sensor harness connector.
      iii. Measure the supply voltage by connecting the breakout cable's supply and return connectors to the multimeter. If the reading is between 4.75 and 5.25 VDC, then the supply voltage is correct.

b. Check the oil pressure sensor signal (sense) voltage.
    i. Disconnect the engine harness connector from the oil pressure sensor.
    ii. Install the pressure sensor breakout cable between the sensor and the sensor harness connector.
    iii. Measure the signal voltage by connecting the breakout cable's signal and return connectors to the multimeter. If the reading is between 0.46 and 4.56 V, then the signal voltage is correct. If not, the sensor is faulty.

Passive Sensor

Check the resistance of the sensor.

a. Disconnect the engine harness connector from the oil pressure sensor.
b. Measure the resistance between the oil pressure signal pin and the oil pressure return pin.
c. Refer to the troubleshooting and repair manual for the specific engine platform for oil pressure ranges.

Switch

a. Check generator set manual to determine if switch should be normally open or normally closed.
b. Ensure physical switch is of same type.

4. Faulty engine harness.
    a. Inspect the engine harness and the connector pins.
        i. Disconnect the engine harness connector from the extension harness.
        ii. Inspect for corroded pins, bent or broken pins, and pushed back or expanded pins.
        iii. Inspect for evidence of moisture in or on the connector.
        iv. Inspect for missing or damaged connector seals.
        v. Inspect for dirt or debris in or on the connector pin.
    b. Check for a short circuit from pin to pin.
        i. Disconnect the engine harness from the extension harness.
        ii. Disconnect the engine harness connector from the oil pressure sensor.
        iii. Disconnect the engine harness from all sensors that have a shared supply or return with the oil pressure sensor.
        iv. Measure the resistance from the oil pressure 5 VDC supply pin on the engine harness inline connector to all other pins in the engine harness inline connector.
        v. Measure the resistance from the oil pressure return pin on the engine harness inline connector to all other pins in the engine harness inline connector.
        vi. Measure the resistance from the oil pressure signal pin on the engine harness inline connector to all other pins in the engine harness inline connector.
        vii. If all measurements are greater than 100k ohms, then the resistance is correct.
    c. Check for a short circuit to engine block ground.
        i. Disconnect the extension harness from the AUX105.
        ii. Disconnect the extension harness from the engine harness.
        iii. Measure the resistance from the oil pressure signal pin on the extension harness connector to the engine block ground.

iv. Measure the resistance from the oil pressure 5 VDC pin on the extension harness connector to the engine block ground.

v. If the measurement is more than 100k ohms, then the resistance is correct.

d. Check for an open circuit.

i. Disconnect the engine harness connector from the extension harness.

ii. Disconnect the engine harness from the oil pressure sensor.

iii. Measure the resistance from the oil pressure return pin on the engine harness inline connector to the oil pressure return pin on the engine harness sensor connector.

iv. If the measurement is less than 10 ohms, then the resistance is correct.

5. Faulty extension harness.

a. Inspect the extension harness and the AUX105 connector pins.

i. Disconnect the extension harness connector from the AUX105.

ii. Inspect for corroded pins, bent or broken pins, and pushed back or expanded pins.

iii. Inspect for evidence of moisture in or on the connector.

iv. Inspect for missing or damaged connector seals.

v. Inspect for dirt or debris in or on the connector pins.

b. Check for a short circuit from pin to pin.

i. Disconnect the extension harness connector from the AUX105.

ii. Disconnect the extension harness from the engine harness.

iii. Measure the resistance from the oil pressure 5 VDC supply pin on the extension harness connector to all other pins in the extension harness connector.

iv. Measure the resistance from the oil pressure return pin on the extension harness connector to all other pins in the extension harness connector.

v. Measure the resistance from the oil pressure signal pin on the extension harness connector to all other pins in the extension harness connector.

vi. If all measurements are greater than 100k ohms, then the resistance is correct.

c. Check for a short circuit to engine block ground.

i. Disconnect the extension harness from the AUX105.

ii. Disconnect the extension harness from the engine harness.

iii. Measure the resistance from the oil pressure signal pin on the extension harness connector to the engine block ground.

iv. Measure the resistance from the oil pressure 5 VDC pin on the extension harness connector to the engine block ground.

v. If the measurement is more than 100k ohms, then the resistance is correct.

d. Check for an open circuit.

i. Disconnect the extension harness connector from the AUX105.

ii. Disconnect the extension harness from the engine harness.

iii. Measure the resistance from the engine oil temperature return pin on the extension harness connector to the engine oil temperature return pin at the extension harness inline connector.

iv. Measure the resistance from the engine oil temperature signal pin on the extension harness connector to the engine oil temperature signal pin at the extension harness inline connector.

v. If the measurement is less than 10 ohms, then the resistance is correct.

10.8.6 Code 143 - Low Oil Rifle Pressure

Logic:

Engine oil pressure is below the low oil pressure warning threshold.

NOTICE
This warning will only occur if the generator set is equipped with an oil rifle pressure sensor.

Possible Causes:

1. Oil pressure sensor is inaccurate.
2. Fault simulation is enabled.
3. Threshold is set too high.

Diagnosis and Repair:

1. Check the oil pressure sensor accuracy with a mechanical oil pressure gauge.
   a. Connect a mechanical oil pressure gauge of known quality and calibration to the engine at one of the plugs on top of the oil filter head.
   b. Connect InPower.
   c. While the engine is stopped, compare the oil pressure reading on the service tool to the reading on the mechanical oil pressure gauge.
   d. Only proceed if engine troubleshooting has been completed. Do not attempt to start the engine if there is doubt about the oil pressure.

⚠ CAUTION
Do not attempt to start the engine if there is any doubt about the oil pressure, or the generator set may be damaged.

   e. Start the generator set.
   f. Compare the oil pressure reading on the service tool to the reading on the mechanical oil pressure gauge.
   g. Refer to the troubleshooting and repair manual for the specific engine platform for oil pressure ranges.
2. Fault simulation is enabled.

   Connect to the control with InPower, and make sure that fault simulation for LOP is not enabled.
3. Threshold is set too high.

   Using the electronic service tool, verify that the fault threshold is NOT within the normal operating range for the oil pressure sensor. Refer to the appropriate base engine manual for normal operating range.

10.8.7 Code 144 - Engine Coolant Temperature OOR High

Logic:

Engine coolant temperature signal voltage is out of range - shorted high

Possible Causes:

1. Fault simulation feature is enabled.
2. Faulty coolant temperature sensor connections.
3. Faulty coolant temperature sensor.
4. Faulty engine harness.
5. Faulty extension harness.

NOTICE
Part number 382275800 - Male Deutsch/AMP/Metri-Pack test lead
Part number 382291700 - Female Deutsch/AMP/Metri-Pack test lead

Diagnosis and Repair:

1. Verify that the fault simulation feature is not enabled.
   a. Connect InPower.
   b. Verify that the fault simulation is NOT enabled for the intake manifold temperature sensor by connecting to the PCC via InPower. If fault simulation is disabled, there is no problem.
2. Coolant temperature sensor connections.

   Inspect the coolant temperature sensor and the harness connector pins.
   a. Disconnect the engine harness connector from the coolant temperature sensor.
   b. Inspect for corroded pins, bent pins, broken pins, pushed-back pins or expanded pins.
   c. Inspect for evidence of moisture in or on the connector.
   d. Inspect for missing or damaged connector seals.
   e. Inspect for dirt or debris in or on the connector pins.
3. Faulty sensor.

   Check the resistance of the sensor.
   a. Disconnect the engine harness connector from the coolant temperature sensor.
   b. Measure the resistance between the coolant temperature signal pin and the coolant temperature return pin.
   c. Refer to the troubleshooting and repair manual for the specific engine platform for coolant temperature ranges.
4. Faulty engine harness.

   Inspect the engine harness and the extension harness connector pins.
   a. Disconnect the engine harness connector from the extension harness.
   b. Inspect for corroded pins, bent pins, broken pins, pushed-back pins or expanded pins.
   c. Inspect for evidence of moisture in or on the connector.
   d. Inspect for missing or damaged connector seals.

e. Inspect for dirt or debris in or on the connector pins.

Check for a short circuit from pin-to-pin.

a. Disconnect the engine harness connector from the extension harness.

b. Disconnect the engine harness from the coolant temperature sensor.

c. Disconnect the engine harness from all sensors that have a shared return with the coolant temperature sensor.

d. Measure the resistance from the coolant temperature return pin on the engine harness inline connector to all other pins in the engine harness inline connector.

e. Measure the resistance from the coolant temperature signal pin on the engine harness inline connector to all other pins in the engine harness inline connector.

f. If all measurements are greater than 100K ohms, then the resistance is correct.

Check for an open circuit.

a. Disconnect the engine harness connector from the extension harness.

b. Disconnect the engine harness from the coolant temperature sensor.

c. Measure the resistance from the coolant temperature return pin on the engine harness inline connector to the coolant temperature return pin on the engine harness sensor connector.

d. Measure the resistance from the coolant temperature signal pin on the engine harness inline connector to the coolant temperature signal pin on the engine harness sensor connector.

e. If the measurements are less than 10 ohms, then the resistance is correct.

5. Faulty extension harness.

Inspect the extension harness and the AUX105 connector pins.

a. Disconnect the engine harness connector from the AUX105.

b. Inspect for corroded pins, bent pins, broken pins, pushed-back pins or expanded pins.

c. Inspect for evidence of moisture in or on the connector.

d. Inspect for missing or damaged connector seals.

e. Inspect for dirt or debris in or on the connector pins.

Check for an open circuit.

a. Disconnect the extension harness from the AUX105.

b. Disconnect the extension harness from the engine harness.

c. Measure the resistance from the coolant temperature return pin on the extension harness connector to the coolant temperature return pin on the extension harness inline connector.

d. Measure the resistance from the coolant temperature signal pin on the extension harness to the coolant temperature signal pin on the extension harness inline connector.

e. If the measurements are less than 10 ohms, then the resistance is correct.

Check for a short circuit from pin-to-pin.

a. Disconnect the extension harness from the AUX105.

b. Disconnect the extension harness from the engine harness.

c. Measure the resistance from the coolant temperature return pin on the extension harness connector to all other pins in the extension harness connector.

d. Measure the resistance from the coolant temperature signal pin on the extension harness connector to all other pins in the engine harness connector.

e. If all measurements are greater than 100K ohms, then the resistance is correct.

10.8.8 Code 145 - Engine Coolant Temperature OOR Low

Logic:

Engine coolant temperature signal voltage is out of range - shorted low

Possible Causes:

1. Faulty coolant temperature sensor connections.
2. Faulty coolant temperature sensor.
3. Faulty engine harness.
4. Faulty extension harness.

NOTICE
Part number 382275800 - Male Deutsch/AMP/Metri-Pack test lead   **Part number 382291700 - Female Deutsch/AMP/Metri-Pack test lead**

Diagnosis and Repair:

1. Coolant temperature sensor connections.

   Inspect the coolant temperature sensor and the harness connector pins.

   a. Disconnect the engine harness connector from the coolant temperature sensor.
   b. Inspect for corroded pins, bent pins, broken pins, pushed-back pins or expanded pins.
   c. Inspect for evidence of moisture in or on the connector.
   d. Inspect for missing or damaged connector seals.
   e. Inspect for dirt or debris in or on the connector pins.

2. Faulty sensor.

   Check the resistance of the sensor.

   a. Disconnect the engine harness connector from the coolant temperature sensor.
   b. Measure the resistance between the coolant temperature signal pin and the coolant temperature return pin.
   c. Refer to the troubleshooting and repair manual for the specific engine platform for coolant temperature ranges.

3. Faulty engine harness.

   Inspect the engine harness and the extension harness connector pins.

   a. Disconnect the engine harness connector from the extension harness.
   b. Inspect for corroded pins, bent pins, broken pins, pushed-back pins or expanded pins.
   c. Inspect for evidence of moisture in or on the connector.
   d. Inspect for missing or damaged connector seals.
   e. Inspect for dirt or debris in or on the connector pins.

   Check for a short circuit from pin-to-pin.

   a. Disconnect the engine harness connector from the extension harness.
   b. Disconnect the engine harness from the coolant temperature sensor.

c. Disconnect the engine harness from all sensors that have a shared return with the coolant temperature sensor.

d. Measure the resistance from the coolant temperature return pin on the engine harness inline connector to all other pins in the engine harness inline connector.

e. Measure the resistance from the coolant temperature signal pin on the engine harness inline connector to all other pins in the engine harness inline connector.

f. If all measurements are greater than 100K ohms, then the resistance is correct.

Check for a short circuit to engine block ground.

a. Disconnect the extension harness from the AUX105.

b. Disconnect the extension harness from the engine harness.

c. Measure the resistance from the coolant temperature signal pin on the extension harness connector to the engine block ground.

d. If the measurement is greater than 100K ohms, then the resistance is correct.

Check for an open circuit.

a. Disconnect the engine harness connector from the extension harness.

b. Disconnect the engine harness from the coolant temperature sensor.

c. Measure the resistance from the coolant temperature return pin on the engine harness inline connector to the coolant temperature return pin on the engine harness sensor connector.

d. Measure the resistance from the coolant temperature signal pin on the engine harness inline connector to the coolant temperature signal pin on the engine harness sensor connector.

e. If the measurements are less than 10 ohms, then the resistance is correct.

4. Faulty extension harness.

Inspect the extension harness and the AUX105 connector pins.

a. Disconnect the extension harness connector from the AUX105.

b. Inspect for corroded pins, bent pins, broken pins, pushed-back pins or expanded pins.

c. Inspect for evidence of moisture in or on the connector.

d. Inspect for missing or damaged connector seals.

e. Inspect for dirt or debris in or on the connector pins.

Check for a short circuit to engine block ground.

a. Disconnect the extension harness from the AUX105.

b. Disconnect the extension harness from the engine harness.

c. Measure the resistance from the coolant temperature signal pin on the extension harness connector to the engine block ground.

d. Measure the resistance from the coolant temperature return pin on the extension harness connector to the engine block ground.

e. If all measurements are greater than 100K ohms, then the resistance is correct.

Check for a short circuit from pin-to-pin.

a. Disconnect the extension harness from the AUX105.

b. Disconnect the extension harness from the engine harness.

c. Measure the resistance from the coolant temperature return pin on the extension harness connector to all other pins in the extension harness connector.

   d. Measure the resistance from the coolant temperature signal pin on the extension harness connector to all other pins in the engine harness connector.
   e. If all measurements are greater than 100K ohms, then the resistance is correct.

Check for an open circuit.

   a. Disconnect the extension harness from the AUX105.
   b. Disconnect the extension harness from the engine harness.
   c. Measure the resistance from the coolant temperature return pin on the extension harness connector to the coolant temperature return pin on the extension harness inline connector.
   d. Measure the resistance from the coolant temperature signal pin on the extension harness to the coolant temperature signal pin on the extension harness inline connector.
   e. If the measurements are less than 10 ohms, then the resistance is correct.

10.8.9 Code 146 - Engine Coolant Temperature Moderately Above Normal

Logic:

Engine coolant temperature has exceeded the warning threshold for high coolant temperature.

Possible Causes:

1. Inaccurate coolant temperature sensor.
2. Fault simulation feature is enabled.
3. Incorrect threshold setting.

Diagnosis and Repair:

1. Verify the sensor accuracy with a thermocouple or similar temperature probe.
   a. Connect the temperature probe to the engine near the coolant temperature sensor.
   b. Connect InPower.
   c. Compare the coolant temperature reading from the service tool to the reading from the temperature sensor. If the two readings are reasonably close, then the sensor is reading correctly.
2. Verify that the fault simulation feature is not enabled.
   a. Connect InPower.
   b. Verify that the fault simulation is NOT enabled for the coolant temperature sensor by connecting to the PCC via InPower. If fault simulation is disabled, there is no problem.
3. Check threshold settings.
   a. Connect InPower.
   b. Verify that the fault threshold is within the normal operating range for the coolant temperature sensor. Refer to the engine manual for correct threshold values, and make the appropriate changes using InPower.

10.8.10 Code 151 - Engine Coolant Temperature High - Critical

Logic:

Engine coolant temperature has exceeded the alarm (shutdown) threshold for high coolant temperature.

Possible Causes:

1. Inaccurate engine temperature sensor.
2. Fault simulation feature is enabled.
3. Incorrect threshold setting.

Diagnosis and Repair:

1. Verify the sensor accuracy with a thermocouple or similar temperature probe.
   a. Connect the temperature probe to the engine near the coolant temperature sensor.
   b. Connect InPower.
   c. Compare the coolant temperature reading from the service tool to the reading from the temperature sensor. If the two readings are reasonably close, then the sensor is reading correctly.
2. Verify that the fault simulation feature is not enabled.
   a. Connect InPower.
   b. Verify that the fault simulation is NOT enabled for the coolant temperature sensor by connecting to the PCC via InPower. If fault simulation is disabled, there is no problem.
3. Check threshold settings.
   a. Connect InPower.
   b. Verify that the fault threshold is within the normal operating range for the coolant temperature sensor. Refer to the engine manual for correct threshold values, and make the appropriate changes using InPower.

10.8.11 Code 153 - Intake Manifold Temperature OOR - High

Logic:

Engine intake manifold temperature sensor signal is out of range - shorted high.

Possible Causes:

1. Faulty intake manifold temperature sensor connections.
2. Faulty intake manifold temperature sensor.
3. Faulty engine harness.
4. Faulty extension harness.

NOTICE
Part number 382275800 - Male Deutsch/AMP/Metri-Pack test lead
Part number 382291700 - Female Deutsch/AMP/Metri-Pack test lead

Diagnosis and Repair:

1. Intake manifold temperature sensor connections

   Inspect the intake manifold temperature sensor and the harness connector pins.
   a. Disconnect the engine harness connector from the intake manifold temperature sensor.
   b. Inspect for corroded pins, bent pins, broken pins, pushed-back pins, or expanded pins.
   c. Inspect for evidence of moisture in or on the connector.
   d. Inspect for missing or damaged connector seals.

   e. Inspect for dirt or debris in or on the connector pins.

2. Faulty sensor.

   Check the resistance of the sensor.

   a. Disconnect the engine harness connector from the intake manifold temperature sensor.
   b. Measure the resistance between the intake manifold temperature signal pin and the intake manifold temperature return pin.
   c. Refer to the troubleshooting and repair manual for the specific engine platform for intake manifold temperature ranges.

3. Faulty engine harness.

   Inspect the engine harness and the extension harness connector pins.

   a. Disconnect the engine harness connector from the extension harness.
   b. Inspect for corroded pins, bent pins, broken pins, pushed-back pins, or expanded pins.
   c. Inspect for evidence of moisture in or on the connector.
   d. Inspect for missing or damaged connector seals.
   e. Inspect for dirt or debris in or on the connector pins.

   Check for a short circuit from pin-to-pin.

   a. Disconnect the engine harness connector from the extension harness.
   b. Disconnect the engine harness from the intake manifold temperature sensor.
   c. Disconnect the engine harness from all sensors that have a shared return with the intake manifold temperature sensor.
   d. Measure the resistance from the intake manifold temperature return pin on the engine harness inline connector to all other pins in the engine harness inline connector.
   e. Measure the resistance from the intake manifold temperature signal pin on the engine harness inline connector to all other pins in the engine harness inline connector.
   f. If all measurements are greater than 100K ohms, then the resistance is correct.

   Check for an open circuit.

   a. Disconnect the engine harness connector from the extension harness.
   b. Disconnect the engine harness from the intake manifold temperature sensor.
   c. Measure the resistance from the intake manifold temperature return pin on the engine harness inline connector to the intake manifold temperature return pin at the engine harness sensor connector.
   d. Measure the resistance from the intake manifold temperature signal pin on the engine harness inline connector to the intake manifold temperature signal pin at the engine harness sensor connector.
   e. If all measurements are less than 10 ohms, then the resistance is correct.

4. Faulty extension harness.

   Inspect the extension harness and the AUX105 connector pins.

   a. Disconnect the extension harness connector from the AUX105.
   b. Inspect for corroded pins, bent pins, broken pins, pushed-back pins, or expanded pins.
   c. Inspect for evidence of moisture in or on the connector.
   d. Inspect for missing or damaged connector seals.

e. Inspect for dirt or debris in or on the connector pins.

Check for an open circuit.

a. Disconnect the extension harness connector from the AUX105.

b. Disconnect the extension harness from the engine harness.

c. Measure the resistance from the intake manifold temperature return pin on the extension harness connector to the intake manifold temperature return pin at the extension harness inline connector.

d. Measure the resistance from the intake manifold temperature signal pin on the extension harness connector to the intake manifold temperature signal pin at the extension harness inline connector.

e. If all measurements are less than 10 ohms, then the resistance is correct.

Check for a short circuit from pin-to-pin.

a. Disconnect the extension harness from the AUX105.

b. Disconnect the extension harness from the engine harness.

c. Measure the resistance from the intake manifold temperature return pin on the extension harness connector to all other pins in the extension harness connector.

d. Measure the resistance from the intake manifold temperature signal pin on the extension harness connector to all other pins in the extension harness connector.

e. If all measurements are greater than 100K ohms, then the resistance is correct.

10.8.12 Code 154 - Intake Manifold Temperature OOR - Low

Logic:

Engine intake manifold temperature sensor signal is out of range - shorted low.

Possible Causes:

1. Faulty intake manifold temperature sensor connections.
2. Faulty intake manifold temperature sensor.
3. Faulty engine harness.
4. Faulty extension harness.

NOTICE
Part number 382275800 - Male Deutsch/AMP/Metri-Pack test lead
Part number 382291700 - Female Deutsch/AMP/Metri-Pack test lead

Diagnosis and Repair:

1. Intake manifold temperature sensor connections

   Inspect the intake manifold temperature sensor and the harness connector pins.

   a. Disconnect the engine harness connector from the intake manifold temperature sensor.

   b. Inspect for corroded pins, bent pins, broken pins, pushed-back pins, or expanded pins.

   c. Inspect for evidence of moisture in or on the connector.

   d. Inspect for missing or damaged connector seals.

   e. Inspect for dirt or debris in or on the connector pins.

2. Faulty sensor.

   Check the resistance of the sensor.

   a. Disconnect the engine harness connector from the intake manifold temperature sensor.
   b. Measure the resistance between the intake manifold temperature signal pin and the intake manifold temperature return pin.
   c. Refer to the troubleshooting and repair manual for the specific engine platform for intake manifold temperature ranges.

   Check for a short circuit to engine block ground.

   a. Disconnect the engine harness connector from the intake manifold temperature sensor.
   b. Measure the resistance from one of the pins of the intake manifold temperature sensor connector to engine block ground. If the resistance is more than 100K ohms, the sensor is operating correctly.

3. Faulty engine harness.

   Inspect the engine harness and the connector pins.

   a. Disconnect the engine harness connector from the extension harness.
   b. Inspect for corroded pins, bent pins, broken pins, pushed-back pins, or expanded pins.
   c. Inspect for evidence of moisture in or on the connector.
   d. Inspect for missing or damaged connector seals.
   e. Inspect for dirt or debris in or on the connector pins.

   Check for a short circuit from pin-to-pin.

   a. Disconnect the engine harness connector from the extension harness.
   b. Disconnect the engine harness from the intake manifold temperature sensor.
   c. Disconnect the engine harness from all sensors that have a shared return with the intake manifold temperature sensor.
   d. Measure the resistance from the intake manifold temperature return pin on the engine harness inline connector to all other pins in the engine harness inline connector.
   e. Measure the resistance from the intake manifold temperature signal pin on the engine harness inline connector to all other pins in the engine harness inline connector.
   f. If all measurements are greater than 100K ohms, then the resistance is correct.

   Check for a short circuit to engine block ground.

   a. Disconnect the extension harness from the AUX105.
   b. Disconnect the extension harness from the engine harness.
   c. Measure the resistance from the intake manifold temperature signal pin on the extension harness connector to engine block ground.
   d. If the resistance is more than 100K ohms, the sensor is operating correctly.

   Check for an open circuit.

   a. Disconnect the engine harness connector from the extension harness.
   b. Disconnect the engine harness from the intake manifold temperature sensor.
   c. Measure the resistance from the intake manifold temperature return pin on the engine harness inline connector to the intake manifold temperature return pin at the engine harness sensor connector.

d. Measure the resistance from the intake manifold temperature signal pin on the engine harness inline connector to the intake manifold temperature signal pin at the engine harness sensor connector.

e. If all measurements are less than 10 ohms, then the resistance is correct.

4. Faulty extension harness.

Inspect the extension harness and the AUX105 connector pins.

a. Disconnect the extension harness connector from the AUX105.

b. Inspect for corroded pins, bent pins, broken pins, pushed-back pins, or expanded pins.

c. Inspect for evidence of moisture in or on the connector.

d. Inspect for missing or damaged connector seals.

e. Inspect for dirt or debris in or on the connector pins.

Check for a short circuit to engine block ground.

a. Disconnect the extension harness from the AUX105.

b. Disconnect the extension harness from the engine harness.

c. Measure the resistance from the intake manifold temperature signal pin on the extension harness connector to engine block ground.

d. Measure the resistance from the intake manifold temperature return pin on the extension harness connector to engine block ground.

e. If the resistance is more than 100K ohms, the sensor is operating correctly.

Check for a short circuit from pin-to-pin.

a. Disconnect the extension harness from the AUX105.

b. Disconnect the extension harness from the engine harness.

c. Measure the resistance from the intake manifold temperature return pin on the extension harness connector to all other pins in the extension harness connector.

d. Measure the resistance from the intake manifold temperature signal pin on the extension harness connector to all other pins in the extension harness connector.

e. If all measurements are greater than 100K ohms, then the resistance is correct.

Check for an open circuit.

a. Disconnect the extension harness connector from the AUX105.

b. Disconnect the extension harness from the engine harness.

c. Measure the resistance from the intake manifold temperature return pin on the extension harness connector to the intake manifold temperature return pin at the extension harness inline connector.

d. Measure the resistance from the intake manifold temperature signal pin on the extension harness connector to the intake manifold temperature signal pin at the extension harness inline connector.

e. If all measurements are less than 10 ohms, then the resistance is correct.

10.8.13 Code 155 - Intake Manifold Temperature High - Critical

Logic:

Engine intake manifold temperature has exceeded the alarm (shutdown) threshold for high intake manifold temperature.

Possible Causes:

1. Inaccurate engine temperature sensor.
2. Fault simulation feature is enabled.
3. Incorrect threshold setting.

Diagnosis and Repair:

1. Verify the sensor accuracy with a thermocouple or similar temperature probe.
   a. Connect the temperature probe to the engine near the intake manifold temperature sensor.
   b. Connect InPower.
   c. Compare the intake manifold temperature reading from the service tool to the reading from the temperature sensor. If the two readings are reasonably close, then the sensor is reading correctly.

NOTICE
Only proceed if engine troubleshooting has been completed. Do not attempt to start the engine if there is doubt about the intake manifold temperature, or the generator set may be damaged.

   d. Start the generator set.
   e. Compare the intake manifold temperature reading from the service tool to the reading from the temperature sensor. If the two readings are reasonably close, then the sensor is reading correctly.
2. Verify that the fault simulation feature is not enabled.
   a. Connect InPower.
   b. Verify that the fault simulation is NOT enabled for the intake manifold temperature sensor by connecting to the PCC via InPower. If fault simulation is disabled, there is no problem.
3. Check threshold settings.
   a. Connect InPower.
   b. Verify that the fault threshold is within the normal operating range for the intake manifold temperature sensor. Refer to the engine manual for correct threshold values, and make the appropriate changes using InPower.

10.8.14 Code 197 - Low Coolant Level

Logic:

Low Coolant Level input is active and the threshold response is set to “Warning".

Possible Causes:

1. Low coolant.
2. Faulty sensor or wiring.
3. PCCNet Annunciator (if fitted).
4. Faulty base board.

Diagnosis and Repair:

1. Low coolant.
   a. Visually inspect that the engine coolant is at the correct level.
   b. Remove the radiator cap and check that the coolant is at the correct level.
   c. If coolant is below 2.5 cm (1 in) from the top add manufacturer's prescribed coolant.
2. Faulty sensor or wiring.
   a. Disconnect the signal leads at the sensor, so the sensor is no longer connected to the control; then reset the control by pressing the Reset button. If event/fault code 197 clears and does not reappear, then replace the low coolant level sensor.
   b. If event/fault code 197 reappears then check for a short in the wiring between the low coolant level sensor and the input to the control (at J20-17: Input and J20-5: Ground). A ground input into J20-17 will activate the alarm at the control.
3. PCCNet Annunciator.
   a. If a PCCNet Annunciator is not used, go to step 4. If a PCCNet Annunciator is used, check the wiring on the back of the PCCNet Annunciator at TB1-6 to the Low Coolant Level sender. Ensure that an open circuit or short circuit does not exist in the wiring.
   b. Refer to the PCCNet Annunciator Operator's Manual to ensure that the Annunciator is configured correctly; since inputs can be configured to Active Open or Active Closed. Then check the input on the back of the PCCNet Annunciator at TB1–6 and ensure that the input signal into the PCCNet Annunciator is properly configured.
4. Faulty base board.
   a. Replace faulty base board.

10.8.15 Code 212 - Engine Oil Temperature OOR High

Logic:

Engine oil temperature is out of range - shorted high.

Possible Causes:

1. Faulty engine oil temperature sensor connections.
2. Faulty engine oil temperature sensor.
3. Faulty engine harness.
4. Faulty extension harness.

NOTICE
Part number 382275800 - Male Deutsch/AMP/Metri-Pack test lead
Part number 382291700 - Female Deutsch/AMP/Metri-Pack test lead

Diagnosis and Repair:

1. Engine oil temperature sensor connections

   Inspect the engine oil temperature sensor and the harness connector pins.
   a. Disconnect the engine harness connector from the engine oil temperature sensor.
   b. Inspect for corroded pins, bent pins, broken pins, pushed-back pins, or expanded pins.
   c. Inspect for evidence of moisture in or on the connector.

d. Inspect for missing or damaged connector seals.

e. Inspect for dirt or debris in or on the connector pins.

2. Faulty sensor.

   Check the resistance of the sensor.

   a. Disconnect the engine harness connector from the engine oil temperature sensor.

   b. Measure the resistance between the engine oil temperature signal pin and the engine oil temperature return pin.

   c. Refer to the troubleshooting and repair manual for the specific engine platform for engine oil temperature ranges.

3. Faulty engine harness.

   Inspect the engine harness and the extension harness connector pins.

   a. Disconnect the engine harness connector from the extension harness.

   b. Inspect for corroded pins, bent pins, broken pins, pushed-back pins, or expanded pins.

   c. Inspect for evidence of moisture in or on the connector.

   d. Inspect for missing or damaged connector seals.

   e. Inspect for dirt or debris in or on the connector pins.

   Check for a short circuit from pin-to-pin.

   a. Disconnect the engine harness connector from the extension harness.

   b. Disconnect the engine harness from the engine oil temperature sensor.

   c. Disconnect the engine harness from all sensors that have a shared return with the engine oil temperature sensor.

   d. Measure the resistance from the engine oil temperature return pin on the engine harness inline connector to all other pins in the engine harness inline connector.

   e. Measure the resistance from the engine oil temperature signal pin on the engine harness inline connector to all other pins in the engine harness inline connector.

   f. If all measurements are greater than 100K ohms, then the resistance is correct.

   Check for an open circuit.

   a. Disconnect the engine harness connector from the extension harness.

   b. Disconnect the engine harness from the engine oil temperature sensor.

   c. Measure the resistance from the engine oil temperature return pin on the engine harness inline connector to the engine oil temperature return pin at the engine harness sensor connector.

   d. Measure the resistance from the engine oil temperature signal pin on the engine harness inline connector to the engine oil temperature signal pin at the engine harness sensor connector.

   e. If all measurements are less than 10 ohms, then the resistance is correct.

4. Faulty extension harness.

   Inspect the extension harness and the AUX105 connector pins.

   a. Disconnect the extension harness connector from the AUX105.

   b. Inspect for corroded pins, bent pins, broken pins, pushed-back pins, or expanded pins.

   c. Inspect for evidence of moisture in or on the connector.

   d. Inspect for missing or damaged connector seals.

e. Inspect for dirt or debris in or on the connector pins.

Check for an open circuit.

a. Disconnect the extension harness connector from the AUX105.

b. Disconnect the extension harness from the engine harness.

c. Measure the resistance from the engine oil temperature return pin on the extension harness connector to the engine oil temperature return pin at the extension harness inline connector.

d. Measure the resistance from the engine oil temperature signal pin on the extension harness connector to the engine oil temperature signal pin at the extension harness inline connector.

e. If all measurements are less than 10 ohms, then the resistance is correct.

Check for a short circuit from pin-to-pin.

a. Disconnect the extension harness from the AUX105.

b. Disconnect the extension harness from the engine harness.

c. Measure the resistance from the engine oil temperature return pin on the extension harness connector to all other pins in the extension harness connector.

d. Measure the resistance from the engine oil temperature signal pin on the extension harness connector to all other pins in the extension harness connector.

e. If all measurements are greater than 100K ohms, then the resistance is correct.

10.8.16 Code 213 - Engine Oil Temperature OOR Low

Logic:

Engine oil temperature is out of range - shorted low.

Possible Causes:

1. Faulty engine oil temperature sensor connections.
2. Faulty engine oil temperature sensor.
3. Faulty engine harness.
4. Faulty extension harness.

NOTICE
Part number 382275800 - Male Deutsch/AMP/Metri-Pack test lead
Part number 382291700 - Female Deutsch/AMP/Metri-Pack test lead

Diagnosis and Repair:

1. Engine oil temperature sensor connections

   Inspect the engine oil temperature sensor and the harness connector pins.

   a. Disconnect the engine harness connector from the engine oil temperature sensor.

   b. Inspect for corroded pins, bent pins, broken pins, pushed-back pins, or expanded pins.

   c. Inspect for evidence of moisture in or on the connector.

   d. Inspect for missing or damaged connector seals.

   e. Inspect for dirt or debris in or on the connector pins.

2. Faulty sensor.

Check the resistance of the sensor.

a. Disconnect the engine harness connector from the engine oil temperature sensor.

b. Measure the resistance between the engine oil temperature signal pin and the engine oil temperature return pin.

c. Refer to the troubleshooting and repair manual for the specific engine platform for engine oil temperature ranges.

3. Faulty engine harness.

Inspect the engine harness and the extension harness connector pins.

a. Disconnect the engine harness connector from the extension harness.

b. Inspect for corroded pins, bent pins, broken pins, pushed-back pins, or expanded pins.

c. Inspect for evidence of moisture in or on the connector.

d. Inspect for missing or damaged connector seals.

e. Inspect for dirt or debris in or on the connector pins.

Check for a short circuit from pin-to-pin.

a. Disconnect the engine harness connector from the extension harness.

b. Disconnect the engine harness from the engine oil temperature sensor.

c. Disconnect the engine harness from all sensors that have a shared return with the engine oil temperature sensor.

d. Measure the resistance from the engine oil temperature return pin on the engine harness inline connector to all other pins in the engine harness inline connector.

e. Measure the resistance from the engine oil temperature signal pin on the engine harness inline connector to all other pins in the engine harness inline connector.

f. If all measurements are greater than 100K ohms, then the resistance is correct.

Check for a short circuit to engine block ground.

a. Disconnect the extension harness from the AUX105.

b. Disconnect the extension harness from the engine harness.

c. Measure the resistance from the oil temperature signal pin on the extension harness connector to the engine block ground.

d. If the measurement is more than 100K ohms, then the resistance is correct.

Check for an open circuit.

a. Disconnect the engine harness connector from the extension harness.

b. Disconnect the engine harness from the engine oil temperature sensor.

c. Measure the resistance from the engine oil temperature return pin on the engine harness inline connector to the engine oil temperature return pin at the engine harness sensor connector.

d. Measure the resistance from the engine oil temperature signal pin on the engine harness inline connector to the engine oil temperature signal pin at the engine harness sensor connector.

e. If all measurements are less than 10 ohms, then the resistance is correct.

4. Faulty extension harness.

Inspect the extension harness and the AUX105 connector pins.

a. Disconnect the extension harness connector from the AUX105.

b. Inspect for corroded pins, bent pins, broken pins, pushed-back pins, or expanded pins.

c. Inspect for evidence of moisture in or on the connector.

d. Inspect for missing or damaged connector seals.

e. Inspect for dirt or debris in or on the connector pins.

Check for a short circuit to engine block ground.

a. Disconnect the extension harness from the AUX105.

b. Disconnect the extension harness from the engine harness.

c. Measure the resistance from the oil temperature signal pin on the extension harness connector to the engine block ground.

d. Measure the resistance from the oil temperature return pin on the extension harness connector to the engine block ground.

e. If the measurement is more than 100K ohms, then the resistance is correct.

Check for an open circuit.

a. Disconnect the extension harness connector from the AUX105.

b. Disconnect the extension harness from the engine harness.

c. Measure the resistance from the engine oil temperature signal pin on the extension harness connector to the engine oil temperature signal pin at the extension harness inline connector.

d. Measure the resistance from the engine oil temperature return pin on the extension harness connector to the engine oil temperature return pin at the extension harness inline connector.

e. If all measurements are less than 10 ohms, then the resistance is correct.

Check for a short circuit from pin-to-pin.

a. Disconnect the extension harness from the AUX105.

b. Disconnect the extension harness from the engine harness.

c. Measure the resistance from the engine oil temperature return pin on the extension harness connector to all other pins in the extension harness connector.

d. Measure the resistance from the engine oil temperature signal pin on the extension harness connector to all other pins in the extension harness connector.

e. If all measurements are greater than 100K ohms, then the resistance is correct.

10.8.17 Code 214 - Engine Oil Temperature High - Critical

Logic:

Engine oil temperature has exceeded the alarm (shutdown) threshold for high engine oil temperature.

Possible Causes:

1. Inaccurate engine temperature sensor.
2. Fault simulation feature is enabled.
3. Incorrect threshold setting.

Diagnosis and Repair:

1. Verify the sensor accuracy with a thermocouple or similar temperature probe.

   a. Connect the temperature probe to the engine near the engine oil temperature sensor.

   b. Connect InPower.

c. Compare the engine oil temperature reading from the service tool to the reading from the temperature sensor. If the two readings are reasonably close, then the sensor is reading correctly.

2. Verify that the fault simulation feature is not enabled.
   a. Connect InPower.
   b. Verify that the fault simulation is NOT enabled for the engine oil temperature sensor by connecting to the PCC via InPower. If fault simulation is disabled, there is no problem.
3. Check threshold settings.
   a. Connect InPower.
   b. Verify that the fault threshold is set correctly for the normal operating range for the engine oil temperature sensor. Refer to the engine manual for correct threshold values, and make the appropriate changes using InPower.

10.8.18 Code 234 - Engine Speed High - Critical

Logic:

Engine speed signals indicate the engine speed is greater than the shutdown threshold.

Possible Causes:

1. Fault simulation feature is enabled.
2. Incorrect threshold setting.
3. Incorrect fuel type setting.
4. Faulty engine speed sensor connections.
5. Faulty engine harness.
6. Faulty extension harness.
7. Faulty engine speed/position sensor.

Diagnosis and Repair:

1. Verify that the fault simulation feature is not enabled.
   a. Connect InPower.
   b. Verify that the fault simulation is NOT enabled for the engine speed sensor by connecting to the PCC via InPower. If fault simulation is disabled, there is no problem.
2. Check threshold settings.
   a. Connect InPower.
   b. Verify that the fault threshold is set correctly for the normal operating range for the engine overspeed sensor. Refer to the engine manual for correct threshold values, and make the appropriate changes using InPower.
3. Check for the correct fuel type setting.
   a. Connect InPower.
   b. Verify the fuel source set in InPower is the same fuel used by the generator set.
4. Engine speed sensor connections.

   Inspect the engine speed sensor and the harness connector pins.
   a. Disconnect the engine harness connector from the engine speed sensor.
   b. Inspect for corroded pins, bent pins, broken pins, pushed-back pins, or expanded pins.

c. Inspect for evidence of moisture in or on the connector.

d. Inspect for missing or damaged connector seals.

e. Inspect for dirt or debris in or on the connector pins.

5. Faulty engine harness.

   Inspect the engine harness and the connector pins.

   a. Disconnect the engine harness connector from the extension harness.

   b. Inspect for corroded pins, bent pins, broken pins, pushed-back pins, or expanded pins.

   c. Inspect for evidence of moisture in or on the connector.

   d. Inspect for missing or damaged connector seals.

   e. Inspect for dirt or debris in or on the connector pins.

