



Service Manual

Controller

PowerCommand[®] 3.3

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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
<i>Indicates a hazardous situation that, if not avoided, will result in death or serious injury.</i>

 WARNING
<i>Indicates a hazardous situation that, if not avoided, could result in death or serious injury.</i>

 CAUTION
<i>Indicates a hazardous situation that, if not avoided, could result in minor or moderate injury.</i>

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 AC Disconnect Sources

WARNING

Hazardous Voltage

Contact with high voltages can cause severe electrical shock, burns, or death.

The equipment may have more than one source of electrical energy. Disconnecting one source without disconnecting the others presents a shock hazard. Before starting work, disconnect the equipment, and verify that all sources of electrical energy have been removed.

1.4.3 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	<p>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.</p> <p>For events/faults, this term describes the time the PCC generates the event/fault through the time the event/fault is cleared.</p>
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 output" 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	<p>This term has no meaning if you do not have access to the PCC control board or the back panel of the Operator Panel.</p> <p>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).</p> <p>This term also refers to the end of a wire or harness that is plugged into the housing.</p>
Event Fault	<p>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.</p> <p>The PCC generates a fault when the conditions indicate a more serious problem; the PCC generates an event only for information purposes.</p>
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 PowerCommand 3.3

The PowerCommand® 3.3 is suitable for paralleling generator sets ("gensets") in standby or prime-power applications.

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

- Control the generator set to maintain a specified generator set voltage and generator set frequency
- Warn the operator when unsafe conditions are occurring
- Shut down the generator set to prevent damage
- Provide 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.

4.2.1 PowerCommand 3.3 Masterless Load Demand

The PowerCommand® 3.3 controller with Masterless Load Demand (MLD) control baseboard provides all the functionality of the standard PowerCommand® 3.3 plus the MLD feature.

MLD capable generator set controls are equipped with an additional s-CAN network connection that allows the sharing of information between generator set controls. When multiple MLD equipped controls are operated as a paralleled isolated bus, the generator sets in a MLD network share information to determine total load on the generator AC bus, available capacity of operating generator sets, and available capacity of non-operating generator sets. The generator set controls use this information to start and stop generator sets based on the load demands on the generator AC bus.

The priority of which generator set turns on and off can be configured to a fixed priority sequence, or based on the number of hours on each generator set.

The s-CAN network is Masterless in that if any one generator set fails or goes offline (i.e. a generator set shutdown fault) the network will start an additional set and remain in operation. Further should one generator set fail, it will not disable the system.

4.3 Controller Area Network

Controller Area Network (CAN) have different ground topologies. Standard CAN networks (ECM CAN) are typically 2-wire with a shielded ground. Isolated ground CAN networks (s-CAN) are typically 3-wire with a shielded ground; CAN High (CAN H), CAN Low (CAN L) and CAN-ground. Each device (node) in a CAN network has a unique address in the network. All nodes in the network have a CAN controller chip that allows the node to see all messages sent in the CAN network. Each node can then decide if the message is relevant or if it should be filtered.

A CAN network is a peer-to-peer network, when a CAN node is ready to transmit a message, the node checks if the CAN network is busy or not. If the CAN network is busy, the node waits until the message is sent. If more than one node is trying to use the CAN network at the same time, the node with the higher priority will send its message first. If the network is not busy, the node sends a message that can be seen by all nodes on the CAN network. Each node can then decide if the message should be accepted or not.

CAN Network Signals: The CAN Network cable carries a series of 1s and 0s in each message

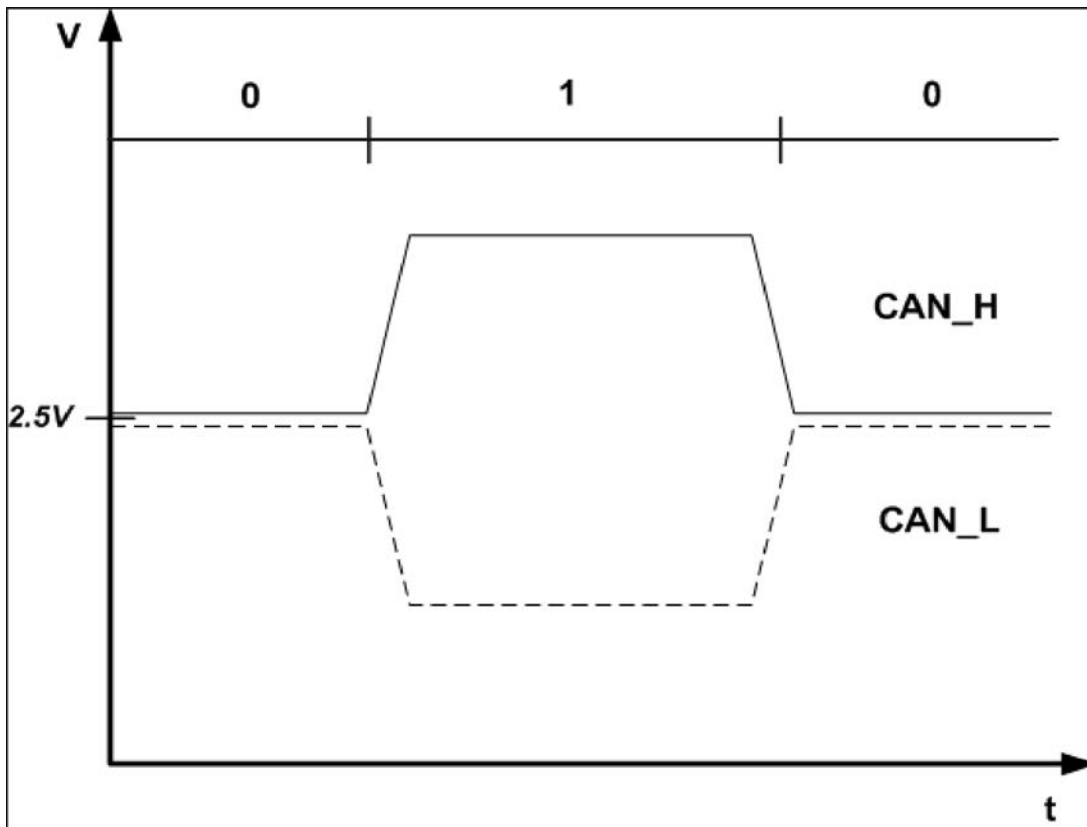


FIGURE 1. TYPICAL CAN SIGNAL REFERENCED TO GROUND

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.

TABLE 1. VOLTAGE DIFFERENTIAL

Data Signal	0	1
CAN H	2.5 V	3.5 V
CAN L	2.5 V	1.5 V
Voltage Differential	0	2 V
NOTICE		
Voltage Differential = CAN H voltage - CAN L voltage		

TABLE 2. VOLTAGE DIFFERENTIAL WHEN CAN DATA SIGNAL = 0 (SEE SAE J1939-11 FOR FULL SIGNAL SPECIFICATIONS)

MIN	Nominal	Max
-400 mV	0	12 mV

TABLE 3. VOLTAGE DIFFERENTIAL WHEN CAN DATA SIGNAL = 1 (SEE SAE J1939-11 FOR FULL SIGNAL SPECIFICATIONS)

MIN	Nominal	Max
1.2 V	2 V	3 V

4.4 Components (Applications with Engine Control Modules)

The PowerCommand 3.3 Control System consists of the following parts:

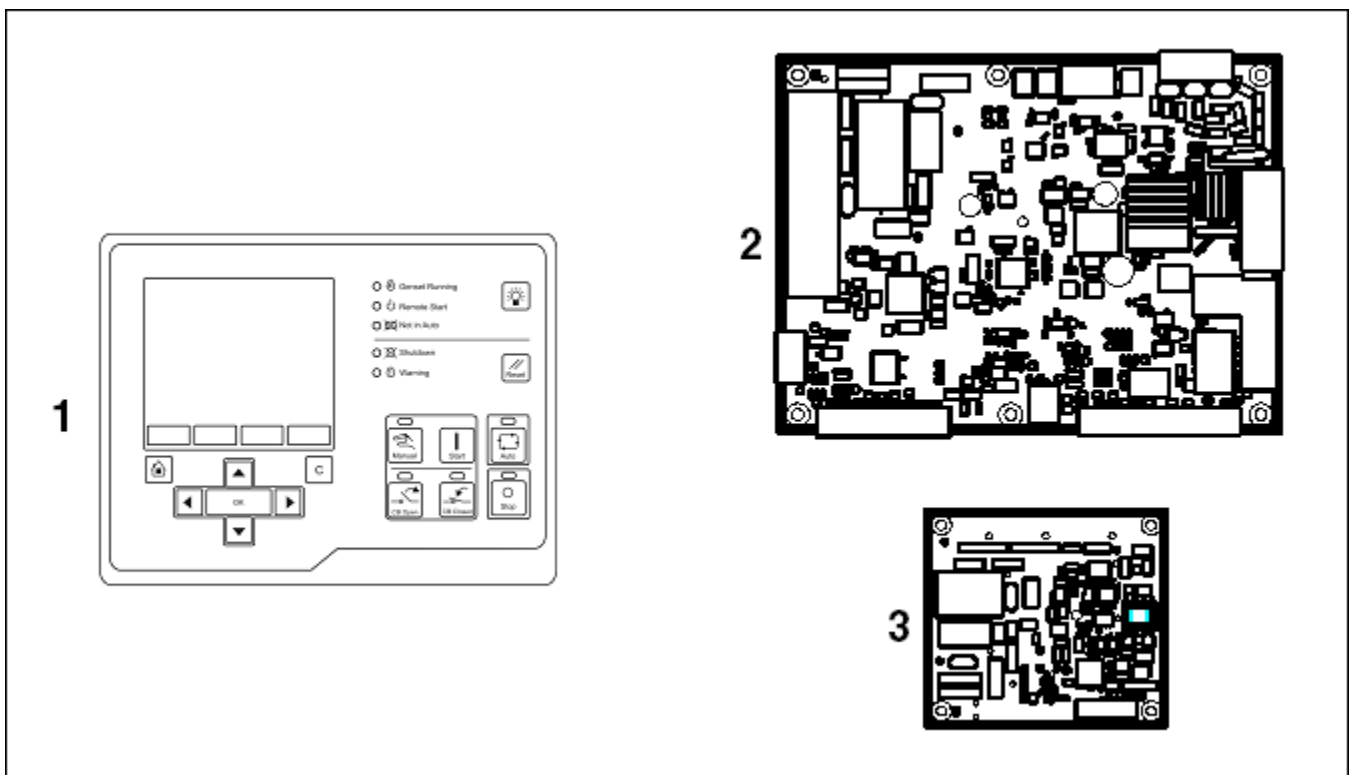


FIGURE 2. POWERCOMMAND 3.3 CONTROL SYSTEM (APPLICATIONS WITH ENGINE CONTROL MODULES)

TABLE 4. POWERCOMMAND 3.3 CONTROL SYSTEM (APPLICATIONS WITH ENGINE CONTROL MODULES)

PART DESCRIPTION	PART NUMBER
1: HMI320 ("Operator Panel")	0300-6315-02
2: PCC3300 Control ("PCC")	Table 7
4: AUX103 AVR power stage	0327-1593

4.5 Components (Applications with Hydromechanical Engines)

The PowerCommand® 3.3 Control System consists of the following parts:

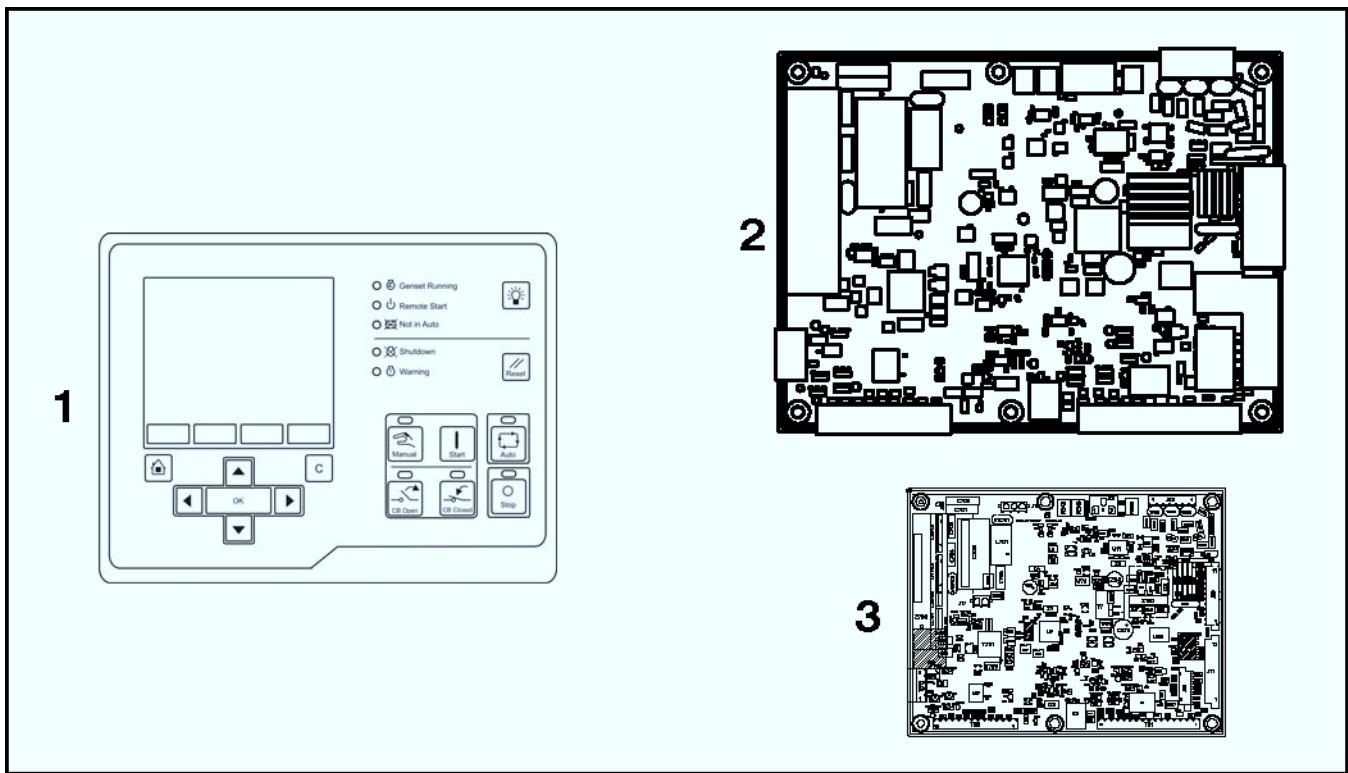


FIGURE 3. POWERCOMMAND 3.3 CONTROL SYSTEM (APPLICATIONS WITH HYDROMECHANICAL ENGINES)

TABLE 5. POWERCOMMAND 3.3 CONTROL SYSTEM (APPLICATIONS WITH HYDROMECHANICAL ENGINES)

PART DESCRIPTION	PART NUMBER
1: HMI320 ("Operator Panel")	0300-6315-02
2: PCC3300 Control ("PCC")	Table 7
4: AUX105 HM ECM and AVR power stage	A028T766

4.6 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.

4.7 AUX103

The AUX103 helps the PCC maintain a specified generator set voltage.

In this manual, "PCC" may refer to "PCC and AUX103" without explicitly stating this. Distinction is made when necessary.

<i>NOTICE</i>

The AUX103 should be installed where it can be accessed only by authorized service representatives. Unauthorized personnel, including an operator, should not have access to it.

4.8 AUX105

The AUX105 acts like an engine control module and helps the PCC maintain a specified generator set voltage.

In this manual, "PCC" may refer to "PCC and AUX105" without explicitly stating this. Distinction is made when necessary.

<i>NOTICE</i>

The AUX105 should be installed where it can be accessed only by authorized service representatives. Unauthorized personnel, including an operator, should not have access to it.

4.9 Remote HMI Operator Panel (Optional)

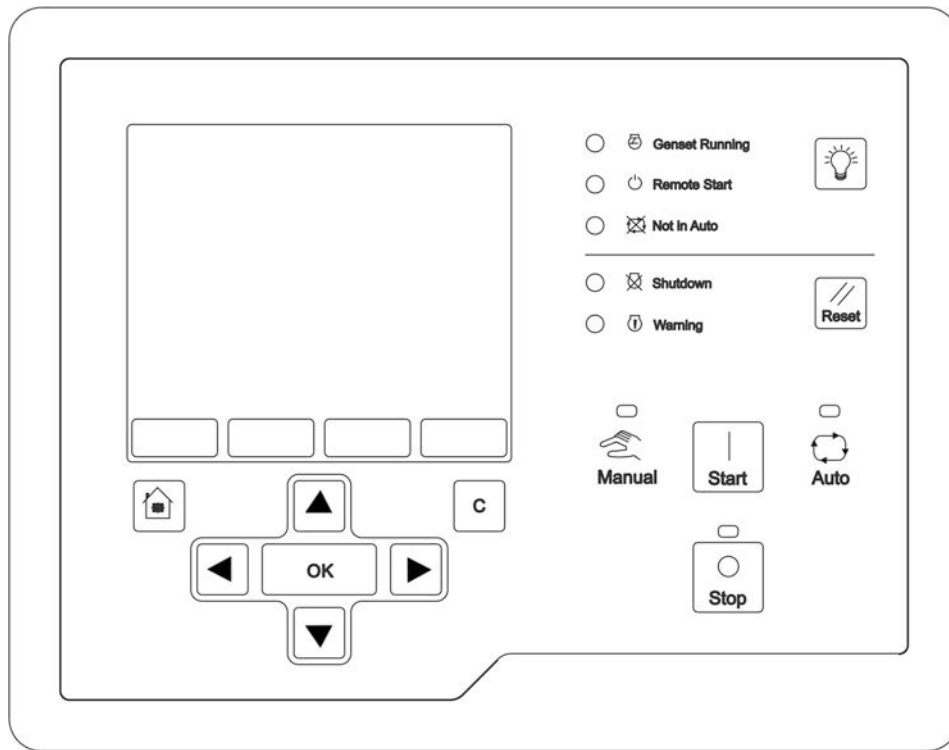


FIGURE 4. REMOTE HMI 320 OPERATOR PANEL (PART #0300-6315-03) (OPTIONAL)

4.10 Generator Set Specifications

TABLE 6. GENERATOR SET SPECIFICATIONS

CATEGORY	CHARACTERISTIC
Paralleling	Three-Phase operation Dead bus close First start arbitration (with compatible controllers) Droop (speed droop and voltage droop) Synchronization Load share (with compatible controllers) Load govern Power transfer control
Generator Set Output	Single-phase or three-phase operation 50 Hz or 60 Hz operation 190-45,000 VAC line-to-line (generator set) 110-600 VAC line-to-line (PCC input from generator set; if the generator set 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 or lean-burn natural gas (LBNG) 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. Hydromechanical
Communication	PCCNet Modbus System bus 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)

4.11 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 3300 Control Base Board

TABLE 7. PCC CONTROL BASE BOARD PART NUMBERS

Part Description	Part Number
PCC 3300 Control	0327-1601-01
PCC 3300 Control with Masterless Load Demand (MLD)	A041W736
PCC 3300 Control (For Training only)	0327-1601-02

The control base board ([Figure 5](#) contains the microprocessor and the operational software for the PCC).

All PCC 3300 Control base boards use the same calibration software, Part Number 0326-7474

The control base board is potted to provide resistance to dust and moisture. It is specifically designed and tested for resistance to RFI/EMI, and it also includes transient voltage surge suppression to provide compliance with referenced standards.

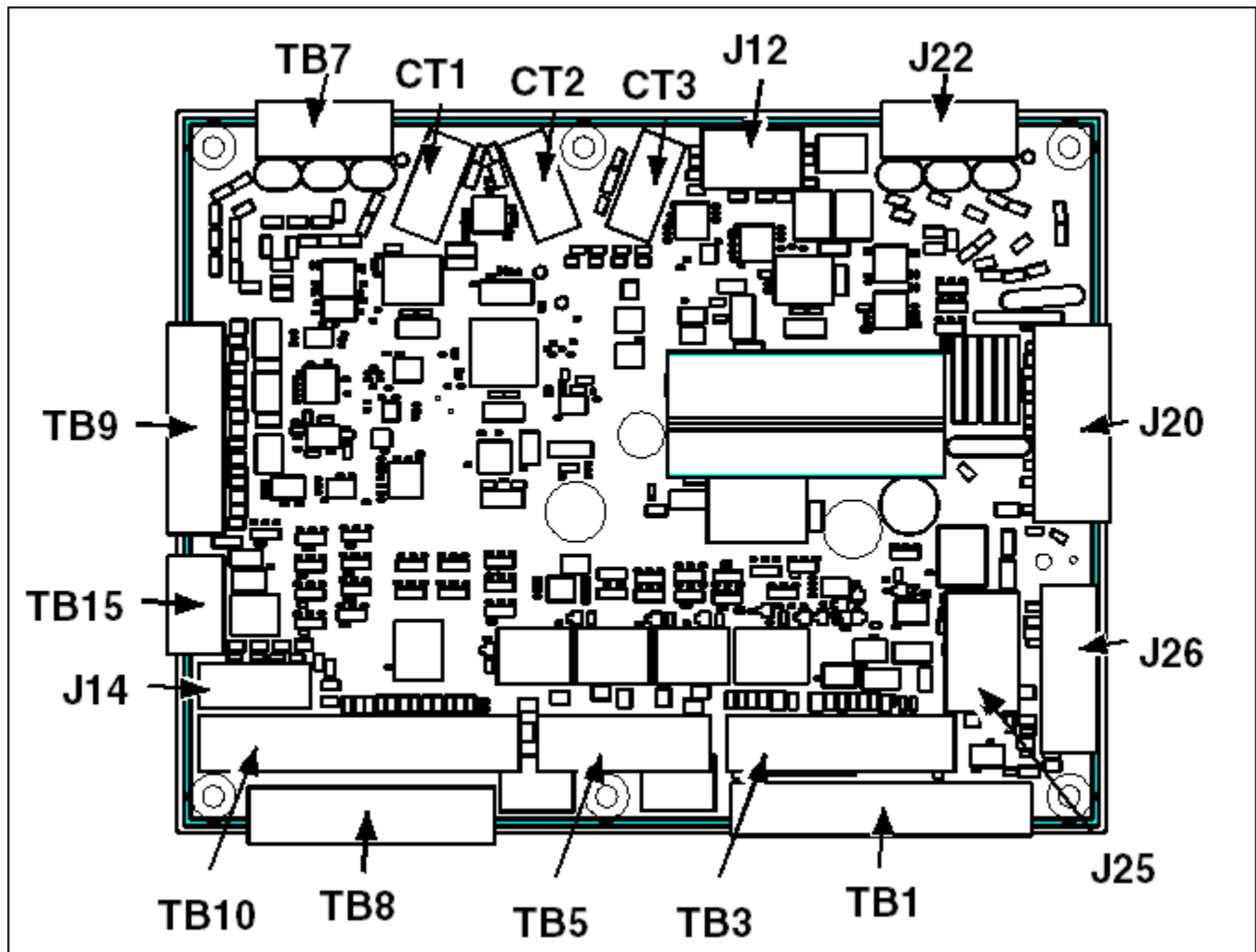


FIGURE 5. PCC 3300 CONTROL BASE BOARD

5.2.1 LEDs

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

The LEDs are located next to CT2 and CT3.

TABLE 8. PCC BASE BOARD LEDs

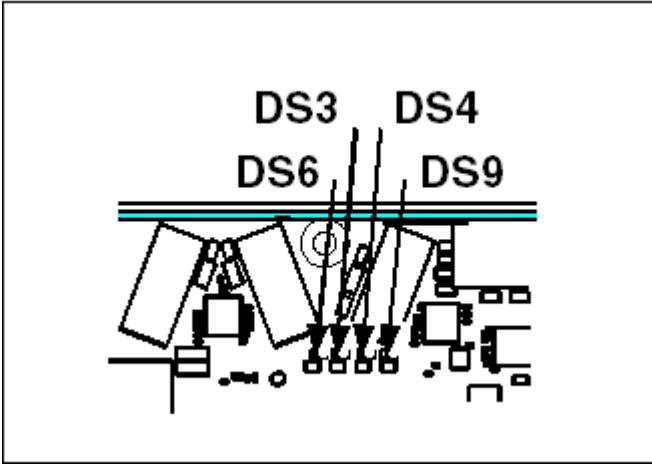
		
LED	Color	Description
DS3 (Heartbeat)	Green	This LED blinks regularly (once every two seconds) when the PCC has power and is not in power-down mode.
DS4		This is reserved for future use.
DS6	Amber	This LED is on if event 1483 (Common Alarm) is active.
DS9	Amber	<p>This LED is on while the PCC is changing between MON protocol and Modbus protocol on TB15.</p> <ul style="list-style-type: none"> If the <i>Protocol Mode</i> is Modbus, this LED is on when the PCC is receiving or transmitting data through the Modbus connection. If the <i>Protocol Mode</i> 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.

FIGURE 6. PCC BASE BOARD LEDs

5.2.2 S1 s-CAN Terminating Resistor Switch

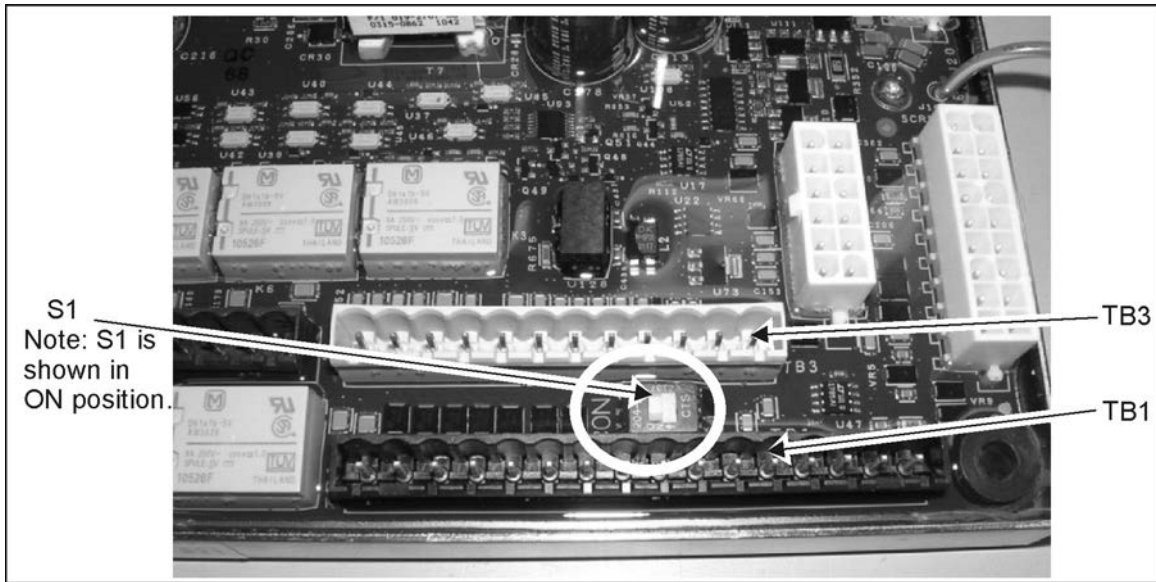


FIGURE 7. S1 TERMINATING RESISTOR SWITCH LOCATION

TABLE 9. S1 SWITCH

Name	Description	Function / Connects to
S1	s-CAN Terminating Resistor Switch	The network must be terminated, to use on-board terminating resistors move switch S1 to the ON position PCC 3300 with MLD ONLY

s-CAN network (bus) must be terminated by 120 ohm resistors on both ends of the s-CAN network. This can be done by installing a resistor at TB3 in the harness or using the on-board terminating resistor (S1). See SAE J1939-11 for full list of network physical requirements.

5.2.3 Connections

[Table 10](#) provides an overview of the connections on this circuit board.

TABLE 10. PCC CONNECTIONS OVERVIEW

Connection	Description	Housing	Pins
CT1	Generator set bus/utility L1 current sensing		
CT2	Generator set bus/utility L2 or generator set neutral current sensing		
CT3	Generator set bus/utility L3 current sensing		
J11	Engine input and output	0323-2161	0323-2466
J12	CT input	0323-1932	0323-1200
J14	PC-based service tool interface (no calibrations)		
J17	AVR control	0323-2098	0323-1200

Connection	Description	Housing	Pins
J18	AVR input	0323-2444	0323-1200
J20	Generator set input and output	0323-2446	0323-2466
J22	PT input	0323-2226-03	
J25	Accessories input and output	0323-2445	0323-2466
J26	Interconnect (J11 and AUX103)	0323-2454	0323-2466
TB1	Customer input and output	0323-1678-15	
TB3	Customer input and output	0323-2498	
TB5	Circuit breaker control	0323-2499	
TB7	Generator set bus/utility voltage sensing	0323-2476	
TB8	Customer input and output	0323-2325-03	
TB9	Analog input and output	0323-2501	
TB10	Circuit breaker status	0323-2502	
TB15	Modbus, PC-based service tool interface	0323-2192-04	

Configurable Inputs

[Table 11](#) identifies all of the configurable inputs.

TABLE 11. 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
Configurable Input #14	TB8-8, TB8-13
Configurable Input #20	TB3-9, TB3-1
Configurable Input #21	TB3-10, TB3-12
Configurable Input #23	TB10-4, TB10-1
Configurable Input #24	TB10-5, TB10-1
Configurable Input #25	TB10-6, TB10-9
Configurable Input #26	TB10-8, TB10-2
Configurable Input #27	TB10-10, TB10-2

Description	PCC
Configurable Input #28	TB10-11, TB10-9
Configurable Input #29	TB10-12, TB10-16
Configurable Input #30	TB10-13, TB10-17
Configurable Input #31	TB10-14, TB10-17
Configurable Input #32	TB10-15, TB10-16

Configurable Analog Inputs

[Table 12](#) identifies all of the configurable analog inputs.

TABLE 12. CONFIGURABLE ANALOG INPUT CONNECTIONS

Description	PCC
Configurable Analog Input #1	TB9-1, TB9-2
Configurable Analog Input #2	TB9-3, TB9-2

Configurable Outputs

[Table 13](#) identifies all of the configurable outputs.

TABLE 13. 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
Configurable Output #20	TB3-5
Configurable Output #21	TB3-6
Configurable Output #22	TB3-8

Configurable Analog Outputs

[Table 14](#) identifies all of the configurable analog outputs.

TABLE 14. CONFIGURABLE ANALOG OUTPUT CONNECTIONS

Description	PCC
Configurable Analog Output #1	TB9-5, TB9-6
Configurable Analog Output #2	TB9-4, TB9-6

5.2.4 CT1 Connections

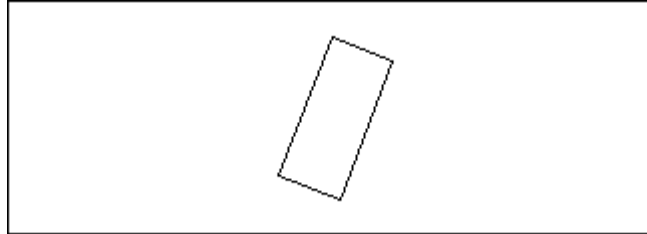


FIGURE 8. CT1

This connector is oriented the same way it is oriented in [Figure 5](#).

TABLE 15. CT1: GENERATOR SET BUS/UTILITY L1 CURRENT SENSING

Coupling	Description	Function / Connects to
CT1 1	Generator Set Bus L1 Current OR Utility L1 Current	Generator Set bus or utility L1 current measurement. Route external CT secondary wiring through CT such that current flows through the onboard CT entering at 1 when the measured source is providing power.

5.2.5 CT2 Connections

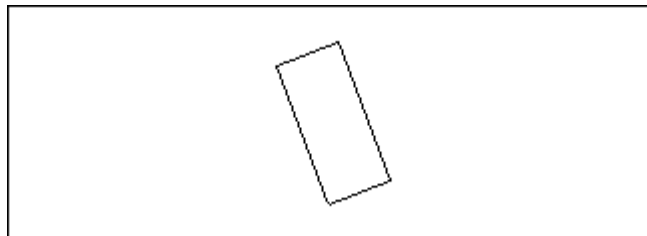


FIGURE 9. CT2

This connector is oriented the same way it is oriented in [Figure 5](#).

TABLE 16. CT1: GENERATOR SET BUS/UTILITY L2 OR GENERATOR SET NEUTRAL CURRENT SENSING

Coupling	Description	Function / Connects to
CT2 1	Generator Set Bus L2 Current OR Utility L2 Current OR Generator Set Neutral Current	Generator set bus/utility L2 or generator set neutral current measurement. Route external CT secondary wiring through CT such that current flows through the onboard CT entering at 1 when the measured source is providing power.

5.2.6 CT3 Connections

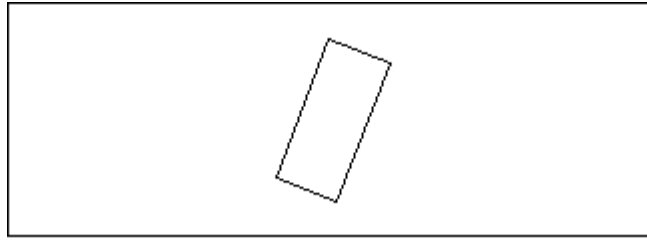


FIGURE 10. CT3

This connector is oriented the same way it is oriented in [Figure 5](#).

TABLE 17. CT1: GENERATOR SET BUS/UTILITY L3 CURRENT SENSING

Coupling	Description	Function / Connects to
CT3 1	Generator Set Bus L3 Current OR Utility L3 Current	Generator set bus or utility L3 current measurement. Route external CT secondary wiring through CT such that current flows through the onboard CT entering at 1 when the measured source is providing power. Alternatively, you can use CT3 to measure ground current, in which case the PCC can generate fault code 2938 (Earth/Ground Fault).

5.2.7 J12 Connections

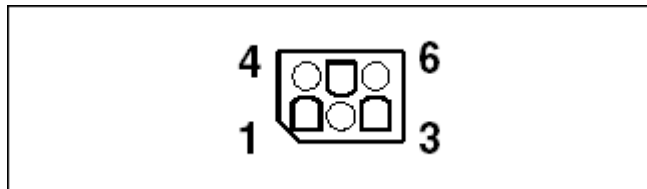


FIGURE 11. J12 PINS

This connector is oriented the same way it is oriented in [Figure 5](#).

TABLE 18. 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 generator set.

Set the CT ratio in *Genset Primary CT Current* (actual generator set current) and *Genset CT Secondary Current* (reduced generator set 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 generator set is using the center tap on the CT and automatically doubles the CT ratio.

Generator Set 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 generator set 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 generator sets. 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.

5.2.8 J14 Connections

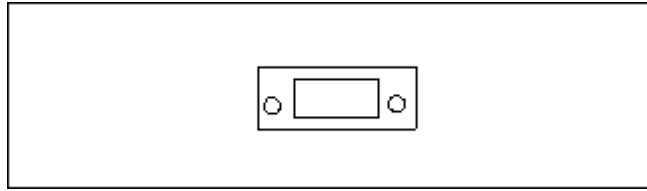


FIGURE 12. J14 PINS

This connector is oriented the same way it is oriented in [Figure 5](#).

This connection provides a way to connect to the PCC with a PC-based service tool without disconnecting any Modbus devices on TB15.

NOTICE

You cannot use J14 to download calibrations to the PCC. You cannot do initial calibration or update calibrations on this connector.

PC-based service tools should use harness 0338-3277 to connect to this RS-232 connection. A female-to-female adapter is also required.

5.2.8.1 DB9 Connections

The standard DB9 connections are shown below:

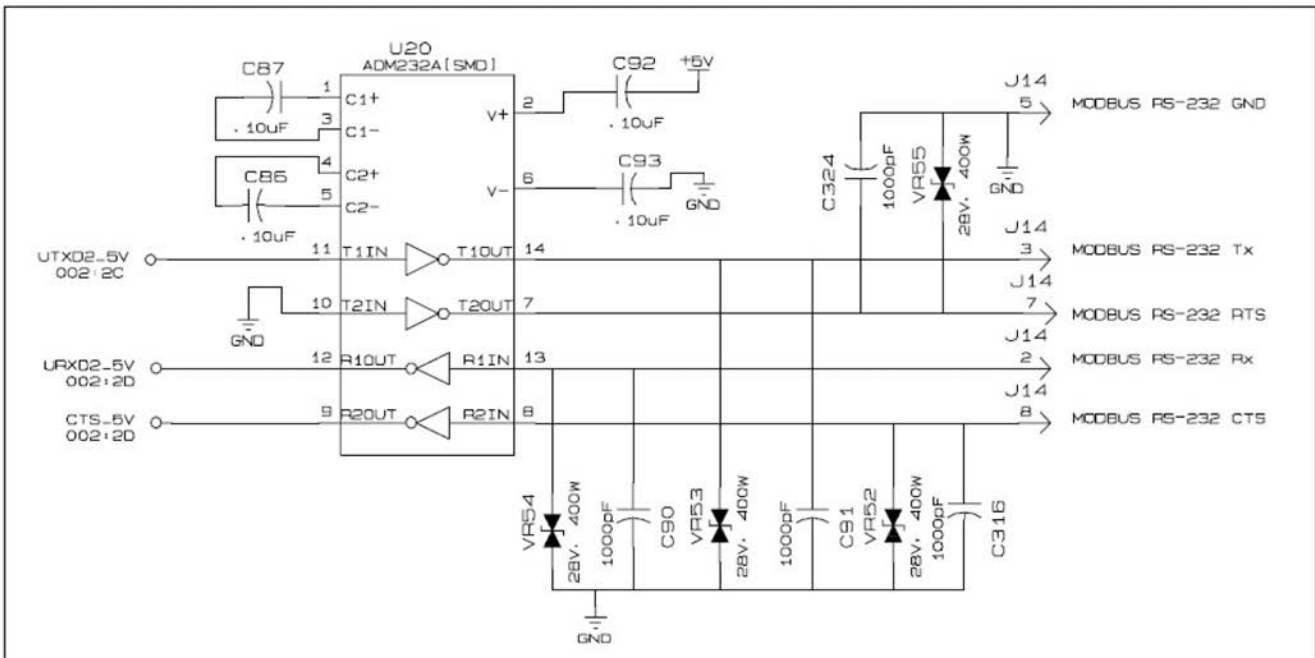


FIGURE 13. DB9 CONNECTIONS

5.2.9 J20 Connections

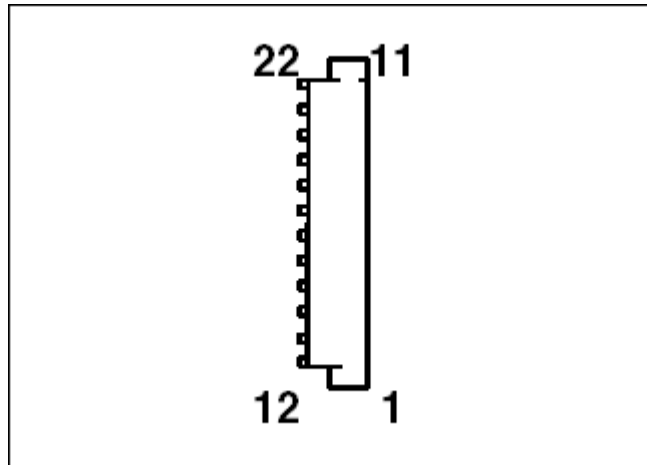


FIGURE 14. J20 PINS

This connector is oriented the same way it is oriented in [Figure 5](#).

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 19. J20 PIN ASSIGNMENTS: GENERATOR SET 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. If *LBNG Genset Enable* is set to Disable, You can specify the active state of this input. If *LBNG Genset Enable* is set to Enable, this connection is active-closed.

J20-6 and J20-18 are Configurable Input #6. If *LBNG Genset Enable* is set to Disable, You can specify the active state of this input. If *LBNG Genset Enable* is set to Enable, this connection is active-closed.

J20-8 and J20-19 are Configurable Input #12. If *LBNG Genset Enable* is set to Disable, You can specify the active state of this input. If *LBNG Genset Enable* is set to Enable, this connection is active-closed.

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 24](#).

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 24](#).

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 generator set.

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 24](#).

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.

If *LBNG Genset Enable* is set to Enable, the PCC turns on J20-14 when the engine speed is greater than zero. The PCC turns off J20-14 when the generator set is stopped.

Starter Connections

J20-15 is a low-side driver. Its specifications are shown in [Table 24](#).

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.

5.2.10 J22 Connections

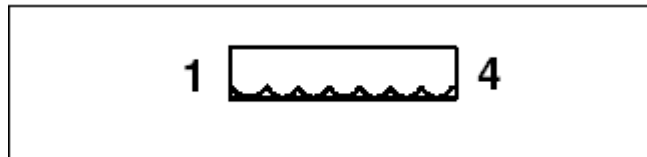


FIGURE 15. J22 PINS

This connector is oriented the same way it is oriented in [Figure 5](#).

TABLE 20. 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 generator set line-to-line voltage is greater than 600 VAC, potential transformers (PTs) are required to reduce the generator set voltage before it enters the PCC.

If the generator set 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 [Figure 16](#) if the PT secondary voltage is less than 300 VAC.

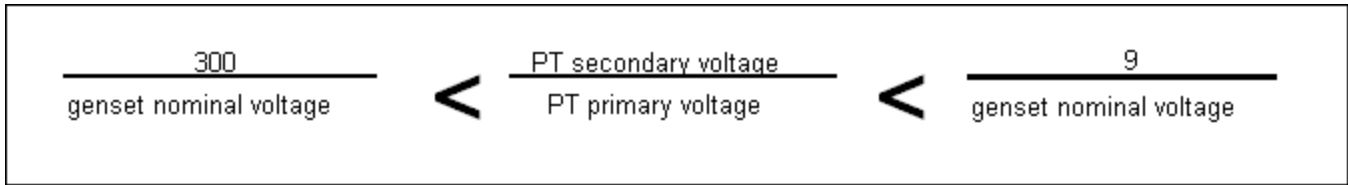


FIGURE 16. POTENTIAL TRANSFORMER SIZING RULES (PT SECONDARY VOLTAGE < 300 VAC)

Use the PT sizing rules in [Figure 17](#) if the PT secondary voltage is greater than 300 VAC.

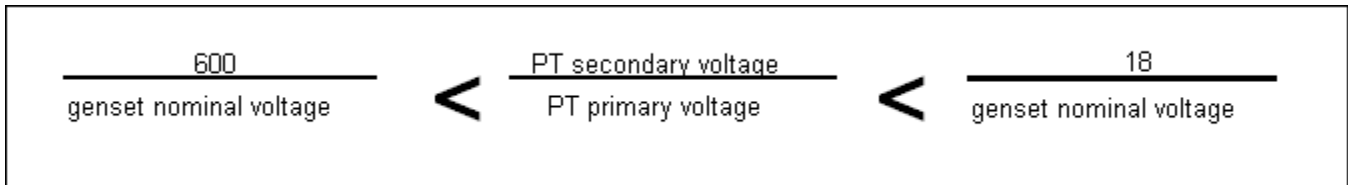


FIGURE 17. POTENTIAL TRANSFORMER SIZING RULES (PT SECONDARY VOLTAGE > 300 VAC)

5.2.11 J25 Connections

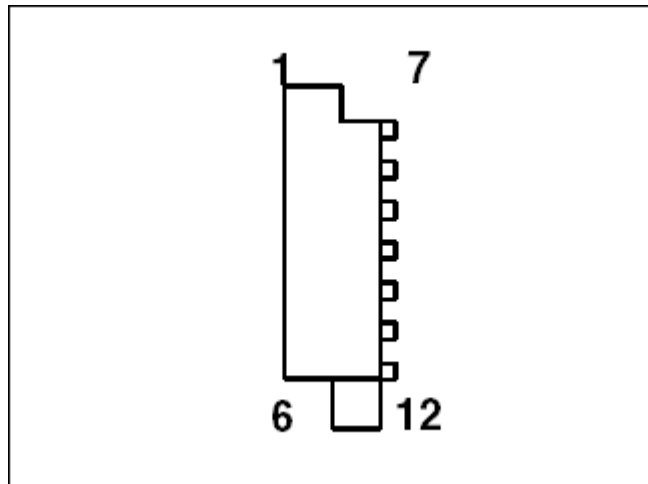


FIGURE 18. J25 PINS

This connector is oriented the same way it is oriented in [Figure 5](#).

TABLE 21. 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	

Pin	Description	Function / Connects to
J25-6	Discrete Input Return	
J25-7	Discrete Input Return	
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 (Fuse B+)	Battery (+) positive, not used

J25-1 is Configurable Output #7. It is a low-side driver. Its specifications are shown in [Table 24](#).

Emergency Stop Connections

See [Appendix A](#) for detailed examples of these connections.

If *LBNG Genset Enable* is set to Disable, use *Local E-stop Active State Selection* (This parameter is not available in the Operator Panel, see Parameters table) to set up the active state of the connection between J25-2 and J25-6. If *LBNG Genset Enable* is set to Enable, this connection is active-closed.

Mode of Operations Connections

If *LBNG Genset Enable* is set to Disable, *Manual Switch Active State* (This parameter is not available in the Operator Panel, see Parameters table) specifies the active state of the connection between J25-10 and J25-8. If *LBNG Genset Enable* is set to Enable, this connection is active-closed.

If *LBNG Genset Enable* is set to Disable, *Auto Switch Active State Selection* (This parameter is not available in the Operator Panel, see Parameters table) specifies the active state of the connection between J25-11 and J25-8. If *LBNG Genset Enable* is set to Enable, this connection is active-closed.

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 generator set 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.

5.2.12 J26 Connections

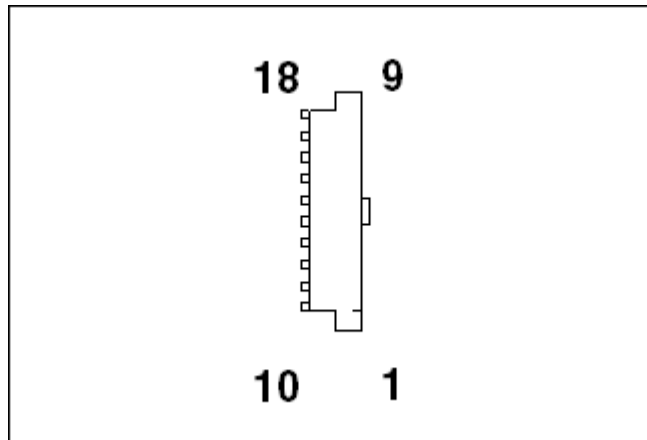


FIGURE 19. J26 PINS

This connector is oriented the same way it is oriented in [Figure 5](#).

TABLE 22. J26 PIN ASSIGNMENTS: INTERCONNECT (J11 AND AUX103)

Pin	Description	Function / Connects to
J26-1	J1939 (Shield)	CAN Datalink
J26-2	Backup Start Disconnect / Configurable Input #33	AUX103 AVR powerstage / Works with J26-8, active open or active close
J26-3	AVR PWM -	AUX103 AVR powerstage
J26-4	NA	
J26-5	B+ Return	Power for AUX103 AVR powerstage
J26-6	NA	
J26-7	Field -	Alternator Field XX- (F2)
J26-8	Configurable Input #33 Return	Common for J26-2, active open or active close
J26-9	AVR Fused B+	Power for AUX103 AVR powerstage
J26-10	J1939 (-)	CAN Datalink
J26-11	J1939 (+)	CAN Datalink
J26-12	NA	
J26-13	NA	
J26-14	Field +	Alternator Field X+ (F1)

Pin	Description	Function / Connects to
J26-15	Keyswitch	Engine control module (ECM)
J26-16	AVR PWM +	AUX103 AVR powerstage
J26-17	NA	
J26-18	NA	

Engine Control Module (ECM) Connections

NOTICE

The ECM keyswitch has no effect if *ECM CAN Enable* is set to Disable.

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

J26-15 is a low-side driver. It is limited to 250 mA.

J26-15 should be connected with Emergency Stop B+ Power ([Appendix A](#)) so that the ECM keyswitch is physically interrupted when an emergency stop button.

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

5.2.13 TB1 Connections

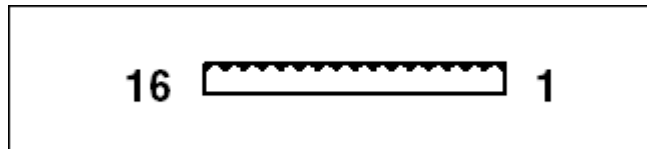


FIGURE 20. TB1 PINS

This connector is oriented the same way it is oriented in [Figure 5](#).

TABLE 23. 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

Pin	Description	Function / Connects to
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 [Table 24](#).

TABLE 24. LOW-SIDE DRIVER SPECIFICATIONS

Description	Specification
Maximum Voltage	30 VDC
Maximum Current	250 mA
Maximum Inrush	3 A
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 [Table 25](#).

TABLE 25. 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 [Table 25](#).

TB1-12 and TB1-13 are Configurable Input #1. If *LBNG Genset Enable* is set to Disable, you can specify the active state of this input. If *LBNG Genset Enable* is set to Enable, this connection is active-closed.

TB1-14 and TB1-15 are Configurable Input #2. If *LBNG Genset Enable* is set to Disable, you can specify the active state of this input. If *LBNG Genset Enable* is set to Enable, this connection is active-closed.

Remote Start Connections

If *LBNG Genset Enable* is set to Disable, use *Remote Start Switch Active State Selection* (This parameter is not available in the Operator Panel, see Parameters table) to set up the active state of the connection between TB1-10 and TB1-11. If *LBNG Genset Enable* is set to Enable, this connection is active-closed.

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.

If *LBNG Genset Enable* is set to Disable, use *Remote E-stop Active State Selection* (This parameter is not available in the Operator Panel, see Parameters table) to set up the active state of the connection between TB1-16 and TB1-15. If *LBNG Genset Enable* is set to Enable, this connection is active-closed.

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 generator set 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.

5.2.14 TB3 Connections

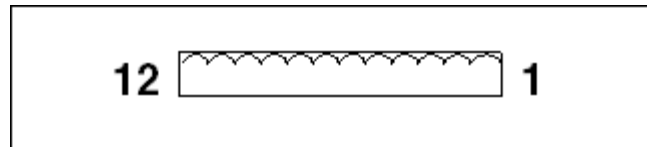


FIGURE 21. TB3 PINS

This connector is oriented the same way it is oriented in [Figure 5](#).

TABLE 26. TB3 PIN ASSIGNMENTS: CUSTOMER INPUT/OUTPUT CONNECTIONS

Pin	Description	Function / Connects to
TB3 - 1	Ground	s-CAN shield connection point or use as a signal return for switch inputs
TB3 - 2	s-CAN Isolated Ground	s-CAN network ground only, Do not connect to chassis/Battery Ground Connect to TB3-2 of other PCC3300 controls on the s-CAN Network PCC 3300 with MLD ONLY
TB3 - 3	s-CAN CAN L	s-CAN data line for control-to-control communications Connect to TB3-3 of other PCC3300 controls on the s-CAN Network PCC 3300 with MLD ONLY
TB3 - 4	s-CAN CAN H	s-CAN data line for control-to-control communications Connect to TB3-4 of other PCC3300 controls on the s-CAN Network PCC 3300 with MLD ONLY

Pin	Description	Function / Connects to
TB3 - 5	Configurable Output #20 Status	Configurable output #20; intended to drive a relay coil; default is set by trim Configurable Output #20 Event Code
TB3 - 6	Configurable Output #21 Status	Configurable output #21; intended to drive a relay coil; default is set by trim Configurable Output #21 Event Code
TB3 - 7	N/A	
TB3 - 8	Configurable Output #22 Status	Configurable output #22; intended to drive a relay coil; default is set by trim Configurable Output #22 Event Code
TB3 - 9	Transfer Inhibit/Configurable Input #20 Switch	Normally inhibits transfer to generator set; under some conditions it is ignored; not the same as genset CB inhibit
TB3 - 10	Retransfer Inhibit/Configurable Input #21 Switch	Normally inhibits retransfer to utility; under some conditions it is ignored; not the same as utility CB inhibit
TB3 - 11	First Start Arbitration	For paralleling connect supply to supply: (TB3-11 to TB3-11 of other generator sets)
TB3 - 12	Return	Return for master first start TB3-11 For paralleling connect return to return: (TB3-12 to TB3-12 of other generator sets)

TB3-5 is Configurable Output #20. It is a low-side driver.

TB3-6 is Configurable Output #21. It is a low-side driver.

TB3-8 is Configurable Output #22. It is a low-side driver.

TB3-5, TB3-6, and TB3-8 specifications are shown in [Table 24](#).

TB3-9 and TB3-1 are Configurable Input #20. If *LBNG Genset Enable* is set to Disable, you can specify the active state of this input. If *LBNG Genset Enable* is set to Enable, this connection is active-closed.

TB3-10 and TB3-1 are Configurable Input #21. If *LBNG Genset Enable* is set to Disable, you can specify the active state of this input. If *LBNG Genset Enable* is set to Enable, this connection is active-closed.

TB3-2, 3, or 4 s-CAN Network Connections (**PCC 3300 with MLD ONLY**)

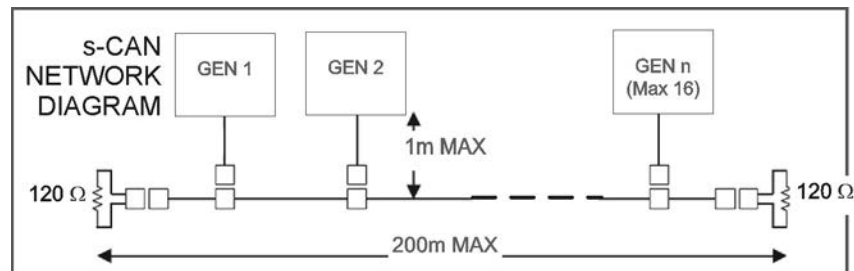


FIGURE 22. S-CAN NETWORK DIAGRAM

s-CAN cable requirements: Twisted pair (shielded) cable meets SAE J1939-11 standards, 200m maximum network length.

NOTICE

Recommended cable type: Belden 3106A or equivalent.

To prevent ground loops shield/drain wire are to be connected to TB3-1 at only one end of a s-CAN network (bus) cable/segment. Shield continuity must be maintained over entire length of cable/segment.

NOTICE

Recommended shield connection method [Figure 23](#)

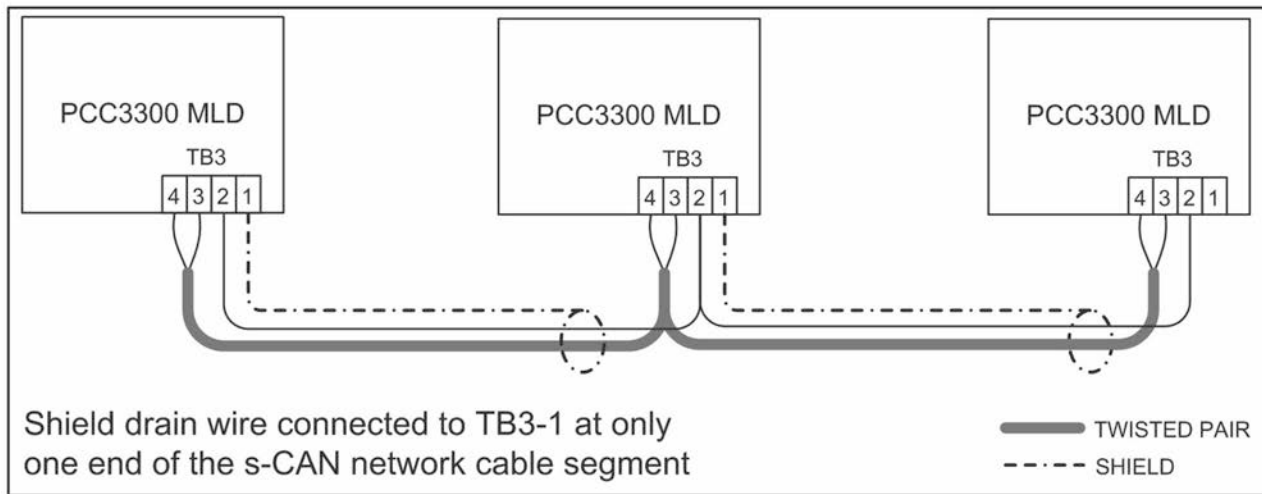


FIGURE 23. SHIELD CONNECTIONS ON MLD S-CAN NETWORK

5.2.15 TB5 Connections

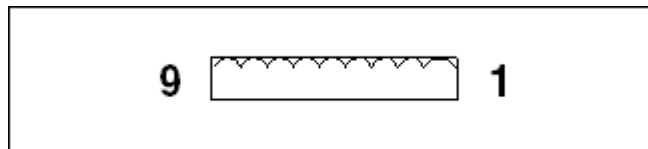


FIGURE 24. TB5 PINS

This connector is oriented the same way it is oriented in [Figure 5](#).

TABLE 27. TB5 PIN ASSIGNMENTS: CIRCUIT BREAKER CONTROL CONNECTIONS

Pin	Description	Function / Connects to
TB5 - 1	Generator Set CB Close Control	Contact for closing generator set breaker; ratings 5A 30VDC inductive L/R=7msec.; also used for tripping generator set CB in Standalone and Synchronize
TB5 - 2	Generator Set CB Close Control Return	
TB5 - 3	NA	
TB5 - 4	Generator Set CB Open Control	Contact for opening generator set breaker; ratings 5A 30VDC inductive L/R=7msec.

Pin	Description	Function / Connects to
TB5 - 5	Generator Set CB Open Control Return	
TB5 - 6	Utility CB Close Control	Contact for closing utility breaker; ratings 5A 30VDC inductive L/R=7msec.
TB5 - 7	Utility CB Close Control Return	
TB5 - 8	Utility CB Open Control	Contact for opening utility breaker; ratings 5A 30VDC inductive L/R=7msec.
TB5 - 9	Utility CB Open Control Return	

Generator Set Circuit Breaker

TB5-1 and TB5-2 are connected to a relay. The relay specifications are shown in [Table 25](#).

TB5-4 and TB5-5 are connected to a relay. The relay specifications are shown in [Table 25](#).

Utility Circuit Breaker

These connections are used only if *Genset Application Type* is set to Power Transfer Control.

TB5-6 and TB5-7 are connected to a relay. The relay specifications are shown in [Table 25](#).

TB5-8 and TB5-9 are connected to a relay. The relay specifications are shown in [Table 25](#).

5.2.16 TB7 Connections

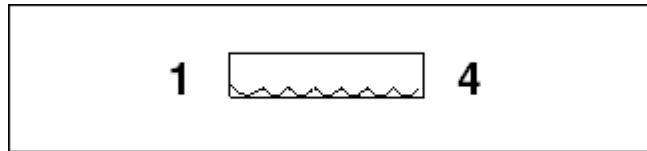


FIGURE 25. TB7 PINS

This connector is oriented the same way it is oriented in [Figure 5](#).

TABLE 28. TB7 PIN ASSIGNMENTS: GENERATOR SET BUS/UTILITY VOLTAGE SENSING

Pin	Description	Function / Connects to
TB7 - 1	Generator Set Bus L1L2 Voltage OR Utility L1L2 Voltage	Generator set bus or utility L1 voltage measurement, up to 600VAC line to line direct connect.
TB7 - 2	Generator Set Bus L2L3 Voltage OR Utility L2L3 Voltage	Generator set bus or utility L2 voltage measurement, up to 600VAC line to line direct connect.
TB7 - 3	Generator Set Bus L3L1 Voltage OR Utility L3L1 Voltage	Generator set bus or utility L3 voltage measurement, up to 600VAC line to line direct connect.
TB7 - 4	Neutral	Generator set bus or utility neutral voltage reference, up to 600VAC line to line direct connect. If delta voltage connection leave unconnected.

This connector is the same as J22, except that TB7 is used to measure the bus voltage instead of the generator set voltage.

Utility Delta/Wye Connection and *Single/3 Phase Connection* specify the utility configuration.

Paralleling Application value specifies the function of the meter with either *None*, *Utility* or *Generator Set Bus*.

NOTICE

For Generator Source nominal voltage less than or equal to 600 Volts, the PT ratio is not supported; for Generator set bus and utility less than or equal to 600 Volts, the PT ratio is supported.

5.2.17 TB8 Connections

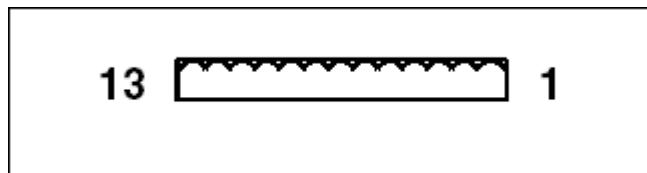


FIGURE 26. TB8 PINS

This connector is oriented the same way it is oriented in [Figure 5](#).

TABLE 29. 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. If *LBNG Genset Enable* is set to Disable, you can specify the active state of this input. If *LBNG Genset Enable* is set to Enable, this connection is active-closed.

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. If *LBNG Genset Enable* is set to Disable, you can specify the active state of this input. If *LBNG Genset Enable* is set to Enable, this connection is active-closed.

TB8-3 is Configurable Output #10. It is a low-side driver. Its specifications are shown in [Table 24](#).

TB8-4 is a low-side driver. Its specifications are shown in [Table 24](#).

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

TB8-7 and TB8-12 are Configurable Input #13. If *LBNG Genset Enable* is set to Disable, you can specify the active state of this input. If *LBNG Genset Enable* is set to Enable, this connection is active-closed.

TB8-8 and TB8-13 are Configurable Input #14. If *LBNG Genset Enable* is set to Disable, you can specify the active state of this input. If *LBNG Genset Enable* is set to Enable, this connection is active-closed.

TB8-9 is Configurable Output #4. It is a low-side driver. Its specifications are shown in [Table 24](#).

TB8-10 is Configurable Output #3. It is a low-side driver. Its specifications are shown in [Table 24](#).

TB8-11 is Configurable Output #11. It is a low-side driver. Its specifications are shown in [Table 24](#).

5.2.18 TB9 Connections

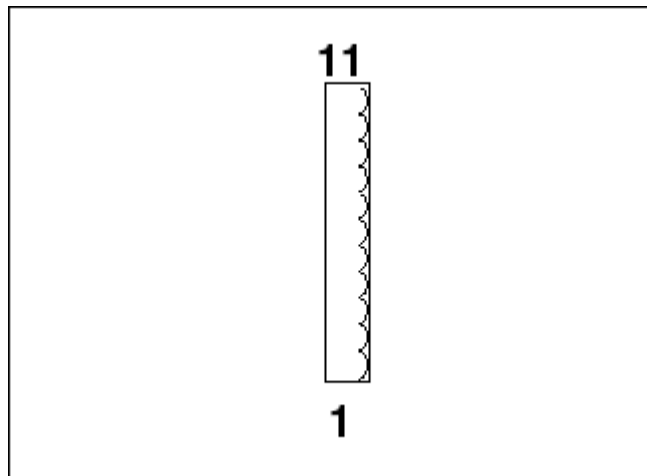


FIGURE 27. TB9 PINS

This connector is oriented the same way it is oriented in [Figure 5](#).

TABLE 30. TB9 PIN ASSIGNMENTS: ANALOG INPUT/OUTPUT CONNECTIONS

Pin	Description	Function / Connects to
TB9 - 1	kW Load Setpoint / Configurable Analog Input #1	Analog Input which sets the generator set kW output level when the generator set is in load govern mode. Maximum kW output is limited by the generator set base load setting.
TB9 - 2	Analog Return	Use as a signal return for analog inputs on TB9-1 and TB9-3.
TB9 - 3	kVAR Load Setpoint / Configurable Analog Input #2	Analog Input which sets the generator set kVAR output level when the generator set is in load govern mode.
TB9 - 4	Voltage Bias Output / Configurable Analog output #2 Output Predictor	Analog Output which allows for sharing of kVAR load between generator sets when paralleling to non-PCC based generator sets.

Pin	Description	Function / Connects to
TB9 - 5	Speed Bias Output / Configurable Analog output #1 Output Predictor	Analog Output which allows for sharing of kW load between generator sets when paralleling to non-PCC based generator sets.
TB9 - 6	Analog Return	Use as a signal return for analog outputs on TB9-4 and TB9-5.
TB9 - 7	kW Load Share -	Connects from generator set to generator set when paralleling to enable generator sets to share kW load. In addition can be used as an input from a master synchronizer for frequency/phase matching.
TB9 - 8	kW Load Share +	Connects from generator set to generator set when paralleling to enable generator sets to share kW load. In addition can be used as an input from a master synchronizer for frequency/phase matching.
TB9 - 9	Load Share Shield	Load share shield connection point.
TB9 - 10	kVAR Load Share +	Connects from generator set to generator set when paralleling to enable generator sets to share kVAR load. In addition can be used as an input from a master synchronizer for voltage matching.
TB9 - 11	kVAR Load Share -	Connects from generator set to generator set when paralleling to enable generator sets to share kVAR load. In addition can be used as an input from a master synchronizer for voltage matching.

Configurable Analog Input #1

TB9-1 and TB9-2 support a range of -5 VDC ~ 5 VDC.

The PCC generates warning fault 1322 (kW Load Setpoint OOR High) if these conditions are met for *kW Load Setpoint OOR Time*:

- *kW Load Setpoint OOR Check Enable* is set to Enabled.
- The input voltage is greater than *kW Load Setpoint OOR High Limit*.

The PCC generates warning fault 1323 (kW Load Setpoint OOR Low) if these conditions are met for *kW Load Setpoint OOR Time*:

- *kW Load Setpoint OOR Check Enable* is set to Enabled.
- The input voltage is less than *kW Load Setpoint OOR Low Limit*.

Configurable Analog Input #2

TB9-3 and TB9-2 support a range of -5 VDC ~ 5 VDC.

The PCC generates warning fault 1324 (kVAR Load Setpoint OOR High) if these conditions are met for *kVAR Load Setpoint OOR Time*:

- *kVAR Load Setpoint OOR Check Enable* is set to Enabled.
- The input voltage is greater than *kVAR Load Setpoint OOR High Limit*.

The PCC generates warning fault 1325 (kVAR Load Setpoint OOR Low) if these conditions are met for *kVAR Load Setpoint OOR Time*:

- *kVAR Load Setpoint OOR Check Enable* is set to Enabled.
- The input voltage is less than *kVAR Load Setpoint OOR Low Limit*.

Configurable Analog Output #1

TB9-5 and TB9-6 support a range of -10 VDC ~ 10 VDC.

[Figure 28](#) shows the relationship between the output value **x** and the output voltage **V**.

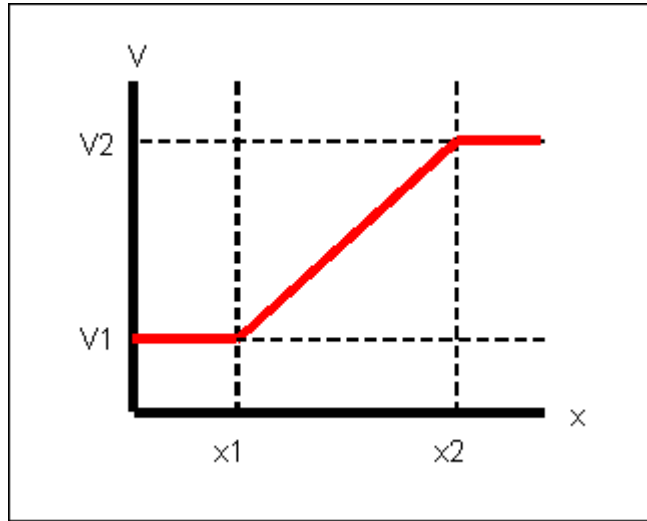


FIGURE 28. OUTPUT VOLTAGE OF CONFIGURABLE ANALOG OUTPUT

The values **x1**, **x2**, **V1**, and **V2** depend on the function of the configurable analog output. If this parameter is set to Default, see [Table 31](#). If this parameter is set to Do Nothing, the output is always 0 VDC. Otherwise, see [Table 32](#).

TABLE 31. OUTPUT VOLTAGE OF CONFIGURABLE ANALOG OUTPUT (DEFAULT OR DO NOTHING)

Label	Description
x1	<i>Speed Bias Output / Configurable Analog output #1 Engineering In Low Setpoint x Configurable Analog Output #1 Engineering Units Function Scaling</i>
x2	<i>Speed Bias Output / Configurable Analog output #1 Engineering In High Setpoint x Configurable Analog Output #1 Engineering Units Function Scaling</i>
V1	<i>Speed Bias Output / Configurable Analog output #1 Analog Out Low Setpoint</i>
V2	<i>Speed Bias Output / Configurable Analog output #1 Analog Out High Setpoint</i>

TABLE 32. OUTPUT VOLTAGE OF CONFIGURABLE ANALOG OUTPUT (OTHER FUNCTION)

Label	Description
x1	<i>Speed Bias Output / Configurable Analog output #1 Engineering In Low Function Setpoint x Configurable Analog Output #1 Engineering Units Function Scaling</i>
x2	<i>Speed Bias Output / Configurable Analog output #1 Engineering In High Setpoint x Configurable Analog Output #1 Engineering Units Function Scaling</i>

Label	Description
V1	<i>Speed Bias Output / Configurable Analog output #1 Analog Out Low Function Setpoint</i>
V2	<i>Speed Bias Output / Configurable Analog output #1 Analog Out High Function Setpoint</i>

For example, consider the scenario in [Table 33](#). Speed Bias Output / Configurable Analog Output #1 Analog Output Function Pointer is set to Genset Frequency.

TABLE 33. EXAMPLE: CONFIGURABLE ANALOG OUTPUT #1

Parameter	Value
<i>Speed Bias Output / Configurable Analog output #1 Engineering In Low Function Setpoint</i>	5000
<i>Speed Bias Output / Configurable Analog output #1 Engineering In High Function Setpoint</i>	7000
<i>Configurable Analog Output #1 Engineering Units Function Scaling</i>	0.01
<i>Speed Bias Output / Configurable Analog output #1 Analog Out Low Function Setpoint</i>	0.0 VDC
<i>Speed Bias Output / Configurable Analog output #1 Analog Out High Function Setpoint</i>	5.0 VDC

The minimum value of *Genset Frequency* is 50 Hz (5000 x 0.01). This corresponds to 0.0 VDC. If *Genset Frequency* is lower than 50 Hz, the output voltage is still 0.0 VDC.

The maximum value of *Genset Frequency* is 70 Hz (7000 x 0.01). This corresponds to 5.0 VDC. If *Genset Frequency* is higher than 70 Hz, the output voltage is still 5.0 VDC.

Between 50 Hz and 70 Hz, the output voltage rises proportional to the *Genset Frequency*. If *Genset Frequency* is 58.0 Hz, the output voltage is 2.0 VDC. If *Genset Frequency* is 65.0 Hz, the output voltage is 3.75 VDC.

It is possible for *Speed Bias Output / Configurable Analog output #1 Engineering In Low Function Setpoint* to be greater than *Speed Bias Output / Configurable Analog output #1 Engineering In High Function Setpoint*. For example, if you switch the 5000 and 7000 values in the example in [Table 33](#), higher output voltages correspond to lower generator set frequencies. If *Genset Frequency* is 58.0 Hz, the output voltage is 3.0 VDC.

Configurable Analog Output #2

TB9-4 and TB9-6 support an output range of -10 VDC ~ 10 VDC.

This configurable analog output works the same way Configurable Analog Output #1 works, except it has a separate set of parameters.

Load Share Communications Protocol

The generator sets are connected by two sets of load share lines: the kW load share lines and the kVAR load share lines. Both sets of load share lines behave the same way. [Figure 29](#) shows the basic hardware setup for one set of load share lines.

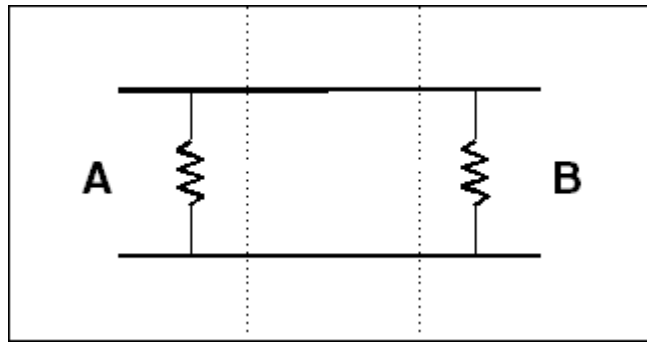


FIGURE 29. LOAD SHARE CONNECTION BETWEEN GENERATOR SETS

Each generator set controller (**A** and **B**) drives a current into each set of load share lines. The current is proportional to the percentage of rated kW load (in the kW load share lines) or rated kVAR load (in the kVAR load share lines) the generator set is taking.

Each generator set has an internal resistor with the same resistance on each set of load share lines. The currents provided by the generator sets are added together and divided equally across the equal resistances. Each generator set measures the voltage across the internal resistor on each set of load share lines to calculate the percentage of rated kW load or rated kVAR load the generator set should be taking.

Then, based on the difference between the percentage of rated kW load or rated kVAR load the generator set should be taking and the percentage of rated kW load or rated kVAR load the generator set is taking, each generator set controller adjusts the engine speed or generator set voltage to change the load the generator set is taking.

PCC Current Drivers for Load Share Lines

NOTICE

The PCC drives the load share lines the same way that Cummins' PCC 3xxx or PowerCommand 3.x controllers do.

The PCC uses pulse-width modulation (PWM) to control the currents the genset drives into each set of load share lines.

kW Load Share Output Command is the PWM percentage in the kW load share lines. It represents the percentage of rated kW load the generator set is taking. *kW Load Share Output Command* is the sum of these values:

- *Load Share kW Balance*
- *kW Load Share Ramp PWM Offset*
- $0.735 \times (\text{Generator Set \% Standby Total kW} - \text{Load Share Minimum kW})$

kW Load Share Ramp PWM Offset is zero unless the PCC is running the load share ramp load process or the load share ramp unload process.

kW Load Share Output Command is limited to 0-100% and then converted to 0-500µA.

kVAR Load Share Output Command is the PWM percentage in the kVAR load share lines. It represents the percentage of rated kVAR load the generator set is taking. *kVAR Load Share Output Command* is the sum of these values:

- *Load Share kVAR Balance*
- *kVAR Load Share Ramp PWM Offset*
- $1.174 \times (\text{Generator Set Total kVAR per Standby kVA} - \text{Load Share Minimum kVAR})$

kVAR Load Share Ramp PWM Offset is zero unless the PCC is running the load share ramp load process or the load share ramp unload process.

kVAR Load Share Output Command is limited to 0-100% and then converted to 0-500 μ A.

PCC Voltage Sensing for Load Share Lines

The internal resistor is 5 k Ω . The load share lines can have 0-5 VDC. At 0% load, a typical voltage is 0.25 VDC; at 100% load, a typical voltage is 2.5 VDC. The actual voltage depends not only on the current driven by the PCC but also the current driven by other generator set controllers.

5.2.19 TB10 Connections

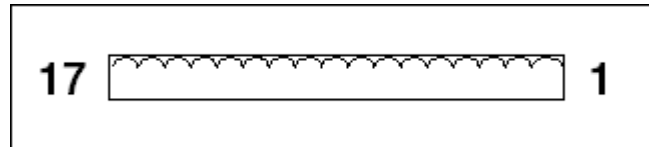


FIGURE 30. TB10 PINS

This connector is oriented the same way it is oriented in [Figure 5](#).

TABLE 34. TB10 PIN ASSIGNMENTS: CIRCUIT BREAKER STATUS CONNECTIONS

Pin	Description	Function / Connects to
TB10 - 1	Return	Use as signal return for switch inputs.
TB10 - 2	Return	Use as signal return for switch inputs.
TB10 - 3	Utility CB Pos A Switch	The 'a' contact from utility main breaker; control uses this to determine breaker position. When closed the control is in load govern mode.
TB10 - 4	Utility CB Pos B/Configurable Input #23 Switch	The 'b' contact from utility main breaker; control uses this only to determine breaker contact failure by comparing it to the 'a' contact; this feature can be enabled/disabled.
TB10 - 5	Utility CB Tripped Switch	Use to indicate to control that utility main is tripped. Control will consider source unavailable.
TB10 - 6	Utility CB Inhibit/Configurable Input #25 Switch	Opens utility main if closed; inhibits closure if utility main is open.
TB10 - 7	Generator Set CB Pos A Switch	The 'a' contact from generator set breaker; control uses this to determine breaker position.
TB10 - 8	Generator Set CB Pos B/Configurable Input #26 Switch	The 'b' contact from generator set breaker; control uses this only to determine breaker contact failure by comparing it to the 'a' contact; this feature can be enabled/disabled.
TB10 - 9	Return	Use as signal return for switch inputs.
TB10 - 10	Generator Set CB Tripped Switch	Use to indicate to control that generator set breaker is tripped. Control will consider source unavailable for PTC applications.
TB10 - 11	Generator Set CB Inhibit/Configurable Input #28 Switch	Opens generator set breaker if closed; inhibits closure if generator set breaker is open.

Pin	Description	Function / Connects to
TB10 – 12	Utility Single Mode Verify/Configurable Input #29 Switch	
TB10 – 13	Sync Enable/Configurable Input #30 Switch	Use to enable synchronizing when in manual or when generator set application type is synchronize only; (otherwise sync enabling is automatically done by the control).
TB10 – 14	Load Demand Stop/Configurable Input #31 Switch	Use to stop generator set when not needed while the remote start is active.
TB10 – 15	Extended Parallel/Configurable Input #32 Switch	
TB10 – 16	Return	Use as signal return for switch inputs.
TB10 - 17	Return	Use as signal return for switch inputs.

TB10-6 and TB10-9 are Configurable Input #25. If *LBNG Genset Enable* is set to Disable, you can specify the active state of this input. If *LBNG Genset Enable* is set to Enable, this connection is active-closed.

TB10-11 and TB10-9 are Configurable Input #28. If *LBNG Genset Enable* is set to Disable, you can specify the active state of this input. If *LBNG Genset Enable* is set to Enable, this connection is active-closed.

TB10-13 and TB10-17 are Configurable Input #30. If *LBNG Genset Enable* is set to Disable, you can specify the active state of this input. If *LBNG Genset Enable* is set to Enable, this connection is active-closed.

TB10-14 and TB10-17 are Configurable Input #31. If *LBNG Genset Enable* is set to Disable, you can specify the active state of this input. If *LBNG Genset Enable* is set to Enable, this connection is active-closed.

TB10-15 and TB10-16 are Configurable Input #32. If *LBNG Genset Enable* is set to Disable, you can specify the active state of this input. If *LBNG Genset Enable* is set to Enable, this connection is active-closed.

Utility Circuit Breaker Position Connections

If *Utility Breaker Position Contacts* is set to Single Contact, *Utility CB Position Status* depends only on TB10-3.

If *Utility Breaker Position Contacts* is set to Dual Contact, *Utility CB Position Status* is Open only if both TB10-3 and TB10-4 indicate that the circuit breaker is open. Otherwise, *Utility CB Position Status* is Closed.

NOTICE

If TB10-3 and TB10-4 disagree about the position of the circuit breaker, the circuit breaker is considered closed.

TB10-4 and TB10-1 are Configurable Input #23. If *LBNG Genset Enable* is set to Disable, you can specify the active state of this input. If *LBNG Genset Enable* is set to Enable, this connection is active-closed.

NOTICE

In some situations, the PCC also checks the current to verify the circuit breaker position. If the current in all three phases is greater than *Breaker Closed Current Threshold*, the PCC considers the circuit breaker closed in these situations:

- When it determines whether or not the utility is available.
- When the transfer inhibit signal is active.
- When it determines whether or not certain circuit breaker events/faults are active.

Generator Set Circuit Breaker Position Connections

If *Genset Breaker Position Contacts* is set to Single Contact, *Genset CB Position Status* depends only on TB10-7.

If *Genset Breaker Position Contacts* is set to Dual Contact, *Genset CB Position Status* is Open only if both TB10-7 and TB10-8 indicate that the circuit breaker is open. Otherwise, *Genset CB Position Status* is Closed.

NOTICE

If TB10-7 and TB10-8 disagree about the position of the circuit breaker, the circuit breaker is considered closed.

TB10-8 and TB10-1 are Configurable Input #26. If *LBNG Genset Enable* is set to Disable, you can specify the active state of this input. If *LBNG Genset Enable* is set to Enable, this connection is active-closed.

NOTICE

In some situations, the PCC also checks the current to verify the circuit breaker position. If the current in all three phases is greater than *Breaker Closed Current Threshold*, the PCC considers the circuit breaker closed in these situations:

- When it determines whether or not the generator set is available.
- When the retransfer inhibit signal is active.
- When it determines whether or not certain circuit breaker events/faults are active.

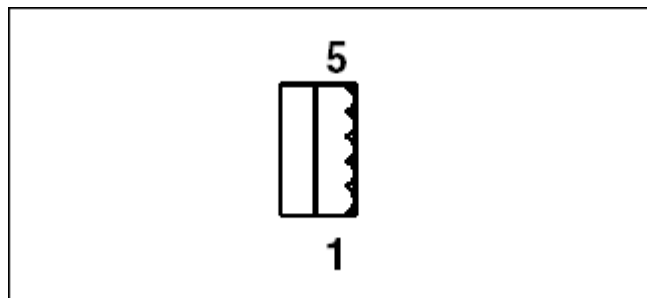
5.2.20 TB15 Connections

FIGURE 31. TB15 PINS

This connector is oriented as shown in [Figure 5](#).

TABLE 35. TB15 PIN ASSIGNMENTS: TOOLS INTERFACE CONNECTIONS

Pin	Description	Function / Connects to
TB15-1	RS-485 Shield	Network Shield
TB15-2	NA	
TB15-3	RS-485 DATA A (+)	Tool / Modbus
TB15-4	RS-485 DATA B (-)	Tool / Modbus
TB15-5	System Wakeup	

When TB15-5 is connected to ground (TB15-1), it will present the Wake-up signal to the hardware.

This RS-485 connection may be used by Modbus or PC-based service tools.

NOTICE

If the PCC is mounted within a sealed enclosure, it is recommended to use J14 for the primary Modbus communications link. This allows TB15 to be used by the Tools without special hardware to change the data connections.

TB15 implements an automatic switch between the Modbus protocol and the Tool protocol (MON). This protocol switching is based on the interpretation of the information received; invalid information may initiate a protocol switch, which can take several seconds.

To maintain Modbus as the active protocol there must be at least one valid request every 5 seconds. Longer delays between frames may initiate the protocol switch.

While the protocol engine is switching protocols, no messages will be processed. This can lead to delays while the protocol engine waits for enough messages to determine the proper protocol to use.

Several CRC errors may be logged in the MODBUS Error counter in the HMI or InPower service tool during this switch. The appearance of these errors is normal, and they can be cleared or negated while counting actual MODBUS errors.

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 cable specifications.

The PCC functions as a Modbus Slave device using Modbus RTU (Remote Terminal Unit) protocol on a two-wire RS-485 bus.

Modbus field wiring must be installed according to the Modbus Standard and local electrical codes.