6. Faulty extension harness.

   Inspect the extension harness and the AUX105 connector pins.

   a. Disconnect the extension harness connector from the AUX105.

   b. Inspect for corroded pins, bent pins, broken pins, pushed-back pins, or expanded pins.

   c. Inspect for evidence of moisture in or on the connector.

   d. Inspect for missing or damaged connector seals.

   e. Inspect for dirt or debris in or on the connector pins.

7. Faulty engine speed/position sensor.

   Inspect the engine speed/position sensor.

   a. Disconnect the engine speed/position sensor from the engine and engine harness.

   b. Inspect sensor for bent, corroded, or loose pins.

   c. Inspect the sensor for structural deficiencies.

10.8.19 Code 235 - Low Coolant Level

Logic:

Low Coolant Level input is active and the threshold response is set to “Shutdown".

Possible Causes:

1. Faulty sensor or wiring.
2. PCCNet Annunciator.

Diagnosis and Repair:

1. Faulty sensor or wiring.

   a. Disconnect the signal leads at the sensor, so the sensor is no longer connected to the control; then reset the control by pressing the Reset button. If event/fault code 197 clears and does not reappear, then replace the low coolant level sensor.

   b. If event/fault code 197 reappears, check for a short in the wiring between the low coolant level sensor and the input to the control (at J20-17: Input and J20-5: Ground). A ground input into J20-17 will activate the alarm at the control.

2. PCCNet Annunciator.

   a. If a PCCNet Annunciator is not used, go to step 4. If a PCCNet Annunciator is used, check the wiring on the back of the PCCNet Annunciator at TB1-6 to the Low Coolant Level sender. Ensure that an open circuit or short circuit does not exist in the wiring.

   b. Refer to the PCCNet Annunciator Operator's Manual to ensure that the Annunciator is configured correctly; since inputs can be configured to Active Open or Active Closed. Then check the input on the back of the PCCNet Annunciator at TB1 – 6 and ensure that the input signal into the PCCNet Annunciator is properly configured.

10.8.20 Code 236 - Engine Speed/Position Sensor Circuit

Logic:

Engine speed/position sensor signal is not detected.

Possible Causes:

1. Inaccurate engine speed/position sensor.
2. Faulty engine speed sensor connections.
3. Faulty engine harness.
4. Faulty extension harness.
5. Faulty engine speed/position sensor.

If the generator set stalls after starting, this is not a control issue.

NOTICE
Part number 382275800 - Male Deutsch/AMP/Metri-Pack test lead
Part number 382291700 - Female Deutsch/AMP/Metri-Pack test lead

Diagnosis and Repair:

1. Inaccurate engine speed/position sensor.

   Check the sensor gap.

   a. Measure the sensor gap.

   b. Refer to the engine manual for appropriate gap size, and adjust as necessary.

2. Engine speed sensor connections

   Inspect the engine speed sensor and the harness connector pins.

   a. Disconnect the engine harness connector from the engine speed sensor.

   b. Inspect for corroded pins, bent pins, broken pins, pushed-back pins, or expanded pins.

   c. Inspect for evidence of moisture in or on the connector.

   d. Inspect for missing or damaged connector seals.

   e. Inspect for dirt or debris in or on the connector pins.

3. Faulty engine harness.

   Inspect the engine harness and the extension harness connector pins.

   a. Disconnect the engine harness connector from the extension harness.

   b. Inspect for corroded pins, bent pins, broken pins, pushed-back pins, or expanded pins.

   c. Inspect for evidence of moisture in or on the connector.

d. Inspect for missing or damaged connector seals.

e. Inspect for dirt or debris in or on the connector pins.

Check for a short circuit from pin-to-pin.

a. Disconnect the engine harness connector from the extension harness.

b. Disconnect the engine harness from the engine speed sensor.

c. Disconnect the engine harness from all sensors that have a shared return with the engine speed sensor.

d. Measure the resistance from the engine speed return pin on the engine harness inline connector to all other pins in the engine harness inline connector.

e. Measure the resistance from the engine speed signal pin on the engine harness inline connector to all other pins in the engine harness inline connector.

f. If all measurements are greater than 100K ohms, then the resistance is correct.

Check for an open circuit.

a. Disconnect the engine harness connector from the extension harness.

b. Disconnect the engine harness from the engine speed sensor.

c. Measure the resistance from the engine speed return pin on the engine harness inline connector to the engine speed return pin at the engine harness sensor connector.

d. Measure the resistance from the engine speed signal pin on the engine harness inline connector to the engine speed signal pin at the engine harness sensor connector.

e. If all measurements are less than 10 ohms, then the resistance is correct.

4. Faulty extension harness.

Inspect the extension harness and the AUX105 connector pins.

a. Disconnect the extension harness connector from the engine extension harness.

b. Inspect for corroded pins, bent pins, broken pins, pushed-back pins, or expanded pins.

c. Inspect for evidence of moisture in or on the connector.

d. Inspect for missing or damaged connector seals.

e. Inspect for dirt or debris in or on the connector pins.

Check for an open circuit.

a. Disconnect the extension harness connector from the AUX105.

b. Disconnect the extension harness from the engine harness.

c. Measure the resistance from the engine speed signal pin on the extension harness connector to the engine speed signal pin at the extension harness inline connector.

d. Measure the resistance from the engine speed return pin on the extension harness connector to the engine speed return pin at the extension harness inline connector.

e. If all measurements are less than 10 ohms, then the resistance is correct.

Check for a short circuit from pin-to-pin.

a. Disconnect the extension harness from the AUX105.

b. Disconnect the extension harness from the engine harness.

c. Measure the resistance from the engine speed return pin on the extension harness connector to all other pins in the extension harness connector.

   d. Measure the resistance from the engine speed signal pin on the extension harness connector to all other pins in the extension harness connector.

   e. If all measurements are greater than 100K ohms, then the resistance is correct.

5. Faulty sensor.

   Inspect the engine speed sensor.

   a. Disconnect the engine speed/position sensor from the engine and engine harness.

   b. Inspect the sensor for bent, corroded, or loose pins.

   c. Inspect the sensor for structural deficiencies.

10.8.21 Code 359 - Fail To Start

Logic:

Engine has failed to start after the last crank cycle.

Possible Causes:

1. Faulty glow relay or glow plug settings.
2. Faulty ignition relay.
3. Incorrect flywheel teeth setting.
4. Incorrect starter disconnect speed.
5. Faulty engine harness or extension harness.

Diagnosis and Repair:

Glow Plugs

1. Check the glow plug relay at J11-6 and J11-7. When active, J11-6 should have B+, and J11-7 should be ground.
2. Connect to the control via InPower.
   - Make sure *Glow Plug Enable* is Enabled.
   - Make sure *Max Preheat Temperature* and *Min Preheat Temperature* are set appropriately. *Min Preheat Temperature* should be less than *Max Preheat Temperature*.
   - Make sure *Max Glow Time* is set appropriately.

Ignition Relay

Check the ignition relay at J11-6 and J11-7. When normal operation, J11-6 should have B+, and J11-7 should be ground.

Flywheel Teeth

Connect to the control via InPower. Make sure *Teeth Pulses Per Revolution* matches the actual number of flywheel teeth.

Starter Disconnect

Connect to the control via InPower. Make sure *Starter Disconnect Speed* is set to a reasonable value. Check the engine manual.

Governor

Faulty engine harness.

1. Inspect the engine harness and the connector pins.

   a. Disconnect the engine harness connector from the extension harness.

   b. Inspect for corroded pins, bent or broken pins, and pushed back or expanded pins.
   c. Inspect for evidence of moisture in or on the connector.
   d. Inspect for missing or damaged connector seals.
   e. Inspect for dirt or debris in or on the connector pin.

2. Check for a short circuit from pin to pin.
   a. Disconnect the engine harness from the extension harness.
   b. Disconnect the engine harness connector from the oil pressure sensor.
   c. Disconnect the engine harness from all sensors that have a shared supply or return with the oil pressure sensor.
   d. Measure the resistance from the oil pressure 5 VDC supply pin on the engine harness inline connector to all other pins in the engine harness inline connector.
   e. Measure the resistance from the oil pressure return pin on the engine harness inline connector to all other pins in the engine harness inline connector.
   f. Measure the resistance from the oil pressure signal pin on the engine harness inline connector to all other pins in the engine harness inline connector.
   g. If all measurements are greater than 100k ohms, then the resistance is correct.

3. Check for an open circuit.
   a. Disconnect the engine harness from the extension harness.
   b. Disconnect the engine harness connector from the oil pressure sensor.
   c. Measure the resistance from the oil pressure return pin on the engine harness inline connector to the oil pressure return pin on the engine harness sensor connector.
   d. If the measurement is less than 10 ohms, then the resistance is correct.

Faulty extension harness.

1. Inspect the extension harness and the AUX105 connector pins.
   a. Disconnect the extension harness connector from the AUX105.
   b. Inspect for corroded pins, bent or broken pins, and pushed back or expanded pins.
   c. Inspect for evidence of moisture in or on the connector.
   d. Inspect for missing or damaged connector seals.
   e. Inspect for dirt or debris in or on the connector pins.

2. Check for an open circuit.
   a. Disconnect the extension harness connector from the AUX105.
   b. Disconnect the extension harness from the engine harness.
   c. Measure the resistance from the oil pressure return pin on the extension harness connector to the oil pressure return pin on the extension harness inline connection.
   d. If the measurement is less than 10 ohms, then the resistance is correct.

3. Check for a short circuit from pin to pin.
   a. Disconnect the extension harness connector from the AUX105.
   b. Disconnect the extension harness from the engine harness.
   c. Measure the resistance from the oil pressure 5 VDC supply pin on the extension harness connector to all other pins in the extension harness connector.

d. Measure the resistance from the oil pressure return pin on the extension harness connector to all other pins in the extension harness connector.

e. Measure the resistance from the oil pressure signal pin on the extension harness connector to all other pins in the extension harness connector.

f. If all measurements are greater than 100k ohms, then the resistance is correct.

10.8.22 Code 415 - Engine Oil Pressure Low - Critical

Logic:

Voltage signal indicates oil pressure has dropped below the shutdown threshold.

Possible Causes:

1. Oil pressure sensor is inaccurate.
2. Fault simulation is enabled.
3. Threshold is set too high.

Diagnosis and Repair:

1. Check the oil pressure sensor accuracy with a mechanical oil pressure gauge.
   a. Check the oil pressure with a mechanical oil pressure gauge of known quality and calibration while the unit is running and when it is stopped. Check the engine service manual for the oil pressure readings.
   b. Connect InPower.
   c. While the engine is stopped, compare the oil pressure reading on the service tool to the reading on the mechanical oil pressure gauge.

NOTICE
Only proceed if engine troubleshooting has been completed. Do not attempt to start the engine if there is doubt about the oil pressure, or the generator set may be damaged.

   d. Start the generator set.
   e. Compare the oil pressure reading on the service tool to the reading on the mechanical oil pressure gauge.
   f. Refer to the troubleshooting and repair manual for the specific engine platform for oil pressure ranges.
2. Fault simulation is enabled.

   Connect to the control with InPower, and make sure that the fault simulation for LOP is not enabled.
3. Threshold is set too high.

   Using the electronic service tool, verify that the fault threshold is NOT within the normal operating range for the oil pressure sensor. Refer to the appropriate engine service manual for normal operating range.

10.8.23 Code 421 - Engine Oil Temperature Moderately Above Normal

Logic:

Engine oil temperature has exceeded the warning threshold for high oil temperature.

Possible Causes:

1. Inaccurate engine oil temperature sensor.
2. Fault simulation feature is enabled.
3. Incorrect threshold setting.

Diagnosis and Repair:

1. Verify the sensor accuracy with a thermocouple or similar temperature probe.
   a. Connect the temperature probe to the engine near the engine oil temperature sensor.
   b. Connect InPower.
   c. Compare the engine oil temperature reading from the service tool to the reading from the temperature sensor. If the two readings are reasonably close, then the sensor is reading correctly.
2. Verify that the fault simulation for the sensor is not enabled.
   a. Connect InPower.
   b. Verify that the fault simulation is NOT enabled for the engine oil temperature sensor by connecting to the PCC via InPower. If the fault simulation is disabled, there is no problem.
3. Check threshold settings.
   a. Connect InPower.
   b. Verify that the fault threshold is within the normal operating range for the engine oil temperature sensor. Refer to the engine service manual for correct threshold values, and make the appropriate changes using InPower.

10.8.24 Code 427 - CAN Data Link Degraded

Logic:

Communication between the engine control (ECM) and the generator set control is severed.

Possible Causes:

1. The Engine ECM has lost power or failed.
2. The CAN datalink has failed.

Diagnosis and Repair:

1. The Engine ECM has lost power or failed.
   a. Emergency (E-Stop) button is a closed relay when it is pulled out (not active), and open relay when depressed (active). The E-Stop button on the Operator Panel disables power to the engine ECM when it is depressed (active); CAN-LINK communication will cease when power to the ECM is lost. Ensure that the E-Stop is not active on the control. Follow the procedure below:

      Reset the Local/Remote Emergency Stop

      i. Pull-out (not active) the Local/Remote Emergency Stop button.
      ii. Press the Off button on the Operator Panel.
      iii. Press the Reset button.
      iv. Select Manual or Auto as required.

b. Ensure that the emergency stop button is functioning correctly, measure the outputs of the E-Stop (Normally Open and Normally Closed contacts) and ensure that the outputs switch state correctly when engaged and disengaged, replace the switch if faulty.

c. Check the wiring from the base board.

d. Keyswitch control relay is a normally open relay. Ensure that B+ is available at the relay input, then measure the voltage output. If there is a B+ at both the input and output of the Keyswitch control relay, the relay is not faulty. If B+ is noted at the input but not at the output of the Keyswitch control relay, replace the relay.

e. Connect to the engine ECM with InPower and/or InSite, to verify that the ECM is functioning properly and is communicating with the CAN-LINK network. Refer to the engine service manual for ECM Troubleshooting procedures, if the ECM is faulty, then replace.

2. The CAN datalink has failed.

   a. There is a defective datalink harness connection, or open circuit; inspect the datalink harness and connector pins from J11-20 to J1939+ and from J11-19 to J1039-; also check the shield ground connection at J11-17.

   b. Check the terminating resistors. With connector J11 disconnected from the base board and the engine datalink connection disconnected from the ECM control, measure resistance between Pins J11-19 and J11-20 (60 ohms is satisfactory). If the resistance is not 60 ohms, check the terminating resistors. Each of the two terminating resistors should be 120 ohms, replace if not 120 ohms.

10.8.25 Code 441 - Low Battery Voltage

Logic:

Low battery voltage.

Possible Causes:

1. Damaged battery cable connections.
2. Low battery voltage.
3. Bad battery ground connection.
4. Damaged accessory wiring at B+.
5. Damaged OEM battery harness.
6. Damaged engine harness.
7. Discharged or defective battery.
8. Alternator not functioning properly.
9. Incorrect battery setting.

NOTICE
Part Number 382275800 - Male Deutsch/AMP/Metri-Pack test lead
Part Number 382291700 - Female Deutsch/AMP/Metri-Pack test lead

Diagnosis and Repair:

1. Inspect the battery cable connections.

   a. Inspect connections for corrosion.

   b. Inspect connections for loose connections.

2. Measure the battery voltage.
   a. Measure the battery voltage from the positive (+) terminal to the negative (-) terminal. If the voltage is between 17.3 and 34.7 V on a 24 VDC system, then the voltage is within normal range.
3. Inspect the battery ground connection.
   a. Disconnect the engine harness.
   b. Measure the resistance from the negative (-) battery terminal to the engine block ground. If the resistance is less than 10 ohms, then there exists proper grounding. If the resistance is greater than 10 ohms, then the battery ground connection is in need of repair.
4. Check for add-on or accessory wiring at the positive (+) terminal of the battery.
   a. Starting at the positive (+) terminal, follow any add-on or accessory wiring and examine the wire(s) for damaged insulation or installation error that can cause supply wire to be shorted to the engine block.
5. Damaged OEM battery harness.

   Inspect the OEM battery harness and the Inline E connector pins.
   a. Disconnect the OEM battery harness from the Inline E connector.
   b. Inspect for corroded pins, bent or broken pins, pushed back or expanded pins.
   c. Inspect for evidence of moisture in or on the connector.
   d. Inspect for missing or damaged connector seals.
   e. Inspect for dirt and debris in or on the connector pins.

   Check for an open circuit.
   a. Disconnect the OEM battery harness from the engine.
   b. Disconnect the positive (+) battery terminal.
   c. Measure the resistance from all pins being supplied by unswitched battery on the OEM battery harness at the Inline E connector to the positive (+) battery terminal connector. If the resistance is less than 10 ohms, then there is not an open circuit. If the resistance is greater than 10 ohms, then there is an open circuit that is in need of repair.

   Check for a short circuit from pin to pin.
   a. Disconnect the engine harness.
   b. Disconnect the positive (+) battery terminal.
   c. Measure the resistance from all unswitched battery pins on the Inline E connector to all other pins on the Inline E connector. If the resistance is more than 100k ohms, then there is not a short circuit. If the resistance is less than 100k ohms, then there is a short circuit that is in need of repair.
6. Damaged engine harness.

   Inspect the engine harness fuse connection. Inspect that it is installed correctly.

   Check the engine harness fuse.
   a. Disconnect the 20 amp fuse from the OEM harness.
   b. Inspect that the 20 amp to verify the fuse is not blown.

   Inspect the engine harness and the extension harness inline connector pins.
   a. Disconnect the engine harness.
   b. Inspect for corroded pins, bent or broken pins, pushed back or expanded pins.

c. Inspect for evidence of moisture in or on the connector.

d. Inspect for missing or damaged connector seals.

e. Inspect for dirt and debris in or on the connector pins.

Check for an open circuit.

a. Disconnect the OEM battery harness from the engine connector.

b. Disconnect the positive (+) battery terminal.

c. Measure the resistance from all pins being supplied by unswitched battery on the OEM battery harness at the Inline E connector to the positive (+) battery terminal connector. If the resistance is less than 10 ohms, then there is not an open circuit. If the resistance is greater than 10 ohms, then there is an open circuit that is in need of repair.

Check for a short circuit from pin to pin.

a. Disconnect the engine harness.

b. Disconnect the positive (+) battery terminal.

c. Measure the resistance from all unswitched battery pins on the Inline E connector to all other pins on the Inline E connector. If the resistance is more than 100k ohms, then there is not a short circuit. If the resistance is less than 100k ohms, then there is a short circuit that is in need of repair.

7. Weak or discharged battery. If the battery cannot hold adequate voltage, then replace the battery

   a. Measure the voltage of the battery with a voltmeter. Battery voltage should be 24 VDC or greater in a 24 V system. If the battery voltage is low, check the electrolyte level. Replenish the electrolyte level if low and recharge the battery; the specific gravity of a fully charged lead acid battery is approximately 1.260 at 80 F (27 C).

   b. If the battery cannot hold adequate voltage, then replace the battery.

8. Check engine DC alternator.

   a. Check the engine DC alternator. If charging voltage is not 12-14 VDC for a 12 V system, or 24-26 VDC in a 24 V system, replace the alternator.

9. Check battery voltage setting.

   a. Verify that the battery voltage (12V or 24V) matches calibration.

10.8.26 Code 442 - High Battery Voltage

Logic:

High battery voltage.

Possible Causes:

1. Incorrect battery voltage setup
2. The voltage of the battery is above the high battery voltage threshold.
3. Battery charger is overcharging the battery.
4. Faulty engine DC alternator.

NOTICE
Part Number 382275800 - Male Deutsch/AMP/Metri-Pack test lead
Part Number 382291700 - Female Deutsch/AMP/Metri-Pack test lead

Diagnosis and Repair:

1. Incorrect battery voltage setup
   a. Measure the voltage of the battery with a voltmeter. Battery voltage of lead acid batteries should be between 12-14 VDC in a 12 VDC system or 24-28 VDC in a 24 VDC system. Verify that the battery voltage matches the voltage that the control is calibrated for. If the genset has a 24 V battery, but the control is calibrated to 12 V, the high battery voltage alarm will activate. In these cases, change the voltage on the control to 24 V. To access the battery voltage setup menu from the operator panel, go to **Setup > OEM Setup > OEM Engine Setup > Nominal Battery Voltage**. You can also use InPower.
2. The voltage of the battery is above the high battery voltage threshold.
   a. Voltage of the battery is above the “High Battery" threshold for the time set in the “High Battery Set Time" parameter. To access the battery voltage setup menu from the operator panel, go to **Setup > OEM Setup > OEM Engine Setup > Nominal Battery Voltage** and change the battery voltage setup of the control accordingly. You can also use InPower.
3. Battery charger is overcharging the battery.
   a. Ensure that the battery charger is charging the battery at an acceptable rate and not overcharging the battery. Adjust the charge rate of the battery charger if the charge rate is above the recommendation of the manufacturer.
   b. Refer to the battery charger manual, if available.
4. Faulty engine DC alternator.
   a. Check the engine DC alternator for overcharging conditions. If charging voltage is not 12-14 VDC in a 12 V system or 24-28 VDC in a 24 V system, replace the DC alternator.

10.8.27 Code 488 - Intake Manifold Temperature Moderately Above Normal

Logic:

Intake manifold temperature has exceeded the warning threshold for high intake manifold temperature.

Possible Causes:

1. Inaccurate intake manifold temperature sensor.
2. Fault simulation feature is enabled.
3. Threshold setting too low.

Diagnosis and Repair:

1. Verify the sensor accuracy with a thermocouple or similar temperature probe.
   a. Connect the temperature probe to the engine near the intake manifold temperature sensor.
   b. Connect InPower.
   c. Compare the intake manifold temperature reading from the service tool to the reading from the temperature probe. If the two readings are reasonably close, then the sensor is reading correctly.
2. Verify that the fault simulation for the sensor is not enabled.
   a. Connect InPower.
   b. Verify that the fault simulation is NOT enabled for the intake manifold temperature sensor by connecting to the PCC via InPower. If the fault simulation is disabled, there is no problem.

3. Check threshold settings.
    a. Connect InPower.
    b. Verify that the fault threshold is within the normal operating range for the intake manifold temperature sensor. Refer to the engine service manual for correct threshold values, and make the appropriate changes using InPower.

10.8.28 Code 611 - Engine Hot Shut Down

Logic:

Engine shutdown hot without a proper cooldown run period.

Possible Causes:

1. Critical Shutdown fault.
2. Emergency shutdown.
3. Incorrect shutdown of generator set.

Diagnosis and Repair:

1. Critical Shutdown fault.
    a. A critical shutdown fault (e.g., overspeed) has caused the engine to shut down immediately without allowing the engine to complete the proper cooldown process. Troubleshoot the other shutdown fault(s) that are causing the generator set to shut down.
2. Emergency shutdown.
    a. An Emergency Stop command has immediately shutdown the engine, which has bypassed the proper cooldown process for the engine.
3. Incorrect shutdown of generator set.
    a. The generator set has been shut down without allowing the proper cooldown process for the engine (control switched to OFF manually by user/operator).

10.8.29 Code 781 - The ECM CAN Datalink Has Failed

Logic:

Communication between the engine control module (ECM) and the generator set control is severed.

Possible Causes:

1. The Engine ECM has lost power or failed.
2. The CAN datalink has failed.

Diagnosis and Repair:

1. The Engine ECM has lost power or failed.
    a. Check the wiring from the base board.
    b. Keyswitch control relay is a normally open relay. Ensure that B+ is available at the relay input, then measure the voltage output. If there is a B+ at both the input and output of the Keyswitch control relay, the relay is not faulty. If B+ is noted at the input but not at the output of the Keyswitch control relay, replace the relay.

c. Connect to the engine ECM with InPower and/or InSite, to verify that the ECM is functioning properly and is communicating with the CAN-LINK network. Refer to the engine service manual for ECM Troubleshooting procedures, if the ECM is faulty, then replace.

2. The CAN datalink has failed.

   a. There is a defective datalink harness connection, or open circuit; inspect the datalink harness and connector pins from J11-20 to J1939+ and from J11-19 to J1039-; also check the shield ground connection at J11-17.

   b. Check the terminating resistors. With connector J11 disconnected from the base board and the engine datalink connection disconnected from the ECM control, measure resistance between Pins J11-19 and J11-20 (60 ohms is satisfactory). If the resistance is not 60 ohms, check the terminating resistors. Each of the two terminating resistors should be 120 ohms, replace if not 120 ohms.

10.8.30 Code 1121 - Fail To Disconnect

Logic:

If the “Fail To Disconnect Enable" parameter is set to enable, and the Genset CB and Utility CB Fail to Open Faults are both active, the generator set control will display event/fault code 1121.

Possible Causes:

1. Event/fault code 1221 is mapped to a configurable output and event/fault code 1453 and event/fault code 2397 are active.

Diagnosis and Repair:

1. Event/fault code 1221 is mapped to a configurable output and event/fault code 1453 and event/fault code 2397 are active.

   a. Event/fault code 1221 can be mapped to send an external notification thru a configurable customer output relay on the base board to an external device that the Genset CB and Utility CB have failed to open. This fault will become active if the “Fail To Disconnect Enable" parameter is set to enable, event/fault code 1221 is mapped to a configurable output, and if event/fault code 1453 and event/fault code 2397 are active. Troubleshoot event/fault code 1453 and event/fault code 2397 to resolve this issue.

   To disable event/fault code 1221 go to **Setup > Paralleling Setup > Power Transfer Control > Fail to Disc En** on the display and set the “Fail To Disconnect Enable" parameter to Disable, then determine which configurable output is set to activate when event/fault code 1221 is active and go to: **Setup > Configurable I/O** on the display and remove the mapping of event/fault code 1221 to that output.

10.8.31 Code 1122 - Delayed Rated To Idle Transition

Logic:

If the "Rated to Idle Transition Delay" is greater than zero, event/fault code 1122 will become active when the generator set transitions from rated to idle.

Possible Causes:

1. The generator set is transitioning from rated to idle mode.

Diagnosis and Repair:

1. Event/fault code 1122 is set to “Warning" or “Shutdown" and the generator set is transitioning from rated to idle mode.
   a. This event/fault code can be mapped to a configurable customer output relay in order to send external notification via the relay on the base board to users so that proper action can be taken in the time given before the generator set transitions to idle. This fault can be disabled by setting the "Rated to Idle Transition Delay" to 0 seconds.

      To access the setup menu through the Operator Panel, go to **Setup > Genset Setup > Rated to Idle Delay** and set appropriately.

10.8.32 Code 1124 - Delayed Shutdown

Logic:

Provides advance warning of an impending generator set shutdown to loads which cannot handle sudden losses of power.

Possible Causes:

1. A shutdown fault.

Diagnosis and Repair:

1. A shutdown fault.
   a. Event/fault code 1124 is activated as a result of another non-critical shutdown fault. Troubleshoot the other non-critical shutdown fault(s) that is(are) causing the generator set to shutdown. This event/fault code was designed to send an external notification through a configurable customer output relay on the base board to loads which cannot handle a sudden loss of power. The generator set base board will send a signal to critical loads and will wait for the amount of time in the “Delayed Shutdown Time" parameter before shutting down the generator set. go to **Setup > Genset Setup > Delayed shutdown delay** from the operator panel and set appropriately.

10.8.33 Code 1131 - Battle Short Active

Logic:

Battle Short has been enabled.

Possible Causes:

1. Battle Short enabled.

Diagnosis and Repair:

1. Disable Battle Short.
   a. The purpose of this fault is to provide a record in the fault history and fault occurrence list that the Battle Short feature is activate. The Battle Short fault becomes active when all of the following are true:
      - The Battle Short parameter is Enabled.
      - One of the configurable inputs on the base board is configured for Battle Short.
      - The configurable input configured for Battle Short becomes Active.

10.8.34 Code 1132 - Controlled Shutdown

Logic:

A fault set to Shutdown with Cooldown is active and has put the generator set in a controlled shutdown.

Possible Causes:

1. A fault set to Shutdown with Cooldown is active.

Diagnosis and Repair:

1. A fault is set to Shutdown with Cooldown is active.
    a. Event/fault code 1132 is activated by another active event/fault that is set to "Shutdown with Cooldown". Troubleshoot the other shutdown fault(s) that are causing the generator set to shutdown. A controlled shutdown of the system allows first for loads to be transferred or ramped off, and then for a proper cooldown of the generator set to take place before shutting down. Go to **Setup > Genset Setup > Ctrld Shutdown Advance** from the Operator Panel in order to appropriately set the Controlled Shutdown Advanced Notice Delay.

10.8.35 Code 1219 - Utility CB Tripped

Logic:

The Utility CB has tripped.

Possible Causes:

1. Overload, Short Circuit, or Ground Fault.
2. Incorrectly wired or short circuit.
3. CB Trip solenoid is incorrectly configured or faulty.
4. Faulty Utility CB.

Diagnosis and Repair:

1. Overload, Short Circuit, or Ground Fault.
    a. Check the load of the application, load cables, and the ground fault relay if available. Repair if necessary.
2. Incorrectly wired or short circuit.
    a. Verify the wiring from the Utility CB to the Utility CB Tripped status input on the base board. The Utility CB Tripped status input is a Normally Open contact at TB10-5 and TB10-1 (B+ Return). Ensure that the connection from the Utility CB to TB10-5 on the base board is not shorted to ground.
3. CB Trip solenoid is incorrectly configured or faulty.
    a. Utility CB Trip settings are configured to trip at a low over-current threshold. Check other settings on the Utility CB that might cause it to trip since circuit breakers can have multiple trip settings. Configure the Utility CB Trip Solenoid to trip at adequate trip settings for the application.
    b. Faulty Trip solenoid.
4. Faulty Utility CB.

10.8.36 Code 1223 - Utility Frequency Error

Logic:

In Power Transfer Control (PTC) Operation, if the “Utility Frequency Sensor Enable" parameter is enabled and the utility frequency exceeds the “Utility Frequency Upper Drop-Out Threshold", or is below the “Utility Frequency Lower Drop-Out Threshold", or is Out of Range Low, for the “Utility Frequency Drop-Out Delay", fault code 1223 will become active.

Possible Causes:

1. Utility Frequency drop-out thresholds are incorrectly set.
2. The frequency of the Utility is not stable.

Diagnosis and Repair:

1. Utility Frequency drop-out thresholds are incorrectly set.
   a. This fault will become active when the Utility Frequency goes above or below the drop-out thresholds. Drop-out threshold are dependent of the following parameters:
      - Utility Center Frequency.
      - Utility Frequency Pick-Up Bandwidth.
      - Utility Frequency Drop-Out Bandwidth.

      To Modify the preceding parameters, on the display go to: **Setup > Paralleling Setup > Power Transfer Control > Center Frequency** or **Pick-Up BW** or **Drop-out BW** or **Drop-Out Delay** and set appropriately. Refer to the PTC section for setup information and instructions.

   b. To disable this function, set the “Utility Frequency Sensor Enable" parameter to disable. On the display go to: **Setup > Paralleling Setup > Power Transfer Control > Enable** and set appropriately. Refer to the PTC section for more information.
2. The frequency of the Utility is not stable.
   a. The frequency of the utility is unstable, check with your utility company.

10.8.37 Code 1224 - High Genset Voltage

Logic:

In Power Transfer Control (PTC) Operation, if the “Genset Overvoltage Sensor Enable" parameter is set to enable, and the generator set voltage goes above the “Genset Overvoltage Drop-Out Threshold", for the “Genset Overvoltage Drop-Out Delay" time, fault code 1224 will become active.

Possible Causes:

1. Genset High AC Voltage fault.
2. Genset Overvoltage drop-out thresholds are incorrectly set.

Diagnosis and Repair:

1. Genset High AC Voltage fault.
   a. If the High AC Voltage fault is active on the display, refer to the troubleshooting procedures for High AC Voltage, fault code 1446.

2. Genset Overvoltage drop-out thresholds are incorrectly set.

   a. This fault will become active when the Genset voltage goes above the “Genset Overvoltage Drop-Out Threshold" for the “Genset Overvoltage Drop-Out Delay" time. The generator set overvoltage drop-out threshold is dependent of the following parameters:

      - Genset Overvoltage Drop-out percentage.
      - Genset Overvoltage Drop-out Delay.

      To Modify the preceding parameters, on the display go to: **Setup > Paralleling Setup > Power Transfer Control > Drop out** or **Drop-Out Delay** and set appropriately. Refer to the PTC section for setup information and instructions.

   b. To disable this function, set the “Genset Overvoltage Sensor Enable" parameter to disable. On the display go to: **Setup > Paralleling Setup > Power Transfer Control > Enable** and set appropriately. Refer to the PTC section for more information.

10.8.38 Code 1225 - Low Genset Voltage

Logic:

In Power Transfer Control (PTC) Operation, if the generator set voltage drops below the “Genset Undervoltage Drop-Out Threshold", for the “Genset Undervoltage Drop-Out Delay" time, fault code 1225 will become active.

Possible Causes:

1. Genset Low AC Voltage fault.
2. Genset Undervoltage drop-out thresholds are incorrectly set.

Diagnosis and Repair:

1. Genset Low AC Voltage fault.

   a. If the Low AC Voltage fault is active on the display, refer to the troubleshooting procedures for Low AC Voltage, fault code 1447.

2. Genset Undervoltage drop-out thresholds are incorrectly set.

   a. This fault will become active when the generator set voltage drops below the “Genset Undervoltage Drop-Out Threshold" for the “Genset Undervoltage Drop-Out Delay" time. The generator set Undervoltage drop-out threshold is dependent of the following parameters:

      - Genset Undervoltage Drop-out percentage.
      - Genset Undervoltage Drop-out Delay.

      To Modify the preceding parameters, on the display go to: **Setup > Paralleling Setup > Power Transfer Control > Drop out** or **Drop-Out Delay** and set appropriately. Refer to the PTC section for setup information and instructions.

10.8.39 Code 1226 - Genset Frequency Error

Logic:

In Power Transfer Control (PTC) Operation, if the “Genset Frequency Sensor Enable" parameter is enabled and the generator set frequency exceeds the “Genset Frequency Upper Drop-Out Threshold", or is below the “Genset Frequency Lower Drop-Out Threshold", or is Out of Range Low, for the “Genset Frequency Drop-Out Delay", fault code 1226 will become active.

Possible Causes:

1. Genset Frequency drop-out thresholds are incorrectly set.
2. The frequency of the generator set is not stable.

Diagnosis and Repair:

1. Genset Frequency drop-out thresholds are incorrectly set.
    a. This fault will become active when the Genset Frequency goes above or below the drop-out thresholds. Drop-out threshold are dependent of the following parameters:
        - Genset Center Frequency.
        - Genset Frequency Pick-Up Bandwidth.
        - Genset Frequency Drop-Out Bandwidth.

        To Modify the preceding parameters, on the display go to: **Setup > Paralleling Setup > Power Transfer Control > Center Frequency** or **Pick-Up BW** or **Drop-out BW** or **Drop-Out Delay** and set appropriately. Refer to the PTC section for setup information and instructions.
2. The frequency of the generator set is not stable.
    a. If the generator set frequency is not stable or the generator set is hunting/oscillating while it is running, refer to the troubleshooting procedures for fault codes 1448 and 1449.

10.8.40 Code 1243 - Engine Derated

Logic:

Event/fault code 1243 will become active if the engine has gone into a derate mode to protect itself from a shutdown, and if there are no other active derate events on the PCC.

Possible Causes:

1. A derate condition has been initiated by the engine ECM.

Diagnosis and Repair:

1. A derate condition has been initiated by the engine ECM.
    a. Event/fault code 1243 is activated by another active engine fault. Determine the fault(s) that caused the engine to derate by checking the operator panel or using InPower or InSite to connect to the ECM. Troubleshoot the event/fault(s) and resolve the issue(s) (Reference the Engine Service Manual). After the issue is resolved, press the Reset button on the generator set control to allow the generator set to return to a normal mode of operation. If the issue is not resolved when the Reset button is pressed, the engine will stay in derated mode.

10.8.41 Code 1244 - Engine Normal Shutdown

Logic:

A normal shutdown with cooldown request has been received by the engine and no active Shutdown with Cooldown faults exist.

Possible Causes:

1. The generator set is going through a normal shutdown with cooldown.

Diagnosis and Repair:

1. The generator set is going through a normal shutdown with cooldown.
   a. The generator set is going through a normal shutdown with cooldownand there are no active shutdown faults in the ECM for at least 2 seconds.

10.8.42 Code 1245 - Engine Shutdown Fault

Logic:

Engine shutdown fault has occurred in the engine ECM.

Possible Causes:

1. Engine shutdown fault.

Diagnosis and Repair:

1. Engine shutdown fault.
   a. Event/fault code 1245 is activated by another active shutdown fault in the ECM. Connect to the Engine ECM with InPower or InSite to determine the actual shutdown fault that is generating event/fault code 1245; then troubleshoot the shutdown fault(s) (Reference the Engine Service Manual).

10.8.43 Code 1246 - Unknown Engine Fault

Logic:

An unrecognized engine fault has been received over the datalink.

Possible Causes:

1. The generator set control has received an unknown event/fault code from the ECM.

Diagnosis and Repair:

1. The generator set control has received an unknown event/fault code from the ECM.
   a. Connect directly to the Engine ECM with InPower or InSite to determine the actual warning or shutdown fault that is generating event/fault code 1246. Troubleshoot the fault(s) that are causing the generator set to display event/fault code 1246 (Reference the Engine Service Manual).

10.8.44 Code 1248 - Engine Warning

Logic:

An engine warning fault has occurred in the engine ECM.

Possible Causes:

1. An engine warning fault is active.

Diagnosis and Repair:

1. An engine warning fault is active.
   a. Event/fault code 1248 is activated by another active warning fault in the ECM. Connect to the Engine ECM with InPower or InSite to determine the actual warning fault that is generating event/fault code 1248; then troubleshoot the warning fault(s) (Reference the Engine Service Manual).

10.8.45 Code 1312 - Config Input #2 Fault

Logic:

Configurable input #2 fault is active.

Possible Causes:

1. Condition for which "Configurable Input #2" is configured for is active.
2. “Configurable Input #2 Active State Selection" parameter is configured incorrectly.
3. Incorrectly wired; or open circuit or short circuit in the wiring.
4. External Switch is faulty.

Diagnosis and Repair:

1. Condition for which "Configurable Input #2" is configured for is active.
   a. Check the condition for which "Configurable Input #2" has been configured for; ex. if "Configurable Input #2" was configured to become active when the fuel level is low, check the fuel level and add fuel if needed. After the issue is resolved, press the Reset button on the Operator Panel in order to clear the fault, if the fault does not clear go to step 2.
2. “Configurable Input #2 Active State Selection" parameter is configured incorrectly.
   a. With InPower or through the Operator Panel check the switch input setting (active closed or active open) for Configurable Input #2. Ensure that the switch input setting is correctly set. If “Configurable Input #2 Input Function Pointer" parameter is set to default and if “Configurable Input #2 Active State Selection" parameter is set to “active closed", input 2 (event/fault code 1312) will become active when TB1-14 (input 2) and TB1-15 (ground) are connected (shorted) together.

      If “Configurable Input #2 Input Function Pointer" parameter is set to default and if “Configurable Input #2 Active State Selection" parameter is set to “active open", input 2 (event/fault code 1312) will become active when there is an open circuit between TB1-14 (input 2) and TB1-15 (ground).

      To access the input configuration on the operator panel go to **Setup > Configurable I/O > Config Input #2 Menu > Active** (level-1 password 574 required) and set this parameter appropriately for the application.
3. Incorrectly wired; or open circuit or short circuit in the wiring.
   a. Check the wiring at TB1-14 (input 2) and TB1-15 (ground) for an open circuit, short circuit, or a miswired condition.
4. External Switch is faulty.
   a. Check for External Switch functionality.

10.8.46 Code 1317 - Config Input #13 Fault

Logic:

Configurable input #13 (input # 3) fault is active.

Possible Causes:

1. Condition for which "Configurable Input #3" is configured for is active.
2. “Configurable Input #13 (input #3) Active State Selection" parameter is configured incorrectly.
3. Incorrectly wired; or open circuit or short circuit in the wiring.

   External Switch is faulty.

Diagnosis and Repair:

1. Condition for which "Configurable Input #3" is configured for is active.
   a. Check the condition for which "Configurable Input #3" has been configured for; ex. if "Configurable Input #3" was configured to become active when the fuel level is low, check the fuel level and add fuel if needed. After the issue is resolved, press the Reset button on the Operator Panel in order to clear the fault; if the fault does not clear, go to step 2.
2. “Configurable Input #13 (input #3) Active State Selection" parameter is configured incorrectly.
   a. With InPower or through the operator panel check the switch input setting (active closed or active open) for Configurable Input #3. Ensure that the switch input setting is correctly set. If “Configurable Input #13 (input #3) Input Function Pointer" parameter is set to default and if “Configurable Input #13 (input #3) Active State Selection" parameter is set to “active closed", (Input 3, event/fault code 1317) will become active when TB8-7 (input 3) and TB8-12 (ground) are connected (shorted) together.

      If “Configurable Input #13 (input #3) Input Function Pointer" parameter is set to default and if “Configurable Input #13 (input #3) Active State Selection" parameter is set to “active open", (Input 3, event/fault code 1317) will become active when there is an open circuit between TB8-7 (input 3) and TB8-12 (ground).

      To access the input configuration on the operator panel go to **Setup > Configurable I/O > Config Input #13 Menu > Active** (level-1 password 574 required) and set this parameter appropriately for the application.
3. Incorrectly wired; or open circuit or short circuit in the wiring.
   a. Check the wiring at TB8-7 (input 3) and TB8-12 (ground) for an open circuit, short circuit, or a miswired condition.
4. External Switch is faulty.
   a. Check for External Switch functionality.

10.8.47 Code 1318 - Config Input #14 Fault

Logic:

Configurable input #14 (input #4) fault is active.

Possible Causes:

1. Condition for which "Configurable Input #4" is configured for is active.
2. “Configurable Input #14 (input #4) Active State Selection" parameter is configured incorrectly.
3. Incorrectly wired; or open circuit or short circuit in the wiring.

4. External Switch is faulty.

Diagnosis and Repair:

1. Condition for which "Configurable Input #4" is configured for is active.
   a. Check the condition for which "Configurable Input #4" has been configured for; ex. if "Configurable Input #4" was configured to become active when the fuel level is low, check the fuel level and add fuel if needed. After the issue is resolved, press the Reset button on the Operator Panel in order to clear the fault, if the fault does not clear go to step 2.
2. “Configurable Input #14 (input #4) Active State Selection" parameter is configured incorrectly.
   a. With InPower or through the operator panel, check the switch input setting (active closed or active open) for Configurable Input #4. Ensure that the switch input setting is correctly set. If “Configurable Input #14 (input #4) Input Function Pointer" parameter is set to default and if “Configurable Input #14 (input #4) Active State Selection" parameter is set to “active closed", (Input 4, event/fault code 1318) will become active when TB8-8 (input 4) and TB8-13 (ground) are connected (shorted) together.

      If “Configurable Input #14 (input #4) Input Function Pointer" parameter is set to default and if “Configurable Input #14 (input #4) Active State Selection" parameter is set to “active open", (Input 4, event/fault code 1318) will become active when there is an open circuit between TB8-8 (input 4) and TB8-13 (ground).

      To access the input configuration on the operator panel go to **Setup > Configurable I/O > Config Input #14 Menu > Active** (level-1 password 574 required) and set this parameter appropriately for the application.
3. Incorrectly wired; or open circuit or short circuit in the wiring.
   a. Check the wiring at TB8-8 (input 4) and TB8-13 (ground) for an open circuit, short circuit, or a miswired condition.
4. External Switch is faulty.
   a. Check for External Switch functionality.

10.8.48 Code 1328 - Genset CB Tripped

Logic:

The Genset CB has tripped.

Possible Causes:

1. Correct any active generator set faults.
2. Incorrectly wired or short circuit.
3. CB Trip solenoid is incorrectly configured or faulty.
4. Faulty Genset CB.

Diagnosis and Repair:

1. Correct any active generator set faults.
   a. Check for active generator set faults on the display (especially Overload, Short Circuit, or Ground Faults); then correct these faults.

2. Incorrectly wired or short circuit.
    a. Verify the wiring from the Genset CB to the Genset CB Tripped status input on the base board. The Genset CB Tripped status input is a Normally Open contact at TB10-10 and TB10-2 (B+ Return). Ensure that the connection from the Genset CB to TB10-10 on the base board is not shorted to ground.
3. CB Trip solenoid is incorrectly configured or faulty.
    a. Genset CB Trip settings are configured to trip at a low over-current threshold. Check other settings on the Genset CB that might cause it to trip since circuit breakers can have multiple trip settings. Configure the Genset CB Trip Solenoid to trip at adequate trip settings for the application.
    b. Faulty Trip solenoid.
4. Faulty Genset CB.

10.8.49 Code 1416 - Fail To Shutdown

Logic:

To provide a record in the fault history that generator set shutdown faults were bypassed while the control was in Battle Short mode.

Possible Causes:

1. A shutdown fault was bypassed while the Battle Short feature was enabled on the control.

Diagnosis and Repair:

1. A shutdown fault was bypassed while the Battle Short feature was enabled on the control.
    a. Event/fault code 1416 is activated because of an active “Shutdown fault" while the control is operating in battle-short mode. Troubleshoot the other shutdown fault(s) that are causing the generator set to display event/fault code 1416.

10.8.50 Code 1417 - Power Down Failure

Logic:

The control has failed to go to sleep.

Possible Causes:

1. Faulty base board.

Diagnosis and Repair:

1. Faulty base board.
    a. Remove power (B+) from the control for 5-10 seconds and reconnect B+ to the control. If the control fails to go to sleep after power is cycled from the control and the control shows event/fault code 1417 again, replace the base board.

10.8.51 Code 1433 - Local E-Stop

Logic:

The Local Emergency Stop has been activated.

Possible Causes:

1. The Local Emergency Stop button has been activated.
2. Faulty connection or faulty Emergency Stop switch.

Diagnosis and Repair:

1. The Local Emergency Stop button has been activated.
   a. Reset the Local Emergency Stop:
      1. Pull the Local Emergency stop button out.
      2. Press the Off button.
      3. Press the Reset button.
      4. Select Manual or Auto as required.
2. Faulty connection or faulty Emergency Stop switch.
   a. Check the Emergency Stop button, and verify that it is working properly. The Emergency Stop button is a closed relay when it is pulled out (not active), and open relay when depressed (active).
   b. Verify that the connection/wiring from the Local Emergency Stop switch to the control for an open circuit condition. A ground connection to the Local E-Stop control input (J25 - 2 Input; J25 - 6 Ground) disables the emergency stop alarm. An open circuit should activate the Emergency stop alarm.

      J25 - 2 Input

      J25 - 6 Ground

10.8.52 Code 1434 - Remote E-Stop

Logic:

The Remote Emergency Stop has been activated.

Possible Causes:

1. The Remote Emergency stop button has been activated.
2. Faulty connection or faulty Emergency Stop switch.

Diagnosis and Repair:

1. The Remote Emergency stop button has been activated.
   a. Reset the Remote Emergency Stop:
      1. Pull the Remote Emergency stop button out.
      2. Press the Off button.
      3. Press the Reset button.
      4. Select Manual or Auto as required.
   b. If the Remote Emergency Stop is not used, then install a jumper between:

      TB1 – 16 Input

      TB1 – 15 Ground

      And repeat step 1a.

2. Faulty connection or faulty Emergency Stop switch.

   a. Check the Emergency Stop button, and verify that it is working properly. The Emergency Stop button is a closed relay when it is pulled out (not active), and open relay when depressed (active).

   b. Verify that the connection/wiring from the Remote Emergency Stop switch to the control for an open circuit condition. A ground connection to the Remote E-Stop control input (TB1 – 16 Input; TB1 – 15 Ground) disables the emergency stop alarm. An open circuit should activate the Emergency stop alarm.

      TB1 – 16 Input

      TB1 – 15 Ground.

10.8.53 Code 1435 - Low Coolant Temperature

Logic:

Engine coolant temperature is below the low coolant temperature warning threshold.

Possible Causes:

1. Threshold is set too high.
2. Faulty or incorrectly configured PCCNet Annunciator.
3. Coolant heater(s) is/are not operating properly.
4. Low ambient temperature.
5. Thermostat not operating properly.

Diagnosis and Repair:

1. Threshold is set too high.

   Check the LCT Warning Threshold parameter and verify it is set to an appropriate threshold. On the operator panel, to access the LCT Warning Threshold parameter, go to **Setup > Genset Setup > LCT Warning Threshold.**

2. Faulty or incorrectly configured PCCNet Annunciator.

   a. If a PCCNet Annunciator is not used, go to step 3. If a PCCNet Annunciator is used, check the wiring from the back of the PCCNet Annunciator at TB2-8 to the Low Coolant Temp sender and ensure that an open circuit or short circuit does not exist in the wiring.

   b. Refer to the PCCNet Annunciator Operator's Manual to ensure that the Annunciator is configured correctly; since inputs can be configured to Active Open or Active Closed. Then check the input on the back of the PCCNet Annunciator at TB2–8 and insure that the input signal into the PCCNet Annunciator is properly configured.

3. Coolant heater(s) is/are not operating properly.

   a. Ensure that the coolant heater(s) is/are connected properly to a power supply, check for open circuits in the wiring. Ensure that the power supply of the coolant heater is working properly.

   b. Measure the temperature of the coolant heater(s) using a proper temperature measuring device. If the ambient temperature is above 40 degrees F, the measured temperature of the coolant heater(s) should be above close to 90 degrees F (dependent on ambient temperature). If the temperature of the coolant heater(s) is close to the ambient temperature, replace the coolant heater(s). If the ambient temperature is very low, do not replace the coolant heaters, go to step 5.

4. Low ambient temperature.
    a. If the coolant heaters are working properly and the radiator has enough coolant, but the ambient temperature around the generator set is very cold (less than 40 degrees F); the coolant heaters might not have the capability to keep the coolant temperature above 70 degrees F. This could be an application issue and will need to be further investigated.
5. Thermostat not operating properly.
    a. Check the operation of the thermostat.

10.8.54 Code 1438 - Fail to Crank

Logic:

The engine has failed to crank when given a start signal.

Possible Causes:

1. Low battery voltage or weak battery.
2. Faulty starter.
3. Faulty Emergency Stop switch or faulty connection.
4. Faulty base board or relays.
5. Inadequate air supply (air start only, LBNG).
6. Rotating mechanisms are locked or faulty (LBNG).

Diagnosis and Repair:

1. Low battery voltage or weak battery.
    a. During cranking if the battery voltage goes below the engine ECM minimum operating voltage, the ECM will reset and event/fault code 1438 will become active. Refer to event/fault code 441 and 1442.
2. Faulty starter.
    a. Reset the control by pressing the Reset button on the operator panel. Then test for B+ at the starter while attempting to start the generator set. If there is B+ at the starter, and the starter does not crank, then the starter could be faulty. Test the starter (see engine service manual), and replace if faulty. If B+ is not present at the starter, go to the next step.
3. Faulty emergency stop switch or faulty connection.
    a. If the emergency stop is depressed (engaged), the control will not provide voltage to the starter pilot relay or the starter control relay. Ensure that the emergency stop button is functioning correctly, measure the outputs of the E-Stop (Normally Open and Normally Closed contacts) and ensure that the outputs switch state correctly when engaged and disengaged, replace the switch if faulty.
    b. Check the wiring from the base board (E-Stop B+ and J20 - 14 (negative)) to the FSO relay for short or open circuits. If short or open circuits are found, correct the wiring.
    c. Check the wiring from the base board (E-Stop B+ and J20-15 (negative)) to the starter control relay for short or open circuits. If short or open circuits are found, correct the wiring.
4. Faulty base board or relays.
    a. Ensure that the control board is sending a signal to the FSO control relay. Measure the voltage at E-Stop B+ and J20 - 14 (negative) while cranking the generator set; if a B+ signal is not available, the base board is faulty; replace the base board. If a B+ signal is available at the input of the FSO control relay, go to the next step.

b. The FSO relay is a normally-open relay. Ensure that B+ is available to the relay and then measure the voltage output. If there is a B+ at both the input and output of the FSO Control relay, the relay is not faulty. If B+ is noted at the input but not at the output of the FSO Control relay, replace the relay.

c. Ensure that the control board is sending a signal to the starter control relay. Measure the voltage at E-Stop B+ and J20-15 (negative) while cranking the generator set; if a B+ signal is not available, the base board is faulty; replace the base board. If a B+ signal is available at the input of the starter control relay, go to the next step.

d. The starter control relay is a normally-open relay. Ensure that B+ is available to the input of the relay and then measure the voltage output. If there is a B+ at both the input and output of the starter control relay, the relay is not faulty. If B+ is noted at the input but not at the output of the starter control relay, replace the relay.

5. Inadequate air supply (air start only, LBNG).

   a. Verify all valves controlling air supply to the starter are completely open/functioning properly.

   b. Verify the line supply pressure is per generator set spec.

   c. During crank attempts, verify line pressure does not drop below the minimum required for cranking.

6. Rotating mechanisms are locked or faulty (LBNG).

   a. Properly lock-out the generator set to prevent accidental starting during this diagnosis.

   b. Check for machine rotation by physically barring the engine.

NOTICE
Each generator set barring interface is different; verify a means of barring per your generator set service manual.

   c. If the machine rotates without significant effort, the fail to crank issue lies with another component.

   d. If the machine rotated with significant effort or does not rotate at all, contact your service provider for further investigation. Do not attempt to force the machine to rotate with tremendous effort as you may propagate the issue.

10.8.55 Code 1439 - Low Day Tank Fuel

Logic:

Indicates day tank fuel supply is running low.

Possible Causes:

1. Fuel sender incorrectly wired.
2. Faulty fuel sender.
3. The “Configurable Input Active State Selection" parameter is configured incorrectly.

Diagnosis and Repair:

1. Fuel sender incorrectly wired.

   a. Check the wiring for improper wiring, a short or open circuit from the fuel sensor to the discrete configurable input on the base board that was configured for the “Low Day Tank Fuel Level". If a short or open circuit or improper wiring is found, correct the wiring.

2. Faulty fuel sender.

    a. Measure the resistance of the fuel sender at the day tank. If the sender is reading incorrectly (Shorted or Open Circuit), replace the fuel sender.

3. The "Configurable Input Active State Selection" parameter is configured incorrectly.

    a. With InPower or through the operator panel, check the switch input setting (active closed or active open) for the configurable input that was configured to “Low Fuel in Day Tank Switch". Ensure that the switch input setting is correctly set. If the “Configurable Input Function Pointer" parameter is set to “Low Fuel in Day Tank Switch" and the “Configurable Input Active State Selection" parameter is set to “active closed", event/fault code 1439 will become active when the configurable input that was configured to “Low Fuel in Day Tank Switch" is connected to ground.

       If the “Configurable Input Function Pointer" parameter is set to “Low Fuel in Day Tank Switch" and the “Configurable Input Active State Selection" parameter is set to “active open", event/fault code 1439 will become active when the configurable input that was configured to “Low Fuel in Day Tank Switch" is an open circuit.

       To access the input configuration on the operator panel go to **Setup > Configurable I/O >** and set the “Configurable Input Active State Selection" parameter appropriately for the configurable input that was configured to “Low Fuel in Day Tank Switch".

10.8.56 Code 1441 - Low Fuel Level

Logic:

The "Fuel level % (AUX 101)" input has gone below the "Low Fuel Level Threshold (AUX 101)" setting for the time in the "Low Fuel Level Time (AUX 101)" setting.

Possible Causes:

1. Check for fuel level in tank.
2. Fuel sender incorrectly wired.
3. Faulty fuel sender.
4. The “Low Fuel Set/Clear Time" parameter is configured incorrectly.

Diagnosis and Repair:

1. Low fuel in tank.

    a. Check for fuel in tank, if low then fill fuel.

2. Check the wiring of the fuel sensor.

    a. Ensure that the sender is correctly wired to the base board. Check the wiring for a short circuit from the fuel sensor to the input on the base board that is configured for the “Fuel Level". If a short circuit is found, correct the wiring.

3. Faulty fuel sender.

    a. Measure the resistance between the fuel level signal pin and the fuel level return pin. The resistance should be between 600 Ohms to 2500 Ohms when the tank is full. Replace the sender if the resistance value is below the recommended threshold when the fuel tank is full.

4. The "Low Fuel Set/Clear Time" parameter is configured incorrectly.

    a. Check the low fuel level setup parameter. To access the input configuration on the operator panel go to **Setup > Genset Setup** and set the "Low Fuel Set/Clear Time" parameter appropriately for the application.

10.8.57 Code 1442 - Weak Battery

Logic:

This fault occurs when the engine is starting (cranking) and the voltage of the battery drops below the “Weak Battery Voltage threshold" for the time set in the “Weak Battery Voltage Set Time".

Possible Causes:

1. Weak or discharged battery.
2. Battery connections are loose or dirty.
3. “Weak battery" voltage threshold parameter is set too high.
4. Insufficient battery charging voltage.
5. Faulty engine DC alternator.
6. Faulty harness.

Diagnosis and Repair:

1. Weak or discharged battery.
   a. Measure the voltage of the battery with a voltmeter. Battery voltage should be 12 VDC or greater in a 12 V system or 24 VDC or greater in a 24 VDC system. If the battery voltage is low, check the electrolyte level in the battery. Replenish the electrolyte level if low and recharge the battery; the specific gravity for a fully charged lead acid battery is approximately 1.260 at 80 ºF (27 ºC).
   b. If the battery cannot hold adequate voltage, then replace the battery.
2. Battery connections are loose or dirty.
   a. Clean and tighten battery terminals and battery cable connectors. If the battery cable connectors are cracked or worn out, then replace.
3. "Weak battery" voltage threshold parameter is set too high.
   a. Ensure that the Weak Battery Voltage parameter is set to an appropriate voltage value that takes into account voltage drop during cranking (refer to the parameter list to see the default value). To access the battery voltage setup menu from the operator panel, go to **Setup > OEM Setup > OEM Engine Setup > Weak Battery** and change the weak battery voltage parameter of the control accordingly.
4. Insufficient battery charging voltage.
   a. Ensure that the battery charger is charging the battery at an acceptable rate. Adjust the charge rate if the rate is below the recommendation of the manufacturer.
   b. If the battery located far from the battery charger, ensure that a proper wire size is used to compensate for voltage drop.
5. Faulty engine DC alternator.
   a. Check the engine DC alternator. If normal charging voltage is not 12 to 14 VDC in a 12 V system or 24 to 26 VDC in a 24 V system then replace the DC alternator.
6. Faulty harness.
   a. Measure the battery voltage at the battery terminals, then measure the battery voltage at the base board input. Measure the voltage at B+ (J20–9, J20–10, J20-20, J20–21) and B- (negative) input (J20– 2, J20–4, J20–7, J20–12).
      - If the voltage at the battery terminals and the control is not the same then check the harness and replace if necessary.

10.8.58 Code 1443 - Dead Battery

Logic:

During cranking, the battery voltage drops below the operating voltage of the control, which resets the control. After the control has reset three consecutive times, event/fault code 1443 will become active.

Possible Causes:

1. Weak or discharged battery.
2. Battery connections are loose or dirty.
3. Insufficient battery charging voltage.
4. Faulty engine DC alternator.
5. Faulty harness.

Diagnosis and Repair:

1. Weak or discharged battery.
   a. Measure the voltage of the battery with a voltmeter. Battery voltage should be 12 VDC or greater in a 12 V system or 24 VDC or greater in a 24 VDC system. If the battery voltage is low, check the electrolyte level in the battery. Replenish the electrolyte level if low and recharge the battery; the specific gravity for a fully charged lead acid battery is approximately 1.260 at 80 °F (27 °C).
   b. If the battery cannot hold adequate voltage, then replace the battery.
2. Battery connections are loose or dirty.
   a. Clean and tighten battery terminals and battery cable connectors. If the battery cable connectors are cracked or worn out, then replace.
3. Insufficient battery charging voltage.
   a. Ensure that the battery charger is charging the battery at an acceptable rate. Adjust the charge rate if the rate is below the recommendation of the manufacturer.
   b. If the location of the battery is a far distance from the battery charger, ensure that a proper wire size is used to compensate for voltage drop.
4. Faulty engine DC alternator.
   a. Check the engine DC alternator. If normal charging voltage is not 12 to 14 VDC in a 12 V system or 24 to 26 VDC in a 24 V system then replace the DC alternator.
5. Faulty harness.
   a. Measure the battery voltage at the battery terminals while the generator set is cranking, then measure the battery voltage at the base board input while the generator set is cranking. Measure the voltage at B+ (J20–9, J20–10, J20-20, J20–21) and B- (negative) input (J20–2, J20–4, J20–7, J20–12).
      - If the voltage at the battery terminals and the control is not the same then check the harness and replace if necessary.

10.8.59 Code 1444 - kW Overload

Logic:

The "Overload Threshold" has been exceeded for the time that is registered in the "Overload Set Time" parameter.

Possible Causes:

1. The "Overload Threshold" parameter is set too low.
2. Short in the load or load cables.
3. Incorrect CT Ratio, CTs, or CT connections.
4. Incorrect PT Ratio, PTs, or PT connections.

Diagnosis and Repair:

1. The "Overload Threshold" parameter is set too low.
   a. To access the input configuration on the operator panel go to **Setup > Genset Setup** and set the "Overload Threshold" parameter appropriately for the application. Refer to the parameter section to see the default value for Overload (Setting the overload threshold too high can cause damage to the alternator).
2. Short in the load or load cables.
   a. Check the load and load cables. Repair if necessary.
3. Incorrect CT Ratio, CTs, or CT connections.
   a. Check the CT Ratio, CTs, and CT connections, reference event/fault code 2814.
4. Incorrect PT Ratio, PTs, or PT connections.
   a. Check the PT Ratio, PTs, and PT connections, reference event/fault code 2816.

10.8.60 Code 1445 - Short Circuit

Logic:

The generator output current has exceeded 175% of rated current.

NOTICE
This fault remains active and cannot be reset until the Alternator Overheat Integral time has expired (which takes up to five minutes). The Alternator Overheat Integral time allows the alternator to cool down before allowing a restart.

Possible Causes:

1. Short in the load or load cables.
2. Faulty CTs, incorrect CT ratio, CTs, CT connections.

Diagnosis and Repair:

1. Short in the load or load cables.
   a. Check the load and load cables. Repair if necessary.
2. Faulty CTs, incorrect CT ratio, CTs, CT connections.
   a. Verify the CT connections are correct from the CTs to the input of the base board.
   b. Ensure the control is set up for the correct CT ratio. Reference event/fault code 2814 for CT ratio troubleshooting information.
   c. Check the current going into the CT input on the control board (use a current probe to check the secondary output of the CT). This should be the value that the control secondary is calibrated with. (e.g. If the control is calibrated with a CT Ratio of 1000:5, the current input into the base board should not be more than 5 A.)

d. If previous steps check out ok, replace the base board.

10.8.61 Code 1446 - High AC Voltage

Logic:

One or more of the phase voltages has exceeded the high AC voltage threshold .

Possible Causes:

1. Fault simulation is enabled.
2. The High AC Voltage Trip parameter is incorrectly set for the application.
3. The High AC Voltage threshold is set too low for the application.
4. Faulty PTs, incorrect PT ratio, PTs, PT connections.
5. Faulty AVR.
6. Faulty PMG.
7. Governor preload offset percentage too high.

Diagnosis and Repair:

1. Fault simulation is enabled.
   a. Connect with InPower and ensure that the fault simulation for High AC Voltage is not enabled. If InPower is not available, cycle power to the control:

      1. Depress the Emergency Stop button and wait 30 seconds.

      2. Disconnect/disable the battery charger.

      3. Disconnect the battery (disconnect negative first).

      4. Leave the controller without power for 1 minute.

      5. Reconnect the battery, enable the battery charger, pullout the E-Stop button, and reset the control (in this order).
2. The High AC Voltage Trip parameter is incorrectly set for the application.
   a. Ensure that the High AC voltage parameter is set correctly for the application.

      If the control is set up as “Inverse time", it will be more sensitive to voltage spikes and will trip more rapidly; “Inverse time" follows the “Instantaneous High AC Voltage Threshold".

      If the control is set to “Fixed Time", it will allows a greater time delay until shutdown when voltage overshoots; when trying to start a large motor, the “Fixed time" setting is recommended. This parameter works with the “High AC Voltage Delay" parameter.

      To access the configuration menu on the operator panel go to **Setup > OEM Setup > OEM ALT Setup > High AC Voltage Trip** and set the “High AC Voltage Trip" parameter appropriately for the application.
3. The High AC Voltage threshold is set too low for the application.
   a. To access the High AC Voltage configuration menu on the operator panel go to **Setup > OEM Setup > OEM ALT Setup > High AC Voltage Threshold** and set the “High AC Voltage Threshold" parameter appropriately for the application. Refer to the parameter list to see the default value for High AC Voltage.

4. Faulty PTs, incorrect PT ratio, PTs, PT connections.

    a. Check the connections from the alternator to the PT, and from the PT to the base board. (Three phase inputs on the base board: L1 = J22-1, L2 = J22-2, L3 = J22-3, LN = J22-4; for single phase use L1, L2 and LN). If the wires are incorrectly connected, or there is an open circuit, correct the wiring issue. (If the voltage input is less than 600 VAC, a PT is not required.)

    b. Ensure that the control is set up with the correct PT ratio (primary vs. secondary). Reference event/fault code 2816 for troubleshooting information on the PT ratio. To access the PT Ratio configuration menu on the operator panel go to **Setup > OEM Setup > OEM ALT Setup > PT Primary or PT Sec** and set the PT ratio appropriately for the application.

    c. Measure the voltage going into the PT from the alternator.

⚠ WARNING
High voltages are present in this step. Special equipment and training is required to work on or around high-voltage equipment. Operation and maintenance must be done only by persons trained and qualified to work on such devices. Improper use or procedures may result in severe personal injury or death.

    Then measure the voltage output of PT to the base board. (Three phase inputs on the base board: L1 = J22-1, L2 = J22-2, L3 = J22-3, LN = J22-4; for single phase use L1, L2 and LN). The control calibrated PT ratio (PT voltage input: PT voltage output) should match the voltage input into and output of the PT.

    d. If the control calibrated PT ratio matches the voltage input into the PT, but does not match the voltage output (e.g., control calibrated PT ratio is 13,500:480, the voltage input into the PT is 13,500 VAC, but the output of the PT is 589 VAC instead of 480 VAC), replace the PT module.

5. Faulty AVR.

    a. Measure the output of the AVR at J17-1 and J17-2. The output should be at 9-12 VDC when the genset is operating at “No Load". If the voltage output of J17-1 and J17-2 is constantly high, then the AVR portion of the base board is faulty. Replace the base board.

    b. Using a True RMS meter, measure the PWM at J19-2 (AVR PWM +) and J19-9 (AVR PWM -) while turning the genset “ON". This is a 2.5 VDC max output from the base board to the AUX103 AVR; if the voltage at J19-2 and J19-9 is continuously 2.0-2.5 VDC, without any change, then replace the base board.

    c. Measure the output of the AUX103 AVR at J17-1 and J17-2, the output should be at 9-12 VDC when the genset is operating at “No Load", if the voltage output of J17-1 & J17-2 is constantly high, then the AUX103 AVR is faulty replace the AUX103 AVR.

6. Faulty PMG.

    a. Start the genset and run at rated speed. Measure the voltages at the AVR terminals P2 (J18-1), P3 (J18-2), and P4 (J18-3). These should be balanced and within the following ranges:

    50Hz generators - 170-180 Volts

    60Hz generators - 200-216 Volts

    Should the voltages be unbalanced, stop the genset, remove the PMG sheet metal cover from the non drive end bracket and disconnect the multi-pin plug in the PMG output leads. Check leads P2, P3, and P4 for continuity. Check the PMG stator resistances between output leads. These should be balanced and within +/-10% of 2.3 Ohms. If resistances are unbalanced and/or incorrect the PMG stator must be replaced. If the voltages are balanced but low and the PMG stator winding resistances are correct the PMG rotor must be replaced.

7. Governor preload offset percentage too high.

If this fault code occurs during startup,

a. Connect with InPower.

b. Check the governor preload offset percentage. The higher the percentage, the larger the overshoot. Lower the governor preload offset.

10.8.62 Code 1447 - Low AC Voltage

Logic:

Voltage has decreased below the “Low AC Voltage Threshold" for the time that is registered in the “Low AC Voltage Delay" parameter.

Possible Causes:

1. Fault simulation is enabled.
2. The Low AC Voltage threshold is set too high.
3. Faulty PTs, incorrect PT ratio, PTs, PT connections.
4. Faulty AVR.
5. Faulty PMG.
6. Faulty rotating rectifier assembly.

Diagnosis and Repair:

1. Fault simulation is enabled.

   a. Connect with InPower and ensure that the Fault simulation for Low AC Voltage is not enabled. If InPower is not available, cycle power to the control:

   1. Depress the Emergency Stop button and wait 30 seconds.

   2. Disconnect/disable the battery charger.

   3. Disconnect the battery (disconnect negative first).

   4. Leave the controller without power for 1 minute.

   5. Reconnect the battery, enable the battery charger, pullout the E-Stop button, and reset the control (in this order).

2. The Low AC Voltage threshold is set too high.

   a. To access the Low AC Voltage configuration menu on the operator panel go to **Setup > OEM Setup > OEM ALT Setup > Low AC Voltage Threshold** and set the “Low AC Voltage Threshold" Parameter appropriately for the application. Refer to the parameter list to see the default value for Low AC Voltage.

3. Faulty PTs, incorrect PT ratio, PTs, PT connections.

   a. Check the connections from the alternator to the PT and from the PT to the base board. (Three phase inputs on the base board: L1 = J22-1, L2 = J22-2, L3 = J22-3, LN = J22-4; for single phase use L1, L2 and LN). If the wires are incorrectly connected, or there is an open or short circuit correct the wiring issue. (If the voltage input is less than 600 VAC, a PT is not required.)

   b. Ensure that the control is set up with the correct PT ratio (primary vs. secondary). Reference event/fault code 2817 for troubleshooting information on the PT ratio. To access the PT Ratio configuration menu on the operator panel go to **Setup > OEM Setup > OEM ALT Setup > PT Primary or PT Sec** and set the PT ratio appropriately for the application.

   c. Measure the voltage going into the PT from the alternator.

⚠ WARNING

High voltages are present in this step. Special equipment and training is required to work on or around high-voltage equipment. Operation and maintenance must be done only by persons trained and qualified to work on such devices. Improper use or procedures may result in severe personal injury or death.

Then measure the voltage output of PT to the base board. (Three phase inputs on the base board: L1 = J22-1, L2 = J22-2, L3 = J22-3, LN = J22-4; for single phase use L1, L2 and LN.) The control calibrated PT ratio (PT voltage input: PT voltage output) should match the voltage input into the PT and voltage output of the PT. If the control calibrated PT ratio matches the voltage input into the PT, but does not match the voltage output (e.g., control calibrated PT ratio is 13,500:480, the voltage input into the PT is 13,500 VAC, but the output of the PT is 320 VAC instead of 480 VAC), replace the PT module.

4. Faulty AVR.

   a. Measure the output of the AVR at J17 -1 and J17-2, the output should be at least 9-12 VDC when the generator set is operating at “No Load". If the voltage output of J17-1 and J17-2 is constantly zero or less than 9-12 VDC, then the AVR portion of the PCC is faulty. To double-check, disconnect the J17-1 and J17-2 connection from the AVR board (the AVR board will no longer be connected to the field wires) and place a 9-12 VDC power supply (Depending on the alternator) to the field wires (J17-1 is positive, and J17-2 is negative). If the generator set produces adequate voltage (Nominal Voltage or Greater), the AVR portion of the base board is faulty, replace the base board.

   b. Check the Power Supply to the AVR. Ensure that the 10 Amp fuses at J18-1 and J18-2 are not open, replace if open circuit. Make sure that the AVR has sufficient power at:

      - J18-1 and J18-2 if it is a Shunt application or
      - J18-1, J18-2, and J18-3 if it is a PMG application

      If the AVR has no power, you will need to troubleshoot the power supply connections.

   c. Using a True RMS meter, measure the PWM at J19-2 (AVR PWM +) and J19-9 (AVR PWM -) while turning the generator set “ON". This is a 0-2.5 VDC max output from the base board to the AUX103 AVR; if the voltage at J19-2 and J19-9 is continuously 0 VDC, without any change, check the wiring between J26-16 and J19-2 and between J26-3 and J19-9 to ensure than a short circuit does not exist. Correct the wiring if a short circuit exists in the wiring. If the wiring is OK, but there is no voltage from the base board to the AUX103 AVR, then replace the base board.

   d. Measure the output of the AVR at J17-1 and J17-2, the output should be at least 9-12 VDC when the generator set is operating at “No Load", if the voltage output of J17-1 & J17-2 is constantly zero or less than 9-12, then the AUX103 AVR is faulty. To double check, disconnect the J17-1 and J17-2 connection from the AUX103 AVR (the AVR board will no longer be connected to the field wires) and place a 9-12 VDC power supply (Depending on the alternator) to the field wires (J17-1 is positive, and J17-2 is negative). If the generator set produces adequate voltage (Nominal Voltage or Greater) with the power supply connected to the field wires, the AUX103 AVR is faulty, replace the AUX103 AVR.

5. Faulty PMG.

   a. Start the generator set and run at rated speed. Measure the voltages at the AVR terminals P2 (J18-1), P3 (J18-2), and P4 (J18-3). These should be balanced and within the following ranges:

      50Hz generators - 170-180 Volts

      60Hz generators - 200-216 Volts

      Should the voltages be unbalanced:

1. Stop the generator set.

2. Remove the PMG sheet metal cover from the non drive end bracket and disconnect the multi-pin plug in the PMG output leads.

3. Check leads P2, P3, and P4 for continuity. Check the PMG stator resistances between output leads. These should be balanced and within +/-10% of 2.3 Ohms.

4. If resistances are unbalanced and/or incorrect the PMG stator must be replaced.

5. If the voltages are balanced but below the voltage range noted above, and the PMG stator winding resistances are correct - the PMG rotor must be replaced.

6. Faulty rotating rectifier assembly.

   a. This procedure is carried out with leads J17-1 and J17-2 disconnected at the AVR or transformer control rectifier bridge and using a 12 volt D.C. supply to leads J17-1 and J17-2 (J17-1 is positive, and J17-2 is negative).

      1. Start the set and run at rated speed.

      2. Measure the voltages at the main output terminals L1, L2 and L3.

      3. If voltages are balanced but below the voltage range in step 5, there is a fault in the rotating diode assembly or the main excitation windings (Refer to Servicing the Generator section in the manual to troubleshoot the main excitation windings).

      4. The diodes on the main rectifier assembly can be checked with a multimeter. The flexible leads connected to each diode should be disconnected at the terminal end, and the forward and reverse resistance checked. A healthy diode will indicate a very high resistance (infinity) in the reverse direction, and a low resistance in the forward direction. A faulty diode will give a full deflection reading in both directions with the test meter on the 10,000 Ohms scale, or an infinity reading in both directions. On an electronic digital meter a healthy diode will give a low reading in one direction, and a high reading in the other. Replace diode(s) if faulty.

10.8.63 Code 1448 - Underfrequency

Logic:

The frequency has dropped below the “Underfrequency Threshold" for the time set in the “Underfrequency Delay" parameter.

Possible Causes:

1. Fault simulation is enabled.
2. Underfrequency threshold is set too high.
3. Overload.

Diagnosis and Repair:

1. Fault simulation is enabled.

   a. Connect with InPower and ensure that the Fault simulation for Low Frequency is not enabled. If InPower is not available, cycle power to the control:

      1. Depress the Emergency Stop button and wait 30 seconds.

      2. Disconnect/disable the battery charger.

      3. Disconnect the battery (disconnect negative first).

      4. Leave the controller without power for 1 minute.

5. Reconnect the battery, enable the battery charger, pullout the E-Stop button, and reset the control (in this order).

2. Underfrequency threshold is set too high.

   A. To access the Underfrequency configuration menu on the operator panel go to **Setup > OEM Setup > OEM ALT Setup > Underfrequency Threshold** and set the “Underfrequency Threshold" Parameter appropriately for the application. Refer to the parameter list to see the default value for Underfrequency.

3. Overload.

   a. Ensure that the load on the generator set does not exceed the Genset KW Rating. If the generator set is producing correct frequency with no load, but shutting down on underfrequency when the generator set picks up certain loads, the underfrequency shutdowns are being cause by the load. Motors, Uninterruptible Power Supply (UPS), Variable Frequency Drive (VFD), Medical Diagnostic Imagining Equipment, Fire Pumps and certain types of lighting have a considerable and different influence on a generator and might require starting these loads when there is a minimum load on the generator set. Revisit the generator set sizing process to ensure that the generator set is correctly sized for the application, especially if new loads have been introduced into the system (reference the T-030 manual).

10.8.64 Code 1449 - Overfrequency

Logic:

Frequency has gone above the "Overfrequency Threshold" for the time that is registered in the "Overfrequency Delay" parameter.

Possible Causes:

1. Fault simulation is enabled.
2. Overfrequency threshold is set too low.

Diagnosis and Repair:

1. Fault simulation is enabled.

   a. Connect with InPower and ensure that the Fault simulation for Overfrequency Enable is not enabled. If InPower is not available, cycle power to the control:

      1. Depress the Emergency Stop button and wait 30 seconds.

      2. Disconnect/disable the battery charger.

      3. Disconnect the battery (disconnect negative first).

      4. Leave the controller without power for 1 minute.

      5. Reconnect the battery, enable the battery charger, pullout the E-Stop button, and reset the control (in this order).

2. Overfrequency threshold is set too low.

   a. To access the Overfrequency configuration menu on the operator panel go to **Setup > OEM Setup > OEM ALT Setup > Overfrequency Threshold** and set the "Overfrequency Threshold" Parameter appropriately for the application. Refer to the parameter list to see the default value for Overfrequency.

10.8.65 Code 1451 - Genset/Bus V Mismatch

Logic:

Five seconds after the Generator set circuit breaker (CB) closes, the base board continuously verifies whether the generator set and bus voltages are within 5% of each other; if the difference between the generator set and bus voltage is greater than 5%, event/fault code 1451 becomes active.

Possible Causes:

1. The generator set and bus voltages are not properly setup or calibrated.

Diagnosis and Repair:

1. The generator set and bus voltages are not properly calibrated.
    a. Calibrate the generator set and bus voltage (all phases) in order to improve the voltage match performance, as well as the metering accuracy. Refer to the calibration section.
    b. If the voltage is greater than 600 VAC, ensure that the PT ratio is correctly set. To change the Utility PT ratio parameter appropriately for the application, go to: **Setup > Paralleling Setup > Power Transfer Control > PT Primary or PT Secondary** and set appropriately. To change the generator set PT ratio parameter appropriately for the application, go to: **Setup > OEM Setup > OEM Alt Setup > PT Primary or PT Secondary** and set appropriately.

10.8.66 Code 1452 - Genset CB Fail To Close

Logic:

Genset circuit breaker (CB) has failed to close for the time that is registered in the “Gen CB Fail to Close Time Delay" parameter.

Possible Causes:

1. Incorrectly wired.
2. Faulty Genset Circuit Breaker (CB).

Diagnosis and Repair:

1. Incorrectly wired.
    a. The base board is sending the Genset CB a close command, but the Genset CB Position Status remains open. Correct the wiring from the CB Close Control output on the base board at TB5-1 and TB5-2 to the Genset breaker; check for an open circuit at the circuit breaker. The Genset CB Close control output is a NO Relay at TB5-1 and TB5-2 (Relay Common) on the base board. When the relay on the base board is closed, the Genset Breaker should be closed. The output of TB5-2 and TB5-3 should match the status of the Genset CB Close command; go to: **Setup > Paralleling Setup > Basic > Pos Contacts > Genset Breaker Position Contacts** and ensure that the status of the CB close position command at the display matches the output.
    b. Verify the wiring of the CB position status from the Genset breaker to the base board. The CB position sensing can be set up as single or dual sensing in the base board; check the display if the base board is setup as single or dual sensing. To access the CB position sensing, go to: **Setup > Paralleling Setup > Basic > Pos Contacts > Genset Breaker Position Contacts**
        - If the CB position sensing is set up as single, verify the connection at CB A (NO) status at TB10-7 and the Return at TB10-2.

- If the CB position sensing is set up as dual, verify the connection at CB A (NO) status at TB10-7 and the Return at TB10-2 and also verify the connection at CB B (NC) status at TB10-8 and TB10-2 (Return). The input status at CB A (NO) and CB B (NC) should be opposite; one input will be open while the other is closed, if they are the same check the wiring between the Genset breaker and the CB status input on the base board.

  Ensure that the connections on the base board are correctly connected and that a short and/or open circuit does not exist. The physical connection to the base board should match the status of the CB position; go to: **Setup > Paralleling Setup > Basic > Pos Contacts > Genset Breaker Position Contacts** and ensure that the status of the CB position matches the connection.