The TB15 supports the following baud rates:

- 9600
- 19,200 (default)
- 38,400

The parity and stop bit can be one of the following:

- Even parity, 1 stop bit

- Odd parity, 1 stop bit
- No parity, 1 stop bit (default)
- No parity, 2 stop bits

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 36. 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

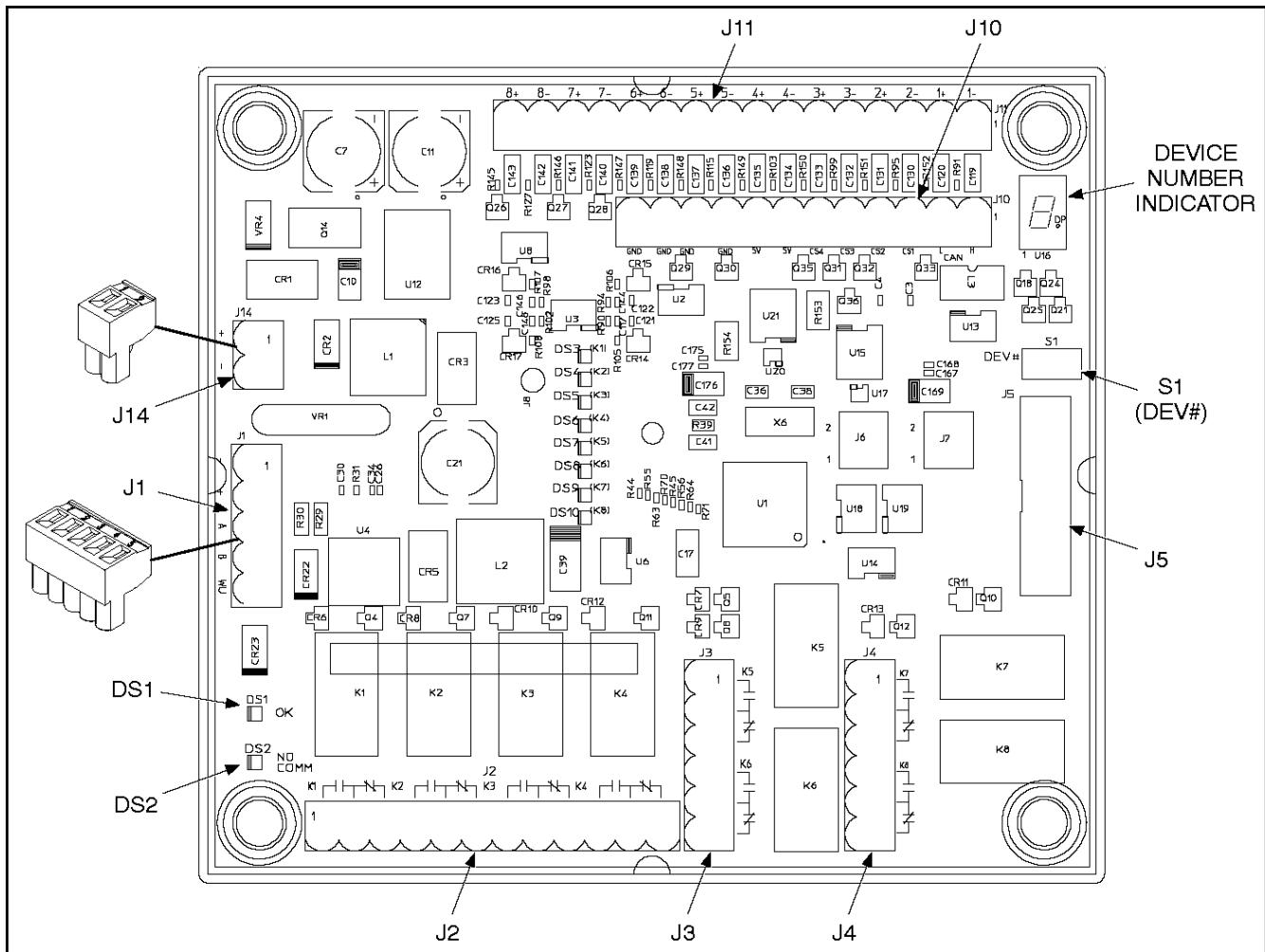


FIGURE 32. AUX101 BOARD

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 37. 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 38. 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

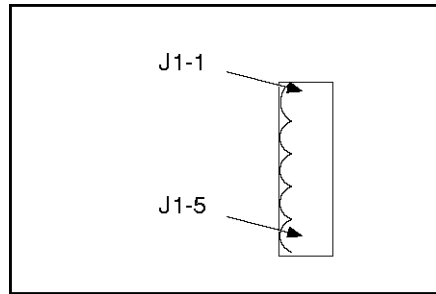


FIGURE 33. AUX101 J1

TABLE 39. 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

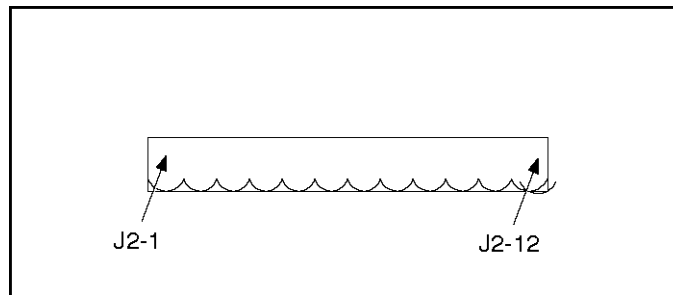


FIGURE 34. AUX101 J2

TABLE 40. 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 41. 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

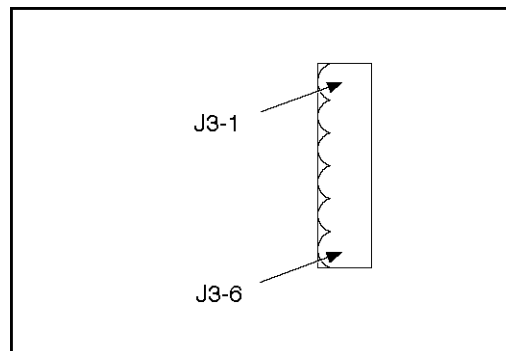


FIGURE 35. AUX101 J3

TABLE 42. 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 43. 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

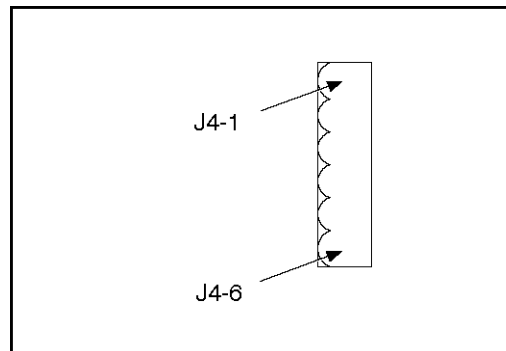


FIGURE 36. AUX101 J4

TABLE 44. 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 45. 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.

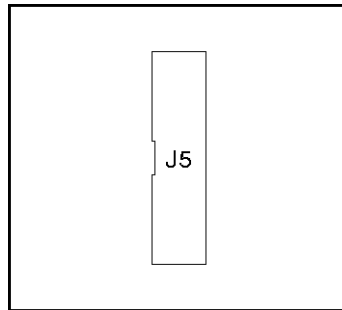


FIGURE 37. AUX101 J5

There is no pin description for AUX101 J5.

5.3.4.4.6 AUX101 J10

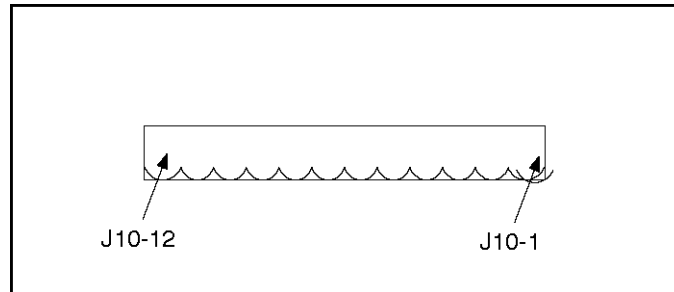


FIGURE 38. AUX101 J10

TABLE 46. 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 47. AUX101 CURRENT SOURCE SPECIFICATIONS

Description	Value
Maximum Output Current	20 mA

5.3.4.4.6.2 AUX101 Voltage Source Specifications

TABLE 48. AUX101 VOLTAGE SOURCE SPECIFICATIONS

Description	Value
Output Voltage	5 VDC
Maximum Output Current	20 mA

5.3.4.4.7 AUX101 J11

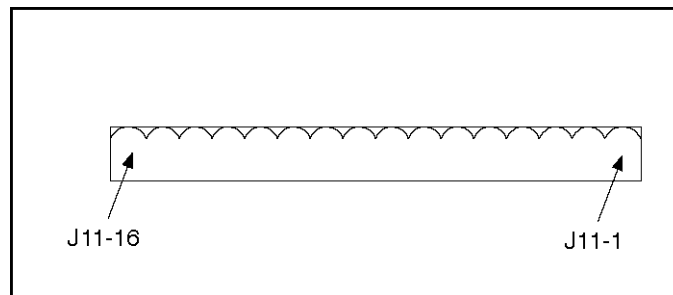


FIGURE 39. AUX101 J11

TABLE 49. 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 50. 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 51. 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 52. 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

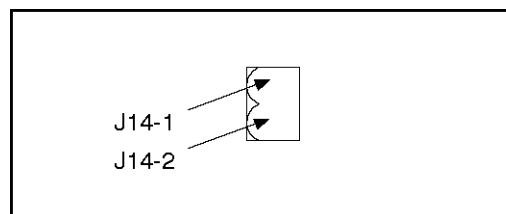


FIGURE 40. AUX101 J14

TABLE 53. 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 54. 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 55. 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 56. 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 57. 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

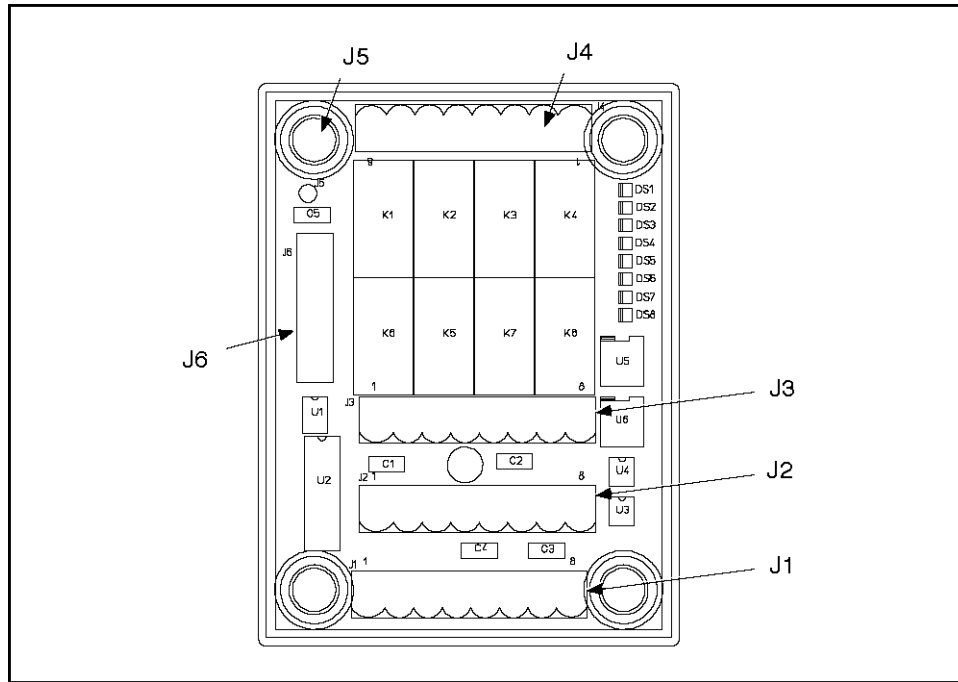


FIGURE 41. AUX102 BOARD

5.4.5.1 AUX102 Indicators

TABLE 58. 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 59. 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

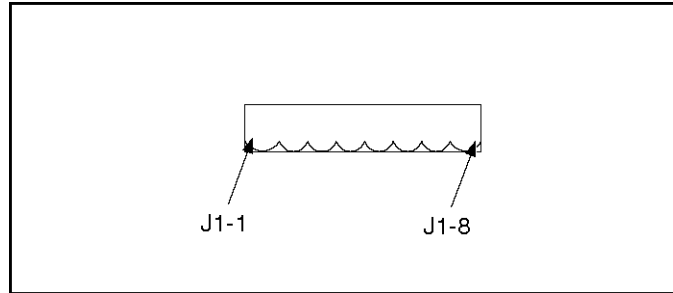


FIGURE 42. AUX102 J1

TABLE 60. 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

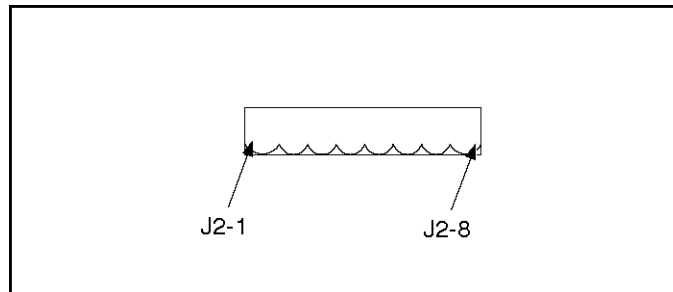
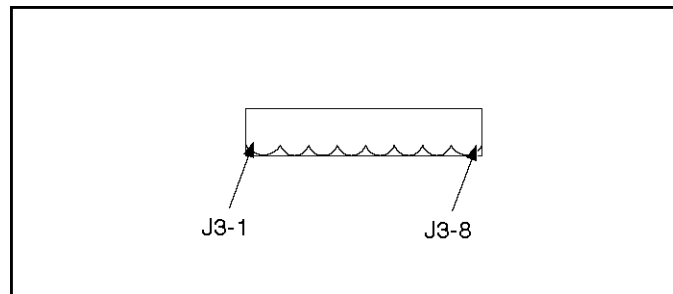


FIGURE 43. AUX102 J2

TABLE 61. 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 44. AUX102 J3****TABLE 62. 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

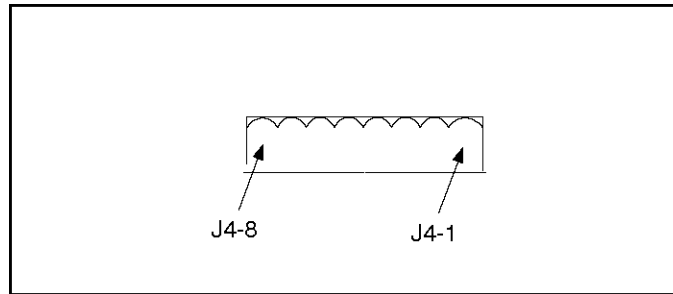


FIGURE 45. AUX102 J4

TABLE 63. 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.

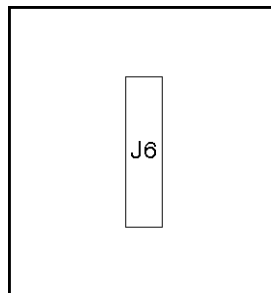


FIGURE 46. AUX102 J6

There is no pin description for AUX102 J6.

5.4.6 Pin Connections for AUX102 Inputs 9-12

TABLE 64. 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 65. 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 AUX103

TABLE 66. AUX103 PART NUMBERS

Part Description	Part Number
AUX103 AVR Power Stage	0327-1593

This circuit board is the AVR power stage.

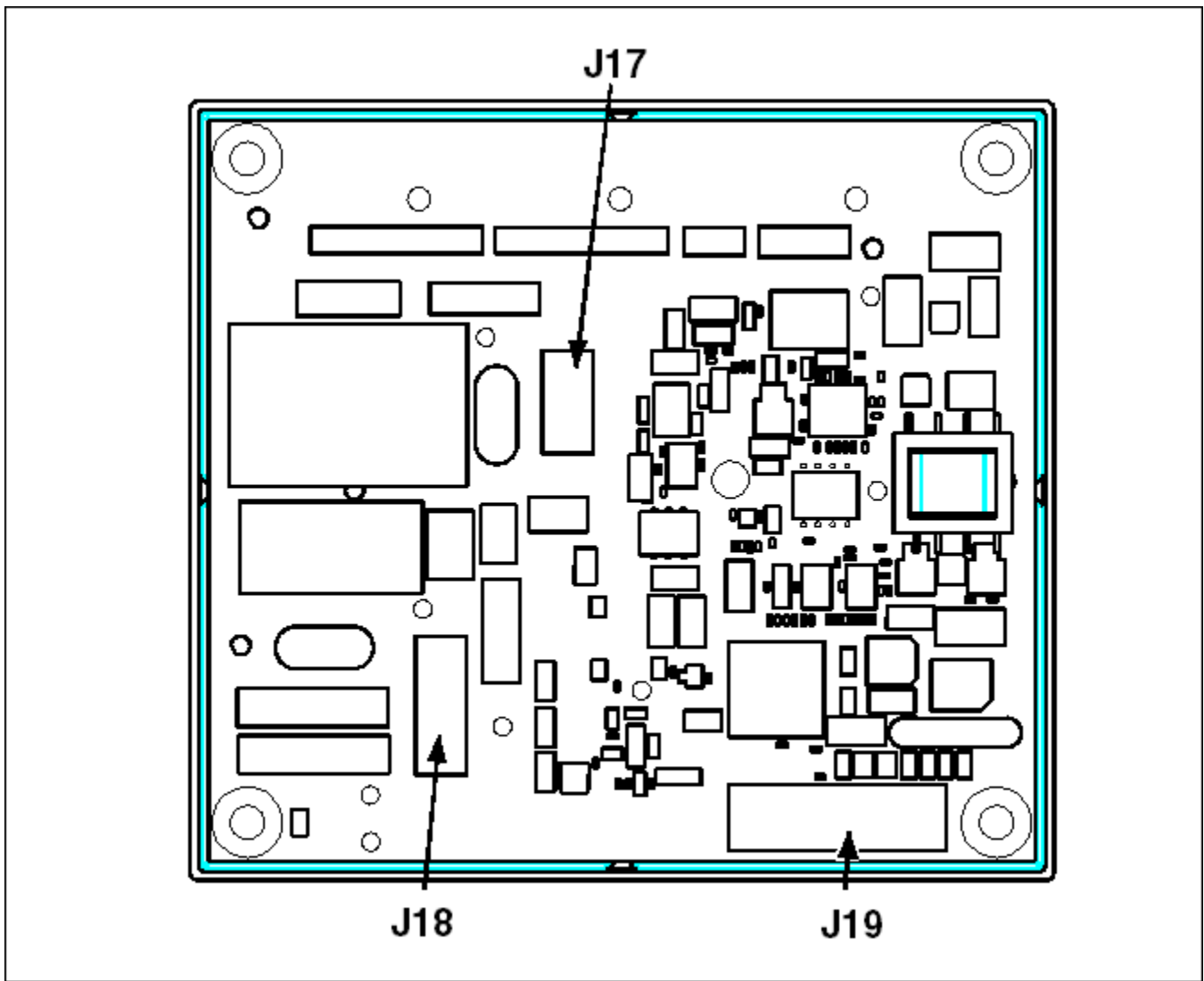


FIGURE 47. AUX103 AVR POWER STAGE

5.5.1 Connections

[Table 67](#) provides an overview of the connections on this circuit board.

TABLE 67. AUX103 CONNECTIONS OVERVIEW

Connection	Description	Housing	Pins
J17	AVR control	0323-2098	0323-1200
J18	AVR input	0323-2444	0323-1200
J19	Interconnect (PCC base board)	0323-2453	0323-2466

5.5.2 J17 Connections

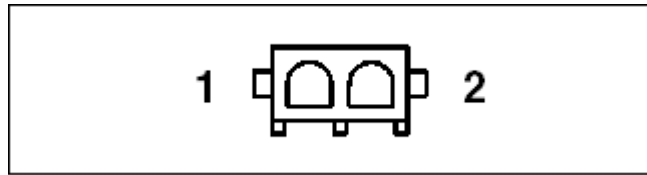


FIGURE 48. J17 PINS

This connector is oriented the same way it is oriented in [Figure 47](#).

TABLE 68. 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 generator set does not produce any voltage.

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

5.5.3 J18 Connections

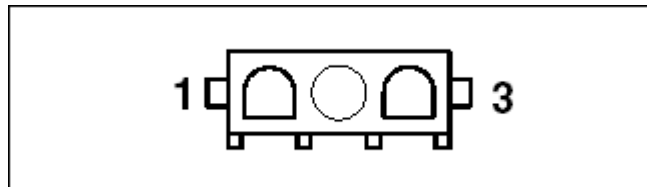


FIGURE 49. J18 PINS

This connector is oriented the same way it is oriented in [Figure 47](#).

TABLE 69. 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 generator set 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 generator set is starting motors.)
- The generator set 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 generator set 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.

5.5.4 J19 Connections

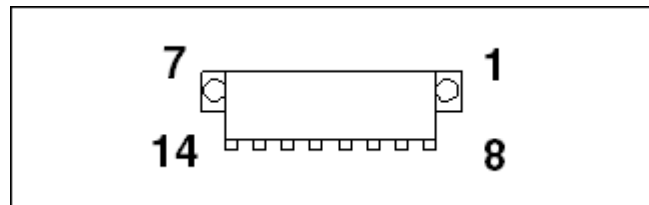


FIGURE 50. J19 PINS

This connector is oriented the same way it is oriented in [Figure 47](#).

TABLE 70. J19 PIN ASSIGNMENTS: INTERCONNECT (PCC BASE BOARD)

Pin	Description	Function / Connects to
J19-1	AVR Fused B+	PCC base board
J19-2	AVR PWM +	PCC base board
J19-3	Backup Start Disconnect	PCC base board
J19-4	Field Current +	PCC base board
J19-5	NA	
J19-6	NA	
J19-7	NA	
J19-8	B+ Return	PCC base board
J19-9	AVR PWM -	PCC base board
J19-10	Field Current -	PCC base board
J19-11	NA	
J19-12	NA	
J19-13	NA	
J19-14	Ground Chassis	Connect to chassis ground

5.6 AUX104

TABLE 71. AUX104 PART NUMBERS

Part Description	Part Number
AUX104 External Governor Power Module	0327-1507

This circuit board is the external governor power module for the AUX105.

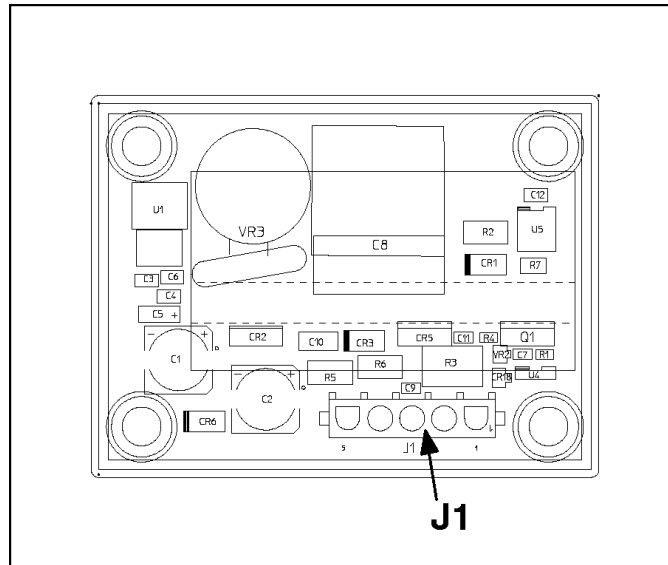


FIGURE 51. AUX104 CONTROL ASSEMBLY

5.6.1 Connections

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

TABLE 72. AUX104 CONNECTIONS OVERVIEW

Connection	Description	Housing	Pins
J1	All connections	0323-2216	0323-1200

5.6.2 J1 Connections

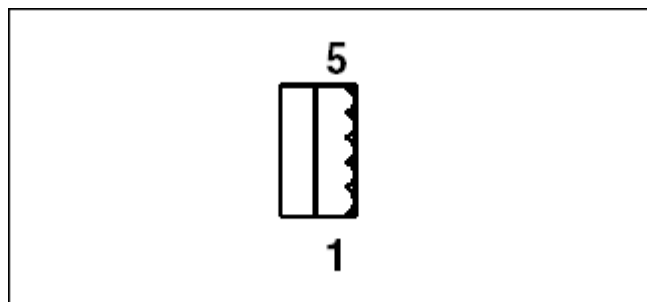


FIGURE 52. J1 PINS

This connector is oriented the same way it is oriented in [Figure 51](#).

TABLE 73. J1 PIN ASSIGNMENTS: ALL CONNECTIONS

Pin	Description	Function / Connects to
J1-1	Gov PWM -	
J1-2	Gov PWM +	
J1-3	B+	Battery (+) positive
J1-4	Actuator	Low side of actuator
J1-5	B+ Return	Battery (-) negative

5.7 AUX105

TABLE 74. AUX105 PART NUMBERS

Part Description	Part Number
AUX105 Control Assembly	A028T766

This circuit board is the hydromechanical engine control module (ECM) and automatic voltage regulator (AVR) power stage.

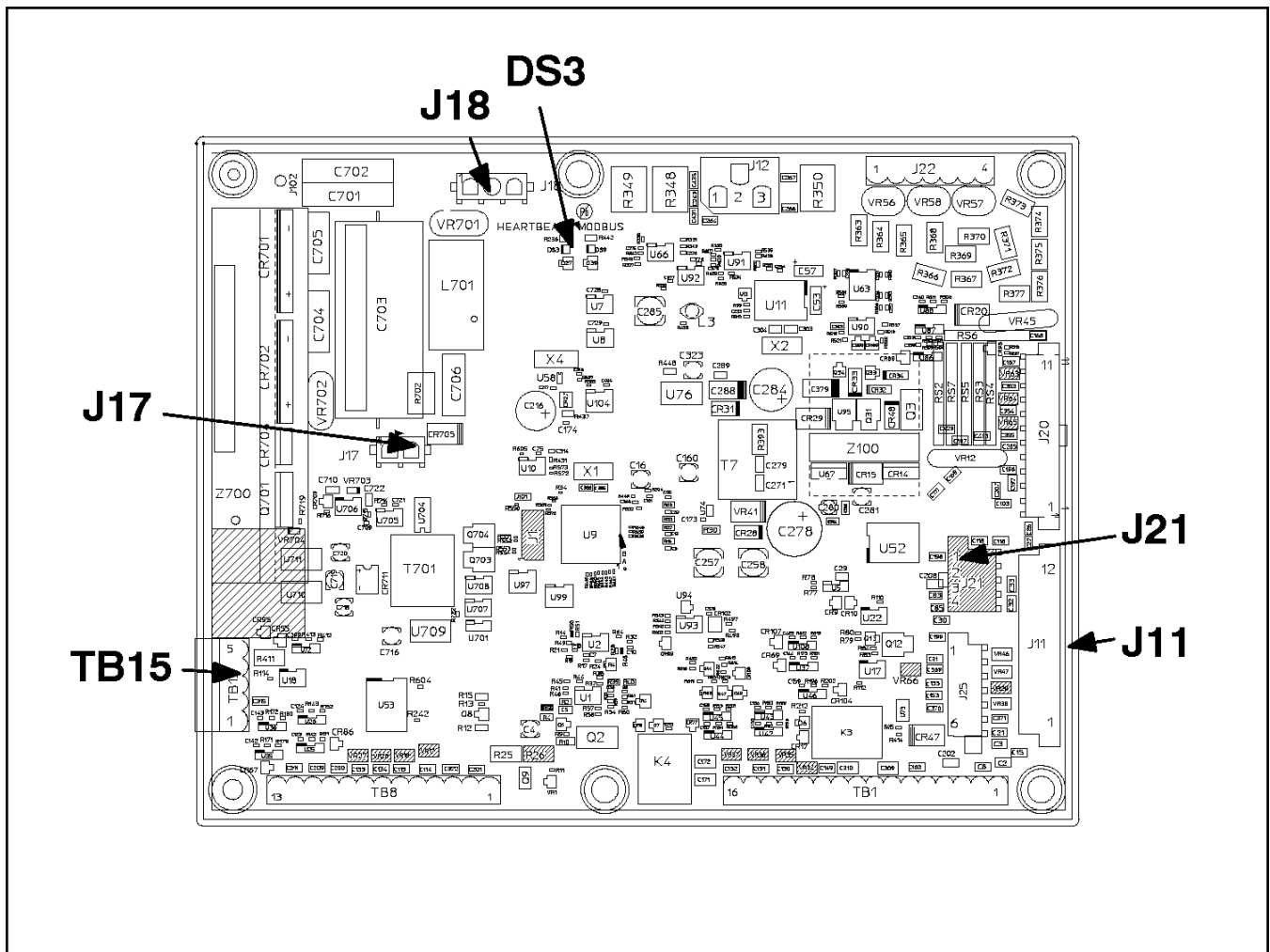


FIGURE 53. AUX105 CONTROL ASSEMBLY

5.7.1 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 75. AUX105 LEDs

LED	Color	Description
DS3 (Heartbeat)	Green	This LED blinks regularly (once per second) when the AUX105 has power and is not in power-down mode. This LED blinks faster (four times per second) when downloading information to the AUX105 or if the AUX105 is unable to boot. If the AUX105 is unable to boot, it may require another download to fix it.

5.7.2 Connections

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

TABLE 76. AUX105 CONNECTIONS OVERVIEW

Connection	Description	Housing	Pins
J11	Engine input and output	0323-2161	0323-2466
J17	AVR control	0323-2098	0323-1200
J18	AVR input	0323-2444	0323-1200
J21	Power, CAN, PCCNet	0323-2455	0323-2466
TB15	Modbus, PC-based service tool interface	0323-2192-04	

5.7.3 J11 Connections

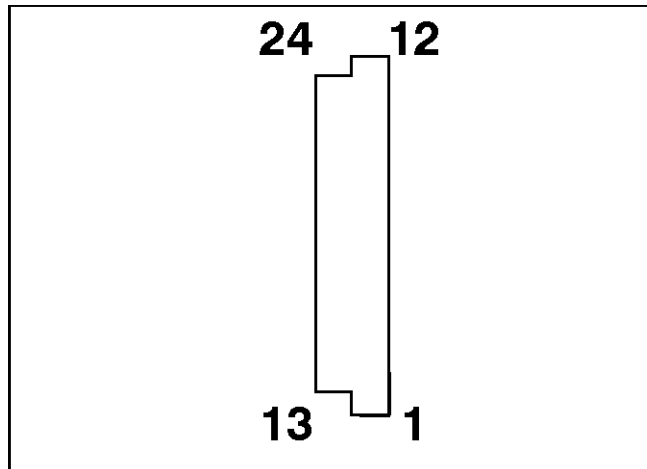


FIGURE 54. J11 PINS

This connector is oriented the same way it is oriented in [Figure 53](#).

TABLE 77. 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

Pin	Description	Function / Connects to
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	N/A	
J11-18	N/A	
J11-19	N/A	
J11-20	N/A	
J11-21	N/A	
J11-22	N/A	
J11-23	N/A	
J11-24	N/A	

J11-6 is internally fused at 1.85 A.

5.7.4 J17 Connections

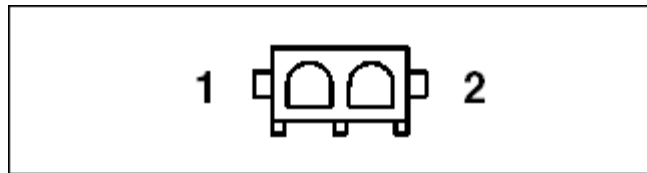


FIGURE 55. J17 PINS

This connector is oriented the same way it is oriented in [Figure 53](#).

TABLE 78. 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.

5.7.5 J18 Connections

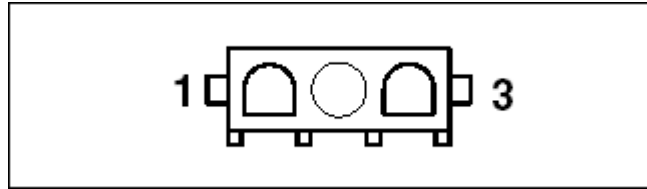


FIGURE 56. J18 PINS

This connector is oriented the same way it is oriented in [Figure 53](#).

TABLE 79. J18 PIN ASSIGNMENTS: FIELD POWER CONNECTIONS

Pin	Description	Function / Connects to
J18-1	PMG P2 / Main Alternator L1	See Appendix A for schematics.
J18-2	PMG P3 / Main Alternator L2	See Appendix A for schematics.
J18-3	PMG P4	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.

5.7.6 J21 Connections

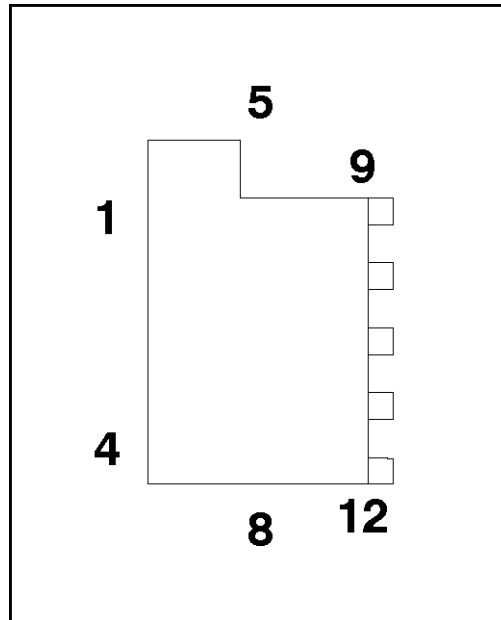


FIGURE 57. J21 PINS

This connector is oriented the same way it is oriented in [Figure 53](#).

TABLE 80. J21 PIN ASSIGNMENTS: POWER, ECM, AND PCCNET CONNECTIONS

Pin	Description	Function / Connects to
J21-1	B+ Return	Battery (-) negative
J21-2	ECM CAN Low	To be used with PCC base board (-) and (+) with 120-ohm terminating resistor
J21-3	ECM CAN High	To be used with PCC base board (-) and (+) with 120-ohm terminating resistor
J21-4	ECM CAN Shield	CAN-Link shield connection
J21-5	B+ Return	Battery (-) negative
J21-6	B+ Return	Battery (-) negative
J21-7	PCCNet Shield	PCCNet harness shield
J21-8	PCCNet A	Network Data A
J21-9	ECM Fused B+	
J21-10	B+ Input (Fused B+)	Battery (+) positive
J21-11	Keyswitch in	(wake-up)
J21-12	PCCNet B	Network Data B

The AUX105 leaves power-down mode if J21-11 is closed.

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

PCCNet devices that are connected to J21 should connect to Fused B+ ([Appendix A](#)) for power.

NOTICE

When using any PCCNet device on a generator set 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.

5.7.7 TB15 Connections

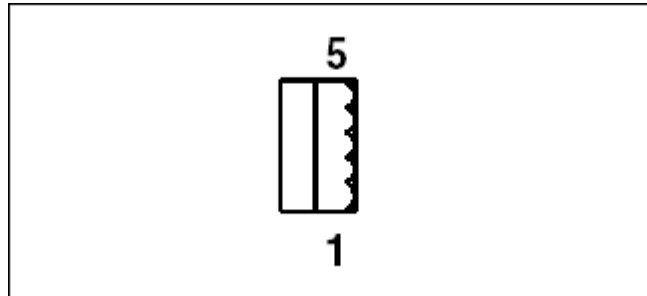


FIGURE 58. TB15 PINS

This connector is oriented the same way it is oriented in [Figure 53](#).

TABLE 81. TB15 PIN ASSIGNMENTS: TOOLS INTERFACE CONNECTIONS

Pin	Description	Function / Connects to
TB15-1	RS-485 Shield	Network Shield
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	

TB15-5 is a System Wakeup pin.

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

NOTICE

If the PCC base board is in power-down mode, the AUX105 will not have any power. The PCC base board must not be in power-down mode if you want to connect to the AUX105 using PC-based service tools.

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

5.8 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.

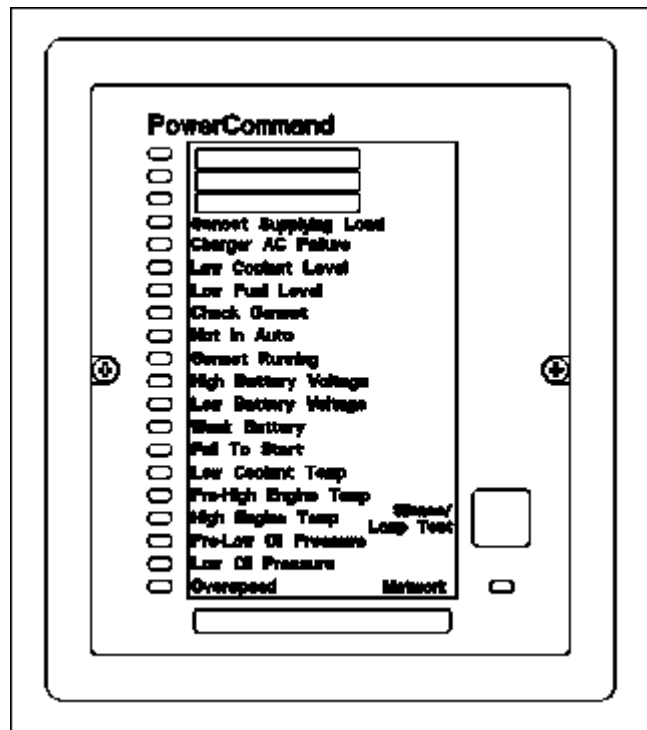


FIGURE 59. EXAMPLE OF HMI113

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%).

5.8.1 PCC Support for HMI113

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

5.8.2 HMI113 Part Numbers

TABLE 82. HMI113 PART NUMBERS

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

5.9 HMI114

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

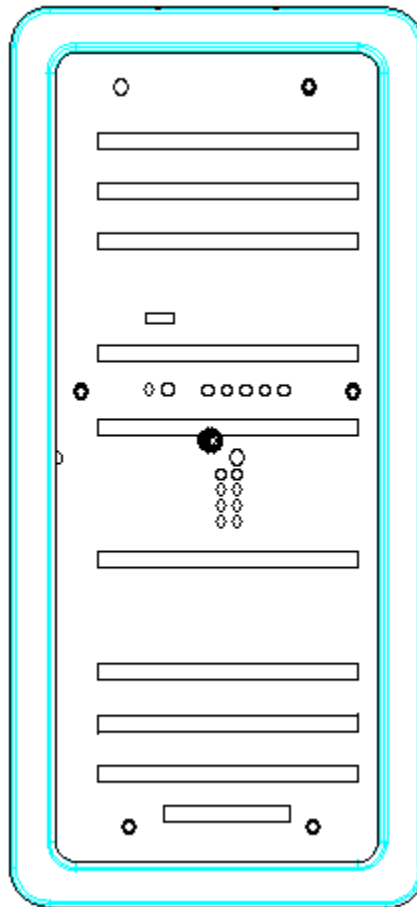


FIGURE 60. HMI114

5.9.1 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.

5.9.2 HMI114 Part Numbers

TABLE 83. HMI114 PART NUMBERS

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

5.9.3 HMI114 Modes

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

5.10 Operator Panel

TABLE 84. OPERATOR PANEL PART NUMBERS

Part Description	Part Number
HMI320 (Operator Panel)	0300-6315-01 0300-6315-02
HMI320 Operator Panel software	0326-7431
HMI320 Operator Panel language software	0326-7449 0326-7450
Remote HMI320 (Operator Panel)	0300-6315-03
Remote HMI320 Operator Panel software	0326-7431
Remote HMI320 Operator Panel language software	0326-7449 0326-7450

This is the Operator Panel for the PCC. Its environmental specifications are identified in [Table 85](#).

TABLE 85. 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 HMI220 graphical display is 160 x 160 pixels. The HMI320 graphical display is 320 x 320 pixels.

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

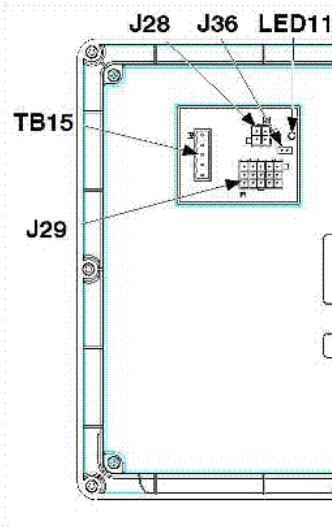


FIGURE 61. OPERATOR PANEL CONNECTIONS

5.10.1 LEDs

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

TABLE 86. 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.

5.10.2 Connections

[Table 87](#) provides an overview of the connections for this module.

TABLE 87. OPERATOR PANEL CONNECTIONS OVERVIEW

Connection	Description	Housing	Pins
J28	Power	0323-2091	0323-2466
J29	Local installations	0323-2456	0323-2466
J36	Power-down mode disable		

Connection	Description	Housing	Pins
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.

5.10.3 J28 Connections

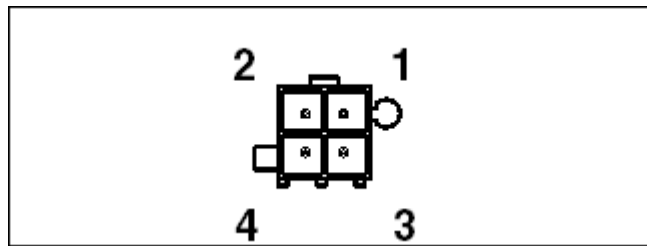


FIGURE 62. J28 PINS

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

TABLE 88. 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	

5.10.4 J29 Connections

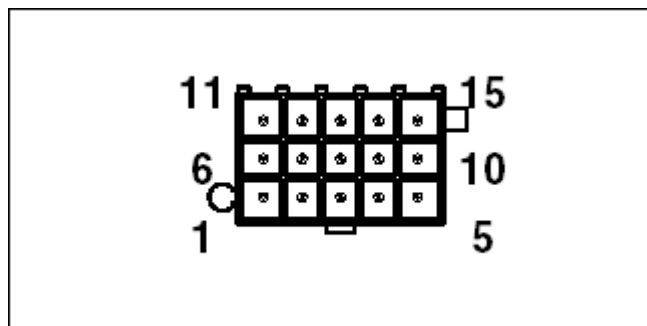


FIGURE 63. J29 PINS

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

TABLE 89. 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.

5.10.5 J36 Connections

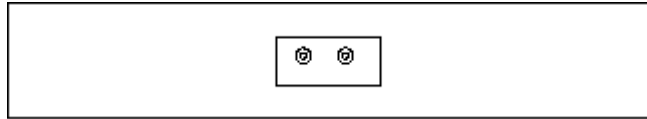


FIGURE 64. J36 PINS

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

5.10.6 TB15 Connections

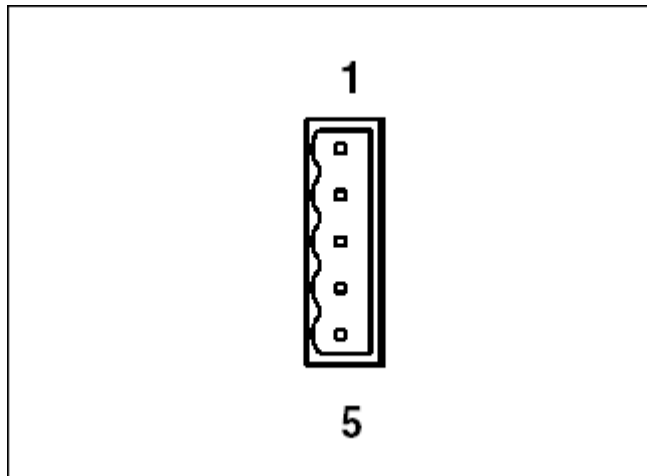


FIGURE 65. TB15 PINS

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

TABLE 90. 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.

5.11 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.

5.12 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...

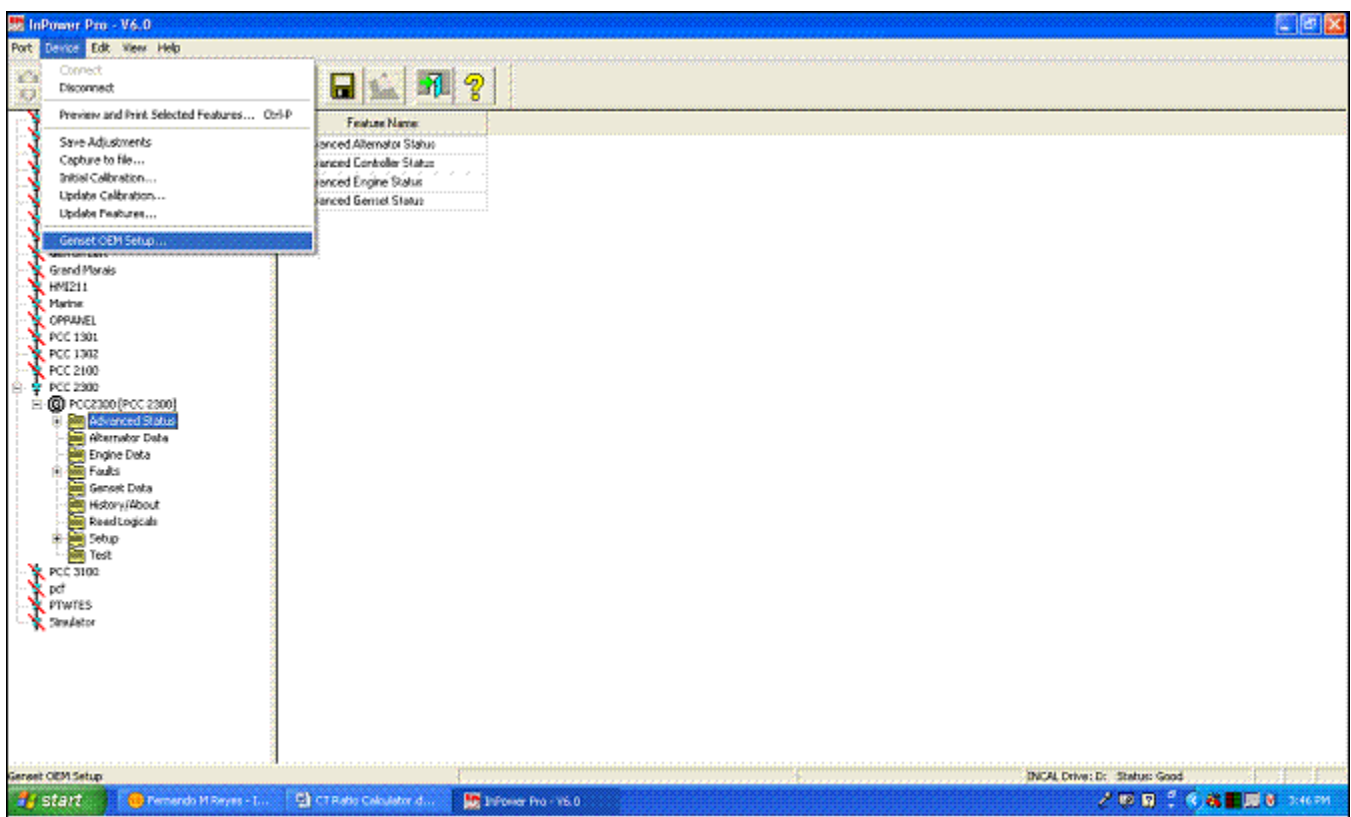


FIGURE 66. INPOWER - GENSET OEM SETUP SELECTION

The screenshot shows the 'Genset OEM Setup' window with the following sections:

- Navigation:** Engine OEM (3 of 6), Engine OEM (4 of 6), Engine OEM (5 of 6), Alternator OEM (1 of 2), Alternator OEM (2 of 2), Genset OEM (1 of 4), Genset OEM (2 of 4), Genset OEM (3 of 4), Genset OEM (4 of 4), Engine OEM (1 of 6).
- Genset Application Rating:** Application Rating with radio buttons for Standby (selected) and Prime.
- Battery Voltage:** Nominal Battery voltage with radio buttons for 12V and 24V (selected).
- Genset Power Rating:** A list of eight kVA ratings for Standby and Prime in 3 Phase and Single Phase configurations at 60Hz and 50Hz. Each has a numeric input field (e.g., 375.0, 1.0) and a unit label (KVA).
- Frequency Range:** Frequency Options with radio buttons for 60 Hz Only, 50 Hz Only, and 50 Hz or 60 Hz (selected).
- Nominal Frequency:** Alternate Frequency Switch with radio buttons for 60 Hz and 50 Hz (selected).
- Dataplate Information:** Four text input fields for Genset Serial Number, Genset Model Number, Alternator Serial Number, and Alternator Model Number, each with a range of 20 Alpha/Numberic.
- Buttons:** Setup mode Disabled, Enable Setup Mode, Disable Setup Mode and Exit, Save / Discard Adjustments and Disable Setup Mode, Help.
- Footnote:** ** = Must have Setup Mode Enabled to modify Parameter

FIGURE 67. 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.

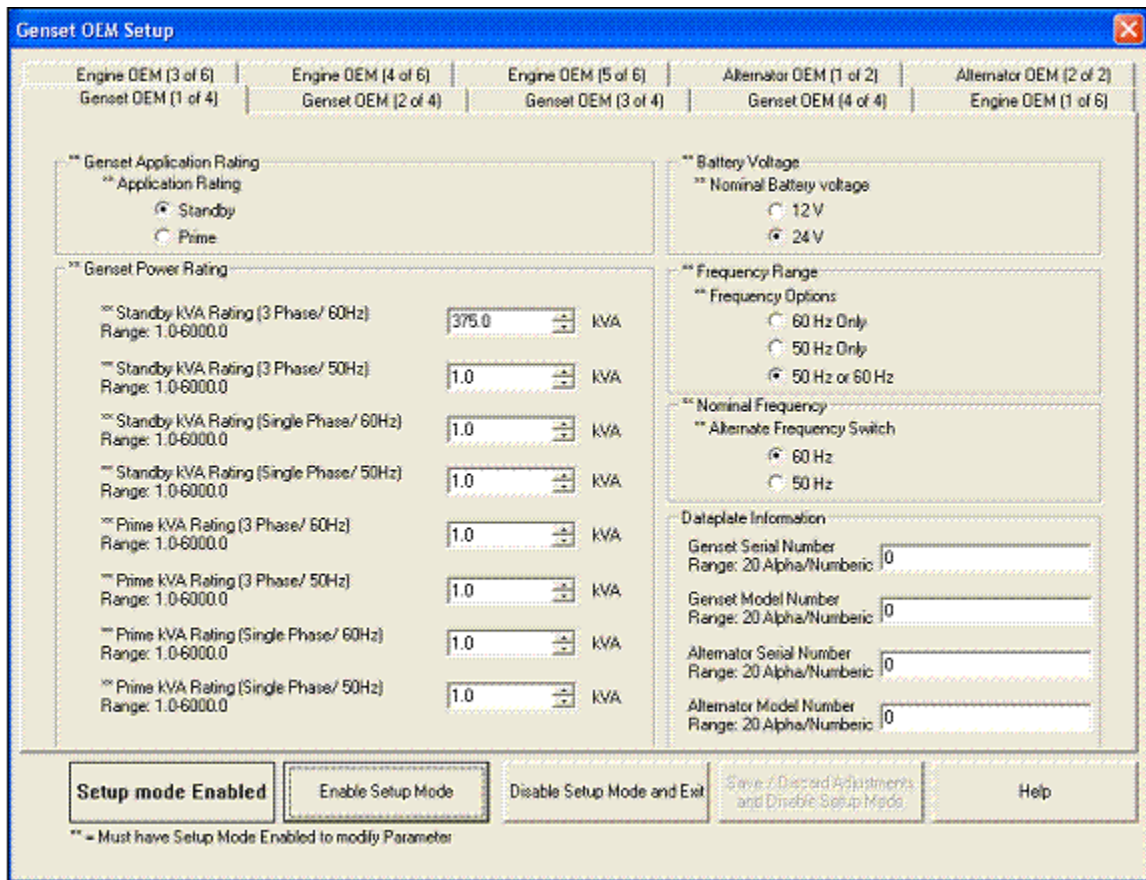


FIGURE 68. GENSET OEM SETUP WINDOW - ENABLE SETUP MODE

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

Genset OEM Setup

Genset OEM (1 of 4) | Genset OEM (2 of 4) | Genset OEM (3 of 4) | Genset OEM (4 of 4) | Engine OEM (1 of 6)
 Engine OEM (3 of 6) | Engine OEM (4 of 6) | Engine OEM (5 of 6) | **Alternator OEM (1 of 2)** | Alternator OEM (2 of 2)

Nominal Voltage Limits

** 3 ph high conn Genset nom voltage lo limit
Range: 1 - 45,000 418 Vac

** 3 ph high conn Genset nom voltage hi limit
Range: 1 - 45,000 430 Vac

** 3 ph low conn Genset nom voltage lo limit
Range: 1 - 45,000 208 Vac

** 3 ph low conn Genset nom voltage hi limit
Range: 1 - 45,000 240 Vac

** Single phase Genset nom voltage lo limit
Range: 1 - 45,000 208 Vac

** Single phase Genset nom voltage hi limit
Range: 1 - 45,000 240 Vac

Nominal Voltage

** Nominal Voltage
Range: See Nominal Voltage Limits 480 Vac

Note:
1. If Nominal Voltage > 600, a PT must be used
2. Adjust Nominal Voltage Limits first.

PMG/Shunt Excitation

** Excitation Source
 PMG
 Shunt

PT Ratios

** Genset PT Primary Voltage
Range: 600 - 45,000 600 Vac

** Genset PT Secondary Voltage
Range: 100 - 600 100 Vac

CT Ratio - Secondary

** Genset Secondary CT Current
 1 Amp
 5 Amps

CT Ratio - Primary

** Genset Primary CT Current
Range: 5 - 10,000 945 Amps

CT Calculated Upper Range 3152

CT Calculated Lower Range 751

Note: Please enter Genset Power Ratings, Frequency Range and Nominal Voltage Limits first to get proper CT Calculated Upper & Lower Limits

Note: If a 3 lead CT is used (two ratings), please enter the LOWER of the two values. If a two lead CT is used and the Nominal Voltage is < 300VAC, enter ½ the CT's Primary value, otherwise use the full value.

Setup mode Disabled Enable Setup Mode Disable Setup Mode and Exit Save / Discard Adjustments and Disable Setup Mode Help

* = Must have Setup Mode Enabled to modify Parameter

FIGURE 69. 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 70. 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.

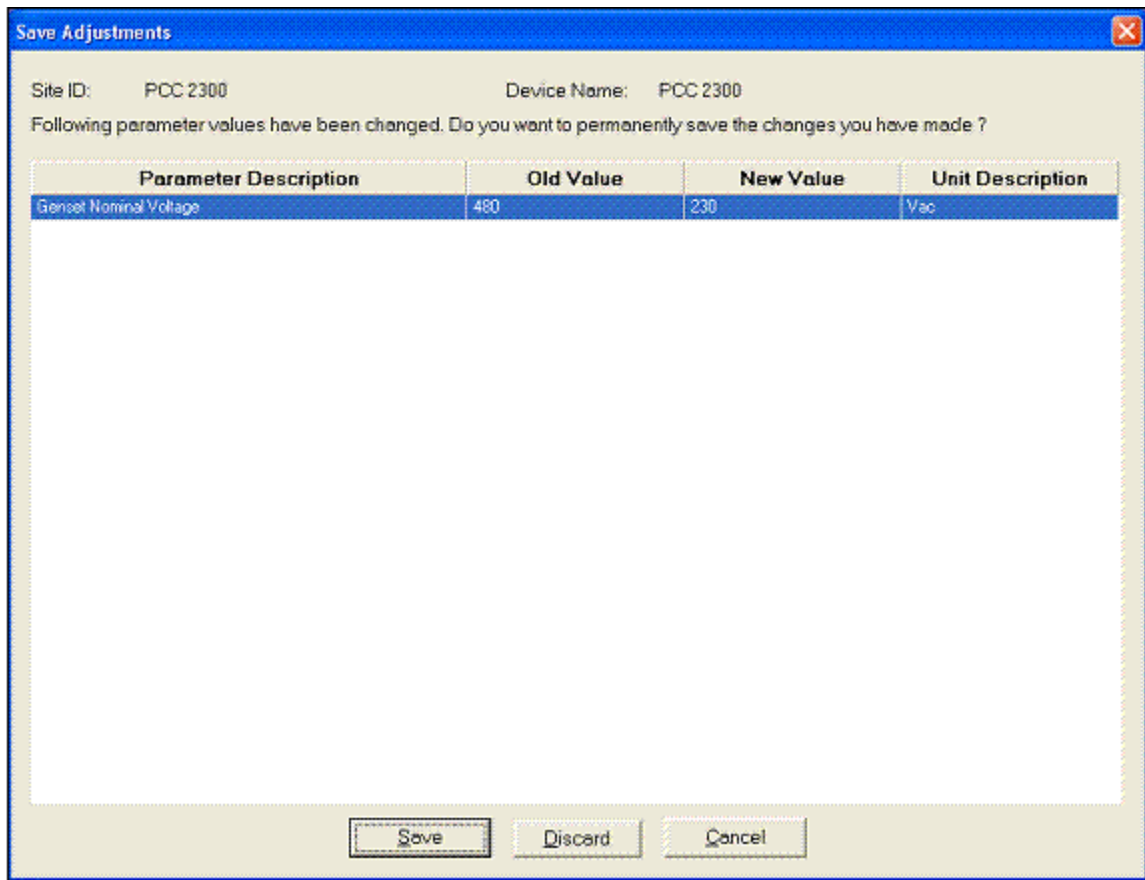


FIGURE 71. SAVE ADJUSTMENTS WINDOW

5.13 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.

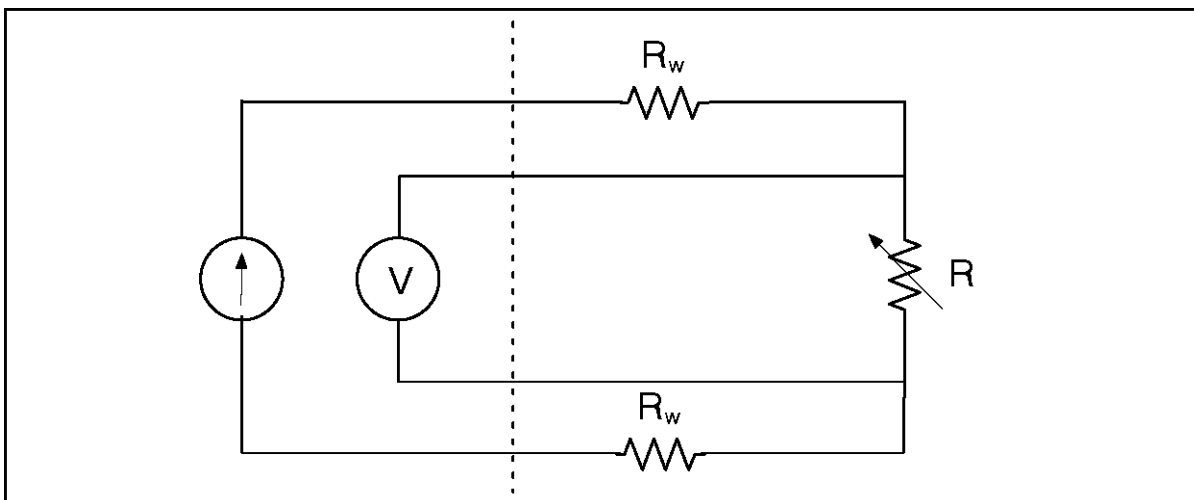


FIGURE 72. FOUR-WIRE CONNECTION

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.

5.13.1 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.

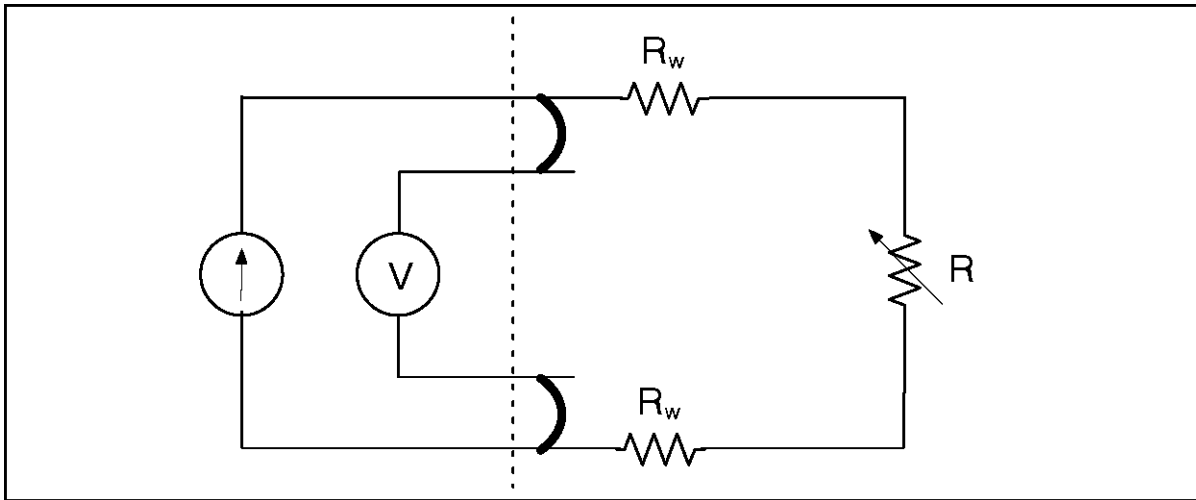


FIGURE 73. HOW TO CONVERT A FOUR-WIRE CONNECTION INTO A TWO-WIRE CONNECTION

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 91. 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 generator set is controlled by the exercise signal and the remote start signal.

NOTICE

If power transfer control (PTC) is enabled, the generator set is controlled by additional signals.

⚠ WARNING

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

If the generator set is running when the PCC enters this mode, the PCC keeps running the generator set 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 generator set. 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.

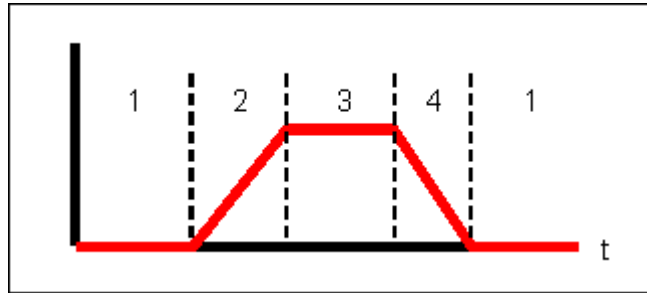
NOTICE

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 74. SEQUENCES OF OPERATION

6.2.1 Synchronize System Settings

Enabling triggers the push of settings from one generator set to all other generator sets connected to the network.

6.2.2 Clear Lost Generator Sets Local

Enabling triggers the transition of all generator sets in state 'Lost' to state 'Gen Does Not Exist'.

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 92. 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:

- Genset Application Type is not set to Utility Single or Power Transfer Control.
- 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 generator set 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 93. 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.

6.3.1.3 AUX105 Power-down Mode

The following table shows how much current the AUX105 consumes in normal operation and in power-down mode.

TABLE 94. AUX105 CURRENT CONSUMPTION

PCC Mode	Current
Normal operation	160 mA
Power-down mode	0 mA

The AUX105 enters power-down mode when all of these conditions are met:

- The PCC base board is not in power-down mode. (If the PCC base board is in power-down mode, it stops providing power to the AUX105.)
- The generator set is not running.

- The keyswitch is off.
- The PC-based service tool is not connected.
- 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 AUX105 draws no current.

The AUX105 leaves power-down mode when any of these conditions, called wakeup signals, is met:

- The keyswitch is turned on.
- The PC-based service tool is connected.
- Any System Wakeup connection is active.

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.

This has no effect in applications with hydromechanical engines.

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.

This has no effect in applications with hydromechanical engines.

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.

This has no effect in applications with hydromechanical engines.

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.

6.4.4 Additional Steps for Hydromechanical Engines

6.4.4.1 Glow Plugs

The PCC controls the glow plugs if the following conditions are met:

- *Engine Application Type* is Hydro-Mechanical.
- *Glow Plug Enable* is Enable.
- *Fuel System* is Diesel.

If the PCC controls the glow plugs, it turns on the glow plugs each time before it turns on the starter. The PCC turns on the glow plugs for an amount of time that depends on the current coolant temperature.

- If the coolant temperature is less than *Min Preheat Temperature*, the PCC turns on the glow plugs for *Min Time at Preheat Temperature*.
- If the coolant temperature is between *Min Preheat Temperature* and *Max Preheat Temperature*, the amount of time decreases linearly as the coolant temperature approaches *Max Preheat Temperature*. For example, if the coolant temperature is halfway between *Min Preheat Temperature* and *Max Preheat Temperature*, the amount of time is one-half *Min Time at Preheat Temperature*.
- If the coolant temperature is greater than *Max Preheat Temperature*, the PCC does not turn on the glow plugs at all.

The PCC does not turn on the starter until it turns off the glow plugs.

NOTICE

If the PCC controls the glow plugs, it takes longer to start the engine because the PCC turns the glow plugs on and off each time before it turns on the starter.

If the coolant temperature is less than *Max Post Glow Temperature*, the PCC also turns on the glow plugs for *Max Post Glow Time* after the engine has started. This can help the engine start more smoothly, and it might reduce the amount of white smoke during startup.

Each time it runs the start sequence, the PCC stops turning on the glow plugs once the glow plugs have been on for *Max Preheat Glow Time*.

6.4.4.2 Crank Fueling

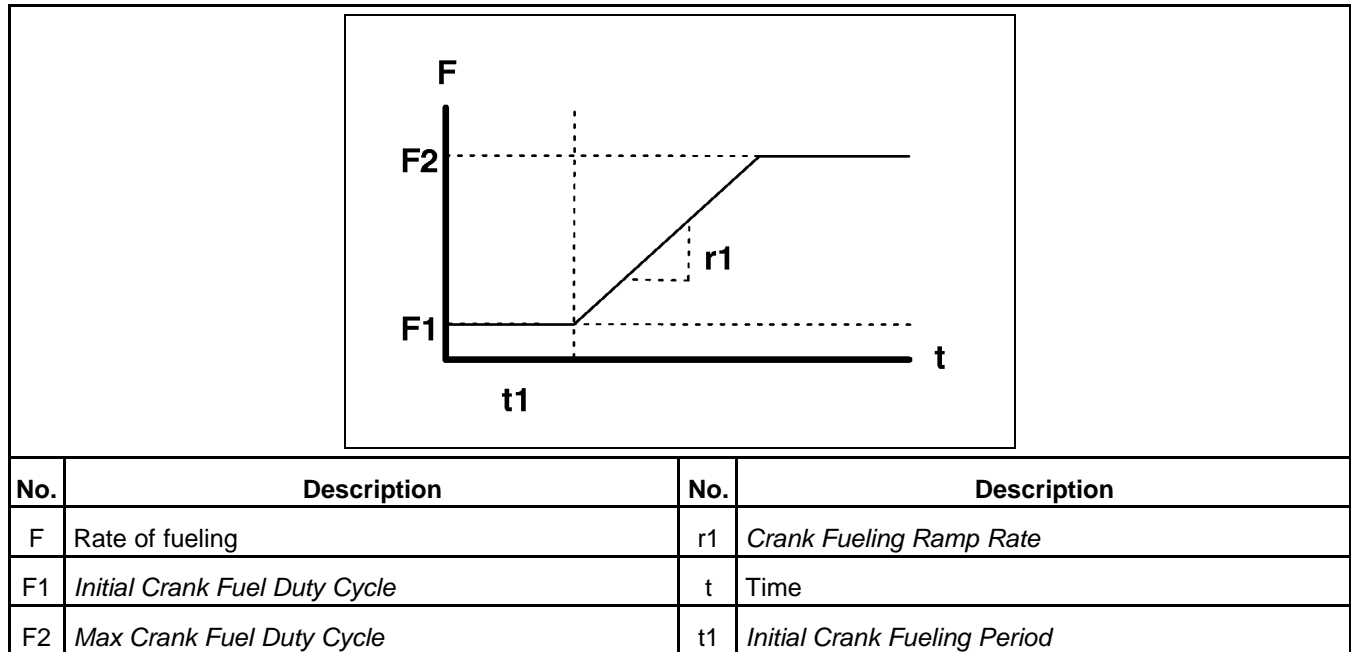


FIGURE 75. CRANK FUELING

During cranking, the AUX105 controls the rate of fueling as follows:

1. The rate of fueling is *Initial Crank Fuel Duty Cycle* for *Initial Crank Fueling Period*.
2. The rate of fueling rises from *Initial Crank Fuel Duty Cycle* to *Max Crank Fuel Duty Cycle* at *Crank Fueling Ramp Rate*.
3. The rate of fueling remains at *Max Crank Fuel Duty Cycle*.

After cranking, the rate of fueling is *Crank Exit Fuel Duty Cycle* until the electronic governor takes control of the rate of fueling.

6.4.4.3 Start Electronic Governor

The electronic governor is enabled when all of these conditions are met:

- *Engine Application Type* is Hydro-Mechanical.
- *Electronic Governor Enable* is Enable.

If all of these conditions are met, the PCC starts the electronic governor when one of these conditions is met.

- The engine speed reaches *Governor Enable Engine Speed*.
- The engine speed reaches *Idle Speed*, and the engine is going to warm up in idle.

Then, the electronic governor raises the engine speed to idle speed (if the engine is going to warm up in idle) or rated speed linearly during *Governor Ramp Time*.

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
 - PCC's Speed Bias Input connection, multiplied by Alternate Frequency Switch
 - Paralleling frequency reference offset
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
 - PCC's Voltage Bias Input connection, limited to -40%~10%
 - Paralleling voltage reference offset
2. If the PCC is not running in Synchronize paralleling state or in Load Govern paralleling state, 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*

NOTICE

There is one exception. If the PCC is running in Load Govern paralleling state and *Load Govern Zero AVR Error Enable* is set to Enable, the PCC ignores these voltages, and excitation depends only on the paralleling voltage reference offset. This might be used in applications when the utility voltage is not steady.

If the generator set 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 Controlled Shutdown

This sequence begins when all of these conditions are met:

- There are no active shutdown faults.
- There is an active shutdown with cooldown fault.
- The PCC is not running in Load Govern paralleling state, or *Genset Application Type* is set to Power Transfer Control.
- Any of these conditions are met:
 - *Genset Application Type* is set to Standalone or Synchronize Only.
 - The open signal for the generator set circuit breaker is active, and *Genset CB Position Status* is set to Open.

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 Controlled Shutdown Advance Notice Delay

The PCC runs the generator set at rated speed and voltage for *Controlled Shutdown Advance Notice Delay*.

This delay gives another device more time to transfer the load from the generator set.

6.6.1.1.2 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.

6.6.1.1.2.1 Time Delay to Stop

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

If the PCC is in Load Govern paralleling state, the PCC runs the load govern ramp unload processes simultaneously.

The PCC remains in this step indefinitely until one of these conditions is met:

- *Genset Application Type* is set to Standalone or Synchronize Only.
- The open signal for the generator set circuit breaker is active, and *Genset CB Position Status* is set to Open.
- The PCC returns to rated speed and voltage.

6.6.1.1.2.2 Rated Cooldown Time

If an active shutdown with cooldown fault is active, the PCC runs the generator set at rated speed and voltage for *Rated Cooldown Time*.

If there is no active shutdown with cooldown fault, the PCC runs the generator set at rated speed and voltage until the generator set 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%.

If the PCC is in Load Govern paralleling state, the PCC runs the load govern ramp unload processes simultaneously.

The PCC remains in this step indefinitely until one of these conditions is met:

- *Genset Application Type* is set to Standalone or Synchronize Only.
- The open signal for the generator set circuit breaker is active, and Genset CB Position Status is set to Open.
- The PCC returns to rated speed and voltage.

6.6.1.1.3 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.)

6.6.1.1.4 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.

6.6.1.1.5 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*.

6.6.1.1.6 Idle Cooldown Time

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

6.6.1.1.7 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 Controlled Shutdown Advance Notice Delay

The PCC runs the generator set at rated speed and voltage for *Controlled Shutdown Advance Notice Delay*.

This delay gives another device more time to transfer the load from the generator set.

6.6.1.2.2 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.

6.6.1.2.2.1 Time Delay to Stop

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

If the PCC is in Load Govern paralleling state, the PCC runs the load govern ramp unload processes simultaneously.

The PCC remains in this step indefinitely until one of these conditions is met:

- *Genset Application Type* is set to Standalone or Synchronize Only.
- The open signal for the generator set circuit breaker is active, and *Genset CB Position Status* is set to Open.
- The PCC returns to rated speed and voltage.

6.6.1.2.2.2 Rated Cooldown Time

If an active shutdown with cooldown fault is active, the PCC runs the generator set at rated speed and voltage for *Rated Cooldown Time*.

If there is no active shutdown with cooldown fault, the PCC runs the generator set at rated speed and voltage until the generator set 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%.

If the PCC is in Load Govern paralleling state, the PCC runs the load govern ramp unload processes simultaneously.

The PCC remains in this step indefinitely until one of these conditions is met:

- *Genset Application Type* is set to Standalone or Synchronize Only.
- The open signal for the generator set circuit breaker is active, and *Genset CB Position Status* is set to Open.
- The PCC returns to rated speed and voltage.

6.6.1.2.3 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.

6.6.1.2.4 Stop Engine

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

6.6.2 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.

6.6.2.1 With Idle Cooldown

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

6.6.2.1.1 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.

6.6.2.1.1.1 Time Delay to Stop

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

If the PCC is in Load Govern paralleling state, the PCC runs the load govern ramp unload processes simultaneously.

The PCC remains in this step indefinitely until one of these conditions is met:

- *Genset Application Type* is set to Standalone or Synchronize Only.
- The open signal for the generator set circuit breaker is active, and *Genset CB Position Status* is set to Open.
- The PCC returns to rated speed and voltage.

6.6.2.1.1.2 Rated Cooldown Time

If an active shutdown with cooldown fault is active, the PCC runs the generator set at rated speed and voltage for *Rated Cooldown Time*.

If there is no active shutdown with cooldown fault, the PCC runs the generator set at rated speed and voltage until the generator set 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%.

If the PCC is in Load Govern paralleling state, the PCC runs the load govern ramp unload processes simultaneously.

The PCC remains in this step indefinitely until one of these conditions is met:

- *Genset Application Type* is set to Standalone or Synchronize Only.
- The open signal for the generator set circuit breaker is active, and *Genset CB Position Status* is set to Open.
- The PCC returns to rated speed and voltage.

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 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.

6.6.2.1.4 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*.

6.6.2.1.5 Idle Cooldown Time

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

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 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.

6.6.2.2.1.1 Time Delay to Stop

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

If the PCC is in Load Govern paralleling state, the PCC runs the load govern ramp unload processes simultaneously.

The PCC remains in this step indefinitely until one of these conditions is met:

- *Genset Application Type* is set to Standalone or Synchronize Only.
- The open signal for the generator set circuit breaker is active, and *Genset CB Position Status* is set to Open.
- The PCC returns to rated speed and voltage.

6.6.2.2.1.2 Rated Cooldown Time

If an active shutdown with cooldown fault is active, the PCC runs the generator set at rated speed and voltage for *Rated Cooldown Time*.

If there is no active shutdown with cooldown fault, the PCC runs the generator set at rated speed and voltage until the generator set 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%.

If the PCC is in Load Govern paralleling state, the PCC runs the load govern ramp unload processes simultaneously.

The PCC remains in this step indefinitely until one of these conditions is met:

- *Genset Application Type* is set to Standalone or Synchronize Only.
- The open signal for the generator set circuit breaker is active, and Genset CB Position Status is set to Open.
- The PCC returns to rated speed and voltage.

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 Manual Stop

This sequence begins when all of these conditions are met:

- The PCC is in Manual mode.
- The generator set is running at rated speed and voltage.
- The auto signal is inactive.
- There are no active shutdown faults.

This sequence also begins when all of these conditions are met:

- There are no active shutdown faults.
- There is an active shutdown with cooldown fault.
- The PCC is running in Load Govern paralleling state.

6.6.3.1 With Idle Cooldown

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

6.6.3.1.1 Rated Cooldown Time

If an active shutdown with cooldown fault is active, the PCC runs the generator set at rated speed and voltage for *Rated Cooldown Time*.

If there is no active shutdown with cooldown fault, the PCC runs the generator set at rated speed and voltage until the generator set 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%.

If the PCC is in Load Govern paralleling state, the PCC runs the load govern ramp unload processes simultaneously.

The PCC remains in this step indefinitely until one of these conditions is met:

- *Genset Application Type* is set to Standalone or Synchronize Only.
- The open signal for the generator set circuit breaker is active, and Genset CB Position Status is set to Open.
- The PCC returns to rated speed and voltage.

6.6.3.1.2 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.)

6.6.3.1.3 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.

6.6.3.1.4 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*.

6.6.3.1.5 Idle Cooldown Time

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

6.6.3.1.6 Stop Engine

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

6.6.3.2 Without Idle Cooldown

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

6.6.3.2.1 Rated Cooldown Time

If an active shutdown with cooldown fault is active, the PCC runs the generator set at rated speed and voltage for *Rated Cooldown Time*.

If there is no active shutdown with cooldown fault, the PCC runs the generator set at rated speed and voltage until the generator set 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%.

If the PCC is in Load Govern paralleling state, the PCC runs the load govern ramp unload processes simultaneously.

The PCC remains in this step indefinitely until one of these conditions is met:

- *Genset Application Type* is set to Standalone or Synchronize Only.

- The open signal for the generator set circuit breaker is active, and Genset CB Position Status is set to Open.
- The PCC returns to rated speed and voltage.

6.6.3.2.2 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.

6.6.3.2.3 Stop Engine

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

6.6.4 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 generator set is running when the PCC enters Off mode.
- The generator set is running when the PCC enters Manual mode.

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

The open signal for the generator set circuit breaker becomes active.

6.7 Idle Requests

Idle requests make the PCC run the generator set 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.
- There are no active shutdown with cooldown 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 generator set and the final state of the generator set.

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, 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.

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.

NOTICE

If **LBNG Genset Enable** is set to **Enable** and **Enable Start-Enable Function** is set to **Enable**, the PCC does not complete this step as long as warning fault 9973 (Start-Inhibit Warning Fault Event) is active.

6.7.2 Idle Speed to Stop

The PCC stops the generator set.

6.7.3 Rated Speed to Idle Speed

This sequence begins when one of these additional conditions is met:

- Genset Application Type is set to Standalone or Synchronize Only.
- The open signal for the generator set circuit breaker is active, and Genset CB Position Status is set to Open.

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 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.

6.7.3.3 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*.

6.7.4 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.

6.7.5 Additional Steps for Hydromechanical Engines

6.7.5.1 Glow Plugs

The PCC controls the glow plugs if the following conditions are met:

- *Engine Application Type* is Hydro-Mechanical.
- *Glow Plug Enable* is Enable.
- *Fuel System* is Diesel.

If the PCC controls the glow plugs, it turns on the glow plugs each time before it turns on the starter. The PCC turns on the glow plugs for an amount of time that depends on the current coolant temperature.

- If the coolant temperature is less than *Min Preheat Temperature*, the PCC turns on the glow plugs for *Min Time at Preheat Temperature*.
- If the coolant temperature is between *Min Preheat Temperature* and *Max Preheat Temperature*, the amount of time decreases linearly as the coolant temperature approaches *Max Preheat Temperature*. For example, if the coolant temperature is halfway between *Min Preheat Temperature* and *Max Preheat Temperature*, the amount of time is one-half *Min Time at Preheat Temperature*.
- If the coolant temperature is greater than *Max Preheat Temperature*, the PCC does not turn on the glow plugs at all.

The PCC does not turn on the starter until it turns off the glow plugs.

NOTICE
If the PCC controls the glow plugs, it takes longer to start the engine because the PCC turns the glow plugs on and off each time before it turns on the starter.

If the coolant temperature is less than *Max Post Glow Temperature*, the PCC also turns on the glow plugs for *Max Post Glow Time* after the engine has started. This can help the engine start more smoothly, and it might reduce the amount of white smoke during startup.

Each time it runs the start sequence, the PCC stops turning on the glow plugs once the glow plugs have been on for *Max Preheat Glow Time*.

6.7.5.2 Crank Fueling

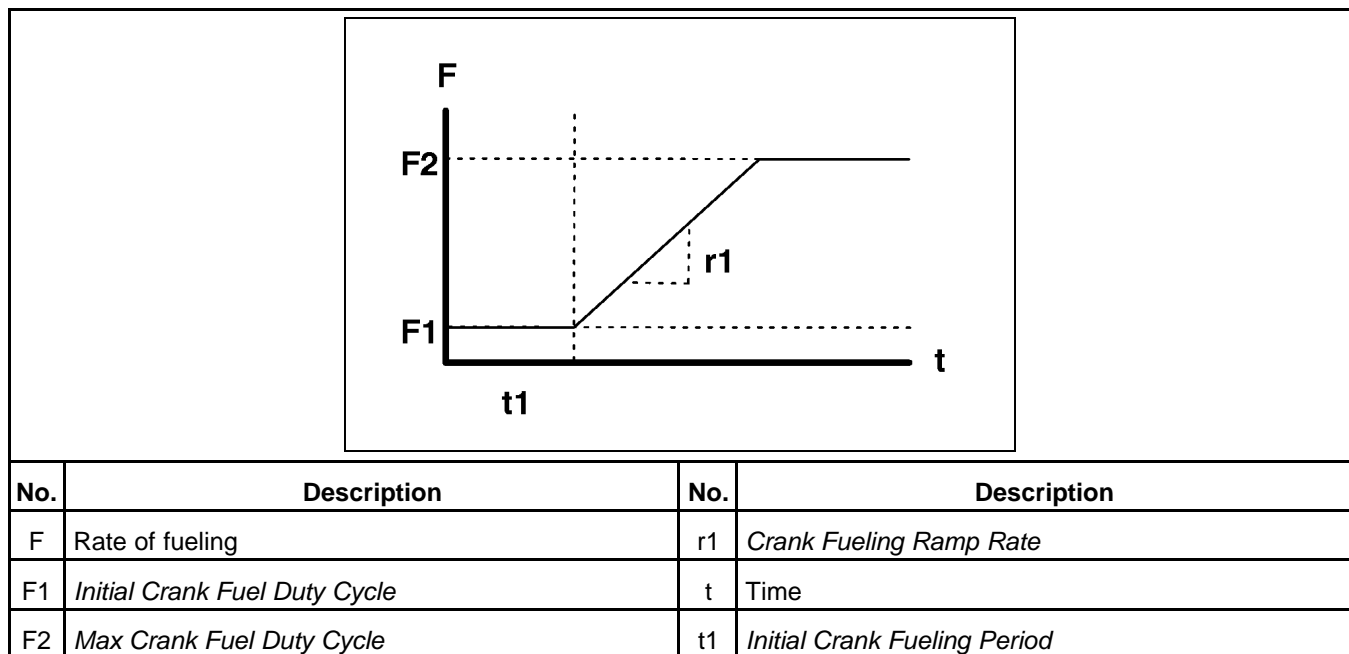


FIGURE 76. CRANK FUELING

During cranking, the AUX105 controls the rate of fueling as follows:

1. The rate of fueling is *Initial Crank Fuel Duty Cycle* for *Initial Crank Fueling Period*.

2. The rate of fueling rises from *Initial Crank Fuel Duty Cycle* to *Max Crank Fuel Duty Cycle* at *Crank Fueling Ramp Rate*.
3. The rate of fueling remains at *Max Crank Fuel Duty Cycle*.

After cranking, the rate of fueling is *Crank Exit Fuel Duty Cycle* until the electronic governor takes control of the rate of fueling.

6.7.5.3 Start Electronic Governor

The electronic governor is enabled when all of these conditions are met:

- *Engine Application Type* is Hydro-Mechanical.
- *Electronic Governor Enable* is Enable.

If all of these conditions are met, the PCC starts the electronic governor when one of these conditions is met.

- The engine speed reaches *Governor Enable Engine Speed*.
- The engine speed reaches *Idle Speed*, and the engine is going to warm up in idle.

Then, the electronic governor raises the engine speed to idle speed (if the engine is going to warm up in idle) or rated speed linearly during *Governor Ramp Time*.

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 77](#).

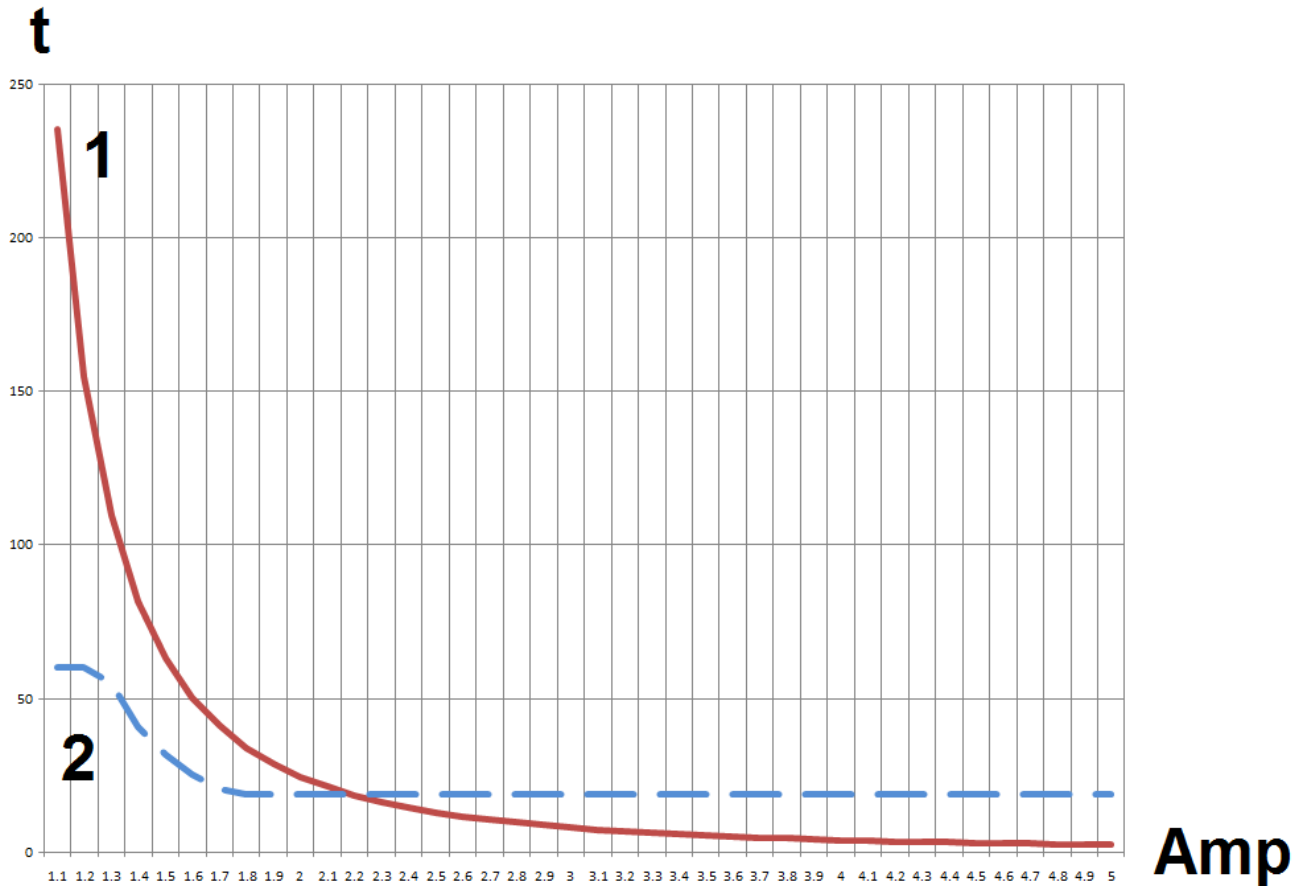


FIGURE 77. AMPSENTRY PROTECTIVE RELAY

TABLE 95. 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 $43.5 / ((\% \text{ Rated Current} - 0.67) ^ 2)$ 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.

6.8.1 AmpSentry Maintenance Mode

AmpSentry Maintenance Mode is an integrated maintenance mode feature which changes the trip settings of the generator, providing instantaneous protection by minimizing the current. This feature is Enabled when any of the following conditions are active:

- Service Tool is connected
- Generator set is started manually
- Configurable Input of AMM in Auto is configured

This mode can be disabled by setting the AmpSentry Maintenance Mode Disable Override to "Enable" using the Service Tool, or through the HMI by navigating to Genset Setup (4/8).

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.

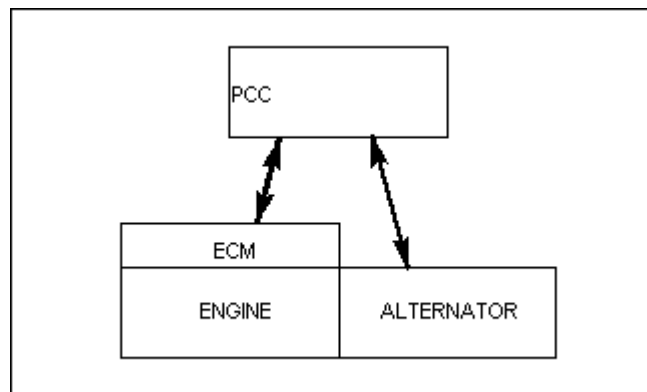


FIGURE 78. PGI OVERVIEW

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 79](#).

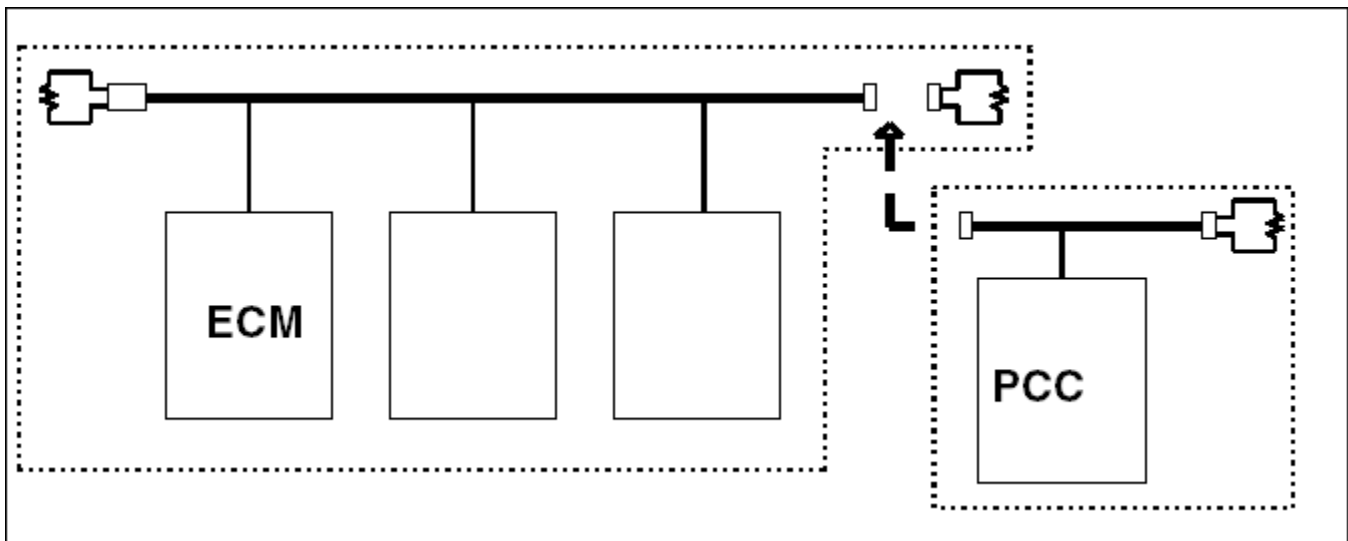


FIGURE 79. CAN DATALINK

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 80](#).

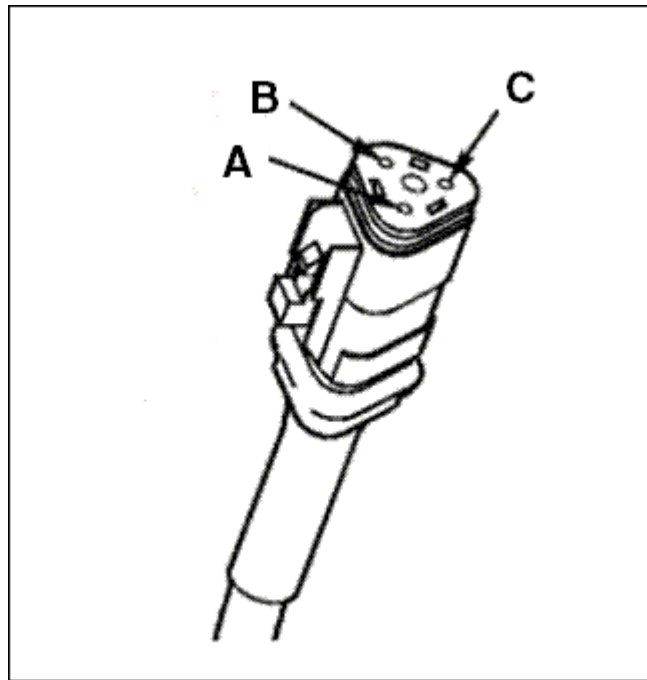


FIGURE 80. CABLE FOR PGI GENERATOR SETS

Each wire is identified in [Table 96](#).

TABLE 96. 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 97. 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 Generator Set 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 generator set 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.

The screenshot shows the InPower Pro V6.0 interface. On the left, a tree view shows the system hierarchy with 'PCC 2300' selected. The main window displays a table of engine parameters:

Parameter	Value	Units	Time Last Read
Engine Running Time	206.00	hours	12/06/2007 17:07:04.35
Coolant Temperature	59.2	degF	12/06/2007 17:07:04.37
Average Engine Speed	0.0	rpm	12/06/2007 17:07:04.37
Battery Voltage	12.359	Vdc	12/06/2007 17:07:04.37
Oil Pressure	0.0	psi	12/06/2007 17:07:04.39
Oil Temperature	93.2	degF	12/06/2007 17:07:04.39
Intake Manifold Temperature	73.4	degF	12/06/2007 17:07:04.39
Boost Pressure	0.0	psi	12/06/2007 17:07:04.39
Fuel Outlet Pressure	0.0	psi	12/06/2007 17:07:04.40
Fuel Temperature	158.0	degF	12/06/2007 17:07:04.40
Coolant Pressure	Not Available	psi	12/06/2007 17:07:04.40
Fuel Supply Pressure	80.3	psi	12/06/2007 17:07:04.42
Crankcase Pressure	Not Available	psi	12/06/2007 17:07:04.42
Aftercooler Temperature	Not Available	degF	12/06/2007 17:07:04.42
Barometric Absolute Pressure	14.1	psi	12/06/2007 17:07:04.42

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 generator set to activate the Low Coolant Temperature alarm.

The screenshot shows the InPower Pro V6.0 interface with the 'Genset Setup' menu open. The 'LCT Warning Threshold' parameter is highlighted in blue. The table below shows the relevant parameters:

Parameter	Value	Units	Time Last Read
Idle to Rated Ramp Time	0.0	seconds	12/06/2007 17:07:43.42
Rated to Idle Transition Delay	0.0	seconds	12/06/2007 17:07:43.42
Rated to Idle Ramp Time	0.0	seconds	12/06/2007 17:07:43.40
Rated Cooldown Time	180	seconds	12/06/2007 17:07:43.40
Idle Cooldown Time	5.00	minutes	12/06/2007 17:07:43.40
Prebake Cycle Enable	Disabled		12/06/2007 17:07:43.40
Prebake Cycle Time	168.0	hour	12/06/2007 17:07:43.39
Prebake Oil Pressure Threshold	3.0	psig	12/06/2007 17:07:43.39
Prebake Timeout Period	10.0	seconds	12/06/2007 17:07:43.39
Load Dump Activation Method	Overload or Underspeed		12/06/2007 17:07:43.37
Load Dump Overload Threshold	105	%	12/06/2007 17:07:43.37
Load Dump Overload Set Time	60	seconds	12/06/2007 17:07:43.37
Load Dump Underspeed Threshold	0.0	Hz	12/06/2007 17:07:43.37
Load Dump Underspeed Offset	3	Hz	12/06/2007 17:07:43.35
Load Dump Underspeed Set Time	3	seconds	12/06/2007 17:07:43.35
Overload Warning Threshold	105.00	%	12/06/2007 17:07:43.35
Overload Warning Set Time	60	seconds	12/06/2007 17:07:43.35
Reverse kW Threshold	10.00	%	12/06/2007 17:07:43.34
Reverse kW Time Delay	3.0	seconds	12/06/2007 17:07:43.34
Reverse kWAR Threshold	20.00	%	12/06/2007 17:07:43.34
Reverse kWAR Time Delay	10.0	seconds	12/06/2007 17:07:43.34
LDL Detection Response	None		12/06/2007 17:07:43.32
LCT Warning Threshold	100	degF	12/06/2007 17:07:56.04
LCT Warning Set Time	1	Minutes	12/06/2007 17:07:43.32
LCT Warning Clear Time	1	Minutes	12/06/2007 17:07:43.31
Low Fuel Set/Clear Time	2	seconds	12/06/2007 17:07:43.31
Low Fuel in Day Tank Time	2	seconds	12/06/2007 17:07:43.31
Rupture Basin Time	2.0	seconds	12/06/2007 17:07:43.31
Schedule Program Select	1		12/06/2007 17:07:43.29
Scheduler Program Setup Table	<dataTable>		12/06/2007 15:51:43.79
Scheduler Exception Select	1		12/06/2007 17:07:43.29
Scheduler Exception Setup Table	<dataTable>		12/06/2007 15:51:43.85
Exercise Scheduler Enable	Disabled		12/06/2007 17:07:43.29

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.

Parameter	Value	Units	Time Last Read
Setup Mode Enable	Disable		11/05/2007 15:24:54.43
Controller Mode	Ready		11/05/2007 15:23:57.15
Configurable Input #11 Active State Selection	Active Open		11/05/2007 15:25:30.76
Configurable Input #11 Input Function Pointer	Battery Charger Failed Switch		11/05/2007 15:24:39.06
Configurable Input #11 Fault Test	Customer Input 1		11/05/2007 15:23:57.14
Configurable Input #11 Fault Response	Shutdown		11/05/2007 15:23:57.12
Configurable Input #12 Active State Selection	Active Closed		11/05/2007 15:23:57.12
Configurable Input #12 Input Function Pointer	Low Engine Temperature Switch		11/05/2007 15:23:57.12
Configurable Input #12 Fault Test	Customer Input 2		11/05/2007 15:23:57.12
Configurable Input #12 Fault Response	Shutdown		11/05/2007 15:23:57.10
Configurable Input #13 Active State Selection	Active Closed		11/05/2007 15:23:57.10
Configurable Input #13 Fault Test	Customer Input 3		11/05/2007 15:23:57.10
Configurable Input #13 Fault Response	None		11/05/2007 15:23:57.09
Configurable Input #14 Active State Selection	Active Closed		11/05/2007 15:23:57.09
Configurable Input #14 Input Function Pointer	Default		11/05/2007 15:23:57.09
Configurable Input #14 Fault Test	None		11/05/2007 15:23:57.07
Configurable Input #14 Fault Response	Shutdown		11/05/2007 15:23:57.07
Coolant Level/Configurable Input #5 Active State Selection	Active Closed		11/05/2007 15:23:57.07
Coolant Level/Configurable Input #5 Function Pointer	Default		11/05/2007 15:23:57.06
Coolant Level Switch	Inactive		11/05/2007 15:23:57.06
Low Fuel/Configurable Input #6 Active State Selection	Active Closed		11/05/2007 15:23:57.06
Low Fuel/Configurable Input #6 Function Pointer	Default		11/05/2007 15:23:57.06
Low Fuel Switch	Inactive		11/05/2007 15:23:57.04
Fault Reset/Configurable Input #10 Active State Selection	Active Closed		11/05/2007 15:23:57.04
Fault Reset/Configurable Input #10 Function Pointer	Default		11/05/2007 15:23:57.04
Fault Reset Switch	Inactive		11/05/2007 15:23:57.03
Start Type/Configurable Input #11 Active State Selection	Active Closed		11/05/2007 15:23:57.03
Start Type/Configurable Input #11 Function Pointer	Default		11/05/2007 15:23:57.03
Start Type Switch	Inactive		11/05/2007 15:23:57.03
Rupture Basin/Configurable Input #12 Active State Selection	Active Closed		11/05/2007 15:23:57.01
Rupture Basin/Configurable Input #12 Function Pointer	Default		11/05/2007 15:23:57.01
Rupture Basin Switch	Inactive		11/05/2007 15:23:57.01
Configurable Output #1 Event Code	1311		11/05/2007 15:23:57.01

Check Genset/Common Alarm

Engage the Emergency Stop button.

Not In Auto

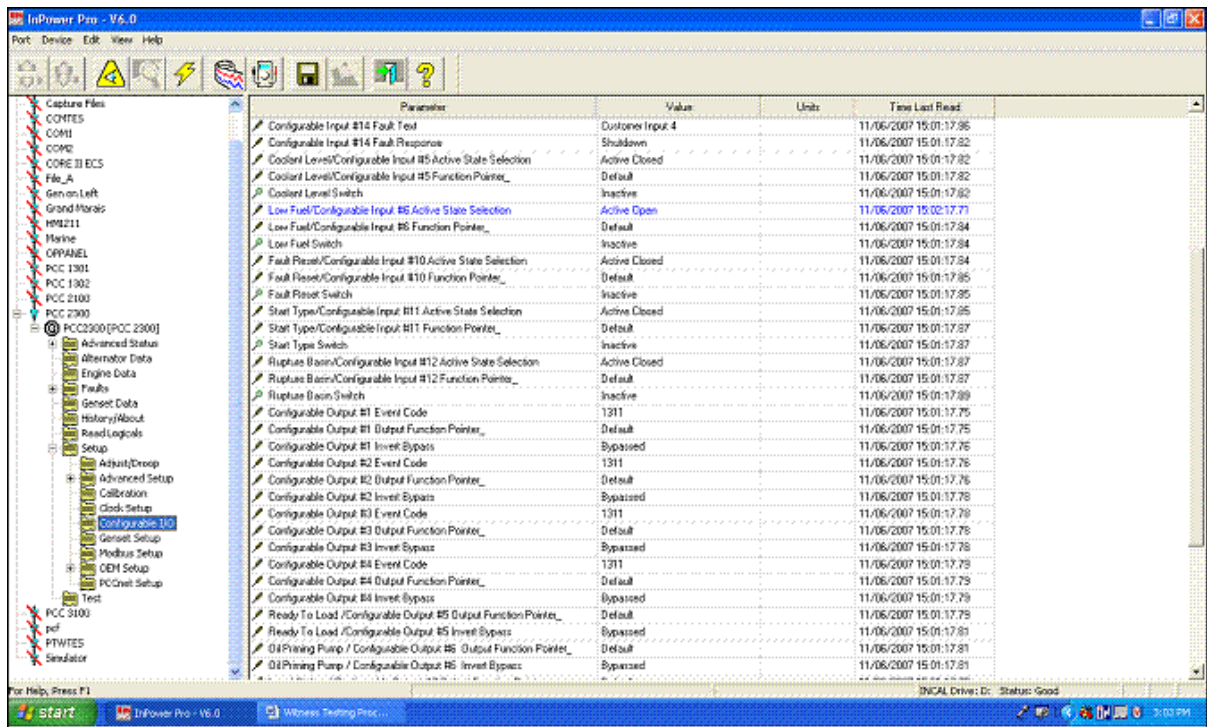
On the Operator Panel, press the Stop or Manual button to take the control out of Auto mode.

Genset Running

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

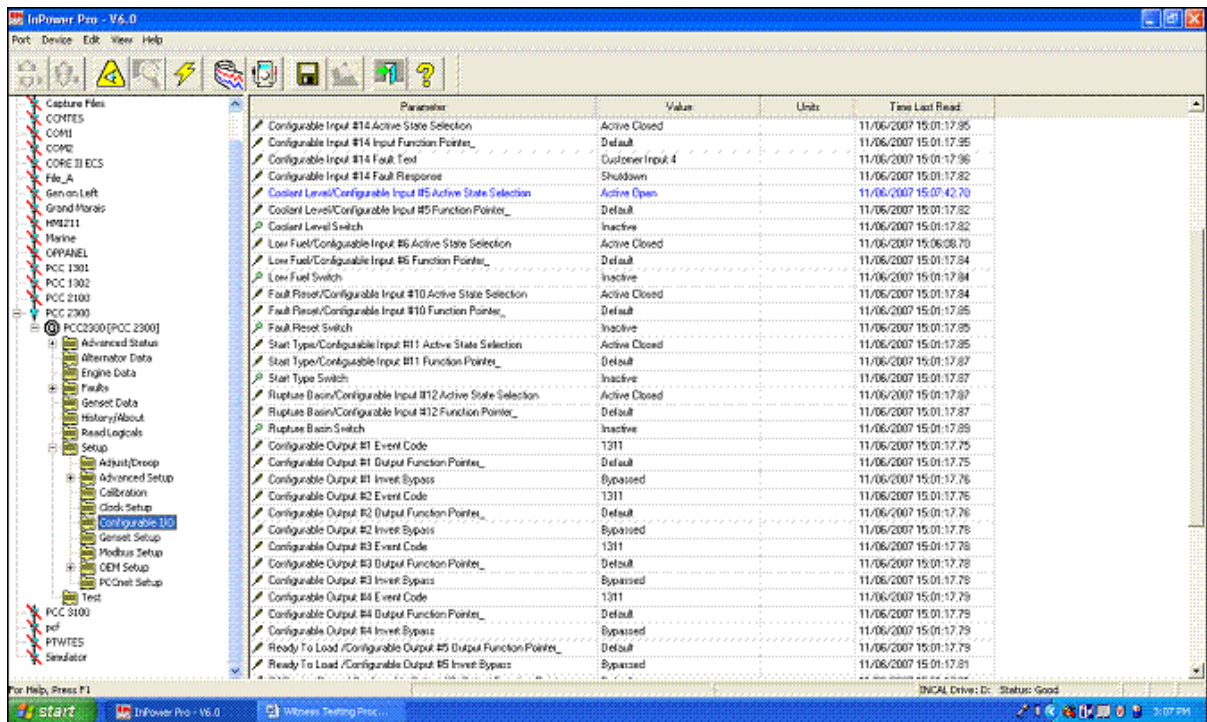
Low Fuel Level

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:

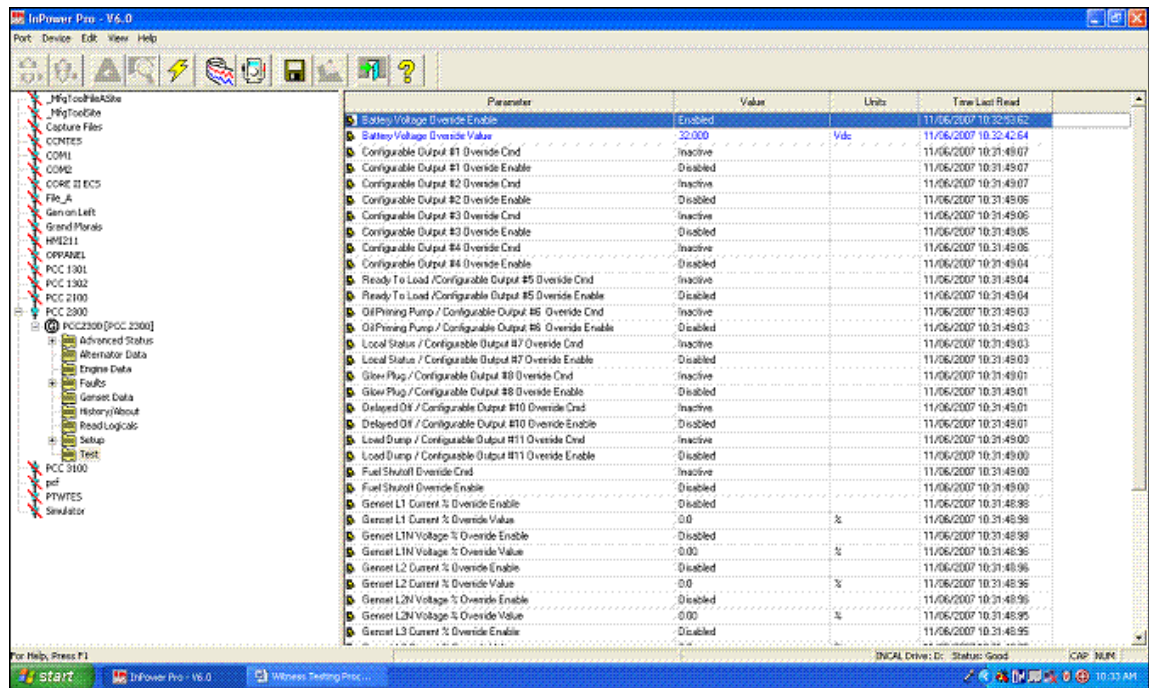
- Nominal Battery Voltage (12 or 24 VDC)
- 24 V High Battery Voltage Threshold
- 12 V High Battery Voltage Threshold
- High Battery Voltage Set Time

Under Test, follow these steps.

1. Set the Battery Voltage Override Enable to Enable.
2. Under Setup > OEM Setup > OEM Genset Setup > J1939 Aux 101 (Non-LBNG), make sure no Function Pointer is set up to Battery X Voltage where "X" could be 1, 2, or 3.

If so, change it back to None.

3. Set the "Battery Voltage Override Cmd" to the following:
 - If the Nominal Battery Voltage Threshold is set to 12 V, then set the Battery Voltage Override Cmd higher than 12 V High Battery Voltage Threshold (Default: 16 V).
 - If the Nominal Battery Voltage Threshold is set to 24 V, then set the Battery Voltage Override Cmd higher than 24 V High Battery Voltage Threshold (Default: 32 V).



4. (Optional) Set the High Battery Voltage Set Time to 5 seconds (Default: 60 seconds).
5. Patiently wait for the amount of time that is set in the High Battery Voltage Set Time to allow FC442 High Battery Voltage alarm to activate.

Click on Save, and wait.

Code	Description	Source Address	Level	Status	Site
1483	Common Alarm Fault	220	None	Active	
442	Battery 1 Voltage - Data Valid but Above Normal Operational Range - Moderately Severe Level	220	Warning	Active	

Low Battery Voltage

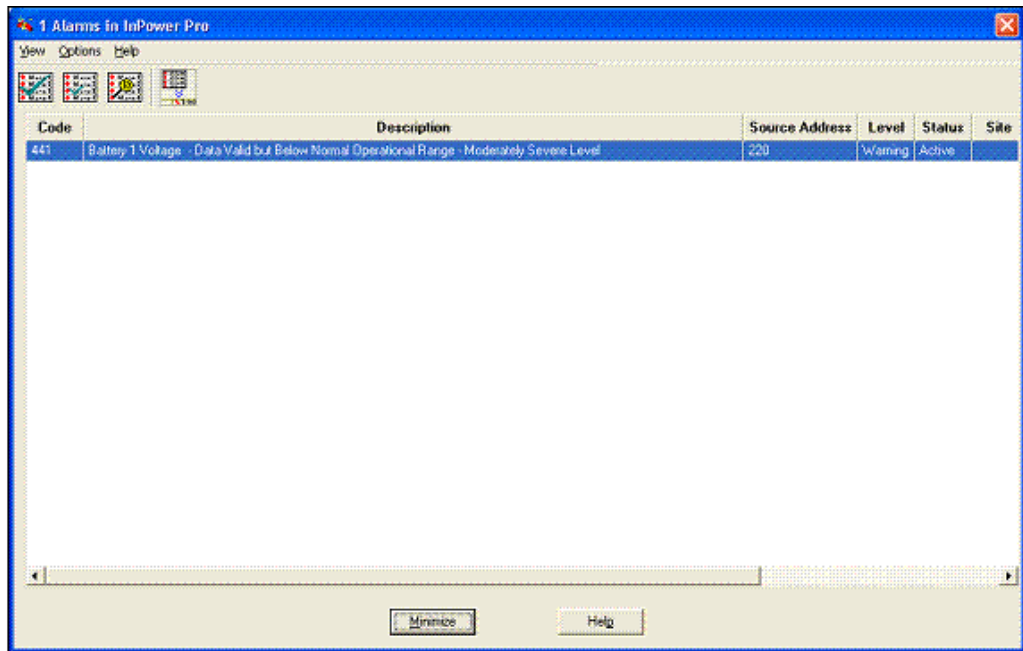
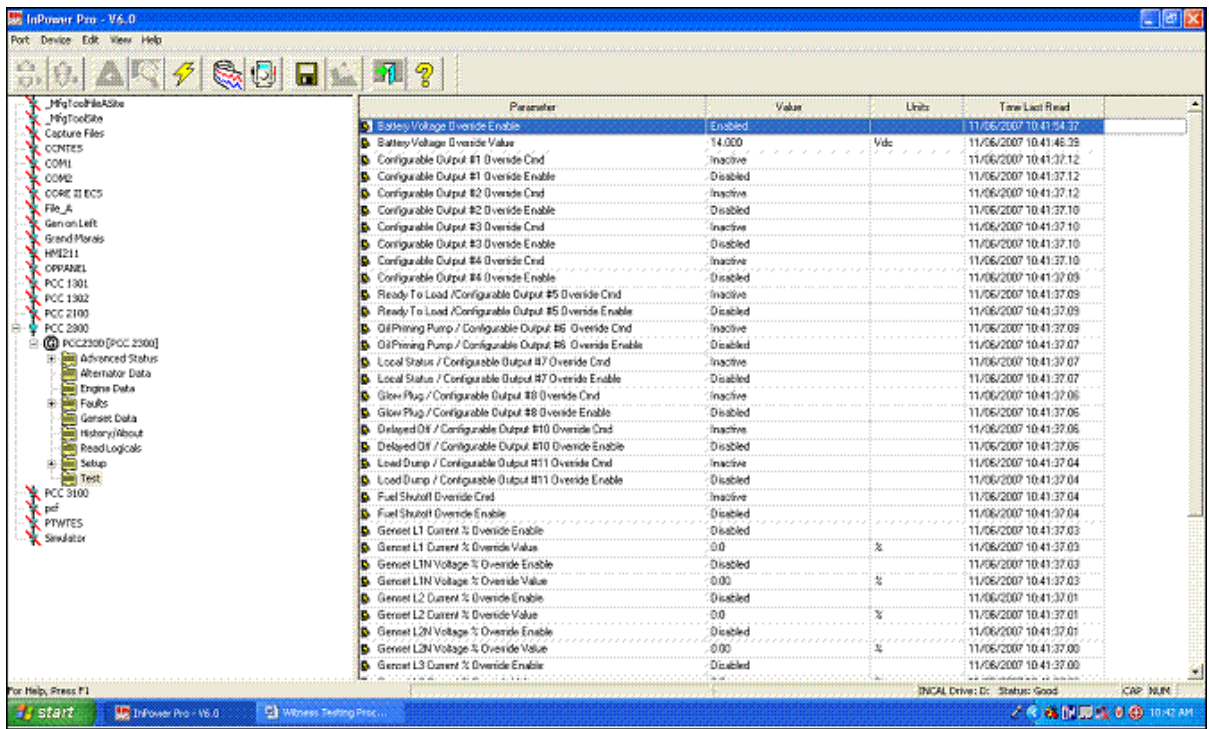
Take note of the following battery voltage settings under Setup > OEM Setup > OEM Engine Setup.

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 Enable to Enable.
2. Under Setup > OEM Setup > OEM Genset Setup > J1939 Aux 101 (Non-LBNG), make sure no Function Pointer is set up to Battery X Voltage where "X" could be 1, 2, or 3.
If so, change it back to None.
3. Set the "Battery Voltage Override Cmd" to the following:
 - If the Nominal Battery Voltage Threshold is set to 12 V, then set the Battery Voltage Override Cmd lower than 12 V Low Battery Voltage Running Threshold and 12 V Low Battery Voltage Stopped Threshold (Default: 12 V).
 - If the Nominal Battery Voltage Threshold is set to 24 V, then set the Battery Voltage Override Cmd lower than 24 V High Battery Voltage Running Threshold and 24 V High Battery Voltage Stopped Threshold (Default: 24 V).
4. (Optional) Set the Low Battery Voltage Set Time to 5 seconds (Default: 60 seconds).
5. Patiently wait for the amount of time that is set in the Low Battery Voltage Set Time to allow FC441 Low Battery Voltage alarm to activate.



Weak Battery Voltage

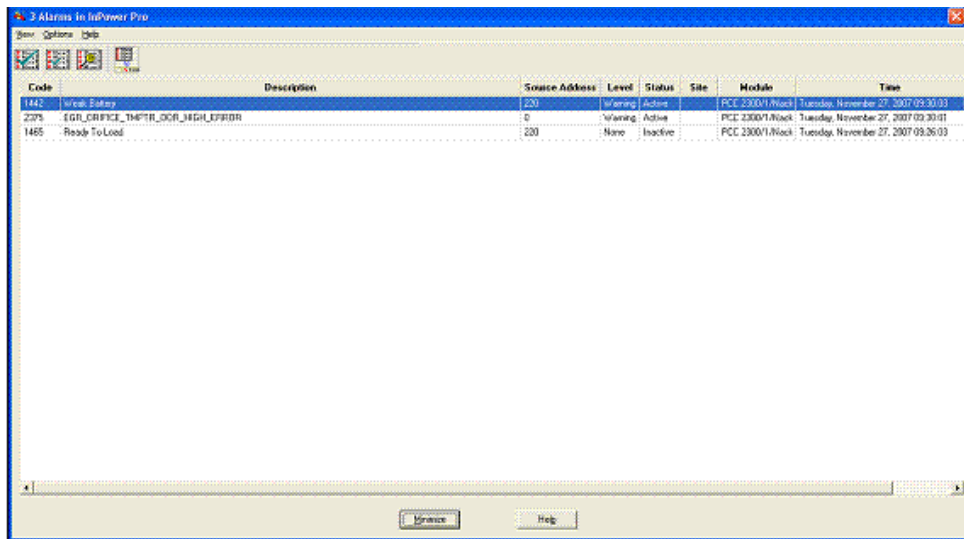
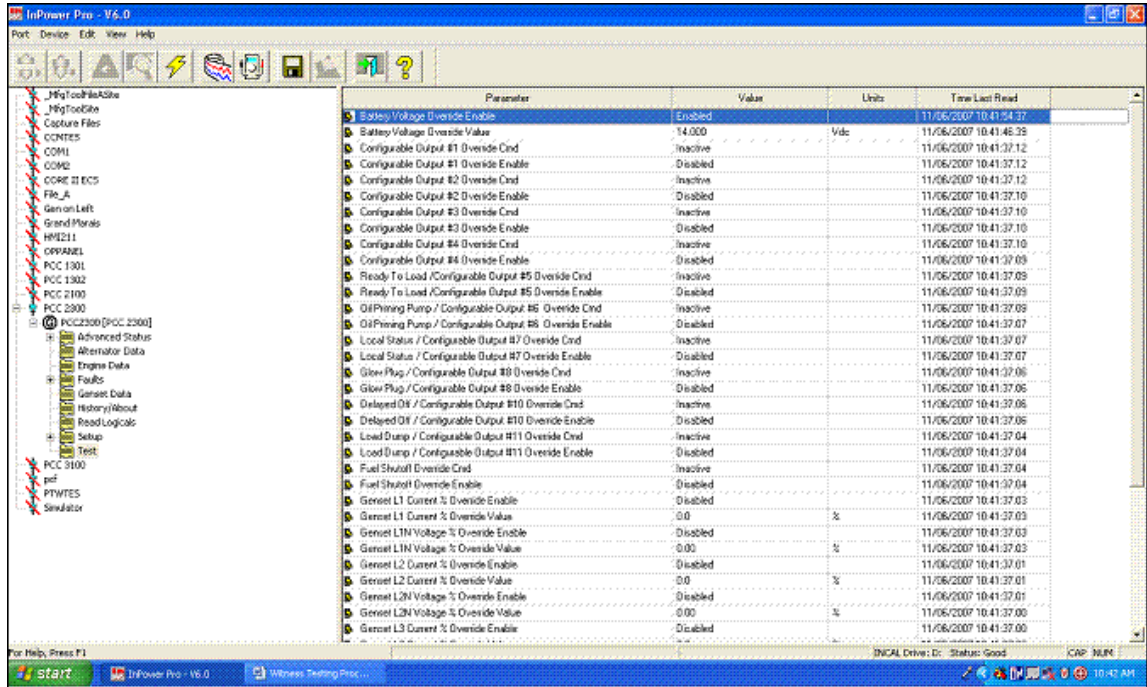
Take note of the following battery voltage settings under Setup > OEM Setup > OEM Engine Setup.

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

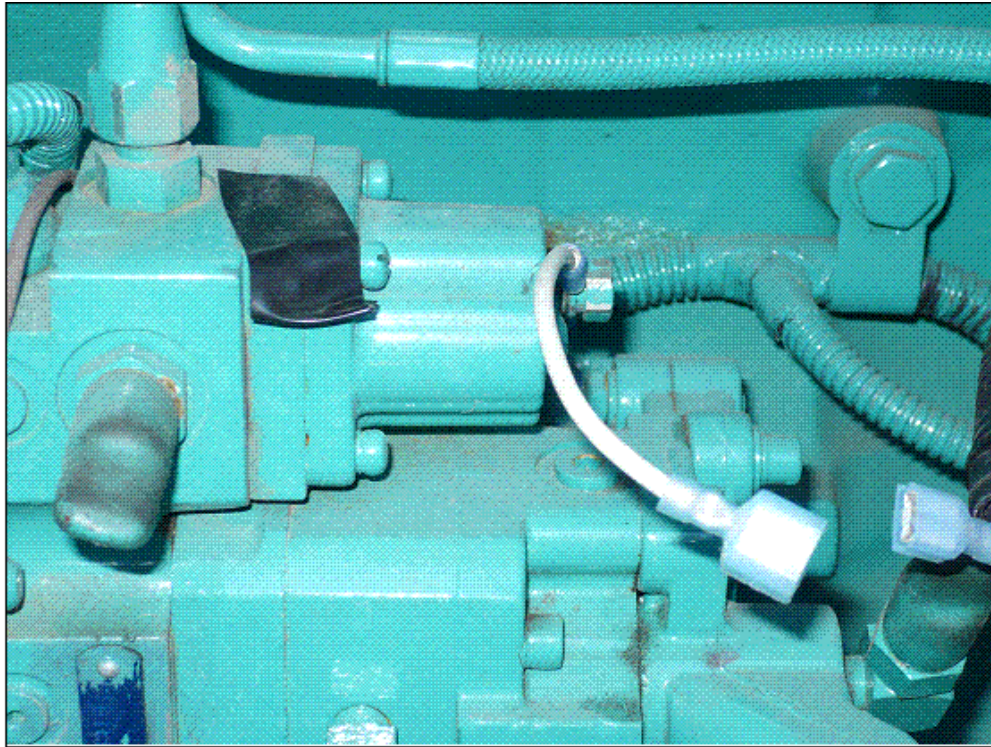
Under Test, follow these steps.

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 generator set by putting the generator set 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.



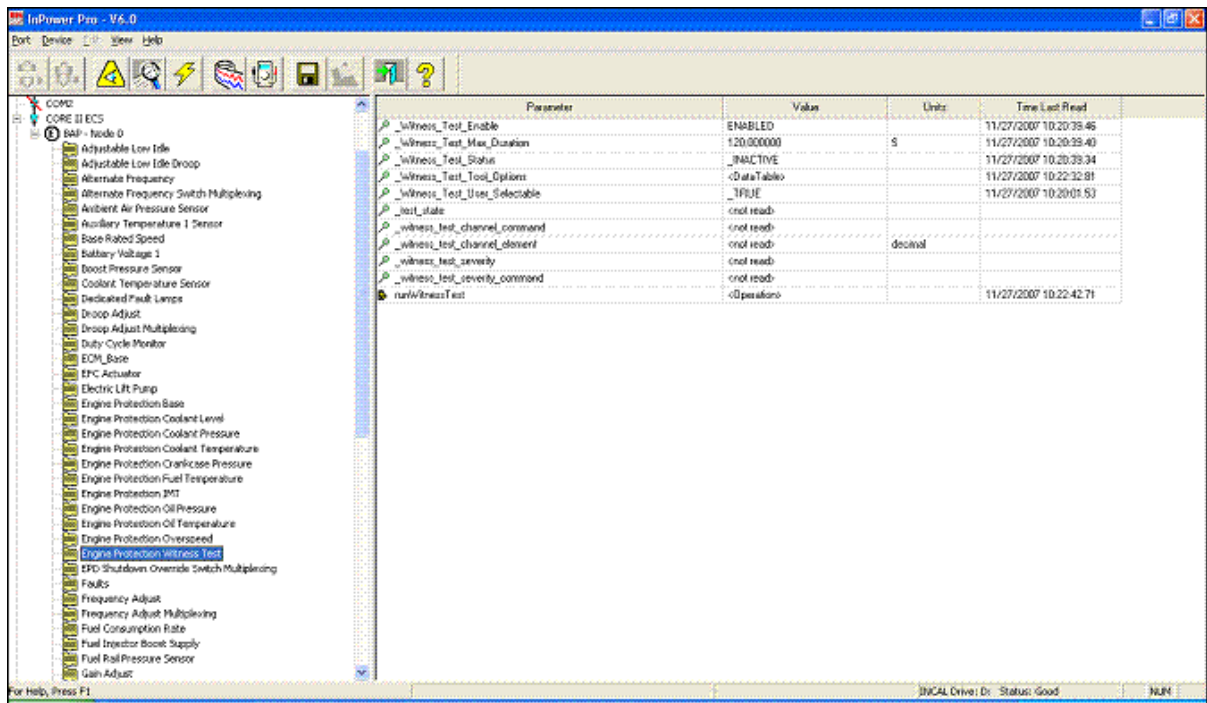
Start the generator set by putting the generator set in Manual mode and pressing Start.

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

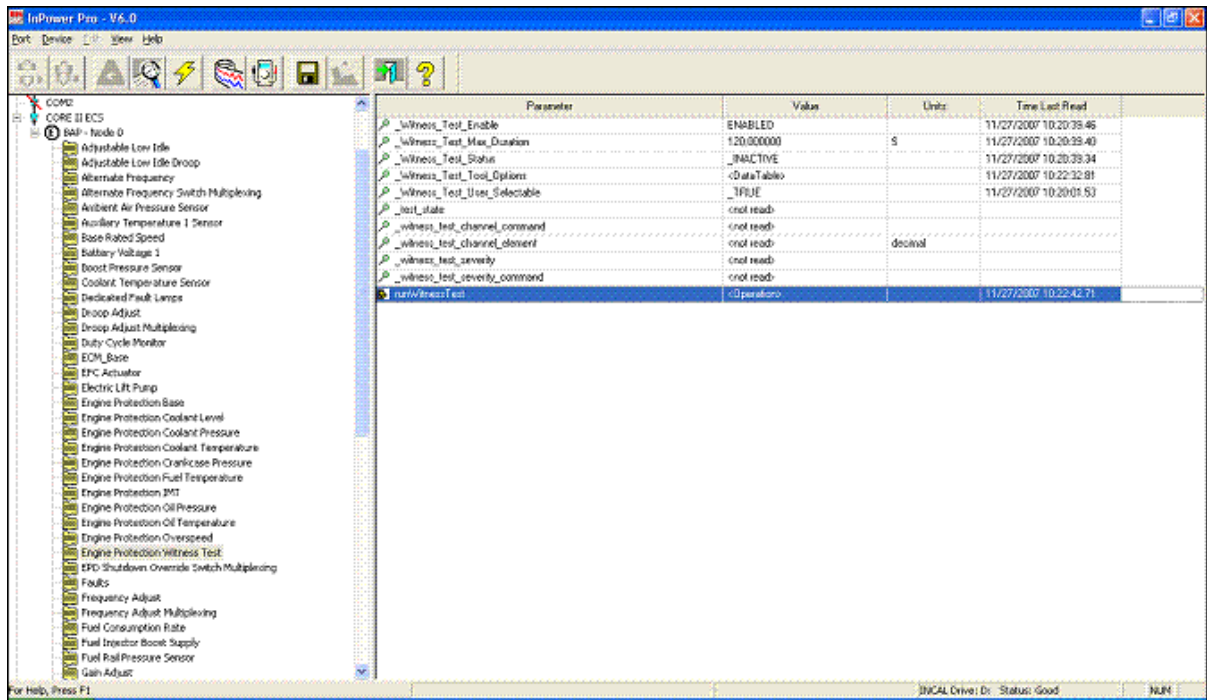
Code	Description	Source Address	Level	Status	Site	Module	Time
350	Engine Failed Automatic Start Condition Exists	220	Shutdown	Active	PCC 23001/1/Black	Tuesday, November 27, 2007 09:56:30	
295	FSO_PWH_LOW_CONTROL_ERROR	0	Warning	Active	PCC 23001/1/Black	Tuesday, November 27, 2007 09:53:55	
1893	338_EGR_VALVE_OPEN_TIMEOUT_ERROR	0	Warning	Inactive	PCC 23001/1/Black	Tuesday, November 27, 2007 09:49:16	
2305	EGR_OPEN_CLOSE_TIMEOUT_ERROR	0	Warning	Inactive	PCC 23001/1/Black	Tuesday, November 27, 2007 09:45:16	
123	Inake Manifold Pressure Sensor Circuit - Voltage Below Normal, or Shorted to Low Source	0	Warning	Inactive	PCC 23001/1/Black	Tuesday, November 27, 2007 09:45:16	
1080	338_EGR_VALVE_OPEN_TIMEOUT_ERROR	0	Warning	Active	PCC 23001/1/Black	Tuesday, November 27, 2007 09:45:07	
123	Inake Manifold Pressure Sensor Circuit - Voltage Below Normal, or Shorted to Low Source	0	Warning	Active	PCC 23001/1/Black	Tuesday, November 27, 2007 09:42:53	
441	Battery 1 Voltage - Data Valid but Below Normal Operational Range - Moderately Severe Level	220	Warning	Inactive	PCC 23001/1/Black	Tuesday, November 27, 2007 09:36:19	

6.11.2 ECM Alarms

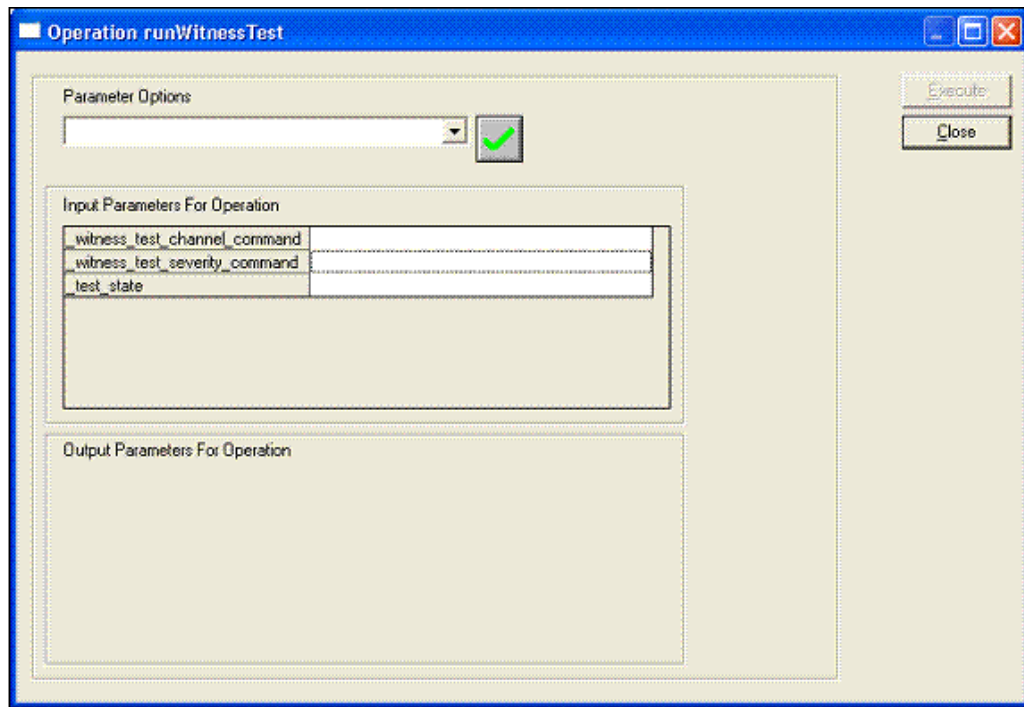
Connect to the ECM with InPower through the Inline 4 or 5 adapter, and click on the CORE II ECS connection. Click on the Engine Protection Witness Test folder as shown below.



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

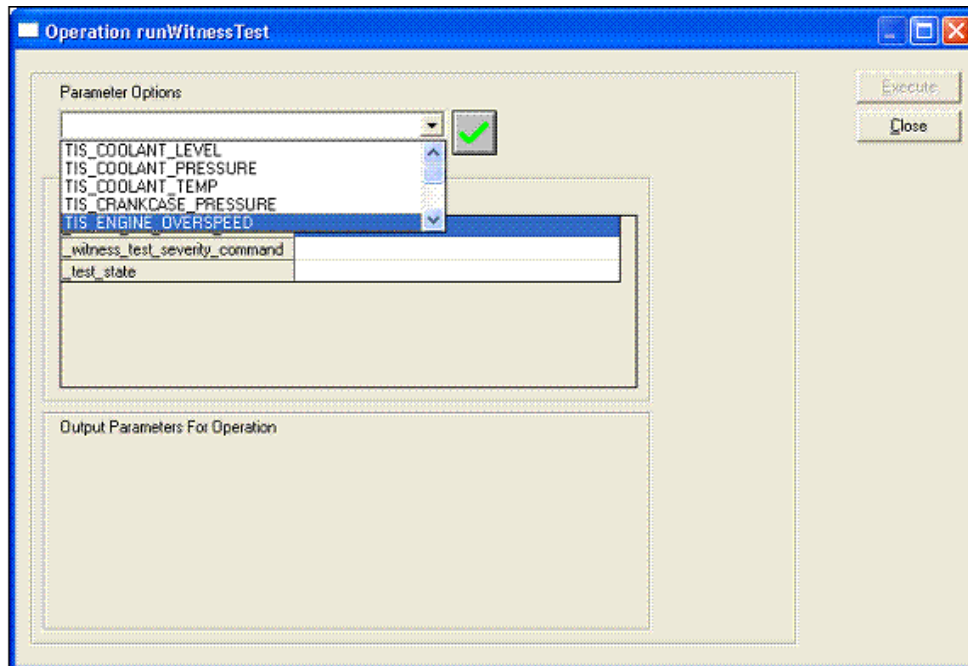


The following screen should appear.

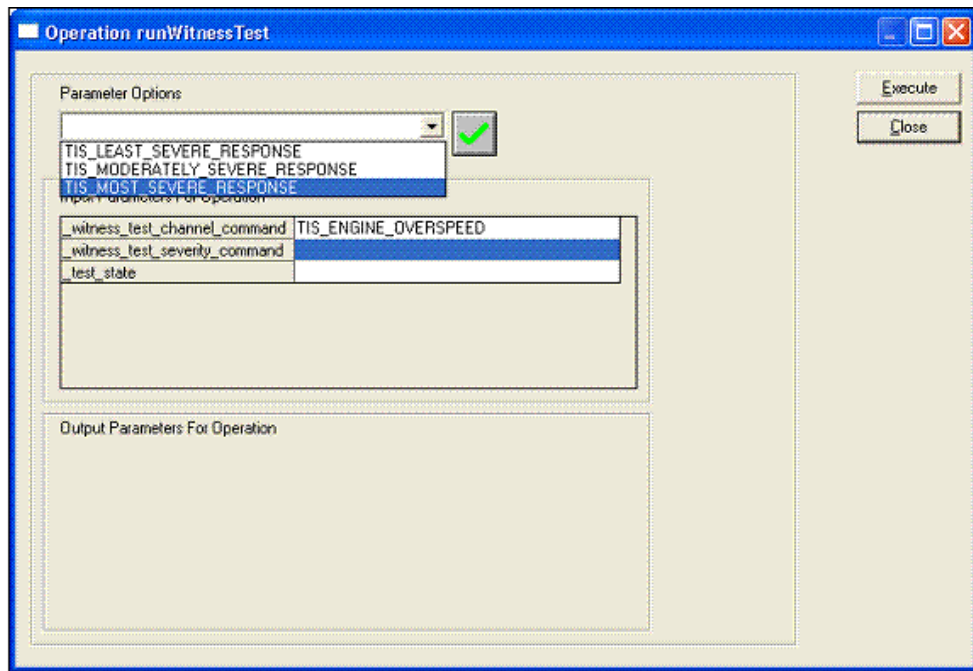


Overspeed

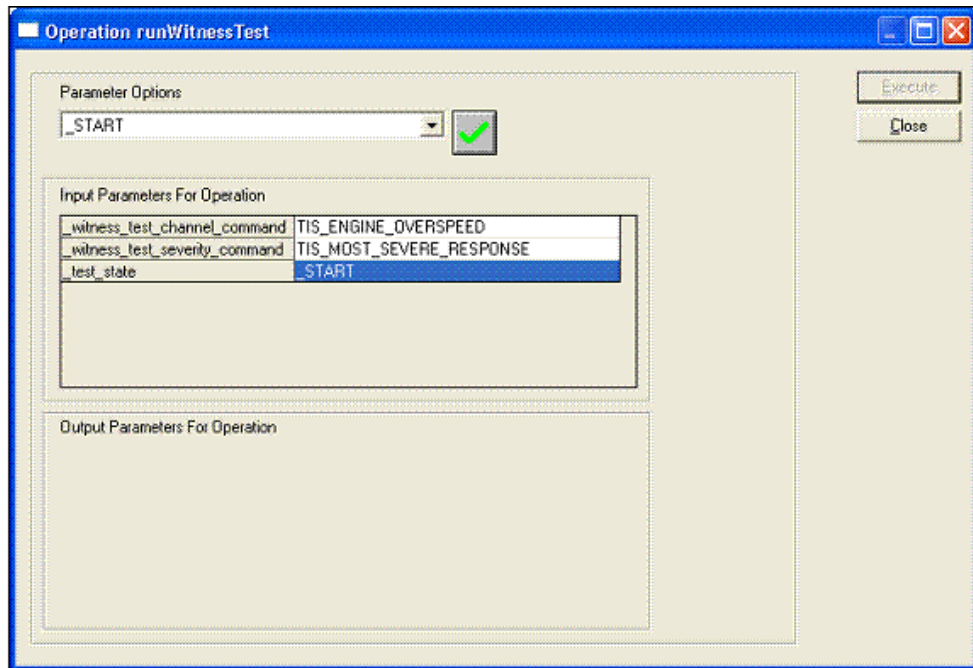
1. Start the generator set by putting the generator set in Manual mode and pressing Start.
2. Follow the instructions under **ECM Alarms** to open the Operation runWitness Test screen.
3. Select TIS_ENGINE_OVERSPEED, and click on the Green Check mark, as shown below.



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.

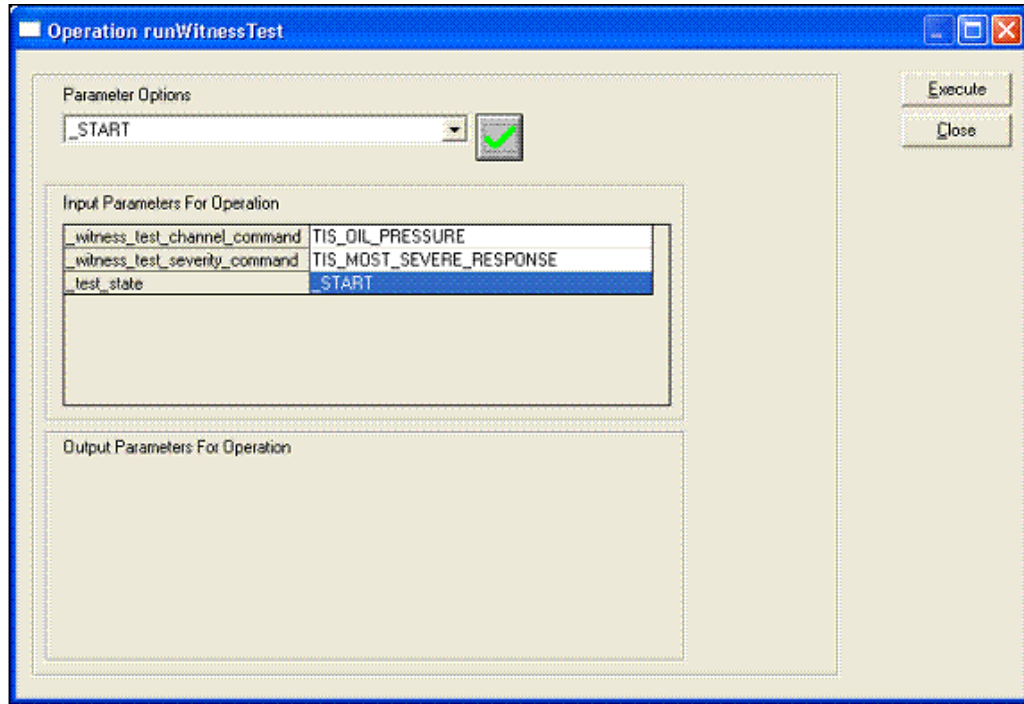
Low Oil Pressure

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.

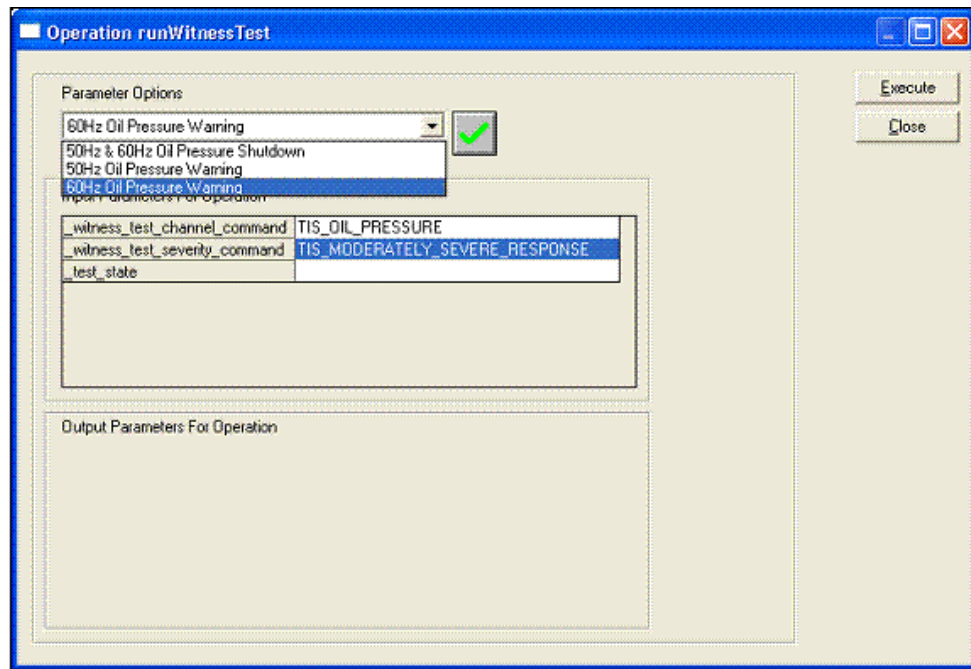


Pre-Low Oil Pressure

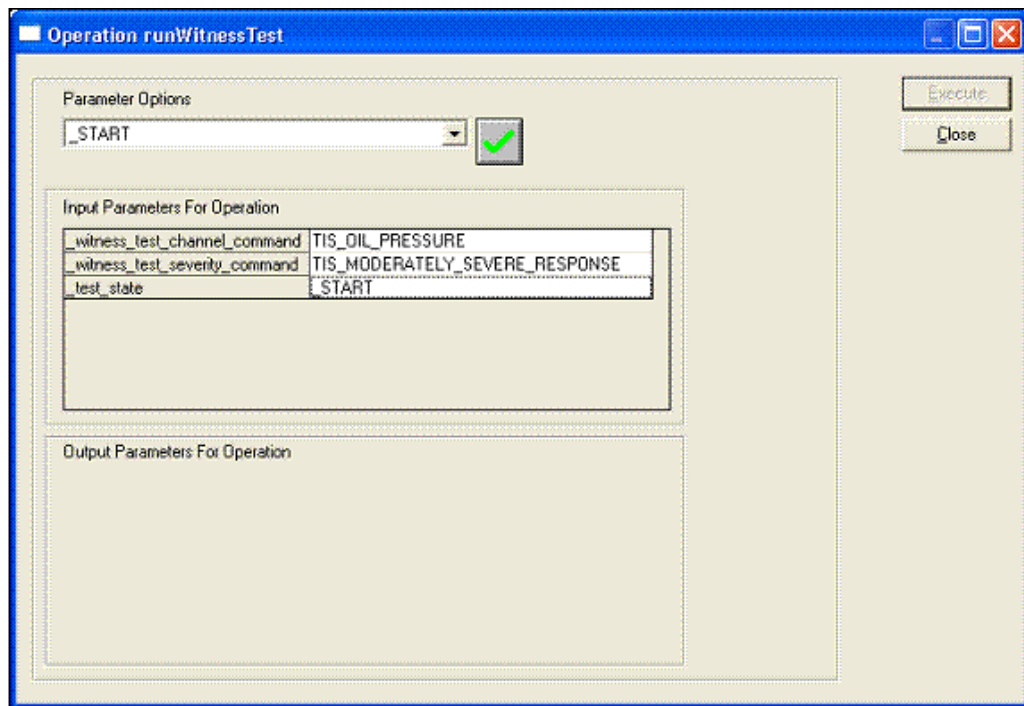
Start the generator set by putting the generator set in Manual mode and pressing Start.

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

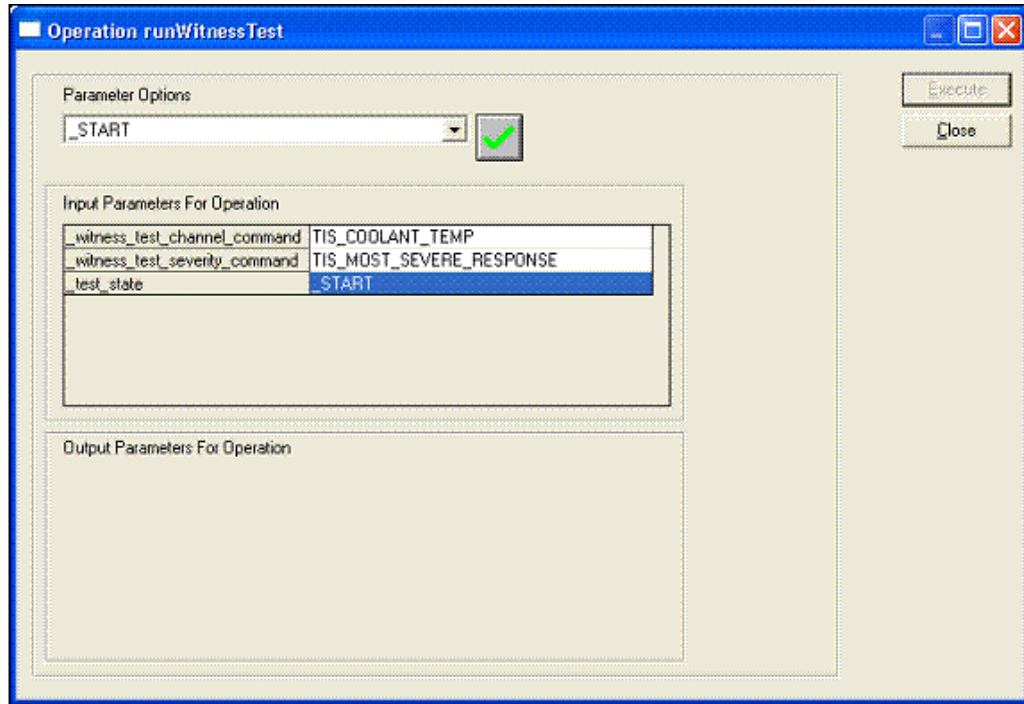
Start the generator set by putting the generator set in Manual mode and pressing Start.

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.



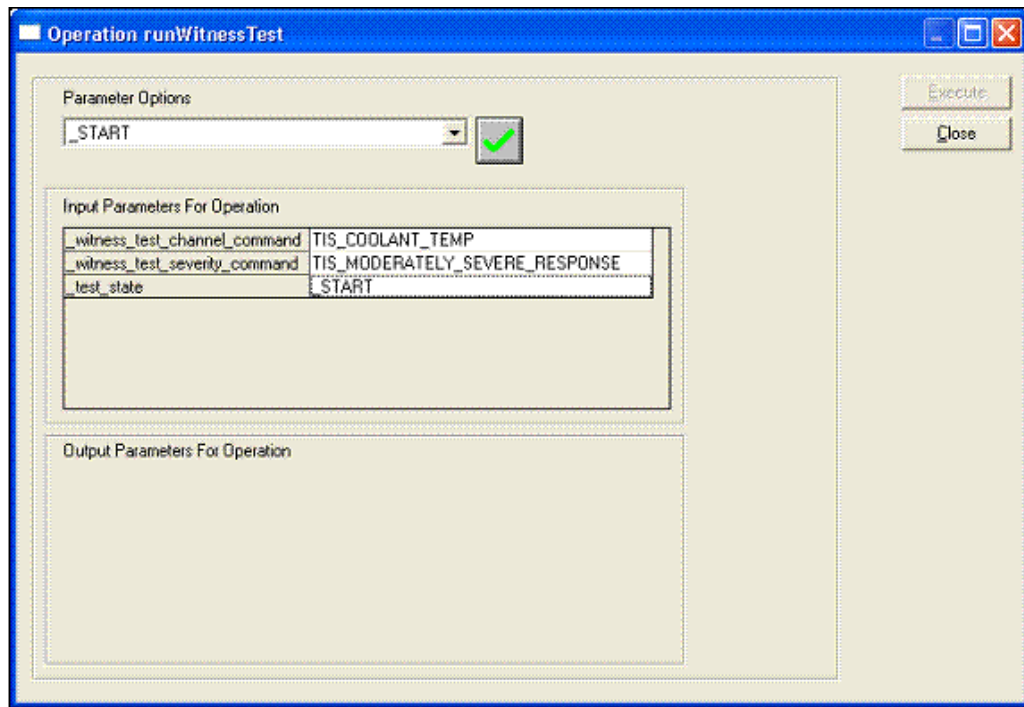
Pre-High Engine Temperature

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.



6.11.3 Additional Generator Set Alarms (Hydromechanical Applications)

Connect to the PCC or AUX105 to run these tests in hydromechanical applications.

Overspeed

1. Connect to the PCC using InPower.
2. Go to Test > Protection Verification > Speed Override for HM Genset.
3. Set *Acceleration Ramp Time* to 15 sec.
4. Enable Setup mode. Take note of the "Overspeed Trip Level" for the appropriate base frequency.
5. Set the "Overspeed Trip Level" to 100 rpm more than *Base Speed*.
6. Set *Speed Reference Override* to 20 rpm more than "Overspeed Trip Level".
7. Save the parameters, and disable Setup mode.
8. Put the generator set in Manual mode, and press Start.
9. Enable *Speed Reference Override Enable*.
10. Monitor the engine speed during *Accel Ramp for Spd Override*. After the speed reaches the override speed, wait for *Overspeed Shutdown Set Time*. The PCC should generate a shutdown fault.
11. Put the generator set into Off mode, and reset the fault.
12. Disable *Speed Reference Override Enable*.
13. Enable Setup Mode, and restore the previous value of "Overspeed Trip Level".
14. Save the parameters, and disable Setup mode.

Low Oil Pressure

1. Connect to the AUX105 using InPower.

2. Go to Test > Protection Verification > Engine Protection Test > Oil Pressure.
3. Put the generator set in Manual mode, and press Start.
4. Go to the Oil Pressure folder in InPower.
5. Make sure *Oil Pressure Sensor Status* is Valid.
6. Set *Oil Pressure Override Command* a little lower than *LOP Shutdown Threshold*.
7. Set *Oil Pressure Override Enable* to Enable.
8. Wait for *LOP Shutdown Set Time*. The PCC should generate a shutdown fault.
9. Put the generator set into Off mode.
10. Set *Oil Pressure Override Enable* to Disable.
11. Reset the fault.

Pre-Low Oil Pressure

1. Connect to the AUX105 using InPower.
2. Go to Test > Protection Verification > Engine Protection Test > Oil Pressure.
3. Put the generator set in Manual mode, and press Start.
4. Go to the Oil Pressure folder in InPower.
5. Make sure *Oil Pressure Sensor Status* is Valid.
6. Set *Oil Pressure Override* higher than *Low Oil Pressure Shutdown Threshold* but lower than *Low Oil Pressure Warning Threshold*.
7. Set *Oil Pressure Override Enable* to Enable.
8. Wait for *Low Oil Pressure Warning Set Time*. The PCC should generate a warning fault.
9. Set *Oil Pressure Override Enable* to Disable.
10. Reset the fault.

High Engine Temperature

1. Connect to the AUX105 using InPower.
2. Go to Test > Protection Verification > Engine Protection Test > Coolant Temperature.

For a shutdown with cooldown test,

1. Set *Coolant Temp override Command* to a value higher than *High Coolant Temperature Shutdown/W Cooldown Threshold* but lower than *High Coolant Temperature Shutdown Threshold*.
2. Set *Coolant Temp Override Enable* to Enable.
3. Wait for *High Coolant Temperature Shutdown Set Time*. The PCC should generate a shutdown with cooldown fault.
4. Set *Coolant Temp Override Enable* to Disable.
5. Put the generator set into Off mode, and reset the fault.

For a shutdown without cooldown test,

1. Set *Coolant Temp override Cmd* higher than *High Coolant Temperature Shutdown Threshold*.
2. Set *Coolant Temp Override Enable* to Enable.
3. Wait for *High Coolant Temperature Shutdown Set Time*. The PCC should generate a shutdown fault.
4. Set *Coolant Temp Override Enable* to Disable.

5. Put the generator set into Off mode, and reset the fault.

Pre-High Engine Temperature

1. Connect to the AUX105 using InPower.
2. Go to Test > Protection Verification > Engine Protection Test > Coolant Temperature.
3. Start the generator set.
4. Set *Coolant Temp override command* higher than *High Coolant Temperature Warning Threshold* but lower than *High Coolant Temperature Shutdown/W Cooldown Threshold*.
5. Set *Coolant Temp Override Enable* to Enable.
6. Wait for *High Coolant Temperature Warning Set Time*. The PCC should generate a warning fault.
7. Set *Coolant Temp Override Enable* to Disable.
8. Reset the fault.

7 Paralleling Operation

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

NOTICE

See [Appendix C](#) for sequence diagrams that summarize the behavior of the PCC in some generator set application types.

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

7.1 Generator Set Application Type

Generator set application type is the primary setting for configuring the paralleling features of the PCC.

[Table 98](#) provides more information about each generator set application type. It indicates what the generator set can run in parallel, what paralleling states or processes are available, and how much control the PCC has over circuit breakers.

TABLE 98. OVERVIEW OF GENERATOR SET APPLICATION TYPES, PARALLELING STATES, AND PARALLELING PROCESSES

	Standalone	Synchronizer Only	Isolated Bus Only	Utility Single	Utility Multiple	Power Transfer Control
Parallel with utility				Yes	Yes	Yes
Parallel with other generator sets			Yes		Yes	
Paralleling States:						
Standby	Yes	Yes	Yes	Yes	Yes	Yes
Dead Bus/First Start			Yes	Yes	Yes	
Synchronize		Yes	Yes	Yes	Yes	Yes
Load Share			Yes		Yes	
Load Govern				Yes	Yes	Yes
Masterless Load Demand (MLD)			Yes			
Genset CB trip	Yes	Yes				
Genset CB control			Yes	Yes	Yes	Yes
Utility CB control						Yes

In general, generator set application types are distinguished by what can run in parallel with the generator set. Synchronizer Only and Power Transfer Control are further distinguished by other characteristics:

- In Synchronizer Only, the generator set is not running in parallel with other generator sets or with the utility, but the PCC can synchronize its voltage, frequency, and phase with one other power source. This is typically used in applications with transfer switches that use fast-close transitions but do not have a built-in synchronizer.
- In Power Transfer Control, the PCC controls the generator set, the generator set circuit breaker, and the utility circuit breaker to make sure the load has power. The PCC does not control the utility circuit breaker in any other generator set application type.

The generator set application type is determined by Genset Application Type.

NOTICE

The PCC does not support paralleling in a single-phase configuration. If Single/3 Phase Connection is set to Single Phase, the generator set application type is Standalone.

7.1.1 Standalone

This generator set application type is shown in [Figure 81](#).

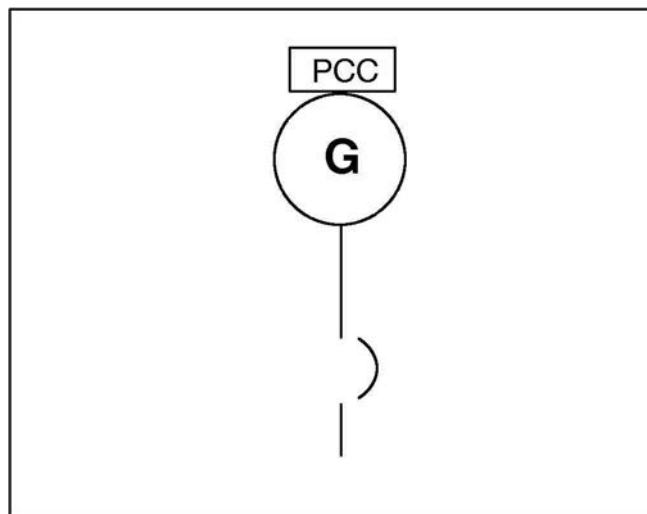


FIGURE 81. GENERATOR SET APPLICATION TYPE: STANDALONE

In this generator set application type, the generator set is not running in parallel with other generator sets or with the utility. The PCC is always in the Standby paralleling state.

7.1.2 Synchronizer Only

NOTICE

See [Appendix A](#) for a sequence diagram that summarizes the behavior of the PCC in this generator set application type.

This generator set application type is shown in [Figure 82](#).

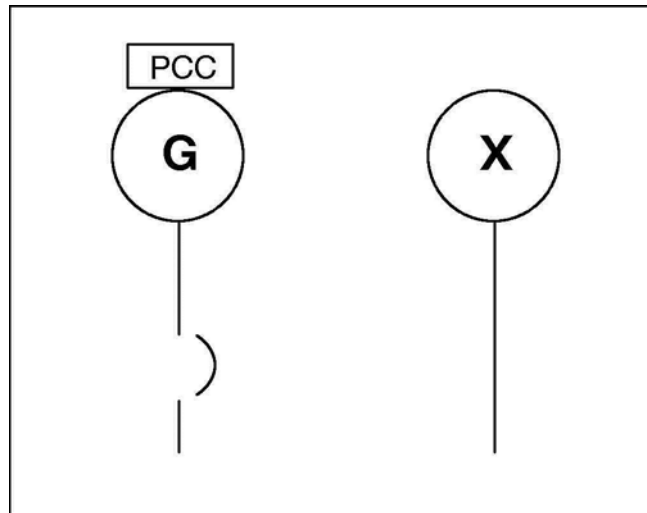


FIGURE 82. GENERATOR SET APPLICATION TYPE: SYNCHRONIZER ONLY

In this generator set application type, the generator set is not running in parallel with other generator sets or with the utility, but the PCC can synchronize its voltage, frequency, and phase with one other power source.

This is typically used in applications with transfer switches that use fast-close transitions but do not have a built-in synchronizer.

The PCC is in the Standby paralleling state until event 1465 (Ready to Load) is active. Then, the PCC synchronizes if all of these conditions are met:

- The sync enable signal is active.
- The synchronizer conditions are met.

If any of these conditions are not met, the PCC is in the Standby paralleling state.

Sync Enable Signal

This signal has no effect unless the synchronizer conditions are met:

This signal may come from any of these sources.

- PCC's Sync Enable connection
- PCCNet devices, such as the Operator Panel
- Modbus networks

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 signal is active 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 synchronizes with the (live) bus if the synchronizer condition are met. When this signal becomes inactive, the PCC does not synchronize with the bus.

7.1.3 Isolated Bus Only

This generator set application type is shown in [Figure 83](#).

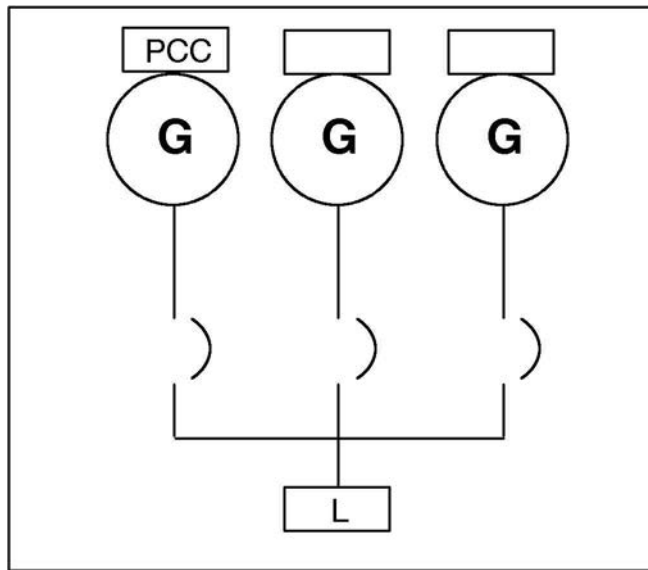


FIGURE 83. GENERATOR SET APPLICATION TYPE: ISOLATED BUS ONLY

In this generator set application type, the generator set is running in parallel with other generator sets.

The PCC is in the Standby paralleling state until event 1465 (Ready to Load) is active. Then, the PCC considers the current position of the generator set circuit breaker, as shown in [Table 99](#).

TABLE 99. ISOLATED BUS ONLY: CONDITIONS FOR EACH PARALLELING STATE

Genset CB	Description
Open	<p>The PCC in the Standby paralleling state.</p> <p>Run the first start process if all of these conditions are met:</p> <ul style="list-style-type: none"> • Bus L1L2 Voltage%, Bus L2L3 Voltage%, and Bus L3L1 Voltage% are less than 20% of Genset Nominal Voltage. • The first start conditions are met. <p>Then, close the generator set circuit breaker if all of these conditions are met:</p> <ul style="list-style-type: none"> • There are no generator set CB open requests. • There is a generator set CB close request. • If the PCC is in Manual mod, the CB Close button is pressed on the Operator Panel. <p>Synchronize if all of these conditions are met:</p> <ul style="list-style-type: none"> • Bus L1L2 Voltage%, Bus L2L3 Voltage%, and Bus L3L1 Voltage% are 60-110% of Genset Nominal Voltage. • Bus Frequency is 60-100% of Base Frequency. • The synchronizer conditions are met. <p>Then, close the generator set circuit breaker if all of these conditions are met:</p> <ul style="list-style-type: none"> • There are no generator set CB open requests. • There is a generator set CB close request.
Closed	<p>The PCC is in the Load Share paralleling state.</p> <p>Open the generator set circuit breaker if there are any generator set CB open requests.</p>

NOTICE

Generator Set with PCC3.3 control can be paralleled with generator set with DIEF's AGC-4 control in Isochronous Load Sharing mode. Refer to Instruction Sheet A053F641 for more details.

7.1.4 Utility Single

NOTICE

See [Appendix A](#) for a sequence diagram that summarizes the behavior of the PCC in this generator set application type.

This generator set application type is shown in [Figure 84](#).

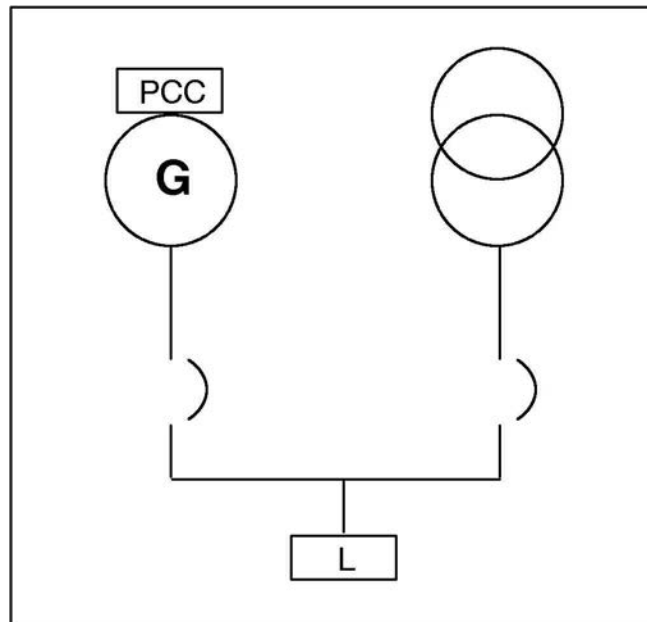


FIGURE 84. GENERATOR SET APPLICATION TYPE: UTILITY SINGLE

In this generator set application type, the generator set is running in parallel with the utility. There are no other generator sets.

NOTICE

If Utility Single Mode Verify/Configurable Input #29 Function Pointer is set to Default, the PCC generates warning fault 1455 (Utility Breaker Position Contact) if Configurable Input #29 is inactive.

The PCC is in the Standby paralleling state until event 1465 (Ready to Load) is active. Then, the PCC considers the current position of the generator set circuit breaker and the utility circuit breaker, as shown in [Table 100](#).

TABLE 100. UTILITY SINGLE: CONDITIONS FOR EACH PARALLELING STATE

Genset CB	Utility CB	Description
Open	Open	The PCC is in the Standby paralleling state. Run the dead bus process. Then, close the generator set circuit breaker if all of these conditions are met: <ul style="list-style-type: none"> • There are no generator set CB open requests. • There is a generator set CB close request. • If the PCC is in Manual mode, the CB Close button is pressed on the Operator Panel.
Open	Closed	The PCC is in the Standby paralleling state. Synchronize if the synchronizer conditions are met. Then, close the generator set circuit breaker if all of these conditions are met: <ul style="list-style-type: none"> • There are no generator set CB open requests. • There is a generator set CB close request.
Closed	Open	The PCC is in the Standby paralleling state. Synchronize if all of these conditions are met: <ul style="list-style-type: none"> • The sync enable signal is active. • The synchronizer conditions are met.
Closed	Closed	The PCC is in the Load Govern paralleling state. Open the generator set circuit breaker if there are any generator set CB open requests.

7.1.5 Utility Multiple

NOTICE

See [Appendix A](#) for a sequence diagram that summarizes the behavior of the PCC in this generator set application type.

This generator set application type is shown in [Figure 85](#).

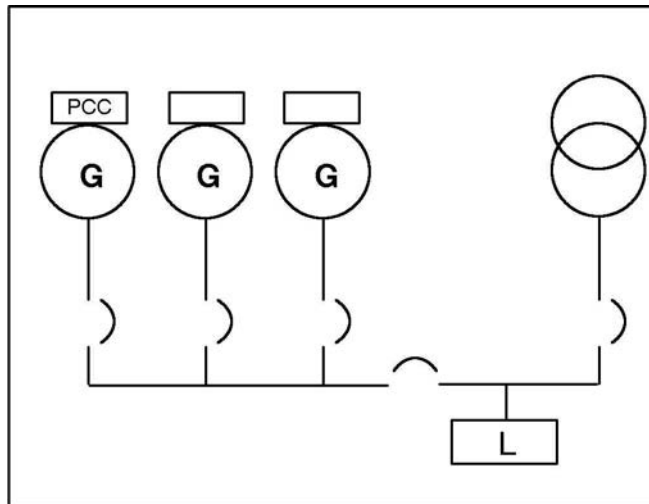


FIGURE 85. GENERATOR SET APPLICATION TYPE: UTILITY MULTIPLE

In this generator set application type, the generator set is running in parallel with other generator sets, and the generator sets are running in parallel with the utility.

The PCC is in the Standby paralleling state until event 1465 (Ready to Load) is active. Then, the PCC considers the current position of the generator set circuit breaker and the utility circuit breaker, as shown in [Table 101](#).

TABLE 101. UTILITY MULTIPLE: CONDITIONS FOR EACH PARALLELING STATE

Genset CB	Utility CB	Description
Open	Open	The PCC is in the Standby paralleling state.
Open	Closed	Run the first start process if all of these conditions are met: Bus L1L2 Voltage%, Bus L2L3 Voltage%, and Bus L3L1 Voltage% are less than 20% of Genset Nominal Voltage. The first start conditions are met. Then, close the generator set circuit breaker if all of these conditions are met: <ul style="list-style-type: none"> • There are no generator set CB open requests. • There is a generator set CB close request. If the PCC is in Manual mode, the CB Close button is pressed on the Operator Panel. Synchronize if all of these conditions are met: <ul style="list-style-type: none"> • Bus L1L2 Voltage%, Bus L2L3 Voltage%, and Bus L3L1 Voltage% are 60-110% of Genset Nominal Voltage. • Bus Frequency is 60-100% of Base Frequency. • The synchronizer conditions are met. Then, close the generator set circuit breaker if all of these conditions are met: <ul style="list-style-type: none"> • There are no generator set CB open requests. • There is a generator set CB close request.
Closed	Open	The PCC is in the Load Share paralleling state. Open the generator set circuit breaker if there are any generator set CB open requests.

Genset CB	Utility CB	Description
Closed	Closed	The PCC is in the Load Govern paralleling state. Open the generator set circuit breaker if there are any generator set CB open requests.

7.1.6 Power Transfer Control

This generator set application type is shown in [Figure 86](#).

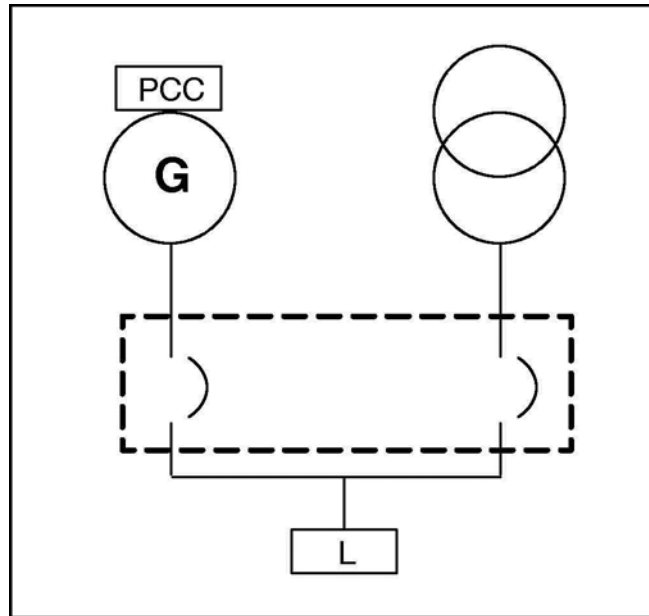


FIGURE 86. GENERATOR SET APPLICATION TYPE: POWER TRANSFER CONTROL

In this generator set application type, the generator set is typically running in parallel with the utility. There are no other generator sets.

NOTICE

If Utility Single Mode Verify / Configurable Input #29 is inactive, the PCC generates warning fault 1455 (Utility Breaker Position Contact).

The PCC controls the generator set, the generator set circuit breaker, and the utility circuit breaker to make sure the load has power. For example, the PCC monitors the utility. If the utility fails, the PCC starts the generator set and transfers the load to the generator set. When the utility is available again, the PCC transfers the load to the utility and shuts down the generator set.

In power transfer control (PTC), you can also test the generator set, exercise the generator set, and run the generator set in parallel with the utility.

7.1.6.1 PTC Operating Mode

The PTC operating mode determines the conditions under which the PCC opens and closes the generator set circuit breaker and the utility circuit breaker, as well as the conditions under which the PCC starts and stops the generator set.

The PTC operating mode is related to the mode of operation. The following table provides a summary of the relationships between the mode of operation and the PTC operating mode.

TABLE 102. SUMMARY OF RELATIONSHIPS BETWEEN MODES OF OPERATION AND PTC OPERATING MODES

Mode of Operation	Condition	PTC Operating Mode
Off	Default mode	Off
Auto	Default mode	Normal
	PTC mode switch signal	Manual
	Exercise signal	Exercise
	Remote start signal	Test
	Extended parallel signal	Extended Parallel
	Generator Set is unavailable	Normal Override
	Utility is unavailable	Utility Fail
Manual	Default mode	Manual

NOTICE

The conditions in this table are intended to be helpful, but they are not complete. The specific conditions required for each PTC operating mode are explained in more detail when each PTC operating mode is introduced.

7.1.6.1.1 Exercise Mode

In this PTC operating mode, the PCC responds to the exercise signal.

This PTC operating mode is similar to the Test PTC operating mode with these exceptions:

- The exercise signal replaces the remote start signal, and the remote start signal must be inactive.
- If the exercise scheduler is active, Scheduler Program Run Mode replaces Test With Load Enable.