2. Faulty Genset CB.

10.8.67 Code 1453 - Genset CB Fail To Open

Logic:

Genset circuit breaker (CB) has failed to open for the time that is registered in the “Gen CB Fail to Open Time Delay" parameter.

Possible Causes:

1. Incorrectly wired.
2. Faulty Genset Circuit Breaker (CB).

Diagnosis and Repair:

1. Incorrectly wired.
   a. The base board is sending the Genset CB an open command, but the Genset CB Position Status remains closed. Correct the wiring from the CB Open Control output on the base board at TB5-5 and TB5-4 to the Genset breaker; check for a short circuit. The Genset CB Open control output is a NC Relay at TB5-5 and TB5-4 (Relay Common) on the base board. When the relay is closed the Genset Breaker is closed. The output of TB5-4 and TB5-5 should match the status of the Genset CB Open position command; go to: **Setup > Paralleling Setup > Basic > Pos Contacts > Genset Breaker Position Contacts**, and ensure that the status of the CB Open position command at the display matches the output.
   b. Verify the wiring of the CB position status from the Genset breaker to the base board. The CB position sensing can be set up as single or dual sensing in the base board; check the display if the base board is setup as single or dual sensing. To access the CB position sensing, go to: **Setup > Paralleling Setup > Basic > Pos Contacts > Genset Breaker Position Contacts**
      - If the CB position sensing is set up as single, verify the connection at CB A (NO) status at TB10-7 and the Return at TB10-2.
      - If the CB position sensing is set up as dual, verify the connection at CB A (NO) status at TB10-7 and the Return at TB10-2 and also verify the connection at CB B (NC) status at TB10-8 and TB10-2 (Return). The input status at CB A (NO) and CB B (NC) should be opposite; one input will be open while the other is closed, if they are the same check the wiring between the Genset breaker and the CB status input on the base board.

        Ensure that the connections on the base board are correctly connected and that a short and/or open circuit does not exist. The physical connection to the base board should match the status of the CB position; go to: **Setup > Paralleling Setup > Basic > Pos Contacts > Genset Breaker Position Contacts**, and ensure that the status of the CB position matches the connection.
2. Faulty Genset CB.

10.8.68 Code 1454 - Genset CB Pos Error

Logic:

A mismatch in the Genset position status exists.

Possible Causes:

1. Mismatch in the Genset position sensing.
2. Faulty Genset CB.

Diagnosis and Repair:

1. Mismatch in the Genset position sensing.
   a. Verify the wiring of the CB position status from the Genset breaker to the base board. The CB position sensing can be set up as single or dual sensing in the base board; check the display if the base board is setup as single or dual sensing. To access the CB position sensing, go to: **Setup > Paralleling Setup > Basic > Pos Contacts > Genset Breaker Position Contacts**
   b. When the Genset Breaker Position contact is set to Single, the base board monitors current going thru the Genset CB (Amps going thru the CB means it is closed) and CB A position status to determine the position of the Genset CB. If there is a mismatch between the current-based breaker position and CB A position sensing, fault code 1454 will occur. Verify the connection at CB A (NO) status at TB10-7 and the Return at TB10-2, and ensure that an open/short circuit does not exist.
   c. If the CB position sensing is set up as dual, verify the connection at CB A (NO) status at TB10-7 and the Return at TB10-2 and also verify the connection at CB B (NC) status at TB10-8 and TB10-2 (Return). The input status at CB A (NO) and CB B (NC) should be opposite; one input will be open while the other is closed, if they are the same, check the wiring between the Genset breaker and the CB status input on the base board. Ensure that the connections on the base board are correctly connected and that a short and/or open circuit does not exist. The physical connection to the base board should match the status of the CB position; go to: **Paralleling Status > Paralleling Status-Iso Bus Sc 1 > Genset CB Pos > Genset CB Position Status**, and ensure that the status of the CB position matches the connection.
2. Faulty Genset CB.

10.8.69 Code 1455 - Utility CB Pos Error

Logic:

A mismatch in the Utility position status exists.

Possible Causes:

1. Utility Single Mode Verify Switch is Inactive.
2. Mismatch in the Utility position sensing.
3. Faulty Utility CB.

Diagnosis and Repair:

1. Utility Single Mode Verify Switch is Inactive.

    a. Event/fault code 1455 will become active, if the genset is setup to operate in the following genset application types; Utility Single, Utility Multiple, or PTC, and the Utility Single Mode Verify Switch is not active, The base board will not close the Utility breaker until the Utility Single Mode Verify Switch input is activated. This procedure is to ensure that the whole system has been rechecked before allowing the base board to close the Utility Breaker. To activate the Utility Single Mode Verify Switch, make a connection between TB10-12 (Single Mode Verify Input) and TB10-16 (Return); then press the fault reset button on the display to clear the fault.

2. Mismatch in the Utility position sensing.

    a. Verify the wiring of the CB position status from the Utility breaker to the base board. The CB position sensing can be set up as single or dual sensing in the base board; check the display if the base board is setup as single or dual sensing. To access the CB position sensing, go to: **Setup > Paralleling Setup > Basic > Pos Contacts > Utility Breaker Position Contacts**.

    b. When the Utility Breaker Position contact is set to Single, the base board monitors current going thru the Utility CB (Amps going thru the CB means it is closed) and CB A position status to determine the position of the Utility CB. If there is a mismatch between the current-based breaker position and CB A position sensing, fault code 1455 will occur. Verify the connection at CB A (NO) status at TB10-3 and the Return at TB10-1, and ensure that an open/short circuit does not exist.

    c. If the CB position sensing is set up as dual, verify the connection at CB A (NO) status at TB10-3 and the Return at TB10-1 and also verify the connection at CB B (NC) status at TB10-4 and TB10-1 (Return). The input status at CB A (NO) and CB B (NC) should be opposite; one input will be open while the other is closed, if they are the same check the wiring between the Utility breaker and the CB status input on the base board. Ensure that the connections on the base board are correctly connected and that a short and/or open circuit does not exist. The physical connection to the base board should match the status of the CB position; go to: **Paralleling Status > Paralleling Status-PTC Sc 1 > Util CB Pos > Utility CB Position Status**, and ensure that the status of the CB position matches the connection.

3. Faulty Utility CB.

10.8.70 Code 1456 - Bus Out Of Sync Range

Logic:

The Synchronizer cannot be enabled because the Bus Voltage and/or Frequency are not within 60 – 110% of nominal.

Possible Causes:

1. System bus voltage cables are incorrectly wired or open circuit to the paralleling breaker.
2. System bus voltage sensing connections are incorrectly wired at the base board.
3. Faulty PT.

Diagnosis and Repair:

1. System bus voltage cables are incorrectly wired or open circuit to the paralleling breaker.

⚠ WARNING

High voltages are present in this step. Special equipment and training is required to work on or around high-voltage equipment. Operation and maintenance must be done only by persons trained and qualified to work on such devices. Improper use or procedures may result in severe personal injury or death.

a. The system bus has lost a phase, using a phase rotation meter or a synchronizing light; verify that the phase rotation of the system bus at the paralleling breaker is correct; in synchronization with the generator set phase rotation. For proper phase rotation measurement procedures, refer to the phase rotation meter instructions. If the phase rotation check shows that a phase is missing, check for blown fuses, and an open circuit at the system bus voltage cables connected to the paralleling breaker.

2. System bus voltage sensing connections are incorrectly wired at the base board.

   a. If the nominal voltage is 600 VAC or lower, ensure that the voltage sensing connections are correct.

      - Measure the phase rotation and voltage input into the base board from the System bus at: L1, TB7-1; L2, TB7-2; and L3, TB7-3. The voltage should match nominal voltage, and the phase rotation should be "L1 – L2 –L3", for proper phase rotation measurement procedures, refer to the phase rotation meter instructions. If the phase rotation and/or voltage are not correct, re-check the wiring.

   b. If the nominal voltage is over 600 VAC, check the voltage sensing connections from the base board to the PT and the PT to the System bus.

      - Measure the phase rotation and voltage input into the base board from the PT (Potential Transformer) at: L1, TB7-1; L2, TB7-2; and L3, TB7-3. The voltage should match nominal voltage, and the phase rotation should be "L1 – L2 –L3", for proper phase rotation measurement procedures, refer to the phase rotation meter instructions. If the phase rotation and/or voltage are not correct, re-check the wiring from the base board to the PT.
      - Measure the phase rotation and voltage input into the TB8 - 5 and TB8 – 1

3. Faulty PT.

   a. With a calibrated Voltage meter, measure the voltage input and output of the PT. The Input and output of the PT should be proportional; ex. Inputs: L1 = 4160, L2 = 4160, L3 = 4160; Outputs: L1 = 120, L2 = 120, L3 = 120. If the inputs and outputs of the PT are not proportional, replace the PT.

10.8.71 Code 1457 - Fail To Synchronize

Logic:

Synchronizer has not met the synch check conditions within the "Fail To Synchronize Time" parameter

Possible Causes:

1. Improper adjustment of bus or generator set voltage.
2. Faulty PT.
3. Permissive window parameters are set too tight.

Diagnosis and Repair:

1. Improper adjustment of bus or generator set voltage.
   a. Ensure that that the base board is calibrated correctly by checking that the generator set is operating at proper voltage and frequency. With a calibrated Frequency and Voltage meter, measure the frequency and voltage output of the genset at the alternator; while thru the display, ensuring that the base board is displaying the same voltage and frequency that is shown on the meter. (Go to the Servicing the Generator section in the manual)
   b. Ensure that that the base board is calibrated correctly by checking the System bus voltage and frequency. With a calibrated Frequency and Voltage meter, measure the frequency and voltage of the System bus; while thru the display, ensuring that the base board is displaying the same voltage and frequency that is shown on the meter. To view and adjust the Bus Voltage, go to: **Setup > Calibration > L12 (L23, L31) Adjust > Genset Bus L1L2 (L2L3, L3L1) Voltage Calibration** and if appropriate, change the Bus Voltage to reflect the voltage that is shown on the meter. To view and adjust the Bus Frequency go to: **Setup > Adjust > Frequency Calibration > Frequency Calibration** and if appropriate, change the Bus Frequency to reflect the frequency that is shown on the meter.
2. Faulty PT.
   a. With a calibrated Voltage meter, measure the voltage input and output of the PT. The Input and output of the PT should be proportional; ex. Inputs: L1 = 4160, L2 = 4160, L3 = 4160; Outputs: L1 = 120, L2 = 120, L3 = 120. If the inputs and outputs of the PT are not proportional, replace the PT.
3. Permissive window parameters are set too tight.
   a. The synch check function monitors the genset and bus voltage, frequency, and phase rotation, to determine whether the two sources can be paralleled. The difference in voltage, frequency, and phase rotation between the genset and system bus must be smaller than the Permissive parameter windows. Set the following parameters appropriately for the application:
      - Permissive Frequency Window
      - Permissive Voltage Window
      - Permissive Window Time
      - Permissive Phase Window

      To access the Permissive Parameters Window setup menu from the display, . Refer to the parameter section for the default value, and limits.
   b. Synchronizer has failed to synchronize the Generator set to the System bus within the “Fail To Synchronize Time" parameter. To increase the “Fail To Synchronize Time" parameter from the display, go to: Setup > Paralleling Setup > Basic > Sync Time and change the “Fail To Synchronize Time" parameter of the control appropriately. Refer to the parameter section for the default value, and limits.

10.8.72 Code 1458 - Sync Ph Rot Mismatch

Logic:

Mismatch in phase rotation between the generator set output and the system bus.

Possible Causes:

1. Generator set or system bus voltage cables are incorrectly wired to the paralleling breaker.
2. Generator set or system bus voltage sensing connections are incorrectly wired at the base board.

Diagnosis and Repair:

1. Generator set or system bus voltage cables are incorrectly wired to the paralleling breaker.

⚠ WARNING
High voltages are present in this step. Special equipment and training is required to work on or around high-voltage equipment. Operation and maintenance must be done only by persons trained and qualified to work on such devices. Improper use or procedures may result in severe personal injury or death.

   a. Using a phase rotation meter or a synchronizing light; verify that the phase rotation of the generator set output relative to the system bus. Energize the system bus and start the generator set in question in Manual mode, but do not close the paralleling breaker. First check the phase rotation of the system bus with the phase rotation meter. Then check the phase rotation of the generator set. The generator set and the system bus should have the same phase rotation, L1–L2–L3. For proper phase rotation measurement procedures, refer to the phase rotation meter instructions. Correct the wiring if the phase rotation between the generator set and system bus is different. If the phase rotation check shows that a phase is missing, check for blown fuses and an open circuit at the system bus voltage cables and the generator set voltage cables connected to the paralleling breaker.

2. Generator set or system bus voltage sensing connections are incorrectly wired at the base board.

   a. If the nominal voltage is 600 VAC or lower, ensure that the voltage sensing connections are correct.

      - Measure the phase rotation at base board from the system bus at: L1, TB7-1; L2, TB7-2; L3, TB7-3. The phase rotation should be “L1 – L2 –L3", for proper phase rotation measurement procedures, refer to the phase rotation meter instructions. If the phase rotation is not correct, re-check the wiring.

      - Measure the phase rotation at base board from the Generator set at: L1, J22-1; L2, J22-2; L3, J22-3. The phase rotation should be “L1 – L2 –L3", for proper phase rotation measurement procedures, refer to the phase rotation meter instructions. If the phase rotation is not correct, re-check the wiring.

   b. If the nominal voltage is over 600 VAC, check the voltage sensing connections from the base board to the PT and the PT to the System bus.

⚠ WARNING
High voltages are present in this step. Special equipment and training is required to work on or around high-voltage equipment. Operation and maintenance must be done only by persons trained and qualified to work on such devices. Improper use or procedures may result in severe personal injury or death.

      - Measure the phase rotation at the input of the PT (Potential Transformer) from the system bus. The phase rotation at the input of the PT should match the phase rotation at the input of the base board. The phase rotation (“L1 – L2 –L3") at the input of the PT should be the same as the phase rotation at the input of the base board at L1, TB7-1; L2, TB7-2; L3, TB7-3; if the phase rotation does not match, correct the wiring from the System bus to the PT and/or from the PT the base board.

- Measure the phase rotation at the input of the PT (Potential Transformer) from the generator set. The phase rotation at the input of the PT should match the phase rotation at the input of the base board. The phase rotation (“L1 – L2 –L3") at the input of the PT should be the same as the phase rotation at the input of the base board at J22-1; L2, J22-2; L3, J22-3; if the phase rotation does not match, correct the wiring from the Generator set to the PT and/or from the PT the base board.

10.8.73 Code 1459 - Reverse Power

Logic:

The “Reverse KW threshold" has been exceeded for the time that is registered in the “Reverse KW time delay" setting.

Possible Causes:

1. CTs are incorrectly connected or installed.
2. Reverse KW threshold is set too low.
3. Loading issue.

Diagnosis and Repair:

1. CTs are incorrectly connected or installed.
   a. If event/fault code 1459 becomes active as soon as the generator set picks up load, check the generator set operator panel under the **Alternator Data** menu and view the **L1 KW, L2 KW, and L3 KW** parameters when the generator set picks up load (right before the generator set shuts down). If L1 KW, L2 KW, or L3 KW is a negative value, it is likely that the CT connected to the negative KW value has an incorrect orientation or is connected backwards. Verify the CT orientation and CT wiring at L1: J12-1 and J12-4, L2: J12-2 and J12-5, L3: J12-3 and J12-6, correct if miswired.
2. Reverse KW threshold is set too low.
   a. To access the Reverse KW threshold configuration menu on the operator panel go to **Setup > Genset Setup > Reverse KW Threshold** and set the “Reverse KW Threshold" Parameter appropriately for the application. Refer to the parameter list to see the default value for Reverse KW.
3. Loading issue.
   a. Ensure that the load on the generator set does not exceed the Genset KW Rating. Motors, Uninterruptible Power Supply (UPS), Variable Frequency Drive (VFD), Medical Diagnostic Imagining Equipment, and Fire Pumps have a considerable and different influence on a generator. Revisit the generator set sizing process to ensure that the generator set is correctly sized for the application, especially if new loads have been introduced into the system (reference the T-030 manual).

⚠ CAUTION
Increasing the KW threshold or time delay may have adverse effects on the alternator. Always check the capability of the alternator.

4. kW load share lines.
   a. Make sure the kW load share lines are wired correctly.

      Negative: TB9-7 to TB9-7

      Positive: TB9-8 to TB9-8

Shield: TB9-9 to TB9-9

b. Disconnect the kW load share lines wires, including the shield. Check the continuity of the each kW load share line. The resistance should be less than 10 ohms.

10.8.74 Code 1461 - Loss of Field

Logic:

The “Reverse KVAR threshold" has been exceeded for the time that is registered in the “Reverse KVAR time delay" setting.

Possible Causes:

1. Improper voltage calibration of the genset.
2. Improperly set Leading Power Factor.

Diagnosis and Repair:

1. Improper voltage calibration of the genset.

   a. If the genset is not operating in droop paralleling mode, go to step 2. Using a voltmeter measure the AC voltage of the Electric Bus that the genset is paralleled to (voltage of the Genset Bus or the Utility). Then measure the output voltage of the genset and ensure that the genset output voltage is +3 VAC/-0 VAC that of the source which the genset is paralleled to. Event/fault code 1461 is a result of the genset not matching or exceeding the voltage of the electric bus, which causes the genset to import current from the electric bus (Reverse KVAR). To access the voltage calibration menu on the operator panel go to **Setup > Adjust > Voltage Calibration** and increase the genset output voltage.

   b. Using a volt-meter measure the AC voltage of the Electric Bus that the genset is paralleled to (voltage of the Genset Bus or the Utility). Then measure the output voltage of the genset and ensure that the genset output voltage is +3 VAC/-0 VAC that of the source which the genset is paralleled to. Event/fault code 1461 is a result of the generator set not matching or exceeding the voltage of the electric bus, which causes the genset to import current from the electric bus (Reverse KVAR). To access the voltage calibration configuration menu on the display go to: **Setup > Adjust > Voltage Calibration** and increase the genset output voltage.

2. Load sharing lines incorrectly connected.

   a. Ensure that the orientation of the load sharing connections is correct, and that the shield is only grounded at one point. Check for damaged or disconnected wires at TB9-8, KW+ ; TB9-7, KW- ; TB9-10, KVAR+ ; TB9-11, KVAR- ; TB9-9, Shield (shield should be grounded at only one genset). Correct connections if faulty.

3. Improperly set Leading Power Factor.

   a. If Loss of excitation occurs when the genset is lightly loaded, a leading power factor may be the cause. Leading Power factor can be caused by operation of filters and power factor correction capacitors when the KW load level on the genset is low. Motors, Uninterruptible Power Supply (UPS), Variable Frequency Drive (VFD), Medical Diagnostic Imagining Equipment, Fire Pumps and certain types of lighting have a considerable and different influence on a generator and can also cause a leading power factor. Leading power factor loads can cause the genset to lose control of the output voltage of the genset. To access the Power Factor menu on the operator panel go to **Alternator Data** and view the value of L1 PF, L2 PF, L3 PF, and Total PF, right before the genset shuts down on event/fault code 1461. Revisit the genset sizing process if the power factor is leading to ensure that the genset is correctly sized for the application, especially if new loads have been introduced into the system (reference the T-030 manual).

⚠ CAUTION

Increasing the KVAR threshold or time delay may have adverse effects on the alternator. Always check the capability of the alternator.

4. kVAR load share lines.

    a. Make sure the kVAR load share lines are wired correctly.

    Negative: TB9-11 to TB9-11

    Shield: TB9-9 to TB9-9

    Positive: TB9-10 to TB9-10

    b. Disconnect the kVAR load share lines wires, including the shield. Check the continuity of the each kVAR load share line. The resistance should be less than 10 ohms.

10.8.75 Code 1464 - Load Dump

Logic:

If the "Load Dump" parameter is enabled and the generator set KW output exceeds the "Overload Threshold" for the "Overload Set Time" or the output frequency of the generator set drops below the "Under-frequency Offset" for the "Under-frequency Set Time"; the generator set will dump its electrical load.

Possible Causes:

1. Active fault code is set to Derate.
2. The "Overload Threshold" is set too low.
3. The "Under-frequency Offset" is set too low.
4. The "Overload Set Time" or "Under-frequency Set Time" is set too low.
5. Incorrect CTs or CT Connections.

Diagnosis and Repair:

1. Active fault code is set to Derate.

    a. Event/fault code 1464 can be activated as a result of another active fault that is set to "Derate". Troubleshoot the other active fault(s) that are set to Derate.

2. The "Overload Threshold" is set too low.

    a. To access the Overload Threshold configuration menu on the operator panel go to **Setup > Genset Setup** and set the "Overload Threshold" parameter appropriately for the application. Refer to the parameter list to see the default value for "Overload Threshold".

3. The "Under-frequency Offset" is set too low.

    a. To access the Under-frequency Offset configuration menu on the operator panel go to **Setup > Genset Setup** and set the "Under-frequency Offset" parameter appropriately for the application. Refer to the parameter list to see the default value for "Under-frequency Offset".

4. The "Overload Set Time" or "Under-frequency Set Time" is set too low.

    a. To access the "Overload Set Time" and "Under-frequency Set Time" configuration menu on the operator panel go to **Setup > Genset Setup** and set the "Overload Set Time" and "Under-frequency Set Time" Parameters appropriately for the application. Refer to the parameter list to see the default values for "Overload Set Time" and "Under-frequency Set Time".

5. Incorrect CTs, CT Connections, or CT ratio.
   a. Check the CTs, CT Connections, and CT ratio. For installation instructions, refer to the section on Current Transformer Installation or reference event/fault code 2814 and event/fault code 2815.

10.8.76 Code 1469 - Speed/Hz Mismatch

Logic:

Engine speed and generator set output frequency do not match.

Possible Causes:

1. Fly wheel teeth number is incorrectly set.
2. Faulty Magnetic Pick-up.
3. Incorrect engine speed data from the ECM.
4. A new alternator was installed with a different number of poles.
5. Load induced.
6. Speed/frequency mismatch threshold set too low.
7. Speed/frequency mismatch fault time.
8. Frequency-to-speed gain select.
9. Gearbox teeth incorrect.

Diagnosis and Repair:

1. Fly wheel teeth number is incorrectly set.
   a. If this generator set has an ECM, go to step number 3. For a hydro-mechanical generator set, access the Flywheel Teeth setup screen through the Operator Panel and ensure that the PCC is set up with the correct number of engine flywheel teeth.
2. Faulty Magnetic Pick-up
   a. If this generator set has an ECM, go to step number 3. For a Hydro-mechanical application, inspect the MPU wires/connector pins for shorts and open circuits. Remove the MPU connectors and check for 3.5 to 15 VAC at the MPU while cranking. If the MPU tests satisfactorily, then check the voltage output of the board at J11-9 (MPU +) and J11-10 (MPU -).
3. Incorrect engine speed data from the ECM.
   a. If the engine has an ECM ensure that the correct engine speed information is being communicated to the generator set control via the CAN datalink. Through the operator panel, verify the engine speed by going to **Engine Data > Engine Speed.** Refer to the engine service manual to correct.

      Correct Speeds

      1800 RPM at 60 Hz

      1500 RPM at 50 Hz
4. A new alternator was installed with a different number of poles.
   a. If a new alternator with a different number of poles replaced an original alternator, then the speed and frequency ratio is inaccurate. Go to **Setup > OEM Setup >OEM Engine Setup > Freq/Speed** and adjust the “Frequency to Speed Gain Select" parameter accordingly to the alternator. To calculate the Frequency to Speed value use the following equation:

Frequency to Speed = 120 / Number of poles of the Alternator

5. Load induced.
   a. Non-linear loads like Uninterruptible Power Supply (UPS) and certain types of lighting have a considerable and different influence on a generator which can cause significant frequency fluctuations that do not match measured engine speed; ex: a UPS causes 62 Hz at 1800 RPM. This is an application issue; correct the application issue and refer to the T030 manual.
6. Speed/frequency mismatch threshold set too low.
   a. Connect with InPower.
   b. Make sure the speed/frequency mismatch threshold is set within 0.1-20 Hz.
7. Speed/frequency mismatch fault time.
   a. Connect with InPower.
   b. Make sure the speed/frequency mismatch threshold time is set within 0.2-10 sec.
8. Frequency-to-speed gain select.
   a. Connect with InPower.
   b. Make sure the frequency-to-speed gain select is set properly.
9. Gearbox teeth incorrect.

   In the case of gearbox setup, make sure the settings are correct.
   a. Connect with InPower.
   b. Make sure the flywheel teeth parameter is set to the number of teeth of the gearbox.

10.8.77 Code 1471 - High Current Warning

Logic:

Generator set output current has exceeded 110% for 60 seconds.

Possible Causes:

1. Overload.
2. Incorrect CT Ratio, CTs, or CT connections.

Diagnosis and Repair:

1. Overload.
   a. Reference the first 2 steps of event/fault code 1444.
2. Incorrect CT Ratio, CTs, or CT connections.
   a. Check the CT Ratio, CTs, and CT connections, reference event/fault code 2814.

10.8.78 Code 1472 - High Current Shutdown

Logic:

The AmpSentry High Current Shutdown threshold has been exceeded.

NOTICE

This fault remains active and cannot be reset until the Alternator Overheat Integral time has expired (which takes up to five minutes). The Alternator Overheat Integral time allows the alternator to cool down before allowing a restart.

Possible Causes:

1. Short or overload.
2. Incorrect CT Ratio, CTs, or CT connections.

Diagnosis and Repair:

1. Short or overload.
    a. Check the load and load cables. Repair if necessary.
2. Incorrect CT Ratio, CTs, or CT connections.
    a. Check the CT Ratio, CTs, and CT connections, reference event/fault code 2814.

10.8.79 Code 1475 - First Start Backup Fail

Logic:

Generator set has not received permission to close the Generator set CB to a dead bus from the First Start Input within the “First Start Back up time" parameter.

Possible Causes:

1. Wiring issue at the First Start Arbitration input.

Diagnosis and Repair:

1. Wiring issue at the First Start Arbitration input.
    a. The First Start Arbitration input is incorrectly wired between generator sets or an open circuit exists at the First Start Arbitration input. Check the wiring at TB3-11 (First Start Arbitration) and TB3-12 (Return) between this and all generator sets that are interconnected, and ensure that the wiring is correct.

10.8.80 Code 1483 - Common Alarm

Logic:

The control has detected a warning fault and/or shutdown fault.

Possible Causes:

1. A warning fault and/or shutdown fault is active.

Diagnosis and Repair:

1. A warning fault and/or shutdown fault is active.
    a. This fault is activated as a result of another warning or shutdown fault. Troubleshoot the other fault(s) that are causing the generator set to generate this event/fault code.

10.8.81 Code 1540 - Common Warning

Logic:

The control has detected a warning fault.

Possible Causes:

1. Active warning fault.

Diagnosis and Repair:

1. Active warning fault.
   a. This fault is activated as a result of another warning fault. Troubleshoot the other warning fault(s) that are causing the generator set to generate a warning fault.

10.8.82 Code 1541 - Common Shutdown

Logic:

The control has detected a shutdown fault.

Possible Causes:

1. Active shutdown fault.

Diagnosis and Repair:

1. Active shutdown fault.
   a. This fault is activated as a result of another shutdown fault. Troubleshoot the other shutdown fault(s) that are causing the generator set to shut down.

10.8.83 Code 1573 - Config Input #1 Fault

Logic:

Configurable input #1 fault is active.

Possible Causes:

1. Condition for which "Configurable Input #1" is configured for service.
2. "Configurable Input #1 Active State Selection" parameter is configured incorrectly.
3. Incorrectly wired; or open circuit or short circuit in the wiring.
4. External Switch is faulty.

Diagnosis and Repair:

1. Condition for which "Configurable Input #1" is configured for service.
   a. Check the condition for which "Configurable Input #1" has been configured for; ex. if "Configurable Input #1" was configured to become active when the fuel level is low, check the fuel level and add fuel if needed. After the issue is resolved, press the Reset button on the Operator Panel in order to clear the fault, if the fault does not clear go to step 2.

2. "Configurable Input #1 Active State Selection" parameter is incorrectly configured.

   a. With InPower or through the operator panel check the switch input setting (active closed or active open) for Configurable Input #1. Ensure that the switch input setting is correctly set. If "Configurable Input #1 Input Function Pointer" parameter is set to default and if "Configurable Input #1 Active State Selection" parameter is set to "active closed", input 1 (event/fault code 1573) will become active when TB1-12 (input 1) and TB1-13 (ground) are connected (shorted) together.

      If "Configurable Input #1 Input Function Pointer" parameter is set to default and if "Configurable Input #1 Active State Selection" parameter is set to "active open", input 1 (event/fault code 1573) will become active when there is an open circuit between TB1-12 (input 1) and TB1-13 (ground).

      To access the input configuration on the operator panel go to **Setup > Configurable I/O > Config Input #1 Menu > Active** and set this parameter appropriately for the application.

3. Incorrectly wired; or open circuit or short circuit in the wiring.

   a. Check the wiring at TB1-12 (input 1) and TB1-13 (ground) for an open circuit, short circuit, or a miswired condition.

4. External Switch is faulty.

   a. Check for External switch functionality.

10.8.84 Code 1689 - Reset Real Time Clock

Logic:

Power to the Real Time Clock (RTC) chip on the base board has been lost and the clock is no longer accurate.

Possible Causes:

1. Battery power has been lost.

Diagnosis and Repair:

1. Battery power has been lost.

   a. The RTC chip requires little, but constant, power to keep the control's internal clock accurate. It has an internal capacitor that keeps the RTC operating for up to 1 hour when the battery is disconnected or dead. If battery power is lost for over 1 hour, the RTC will stop functioning. When battery power is supplied to the control again, the control will display event/fault code 1689, because the RTC is no longer accurate. If the fault clears after being acknowledged, then the control is OK. To set the real time clock, on the operator panel go to **Setup > Clock Setup** and set the RTC clock appropriately.

10.8.85 Code 1847 - Engine Coolant Temperature High

Logic:

Engine coolant temperature has exceeded the alarm (shutdown with cooldown) threshold for high coolant temperature.

Possible Causes:

1. Inaccurate engine temperature sensor.

2. Fault simulation feature is enabled.

3. Threshold setting too low.

Diagnosis and Repair:

1. Verify the sensor accuracy with a thermocouple or similar temperature probe.
   a. Connect the temperature probe to the engine near the coolant temperature sensor.
   b. Connect InPower.
   c. Compare the coolant temperature reading from the service tool to the reading from the temperature probe. If the two readings are reasonably close, then the sensor is reading correctly.
2. Verify that the fault simulation for the sensor is not enabled.
   a. Connect InPower.
   b. Verify that the fault simulation is NOT enabled for the coolant temperature sensor by connecting to the PCC via InPower. If the fault simulation is disabled, there is no problem.
3. Check threshold settings.
   a. Connect InPower.
   b. Verify that the fault threshold is within the normal operating range for the coolant temperature sensor. Refer to the engine service manual for correct threshold values, and make the appropriate changes using InPower.

10.8.86 Code 1853 - Annunciator Input 1 Fault

Logic:

Customer fault 1 (input 1, LED 1) on the Universal Annunciator is active.

Possible Causes:

1. Condition for which "Annunciator Input #1" is configured for is active.
2. Incorrectly configured or wiring issue.
3. Faulty annunciator.

Diagnosis and Repair:

1. Condition for which "Annunciator Input #1" is configured for is active.
   a. Check the condition for which "Annunciator Input #1" has been configured for; ex. if "Annunciator Input #1" was configured to become active when the fuel level is low, check the fuel level and add fuel if needed. After the issue is resolved, press the Reset button on the Operator Panel in order to clear the fault, if the fault does not clear go to step 2.
2. Incorrectly configured or wiring issue.
   a. Customer input 1 on the Universal Annunciator can be configured to conform to different applications. Below are two configurations that have an impact on how input 1 becomes active.

Configurable Parameter	Option 1 (Default)	Option 2
Negative or Positive Input 1 Activation	Negative Input (ground input)	Positive Input (B+ input)
Inverting Active Hardware Signals	Don't Invert	Invert

Negative or positive Input 1 activation: Allows the user to activate with a negative (ground) or positive (B+) input; the default setting is a negative (ground) input.

Inverting active hardware signals: Input 1 has the capability to be inverted. If annunciator input 1 is set to inverted, then an active hardware signal will be considered inactive and an inactive signal will be considered active, default is set to non-inverted.

When set to default, event/fault code 1853 (customer input 1) becomes active when there is a ground input at TB1-1 on the back of the Universal Annunciator.

Ensure that the Universal Annunciator is correctly configured; for setup and configuration instructions, refer to the Universal Annunciator operator's manual (P/N 0900-0301).

b. Check the wiring at TB1-1 and ensure that customer input 1 is not wired incorrectly. Depending on the configuration of the annunciator in step 1A, ensure that there is not a short or open circuit at the TB1-1 connection.

c. Check the sender, relay, or device that is activating Input 1 on the Universal Annunciator, replace if faulty.

3. Faulty Annunciator.

   a. If the wiring and configuration is satisfactory, replace the Universal Annunciator.

10.8.87 Code 1854 - Annunciator Input 2 Fault

Logic:

Customer fault 2 (input 2, LED 2) on the Universal Annunciator is active .

Possible Causes:

1. Condition for which "Annunciator Input #2" is configured for is active.
2. Incorrectly configured or wiring issue.
3. Faulty annunciator.

Diagnosis and Repair:

1. Condition for which "Annunciator Input #2" is configured for is active.

   a. Check the condition for which "Annunciator Input #2" has been configured for; ex. if "Annunciator Input #2" was configured to become active when the fuel level is low, check the fuel level and add fuel if needed. After the issue is resolved, press the Reset button on the Operator Panel in order to clear the fault, if the fault does not clear go to step 2.

2. Incorrectly configured or wiring issue.

   a. Customer input 2 on the Universal Annunciator can be configured to conform to different applications. Below are two configurations that have an impact on how input 2 becomes active.

Configurable Parameter	**Option 1 (Default)**	**Option 2**
Negative or Positive Input 2 Activation	Negative Input (ground input)	Positive Input (B+ input)
Inverting Active Hardware Signals	Don't Invert	Invert

Negative or positive Input 2 activation: Allows the user to activate with a negative (ground) or positive (B+) input; the default setting is a negative (ground) input.

Inverting active hardware signals: Input 2 has the capability to be inverted. If annunciator input 2 is set to inverted, then an active hardware signal will be considered inactive and an inactive signal will be considered active, default is set to non-inverted.

When set to default, event/fault code 1854 (customer input 2) becomes active when there is a ground input at TB1-2 on the back of the Universal Annunciator.

Ensure that the Universal Annunciator is correctly configured; for setup and configuration instructions, refer to the Universal Annunciator operator's manual (P/N 0900-0301).

b. Check the wiring at TB1-2 and ensure that customer input 2 is not wired incorrectly. Depending on the configuration of the annunciator in step 1A, ensure that there is not a short or open circuit at the TB1-2 connection.

c. Check the sender, relay, or device that is activating Input 2 on the Universal Annunciator, replace if faulty.

3. Faulty Annunciator.

   a. If the wiring and configuration is satisfactory, replace the Universal Annunciator.

10.8.88 Code 1855 - Annunciator Input 3 Fault

Logic:

Customer fault 3 (input 3, LED 3) on the Universal Annunciator is active .

Possible Causes:

1. Condition for which "Annunciator Input #3" is configured for is active.
2. Incorrectly configured or wiring issue.
3. Faulty annunciator.

Diagnosis and Repair:

1. Condition for which "Annunciator Input #3" is configured for is active.

   a. Check the condition for which "Annunciator Input #3" has been configured for; ex. if "Annunciator Input #3" was configured to become active when the fuel level is low, check the fuel level and add fuel if needed. After the issue is resolved, press the Reset button on the Operator Panel in order to clear the fault, if the fault does not clear go to step 2.

2. Incorrectly configured or wiring issue.

   a. Customer input 3 on the Universal Annunciator can be configured to conform to different applications. Below are two configurations that have an impact on how input 3 becomes active.

Configurable Parameter	**Option 1 (Default)**	**Option 2**
Negative or Positive Input 3 Activation	Negative Input (ground input)	Positive Input (B+ input)
Inverting Active Hardware Signals	Don't Invert	Invert

Negative or positive Input 3 activation: Allows the user to activate with a negative (ground) or positive (B+) input; the default setting is a negative (ground) input.

Inverting active hardware signals: Input 3 has the capability to be inverted. If annunciator input 3 is set to inverted, then an active hardware signal will be considered inactive and an inactive signal will be considered active, default is set to non-inverted.

When set to default, event/fault code 1855 (customer input 3) becomes active when there is a ground input at TB1-3 on the back of the Universal Annunciator.

Ensure that the Universal Annunciator is correctly configured; for setup and configuration instructions, refer to the Universal Annunciator operator's manual (P/N 0900-0301).

b. Check the wiring at TB1-3 and ensure that customer input 3 is not wired incorrectly. Depending on the configuration of the annunciator in step 1A, ensure that there is not a short or open circuit at the TB1-3 connection.

c. Check the sender, relay, or device that is activating Input 3 on the Universal Annunciator, replace if faulty.

3. Faulty Annunciator.

   a. If the wiring and configuration is satisfactory, replace the Universal Annunciator.

10.8.89 Code 1912 - Utility Loss Of Phase

Logic:

In Power Transfer Control (PTC) Operation, if the phase angle between phases drops below 90 degrees or exceeds 150 degrees, for the “Utility Loss of Phase Drop-Out Delay" time parameter, fault code 1912 will become active.

Possible Causes:

1. Open circuit at the utility voltage sensing inputs.
2. Utility voltage or frequency is unstable.

Diagnosis and Repair:

1. Open circuit at the utility voltage sensing inputs.
   a. The phase angle between phases L1-L2, L2-L3, and L3-L1 should be 120 degrees. At least one connection point that is used to calculate phase angle has been lost. Check the voltage sensing connections at L1: TB7-1; L2: TB7-2, L3: TB7-3 for an open circuit, and ensure that voltage and phase angle is correct. If using a PT also check the inputs and outputs of the PT.
2. Utility phase angle is unstable.
   a. Check with your utility company.

10.8.90 Code 1913 - Genset Loss Of Phase

Logic:

In Power Transfer Control (PTC) Operation, if the phase angle between phases drops below 90 degrees or exceeds 150 degrees, for the “Genset Loss of Phase Drop-Out Delay" time parameter, fault code 1913 will become active.

Possible Causes:

1. Correct any active generator set faults.
2. Open circuit at the generator set voltage sensing inputs.

Diagnosis and Repair:

1. Correct any active generator set faults.
   a. Correct any active generator set faults on the display, especially faults that might cause the engine to hunt/oscillate.

2. Open circuit at the generator set voltage sensing inputs.

   a. The phase angle between phases L1-L2, L2-L3, and L3-L1 should be 120 degrees. At least one connection point that is used to calculate phase angle has been lost. Check the voltage sensing connections at L1, J22-1; L2, J22-2; L3, J22-3 for an open circuit, and ensure that voltage and phase angle is correct. If using a PT also check the inputs and outputs of the PT.

10.8.91 Code 1914 - Utility Ph Rotation Error

Logic:

Utility Phase rotation is incorrect.

Possible Causes:

1. Utility voltage sensing connections are incorrectly wired at the base board.

Diagnosis and Repair:

1. Utility voltage sensing connections are incorrectly wired at the base board.

   a. If the nominal voltage is 600 VAC or lower, ensure that the voltage sensing connections are correct.

      - Measure the phase rotation and voltage input into the base board from the Utility bus at: L1, TB7-1; L2, TB7-2; L3, TB7-3. The voltage should match nominal voltage, and the phase rotation should be “L1 – L2 –L3", for proper phase rotation measurement procedures, refer to the phase rotation meter instructions. If the phase rotation and/or voltage are not correct, re-check the wiring.

   b. If the nominal voltage is over 600 VAC, measure the voltage sensing connections from the base board to the PT and the PT to the Utility bus.

⚠ WARNING
High voltages are present in this step. Special equipment and training is required to work on or around high-voltage equipment. Operation and maintenance must be done only by persons trained and qualified to work on such devices. Improper use or procedures may result in severe personal injury or death.

      - Measure the phase rotation and voltage input into the base board from the PT (Potential Transformer) at: L1, TB7-1; L2, TB7-2; L3, TB7-3, L4, TB7-4. The voltage should match nominal voltage, and the phase rotation should be “L1 – L2 –L3", for proper phase rotation measurement procedures, refer to the phase rotation meter instructions. If the phase rotation and/or voltage are not correct, re-check the wiring from the base board to the PT and correct if necessary.
      - Measure the phase rotation and voltage input into the PT (Potential Transformer) from the Utility bus. The voltage into the PT should match the Utility bus voltage, and the phase rotation should be “L1 – L2 –L3", for proper phase rotation measurement procedures, refer to the phase rotation meter instructions. If the phase rotation and/or voltage are not correct, re-check the wiring from the PT to the Utility bus and correct if necessary.