7.1.6.1.2 Extended Parallel Mode

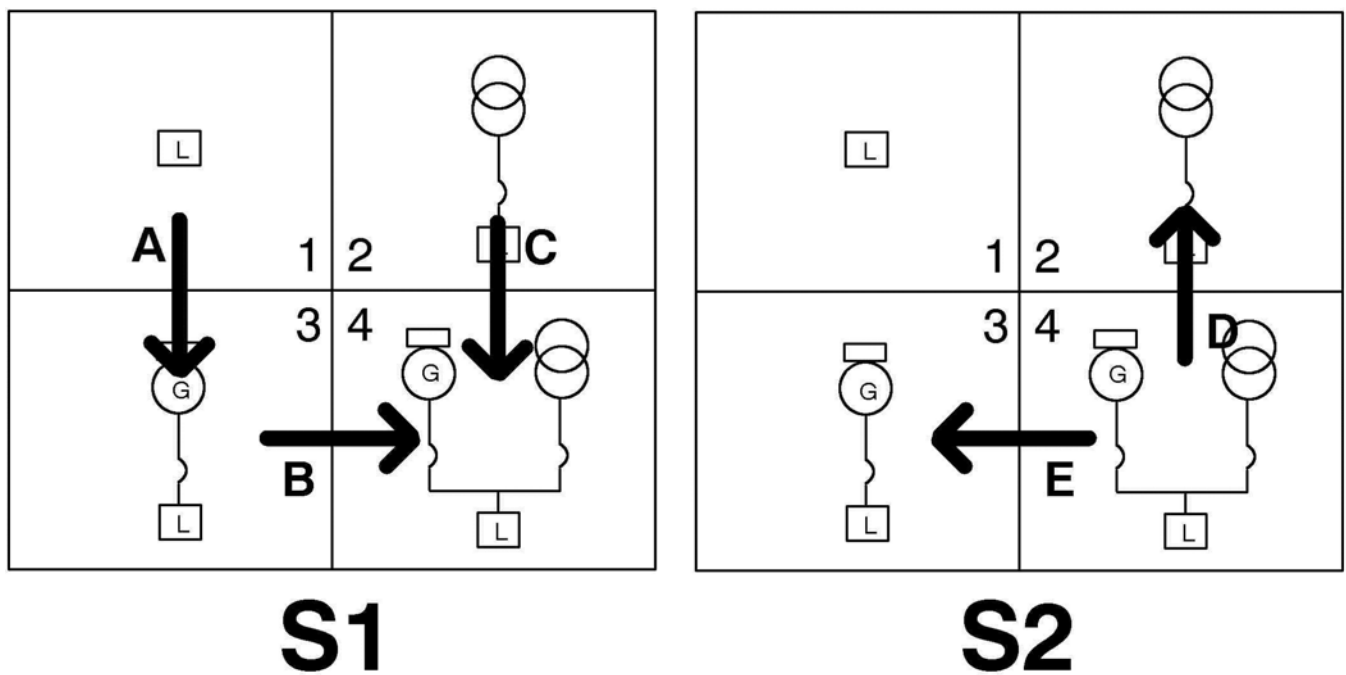
In this PTC operating mode, the PCC responds to the extended parallel signal. The generator set and the utility are supposed to run in parallel.

The PCC is in this PTC operating mode when all of these conditions are met:

- Single/3 Phase Connection is set to Three Phase.
- The PTC mode switch signal is inactive.
- The PCC is in Auto mode.
- The extended parallel signal is active.
- Extended Parallel Enable is set to Enable.
- Utility CB Position Status is set to Closed; or the generator set is available, and Genset CB Position Status is set to closed.

When the PCC enters this PTC operating mode, it initiates a Non-emergency Start sequence if the generator set is not running.

In this PTC operating mode, the PCC considers the current position of the generator set circuit breaker and the utility circuit breaker. See [Section 7.3.3](#) for more information about circuit breaker control.



S1	Typical control.
S2	The genset becomes unavailable, or the utility becomes unavailable.

FIGURE 87. CIRCUIT BREAKER CONTROL IN EXTENDED PARALLEL MODE

As illustrated in the figure above, the PCC tries to run the generator set and the utility in parallel in this PTC operating mode. If they are not in parallel when the PCC enters this PTC operating mode, the PCC synchronizes the generator set with the utility and closes the appropriate circuit breaker(s) until they are in parallel.

TABLE 103. CIRCUIT BREAKER CONTROL IN EXTENDED PARALLEL MODE

#	Genset CB	Utility CB	Description
1	Open	Open	The PCC is in the Standby paralleling state. A: Close the generator set circuit breaker if all of these conditions are met: <ul style="list-style-type: none"> • The generator set is available. • Programmed Transition Delay has expired.
2	Open	Closed	The PCC is in the Standby paralleling state. B: Synchronize if all of these conditions are met: <ul style="list-style-type: none"> • The generator set is available. • The utility is available. • Transfer Delay (TDNE) has expired, or the transfer/retransfer inhibit override signal is active. • The transfer inhibit signal is inactive. • Warning fault 2397 (Utility Breaker Fail To Open) is inactive. • Warning fault 1999 (Maximum Parallel Time) is inactive. • The synchronizer conditions are met. Then, close the generator set circuit breaker when the generator set and the utility are synchronized.
3	Closed	Open	The PCC is in the Standby paralleling state. C: Synchronize if all of these conditions are met: <ul style="list-style-type: none"> • The generator set is available. • The utility is available. • Retransfer Delay (TDEN) has expired, or the transfer/retransfer inhibit override signal is active. • The retransfer inhibit signal is inactive. • Warning fault 1453 (Genset Breaker Fail To Open) is inactive. • The synchronizer conditions are met. Then, close the utility circuit breaker when the generator set and the utility are synchronized.
4	Closed	Closed	The PCC is in the Load Govern paralleling state. D: Open the generator set circuit breaker if the generator set is not available. E: Open the utility circuit breaker if the utility is not available.

All transitions in this PTC operating mode are soft closed transitions, regardless of Transition Type.

7.1.6.1.3 Manual Mode

This is the default PTC operating mode when Single/3 Phase Connection is set to Three Phase and one of these conditions is met:

- The PTC mode switch signal is active.
- The PCC is in Manual mode.

When the PCC enters this PTC operating mode, it may start or stop the generator set. See **Manual Mode**.

In this PTC operating mode, the PCC considers the current position of the generator set circuit breaker and the utility circuit breaker. See [Section 7.3.3](#) for more information about circuit breaker control.

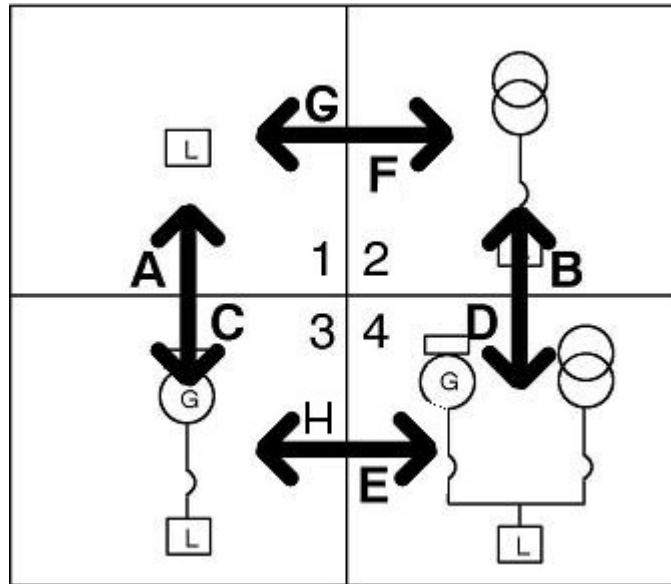


FIGURE 88. CIRCUIT BREAKER CONTROL IN MANUAL MODE

As illustrated in the figure above, you can open and close the generator set circuit breaker in this PTC operating mode. You can run the generator set in parallel with the utility, but the sync enable signal is required to synchronize the generator set with the utility.

If the utility becomes unavailable while the generator set and the utility are in parallel, the PCC opens the utility circuit breaker in this PTC operating mode.

TABLE 104. CIRCUIT BREAKER CONTROL IN MANUAL MODE

#	Genset CB	Utility CB	Description
1	Open	Open	<p>The PCC is in the Standby paralleling state.</p> <p>A: Close the generator set circuit breaker if all of these conditions are met:</p> <ul style="list-style-type: none"> • The CB Close button is pressed. • The generator set is available. • Programmed Transition Delay has expired. <p>G: Close the utility circuit breaker if all of these conditions are met:</p> <ul style="list-style-type: none"> • The CB Close button is pressed. • The utility is available. • Programmed Transition Delay has expired.
2	Open	Closed	<p>The PCC is in the Standby paralleling state.</p> <p>F: Open the utility circuit breaker if the CB Open button is pressed.</p> <p>B: Close the generator set circuit breaker if all of these conditions are met:</p> <ul style="list-style-type: none"> • The CB Close button is pressed. • The generator set is available. • The utility is available. • Transition Type is set to Hard Closed Transition or Soft Closed Transition. • Warning fault 2397 (Utility Breaker Fail To Open) is inactive. • Warning fault 1999 (Maximum Parallel Time) is inactive. • The generator set and the utility are synchronized. <p>Note: Synchronization requires the sync enable signal. Without it, the PCC does not automatically synchronize the generator set and the utility.</p>
3	Closed	Open	<p>The PCC is in the Standby paralleling state.</p> <p>C: Open the generator set circuit breaker if the CB Open button is pressed.</p> <p>H: Close the utility circuit breaker if all of these conditions are met:</p> <ul style="list-style-type: none"> • The CB Close button is pressed. • The generator set is available. • The utility is available. • Transition Type is set to Hard Closed Transition or Soft Closed Transition. • Warning fault 1453 (Genset CB Fail To Open) is inactive. • The generator set and the utility are synchronized. <p>Note: Synchronization requires an external signal. The PCC does not automatically synchronize the generator set and the utility, and it does not close the utility circuit breaker until the generator set and the utility are synchronized.</p>

#	Genset CB	Utility CB	Description
4	Closed	Closed	<p>The PCC is in the Load Govern paralleling state.</p> <p>D: Open the generator set circuit breaker if one of these conditions is met:</p> <ul style="list-style-type: none"> • The CB Open button is pressed. • Transition Type is set to Open Transition. • Maximum Parallel Time (TDMP) has expired. • The generator set is not available. <p>E: Open the utility circuit breaker if the utility is not available.</p>

7.1.6.1.4 Normal Mode

In this PTC operating mode, the load should be powered by the utility.

This is the default PTC operating mode when all of these conditions are met:

- Single/3 Phase Connection is set to Three Phase.
- The PTC mode switch signal is inactive.
- The PCC is in Auto mode.
- The utility is available.

When the PCC enters this PTC operating mode, it initiates a Shutdown with Cooldown sequence if all of these conditions are met:

- The generator set is running.
- Utility CB Position Status is set to Closed.
- Genset CB Position Status is set to Open.

In this PTC operating mode, the PCC considers the current position of the generator set circuit breaker and the utility circuit breaker. See [Section 7.3.3](#) for more information about circuit breaker control.

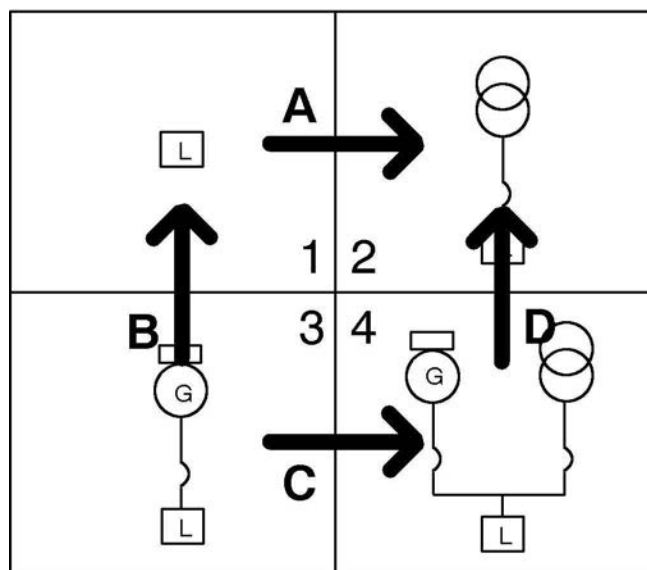


FIGURE 89. CIRCUIT BREAKER CONTROL IN NORMAL MODE

As illustrated in the figure above, the PCC tries to connect the utility to the load in this PTC operating mode. If it succeeds, it shuts down the generator set.

TABLE 105. CIRCUIT BREAKER CONTROL IN NORMAL MODE

#	Genset CB	Utility CB	Description
1	Open	Open	The PCC is in the Standby paralleling state. A: Close the utility circuit breaker if Programmed Transition Delay has expired.
2	Open	Closed	The PCC is in the Standby paralleling state. Initiate a Shutdown with Cooldown sequence if the generator set is running.
3	Closed	Open	The PCC is in the Standby paralleling state. B: Open the generator set circuit breaker if one of these conditions is met: <ul style="list-style-type: none"> • Transition Type is set to Open Transition, the retransfer inhibit signal is inactive, and either Retransfer Delay (TDEN) has expired or the transfer/retransfer inhibit override signal is active. • The generator set is not available. • Warning fault 1457 (Fail To Synchronize) is active, Fail To Sync Open Transition Retransfer Enable is set to Enable, and the retransfer inhibit signal is inactive. C: Synchronize if all of these conditions are met: <ul style="list-style-type: none"> • The generator set is available. • The utility is available. • Transition Type is set to Hard Closed Transition or Soft Closed Transition. • The retransfer inhibit signal is inactive. • Retransfer Delay (TDEN) has expired, or the transfer/retransfer inhibit override signal is active. • Warning fault 1453 (Genset Breaker Fail To Open) is inactive. • The synchronizer conditions are met. Then, close the utility circuit breaker when the generator set and the utility are synchronized.
4	Closed	Closed	The PCC is in the Load Govern paralleling state. D: Open the generator set circuit breaker if one of these conditions is met: <ul style="list-style-type: none"> • The generator set is not available. • Transition Type is set to Open Transition or Hard Closed Transition. • Maximum Parallel Time (TDMP) has expired. • The PCC is running the load govern kW ramp unload process; and Load Govern kW Reference is zero.

7.1.6.1.5 Normal Override Mode

In this PTC operating mode, the PCC responds to the loss or potential loss of the generator set.

The PCC is in this PTC operating mode when the Single/3 Phase Connection is set to Three Phase, the PTC mode switch signal is inactive, PCC is in Auto mode, the utility is available, and one of these conditions is met:

- There is a shutdown fault.
- Utility CB Position Status is set to Open when the generator set becomes unavailable.
- Genset CB Position Status is set to Closed, and the generator set is unavailable.

- Warning fault 1452 (Genset Breaker Fail To Close) is inactive.
- There is a warning fault, the remote start signal is active, and the start type signal is active.
- There is a warning fault, and the exercise signal is active.

When the PCC enters this PTC operating mode, it initiates a Shutdown with Cooldown sequence if all of these conditions are met:

- The generator set is running.
- Utility CB Position Status is set to Closed.
- Genset CB Position Status is set to Open.

In this PTC operating mode, the PCC considers the current position of the generator set circuit breaker and the utility circuit breaker. See [Section 7.3.3](#) for more information about circuit breaker control.

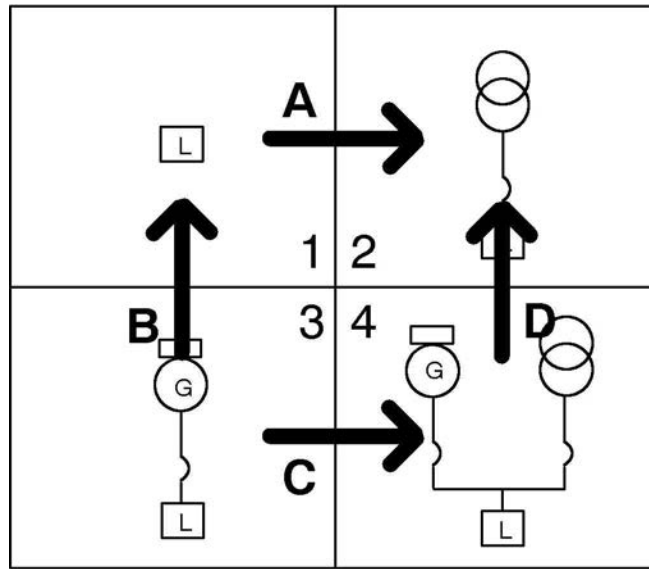


FIGURE 90. CIRCUIT BREAKER CONTROL IN NORMAL OVERRIDE MODE

As illustrated in the figure above, the PCC tries to connect the utility to the load in this PTC operating mode. If it succeeds, it shuts down the generator set.

TABLE 106. CIRCUIT BREAKER CONTROL IN NORMAL OVERRIDE MODE

#	Genset CB	Utility CB	Description
1	Open	Open	The PCC is in the Standby paralleling state. A: Close the utility circuit breaker if Programmed Transition Delay has expired.
2	Open	Closed	Initiate a Shutdown with Cooldown sequence if the generator set is running. The PCC is in the Standby paralleling state.

#	Genset CB	Utility CB	Description
3	Closed	Open	<p>The PCC is in the Standby paralleling state.</p> <p>B: Open the generator set circuit breaker if one of these conditions is met:</p> <ul style="list-style-type: none"> • The generator set is not available. • Transition Type is set to Open Transition. • Warning fault 1457 (Fail To Synchronize) is active, Fail To Sync Open Transition Retransfer Enable is set to Enable, and the retransfer inhibit signal is inactive. <p>C: Synchronize if all of these conditions are met:</p> <ul style="list-style-type: none"> • The generator set is available. • Transition Type is set to Hard Closed Transition or Soft Closed Transition. • Warning fault 1453 (Genset Breaker Fail To Open) is inactive. • The synchronizer conditions are met. <p>Then, close the utility circuit breaker when the generator set and the utility are synchronized.</p>
4	Closed	Closed	<p>The PCC is in the Load Govern paralleling state.</p> <p>D: Open the generator set circuit breaker if one of these conditions is met:</p> <ul style="list-style-type: none"> • The generator set is not available. • Transition Type is set to Open Transition or Hard Closed Transition. • Maximum Parallel Time (TDMP) has expired. • The PCC is running the load govern kW ramp unload process; and Load Govern kW Reference is zero.

7.1.6.1.6 Off Mode

The PCC is in this PTC operating mode when the PTC mode switch signal is inactive and one of these conditions is met:

- The PCC is in Off mode.
- Single/3 Phase Connection is set to Single Phase.

When the PCC enters this PTC operating mode, it initiates a Shutdown Without Cooldown sequence if the generator set is running.

In this PTC operating mode, the PCC does not open or close the generator set circuit breaker or the utility circuit breaker. It also does not allow the generator set to start. You have to change the PTC operating mode if you want to start the generator set.

7.1.6.1.7 Test Mode

In this PTC operating mode, the PCC responds to the remote start signal.

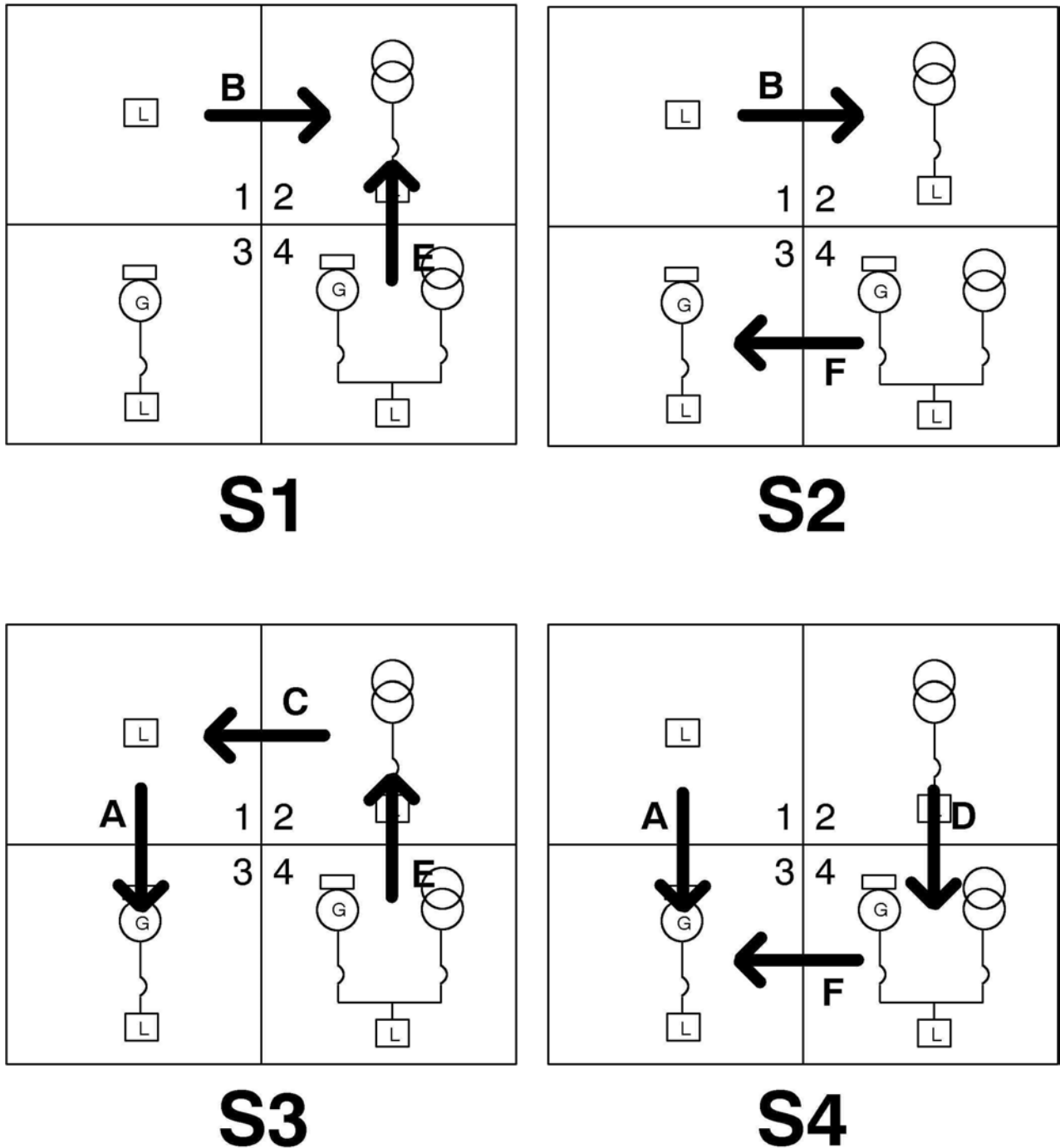
The PCC enters this PTC operating mode when all of these conditions are met:

- Single/3 Phase Connection is set to Three Phase.
- The PTC mode switch signal is inactive.
- The PCC is in Auto mode.
- The remote start signal is active.
- The utility is available.

- The PCC is not in Extended Parallel PTC operating mode.
- One of these conditions is met:
 - Utility CB Position Status is set to Closed, and Genset CB Position Status is set to Open.
 - The generator set is available, Genset CB Position Status is set to Closed, and Utility CB Position Status is set to Open.

When the PCC enters this PTC operating mode, it starts the generator set if the generator set is not running already. See **Remote Start Signal**.

In this PTC operating mode, the PCC considers the current position of the generator set circuit breaker and the utility circuit breaker. See [Section 7.3.3](#) for more information about circuit breaker control.



S1	Test With Load Enable = Disabled, Transition Type = Open Transition.
S2	Test With Load Enable = Disabled, Transition Type = Hard Closed Transition or Soft Closed Transition.
S3	Test With Load Enable = Enabled, Transition Type = Open Transition.
S4	Test With Load Enable = Enabled, Transition Type = Hard Closed Transition or Soft Closed Transition.

FIGURE 91. CIRCUIT BREAKER CONTROL IN TEST MODE AND IN EXERCISE MODE

As illustrated in the figure above, the PCC's behavior depends on Test With Load Enable and Transition Type in this PTC operating mode.

If Test With Load Enable is set to Disabled, the PCC tries to connect the utility to the load. However, if the generator set is connected to the load but the utility is not, the PCC does not change the position of the circuit breakers.

If Test With Load Enable is set to Enabled, the PCC tries to connect the generator set to the load.

NOTICE

If Genset CB Position Status is set to Closed and Utility CB Position Status is set to Open, the PCC does not open or close either circuit breaker, even if Test with Load Enable is set to Disabled.

Transition Type determines the way the PCC controls the circuit breakers to connect the desired source to the load.

TABLE 107. CIRCUIT BREAKER CONTROL IN TEST MODE AND IN EXERCISE MODE

#	Genset CB	Utility CB	Description
1	Open	Open	<p>The PCC is in the Standby paralleling state.</p> <p>A: Close the generator set circuit breaker if all of these conditions are met:</p> <ul style="list-style-type: none"> • The generator set is available. • Programmed Transition Delay has expired. • Test With Load Enable is set to Enabled. <p>B: Close the utility circuit breaker if all of these conditions are met:</p> <ul style="list-style-type: none"> • Programmed Transition Delay has expired. • Test With Load Enable is set to Disabled.
2	Open	Closed	<p>The PCC is in the Standby paralleling state.</p> <p>C: Open the utility circuit breaker if all of these conditions are met:</p> <ul style="list-style-type: none"> • The generator set is available. • Transition Type is set to Open Transition. • Test With Load Enable is set to Enabled. • The transfer inhibit signal is inactive. • Transfer Delay (TDNE) has expired, or the transfer/retransfer inhibit override signal is active. <p>D: Synchronize if all of these conditions are met:</p> <ul style="list-style-type: none"> • The generator set is available. • Test With Load Enable is set to Enabled. • The transfer inhibit signal is inactive. • Transfer Delay (TDNE) has expired, or the transfer/retransfer inhibit override signal is active. • Transition Type is set to Hard Closed Transition or Soft Closed Transition. • Warning fault 2397 (Utility Breaker Fail To Open) is inactive. • Warning fault 1999 (Maximum Parallel Time) is inactive. • The synchronizer conditions are met. <p>Then, close the generator set circuit breaker when the generator set and the utility are synchronized.</p>
3	Closed	Open	<p>The PCC is in the Standby paralleling state.</p>
4	Closed	Closed	<p>The PCC is in the Load Govern paralleling state.</p> <p>E: Open the generator set circuit breaker if one of these conditions is met:</p> <ul style="list-style-type: none"> • Transition Type is set to Open Transition. • Maximum Parallel Time (TDMP) has expired. <p>F: Open the utility circuit breaker if one of these conditions is met:</p> <ul style="list-style-type: none"> • Utility Total kW is less than or equal to Utility Unloaded Level. • Transition Type is set to Hard Closed Transition.

The PCC leaves this PTC operating mode when one of these conditions is met:

- The PCC leaves Auto mode.
- The remote start signal becomes inactive.

7.1.6.1.8 Utility Fail Mode

In this PTC operating mode, the PCC responds to the loss of the utility.

The PCC is in this PTC operating mode when all of these conditions are met:

- Single/3 Phase Connection is set to Three Phase.
- The PTC mode switch signal is inactive.
- The PCC is in Auto mode.
- The utility is not available.

When the PCC enters this PTC operating mode, it initiates an Emergency Start sequence if the generator set is not running already.

In this PTC operating mode, the PCC considers the current position of the generator set circuit breaker and the utility circuit breaker. See [Section 7.3.3](#) for more information about circuit breaker control.

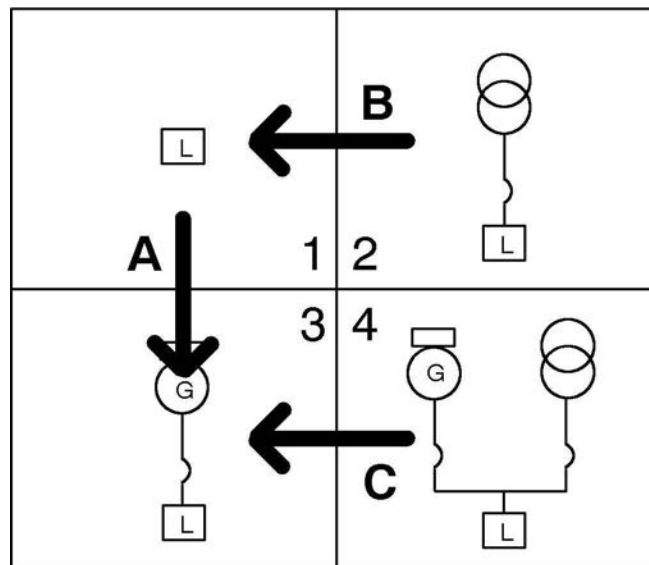


FIGURE 92. CIRCUIT BREAKER CONTROL IN UTILITY FAIL MODE

As illustrated in the figure above, the PCC tries to connect the generator set to the load in this PTC operating mode. If the generator set is not running when the PCC enters this PTC operating mode, the PCC starts the generator set.

TABLE 108. CIRCUIT BREAKER CONTROL IN UTILITY FAIL MODE

#	Genset CB	Utility CB	Description
1	Open	Open	The PCC is in the Standby paralleling state. A: Close the generator set circuit breaker if all of these conditions are met: <ul style="list-style-type: none"> The generator set is available. Programmed Transition Delay has expired.
2	Open	Closed	The PCC is in the Standby paralleling state. B: Open the utility circuit breaker according to <i>Utility Breaker Opening Point</i> . If <i>Utility Breaker Opening Point</i> is After Transfer Delay, <ul style="list-style-type: none"> The generator set is available. The transfer inhibit signal is inactive. Transfer Delay (TDNE) has expired, or the transfer/retransfer inhibit override signal is active. If <i>Utility Breaker Opening Point</i> is Upon Utility Failure, the utility is unavailable.
3	Closed	Open	The PCC is in the Standby paralleling state.
4	Closed	Closed	C: Open the utility circuit breaker.

7.1.6.2 Commit to Transfer

This refers to the point in time at which the PCC commits to transferring the loads to the generator set even if the utility becomes available again. Once the loads are connected to the generator set, they will then be powered by the generator set for at least the retransfer time delay. If the utility becomes available before this point in time, the PCC will return to or stay on the utility.

- No Commit: the PCC commits when the generator set circuit breaker is closed. This setting should be used in applications that prefer the utility to provide power to the loads as much as possible. However, the generator sets can start and stop repeatedly if the utility is intermittent.
- Genset Start: the PCC commits when it tells the generator sets to start. This setting is typical in applications with uninterruptible power supplies (UPS) that require a guaranteed amount of generator set time to recharge the batteries.
- Utility Disconnect: the PCC commits when the PCC opens the utility circuit breaker. This setting reduces the likelihood of issues such as wet stacking.

7.1.6.3 Genset Availability

The status of the generator set is tracked in Genset Availability Status. Genset Availability Status is set to Not Available if any of these conditions is met:

- Genset Undervoltage Sensor Status is set to Dropped Out.
- Genset Overvoltage Sensor Enable is set to Enable, and Genset Overvoltage Sensor Status is set to Dropped Out.
- Genset Frequency Sensor Enable is set to Enable, and Genset Frequency Sensor Status is set to Dropped Out.
- Genset Loss of Phase Sensor Enable is set to Enable, and Genset Loss of Phase Sensor Status is set to Dropped Out.
- Genset Phase Rotation Sensor Enable is set to Enable, and Genset Phase Rotation Sensor Status is set to Dropped Out.

- Warning fault 1328 (Genset Breaker Tripped) is active.
- Warning fault 1452 (Genset Breaker Fail To Close) is active.
- Warning fault 1454 (Genset Breaker Position Contact) is active, and Genset Current Based Breaker Position is set to Unknown.

If none of these conditions is met, Genset Availability Status is set to Available.

The PCC calculates Genset Undervoltage Sensor Status and Genset Overvoltage Sensor Status this way.

- The sensor value depends on Genset Voltage Sensor Type. If Genset Voltage Sensor Type is set to Line to Line, the PCC uses the generator set line-to-line voltages. If Genset Voltage Sensor Type is set to Line to Neutral, the PCC uses the generator set line-to-neutral voltages.
- The PCC sets the parameter to Picked Up if all of the sensor values cross a specified pick-up threshold.
- The PCC sets the parameter to Dropped Out if any of the sensor values crosses a specified drop-out threshold for a specified amount of time.

This table identifies the thresholds and amount of time required for each generator set sensor status parameter.

TABLE 109. CALCULATION OF GENSET SENSOR STATUS FOR UNDERVOLTAGE AND OVERVOLTAGE

Genset sensor	Pick-Up Threshold	Drop-out Threshold	Drop-out Time Delay
Undervoltage	Genset Undervoltage Pick-Up Percentage	Genset Undervoltage Drop-Out Percentage x Genset Undervoltage Pick-Up Percentage	Genset Undervoltage Drop-Out Delay
Overvoltage	Genset Overvoltage Pick-Up Threshold	Genset Overvoltage Drop-Out Percentage	Genset Overvoltage Drop-Out Delay

When the PCC is in the Synchronize paralleling state, the PCC ignores the thresholds in the table above and uses the fixed values in the table below.

TABLE 110. FIXED THRESHOLDS FOR UNDERVOLTAGE AND OVERVOLTAGE IN THE SYNCHRONIZE PARALLELING STATE

Genset sensor	Pick-Up	Drop-out
Undervoltage	85%	75%
Overvoltage	95%	120%

The PCC calculates Genset Frequency Sensor Status and Genset Loss of Phase Sensor Status this way.

- The PCC sets the parameter to Picked Up if the sensor value is in a specified range.
- The PCC sets the parameter to Dropped Out if the sensor value is outside the specified range for a specified amount of time.

This table identifies the range and amount of time required for each generator set sensor status parameter.

TABLE 111. CALCULATION OF GENSET SENSOR STATUS FOR FREQUENCY AND LOSS OF PHASE

Genset sensor	Low Value	High Value	Drop-out Time Delay
Frequency	Genset Center Frequency x (1 - Genset Frequency Pick-Up Bandwidth - Genset Frequency Drop-Out Bandwidth)	Genset Center Frequency x (1 + Genset Frequency Pick-Up Bandwidth + Genset Frequency Drop-Out Bandwidth)	Genset Frequency Drop-Out Delay
Loss of Phase	90	150	Genset Loss of Phase Drop-Out Delay

When the PCC is in the Synchronize paralleling state, the PCC ignores the frequency range in the table above and uses 75-125% instead.

The PCC calculates Genset Phase Rotation Sensor Status this way.

- The PCC sets the parameter to Picked Up if Genset Phase Rotation is equal to System Phase Rotation.
- The PCC sets the parameter to Dropped Out if Genset Phase Rotation is not equal to System Phase Rotation for one second.

7.1.6.4 Utility Availability

The status of the utility is tracked in Utility Availability Status. Utility Availability Status is calculated the same way Genset Availability Status is calculated with these exceptions:

- The calculation uses the corresponding Utility parameters and faults.
- The PCC does not use fixed thresholds in the Synchronize paralleling state.

7.1.6.5 Power Transfer Control Signals

7.1.6.5.1 Extended Parallel Signal

This signal has no effect unless the Genset Application Type is set to Power Transfer Control.

This signal may come from any of these sources:

- PCC's Extended Parallel Switch connection
- PCCNet devices
- Modbus networks
- Exercise scheduler (internal function; no hardware connection)

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 signal is active 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 may enter Extended Parallel PTC operating mode.

NOTICE
Other conditions are required for the PCC to enter Extended Parallel PTC operating mode.

7.1.6.5.2 PTC Mode Switch Signal

This signal has no effect unless the Genset Application Type is set to Power Transfer Control.

This signal may come from any of these sources:

- PCC PTC Mode Switch connection
- PCCNet devices
- Modbus networks

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 signal is active 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 enters Manual PTC operating mode.

7.1.6.5.3 Retransfer Inhibit Signal

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

- The transfer/retransfer inhibit override signal is inactive.
- Warning fault 1454 (Genset Breaker Position Contact) is active, and Genset Current Based Breaker Position is set to Closed.
- The PCC is in Extended Parallel, Normal, or Normal Override PTC operating mode.
- Genset CB Position Status is set to Closed.
- Utility CB Position Status is set to Open.

This signal may come from any of these sources:

- PCC Retransfer Inhibit Switch connection
- PCCNet devices
- Modbus networks

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 signal is active 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 cannot transfer load from the generator set to the utility. (There are exceptions in some PTC operating modes.) This signal prevents the PCC from synchronizing the generator set with the utility and from opening the generator set circuit breaker.

7.1.6.5.4 Transfer Inhibit Signal

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

- The transfer/retransfer inhibit override signal is inactive.
- Warning fault 1455 (Utility Breaker Position Contact) is active, and Utility Current Based Breaker Position is set to Closed.

- The PCC is in Exercise, Extended Parallel, Test, or Utility Fail PTC operating mode.
- Genset CB Position Status is set to Open.
- Utility CB Position Status is set to Closed.

This signal may come from any of these sources:

- PCC Transfer Inhibit connection
- PCCNet devices
- Modbus networks

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 signal is active 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 cannot transfer load from the utility to the generator set. This signal prevents the PCC from synchronizing the generator set with the utility and from opening the utility circuit breaker.

7.1.6.5.5 Transfer/retransfer Inhibit Override Signal

This signal has no effect unless the Genset Application Type is set to Power Transfer Control.

This signal may come from any of these sources:

- PCCNet devices
- Modbus networks

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 signal is active if any source is active. You have to make all of the sources inactive to make the signal inactive.

When this signal becomes active, Transfer Delay (TDNE) and Retransfer Delay (TDEN) have no effect. The PCC does not wait for these timers to expire. The PCC also ignores the retransfer inhibit signal and the transfer inhibit signal.

7.2 Paralleling States

When event 1465 (Ready to Load) is active, the PCC is in one paralleling state. The paralleling state reflects the status of the paralleling system, which determines the way the PCC behaves.

In general, the paralleling state is determined by the genset application type, the positions of the circuit breakers, and whether or not the bus is dead or live.

The parameter ES State indicates which paralleling state the PCC is in.

Genset Bus parameters refer to the bus shared with other generator sets. The PCC uses these parameters when Genset Application Type is Isolated Bus Only or Utility Multiple.

Utility parameters refer to the bus shared with the utility. The PCC uses these parameters when Genset Application Type is Synchronize Only or Utility Single Synchronize Only, Utility Single, or Power Transfer Control.

NOTICE

In many cases, an explanation in this manual is the same regardless of whether the generator set is in parallel with other generator sets or with the utility. Therefore, to make explanations a little simpler, this manual refers to Bus parameters when it is not necessary to distinguish between Genset Bus parameters and Utility parameters.

7.2.1 Dead Bus Close

The PCC is in this paralleling state when it wants to close the generator set circuit breaker to a dead bus.

In this paralleling state, the PCC controls the paralleling frequency reference offset and the paralleling voltage reference offset the same way it controls them in the Standby paralleling state.

In addition, the PCC runs one of these processes to decide whether or not to close the generator set circuit breaker.

Dead Bus

The PCC uses this to determine whether or not to close the generator set circuit breaker onto a dead bus when Genset Application Type is set to Utility Single. The PCC concludes that the bus is dead if the utility circuit breaker is open.

Circuit Breaker Control

The PCC generates a genset CB close request if all of these conditions are met:

- Genset Application Type is set to Utility Single.
- Event 1465 (Ready to Load) is active.
- Genset CB Position Status is set to Open.
- Utility CB Position Status is set to Open.
- There are no genset CB open requests.
- Warning fault 1452 (Genset Breaker Fail To Close) is inactive.
- Utility CB Position Verify Fault Condition is set to Inactive.

The PCC stops generating a genset CB close request if one of these conditions is met:

- There is a genset CB open request.
- Warning fault 1452 (Genset Breaker Fail To Close) is active.

First Start

The PCC uses this to determine whether or not to close the generator set circuit breaker onto a dead bus when it is in parallel with other generator sets.

First start is based on first start arbitration. The PCC joins first start arbitration when the first start conditions are met. The winner of the arbitration gets permission to close to the dead bus. The other generator sets then have to wait for the bus to go live and synchronize to it.

First Start Conditions

The PCC joins first start arbitration when all of these conditions are met:

- Genset Application Type is set to Isolated Bus Only or Utility Multiple.
- Event 1465 (Ready to Load) is active.
- Genset CB Position Status is Open.
- Bus L1L2 Voltage%, Bus L2L3 Voltage%, and Bus L3L1 Voltage% are less than 20% of Genset Nominal Voltage.
- The PCC is not in Manual mode.
- There are no genset CB open requests.
- Warning fault 1452 (Genset Breaker Fail To Close) is inactive.

First Start Arbitration

The generator sets arbitrate with each other through the first start connection. Each generator set tries to send a series of random bursts (1-8 ms each) through this connection for 800 ms. If a generator set detects a burst from another generator set at any time, the generator set stops, waits for 2.5 sec, and starts over. Otherwise, after 800 ms, the generator set has permission to close to the dead bus, and it turns on the first start connection to prevent other generator sets from getting permission.

The PCC automatically gives itself permission to close to the dead bus First Start Backup Time after it joins the arbitration, regardless of the results of the arbitration. This lets the system continue functioning in case first start arbitration fails for some reason. To prevent two or more generator sets from closing to the dead bus at the same time, First Start Backup Time should be set to different values on each generator set.

Circuit Breaker Control

The PCC generates a genset CB close request if all of these conditions are met:

- Genset Application Type is set to Isolated Bus Only or Utility Multiple.
- Event 1465 (Ready to Load) is active.
- Genset CB Position Status is set to Open.
- If Genset Application Type is set to Utility Multiple, Utility CB Position Status is set to Open.
- Bus L1L2 Voltage%, Bus L2L3 Voltage%, and Bus L3L1 Voltage% are less than 20% of Genset Nominal Voltage.
- If the PCC is not in Manual mode, the PCC just won first start arbitration or First Start Backup Time has elapsed since the PCC joined first start arbitration.
- There are no genset CB open requests.
- Warning fault 1452 (Genset Breaker Fail To Close) is inactive.
- Utility CB Position Verify Fault Condition is set to Inactive.

The PCC stops generating a genset CB close request if one of these conditions is met:

- There is a genset CB open request.
- Warning fault 1452 (Genset Breaker Fail To Close) is active.

7.2.2 Synchronize

The PCC uses this to determine whether or not to close the generator set circuit breaker onto a live bus.

The PCC usually initiates this process automatically if Genset CB Position Status is set to Open and Utility CB Position Status is set to Closed. This process must be initiated manually if Genset CB Position Status is set to Closed and Utility CB Position Status is set to Open.

The PCC adjusts the speed reference and the voltage setpoint to make the generator set voltage, generator set frequency, and generator set phase match the bus voltage, bus frequency, and bus phase.

Synchronizer Conditions

The synchronizer is enabled when all of these conditions are met:

- Bus L1L2 Voltage%, Bus L2L3 Voltage%, and Bus L3L1 Voltage% are 60-110% of Genset Nominal Voltage.
- Bus Frequency is 60-110% of Base Frequency.
- If Genset CB Fail To Close Standalone Mode Enable is set to Enable, warning fault 1452 (Genset Breaker Fail To Close) is inactive, or the PCC has stopped the generator set for any reason other than a shutdown fault since warning fault 1452 became active.
- The PCC is not raising the engine speed to idle speed or rated speed or lowering the engine speed to idle speed.
- Event 1465 (Ready to Load) is active.
- If the PCC is in Manual mode, Sync Disable is Inactive.
- If Fail To Sync Lockout Enable is Enable, event 1457 (Fail To Synchronize) is inactive.
- Synchronizer Speed Control Method is not External, Synchronizer Voltage Control Method is not External, or both are not External.

Paralleling Frequency Reference Offset

The PCC adjusts the speed reference to make the generator set frequency match the bus frequency. The PCC may also try to make the generator set phase match the bus phase. This adjustment is the paralleling frequency reference offset.

The PCC uses one of these methods to calculate the paralleling frequency reference offset.

Phase Match

This method is used when all of these conditions are met:

- The speed droop enable signal is inactive.
- Sync Speed Control Method is Phase Match.

The PCC uses a single PI (proportional-integral) loop to calculate the paralleling frequency reference offset to meet all of these conditions.

- Genset Frequency matches Bus Frequency
- The generator set phase matches the bus phase with an offset of Sync Phase Offset.

Sync Phase Offset should be used when a phase shift exists between the generator set and the bus (for example, if there is a delta/wye transformer).

NOTICE

Sync Phase Offset is the desired difference between the generator set phase and the bus phase.

The initial value of the paralleling frequency reference offset is the difference between Bus Frequency and the speed reference divided by Frequency to Speed Gain Select. This ensures that there is a minimal transient when the PCC enters this paralleling state.

The PCC raises the paralleling frequency reference offset linearly from the initial value to the output of the PI loop during Frequency Match Ramp Rate.

The paralleling frequency reference offset is limited to 60-110% of Base Frequency.

Slip Frequency

This method is used when all of these conditions are met:

- The speed droop enable signal is inactive.
- Sync Speed Control Method is Slip Frequency.

This method is often selected in one of these situations:

- It is important that power flows in the desired direction when the generator sets are first connected in parallel.
- The generator set cannot be controlled well enough to make the generator set phase match the bus phase (for example, with gas generator sets).

The PCC uses a single PI (proportional-integral) loop to calculate the paralleling frequency reference offset that makes Genset Frequency match Bus Frequency with an offset of Slip Frequency.

NOTICE

Slip Frequency is the desired difference between Genset Frequency and Bus Frequency.

The initial value of the paralleling frequency reference offset is the difference between Bus Frequency and the speed reference divided by Frequency to Speed Gain Select. This ensures that there is a minimal transient when the PCC enters this paralleling state.

The PCC raises the paralleling frequency reference offset linearly from the initial value to the output of the PI loop during Frequency Match Ramp Rate.

The paralleling frequency reference offset is limited to 60-110% of Base Frequency.

Speed Droop

This method is used when one of these conditions is met:

- The speed droop enable signal is active.
- Sync Speed Control Method is External, and Isolated Bus Speed Control Method is Droop.

The PCC uses speed droop to calculate the paralleling frequency reference offset.

No Offset

This method is used when all of these conditions are met:

- The speed droop enable signal is inactive.
- Sync Speed Control Method is External.
- Isolated Bus Speed Control Method is Constant.

The paralleling frequency reference offset is zero.

Paralleling Voltage Reference Offset

The PCC adjusts the voltage setpoint to make the generator set voltage match the bus voltage. This adjustment is the paralleling voltage reference offset.

The PCC uses one of these methods to calculate the paralleling voltage reference offset.

Voltage Match

This is used when all of these conditions are met:

- The voltage droop enable signal is inactive.
- Sync Voltage Control Method is Voltage Match.

The PCC uses a single PI (proportional-integral) loop to calculate the paralleling voltage reference offset that makes Genset Average Voltage% match Bus Average Voltage%.

The initial value of the paralleling voltage reference offset is the difference between Genset Average Voltage% and Bus Average Voltage%. This ensures that there is a minimal transient when the PCC enters this paralleling state.

The PCC raises the paralleling voltage reference offset linearly from the initial value to the output of the PI loop during Voltage Match Ramp Rate.

The paralleling voltage reference offset is limited to 60-110% of Genset Nominal Voltage.

Voltage Droop

This method is used when one of these conditions is met:

- The voltage droop enable signal is active.
- Sync Voltage Control Method is External, and Isolated Bus Voltage Control Method is Droop.

The PCC uses voltage droop to calculate the paralleling voltage reference offset.

No Offset

This method is used when all of these conditions are met:

- The voltage droop enable signal is inactive.
- Sync Voltage Control Method is External.
- Isolated Bus Voltage Control Method is Constant.

The paralleling voltage reference offset is zero.

Permissive Sync (Permissive Close Allowed)

The PCC monitors the generator set and bus line-to-line voltages, frequencies, phase rotations, and L1-to-L1 phase relationship in order to determine whether or not the two sources can run in parallel. Permissive Close Allowed indicates whether or not the two sources can run in parallel.

First, all of these conditions must be met for Permissive Window Time:

- Bus Line Frequency is 60-110% of Alternate Frequency Switch.
- Bus Phase Rotation matches Genset Phase Rotation.
- The difference between Sync Phase Difference and Sync Phase Offset is less than or equal to Permissive Phase Window.
- Bus L1L2 Voltage%, Bus L2L3 Voltage%, and Bus L3L1 Voltage% are 60-110% of Genset Nominal Voltage.
- The difference between Bus Frequency and Genset Frequency is less than or equal to Permissive Frequency Window.
- The difference between Bus L1L2 Voltage% and Genset L1L2 Voltage% is less than or equal to Permissive Voltage Window.
- The difference between Bus L2L3 Voltage% and Genset L2L3 Voltage% is less than or equal to Permissive Voltage Window.

- The difference between Bus L3L1 Voltage% and Genset L3L1 Voltage% is less than or equal to Permissive Voltage Window.

Then, the PCC sets Permissive Close Allowed to Allowed if one of these conditions is met:

- The difference between Sync Phase Difference and Sync Phase Offset has been decreasing for the last 100 ms.
- The difference between Sync Phase Difference and Sync Phase Offset is less than or equal to 10 degrees.

If neither of these conditions is met, the PCC waits for one of them to be met as long as the first set of conditions continues to be met.

Event 1916 (Sync Check OK) is active when Permissive Close Allowed is set to Allowed.

The PCC changes Permissive Close Allowed from Allowed to Not Allowed if one of these conditions is met:

- Bus Line Frequency is not 60-110% of Alternate Frequency Switch.
- Bus Phase Rotation does not match Genset Phase Rotation.
- The difference between Sync Phase Difference and Sync Phase Offset is greater than Permissive Phase Window and 20 degrees.
- Bus L1L2 Voltage%, Bus L2L3 Voltage%, and Bus L3L1 Voltage% are not 60-110% of Genset Nominal Voltage.
- The difference between Bus L1L2 Voltage% and Genset L1L2 Voltage% is greater than Permissive Voltage Window and 5%.
- The difference between Bus L2L3 Voltage% and Genset L2L3 Voltage% is greater than Permissive Voltage Window and 5%.
- The difference between Bus L3L1 Voltage% and Genset L3L1 Voltage% is greater than Permissive Voltage Window and 5%.
- Warning fault 1452 (Genset Breaker Fail To Close) is active.
- Warning fault 2396 (Utility Breaker Fail To Close) is active.

Event 1916 (Sync Check OK) is inactive when Permissive Close Allowed is set to Not Allowed.

Circuit Breaker Control

The PCC generates a genset CB close request if all of these conditions are met:

- Genset Application Type is set to Isolated Bus Only, Utility Single, or Utility Multiple.

NOTICE

If the Genset Application Type is set to Power Transfer Control, the PCC runs in the Synchronize paralleling state, but the generator set circuit breaker is controlled by Power Transfer Control logic.

- If Genset Application Type is set to Utility Single, Genset CB Position Status is set to Open.
- If the PCC is in Manual mode, the CB Close button is pressed on the Operator Panel.
- Permissive Close Allowed is set to Allowed.
- There are no genset CB open requests or PTC genset CB open requests, depending on Genset Application Type.

The PCC stops generating a genset CB close request if one of these conditions is met:

- Genset CB Position Status is set to Open, and Permissive Close Allowed is set to Not Allowed.
- There is a genset CB open request or a PTC genset CB open request, depending on Genset Application Type.

7.2.3 Load Share

In this paralleling state, the PCC is in parallel with other generator sets while isolated from the utility. The PCC adjusts the speed reference and the voltage setpoint so that the generator set takes its fair share of the load. The generator set should run at the same percentage of its rated load at which other generator sets run.

NOTICE

The PCC communicates with other generator sets through the Load Share connection.

Paralleling Frequency Reference Offset

The PCC adjusts the speed reference so that the generator set takes the same percentage of its rated kW load that other generator sets take. This adjustment is the paralleling frequency reference offset.

The PCC uses one of these methods to calculate the paralleling frequency reference offset.

Load Share Frequency Reference Offset

This method is used when all of these conditions are met:

- The speed droop enable signal is inactive.
- Isolated Bus Speed Control Method is Constant.

The paralleling frequency reference offset is directly proportional to all of these values:

- The difference between the percentage of rated kW load the generator set should be taking and the percentage of rated kW load the generator set is taking (kW Load Share Output Command).
- K1 Load Share kW
- Load Share kW Gain

When any of these values changes, the paralleling frequency reference offset changes proportionally. For example, if you change Load Share kW Gain from 1 to 1.5, the paralleling frequency reference offset rises 50%.

The paralleling frequency reference offset is limited to (-24 Hz)-(+6 Hz).

Speed Droop

NOTICE

This method is required if other generator sets do not have load share lines.

This method is used when one of these conditions is met:

- The speed droop enable signal is active.
- Isolated Bus Speed Control Method is Droop.

The PCC uses speed droop to calculate the paralleling frequency reference offset.

Paralleling Voltage Reference Offset

The PCC adjusts the voltage setpoint so that the generator set takes the same percentage of its rated kVAR load that other generator sets take. This adjustment is the paralleling voltage reference offset.

The PCC uses one of these methods to calculate the paralleling voltage reference offset.

Load Share Voltage Reference Offset

This method is used when all of these conditions are met:

- The voltage droop enable signal is inactive.
- Isolated Bus Voltage Control Method is Droop.

The paralleling voltage reference offset is directly proportional to all of these values:

- The difference between the percentage of rated kVAR load the generator set should be taking and the percentage of rated kVAR load the generator set is taking (kVAR Load Share Output Command).
- K1 Load Share kVAR
- Load Share kVAR Gain

When any of these values changes, the paralleling voltage reference offset changes proportionally. For example, if you change Load Share kVAR Gain from 1 to 1.5, the paralleling voltage reference offset rises 50%.

The paralleling voltage reference offset is limited to (-40%)-(10%) of Genset Nominal Voltage.

Voltage Droop

NOTICE

This method is required if other generator sets do not have load share lines.

This method is used when one of these conditions is met:

- The voltage droop enable signal is active.
- Isolated Bus Voltage Control Method is Droop.

The PCC uses voltage droop to calculate the paralleling voltage reference offset.

Load Share Signals

In this paralleling state, the PCC is controlled by these signals.

Load Demand Stop

All of the general information on applies. This section provides more details about this signal in this paralleling state.

In this paralleling state, this signal has no effect unless warning fault 1453 (Genset Breaker Fail To Open) is inactive when this signal becomes active.

When this signal becomes active, the PCC runs the load share ramp unload process until one of these conditions is met:

- Genset % Standby Total kW is less than or equal to Load Share Ramp kW Unload Level.
- The PWM on the kW load share lines is greater than or equal to 100% PWM.

Then, the PCC initiates the Shutdown with Cooldown sequence.

Ramp Load Unload

All of the general information on applies. This section provides more details about this signal in this paralleling state.

In this paralleling state, this signal has no effect unless none of these conditions is met:

- Bus Line Frequency is less than the sum of Base Frequency, Frequency Adjust, and -1.0 Hz.
- The voltage across the internal resistor on the kW load share lines indicates that the PCC should be taking at least 98% of rated kW load.
- Genset % Standby Total kW is less than or equal to -5%.
- Genset Total kVAR per Standby kVA is less than or equal to -15%.

Load Share Ramp Load

In this process, the PCC lowers kW Load Share Ramp PWM Offset and kVAR Load Share Ramp PWM Offset to make other generator sets reduce their loads.

NOTICE

The PCC adds these parameters when it calculates the percentage of rated load at which the generator set is running. If these parameters decrease, the generator set takes on more load.

The initial values of kW Load Share Ramp PWM Offset and kVAR Load Share Ramp PWM Offset are the same values they had at the end of the last load share ramp unload process. If these values have been reset to zero (for example, after a load demand start request signal shut down the generator set), the initial values are based on the current difference between the percentage of rated kW load or rated kVAR load the generator set should be taking and the percentage of rated kW load or rated kVAR load the generator set is taking.

Each second, the PCC lowers kW Load Share Ramp PWM Offset from its initial value to 0% linearly in increments of 147% divided by Load Share Ramp Load Time.

Each second, the PCC lowers kVAR Load Share Ramp PWM Offset from its initial value to 0% linearly in increments of 140.88% divided by Load Share Ramp Load Time each second.

The PCC sets kW Load Share Ramp PWM Offset and kVAR Load Share Ramp PWM Offset to 0% immediately if any of these conditions is met:

- kW Load Share Ramp PWM Offset is less than or equal to zero. (The PCC does not consider kVAR Load Share Ramp PWM Offset.)
- Bus Line Frequency is less than the sum of Base Frequency, Frequency Adjust, and -1.0 Hz.
- The voltage across the internal resistor on the kW load share lines indicates that the PCC should be taking at least 98% of rated kW load.
- Genset % Standby Total kW is less than or equal to -5%.
- Genset Total kVAR per Standby kVA is less than or equal to -15%.

Load Share Ramp Unload

In this process, the PCC raises kW Load Share Ramp PWM Offset and kVAR Load Share Ramp PWM Offset to make other generator sets increase their loads.

NOTICE

The PCC adds these parameters when it calculates the percentage of rated load at which the generator set is running. If these parameters increase, the generator set takes on less load.

NOTICE

This process assumes that it takes longer to unload kW than it takes to unload kVAR.

The PCC raises kW Load Share Ramp PWM Offset from 0% to 147% linearly during Load Share Ramp Unload Time until one of these conditions is met:

- Genset % Standby Total kW is less than or equal to Load Share Ramp kW Unload Level.
- The PWM on the kW load share lines is greater than or equal to 100% PWM.

The PCC raises kVAR Load Share Ramp PWM Offset from 0% in 17.61%-increments each second until one of these conditions is met:

- The PWM on the kVAR load share lines is greater than or equal to 100% PWM.
- Genset Total kVAR per Standby kVA is less than zero.

NOTICE

Generator set with PCC3.3 control can be paralleled with generator set with DIEF's AGC-4 control in Isochronous Load Sharing mode. Refer to Instruction Sheet A053F641 for more details.

7.2.4 Load Govern

In this paralleling state, the PCC is in parallel with the utility. Since the utility frequency and voltage are fixed, the PCC regulates the generator set kW output and generator set kVAR output, instead of the generator set frequency and generator set voltage.

Paralleling Frequency Reference Offset

The PCC adjusts the speed reference to control the amount of fuel provided to the engine and, in turn, to control the generator set kW output. This adjustment is the paralleling frequency reference offset.

The PCC uses one of these methods to calculate the paralleling frequency reference offset:

- Generator set kW

NOTICE

This method is also called base load.

The PCC regulates the generator set kW output to a fixed reference value.

- Generator set kW w/Utility Constraint

The PCC regulates the generator set kW output to a fixed reference value as long as the utility kW output is above a specified threshold.

NOTICE

This method is similar to base load except that it prevents the generator set from sending power to the utility or tripping the utility reverse-power relay.

- Utility kW

NOTICE

This method is also called peak shave.

The PCC regulates the generator set kW output to keep the utility kW output at a fixed reference value.

- Speed Droop

The PCC uses speed droop to calculate the paralleling frequency reference offset.

The effect of each method (except speed droop) on the generator set kW output is illustrated in [Figure 93](#).

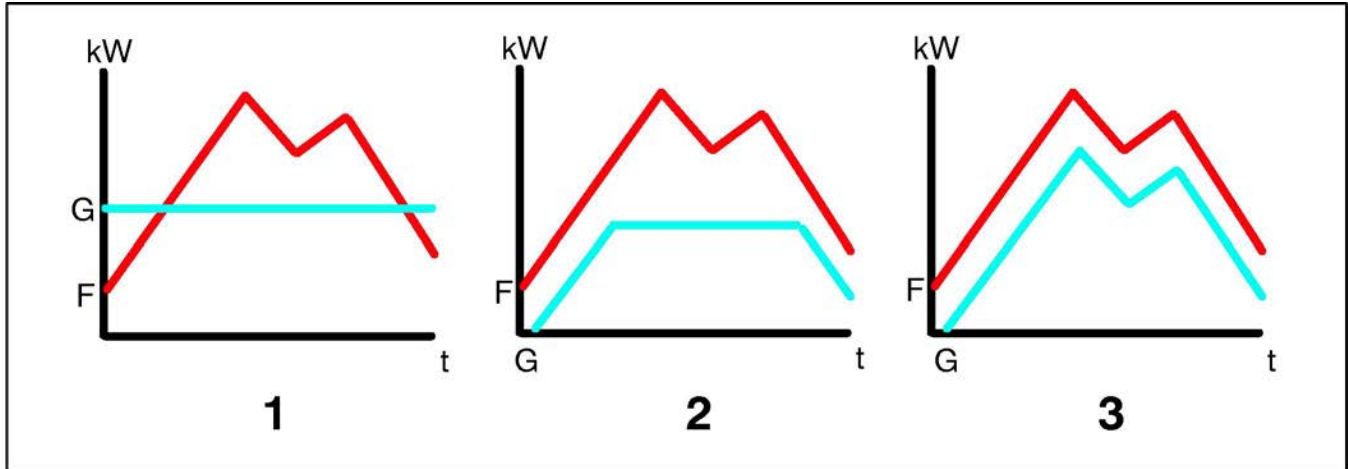


FIGURE 93. EFFECT OF EACH METHOD TO CALCULATE THE PARALLELING FREQUENCY REFERENCE OFFSET IN THE LOAD GOVERN PARALLELING STATE

TABLE 112. EFFECT OF EACH METHOD TO CALCULATE THE PARALLELING FREQUENCY REFERENCE OFFSET IN THE LOAD GOVERN PARALLELING STATE

Label	Description
1	Generator set kW
2	Generator set kW w/Utility Constraint
3	Utility kW
F	Facility load
G	Generator set kW output

[Table 113](#) identifies the conditions the PCC checks to select the method.

TABLE 113. CONDITIONS FOR EACH METHOD TO CONTROL THE PARALLELING FREQUENCY REFERENCE OFFSET IN THE LOAD GOVERN PARALLELING STATE

Conditions \ Method	Generator set kW	Generator set kW w/ Utility Constraint	Utility kW	Speed Droop	
				Inactive	Active
Speed droop enable signal	Inactive	Inactive	Inactive	Inactive	Active
Utility Parallel Speed Control Method	Load Govern	Load Govern	Load Govern	Droop	Any
Load Govern kW Method	Generator set kW	Generator set kW w/Utility Constraint	Utility kW	Any	Any

Conditions \ Method	Generator set kW	Generator set kW w/ Utility Constraint	Utility kW	Speed Droop	
				Any	Any
Generator set Application Type	Any	Utility Single or Power Transfer Control	Utility Single or Power Transfer Control	Any	Any

Each method (except speed droop) uses a PID algorithm to calculate the paralleling frequency reference offset. This algorithm monitors the difference between Load Govern kW Reference and Genset % Standby Total kW.

Load Govern kW Reference is a percentage of Genset Standby kW rating. It is usually equal to Load Govern kW Target.

Load Govern kW Target depends on Load Govern kW Setpoint Source and the method, as shown in [Table 114](#).

TABLE 114. LOAD GOVERN KW TARGET

Load Govern kW Setpoint Source	Generator set kW	Generator set kW w/ Utility Constraint	Utility kW
Analog Input	kW Load Setpoint	kW Load Setpoint	System Total kW - kW Load Setpoint
Internal	Generator set kW Setpoint Percent	Generator set kW Setpoint Percent	System Total kW-Utility kW Setpoint

NOTICE
kW Load Setpoint is Configurable Analog Input #1.

Load Govern kW Target cannot be greater than any of these values:

- Load Govern kW Maximum.
- (100%-Derate Request)*Genset % Standby Total kW.
- 100% for the first 120 seconds the PCC runs in this paralleling state; Load Govern kW Maximum Delayed after 120 seconds.

Load Govern kW Reference is different than Load Govern kW Target in these situations.

Initialization

When the PCC enters the Load Govern paralleling state, it raises the value of Load Govern kW Reference gradually.

If the PCC has been in Load Govern paralleling state since power-up, the initial value of Load Govern kW Reference is equal to Genset % Standby Total kW 100 ms after the PCC last left the Load Govern paralleling state. Otherwise, the initial value is zero.

Then, the PCC raises Load Govern kW Reference from its initial value to Load Govern kW Target in increments of 100%kW divided by Load Govern kW Ramp Load Time.

Invalid kW Load Setpoint

kW Load Setpoint is invalid if Load Govern kW Setpoint Source is set to Analog Input and one of these conditions is met:

- There is a hardware failure.

- kW Load Setpoint is not available on the network.
- The value of kW Load Setpoint is a negative value.
- If kW Load Setpoint OOR Check Enable is set to Enable, the value of kW Load Setpoint is out of range.

When kW Load Setpoint becomes invalid, the PCC starts running the load govern kW ramp unload process.

When kW Load Setpoint becomes valid or if Load Govern kW Setpoint Source is set to Internal, the PCC sets Load Govern kW Reference equal to Load Govern kW Target immediately as long as the PCC is running at rated speed and voltage.

Ramp Load Unload

All of the general information applies.

Load Demand Stop

All of the general information applies. This section provides more details about this signal in this paralleling state.

If this signal becomes inactive before the PCC finishes the load govern kW ramp unload process, the PCC runs the load govern ramp load processes.

The PCC initiates the Shutdown with Cooldown sequence when Load Govern kW Reference reaches zero.

If this signal becomes inactive before the PCC finishes Time Delay to Stop and Rated Cooldown Time), the stop sequence is interrupted, and the PCC runs the load govern ramp load processes.

If this signal becomes inactive after the PCC finishes Time Delay to Stop and Rated Cooldown Time, the stop sequence is interrupted, and the PCC initiates a Load Demand Start sequence. Then, when the generator set is in the Load Share paralleling state or in the Load Govern paralleling state again, the PCC runs the appropriate ramp load process if the generator set is in parallel with other generator sets or with the utility.

PTC Operating Mode

When PTC Operating Mode is set to Normal or Normal Override, the PCC starts running the load govern kW ramp unload process.

When PTC Operating Mode is set to Test, Exercise, or Extended Parallel, the PCC starts running the load govern kW ramp load process.

Stop Sequence

When the PCC initiates a Shutdown with Cooldown sequence or a Manual Stop sequence, the PCC starts running the load govern kW ramp unload process. The PCC stops running this process when the PCC runs Stop Automatic Voltage Regulator (AVR).

If the stop sequence is interrupted, the PCC starts running the load govern kW ramp load process.

Load Govern kW Ramp Unload Process

When the PCC starts running this process, Load Govern kW Reference is set to Genset % Standby Total kW. Then, the PCC reduces Load Govern kW Reference from Genset % Standby Total kW to zero in increments of 100%kW divided by Load Govern kW Ramp Unload Time.

Load Govern kW Ramp Load Process

The PCC runs this process only if all of these conditions are met:

- If Load Govern kW Setpoint Source is set to Analog Input, kW Load Setpoint is valid; or Load Govern kW Setpoint Source is set to Internal
- The PCC is running at rated speed and voltage.

In this process, the PCC raises Load Govern kW Reference from its current value to Load Govern kW Target in increments of 100%kW divided by Load Govern kW Ramp Load Time.

Paralleling Voltage Reference Offset

The PCC adjusts the voltage setpoint to control the amount of excitation provided to the exciter and, in turn, to control the generator set kVAR output. This adjustment is the paralleling voltage reference offset.

NOTICE

If Load Govern Zero AVR Error Enable is set to Enable, the PCC ignores other adjustments in the voltage setpoint, and excitation depends only on the paralleling voltage reference offset.

The PCC uses one of these methods to calculate the paralleling voltage reference offset:

- Generator set kVAR
The PCC regulates the generator set kVAR output to a fixed reference value.
- Utility kVAR
The PCC regulates the generator set kVAR output to keep the utility kVAR output at a fixed reference value.
- Generator set Power Factor
The PCC regulates the generator set kVAR output to maintain a fixed generator set power factor.
- Utility Power Factor
The PCC regulates the generator set kVAR output to maintain a fixed utility power factor.
- Voltage Droop
The PCC uses voltage droop to calculate the paralleling voltage reference offset.

NOTICE

This method is useful if the utility voltage changes quickly.

[Table 115](#) identifies the conditions the PCC checks to select the method.

TABLE 115. CONDITIONS FOR EACH METHOD TO CONTROL THE PARALLELING VOLTAGE REFERENCE OFFSET IN THE LOAD GOVERN PARALLELING STATE

Conditions \ Method	Generator set kVAR	Utility kVAR	Generator set Power Factor	Utility Power Factor	Voltage Droop	
					Inac tive	Acti ve
Voltage droop enable signal	Inactive	Inactive	Inactive	Inactive	Inac tive	Acti ve
Utility Parallel Voltage Control Method	Load Govern*	Load Govern*	Load Govern*	Load Govern*	Dro op	Any op

Conditions \ Method	Generator set kVAR	Utility kVAR	Generator set Power Factor	Utility Power Factor	Voltage Droop	
					Any	Any
Load Govern kVAR Method	Generator set kVAR	Utility kVAR	Generator set Power Factor	Utility Power Factor	Any	Any
Generator set Application Type	Any	Utility Single or Power Transfer Control	Any	Utility Single or Power Transfer Control	Any	Any

* - Includes Load Govern with Droop Feed Forward

Each method (except voltage droop) uses a PI algorithm to calculate the paralleling voltage reference offset. This algorithm monitors the difference between Load Govern kVAR Reference and Genset Total kVARs per Standby kVA.

Load Govern kVAR Reference is a percentage of Genset Standby kVA rating. It is usually equal to Load Govern kVAR Target.

Load Govern kVAR Target depends on Load Govern kVAR Setpoint Source and the method, as shown in [Table 116](#).

TABLE 116. LOAD GOVERN KVAR TARGET

Load Govern kVAR Setpoint Source	Generator set kVAR	Utility kVAR	Generator set Power Factor	Utility Power Factor
Analog Input	kVAR Load Setpoint	System Total kVAR - kVAR Load Setpoint	kVAR Load Setpoint * Load Govern kW Reference	System Total kVAR - (Utility Total kW * kVAR Load Setpoint)
Internal	Generator set kVAR Setpoint Percent	System Total kVAR - Utility kVAR Setpoint	Generator set Power Factor Setpoint * Load Govern kW Reference	System Total kVAR - (Utility Total kW * Utility Power Factor Setpoint)

NOTICE

kVAR Load Setpoint is Configurable Analog Input #2.

Load Govern kVAR Target cannot be greater than any of these values:

- Load Govern kVAR Maximum.
- 60%.

Load Govern kVAR Reference is different than Load Govern kVAR Target in the same situations that Load Govern kW Reference is different than Load Govern kW Target.

NOTICE

These situations are not repeated in this section. They are identical except that kVAR parameters and processes are substituted for kW parameters and processes.

Load Govern kVAR Ramp Unload Process

When the PCC starts running this process, Load Govern kVAR Reference is set to Genset Total kVARs per Standby kVA. Then, the PCC reduces Load Govern kW Reference from Genset Total kVARs per Standby kVA to zero in increments of 60%kVAR divided by Load Govern kVAR Ramp Unload Time.

Load Govern kVAR Ramp Load Process

The PCC runs this process only if all of these conditions are met:

- If Load Govern kVAR Setpoint Source is set to Analog Input, kVAR Load Setpoint is valid; or Load Govern kVAR Setpoint Source is set to Internal
- The PCC is running at rated speed and voltage.

In this process, the PCC raises Load Govern kVAR Reference from its current value to Load Govern kVAR Target in increments of 60%kVAR divided by Load Govern kVAR Ramp Load Time.

7.3 Circuit Breaker Control

The level of control the PCC has over the generator set circuit breaker depends on the generator set application type.

7.3.1 Standalone and Synchronizer Only

If Genset CB Shunt Trip Enable is set to Enable, the PCC may be connected to the generator set circuit breaker to trip the circuit breaker when there is a shutdown fault or a shutdown with cooldown fault.

7.3.2 Isolated Bus Only, Utility Single, and Utility Multiple

The PCC is connected to the generator set circuit breaker to open and close the circuit breaker. The PCC sends an open signal and a close signal to the generator set circuit breaker. The logic is arranged so that one of the signals is on at almost all times and so that the open signal has higher priority than the close signal.

The open signal is active and the close signal is inactive when one of these conditions is met:

- There is a genset CB open request.
- There are no genset CB close requests.

The open signal is inactive when none of these conditions are met. The close signal becomes active after the open signal has been inactive for Genset CB Open To Close Delay. This delay prevents the generator set circuit breaker from locking out the close coil.

Genset CB Open Request

NOTICE

This section applies only if Genset Application Type is set to Utility Single, Utility Multiple, or Power Transfer Control.

There is a genset CB open request when at least one of these conditions is met:

- If the PCC is in Manual mode, Excitation Disable Override is set to Excitation Off, or the CB Open button is pressed on the Operator Panel.
- If the PCC is not in Manual mode, the genset CB inhibit signal is active.
- The generator set is not running at rated speed and voltage.
- The engine is running at rated speed in one of the stop sequences; the PCC is running the load govern kW ramp unload process; and Load Govern kW Reference is zero.
- There is an idle request.
- There is an active shutdown fault.

- If Genset CB Fail To Close Standalone Mode Enable is set to Enable, warning fault 1452 (Genset Breaker Fail To Close) is inactive, or the PCC has stopped the generator set for any reason other than a shutdown fault since warning fault 1452 became active.
- It has been less than Genset CB Recharge Delay since the close signal became active.

Genset CB Close Request

A genset CB close request comes from one of these sources:

- Dead Bus process
- First Start process
- Synchronize

Dead Bus Gen CB Close Request indicates that the Dead Bus process or First Start process is generating a genset CB close request. Sync Gen CB Close Request indicates that the synchronizer is generating a genset CB close request.

Genset CB Inhibit Signal

This signal may come from any of these sources:

- PCC Genset CB Inhibit Switch connection
- PCCNet devices
- Modbus networks

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.

This signal generates a genset CB open request or a PTC genset CB open request if the PCC is not in Manual mode.

7.3.3 Power Transfer Control

The PCC controls the genset circuit breaker and the utility circuit breaker. Transition Type controls the way the PCC transfers load from one source to the other.

Transition Type

This is a summary of the effects of Transition Type. For the detailed conditions in which the PCC opens and closes each circuit breaker, see the PTC operating modes, genset circuit breaker control, and utility circuit breaker control.

Transition Type controls the way the PCC transfers load from one source to the other. It is set to one of these values:

- Open Transition: The PCC opens the circuit breaker for the first source, waits Programmed Transition Delay (TDPT), and then closes the circuit breaker for the second source.

In Open Transition, the two sources are not allowed to be in parallel with each other, even in Manual PTC operating mode.

- Hard Closed Transition: The PCC closes the circuit breaker for the second source and then opens the circuit breaker for the first source immediately.
- Soft Closed Transition: The PCC closes the circuit breaker for the second source, waits until Maximum Parallel Time (TDMP), and then opens the circuit breaker for the first source.

If the PCC is in Exercise or Test PTC operating mode, the PCC also opens the utility circuit breaker when the utility is unloaded.

Transition Type has no effect in Extended Parallel, Off, and Utility Fail PTC operating modes.

Genset Circuit Breaker Control

The PCC is connected to the genset circuit breaker to open and close the circuit breaker. The PCC sends an open signal and a close signal to the genset circuit breaker. The logic is arranged so that the signals are on only until the PCC senses that the circuit breaker is in the desired position.

The open signal is active and the close signal is inactive when there is a PTC genset CB open request.

The open signal is inactive when there are no PTC genset CB open requests. The close signal becomes active after the open signal has been inactive for Genset CB Open To Close Delay and when all of these conditions are met:

- Based on the PTC operating mode, the conditions are met to close the genset circuit breaker.
 - This condition does not apply until Breaker Commitment Time Delay has elapsed since the last time the PCC tried to open or close the genset circuit breaker or the utility circuit breaker.
- If the PCC is not in Extended Parallel PTC operating mode, Transition Type is not set to Open Transition, or Utility CB Position Status is not set to Open.
- Permissive Close Allowed is Allowed, or Utility CB Position Status is set to Open.
- Warning fault 1455 (Utility Breaker Position Contact) is inactive, or Utility CB Position Status is not set to Open.
- It has been less than Genset CB Recharge Delay since the genset CB close signal last changed state.

This delay prevents the genset circuit breaker from locking out the close coil.

PTC Genset CB Open Request

NOTICE

This section applies only if Genset Application Type is set to Power Transfer Control.

There is a PTC genset CB open request when at least one of these conditions is met:

- Based on the PTC operating mode, the conditions are met to open the genset circuit breaker.
 - This condition does not apply until Breaker Commitment Time Delay has elapsed since the last time the PCC tried to open or close the genset circuit breaker or the utility circuit breaker.
- If the PCC is in Manual mode, Excitation Disable Override is set to Excitation Off.
- If the PCC is not in Manual mode, the genset CB inhibit signal is active.
- The genset is not running at rated speed and voltage.
- There is an idle request.
- There is an active shutdown fault.
- If Fail To Disconnect Enable is set to Enable, warning fault 2397 (Utility Breaker Fail To Open) is active, and Genset CB Position Status is set to Closed.

Utility Circuit Breaker Control

The PCC is connected to the utility circuit breaker to open and close the circuit breaker. The PCC sends an open signal and a close signal to the utility circuit breaker. The logic is arranged so that the signals are on only until the PCC senses that the circuit breaker is in the desired position.

The open signal is active and the close signal is inactive when there is a PTC utility CB open request.

The open signal is inactive when there are no PTC utility CB open requests. The close signal becomes active after the open signal has been inactive for Utility CB Open To Close Delay and when all of these conditions are met:

- Based on the PTC operating mode, the conditions are met to close the utility circuit breaker.
This condition does not apply until Breaker Commitment Time Delay has elapsed since the last time the PCC tried to open or close the genset circuit breaker or the utility circuit breaker.
- If the PCC is not in Extended Parallel PTC operating mode, Transition Type is not set to Open Transition, or Genset CB Position Status is not set to Open.
- Permissive Close Allowed is Allowed, or Genset CB Position Status is set to Open.
- Warning fault 1454 (Genset Breaker Position Contact) is inactive.
- It has been less than Utility CB Recharge Delay since the utility CB close signal last changed state.

PTC Utility CB Open Request

NOTICE

This section applies only if Genset Application Type is set to Power Transfer Control.

There is a PTC utility CB open request when at least one of these conditions is met:

- Based on the PTC operating mode, the conditions are met to open the utility circuit breaker.
This condition does not apply until Breaker Commitment Time Delay has elapsed since the last time the PCC tried to open or close the genset circuit breaker or the utility circuit breaker.
- If the PCC is not in Manual mode, the utility CB inhibit signal is active.
- If Fail To Disconnect Enable is set to Enable, warning fault 1453 (Genset Breaker Fail To Open) is active, and Utility CB Position Status is set to Closed.

Utility CB Inhibit Signal

This signal may come from any of these sources:

- PCC Utility CB Inhibit Switch connection
- PCCNet devices
- Modbus networks

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.

This signal generates a PTC utility CB open request if the PCC is not in Manual mode.

7.4 Paralleling Modes

When event 1465 (Ready to Load) is active, the PCC is in one paralleling stat.

Paralleling mode is similar to paralleling state, but the paralleling mode provides more information about the methods the PCC is using to adjust the paralleling frequency reference offset and the paralleling voltage reference offset. As a result, the PCC is in one paralleling mode for the speed reference and in one paralleling mode for the voltage setpoint at any given time.

NOTICE

The PCC is in one paralleling mode for the speed reference and one paralleling mode for the voltage setpoint.

The parameters Paralleling Speed Control Mode and Paralleling Voltage Control Mode indicate which paralleling modes the PCC is in.

[Table 117](#) shows the relationship between paralleling mode and paralleling state.

TABLE 117. PARALLELING MODE VS. PARALLELING STATE

Paralleling State	Paralleling Mode
Standby	Isochronous
Dead Bus Close	Isochronous
Synchronize	Synchronize
Load Share	Load Share
Load Govern	Load Govern
Any*	Droop

* - If the PCC is using speed droop or voltage drool, the corresponding paralleling mode is Droop, regardless of the paralleling state.

NOTICE

In the PCC, the term "isochronous" refers to the paralleling mode that occurs when the paralleling speed reference offset or paralleling voltage reference offset is set to zero. With other controllers, "isochronous" refers to maintaining the same frequency or voltage regardless of load. In general, the PCC maintains the same frequency or voltage regardless of load in every paralleling mode except Droop.

Most of the paralleling modes are introduced in the same sections in which the corresponding paralleling states are introduced. The rest of this section introduces Droop paralleling mode.

7.4.1 Droop

This paralleling mode consists of speed droop and voltage droop.

In speed droop, the PCC reduces the speed reference in response to higher kW. This forces other generator sets to pick up more kW. This reduction is the paralleling speed reference offset.

In voltage droop, the PCC reduces the voltage setpoint in response to lagging kVAR. This forces other generator sets to pick up more lagging kVAR. This reduction is the paralleling voltage reference offset.

Speed Droop (Paralleling Speed Reference Offset)

The PCC uses this method when one of these conditions is met:

- The speed droop enable signal is active.
- The PCC is running in the Standby paralleling state or the Load Share paralleling state, and Isolated Bus Speed Control Method is set to Droop.
- The PCC is running in the Synchronize paralleling state, Synchronizer Speed Control Method is set to External, and Isolated Bus Speed Control Method is set to Droop.

- The PCC is running in the Load Govern paralleling state, and Utility Parallel Speed Control Method is set to Droop.

The PCC reduces the speed reference in response to higher kW. This forces other generator sets to pick up more kW. This reduction is the paralleling speed reference offset.

The PCC reduces the engine speed linearly from no reduction at no load to Speed Droop Percentage at full load. The load is based on Genset % Standby Total kW.

The paralleling frequency reference offset is limited to (-24 Hz)-(+6 Hz).

If the generator set is in parallel with the utility, this function acts like a base load. The engine speed is fixed because the utility frequency is fixed. The generator set kW output depends on how much the PCC tries to reduce the engine speed while it runs at the utility frequency. In this case, use Frequency Adjust to adjust the amount of kW the PCC's generator set provides.

Speed Droop Enable Signal

This signal may come from any of these sources:

- PCC Speed Droop Enable connection
- PCCNet devices
- Modbus networks

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 signal is active 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 uses speed droop to calculate the paralleling speed reference offset.

Voltage Droop (Paralleling Voltage Reference Offset)

The PCC uses this method when one of these conditions is met:

- The voltage droop enable signal is active.
- The PCC is running in the Standby paralleling state or the Load Share paralleling state, and Isolated Bus Voltage Control Method is set to Droop.
- The PCC is running in the Synchronize paralleling state, Synchronizer Voltage Control Method is set to External, and Isolated Bus Voltage Control Method is set to Droop.
- The PCC is running in the Load Govern paralleling state, and Utility Parallel Voltage Control Method is set to Droop.

The PCC reduces the voltage setpoint in response to lagging kVAR. This forces other generator sets to pick up more lagging kVAR. This reduction is the paralleling voltage reference offset.

The PCC reduces the generator set voltage linearly from no reduction at no load to Voltage Droop Percentage at full load (0.8 power factor). The load is based on Genset Total kVAR per Standby kVA.

The paralleling voltage reference offset is limited to (-40%)-(+10%) of Genset Nominal Voltage.

If the generator set is in parallel with the utility, this function acts like a base load. The generator set voltage is fixed because the utility frequency is fixed. The generator set kVAR output depends on how much the PCC reduces the generator set voltage when it runs at the utility voltage. In this case, use Voltage Adjust to adjust the amount of kVAR the generator set provides.

Voltage Droop Enable Signal

This signal may come from any of these sources:

- PCC Voltage Droop Enable connection
- PCCNet devices
- Modbus networks

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 signal is active 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 uses voltage droop to calculate the paralleling voltage reference offset.

7.5 Paralleling Operation Signals

7.5.1 Load Demand Stop

This signal tells the PCC to shut down the generator set because there is excess capacity.

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

- The PCC is in the Load Share paralleling state or in the Load Govern paralleling state.
- The PCC is in Auto mode.
- The remote start signal is active.

This signal may come from any of these sources:

- PCC Load Demand Stop connection
- s-CAN Network (PCC3300 MLD controls only)
- Modbus networks

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

This section provides an overview of the effects of this signal. The effects are discussed in more detail in the sections for the Load Share paralleling state and the Load Govern paralleling state.

When this signal becomes active, the PCC runs the appropriate ramp unload process. When the ramp unload process finishes, the PCC initiates a Shutdown with Cooldown sequence.

The PCC skips the ramp unload process if one of these conditions is met:

- Genset CB Position Status is set to Open.
- The PCC is using speed droop to control the paralleling speed reference offset.

If this signal becomes inactive before the end of the ramp unload process, the PCC runs the appropriate ramp load process.

If this signal becomes inactive before the end of the Shutdown with Cooldown sequence, the stop sequence is interrupted.

If this signal becomes inactive after the PCC shuts down the generator set, the PCC initiates a Load Demand Start sequence. Then, when the generator set is in the Load Share paralleling state or in the Load Govern paralleling state again, the PCC runs the appropriate ramp load process if the generator set is in parallel with other generator sets or with the utility.

7.5.2 Ramp Load Unload

This signal tells the PCC to increase or decrease the generator set output.

NOTICE

In most applications, this signal is not required.

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

- The PCC is in the Load Share paralleling state or in the Load Govern paralleling state.
- The PCC is in Auto mode.
- The remote start signal is active.

This signal may come from any of these sources:

- PCC Ramp Load Unload connection
- PCCNet devices
- Modbus networks

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.

When this signal changes from inactive to active, the PCC starts running the appropriate ramp unload process.

When this signal changes from active to inactive, the PCC starts running the appropriate load process.

7.6 Masterless Load Demand

Masterless Load Demand (MLD) capable generator set controls are equipped with an additional s-CAN network connection that allows the sharing of information between generator set controls. When multiple MLD equipped controls are operated as a paralleled isolated bus, the generator sets in a MLD network share information to determine total load on the generator AC bus, available capacity of operating generator sets, and available capacity of non-operating generator sets. The generator set controls use this information to start and stop generator sets based on the load demands on the generator AC bus.

The s-CAN network is Masterless in that if any one generator set fails or goes offline (i.e. a generator set shutdown fault) the network will start an additional set and remain in operation. Further should one generator set fail, it will not disable the system.