10.8.92 Code 1915 - Genset Phase Rotation

Logic:

Generator set Phase rotation is incorrect.

Possible Causes:

1. Generator set voltage sensing connections are incorrectly wired at the base board.

Diagnosis and Repair:

1. Generator set voltage sensing connections are incorrectly wired at the base board.
   a. If the nominal voltage is 600 VAC or lower, ensure that the voltage sensing connections are correct.
      - Measure the phase rotation and voltage input into the base board from the Generator set at: L1, J22-1; L2, J22-2; L3, J22-3. The voltage should match nominal voltage, and the phase rotation should be “L1 – L2 –L3", for proper phase rotation measurement procedures, refer to the phase rotation meter instructions. If the phase rotation and/or voltage are not correct, re-check the wiring.

   b. If the nominal voltage is over 600 VAC, measure the voltage sensing connections from the base board to the PT and the PT to the Generator set.

⚠ WARNING
High voltages are present in this step. Special equipment and training is required to work on or around high-voltage equipment. Operation and maintenance must be done only by persons trained and qualified to work on such devices. Improper use or procedures may result in severe personal injury or death.

      - Measure the phase rotation and voltage input into the base board from the PT (Potential Transformer) at: L1, J22-1; L2, J22-2; L3, J22-3. The voltage should match nominal voltage, and the phase rotation should be “L1 – L2 –L3", for proper phase rotation measurement procedures, refer to the phase rotation meter instructions. If the phase rotation and/or voltage are not correct, re-check the wiring from the base board to the PT and correct if necessary.
      - Measure the phase rotation and voltage input into the PT (Potential Transformer) from the Generator set. The voltage into the PT should match the Generator set voltage, and the phase rotation should be “L1 – L2 –L3", for proper phase rotation measurement procedures, refer to the phase rotation meter instructions. If the phase rotation and/or voltage are not correct, re-check the wiring from the PT to the Generator set and correct if necessary.

10.8.93 Code 1944 - HMI113 Out Config Error

Logic:

PCCNet Annunciator (HMI113) output relay(s) are being activated by more than one source.

Possible Causes:

1. PCCNet Annunciator (HMI113) output relay(s) are being activated by more than one source at the same time.
2. Faulty annunciator.

Diagnosis and Repair:

1. PCCNet Annunciator (HMI113) output relay(s) are being activated by more than one source at the same time.
   a. The Universal Annunciator(s) should only be connected to one generator set control; only one generator set control should active the relays. Event/fault code 1944 becomes active when any of the four PCCNet annunciator relays are being driven by more than one source in the PCCNet network; if the PCCNet annunciator is connected to two generator set controls or more, this is the cause of the fault. Ensure that the PCCNet annunciator(s) are only connected to one generator set control.
2. Faulty annunciator.
   a. If the previous steps are satisfactory, then replace the annunciator.

10.8.94 Code 1999 - Maximum Parallel time

Logic:

In Power Transfer Control (PTC) Operation, if the generator set remains paralleled to the utility for a time that is longer than the "Maximum Parallel Time" parameter, fault code 1999 will become active.

Possible Causes:

1. "Maximum Parallel Time" parameter is set too low.

Diagnosis and Repair:

1. "Maximum Parallel Time" parameter is set too low.
   a. Fault code 1999 becomes active when the generator set remains paralleled to the utility for a time that is longer than the "Maximum Parallel Time" parameter. Check the setting of the Maximum Parallel Time parameter and ensure that it is set to an appropriate value for the application. To modify the "Maximum Parallel Time" parameter on the display, go to: **Setup > Paralleling Setup > Power Transfer Control > Max Parallel** and set appropriately for the application.

10.8.95 Code 2331 - Low Utility Voltage

Logic:

In Power Transfer Control (PTC) Operation, if the utility voltage is below the “Utility Undervoltage Drop-Out Threshold", for the “Utility Undervoltage Drop-Out Delay", fault code 2331 will become active.

Possible Causes:

1. Utility undervoltage drop-out thresholds are incorrectly set.
2. The voltage of the utility is low and/or unstable.

Diagnosis and Repair:

1. Utility undervoltage drop-out thresholds are incorrectly set.
   a. This fault will become active when the Utility voltage goes below the “Utility undervoltage drop-out threshold" for the “Utility Undervoltage Drop-Out Delay". Utility undervoltage drop-out threshold is dependent of the following parameters:
      - Utility Undervoltage Drop-out percentage.
      - Utility Undervoltage Drop-out Delay.

To Modify the preceding parameters, on the display go to: **Setup > Paralleling Setup > Power Transfer Control > Drop out or Drop-Out Delay** and set appropriately. Refer the PTC section for setup information and instructions.

2. The voltage of the utility is low and/or unstable.
   a. The voltage of the utility is low and/or unstable, check with your utility company.

10.8.96 Code 2335 - Excitation Fault

Logic:

The control has detected the simultaneous loss of all phases of sensing.

Possible Causes:

1. Incorrectly configured or wiring issue.

Diagnosis and Repair:

1. Incorrectly configured or wiring issue.
   a. Ensure that the configuration of the “Lost AC Voltage Threshold" parameter is set appropriately for the application. To access the Lost AC Voltage Threshold configuration menu on the operator panel go to **Setup > OEM Setup > OEM ALT Setup > Lost AC Voltage Threshold** and set the “Lost AC Voltage Threshold" parameter appropriately for the application. Refer to the parameter list to see the default value for “Lost AC Voltage Threshold".
   b. All the connections that are used to calculate voltage and current by the control have been lost (either by disconnection or no voltage, current, frequency input into the control, etc.) Check the voltage sensing (L1: J22 -1; L2: J22 -2, L3: J22-3, L4: J22-4) and current sensing (L1: J12-1, J12-4; L2: J12-2, J12-5; L3: J12-3, J12-6;) connections into the control and ensure that voltage and current are available at these connections when the generator set is running. If using a PT also check the inputs and outputs of the PT.

10.8.97 Code 2336 - Checksum Fault

Logic:

Integrity check has found corrupted memory block(s) in the PCC.

Possible Causes:

1. PCC has corrupted memory block(s).

Diagnosis and Repair:

1. PCC has corrupted memory block(s).
   a. The PCC has corrupted memory block(s), this is indicated by all of the LEDs on the base board flashing. Perform an initial calibration on the base board with the newest Incal files. If the Incal update does not resolve the issue, then replace the base board.

10.8.98 Code 2342 - Too Long In Idle

Logic:

The engine has been running at Low Speed Idle for a time longer than the "Max Idle Time" parameter.

Possible Causes:

1. "Idle Time" parameters are configured incorrectly.

Diagnosis and Repair:

1. Idle Time parameters are configured incorrectly.
   a. If the generator set has been running in Idle and displays event/fault code 2342, ensure that the generator set is not configured to run in idle for more that 10 min. Long periods of engine idling (more than 10 min) can eventually affect engine performance and may not be covered by the engine warranty. Set the **"Idle Warmup Time"** and **"Idle Cooldown Time"** to an appropriate value. To access these parameters, on the operator panel go to **Setup > Genset Setup > Idle Warmup Time** or **Idle Cooldown Time** and set these parameter appropriately for the application. Refer to the parameter list to see the default value for "Idle Warmup Time" and "Idle Cooldown Time".
   b. The "Max Idle Time" parameter might be set too low. To access the Max Idle Time configuration menu on the operator panel go to **Setup > Genset Setup > Max Idle Time** and set the "Max Idle Time" parameter appropriately for the application. Refer to the parameter list to see the default value for "Max Idle Time" parameter.
   c. If the "Idle Warmup Coolant Temp" is set too high, the generator set will idle for a longer period of time until the temperature of the engine reaches this set point. To access the Idle Warmup Coolant Temp configuration menu on the operator panel go to **Setup > Genset Setup > Idle Warmup Coolant Temp** and set the "Idle Warmup Coolant Temp" parameter appropriately for the application. Refer to the parameter list to see the default value for "Idle Warmup Coolant Temp" parameter.

10.8.99 Code 2358 - High Utility Voltage

Logic:

In Power Transfer Control (PTC) Operation, if the “Utility Overvoltage Sensor Enable" parameter is set to enable, and the utility voltage goes above the “Utility Overvoltage Drop-Out Threshold", for the “Utility Overvoltage Drop-Out Delay" time, fault code 2358 will become active.

Possible Causes:

1. Utility Overvoltage drop-out thresholds are incorrectly set.
2. The voltage of the Utility is not stable.

Diagnosis and Repair:

1. Utility Overvoltage drop-out thresholds are incorrectly set.
   a. This fault will become active when the Utility voltage goes above the “Utility Overvoltage Drop-Out Threshold" for the “Utility Overvoltage Drop-Out Delay" time. The utility overvoltage drop-out threshold is dependent of the following parameters:
      - Utility Overvoltage Drop-out percentage.
      - Utility Overvoltage Drop-out Delay.

      To Modify the preceding parameters, on the display go to: **Setup > Paralleling Setup > Power Transfer Control > Drop out or Drop-Out Delay** and set appropriately. Refer the PTC section for setup information and instructions.
   b. To disable this function, set the “Utility Overvoltage Sensor Enable" parameter to disable. On the display go to: **Setup > Paralleling Setup > Power Transfer Control > Enable** and set appropriately. Refer the PTC section for more information.

2. The voltage of the utility is very high and/or unstable.
    a. The voltage of the utility is very high and/or unstable, check with your utility company.

10.8.100 Code 2396 - Utility CB Fail To Close

Logic:

Utility circuit breaker (CB) has failed to close for the time that is registered in the “Util CB Fail to Close Time Delay" parameter.

Possible Causes:

1. Incorrectly wired.
2. Faulty Utility Circuit Breaker (CB).

Diagnosis and Repair:

1. Incorrectly wired.
    a. The base board is sending the Utility CB a close command, but the Utility CB Position Status remains open. Correct the wiring from the CB Close Control output on the base board at TB5-6 and TB5-7 to the Utility breaker; check for an open circuit at the Utility breaker. The Utility CB Close control output is a NO Relay at TB5-6 and TB5-7 (Relay Common) on the base board. When the relay on the base board is closed, the Utility Breaker should be closed. The output of TB5-6 and TB5-7 should match the status of the Utility CB Close command; go to: **Advanced Status > Advanced Controller Status**, and ensure that the status of the CB close position command at the display matches the output.
    b. Verify the wiring of the CB position status from the Utility breaker to the base board. The CB position sensing can be set up as single or dual sensing in the base board; check the display if the base board is setup as single or dual sensing. To access the CB position sensing, go to: **Setup > Paralleling Setup > Basic > Pos Contacts > Utility Breaker Position Contacts**
        - If the CB position sensing is set up as single, verify the connection at CB A (NO) status at TB10-3 and the Return at TB10-1.
        - If the CB position sensing is set up as dual, verify the connection at CB A (NO) status at TB10-3 and the Return at TB10-1 and also verify the connection at CB B (NC) status at TB10-4 and TB10-1 (Return). The input status at CB A (NO) and CB B (NC) should be opposite, one input will be open while the other is closed, if they are the same check the wiring between the Utility breaker and the CB status input on the base board.

          Ensure that the connections on the base board are correctly connected and that a short and/or open circuit does not exist. The physical connection to the base board should match the status of the CB position; go to: **Paralleling Status > Paralleling Status-PTC Sc 1 > Util CB Pos > Utility CB Position Status**, and ensure that the status of the CB position matches the connection.
2. Faulty Utility CB.

10.8.101 Code 2397 - Utility CB Fail To Open

Logic:

Utility circuit breaker (CB) has failed to open for the time that is registered in the “Utility CB Fail to Open Time Delay" parameter.

Possible Causes:

1. Incorrectly wired.

2. Faulty Utility Circuit Breaker (CB).

Diagnosis and Repair:

1. Incorrectly wired.
   a. The base board is sending the Utility CB an open command, but the Utility CB Position Status remains closed. Correct the wiring from the CB Open Control output on the base board at TB5-8 and TB5-9 to the Utility breaker; check for a short circuit. The Utility CB Open control output is a NO Relay at TB5-8 and TB5-9 (Relay Common) on the base board. When the relay is closed the Utility Breaker is closed. The output of TB5-8 and TB5-9 should match the status of the **Utility CB Open position command**; go to: **Advanced Status > Advanced Controller Status**, and ensure that the status of the Utility CB Open position command at the display matches the output.
   b. Verify the wiring of the CB position status from the Utility breaker to the base board. The CB position sensing can be set up as single or dual sensing in the base board; check the display if the base board is setup as single or dual sensing. To access the CB position sensing, go to: **Setup > Paralleling Setup > Basic > Pos Contacts > Utility Breaker Position Contacts.**
      - If the CB position sensing is set up as single, verify the connection at CB A (NO) status at TB10-3 and the Return at TB10-1.
      - If the CB position sensing is set up as dual, verify the connection at CB A (NO) status at TB10-3 and the Return at TB10-1 and also verify the connection at CB B (NC) status at TB10-4 and TB10-1 (Return). The input status at CB A (NO) and CB B (NC) should be opposite, one input will be open while the other is closed, if they are the same check the wiring between the Utility breaker and the CB status input on the base board.

        Ensure that the connections on the base board are correctly connected and that a short and/or open circuit does not exist. The physical connection to the base board should match the status of the Utility CB position; go to: **Paralleling Status > Paralleling Status-PTC Sc 1 > Util CB Pos > Utility CB Position Status**, and ensure that the status of the Utility CB position matches the connection.
2. Faulty Utility CB.

10.8.102 Code 2545 - Keyswitch Reset Required

Logic:

CAN datalink communication has been lost between the genset control and ECM, therefore event/fault code 2545 becomes active if event/fault code 781 “CAN Data Link Failure" is also active at the ECM .

Possible Causes:

1. CAN datalink failure.
2. Faulty ECM.

Diagnosis and Repair:

1. CAN datalink failure.
   a. Reset the Keyswitch manually.

      1. Put the genset control in the OFF position and press the Reset button on the operator panel. This action will clear any shutdown faults and resets the Keyswitch.

      2. Enable the Keyswitch through the operator panel. Go to **Setup > Calibration > Keyswitch Override Enable**, set to Enable.
   b. Reset the ECM and PCC control.

1. Depress the Emergency Stop button.
2. Wait 30 seconds.
3. Disconnect the battery terminals from the battery.
4. Wait 10-15 seconds.
5. Reconnect the battery cables to the battery terminals correctly.
6. Deactivate the Emergency Stop by pulling the switch out.
7. Press the Fault Reset button.

c. Check the relay that is proving power to the Keyswitch. This relay is normally open, and if faulty, replace.

d. Check the terminating resistors. With connectors J11 and J26 removed, measure resistance between pins J11-19 and J11-20 (60 Ohms, is satisfactory).

e. Reference the troubleshooting procedure for event/fault code 781 in the engine service manual.

2. Faulty ECM.

a. After ensuring that the ECM has an adequate B+ supply, connect to the ECM with InPower or InSite in order to determine if it is functioning correctly and can communicate with the PCC controller. Replace the controller if communication to it with InPower is not possible.

10.8.103 Code XXXX - Aux101 #m Input #n Fault

Where:

m=0,1

n=1, 2, 3, 4, 5, 6, 7, 8

XXXX is defined below:

Fault (XXXX)	Description	Fault (XXXX)	Description
5182	*AUX101 0 Input 1 Fault*	**2882**	*AUX101 1 Input 1 Fault*
2621	*AUX101 0 Input 2 Fault*	**2883**	*AUX101 1 Input 2 Fault*
2622	*AUX101 0 Input 3 Fault*	**2884**	*AUX101 1 Input 3 Fault*
2623	*AUX101 0 Input 4 Fault*	**2885**	*AUX101 1 Input 4 Fault*
2624	*AUX101 0 Input 5 Fault*	**2886**	*AUX101 1 Input 5 Fault*
2625	*AUX101 0 Input 6 Fault*	**2887**	*AUX101 1 Input 6 Fault*
2626	*AUX101 0 Input 7 Fault*	**2888**	*AUX101 1 Input 7 Fault*
2627	*AUX101 0 Input 8 Fault*	**2889**	*AUX101 1 Input 8 Fault*

Logic:

AUX101 device #m Input #n Fault is Active

Possible Causes:

1. Condition for which “AUX101 device #m Input #n” is configured for is Active.
2. “AUX101 device #m Analog Input #n Sensor Type” parameter is configured incorrectly.
3. Incorrectly wired; or open circuit or short circuit in the wiring.

4. External Switch is faulty.

Diagnosis and Repair:

1. Condition for which “AUX101 device #m Input #n” is configured for is Active.
   a. Check the condition for which “AUX101 device #m Input #n” has been configured for; ex. If “AUX101 device #m Input #n” was configured to become active when the fuel level is low, check the fuel level and add fuel if needed. After the fuel is filled, press the Reset button on the Operator Panel in order to clear the fault, if the fault does not clear, go to step 2.
2. “AUX101 #m Analog Input #n Sensor Type” parameter is configured incorrectly.
   a. With InPower or through the Operator Panel check the switch input setting (‘switch input - active closed’ or ‘switch input - active open’) for “AUX101 device #m Input #n”. Ensure the switch input setting is correctly set. If “AUX101 device #m Input #n Function Pointer” parameter is set to default and if “AUX101 device #m Analog Input #n Sensor Type” is set to ‘switch input – active closed’, input #n will become active. e.g. input 2 (event/fault code 1312) will become active when TB1-14 (input 2) and ground (e.g. TB1-15) are connected (shorted) together.

      If “AUX101 device #m Input #n Function Pointer” parameter is set to default and if “AUX101 device #m Analog Input #n Sensor Type” is set to ‘switch input – active open’, input #n will become active. e.g. input 2 (event/fault code 1312) will become active when there is an open circuit between TB1-14 (input 2) and ground (e.g. TB1-15).

      To access the input configuration on the operator panel go to **setup > AUX101 Setup > AUX101 #m Input #n > Sensor Type (level-1 Password 574 required)** and set this parameter appropriately for the application.
3. Incorrectly wired; or open circuit or short circuit in the wiring.
   a. Check the wiring at respective connector pins. e.g. TB1-14 (input 2) and ground (e.g. TB1-15) for an open circuit, short circuit or a mis-wired condition.
4. External Switch is faulty.
   a. Check for external switch functionality.

10.8.104 Code 2661 - One or more Unacknowledged Engine Fault Codes

Logic:

One or more engine shutdown faults are active.

Possible Causes:

1. Engine Fault Code active.

Diagnosis and Repair:

1. Engine Fault Code
   a. Using InSite, connect to the engine ECM. Check for active fault codes.
   b. Diagnose and repair any active fault codes. Refer to the engine service manual.
   c. Clear all engine fault codes. Cycle power to the control.

10.8.105 Code 2662 - One or more Acknowledged Engine Fault Codes

Logic:

One or more engine shutdown faults are active.

Possible Causes:

1. Engine Fault Code active.

Diagnosis and Repair:

1. Engine Fault Code
    a. Using InSite, connect to the engine ECM. Check for active fault codes.
    b. Diagnose and repair any active fault codes. Refer to the engine service manual.
    c. Clear all engine fault codes. Cycle power to the control.

NOTICE
For PCC software version 3.280 and later, FC 2662 is no longer active. FC 2662 has been replaced with FC 6598 which has similar logic. Please see the troubleshooting for FC6598 for additional information.

10.8.106 Code 2678 - Charging Alternator Fail

Logic:

Battery charging alternator is not charging.

Possible Causes:

1. Faulty engine DC alternator or open circuit.

Diagnosis and Repair:

1. Faulty engine DC alternator or open circuit.
    a. Check the wiring of the alternator for open circuits. If the wiring is satisfactory, measure the output voltage of the alternator to the battery while the engine is running. Normal charging voltage is 12-14 VDC in a 12 V system or 24-26 VDC in a 24 V system. If the appropriate output is not observed, replace the DC alternator.

10.8.107 Code 2814 - Genset CT Ratio Low

Logic:

The generator set CT ratio (primary vs. secondary) is too small for the control to function properly for the voltage and KW rating of this generator set.

Possible Causes:

1. Incorrect CT ratio setup (or feature code).
2. The CTs are incorrectly sized.
3. Incorrect voltage or kW rating setup.

Diagnosis and Repair:

1. Incorrect CT ratio setup (or feature code).

   a. The control uses voltage, kW, and the CT ratio in order to determine if the CT ratio is correct for the operation of the generator set. Use the **CT ratio calculator** in InPower to determine the correct CT ratio for this generator set. Then enter the correct CT ratio via InPower or through the operator panel. To access the Genset CT ratio configuration menu on the operator panel go to **Setup > OEM Setup > OEM Alt Setup > Genset CT Ratio** and set the “Genset CT Ratio primary" and “Genset CT Ratio secondary" parameters appropriately for the application.

2. The CTs are incorrectly sized.

   a. Change the CTs to the correct size.

3. Incorrect voltage or kW rating setup.

   a. The PCC uses voltage, kW, and the CT ratio in order to determine if the CT ratio is correct for the operation of the generator set. If the voltage or kW setup is incorrect, event/fault code 2814 can become active. Use the CT calculator in InPower to determine the correct voltage and kW rating for this generator set. To access the generator set voltage and kW rating setup on the Operator Panel, go to **Setup > OEM Setup > OEM Alt Setup > Genset Nominal Voltage** and **Setup > OEM Setup > OEM Genset Setup** and set the parameters appropriately for the application.

10.8.108 Code 2815 - Genset CT Ratio High

Logic:

The ratio of the generator set CT is too large for this generator set. The generator set CT ratio (primary vs. secondary) is too large for the control to calculate current accurately at the voltage and KW ratings for this generator set.

Possible Causes:

1. The control is set up with the incorrect CT ratio (or feature code).
2. The CTs are incorrectly sized.
3. Incorrect voltage or kW rating setup.

Diagnosis and Repair:

1. The control is set up with the incorrect CT ratio (or feature code).

   a. The control uses voltage, kW, and the CT ratio in order to determine if the CT ratio is correct for the operation of the generator set. Use the **CT ratio calculator** in InPower to determine the correct CT ratio for this generator set. Then enter the correct CT ratio via InPower or through the operator panel. To access the Genset CT ratio configuration menu on the operator panel go to **Setup > OEM Setup > OEM Alt Setup >** and set the “Genset CT Ratio primary" and “Genset CT Ratio secondary" parameters appropriately for the application.

2. The CTs are incorrectly sized.

   a. Change the CTs to the correct size.

3. Incorrect voltage or kW rating setup.

   a. The PCC uses voltage, kW, and the CT ratio in order to determine if the CT ratio is correct for the operation of the generator set. If the voltage or kW setup is incorrect, event/fault code 2815 can become active. Use the CT calculator in InPower to determine the correct voltage and kW rating for this generator set. To access the Generator set voltage and kW rating setup on the Operator Panel, go to **Setup > OEM Setup > OEM Alt Setup > Genset Nominal Voltage** and Setup > OEM Setup > OEM Genset Setup and set the parameters appropriately for the application.

10.8.109 Code 2816 - Genset PT Ratio Low

Logic:

The generator set PT ratio is too small for the generator set rating. The generator set PT ratio (primary vs. secondary) is too small and will cause high voltage readings.

Possible Causes:

1. The control is set up with the incorrect PT ratio.
2. The PTs are incorrectly sized.

Diagnosis and Repair:

1. The control is set up with the incorrect PT ratio.

   a. The control uses nominal voltage and the PT ratio in order to determine if the PT ratio is correct for proper operation of the generator set. Voltage input into the control board should not exceed 600 VAC, whether an external PT is used or not. Use the following equation to determine if you have the correct PT ratio: If (Genset Nominal Voltage / Genset PT Primary voltage) * Genset PT Secondary voltage > 600 VAC, your PT ratio is too small.

      Then configure the control with the correct PT Ratio. To access the generator set PT ratio configuration menu on the operator panel, go to **Setup > OEM Setup > OEM Alt Setup >** and set the “Genset PT Ratio primary" and “Genset PT Ratio secondary" parameters appropriately for the application.

2. The PTs are incorrectly sized.

   a. Use the following equation to determine if the correct PT for the application is installed: (Genset Nominal Voltage / Genset PT Primary voltage) * Genset PT Secondary voltage > 600 VAC, your PT ratio is too small.

   b. Check the voltage input into the control board. When the generator set is running, the voltage input between L1 and L2 (J22-1 and J22-2) or L2 and L3 (J22-2 and J22-3) should not be more that 600 VAC.

10.8.110 Code 2817 - Genset PT Ratio High

Logic:

The generator set PT ratio is too large, which causes an inaccurate reading of nominal voltage during normal operation; when the generator set PT is used (above 600 VAC).

Possible Causes:

1. The control is set up with the incorrect PT ratio.
2. The PTs are incorrectly sized.

Diagnosis and Repair:

1. The control is set up with the incorrect PT ratio.
   a. The control uses nominal voltage and the PT ratio in order to determine if the PT ratio is correct for the operation of the generator set. Voltage input into the control board should exceed 50% of the nominal voltage to allow the control to obtain an accurate voltage reading, whether an external PT is used or not. Use the following equation to determine if you have the correct PT ratio: If (Genset Nominal Voltage / Genset PT Primary voltage) * Genset PT Secondary voltage < (Nominal voltage *.5), the PT ratio is too large.

      Then configure the control with the correct PT ratio. To access the generator set PT ratio configuration menu on the operator panel, go to **Setup > OEM Setup > OEM Alt Setup >** and set the “Genset PT Ratio primary" and “Genset PT Ratio secondary" parameters appropriately for the application.
2. The PTs are incorrectly sized.
   a. Use the following equation to determine if you have the correct PT for the application: (Genset Nominal Voltage / Genset PT Primary voltage) * Genset PT Secondary voltage < (Nominal voltage *.5), your PT ratio is too large.

      B. Check the voltage input into the control board. When the generator set is running the voltage input between L1 and L2 (J22-1 and J22-2) or L2 and L3 (J22-2 and J22-3) should be greater than (Genset Bus Nominal Voltage *.5) VAC.

10.8.111 Code 2818 - Bus PT Ratio Low

Logic:

The Generator set Bus PT ratio is too small for the Generator set Bus rating. The Bus PT ratio (primary vs. secondary) is too small and will cause high voltage readings.

Possible Causes:

1. The control is set up with the incorrect PT Ratio.
2. The PTs are incorrectly sized.

Diagnosis and Repair:

1. The control is set up with the incorrect PT Ratio.
   a. The control uses nominal voltage and the PT ratio in order to determine if the PT ratio is correct for proper operation of the bus. Voltage input into the control board should not exceed 600 VAC, whether an external PT is used or not. Use the following equation to determine if you have the correct PT Ratio: If (Genset Bus Nominal Voltage / Genset Bus PT Primary voltage) * Genset Bus PT Secondary voltage > 600 VAC, your PT Ratio is too small.

      Then configure the control with the correct PT Ratio. To access the Bus PT ratio configuration menu on the display go to: **Setup > Paralleling Setup > Basic > PT Primary and PT Secondary** and set the “Genset Bus PT Primary Voltage" and “Genset Bus PT Secondary Voltage" parameters appropriately for the application.
2. The PTs are incorrectly sized.
   a. Use the following equation to determine if the correct PT for the application is installed: If (Genset Bus Nominal Voltage / Genset Bus PT Primary voltage) * Genset Bus PT Secondary voltage > 600 VAC, your PT Ratio is too small.
   b. Check the voltage input into the control board between L1 & L2 (J22-1 & J22-2) or L2 & L3 (J22-2 & J22-3) the voltage reading should not be more that 600 VAC.

10.8.112 Code 2819 - Bus PT Ratio High

Logic:

The Generator set Bus PT ratio is too large, which causes an inaccurate reading of Genset Bus Nominal voltage during normal operation; when the Genset PT is used (above 600 VAC)

Possible Causes:

1. The control is set up with the incorrect Genset Bus PT Ratio.
2. The PTs are incorrectly sized.

Diagnosis and Repair:

1. The control is set up with the incorrect Genset Bus PT Ratio.
    a. The control uses Genset Bus Nominal voltage and the PT ratio in order to determine if the PT ratio is correct for the operation of the generator set. Voltage input into the control board should exceed 50% of the Genset Bus Nominal voltage (up to 600 VAC), to allow the control to obtain an accurate voltage reading, whether an external PT is used or not. Use the following equation to determine if you have the correct PT Ratio: If (Genset Bus Nominal Voltage / Genset Bus PT Primary voltage) * Genset Bus PT Secondary voltage < (Genset Bus Nominal voltage *.5), the PT Ratio is too large.

       Then configure the control with the correct PT Ratio. To access the Genset Bus PT ratio configuration menu on the display go to: **Setup > Paralleling Setup > Basic > PT Primary and PT Secondary** and set the "Genset Bus PT Primary Voltage" and "Genset Bus PT Secondary Voltage" parameters appropriately for the application.
2. The PT's are incorrectly sized.
    a. Use the following equation to determine if you have the correct PT for the application: If (Genset Bus Nominal Voltage / Genset Bus PT Primary voltage) * Genset Bus PT Secondary voltage < (Genset Bus Nominal voltage *.5), the PT Ratio is too large.
    b. Check the voltage input into the control board between L1 & L2 (J22-1 & J22-2) or L2 & L3 (J22-2 & J22-3) the voltage should be greater than (Genset Bus Nominal Voltage *.5) VAC.

10.8.113 Code 2821 - Utility PT Ratio Low

Logic:

The Utility PT ratio is too small for the Utility rating. The Utility PT ratio (primary vs. secondary) is too small and will cause high voltage readings

Possible Causes:

1. The control is set up with the incorrect PT Ratio.
2. The PT's are incorrectly sized.

Diagnosis and Repair:

1. The control is set up with the incorrect PT Ratio.
    a. The control uses nominal utility voltage and the PT ratio in order to determine if the PT ratio is correct for proper operation of the utility. Voltage input into the control board should not exceed 600 VAC, whether an external PT is used or not. Use the following equation to determine if you have the correct PT Ratio: If (Utility Nominal Voltage / Utility PT Primary voltage) * Utility PT Secondary voltage > 600 VAC, your PT Ratio is too small.

Then configure the control with the correct PT Ratio. To access the utility PT ratio configuration menu on the display go to: **Setup > Paralleling Setup > Basic > PT Primary and PT Secondary** and set the “Utility PT Primary Voltage" and “Utility PT Secondary Voltage" parameters appropriately for the application.

2. The PT's are incorrectly sized.

   a. Use the following equation to determine if the correct PT for the application is installed: If (Utility Nominal Voltage / Utility PT Primary voltage) * Utility PT Secondary voltage > 600 VAC, your PT Ratio is too small.

   b. Check the voltage input into the control board between L1 & L2 (J22-1 & J22-2) or L2 & L3 (J22-2 & J22-3) the voltage reading should not be more that 600 VAC.

10.8.114 Code 2822 - Utility PT Ratio High

Logic:

The Utility PT ratio is too large, which causes an inaccurate reading of Utility Nominal voltage during normal operation; when the Genset PT is used (above 600 VAC)

Possible Causes:

1. The control is set up with the incorrect Utility PT Ratio.
2. The PT's are incorrectly sized.

Diagnosis and Repair:

1. The control is set up with the incorrect Utility PT Ratio.

   a. The control uses Utility Nominal voltage and the PT ratio in order to determine if the PT ratio is correct for the operation of the generator set. Voltage input into the control board should exceed 50% of the Utility Nominal voltage (up to 600 VAC), to allow the control to obtain an accurate voltage reading, whether an external PT is used or not. Use the following equation to determine if you have the correct PT Ratio: If (Utility Nominal Voltage / Utility PT Primary voltage) * Utility PT Secondary voltage < (Utility Nominal voltage *.5), the PT Ratio is too large.

   Then configure the control with the correct PT Ratio. To access the Utility PT ratio configuration menu on the display go to: **Setup > Paralleling Setup > Basic > PT Primary and PT Secondary** and set the “Utility PT Primary Voltage" and “Utility PT Secondary Voltage" parameters appropriately for the application.

2. The PT's are incorrectly sized.

   a. Use the following equation to determine if you have the correct PT for the application: If (Utility Nominal Voltage / Utility PT Primary voltage) * Utility PT Secondary voltage < (Utility Nominal voltage *.5), the PT Ratio is too large.

   b. Check the voltage input into the control board between L1 & L2 (J22-1 & J22-2) or L2 & L3 (J22-2 & J22-3) the voltage should be greater than (Utility Nominal Voltage *.5) VAC.

10.8.115 Code 2895 - PCCNet Device Failed

Logic:

A non-critical PCCNet device has failed.

Possible Causes:

1. PCCNet communication has been lost or PCCNet device is faulty.

Diagnosis and Repair:

1. PCCNet communication has been lost or PCCNet device is faulty.
   a. If a PCCNet device has lost network communication, the network status light for that device will turn RED. Locate the device with the red network status LED to identify the affected device.
   b. Ensure that the network device has sufficient voltage (12-24 V), as measured at the input of the device, not at the source or battery. Also verify that the device is awake and has a heartbeat. A heartbeat is a LED on the PCCNet device that blinks every 1 second to inform the operator that the device is functioning.
   c. Check the network cable connections of the device(s) and ensure that there are no open or short circuits. The PCCNet network devices are polarity sensitive. For example: Control (RS485+) to Annunciator (RS485+) and Control (RS485-) to Annunciator (RS485-). If the connections are incorrect, the devices will not properly communicate over the network. Ensure that the shield is grounded at one point ONLY. Refer to the respective PCCNet device manual for line limitations and cable requirements.
   d. If previous steps are satisfactory, replace the network device.
   e. If replaced device is still exhibiting network issues, this can be due to a grounding loop or ground referencing for remotely mounted and powered network, incorrect network wire, or a noise (EMI) issue. As a test, connect the PCCNet device close (2-5 FT) to the base board, using the power supply from the base board (TB1-5, B+ and TB1-3 ground) and use the required network wire. If the network device functions appropriately, correct the grounding issue, EMI issue, or replace the network wire with the required network wire.

10.8.116 Code 2896 - Critical PCCNet Dev Fail

Logic:

A critical PCCNet device has failed and has caused the generator set to shutdown.

Possible Causes:

1. PCCNet communication has been lost or PCCNet device is faulty.

Diagnosis and Repair:

1. PCCNet communication has been lost or PCCNet device is faulty.
   a. If a PCCNet device has lost network communication, the network status light for that device will turn red. Locate the device with the red network status LED to identify the affected device.
   b. Ensure that the network device has sufficient voltage (12-24 V), as measured at the input of the device, not at the source or battery. Also verify that the device is awake and has a heartbeat. A heartbeat is a LED on the PCCNet device that blinks every 1 second to inform the operator that the device is functioning.
   c. Check the network cable connections of the device(s) and ensure that there are no open or short circuits. The PCCNet network devices are polarity sensitive. For example: Control (RS485+) to Annunciator (RS485+) and Control (RS485-) to Annunciator (RS485-). If the connections are incorrect, the devices will not properly communicate over the network. Ensure that the shield is grounded at one point ONLY. Refer to the respective PCCNet device manual for line limitations and cable requirements.
   d. If previous steps are satisfactory, replace the network device.

e. If replaced device is still exhibiting network issues, this can be due to a grounding loop or ground referencing for remotely mounted and powered network, incorrect network wire, or a noise (EMI) issue. As a test, connect the PCCNet device close (2-5 FT) to the base board, using the power supply from the base board (TB1-5, B+ and TB1-3 ground), and use the required network wire. If the network device functions appropriately, correct the grounding issue, EMI issue, or replace the network wire with the required network wire.

10.8.117 Code 2914 - Genset AC Meter Failed

Logic:

Metering chip has failed and can no longer accurately monitor generator set current and voltage.

Possible Causes:

1. An over-voltage/-current condition has damaged the metering chip.

Diagnosis and Repair:

1. An over-voltage or over-current condition has damaged the metering chip.
   a. Measure the voltage (L1: J22 -1; L2: J22 -2, L3: J22-3, L4: J22-4) and current (L1: J12-1, J12-4; L2: J12-2, J12-5; L3: J12-3, J12-6;) input into the control. Voltage input into the board should not exceed 600 VAC, (damage to board occurs at 750 VAC). Current input into the board should not exceed 5 Amps. If a short circuit or an over-voltage/-current issue exists, correct the problem(s).

10.8.118 Code 2915 - Gen Bus AC Meter Failed

Logic:

Metering chip has failed and can no longer accurately monitor generator set bus current and voltage.

Possible Causes:

1. An over-voltage/-current condition has damaged the metering chip.

Diagnosis and Repair:

1. An over-voltage or over-current condition has damaged the metering chip.
   a. Measure the voltage using a volt-meter at L1: TB7-1; L2: TB7-2, L3: TB7-3, L4: TB7-4; and the current using a current probe at CT1, CT2, and CT3. Voltage input into the board should not exceed 600 VAC, (damage to board occurs at 750 VAC). Current input into the board should not exceed 5 Amps. If a short circuit or over-voltage/-current condition exists, correct the problem.

10.8.119 Code 2916 - Utility AC Meter Failed

Logic:

Metering chip has failed and can no longer accurately monitor utility current and voltage.

Possible Causes:

1. An over-voltage/-current condition has damaged the metering chip.

Diagnosis and Repair:

1. An over-voltage or over-current condition has damaged the metering chip.
   a. Measure the voltage using a volt-meter at L1: TB7-1; L2: TB7-2, L3: TB7-3, L4: TB7-4; and the current using a current probe at CT1, CT2, and CT3. Voltage input into the board should not exceed 600 VAC, (damage to board occurs at 750 VAC). Current input into the board should not exceed 5 Amps. If a short circuit or over-voltage/-current condition exists, correct the problem.

10.8.120 Code 2917 - Gen Bus Voltage OOR HI

Logic:

If the Paralleling Application parameter is set to “Genset Bus", and the Generator set Bus Voltage sensing input into the base board exceeds 1020 VAC for the time that is registered in the “Genset Bus Voltage OOR Delay; the generator set control will display event/fault code 2917.

Possible Causes:

1. The control is set up with the incorrect Genset Bus PT Ratio or the PTs are incorrectly sized.
2. The voltage of the Generator set Bus is too high and/or unstable.

Diagnosis and Repair:

1. The control is set up with the incorrect Genset Bus PT Ratio or the PTs are incorrectly sized.
   a. Refer to event/fault code 2819.
2. The voltage of the Generator set Bus is too high and/or unstable.
   a. Ensure that the voltage of the Generator set Bus is at nominal or stable; high generator set bus voltage can also damage the base board.

10.8.121 Code 2918 - Utility Voltage OOR Hi

Logic:

If the Paralleling Application parameter is set to “Utility", and the Utility Voltage sensing input into the base board exceeds 1020 VAC for the time that is registered in the “Utility Voltage OOR Delay; the generator set control will display event/fault code 2918.

Possible Causes:

1. The control is set up with the incorrect Utility PT Ratio or the PTs are incorrectly sized.
2. The voltage of the Utility is too high and/or unstable.

Diagnosis and Repair:

1. The control is set up with the incorrect Utility PT Ratio or the PTs are incorrectly sized.
   a. Refer to event/fault code 2819.
2. The voltage of the Utility is too high and/or unstable.
   a. Check with your utility company.

10.8.122 Code 2919 - Utility Current OOR Hi

Logic:

If the Paralleling Application parameter is set to “Utility", and the Utility Current sensing input into the base board exceeds 140% for the time that is registered in the “Utility Current OOR Delay; the generator set control will display event/fault code 2919.

Possible Causes:

1. The control is set up with the incorrect Utility CT Ratio or the CT's are incorrectly sized.
2. Short Circuit
3. The Current of the Utility is too high and/or unstable.

Diagnosis and Repair:

1. The control is set up with the incorrect Utility CT Ratio or the CT's are incorrectly sized.
   a. If this fault becomes active during the commissioning processes, verify the sizing of the CT's and the setup of the Utility CT Ratio. The Utility secondary CT ratio can be set to 1 or 5 Amps; Fault code 2919 will become active when the Utility secondary CT current going into the base board is 1.4 amps or 7 amps. Ensure that the Maximum Utility primary CT current, Full Load Amps (FLA) of the building/application is correct.

      Use the following equation to determine the FLA:

      - FLA (one phase) = Maximum KW / Voltage
      - FLA (three phases) = Maximum KW / Voltage * (1.732)
      - Primary CT : Secondary CT = (FLA * 1.1) : (1 or 5 Amps).