7.6.1 MLD s-CAN Network (PCC3300 with MLD Controls ONLY)

s-CAN is a CAN based system network used ONLY for Masterless Load Demand (MLD). A separate CAN network exists for communications to the ECM. The s-CAN network allows the connection of up to 16 generator sets over a total network length of 200 meters. When connected this network allows the generator sets to share information to allow load demand operation. s-CAN physical requirements comply with the SAE J1939-11 standard, the same standards used for ECMs, and the same operating,

installation, and troubleshooting rules apply. s-CAN is unique in that the ground for the CAN bus is isolated from the generator set ground. By isolating the s-CAN network ground the generator set to generator set communications network is less susceptible to ground potential differences and the ground noise which ultimately provides for a more robust system network connection. See [Section 5.2.14](#) for additional instructions.

NOTICE

The s-CAN network is a 3-wire plus shield network. The ECM CAN networks are typically 2-wire plus shield network. All 3-wire connections are required for reliable connections.

NOTICE

To ensure the network is as robust as possible do NOT connect the s-CAN ground to the B+ return or chassis ground and make sure to follow all installation instructions. s-CAN Network devices should only be connected to other s-CAN devices.

NOTICE

Do not connect the s-CAN Networks to any other CAN Networks.

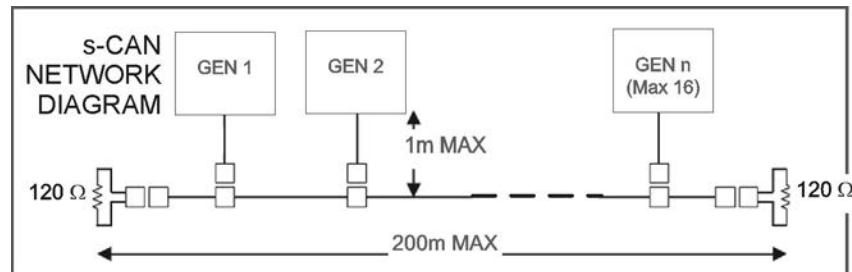


FIGURE 94. S-CAN NETWORK CONNECTIONS (PCC3300 WITH MLD CONTROLS ONLY)

7.6.2 Load Demand (LD) Type

Load demand type allows the operator to set the generator load demand sequencing priority based on a user defined priority (Fixed Priority Sequence) or based on differences in the running hours of the generator sets (Run Hours Equalization).

To protect system integrity, load demand will restart all generator sets whenever an overload condition is detected. Control functions for starting or stopping generator sets for load demand are adjustable and can be adjusted while the system is operational.

7.6.2.1 Run Hours Equalization

Run hours equalization uses Load Demand Genset Run Hours and Run Hours Differential to set the generator set priority for load demand, see examples in [Appendix B](#).

- Generator set run hours uses a writable run hours accumulator for load demand run hours equalization.
- When the difference in load demand run hours between any two generator sets is the same the start or stop priority is based off of the Genset ID, for example Gen3 is higher priority than Gen4.

Theory of Operation:

- All running generator sets are considered as a higher priority than all stopped generator sets.

- Of all running generator sets, generator set priorities are assigned according to Load Demand Genset Run Hours from smallest to largest. Generator sets with the lowest Load Demand Genset Run Hours are given the highest priority.

The running generator set with the lowest priority is the next generator set to stop.

- Of all stopped generator sets, the highest generator set priority is assigned according to Load Demand Genset Run Hours from smallest to largest. Generator sets with the lowest Load Demand Genset Run Hours are given the highest remaining priority.

The stopped generator set with the highest priority is the next generator set to start.

- When the difference in the run hours between the Load Demand Next Gen to Stop (Nxt Gen To Stop) and Load Demand Next Gen to Start (Nxt Gen To Start) exceeds the Run Hours Differential, the system starts up the generator set with the lower number of running hours and shuts down the one with the higher number of hours.
- Only generator sets with Load Demand Genset Status showing Online, Online Pending (Pending), or Load Demand Stop (LD Stop) will be considered available for Run Hours Equalization.

NOTICE

To enable the load demand (MLD) system to execute Run Hours Equalization based on actual generator set running hours, go to the from the PARALLELING/BASIC SETUP (9/9) menu and set the Load Demand Genset Run Hours (LD Run Hrs) to the same value as the actual Engine Hours on each generator set. Engine hours are shown on the same screen to help with the commissioning and setup process.

7.6.2.2 Fixed Priority Sequence

The fixed priority sequence allows the generator set priority to be manually assigned. See examples in [Appendix B](#).

Each generator set is assigned a fixed priority of 1 through 16. This sets the sequence of starting or stopping the generator sets as system load increases or decreases.

7.6.3 Load Demand Threshold Method

The Load Demand Threshold Method (Threshold Method) sets whether the load demand start and stop control is based on a relative Load Demand Threshold Method (%kW) (Threshold Method %kW) or absolute Load Demand Threshold Method (kW) (Threshold Method kW).

7.6.3.1 Load Demand Threshold Method (%kW)

The Load Demand Threshold Method (%kW) start and stop operation is as follows:

- See examples in [Appendix B](#)
- The Load Demand Start Threshold (%kW) is the maximum ratio of load to capacity before starting the next generator set; it must always be greater than the Load Demand Stop Threshold (%kW) (Stop Thresh %kW) by at least 5%.
- The Load Demand Stop Threshold (%kW) is the minimum ratio of load to capacity before stopping the next generator set; it must always be less than Load Demand Start Threshold (%kW) (Start Thresh %kW) by at least 5%

7.6.3.2 Load Demand Threshold Method (kW)

The Load Demand Threshold Method (kW) start and stop operation is as follows:

- See examples in [Appendix B](#)

- The Load Demand Start Threshold (kW) (Start Thresh kW) is the minimum Load Demand Surplus Capacity (Surplus Cap) before starting the next generator set; it is always less than Load Demand Stop Threshold (kW) (Stop Thresh kW).
- The Load Demand Stop Threshold (kW) (Stop Thresh kW) is the maximum Load Demand Surplus Capacity (Surplus Cap) before stopping the next generator set; it is always greater than Load Demand Start Threshold (kW) (Start Thresh kW).

7.6.4 Spare Capacity Request Value

When large load transients are expected on the generator set AC bus the Load Demand Spare Capacity Request Value (Spare Cap Req) feature provides a mechanism to notify the Masterless Load Demand (MLD) network that additional capacity needs to be brought on line ahead of the load. When the Load Demand Spare Capacity Request Value (Spare Cap Req) input is Active, (Configurable Input see [Section 8.33.1.2](#)), the MLD network will adjust the online capacity to sufficiently handle existing bus loads AND the additional Load Demand Total Spare Capacity Requested (Tot Spare Req). Once the necessary capacity is available the Load Demand Spare Capacity Available (Spare Cap Avail) output is Active, (Configurable Outputs [Section 8.33.3](#)), Load Demand Spare Capacity Available (Spare Cap Avail) on the HMI320 will also be set to Yes, signaling that the load can now be brought on line.

One Spare Capacity Request Value (Spare Cap Req) input may be configured per generator set on the MLD network, up to 16 total spare capacity requests per network.

7.6.5 System Remote Start

When generator sets are connected via the s-CAN network and System Remote Start Enable is ENABLED, a single remote start input on any one generator set will be recognized as a remote start on all other network connected generator sets.

This minimizes the need to wire remote start to all generator sets on the bus.

NOTICE

If the s-CAN network is lost between generator sets while utilizing the System Remote Start in the paralleling system. The network remote start command will be lost on all disconnected generator sets. Without a valid remote start command the generator sets will stop. For applications where redundancy is important, it is recommended that the remote start input be hard-wired to each generator set.

7.6.6 Masterless Load Demand Setup

This section provides information on how to setup the PCC3300 Masterless Load Demand (MLD) feature. Load demand system settings can be found under the paralleling/basic setup menu on the HMI320 or in the InPower service tool.

NOTICE

MLD settings and screen content are only visible on generator sets with the PCC3300 MLD capable control. See [Section 5.2](#) for additional details on how to determine if a generator set is equipped with the MLD feature.

7.6.6.1 Load Demand System Settings

The Load Demand (LD) System Settings page includes all setup parameters for load demand that are shared across the network. System settings can be modified while the system is in operation

NOTICE

Before running load demand, make sure that the system settings are indicated as In Sync. To synchronize system settings, change Synchronize System Setting (Sync System Settings) to Yes. Once system settings have been saved, Synchronize System Settings (Sync System Settings) will return to No.

Rated Freq and Voltage			
Paralleling/Basic Setup(7/9)			
Load Demand (LD) System Settings			
LD Sys Enable	Disable	Run Hrs Diff	1500 hrs
LD Type	Run Hr Eq	LD Initial Delay	1500 sec
Threshold Method	kW	LD Start Delay	1500 sec
Start Thresh %kW	0%	LD Stop Delay	1500 sec
Start Thresh kW	1500kW	LD Gen Fail Delay	1500 sec
Stop Thresh %kW	5%	Sys Rmt Strt En	Disable
Stop Thresh kW	5000kW	Clr Lost Gen	No
System Settings Status		Sync System Settings	
Out of Sync		No	
Status	LD Status	▲	▼

FIGURE 95. PARALLELING/BASIC SETUP (7/9)

TABLE 118. LOAD DEMAND (LD) SYSTEM SETTINGS

PARAMETER (HMI NAME)	DESCRIPTION (For allowed values see Table 158 for additional details)
Load Demand System Enable (LD Sys Enable)	Disables or Enables load demand operation of all connected generator sets
Load Demand Type (LD Type)	Sets the sequencing priority for load demand
Load Demand Threshold Method (Threshold Method)	Sets whether the load demand start/stop control is based on a relative (%kW) or absolute (kW) threshold
Load Demand Start Threshold (%kW) (Start Thresh %kW)	When the ratio of load to capacity is greater than this value the next generator set will start Must be greater than Load Demand Stop Threshold by at least 5% Note: When the Threshold Method is set to %kW, the Load Demand Start Threshold (%kW) needs to be greater than the Load Demand Stop Threshold (%kW). This is different than when the Threshold Method is set to kW where the Load Demand Stop Method (kW) is greater than the Load Demand Start Method (kW).

PARAMETER (HMI NAME)	DESCRIPTION (For allowed values see Table 158 for additional details)
Load Demand Start Threshold (kW) (Start Thresh kW)	When surplus capacity is less than this value the next generator set will start Must be less than Load Demand Stop Threshold (kW)
Load Demand Stop Threshold (%kW) (Stop Thresh %kW)	When the ratio of load to capacity is less than this value the next generator set will stop Must be less than Load Demand Start Threshold by at least 5%
Load Demand Stop Threshold (kW) (Stop Thresh kW)	When surplus capacity is greater than this value the next generator set will stop Must be greater than Load Demand Stop Threshold (kW) Note: To ensure there is always at least two generators on the bus, for redundancy, it is recommended that the Load Demand Stop Threshold (kW) always be set to a value greater than the application rating of a single generator set.
Load Demand Run Hours Differential (Run Hrs Diff)	When the difference between Load Demand Genset Run Hours between any running generator set and any stopped generator set reaches this value the stopped generator set will be started
Load Demand Initial Delay (LD Initial Delay)	Sets the time delay before generator sets are allowed to stop after initial start or after resuming from halted load demand
Load Demand Start Delay (LD Start Delay)	Sets the time delay before next generator set is allowed to start
Load Demand Stop Delay (LD Stop Delay)	Sets the time delay before next generator set is allowed to stop
Load Demand Genset Fail Delay (LD Gen Fail Delay)	Sets the time delay that the system waits for a generator set to come online before declaring it as failed and starting the next generator set
System Network Remote Start Enable (Sys Rmt Strt En)	When ENABLE a remote start signal at any single generator set will start all the generator sets on the s-CAN Network
Clear Lost Gensets Local (Clr Lost Gen)	When set to YES all generator sets in state 'Lost' will change to state 'Gen Does Not Exist' in order to clear Lost Genset Warning or System Network Failed warning
System Settings Status (System Settings Status)	Indicates whether the system settings on the local generator set are in sync with ones from other generator set in the network Note: For proper system operation, System Settings Status should be InSync.
Synchronize System Settings (Sync System Settings)	When set to YES system settings from the generator set will be broadcasted and synchronized to all other generator sets in the network Note: Once system settings have been saved, Sync System Settings will return to No.

7.6.6.2 Load Demand Settings - Fixed Priority

The Load Demand Fixed Priority setup page provides a means to configure the start and stop priority of connected generator sets. Generator set priority can be changed while the system is in operation.

NOTICE

Before running load demand, make sure that the system settings are indicated as InSync. To save synchronize system settings, change Synchronize System Settings (Sync System Settings) to Yes. Once system settings have been saved, Synchronize System Settings (Sync System Settings) will return to No.

Rated Freq and Voltage			
Paralleling/Basic Setup(8/9)			
Load Demand Fixed Priority (Priority:GenID)			
Priority1	Gen 1	Priority9	Gen 9
Priority2	Gen2	Priority10	Gen 10
Priority3	Gen3	Priority11	Gen 11
Priority4	Gen4	Priority12	Gen 12
Priority5	Gen5	Priority13	Gen 13
Priority6	Gen6	Priority14	Gen 14
Priority7	Gen7	Priority15	Gen 15
Priority8	Gen8	Priority16	Gen 16
System Settings Status		Sync System Settings	
Out of Sync		No	
Status	LD Status	▲	▼

FIGURE 96. PARALLELING/BASIC SETUP (8/9)

TABLE 119. LD FIXED PRIORITY (PRIORITY: GENID)

PARAMETER (HMI NAME)	DESCRIPTION (For allowed values see Table 158 for additional details)
Load Demand Fixed Priority 1 - 16 (Priority1 - 16)	Assigns a generator set to fixed priority 1 through 16 Used when Load Demand Type is set to Fixed Sequence
Genset ID (Genset ID)	Assigned unique generator set identifier
System Settings Status (System Settings Status)	Indicates whether the system settings on the local generator set are in sync with ones from other generator sets in the network Note: Before running load demand, make sure that the system settings are indicated as InSync.
Synchronize System Settings (Sync System Settings)	When set to YES, system settings from the generator set will be broadcasted and synchronized to all other generator sets in the network Note: Once system settings have been saved, Synchronize System Settings (Sync System Settings) will return to No.

7.6.6.3 Load Demand Local Settings

The load demand local settings page includes all setup parameters for load demand that are specific to the generator set itself, not system wide settings. The generator set must be stopped to modify some parameters in this section.

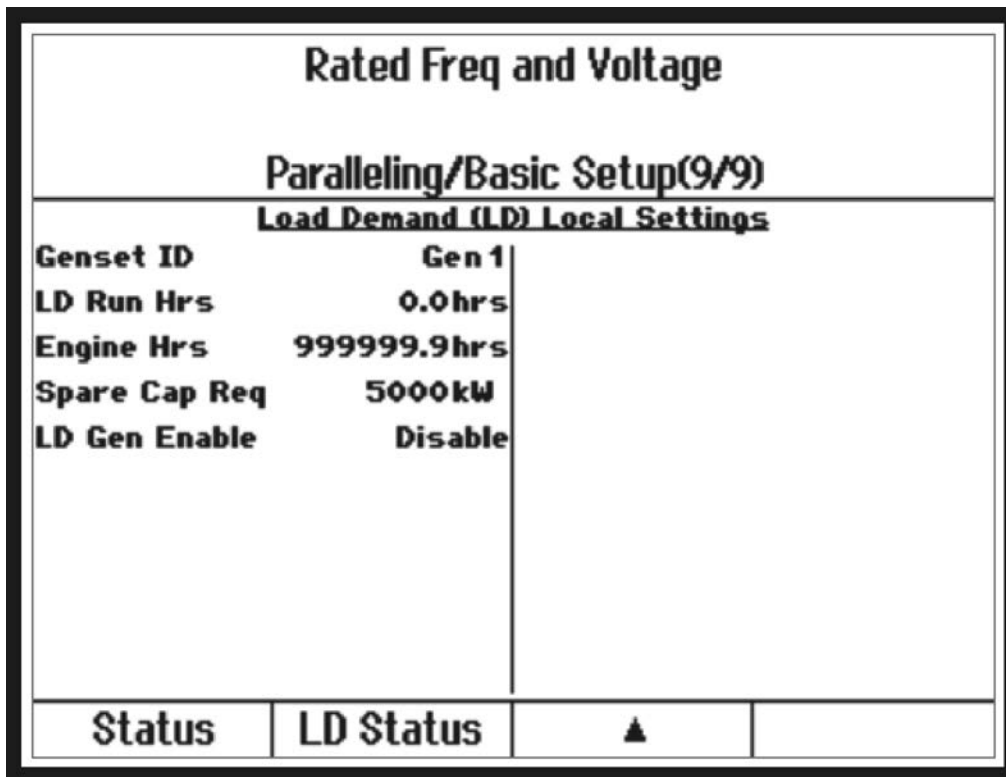


FIGURE 97. PARALLELING/BASIC SETUP (9/9)

TABLE 120. LOAD DEMAND (LD) LOCAL STATUS

PARAMETER (HMI NAME)	DESCRIPTION (For allowed values see Table 158 for additional details)
Genset ID (Genset ID)	Assigned unique generator set identifier Note: To configure Genset ID in the InPower service tool, Setup Mode Enable must be set to ENABLE.
Load Demand Genset Run Hours (LD Run Hrs)	Run hour accumulator used for load demand run hour equalization This is writable
Engine Run Hours (Engine Hrs)	Engine run hours accumulated Note: To enable the load demand (MLD) system to execute Run Hours Equalization based on actual generator set running hours, go to the from the PARALLELING/BASIC SETUP (9/9) menu and set the Load Demand Genset Run Hours (LD Run Hrs) to the same value as the actual Engine Hours on each generator set. Engine hours are shown on the same screen to help with the commissioning and setup process.
Load Demand Spare Capacity Request Value (Spare Cap Req)	Sets the kW value of additional capacity to be requested from the system when the Load Demand Spare Capacity Request Input is Active, see Section 8.33 Note: To configure Load Demand Spare Capacity Request Value in the InPower service tool, Setup Mode Enable must be set to ENABLE.

PARAMETER (HMI NAME)	DESCRIPTION (For allowed values see Table 158 for additional details)
Load Demand Genset Enable (LD Gen Enable)	<p>Disables or enables load demand on this generator set only</p> <p>When set to disable the generator set is not included in the load demand system and can be removed without triggering a com error</p> <p>Note: To configure Load Demand Genset Enable in the InPower service tool, Setup Mode Enable must be set to ENABLE.</p>

7.6.7 Masterless Load Demand Status Screens

This section provides load demand local and system status information for each generator set of the PCC3300 Masterless Load Demand (MLD) feature. Load demand system status can be found under the paralleling status menu on the display or in the InPower service tool.

NOTICE
<p>MLD settings and screen content are only visible on generator sets with the PCC3300 MLD capable controller. See Section 5.2 for additional details on how to determine if a generator set is equipped with the MLD feature</p>

7.6.7.1 Load Demand (LD) System Status

The load demand system status page displays a summary of the load demand system, including the summation of data for all connected generator sets and details to indicate which generator set will start and stop next.

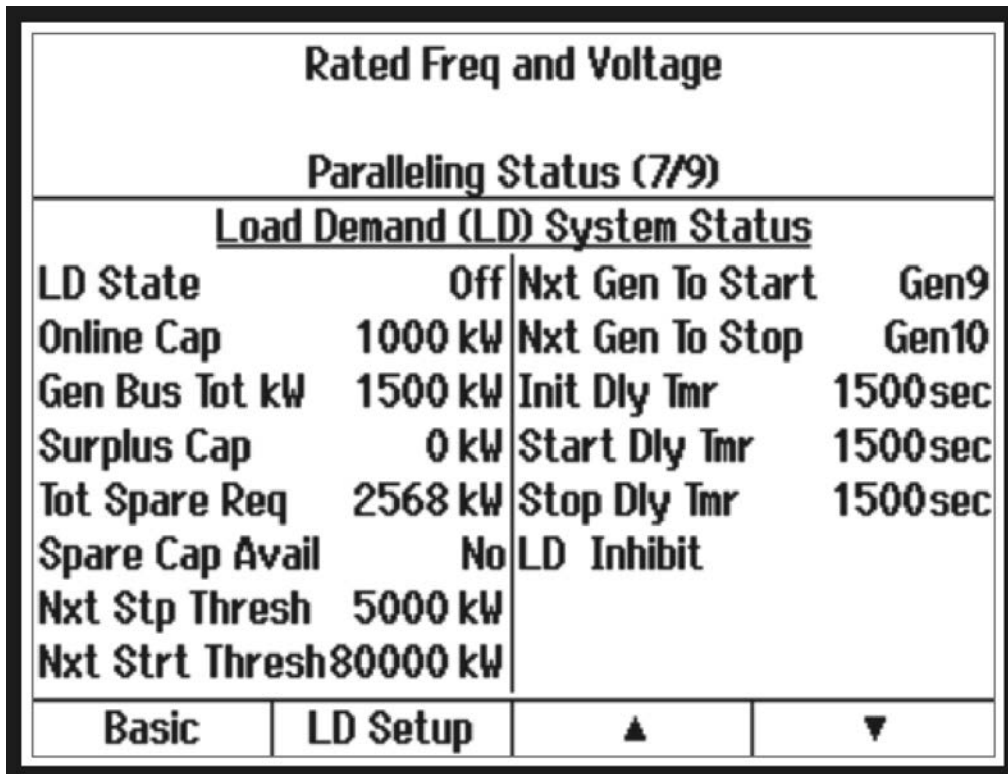


FIGURE 98. PARALLELING STATUS (7/9)

TABLE 121. LOAD DEMAND (LD) SYSTEM STATUS

PARAMETER (HMI NAME)	DESCRIPTION
Load Demand State (LD State)	Indicates the status of Load Demand operation See Table 122 .
Load Demand Online Capacity (Online Cap)	Indicates the total amount of online kW bus capacity for load demand Only generator sets which are eligible for load demand count
Load Demand Genset Bus Total kW (Gen Bus Tot kW)	Indicates the total load of System Network connected generator sets
Load Demand Surplus Capacity (Surplus Cap)	Indicates the amount of unused online kW bus capacity (spinning reserve)
Load Demand Total Spare Capacity Requested (Tot Spare Req)	Indicates the total kW value of all currently active spare capacity requests, generator sets with Load Demand Spare Capacity Request equal to Yes, in the system
Load Demand Spare Capacity Available (Spare Cap Avail)	Indicates when the current load and spare capacity requirements are satisfied Note: To avoid unnecessary generator set starting and stopping once the Load Demand Spare Capacity Available (Spare Cap Avail) Output is Active, Load Demand Spare Capacity Available (Spare Cap Avail) on the HMI320 will also be set to Yes. The load should be applied and the Load Demand Total Spare Capacity Request (Tot Spare Req) Input should be removed before the Load Demand Start Delay Timer (Start Dly Tmr) expires.
Load Demand Next Stop Threshold (kW) (Nxt Stp Thresh)	The kW load at which the next generator set will be stopped
Load Demand Next Start Threshold (kW) (Nxt Strt Thresh)	The kW load at which the next generator set will be started
Load Demand Next Gen to Start (Nxt Gen To Start)	Indicates the Genset ID of the next generator set to start
Load Demand Next Gen to Stop (Nxt Gen To Stop)	Indicates the Genset ID of the next generator set to stop
Load Demand Initial Delay Timer (Init Dly Tmr)	Indicates the time remaining before generator sets are allowed to stop after initial start or after resuming from halted load demand This timer is set by Load Demand Initial Delay
Load Demand Start Delay Timer (Start Dly Tmr)	Indicates the time remaining before next generator set is allowed to start This timer is set by Load Demand Start Delay
Load Demand Stop Delay Timer (Stop Dly Tmr)	Indicates the time remaining before next generator set is allowed to stop This timer is set by Load Demand Stop Delay
Load Demand Inhibit Local (LD Inhibit)	Indicates the status of the Load Demand Inhibit input When ACTIVE all the generator sets will start

TABLE 122. LOAD DEMAND (LD) STATE

STATE	DESCRIPTION
Off	Load Demand System Enable is set to DISABLE. MLD is disabled
Halted	Load demand operation is ceased and all generator sets have started due to one of the following conditions: <ul style="list-style-type: none"> • Load Demand Inhibit is active • The generator set s-CAN datalink status is INACTIVE (no connected generator sets) • One of the generator sets is sensing a dead bus • No generator sets are eligible for load demand, see Table 124 • An active fault exists on the network or generator set that is preventing load demand from operating, i.e. Generator set is lost, a setup error exists, or etc.
Initial Delay	Load demand operation is waiting for an Initial Delay Timer to expire before commencing load demand
Load Monitor	Load demand is operating normally and is actively monitoring and controlling generator set bus load capacity

7.6.7.2 Load Demand (LD) System Overview

The load demand system overview page indicates which generator sets are connected to the network, their assigned priority, and the current status of each generator set.

Rated Freq and Voltage					
Paralleling Status (8/9)					
<u>Ld Dmd System Overview (GenID:Priority:Status)</u>					
Gen1	P0	LD Stop	Gen9	P8	LD Stop
Gen2	P1	Pending	Gen10	P9	Pending
Gen3	P2	Online	Gen11	P10	Online
Gen4	P3	Failed	Gen12	P11	Failed
Gen5	P4	Ineligible	Gen13	P12	Ineligible
Gen6	P5	OK To Disc	Gen14	P13	OK To Disc
Gen7	P6	Lost	Gen15	P14	Lost
Gen8	P7	Not Exist	Gen16	P15	Not Exist
Basic		LD Setup	▲		▼

FIGURE 99. PARALLELING STATUS (8/9)

TABLE 123. LD SYSTEM OVERVIEW (GENID:PRIORITY:STATUS)

PARAMETER (HMI NAME)	DESCRIPTION
Genset ID (Genset ID)	Generator set identifier. All load demand generator sets must have a unique Genset ID
Load Demand Genset Status Table (Status and Priority)	Indicates the load demand priorities and status of all system network connected generator sets See Table 124 for additional information.

TABLE 124. LOAD DEMAND GENSET STATUS TABLE

STATUS	DESCRIPTION
OK To Disconnect (OK To Disc)	The generator set can be disconnected from the System s-CAN Network without a Genset Lost warning and causing the system to abort load demand operation The generator set status is set to OK To Disc when the generator set switch position is set to OFF, and Load Demand Genset Enable (trim) is set to Disable
Ineligible	Conditions exist that make the generator set incapable of operating in Load Demand Online generator sets in that are Ineligible will not be counted as part of the online capacity Example conditions for Ineligible: <ul style="list-style-type: none"> • Circuit Breaker is Inhibited • Generator Set is Not in Auto • The Remote Start Input is Not active The following conditions are required for a generator set to be Eligible for Load Demand (LD): <ul style="list-style-type: none"> • Control Switch Position: Auto • Load Demand Genset Enable (trim): Enable • Load Demand Genset Status Not in a Failed state • Remote Start Command: Active • Genset Application Type: Isolated Bus • No Generator set active shutdown faults (Common Shutdown or Shutdown with Cooldown Command: Inactive) • Load Demand Genset Status: • System network Datalink Status: Active • Load Demand Stop Input/Modbus Command: Inactive • Genset CB Inhibit Input/Modbus Command: Inactive
Online Pending (Pending)	The generator set is in the process of starting, synchronizing, or ramping load to the generator AC bus and will soon be online System network Datalink Status: Active

STATUS	DESCRIPTION
Failed	<p>A generator set failed to come online; start, synchronize, and close its breaker; before the Load Demand Genset Failed Delay timer expired.</p> <p>Examples of conditions for Failed:</p> <ul style="list-style-type: none"> • Fail to load • Fail to come online <p>System network Datalink Status: Active</p>
Online	<p>The generator set is supplying power and contributing to online capacity</p> <p>System network Datalink Status: Active</p>
Load Demand Stop (LD Stop)	<p>The generator set is either ramping off load to stop or is currently stopped awaiting a change in load that will require a start.</p> <p>System network Datalink Status: Active</p>
Genset Does Not Exist (Not Exist)	<p>This state indicates the network regards the generator set as non-existent and does not expect active communications from that Genset ID. Once a generator set with a unique Genset ID begins communicating on the network, the status of that generator set will change from Genset Does Not Exist (Not Exist) to one of the other possible generator set statuses.</p>
Genset Lost (Lost)	<p>Network communications once existed, but now is lost to one or more nodes on the s-CAN network.</p> <p>Example: If the s-CAN connection is lost between one generator set and the network. The disconnected generator set will indicate all other generator sets are Lost. All other generator sets on the network will indicate that the disconnected generator set is Lost.</p> <p>When a generator set is lost (not communicating with other generator sets on the s-CAN Network) the datalink status (System Status Screen 8/9, and etc.) for the failed generator set is indicated as Failed.</p> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p style="text-align: center;">NOTICE</p> <p>Changing Clear Lost Genset (trim) to Yes, will set all Lost generator sets to Genset Does Not Exist, and will change the datalink status for all generator sets still communicating on the network from Failed to Inactive.</p> </div>

7.6.7.3 Load Demand (LD) Local Status

Load demand local status page displays status information pertaining only to the local generator set.

Rated Freq and Voltage			
Paralleling Status (9/9)			
Load Demand (LD) Local Status			
Genset ID	Gen1	Spare Cap Req Status	
LD Run Hrs	0.0 hrs	Inactive	
Datalink Stat	Active		
Term Res Switch	OFF		
Basic	LD Setup	▲	

FIGURE 100. PARALLELING STATUS (9/9)

TABLE 125. LOAD DEMAND (LD) LOCAL STATUS

PARAMETER (HMI NAME)	DESCRIPTION
Genset ID (Genset ID)	Assigned unique generator set identifier
Load Demand Genset Run Hours (LD Run Hrs)	Run hour accumulator used for load demand run hour equalization This is a writable parameter in paralleling setup
System Network Datalink Status (Datalink Stat)	Indicates communication status of the local generator set on System Network (used for load demand) <ul style="list-style-type: none"> • When the generator set datalink failure occurs all generator sets will start to ensure adequate capacity on the generator set AC bus Note: Changing Clear Lost Genset (trim) to Yes will set all Lost generator sets to Genset Does Not Exist, and will change the Datalink Status for the lost generator set from Failed to Inactive. Once this failure is acknowledged, load demand operation will resume. See Table 126 .
System Network Termination Resistor Switch Status (Term Res Switch)	Indicates the status of the on-board CAN termination resistor switch (S1) Note: When the status is on, a 120-ohm resistor is connected across TB3-3 and TB3-4 on the generator set. See Section 7.6.8 for more details on how to configure this switch.
Load Demand Spare Capacity Request Status (Spare Cap Req Status)	Indicates the status of the Load Demand Spare Capacity Request input, Configurable I/O, see Section 8.33 When Active additional spare capacity (set by Load Demand Spare Capacity Request Value) is requested

TABLE 126. SYSTEM NETWORK DATALINK STATUS

STATUS	DESCRIPTION
Active	Generator set is communicating on the s-CAN network
Inactive	There is no communications with any other generator set
Failed	Generator set was communicating and is no longer communicating with any other generator set on the s-CAN network

7.6.8 MLD Service Procedures

Masterless Load Demand (MLD) capable generator sets and controllers can be safely removed from the network to perform maintenance.

7.6.8.1 How to Shutdown a Generator Set Running in a MLD Network

This process describes how to shutdown a generator set running in a MLD network without impacting the operating MLD system, causing a generator AC bus overload, or a dead bus condition.

1. Put the generator set in manual run mode by pressing the Manual button on the generator set to be shutdown followed by the Start button. The next priority generator set will start and come online.
2. Wait for the replacement generator set to come online, Load Demand Genset Status Table to should read Online.
3. Push STOP on the generator set to be shutdown.

⚠ CAUTION

If a generator set is stopped before a replacement generator is online and there is sufficient capacity remaining to sustain the load the generator AC bus may become overloaded or the generator set may shutdown leading to a dead bus condition. MLD will automatically restart all generator sets should these conditions occur. Additional warnings may occur in the system.

NOTICE

System faults may be cleared from any generator set HMI. Individual generator set faults must be cleared on that generator set.

NOTICE

See [Section 7.6.8.3](#) for details on how to return a generator set to the MLD network.

7.6.8.2 Disconnecting the Battery or Removing a Generator Set Controller (PCC3300) from a Generator Set connected to a MLD Network

This process describes how to shutdown a generator set running in a MLD network, and properly disconnecting the battery or removing the generator set controller without impacting the operating MLD system, causing a generator AC bus overload or a dead bus condition.

1. If the s-CAN Network continuity or termination will be disturbed when removing the PCC 3300, see [Section 7.6.8.3](#)
 - Set Load Demand System Enable (LD Sys Enable) to DISABLE and then set Synchronize System Settings (Sync System Settings) to Yes (if system was running in MLD mode, all generator sets will start).

- Wait for all generator sets to come online, LD System Overview (Status) on Paralleling Status (8/9) screen will read Online for each generator set when it is online.

NOTICE

When all generator sets are running on the system, and Load Demand System Enable (LD Sys Enable) is set to DISABLE the number of Online generator sets will not be impacted by communication faults between controls.

2. Follow all steps in [Section 7.6.8.1](#) to stop the generator set.
3. Once the generator set has fully stopped, set Load Demand Genset Enable (LD Gen Enable) to Disable.
4. On the generator to be removed, wait for the Load Demand Genset Status to read OK to Disconnect.
5. Disconnect the battery to the generator set and/or remove the controller from the generator set.

⚠ CAUTION

If a generator set is stopped before a replacement generator is online and there is sufficient capacity remaining to sustain the load, the generator AC bus may become overloaded or the generator set may shutdown leading to a dead bus condition. MLD will automatically restart all generator sets should these conditions occur. Additional warnings may occur in the system.

NOTICE

If the controller is disconnected without following the described process. Load demand will be disabled on the network and all generator sets will start. Additional warnings may occur in the system.

NOTICE

To clear the Genset Lost on System Network, operator must set Clear Lost Gensets to Yes, from the paralleling setup menu, on any single HMI or through InPower service tool, then press the Reset button. This allows load demand to resume normal operation with the remaining connected generator sets.

NOTICE

System faults may be cleared from any generator set HMI. Individual generator set faults must be cleared on that generator set.

NOTICE

See [Section 7.6.8.3](#) for details on how to return a generator set to the s-CAN Network.

7.6.8.3 How to Restore a Generator Set to the MLD Network

This process describes how to return a generator set back to the active MLD network.

NOTICE

If the generator set being restored is at the ends of the s-CAN bus, the system is running MLD, generator sets on the MLD network are Online, then all generator sets will start, before continuing.

1. If the s-CAN Network continuity or termination will be disturbed when adding a generator set back to the system, set Load Demand System Enable (LD Sys Enable) to DISABLE, Synchronize System Settings (Sync System Settings) to Yes, and wait for all generator sets to start and connect to the generator AC bus.
2. Reconnect controller to generator set battery.
3. Set the Genset ID (Genset ID) to unique value, see [Section 7.6.7.3](#).
4. Reconnect controller to network system s-CAN connection at TB3.
5. If required adjust the position of the network terminating resistors or S1 switch position, on the s-CAN Network. See [Appendix A](#) for placement details.
6. Verify all generator sets on the s-CAN Network are communicating (System Network Datalink Status (Datalink Stat) is Active), and Load Demand Genset Status is not equal to Genset Lost (Lost). See [Section 7.6.7.2](#) and [Section 7.6.7.3](#).
7. Update or confirm System Settings Status on the restored generator set by setting Synchronize System Setting (Sync System Settings) to Yes from any OTHER generator set on the network with known correct settings.
8. Verify the System Settings Status are updated to the MLD network on the restored generator set. System Settings Status will be indicated In Sync on the restored generator set.
9. Set any other applicable Local MLD settings of the restored generator set if required. See [Section 7.6.6.3](#)
10. Set Load Demand Genset Enable (LD Gen Enable) to Enable. Load Demand Genset Status will change from OK To Disconnect (OK To Disc) to Ineligible.
11. Set the generator set to Auto and apply the Remote Start input. The generator set starts and connects to the AC bus.
12. If Disabled in step 1, set Load Demand System Enable (LD Sys Enable) to Enable and Synchronize System Settings (Sync System Settings) to Yes.
13. The system is now operating in MLD mode. Generator sets will start and stop based on priority and load on the system.

8 Setup and Calibration

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 generator set operation and may cause damage to the generator set or to equipment connected to the generator set.

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

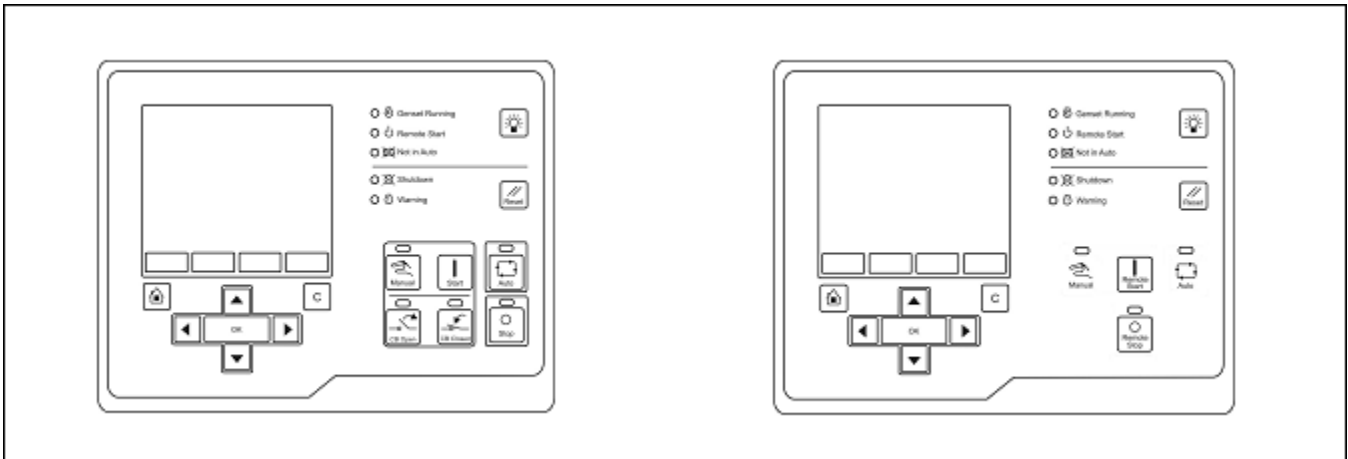


FIGURE 101. OPERATOR PANEL (POWER COMMAND 3.3) AND OPERATOR PANEL (REMOTE)

8.2.1 Operator Panel Description

This section introduces the Operator Panel.

NOTICE

The examples in this section use the remote Operator Panel.

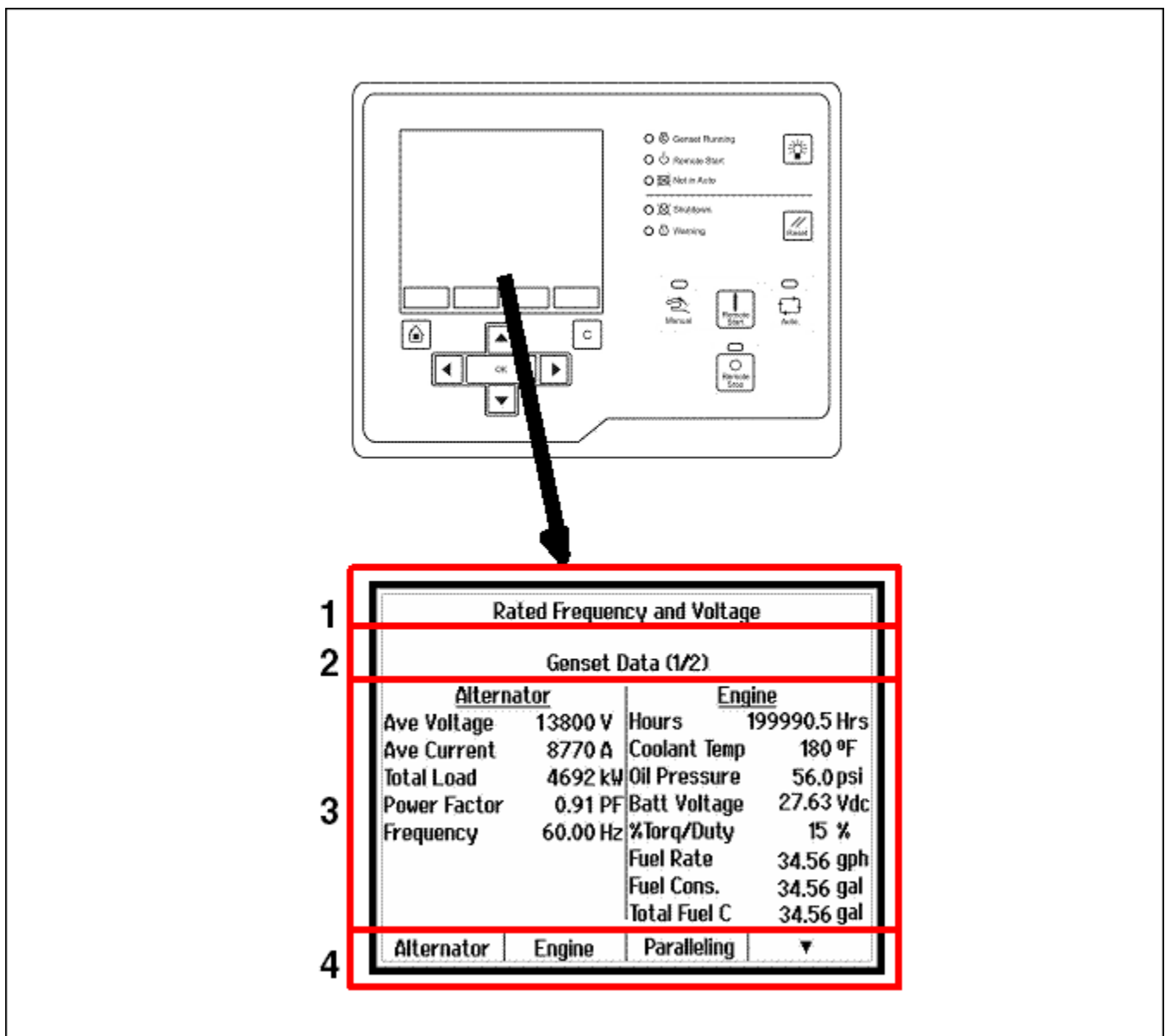


FIGURE 102. GRAPHICAL DISPLAY (AND TYPICAL SCREENSHOT)

TABLE 127. 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 [Figure 102](#) displays the status of the PCC.

TABLE 128. PCC STATUS IN THE GRAPHICAL DISPLAY

STATUS	DESCRIPTION
Ready	This is the default state. The PCC is ready to start the generator set, 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 [Figure 102](#) 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 ([Table 129](#))
- 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 129. 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.
Shutdown with Cooldown	This is a shutdown fault that initiated a Shutdown with Cooldown sequences.

Section 3 in [Figure 102](#) is interactive. You can look at operating values for the generator set, navigate through screens, and adjust parameters.

The default screen is the Genset Data screen.

[Table 130](#) 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 130. 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 [Figure 102](#) 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.

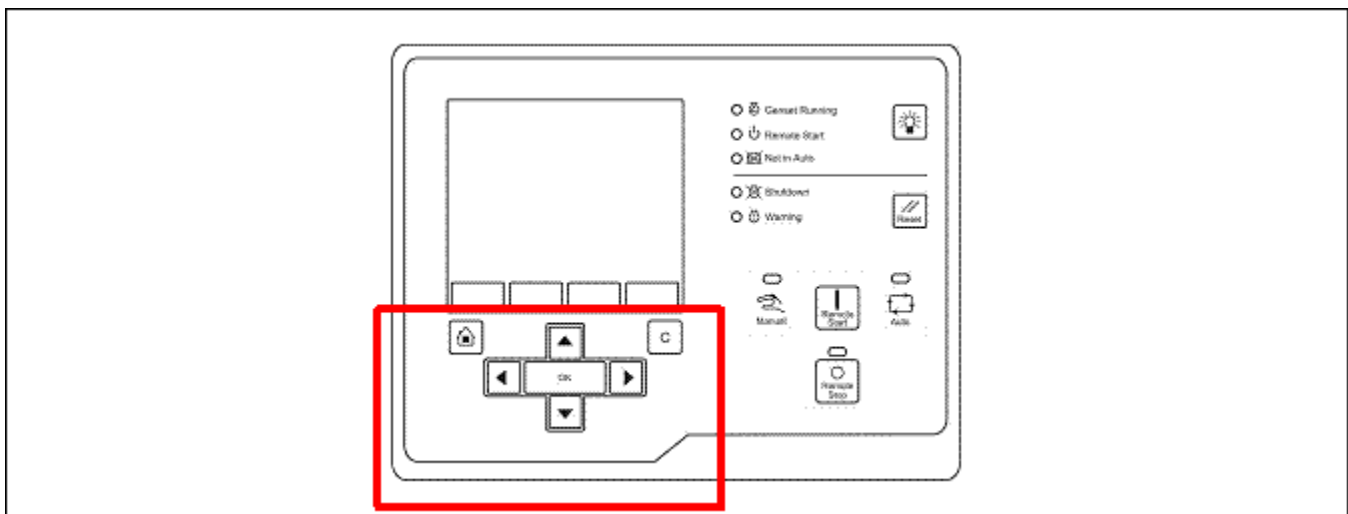



FIGURE 103. MENU NAVIGATION BUTTONS



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 131. MENU NAVIGATION BUTTONS

LED/BUTTON	DESCRIPTION
Home	Press this to return to the main menu.
C	Press this to return to the previous menu. Note: 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.

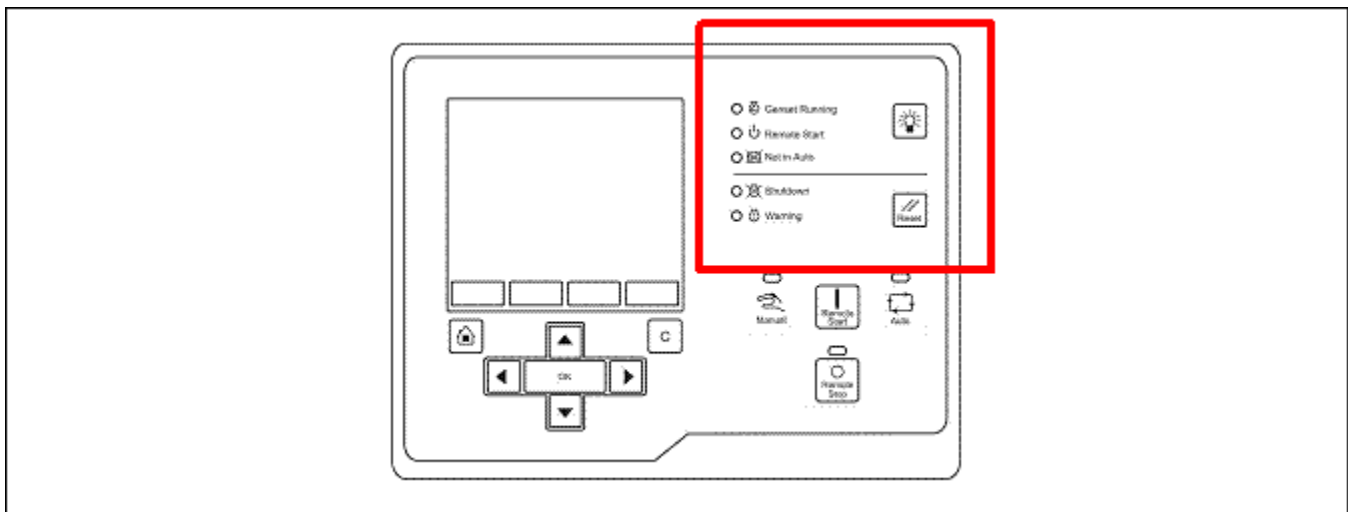


FIGURE 104. LED INDICATORS AND BUTTONS



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 [Table 132](#) remain off (unless you press the Lamp Test button).

TABLE 132. LED INDICATORS AND BUTTONS

LED/BUTTON	DESCRIPTION
Genset Running	This green LED is lit when event 1465 (Ready to Load) is active. The generator set is running at or near rated speed and voltage. This is not lit while the generator set 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.

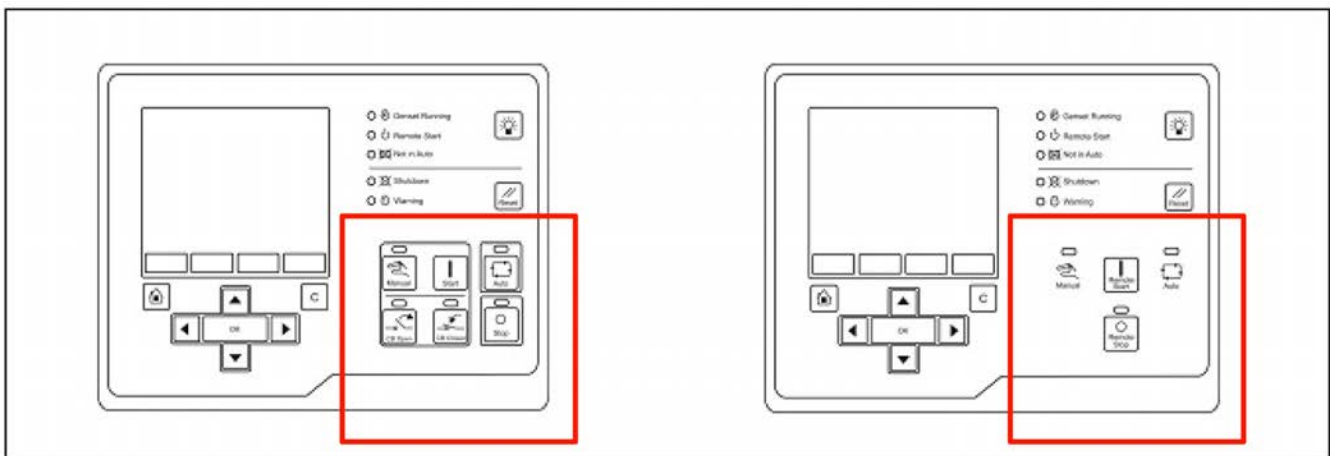


FIGURE 105. MODE OF OPERATION BUTTONS - OPERATOR PANEL (POWER COMMAND 3.3) AND OPERATOR PANEL (REMOTE)

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 [Table 133](#) still work properly.

TABLE 133. MODE OF OPERATION BUTTONS

LED/BUTTON	DESCRIPTION
	These buttons are available only on the remote Operator Panel.
Remote Start	In Auto mode, press this to start the generator set. Note: The Operator Panel is connected to the PCC's Remote Start connection. The generator set does not start if the conditions for the remote start signal are not met.
Remote Stop	In Auto mode, press this to stop the generator set. Note: There can be multiple sources for the remote start signal. The generator set 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 generator set.
	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.
CB Open	This button has no effect if the Genset Application Type is set to Standalone or Synchronizer Only. In Manual mode, press this to open the generator set circuit breaker. This disconnects the generator set from the load. This button has no effect in other modes of operation.
CB Close	This button has no effect if the Genset Application Type is set to Standalone or Synchronizer Only. In Manual mode, press this to close the generator set circuit breaker. This connects the generator set to the load. Note: This button has no effect unless the bus is dead or the generator set is synchronized with the other source(s). This button has no effect in other modes of operation.

LED/BUTTON	DESCRIPTION
Stop	<p>In Manual mode, press this one time to initiate a Manual Stop sequence if the generator set is running. The green LED above this button blinks while the PCC shuts down the generator set. When the Manual Stop sequence is done, the Operator Panel puts the PCC in Off mode.</p> <p>Note: While the Manual Stop sequence is running, press this button a second time to shut down the generator set immediately. The PCC initiates a Shutdown Without Cooldown sequence.</p> <p>If the generator set is running in Auto mode, press this to initiate a Shutdown Without Cooldown sequence.</p> <p>If the generator set is not running, press this to put the PCC in Off mode.</p> <p>If the generator set is running and the PCCNet connection is not active, press this to initiate a Shutdown Without Cooldown sequence.</p> <p>The LED above this button is lit when the PCC is in Off mode.</p> <p>If the LED above this button is blinking when the PCC is not shutting down the generator set 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.</p>

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 134. 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.

In hydromechanical applications, you should not overlay a capture file until the PCC is communicating with the AUX105.

8.6 Menu Description

This section shows a summary of the menus for the PowerCommand®3.3 Controller and PowerCommand® 3.3 with Masterless Load Demand (MLD) Controller

TABLE 135. MENU DESCRIPTION

MENU	DESCRIPTION
History-About	Use this screen to look at historical information about the generator set
Faults	
Active Shutdowns	Use this screen to look at active shutdown faults
Active Warnings	Use this screen to look at active warning faults
History	Use this screen to look at faults that have been cleared
Paralleling Status	Use this screen to look at the status of the bus, circuit breakers, paralleling states, and Masterless Load Demand (MLD)
Generator Set Data	Use this screen to look at the status of the generator set
Alternator Data	Use this screen to look at the status of the alternator
Gas Engine Data	Use this screen to look at the status of the engine
Advanced Status	
Generator Set	Use this screen to look at power, energy, phase differences, and other detailed generator set 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
Auxiliary Status	Use this screen to look at pressures, voltages, temperatures, and other detailed engine information from the AUX101 Note: This screen is available only if LBNG Genset Enable is set to ENABLE.
Gas Engineer Data	Use this screen to look at information about the cylinders in the engine Note: This screen is available only if LBNG Genset Enable is set to ENABLE.
Gas System Data	Use this screen to look at pressures, temperatures, and other detailed engine information Note: This screen is available only if LBNG Genset Enable is set to ENABLE.
Help	Use this screen to get more information about each component in the Operator Panel

MENU	DESCRIPTION
Adjust	Use this screen to configure certain adjustments, overrides, and gains
Generator Set Setup	Use this screen to configure sequences of operation, generator set-related faults, and the exercise scheduler
Paralleling Setup	
Paralleling Basic Setup	Use this screen to configure the bus, circuit breakers, Synchronize, Load Share, Load Govern, and Masterless Load Demand (MLD) settings
Power Transfer Control	Use this screen to configure Power Transfer Control
OEM Setup	
Generator Set	Use this screen to configure application ratings, factory locks, and other detailed generator set 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
AUX101 Setup	Use this screen to setup the AUX101 and AUX102
Save/Restore	Use this screen to save changes to permanent memory in the PCC This is reserved for future use

8.7 History-About (History/About)

TABLE 136. 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

NAME	DESCRIPTION
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) (see Table 7)
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 137. 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 138. 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 139. 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 Paralleling Status

This screen depends on *Genset Application Type*. There is no screen if *Genset Application Type* is set to Standalone.

NOTICE

Data is not displayed if the data is not available.

8.11.1 Isolated Bus Only

Each parameter listed in the diagnostic tools is described in the following table:

TABLE 140. PARALLELING STATUS (ISOLATED BUS ONLY)

PARAMETER	DESCRIPTION
ES State	Internal paralleling status variable Allowed values: Standby, Dead Bus, Synchronize, Load Share, Load Govern
Genset LL Average Voltage	Generator set line-to-line average voltage
Genset Frequency	Generator set frequency
Genset Total kW	Generator set total kW
Genset Total kVAR	Generator set total kVAR
Genset Total Power Factor	Generator set L1 power factor
Genset CB Position Status	Indicates generator set breaker position Allowed values: Open, Closed, Not Available
Phase Match Error	Phase error signal for the synchronizer control algorithm
Load Demand Stop Command	Indicates status of the final load demand stop command to generator set start stop control function Allowed values: Don't Stop, Stop
Genset Bus LL Average Voltage	Generator set bus line-to-line average voltage
Genset Bus Frequency	Generator set bus line frequency
Genset Bus Total kW	Generator set bus total kW
Genset Bus Total kVAR	Generator set bus total kVAR
Genset Bus Total Power Factor	Generator set bus total power factor
Synchronizer Status	Indicates whether synchronizer is on or off Allowed values: Synchronizer Off, Synchronizer On
Bus Status	Indicates status of the bus Allowed values: Unavailable, Dead, Live
Permissive Close Allowed	Indicates when permissive sync check conditions have been met Allowed values: Not Allowed, Allowed
Phase Matched	Sync check phase match status Allowed values: Inactive, Active
Voltage Matched	Sync check voltage match status Allowed values: Inactive, Active

PARAMETER	DESCRIPTION
Frequency Matched	Sync check frequency match status Allowed values: Inactive, Active
Phase Match Error	Phase error signal for the synchronizer control algorithm
Frequency Match Error	Frequency match error value used by frequency match PI loop
Voltage Match Error	Voltage match error value used by voltage match PI loop
Load Govern kW Target	Indicates the final target set point for generator set kW output when paralleled to utility
Load Govern kVAR Target	Indicates the final target set point for generator set kVAR output when paralleled to utility
Power Factor Setpoint	Indicates analog input power factor set point derived from kVAR analog input
Paralleling Speed Control Mode	Indicates which speed control algorithm is in effect Allowed values: Isochronous, Droop, Synchronize, Load Share, Load Govern
Paralleling Voltage Control Mode	Indicates which voltage control algorithm is in effect Allowed values: Isochronous, Droop, Synchronize, Load Share, Load Govern
Genset CB Tripped Command	Generator set CB tripped command Allowed values: Inactive, Active (Default: Inactive)
Genset CB Inhibit Command	Generator set CB inhibit command Allowed values: Inactive, Active (Default: Inactive)
Load Share %kW Error	Indicates %kW error for load sharing control algorithm
Utility CB Tripped Command	Utility CB tripped command Allowed values: Inactive, Active (Default: Inactive)
Load Share %kVAR Error	Indicates %kVAR error for load sharing control algorithm
Utility CB Inhibit Command	Utility CB inhibit command Allowed values: Inactive, Active (Default: Inactive)
Utility Current Based Breaker Position	Indicates utility breaker position based on current
Genset Bus L1L2 Voltage	Generator set bus L1L2 voltage
Genset Bus L2L3 Voltage	Generator set bus L2L3 voltage
Genset Bus L3L1 Voltage	Generator set bus L3L1 voltage
Genset Bus L1N Voltage	Generator set bus L1N voltage
Genset Bus L2N Voltage	Generator set bus L2N voltage
Genset Bus L3N Voltage	Generator set bus L3N voltage
Genset Bus L1 Current	Generator set bus L1 current Allowed values: 0~65530 amps
Genset Bus L2 Current	Generator set bus L2 current Allowed values: 0~65530 amps
Genset Bus L3 Current	Generator set bus L3 current Allowed values: 0~65530 amps

PARAMETER	DESCRIPTION
Genset Bus L1 kW	Generator set bus L1 kW Allowed values: -32768~32762 kW
Genset Bus L2 kW	Generator set bus L2 kW Allowed values: -32768~32762 kW
Genset Bus L3 kW	Generator set bus L3 kW Allowed values: -32768~32762 kW
Genset Bus Total kW	Generator set bus total kW
Genset Bus L1 kVA	Generator set bus L1 kVA
Genset Bus L2 kVA	Generator set bus L2 kVA
Genset Bus L3 kVA	Generator set bus L3 kVA
Genset Bus Total kVA	Generator set bus total kVA
Genset Bus L1 Power Factor	Generator set bus L1 power factor Allowed values: -1.28~1.22 PF
Genset Bus L2 Power Factor	Generator set bus L2 power factor Allowed values: -1.28~1.22 PF
Genset Bus L3 Power Factor	Generator set bus L3 power factor Allowed values: -1.28~1.22 PF
Genset Bus Total Power Factor	Generator set bus total power factor
Genset Bus Frequency	Generator set bus line frequency
Genset Bus L1 Positive kWh	Generator set bus L1 positive kWh accumulation Allowed values: 0~4294967290 kWh (Default: 0 kWh)
Genset Bus L2 Positive kWh	Generator set bus L2 positive kWh accumulation Allowed values: 0~4294967290 kWh (Default: 0 kWh)
Genset Bus L3 Positive kWh	Generator set bus L3 positive kWh accumulation Allowed values: 0~4294967290 kWh (Default: 0 kWh)
Genset Bus Total Positive kWh	Generator set bus total positive kWh accumulation
Genset Bus L1 Negative kWh	Generator set bus L1 negative kWh accumulation Allowed values: 0~4294967290 kWh (Default: 0 kWh)
Genset Bus L2 Negative kWh	Generator set bus L2 negative kWh accumulation Allowed values: 0~4294967290 kWh (Default: 0 kWh)
Genset Bus L3 Negative kWh	Generator set bus L3 negative kWh accumulation Allowed values: 0~4294967290 kWh (Default: 0 kWh)
Genset Bus Total Negative kWh	Generator set bus total negative kWh accumulation
Genset Bus Total Net kWh	Generator set bus total net kWh accumulation
Genset Bus L1 Positive kVARh	Generator set bus L1 positive kVARh accumulation Allowed values: 0~4294967290 kVARh (Default: 0 kVARh)

PARAMETER	DESCRIPTION
Genset Bus L2 Positive kVARh	Generator set bus L2 positive kVARh accumulation Allowed values: 0~4294967290 kVARh (Default: 0 kVARh)
Genset Bus L3 Positive kVARh	Generator set bus L3 positive kVARh accumulation Allowed values: 0~4294967290 kVARh (Default: 0 kVARh)
Genset Bus Total Positive kVARh	Generator set bus total positive kVARh accumulation
Genset Bus L1 Negative kVARh	Generator set bus L1 negative kVARh accumulation Allowed values: 0~4294967290 kVARh (Default: 0 kVARh)
Genset Bus L2 Negative kVARh	Generator set bus L2 negative kVARh accumulation Allowed values: 0~4294967290 kVARh (Default: 0 kVARh)
Genset Bus L3 Negative kVARh	Generator set bus L3 negative kVARh accumulation Allowed values: 0~4294967290 kVARh (Default: 0 kVARh)
Genset Bus Total Negative kVARh	Generator set bus total negative kVARh accumulation
Genset Bus Total Net kVARh	Generator set bus total net kVARh accumulation
Genset Bus Reset All Energy Meters Timestamp - Hour	Time stamp of when energy meters were last reset Allowed values: 0~23 (Default: 0)
Genset Bus Reset All Energy Meters Timestamp - Minute	Time stamp of when energy meters were last reset Allowed values: 0~59 (Default: 0)
Genset Bus Reset All Energy Meters Timestamp - Second	Time stamp of when energy meters were last reset Allowed values: 0~59 (Default: 0)
Genset Bus Reset All Energy Meters Timestamp - Day	Time stamp of when energy meters were last reset Allowed values: 1~31 (Default: 1)
Genset Bus Reset All Energy Meters Timestamp - Month	Time stamp of when energy meters were last reset Allowed values: 1~12 (Default: 1)
Genset Bus Reset All Energy Meters Timestamp - Year	Time stamp of when energy meters were last reset Allowed values: 0~99 (Default: 0)
Genset Bus L1 kVAR	Generator set bus L1 kVAR Allowed values: -32678~32672 kVAR
Genset Bus L2 kVAR	Generator set bus L2 kVAR Allowed values: -32768~32762 kVAR
Genset Bus L3 kVAR	Generator set bus L3 kVAR Allowed values: -32768~32762 kVAR
Genset Bus Total kVAR	Generator set bus total kVAR
Genset Bus L1L2 Phase Difference	Generator set bus L1L2 voltage phase angle
Genset Bus L2L3 Phase Difference	Generator set bus L2L3 voltage phase angle
Genset Bus L3L1 Phase Difference	Generator set bus L3L1 voltage phase angle

PARAMETER	DESCRIPTION
Genset Bus L1 kVAh	Generator set bus L1 kVAh accumulation Allowed values: 0~4294967290 kVAh (Default: 0 kVAh)
Genset Bus L2 kVAh	Generator set bus L2 kVAh accumulation Allowed values: 0~4294967290 kVAh (Default: 0 kVAh)
Genset Bus L3 kVAh	Generator set bus L3 kVAh accumulation Allowed values: 0~4294967295 kVAh (Default: 0 kVAh)
Genset Bus Total kVAh	Generator set bus total kVAh accumulation
Genset Bus Phase Rotation	Generator set bus phase rotation Allowed values: L1-L2-L3, L1-L3-L2, Not Available
System Network Termination Resistor Switch Status	Indicates the status of the on-board CAN termination resistor switch (S1)
Load Demand State	Indicates the status of load demand operation See Table 122 PCC3300 MLD controls only
Load Demand Online Capacity	Indicates the total amount of online kW bus capacity for load demand Only generator sets which are eligible for load demand count PCC3300 MLD controls only
Load Demand Genset Bus Total kW	Indicates the total load of system network connected generator sets PCC3300 MLD controls only
Load Demand Surplus Capacity	Indicates the amount of unused online kW bus capacity (spinning reserve) PCC3300 MLD controls only
Load Demand Total Spare Capacity Requested	Indicates the total kW value of all currently active spare capacity requests in the system PCC3300 MLD controls only
Load Demand Spare Capacity Available	Indicates when the current load and spare capacity requirements are satisfied PCC3300 MLD controls only
Load Demand Next Stop Threshold (kW)	The kW load at which the next generator set will be stopped PCC3300 MLD controls only
Load Demand Next Start Threshold (kW)	The kW load at which the next generator set will be started PCC3300 MLD controls only
Load Demand Next Gen to Start	Indicates Genset ID of the next generator set to start PCC3300 MLD controls only
Load Demand Next Gen to Stop	Indicates Genset ID of the next generator set to stop PCC3300 MLD controls only
Load Demand Initial Delay Timer	Indicates the time remaining before generator sets are allowed to stop after initial start or after resuming from halted load demand This timer is set by Load Demand Initial Delay PCC3300 MLD controls only

PARAMETER	DESCRIPTION
Load Demand Start Delay Timer	Indicates the time remaining before next generator set is allowed to start This timer is set by Load Demand Start Delay PCC3300 MLD controls only
Load Demand Stop Delay Timer	Indicates the time remaining before next generator set is allowed to stop This timer is set by Load Demand Stop Delay PCC3300 MLD controls only
Load Demand Inhibit Local	Indicates the status of the Load Demand Inhibit input When Active all the generator sets will start PCC3300 MLD controls only
Load Demand Genset Status Table	Indicates the load demand priorities and status of all load demand system network connected generator sets See Table 124 PCC3300 MLD controls only
Genset ID	Generator set identifier. All load demand generator sets must have a unique Genset ID PCC3300 MLD controls only
Load Demand Genset Run Hours	Run hour accumulator used for load demand run hour equalization This is writable Allowed Values: 0~999999.9 hours (Default: 0 hours) PCC3300 MLD controls only
System Network Datalink Status	Indicates communication status of the local generator set on system network (used for load demand) See Table 126 PCC3300 MLD controls only
Load Demand Spare Capacity Request Status	Indicates the status of the spare capacity request input When Active additional spare capacity (set by Load Demand Spare Capacity Request Value) is requested PCC3300 MLD controls only

8.11.2 Utility Single

Each parameter is described in the following table :

TABLE 141. PARALLELING STATUS (UTILITY SINGLE)

PARAMETER	DESCRIPTION
ES State	Internal paralleling status variable Allowed values: Standby, Dead Bus, Synchronize, Load Share, Load Govern.
Genset LL Average Voltage	Generator set line-to-line average voltage
Genset Frequency	Generator set frequency
Genset Total kW	Generator set total kW
Genset Total kVAR	Generator set total kVAR
Genset Total Power Factor	Generator set L1 power factor

PARAMETER	DESCRIPTION
Genset CB Position Status	Indicates generator set breaker position Allowed values: Open, Closed, Not Available.
Permissive Phase Match Error	Phase error signal for the permissive sync check algorithm
Utility CB Position Status	Indicates utility breaker position Allowed values: Open, Closed, Not Available.
Utility LL Average Voltage	Utility line-to-line average voltage
Utility Frequency	Utility line frequency
Utility Total kW	Utility total kW
Utility Total kVAR	Utility total kVAR
Utility Total Power Factor	Utility total power factor
Synchronizer	
Synchronizer Status	Indicates whether synchronizer is on or off Allowed values: Synchronizer Off, Synchronizer On.
Bus Status	Indicates status of the bus Allowed values: Unavailable, Dead, Live.
Sync Check	
Permissive Close Allowed	Indicates when permissive sync check conditions have been met Allowed values: Not Allowed, Allowed.
Phase Matched	Sync check phase match status Allowed values: Inactive, Active.
Voltage Matched	Sync check voltage match status Allowed values: Inactive, Active.
Frequency Matched	Sync check frequency match status Allowed values: Inactive, Active.
Sync Check Error	
Permissive Phase Match Error	Phase error signal for the permissive sync check algorithm
Permissive Frequency Match Error	Frequency match error value used by permissive sync check
Permissive Voltage Match Error	Voltage match error value used by permissive sync check
Load Govern Setpoint	
Load Govern kW Target	Indicates the final target set point for generator set kW output when paralleled to utility
Load Govern kVAR Target	Indicates the final target set point for generator set kVAR output when paralleled to utility
Genset Power Factor Setpoint	Indicates analog input power factor set point derived from kVAR analog input
Paralleling Speed Control Mode	Indicates which speed control algorithm is in effect Allowed values: Isochronous, Droop, Synchronize, Load Share, Load Govern.

PARAMETER	DESCRIPTION
Paralleling Voltage Control Mode	Indicates which voltage control algorithm is in effect Allowed values: Isochronous, Droop, Synchronize, Load Share, Load Govern.
Genset CB Status	
Genset CB Inhibit Command	Generator set CB inhibit command Allowed values: Inactive, Active. (Default: Inactive.)
Genset CB Tripped Command	Generator set CB tripped command Allowed values: Inactive, Active. (Default: Inactive.)
Utility CB Status	
Utility CB Inhibit Command	Utility CB inhibit command Allowed values: Inactive, Active. (Default: Inactive.)
Utility CB Tripped Command	Utility CB tripped command Allowed values: Inactive, Active. (Default: Inactive.)
Utility L1L2 Voltage	Utility L1L2 voltage
Utility L1N Voltage	Utility L1N voltage
Utility L1 Current	Utility L1 current
Utility L1 kW	Utility L1 kW
Utility L1 kVA	Utility L1 kVA
Utility L1 Power Factor	Utility L1 power factor
Utility L2L3 Voltage	Utility L2L3 voltage
Utility L2N Voltage	Utility L2N voltage
Utility L2 Current	Utility L2 current
Utility L2 kW	Utility L2 kW
Utility L2 kVA	Utility L2 kVA
Utility L2 Power Factor	Utility L2 power factor
Utility L3L1 Voltage	Utility L3L1 voltage
Utility L3N Voltage	Utility L3N voltage
Utility L3 Current	Utility L3 current
Utility L3 kW	Utility L3 kW
Utility L3 kVA	Utility L3 kVA
Utility L3 Power Factor	Utility L3 power factor
Utility Total kW	Utility total kW
Utility Total kVA	Utility total kVA
Utility Total Power Factor	Utility total power factor
Utility Frequency	Utility line frequency
Bus Energy Metering	

PARAMETER	DESCRIPTION
Utility L1 Positive kWh	Utility L1 positive kWh accumulation Allowed values: 0~4294967295 kWh. (Default: 0 kWh.)
Utility L1 Negative kWh	Utility L1 negative kWh accumulation Allowed values: 0~4294967295 kWh. (Default: 0 kWh.)
Utility L1 Positive kVARh	Utility L1 positive kVARh accumulation Allowed values: 0~4294967295 kVARh. (Default: 0 kVARh.)
Utility L1 Negative kVARh	Utility L1 negative kVARh accumulation Allowed values: 0~4294967295 kVARh. (Default: 0 kVARh.)
Utility L2 Positive kWh	Utility L2 positive kWh accumulation Allowed values: 0~4294967295 kWh. (Default: 0 kWh.)
Utility L2 Negative kWh	Utility L2 negative kWh accumulation Allowed values: 0~4294967295 kWh. (Default: 0 kWh.)
Utility L2 Positive kVARh	Utility L2 positive kVARh accumulation Allowed values: 0~4294967295 kVARh. (Default: 0 kVARh.)
Utility L2 Negative kVARh	Utility L2 negative kVARh accumulation Allowed values: 0~4294967295 kVARh. (Default: 0 kVARh.)
Utility L3 Positive kWh	Utility L3 positive kWh accumulation Allowed values: 0~4294967295 kWh. (Default: 0 kWh.)
Utility L3 Negative kWh	Utility L3 negative kWh accumulation Allowed values: 0~4294967295 kWh. (Default: 0 kWh.)
Utility L3 Positive kVARh	Utility L3 positive kVARh accumulation Allowed values: 0~4294967295 kVARh. (Default: 0 kVARh.)
Utility L3 Negative kVARh	Utility L3 negative kVARh accumulation Allowed values: 0~4294967295 kVARh. (Default: 0 kVARh.)
Utility Total Positive kWh	Utility total positive kWh accumulation
Utility Total Negative kWh	Utility total negative kWh accumulation
Utility Total Positive kVARh	Utility total positive kVARh accumulation
Utility Total Negative kVARh	Utility total negative kVARh accumulation
Utility Total Net kWh	Utility total net kWh accumulation
Utility Total Net kVARh	Utility total net kVARh accumulation
Utility Reset All Energy Meters Timestamp - Hour	Time stamp of when energy meters were last reset Allowed values: 0~23. (Default: 0.)
Utility Reset All Energy Meters Timestamp - Minute	Time stamp of when energy meters were last reset Allowed values: 0~59. (Default: 0.)
Utility Reset All Energy Meters Timestamp - Second	Time stamp of when energy meters were last reset Allowed values: 0~59. (Default: 0.)
Utility Reset All Energy Meters Timestamp - Day	Time stamp of when energy meters were last reset Allowed values: 1~31. (Default: 1.)

PARAMETER	DESCRIPTION
Utility Reset All Energy Meters Timestamp - Month	Time stamp of when energy meters were last reset Allowed values: 1~12. (Default: 1.)
Utility Reset All Energy Meters Timestamp - Year	Time stamp of when energy meters were last reset Allowed values: 0~99. (Default: 0.)
Utility L1 kVAR	Utility L1 kVAR
Utility L2 kVAR	Utility L2 kVAR
Utility L3 kVAR	Utility L3 kVAR
Utility Total kVAR	Utility total kVAR
Phase Difference	
Utility L1L2 Phase Difference	Utility L1L2 voltage phase angle
Utility L2L3 Phase Difference	Utility L2L3 voltage phase angle
Utility L3L1 Phase Difference	Utility L3L1 voltage phase angle
Bus kVAh	
Utility L1 kVAh	Utility L1 kVAh accumulation Allowed values: 0~4294967295 kVAh. (Default: 0 kVAh.)
Utility L2 kVAh	Utility L2 kVAh accumulation Allowed values: 0~4294967295 kVAh. (Default: 0 kVAh.)
Utility L3 kVAh	Utility L3 kVAh accumulation Allowed values: 0~4294967295 kVAh. (Default: 0 kVAh.)
Utility Total kVAh	Utility total kVAh accumulation
Utility Phase Rotation	Utility phase rotation Allowed values: L1-L2-L3, L1-L3-L2, Not Available.
Max. Load Govern KVAR Setpoint Percent per Standby KVA	Indicates the Max. Load Govern KVAR setpoint in % of Standby kVA rating when 'Load Govern KVAR method = Genset PF', based on set values of 'Genset PF setpoint' and 'Load Govern KW Maximum Delayed'.
Max. Load Govern KVAR Setpoint	Indicates the Max. Load Govern KVAR setpoint when Load Govern KVAR method = Genset PF, based on set values of 'Genset PF setpoint' and 'Load Govern KW Maximum Delayed'.

8.11.3 Utility Multiple

Each parameter listed on the diagnostic tool is described in the following table:

TABLE 142. PARALLELING STATUS (UTILITY MULTIPLE)

PARAMETER	DESCRIPTION
ES State	Internal paralleling status variable Allowed values: Standby, Dead Bus, Synchronize, Load Share, Load Govern
Genset LL Average Voltage	Generator set line-to-line average voltage
Genset Frequency	Generator set frequency

PARAMETER	DESCRIPTION
Genset Total kW	Generator set total kW
Genset Total kVAR	Generator set total kVAR
Genset Total Power Factor	Generator set total power factor (L1+L2+L3)
Genset CB Position Status	Indicates generator set breaker position Allowed values: Open, Closed, Not Available
Phase Match Error	Phase error signal for the synchronizer control algorithm
Utility CB Position Status	Indicates utility breaker position Allowed values: Open, Closed, Not Available
Load Demand Stop Command	Indicates status of the final load demand stop command to generator set start stop control function Allowed values: Don't Stop, Stop
Genset Bus LL Average Voltage	Generator set bus line-to-line average voltage
Genset Bus Frequency	Generator set bus line frequency
Genset Bus Total kW	Generator set bus total kW
Genset Bus Total kVAR	Generator set bus total kVAR
Genset Bus Total Power Factor	Generator set bus total power factor
Synchronizer Status	Indicates whether synchronizer is on or off Allowed values: Synchronizer Off, Synchronizer On
Bus Status	Indicates status of the bus Allowed values: Unavailable, Dead, Live
Permissive Close Allowed	Indicates when permissive sync check conditions have been met Allowed values: Not Allowed, Allowed
Phase Matched	Sync check phase match status Allowed values: Inactive, Active
Voltage Matched	Sync check voltage match status Allowed values: Inactive, Active
Frequency Matched	Sync check frequency match status Allowed values: Inactive, Active
Phase Match Error	Phase error signal for the synchronizer control algorithm
Frequency Match Error	Frequency match error value used by frequency match PI loop
Voltage Match Error	Voltage match error value used by voltage match PI loop
Load Govern kW Target	Indicates the final target set point for generator set kW output when paralleled to utility
Load Govern kVAR Target	Indicates the final target set point for generator set kVAR output when paralleled to utility
Power Factor Setpoint	Indicates analog input power factor set point derived from kVAR analog input

PARAMETER	DESCRIPTION
Paralleling Speed Control Mode	Indicates which speed control algorithm is in effect Allowed values: Isochronous, Droop, Synchronize, Load Share, Load Govern
Paralleling Voltage Control Mode	Indicates which voltage control algorithm is in effect Allowed values: Isochronous, Droop, Synchronize, Load Share, Load Govern
Genset CB Tripped Command	Generator set CB tripped command Allowed values: Inactive, Active (Default: Inactive)
Genset CB Inhibit Command	Generator set CB inhibit command Allowed values: Inactive, Active (Default: Inactive)
Load Share %kW Error	Indicates %kW error for load sharing control algorithm
Utility CB Tripped Command	Utility CB tripped command Allowed values: Inactive, Active (Default: Inactive)
Load Share %kVAR Error	Indicates %kVAR error for load sharing control algorithm
Utility CB Inhibit Command	Utility CB inhibit command Allowed values: Inactive, Active (Default: Inactive)
Utility Current Based Breaker Position	Indicates utility breaker position based on current
Genset Bus L1L2 Voltage	Generator set bus L1L2 voltage
Genset Bus L2L3 Voltage	Generator set bus L2L3 voltage
Genset Bus L3L1 Voltage	Generator set bus L3L1 voltage
Genset Bus L1N Voltage	Generator set bus L1N voltage
Genset Bus L2N Voltage	Generator set bus L2N voltage
Genset Bus L3N Voltage	Generator set bus L3N voltage
Genset Bus L1 Current	Generator set bus L1 current Allowed values: 0~65530 amps
Genset Bus L2 Current	Generator set bus L2 current Allowed values: 0~65530 amps
Genset Bus L3 Current	Generator set bus L3 current Allowed values: 0~65530 amps
Genset Bus L1 kW	Generator set bus L1 kW Allowed values: -32768~32762 kW
Genset Bus L2 kW	Generator set bus L2 kW Allowed values: -32768~32762 kW
Genset Bus L3 kW	Generator set bus L3 kW Allowed values: -32768~32762 kW
Genset Bus Total kW	Generator set bus total kW
Genset Bus L1 kVA	Generator set bus L1 kVA
Genset Bus L2 kVA	Generator set bus L2 kVA
Genset Bus L3 kVA	Generator set bus L3 kVA

PARAMETER	DESCRIPTION
Genset Bus Total kVA	Generator set bus total kVA
Genset Bus L1 Power Factor	Generator set bus L1 power factor Allowed values: -1.28~1.22 PF
Genset Bus L2 Power Factor	Generator set bus L2 power factor Allowed values: -1.28~1.22 PF
Genset Bus L3 Power Factor	Generator set bus L3 power factor Allowed values: -1.28~1.22 PF
Genset Bus Total Power Factor	Generator set bus total power factor
Genset Bus Frequency	Generator set bus line frequency
Genset Bus L1 Positive kWh	Generator set bus L1 positive kWh accumulation Allowed values: 0~4294967290 kWh (Default: 0 kWh)
Genset Bus L2 Positive kWh	Generator set bus L2 positive kWh accumulation Allowed values: 0~4294967290 kWh (Default: 0 kWh)
Genset Bus L3 Positive kWh	Generator set bus L3 positive kWh accumulation Allowed values: 0~4294967290 kWh (Default: 0 kWh)
Genset Bus Total Positive kWh	Generator set bus total positive kWh accumulation
Genset Bus L1 Negative kWh	Generator set bus L1 negative kWh accumulation Allowed values: 0~4294967290 kWh (Default: 0 kWh)
Genset Bus L2 Negative kWh	Generator set bus L2 negative kWh accumulation Allowed values: 0~4294967290 kWh (Default: 0 kWh)
Genset Bus L3 Negative kWh	Generator set bus L3 negative kWh accumulation Allowed values: 0~4294967290 kWh (Default: 0 kWh)
Genset Bus Total Negative kWh	Generator set bus total negative kWh accumulation
Genset Bus Total Net kWh	Generator set bus total net kWh accumulation
Genset Bus L1 Positive kVARh	Generator set bus L1 positive kVARh accumulation Allowed values: 0~4294967290 kVARh (Default: 0 kVARh)
Genset Bus L2 Positive kVARh	Generator set bus L2 positive kVARh accumulation Allowed values: 0~4294967290 kVARh (Default: 0 kVARh)
Genset Bus L3 Positive kVARh	Generator set bus L3 positive kVARh accumulation Allowed values: 0~4294967290 kVARh (Default: 0 kVARh)
Genset Bus Total Positive kVARh	Generator set bus total positive kVARh accumulation
Genset Bus L1 Negative kVARh	Generator set bus L1 negative kVARh accumulation Allowed values: 0~4294967290 kVARh (Default: 0 kVARh)
Genset Bus L2 Negative kVARh	Generator set bus L2 negative kVARh accumulation Allowed values: 0~4294967290 kVARh (Default: 0 kVARh)
Genset Bus L3 Negative kVARh	Generator set bus L3 negative kVARh accumulation Allowed values: 0~4294967290 kVARh (Default: 0 kVARh)

PARAMETER	DESCRIPTION
Genset Bus Total Negative kVARh	Generator set bus total negative kVARh accumulation
Genset Bus Total Net kVARh	Generator set bus total net kVARh accumulation
Genset Bus Reset All Energy Meters Timestamp - Hour	Time stamp of when energy meters were last reset Allowed values: 0~23 (Default: 0)
Genset Bus Reset All Energy Meters Timestamp - Minute	Time stamp of when energy meters were last reset Allowed values: 0~59 (Default: 0)
Genset Bus Reset All Energy Meters Timestamp - Second	Time stamp of when energy meters were last reset Allowed values: 0~59 (Default: 0)
Genset Bus Reset All Energy Meters Timestamp - Day	Time stamp of when energy meters were last reset Allowed values: 1~31 (Default: 1)
Genset Bus Reset All Energy Meters Timestamp - Month	Time stamp of when energy meters were last reset Allowed values: 1~12 (Default: 1)
Genset Bus Reset All Energy Meters Timestamp - Year	Time stamp of when energy meters were last reset Allowed values: 0~99 (Default: 0)
Genset Bus L1 kVAR	Generator set bus L1 kVAR Allowed values: -32678~32672 kVAR
Genset Bus L2 kVAR	Generator set bus L2 kVAR Allowed values: -32768~32762 kVAR
Genset Bus L3 kVAR	Generator set bus L3 kVar Allowed values: -32768~32762 kVAR
Genset Bus Total kVAR	Generator set bus total kVAR
Genset Bus L1L2 Phase Difference	Generator set bus L1L2 voltage phase angle
Genset Bus L2L3 Phase Difference	Generator set bus L2L3 voltage phase angle
Genset Bus L3L1 Phase Difference	Generator set bus L3L1 voltage phase angle
Genset Bus L1 kVAh	Generator set bus L1 kVAh accumulation Allowed values: 0~4294967290 kVAh (Default: 0 kVAh)
Genset Bus L2 kVAh	Generator set bus L2 kVAh accumulation Allowed values: 0~4294967290 kVAh (Default: 0 kVAh)
Genset Bus L3 kVAh	Generator set bus L3 kVAh accumulation Allowed values: 0~4294967295 kVAh (Default: 0 kVAh)
Genset Bus Total kVAh	Generator set bus total kVAh accumulation
Genset Bus Phase Rotation	Generator set bus phase rotation Allowed values: L1-L2-L3, L1-L3-L2, Not Available
System Network Termination Resistor Switch Status	Indicates the status of the on-board CAN termination resistor switch (S1)

PARAMETER	DESCRIPTION
Load Demand State	Indicates the status of load demand operation See Table 122 PCC3300 MLD controls only
Load Demand Online Capacity	Indicates the total amount of online kW bus capacity for load demand Only generator sets that are eligible for load demand count PCC3300 MLD controls only
Load Demand Genset Bus Total kW	Indicates the total load of system network connected generator sets PCC3300 MLD controls only
Load Demand Surplus Capacity	Indicates the amount of unused online kW bus capacity (spinning reserve) PCC3300 MLD controls only
Load Demand Total Spare Capacity Requested	Indicates the total kW value of all currently active spare capacity requests in the system PCC3300 MLD controls only
Load Demand Spare Capacity Available	Indicates when the current load and spare capacity requirements are satisfied PCC3300 MLD controls only
Load Demand Next Stop Threshold (kW)	The kW load at which the next generator set will be stopped PCC3300 MLD controls only
Load Demand Next Start Threshold (kW)	The kW load at which the next generator set will be started PCC3300 MLD controls only
Load Demand Next Gen to Start	Indicates Generator set ID of the next generator set to start PCC3300 MLD controls only
Load Demand Next Gen to Stop	Indicates Generator set ID of the next generator set to stop stopPCC3300 MLD controls only
Load Demand Initial Delay Timer	Indicates the time remaining before generator sets are allowed to stop after initial start or after resuming halted load demand This timer is set by Load Demand Initial Delay PCC3300 MLD controls only
Load Demand Start Delay Timer	Indicates the time remaining before next generator set is allowed to start This timer is set by Load Demand Start Delay PCC3300 MLD controls only
Load Demand Stop Delay Timer	Indicates the time remaining before next generator set is allowed to stop This timer is set by Load Demand Stop Delay PCC3300 MLD controls only
Load Demand Inhibit Local	Indicates the status of the Load Demand Inhibit input When Active all the generator sets will start PCC3300 MLD controls only
Load Demand Genset Status Table	Indicates the load demand priorities and status of all load demand system network connected generator sets See Table 124 Shown in PCC3300 MLD control only

PARAMETER	DESCRIPTION
Genset ID	Generator set identifier. All load demand generator sets must have a unique Genset ID PCC3300 MLD controls only
Load Demand Genset Run Hours	Run hour accumulator used for load demand run hour equalization This is writable Allowed Values: 0~999999.9 hours (Default: 0 hours) PCC3300 MLD controls only
System Network Datalink Status	Indicates communication status of the local generator set on system network (used for load demand) See Table 126 PCC3300 MLD controls only
Load Demand Spare Capacity Request Status	Indicates the status of the spare capacity request input When Active additional spare capacity (set by Load Demand Spare Capacity Request Value) is requested PCC3300 MLD controls only
Max. Load Govern KVAR Setpoint Percent per Standby KVA	Indicates the Max. Load Govern KVAR setpoint in % of Standby kVA rating when 'Load Govern KVAR method = Genset PF', based on set values of 'Genset PF setpoint' and 'Load Govern KW Maximum Delayed'.
Max. Load Govern KVAR Setpoint	Indicates the Max. Load Govern KVAR setpoint when Load Govern KVAR method = Genset PF, based on set values of 'Genset PF setpoint' and 'Load Govern KW Maximum Delayed'.

8.11.4 Synchronizer Only

Each parameter is described in the following table :

TABLE 143. PARALLELING STATUS (SYNCHRONIZE ONLY)

PARAMETER	DESCRIPTION
ES State	Internal paralleling status variable Allowed values: Standby, Dead Bus, Synchronize, Load Share, Load Govern.
Genset LL Average Voltage	Generator set line-to-line average voltage
Genset Frequency	Generator set frequency
Genset Total kW	Generator set total kW
Genset Total kVAR	Generator set total kVAR
Genset Total Power Factor	Generator set L1 power factor
Permissive Phase Match Error	Phase error signal for the permissive sync check algorithm
Utility LL Average Voltage	Utility line-to-line average voltage
Utility Frequency	Utility line frequency
Utility Total kW	Utility total kW
Utility Total kVAR	Utility total kVAR
Utility Total Power Factor	Utility total power factor

PARAMETER	DESCRIPTION
Synchronizer	
Synchronizer Status	Indicates whether synchronizer is on or off Allowed values: Synchronizer Off, Synchronizer On.
Bus Status	Indicates status of the bus Allowed values: Unavailable, Dead, Live.
Sync Check	
Permissive Close Allowed	Indicates when permissive sync check conditions have been met Allowed values: Not Allowed, Allowed.
Phase Matched	Sync check phase match status Allowed values: Inactive, Active.
Voltage Matched	Sync check voltage match status Allowed values: Inactive, Active.
Frequency Matched	Sync check frequency match status Allowed values: Inactive, Active.
Sync Check Error	
Permissive Phase Match Error	Phase error signal for the permissive sync check algorithm
Permissive Frequency Match Error	Frequency match error value used by permissive sync check
Permissive Voltage Match Error	Voltage match error value used by permissive sync check
Utility L1L2 Voltage	Utility L1L2 voltage
Utility L1N Voltage	Utility L1N voltage
Utility L1 Current	Utility L1 current
Utility L1 kW	Utility L1 kW
Utility L1 kVA	Utility L1 kVA
Utility L1 Power Factor	Utility L1 power factor
Utility L2L3 Voltage	Utility L2L3 voltage
Utility L2N Voltage	Utility L2N voltage
Utility L2 Current	Utility L2 current
Utility L2 kW	Utility L2 kW
Utility L2 kVA	Utility L2 kVA
Utility L2 Power Factor	Utility L2 power factor
Utility L3L1 Voltage	Utility L3L1 voltage
Utility L3N Voltage	Utility L3N voltage
Utility L3 Current	Utility L3 current
Utility L3 kW	Utility L3 kW
Utility L3 kVA	Utility L3 kVA

PARAMETER	DESCRIPTION
Utility L3 Power Factor	Utility L3 power factor
Utility Total kW	Utility total kW
Utility Total kVA	Utility total kVA
Utility Total Power Factor	Utility total power factor
Utility Frequency	Utility line frequency
Bus Energy Metering	
Utility L1 Positive kWh	Utility L1 positive kWh accumulation Allowed values: 0~4294967295 kWh. (Default: 0 kWh.)
Utility L1 Negative kWh	Utility L1 negative kWh accumulation Allowed values: 0~4294967295 kWh. (Default: 0 kWh.)
Utility L1 Positive kVARh	Utility L1 positive kVARh accumulation Allowed values: 0~4294967295 kVARh. (Default: 0 kVARh.)
Utility L1 Negative kVARh	Utility L1 negative kVARh accumulation Allowed values: 0~4294967295 kVARh. (Default: 0 kVARh.)
Utility L2 Positive kWh	Utility L2 positive kWh accumulation Allowed values: 0~4294967295 kWh. (Default: 0 kWh.)
Utility L2 Negative kWh	Utility L2 negative kWh accumulation Allowed values: 0~4294967295 kWh. (Default: 0 kWh.)
Utility L2 Positive kVARh	Utility L2 positive kVARh accumulation Allowed values: 0~4294967295 kVARh. (Default: 0 kVARh.)
Utility L2 Negative kVARh	Utility L2 negative kVARh accumulation Allowed values: 0~4294967295 kVARh. (Default: 0 kVARh.)
Utility L3 Positive kWh	Utility L3 positive kWh accumulation Allowed values: 0~4294967295 kWh. (Default: 0 kWh.)
Utility L3 Negative kWh	Utility L3 negative kWh accumulation Allowed values: 0~4294967295 kWh. (Default: 0 kWh.)
Utility L3 Positive kVARh	Utility L3 positive kVARh accumulation Allowed values: 0~4294967295 kVARh. (Default: 0 kVARh.)
Utility L3 Negative kVARh	Utility L3 negative kVARh accumulation Allowed values: 0~4294967295 kVARh. (Default: 0 kVARh.)
Utility Total Positive kWh	Utility total positive kWh accumulation
Utility Total Negative kWh	Utility total negative kWh accumulation
Utility Total Positive kVARh	Utility total positive kVARh accumulation
Utility Total Negative kVARh	Utility total negative kVARh accumulation
Utility Total Net kWh	Utility total net kWh accumulation
Utility Total Net kVARh	Utility total net kVARh accumulation

PARAMETER	DESCRIPTION
Utility Reset All Energy Meters Timestamp - Hour	Time stamp of when energy meters were last reset Allowed values: 0~23. (Default: 0.)
Utility Reset All Energy Meters Timestamp - Minute	Time stamp of when energy meters were last reset Allowed values: 0~59. (Default: 0.)
Utility Reset All Energy Meters Timestamp - Second	Time stamp of when energy meters were last reset Allowed values: 0~59. (Default: 0.)
Utility Reset All Energy Meters Timestamp - Day	Time stamp of when energy meters were last reset Allowed values: 1~31. (Default: 1.)
Utility Reset All Energy Meters Timestamp - Month	Time stamp of when energy meters were last reset Allowed values: 1~12. (Default: 1.)
Utility Reset All Energy Meters Timestamp - Year	Time stamp of when energy meters were last reset Allowed values: 0~99. (Default: 0.)
Bus kVAR	
Utility L1 kVAR	Utility L1 kVAR
Utility L2 kVAR	Utility L2 kVAR
Utility L3 kVAR	Utility L3 kVAR
Utility Total kVAR	Utility total kVAR
Phase Difference	
Utility L1L2 Phase Difference	Utility L1L2 voltage phase angle
Utility L2L3 Phase Difference	Utility L2L3 voltage phase angle
Utility L3L1 Phase Difference	Utility L3L1 voltage phase angle
Bus kVAh	
Utility L1 kVAh	Utility L1 kVAh accumulation Allowed values: 0~4294967295 kVAh. (Default: 0 kVAh.)
Utility L2 kVAh	Utility L2 kVAh accumulation Allowed values: 0~4294967295 kVAh. (Default: 0 kVAh.)
Utility L3 kVAh	Utility L3 kVAh accumulation Allowed values: 0~4294967295 kVAh. (Default: 0 kVAh.)
Utility Total kVAh	Utility total kVAh accumulation
Utility Phase Rotation	Utility phase rotation Allowed values: L1-L2-L3, L1-L3-L2, Not Available.

8.11.5 Power Transfer Control

Each parameter is described in the following table :

TABLE 144. PARALLELING STATUS (POWER TRANSFER CONTROL)

PARAMETER	DESCRIPTION
ES State	Internal paralleling status variable Allowed values: Standby, Dead Bus, Synchronize, Load Share, Load Govern.
Genset LL Average Voltage	Generator set line-to-line average voltage
Genset Frequency	Generator set frequency
Genset Total kW	Generator set total kW
Genset Total kVAR	Generator set total kVAR
Genset Total Power Factor	Generator set L1 power factor
Genset Availability Status	Indicates status of the generator set source Allowed values: Not Available, Available, Unknown.
Utility Availability Status	Indicates status of the utility source Allowed values: Not Available, Available, Unknown.
Genset CB Position Status	Indicates generator set breaker position Allowed values: Open, Closed, Not Available.
Permissive Phase Match Error	Phase error signal for the permissive sync check algorithm
Utility CB Position Status	Indicates utility breaker position Allowed values: Open, Closed, Not Available.
Utility LL Average Voltage	Utility line-to-line average voltage
Utility Frequency	Utility line frequency
Utility Total kW	Utility total kW
Utility Total kVAR	Utility total kVAR
Utility Total Power Factor	Utility total power factor
Active Transition Type	Indicates the active transition type for Power Transfer Control Allowed values: None, Programmed Transition, Transfer, Retransfer, Max Parallel.
Active Transition Timer	Countdown value of the active transition timer
PTC State	Indicates the connected state of the Power Transfer Control Allowed values: PTC Not Enabled, No Source Connected, Utility Connected, Genset Connected, Paralleled.
Synchronizer	
Synchronizer Status	Indicates whether synchronizer is on or off Allowed values: Synchronizer Off, Synchronizer On.
Bus Status	Indicates status of the bus Allowed values: Unavailable, Dead, Live.
Sync Check	
Permissive Close Allowed	Indicates when permissive sync check conditions have been met Allowed values: Not Allowed, Allowed.

PARAMETER	DESCRIPTION
Phase Matched	Sync check phase match status Allowed values: Inactive, Active.
Voltage Matched	Sync check voltage match status Allowed values: Inactive, Active.
Frequency Matched	Sync check frequency match status Allowed values: Inactive, Active.
Sync Check Error	
Permissive Phase Match Error	Phase error signal for the permissive sync check algorithm
Permissive Frequency Match Error	Frequency match error value used by permissive sync check
Permissive Voltage Match Error	Voltage match error value used by permissive sync check
Load Govern Setpoint	
Load Govern kW Target	Indicates the final target set point for generator set kW output when paralleled to utility
Load Govern kVAR Target	Indicates the final target set point for generator set kVAR output when paralleled to utility
Genset Power Factor Setpoint	Indicates analog input power factor set point derived from kVAR analog input
Paralleling Speed Control Mode	Indicates which speed control algorithm is in effect Allowed values: Isochronous, Droop, Synchronize, Load Share, Load Govern.
Paralleling Voltage Control Mode	Indicates which voltage control algorithm is in effect Allowed values: Isochronous, Droop, Synchronize, Load Share, Load Govern.
Genset CB Status	
Genset CB Inhibit Command	Generator set CB inhibit command Allowed values: Inactive, Active. (Default: Inactive.)
Genset CB Tripped Command	Generator set CB tripped command Allowed values: Inactive, Active. (Default: Inactive.)
Utility CB Status	
Utility CB Inhibit Command	Utility CB inhibit command Allowed values: Inactive, Active. (Default: Inactive.)
Utility CB Tripped Command	Utility CB tripped command Allowed values: Inactive, Active. (Default: Inactive.)
PTC Status	
PTC Operating Transition Type	Indicates the transition type currently in effect Allowed values: Open Transition, Hard Closed Transition, Soft Closed Transition.
Genset Sensor Status	
Genset Frequency Sensor Status	Indicates generator set frequency sensor status Allowed values: Unknown, Picked Up, Dropped Out.

PARAMETER	DESCRIPTION
Genset Overvoltage Sensor Status	Indicates generator set over voltage sensor status Allowed values: Unknown, Picked Up, Dropped Out.
Genset Undervoltage Sensor Status	Indicates generator set under voltage sensor status Allowed values: Unknown, Picked Up, Dropped Out.
Genset Phase Rotation Sensor Status	Indicates generator set phase rotation sensor status Allowed values: Unknown, Picked Up, Dropped Out.
Genset Loss of Phase Sensor Status	Indicates generator set loss of phase sensor status Allowed values: Unknown, Picked Up, Dropped Out.
Transfer Inhibit Cmd	Indicates whether transfer to generator is inhibited or not Allowed values: Inactive, Active.
Retransfer Inhibit Cmd	Indicates whether re-transfer to utility is inhibited or not Allowed values: Inactive, Active.
Override Switch Command	Override switch command status resulting from all override inputs Allowed values: Inactive, Active.
Utility Sensor Status	
Utility Frequency Sensor Status	Indicates utility frequency sensor status Allowed values: Unknown, Picked Up, Dropped Out.
Utility Overvoltage Sensor Status	Indicates utility over voltage sensor status Allowed values: Unknown, Picked Up, Dropped Out.
Utility Undervoltage Sensor Status	Indicates utility under voltage sensor status Allowed values: Unknown, Picked Up, Dropped Out.
Utility Phase Rotation Sensor Status	Indicates utility phase rotation sensor status Allowed values: Unknown, Picked Up, Dropped Out.
Utility Loss of Phase Sensor Status	Indicates utility loss of phase sensor status Allowed values: Unknown, Picked Up, Dropped Out.
Utility L1L2 Voltage	Utility L1L2 voltage
Utility L1N Voltage	Utility L1N voltage
Utility L1 Current	Utility L1 current
Utility L1 kW	Utility L1 kW
Utility L1 kVA	Utility L1 kVA
Utility L1 Power Factor	Utility L1 power factor
Utility L2L3 Voltage	Utility L2L3 voltage
Utility L2N Voltage	Utility L2N voltage
Utility L2 Current	Utility L2 current
Utility L2 kW	Utility L2 kW
Utility L2 kVA	Utility L2 kVA
Utility L2 Power Factor	Utility L2 power factor

PARAMETER	DESCRIPTION
Utility L3L1 Voltage	Utility L3L1 voltage
Utility L3N Voltage	Utility L3N voltage
Utility L3 Current	Utility L3 current
Utility L3 kW	Utility L3 kW
Utility L3 kVA	Utility L3 kVA
Utility L3 Power Factor	Utility L3 power factor
Utility Total kW	Utility total kW
Utility Total kVA	Utility total kVA
Utility Total Power Factor	Utility total power factor
Utility Frequency	Utility line frequency
Bus Energy Metering	
Utility L1 Positive kWh	Utility L1 positive kWh accumulation Allowed values: 0~4294967295 kWh. (Default: 0 kWh.)
Utility L1 Negative kWh	Utility L1 negative kWh accumulation Allowed values: 0~4294967295 kWh. (Default: 0 kWh.)
Utility L1 Positive kVARh	Utility L1 positive kVARh accumulation Allowed values: 0~4294967295 kVARh. (Default: 0 kVARh.)
Utility L1 Negative kVARh	Utility L1 negative kVARh accumulation Allowed values: 0~4294967295 kVARh. (Default: 0 kVARh.)
Utility L2 Positive kWh	Utility L2 positive kWh accumulation Allowed values: 0~4294967295 kWh. (Default: 0 kWh.)
Utility L2 Negative kWh	Utility L2 negative kWh accumulation Allowed values: 0~4294967295 kWh. (Default: 0 kWh.)
Utility L2 Positive kVARh	Utility L2 positive kVARh accumulation Allowed values: 0~4294967295 kVARh. (Default: 0 kVARh.)
Utility L2 Negative kVARh	Utility L2 negative kVARh accumulation Allowed values: 0~4294967295 kVARh. (Default: 0 kVARh.)
Utility L3 Positive kWh	Utility L3 positive kWh accumulation Allowed values: 0~4294967295 kWh. (Default: 0 kWh.)
Utility L3 Negative kWh	Utility L3 negative kWh accumulation Allowed values: 0~4294967295 kWh. (Default: 0 kWh.)
Utility L3 Positive kVARh	Utility L3 positive kVARh accumulation Allowed values: 0~4294967295 kVARh. (Default: 0 kVARh.)
Utility L3 Negative kVARh	Utility L3 negative kVARh accumulation Allowed values: 0~4294967295 kVARh. (Default: 0 kVARh.)
Utility Total Positive kWh	Utility total positive kWh accumulation
Utility Total Negative kWh	Utility total negative kWh accumulation

PARAMETER	DESCRIPTION
Utility Total Positive kVARh	Utility total positive kVARh accumulation
Utility Total Negative kVARh	Utility total negative kVARh accumulation
Utility Total Net kWh	Utility total net kWh accumulation
Utility Total Net kVARh	Utility total net kVARh accumulation
Utility Reset All Energy Meters Timestamp - Hour	Time stamp of when energy meters were last reset Allowed values: 0~23. (Default: 0.)
Utility Reset All Energy Meters Timestamp - Minute	Time stamp of when energy meters were last reset Allowed values: 0~59. (Default: 0.)
Utility Reset All Energy Meters Timestamp - Second	Time stamp of when energy meters were last reset Allowed values: 0~59. (Default: 0.)
Utility Reset All Energy Meters Timestamp - Day	Time stamp of when energy meters were last reset Allowed values: 1~31. (Default: 1.)
Utility Reset All Energy Meters Timestamp - Month	Time stamp of when energy meters were last reset Allowed values: 1~12. (Default: 1.)
Utility Reset All Energy Meters Timestamp - Year	Time stamp of when energy meters were last reset Allowed values: 0~99. (Default: 0.)
Bus kVAR	
Utility L1 kVAR	Utility L1 kVAR
Utility L2 kVAR	Utility L2 kVAR
Utility L3 kVAR	Utility L3 kVAR
Utility Total kVAR	Utility total kVAR
Phase Difference	
Utility L1L2 Phase Difference	Utility L1L2 voltage phase angle
Utility L2L3 Phase Difference	Utility L2L3 voltage phase angle
Utility L3L1 Phase Difference	Utility L3L1 voltage phase angle
Bus kVAh	
Utility L1 kVAh	Utility L1 kVAh accumulation Allowed values: 0~4294967295 kVAh. (Default: 0 kVAh.)
Utility L2 kVAh	Utility L2 kVAh accumulation Allowed values: 0~4294967295 kVAh. (Default: 0 kVAh.)
Utility L3 kVAh	Utility L3 kVAh accumulation Allowed values: 0~4294967295 kVAh. (Default: 0 kVAh.)
Utility Total kVAh	Utility total kVAh accumulation
Utility Phase Rotation	Utility phase rotation Allowed values: L1-L2-L3, L1-L3-L2, Not Available.

PARAMETER	DESCRIPTION
Max. Load Govern KVAR Setpoint Percent per Standby KVA	Indicates the Max. Load Govern KVAR setpoint in % of Standby kVA rating when 'Load Govern KVAR method = Genset PF', based on set values of 'Genset PF setpoint' and 'Load Govern KW Maximum Delayed'.
Max. Load Govern KVAR Setpoint	Indicates the Max. Load Govern KVAR setpoint when Load Govern KVAR method = Genset PF, based on set values of 'Genset PF setpoint' and 'Load Govern KW Maximum Delayed'.

8.12 Generator Set Data

Each parameter is described in the following table:

TABLE 145. 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	

PARAMETER	DESCRIPTION
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.

8.13 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 parameter is described in the following table:

TABLE 146. ALTERNATOR DATA

PARAMETER	DESCRIPTION
Genset L1L2 Voltage	Generator set L1L2 voltage
Genset L1N Voltage	Generator set L1N voltage
Genset L1 Current	Monitors the generator set L1 current value.
Genset L1 kW	Generator set L1 kW
Genset L1 KVA	Generator set L1 kVA
Genset L1 Power Factor	Generator set L1 power factor
Genset L2L3 Voltage	Generator set L2L3 voltage
Genset L2N Voltage	Generator set L2N voltage
Genset L2 Current	Generator set L2 current
Genset L2 kW	Generator set L2 kW Allowed values: -32768~32762 kW.
Genset L2 KVA	Generator set L2 kVA
Genset L2 Power Factor	Generator set L2 power factor Allowed values: -1.28~1.27 PF.
Genset L3L1 Voltage	Generator set L3L1 voltage
Genset L3N Voltage	Generator set L3N voltage
Genset L3 Current	Generator set L3 current
Genset L3 kW	Generator set L3 kW Allowed values: -32768~32762 kW.
Genset L3 KVA	Generator set L3 kVA Allowed values: 0~4294967.29 kVA.

PARAMETER	DESCRIPTION
Genset L3 Power Factor	Generator set L3 power factor Allowed values: -1.28~1.22 PF.
Genset Total kW	Generator set total kW
Genset Total KVA	Generator set total kVA
Genset Total Power Factor	Generator set L1 power factor
Genset Frequency	Generator set 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	Generator set neutral current Note: This is not displayed if the neutral current is not available.
Ground Current	Ground current
Alternator Temperatures	
Non-Drive End Bearing Temperature (Aux101)	Monitor point for the Non-Drive End Bearing Temp input from the I/O Module. Allowed values: -65534~65535 degF.
Drive End Bearing Temperature (Aux101)	Monitor point for the Drive End Bearing Temp input from the I/O Module. Allowed values: -32767~32762 degF.
Alternator Temperature 1 (Aux101)	Monitor point for the Alternator Temp 1 input from the Aux 101 I/O Module. Allowed values: -32767~32762 degF.
Alternator Temperature 2 (Aux101)	Monitor point for the Alternator Temp 2 input from the Aux 101 I/O Module. Allowed values: -32767~32762 degF.
Alternator Temperature 3 (Aux101)	Monitor point for the Alternator Temp 3 input from the Aux 101 I/O Module. Allowed values: -32767~32762 degF.

8.14 Engine Data

Each label is described in the following table .

TABLE 147. ENGINE DATA (LBNG GENSET ENABLE IS SET TO DISABLE)

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.

NAME	DESCRIPTION
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 °F.
Intake Manifold Temperature	Monitor point for the Intake Manifold Temperature Allowed values: -40~410 °F.
Fuel Temperature	Monitor point for the Fuel Temperature Allowed values: -40~410 °F.
Aftercooler Temperature	Monitor point for the Aftercooler Temperature Allowed values: -40~410 °F.
Battery Voltage	Battery voltage value
Average Engine Speed	Monitor point for the Average Engine Speed
Engine Running Time	Total engine run time
Glow Plug Command	Output of glow plug logic Allowed values: Driver Off, Driver On.
Oil Pressure Switch Status	Low or Not Low. Allowed values: Not Low, Low.

8.15 Gas Engine Data

Each label is described in the following table.

TABLE 148. GAS ENGINE DATA (LBNG GENSET ENABLE IS SET TO ENABLE)

NAME	DESCRIPTION
Average Engine Speed	Monitor point for the Average Engine Speed
Engine Running Time	Total engine run time
Coolant Temperature	Monitor point for the Coolant Temperature

NAME	DESCRIPTION
Coolant Pressure	Monitor point for the Coolant Pressure. Allowed values: 0~145 psi.
Coolant 2 Temperature	Monitor point for the Coolant 2 Temperature Allowed values: -40~260 degF.
Coolant 2 Pressure	Monitor point for the Coolant 2 Pressure. Allowed values: 0~145 psi.
Pre-Filter Oil Pressure	Monitor point for the Pre-Filter Oil Pressure Allowed values: 0~145 psi.
Oil Pressure	Monitor point for the Oil Pressure Allowed values: 0~145 psi.
Oil Temperature	Monitor point for the Oil Temperature Allowed values: -40~410 °F.
Exhaust Sys Port Temperature	Note: Bank A contains odd-numbered cylinders (1, 3, 5, ...). Bank B contains even-numbered cylinders (2, 4, 6, ...).
Exhaust Port 1 Temperature	Monitor point for the Exhaust Port 1 Temperature Allowed values: -459~3155 °F.
Exhaust Port 2 Temperature	Monitor point for the Exhaust Port 2 Temperature Allowed values: -460~3155 °F.
Exhaust Port 3 Temperature	Monitor point for the Exhaust Port 3 Temperature Allowed values: -460~3155 °F.
Exhaust Port 4 Temperature	Monitor point for the Exhaust Port 4 Temperature Allowed values: -460~3155 °F.
Exhaust Port 5 Temperature	Monitor point for the Exhaust Port 5 Temperature Allowed values: -460~3155 °F.
Exhaust Port 6 Temperature	Monitor point for the Exhaust Port 6 Temperature Allowed values: -460~3155 °F.
Exhaust Port 7 Temperature	Monitor point for the Exhaust Port 7 Temperature Allowed values: -460~3155 °F.
Exhaust Port 8 Temperature	Monitor point for the Exhaust Port 8 Temperature Allowed values: -460~3155 °F.
Exhaust Port 9 Temperature	Monitor point for the Exhaust Port 9 Temperature Allowed values: -460~3155 °F.
Exhaust Port 10 Temperature	Monitor point for the Exhaust Port 10 Temperature Allowed values: -460~3155 °F.
Exhaust Port 11 Temperature	Monitor point for the Exhaust Port 11 Temperature Allowed values: -460~3155 °F.
Exhaust Port 12 Temperature	Monitor point for the Exhaust Port 12 Temperature Allowed values: -460~3155 °F.

NAME	DESCRIPTION
Exhaust Port 13 Temperature	Monitor point for the Exhaust Port 13 Temperature Allowed values: -460~3155 °F.
Exhaust Port 14 Temperature	Monitor point for the Exhaust Port 14 Temperature Allowed values: -460~3155 °F.
Exhaust Port 15 Temperature	Monitor point for the Exhaust Port 15 Temperature Allowed values: -460~3155 °F.
Exhaust Port 16 Temperature	Monitor point for the Exhaust Port 16 Temperature Allowed values: -460~3155 °F.
Exhaust Port 17 Temperature	Monitor point for the Exhaust Port 17 Temperature Allowed values: -460~3155 °F.
Exhaust Port 18 Temperature	Monitor point for the Exhaust Port 18 Temperature Allowed values: -460~3155 °F.

8.16 Genset Status (Advanced Genset Status)

Each parameter is described in the following table :

TABLE 149. ADVANCED GENSET STATUS

PARAMETER	DESCRIPTION
Genset Application %Load	
Genset L1L2 Voltage%	Generator set L1L2 voltage%
Genset L1N Voltage%	Generator set L1N voltage%
Genset % Application L1 Current	Monitors the generator set application L1 current percentage output.
Genset % Application L1 kW	Monitors the generator set application L1 KW percentage output.
Genset % Application L1 kVA	Monitors the generator set application L1 KVA percentage output.
Genset L2L3 Voltage%	Generator set L2L3 voltage%
Genset L2N Voltage%	Generator set L2N voltage% Allowed values: 0~655.3 %.
Genset % Application L2 Current	Monitors the generator set application L2 current percentage output.
Genset % Application L2 kW	Monitors the generator set application L2 KW percentage output.
Genset % Application L2 kVA	Monitors the generator set application L2 KVA percentage output.
Genset L3L1 Voltage%	Generator set L3L1 voltage% Allowed values: 0~655.3 %.

PARAMETER	DESCRIPTION
Genset L3N Voltage%	Generator set L3N voltage%
Genset % Application L3 Current	Monitors the generator set application L3 current percentage output.
Genset % Application L3 kW	Monitors the generator set application L3 KW percentage output.
Genset % Application L3 kVA	Monitors the generator set application L3 KVA percentage output.
Genset Average Voltage%	Generator set average voltage percentage.
Genset % Application Total kW	Monitors the total generator set application KW percentage output.
Genset % Application Total kVA	Monitors the total generator set application KVA percentage output.
Standby %Load	
Genset % Standby Total kW	Monitors the total generator set standby KW percentage output.
Genset % Standby Total kVA	Monitors the total generator set standby KVA percentage output.
Genset Energy Metering	
Genset L1 Positive kWh	Generator set L1 positive kWh accumulation Allowed values: 0~4294967290 kWh. (Default: 0 kWh.)
Genset L1 Negative kWh	Generator set L1 negative kWh accumulation Allowed values: 0~4294967290 kWh. (Default: 0 kWh.)
Genset L1 Positive kVARh	Generator set L1 positive kVARh accumulation Allowed values: 0~4294967290 kVARh. (Default: 0 kVARh.)
Genset L1 Negative kVARh	Generator set L1 negative kVARh accumulation Allowed values: 0~4294967290 kVARh. (Default: 0 kVARh.)
Genset L2 Positive kWh	Generator set L2 positive kWh accumulation Allowed values: 0~4294967290 kWh. (Default: 0 kWh.)
Genset L2 Negative kWh	Generator set L2 negative kWh accumulation Allowed values: 0~4294967290 kWh. (Default: 0 kWh.)
Genset L2 Positive kVARh	Generator set L2 positive kVARh accumulation Allowed values: 0~4294967290 kVARh. (Default: 0 kVARh.)
Genset L2 Negative kVARh	Generator set L2 negative kVARh accumulation Allowed values: 0~4294967290 kVARh. (Default: 0 kVARh.)
Genset L3 Positive kWh	Generator set L3 positive kWh accumulation Allowed values: 0~4294967290 kWh. (Default: 0 kWh.)
Genset L3 Negative kWh	Generator set L3 negative kWh accumulation Allowed values: 0~4294967290 kWh. (Default: 0 kWh.)
Genset L3 Positive kVARh	Generator set L3 positive kVARh accumulation Allowed values: 0~4294967290 kVARh. (Default: 0 kVARh.)

PARAMETER	DESCRIPTION
Genset L3 Negative kVARh	Generator set 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	Generator set L2 kVAh accumulation Allowed values: 0~4294967290 kVAh. (Default: 0 kVAh.)
Genset L3 kVAh	Generator set L3 kVAh accumulation Allowed values: 0~4294967290 kVAh. (Default: 0 kVAh.)
Genset Total Positive kWh	Generator set total positive kWh accumulation Allowed values: 0~4294967290 kWh.
Genset Total Negative kWh	Generator set total negative kWh accumulation
Genset Total Positive kVARh	Generator set total positive kVARh accumulation Allowed values: 0~4294967290 kVARh.
Genset Total Negative kVARh	Generator set total negative kVARh accumulation
Genset Total Net kWh	Generator set total net kWh accumulation Allowed values: -2147483648~2147483643 kWh.
Genset Total Net kVARh	Generator set 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 generator set standby L1 current percentage output.
Genset % Standby L2 Current	Monitors the generator set standby L2 current percentage output.
Genset % Standby L3 Current	Monitors the generator set standby L3 current percentage output.

PARAMETER	DESCRIPTION
Generator set kVAR	
Genset L1 kVAR	Generator set L1 KVAR
Genset L2 kVAR	Generator set L2 Kvar Allowed values: -32768~32762 kVAR.
Genset L3 kVAR	Generator set L3 Kvar
Genset Total kVAR	Generator set total kVAR
Genset kVAh	
Genset L1 kVAh	Generator set L1 KVAh
Genset L2 kVAh	Generator set L2 KVAh
Genset L3 kVAh	Generator set L3 KVAh
Genset Total kVAh	Generator set total kVAh accumulation
Genset 3 Phase Fast Average Voltage Percent	Monitor point for Generator set 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	Generator set L1L2 voltage phase angle
Genset L2L3 Phase Difference	Generator set L2L3 voltage phase angle Allowed values: 0~655.3 Degrees.
Genset L3L1 Phase Difference	Generator set L3L1 voltage phase angle Allowed values: 0~655.3 Degrees.
Genset Phase Rotation	Generator set phase rotation Allowed values: L1-L2-L3, L1-L3-L2, Not Available.
Genset Negative Sequence Current %	Generator set Negative Sequence Current as Percent of Standby Current Rating
Ambient Temperature (Aux101)	Monitor point for the Ambient Temp input from the Aux 101 I/O Module. Allowed values: -32767~32762 degF.
Alternator Temperature 1 (Aux101)	Monitor point for the Alternator Temp 1 input from the Aux 101 I/O Module. Allowed values: -32767~32762 degF.
Alternator Temperature 2 (Aux101)	Monitor point for the Alternator Temp 2 input from the Aux 101 I/O Module. Allowed values: -32767~32762 degF.
Alternator Temperature 3 (Aux101)	Monitor point for the Alternator Temp 3 input from the Aux 101 I/O Module. Allowed values: -32767~32762 degF.
Drive End Bearing Temperature (Aux101)	Monitor point for the Drive End Bearing Temp input from the I/O Module. Allowed values: -32767~32762 degF.

PARAMETER	DESCRIPTION
Non-Drive End Bearing Temperature (Aux101)	Monitor point for the Non-Drive End Bearing Temp input from the I/O Module. Allowed values: -65534~65535 degF.
Exhaust Stack Temperature 1 (Aux101)	Monitor point for the Exhaust Stack Temp1 input from the I/O Module. Allowed values: -32767~32762 degF.
Exhaust Stack Temperature 2 (Aux101)	Monitor point for the Exhaust Stack Temp2 input from the I/O Module. Allowed values: -32767~32762 degF.
Fuel Level (PCCnet)	Monitor point for the fuel level (in gallons) input from the I/O Module.
Fuel Level % (PCCnet)	Monitor point for the % fuel level input from the I/O Module.
Intake Manifold Temperature 1 (Aux101)	Monitor point for the Intake Manifold Temp 1 input from the I/O Module. Allowed values: -32767~32762 degF.
Oil Temperature (Aux101)	Monitor point for the Oil Temp input from the I/O Module. Allowed values: -65534~65535 degF.
Aux101 0 Analog Input 1 Voltage	Monitor point for the module 0 analog input 1 in Volts Allowed values: -500~500 Vdc.
Aux101 0 Analog Input 2 Voltage	Monitor point for the module 0 analog input 2 in Volts Allowed values: -500~500 Vdc.
Aux101 0 Outputs 1-8 Signal Status	Monitor point for the controller output logic for outputs 1-8 on I/O module 0.
Aux102 0 Inputs 9-12 Signal Status	Bitmask monitor point for I/O module inputs from inputs 9-12 on Expansion I/O module 0.
Aux102 0 Outputs 9-16 Signal Status	Monitor point for controller output logic for outputs 9-16 on expansion I/O module 0.
Aux101 1 Analog Input 1 Voltage	Monitor point for the module 1 analog input 1 in Volts Allowed values: -500~500 Vdc.
Aux101 1 Analog Input 2 Voltage	Monitor point for the module 1 analog input 2 in Volts Allowed values: -500~500 Vdc.
Aux101 1 Outputs 1-8 Signal Status	Monitor point for controller output logic for outputs 1-8 on I/O module 1.
Aux102 1 Inputs 9-12 Signal Status	Bitmask monitor point for I/O module inputs from inputs 9-12 on Expansion I/O module 1.
Aux102 1 Outputs 9-16 Signal Status	Monitor point for controller output logic for outputs 9-16 on expansion I/O module 1.
High LTA Temperature Threshold (Aux101)	High LTA Temperature threshold for the IO Module fault. Allowed Values: -40~300 degF (Default: 158 degF)

8.17 Controller Status (Advanced Control Status)

TABLE 150. ADVANCED CONTROLLER STATUS

NAME	DESCRIPTION
Timers	
Start Countdown	Time remaining until start is initiated Allowed values: 0~300 seconds.
Stop Countdown	Time remaining until generator set stops Allowed values: 0~5000 seconds.
Time At No Load	Amount of time the generator set 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.

NAME	DESCRIPTION
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.
Low Engine Temperature Switch	Low Engine Temperature 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 <i>Command Inputs</i> parameter to determine which source(s) is(are) active at any time. The <i>Command Inputs parameters are bitmasks. Each bit represents each type of source.</i> 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.

NAME	DESCRIPTION
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.
Inputs	
Transfer Inhibit/Configurable Input #20 Switch	This is the status of the Configurable Input #20. Allowed values: Inactive, Active.
Retransfer Inhibit/Configurable Input #21 Switch	This is the status of the Configurable Input #21. Allowed values: Inactive, Active.
Utility CB Pos B/Configurable Input #23 Switch	This is the status of the Configurable Input #23. Allowed values: Inactive, Active.
Utility CB Tripped/Configurable Input #24 Switch	This is the status of the Configurable Input #24. Allowed values: Inactive, Active.
Utility CB Inhibit/Configurable Input #25 Switch	This is the status of the Configurable Input #25. Allowed values: Inactive, Active.
Genset CB Pos B/Configurable Input #26 Switch	This is the status of the Configurable Input #26. Allowed values: Inactive, Active.
Genset CB Tripped/Configurable Input #27 Switch	This is the status of the Configurable Input #27. Allowed values: Inactive, Active.
Genset CB Inhibit/Configurable Input #28 Switch	This is the status of the Configurable Input #28. Allowed values: Inactive, Active.
Utility Single Mode Verify/Configurable Input #29 Switch	This is the status of the Configurable Input #29. Allowed values: Inactive, Active.
Sync Enable/Configurable Input #30 Switch	This is the status of the Configurable Input #30. Allowed values: Inactive, Active.
Load Demand Stop/Configurable Input #31 Switch	This is the status of the Configurable Input #31. Allowed values: Inactive, Active.
Extended Parallel/Configurable Input #32 Switch	This is the status of the Configurable Input #32. Allowed values: Inactive, Active.
Backup Start Disconnect/Configurable Input #33 Switch	This is the status of the Configurable Input #33. Allowed values: Inactive, Active.
Analog Inputs	

NAME	DESCRIPTION
External Speed Bias Input	Monitor point for the external speed bias input. Allowed values: -100~100 %.
External Voltage Bias Input	Monitor point for the external voltage bias input. Allowed values: -100~100 %.
Command Inputs Bitmask	
PTC Mode Switch Command Inputs	Bitmask to show the inputs to the Command output which are currently on.
Extended Parallel Switch Command Inputs	Bitmask to show the inputs to the Command output which are currently on
Load Demand Stop Request Inputs	bitmask indicating which of the load demand stop inputs are active Allowed values: 0~250.
Outputs	
Configurable Output #20 Status	Indicates if the output's status is Inactive or Active Allowed values: Inactive, Active.
Configurable Output #21 Status	Indicates if the output's status is Inactive or Active Allowed values: Inactive, Active.
Configurable Output #22 Status	Indicates if the output's status is Inactive or Active Allowed values: Inactive, Active.
Circuit Breakers	
Genset CB Open Command	genset cb open command status Allowed values: Inactive, Active.
Genset CB Close Command	genset cb close command status Allowed values: Inactive, Active.
Utility CB Open Command	utility cb open command status Allowed values: Inactive, Active.
Utility CB Close Command	utility cb close command status Allowed values: Inactive, Active.

8.18 Engine Status (Advanced Engine Status)

Each label is described in the following table .

TABLE 151. 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.

NAME	DESCRIPTION
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.
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.

NAME	DESCRIPTION
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.

8.19 Auxiliary Status

Each label is described in the following table.

TABLE 152. AUXILIARY STATUS

NAME	DESCRIPTION
Supply, Heaters & Coolant Status	
GIB Isolator Open (Aux101)	GIB Isolator Open monitor point. Allowed values: No, Yes.
Coolant Pre-Heated State	Status of the engine coolant before start (Pre-Heated or Not) Allowed values: Heated, Cold, Not Available.
Coolant Temperature	Monitor point for the Coolant Temperature
Engine Coolant Pump Ctrl Status	Engine coolant circulating pump status Allowed values: Closed, Open.

NAME	DESCRIPTION
Alternator Heater Status	Alternator Heater status monitor point. Allowed values: OFF, ON, TRIPPED, N/A.
Engine Oil Status	
Oil Priming Pump Control Status	Status for the priming pump (ON or OFF) Allowed values: Not Off, Off, Unavailable.
Oil Pressure	Monitor point for the Oil Pressure Allowed values: 0~145 psi.
Oil Priming State	Status of the engine before start (Pre-Lubed or Not) Allowed values: Lubed, Not Lubed, Not Available.
Engine Oil PreHeater Ctrl Status	Engine Oil pre heater command status Allowed values: Inactive, Active.
Oil Temperature	Monitor point for the Oil Temperature Allowed values: -40~410 degF.
Engine Oil Status	
Derate Authorization (Aux101)	Derate authorization request from customer. Allowed values: Disabled, Enabled.
Start System Status	Start system status monitor point. Allowed values: Not Tripped, Tripped, Reserved, N/A.
Ventilator Fan Status	Vent Fan status monitor point. Allowed values: OFF, ON, TRIPPED, N/A.
Louvres Status	Louvres Closed monitor point. Allowed values: Open, Closed, Reserved, N/A.
Radiator Fan Status	Radiator Fan status monitor point. Allowed values: OFF, ON, TRIPPED, N/A.
DC PSU Unavailable (Aux101)	Engine PSU Not Available monitor point. Allowed values: No, Yes.
Start Inhibit Status & Text Assignment	
Start Inhibit No1 (Aux101)	Start Inhibit No1 monitor point. Allowed values: No, Yes.
Start Inhibit No2 (Aux101)	Start Inhibit No2 monitor point. Allowed values: No, Yes.
Start Inhibit No3 (Aux101)	Start Inhibit No3 monitor point. Allowed values: No, Yes.
Start Inhibit Text No1 (Aux101)	
Start Inhibit Text No2 (Aux101)	
Start Inhibit Text No3 (Aux101)	

8.20 Gas Engineer Data (Engineer Data)

Each label is described in the following table.

TABLE 153. ENGINEER DATA

NAME	DESCRIPTION
Internal ECM Temperature	Temperature of the engine electronic control module
ECM Battery Voltage	Engine Control Module Battery Voltage. Allowed values: 0~65535 Vdc.
Speed Bias Reference (%)	Indicates amount of speed bias offset GCS is commanding to ECS governor Allowed values: -128~127 %.
Genset Total kW	Generator set total kW
Internal ECM 1 Temperature	Temperature of the engine control module 1
Internal ECM 2 Temperature	Temperature of the engine control module 2
ECM 1 Isolated Battery Voltage	Engine Control Module 1 Isolated Battery Voltage. Allowed values: 0~65535 Vdc.
ECM 2 Isolated Battery Voltage	Engine Control Module 2 Isolated Battery Voltage. Allowed values: 0~65535 Vdc.
Cylinder Data - Knock Level	Note: Bank A contains odd-numbered cylinders (1, 3, 5, ...). Bank B contains even-numbered cylinders (2, 4, 6, ...).
DE/DNE Cylinder Viewpoint Reference	Gives reference point for engine cylinder numbering Allowed values: Drive End, Non-Drive, Reserved, N/A. (Default: N/A.)
Knock Level Cylinder 1	Knock Level for cylinder 1
Knock Level Cylinder 2	Knock Level for cylinder 2
Knock Level Cylinder 3	Knock Level for cylinder 3
Knock Level Cylinder 4	Knock Level for cylinder 4
Knock Level Cylinder 5	Knock Level for cylinder 5
Knock Level Cylinder 6	Knock Level for cylinder 6
Knock Level Cylinder 7	Knock Level for cylinder 7
Knock Level Cylinder 8	Knock Level for cylinder 8
Knock Level Cylinder 9	Knock Level for cylinder 9
Knock Level Cylinder 10	Knock Level for cylinder 10
Knock Level Cylinder 11	Knock Level for cylinder 11
Knock Level Cylinder 13	Knock Level for cylinder 13
Knock Level Cylinder 15	Knock Level for cylinder 15
Knock Level Cylinder 17	Knock Level for cylinder 17
Knock Level Cylinder 12	Knock Level for cylinder 12
Knock Level Cylinder 14	Knock Level for cylinder 14

NAME	DESCRIPTION
Knock Level Cylinder 16	Knock Level for cylinder 16
Knock Level Cylinder 18	Knock Level for cylinder 18
Cylinder Data - Spark Advance	Note: Bank A contains odd-numbered cylinders (1, 3, 5, ...). Bank B contains even-numbered cylinders (2, 4, 6, ...).
DE/DNE Cylinder Viewpoint Reference	Gives reference point for engine cylinder numbering Allowed values: Drive End, Non-Drive, Reserved, N/A. (Default: N/A.)
Spark Timing Cyl 1	Spark timing degrees for cylinder 1
Spark Timing Cyl 2	Spark timing degrees for cylinder 2
Spark Timing Cyl 3	Spark timing degrees for cylinder 3
Spark Timing Cyl 4	Spark timing degrees for cylinder 4
Spark Timing Cyl 5	Spark timing degrees for cylinder 5
Spark Timing Cyl 6	Spark timing degrees for cylinder 6
Spark Timing Cyl 7	Spark timing degrees for cylinder 7
Spark Timing Cyl 8	Spark timing degrees for cylinder 8
Spark Timing Cyl 9	Spark timing degrees for cylinder 9
Spark Timing Cyl 10	Spark timing degrees for cylinder 10
Spark Timing Cyl 11	Spark timing degrees for cylinder 11
Spark Timing Cyl 12	Spark timing degrees for cylinder 12
Spark Timing Cyl 13	Spark timing degrees for cylinder 13
Spark Timing Cyl 14	Spark timing degrees for cylinder 14
Spark Timing Cyl 15	Spark timing degrees for cylinder 15
Spark Timing Cyl 16	Spark timing degrees for cylinder 16
Spark Timing Cyl 17	Spark timing degrees for cylinder 17
Spark Timing Cyl 18	Spark timing degrees for cylinder 18
Cylinder Data - Knock Counter	Note: Bank A contains odd-numbered cylinders (1, 3, 5, ...). Bank B contains even-numbered cylinders (2, 4, 6, ...).
DE/DNE Cylinder Viewpoint Reference	Gives reference point for engine cylinder numbering Allowed values: Drive End, Non-Drive, Reserved, N/A. (Default: N/A.)
Knock Count Cyl 1	Knock count value for Cylinder 1 Allowed values: 0~65530.
Knock Count Cyl 2	Knock count value for Cylinder 2 Allowed values: 0~65530.
Knock Count Cyl 3	Knock count value for Cylinder 3 Allowed values: 0~65530.
Knock Count Cyl 4	Knock count value for Cylinder 4 Allowed values: 0~65530.

NAME	DESCRIPTION
Knock Count Cyl 5	Knock count value for Cylinder 5 Allowed values: 0~65530.
Knock Count Cyl 6	Knock count value for Cylinder 6 Allowed values: 0~65530.
Knock Count Cyl 7	Knock count value for Cylinder 7 Allowed values: 0~65530.
Knock Count Cyl 8	Knock count value for Cylinder 8 Allowed values: 0~65530.
Knock Count Cyl 9	Knock count value for Cylinder 9 Allowed values: 0~65530.
Knock Count Cyl 10	Knock count value for Cylinder 10 Allowed values: 0~65530.
Knock Count Cyl 11	Knock count value for Cylinder 11 Allowed values: 0~65530.
Knock Count Cyl 12	Knock count value for Cylinder 12 Allowed values: 0~65530.
Knock Count Cyl 13	Knock count value for Cylinder 13 Allowed values: 0~65530.
Knock Count Cyl 14	Knock count value for Cylinder 14 Allowed values: 0~65530.
Knock Count Cyl 15	Knock count value for Cylinder 15 Allowed values: 0~65530.
Knock Count Cyl 16	Knock count value for Cylinder 16 Allowed values: 0~65530.
Knock Count Cyl 17	Knock count value for Cylinder 17 Allowed values: 0~65530.
Knock Count Cyl 18	Knock count value for Cylinder 18 Allowed values: 0~65530.
Exhaust Back Pressure	Monitor point for exhaust back pressure value

8.21 Gas System Data (Gas System)

Each label is described in the following table.

TABLE 154. SYSTEM DATA

NAME	DESCRIPTION
Safety Shutoff Valves & Valve Proving System	
Downstream Valve Command Status	The result of the FSO driver output command logic for fuel shutoff valve 1 Allowed values: Open, Closed, Reserved, N/A
Upstream Valve Command Status	The result of the FSO driver output command logic for fuel shutoff valve 2 Allowed values: Open, Closed, Reserved, N/A
VPS Status	Control setting for fuel shutoff valve proving system test Allowed values: OFF, ON, Reserved, N/A
Gas Supply Pressure	Gage Pressure of gas supply to fuel metering device
Fuel Valve 1 Inlet Absolute Pressure	Absolute Pressure of Gas on the inlet side of the first system control valve
Engine Data	
Fuel Valve 1 Inlet Absolute Pressure	Absolute Pressure of Gas on the inlet side of the first system control valve
Fuel Valve 2 Inlet Absolute Pressure	Absolute Pressure of Gas on the inlet side of the second system control valve
Gas Mass Flow	Gas Mass Flow value of the engine
Gas Mass Flow 2	Gas Mass Flow 2 value of the engine
Fuel Valve 1 Position	The position of the gaseous fuel valve metering the fuel flow to the engine
Fuel Valve 2 Position	The position of the second gaseous fuel valve metering the fuel flow to the engine
Fuel Valve 1 Outlet Absolute Pressure	Absolute Pressure of Gas on the outlet side of the first system control valve
Fuel Valve 2 Outlet Absolute Pressure	Absolute Pressure of Gas on the outlet side of the second system control valve
Intake Manifold Pressure 1	Intake Manifold Pressure 1
Intake Manifold Pressure 2	Intake Manifold Pressure 2
Intake Manifold Temperature	Monitor point for the Intake Manifold Temperature Allowed values: -40~410 degF
Intake Manifold 2 Temperature	Monitor point for the Intake Manifold 2 Temperature Allowed values: -40~410 degF
Throttle 1 Position	Position of the throttle 1
Throttle 2 Position	Position of the throttle 2
Compressor Outlet Pressure	Absolute Pressure at the outlet of the compressor
Turbocharger 1 Speed	Monitor point for the Turbocharger 1 Speed Allowed values: 0~257000 rpm
Compressor Bypass Position	Engine turbocharger compressor bypass actuator position

8.22 Help

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

8.23 Adjust

NOTICE

You cannot adjust Frequency Adjust or Voltage Adjust if Paralleling Speed Control Mode is set to Synchronize, Load Share, or Load Govern.

Each label is described in the following table .

TABLE 155. ADJUST

NAME	DESCRIPTION
Voltage Calibration	
Genset LL Average Voltage	Generator set 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. Note: If the generator set 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.)

NAME	DESCRIPTION
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.

8.24 Genset Setup (Setup/Genset)

Each label is described in the following table .

TABLE 156. GENSET SETUP

NAME	DESCRIPTION
Genset Nominal Voltage	Generator set 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. Generator set single phase/3 phase metering setup configuration. (Password level: 1.) Allowed values: Single Phase, Three Phase. (Default: Three Phase.)
Application Rating Select	Selects generator set standby/prime/base application rating. (Password level: 1.) Allowed values: Standby, Prime, Base. (Default: Standby.)
Alternate Frequency Switch	Sets the generator set 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.) Note: 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.)

NAME	DESCRIPTION
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: 0~20 % / 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 generator set to recover faster when the frequency drops. (Password level: 1.) Allowed values: 0~10 Hz. (Default: 1 Hz.)
Genset Source Name	Name for the generator set 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.)

NAME	DESCRIPTION
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 generator set 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: 1~10000 hours. (Default: 168 hours.)

NAME	DESCRIPTION
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 kVAR 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 generator set 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 generator set application kW rating. (Password level: 1.) Allowed values: 80~140 %. (Default: 105 %.)

NAME	DESCRIPTION
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 generator set (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.)

NAME	DESCRIPTION
Scheduler Program x Run Mode	Used to adjust the run mode for the selected program. Allowed values: No Load, With Load, Extended Parallel. (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.)

NAME	DESCRIPTION
High Alternator Temperature 1 Threshold (Aux101)	High Alternator Temp 1 Threshold for the I/O Module fault. Warning Threshold (Password level: 1.) Allowed values: 100~1000 degF. (Default: 300 degF.)
High Alternator Temperature 1 Time (Aux101)	High Alternator Temp 1 fault time for the I/O Module fault. Warning Time (Password level: 1.) Allowed values: 1~30 seconds. (Default: 5.0 seconds.)
High Alternator Temperature 1 Shutdown Threshold	High Alternator Temperature 1 Shutdown Threshold for the I/O Module Fault (AUX 101) (Password level: 1.) Allowed values: 100~1000 degF. (Default: 301 degF.)
High Alternator Temperature 1 Shutdown Time	High Alternator Temperature 1 Shutdown Time for the I/O Module Fault (AUX 101) (Password level: 1.) Allowed values: 1~30 seconds. (Default: 6.0 seconds.)
High Alternator Temperature 2 Threshold (Aux101)	High Alternator Temp 2 Threshold for the I/O Module fault. Warning Threshold (Password level: 1.) Allowed values: 100~1000 degF. (Default: 300 degF.)
High Alternator Temperature 2 Time (Aux101)	High Alternator Temp 2 fault time for the I/O Module fault. Warning Time (Password level: 1.) Allowed values: 1~30 seconds. (Default: 5.0 seconds.)
High Alternator Temperature 2 Shutdown Threshold	High Alternator Temperature 2 Shutdown Threshold for the I/O Module Fault (AUX 101) (Password level: 1.) Allowed values: 100~1000 degF. (Default: 301 degF.)
High Alternator Temperature 2 Shutdown Time	High Alternator Temperature 2 Shutdown Time for the I/O Module Fault (AUX 101) (Password level: 1.) Allowed values: 1~30 seconds. (Default: 6.0 seconds.)
High Alternator Temperature 3 Threshold (Aux101)	High Alternator Temp 3 Threshold for the I/O Module fault. Warning Threshold (Password level: 1.) Allowed values: 100~1000 degF. (Default: 300 degF.)
High Alternator Temperature 3 Time (Aux101)	High Alternator Temp 3 fault time for the I/O Module fault. Warning Time (Password level: 1.) Allowed values: 1~30 seconds. (Default: 5.0 seconds.)
High Alternator Temperature 3 Shutdown Threshold	High Alternator Temperature 3 Shutdown Threshold for the I/O Module Fault (AUX 101) (Password level: 1.) Allowed values: 100~1000 degF. (Default: 301 degF.)
High Alternator Temperature 3 Shutdown Time	High Alternator Temperature 3 Shutdown Time for the I/O Module Fault (AUX 101) (Password level: 1.) Allowed values: 1~30 seconds. (Default: 6.0 seconds.)
High Drive End Bearing Temperature Threshold (Aux101)	High Drive End Bearing Temp Threshold for the I/O Module fault. (Password level: 1.) Allowed values: 100~1000 degF. (Default: 300 degF.)
High Drive End Bearing Temperature Time (Aux101)	The time delay until the High Drive End Bearing Temp fault becomes active, from the I/O Module. (Password level: 1.) Allowed values: 1~30 seconds. (Default: 5.0 seconds.)

NAME	DESCRIPTION
High Drive End Bearing Temperature Shutdown Threshold	High Drive End Bearing Temperature Shutdown Threshold for the I/O Module Fault (Password level: 1.) Allowed values: 100~1000 degF. (Default: 310 degF.)
High Drive End Bearing Temperature Shutdown Time	High Drive End Bearing Temperature Shutdown Time for the I/O Module Fault (Password level: 1.) Allowed values: 1~30 seconds. (Default: 5.0 seconds.)
High Exhaust Stack Temperature 1 Threshold (Aux101)	High Exhaust Stack Temp 1 Threshold for the I/O Module fault. (Password level: 1.) Allowed values: 200~1600 degF. (Default: 1250 degF.)
High Exhaust Stack Temperature 1 Time (Aux101)	The time delay until the High Exhaust Stack Temp 1 fault becomes active, from the I/O Module. (Password level: 1.) Allowed values: 1~30 seconds. (Default: 5.0 seconds.)
High Exhaust Stack Temperature 2 Threshold (Aux101)	High Exhaust Stack Temp 2 Threshold for the I/O Module fault. (Password level: 1.) (Password level: 1.) Allowed values: 200~1600 degF. (Default: 1250 degF.)
High Exhaust Stack Temperature 2 Time (Aux101)	The time delay until the High Exhaust Stack Temp 2 fault becomes active, from the I/O Module. (Password level: 1.) Allowed values: 1~30 seconds. (Default: 5.0 seconds.)
High Oil Temperature Threshold (Aux101)	High Oil Temp Threshold for the I/O Module HOT fault. Allowed values: 100~300 degF. (Default: 250 degF.)
High Oil Temperature Time (Aux101)	The time delay until the High Oil Temp fault becomes active, from the I/O Module. (Password level: 1.) Allowed values: 1~30 seconds. (Default: 5.0 seconds.)
High Intake Manifold Temperature 1 Threshold (Aux101)	High Intake Manifold Temp 1 Threshold for the I/O Module fault. (Password level: 1.) Allowed values: 100~270 degF. (Default: 180 degF.)
High Intake Temperature 1 Time (Aux101)	The time delay until the High Intake Manifold Temp 1 fault becomes active, from the I/O Module. (Password level: 1.) Allowed values: 1~30 seconds. (Default: 5.0 seconds.)
High Non-Drive End Bearing Temperature Threshold (Aux101)	High Non-Drive End Bearing Temp Threshold for the I/O Module fault. (Password level: 1.) Allowed values: 100~1000 degF. (Default: 300 degF.)
High Non-Drive End Bearing Temperature Time (Aux101)	The time delay until the High Non-Drive End Bearing Temp fault becomes active, from the I/O Module. (Password level: 1.) Allowed values: 1~30 seconds. (Default: 5.0 seconds.)
High Non-Drive End Bearing Temperature Shutdown Threshold	High Non-Drive End Bearing Temperature Shutdown Threshold for the I/O Module Fault (Password level: 1.) Allowed values: 100~1000 degF. (Default: 301 degF.)
High Non-Drive End Bearing Temperature Shutdown Time	High Non-Drive End Bearing Temperature Shutdown Time for the I/O Module Fault (Password level: 1.) Allowed values: 1~30 seconds. (Default: 5.0 seconds.)
High Fuel Level Threshold (Aux101)	High Fuel Level Threshold for the I/O Module fault. (Password level: 1.) Allowed values: 50~100 %. (Default: 90.0 %.)

NAME	DESCRIPTION
High Fuel Level Time (Aux101)	The time delay until the High Fuel Level fault becomes active, from the I/O Module. (Password level: 1.) Allowed values: 1~30 seconds. (Default: 5.0 seconds.)
Low Fuel Level Threshold (Aux101)	Low Fuel Level Threshold for the I/O Module fault. (Password level: 1.) Allowed values: 10~70 %. (Default: 30 %.)
Low Fuel Level Time (Aux101)	Low Fuel Level fault time for the I/O Module fault. (Password level: 1.) Allowed values: 1~30 seconds. (Default: 5.0 seconds.)
Very Low Fuel Level Threshold (Aux101)	Very Low Fuel Level Threshold for the AUX 101 I/O Module fault. (Password level: 1.) Allowed values: 0~50 %. (Default: 10 %.)
Very Low Fuel Level Time (Aux101)	Very Low Fuel Level fault time for the AUX 101 I/O Module fault. (Password level: 1.) Allowed values: 1~30 seconds. (Default: 5.0 seconds.)
Fuel Level 100 Percent Resistance (Aux101)	During setup this trim is set the 100% resistance, when the fuel tank is full. Allowed values: 601~2500 Ohm. (Default: 2200 Ohm.)
Fuel Level Zero Percent Resistance (Aux101)	Trim to set the 0% (or empty) resistance level on the sensor for the tank to be measured. Allowed values: 0~2500 Ohm. (Default: 600 Ohm.)
Fuel Tank Capacity (Aux101)	Trim to set the fuel tank capacity. Allowed values: 0~7500 Gallons. (Default: 173 Gallons.)
High LTA Temperature Threshold (Aux101)	High LTA Temperature threshold for the IO Module fault. Allowed Values: -40~300 degF (Default: 158 degF)
Hight LTA Temperature Time (Aux101)	The time delay until the High LTA Temperature fault becomes active, from the IO Module. Allowed Values: 0~30 seconds (Default: 5.0 seconds)

8.24.1 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*

8.24.2 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.

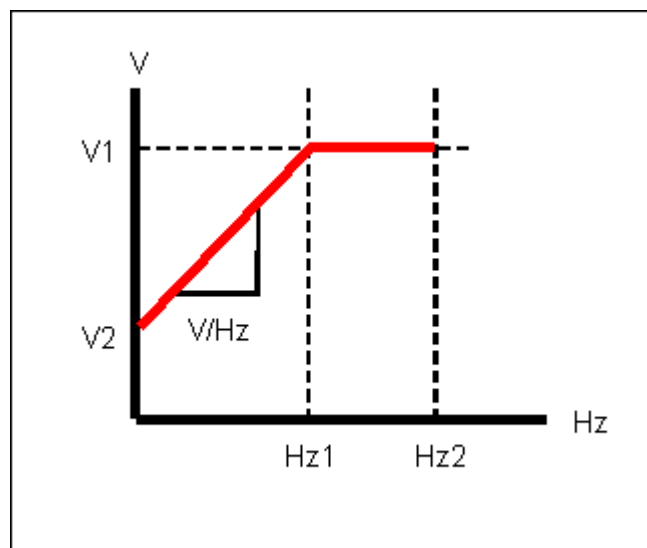


FIGURE 106. V/Hz CURVE

TABLE 157. 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.

8.24.3 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.

8.24.3.1 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.

8.24.3.2 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.

8.24.4 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.

8.25 Paralleling Setup

8.25.1 Paralleling Setup - Basic

Each parameter listed on the diagnostic tool is described in the following table :

TABLE 158. PARALLELING SETUP - BASIC

PARAMETER	DESCRIPTION
Load Govern kVAR Maximum	Sets the nominal maximum kVAR output as a percentage of Genset Standby KVA when paralleled to the utility
Load Govern kW Maximum	Sets the nominal maximum kW output as a percentage of Genset Standby KVA when paralleled to the utility
Load Govern kW Maximum Delayed	Sets the maximum kW output available after the first 120 seconds of utility parallel
Load Govern kW Reference Lower Limit	Load Govern's floor (lower limit) if 0 is undesired
Genset Application Type	Primary setting which configures generator set application (Password level: 1) Allowed values: Standalone, Synchronize Only, Isolated Bus Only, Utility Single, Utility Multiple, Power Transfer Control (Default: Standalone)
Sync Check Method	Used to select whether to use Permissive or Predictive Sync Check Method
Util CB Delay Measurement Method	Used to select how utility circuit breaker delay will be measured
First Start Backup Time	Adjust to different setting on each generator set in system Reduces the chance of generator sets closing simultaneously in the event that the Master First Start function fails (Password level: 1) Allowed values: 3~120 seconds (Default: 10 seconds)
Gen CB Delay Measurement Method	Used to select how generator set circuit breaker delay will be measured
Targeted Phase Angle Difference	The targeted phase angle difference between bus and the oncoming generator set at the point of breaker closure

PARAMETER	DESCRIPTION
Rate of Phase Change Limit	Upper limit for the Rate of Phase Change for which the Predictive Sync Check will work
Util CB Fixed Delay	The fixed value of Utility CB Delay to be inputted
Gen CB Fixed Delay	The fixed value of Genset CB Delay to be inputted
Utility Nominal Voltage	Utility nominal voltage (Password level: 1) Allowed values: 110~45000 Vac (Default: 480 Vac)
Utility Delta/Wye Connection	Delta or wye for utility connection (Password level: 1) Allowed values: Delta, Wye (Default: Wye)
Utility PT Primary Voltage	Utility PT Primary Voltage (Password level: 1) Allowed values: 110~45000 Vac (Default: 480 Vac)
Utility PT Secondary Voltage	Utility PT Secondary Voltage (Password level: 1) Allowed values: 100~600 Vac (Default: 480 Vac)
Utility CT Primary Current	Utility CT primary current (Password level: 1) 0 = Disable amperage and power metering Allowed values: 0~10000 amps (Default: 0 amps)
Utility and Genset Neutral CT Secondary Current	Utility / Neutral / Ground CT secondary current (Password level: 1) Allowed values: 1 amp, 5 amp (Default: 5 amp)
Utility Breaker Position Contacts	Sets whether using single a contact or dual a/b contact for utility breaker feedback (Password level: 1) Allowed values: Single Contact, Dual Contact (Default: Dual Contacts)
Genset Bus Nominal Voltage	Generator set bus nominal voltage (Password level: 1) Allowed values: 110~45000 Vac (Default: 480 Vac)
Genset Bus Delta/Wye Connection	Delta or wye for utility connection (Password level: 1) Allowed values: Delta, Wye (Default: Wye)
Genset Bus PT Primary Voltage	Generator set bus PT primary voltage (Password level: 1) Allowed values: 110~45000 Vac (Default: 480 Vac)
Genset Bus PT Secondary Voltage	Generator set bus PT secondary voltage (Password level: 1) Allowed values: 100~600 Vac (Default: 480 Vac)
Genset Bus CT Primary Current	Generator set bus CT primary current (Password level: 1) 0 = Disable amperage and power metering Allowed values: 0~10000 amps (Default: 0 amps)
Genset Bus CT Secondary Current	Generator set bus CT secondary current (Password level: 1) Allowed values: 1 amp, 5 amp (Default: 5 amp)
Loss of Bus Voltage Sensing Enable	Normally enabled use to disable loss of bus voltage sensing feature
Genset Breaker Position Contacts	Sets whether using single a contact or dual a/b contact for generator set breaker feedback (Password level: 1) Allowed values: Single Contact, Dual Contact (Default: Dual Contacts)
Genset CB Fail To Close Time Delay	Sets generator set breaker fail to close time delay (Password level: 1) Allowed values: 0.1~1 seconds (Default: 0.26 seconds)

PARAMETER	DESCRIPTION
Genset CB Fail To Open Time Delay	Sets generator set breaker fail to open time delay (Password level: 1) Allowed values: 0.2~5 seconds (Default: 1 seconds)
Genset CB Open To Close Delay	Set to avoid breaker anti-pump
Genset CB Shunt Trip Enable	Enables breaker shunt trip function for shutdown faults when Genset Application Type = Standalone or Synchronize
Permissive Voltage Window	Sets the permissive +/- voltage acceptance window for the sync check function (Password level: 1) Allowed values: 0.5~10 % (Default: 5 %)
Permissive Phase Window	Sets the permissive +/- phase angle window for the sync check function (Password level: 1) Allowed values: 0.1~20 degrees (Default: 15 degrees)
Permissive Window Time	Sets the permissive acceptance window dwell time for the sync check function (Password level: 1) Allowed values: 0.1~5 seconds (Default: 0.5 seconds)
Permissive Frequency Window	Sets the maximum frequency difference allowed for permissive close (Password level: 1) Allowed values: 0.001~1 Hz (Default: 1 Hz)
Synchronizer Voltage Control Method	Sets the voltage control method for synchronizing (Password level: 1) Allowed values: Voltage Match, External (Default: Voltage Match)
Voltage Match Kp	Sets overall gain for voltage matching control (Password level: 1) Allowed values: 10~800 (Default: 400)
Voltage Match Ki	Sets integral gain for the voltage match PI loop (Password level: 1) Allowed values: 0~255 (Default: 50)
Utility Current Metering Configuration	Select which CT connection type the utility current/power measurement will be Either 1 or 3 CT's will be used (Password level: 1) Allowed values: 3Ph 3Sensed, 3Ph 1Sensed (Default: 3Ph 3Sensed)
Synchronizer Speed Control Method	Sets the speed control method for synchronizing (Password level: 1) Allowed values: Phase Match, Slip Frequency, External (Default: Phase Match)
Sync Phase Offset	Sets a sync phase offset to accommodate sync across transformer with phase shift
Slip Frequency	Sets the synchronizer slip frequency Requires that Sync Speed Control Method = Slip Frequency (Password level: 1) Allowed values: -3~3 Hz (Default: 0.1 Hz)
Frequency Match Kp	Sets overall gain for the frequency matching control (Password level: 1) Allowed values: 1~300 (Default: 30)
Frequency Match Ki	Sets integral gain for the frequency match PI loop (Password level: 1) Allowed values: 0~250 (Default: 20)
Phase Match Kp	Sets overall gain for the phase matching control (Password level: 1) Allowed values: 10~1500 (Default: 150)
Fail To Sync Lockout Enable	If enabled synchronizer will turn off on a fail to sync (Password level: 1) Allowed values: Disable, Enable (Default: Disable)

PARAMETER	DESCRIPTION
Fail To Synchronize Time	Sets the fail to synchronize diagnostic time delay (Password level: 1) Allowed values: 10~900 seconds (Default: 120 seconds)
Speed Bias OOR Check Enable	Enable for the Speed Bias Out Of Range (OOR) faults
Speed Bias OOR High Limit	High limit trim for the Speed Bias Out Of Range (OOR) fault
Speed Bias OOR Low Limit	Low limit trim for the Speed Bias Out Of Range (OOR) fault
Load Share kW Balance	Use to adjust kW sharing balance between generator sets (Password level: 1) Allowed values: -5~5 % (Default: 0 %)
Genset % Standby Total kW	Monitors the total generator set standby kW percentage output
Load Share kW Gain	Overall kW load share gain adjustment (Password level: 1) Allowed values: 0.1~10 (Default: 1)
Load Share kVAR Balance	Use to adjust kVAR sharing balance between generator sets (Password level: 1) Allowed values: -5~5 % (Default: 0 %)
Genset Total kVARs per Standby kVA	Total kVARs per Standby kVA
Load Share kVAR Gain	Overall kVAR load share gain adjustment (Password level: 1) Allowed values: 0.1~10 (Default: 1)
Load Share Ramp Load Time	Sets kW and kVAR ramp load time for 100% change (Password level: 1) Allowed values: 5~900 seconds (Default: 30 seconds)
Load Share Ramp Unload Time	Sets kW ramp unload time for 100% kW change kVAR rate fixed at 15%/sec (Password level: 1) Allowed values: 5~900 seconds (Default: 30 seconds)
Load Share Ramp kW Unload Level	kW level when load sharing at which generator set is considered unloaded (for breaker opening) (Password level: 1) Allowed values: 0~100 % (Default: 5 %)
Genset kW Setpoint Percent	Indicates the desired set point for generator set kW output when paralleled to utility Sets the generator set load govern kW base load internal operating set point in % of standby rating Requires that Load Govern kW Setpoint Source = Internal and Load Govern kW Method = Genset kW (Password level: 1) Allowed values: 0~100 % (Default: 0 %)
Genset Power Factor Setpoint	Indicates analog input power factor set point derived from kVAR analog input Sets the load govern set point for generator set power factor control Requires that Load Govern kVAR Setpoint Source = Internal and Load Govern kVAR Method = Genset Power Factor (Password level: 1) Allowed values: -1~1 PF (Default: 1 PF)
Load Govern kW Kp	Sets the proportional gain for kW load governing control (Password level: 1) This is the former K1 gain Allowed values: 0~1000 (Default: 60)

PARAMETER	DESCRIPTION
Load Govern kW Ki	Sets the integral gain for kW load governing control (Password level: 1) This is the former K2 gain Allowed values: 0~250 (Default: 60)
Load Govern kVAR Kp	Sets the proportional gain for kVAR load governing control (Password level: 1) This is the former K1 gain Allowed values: 0~1000 (Default: 120)
Load Govern kVAR Ki	Sets the integral gain for kVAR load governing control (Password level: 1) This is the former K2 gain Allowed values: 0~250 (Default: 50)
Load Govern kW Ramp Load Time	Sets load govern kW ramp load rate = Genset Standby kW rating/this time (Password level: 1) Allowed values: 0~900 seconds (Default: 20 seconds)
Load Govern kW Ramp Unload Time	Sets load govern kW ramp unload rate = Genset Standby kW rating/this time (Password level: 1) Allowed values: 0~900 seconds (Default: 20 seconds)
Load Govern kVAR Ramp Load Time	Sets load govern kVAR ramp load rate = Genset Standby KVA * 0.6/this time (Password level: 1) Allowed values: 0~900 seconds (Default: 20 seconds)
Load Govern kVAR Ramp Unload Time	Sets load govern kVAR ramp unload rate = Genset Standby KVA * 0.6/this time (Password level: 1) Allowed values: 0~900 seconds (Default: 20 seconds)
Load Govern kW Maximum	Sets the nominal maximum kW output as a percentage of Genset Standby KVA when paralleled to the utility (Password level: 1) Allowed values: 0~100 % (Default: 80 %)
Load Govern kW Maximum Delayed	Sets the maximum kW output available after the first 120 seconds of utility parallel (Password level: 1) Allowed values: 0~100 % (Default: 80 %)
Load Govern kVAR Maximum	Sets the nominal maximum kVAR output as a percentage of Genset Standby KVA when paralleled to the utility (Password level: 1) Allowed values: 0~60 % (Default: 60 %)
Utility Parallel Voltage Control Method	Sets the voltage control method for utility paralleling Option of 'Load Govern with Droop Feed Forward' is no longer available (Password level: 1) Allowed values: Load Govern, Droop, Load Govern with Droop Feed Forward (Default: Load Govern)
Voltage Droop Percentage	Sets the voltage droop percent from no load to full load 0.8 PF (Password level: 1) Allowed values: 0~15 % (Default: 4 %)
Utility Parallel Speed Control Method	Sets the speed control method for utility paralleling (Password level: 1) Allowed values: Load Govern, Droop (Default: Load Govern)
Speed Droop Percentage	Sets the speed droop percent from no load to full load (Password level: 1) Allowed values: 0~15 % (Default: 5 %)
Setup Mode Enable	Volatile to allow entry into Setup Mode

PARAMETER	DESCRIPTION
Controller Mode	The controller mode
Isolated Bus Speed Control Method	Sets the speed control method for isolated bus paralleling Parameter is also known as Load Share Speed Droop Control Method (Password level: 1) Allowed values: Constant, Droop (Default: Constant)
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	Generator set total kW
Speed Droop Enable Switch (PCCNet)	Speed droop enable switch input status from PCCNet (Password level: 1) Allowed values: Inactive, Active (Default: Inactive)
Speed Bias OOR Check Enable	Enable for the Speed Bias Out Of Range (OOR) faults (Password level: 1) Allowed values: Disable, Enable (Default: Disabled)
Speed Bias OOR High Limit	High limit trim for the Speed Bias Out Of Range (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 Out Of Range (OOR) fault (Password level: 1) Allowed values: -5~5 Vdc (Default: -5 Vdc)
Speed Bias OOR Time	Delay time for the Speed Bias Out Of Range (OOR) faults (Password level: 1) Allowed values: 0~10 seconds (Default: 1 seconds)
Speed Bias Input Scaling Table	XY scaling table for the Speed Bias input
Isolated Bus Voltage Control Method	Sets the voltage control method for isolated bus paralleling (Password level: 1) Allowed values: Constant, Droop (Default: Constant)
Voltage Adjust	A trim that allows the user to add/subtract an offset to the nominal voltage when calculating the voltage set point (Password level: 1) Allowed values: -5~5 % (Default: 0 %)
Genset Total kVAR	Generator set total kVAR
Voltage Droop Enable Switch (PCCNet)	Voltage droop enable switch input status from PCCNet (Password level: 1) Allowed values: Inactive, Active (Default: Inactive)
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 Input Scaling Table	XY scaling table for the Voltage Bias input
External Bias Commands Enable	Enables the external bias (speed and voltage commands) to the hardware outputs

PARAMETER	DESCRIPTION
Speed and Voltage Bias Relay Command	Monitor point for the command which closes the on-board relay enabling the voltage and speed bias outputs
Breaker Closed Current Threshold	Threshold for determining breaker closed if contacts fail
Engine Running Time	Amount of time that the engine has been running
Load Demand System Enable	Disables or Enables load demand operation of all connected generator sets Allowed Values: Disable, Enable (Default: Disable) PCC3300 MLD controls only
Load Demand Type	Sets the sequencing priority for load demand Allowed Values: Run Hours Equalization (Run Hr Eq), Fixed Sequence (Fixed Seq) (Default: Fixed Seq) PCC3300 MLD controls only
Load Demand Threshold Method	Sets whether the load demand start/stop control is based on a relative (%) or absolute (kW) threshold Allowed Values: kW, %kW (Default: %kW) PCC3300 MLD controls only
Load Demand Start Threshold (%kW)	When the ratio of load to capacity is greater than this value the next generator set will start Must be greater than Load Demand Stop Threshold by at least 5% Allowed Values: 25~100 % (Default: 80 %) PCC3300 MLD controls only
Load Demand Start Threshold (kW)	When surplus capacity is less than this value the next generator set will start Must be less than Load Demand Stop Threshold (kW) Allowed Values: 5~5000 kW (Default: 500 kW) PCC3300 MLD controls only
Load Demand Stop Threshold (%kW)	When the ratio of load to capacity is less than this value the next generator set will stop Must be less than Load Demand Start Threshold by at least 5% Allowed Values: 20~95 % (Default: 60 %) PCC3300 MLD controls only
Load Demand Stop Threshold (kW)	When surplus capacity is greater than this value the next generator set will stop Must be greater than Load Demand Stop Threshold (kW) Allowed Values: 5~5000 kW (Default: 1000 kW) PCC3300 MLD controls only
Load Demand Run Hours Differential	When the difference between Load Demand Genset Run Hours between any running generator set and any stopped generator set reaches this value the stopped generator set will be started Allowed Values: 1~250 hours (Default: 50 hours) PCC3300 MLD controls only
Load Demand Initial Delay	Sets the time delay before generator sets are allowed to stop after initial start or after resuming from halted load demand Allowed Values: 60~1500 seconds (Default: 300 seconds) PCC3300 MLD controls only

PARAMETER	DESCRIPTION
Load Demand Start Delay	Sets the time delay before next generator set is allowed to start Allowed Values: 0~1500 seconds (Default: 10 seconds) PCC3300 MLD controls only
Load Demand Stop Delay	Sets the time delay before next generator set is allowed to stop Allowed Values: 60~1500 seconds (Default: 300 seconds) PCC3300 MLD controls only
Load Demand Genset Fail Delay	Sets the time delay that the system waits for a generator set to come online before declaring it as failed Allowed Values: 10~900 seconds (Default: 60 seconds) PCC3300 MLD controls only
System Network Remote Start Enable	When ENABLED a remote start signal at any single generator set will start all the generator sets Allowed Values: Inactive, Active (Default: Disable) PCC3300 MLD controls only
Clear Lost Gensets Local	When set to YES all generator sets in state 'Lost' will change to state "Gen Does Not Exist" in order to clear Lost Genset Warning Allowed Values: No, Yes (Default: No) PCC3300 MLD controls only
Load Demand Fixed Priority 1	Assigns a generator set to fixed priority 1 Used when Load Demand Type is set to Fixed Sequence Allowed Values: Gen1, Gen2, Gen3, Gen4, Gen5, Gen6, Gen7, Ge8, Gen9, Gen10, Gen11, Gen12, Gen13, Gen14, Gen15, Gen16 (Default: Gen1) PCC3300 MLD controls only
Load Demand Fixed Priority 2	Assigns a generator set to fixed priority 2 Used when Load Demand Type is set to Fixed Sequence Allowed Values: Gen1, Gen2, Gen3, Gen4, Gen5, Gen6, Gen7, Ge8, Gen9, Gen10, Gen11, Gen12, Gen13, Gen14, Gen15, Gen16 (Default: Gen2) PCC3300 MLD controls only
Load Demand Fixed Priority 3	Assigns a generator set to fixed priority 3 Used when Load Demand Type is set to Fixed Sequence Allowed Values: Gen1, Gen2, Gen3, Gen4, Gen5, Gen6, Gen7, Ge8, Gen9, Gen10, Gen11, Gen12, Gen13, Gen14, Gen15, Gen16 (Default: Gen3) PCC3300 MLD controls only
Load Demand Fixed Priority 4	Assigns a generator set to fixed priority 4 Used when Load Demand Type is set to Fixed Sequence Allowed Values: Gen1, Gen2, Gen3, Gen4, Gen5, Gen6, Gen7, Ge8, Gen9, Gen10, Gen11, Gen12, Gen13, Gen14, Gen15, Gen16 (Default: Gen4) PCC3300 MLD controls only
Load Demand Fixed Priority 5	Assigns a generator set to fixed priority 5 Used when Load Demand Type is set to Fixed Sequence Allowed Values: Gen1, Gen2, Gen3, Gen4, Gen5, Gen6, Gen7, Ge8, Gen9, Gen10, Gen11, Gen12, Gen13, Gen14, Gen15, Gen16 (Default: Gen5) PCC3300 MLD controls only

PARAMETER	DESCRIPTION
Load Demand Fixed Priority 6	<p>Assigns a generator set to fixed priority 6</p> <p>Used when Load Demand Type is set to Fixed Sequence</p> <p>Allowed Values: Gen1, Gen2, Gen3, Gen4, Gen5, Gen6, Gen7, Ge8, Gen9, Gen10, Gen11, Gen12, Gen13, Gen14, Gen15, Gen16 (Default: Gen6)</p> <p>PCC3300 MLD controls only</p>
Load Demand Fixed Priority 7	<p>Assigns a generator set to fixed priority 7</p> <p>Used when Load Demand Type is set to Fixed Sequence</p> <p>Allowed Values: Gen1, Gen2, Gen3, Gen4, Gen5, Gen6, Gen7, Ge8, Gen9, Gen10, Gen11, Gen12, Gen13, Gen14, Gen15, Gen16 (Default: Gen7)</p> <p>PCC3300 MLD controls only</p>
Load Demand Fixed Priority 8	<p>Assigns a generator set to fixed priority 8</p> <p>Used when Load Demand Type is set to Fixed Sequence</p> <p>Allowed Values: Gen1, Gen2, Gen3, Gen4, Gen5, Gen6, Gen7, Ge8, Gen9, Gen10, Gen11, Gen12, Gen13, Gen14, Gen15, Gen16 (Default: Gen8)</p> <p>PCC3300 MLD controls only</p>
Load Demand Fixed Priority 9	<p>Assigns a generator set to fixed priority 9</p> <p>Used when Load Demand Type is set to Fixed Sequence</p> <p>Allowed Values: Gen1, Gen2, Gen3, Gen4, Gen5, Gen6, Gen7, Ge8, Gen9, Gen10, Gen11, Gen12, Gen13, Gen14, Gen15, Gen16 (Default: Gen9)</p> <p>PCC3300 MLD controls only</p>
Load Demand Fixed Priority 10	<p>Assigns a generator set to fixed priority 10</p> <p>Used when Load Demand Type is set to Fixed Sequence</p> <p>Allowed values: Gen1, Gen2, Gen3, Gen4, Gen5, Gen6, Gen7, Ge8, Gen9, Gen10, Gen11, Gen12, Gen13, Gen14, Gen15, Gen16 (Default: Gen10)</p> <p>PCC3300 MLD controls only</p>
Load Demand Fixed Priority 11	<p>Assigns a generator set to fixed priority 11</p> <p>Used when Load Demand Type is set to Fixed Sequence</p> <p>Allowed values: Gen1, Gen2, Gen3, Gen4, Gen5, Gen6, Gen7, Ge8, Gen9, Gen10, Gen11, Gen12, Gen13, Gen14, Gen15, Gen16 (Default: Gen11)</p> <p>PCC3300 MLD controls only</p>
Load Demand Fixed Priority 12	<p>Assigns a generator set to fixed priority 12</p> <p>Used when Load Demand Type is set to Fixed Sequence</p> <p>Allowed values: Gen1, Gen2, Gen3, Gen4, Gen5, Gen6, Gen7, Ge8, Gen9, Gen10, Gen11, Gen12, Gen13, Gen14, Gen15, Gen16 (Default: Gen12)</p> <p>PCC3300 MLD controls only</p>
Load Demand Fixed Priority 13	<p>Assigns a generator set to fixed priority 13</p> <p>Used when Load Demand Type is set to Fixed Sequence</p> <p>Allowed values: Gen1, Gen2, Gen3, Gen4, Gen5, Gen6, Gen7, Ge8, Gen9, Gen10, Gen11, Gen12, Gen13, Gen14, Gen15, Gen16 (Default: Gen13)</p> <p>PCC3300 MLD controls only</p>

PARAMETER	DESCRIPTION
Load Demand Fixed Priority 14	<p>Assigns a generator set to fixed priority 14</p> <p>Used when Load Demand Type is set to Fixed Sequence</p> <p>Allowed values: Gen1, Gen2, Gen3, Gen4, Gen5, Gen6, Gen7, Ge8, Gen9, Gen10, Gen11, Gen12, Gen13, Gen14, Gen15, Gen16 (Default: 14)</p> <p>PCC3300 MLD controls only</p>
Load Demand Fixed Priority 15	<p>Assigns a generator set to fixed priority 15</p> <p>Used when Load Demand Type is set to Fixed Sequence</p> <p>Allowed values: Gen1, Gen2, Gen3, Gen4, Gen5, Gen6, Gen7, Ge8, Gen9, Gen10, Gen11, Gen12, Gen13, Gen14, Gen15, Gen16 (Default: Gen15)</p> <p>PCC3300 MLD controls only</p>
Load Demand Fixed Priority 16	<p>Assigns a generator set to fixed priority 16</p> <p>Used when Load Demand Type is set to Fixed Sequence</p> <p>Allowed values: Gen1, Gen2, Gen3, Gen4, Gen5, Gen6, Gen7, Ge8, Gen9, Gen10, Gen11, Gen12, Gen13, Gen14, Gen15, Gen16 (Default: Gen16)</p> <p>PCC3300 MLD controls only</p>
Synchronize System Settings	<p>When set to YES system settings from the generator set will be broadcasted and synchronized to all other generator sets in the network</p> <p>Allowed Values: No, Yes (Default: No)</p> <p>PCC3300 MLD controls only</p>
System Settings Status	<p>Indicates whether the system settings on the local generator set is in sync with ones from other generator sets in the network</p> <p>Allowed Values: Out of Sync, InSync</p> <p>Default: Out of Sync</p> <p>PCC3300 MLD controls only</p>
Genset ID	<p>Generator set identifier</p> <p>All load demand generator sets must have a unique Genset ID</p> <p>Allowed Values: Gen1, Gen2, Gen3, Gen4, Gen5, Gen6, Gen7, Ge8, Gen9, Gen10, Gen11, Gen12, Gen13, Gen14, Gen15, Gen16 (Default: Gen1)</p> <p>PCC3300 MLD controls only</p>
Load Demand Genset Run Hours	<p>Run hour accumulator used for load demand run hour equalization</p> <p>This is writable</p> <p>Allowed Values: 0~999999.9 hours (Default: 0 hour)</p> <p>PCC3300 MLD controls only</p>
Load Demand Spare Capacity Request Value	<p>Sets the kW value of additional capacity to be requested from the system when the Load Demand Spare Capacity Request Status is YES</p> <p>Allowed Values: 0~80000 kW (Default: 0 kW)</p> <p>PCC3300 MLD controls only</p>
Load Demand Genset Enable	<p>Disables or Enables load demand on this generator set only</p> <p>When set to disable the generator set is not included in the load demand system and can be removed without triggering a com error</p> <p>Allowed Values: Disable, Enable (Default: Disable)</p> <p>PCC3300 MLD controls only</p>

8.25.2 Power Transfer Control (Paralleling/PTC Setup)

NOTICE

This menu item is available only in the PowerCommand 3.3 .