        Ex. The maximum building load is 100KW, at 480 VAC, three phase.

        FLA = 100000 / 480*1.73 = 120.42

        The Utility primary CT size and CT Ratio should be at least 121 * (1.1) = 133 (1.1 is used as a buffer)

        Primary CT: Secondary CT = 133 : (1 or 5 Amps).

   b. To change the Utility CT Primary Current and Utility CT Secondary Current ratio parameter appropriately for the application, go to: **Setup > Paralleling Setup > Basic > CT Primary or CT Secondary** and set appropriately.
2. Check for a short circuit.
3. The current of the Utility is too high and/or unstable.
   a. Check with your utility company.

10.8.123 Code 2921 - Gen Bus Current OOR Hi

Logic:

If the Paralleling Application parameter is set to “Genset bus", and the Generator set bus Current sensing input into the base board exceeds 140% for the time that is registered in the “Genset bus Current OOR Delay; the generator set control will display event/fault code 2921.

Possible Causes:

1. The control is set up with the incorrect Genset bus CT Ratio or the CTs are incorrectly sized.
2. The current of the Generator set bus is too high and/or unstable.

Diagnosis and Repair:

1. The control is set up with the incorrect Genset bus CT Ratio or the CTs are incorrectly sized.
   a. If this fault becomes active during the commissioning processes, verify the sizing of the CT's and the setup of the Genset bus CT Ratio. The Genset bus secondary CT ratio can be set to 1 or 5 Amps; Fault code 2919 will become active when the Genset bus secondary CT current going into the base board is 1.4 amps or 7 amps. Ensure that the Maximum Genset bus primary CT current, Full Load Amps (FLA) of the building/application is correct.
      - Use the following equation to determine the FLA:
      - FLA (one phase) = Maximum KW / Voltage
      - FLA (three phases) = Maximum KW / Voltage * (1.732)

      Primary CT : Secondary CT = (FLA * 1.1) : (1 or 5 Amps).

      Ex. The maximum building load is 100KW, at 480 VAC, three phase.

      FLA = 100000 / 480*1.73 = 120.42

      The Genset bus primary CT size and CT Ratio should be at least 121 * (1.1) = 133 (1.1 is used as a buffer)

      Primary CT: Secondary CT = 133 : (1 or 5 Amps).
   b. To change the Genset bus CT Primary Current and Genset bus CT Secondary Current ratio parameter appropriately for the application, go to: **Setup > Paralleling Setup > Basic > CT Primary or CT Secondary** and set appropriately.
2. The current of the Generator set bus is too high and/or unstable.
   a. Ensure that the current of the Generator set Bus is at nominal or stable; high generator set bus current can also damage the base board.

10.8.124 Code 2922 - Genset Neutral Curr OOR Hi

Logic:

The Genset Neutral current is above the “Genset Neutral Current Calibration" parameter for the time in the “Genset Neutral Current OOR Delay" time parameter.

Possible Causes:

1. CT ratio is too small or the CTs are not sized correctly for the genset voltage and kW rating.
2. Genset Neutral current is above the “Genset Neutral Current Calibration" parameter.
3. Faulty CT.

Diagnosis and Repair:

1. CT ratio is too small or the CTs are not sized correctly for the genset voltage and kW rating.
   a. Please see event/fault code 2814.
2. Genset Neutral current is above the “Genset Neutral Current Calibration" parameter.
   a. Measure the Genset Neutral current input into the control board with a current probe at J22-4. The maximum value of current going into the control CTs should not be more than the value of the “Genset CT Secondary Current" value that the control is calibrated for. For example, if secondary setting in the control is 1 Amp, current going into the control should not be more than 1 Amp. To access the Genset CT Secondary Current configuration menu on the operator panel go to **Setup > OEM Setup > OEM Alt Setup > CT Sec** and set the “Genset CT Secondary Current" parameter appropriately for the application.

3. Faulty CT.
    a. If the above is satisfactory, check the CT and replace if faulty.

10.8.125 Code 2923 - Gen Bus kW OOR Hi

Logic:

If the Paralleling Application parameter is set to “Genset Bus", and the Genset Bus KW exceeds 32,767 KW or is below -32768 KW for the time that is registered in the “Genset Bus KW OOR Delay; the generator set control will display event/fault code 2923.

Possible Causes:

1. Incorrect application or setup.

Diagnosis and Repair:

1. Incorrect application or setup.
    a. The generator set is being used in an incorrect application in which the power monitoring is out of range. For example, if there are 25 paralleled generator sets operating at 2 MW and 13.8 KV, the generator set will not be able to monitor power above 32.767 MW and will display event/fault code 2923. This application will require external switchgear to monitor power.
    b. Genset Bus CT Ratio is incorrectly set, refer to event/fault code 2921.
    c. Genset Bus PT Ratio is incorrectly set, refer to event/fault code 2917.

10.8.126 Code 2924 - Gen Bus kVAR OOR Hi

Logic:

If the Paralleling Application parameter is set to “Genset Bus", and the Genset Bus KVAR exceeds 32,767 KVAR or is below -32768 KVAR for the time that is registered in the “Genset Bus KVAR OOR Delay; the generator set control will display event/fault code 2924.

Possible Causes:

1. Incorrect application or setup.

Diagnosis and Repair:

1. Incorrect application or setup.
    a. The generator set is being used in an incorrect application in which the power monitoring is out of range. For example, if there are 25 paralleled generator sets operating at 2 MVAR and 13.8 KV, the generator set will not be able to monitor power above 32.767 MVAR and will display event/fault code 2924. This application will require external switchgear to monitor power.
    b. Genset Bus CT Ratio is incorrectly set, refer to event/fault code 2921.
    c. Genset Bus PT Ratio is incorrectly set, refer to event/fault code 2917.

10.8.127 Code 2925 - Gen Bus kVA OOR Hi

Logic:

If the Paralleling Application parameter is set to “Genset Bus", and the Genset Bus KVA exceeds 65,535 KVA for the time that is registered in the “Genset Bus KVA OOR Delay; the generator set control will display event/fault code 2925.

Possible Causes:

1. Incorrect application or setup.

Diagnosis and Repair:

1. Incorrect application or setup.
   a. The generator set is being used in an incorrect application in which the power monitoring is out of range. For example, if there are 35 paralleled generator sets operating at 2 MVA and 25 KV, the generator set will not be able to monitor power above 65.535 MVA and will display event/fault code 2925. This application will require external switchgear to monitor power.
   b. Genset Bus CT Ratio is incorrectly set, refer to event/fault code 2921.
   c. Genset Bus PT Ratio is incorrectly set, refer to event/fault code 2917.

10.8.128 Code 2926 - Utility kW OOR Hi

Logic:

If the Paralleling Application parameter is set to “Utility", and the Utility KW exceeds 32,767 KW or is below -32768 KW for the time that is registered in the “Utility KW OOR Delay; the generator set control will display event/fault code 2926.

Possible Causes:

1. Incorrect application or setup.

Diagnosis and Repair:

1. Incorrect application or setup.
   a. The generator set is being used in an incorrect application in which the power monitoring is out of range. For example, if the Utility power is 40 MW, the generator set will not be able to monitor power above 32.767 MW and will display event/fault code 2926. This application will require external switchgear to monitor power.
   b. Utility CT Ratio is incorrectly set, refer to event/fault code 2919.
   c. Utility PT Ratio is incorrectly set, refer to event/fault code 2918.

10.8.129 Code 2927 - Utility kVAR OOR Hi

Logic:

If the Paralleling Application parameter is set to “Utility", and the Utility KVAR exceeds 32,767 KVAR or is below -32768 KVAR for the time that is registered in the “Utility KVAR OOR Delay; the generator set control will display event/fault code 2927.

Possible Causes:

1. Incorrect application or setup.

Diagnosis and Repair:

1. Incorrect application or setup.
   a. The generator set is being used in an incorrect application in which the power monitoring is out of range. For example, if the Utility power is 40 MVAR, the generator set will not be able to monitor power above 32.767 MVAR and will display event/fault code 2927. This application will require external switchgear to monitor power.

b. Utility CT Ratio is incorrectly set, refer to event/fault code 2919.

c. Utility PT Ratio is incorrectly set, refer to event/fault code 2918.

10.8.130 Code 2928 - Utility kVA OOR Hi

Logic:

If the Paralleling Application parameter is set to “Utility", and the Utility KVA exceeds 65,535 KVA for the time that is registered in the “Utility KVA OOR Delay; the generator set control will display event/fault code 2928.

Possible Causes:

1. Incorrect application or setup.

Diagnosis and Repair:

1. Incorrect application or setup.
    a. The generator set is being used in an incorrect application in which the power monitoring is out of range. For example, if the Utility power is 70 MVAR, the generator set will not be able to monitor power above 65.535 MVA and will display event/fault code 2928. This application will require external switchgear to monitor power.
    b. Utility CT Ratio is incorrectly set, refer to event/fault code 2919.
    c. Utility PT Ratio is incorrectly set, refer to event/fault code 2918.

10.8.131 Code 2938 – Earth/Ground Fault

Logic:

Short to ground in the external wiring.

Possible Causes:

1. "Configurable Input Active State Selection" parameter is incorrectly configured for Ground Fault.
2. Incorrectly wired; open or short circuit in the wiring.
3. Faulty ground fault alarm relay.

Diagnosis and Repair:

1. "Configurable Input Active State Selection" parameter is incorrectly configured for Ground Fault.
    a. Through the operator panel, check the switch input setting (active closed or open) for the Configurable Input setup for Ground Fault. Ensure that the switch input setting is correctly set. If "Configurable Input Function Pointer" parameter is set to Ground Fault and if "Configurable Input Active State Selection" parameter is set to "active closed", event/fault code 2938 will become active when the input is a ground input.

       If "Configurable Input Function Pointer" parameter is set to Ground Fault and if "Configurable Input Active State Selection" parameter is set to "active open", event/fault code 2938 will become active when the input is an open circuit.

       To access the input configuration on the operator panel go to **Setup > Configurable I/O > Config Input Menu > Active** and set the "Configurable Input Active State Selection" parameter appropriately for the application.

2. Incorrectly wired; open or short circuit in the wiring.
   a. Depending on the "Configurable Input Active State Selection" parameter setting, check the wiring for an open/short circuit, or mis-wired condition from the generator set (L1, J22-1; L2, J22-2; L3, J2-3; LN, J22-4) to the Ground Fault Alarm Relay (Input 6 and 8), correct if faulty.
3. Faulty ground fault alarm relay (refer to instruction sheet C648a).
   a. Ensure that the input voltage to the Ground Fault Alarm Relay is 24 VDC, at input 1 and 2.
   b. Verify that the Trip Current and Time Delay settings on the Ground Fault Alarm Relay are set appropriately for the application.
   c. If the previous steps are satisfactory, replace the Ground Fault Alarm Relay.

10.8.132 Code 2939 - MODBUS Failure

Logic:

If any of the Modbus parameters are Active, and the Modbus device stops communicating with the base board for a time period longer than in the “Modbus Failure Time Delay", event/fault code 2939 becomes active.

Possible Causes:

1. Active Modbus fault or wiring issue.
2. Faulty Modbus device.

Diagnosis and Repair:

1. Active Modbus fault or wiring issue.
   a. Check the following parameters for an “Active" Modbus state. If any of the below listed Modbus parameters are Active and have stopped communicating with the base board for a time period longer than in the “Modbus Failure Time Delay", event/fault code 2939 becomes active. Communication with these items will need to be restored.
      - Exercise Switch
      - Remote Start Switch
      - Load Demand Stop
      - Start Type
      - Fault Reset
      - Battle Short Switch
      - Genset CB Inhibit Switch
      - Utility CB Inhibit Switch
      - Synch Enable Switch
      - Ramp Load Unload Switch
      - Speed Droop Enable Switch
      - Voltage Droop Enable Switch
      - Genset CB Tripped Switch
      - Utility CB Tripped Switch
      - Extended Parallel Switch
      - PTC Mode Switch

   b. Check the Modbus connection from the parameters listed above to that base board connection at TB15-3 (RS485+) and TB15-4 (RS485-) for open/short circuits or miswiring. There should be a 120 Ohm terminating resistor at each end of the Modbus network (a resistor at the PCC TB15-3 (RS485+) and TB15-4 (RS485-) and at the last device of the Modbus network). Also ensure that the shield is grounded at TB15-1. The shield should be grounded at ONLY this point.

2. Faulty Modbus device.

   a. Check the Modbus device that is transmitting information to the base board. If this device is faulty and/or has stopped communicating with the base board, event/fault code 2939 becomes Active. If the external Modbus device is faulty then repair or replace.

10.8.133 Code 2942 - Shutdown Override Fail

Logic:

The generator set has failed to transition to Battle Short mode or Delayed Shutdown mode.

Possible Causes:

1. Battle Short or Delayed Shutdown is not enabled in the generator set control.
2. Battle Short is not enabled in the Engine Control Module (ECM).

Diagnosis and Repair:

1. Battle Short or Delayed Shutdown is not enabled in the generator set control.

   a. Through the operator panel, verify that the “Battle Short" parameter is set to enable. To access the “Battle Short" configuration menu on the operator panel go to **Setup > OEM Setup > OEM Genset Setup > Battle Short** and set the parameter to enable, if the battle short mode is required by the customer.

   b. Ensure that one of the configurable inputs is set up to activate Battle Short mode (e.g., Configurable Input #1 = Battle Short). Battle Short may now be enabled by activating the configurable input that was set up for Battle Short (e.g., Enable Configurable Input #1 with a ground input).

   c. Through the operator panel, verify that the “Delayed Shutdown" parameter is set to enable. To access the “Delayed Shutdown" configuration menu on the operator panel go to **Setup > OEM Setup > OEM Genset Setup > Delayed Shutdown** and set the parameter to enable, if the Delayed Shutdown mode is required by the customer.

2. Battle Short is not enabled in the Engine Control Module (ECM).

   a. Connect to the ECM with InSite or InPower and enable the Battle Short parameter in the ECM. Under “Engine Protection", set “Shutdown Manual Override" to “Enable".

10.8.134 Code 2943 - Manual Sw Config Fail

Logic:

Event/fault code 2943 is activated when the control receives an active Manual input from both the operator panel and the PCCNet network at the same time for two seconds or more.

Possible Causes:

1. Two Manual command inputs that are active at the same time.

Diagnosis and Repair:

1. Two Manual command inputs that are active at the same time.
    a. Ensure there is only one Manual switch input to the control that is active, either through the operator panel or PCCNet Network (PCCNet DIM) but not both at the same time.

10.8.135 Code 2944 - Auto Switch Config Fail

Logic:

Event/fault code 2944 is activated when the control receives an active Auto input from both the operator panel and the PCCNet network at the same time for two seconds or more.

Possible Causes:

1. Two Auto command inputs that are active at the same time.

Diagnosis and Repair:

1. Two Auto command inputs that are active at the same time.
    a. Ensure there is only one Auto switch input to the control that is active, either through the operator panel or through PCCNet Network (PCCNet DIM) but not both at the same time.

10.8.136 Code 2945 - Rupture Basin

Logic:

Main fuel tank is leaking into the rupture basin.

Possible Causes:

1. "Rupture Basin/Configurable Input #12 Active State Selection" parameter is incorrectly configured.
2. Incorrectly wired; open or short circuit in the wiring.
3. Faulty sender.

Diagnosis and Repair:

1. "Rupture Basin/Configurable Input #12 Active State Selection" parameter is incorrectly configured.
    a. Through the operator panel check the switch input setting (active closed or open) for the Rupture Basin/Configurable Input #12 Active State Selection. Ensure that the switch input setting is correctly set. If "Rupture Basin/Configurable Input #12 Function Pointer" parameter is set to Default and if "Rupture Basin/Configurable Input #12 Active State Selection" parameter is set to "active closed", event/fault code 2945 will become active when the input is a ground input.

       If ""Rupture Basin/Configurable Input #12 Function Pointer" parameter is set to Default and if "Rupture Basin/Configurable Input #12 Active State Selection" parameter is set to "active open", event/fault code 2945 will become active when the input is an open circuit.

       To access the input configuration on the operator panel go to **Setup > Configurable I/O > Rupture Basin/Configurable Input #12 Active State Selection** and set the "Rupture Basin/Configurable Input #12 Active State Selection" parameter appropriately for the application.

2. Incorrectly wired; open or short circuit in the wiring.
    a. Depending on the "Rupture Basin/Configurable Input #12 Active State Selection" parameter setting, check the wiring at for an open/short circuit, or miswired condition, from the rupture basin sender to the base board at J20-19 and J20-8; correct if wiring is faulty.
3. Faulty sender.
    a. Measure the rupture basin sender for an open or short circuit reading, replace if faulty.

10.8.137 Code 2972 - Field Overload

Logic:

If the time that the Field AVR Duty Cycle is operating at maximum output is longer than the time in the “Max Field Time" parameter, event/fault code 2972 will become active.

Possible Causes:

⚠ WARNING
Excessive voltage is possible during testing. Make sure your meter can handle alternator full voltage.

1. Max Field Time Delay is set too low.
2. Voltage sensing into the base board is too low, or there is an open/short circuit.
3. Application issue.

Diagnosis and Repair:

1. Max Field Time Delay is set too low.
    a. Through the operator panel, check the “Max Field Time" parameter setting. Verify that the “Max Field Time" is not set to zero. The “Max Field Time" parameter may require adjustment to a value more appropriate for the application. To access the Max Field Time configuration menu on the operator panel go to **Setup > OEM Setup > OEM Alt Setup > Max Field Time** and set the “Max Field Time" parameter appropriately for the application. Refer to the parameter list to see the default value for “Max Field Time".
2. Voltage sensing into the base board is too low, or there is an open/short circuit.
    a. Measure the voltage going into the base board at L1 = J22-1, L2 = J22-2, L3 = J22-3, and LN = J22-4 (for single phase applications use L1, L2 and LN). If the generator set control is not sensing voltage, it will try to overcompensate by maxing out the AVR output. If the voltage going into the control board is zero, or less than the voltage that the control was calibrated for (Nominal Voltage), then check the wiring from the alternator to the base board for an open circuit or short circuit.
    b. If the generator set is over 600 VAC, check connections from the alternator to the PT, and from the PT to the base board. If there is voltage going into the PT, but not coming out of the PT, replace the PT.
    c. Measure the output of the AVR at J17 -1 and J17-2 while turning the generator set on. The output should be at least 300 VDC when the generator set is starting, but the voltage should decrease significantly when the generator set builds up voltage. If the output of J17-1 and J17-2 is constantly high or is locked in, then the AVR portion of the PCC is faulty. Replace the base board if the AVR is faulty.

d. Using a True RMS meter, measure the PWM at J19-2 (AVR PWM +) and J19-9 (AVR PWM -) while turning the generator set “ON". This is a 2.5 VDC max output from the base board to the AUX103 AVR; if the voltage at J19-2 and J19-9 is continuously 2.0-2.5 VDC, without any change, then replace the base board.

e. Measure the output of the AUX103 AVR at J17-1 and J17-2, the output should be at 9-12 VDC when the generator set is operating at “No Load", if the voltage output of J17-1 & J17-2 is constantly high, then the AUX103 AVR is faulty replace the AUX103 AVR.

3. Application issue.

   a. If the generator set runs adequately with no load or some load but as soon as additional load is applied, the generator set shuts down on “Field Overload"; then this might be an application issue (load issue, generator set undersized, etc.).

10.8.138 Code 2977 - Low Coolant Level 2

Logic:

Low Coolant Level switch #2 indicates that the coolant level is low in the second radiator.

Possible Causes:

1. Coolant sender incorrectly wired.
2. Faulty coolant level sender.
3. The "Configurable Input Active State Selection" parameter is configured incorrectly.

Diagnosis and Repair:

1. Coolant sender incorrectly wired.

   a. Check for improper wiring, such as a short or open circuit from the coolant sensor to the discrete configurable input on the base board that was configured for the "Low Coolant Level 2 Switch". If a short/open circuit or improper wiring is found, correct the wiring.

2. Faulty coolant level sender.

   a. Measure the resistance of the coolant level sender at the radiator that is full of coolant, if the sender is short or open circuit, replace the coolant sender.

3. The "Configurable Input Active State Selection" parameter is configured incorrectly.

   a. Through the operator panel, check the switch input setting (active closed or active open) for the Configurable Input that was configured to "Low Coolant Level 2 Switch". Ensure the setting is correct. If the "Configurable Input Function Pointer" parameter is set to "Low Coolant Level 2 Switch" and the "Configurable Input Active State Selection" parameter is set to "active closed", event/fault code 2977 will become active when the Configurable Input that was configured to "Low Coolant Level 2 Switch" is connected to ground.

      If the "Configurable Input Function Pointer" parameter is set to "Low Coolant Level 2 Switch" and the "Configurable Input Active State Selection" parameter is set to "active open", event/fault code 2977 will become active when the Configurable Input that was configured to "Low Coolant Level 2 Switch" is an open circuit.

      To access the input configuration on the operator panel go to **Setup > Configurable I/O >** and set the "Configurable Input Active State Selection" parameter appropriately for the Configurable Input that was configured to "Low Coolant Level 2 Switch".

10.8.139 Code 2979 - High Alternator Temp

Logic:

Indicates that the alternator temperature is high.

Possible Causes:

1. Alternator temperature sender incorrectly wired.
2. Faulty alternator temperature sender.
3. The "Configurable Input Active State Selection" parameter is configured incorrectly.

Diagnosis and Repair:

1. Alternator temperature sender incorrectly wired.
   a. Check for improper wiring or a short/open circuit from the alternator temperature sender to the discrete configurable input on the base board that was configured for the "High Alternator Temp Switch". If a short/open circuit or improper wiring is found, correct the wiring.
2. Faulty alternator temperature sender.
   a. Measure the resistance between the alternator temperature signal pin and return pin. The resistance should be between 530 Ohms to 2214 Ohms. Replace the sender if the resistance value is out of specification.
3. The "Configurable Input Active State Selection" parameter is configured incorrectly.
   a. Through the operator panel, check the switch input setting (active closed or open) for the Configurable Input that was configured to "High Alternator Temp Switch". Ensure the setting is correct. If the "Configurable Input Function Pointer" parameter is set to "High Alternator Temp Switch" and the "Configurable Input Active State Selection" parameter is set to "active closed", event/fault code 2979 will become active when the Configurable Input that was configured to "High Alternator Temp Switch" is connected to ground.

      If the "Configurable Input Function Pointer" parameter is set to "High Alternator Temp Switch" and the "Configurable Input Active State Selection" parameter is set to "active open", event/fault code 2979 will become active when the Configurable Input that was configured to "High Alternator Temp Switch" is an open circuit.

      To access the input configuration on the operator panel go to **Setup > Configurable I/O >** and set the "Configurable Input Active State Selection" parameter appropriately for the Configurable Input that was configured to "High Alternator Temp Switch".

10.8.140 Code 2993 - Battery Charger Failed

Logic:

Indicates that the battery charger has failed.

Possible Causes:

1. Faulty battery charger.
2. Battery Charger switch incorrectly wired.
3. Faulty switch.
4. The "Configurable Input Active State Selection" parameter is configured incorrectly.

Diagnosis and Repair:

1. Faulty battery charger.
   a. Check the output voltage of the battery charger. If the battery charger is overcharging, or not charging the batteries at all, then repair or replace the battery charger.
2. Battery Charger switch incorrectly wired.
   a. Check for improper wiring, a short circuit, or an open circuit from the Battery Charger switch to the discrete configurable input on the base board that was configured for the "Battery Charger Switch Fail". If a short circuit, open circuit or improper wiring is found, correct the wiring.
3. Faulty switch.
   a. Measure the resistance of the battery charger switch, if the switch is shorted or open circuit, replace the switch.
4. The "Configurable Input Active State Selection" parameter is configured incorrectly.
   a. Through the operator panel, check the switch input setting (active closed or active open) for the Configurable Input that was configured to "Battery Charger Switch Fail". Ensure that the switch input setting is correctly set. If the "Configurable Input Function Pointer" parameter is set to "Battery Charger Switch Fail" and the "Configurable Input Active State Selection" parameter is set to "active closed", event/fault code 2993 will become active when the Configurable Input that was configured to "Battery Charger Switch Fail" is connected to ground.

      If the "Configurable Input Function Pointer" parameter is set to "Battery Charger Switch Fail" and the "Configurable Input Active State Selection" parameter is set to "active open", event/fault code 2993 will become active when the Configurable Input that was configured to "Battery Charger Switch Fail" is an open circuit.

      To access the input configuration on the operator panel go to **Setup > Configurable I/O >** and set the "Configurable Input Active State Selection" parameter appropriately for the Configurable Input that was configured to "Battery Charger Switch Fail".

10.8.141 Code 3397 - Low GB Oil Pressure

Logic:

Immediate generator set shutdown due to AUX101 sensed gearbox oil pressure activated switch circuit state is active and the generator set average engine speed is greater than the Gearbox Engine Speed Threshold for the duration of the Gearbox Dwell Time.

⚠ WARNING
The gearbox contains hot engine oil, which can cause severe burns. Avoid direct contact with hot oil to prevent personal injury.

Possible Causes:

1. Gearbox oil supply is low.
2. Gearbox oil is leaking.
3. Inadequate Gearbox Dwell Time.
4. Gearbox Engine Speed Threshold set low.
5. Faulty gearbox oil pressure switch wiring.
6. Inadequate gearbox oil flow.
7. Faulty gearbox oil pressure bypass.

8. Faulty gearbox oil pressure switch.
9. Faulty AUX101.

Diagnosis and Repair:

1. Gearbox oil supply is low.
   a. Check and top-up the gearbox oil supply so-as to maintain an adequate quantity of oil to allow the oil pump to maintain system pressure above the pressure switch active threshold. Refer to the generator set maintenance guide to ensure the gearbox oil level is properly maintained.
2. Gearbox oil is leaking.
   a. Conduct a thorough assessment of the gearbox's exterior oil circuit to identify the source of pressure vent that's resulting in lubrication system pressure below the pressure switch active threshold. Sealing the leaks should restore pressure above the switch's active threshold.
      - Leaking at the threaded joint. Ensure the joint's assembly torque is per generator set spec. Disassemble and check thread and sealing interface condition and cleanliness if assembly torque was per spec and leaking persists.
      - Leaking between gasketed surfaces. Ensure clamp force application to the gasketed surface is properly applied. Disassemble and clean sealing surfaces of oil film and debris and replace the gaskets if leaking persists.

        Leaking as the result of a fatigued component. Assess and remedy the source of fatigue induction if the source appears abnormal. Replace fatigued component with new.
3. Inadequate Gearbox Dwell Time / Gearbox Engine Speed Threshold.
   a. Verify current InCal calibration is uploaded.
4. Faulty gearbox oil pressure switch wiring.
   a. Wiring to pressure switch shorted together mimicking a pressure switch closure; repair.
5. Inadequate gearbox oil flow.
   a. Pressure drop across gearbox oil filter resulting in system pressure, post filter, below the inactive threshold of the pressure switch.
      i. Refer to the generator set maintenance logs to ensure the gearbox oil filter is properly maintained.
      ii. Inspect filter for irregular contamination (e.g. excessive metal or debris). Continue internal investigation if irregular contamination is found and filter was properly maintained.
      iii. Clean/replace filter and oil.
      iv. Clean/replace filter and oil if the filter was not properly maintained.
   b. Pressure drop across gearbox oil heat exchanger (HEX) resulting in system pressure, post HEX, below the inactive threshold of the pressure switch.
      i. Check this generator set maintenance logs to determine when the last gearbox oil HEX cleaning was conducted.
      ii. Inspect HEX for irregular contamination (e.g. excessive metal or debris). Continue internal investigation if irregular contamination is found and HEX was properly maintained.
      iii. Clean/replace filter and oil and HEX, if HEX was not properly maintained.
   c. The gearbox's oil pump is worn or faulty and generating insufficient pressure to render the pressure switch inactive.
      - Check pump internal clearances and repair/replace as necessary.

d. Check line and transfer passages for contamination; clear and replace as needed.

6. Faulty gearbox oil pressure bypass.

   a. Gearbox oil pump pressure bypass is stuck open and oil is bypassing the pressure switch rendering it active. Inspect the pressure bypass and clean/replace as necessary.

7. Faulty gearbox oil pressure switch.

   a. Verify pressure switch state (active and inactive).

      i. Disconnect electrical leads from pressure switch (pressure switch must remain installed in original lubrication pressure sensing location).

      ii. Attach DVOM test leads to pressure switch terminals to measure electrical resistance.

      iii. Prepare DVOM to measure electrical resistance.

      iv. Measure and note switch resting resistance (low pressure) = active resistance.

      v. Install physical pressure driven gauge to lubrication system pressure if a gauge isn't already fitted. Note gauge maximum pressure must be greater than lubrication system maximum pressure.

      vi. Measure and note resting pressure.

      vii. Drive gearbox oil pump to operating speed (e.g. start generator set).

      viii. Verify operating lubrication pressure (must be greater than pressure switch inactive threshold).

      ix. Measure and note switch resistance (operating pressure) = inactive resistance.

      x. Replace switch if active resistance = inactive resistance.

8. Faulty AUX101.

   a. AUX101 isn't communicating gearbox oil pressure switch state properly and/or is falsely presenting gearbox oil pressure switch state as active to PCC. Check wiring and connections to AUX101 or refer to AUX101 troubleshooting with respect to the temperature switch interface.

10.8.142 Code 3398 - High GB Oil Temperature

Logic:

Controlled generator set shutdown due to AUX101 sensed gearbox oil temperature activated switch circuit stat is active and the generator set average engine speed is greater than the Gearbox Engine Speed Threshold.

⚠ WARNING
The gearbox contains hot engine oil, which can cause severe burns. Avoid direct contact with hot oil to prevent personal injury.

Possible Causes:

1. Gearbox oil supply is incorrect.
2. Incorrect gearbox oil.
3. External thermal influence.
4. Faulty gearbox oil temperature switch or wiring.
5. Inadequate gearbox oil flow.
6. Gearbox internal clearance incorrect.

7. Faulty AUX101.

Diagnosis and Repair:

1. Gearbox oil supply is incorrect.
   a. Gearbox oil supply contains an inadequate quantity of oil, limiting time required to radiate heat before being employed again, resulting in an oil temperature greater than the temperature switch's active threshold. Check and top-up oil as needed. Refer to the generator set maintenance guide to ensure the gearbox oil level is properly maintained.
   b. Gearbox oil supply contains too much oil which is producing surface friction/drag between the gears and oil as well as potential oil cavitations. The gearbox input energy lost due to friction is converted to heat in both the oil and the gears, resulting in an oil temperature greater than the temperature switched active threshold. Check and remove oil as needed. Check for external influences that may have increased the gearbox's oil level (e.g. rain water ingress). Refer to the generator set maintenance guide to ensure the gearbox oil level is properly maintained.
2. Incorrect gearbox oil.
   a. Gearbox oil has poor heat radiation properties or modified circuit flow allowing the oil temperature to exceed the temperature switch's active threshold. Conduct an oil sample analysis and/or change. Refer to the generator set maintenance guide to ensure the proper gearbox oil is employed.
3. External thermal influence.
   a. An external heat source near the gearbox oil or oil temperature sensor and is driving the oil temperature beyond the temperature switch's active threshold. Reroute or protect the gearbox from said heat source.
4. Faulty gearbox oil temperature switch or wiring.
   a. Verify temperature switch state (active and inactive).
      i. Disconnect electrical leads from temperature switch.
      ii. Attach DVOM test leads to temperature switch terminals to measure electrical resistance.
      iii. Prepare the DVOM to measure electrical resistance.
      iv. Measure and note switch resting resistance (cold) = inactive resistance.
      v. Induce heat approximately equal to gearbox lubrication operating temperature into temperature switch sensor (heat source must be capable of heating switch beyond inactive threshold). Induce heat with care so-as to not exceed switch surface contamination or component flash or metal temperature.
      vi. Measure and note switch resistance (hot) = active resistance.
      vii. Replace switch if active resistance = inactive resistance.
   b. Wiring to the temperature switch shorted together mimicking a temperature switch closure; repair.
5. Inadequate gearbox oil flow.
   a. See Code 3397, step 6 for troubleshooting as oil volumetric flow is inadequate and subject to prolonged employment allowing time for heat ingress beyond the oil's capability to radiate before re-employment and driving temperature above the temperature switch active threshold.
6. Gearbox internal clearance incorrect.
   a. Clearance between gearbox gears is too small resulting in hydraulic heating of the oil; adjust clearance.

   b. Clearance between gearbox gears is too large resulting in impact loading which also hydraulically heats the oil; adjust the clearance.

7. Faulty AUX101.

   a. AUX101 isn't communicating gearbox oil temperature switch state properly and/or is falsely presenting state to PCC. Check wiring and connections to AUX101 or refer to AUX101 troubleshooting with respect to the temperature switch interface.

10.8.143 Code 3399 - Differential Fault

Logic:

Immediate generator set shutdown due to AUX101 sensed differential current relay circuit state is active.

⚠ WARNING
Do not power the current transformers (CTs) without load. CTs powered without load are susceptible to explosion, which can cause personal injury and equipment damage.

Possible Causes:

1. Faulty, improperly wired or improperly sized current differential CT or protection relay.
2. Line load imbalance.
3. Faulty current differential CT.
4. Faulty current differential protection relay.
5. Faulty alternator winding insulation or short.
6. Faulty AUX101.

Diagnosis and Repair:

1. Faulty, improperly wired or improperly sized current differential CT or protection relay.

   a. Secure all CT and relay connections to mitigate any intermittent current imbalances resulting from poor connection that may trip the protection relay.

   b. Verify clearance between CT phases, ground and secondary conductors (one inch/kV + one inch). Ensure the secondary conductors are not parallel or in close proximity to primary conductors to prevent secondary circuit current induction and corresponding protection relay trip. Reroute as needed.

   c. Verify the CT primary and secondary circuits are properly sized for the generator set and protection relay, replace as needed. Note, all CTs must perform identically with respect to the differential protection relay sensitivity unless percent differential relays are employed.

2. Line load imbalance.

   a. Verify and adjust so all loads are properly applied and balanced to below the differential current relay active threshold.

3. Faulty current differential CT.

   a. Differential CT primary or secondary internal failure has delivered an inaccurate current to the protection relay rendering it active. Employ a DVOM and test leads to measure the following with the generator set not producing voltage:

      - Measure winding, winding-to-winding and winding-to-ground or CT case electrical resistance to establish any shorting.

   b. Differential CT primary or secondary internal failure has delivered an inaccurate current to the protection relay rendering it active. Employ a CT tester or A/C current clamp (not in-line) to validate CT performance. Replace CT if damaged or suspect.

4. Faulty current differential protection relay.

   a. Differential protection relay internal failure rendering it active when all CT input is balanced.

      i. Disconnect all connections to protection relay.

      ii. Measure the resistance between the CT secondary line relay inputs. All groups of line inputs should be similar, else: replace relay.

   b. For further assessment, conduct the following if active with relay closed:

      i. Disconnect all connections to protection relay.

      ii. Measure the resistance between the relay active output terminals. If resistance is relatively low, replace relay.

   c. For further assessment, conduct the following if active with relay open:

      i. Disconnect all connections to protection relay.

      ii. Measure the resistance between the relay active output terminals. If resistance is relatively low, relay is OK. Verify by applying a test current to any set of CT secondary line relay inputs, simulating a common input voltage, and measure relay resistance which should be OL or relatively high.

5. Faulty alternator winding insulation or short.

   a. A faulty alternator winding insulation or short has resulted in higher current on a winding, rendering the protection relay active.

      - Visually investigate load lines for wear and shorting, replace and support as necessary.

      - Conduct a megger test for all alternator lines, repair as necessary.

6. Faulty AUX101.

   a. AUX101 isn't communicating differential current protection relay state properly and/or is falsely presenting protection relay state as active to PCC. Check wiring and connections to AUX101 or refer to AUX101 troubleshooting with respect to the protection relay times.

10.8.144 Code 3411 - DC Power Supply Fault

Logic:

⚠ WARNING
Due to AUX101 sensed DC power supply unit (PSU) state is below inactive threshold lower limit for the duration of DC PSU Dwell Time.

Possible Causes:

1. Inadequate DC PSU Dwell Time.
2. Faulty or poor DC power supply.
3. Faulty DC power supply to AUX101 wiring.
4. Faulty AUX101.

Diagnosis and Repair:

1. Inadequate DC PSU Dwell Time.
   a. Via InPower, verify and adjust DC PSU Dwell Time (default = 5 seconds) to permit surge power recovery or battery charger engagement to attain voltage within inactive threshold limits. Note that a high DC PSU Dwell Time may mask DC power supply issues.
2. Faulty or poor DC power supply.
   a. Check source state of charge and physical condition as faulty or poor component state has resulted in voltage below AUX101 inactive threshold lower limit. Clean and replace as necessary.
3. Faulty DC power supply to AUX101 wiring.
   a. Check for continuity in powered mode, between DC PSU and AUX101 (including but not limited to fuses and key switches) as failed component resulted in voltage below AUX101 inactive threshold lower limit. Repair as necessary.
4. Faulty AUX101.
   a. AUX101 isn't communicating DC PSU properly and/or is falsely presenting DC PSU state as below inactive threshold lower limit to PCC. Check wiring and connections to AUX101 or refer to AUX101 troubleshooting with respect to DC PSU.

10.8.145 Code 3412 - GIB Isolator Open Fault

Logic:

⚠ WARNING
Due to AUX101 sensed generator interface box (GIB) isolator switch state is active (open).

Possible Causes:

1. GIB isolator switch is open.
2. Faulty GIB isolator switch or wiring.
3. Faulty AUX101.

Diagnosis and Repair:

1. GIB isolator switch is open.
   a. Close the GIB doors to engage the switch body with switch mechanism and rotate the switch until aligned with the closed symbol to change the switch state to inactive (closed).
2. Faulty GIB isolator switch or wiring.
   a. Check all wiring and measure switch state resistances to ensure proper contact as failed component or wiring to AUX101 is mimicking an active isolator switch. Repair as necessary.
3. Faulty AUX101.
   a. AUX101 isn't communicating GIB isolator switch state properly and/or is falsely presenting switch state as active to PCC. Check wiring and connections to AUX101 or refer to AUX101 troubleshooting with respect to GIB isolator switch state.

10.8.146 Code 3413 - Radiator Fan Trip

Logic:

⚠ WARNING
Due to AUX101 sensed active radiator fan circuit protection state during fan run command active from PCC.

⚠ WARNING
To prevent personal injury, turn off and remove power to the radiator fan while investigating and repairing it.

Possible Causes:

1. Inadequate circuit protection.
2. Faulty fan motor or wiring.
3. Faulty AUX101.

Diagnosis and Repair:

1. Inadequate circuit protection.
    a. Check fan wiring and circuit protection device(s) are sized to suit circuit's current capability as faulty component resulted in active circuit protection. Replace as necessary.
2. Faulty fan motor or wiring.
    a. Check the wiring for loose connections, short circuits or stuck motors resulting in active circuit protection. Replace and repair as necessary.
3. Faulty AUX101.
    a. AUX101 isn't communicating radiator fan circuit protection state properly and/or is falsely presenting circuit protection state as active to PCC. Check wiring and connections to AUX101 or refer to AUX101 troubleshooting with respect to fan circuit protection.

10.8.147 Code 3414 - Ventilator Fan Trip

Logic:

⚠ WARNING
Due to AUX101 sensed active ventilator fan circuit protection state during fan run command active from PCC.

⚠ WARNING
To prevent personal injury, turn off and remove power to the ventilator fan while investigating and repairing it.

NOTICE
Ventilator fans are site-specific, not generator set-specific; be sure to refer to plant wiring diagrams when available.

Possible Causes:

1. Inadequate circuit protection.
2. Faulty ventilator motor or wiring.
3. Faulty AUX101.

Diagnosis and Repair:

1. Inadequate circuit protection.
    a. Check fan wiring and circuit protection device(s) are sized to suit circuit's current capability as faulty component resulted in active circuit protection. Replace as necessary.
2. Faulty ventilator motor or wiring.
    a. Check the wiring for loose connections, short circuits, or stuck motors resulting in active circuit protection. Replace and repair as necessary.
3. Faulty AUX101.
    a. AUX101 isn't communicating ventilator fan circuit protection state properly and/or is falsely representing circuit protection state as active to PCC. Check wiring and connections to AUX101 or refer to AUX101 troubleshooting with respect to ventilator circuit protection.

10.8.148 Code 3415 - Louvres Closed

Logic:

⚠ WARNING
Due to AUX101 sensed active ventilation louvres closed switch state for the duration of the Louvres Closed Dwell Time.