This screen is reserved for future use.

Each label is described in the following table.

TABLE 159. POWER TRANSFER CONTROL

NAME	DESCRIPTION
Transition Type	Sets the load transfer transition type for use when Genset Application Type = Power Transfer Control. (Password level: 1.) Allowed values: Open Transition, Hard Closed Transition, Soft Closed Transition. (Default: Open Transition.)
Test With Load Enable	Use to choose whether a test is with load or without load. (Password level: 1.) Allowed values: Disabled, Enabled. (Default: Disabled.)
Fail To Disconnect Enable	Enables the fail to disconnect logic for utility paralleling. (Password level: 1.) Allowed values: Disable, Enable. (Default: Enable.)
Fail To Sync Open Transition Retransfer Enable	Use to enable an open transition retransfer upon a fail to sync when Genset Application Type = Power Transfer Control. (Password level: 1.) Allowed values: Disable, Enable. (Default: Disable.)
System Phase Rotation	Defines system phase rotation for use with rotation sensors. (Password level: 1.) Allowed values: L1-L2-L3, L1-L3-L2. (Default: L1-L2-L3.)
Extended Parallel Enable	use to enable the extended paralleling mode of PTC (Password level: 1.) Allowed values: Disabled, Enabled. (Default: Disabled.)
Commit to Transfer Method	PTC - sets point at which system commits to transfer to generator set (Password level: 1.) Allowed values: Utility Disconnect, Genset Start, No Commit. (Default: Utility Disconnect.)
Timers	
Programmed Transition Delay (TDPT)	Sets the time delay from when one source opens until the other closes during open transition transfers. (Password level: 1.) Allowed values: 0~60 seconds. (Default: 3 seconds.)
Transfer Delay (TDNE)	Sets the amount of time that the generator set source must be available before the control will transfer to that source. (Password level: 1.) Allowed values: 0~120 seconds. (Default: 10 seconds.)
Retransfer Delay (TDEN)	Sets the amount of time that the utility source must be available before the control will retransfer to that source. (Password level: 1.) Allowed values: 0~1800 seconds. (Default: 600 seconds.)
Maximum Parallel Time (TDMP)	Sets the maximum time that the generator set can remain paralleled to the utility during closed transition transfers. (Password level: 1.) Allowed values: 0~1800 seconds. (Default: 20 seconds.)

NAME	DESCRIPTION
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.)
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.)
Commit to Transfer Timeout	PTC - sets time system will wait for generator set when committed to transfer (Password level: 1.) Allowed values: 0~3200 seconds. (Default: 120 seconds.)
Utility Breaker	
Utility CB Fail To Open Time Delay	Sets utility breaker fail to open time delay. (Password level: 1.) Allowed values: 0.2~5 seconds. (Default: 1 seconds.)
Utility CB Fail To Close Time Delay	Sets utility breaker fail to close time delay. (Password level: 1.) Allowed values: 0.1~1 seconds. (Default: 0.26 seconds.)
Utility Breaker Opening Point	PTC - point in time at which system opens utility breaker (Password level: 1.) Allowed values: After Transfer Delay, Upon Utility Failure. (Default: After Transfer Delay.)
Load Govern Method	
Load Govern kW Method	Use to select how generator set kW output will be controlled when paralleled to utility. (Password level: 1.) Allowed values: Genset kW, Genset kW w/Utility Constraint, Utility kW. (Default: Genset kW.)
Load Govern kVAR Method	Use to select how generator set kVAR output will be controlled when paralleled to utility. (Password level: 1.) Allowed values: Genset kVAR, Genset Power Factor, Utility kVAR, Utility Power Factor. (Default: Genset Power Factor.)
Genset kW Setpoint	
Load Govern kW Setpoint Source	Use to select whether kW load govern setpoint is set internally or by external analog input. (Password level: 1.) Allowed values: Analog Input, Internal. (Default: Analog Input.)
Genset kW Setpoint	Sets the genset load govern kW base load internal operating setpoint in units of kW. Requires that Load Govern kW Setpoint Source = Internal and Load Govern kW Method = Genset kW. (Password level: 1.) Allowed values: 0~32000 kW. (Default: 0 kW.)
Genset kW Setpoint Percent	Sets the generator set load govern kW base load internal operating setpoint in % of standby rating. Requires that Load Govern kW Setpoint Source = Internal and Load Govern kW Method = Genset kW. (Password level: 1.) Allowed values: 0~100 %. (Default: 0 %.)
Genset kVAR Setpoint	

NAME	DESCRIPTION
Load Govern kVAR Setpoint Source	Use to select whether kVAR/PF load govern setpoint is set internally or by external analog input. (Password level: 1.) Allowed values: Analog Input, Internal. (Default: Analog Input.)
Genset kVAR Setpoint	Sets the generator set load govern kVAR base load internal operating setpoint in units of kVAR. Requires that Load Govern kVAR Setpoint Source = Internal and Load Govern kVAR Method = Genset kVAR. (Password level: 1.) Allowed values: -20000~32000 kVAR. (Default: 0 kVAR.)
Genset kVAR Setpoint Percent	Sets the generator set load govern kVAR base load internal operating setpoint in % of standby kVA rating. Requires that Load Govern kVAR Setpoint Source = Internal and Load Govern kVAR Method = Genset kVAR. (Password level: 1.) Allowed values: -60~60 %. (Default: 0 %.)
Utility kW	
Utility kW Constraint	Sets the utility kW minimum load level for constrained base load mode of operation. Requires that Load Govern kW Setpoint Source = Internal and Load Govern kW Method = Genset kW w/Utility Constraint. (Password level: 1.) Allowed values: -32000~32000 kW. (Default: 50 kW.)
Utility kW Constraint Percent	Sets utility kW minimum load level for constrained base load mode in % of generator set standby rating. Requires that Load Govern kW Setpoint Source = Internal and Load Govern kW Method = Genset kW w/Utility Constraint. (Password level: 1.) Allowed values: -320~320 %. (Default: 0 %.)
Utility kW Setpoint	Sets the utility kW peak shave internal operating setpoint in units of kW. Requires that Load Govern kW Setpoint Source = Internal and Load Govern kW Method = Utility kW. (Password level: 1.) Allowed values: -32000~32000 kW. (Default: 50 kW.)
Utility kW Setpoint Percent	Sets the utility kW peak shave internal operating setpoint in % of generator set standby rating. Requires that Load Govern kW Setpoint Source = Internal and Load Govern kW Method = Utility kW. (Password level: 1.) Allowed values: -320~320 %. (Default: 0 %.)
Utility kVAR	
Utility kVAR Setpoint	Sets the utility kVAR peak shave internal operating setpoint in units of kVAR. Requires that Load Govern kVAR Setpoint Source = Internal and Load Govern kVAR Method = Utility kVAR (Password level: 1.) Allowed values: -32000~32000 kVAR. (Default: 0 kVAR.)
Utility kVAR Setpoint Percent	Sets the utility kVAR peak shave internal operating setpoint in % of generator set standby kVA rating. Requires that Load Govern kVAR Setpoint Source = Internal and Load Govern kVAR Method = Utility kVAR. (Password level: 1.) Allowed values: -320~320 %. (Default: 0 %.)
PF Setpoint	
Utility Power Factor Setpoint	Sets the internal setpoint for utility power factor control mode when paralleled to utility. Requires that Load Govern kVAR Setpoint Source = Internal and Load Govern kVAR Method = Utility Power Factor. (Password level: 1.) Allowed values: 0.7~1 PF. (Default: 0.8 PF.)

NAME	DESCRIPTION
Genset Power Factor Setpoint	Sets the load govern setpoint for generator set power factor control. Requires that Load Govern kVAR Setpoint Source = Internal and Load Govern kVAR Method = Genset Power Factor. (Password level: 1.) Allowed values: -1~1 PF. (Default: 0.8 PF.)
Genset Frequency Sensor	
Genset Frequency Sensor Enable	Use to enable generator set frequency sensor. (Password level: 1.) Allowed values: Disable, Enable. (Default: Disable.)
Genset Center Frequency	Sets the center frequency for the generator set frequency sensor bandwidth settings. (Password level: 1.) Allowed values: 45~65 Hz. (Default: 60 Hz.)
Genset Frequency Drop-Out Bandwidth	Sets drop-out delta for generator set frequency sensor as percent of center frequency. (Password level: 1.) Allowed values: 0.3~5 %. (Default: 1 %.)
Genset Frequency Pick-Up Bandwidth	Sets pick-up range of generator set frequency sensor as percent of center frequency. (Password level: 1.) Allowed values: 0.3~20 %. (Default: 10 %.)
Genset Frequency Lower Drop-Out Threshold	Indicates the lower drop-out threshold in Hz for generator set frequency sensor
Genset Frequency Lower Pick-Up Threshold	Indicates the lower pick-up threshold in Hz for generator set frequency sensor
Genset Frequency Upper Pick-Up Threshold	Indicates the upper pick-up threshold in Hz for generator set frequency sensor
Genset Frequency Upper Drop-Out Threshold	Indicates the upper drop-out threshold in Hz for generator set frequency sensor
Genset Frequency Drop-Out Delay	Sets drop-out time delay for generator set frequency sensor. (Password level: 1.) Allowed values: 0.1~15 seconds. (Default: 5 seconds.)
Genset Voltage Sensor	
Genset Voltage Sensor Type	Sets the type of sensing to use for generator set voltage sensors. (Password level: 1.) Allowed values: Line to Line, Line to Neutral. (Default: Line to Line.)
Genset Overvoltage Sensor	
Genset Overvoltage Sensor Enable	Use to enable generator set overvoltage sensor. (Password level: 1.) Allowed values: Disable, Enable. (Default: Disable.)
Genset Overvoltage Drop-Out Percentage	Sets drop-out as percent of nominal voltage for generator set overvoltage sensor. (Password level: 1.) Allowed values: 105~135 %. (Default: 110 %.)
Genset Overvoltage Drop-Out Threshold	Indicates the drop-out threshold in volts for generator set overvoltage sensor
Genset Overvoltage Pick-Up Percentage	Sets pick-up as percent of drop-out setting for generator set overvoltage sensor. (Password level: 1.) Allowed values: 95~99 %. (Default: 95 %.)

NAME	DESCRIPTION
Genset Overvoltage Pick-Up Threshold	Indicates the pick-up threshold in volts for generator set overvoltage sensor
Genset Overvoltage Drop-Out Delay	Sets drop-out time delay for generator set overvoltage sensor. (Password level: 1.) Allowed values: 0.5~120 seconds. (Default: 3 seconds.)
Genset Undervoltage Sensor	
Genset Undervoltage Drop-Out Percentage	Sets drop-out as percent of pick-up setting for generator set undervoltage sensor. (Password level: 1.) Allowed values: 75~98 %. (Default: 90 %.)
Genset Undervoltage Drop-Out Threshold	Indicates the drop-out threshold in volts for generator set undervoltage sensor
Genset Undervoltage Pick-Up Percentage	Sets pick-up as percent of nominal voltage for generator set undervoltage sensor. (Password level: 1.) Allowed values: 85~100 %. (Default: 90 %.)
Genset Undervoltage Pick-Up Threshold	Indicates the pick-up threshold in volts for generator set undervoltage sensor
Genset Undervoltage Drop-Out Delay	Sets drop-out time delay for generator set undervoltage sensor. (Password level: 1.) Allowed values: 0.1~30 seconds. (Default: 5 seconds.)
Utility Frequency Sensor	
Utility Frequency Sensor Enable	Use to enable utility frequency sensor. (Password level: 1.) Allowed values: Disable, Enable. (Default: Disable.)
Utility Center Frequency	Sets the center frequency for the utility frequency sensor bandwidth settings. (Password level: 1.) Allowed values: 45~65 Hz. (Default: 60 Hz.)
Utility Frequency Drop-Out Bandwidth	Sets drop-out delta for utility frequency sensor as percent of center frequency. (Password level: 1.) Allowed values: 0.3~5 %. (Default: 1 %.)
Utility Frequency Pick-Up Bandwidth	Sets pick-up range of utility frequency sensor as percent of center frequency. (Password level: 1.) Allowed values: 0.3~20 %. (Default: 10 %.)
Utility Frequency Lower Drop-Out Threshold	Indicates the lower drop-out threshold in Hz for utility frequency sensor
Utility Frequency Lower Pick-Up Threshold	Indicates the lower pick-up threshold in Hz for utility frequency sensor
Utility Frequency Upper Pick-Up Threshold	Indicates the upper pick-up threshold in Hz for utility frequency sensor
Utility Frequency Upper Drop-Out Threshold	Indicates the upper drop-out threshold in Hz for utility frequency sensor
Utility Frequency Drop-Out Delay	Sets drop-out time delay for utility frequency sensor. (Password level: 1.) Allowed values: 0.1~15 seconds. (Default: 5 seconds.)

NAME	DESCRIPTION
Utility Unloaded Level	Sets threshold at which utility source is considered as unloaded. (Password level: 1.) Allowed values: -32768~32767 kW. (Default: 50 kW.)
Utility Voltage Sensor	
Utility Voltage Sensor Type	Sets the type of sensing to use for utility voltage sensors. (Password level: 1.) Allowed values: Line to Line, Line to Neutral. (Default: Line to Line.)
Utility Overvoltage Sensor	
Utility Overvoltage Sensor Enable	Use to enable utility overvoltage sensor. (Password level: 1.) Allowed values: Disable, Enable. (Default: Disable.)
Utility Overvoltage Drop-Out Percentage	Sets drop-out as percent of nominal voltage for utility overvoltage sensor. (Password level: 1.) Allowed values: 105~135 %. (Default: 110 %.)
Utility Overvoltage Drop-Out Threshold	Indicates the drop-out threshold in volts for utility overvoltage sensor
Utility Overvoltage Pick-Up Percentage	Sets pick-up as percent of drop-out setting for utility overvoltage sensor. (Password level: 1.) Allowed values: 95~99 %. (Default: 95 %.)
Utility Overvoltage Pick-Up Threshold	Indicates the pick-up threshold in volts for utility overvoltage sensor
Utility Overvoltage Drop-Out Delay	Sets drop-out time delay for utility overvoltage sensor. (Password level: 1.) Allowed values: 0.5~120 seconds. (Default: 3 seconds.)
Utility Undervoltage Sensor	
Utility Undervoltage Drop-Out Percentage	Sets drop-out as percent of pick-up setting for utility undervoltage sensor. (Password level: 1.) Allowed values: 75~98 %. (Default: 90 %.)
Utility Undervoltage Drop-Out Threshold	Indicates the drop-out threshold in volts for utility undervoltage sensor
Utility Undervoltage Pick-Up Percentage	Sets pick-up as percent of nominal voltage for utility undervoltage sensor. (Password level: 1.) Allowed values: 85~100 %. (Default: 90 %.)
Utility Undervoltage Pick-Up Threshold	Indicates the pick-up threshold in volts for utility undervoltage sensor
Utility Undervoltage Drop-Out Delay	Sets drop-out time delay for utility undervoltage sensor. (Password level: 1.) Allowed values: 0.1~30 seconds. (Default: 0.5 seconds.)
Genset Loss of Phase Sensor Enable	Use to enable generator set loss of phase sensor. (Password level: 1.) Allowed values: Disable, Enable. (Default: Disable.)
Genset Loss of Phase Drop-Out Delay	Sets drop-out time delay for generator set loss of phase sensor. (Password level: 1.) Allowed values: 1~10 seconds. (Default: 1 second.)
Utility Loss of Phase Sensor Enable	Use to enable utility loss of phase sensor. (Password level: 1.) Allowed values: Disable, Enable. (Default: Disable.)

NAME	DESCRIPTION
Utility Loss of Phase Drop-Out Delay	Sets drop-out time delay for utility loss of phase sensor. (Password level: 1.) Allowed values: 1~10 seconds. (Default: 1 second.)

8.26 Genset (OEM Genset Setup)

Each label is described in the following table.

TABLE 160. OEM GENSET SETUP

NAME	DESCRIPTION
Genset Numbers	
Genset Serial Number	Serial number of identifying this generator set. (Password level: 2.)
Alternator Serial Number	Unique number identifying alternator serial number of this generator set. (Password level: 2.)
Engine Serial Number	Unique number identifying this engine serial number of this generator set. (Password level: 2.)
Model Numbers	
Alternator Model Number	Number identifying alternator model number of this generator set. (Password level: 2.)
Genset Model Number	Number identifying the model of this generator set. (Password level: 2.)
Application Rating Select	Selects generator set 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 generator set with external governor. Allowed values: Disabled, Enabled. (Default: Enabled.)
Standby kVA Rating	
Standby kVA rating (3 phase/ 50Hz)	KVA rating of generator set 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 generator set 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 generator set 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 generator set 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	

NAME	DESCRIPTION
Prime kVA rating (3 phase/ 50Hz)	KVA rating of generator set 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 generator set 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 generator set 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 generator set 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 generator set 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 generator set 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.)

NAME	DESCRIPTION
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.)

NAME	DESCRIPTION
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.)
Input Factory Lock	
Transfer Inhibit/Configurable Input #20 Factory Lock	Transfer Inhibit Factory Lock (Password level: 2.) Allowed values: Not Locked, Locked. (Default: Not Locked.)
Retransfer Inhibit/Configurable Input #21 Factory Lock	Retransfer Inhibit Factory Lock (Password level: 2.) Allowed values: Not Locked, Locked. (Default: Not Locked.)
Utility CB Pos B/Configurable Input #23 Factory Lock	Utility CB Pos B Factory Lock (Password level: 2.) Allowed values: Not Locked, Locked. (Default: Not Locked.)
Utility CB Tripped/Configurable Input #24 Factory Lock	Utility CB Tripped Factory Lock (Password level: 2.) Allowed values: Not Locked, Locked. (Default: Not Locked.)
Utility CB Inhibit/Configurable Input #25 Factory Lock	Utility CB Inhibit Factory Lock (Password level: 2.) Allowed values: Not Locked, Locked. (Default: Not Locked.)
Genset CB Pos B/Configurable Input #26 Factory Lock	Genset CB Pos B Factory Lock (Password level: 2.) Allowed values: Not Locked, Locked. (Default: Not Locked.)
Genset CB Tripped/Configurable Input #27 Factory Lock	Genset CB Tripped Factory Lock (Password level: 2.) Allowed values: Not Locked, Locked. (Default: Not Locked.)
Genset CB Inhibit/Configurable Input #28 Factory Lock	Genset CB Inhibit Factory Lock (Password level: 2.) Allowed values: Not Locked, Locked. (Default: Not Locked.)
Utility Single Mode Verify/Configurable Input #29 Factory Lock	Utility Single Mode Verify Factory Lock (Password level: 2.) Allowed values: Not Locked, Locked. (Default: Not Locked.)

NAME	DESCRIPTION
Sync Enable/Configurable Input #30 Factory Lock	Sync Enable Factory Lock (Password level: 2.) Allowed values: Not Locked, Locked. (Default: Not Locked.)
Load Demand Stop/Configurable Input #31 Factory Lock	Load Demand Stop Factory Lock (Password level: 2.) Allowed values: Not Locked, Locked. (Default: Not Locked.)
Extended Parallel/Configurable Input #32 Factory Lock	Factory Lock for the Ramp Load/Unload input. (Password level: 2.) Allowed values: Not Locked, Locked. (Default: Not Locked.)
Backup Start Disconnect/Configurable Input #33 Factory Lock	Backup Start Disconnect Factory Lock (Password level: 2.) Allowed values: Not Locked, Locked. (Default: Locked.)
Analog Input Factory Lock	
kW Load Setpoint / Configurable Analog Input #1 Factory Lock	Prevents the function pointer trim from being modified unless in factory mode (Password level: 2.) Allowed values: Not Locked, Locked. (Default: Unlocked.)
kVAR Load Setpoint / Configurable Analog Input #2 Factory Lock	Prevents the function pointer trim from being modified unless in factory mode (Password level: 2.) Allowed values: Not Locked, Locked. (Default: Unlocked.)
Output Factory Lock	
Configurable Output #20 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 #21 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 #22 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.)
Analog Output Factory Lock	
Speed Bias Output / Configurable Analog Output #1 Output Factory Lock	Prevents Output Function pointer and scaling trims from being modified unless in Factory mode (Password level: 2.) Allowed values: Not Locked, Locked. (Default: Unlocked.)
Voltage Bias Output / Configurable Analog Output #2 Factory Lock	Prevents Output Function pointer and scaling trims from being modified unless in Factory mode (Password level: 2.) Allowed values: Not Locked, Locked. (Default: Unlocked.)
Reset Gen Bus Energy Meter	
Genset Bus Reset All Energy Meters	Use to permanently clear all generator set bus energy meter values (Password level: 1.) Allowed values: Do Nothing, Clear Counters. (Default: Do Nothing.)
Genset Bus Reset All Energy Meters Timestamp - Hour	Timestamp of when energy meters were last reset Allowed values: 0~23. (Default: 0.)
Genset Bus Reset All Energy Meters Timestamp - Minute	Timestamp of when energy meters were last reset Allowed values: 0~59. (Default: 0.)

NAME	DESCRIPTION
Genset Bus Reset All Energy Meters Timestamp - Second	Timestamp of when energy meters were last reset Allowed values: 0~59. (Default: 0.)
Genset Bus Reset All Energy Meters Timestamp - Day	Timestamp of when energy meters were last reset Allowed values: 1~31. (Default: 1.)
Genset Bus Reset All Energy Meters Timestamp - Month	Timestamp of when energy meters were last reset Allowed values: 1~12. (Default: 1.)
Genset Bus Reset All Energy Meters Timestamp - Year	Timestamp of when energy meters were last reset Allowed values: 0~99. (Default: 0.)
Reset Utility Energy Meter	
Utility Reset All Energy Meters	Use to permanently clear all Utility energy meter values (Password level: 1.) Allowed values: Do Nothing, Clear Counters. (Default: Do Nothing.)
Utility Reset All Energy Meters Timestamp - Hour	Timestamp of when energy meters were last reset Allowed values: 0~23. (Default: 0.)
Utility Reset All Energy Meters Timestamp - Minute	Timestamp of when energy meters were last reset Allowed values: 0~59. (Default: 0.)
Utility Reset All Energy Meters Timestamp - Second	Timestamp of when energy meters were last reset Allowed values: 0~59. (Default: 0.)
Utility Reset All Energy Meters Timestamp - Day	Timestamp of when energy meters were last reset Allowed values: 1~31. (Default: 1.)
Utility Reset All Energy Meters Timestamp - Month	Timestamp of when energy meters were last reset Allowed values: 1~12. (Default: 1.)
Utility Reset All Energy Meters Timestamp - Year	Timestamp of when energy meters were last reset Allowed values: 0~99. (Default: 0.)

8.26.1 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.

8.27 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 generator set does not start, and there is no fault code.

Each label is described in the following table.

TABLE 161. OEM ENGINE SETUP

NAME	DESCRIPTION
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 generator set 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.)
Idle Speed	Sets the speed at which the engine will idle subject to high and low limit calibrations (Password level: 2.) Allowed values: 700~1100 rpm. (Default: 800 rpm.)
QSX15/CM570 Application Enable	Used to enable the control adaptations for the QSX15/CM570 generator set application. (Password level: 2.) Allowed values: Disabled, Enabled. (Default: Disabled.)
Starter Disconnect Speed	Sets the engine speed at which the cranking algorithm disengages the starter (Password level: 2.) Allowed values: 100~600 rpm. (Default: 450 rpm.)
Nominal Battery Voltage	Selects the nominal battery operating voltage of the generator set (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: 10~16 Vdc. (Default: 14.4 Vdc.)
24 V Low Battery Voltage Running Threshold	Sets 24V low battery voltage fault threshold for generator set operation in all modes except rated (Password level: 1.) Allowed values: 22~26 Vdc. (Default: 24 Vdc.)

NAME	DESCRIPTION
24 V Low Battery Voltage Stopped Threshold	Sets 24V low battery voltage fault threshold for generator set 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 generator set 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 generator set 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 generator set 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 <i>Alternate Frequency Switch</i>. 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 generator set to recover faster when the frequency drops. (Password level: 1.) Allowed values: 0~10 Hz. (Default: 1 Hz.)

NAME	DESCRIPTION
V/Hz Rolloff Slope (50 Hz) V/Hz Rolloff Slope (60 Hz)	Note: The parameter depends on <i>Alternate Frequency Switch</i>. 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.)
Governor Ramp Time	Time for governor setpoint to transition from Gov Enable Speed to rated speed. (Password level: 1.) Allowed values: 0~30 seconds. (Default: 0.25 seconds.)
Glow Plug Enable	Enables the glow plug feature. (Password level: 1.) Allowed values: Disable, Enable. (Default value: Disable.)
Min Time at Preheat Temperature	Sets the minimum glow plug preheat time. (Password level: 1.) Allowed values: 0~120 sec. (Default value: 15 sec.)
Min Preheat Temperature	Sets the minimum coolant temp for glow plug operation. (Password level: 1.) Allowed values: -100~300 degF. (Default: -5 degF.)
Max Preheat Temperature	Sets the maximum coolant temp for glow plug operation. (Password level: 1.) Allowed values: -100~300 degF. (Default: 77 degF.)
Max Preheat Glow Time	Sets the maximum glow plug preheat time. (Password level: 1.) Allowed values: 0~120 sec. (Default: 60 sec.)
Max Post Glow Temperature	Sets the maximum coolant temp for glow plug operation. (Password level: 1.) Allowed values: -100~300 degF. (Default: 50 degF.)
Max Post Glow Time	Sets the maximum post glow plug heat time. (Password level: 1.) Allowed values: 0~30 sec. (Default: 5 sec.)
Teeth Pulses Per Revolution	Set number of teeth on flywheel. (Password level: 2.) Allowed values: 0~250. (Default: 110.)
Initial Crank Fuel Duty Cycle	The initial governor duty command when cranking is initiated. (Password level: 1.) Allowed values: 0~90 %. (Default: 25 %.)
Initial Crank Fueling Period	Time spent at Initial Crank Fueling Command. (Password level: 1.) Allowed values: 0~10 seconds. (Default: 2 seconds.)
Crank Fueling Ramp Rate	Fuel command ramp rate after Initial Crank Fueling Command has expired. (Password level: 1.) Allowed values: 5~100 %/sec. (Default: 25 %/sec.)
Max Crank Fuel Duty Cycle	Max Fuel Command during cranking. (Password level: 1.) Allowed values: 50~100 %. (Default: 100 %.)
Crank Exit Fuel Duty Cycle	Fixed fuel command applied after start disconnect until Governor Enable Speed is reached. (Password level: 1.) Allowed values: 0~100 %. (Default: 25 %.)

NAME	DESCRIPTION
Governor Enable Engine Speed	Sets the threshold to transition from open loop governor control to closed loop (Password level: 2.) Allowed values: 601~1400 rpm. (Default: 1100 rpm.)
Governor Preload Offset	An offset used in the governor preload PID calculation. (Password level: 2.) Allowed values: 0~500 %. (Default: 0 %.)
Maximum Duty Cycle	Max duty cycle output from the control. (Password level: 0.) Allowed values: 0~100%. (Default: 95%.)
Minimum Duty Cycle	Min duty cycle output from the control. (Password level: 0.) Allowed values: 0~100%. (Default: 20%.)
Dither Factor	Percentage of dithering added to Gov PWM command. Set to 0 to turn off. (Password level: 1.) Allowed values: 0~30 %. (Default: 15 %.)
Duty Cycle Gain Compensation Enable	Enables the Gov Gain vs Gov Duty Cycle compensation feature. (Password level: 1.) Allowed values: Disable, Enable. (Default: Disable.)
Duty Cycle Gain Compensation X1	Sets the duty cycle point at which the gain compensation starts.(Duty Cycle Gain Compensation X1) (Password level: 1.) Allowed values: 1~50 %. (Default: 50 %.)
Duty Cycle Gain Compensation X2	Sets the duty cycle point at which the gain compensation stops increasing.(Duty Cycle Gain Compensation X2) (Password level: 1.) Allowed values: 50.1~100 %. (Default: 100 %.)
Duty Cycle Gain Compensation Y1	Sets the compensation gain for duty cycles below the Starting Duty Cycle.(Duty Cycle Gain Compensation Y1) (Password level: 1.) Allowed values: 1~5. (Default: 1.0.)
Duty Cycle Gain Compensation Y2	Sets the max compensation gain (reached at End Duty Cycle).(Duty Cycle Gain Compensation Y2) (Password level: 1.) Allowed values: 0~10. (Default: 2.0.)
GK1 High (50Hz)	The governor 50Hz K1 high gain adjust. MODBUS Access: Read Only (Password level: 1.) Allowed values: 0~65530. (Default: 1.)
GK1 (50Hz)	The governor 50Hz K1 gain adjust. MODBUS Access: Read Only (Password level: 1.) Allowed values: 0~65530. (Default: 1.)
GK1 Low (50Hz)	The governor 50Hz K1 low gain adjust. MODBUS Access: Read Only (Password level: 1.) Allowed values: 0~65530. (Default: 1.)
GK2 (50Hz)	The governor 50Hz integral gain adjust. MODBUS Access: Read Only (Password level: 1.) Allowed values: 0~65530. (Default: 1.)
GK3 (50Hz)	The governor 50Hz K3 gain adjust. MODBUS Access: Read Only (Password level: 1.) Allowed values: 0~65530. (Default: 1.)

NAME	DESCRIPTION
Governor Damping Effect (50Hz)	The governor 50Hz damping adjust. MODBUS Access: Read Only (Password level: 1.) Allowed values: 0.6~0.95. (Default: 0.8.)
GK1 High (60Hz)	The governor 60Hz K1 high gain adjust. MODBUS Access: Read Only (Password level: 1.) Allowed values: 0~65530. (Default: 1.)
GK1 (60Hz)	The governor 60Hz K1 gain adjust. MODBUS Access: Read Only (Password level: 1.) Allowed values: 0~65530. (Default: 1.)
GK1 Low (60Hz)	The governor 60Hz K1 low gain adjust. MODBUS Access: Read Only (Password level: 1.) Allowed values: 0~65530. (Default: 1.)
GK2 (60Hz)	The governor 60Hz integral gain adjust. MODBUS Access: Read Only (Password level: 1.) Allowed values: 0~65530. (Default: 1.)
GK3 (60Hz)	The governor 60Hz K3 gain adjust. MODBUS Access: Read Only (Password level: 1.) Allowed values: 0~65530. (Default: 1.)
Governor Damping Effect (60Hz)	The governor 60Hz damping adjust. MODBUS Access: Read Only (Password level: 1.) Allowed values: 0.6~0.95. (Default: 0.8.)
Gain Windowing Enable	Either enables or disables Gain Windowing feature. MODBUS Access: Read Only (Password level: 1.) Allowed values: Disable, Enable. (Default: Disable.)
Governor Speed Delta High	The speed error higher limit. MODBUS Access: Read Only (Password level: 1.) Allowed values: 50~1000. (Default: 50.)
Governor Speed Delta Low	The speed error lower limit. MODBUS Access: Read Only (Password level: 1.) Allowed values: 50~1000. (Default: 50.)
GK1 (Idle)	This trim is used to adjust gk1 in idle mode. MODBUS Access: Read Only (Password level: 1.) Allowed values: 0~65530. (Default: 1.)
GK2 (Idle)	This trim is used to adjust gk2 in idle mode. MODBUS Access: Read Only (Password level: 1.) Allowed values: 0~65530. (Default: 1.)
GK3 (Idle)	This trim is used to adjust gk3 in idle mode. MODBUS Access: Read Only (Password level: 1.) Allowed values: 0~65530. (Default: 1.)
Gov Damping Effect (Idle)	This trim is used to adjust the damping effect in idle mode. MODBUS Access: Read Only (Password level: 1.) Allowed values: 0.6~0.95. (Default: 0.935.)
Coolant Temperature Sensor Type	Either PGBU(Onan) or EBU(Cummins) sensor. MODBUS Access: Read Only (Password level: 1.) Allowed values: PGBU, EBU. (Default: PGBU.)

NAME	DESCRIPTION
Oil Pressure Sensor Type	Either pressure switch or pressure sender. (Password level: 1.) Allowed values: Switch, Sender. (Default: Sender.)
Oil Pressure Sender Type	3-Wire is only option. (Password level: 1.) Allowed values: Reserved, 3-Wire. (Default: 3-Wire.)
Oil Pressure Switch Polarity	Active High = Switch opens with pressure. Active Low = Switch closes with pressure. (Password level: 1.) Allowed values: Active Low, Active High. (Default: Active High.)
Intake Manifold Temperature Sensor Enable	Intake Manifold Temp Sensor available or not. MODBUS Access: Read Only (Password level: 1.) Allowed values: Disable, Enable. (Default: Enable.)
Intake Manifold Temperature Sensor Type	Either PGBU(Onan) or EBU(Cummins) sensor. MODBUS Access: Read Only (Password level: 1.) Allowed values: PGBU, EBU. (Default: PGBU.)
Oil Temperature Sensor Enable	High Oil Temperature Sensor available or not. (Password level: 1.) Allowed values: Disable, Enable. (Default: Enable.)
Oil Temperature Sensor Type	Either PGBU(Onan) or EBU(Cummins) sensor. (Password level: 1.) Allowed values: PGBU, EBU. (Default: PGBU.)
HCT Shutdown/w Cooldown Threshold	High Coolant Temperature Shutdown with Cooldown Threshold. (Password level: 1.) Allowed values: 180~300 degF. (Default: 216 degF.)
HCT Shutdown Threshold	Temperature at which HCT Shutdown fault becomes active. (Password level: 1.) Allowed values: 180~300 degF. (Default: 219 degF.)
HCT Shutdown Set Time	Time delay before fault becomes active. (Password level: 1.) Allowed values: 2~10 seconds. (Default: 2 seconds.)
HCT Warning Threshold	Threshold must be exceeded for the fault to become active. (Password level: 1.) Allowed values: 150~290 degF. (Default: 208 degF.)
HCT Warning Set Time	Time delay before the fault becomes active. (Password level: 1.) Allowed values: 2~10 seconds. (Default: 2 seconds.)
HOT Protection Enable	High Oil Temperature Protection Enable (Password level: 1.) Allowed values: Disabled, Enabled. (Default: Enabled.)
HOT Shutdown Threshold	Temperature value at which the High Oil Temperature Shutdown fault becomes active. (Password level: 1.) Allowed values: 215~250 degF. (Default: 230 degF.)
HOT Shutdown Set Time	Shutdown set time for High Oil Temperature (Password level: 1.) Allowed values: 2~10 seconds. (Default: 2 seconds.)
HOT Warning Threshold	Temperature value at which the high oil temperature Warning fault becomes active. (Password level: 1.) Allowed values: 200~250 degF. (Default: 221 degF.)
HOT Warning Set Time	Sets time to set the high oil temperature fault. (Password level: 1.) Allowed values: 2~10 seconds. (Default: 2 seconds.)
LOP Enable Time	Time spent at Running before feature enables. (Password level: 1.) Allowed values: 0-255 seconds. (Default: 10 seconds.)

NAME	DESCRIPTION
LOP Shutdown Threshold	Pressure at which fault 2 becomes active if pressure sender is installed. (Password level: 1.) Allowed values: 13~100 psig. (Default: 35 psig.)
LOP Warning Threshold	Pressure at which fault 215 becomes active if pressure sender is installed. (Password level: 1.) Allowed values: 19~100 psig. (Default: 40 psig.)
LOP Idle Shutdown Threshold	Pressure at which LOP fault becomes active if pressure sender is installed. (Password level: 1.) Allowed values: 8~100 psig. (Default: 10 psig.)
LOP Idle Warning Threshold	The Low Oil Pressure Warning when the generator set is idling. (Password level: 1.) Allowed values: 12~100 psig. (Default: 15 psig.)
LOP Shutdown Set Time	Time delay before LOP fault becomes active. (Password level: 1.) Allowed values: 2~15 seconds. (Default: 8 seconds.)
LOP Warning Set Time	Time delay before fault 215 becomes active. (Password level: 1.) Allowed values: 2~15 seconds. (Default: 5 seconds.)
High IMT Protection Enable	High IMT Protection Enable (Password level: 1.) Allowed values: Disabled, Enabled. (Default: Enabled.)
High IMT Shutdown Threshold	Temperature value at which the High IMT Shutdown fault becomes active. (Password level: 1.) Allowed values: 140~167 degF. (Default: 162 degF.)
High IMT Shutdown Set Time	Shutdown set time for High intake manifold temp. (Password level: 1.) Allowed values: 2~10 seconds. (Default: 5 seconds.)
High IMT Warning Threshold	Temperature value at which the High IMT Warning fault becomes active. (Password level: 1.) Allowed values: 122~167 degF. (Default: 149 degF.)
High IMT Warning Set Time	Sets time to set the high intake manifold temp fault. (Password level: 1.) Allowed values: 2~10 seconds. (Default: 5 seconds.)
Overspeed Shutdown Threshold (50Hz)	Shutdown will occur when this speed has been exceeded. (Password level: 1.) Allowed values: 0~1875 rpm. (Default: 1725 rpm.)
Overspeed Shutdown Threshold (50Hz) - 20	Shutdown will occur when this speed has been exceeded. (Password level: 1.) Allowed values: 0~1250 rpm. (Default: 1150 rpm.)
Overspeed Shutdown Threshold (50Hz) - 36	Shutdown will occur when this speed has been exceeded. (Password level: 1.) Allowed values: 0~2250 rpm. (Default: 2070 rpm.)
Overspeed Shutdown Threshold (50Hz) - 60	Shutdown will occur when this speed has been exceeded. (Password level: 1.) Allowed values: 0~3750 rpm. (Default: 3450 rpm.)
Overspeed Shutdown Threshold (50Hz) - Adjustable	Shutdown will occur when this speed has been exceeded. (Password level: 1.) Allowed values: 0~3750 rpm. (Default: 1725 rpm.)
Overspeed Shutdown Threshold (60Hz)	Shutdown will occur when this speed has been exceeded. (Password level: 1.) Allowed values: 0~2250 rpm. (Default: 2075 rpm.)
Overspeed Shutdown Threshold (60Hz) - 20	Shutdown will occur when this speed has been exceeded. (Password level: 1.) Allowed values: 0~1250 rpm. (Default: 1150 rpm.)

NAME	DESCRIPTION
Overspeed Shutdown Threshold (60Hz) - 36	Shutdown will occur when this speed has been exceeded. (Password level: 1.) Allowed values: 0~2700 rpm. (Default: 2484 rpm.)
Overspeed Shutdown Threshold (60Hz) - 60	Shutdown will occur when this speed has been exceeded. (Password level: 1.) Allowed values: 0~4500 rpm. (Default: 4140 rpm.)
Overspeed Shutdown Threshold (60Hz) - Adjustable	Shutdown will occur when this speed has been exceeded. (Password level: 1.) Allowed values: 0~4500 rpm. (Default: 2075 rpm.)
Fuel System	Type of fuel and ignition system used by generator set. (Password level: 2.) Allowed values: Diesel, Gas. (Default: Diesel.)

8.28 Alternator (OEM Alternator Setup)

Each label is described in the following table .

TABLE 162. 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.)
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.) Cannot be greater than 3 ph high conn Genset com voltage hi limit; otherwise, FC 6487 will be displayed.
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.) Cannot be greater than 3 ph high conn Genset com voltage lo limit; otherwise, FC 6487 will be displayed.
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.) Cannot be greater than 3 ph low conn Genset com voltage hi limit; otherwise, FC 6487 will be displayed.
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.) Cannot be greater than Single phase Genset nom voltage hi limit; otherwise, FC 6487 will be displayed.

NAME	DESCRIPTION
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.)
Legacy Compatible AVR Mode	Applicable for the PCC3100 to PCC3300 conversion. Allows the PCC3300 to process AVR gains in the same manner as the PCC3100. (Password level: 1.) Allowed values: Disable, Enable (Default: Disable).
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.)
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.)

NAME	DESCRIPTION
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 %.)
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: 0~25 seconds. (Default: 1 seconds.)
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: 0.1~10 Hz. (Default: 6 Hz.)
Underfrequency Delay	Time delay before the Underfrequency fault becomes active. (Password level: 1.) Allowed values: 0.1~20 seconds. (Default: 10 seconds.)
Overfrequency Faults	
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.)

NAME	DESCRIPTION
Speed/Frequency Faults	
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.)
Genset Neg Seq Overcurrent Protection Enable	Use to enable negative sequence overcurrent protection (Password level: 1.) Allowed values: Disabled, Enabled. (Default: Enabled.)
Genset Neg Seq Overcurrent Protection Threshold	Percent negative sequence current above which the protection starts timing (Password level: 1.) Allowed values: 5~25 %. (Default: 12 %.)
Genset Neg Seq Overcurrent Protection K Factor	Trip time scaling factor for negative sequence overcurrent protection fault (Password level: 1.) Allowed values: 1~50. (Default: 20.)
Genset Neg Seq Overcurrent Protection Reset Time	Time to allow for complete cooling after negative sequence overcurrent fault occurs (Password level: 1.) Allowed values: 1~1000 seconds. (Default: 360 seconds.)
Custom Overcurrent Protection Enable	Use to enable custom time overcurrent protection (Password level: 1.) Allowed values: Disabled, Enabled. (Default: Disabled.)
Custom Overcurrent Threshold	% standby current above which custom overcurrent feature starts timing (Password level: 1.) Allowed values: 50~150 %. (Default: 110 %.)
Custom Overcurrent Time Characteristic	sets the timing characteristic of custom overcurrent (Password level: 1.) Allowed values: 0.1~65 seconds. (Default: 7.4 seconds.)
Ground CT Primary Current	Ground CT primary current. 0 = Disable. You must be in Setup mode to edit this parameter. (Password level: 1.) Allowed values: 0~6500 Amps. (Default: 0 Amps.)
Ground Fault Current Threshold	Current threshold for ground fault calculated in amps
Ground Fault Current Threshold Percent	Current threshold setting for ground fault in percent of ground CT primary current (Password level: 1.) Allowed values: 5~100 %. (Default: 5 %.)
Ground Fault Current Delay	Time delay for current-based ground fault (Password level: 1.) Allowed values: 0.1~10 seconds. (Default: 0.1 seconds.)
Load Govern kVAR Minimum	Sets the minimum kVAR output as a percentage of Genset Standby KVA when paralleled to the utility Allowed values: "-60"~ 0% (Default: 0%)

NAME	DESCRIPTION
Under Excitation Threshold Time	This is the time delay to activate 'Under Excitation' Fault protection if AVR PWM Command \leq Under Excitation AVR Duty Cycle Minimum Threshold due to excess KVAR import. Allowed values: 0.1~10 sec (Default: 1 sec)
Under Excitation AVR Duty cycle minimum Threshold	This is the threshold delay to activate 'Under Excitation' Fault protection if 'AVR PWM Command' goes below to this threshold due to excess KVAR import continuously for 'Under Excitation Threshold Time' delay. Allowed values: 0.1~5% (Default: 0.5%)
Extended Time Underfrequency Threshold	Number of Hertz Genset Frequency may be under Final Frequency Reference before Underfrequency fault becomes active. Allowed values: 0.1~6 Hz (Default: 2Hz)
Extended Time Underfrequency Delay	Time delay until the underfrequency shutdown fault is triggered based upon the threshold set by Extended Time Underfrequency Threshold. Allowed values: 1~600 sec (Default: 120 sec)

8.28.1 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 163. 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 164. 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

8.28.2 Generator Set 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,
OR
- *3 ph low conn Genset nom voltage lo limit* <
Genset Nominal Voltage <
3 ph low conn Genset nom voltage hi limit

NOTICE

Failure to comply with restrictions will result in FC 6487 Nominal Voltage Setup OOR.

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 generator set 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.

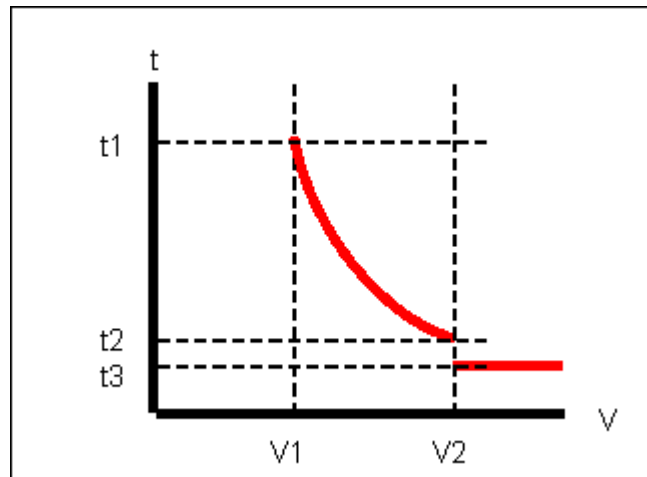


FIGURE 107. HIGH AC VOLTAGE FAULT WHEN TRIP CHARACTERISTIC IS INVERSE TIME

TABLE 165. HIGH AC VOLTAGE FAULT WHEN TRIP CHARACTERISTIC IS INVERSE TIME

LABEL	DESCRIPTION
t1	<i>High AC Voltage Delay</i>
t2	1 second
t3	0.6 seconds
V1	<i>High AC Voltage Threshold</i>
V2	<i>Instantaneous High AC Voltage Threshold</i>

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*.

8.28.3 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*.

8.28.4 Negative Sequence Overcurrent Warning

This function protects the alternator from damage due to excessive negative sequence current. Negative sequence current occurs when load current and/or load power factor are not equal on all three phases. This current causes heating of the rotor damper cage. Excessive amounts can cause an alternator failure.

This protection function uses a standard $I^2 \cdot \text{time}$ trip curve and a linear reset time to allow for cooling after the fault occurs. In the following example, *Genset Neg Seq Overcurrent Protection K Factor* is 20, and *Genset Neg Seq Overcurrent Protection Threshold* is 10%.

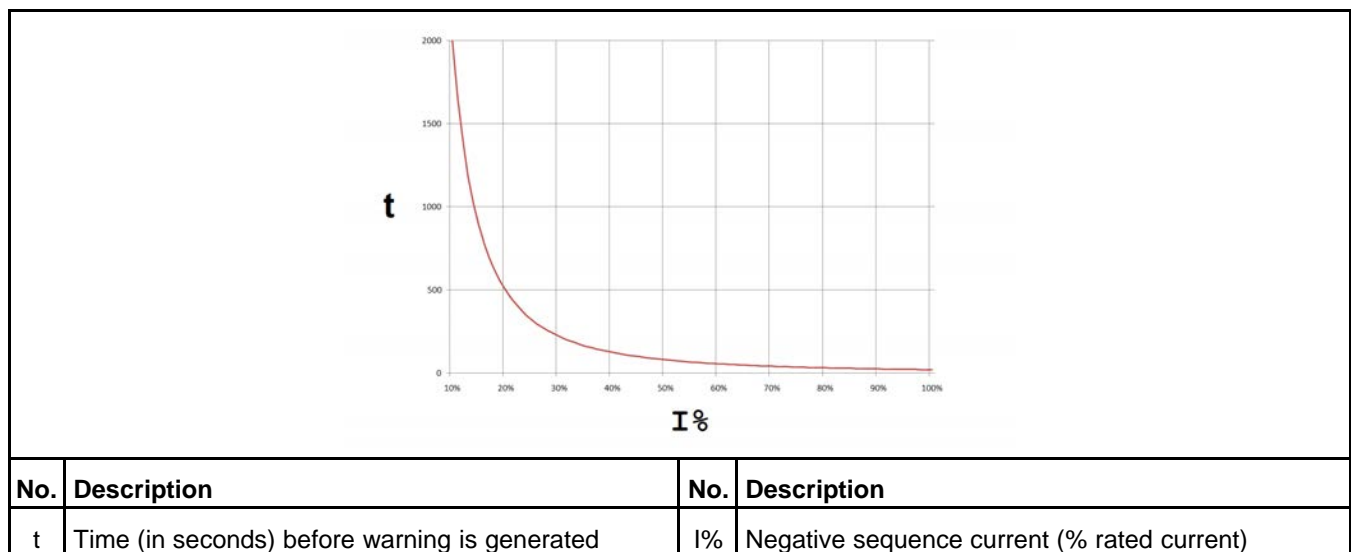


FIGURE 108. EXAMPLE OF NEGATIVE SEQUENCE OVERCURRENT WARNING

8.28.5 Custom Overcurrent Warning/Shutdown

This function provides the ability to trip faster than the normal AmpSentry overcurrent protection faults. This might be used in applications requiring very conservative settings or to support a non-standard alternator.

The function uses inverse square trip and reset curves based on standardized equations found in IEEE C37.112-1996 "IEEE Standard Inverse-Time Characteristic Equations for Overcurrent Relays".

- *Custom Overcurrent Protection Enable* controls whether or not this function is active.
- *Custom Overcurrent Threshold* is the percentage of rated current at which the PCC starts the custom overcurrent timer.
- *Custom Overcurrent Time Characteristic* is the time delay. It is one value with different effects on the trip curve and the reset curve.
 - In the trip curve, it is the number of seconds it takes the PCC to generate the fault when the current is 141.4% above *Custom Overcurrent Threshold*.

- In the reset curve, it is the number of seconds it takes the PCC to reset the fault when the current is zero.

8.28.6 Ground Fault Current Warning

NOTICE

This function provides secondary protection. It is not intended for life safety protection.

With this function, the PCC generates a fault when the ground current reaches excessive levels.

The PCC can detect a ground fault in different ways:

- External ground fault relay connected to a configurable input
- External current transformer (direct measurement)

If an external current transformer is used, the current threshold and time delay are specified, and the PCC displays the measured ground current.

8.29 PCCNet Setup

Each label is described in the following table .

TABLE 166. PCCNET SETUP

NAME	DESCRIPTION
HMI220 PCCnet Failure Response Type	Selects the generator set reaction to a loss of an HMI220 Operator Panel as critical or non-critical. A critical response will shutdown the generator set when PCCnet communication is lost. (Password level: 1.) Allowed values: Critical Device Response, Non-Critical Device Response. (Default: Non-Crit Device Resp.) Note: This is reserved for future use.
HMI320 PCCnet Failure Response Type	Selects the generator set reaction to a loss of an HMI320 Operator Panel as critical or non-critical. A critical response will shutdown the generator set 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 generator set 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 generator set 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 generator set 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.)

NAME	DESCRIPTION
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	
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.)

NAME	DESCRIPTION
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.)

8.29.1 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*.

8.29.2 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 167. PCC-HMI113 COMMUNICATION

BIT	NAME	PCC READS/WITES
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

BIT	NAME	PCC READS/WITES
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
31	Not Used	Not Used
32	Not Used	Not Used

Genset Running is active when event 1465 (Ready To Load) is active.

8.29.2.1 PCC Information to the HMI113

The following table explains the information the PCC sends to the HMI113.

TABLE 168. 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.

8.29.2.2 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.

8.30 Modbus Setup (Setup/MODBUS)

Each label is described in the following table :

TABLE 169. 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)
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)
Modbus Node Address (J14)	Sets the Modbus address for this node, for J14 only (Password level: 1) Allowed values: 1~247 (Default: 2)
Modbus Baud Rate (J14)	Sets the baud rate for Modbus communications, for J14 only (Password level: 1) Allowed values: 2400 Baud, 4800 Baud, 9600 Baud, 19200 Baud, 38400 Baud (Default: 19200)

NAME	DESCRIPTION
Modbus Parity (J14)	Sets the Modbus parity for this node, for J14 only (Password level: 1) Allowed values: Even, Odd, None (Default: None)
Modbus Stop Bits (J14)	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 Bus Message Count (J14)	The number of Modbus bus messages, for J14 port only
Modbus Slave Message Count (J14)	The number of Modbus slave messages, for J14 only
Modbus No Response Count (J14)	Modbus no response count, for J14 only
Modbus CRC Error Count (J14)	The number of Modbus CRC errors, for J14 only
Modbus Exception Count (J14)	Modbus exception count, for J14 only

8.30.1 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 generator set.

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.

Set *Modbus J14 Port Enable* to Disable to restrict J14 to read-only access.

8.31 Display Options

Each label is described in the following table.

TABLE 170. 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.
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.

8.32 Clock Setup

Each label is described in the following table .

TABLE 171. CLOCK SETUP

NAME	DESCRIPTION
Clock	
Clock Hour	Use to set or read the current hour. (Password level: 1.) Allowed values: 0~23.

NAME	DESCRIPTION
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.)
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.)

NAME	DESCRIPTION
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.)

8.32.1 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.

8.33 Configurable I/O

Each parameter is described in the following table :

TABLE 172. CONFIGURABLE I/O

PARAMETER	DESCRIPTION
Configurable Input Fault #1	
Configurable Input #1 Input Function Pointer	Feeds input signal to alternate function input if value not set to default (Password level: 1) Allowed values: Do Nothing, Manual Run Switch, Low Fuel in Day Tank Switch, Low Coolant Switch #27, High Alt Temperature Switch, Ground Fault Switch, PTC Mode Switch, Load Demand Inhibit Switch, Load Demand Spare Capacity Request, Ramp Load/Unload Switch, Exercise Switch, Battle Short Switch, Battery Charger Failed Switch, Low Engine Temperature Switch, Speed Droop Enable Switch, Voltage Droop Enable Switch, Fire Fault Switch, Differential Fault Switch, Rated/Idle Switch, AMM In Auto, Intake Air Restriction Indicator 1 fault switch, Intake Air Restriction Indicator 2 fault switch, Intake Air Restriction Indicator 3 fault switch, Intake Air Restriction Indicator 4 fault switch, Battery Charger 2 Failed Switch, Battery Charger 3 Failed Switch, Battery Charger 4 Failed Switch, Starter Air Supply Pressure Low Fault Switch, Starter Air Tank Volume Low Fault Switch, Cam Switch Location 1, Cam Switch Location 2, Cam Switch Location 3, Cam Switch Location 4, Paralleling Cable Detect, DEF Tank Detector, Low Fuel Pressure Switch, Bank A Pressure Switch, Bank B Pressure Switch, Start Signal Integrity Switch (Default: Default - see Table 173 for additional details)
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, Shutdown w/Cooldown, Derate (Default: None)

PARAMETER	DESCRIPTION
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	Feeds input signal to alternate function input if value not set to default (Password level: 1) Allowed values: Do Nothing, Manual Run Switch, Low Fuel in Day Tank Switch, Low Coolant Switch #30, High Alt Temperature Switch, Ground Fault Switch, PTC Mode Switch, Load Demand Inhibit Switch, Load Demand Spare Capacity Request, Ramp Load/Unload Switch, Exercise Switch, Battle Short Switch, Battery Charger Failed Switch, Low Engine Temperature Switch, Speed Droop Enable Switch, Voltage Droop Enable Switch, Fire Fault Switch, Differential Fault Switch, Rated/Idle Switch, AMM In Auto, Intake Air Restriction Indicator 1 fault switch, Intake Air Restriction Indicator 2 fault switch, Intake Air Restriction Indicator 3 fault switch, Intake Air Restriction Indicator 4 fault switch, Battery Charger 2 Failed Switch, Battery Charger 3 Failed Switch, Battery Charger 4 Failed Switch, Starter Air Supply Pressure Low Fault Switch, Starter Air Tank Volume Low Fault Switch, Cam Switch Location 1, Cam Switch Location 2, Cam Switch Location 3, Cam Switch Location 4, Paralleling Cable Detect, DEF Tank Detector, Low Fuel Pressure Switch, Bank A Pressure Switch, Bank B Pressure Switch, Start Signal Integrity Switch (Default: Default - see Table 173 for additional details)
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, Shutdown w/Cooldown, Derate (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	

PARAMETER	DESCRIPTION
Configurable Input #13 Input Function Pointer	<p>Feeds input signal to alternate function input if value not set to default (Password level: 1)</p> <p>Allowed values: Do Nothing, Manual Run Switch, Low Fuel in Day Tank Switch, Low Coolant Switch #28, High Alt Temperature Switch, Ground Fault Switch, PTC Mode Switch, Load Demand Inhibit Switch, Load Demand Spare Capacity Request, Ramp Load/Unload Switch, Exercise Switch, Battle Short Switch, Battery Charger Failed Switch, Low Engine Temperature Switch, Speed Droop Enable Switch, Voltage Droop Enable Switch, Fire Fault Switch, Differential Fault Switch, Rated/Idle Switch, AMM In Auto, Intake Air Restriction Indicator 1 fault switch, Intake Air Restriction Indicator 2 fault switch, Intake Air Restriction Indicator 3 fault switch, Intake Air Restriction Indicator 4 fault switch, Battery Charger 2 Failed Switch, Battery Charger 3 Failed Switch, Battery Charger 4 Failed Switch, Starter Air Supply Pressure Low Fault Switch, Starter Air Tank Volume Low Fault Switch, Cam Switch Location 1, Cam Switch Location 2, Cam Switch Location 3, Cam Switch Location 4, Paralleling Cable Detect, DEF Tank Detector, Low Fuel Pressure Switch, Bank A Pressure Switch, Bank B Pressure Switch, Start Signal Integrity Switch (Default: Default - see Table 173 for additional details)</p>
Configurable Input #13 Fault Response	<p>If the configurable input #3 is configured as a fault input, this sets the fault level (Password level: 1)</p> <p>Allowed values: None, Warning, Shutdown, Shutdown w/Cooldown, Derate (Default: Event)</p>
Configurable Input #13 Active State Selection	<p>Trim which allows Input #13 to be inverted logically in the software (Password level: 1)</p> <p>Allowed values: Active Closed, Active Open (Default: Active Closed)</p>
Configurable Input #13 Fault Text	<p>Trim to define the 16 character string for use by the Operator panel when this fault becomes active (Password level: 1)</p>
Configurable Input Fault #14	
Configurable Input #14 Input Function Pointer	<p>Feeds input signal to alternate function input if value not set to default (Password level: 1)</p> <p>Allowed values: Do Nothing, Manual Run Switch, Low Fuel in Day Tank Switch, Low Coolant Switch #29, High Alt Temperature Switch, Ground Fault Switch, PTC Mode Switch, Load Demand Inhibit Switch, Load Demand Spare Capacity Request, Ramp Load/Unload Switch, Exercise Switch, Battle Short Switch, Battery Charger Failed Switch, Low Engine Temperature Switch, Speed Droop Enable Switch, Voltage Droop Enable Switch, Fire Fault Switch, Differential Fault Switch, Rated/Idle Switch, AMM In Auto, Intake Air Restriction Indicator 1 fault switch, Intake Air Restriction Indicator 2 fault switch, Intake Air Restriction Indicator 3 fault switch, Intake Air Restriction Indicator 4 fault switch, Battery Charger 2 Failed Switch, Battery Charger 3 Failed Switch, Battery Charger 4 Failed Switch, Starter Air Supply Pressure Low Fault Switch, Starter Air Tank Volume Low Fault Switch, Cam Switch Location 1, Cam Switch Location 2, Cam Switch Location 3, Cam Switch Location 4, Paralleling Cable Detect, DEF Tank Detector, Low Fuel Pressure Switch, Bank A Pressure Switch, Bank B Pressure Switch, Start Signal Integrity Switch (Default: Default - see Table 173 for additional details)</p>
Configurable Input #14 Fault Response	<p>If the configurable input #4 is configured as a fault input, this sets the fault level (Password level: 1)</p> <p>Allowed values: None, Warning, Shutdown, Shutdown w/Cooldown, Derate (Default: Event)</p>

PARAMETER	DESCRIPTION
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	Feeds input signal to alternate function input if value not set to default (Password level: 1) Allowed values: Do Nothing, Manual Run Switch, Low Fuel in Day Tank Switch, Low Coolant Switch #31, High Alt Temperature Switch, Ground Fault Switch, PTC Mode Switch, Load Demand Inhibit Switch, Load Demand Spare Capacity Request, Ramp Load/Unload Switch, Exercise Switch, Battle Short Switch, Battery Charger Failed Switch, Low Engine Temperature Switch, Speed Droop Enable Switch, Voltage Droop Enable Switch, Fire Fault Switch, Differential Fault Switch, Rated/Idle Switch, AMM In Auto, Intake Air Restriction Indicator 1 fault switch, Intake Air Restriction Indicator 2 fault switch, Intake Air Restriction Indicator 3 fault switch, Intake Air Restriction Indicator 4 fault switch, Battery Charger 2 Failed Switch, Battery Charger 3 Failed Switch, Battery Charger 4 Failed Switch, Starter Air Supply Pressure Low Fault Switch, Starter Air Tank Volume Low Fault Switch, Cam Switch Location 1, Cam Switch Location 2, Cam Switch Location 3, Cam Switch Location 4, Paralleling Cable Detect, DEF Tank Detector, Low Fuel Pressure Switch, Bank A Pressure Switch, Bank B Pressure Switch, Start Signal Integrity Switch (Default: Default - see Table 173 for additional details)
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	Feeds input signal to alternate function input if value not set to default (Password level: 1) Allowed values: Do Nothing, Manual Run Switch, Low Fuel in Day Tank Switch, Low Coolant Switch #38, High Alt Temperature Switch, Ground Fault Switch, PTC Mode Switch, Load Demand Inhibit Switch, Load Demand Spare Capacity Request, Ramp Load/Unload Switch, Exercise Switch, Battle Short Switch, Battery Charger Failed Switch, Low Engine Temperature Switch, Speed Droop Enable Switch, Voltage Droop Enable Switch, Fire Fault Switch, Differential Fault Switch, Rated/Idle Switch, AMM In Auto, Intake Air Restriction Indicator 1 fault switch, Intake Air Restriction Indicator 2 fault switch, Intake Air Restriction Indicator 3 fault switch, Intake Air Restriction Indicator 4 fault switch, Battery Charger 2 Failed Switch, Battery Charger 3 Failed Switch, Battery Charger 4 Failed Switch, Starter Air Supply Pressure Low Fault Switch, Starter Air Tank Volume Low Fault Switch, Cam Switch Location 1, Cam Switch Location 2, Cam Switch Location 3, Cam Switch Location 4, Paralleling Cable Detect, DEF Tank Detector, Low Fuel Pressure Switch, Bank A Pressure Switch, Bank B Pressure Switch, Start Signal Integrity Switch (Default: Default - see Table 173 for additional details)
Low Fuel FC 1441 Genset Response	Sets the generator set 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	

PARAMETER	DESCRIPTION
Fault Reset/Configurable Input #10 Function Pointer	<p>Feeds input signal to alternate function input if value not set to default (Password level: 1)</p> <p>Allowed values: Do Nothing, Manual Run Switch, Low Fuel in Day Tank Switch, Low Coolant Switch #33, High Alt Temperature Switch, Ground Fault Switch, PTC Mode Switch, Load Demand Inhibit Switch, Load Demand Spare Capacity Request, Ramp Load/Unload Switch, Exercise Switch, Battle Short Switch, Battery Charger Failed Switch, Low Engine Temperature Switch, Speed Droop Enable Switch, Voltage Droop Enable Switch, Fire Fault Switch, Differential Fault Switch, Rated/Idle Switch, AMM In Auto, Intake Air Restriction Indicator 1 fault switch, Intake Air Restriction Indicator 2 fault switch, Intake Air Restriction Indicator 3 fault switch, Intake Air Restriction Indicator 4 fault switch, Battery Charger 2 Failed Switch, Battery Charger 3 Failed Switch, Battery Charger 4 Failed Switch, Starter Air Supply Pressure Low Fault Switch, Starter Air Tank Volume Low Fault Switch, Cam Switch Location 1, Cam Switch Location 2, Cam Switch Location 3, Cam Switch Location 4, Paralleling Cable Detect, DEF Tank Detector, Low Fuel Pressure Switch, Bank A Pressure Switch, Bank B Pressure Switch, Start Signal Integrity Switch (Default: Default - see Table 173 for additional details)</p>
Fault Reset/Configurable Input #10 Active State Selection	<p>Fault Reset input software logic state inversion bypass control (Password level: 1)</p> <p>Allowed values: Active Closed, Active Open (Default: Active Closed)</p>
Start Type/Input #11	
Start Type/Configurable Input #11 Function Pointer	<p>Feeds input signal to alternate function input if value not set to default (Password level: 1)</p> <p>Allowed values: Do Nothing, Manual Run Switch, Low Fuel in Day Tank Switch, Low Coolant Switch #41, High Alt Temperature Switch, Ground Fault Switch, PTC Mode Switch, Load Demand Inhibit Switch, Load Demand Spare Capacity Request, Ramp Load/Unload Switch, Exercise Switch, Battle Short Switch, Battery Charger Failed Switch, Low Engine Temperature Switch, Speed Droop Enable Switch, Voltage Droop Enable Switch, Fire Fault Switch, Differential Fault Switch, Rated/Idle Switch, AMM In Auto, Intake Air Restriction Indicator 1 fault switch, Intake Air Restriction Indicator 2 fault switch, Intake Air Restriction Indicator 3 fault switch, Intake Air Restriction Indicator 4 fault switch, Battery Charger 2 Failed Switch, Battery Charger 3 Failed Switch, Battery Charger 4 Failed Switch, Starter Air Supply Pressure Low Fault Switch, Starter Air Tank Volume Low Fault Switch, Cam Switch Location 1, Cam Switch Location 2, Cam Switch Location 3, Cam Switch Location 4, Paralleling Cable Detect, DEF Tank Detector, Low Fuel Pressure Switch, Bank A Pressure Switch, Bank B Pressure Switch, Start Signal Integrity Switch (Default: Default - see Table 173 for additional details)</p>
Start Type/Configurable Input #11 Active State Selection	<p>Start Type input software logic state inversion bypass control (Password level: 1)</p> <p>Allowed values: Active Closed, Active Open (Default: Active Closed)</p>
Rupture Basin/Input #12	

PARAMETER	DESCRIPTION
Rupture Basin/Configurable Input #12 Function Pointer	<p>Feeds input signal to alternate function input if value not set to default (Password level: 1)</p> <p>Allowed values: Do Nothing, Manual Run Switch, Low Fuel in Day Tank Switch, Low Coolant Switch #40, High Alt Temperature Switch, Ground Fault Switch, PTC Mode Switch, Load Demand Inhibit Switch, Load Demand Spare Capacity Request, Ramp Load/Unload Switch, Exercise Switch, Battle Short Switch, Battery Charger Failed Switch, Low Engine Temperature Switch, Speed Droop Enable Switch, Voltage Droop Enable Switch, Fire Fault Switch, Differential Fault Switch, Rated/Idle Switch, AMM In Auto, Intake Air Restriction Indicator 1 fault switch, Intake Air Restriction Indicator 2 fault switch, Intake Air Restriction Indicator 3 fault switch, Intake Air Restriction Indicator 4 fault switch, Battery Charger 2 Failed Switch, Battery Charger 3 Failed Switch, Battery Charger 4 Failed Switch, Starter Air Supply Pressure Low Fault Switch, Starter Air Tank Volume Low Fault Switch, Cam Switch Location 1, Cam Switch Location 2, Cam Switch Location 3, Cam Switch Location 4, Paralleling Cable Detect, DEF Tank Detector, Low Fuel Pressure Switch, Bank A Pressure Switch, Bank B Pressure Switch, Start Signal Integrity Switch (Default: Default - see Table 173 for additional details)</p>
Rupture Basin Level Response	<p>Sets rupture basin fault response to None, Warning or Shutdown (Password level: 1)</p> <p>Allowed values: None, Warning, Shutdown (Default: Warning)</p>
Rupture Basin/Configurable Input #12 Active State Selection	<p>Rupture Basin input software logic state inversion bypass control (Password level: 1)</p> <p>Allowed values: Active Closed, Active Open (Default: Active closed)</p>
Configurable Output #1	
Configurable Output #1 Event Code	<p>The event code for this output (Password level: 1)</p> <p>Allowed values: 0~65530 (Default: 1540)</p>
Configurable Output #1 Output Function Pointer	<p>Points to the function that controls the output (Password level: 1)</p> <p>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: Default - see Table 173 for additional details)</p>
Configurable Output #1 Invert Bypass	<p>Controls whether the output function is inverted or not. Bypassed = function not inverted (Password level: 1)</p> <p>Allowed values: Not Bypassed, Bypassed (Default: Bypassed)</p>
Configurable Output #2	
Configurable Output #2 Event Code	<p>The event code for this output (Password level: 1)</p> <p>Allowed values: 0~65530 (Default: 1541)</p>
Configurable Output #2 Output Function Pointer	<p>Points to the function that controls the output (Password level: 1)</p> <p>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: Default - see Table 173 for additional details)</p>

PARAMETER	DESCRIPTION
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	
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)
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)
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: 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: Default - see Table 173 for additional details)
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: 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: Default - see Table 173 for additional details)
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)
Ready to Load/Output #5	

PARAMETER	DESCRIPTION
Ready To Load /Configurable Output #5 Output Function Pointer	Points to the function that controls the 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: Default - see Table 173 for additional details)
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: 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: Default - see Table 173 for additional details)
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: 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: Default - see Table 173 for additional details)
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 output 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: 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: Default - see Table 173 for additional details)
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	

PARAMETER	DESCRIPTION
Delayed Off / Configurable Output #10 Output Function Pointer	Points to the function that controls the 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: Default - see Table 173 for additional details)
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	
Load Dump / Configurable Output #11 Output Function Pointer	Points to the function that controls the 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: Default - see Table 173 for additional details)
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)
Transfer Inhibit/Input #20	
Transfer Inhibit/Configurable Input #20 Function Pointer	Feeds input signal to alternate function input if value not set to default (Password level: 1) Allowed values: Do Nothing, Manual Run Switch, Low Fuel in Day Tank Switch, Low Coolant Switch #43, High Alt Temperature Switch, Ground Fault Switch, PTC Mode Switch, Load Demand Inhibit Switch, Load Demand Spare Capacity Request, Ramp Load/Unload Switch, Exercise Switch, Battle Short Switch, Battery Charger Failed Switch, Low Engine Temperature Switch, Speed Droop Enable Switch, Voltage Droop Enable Switch, Fire Fault Switch, Differential Fault Switch, Rated/Idle Switch, AMM In Auto, Intake Air Restriction Indicator 1 fault switch, Intake Air Restriction Indicator 2 fault switch, Intake Air Restriction Indicator 3 fault switch, Intake Air Restriction Indicator 4 fault switch, Battery Charger 2 Failed Switch, Battery Charger 3 Failed Switch, Battery Charger 4 Failed Switch, Starter Air Supply Pressure Low Fault Switch, Starter Air Tank Volume Low Fault Switch, Cam Switch Location 1, Cam Switch Location 2, Cam Switch Location 3, Cam Switch Location 4, Paralleling Cable Detect, DEF Tank Detector, Low Fuel Pressure Switch, Bank A Pressure Switch, Bank B Pressure Switch, Start Signal Integrity Switch (Default: Default - see Table 173 for additional details)
Transfer Inhibit/Configurable Input #20 Active State Selection	Transfer Inhibit input software logic state inversion bypass control (Password level: 1) Allowed values: Active Closed, Active Open (Default: Active Closed)
Retransfer Inhibit/Input #21	

PARAMETER	DESCRIPTION
Retransfer Inhibit/Configurable Input #21 Function Pointer	<p>Feeds input signal to alternate function input if value not set to default (Password level: 1)</p> <p>Allowed values: Do Nothing, Manual Run Switch, Low Fuel in Day Tank Switch, Low Coolant Switch #39, High Alt Temperature Switch, Ground Fault Switch, PTC Mode Switch, Load Demand Inhibit Switch, Load Demand Spare Capacity Request, Ramp Load/Unload Switch, Exercise Switch, Battle Short Switch, Battery Charger Failed Switch, Low Engine Temperature Switch, Speed Droop Enable Switch, Voltage Droop Enable Switch, Fire Fault Switch, Differential Fault Switch, Rated/Idle Switch, AMM In Auto, Intake Air Restriction Indicator 1 fault switch, Intake Air Restriction Indicator 2 fault switch, Intake Air Restriction Indicator 3 fault switch, Intake Air Restriction Indicator 4 fault switch, Battery Charger 2 Failed Switch, Battery Charger 3 Failed Switch, Battery Charger 4 Failed Switch, Starter Air Supply Pressure Low Fault Switch, Starter Air Tank Volume Low Fault Switch, Cam Switch Location 1, Cam Switch Location 2, Cam Switch Location 3, Cam Switch Location 4, Paralleling Cable Detect, DEF Tank Detector, Low Fuel Pressure Switch, Bank A Pressure Switch, Bank B Pressure Switch, Start Signal Integrity Switch (Default: Default - see Table 173 for additional details)</p>
Retransfer Inhibit/Configurable Input #21 Active State Selection	<p>Retransfer Inhibit input software logic state inversion bypass control (Password level: 1)</p> <p>Allowed values: Active Closed, Active Open (Default: Active Closed)</p>
Utility CB Pos B/Input #23	
Utility CB Pos B/Configurable Input #23 Function Pointer	<p>Feeds input signal to alternate function input if value not set to default (Password level: 1)</p> <p>Allowed values: Do Nothing, Manual Run Switch, Low Fuel in Day Tank Switch, Low Coolant Switch #45, High Alt Temperature Switch, Ground Fault Switch, PTC Mode Switch, Load Demand Inhibit Switch, Load Demand Spare Capacity Request, Ramp Load/Unload Switch, Exercise Switch, Battle Short Switch, Battery Charger Failed Switch, Low Engine Temperature Switch, Speed Droop Enable Switch, Voltage Droop Enable Switch, Fire Fault Switch, Differential Fault Switch, Rated/Idle Switch, AMM In Auto, Intake Air Restriction Indicator 1 fault switch, Intake Air Restriction Indicator 2 fault switch, Intake Air Restriction Indicator 3 fault switch, Intake Air Restriction Indicator 4 fault switch, Battery Charger 2 Failed Switch, Battery Charger 3 Failed Switch, Battery Charger 4 Failed Switch, Starter Air Supply Pressure Low Fault Switch, Starter Air Tank Volume Low Fault Switch, Cam Switch Location 1, Cam Switch Location 2, Cam Switch Location 3, Cam Switch Location 4, Paralleling Cable Detect, DEF Tank Detector, Low Fuel Pressure Switch, Bank A Pressure Switch, Bank B Pressure Switch, Start Signal Integrity Switch (Default: Default - see Table 173 for additional details)</p>
Utility CB Pos B/Configurable Input #23 Active State Selection	<p>Utility CB Pos B input software logic state inversion bypass control (Password level: 1)</p> <p>Allowed values: Active Closed, Active Open (Default: Active Closed)</p>
Utility CB Tripped/Input #24	

PARAMETER	DESCRIPTION
Utility CB Tripped/Configurable Input #24 Function Pointer	<p>Feeds input signal to alternate function input if value not set to default (Password level: 1)</p> <p>Allowed values: Do Nothing, Manual Run Switch, Low Fuel in Day Tank Switch, Low Coolant Switch #46, High Alt Temperature Switch, Ground Fault Switch, PTC Mode Switch, Load Demand Inhibit Switch, Load Demand Spare Capacity Request, Ramp Load/Unload Switch, Exercise Switch, Battle Short Switch, Battery Charger Failed Switch, Low Engine Temperature Switch, Speed Droop Enable Switch, Voltage Droop Enable Switch, Fire Fault Switch, Differential Fault Switch, Rated/Idle Switch, (Default: Default - see Table 173 for additional details)</p>
Utility CB Tripped/Configurable Input #24 Active State Selection	<p>Utility CB Tripped input software logic state inversion bypass control (Password level: 1)</p> <p>Allowed values: Active Closed, Active Open (Default: Active Closed)</p>
Utility CB Inhibit/Input #25	
Utility CB Inhibit/Configurable Input #25 Function Pointer	<p>Feeds input signal to alternate function input if value not set to default (Password level: 1)</p> <p>Allowed values: Do Nothing, Manual Run Switch, Low Fuel in Day Tank Switch, Low Coolant Switch #44, High Alt Temperature Switch, Ground Fault Switch, PTC Mode Switch, Load Demand Inhibit Switch, Load Demand Spare Capacity Request, Ramp Load/Unload Switch, Exercise Switch, Battle Short Switch, Battery Charger Failed Switch, Low Engine Temperature Switch, Speed Droop Enable Switch, Voltage Droop Enable Switch, Fire Fault Switch, Differential Fault Switch, Rated/Idle Switch, AMM In Auto, Intake Air Restriction Indicator 1 fault switch, Intake Air Restriction Indicator 2 fault switch, Intake Air Restriction Indicator 3 fault switch, Intake Air Restriction Indicator 4 fault switch, Battery Charger 2 Failed Switch, Battery Charger 3 Failed Switch, Battery Charger 4 Failed Switch, Starter Air Supply Pressure Low Fault Switch, Starter Air Tank Volume Low Fault Switch, Cam Switch Location 1, Cam Switch Location 2, Cam Switch Location 3, Cam Switch Location 4, Paralleling Cable Detect, DEF Tank Detector, Low Fuel Pressure Switch, Bank A Pressure Switch, Bank B Pressure Switch, Start Signal Integrity Switch (Default: Default - see Table 173 for additional details)</p>
Utility CB Inhibit/Configurable Input #25 Active State Selection	<p>Utility CB Inhibit input software logic state inversion bypass control (Password level: 1)</p> <p>Allowed values: Active Closed, Active Open (Default: Active Closed)</p>
Genset CB Pos B/Input #26	

PARAMETER	DESCRIPTION
Genset CB Pos B/Configurable Input #26 Function Pointer	<p>Feeds input signal to alternate function input if value not set to default (Password level: 1)</p> <p>Allowed values: Do Nothing, Manual Run Switch, Low Fuel in Day Tank Switch, Low Coolant Switch #35, High Alt Temperature Switch, Ground Fault Switch, PTC Mode Switch, Load Demand Inhibit Switch, Load Demand Spare Capacity Request, Ramp Load/Unload Switch, Exercise Switch, Battle Short Switch, Battery Charger Failed Switch, Low Engine Temperature Switch, Speed Droop Enable Switch, Voltage Droop Enable Switch, Fire Fault Switch, Differential Fault Switch, Rated/Idle Switch, AMM In Auto, Intake Air Restriction Indicator 1 fault switch, Intake Air Restriction Indicator 2 fault switch, Intake Air Restriction Indicator 3 fault switch, Intake Air Restriction Indicator 4 fault switch, Battery Charger 2 Failed Switch, Battery Charger 3 Failed Switch, Battery Charger 4 Failed Switch, Starter Air Supply Pressure Low Fault Switch, Starter Air Tank Volume Low Fault Switch, Cam Switch Location 1, Cam Switch Location 2, Cam Switch Location 3, Cam Switch Location 4, Paralleling Cable Detect, DEF Tank Detector, Low Fuel Pressure Switch, Bank A Pressure Switch, Bank B Pressure Switch, Start Signal Integrity Switch (Default: Default - see Table 173 for additional details)</p>
Genset CB Pos B/Configurable Input #26 Active State Selection	<p>Genset CB Pos B input software logic state inversion bypass control (Password level: 1)</p> <p>Allowed values: Active Closed, Active Open (Default: Active Closed)</p>
Genset CB Tripped/Input #27	
Genset CB Tripped/Configurable Input #27 Function Pointer	<p>Feeds input signal to alternate function input if value not set to default (Password level: 1)</p> <p>Allowed values: Do Nothing, Manual Run Switch, Low Fuel in Day Tank Switch, Low Coolant Switch #36, High Alt Temperature Switch, Ground Fault Switch, PTC Mode Switch, Load Demand Inhibit Switch, Load Demand Spare Capacity Request, Ramp Load/Unload Switch, Exercise Switch, Battle Short Switch, Battery Charger Failed Switch, Low Engine Temperature Switch, Speed Droop Enable Switch, Voltage Droop Enable Switch, Fire Fault Switch, Differential Fault Switch, Rated/Idle Switch, AMM In Auto, Intake Air Restriction Indicator 1 fault switch, Intake Air Restriction Indicator 2 fault switch, Intake Air Restriction Indicator 3 fault switch, Intake Air Restriction Indicator 4 fault switch, Battery Charger 2 Failed Switch, Battery Charger 3 Failed Switch, Battery Charger 4 Failed Switch, Starter Air Supply Pressure Low Fault Switch, Starter Air Tank Volume Low Fault Switch, Cam Switch Location 1, Cam Switch Location 2, Cam Switch Location 3, Cam Switch Location 4, Paralleling Cable Detect, DEF Tank Detector, Low Fuel Pressure Switch, Bank A Pressure Switch, Bank B Pressure Switch, Start Signal Integrity Switch (Default: Default - see Table 173 for additional details)</p>
Genset CB Tripped/Configurable Input #27 Active State Selection	<p>Genset CB Tripped input software logic state inversion bypass control (Password level: 1)</p> <p>Allowed values: Active Closed, Active Open (Default: Active Closed)</p>
Genset CB Inhibit/Input #28	

PARAMETER	DESCRIPTION
Genset CB Inhibit/Configurable Input #28 Function Pointer	<p>Feeds input signal to alternate function input if value not set to default. (Password level: 1)</p> <p>Allowed values: Do Nothing, Manual Run Switch, Low Fuel in Day Tank Switch, Low Coolant Switch #34, High Alt Temperature Switch, Ground Fault Switch, PTC Mode Switch, Load Demand Inhibit Switch, Load Demand Spare Capacity Request, Ramp Load/Unload Switch, Exercise Switch, Battle Short Switch, Battery Charger Failed Switch, Low Engine Temperature Switch, Speed Droop Enable Switch, Voltage Droop Enable Switch, Fire Fault Switch, Differential Fault Switch, Rated/Idle Switch, AMM In Auto, Intake Air Restriction Indicator 1 fault switch, Intake Air Restriction Indicator 2 fault switch, Intake Air Restriction Indicator 3 fault switch, Intake Air Restriction Indicator 4 fault switch, Battery Charger 2 Failed Switch, Battery Charger 3 Failed Switch, Battery Charger 4 Failed Switch, Starter Air Supply Pressure Low Fault Switch, Starter Air Tank Volume Low Fault Switch, Cam Switch Location 1, Cam Switch Location 2, Cam Switch Location 3, Cam Switch Location 4, Paralleling Cable Detect, DEF Tank Detector, Low Fuel Pressure Switch, Bank A Pressure Switch, Bank B Pressure Switch, Start Signal Integrity Switch (Default: Default - see Table 173 for additional details)</p>
Genset CB Inhibit/Configurable Input #28 Active State Selection	<p>Genset CB Inhibit input software logic state inversion bypass control (Password level: 1)</p> <p>Allowed values: Active Closed, Active Open (Default: Active Closed)</p>
Util Sing Mode Ver/Input #29	
Utility Single Mode Verify/Configurable Input #29 Function Pointer	<p>Feeds input signal to alternate function input if value not set to default (Password level: 1)</p> <p>Allowed values: Do Nothing, Manual Run Switch, Low Fuel in Day Tank Switch, Low Coolant Switch #47, High Alt Temperature Switch, Ground Fault Switch, PTC Mode Switch, Load Demand Inhibit Switch, Load Demand Spare Capacity Request, Ramp Load/Unload Switch, Exercise Switch, Battle Short Switch, Battery Charger Failed Switch, Low Engine Temperature Switch, Speed Droop Enable Switch, Voltage Droop Enable Switch, Fire Fault Switch, Differential Fault Switch, Rated/Idle Switch, AMM In Auto, Intake Air Restriction Indicator 1 fault switch, Intake Air Restriction Indicator 2 fault switch, Intake Air Restriction Indicator 3 fault switch, Intake Air Restriction Indicator 4 fault switch, Battery Charger 2 Failed Switch, Battery Charger 3 Failed Switch, Battery Charger 4 Failed Switch, Starter Air Supply Pressure Low Fault Switch, Starter Air Tank Volume Low Fault Switch, Cam Switch Location 1, Cam Switch Location 2, Cam Switch Location 3, Cam Switch Location 4, Paralleling Cable Detect, DEF Tank Detector, Low Fuel Pressure Switch, Bank A Pressure Switch, Bank B Pressure Switch, Start Signal Integrity Switch (Default: Default - see Table 173 for additional details)</p>
Utility Single Mode Verify/Configurable Input #29 Active State Selection	<p>Utility Single Mode Verify input software logic state inversion bypass control (Password level: 1)</p> <p>Allowed values: Active Closed, Active Open (Default: Active Closed)</p>
Sync Enable/Input #30	