Possible Causes:

1. Louvres didn't open.
2. Faulty louvre position switch or wiring.
3. Inadequate Louvre Closed Dwell Time.
4. Faulty AUX101.

Diagnosis and Repair:

1. Louvres didn't open.
    a. Clear obstruction and/or fix damaged louvres and movement driving mechanisms to ensure unrestricted movement beyond the louvre position switch inactive threshold.
    b. Verify wiring and connections between louvre motor control relay and louvre motor are proper to enable movement beyond the louvre position switch inactive threshold; Repair as needed.
2. Faulty louvre position switch or wiring.
    a. Check wiring between AUX101 and louvre position switch for short circuits that may mimic position below switch inactive threshold. Replace and/or repair as needed.
    b. Correspond switch active/inactive states with louvre position via resistance measurement across switch terminals.
        i. Disconnect all connections to louvre position switch.

ii. Attach DVOM test leads to louvre position switch terminals to measure electrical resistance.

iii. Prepare DVOM to measure electrical resistance.

iv. Measure and note switch resting resistance (louvres closed) = active resistance.

v. Open louvres beyond louvre position switch inactive threshold.

vi. Measure and note switch resistance (louvres open) = inactive resistance.

vii. Replace switch if active resistance = inactive resistance.

3. Inadequate Louvre Closed Dwell Time.

   a. Via InPower, verify/adjust Louvre Closed Dwell Time (default - 100 seconds) so-as to permit position switch to attain inactive and stable state. Mind time required for complete louvre opening. Note that a high Louvre Closed Dwell Time may mask louvre mechanism issues.

4. Faulty AUX101.

   a. AUX101 isn't communicating Louvre position switch state properly and/or is falsely representing state to PCC. Check wiring and connections to AUX101 or refer to AUX101 troubleshooting with respect to louvres closed protection.

10.8.149 Code 3416 - Start System

See the troubleshooting procedures for fault code 359 or 1438.

10.8.150 Code 3417 - Alternator Heater Trip

Logic:

⚠ WARNING
Due to AUX101 sensed active alternator heater circuit protection state during alternator heater control active from PCC.

Possible Causes:

1. Inadequate circuit protection.
2. Faulty alternator heater or wiring.
3. Faulty alternator heater relay.
4. Faulty AUX101.

Diagnosis and Repair:

1. Inadequate circuit protection.

   a. Check heater wiring, heater relays and circuit protection device(s) are sized to suit circuit's current capability as faulty component resulted in current greater than heater circuit protection active threshold. Replace as necessary.

2. Faulty alternator heater or wiring.

   a. Check the following circuits, repair as needed:

      - AUX101 to alternator heater relay input for loose connections and short circuit between wires as fault will result in failure to deliver the electrical current required to close the alternator heater relay switch and mimic alternator heater current greater than circuit protection active threshold.

- AUX101 to alternator heater relay sense for loose connections and short circuit between wires as fault will result in failure to report alternator heater circuit current and mimic alternator heater current greater than circuit protection active threshold.
- Alternator heather circuit protection to alternator heater relay for short to ground as fault will result in alternator heater current greater than circuit protection active threshold.

3. Faulty alternator heater relay.
   a. Check that the alternator heater relay for closure when AUX101 input is applied by measuring resistance of relay's high current circuit; replace if open as fault will mimic circuit protection active.
4. Faulty AUX101.
   a. AUX101 isn't communicating alternator heater circuit current properly and/or is falsely representing state to PCC. Check wiring and connections to AUX101 or refer to AUX101 troubleshooting with respect to alternator heater circuit protection.

10.8.151 Code 3457 - Loss of Bus Voltage Sensing

Logic:

An open circuit condition exists in all 3 phases of the bus voltage sensing in Isolated Bus or Utility Multiple applications.

Possible Causes:

1. Generator set bus voltage sensing connections are open circuit or incorrectly wired at the base board.
2. kW load share and kVAR lines are switched.
3. Faulty PT.

Diagnosis and Repair:

1. Generator set bus voltage sensing connections are open circuit or incorrectly wired at the base board.
   a. The purpose of this event/fault code is to prevent closing the generator set circuit breaker to a bus which is actually live, but which appears to the controller to be dead. Check and ensure that the following are OK: TB7 is securely connected to the base board, bus fuses have been re-closed after troubleshooting/maintenance procedures, blow bus fuses have been checked and replaced as needed, and disconnected medium voltage set of PTs have been reconnected.
   b. If the nominal voltage is 600 VAC or lower, ensure that the voltage sensing connections are correct.
      - Measure the phase rotation, frequency, and voltage input into the base board from the Generator set bus at: L1, TB7-1; L2, TB7-2; and L3, TB7-3. The voltage and frequency should match the Generator set bus nominal voltage and frequency. The phase rotation should be "L1-L2-L3" at TB7-1, TB7-2, and TB7-3 on the base board; for proper phase rotation measurement procedures, refer to the phase rotation meter instructions. If the phase rotation, voltage and/or frequency are not correct, re-check the wiring.

c. If the nominal voltage is over 600 VAC, check the voltage sensing connections from the base board to the PT and the PT to the Generator set bus.

- Measure the phase rotation, frequency, and voltage input into the base board from the PT (Potential Transformer) at: L1, TB7-1; L2, TB7-2; and L3, TB7-3. The voltage input into the base board should match the secondary voltage of the PT (for example, if the PT ratio is 13,800:240, the voltage measured at the base board should be 240 VAC). The phase rotation at TB7-1, TB7-2, and TB7-3 should be "L1-L2-L3" for proper phase rotation measurement procedures; refer to the phase rotation meter instructions. The frequency should match the Generator set bus nominal frequency. If the phase rotation, frequency, and/or voltage are not correct at the base board, correct the wiring from the base board to the PT.

2. kW load share and kVAR lines are switched.

   a. Ensure kW load share line on generator set 1 is connected to kW load share line on generator set 2 and kVAR load share is connected to kVAR it will cause this FC.

3. Faulty PT.

   a. With a calibrated voltage meter, measure the voltage input and output of the PT. The input and output of the PT should be proportional; ex. Inputs: L1 = 13,800, L2 = 13,800, L3 = 13,800; Outputs: L1 = 240, L2 = 240, L3 = 240. If the inputs and outputs of the PT are not proportional, replace the PT.

10.8.152 Code 3513 – NegSeq Overcurrent

This fault is triggered when the load current or load power factor are not equal in all the three phases.

A. Check Phase Wiring for Generator Set Control and Metering

1. Check all CT wiring is going to the correct locations.
2. Check all voltage sensing wires are going to the correct locations.

B. Check Control Threshold Values

Make sure that the following settings under **Setup > OEM Setup > OEM ALT Setup** are correct:

- Genset Neg Seq Overcurrent Protection Enable (Default=Enabled)
- Genset Neg Seq Overcurrent Protection K Factor (Default=20)
- Genset Neg Seq Overcurrent Protection Reset Time (Default=360)
- Genset Neg Seq Overcurrent Protection Threshold (Default=12.00)

C. Check for Short

1. Check generator set main output leads for any signs of shorting.
2. Repair short as necessary.

10.8.153 Code 3611 – Custom Overcurrent Fault

Logic:

For ‘Custom Overcurrent Protection is Enabled and if ‘Custom Overcurrent Threshold’ has exceeded for the defined ‘Custom Overcurrent Time Characteristic’, the Warning fault becomes Active.

Possible Causes:

1. Incorrect threshold settings.

Diagnosis and Repair:

1. Incorrect threshold settings.
   a. Connect InPower.
   b. Verify the ‘Custom Overcurrent Protection Enable’ feature is required to be Enabled, if not required Disable it.
   c. Verify the ‘Custom Overcurrent Threshold’ settings are appropriate as per load conditions and customer specific requirements.
   d. Verify the ‘Custom Overcurrent Time Characteristic’ settings are appropriate as per load conditions and customer specific requirements.

10.8.154 Code 3629 - Device Calibration Update Recommended

Logic:

The PCC may have setup parameters that the AUX105 does not have.

Possible Causes:

1. Incorrect calibration file in the PCC.
2. Incorrect calibration file in AUX105.

Diagnosis and Repair:

1. Verify the calibration files for the PCC.
   a. Connect InPower to the PCC.
   b. Download the latest calibration to the PCC.
2. Verify the calibration files for the AUX105.
   a. Connect InPower to the AUX105.
   b. Download the latest calibration to the AUX105.

10.8.155 Code 3631 - Device Calibration Update Required

Logic:

The AUX105 did not receive a setup parameter from the PCC.

Possible Causes:

1. Incorrect calibration file in the PCC.
2. Incorrect calibration file in AUX105.

Diagnosis and Repair:

1. Verify the calibration files for the PCC.
   a. Connect InPower to the PCC.
   b. Download the latest calibration to the PCC.
2. Verify the calibration files for the AUX105.
   a. Connect InPower to the AUX105.
   b. Download the latest calibration to the AUX105.

10.8.156 Code 5134 - Unknown Shutdown at Idle

Logic:

Engine speed remains zero when the controller mode is idle.

Possible Causes:

1. Incorrect PCC reference to engine speed.
2. Engine Fault Code active.
3. Faulty engine speed/position sensor.
4. Faulty engine speed sensor connections.
5. Faulty engine harness.
6. Faulty extension harness.

Diagnosis and Repair:

1. Check for PCC reference to engine speed while cranking.
   a. Connect with InPower.
   b. Check if Alternate Frequency Switch, Frequency Adjust, and Frequency to Speed Gain Select are set up properly.
   c. If ECM CAN Enable is set to Enable, the PCC sends the speed bias reference to the ECM. The speed bias reference is the percent difference between the speed reference and the base speed (Alternate Frequency Switch multiplied by Frequency to Speed Gain Select).
2. Engine Fault Code.
   a. Using InSite, connect to the engine ECM. Check for active or inactive fault codes.
   b. Diagnose and repair any engine fault codes. Refer to the engine service manual.
   c. Clear all engine fault codes. Cycle power to the control.
3. Faulty engine speed/position sensor.

   Inspect the engine speed/position sensor.
   a. Disconnect the engine speed/position sensor from the engine and engine harness.
   b. Inspect sensor for bent, corroded, or loose pins.
   c. Inspect the sensor for structural deficiencies.
4. Engine speed sensor connections.

   Inspect the engine speed sensor and the harness connector pins.
   a. Disconnect the engine harness connector from the engine speed sensor.
   b. inspect for corroded pins, bent pins, broken pins, pushed-back pins, or explained pins.
   c. Inspect for evidence of moisture in or on the connector.
   d. Inspect for missing or damage connector seals.
   e. Inspect for dirt or debris in or on the connector pins.
5. Faulty engine harness.

   Inspect the engine harness and the connector pins.
   a. Disconnect the engine harness connector from the extension harness.

b. Inspect for corroded pins, bent pins, broken pins, pushed-back pins, or expanded pins.

c. Inspect for evidence of moisture in or on the connector.

d. Inspect for missing or damaged connector seals.

e. Inspect for dirt or debris in or on the connector pins.

6. Faulty extension harness.

   Inspect the extension harness and the AUX105 connector pins.

   a. Disconnect the extension harness connector form the AUX105.
   b. Inspect for corroded pins, bent pins, broken pins, pushed-back pins, or expanded pins.
   c. Inspect for evidence of moisture in or on the connector.
   d. Inspect for missing or damaged connector seals.
   e. Inspect for dirt or debris in or on the connector pins.

10.8.157 Code 5135 – Genset Overload

Logic:

When Genset is running in rated and if Genset % Application Total kW exceeds Overload shutdown threshold continuously for Overload Shutdown Set Time, Shutdown fault becomes Active.

Possible Causes:

1. Incorrect Overload settings.
2. Incorrect genset power rating configuration.
3. Load is exceeding the genset rated capacity.

Diagnosis and Repair:

1. Incorrect Overload settings.
   a. Connect InPower.
   b. Verify the ‘Overload Shutdown Threshold’ settings are appropriate as per load conditions and customer specific requirements.
   c. Verify the ‘Overload Shutdown Set Time’ settings are appropriate as per load conditions and customer specific requirements.
2. Incorrect genset power rating configuration.
   a. Connect InPower.
   b. Check if there is mismatch between actual power rating on the genset plate and the configured power ratings in InPower. Correct if required.
3. External Load.
   a. Load connected by user to Genset should not exceed the Rated Genset rating.

10.8.158 Code 5397 – L-N Short Circuit Shutdown

Logic:

The generator output current has exceeded 300% of rated current continuously for LN Short Circuit Time Delay (default-1.5 sec), Shutdown fault becomes Active.

NOTICE

This fault remains active and cannot be reset until the Alternator Overheat Integral Time has expired (which takes up to five minutes). The Alternator Overheat Integral Time allows the alternator to cool down before allowing a restart.

Possible Causes:

1. Short in one of the phases and Neutral cables.
2. Faulty CTs.

Diagnosis and Repair:

1. Short in one of the phases and Neutral cables.
    a. Check the load and neutral cables. Repair if necessary.
2. Faulty CTs.
    a. Verify the CT connections are correct from the CTs to the input of the base board.
    b. If CTs found faulty, replace CTs.

10.8.159 Code 5398 – L-L Short Circuit Shutdown

Logic:

For Three phase application if the generator output current has exceeded 300% of rated current continuously for LL Short Circuit Time Delay (default-4.5 sec), Shutdown fault becomes Active.

NOTICE

This fault remains active and cannot be reset until the Alternator Overheat Integral Time has expired (which takes up to five minutes). The Alternator Overheat Integral Time allows the alternator to cool down before allowing a restart

Possible Causes:

1. Short in the Load or Load cables.
2. Faulty CTs, incorrect ratio, CTs, CT connections.

Diagnosis and Repair:

1. Short in the Load or Load cables.
    a. Check the load and Load cables. Repair if necessary.
2. Faulty CTs, CT connections.
    a. Verify the CT connections are correct from the CTs to the input of the base board.
    b. If CTs found faulty, replace CTs.

OTIS Application
OTIS (Open Tool Interface Specification) is Cummins implementation of UDS (Unified Diagnostic Services). OTIS is implemented to expose the engine parameters (through CAN) to the third party OEMs in a standard way (like Insite, Calterm) so that they can be re-configured as needed.

10.8.160 Code 5399 - AmpSentry Maintenance Mode Active (Event)

Logic:

Modifications added to AmpSentry in the PCC controller to improve the arc flash level and asymmetrical short circuit performance.

Possible Causes:

Short circuit conditions occurred and the AmpSentry feature of the PCC controller modulated the short circuit current and shut down the generator set in 10 seconds for 3-phase faults, 5 seconds for L-L faults, and 2 seconds for L-N faults. This fault code will not be displayed on the HMI, but it can be seen in the PCC fault history using the InPower Service tool.

10.8.161 Code 5637 - Unknown Shutdown at Startup

Logic:

Engine speed remains zero when the controller mode is rated.

Possible Causes:

1. Incorrect PCC reference to engine speed.
2. Engine Fault Code active.
3. Faulty engine speed/position sensor.
4. Faulty engine speed sensor connections.
5. Faulty engine harness.
6. Faulty extension harness.

Diagnosis and Repair:

1. Check for PCC reference to engine speed while cranking.
    a. Connect with InPower.
    b. Check if Alternate Frequency Switch, Frequency Adjust, and Frequency to Speed Gain Select are set up properly.
    c. If ECM CAN Enable is set to Enable, the PCC sends the speed bias reference to the ECM. The speed bias reference is the percent difference between the speed reference and the base speed (Alternate Frequency Switch multiplied by Frequency to Speed Gain Select).
2. Engine Fault Code.
    a. Using InSite, connect to the engine ECM. Check for active or inactive fault codes.
    b. Diagnose and repair any engine fault codes. Refer to the engine service manual.
    c. Clear all engine fault codes. Cycle power to the control.
3. Faulty engine speed/position sensor.

    Inspect the engine speed/position sensor.

    a. Disconnect the engine speed/position sensor from the engine and engine harness.
    b. Inspect sensor for bent, corroded, or loose pins.
    c. Inspect the sensor for structural deficiencies.
4. Engine speed sensor connections.

Inspect the engine speed sensor and the harness connector pins.

a. Disconnect the engine harness connector from the engine speed sensor.
b. inspect for corroded pins, bent pins, broken pins, pushed-back pins, or explained pins.
c. Inspect for evidence of moisture in or on the connector.
d. Inspect for missing or damage connector seals.
e. Inspect for dirt or debris in or on the connector pins.

5. Faulty engine harness.

   Inspect the engine harness and the connector pins.

   a. Disconnect the engine harness connector from the extension harness.
   b. Inspect for corroded pins, bent pins, broken pins, pushed-back pins, or expanded pins.
   c. Inspect for evidence of moisture in or on the connector.
   d. Inspect for missing or damaged connector seals.
   e. Inspect for dirt or debris in or on the connector pins.

6. Faulty extension harness.

   Inspect the extension harness and the AUX105 connector pins.

   a. Disconnect the extension harness connector form the AUX105.
   b. Inspect for corroded pins, bent pins, broken pins, pushed-back pins, or expanded pins.
   c. Inspect for evidence of moisture in or on the connector.
   d. Inspect for missing or damaged connector seals.
   e. Inspect for dirt or debris in or on the connector pins.

10.8.162 Code 6598 - One or more Acknowledged Engine Fault Codes

Logic:

One or more engine shutdown faults are active.

Possible Causes:

1. Engine Fault Code active.

Diagnosis and Repair:

1. Engine Fault Code
   a. Using InSite, connect to the engine ECM. Check for active fault codes.
   b. Diagnose and repair any active fault codes. Refer to the engine service manual.
   c. Clear all engine fault codes. Cycle power to the control.

10.8.163 Code 7892 - Start Signal Integrity Fail

Logic:

If "Remote Start Signal" or "Start Signal Integrity Signal" is compromised (wire break/fall, short), genset will start in emergency mode with fault code 7892 active.

Possible Causes:

1. Open or Short Circuit in Remote Start Signal Wiring.
2. Open or Short Circuit in Start Signal Integrity Wiring.

Diagnosis and Repair:

1. Open or Short Circuit in Remote Start Signal Wiring.
   a. Check for improper wiring or a short/open circuit of a remote start signal from ATS cabinet or Modbus or PCCNet to TB1-11 of base board which is configured to "Remote Start Input". If improper wiring or a short/open circuit is found, correct the wiring.
2. Open or Short Circuit in Start Signal Integrity Wiring.
   a. Check for improper wiring or a short/open circuit of a start signal integrity form ATS cabinet to configurable inouts of baseboard which is configured to "Start Signal Integrity Switch". If improper wiring or a short/open circuit is found, correct the wiring.

10.9 CAN Network Troubleshooting Recommendation

The following procedure provides information on how to troubleshoot common hardware problems on a CAN network.

NOTICE
It is possible that more than one of the following failure modes may be present on the CAN network. If wiring changes are made to correct issues during testing, the following tests should be repeated to ensure correct CAN network wiring and reliability.

10.9.1 CAN Network Visual Inspection and Installation Validation Recommendation

- Visually inspect the CAN network to look for disconnected/damaged wires and landed wires not securely fastened.
- Verify that all connected CAN nodes are powered and show no obvious signs of failure.
- Validate the CAN communications cable type used is shielded twisted pair cable and is meets all J1939-11 physical requirements.
- Validate that the CAN network total length and make sure that it does not exceed the specifications defined for the network (ECM CAN maximum lengths less than 40 meters, s-CAN maximum lengths less than 200 meters).
- Validate that the number of nodes on the network does not exceed the specifications defined for the network.
- Validate that the CAN communications cable is NOT routed next to high voltage or current carrying conductors (line voltage, generator voltage connections, utility voltage wiring, battery chargers, and etc.).
- Stub lengths, the wire length between the CAN node and the main CAN network, should be 1 meter in length or less.

10.9.2 CAN Network Resistance Measurement and Troubleshooting Recommendations

10.9.2.1 CAN H and CAN L Resistance Measurement and Test Recommendations

Disconnect the power supply to all connected CAN nodes and measure the resistance between CAN H and CAN L wires at the middle and ends of the network. The measured resistance should be between 50 and 70 ohms and should vary minimally between each measurement point.

If the resistance measurement is less than 50 ohms then perform the following:

- Visually inspect the CAN connections at each node to ensure that CAN H and CAN L signals were not crossed during installation or service. Correct wiring issues if found.
- Visually inspect the CAN data link lines to make sure that there are only two terminating resistors (120 ohm each) on the network and that those resistors are installed at the ends of the network.
- If there is more than two terminating resistors, remove or disable extra terminating resistors on the network.
- Measure the resistance of each terminating resistor to verify that it is between 110 and 130 ohms. Replace any shorted, worn, or damaged resistors.

NOTICE
Terminating resistors may be installed externally on a network, may be permanently installed on a network node, or may be enabled on the CAN node via a switch.

- If the S1 switch is used for network termination, the resistance of the termination resistor can be measured directly across CAN H and CAN L on the control.

If the resistance measurement is greater than 70 ohms then perform the following:

- Visually inspect the CAN connections at each node to ensure that CAN H and CAN L signals are not open circuit and there are no high resistance connections. Common causes of high resistance connections include broken strands of a multi-strand wire, improper or damaged wire crimps, corrosion or oxidization of wiring connections.
- Visually inspect the CAN data link lines to make sure that there are only two terminating resistors (120 ohm each) on the network and that those resistors are installed at the ends of the network.
- Measure the resistance of each terminating resistor to verify that it is between 110 and 130 ohms. Replace any shorted, worn, or damaged resistors.

NOTICE
Terminating resistors may be installed externally on a network, may be permanently installed on a network node, or may be enabled on the CAN node via a switch.

- If the S1 switch is used for network termination, the resistance of the termination resistor can be measured directly across CAN H and CAN L on the control.

Check for short circuits between the CAN H and CAN L wires and Ground. With the power supply to both CAN nodes still off, measure the resistance between CAN H and Chassis Ground (B+ return) and CAN L and Chassis Ground (B+ return) and verify they are not connected.

Isolated Ground (s-CAN) (3-wire plus shield) CAN network Additional test

- Check for short circuits between the CAN H and CAN L wires and Isolated Ground. With the power supply to both CAN nodes still off, measure the resistance between CAN H and Isolated Ground and CAN-L and Isolated Ground and verify they are not connected.

10.9.2.2 CAN Ground (GND) and Isolated Ground Resistance Measurement and Test Recommendation

NOTICE
CAN networks may have different ground topologies. Standard CAN networks (i.e. ECM CAN) are typically 2-wire with a shield ground. Isolated Ground CAN networks (i.e. s-CAN) are typically 3-wire (CAN H, CAN L, and Isolated Ground) with a shielded ground if for 3-wire CAN networks. The Isolated Ground connection is required for reliable communications. CAN networks with different grounding topologies should never be connected together.

Disconnect the power supply to all connected CAN nodes.

For use with PCC3300 ECM-CAN network: Common CAN (2-wire plus shield) CAN network grounding resistance test, see **Figure 69**. The CAN wire shield should be terminated by a wire conductor and directly grounded at only one point of a given CAN cable segment.

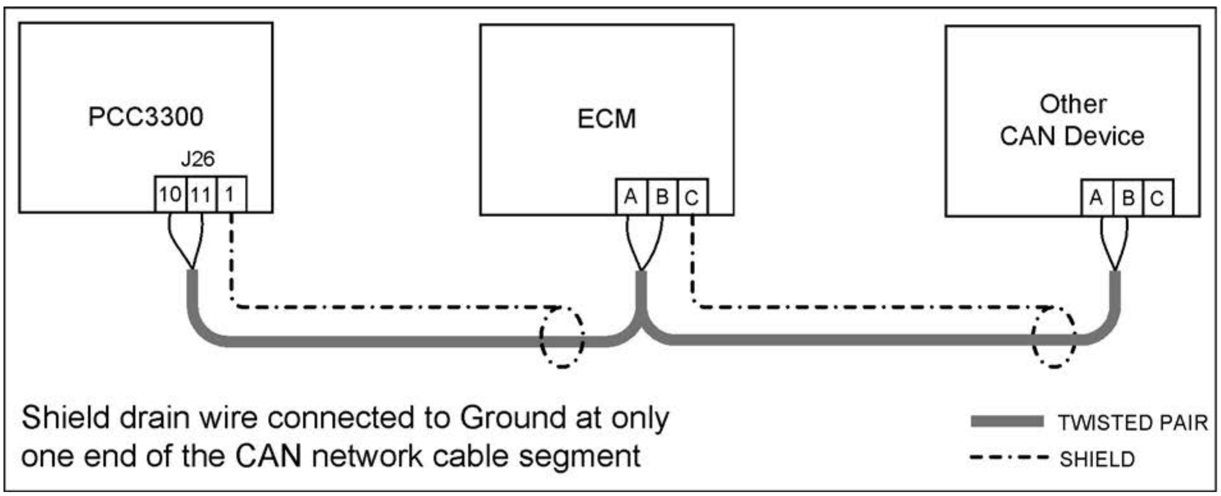


FIGURE 69. COMMON CAN, 2-WIRE PLUS SHIELD, CAN NETWORK

- Disconnect the CAN cable shield ground
- Measure the resistance between the CAN cable shield and the Local Ground (B+ Return) other than the shield connection point and validate resistance is open circuit.
- Reconnect the CAN cable shield ground.
- Measure the resistance between the CAN cable shield and the Local Ground (B+ Return), other than the shield connection point and validate that the shield is connected to ground.
- Repair and or replace any incorrect or damaged wiring shields or shield connections.
- Repeat test for any additional CAN cable segments.

For use with PCC3300 s-CAN network: Isolated Ground (3-wire plus shield) CAN network grounding resistance test, see **Figure 70**. The CAN wire shield should be terminated by a wire conductor and directly grounded at only one point of a given CAN wiring segment.

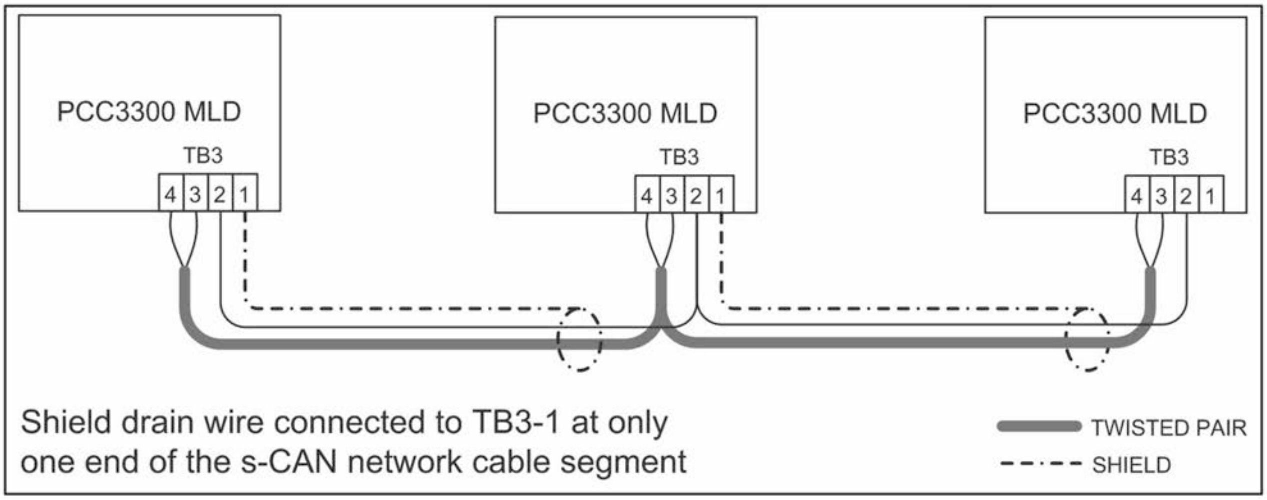


FIGURE 70. ISOLATED GROUND, 3-WIRE PLUS SHIELD, CAN NETWORK

NOTICE
The CAN shield should NOT be connected to the Isolated Ground. Further the Isolated Ground should NOT be connected to the common ground (B+ Return) or shield ground.

- Measure the resistance between the Isolated Ground and the Shield Ground. Verify that the grounds are not connected.
- Measure the resistance between the Isolated Ground and a Local Ground (B+ Return), other than the shield connection point. Verify that the grounds are not connected.
- Repair and or replace any short circuit connections between the shield ground and the local ground connections (B+ return)
- Disconnect the CAN cable shield ground.
- Measure the resistance between the CAN cable shield and the Local Ground (B+ Return) or the shield connection point and validate resistance is open circuit.
- Reconnect the CAN cable shield ground.
- Measure the resistance between the CAN cable shield and the Local Ground (B+ Return), or the shield connection point and validate that the shield is connected to ground.
- Repair and or replace any incorrect or damaged wiring shields or shield connections.
- Repeat test for any additional CAN cable segments.

10.9.3 Isolated Ground Voltage Measurement Test Recommendation

If the connected network is an Isolated ground (3-wire) CAN Network

- Connect power to all connected CAN nodes
- Measure the Isolated Ground (3-wire plus shield) CAN network voltage referenced to Common Ground (B+ return)
- Offset voltages, between the isolated CAN signals and system GND are normal, however offset voltage approaching the system supply voltage (12 or 24 Volts) may indicate short between the CAN isolated ground and other control signals.

- Isolated Ground CAN networks may operate correctly with significant voltage offsets present, however having this offset present increases the risk of other network or system failures and should be corrected.
- If significant isolated Ground Offset voltage exist, investigate potential connections of s-CAN network isolated ground to active control signals.
- Repair and replace wiring problems identified.

NOTICE
CAN networks may have different ground topologies. Standard CAN networks (i.e. ECM CAN) are typically 2-wire with a shield ground. Isolated Ground CAN networks (i.e. s-CAN) are typically 3-wire (CAN H, CAN L, and Isolated Ground) with a shielded ground. The Isolated Ground connection is required for reliable communications.

NOTICE
CAN networks with different grounding topologies should never be connected together.

NOTICE
Voltage sources may not always be present when the engine is running or if power is removed (i.e. starter solenoids, fuel pumps, Relays, customer I/O, and etc.)

NOTICE
It is possible that more than one failure mode may be present on the CAN network. If wiring changes are made to correct issues during testing, all the tests should be repeated to ensure correct CAN network wiring and reliability.

10.10 How to Obtain Service

At Cummins Inc., we want to deliver more than just good service. The process starts with an accurate description of generator set information, such as event/fault codes and troubleshooting procedures performed, without which no repair can possibly be performed accurately.

Before contacting your local distributor, locate the name plate on the side of the generator output box, and have the following information available.

Model of Controller:

____

Control Part Number and Serial Number:

____

Describe the control issue:

____

____

Are there any fault codes on the operator panel?

____

If so, list the fault codes on the operator panel:

____

To find the closest distributor,

1. Go to **www.cumminspower.com**.
2. Click on “Distributor Locator".

At Cummins Inc., we want to deliver more than just good service. The process starts with an accurate description of generator set information, such as event/fault codes and troubleshooting procedures performed, without which no repair can possibly be performed accurately.

Before contacting your local distributor, locate the name plate on the side of the generator output box, and have the following information available.

⚠ WARNING

Incorrect service or replacement of parts can result in severe personal injury, death, and/or equipment damage. Service personnel must be trained and experienced to perform electrical and mechanical service. Read Safety Precautions, and carefully observe all of the instructions and precautions in this manual.

11 Manufacturing Facilities

U.S. and CANADA	EMEA, CIS	EMEA, CIS
Cummins Inc. 1400 73rd Ave. NE Minneapolis, MN 55432 USA	Cummins Inc. Columbus Avenue Manston Park Manston, Ramsgate Kent CT12 5BF United Kingdom	Cummins Inc. Royal Oak Way South Daventry Northamptonshire NN11 8NU United Kingdom
Toll Free 1-800-CUMMINS™ (1-800-286-6467) Phone +1 763-574-5000 Fax +1 763-574-5298	Phone +44 1843 255000 Fax +44 1843 255902	Phone +44 1327 88-6453 Fax +44 1327 88-6125
BRAZIL	**CHINA**	**INDIA**
Rua Jati, 310, Cumbica Guarulhos, SP 07180-900 CNPJ: 43.2201.151/0001-10 Brazil	Cummins Inc. No.118 South Quanli Road , Wuhan Economic& Technological Development Zone , Hubei, P.R.China 430058	Cummins Inc. Plot No B-2, SEZ Industrial Area, Village-Nandal & Surwadi, Taluka-Phaltan Dist- Satara, Maharashtra 415523 India
Phone 0800 286 6467	Phone + 86 (27) 8421 4008 Fax + 86 (27) 8421 4804	Phone +91 021 66305514
LATIN AMERICA	**MEXICO**	**ASIA PACIFIC**
3350 Southwest 148th Ave. Suite 205 Miramar, FL 33027 USA	Eje 122 No. 200 Zona Industrial San Luis Potosi, S.L.P. 78395 Mexico	Cummins Sales and Service Singapore Pte Ltd 85 Tuas South Avenue 1 Singapore 637419
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Appendix A. Schematics

Table of Contents

A.0 0630-3440

NOTICE
This section contains basic (generic) wiring diagrams and schematics to help in troubleshooting. Service personnel must use the wiring diagrams and schematics shipped with the unit. These wiring diagrams and schematics should be updated when modifications are made to the unit.

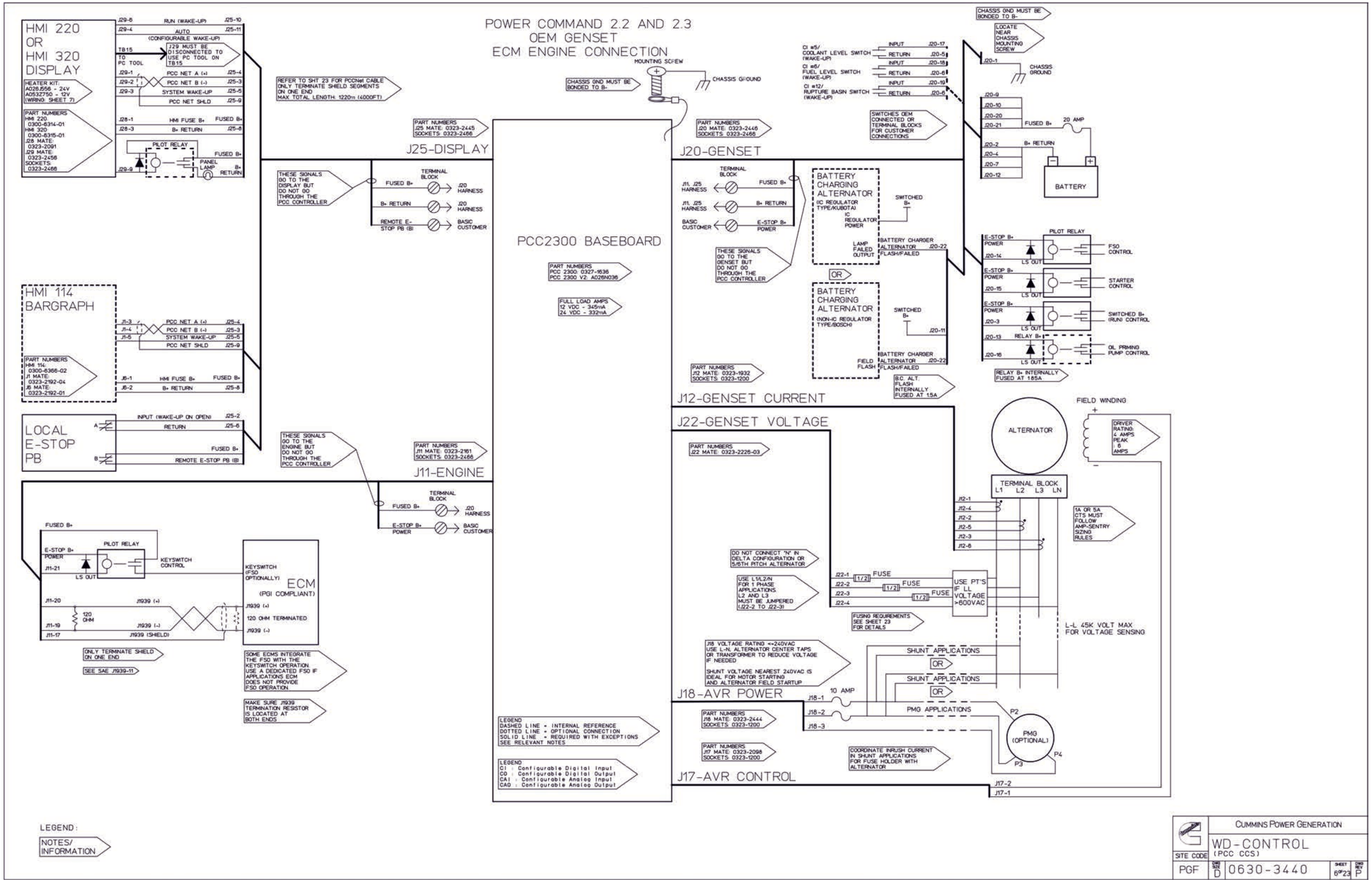

FIGURE 71. PCC OEM GENSET ECM ENGINE CONNECTIONS

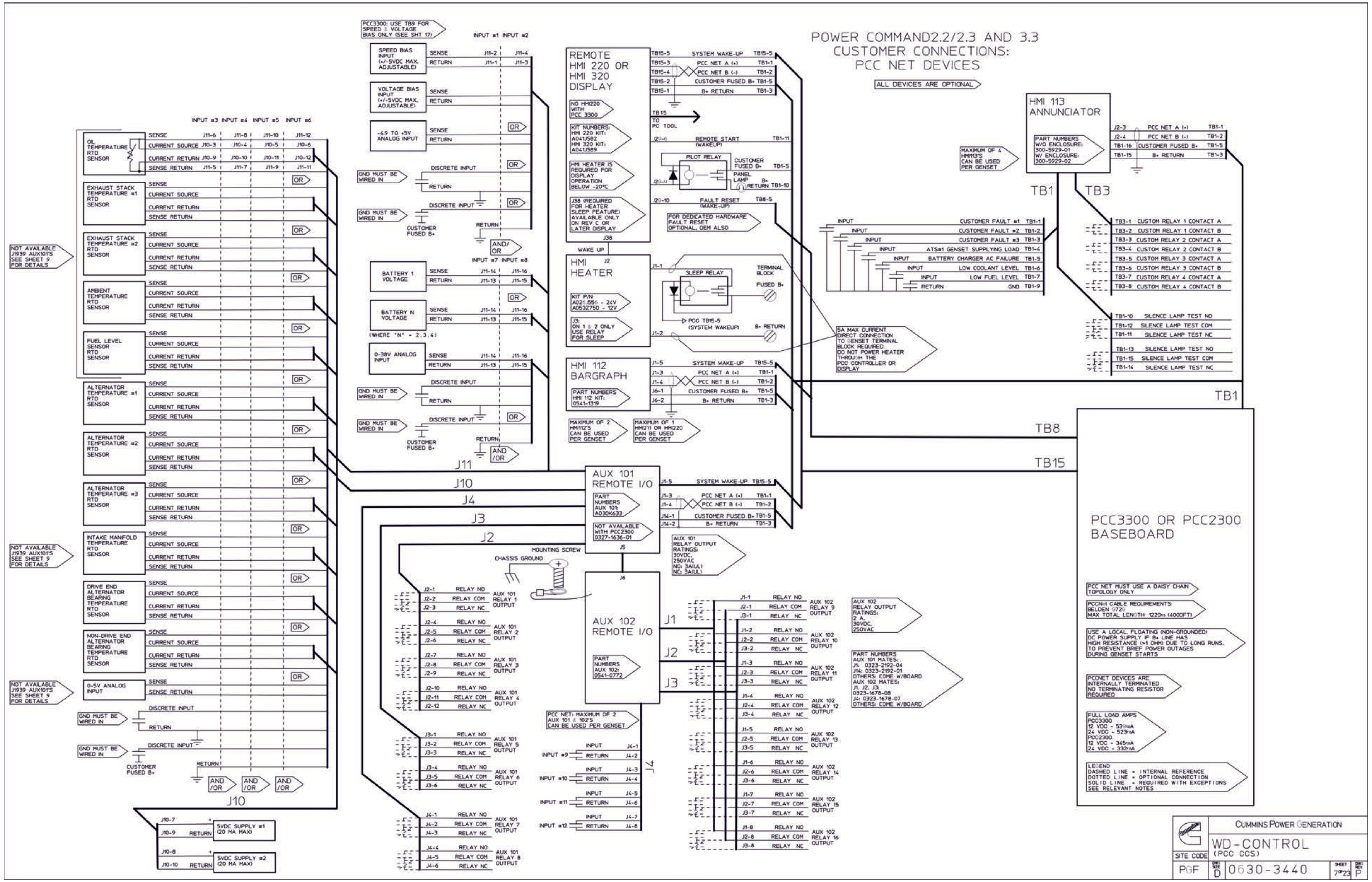

FIGURE 72. PCCNET DEVICE CONNECTION

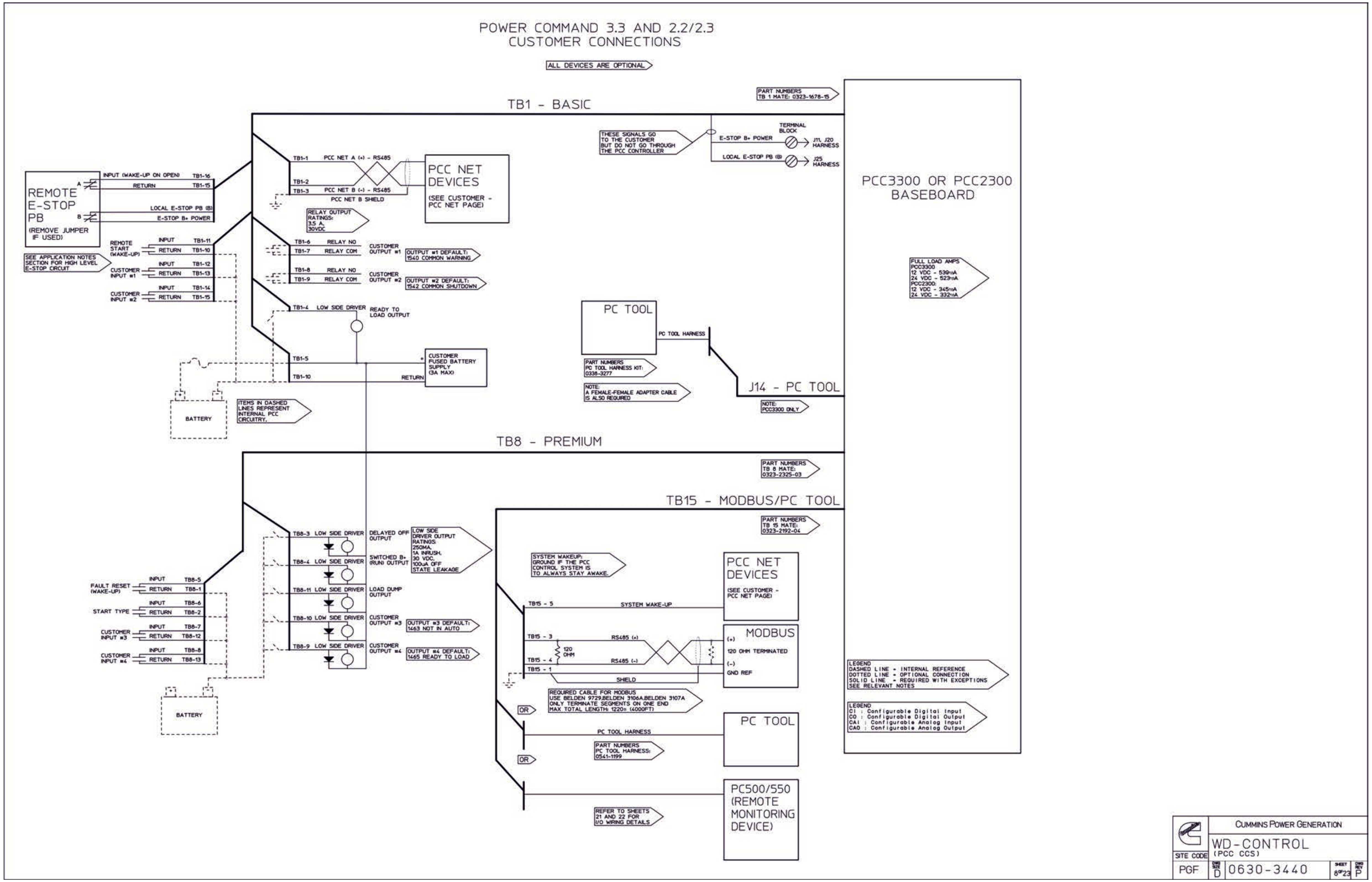

FIGURE 73. PCC CUSTOMER CONNECTIONS

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A.1 Alternator Connections

NOTICE

This section contains basic (generic) wiring diagrams and schematics to help in troubleshooting. Service personnel must use the wiring diagrams and schematics shipped with the unit. These wiring diagrams and schematics should be updated when modifications are made to the unit.

These figures show the connections between the PCC and the main alternator in various alternator configurations.

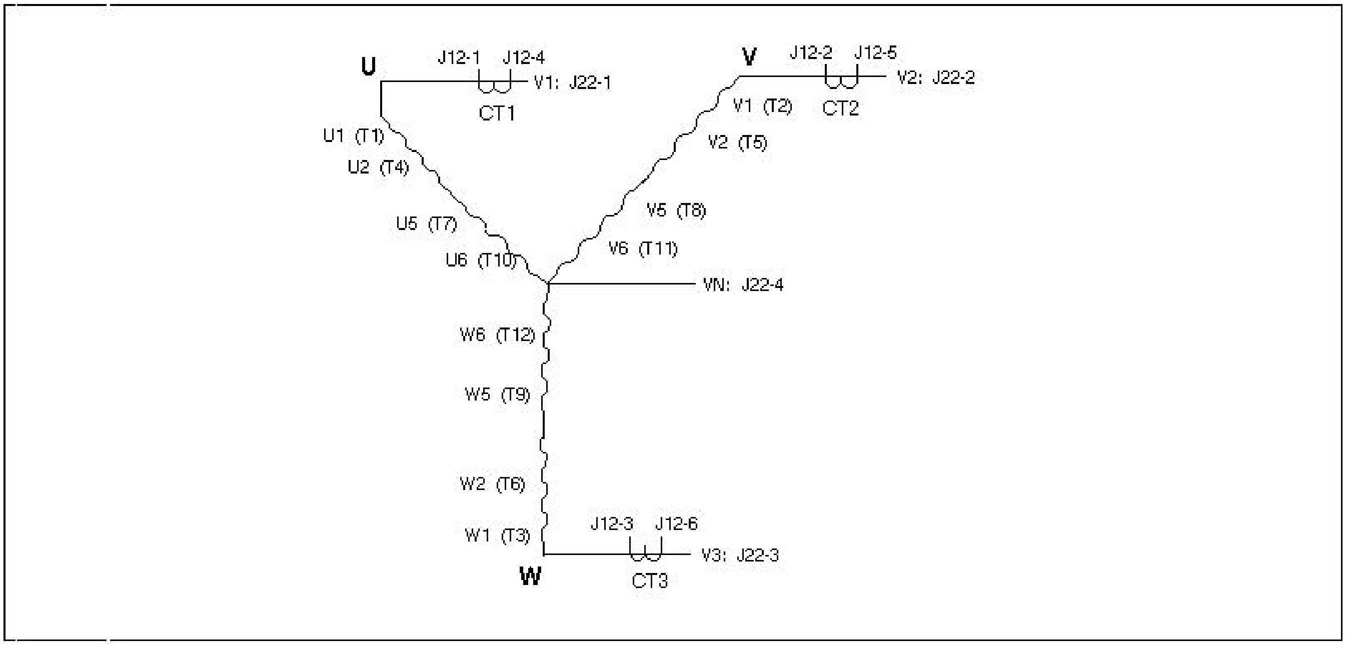

FIGURE 74. ALTERNATOR CONNECTIONS: SERIES STAR

NOTICE

Sense N must not be connected in three-phase delta configurations, such as series delta. (Double delta is a single-phase configuration, and sense N should be connected in double delta configurations)

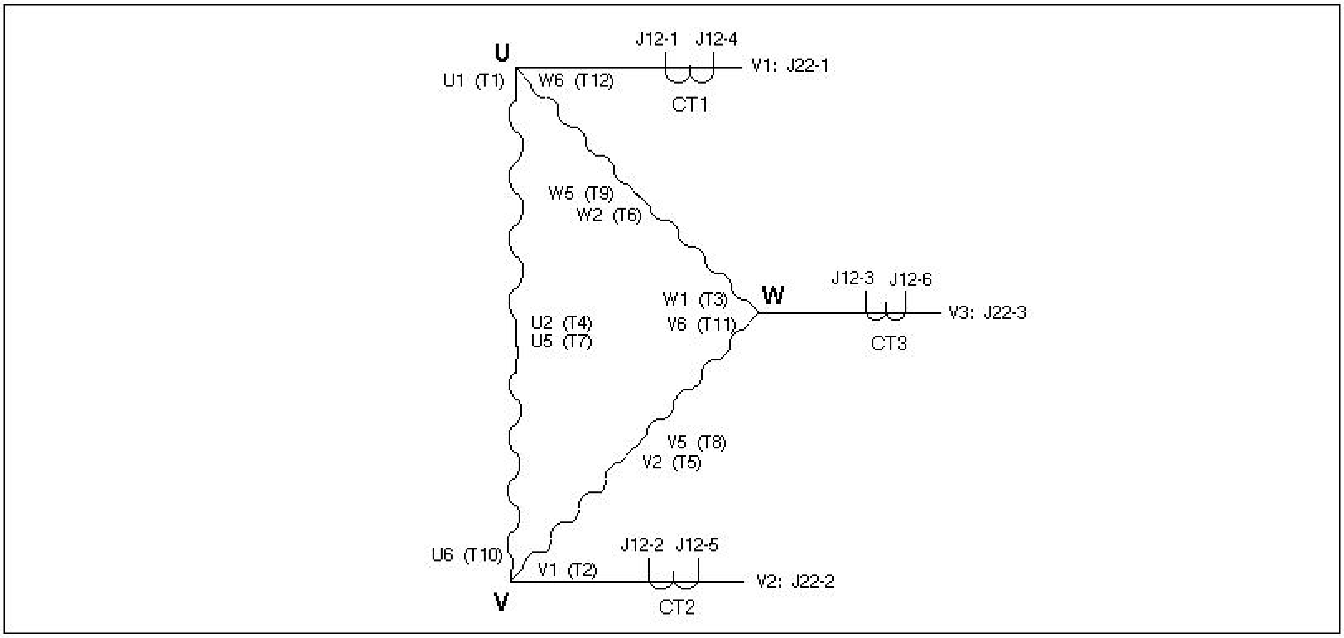

FIGURE 75. ALTERNATOR CONNECTIONS: SERIES DELTA

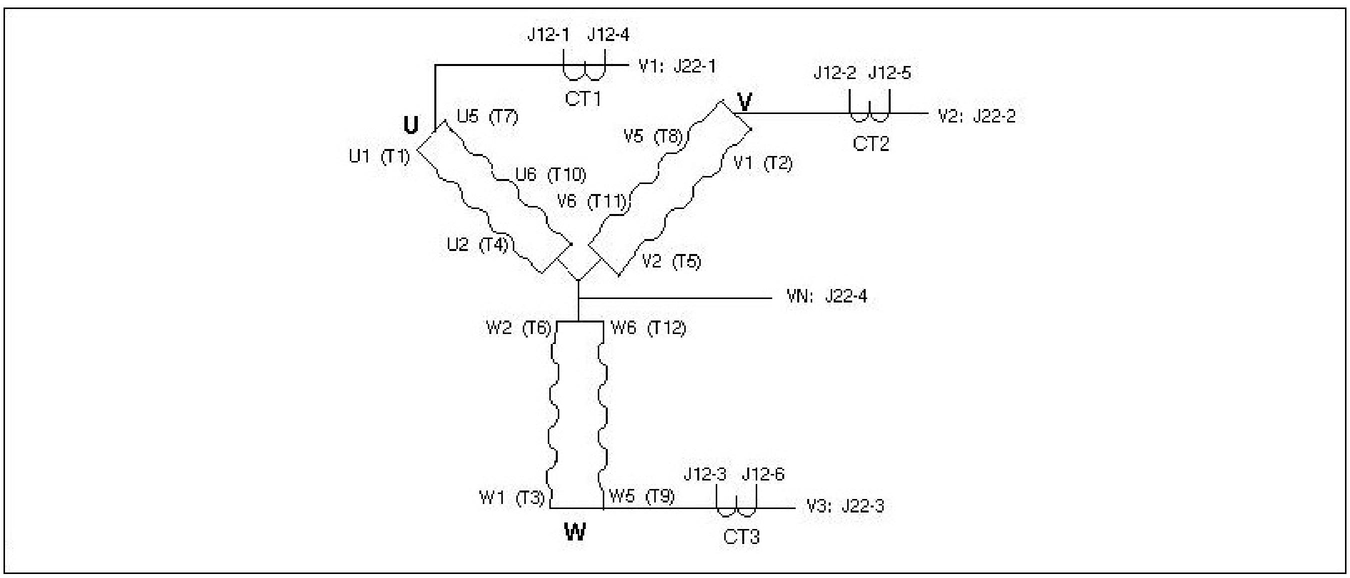

FIGURE 76. ALTERNATOR CONNECTIONS: PARALLEL STAR

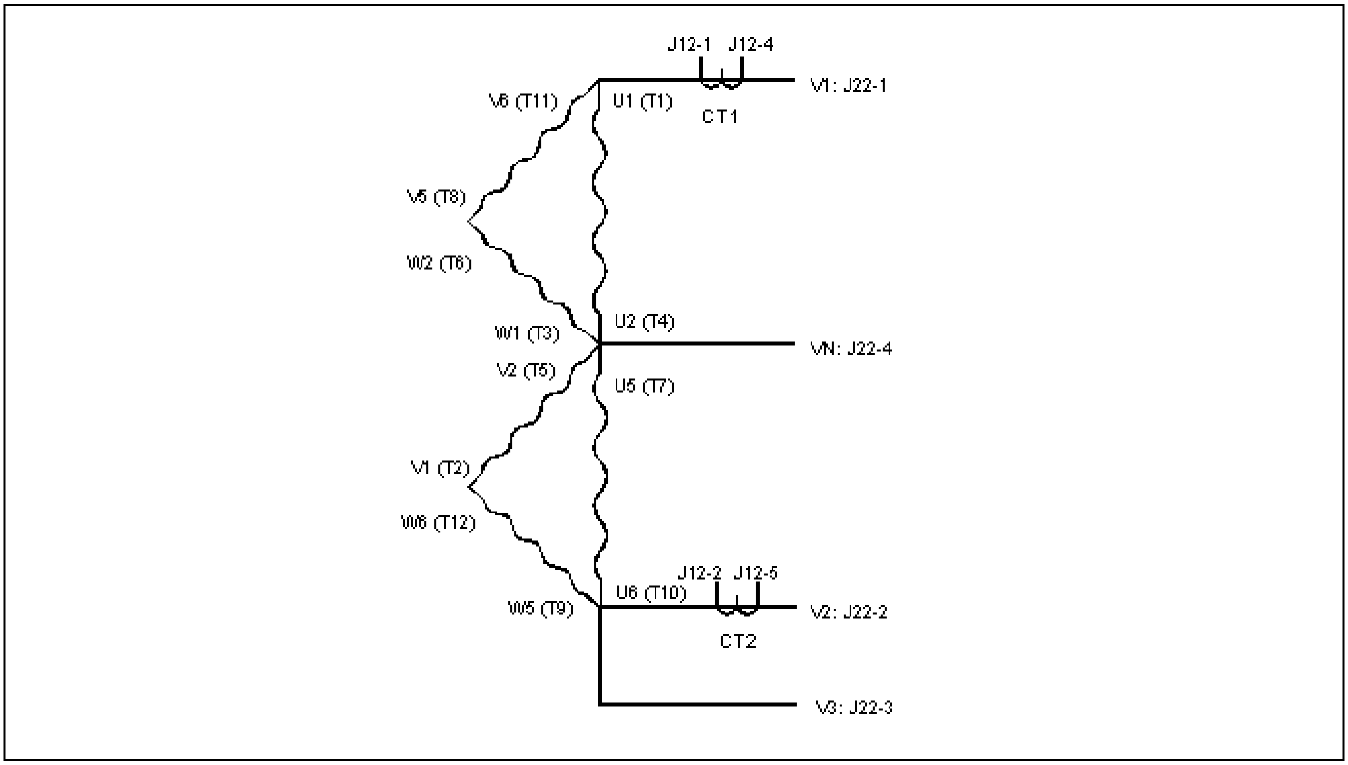

FIGURE 77. ALTERNATOR CONNECTIONS: DOUBLE DELTA

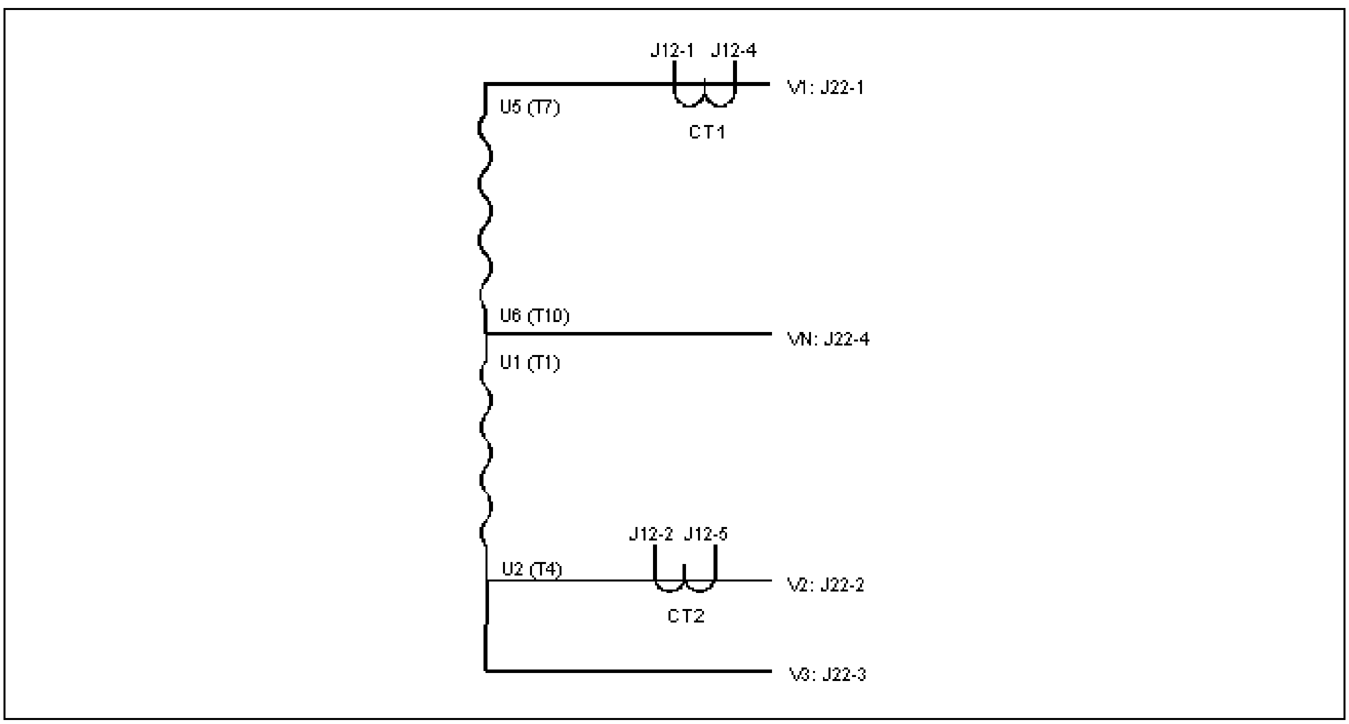

FIGURE 78. ALTERNATOR CONNECTIONS: SINGLE PHASE

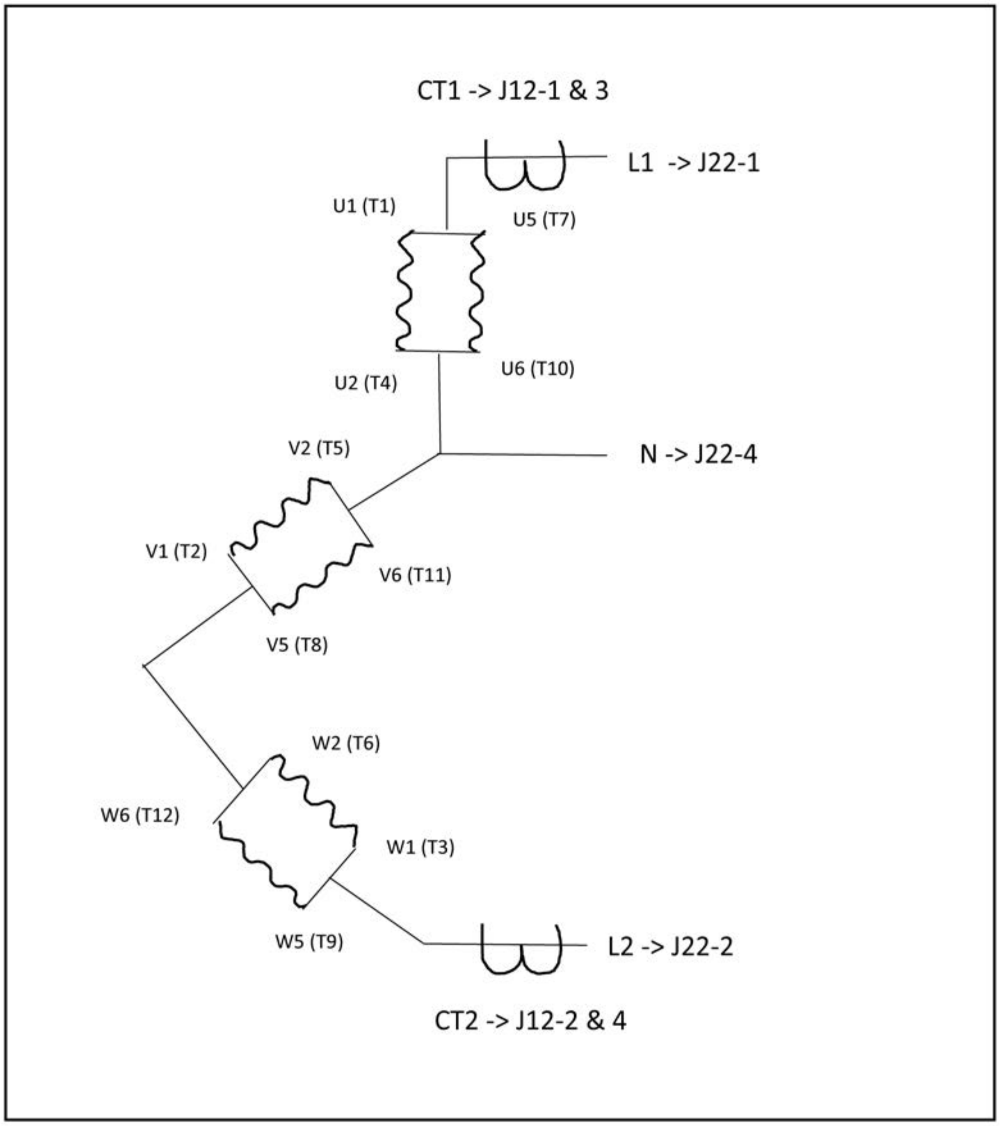

FIGURE 79. ALTERNATOR CONNECTIONS: PARALLEL ZIG ZAG ONE LINE

A.2 Potential Transformer Connections

NOTICE
This section contains basic (generic) wiring diagrams and schematics to help in troubleshooting. Service personnel must use the wiring diagrams and schematics shipped with the unit. These wiring diagrams and schematics should be updated when modifications are made to the unit.

These figures show the connections for potential transformers.

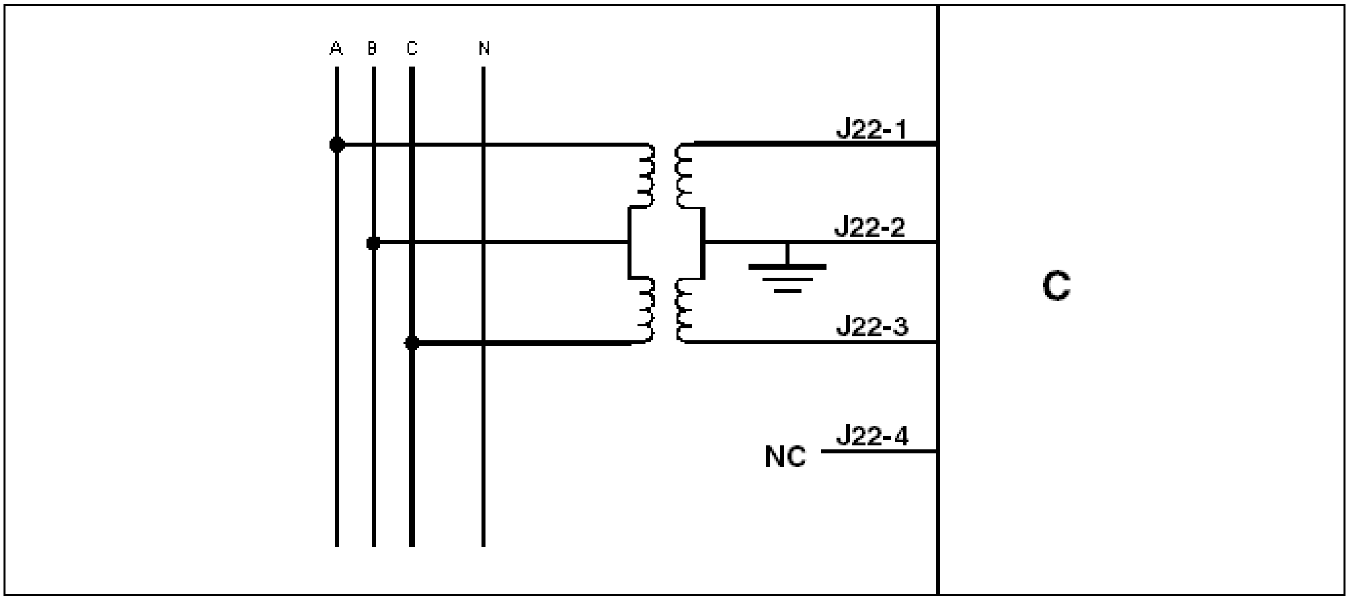

FIGURE 80. POTENTIAL TRANSFORMER CONNECTIONS IN 3-WIRE CONNECTIONS

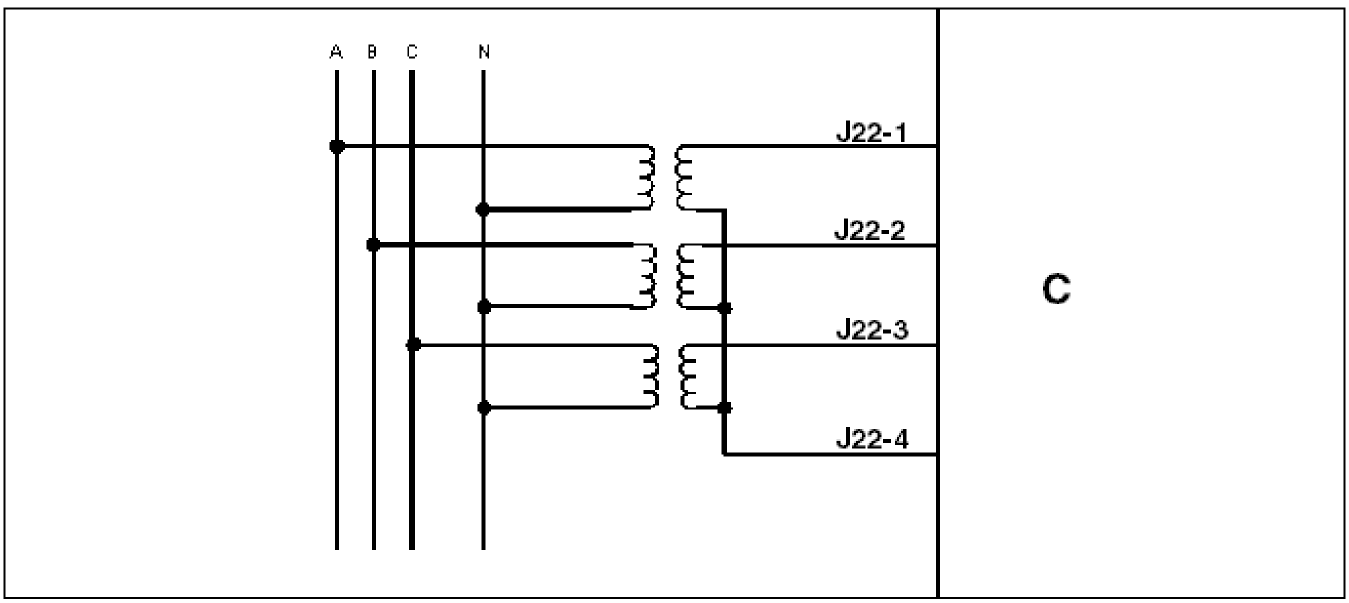

FIGURE 81. POTENTIAL TRANSFORMER CONNECTIONS IN 4-WIRE CONNECTIONS

A.3 Emergency Stop Button Wiring Diagram

NOTICE
This section contains basic (generic) wiring diagrams and schematics to help in troubleshooting. Service personnel must use the wiring diagrams and schematics shipped with the unit. These wiring diagrams and schematics should be updated when modifications are made to the unit.

This figure shows one way to connect emergency stop buttons.

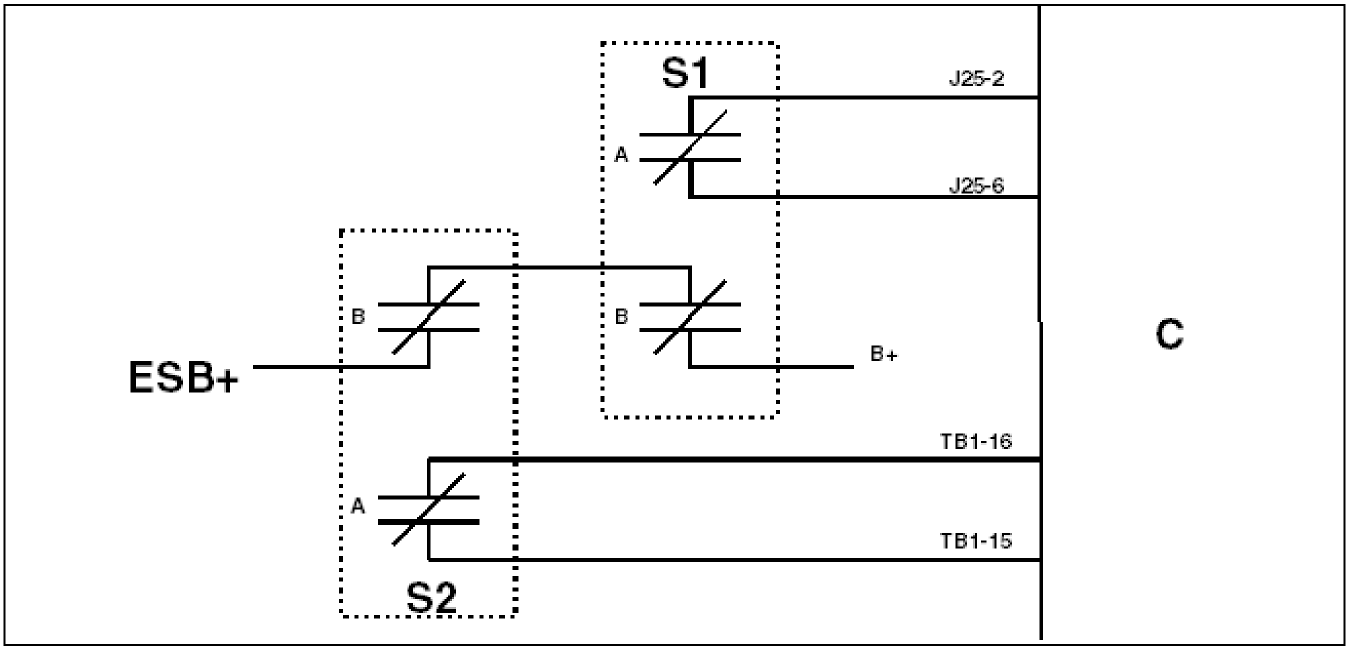

FIGURE 82. EMERGENCY STOP BUTTON WIRING DIAGRAM

C: PCC

S1: Local emergency switch

S2: Remote emergency switch

ESB+: Emergency Stop B+ Power

A.4 ECM Keyswitch Connections

NOTICE
This section contains basic (generic) wiring diagrams and schematics to help in troubleshooting. Service personnel must use the wiring diagrams and schematics shipped with the unit. These wiring diagrams and schematics should be updated when modifications are made to the unit.

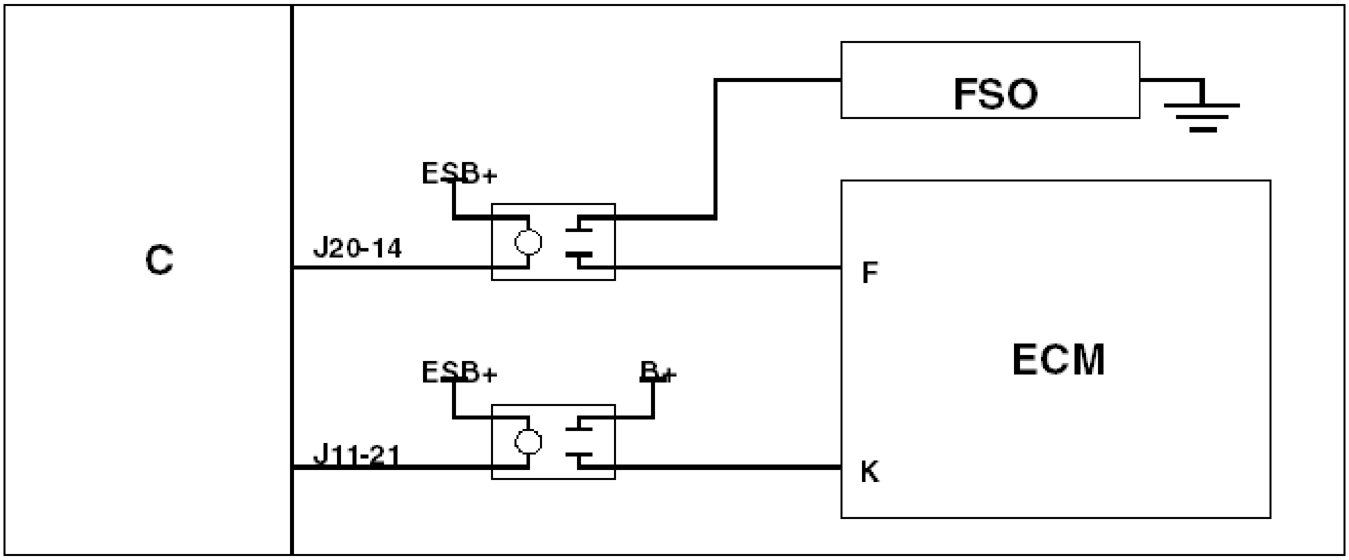

FIGURE 83. KEYSWITCH CONNECTIONS WHEN ECM CONTROLS FUEL SHUTOFF SOLENOID

C: PCC

ESB+: Emergency Stop B+ Power

FSO: Fuel Shutoff Solenoid

ECM: Engine Control Module (for example, CM570 or CM876)

F: FSO Driver (in ECM)

K: Keyswitch (in ECM)

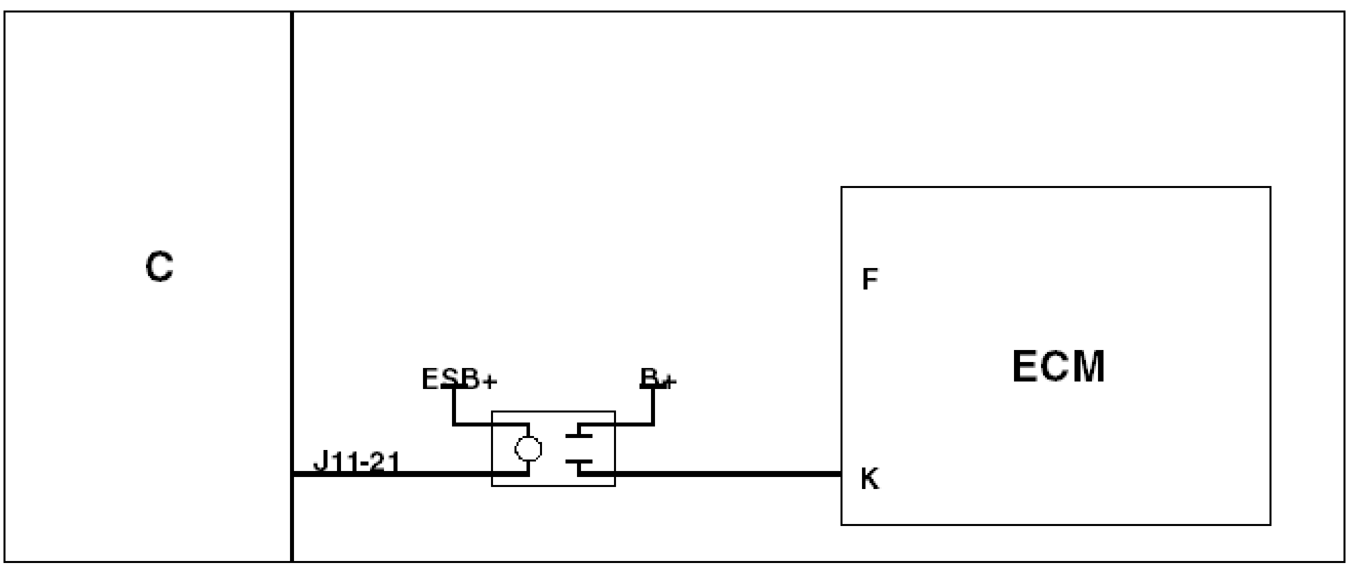

FIGURE 84. KEYSWITCH CONNECTIONS WHEN ECM DOES NOT CONTROL FUEL SHUTOFF SOLENOID

C: PCC

ESB+: Emergency Stop B+ Power

ECM: Engine Control Module (for example, CM850)

F: FSO Driver (in ECM)

K: Keyswitch (in ECM)

Appendix B. Parts List

Table of Contents

TABLE 171. PART NUMBERS

PART DESCRIPTION	PART NUMBER
AUX 101	A030K633
AUX 102	0541-0772
Emergency stop button	0308-1165
Fluke test leads "TL80A"	0541-1627
HMI 113 (No enclosure)	0300-5929-01
HMI 113 (Enclosure)	0300-5929-02
HMI 114 (Bargraph)	0300-6366-02
HMI 114 (Bargraph software)	0326-7431
HMI 220 (Operator Panel)	0300-6314-01
HMI 220 Operator Panel software	0326-7330
HMI 220 Operator Panel language software	0326-7447 0326-7448
HMI 320 (Operator Panel)	0300-6315-02
HMI 320 Operator Panel software	0326-7431
HMI 320 Operator Panel language software	0326-7449 0326-7450
INLINE 4 product kit	4918190
INLINE 5 product kit	4918416
InPower Pro service tool	0998-0077-02 (existing user) 0998-0077-04 (new user)
Remote HMI 320 (Operator Panel)	0300-6315-03
Remote HMI 320 Operator Panel software	0326-7431
Remote HMI 320 Operator Panel language software	0326-7449 0326-7450
PCC 2300 controller	0327-1636
PC-based service tool harness (InPower harness)	0541-1199

TABLE 173. PART NUMBERS FOR PCC CONNECTORS

CONNECTION	DESCRIPTION	HOUSING	PINS
J11	Engine input and output	0323-2161	0323-2466
J12	CT input	0323-1932	0323-1200
J17	AVR control	0323-2098	0323-1200
J18	AVR input	0323-2444	0323-1200
J20	Genset input and output	0323-2446	0323-2466

CONNECTION	DESCRIPTION	HOUSING	PINS
J22	PT input	0323-2226-03	
J25	Accessories input and output	0323-2445	0323-2466
TB1	Customer input and output	0323-1678-15	
TB8	Customer input and output	0323-2325-03	
TB15	Modbus, PC-based service tool interface	0323-2192-04	

TABLE 175. PART NUMBERS FOR OPERATOR PANEL CONNECTORS

CONNECTION	DESCRIPTION	HOUSING	PINS
J28	Power	0323-2091	0323-2466
J29	Local installations	0323-2456	0323-2466
J36	Power-down mode disable		
TB15	Remote installations, PC-based service tool	0323-2191-04 0323-2192-04	

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