PARAMETER	DESCRIPTION
Sync Enable/Configurable Input #30 Function Pointer	<p>Feeds input signal to alternate function input if value not set to default (Password level: 1)</p> <p>Allowed values: Do Nothing, Manual Run Switch, Low Fuel in Day Tank Switch, Low Coolant Switch #42, High Alt Temperature Switch, Ground Fault Switch, PTC Mode Switch, Load Demand Inhibit Switch, Load Demand Spare Capacity Request, Ramp Load/Unload Switch, Exercise Switch, Battle Short Switch, Battery Charger Failed Switch, Low Engine Temperature Switch, Speed Droop Enable Switch, Voltage Droop Enable Switch, Fire Fault Switch, Differential Fault Switch, Rated/Idle Switch, AMM In Auto, Intake Air Restriction Indicator 1 fault switch, Intake Air Restriction Indicator 2 fault switch, Intake Air Restriction Indicator 3 fault switch, Intake Air Restriction Indicator 4 fault switch, Battery Charger 2 Failed Switch, Battery Charger 3 Failed Switch, Battery Charger 4 Failed Switch, Starter Air Supply Pressure Low Fault Switch, Starter Air Tank Volume Low Fault Switch, Cam Switch Location 1, Cam Switch Location 2, Cam Switch Location 3, Cam Switch Location 4, Paralleling Cable Detect, DEF Tank Detector, Low Fuel Pressure Switch, Bank A Pressure Switch, Bank B Pressure Switch, Start Signal Integrity Switch (Default: Default - see Table 173 for additional details)</p>
Sync Enable/Configurable Input #30 Active State Selection	<p>Sync Enable input software logic state inversion bypass control (Password level: 1)</p> <p>Allowed values: Active Closed, Active Open (Default: Active Closed)</p>
Load Demand Stop/Input #31	
Load Demand Stop/Configurable Input #31 Function Pointer	<p>Feeds input signal to alternate function input if value not set to default (Password level: 1)</p> <p>Allowed values: Do Nothing, Manual Run Switch, Low Fuel in Day Tank Switch, Low Coolant Switch #37, High Alt Temperature Switch, Ground Fault Switch, PTC Mode Switch, Load Demand Inhibit Switch, Load Demand Spare Capacity Request, Ramp Load/Unload Switch, Exercise Switch, Battle Short Switch, Battery Charger Failed Switch, Low Engine Temperature Switch, Speed Droop Enable Switch, Voltage Droop Enable Switch, Fire Fault Switch, Differential Fault Switch, Rated/Idle Switch, AMM In Auto, Intake Air Restriction Indicator 1 fault switch, Intake Air Restriction Indicator 2 fault switch, Intake Air Restriction Indicator 3 fault switch, Intake Air Restriction Indicator 4 fault switch, Battery Charger 2 Failed Switch, Battery Charger 3 Failed Switch, Battery Charger 4 Failed Switch, Starter Air Supply Pressure Low Fault Switch, Starter Air Tank Volume Low Fault Switch, Cam Switch Location 1, Cam Switch Location 2, Cam Switch Location 3, Cam Switch Location 4, Paralleling Cable Detect, DEF Tank Detector, Low Fuel Pressure Switch, Bank A Pressure Switch, Bank B Pressure Switch, Start Signal Integrity Switch (Default: Default - see Table 173 for additional details)</p>
Load Demand Stop/Configurable Input #31 Active State Selection	<p>Load Demand Stop input software logic state inversion bypass control (Password level: 1)</p> <p>Allowed values: Active Closed, Active Open (Default: Active Closed)</p>
Extended Parallel/Input #32	

PARAMETER	DESCRIPTION
Extended Parallel/Configurable Input #32 Function Pointer	<p>Feeds input signal to alternate function input if value not set to default (Password level: 1)</p> <p>Allowed values: Do Nothing, Manual Run Switch, Low Fuel in Day Tank Switch, Low Coolant Switch #32, High Alt Temperature Switch, Ground Fault Switch, PTC Mode Switch, Load Demand Inhibit Switch, Load Demand Spare Capacity Request, Ramp Load/Unload Switch, Exercise Switch, Battle Short Switch, Battery Charger Failed Switch, Low Engine Temperature Switch, Speed Droop Enable Switch, Voltage Droop Enable Switch, Fire Fault Switch, Differential Fault Switch, Rated/Idle Switch, AMM In Auto, Intake Air Restriction Indicator 1 fault switch, Intake Air Restriction Indicator 2 fault switch, Intake Air Restriction Indicator 3 fault switch, Intake Air Restriction Indicator 4 fault switch, Battery Charger 2 Failed Switch, Battery Charger 3 Failed Switch, Battery Charger 4 Failed Switch, Starter Air Supply Pressure Low Fault Switch, Starter Air Tank Volume Low Fault Switch, Cam Switch Location 1, Cam Switch Location 2, Cam Switch Location 3, Cam Switch Location 4, Paralleling Cable Detect, DEF Tank Detector, Low Fuel Pressure Switch, Bank A Pressure Switch, Bank B Pressure Switch, Start Signal Integrity Switch (Default: Default - see Table 173 for additional details)</p>
Extended Parallel/Configurable Input #32 Active State Selection	<p>Ramp Load/Unload input software logic state inversion bypass control (Password level: 1)</p> <p>Allowed values: Active Closed, Active Open (Default: Active Closed)</p>
Backup Strt Disc/Input #33	
Backup Start Disconnect/Configurable Input #33 Function Pointer	<p>Feeds input signal to alternate function input if value not set to default (Password level: 1)</p> <p>Allowed values: Do Nothing, Manual Run Switch, Low Fuel in Day Tank Switch, Low Coolant Switch 26, High Alt Temperature Switch, Ground Fault Switch, PTC Mode Switch, Load Demand Inhibit Switch, Load Demand Spare Capacity Request, Ramp Load/Unload Switch, Exercise Switch, Battle Short Switch, Battery Charger Failed Switch, Low Engine Temperature Switch, Speed Droop Enable Switch, Voltage Droop Enable Switch, Fire Fault Switch, Differential Fault Switch, Rated/Idle Switch, AMM In Auto, Intake Air Restriction Indicator 1 fault switch, Intake Air Restriction Indicator 2 fault switch, Intake Air Restriction Indicator 3 fault switch, Intake Air Restriction Indicator 4 fault switch, Battery Charger 2 Failed Switch, Battery Charger 3 Failed Switch, Battery Charger 4 Failed Switch, Starter Air Supply Pressure Low Fault Switch, Starter Air Tank Volume Low Fault Switch, Cam Switch Location 1, Cam Switch Location 2, Cam Switch Location 3, Cam Switch Location 4, Paralleling Cable Detect, DEF Tank Detector, Low Fuel Pressure Switch, Bank A Pressure Switch, Bank B Pressure Switch, Start Signal Integrity Switch (Default: Default - see Table 173 for additional details)</p>
Backup Start Disconnect/Configurable Input #33 Active State Selection	<p>Backup Start Disconnect input software logic state inversion bypass control (Password level: 1)</p> <p>Allowed values: Active Closed, Active Open (Default: Active Closed)</p>
Configurable Output #20	
Configurable Output #20 Event Code	<p>The event code for this output (Password level: 1)</p> <p>Allowed values: 0~65530 (Default: Fault Code 1311)</p>

PARAMETER	DESCRIPTION
Configurable Output #20 Output Function Pointer	Points to the function that controls the 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: Default - see Table 173 for additional details)
Configurable Output #20 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 #21	
Configurable Output #21 Event Code	The event code for this output (Password level: 1) Allowed values: 0~65530 (Default: Fault Code 1311)
Configurable Output #21 Output Function Pointer	Points to the function that controls the 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: Default - see Table 173 for additional details)
Configurable Output #21 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 #22	
Configurable Output #22 Event Code	The event code for this output (Password level: 1) Allowed values: 0~65530 (Default: Fault Code 1311)
Configurable Output #22 Output Function Pointer	Points to the function that controls the 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: Default - see Table 173 for additional details)
Configurable Output #22 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)
kW Load Setpoint/AI #1	
kW Load Setpoint/Configurable Analog Input #1 Analog Input Function Pointer	Points to the function the analog input signal feeds (Password level: 1) Allowed values: Default, Do Nothing, External Speed Bias Input, External Voltage Bias Input (Default: Default)
kW Load Setpoint OOR Check Enable	Enable for the default function OOR faults (Password level: 1) Allowed values: Disabled, Enabled (Default: Disabled)
kVAR Load Setpoint/AI #2	

PARAMETER	DESCRIPTION
kVAR Load Setpoint/Configurable Analog Input #2 Analog Input Function Pointer	Points to the function the analog input signal feeds (Password level: 1) Allowed values: Default, Do Nothing, External Speed Bias Input, External Voltage Bias Input (Default: Default)
kVAR Load Setpoint OOR Check Enable	Enable for the default function OOR faults (Password level: 1) Allowed values: Disabled, Enabled (Default: Disabled)
Speed Bias/AO #1	
Speed Bias Output/Configurable Analog Output #1 Analog Output Function Pointer	Points to the function that controls the analog output (Password level: 1) Allowed values: Default, Do Nothing, Genset Average Voltage, Genset Average Current, Genset Total Power Factor, Genset Frequency, Genset Total kW, Genset Total kVAR, Engine Speed, Coolant Temperature, Oil Pressure, Oil Temperature, Intake Manifold Temperature (Default: Default)
Speed Bias Output/Configurable Analog output #1 Engineering In Low Setpoint	The engineering value that corresponds to the Low Analog output value, scaling unit (Password level: 1) Allowed values: -32768~32762 (Default: -10000)
Speed Bias Output/Configurable Analog output #1 Engineering In High Setpoint	The engineering value that corresponds to the High Analog output value, scaling unit (Password level: 1) Allowed values: -32768~32762 (Default: 10000)
Speed Bias Output/Configurable Analog output #1 Analog Out Low Setpoint	The analog value that corresponds to the Low engineering value; scaling unit, and lower clamp (Password level: 1) Allowed values: -10~10 Vdc (Default: -3 Vdc)
Speed Bias Output/Configurable Analog output #1 Analog Out High Setpoint	The analog value that corresponds to the high engineering value; scaling unit, and upper clamp (Password level: 1) Allowed values: -10~10 Vdc (Default: 3 Vdc)
Configurable Analog Output #1 Engineering Units Function Scaling	Displays the input precision of the incoming data for the currently selected function Allowed values: 0~500 (Default: 0)
Speed Bias Output/Configurable Analog output #1 Engineering In Low Function Setpoint	The engineering value that corresponds to the Low Analog output value, scaling unit (Password level: 1) Allowed values: -32768~32762 (Default: -10000)
Speed Bias Output/Configurable Analog output #1 Engineering In High Function Setpoint	The engineering value that corresponds to the High Analog output value, scaling unit (Password level: 1) Allowed values: -32768~32762 (Default: 10000)
Speed Bias Output/Configurable Analog output #1 Analog Out Low Function Setpoint	The analog value that corresponds to the Low engineering value; scaling unit, and lower clamp (Password level: 1) Allowed values: -10~10 Vdc (Default: -3 Vdc)
Speed Bias Output/Configurable Analog output #1 Analog Out High Function Setpoint	The analog value that corresponds to the high engineering value; scaling unit, and upper clamp (Password level: 1) Allowed values: -10~10 Vdc (Default: 3 Vdc)

PARAMETER	DESCRIPTION
Voltage Bias/AO #2	
Voltage Bias Output/Configurable Analog Output #2 Analog Output Function Pointer	Points to the function that controls the analog output (Password level: 1) Allowed values: Default, Do Nothing, Genset Average Voltage, Genset Average Current, Genset Total Power Factor, Genset Frequency, Genset Total kW, Genset Total kVAR, Engine Speed, Coolant Temperature, Oil Pressure, Oil Temperature, Intake Manifold Temperature (Default: Default)
Voltage Bias Output/Configurable Analog output #2 Engineering In Low Setpoint	The engineering value that corresponds to the Low Analog output value, scaling unit (Password level: 1) Allowed values: -32768~32762 (Default: -2500)
Voltage Bias Output/Configurable Analog output #2 Engineering In High Setpoint	The engineering value that corresponds to the High Analog output value, scaling unit (Password level: 1) Allowed values: -32768~32762 (Default: 2500)
Voltage Bias Output/Configurable Analog output #2 Analog Out Low Setpoint	The analog value that corresponds to the Low engineering value; scaling unit, and lower clamp (Password level: 1) Allowed values: -10~10 Vdc (Default: -5 Vdc)
Voltage Bias Output/Configurable Analog output #2 Analog Out High Setpoint	The analog value that corresponds to the high engineering value; scaling unit, and upper clamp (Password level: 1) Allowed values: -10~10 Vdc (Default: 5 Vdc)
Configurable Analog Output #2 Engineering Units Function Scaling	Displays the input precision of the incoming data for the currently selected function Allowed values: 0~500 (Default: 0)
Voltage Bias Output/Configurable Analog output #2 Engineering In Low Function Setpoint	The engineering value that corresponds to the Low Analog output value, scaling unit (Password level: 1) Allowed values: -32768~32762 (Default: -2500)
Voltage Bias Output/Configurable Analog output #2 Engineering In High Function Setpoint	The engineering value that corresponds to the High Analog output value, scaling unit (Password level: 1) Allowed values: -32768~32762 (Default: 2500)
Voltage Bias Output/Configurable Analog output #2 Analog Out Low Function Setpoint	The analog value that corresponds to the Low engineering value; scaling unit, and lower clamp (Password level: 1) Allowed values: -10~10 Vdc (Default: -5 Vdc)
Voltage Bias Output/Configurable Analog output #2 Analog Out High Function Setpoint	The analog value that corresponds to the high engineering value; scaling unit, and upper clamp (Password level: 1) Allowed values: -10~10 Vdc (Default: 5 Vdc)

8.33.1 Configurable Inputs

Each configurable input has a default function. These default functions are identified in the following table.

TABLE 173. DEFAULT FUNCTIONS FOR CONFIGURABLE INPUTS

INPUT	DEFAULT FUNCTIONS FOR CONFIGURABLE INPUTS
1	Event/fault Input
2	Event/fault Input
5	Low Coolant Level Switch Fire Detected
6	Low Fuel Level Switch
10	Remote Fault Reset Switch
11	Start Type
12	Rupture Basin Switch Differential Fault
13	Event/fault Input
14	Event/fault Input
20	Transfer Inhibit
21	Retransfer Inhibit
23	Utility CB Pos B (NC)
24	Utility CB Tripped Status
25	Utility CB Inhibit
26	Genset CB Pos B (NC)
27	Genset CB Tripped Status
28	Genset CB Inhibit
29	Single Mode Verify
30	Synchronizer Enable
31	Load Demand Stop
32	Ramp Load/Unload

If there are two default functions in the table, the function depends on *LBNG Genset Enable*. If this is set to Disable, the first function is the default function. If this is set to Enable, the second function is the default function.

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:

- Do Nothing
- Manual Run Switch
- Low Fuel in Day Tank Switch
- Low Coolant Switch #2
- High Alt Temperature Switch
- Ground Fault Switch

- PTC Mode Switch
- Load Demand Inhibit Switch
- Load Demand Spare Capacity Request
- Ramp Load/Unload Switch
- Exercise Switch
- Battle Short Switch
- Battery Charger Failed Switch
- Low Engine Temperature Switch
- Speed Droop Enable Switch
- Voltage Droop Enable Switch
- Fire Fault Switch
- Differential Fault Switch
- Rated/Idle Switch
- AMM In Auto
- Intake Air Restriction Indicator 1 fault switch
- Intake Air Restriction Indicator 2 fault switch
- Intake Air Restriction Indicator 3 fault switch
- Intake Air Restriction Indicator 4 fault switch
- Battery Charger 2 Failed Switch
- Battery Charger 3 Failed Switch
- Battery Charger 4 Failed Switch
- Starter Air Supply Pressure Low Fault Switch
- Starter Air Tank Volume Low Fault Switch
- Cam Switch Location 1
- Cam Switch Location 2
- Cam Switch Location 3
- Cam Switch Location 4
- Paralleling Cable Detect
- DEF Tank Detector
- Low Fuel Pressure Switch
- Bank A Pressure Switch
- Bank B Pressure Switch
- Start Signal Integrity Switch

NOTICE

If LBNG Genset Enable is set to Enable, you cannot change the function of Configurable Input #5 or Configurable Input #12.

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.

If *LBNG Genset Enable* is set to Disable, 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.

8.33.1.1 Event/fault Input (Default Function for Configurable Inputs #1, #2, #13, and #14)

The following table identifies the configurable inputs and the event/fault codes the PCC generates when a configurable input becomes active.

TABLE 174. CONFIGURABLE INPUT EVENT/FAULT CODES

INPUT	EVENT/FAULT CODE
1	1573
2	1312
13	1317
14	1318

You can specify the type of event/fault the PCC generates when the configurable input is active. For example, use *Configurable Input #1 Fault Response* to specify whether the PCC generates a shutdown fault, shutdown with cooldown fault, warning fault, derate event, or event when Configurable Input #1 is active.

NOTICE

Configurable Input #1 Fault Response has no effect unless the configurable input is mapped to its default function.

By default, configurable inputs generate events, though this may be changed at the factory.

You can specify the text that is displayed when the corresponding event/fault input is active. For example, use *Configurable Input #1 Fault Text* to specify the text for event/fault code 1573. The parameters for other configurable inputs are similar.

8.33.1.2 Additional Configurable Inputs

Fire Detected (Default Function for Configurable Input #5)

The PCC generates shutdown with cooldown fault 1794 (Fire Detected) when the switch becomes active.

Low Coolant Level Switch (Default Function for Configurable Input #5)

The PCC generates one of the events/faults in the following table when the switch becomes active.

TABLE 175. LOW COOLANT LEVEL FAULTS

LCL DETECTION RESPONSE	EVENT/FAULT
Shutdown	Shutdown fault 235
Warning	Warning fault 197
None	No fault

Low Fuel Level Switch (Default Function for Configurable Input #6)

The PCC generates warning fault 1441 (Low Fuel Level) after the switch is active for Low Fuel Set/Clear Time.

Remote Fault Reset Switch (Default Function for Configurable Input #10)

The PCC may be connected to a device that can generate a fault reset signal.

Start Type (Default Function for Configurable Input #11)

The PCC may be connected to a device that can generate a start type signal.

Rupture Basin Switch (Default Function for Configurable Input #12)

The PCC generates warning fault 2945 (Rupture Basin Switch) after this switch is active for *Rupture Basin Time*.

Differential Fault (Default Function for Configurable Input #12)

The PCC generates shutdown fault 3399 (Differential Fault - Condition Exists) when the switch becomes active.

Transfer Inhibit (Default Function for Configurable Input #20)

The PCC may be connected to a device that can generate a transfer inhibit signal.

Retransfer Inhibit (Default Function for Configurable Input #21)

The PCC may be connected to a device that can generate a retransfer inhibit signal.

Utility CB Pos B (NC) (Default Function for Configurable Input #23)

The PCC monitors the normally-closed output of a dual-contact, utility circuit breaker.

Utility CB Tripped Status (Default Function for Configurable Input #24)

The PCC generates warning fault 1219 (Utility Breaker Tripped) when the switch becomes active.

Utility CB Inhibit (Default Function for Configurable Input #25)

The PCC may be connected to a device that can generate a utility CB inhibit signal.

Genset CB Pos B (NC) (Default Function for Configurable Input #26)

The PCC generates warning fault 1328 (Genset Breaker Tripped) when the switch becomes active.

Genset CB Tripped Status (Default Function for Configurable Input #27)

The PCC generates warning fault 1328 (Genset Breaker Tripped) when the switch becomes active.

Genset CB Inhibit (Default Function for Configurable Input #28)

The PCC may be connected to a device that can generate a genset CB inhibit signal.

Single Mode Verify (Default Function for Configurable Input #29)

The PCC generates warning fault 1455 (Utility Breaker Position Contact) when the switch becomes inactive.

Synchronizer Enable (Default Function for Configurable Input #30)

The PCC may be connected to a device that can generate a sync enable signal.

Load Demand Stop (Default Function for Configurable Input #31)

The PCC may be connected to a device that can generate a load demand stop signal.

Extended Parallel Switch (Default Function for Configurable Input #32)

The PCC may be connected to a device that can generate an extended parallel signal.

Low Fuel in Day Tank Switch

The PCC generates warning fault 1439 (Low Day Tank Fuel Sw) after the switch is active for *Low Fuel in Day Tank Time*.

Low Coolant Switch #2

The PCC generates warning fault 2977 (Low Coolant Level 2 Sw) as soon as the switch becomes active.

High Alt Temperature Switch

The PCC generates warning fault 2979 (High Alternator Temp Sw) after the switch is active for *High Alternator Temperature Switch Time*.

Ground/Earth Fault Switch

The PCC generates warning fault 2938 (Earth/Ground Fault) when the ground fault relay becomes active for ground fault current delay.

Exercise Switch

The PCC may be connected to a device that can generate an exercise signal.

Battle Short Switch

The PCC may be connected to a device that puts the PCC in Battle Short mode.

Battery Charger Failed Switch

The PCC generates warning fault 2993 (Battery Charger Sw Fail) when the battery charger stops working properly.

Low Engine Temperature Switch

The PCC generates warning fault 1435 (Low Coolant Temperature) when the switch becomes active.

Speed Droop Enable Switch

The PCC may be connected to a device that can generate a speed droop enable signal.

Voltage Droop Enable Switch

The PCC may be connected to a device that can generate a voltage droop enable signal.

PTC Mode Switch

The PCC may be connected to a device that can generate a PTC mode switch signal.

Ramp Load/Unload Switch

The PCC may be connected to a device that can generate a ramp load unload signal.

Load Demand Inhibit Switch

PCC3300 MLD systems only.

When LD system enable (trim) is enabled, and input is ACTIVE; Load Demand System Enable is inhibited, all the generator sets will start.

Load Demand Spare Capacity Requested

PCC3300 MLD system only.

When LD system enable (trim) is enabled, and input is ACTIVE; additional spare capacity (set by Load Demand Spare Capacity Request Value) is requested on the generator set bus.

8.33.2 Configurable Analog Inputs

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

TABLE 176. DEFAULT FUNCTIONS FOR CONFIGURABLE ANALOG INPUTS

INPUT	DEFAULT FUNCTIONS
1	kW Load Setpoint
2	kVAR Load Setpoint

Default functions are available only on the indicated inputs. For example, Configurable Analog Input #1 can be a kW Load Setpoint but not a kVAR Load Setpoint.

Each configurable analog input can also be mapped to one of these functions, instead of their default function:

- External Speed Bias
- External Voltage Bias

You can only map one configurable input to each of these functions. For example, there cannot be two External Speed Bias inputs.

You can also set up a configurable input to do nothing at all.

You can specify the function of each configurable analog input if this ability is not locked. For example, if *Configurable Analog Input #1 Factory Lock* is Not Locked, use *Configurable Analog Input #1 Analog Input Function Pointer_* to specify the function of Configurable Analog Input #1. If *Configurable Analog Input #1 Factory Lock* is Locked, you can still look at *Configurable Analog Input #1 Analog Input Function Pointer_* to see what the current function of Configurable Analog Input #1 is.

kW Load Setpoint (Default Function for Configurable Analog Input #1)

This function has no effect unless these conditions are met:

- The PCC is in Load Govern paralleling state
- *Load Govern kW Setpoint Source* is set to Analog Input

The PCC may be connected to a device that helps determine *Load Govern kVAR Target*.

kVAR Load Setpoint is the current value of this configurable analog input.

kW Load Setpoint (Default Function for Configurable Analog Input #1)

This function has no effect unless these conditions are met:

- The PCC is in Load Govern paralleling state (page 5-28).
- *Load Govern kW Setpoint Source* is set to Analog Input.

The PCC may be connected to a device that helps determine *Load Govern kW Target*.

kW Load Setpoint is the current value of this configurable analog input.

kVAR Load Setpoint (Default Function for Configurable Analog Input #2)

This function has no effect unless these conditions are met:

- The PCC is in Load Govern paralleling state (page 5-28).
- *Load Govern kVAR Setpoint Source* is set to Analog Input.

The PCC may be connected to a device that helps determine *Load Govern kVAR Target*.

kVAR Load Setpoint is the current value of this configurable analog input.

kVAR Load Setpoint (Default Function for Configurable Analog Input #2)

This function has no effect unless these conditions are met:

- The PCC is in Load Govern paralleling stat.
- *Load Govern kW Setpoint Source* is set to Analog Input.

The PCC may be connected to a device that helps determine *Load Govern kW Target*.

kVAR Load Setpoint is the current value of this configurable analog input.

External Speed Bias

The PCC may be connected to a device that can adjust the speed reference.

8.33.3 Configurable Outputs

Each configurable output has a default function. These default functions are identified in the following table.

TABLE 177. DEFAULT FUNCTIONS FOR CONFIGURABLE OUTPUTS

OUTPUT	DEFAULT FUNCTIONS
1	Event/fault Output
2	Event/fault Output
3	Event/fault Output
4	Event/fault Output

OUTPUT	DEFAULT FUNCTIONS
5	Ready To Load
6	Oil Priming Pump
7	Local Status
8	Glow Plug
10	Delayed Off
11	Load Dump
20	Event/fault Output
21	Event/fault Output
22	Event/fault Output

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*
- LBNG Start-Enable Function
- LBNG Idle Speed Event Function

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*
- *Configurable Output #20 Event Code*
- *Configurable Output #21 Event Code*
- *Configurable Output #22 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 generator set is running at 90% rated voltage.
- The generator set 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 generator set 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.

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 shutdown fault code 9972 (Start-Inhibit Shutdown Fault) or warning fault code 9973 (Start-Inhibit Warning Fault Event) is active.

LBNG Idle Speed Event Function

This function has no effect unless these conditions are met.

- *LBNG Genset Enable* is set to Enable.
- *LBNG Idle Speed Event Enable* is set to Enable.

The PCC may notify a device when the PCC is running Idle Warmup, Rated to Idle Ramp Time, or Idle Cooldown Time.

Load Demand Spare Capacity Available

PCC3300 MLD system only.

When LD system enable (trim) is enabled, and output is ACTIVE; Current load and spare capacity requirements are satisfied.

8.33.4 Configurable Analog Outputs

Each configurable analog output has a default function. These default functions are identified in the following table.

TABLE 178. DEFAULT FUNCTIONS FOR CONFIGURABLE ANALOG OUTPUTS

OUTPUT	DEFAULT FUNCTION
1	Speed Bias Output
2	Voltage Bias Output

Default functions are available only on the indicated outputs. For example, Configurable Analog Output #1 can generate a Speed Bias Output but not a Voltage Bias Output.

Each configurable analog output can also be mapped to one of these functions, instead of their default function:

- *Genset Average Voltage*
- *Genset Average Current*
- *Genset Total Power Factor*
- *Genset Frequency*
- *Genset Total kW*
- *Genset Total kVAR*
- *Average Engine Speed (Engine Speed)*
- *Coolant Temperature*
- *Oil Pressure*
- *Oil Temperature*
- *Intake Manifold Temperature*

You can only map one configurable analog output to each of these parameters. For example, there cannot be two Genset Average Voltage outputs.

You can also set up a configurable output to do nothing at all.

In addition, you can specify the function of each configurable analog output if this ability is not locked. For example, use *Configurable Analog Output #1 Analog Output Function Pointer* to specify the function of Configurable Analog Output #1 if *Configurable Analog Output #1 Output Factory Lock* is Not Locked. If *Configurable Analog Output #1 Output Factory Lock* is Locked, you can still look at *Configurable Analog Output #1 Analog Output Function Pointer* to see what the current function of Configurable Analog Output #1 is.

Speed Bias Output (Default Function for Configurable Analog Output #1)

This function depends on whether or not the PCC is running one of these processes:

- Starting to Rated Ramp Time
- Idle to Rated Ramp Time
- Rated speed and voltage
- Controlled Shutdown Advance Notice Delay
- Time Delay to Stop
- Rated Cooldown Time

- Rated to Idle Transition Time

If the PCC is running one of these processes, the PCC notifies another device what the percentage difference is between the speed reference and the base speed (*Alternate Frequency Switch* multiplied by *Frequency to Speed Gain Select*). If the speed reference is less than the base speed, this value is negative.

If the PCC is not running one of these processes, the output is 0%.

Voltage Bias Output (Default Function for Configurable Analog Output #2)

This function depends on *External Bias Commands Enable* and whether or not the PCC is running one of these processes:

- Starting to Rated Ramp Time
- Idle to Rated Ramp Time
- Rated speed and voltage
- Controlled Shutdown Advance Notice Delay
- Time Delay to Stop
- Rated Cooldown Time
- Rated to Idle Transition Time

If *External Bias Commands Enable* is set to Enabled and the PCC is running one of these processes, the PCC notifies another device what the difference is between the voltage setpoint and 100%. If the voltage setpoint is less than 100%, this value is negative.

If *External Bias Commands Enable* is set to Disabled or the PCC is not running one of these processes, the output is 0%.

8.34 Calibration

Each label is described in the following table.

TABLE 179. CALIBRATION

NAME	DESCRIPTION
Genset 3 Phase Voltage Cal	
Genset L1L2 Voltage	Generator set L1L2 voltage
Genset L12 Voltage Adjust	Generator set L12 voltage Calibration trim (Password level: 1.) Allowed values: 90~110 %. (Default: 100 %.)
Genset L2L3 Voltage	Generator set L2L3 voltage
Genset L23 Voltage Adjust	Generator set L23 voltage Calibration trim (Password level: 1.) Allowed values: 90~110 %. (Default: 100 %.)
Genset L3L1 Voltage	Generator set L3L1 voltage
Genset L31 Voltage Adjust	Generator set L31 voltage Calibration trim (Password level: 1.) Allowed values: 90~110 %. (Default: 100 %.)
Genset 1 Phase Voltage Cal	
Genset L1N Voltage	Generator set L1N voltage

NAME	DESCRIPTION
Genset Single Phase L1N Voltage Adjust	Generator set Single Phase L1N voltage Calibration trim. (Password level: 1.) Allowed values: 90~110 %. (Default: 100 %.)
Genset L2N Voltage	Generator set L2N voltage
Genset Single Phase L2N Voltage Adjust	Generator set Single Phase L2N voltage Calibration trim. (Password level: 1.) Allowed values: 90~110 %. (Default: 100 %.)
Genset Current Cal	
Genset L1 Current	Monitors the generator set L1 current value.
Genset L1 Current Adjust	Generator set L1 current Calibration trim in percentage. (Password level: 1.) Allowed values: 90~110 %. (Default: 100 %.)
Genset L2 Current	Generator set L2 current
Genset L2 Current Adjust	Generator set L2 current Calibration trim (Password level: 1.) Allowed values: 90~110 %. (Default: 100 %.)
Genset L3 Current	Generator set L3 current
Genset L3 Current Adjust	Generator set L3 current Calibration trim (Password level: 1.) Allowed values: 90~110 %. (Default: 100 %.)
Genset Neutral Current Cal	
Genset Neutral Current	Generator set neutral current
Genset Neutral Current Adjust	Generator set Neutral current Calibration trim (Password level: 1.) Allowed values: 90~110 %. (Default: 100 %.)
Genset Bus Voltage Cal	
Genset Bus L1L2 Voltage	Generator set Bus L1L2 voltage
Genset Bus L12 Voltage Adjust	Generator set Bus L12 voltage Calibration trim (Password level: 1.) Allowed values: 90~110 %. (Default: 100 %.)
Genset Bus L2L3 Voltage	Generator set Bus L2L3 voltage
Genset Bus L23 Voltage Adjust	Generator set Bus L23 voltage Calibration trim (Password level: 1.) Allowed values: 90~110 %. (Default: 100 %.)
Genset Bus L3L1 Voltage	Generator set Bus L3L1 voltage
Genset Bus L31 Voltage Adjust	Generator set Bus L31 voltage Calibration trim (Password level: 1.) Allowed values: 90~110 %. (Default: 100 %.)
Genset Bus Current Cal	
Genset Bus L1 Current	Generator set Bus L1 current Allowed values: 0~65530 Amps.
Genset Bus L1 Current Adjust	Generator set Bus L1 current Calibration trim (Password level: 1.) Allowed values: 90~110 %. (Default: 100 %.)
Genset Bus L2 Current	Generator set Bus L2 current
Genset Bus L2 Current Adjust	Generator set Bus L2 current Calibration trim (Password level: 1.) Allowed values: 90~110 %. (Default: 100 %.)

NAME	DESCRIPTION
Genset Bus L3 Current	Generator set Bus L3 current
Genset Bus L3 Current Adjust	Generator set Bus L3 current Calibration just trim (Password level: 1.) Allowed values: 90~110 %. (Default: 100 %.)
Paralleling Application	Determines what the function of the Other Meter is. Allowed values: None, Utility, Genset Bus.
Utility Voltage Cal	
Utility L1L2 Voltage	Utility L1L2 voltage
Utility L12 Voltage Adjust	Utility L12 voltage Calibration trim (Password level: 1.) Allowed values: 90~110 %. (Default: 100 %.)
Utility L2L3 Voltage	Utility L2L3 voltage
Utility L23 Voltage Adjust	Utility L23 voltage Calibration trim (Password level: 1.) Allowed values: 90~110 %. (Default: 100 %.)
Utility L3L1 Voltage	Utility L3L1 voltage
Utility L31 Voltage Adjust	Utility L31 voltage Calibration trim (Password level: 1.) Allowed values: 90~110 %. (Default: 100 %.)
Utility Current Cal	
Utility L1 Current	Utility L1 current
Utility L1 Current Adjust	Utility L1 current Calibration trim (Password level: 1.) Allowed values: 90~110 %. (Default: 100 %.)
Utility L2 Current	Utility L2 current
Utility L2 Current Adjust	Utility L2 current Calibration trim (Password level: 1.) Allowed values: 90~110 %. (Default: 100 %.)
Utility L3 Current	Utility L3 current
Utility L3 Current Adjust	Utility L3 current Calibration trim (Password level: 1.) Allowed values: 90~110 %. (Default: 100 %.)
Ground Current	Ground current
Ground Current Adjust	Ground current adjust trim. Use to field calibrate ground current reading as required. (Password level: 1.) Allowed values: 90~110 %. (Default: 100 %.)

NAME	DESCRIPTION
Genset kW Scalar Cal**	
Genset L1kW adjust	Genset L1 kW Calibration trim. (Password level: 1.) Allowed Values: 0.9000~1.1000 (Default value: 1.0000)
Genset L2kW adjust	Genset L2 kW Calibration trim. (Password level: 1.) Allowed Values: 0.9000~1.1000 (Default value: 1.0000)

Genset L3kW adjust	Genset L3 kW Calibration trim. (Password level: 1.) Allowed Values: 0.9000~1.1000 (Default value: 1.0000)
Genset kVAR Scalar Cal**	
Genset L1kVAR adjust	Genset L1 kVAR Calibration trim. (Password level: 1.) Allowed Values: 0.9000~1.1000 (Default value: 1.0000)
Genset L2kVAR adjust	Genset L2 kVAR Calibration trim. (Password level: 1.) Allowed Values: 0.9000~1.1000 (Default value: 1.0000)
Genset L3kVAR adjust	Genset L3 kVAR Calibration trim. (Password level: 1.) Allowed Values: 0.9000~1.1000 (Default value: 1.0000)
Genset kVA Scalar Cal**	
Genset L1kVA adjust	Genset L1 kVA Calibration trim. (Password level: 1.) Allowed Values: 0.9000~1.1000 (Default value: 1.0000)
Genset L2kVA adjust	Genset L2 kVA Calibration trim. (Password level: 1.) Allowed Values: 0.9000~1.1000 (Default value: 1.0000)
Genset L3 kVA adjust	Genset L3 kVA Calibration trim. (Password level: 1.) Allowed Values: 0.9000~1.1000 (Default value: 1.0000)
Utility kW Scalar Cal**	
Utility L1kW adjust	Utility L1 kW Calibration trim. (Password level: 1.) Allowed Values: 0.9000~1.1000 (Default value: 1.0000)
Utility L2kW adjust	Utility L2 kW Calibration trim. (Password level: 1.) Allowed Values: 0.9000~1.1000 (Default value: 1.0000)
Utility L3kW adjust	Utility L3 kW Calibration trim. (Password level: 1.) Allowed Values: 0.9000~1.1000 (Default value: 1.0000)
Utility kVAR Scalar Cal**	
Utility L1kVAR adjust	Utility L1 kVAR Calibration trim. (Password level: 1.) Allowed Values: 0.9000~1.1000 (Default value: 1.0000)
Utility L2kVAR adjust	Utility L2 kVAR Calibration trim. (Password level: 1.) Allowed Values: 0.9000~1.1000 (Default value: 1.0000)
Utility L3kVAR adjust	Utility L3 kVAR Calibration trim. (Password level: 1.) Allowed Values: 0.9000~1.1000 (Default value: 1.0000)
Utility kVA Scalar Cal**	
Utility L1kVA adjust	Utility L1 kVA Calibration trim. (Password level: 1.) Allowed Values: 0.9000~1.1000 (Default value: 1.0000)
Utility L2kVA adjust	Utility L2 kVA Calibration trim. (Password level: 1.) Allowed Values: 0.9000~1.1000 (Default value: 1.0000)
Utility L3kVA adjust	Utility L3 kVA Calibration trim. (Password level: 1.) Allowed Values: 0.9000~1.1000 (Default value: 1.0000)
Genset Bus kW Scalar Cal**	

Genset Bus L1kW adjust	Genset bus L1 kW Calibration trim. (Password level: 1.) Allowed Values: 0.9000~1.1000 (Default value: 1.0000)
Genset Bus L2kW adjust	Genset bus L2 kW Calibration trim. (Password level: 1.) Allowed Values: 0.9000~1.1000 (Default value: 1.0000)
Genset Bus L3kW adjust	Genset bus L3 kW Calibration trim. (Password level: 1.) Allowed Values: 0.9000~1.1000 (Default value: 1.0000)
Genset Bus kVAR Scalar Cal**	
Genset Bus L1kVAR adjust	Genset bus L1 kVAR Calibration trim. (Password level: 1.) Allowed Values: 0.9000~1.1000 (Default value: 1.0000)
Genset Bus L2kVAR adjust	Genset bus L2 kVAR Calibration trim. (Password level: 1.) Allowed Values: 0.9000~1.1000 (Default value: 1.0000)
Genset Bus L3kVAR adjust	Genset bus L3 kVAR Calibration trim. (Password level: 1.) Allowed Values: 0.9000~1.1000 (Default value: 1.0000)
Genset Bus kVA Scalar Cal**	
Genset Bus L1kVA adjust	Genset bus L1 kVA Calibration trim. (Password level: 1.) Allowed Values: 0.9000~1.1000 (Default value: 1.0000)
Genset Bus L2kVA adjust	Genset bus L2 kVA Calibration trim. (Password level: 1.) Allowed Values: 0.9000~1.1000 (Default value: 1.0000)
Genset Bus L3kVA adjust	Genset bus L3 kVA Calibration trim. (Password level: 1.) Allowed Values: 0.9000~1.1000 (Default value: 1.0000)

NOTICE

****These values shall be calibrated only after voltage and current values are calibrated. These values require full load conditions for calibration. Use calibrated meters to set above mentioned adjust factors.**

8.35 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 180. 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 Integrity 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)

8.35.1 Characteristics of the AUX101 and AUX102 with the PowerCommand 2.x and 3.x

8.35.1.1 Maximum Number of AUX101/102 for the PowerCommand 2.x and 3.x

TABLE 181. 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

8.35.1.2 Required Part Numbers to Support the AUX101 for the PowerCommand 2.x

TABLE 182. 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.

8.35.1.3 Possible Functions of AUX101 Inputs for PowerCommand 2.x and 3.x

TABLE 183. 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)

8.35.1.3.1 Default Functions of AUX101 Inputs for PowerCommand 2.x and 3.x

All AUX101 inputs are disabled.

8.35.1.3.2 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 184. 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 .

8.35.1.3.3 Additional Functions of Configurable Inputs on the PowerCommand 3.x

Each configurable input can be mapped to one of these functions, instead of their default function.

TABLE 185. ADDITIONAL FUNCTIONS OF CONFIGURABLE INPUTS ON THE POWERCOMMAND 3.X

Function	Related Settings
Manual Run Switch	None
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
PTC Mode Switch	See PTC settings.
Load Demand Inhibit Switch	None
Predictive Load Enable Switch	Not available
Ramp Load/Unload Switch	Load Govern kVAR Ramp Load Time, Load Govern kVAR Ramp Unload Time, Load Govern kW Ramp Load Time, Load Govern kW Ramp Unload Time, Load Share Ramp Load Time, Load Share Ramp Unload Time
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

Masterless Load Demand Enable Switch and Predictive Load Enable Switch are not available yet.

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.

8.35.1.3.4 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 186. 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.

8.35.1.3.5 PowerCommand 2.x and 3.x Fault Codes Generated by AUX101 Switch Inputs

TABLE 187. 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

8.35.1.4 Default Functions of AUX101 Outputs with the PowerCommand 2.x and 3.x

TABLE 188. 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

8.35.1.5 Possible Functions of AUX102 Inputs for PowerCommand 2.x and 3.x

TABLE 189. 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

8.35.1.5.1 Default Functions of AUX102 Inputs for PowerCommand 2.x and 3.x

All AUX102 inputs are disabled.

8.35.1.5.2 PowerCommand 2.x and 3.x Fault Codes Generated by AUX102 Switch Inputs

TABLE 190. 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

8.35.1.6 Default Functions of AUX102 Outputs with the PowerCommand 2.x and 3.x

TABLE 191. 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

8.35.2 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

8.35.2.1 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.

8.35.2.2 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.

8.35.2.3 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.

8.35.2.3.1 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.

8.35.2.4 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.

8.35.2.4.1 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.

8.35.2.4.2 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 192. 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)

8.35.2.5 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.

8.35.2.5.1 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.

8.36 Calibration Procedures

NOTICE

Use the same procedure to calibrate the generator set, the generator set bus, or the utility.

⚠ 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.

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 generator set output.

8.36.1 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).

8.36.2 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*).

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 generator set. The values shown are based on the original settings for the PCC and may be adjusted when the generator set is designed, when the generator set is installed, or by other operators after installation.

TABLE 193. 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
Aux101 LTA Temperature OOR Check Enable	Yes		Enabled	Enables the AUX101 I/O Module LTA Temperature OOR Faults.
Aux101 LTA Temperature OOR High Limit	Yes		4.8 VDC	High limit for the AUX101 I/O Module LTA temperature OOR Faults.
Aux101 LTA Temperature OOR Low Limit	Yes		0.2 VDC	Low limit for the AUX101 I/O Module LTA temperature OOR Faults.
Aux101 LTA Temperature OOR Time	Yes		2.0 Seconds	Time limit for the AUX101 I/O Module LTA temperature OOR Faults.
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.
Breaker Closed Current Threshold			5%	Threshold for determining breaker closed in contacts fail.
Derate Request		Yes		The requested % derate from the derate request logic.
Enable Start-Enable Function			Disable	Enable Trim for LBNG Start-Enable Function.
Extended Paralleling Enable			Disabled	Use to enable the extended paralleling mode of PTC.
External Bias Commands Enable		Yes	Disabled	Enables the external bias (speed and voltage commands) to the hardware outputs.

Parameter	InPower	Modbus	Default Value	Description
Frequency Match Ramp Rate			1 sec	Sets the ramp time for frequency match output limits to soften sync transition.
Genset CB Fail To Close Standalone Mode Enable			Disable	Enables generator set to run standalone if gen cb fails to close.
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.
Genset CB Recharge Delay			10 sec	Sets time required between successive generator set breaker close commands. Allows breaker close spring to recharge.
Genset CB Shunt Trip Enable			Disable	Enables breaker shunt trip function for shutdown faults when Genset Application Type = Standalone.
Genset Current Based Breaker Position		Yes		Indicates generator set breaker position based on current.
Genset Loss of Phase Drop-Out Delay			1 sec	Sets drop-out time delay for generator set loss of phase sensor.
Genset Loss of Phase Sensor Enable			Disable	Use to enable generator set loss of phase sensor.
Genset Phase Rotation Sensor			Disable	Use to enable generator set phase rotation sensor.
Instantaneous High AC Voltage Threshold	Yes		130%	Percent of desired voltage at which Instantaneous High AC Voltage fault becomes active.
kVar Load Setpoint		Yes		EU scales value for the kVar load setpoint.
kVar Load Setpoint OOR High			4.750 Vdc	High Limit for the default function OOR faults.
kVar Load Setpoint OOR Low			0.250 Vdc	Low Limit for the default function OOR faults.
kVar Load Setpoint OOR Time			1 sec	Time Limit for the default function OOR faults.
kVar Load Share Output Command				Load share kVar output command level from load share algorithm.
kVar Load Share Ramp PWM Offset				kVar load share line PWM offset for load ramping control.
kW Load Setpoint		Yes		EU scaled value for the kW load setpoint.
kW Load Setpoint OOR High Limit			4.75 Vdc	High Limit for the default function OOR faults.

Parameter	InPower	Modbus	Default Value	Description
kW Load Setpoint OOR Low Limit			0.250 Vdc	Low Limit for the default function OOR faults.
kW Load Setpoint OOR Time			1 sec	Time Limit for the default function OOR faults.
kW Load share Output Command				
kW Load Share Ramp PWM Offset				kW load share line PWM offset for load ramping control.
LBNG Derate Enable			Disable	Enable Trim for LBNG Derate Function.
LBN Genset Enable		Yes		Switch to enable or disable the gas specific features and parameters.
Load Govern kVar Reference				Indicates the reference for the kVar closed loop control for load governing.
Load Govern kW Reference				Indicates the reference for the kW closed loop control for load governing.
Load Govern Zero AVR Error Enable			Disable	Enables the zeroing of the voltage regulator's incoming voltage error, and just passes forward the paralleling offset.
Load Share Minimum kVar			-10%	Sets minimum kVar for load sharing.
Load Share Minimum kW			-11%	Sets minimum kW for load sharing.
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
Max Setup Mode Time	Yes	Yes	600 sec	Max time allowed in Setup Mode.
PTC Operating Mode				Output of the PTC operating mode arbitration logic.
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.
Sync Disable		Yes	Inactive	Use to turn off synchronizer for testing purposes.

Parameter	InPower	Modbus	Default Value	Description
Sync Phase Difference		Yes		Other meter to generator set meter L1 voltage phase angle.
Sync Phase Offset			0 degrees	Sets a sync phase offset to accommodate sync across transformer with phase shift.
System Total kVAR		Yes		Sum of generator set bus and utility bus kVAR.
Utility CB Recharge Delay			10 sec	Sets time required between successive utility breaker close commands. Allows breaker close spring to recharge.
Utility Current Based Breaker Position		Yes		Indicates utility breaker position based on current.
Voltage Match Ramp Rate			1 sec	Sets the ramp time for voltage match output limits to soften sync transition.
Zero Speed Voltage Measurement Floor	Yes		8%	Allows adjustment of the voltage threshold (% of full-scale) where the generator set 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 Shutdown with Cooldown Faults

Shutdown with cooldown faults are shutdown faults in which the PCC has time to cool down the generator set.

When the PCC generates a shutdown with cooldown fault, the shutdown with cooldown fault becomes active. If the PCC is running in Load Govern paralleling state, it initiates a Manual Stop sequence and starts running the load govern kW ramp unload process. If the PCC is not running in Load Govern paralleling state, it initiates a Controlled Shutdown sequence. When the stop sequence has finished, the PCC generates shutdown fault 1336 (Cooldown Complete).

If a shutdown with cooldown fault is active and the engine speed is greater than zero, warning fault 1132 (Controlled Shutdown) is active. You can assign this event/fault to a configurable output, so that the PCC notifies an external device that is going to shut down the generator set.

In other ways, shutdown with cooldown faults are the same as shutdown faults.

10.2.1.2 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 194. 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 generator set.

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%.

The PCC is running in Load Govern paralleling state, the PCC requests that *Genset % Standby Total kW* be no more than $100\% - \text{Derate Request}$ (This Parameter is not available in the Operator Panel, refer to parameters table). This becomes a limitation for *Load Govern kW Target*.

If the PCC is not running in Load Govern paralleling state, the PCC generates warning fault 1464 (Load Dump Fault). 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.

If *LBNG Genset Enable* is set to Enable, the PCC recognizes derate requests from the engine control module (ECM) only if all of these conditions are met.

- *LBNG Derate Enable* is set to Enable.
- The AUX101's Derate Authorization connection is active.

10.2.3 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.

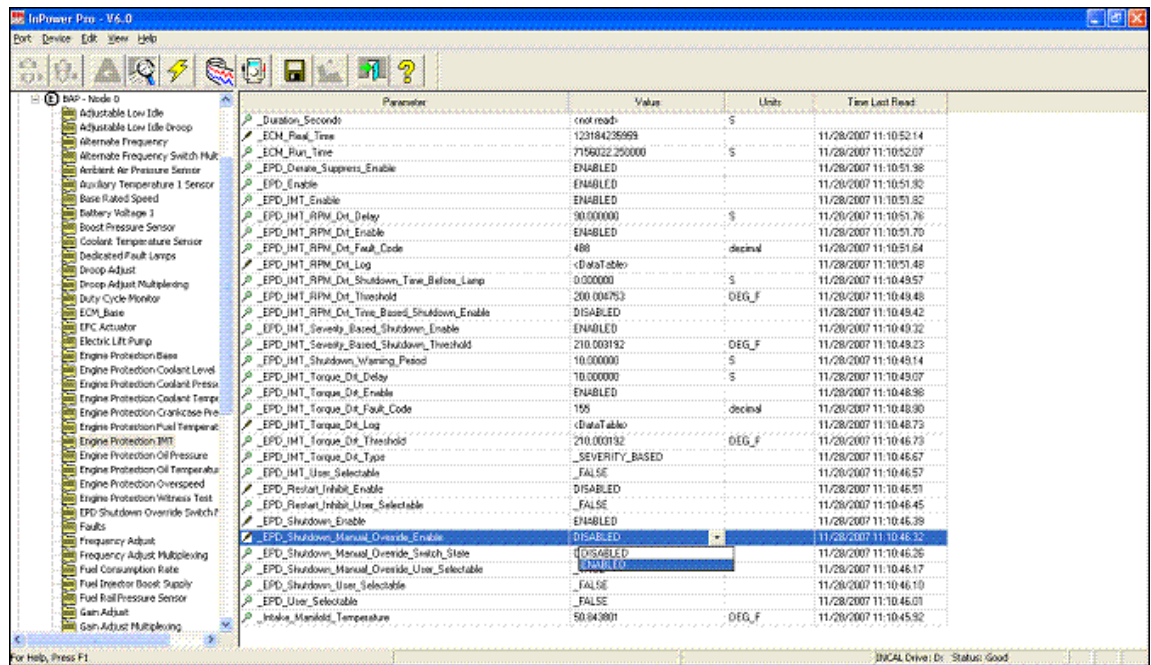
These procedures require the equipment identified in the table below.

TABLE 195. 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

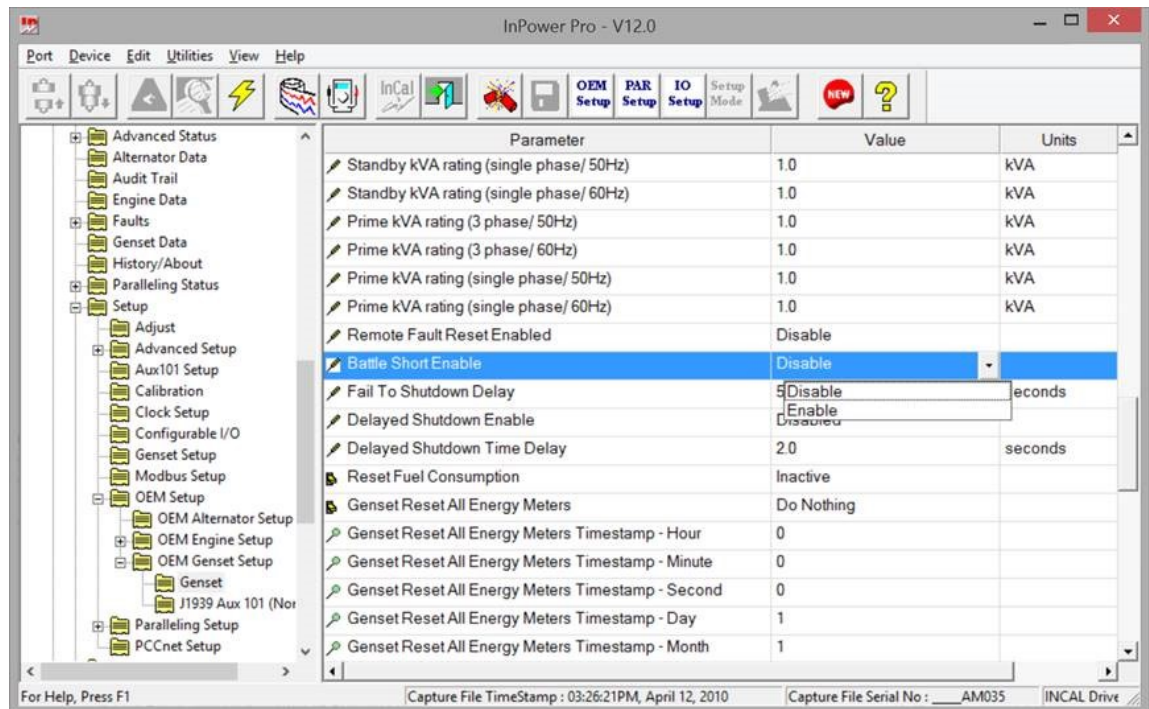
1. Put the PCC in Off mode.
2. Connect the Inline 5 adapter to the engine control module (ECM), and connect the computer to the Inline 5 adapter.
3. Open InPower (make sure the security dongle is attached to the computer), and click on Core II ECS in the left side of the window.
4. Click on the Engine Protection IMT folder.
5. Set the EPD_Shutdown_Manual_Override_Enable parameter to Enable, as shown below.



- Click Save in order to save the changes.
- Close InPower after the save is complete.
- Engage/Activate the local emergency stop button, and wait 30-60 seconds for the ECM to complete the data save.
- Remove power from the ECM, and wait 30-60 seconds.
- Reapply power to the ECM, pull out/disengage the local emergency stop button, and press the Reset button on the Operator Panel.
- 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

- Put the PCC in Off mode.
- Use the PC-based service tool harness to connect the computer to TB15 on the PCC base board.
- 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).
- Click on **Setup > OEM Setup > OEM Genset Setup > Genset**.
- Set the Battle Short Enable parameter to Enable, as shown below.

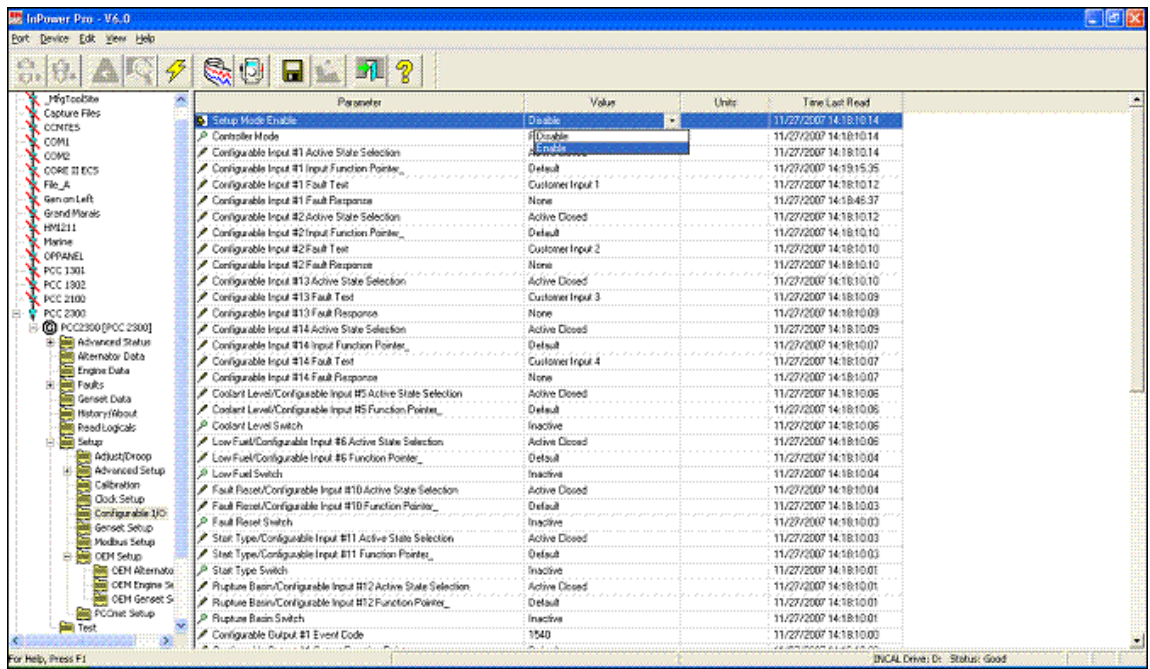


6. Click on Save in order to save the changes.

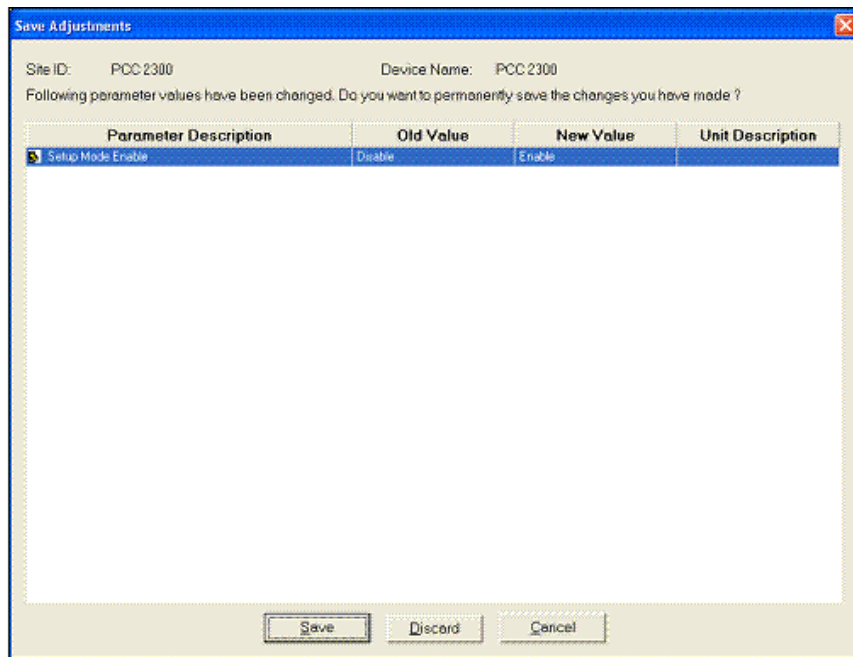
10.5.3 Map a Configurable Input to Battle Short Switch

After Battle Short mode is enabled in the ECM and the PCC, you have to map a configurable input to the Battle Short Switch.

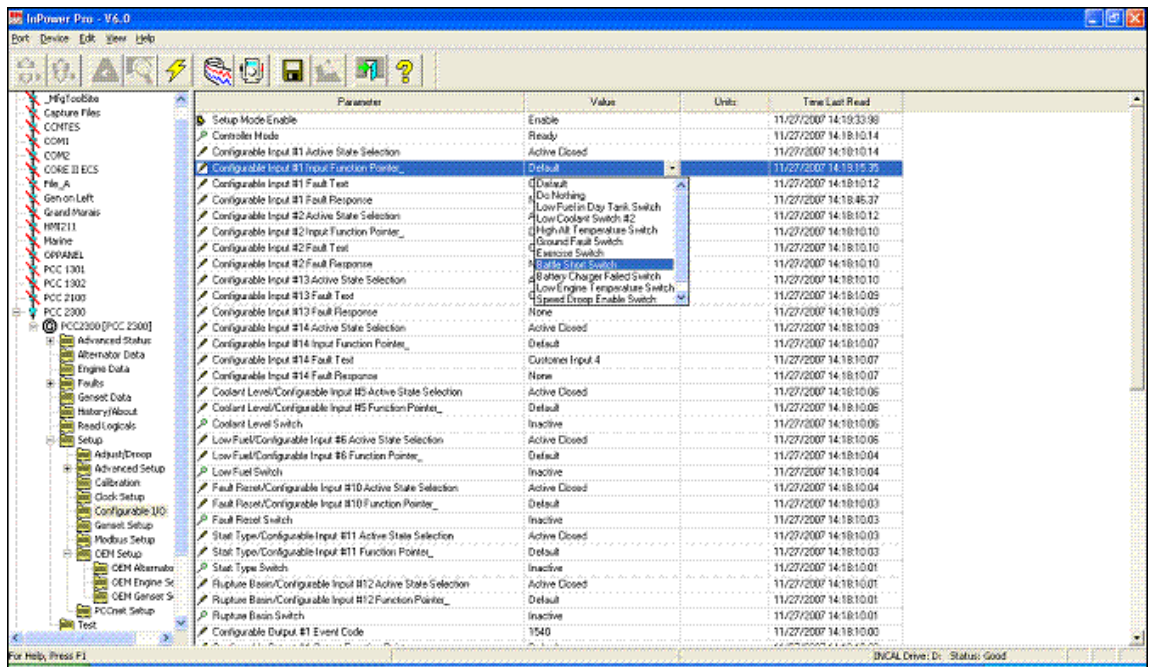
1. Put the PCC in Off mode.
2. Use the PC-based service tool harness to connect the computer to TB15 on the PCC base board.
3. Open InPower (make sure that the security dongle is attached to the computer) and click on the control (PCC 2300 in this example) in the left side of the window.
4. Click on the Setup >Configurable I/O folders.
5. Set the Setup Mode Enable parameter to Enable in order to enter Setup mode, as shown below.



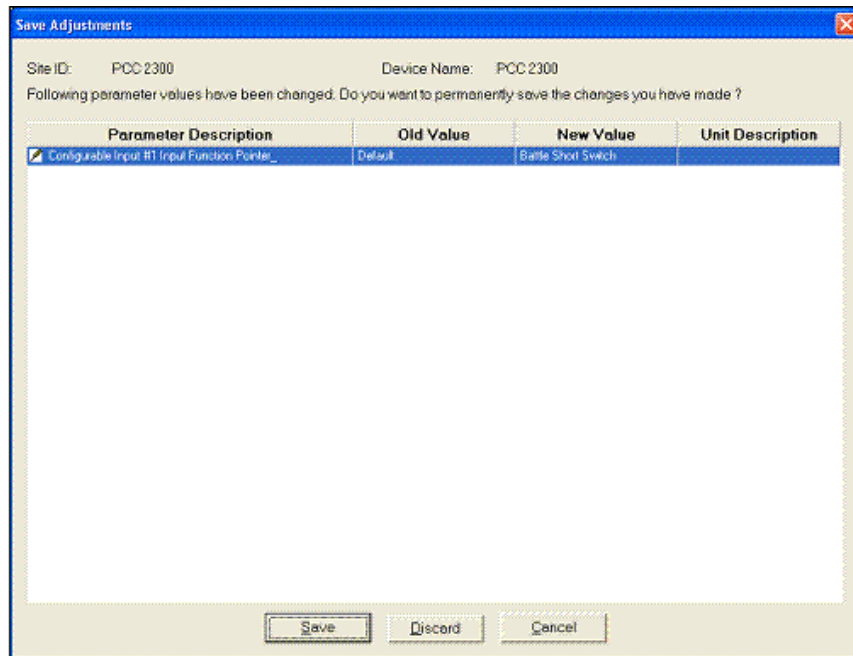
6. Click on Save, as shown below.



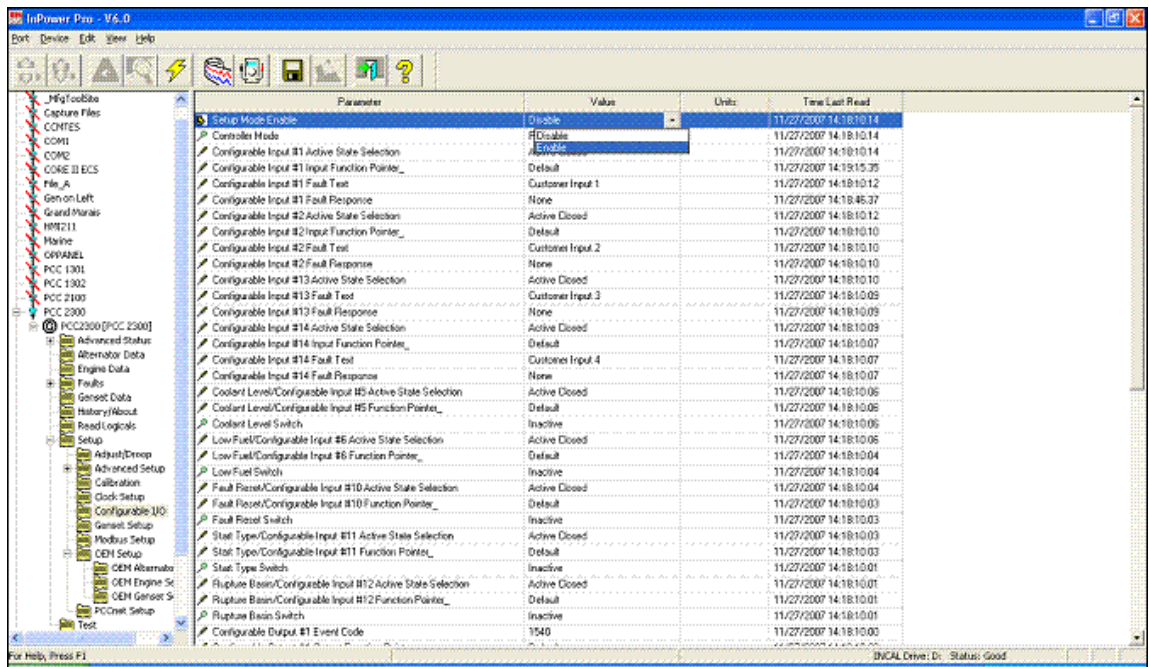
7. Any configurable input can be mapped to Battle Short Switch. Choose one of them. For example, set Configurable Input #1 Input Function Pointer parameter to Battle Short Switch, as shown below.



8. Click on Save, as shown below.



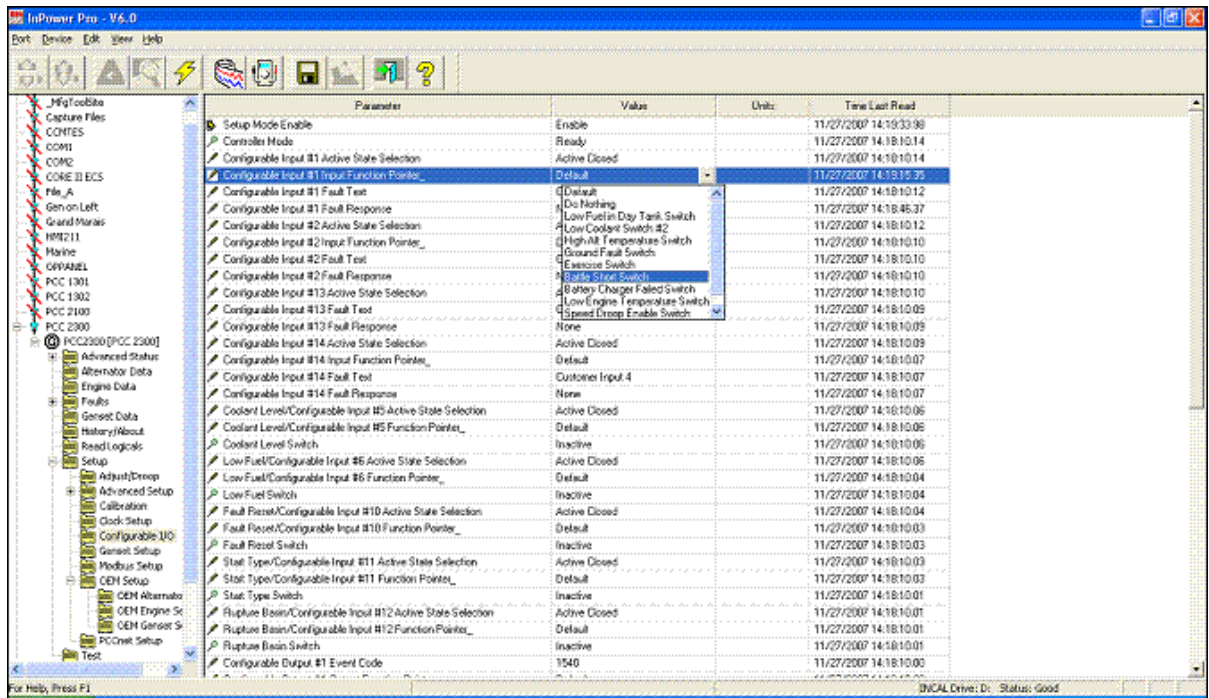
9. Set the Setup Mode Enable parameter to Disable, and click on Save in order to exit Setup mode.



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
PCC generator set may not be able to generate some faults or events .

InPower can be used to raise the response/severity of an event or fault. For example, an event can be changed to a warning fault or a warning fault to a shutdown fault. The response/severity of an event or fault (except event/fault 1452 (Genset Breaker Fail to Close)) cannot be set lower than its default value, and the severity cannot be changed of any fault or event with an asterisk (*).

TABLE 196. EVENT/FAULT LIST

Event/Fault Code	Description	Severity
111	Engine Control Module Critical Internal Failure	Shutdown
115	Eng Crank Sensor Error	Shutdown
121	EPS Main Channel Lost Error	Warning
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
136	Oil Inlet Pressure High Error	Warning
137	Oil Inlet Pressure Low Error	Warning
141	Low Oil Rifle 1 Pressure	Warning
142	Oil Overpressure Error	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
152	Low Coolant Temp	None

Event/Fault Code	Description	Severity
153	High Intake Manf 1 Temp	Warning
154	Low Intake Manf 1 Temp	Warning
155	High Intake Manf 1 Temp	Shutdown
156	Intake Manifold Temp 2 OORH	Warning
157	Intake Manifold Temp 2 OORL	Warning
158	Intake Manifold Temp 2 High	Shutdown
159	Intake Manifold 3 Temp OORH	Warning
161	Intake Manifold 3 Temp OORL	Warning
162	Intake Manifold 3 Temp High	Shutdown
163	Intake Manifold 4 Temp OORH	Warning
164	Intake Manifold 4 Temp OORL	Warning
165	Intake Manifold 4 Temp High	Shutdown
175	Throttle_Driver_Feedback_High_Error	Shutdown w/Cooldown
176	Throttle_Driver_Feedback_Low_Error	Shutdown w/Cooldown
177	Throttle_Actuator_Error	Shutdown w/Cooldown
187	Sensor Supply 2 Low	Warning
189	HT Coolant Temperature Root Cause Unknown	Shutdown w/Cooldown
195	High Coolant 1 Level	Warning
196	Low Coolant 1 Level	Warning
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
229	HT Coolant Pressure Incorrect	Warning
231	High Coolant Pressure	Warning

Event/Fault Code	Description	Severity
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
244	Red Stop Lamp Driver OORL	Warning
245	Fan Control Low	Warning
246	Exhaust Gas Temp Sensor 1 OORH	Warning
247	Exhaust Gas Temp Sensor 1 OORL	Warning
248	Exhaust Gas Temp Sensor 1 High	Warning
253	Oil Level Low Error	Shutdown w/Cooldown
254	FSO_PWM_HIGH_CONTROL_ERROR	Shutdown
255	FSO_PWM_LOW_CONTROL_ERROR	Warning
259	Engine Fuel Shutoff Valve stuck open	Warning
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
277	Fuel Control Valve Out of Adj	Warning
281	Cylinder Press Imbalance	Warning
284	Eng Speed/Position Sensor :Voltage Below Normal	Warning
285	CAN Mux PGN Rate Err	Warning
286	CAN Mux Calibration Err	Warning
287	CAN Mux Accel Data Err	Warning
295	Key On Air Press Error	Warning
311	ACT1_FF_SHORTED_HS_TO_LS_ERROR	Warning
312	ACT5_SHORTED_HS_TO_LS_ERROR	Warning
313	ACT3_RF_SHORTED_HS_TO_LS_ERROR	Warning
314	ACT6_SHORTED_HS_TO_LS_ERROR	Warning

Event/Fault Code	Description	Severity
315	ACT2_FT_SHORTED_HS_TO_LS_ERROR	Warning
319	RTC PWR Intr:Data Erratic Intermittent or Wrong	Warning
321	ACT4_RT_SHORTED_HS_TO_LS_ERROR	Warning
322	Inj 1 Solenoid Low Curr	Warning
323	Inj 5 Solenoid Low Curr	Warning
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
334	HT Coolant Temperature Incorrect	Warning
341	Engine Control Module data lost	Warning
342	Calibration Code Fail	Shutdown
343	ECM Hardware Failure	Warning
344	Fuel Filter (suction side) Differential Pressure - Data Valid But Above Normal Operating Range - Least Severe Level	Maintenance (None)
346	Powerdown Data Lost Error	Warning
351	Injector Supply Failure	Warning
352	Sensor Supply 1 Low	Warning
354	Manifold_Absolute_Pressure_1_High_Error	Warning
355	Manifold_Absolute_Pressure_1_Low_Error	Warning
359	Fail To Start	Shutdown
378	Elect Fuel Inj Cntrl Calve Ckt : Curr Below Normal	Warning
379	Elect Fuel Inj Cntrl Valve Ckt : Curr Above Normal	Warning
386	Sensor Supply 1 High	Warning
394	Eng Timing Actuator Driver Ckt: Curr Below Normal	Warning
395	Eng Timing Actuator Driver Ckt : Curr Above Normal	Warning
396	Fuel Cntl Valve Solenoid Driver 2 Sensor Ckt :OC	Warning
397	Fuel Cntl Valve Solenoid Driver 2 - Grounded Ckt	Warning
398	Engine Timing Actuator Driver 2 Circuit : OC	Warning
399	Engine Timing Actuator Driver 2 :Grounded Ckt	Warning
412	J1708 Link Cannot Transmit Error	Event
414	J1708 Link Not Fast Enough Error	Event
415	Low Oil Rifle Press	Shutdown
418	High H2O In Fuel	Warning

Event/Fault Code	Description	Severity
419	Intake Manifold Pres Bank Imbalance : Data Erratic	Warning
421	High Oil Temperature	Warning
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
433	Intake Manfld Press Sensor Ckt : Data Erratic	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
453	Gas_Mass_Flow_High_Error	Warning
454	Gas_Mass_Flow_Low_Error	Warning
458	Spark_Timing_B_Error	Shutdown w/Cooldown
459	Spark_Timing_A_Error	Shutdown w/Cooldown
461	Spark_Reference_B_Error	Shutdown w/Cooldown
462	Spark_Reference_A_Error	Shutdown w/Cooldown
463	Exhaust_Gas_Oxygen_High_Error	Warning
464	Exhaust_Gas_Oxygen_Low_Error	Warning
471	Sump Oil Level Warning Error	Warning
477	Isolated Battery Voltage Low Error	Warning
478	Isolated Battery Voltage High Error	Warning
482	Fuel Press Low: Valid But Below Normal: Mod Severe	Warning
488	High Intake Manf 1 Temp	Derate
496	Eng Speed Sensor2 Supply Volt: Rootcause Unknown	Warning
512	Throttle Pos 1 Feedback OOR High	Warning
513	Throttle Pos 1 Feedback OOR Low	Warning
514	FCV_Actuator_Error	Shutdown w/Cooldown
546	Fuel Delivery Press High	Warning

Event/Fault Code	Description	Severity
547	Fuel Delivery Press Low	Warning
553	APC Pressure High	Warning
554	APC Pressure Error	Warning
556	Crankcase Press High	Shutdown
557	Fuel Control Valve 2 OORH	Shutdown w/Cooldown
558	Fuel Control Valve 2 OORL	Warning
559	Inj Metering 1 Press Low	Warning
561	Heavy_Knock_Error_1_(A1)	Shutdown w/Cooldown
562	Heavy_Knock_Error_2_(B1)	Shutdown w/Cooldown
563	Heavy_Knock_Error_3_(A2)	Shutdown w/Cooldown
564	Heavy_Knock_Error_4_(B2)	Shutdown w/Cooldown
565	Heavy_Knock_Error_5_(A3)	Shutdown w/Cooldown
566	Heavy_Knock_Error_6_(B3)	Shutdown w/Cooldown
567	Heavy_Knock_Error_7_(A4)	Shutdown w/Cooldown
568	Heavy_Knock_Error_8_(B4)	Shutdown w/Cooldown
569	Heavy_Knock_Error_9_(A5)	Shutdown w/Cooldown
571	Knock Cyl 1 (A1) OORL	Warning
572	Knock Cyl 2 (B1) OORL	Warning
573	Knock Cyl 3 (A2) OORL	Warning
574	Knock Cyl 4 (B2) OORL	Warning
575	Knock Cyl 5 (A3) OORL	Warning
576	Knock Cyl 6 (B3) OORL	Warning
577	Knock Cyl 7 (A4) OORL	Warning
578	Knock Cyl 8 (B4) OORL	Warning
579	Knock Cyl 9 (A5) OORL	Warning
584	High Side DRV3 High Control Error	Warning
585	High Side DRV3 Low Control Error	Warning
591	Exhaust_Backpressure_High_Error	Warning

Event/Fault Code	Description	Severity
592	Exhaust_Backpressure_Low_Error	Warning
595	Turbo 1 Overspeed Warning Error	Warning
611	Engine Hot Shut Down	Warning
618	Turbo 1 Inlet Pressure High	Warning
619	Turbo 2 Inlet Press High	Warning
641	Exhaust Temp 1 (A1) High Serious Error	Shutdown w/Cooldown
642	Exhaust Temp 3 (A2) High Serious Error	Shutdown w/Cooldown
643	Exhaust Temp 5 (A3) High Serious Error	Shutdown w/Cooldown
644	Exhaust Temp 7 (A4) High Serious Error	Shutdown w/Cooldown
645	Exhaust Temp 9 (A5) High Serious Error	Shutdown w/Cooldown
646	Exhaust Temp 11 (A6) High Serious Error	Shutdown w/Cooldown
647	Exhaust Temp 13 (A7) High Serious Error	Shutdown w/Cooldown
648	Exhaust Temp 15 (A8) High Serious Error	Shutdown w/Cooldown
651	Exhaust Temp 17 (A9) High Serious Error	Shutdown w/Cooldown
652	Exhaust Temp 2 (B1) High Serious Error	Shutdown w/Cooldown
653	Exhaust Temp 4 (B2) High Serious Error	Shutdown w/Cooldown
654	Exhaust Temp 6 (B3) High Serious Error	Shutdown w/Cooldown
655	Exhaust Temp 8 (B4) High Serious Error	Shutdown w/Cooldown
656	Exhaust Temp 10 (B5) High Serious Error	Shutdown w/Cooldown
657	Exhaust Temp 12 (B6) High Serious Error	Shutdown w/Cooldown
658	Exhaust Temp 14 (B7) High Serious Error	Shutdown w/Cooldown
671	Exhaust Gas Temp Cyl 1 (A1) OORL	Warning
672	Exhaust Gas Temp Cyl 3 (A2) OORL	Warning
673	Exhaust Gas Temp Cyl 5 (A3) OORL	Warning

Event/Fault Code	Description	Severity
674	Exhaust Gas Temp Cyl 7 (A4) OORL	Warning
675	Exhaust Gas Temp Cyl 9 (A5) OORL	Warning
676	Exhaust Gas Temp Cyl 11 (A6) OORL	Warning
677	Exhaust Gas Temp Cyl 13 (A7) OORL	Warning
678	Exhaust Gas Temp Cyl 15 (A8) OORL	Warning
683	Turbo 2 Speed Moderate High	Warning
684	Turbo 2 Speed Moderate Low	Warning
685	Turbo 2 Speed Incorrect	Warning
686	Turbo 1 Speed Incorrect	Warning
687	Turbo 1 Speed Low	Warning
689	Crankshaft Speed Error	Warning
697	ECM Temperature High	Warning
698	ECM Temperature Low	Warning
699	High ECM Internal Temperature	Warning
721	Exhaust Gas Temp 2 (B1) OORL	Warning
722	Exhaust Gas Temp 4 (B2) OORL	Warning
723	Exhaust Gas Temp 6 (B3) OORL	Warning
724	Exhaust Gas Temp 8 (B4) OORL	Warning
725	Exhaust Gas Temp 10 (B5) OORL	Warning
726	Exhaust Gas Temp 12 (B6) OORL	Warning
727	Exhaust Gas Temp 14 (B7) OORL	Warning
728	Exhaust Gas Temp 16 (B8) OORL	Warning
731	Crankshaft Mech Misalign	Warning
736	Starter Air Pressure OORL	Warning
737	Starter Air Pressure OORH	Warning
738	Starter Air Press Underpressure Error	Warning
741	Air Filter Restriction Pressure High Error	Warning
742	Air Filter Restriction Pressure Low Error	Warning
751	Gas_Mass_Flow_In_Range_Error	Warning
752	Exhaust_Gas_Oxygen_In_Range_Error	Warning
757	ALL_PERSISTANT_DATA_LOST_ERROR	Warning
778	EPS_Backup_Lost_Sync_Error	Warning
781	CAN Data Link Failure	Shutdown

Event/Fault Code	Description	Severity
782	SAE J1939 Data Link 2 Engine Network No Data Received - Condition Exists	Shutdown
783	Intake Manf 1 Rate Error	Shutdown w/Cooldown
831	Spark Plug 1 (A1) OORL	Warning
832	Spark Plug 2 (B1) OORL	Warning
833	Spark Plug 3 (A2) OORL	Warning
834	Spark Plug 4 (B2) OORL	Warning
835	Spark Plug 5 (A3) OORL	Warning
836	Spark Plug 6 (B3) OORL	Warning
837	Spark Plug 7 (A4) OORL	Warning
838	Spark Plug 8 (B4) OORL	Warning
839	Spark Plug 9 (A5) OORL	Warning
841	Spark Plug 10 (B5) OORL	Warning
842	Spark Plug 11 (A6) OORL	Warning
843	Spark Plug 12 (B6) OORL	Warning
844	Spark Plug 13 (A7) OORL	Warning
845	Spark Plug 14 (B7) OORL	Warning
846	Spark Plug 15 (A8) OORL	Warning
847	Spark Plug 16 (B8) OORL	Warning
848	Spark Plug 17 (A9) OORL	Warning
849	Spark Plug 18 (B9) OORL	Warning
891	Spark Plug 1 (A1) Root Cause Unknown	Warning
892	Spark Plug 2 (B1) Root Cause Unknown	Warning
893	Spark Plug 3 (A2) Root Cause Unknown	Warning
894	Spark Plug 4 (B2) Root Cause Unknown	Warning
895	Spark Plug 5 (A3) Root Cause Unknown	Warning
896	Spark Plug 6 (B3) Root Cause Unknown	Warning
897	Spark Plug 7 (A4) Root Cause Unknown	Warning
898	Spark Plug 8 (B4) Root Cause Unknown	Warning
899	Spark Plug 9 (A5) Root Cause Unknown	Warning
911	Spark Plug 10 (B5) Root Cause Unknown	Warning
912	Spark Plug 11 (A6) Root Cause Unknown	Warning
913	Spark Plug 12 (B6) Root Cause Unknown	Warning
914	Spark Plug 13 (A7) Root Cause Unknown	Warning

Event/Fault Code	Description	Severity
915	Spark Plug 14 (B7) Root Cause Unknown	Warning
916	Spark Plug 15 (A8) Root Cause Unknown	Warning
917	Spark Plug 16 (B8) Root Cause Unknown	Warning
918	Spark Plug 17 (A9) Root Cause Unknown	Warning
919	Spark Plug 18 (B9) Root Cause Unknown	Warning
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	Warning
1135	SAE J1939 Data Link 2 Engine Network - Abnormal Update Rate	Warning
1139	UFD_INJECTOR_1_ERROR	Warning
1141	UFD_INJECTOR_2_ERROR	Warning
1142	UFD_INJECTOR_3_ERROR	Warning
1143	UFD_INJECTOR_4_ERROR	Warning
1144	UFD_INJECTOR_5_ERROR	Warning
1145	UFD_INJECTOR_6_ERROR	Warning
1213	COP_Overboost_Error	Shutdown w/Cooldown
1219	Utility Breaker Tripped	Warning
1223	Utility Frequency	Warning
1224	Genset Overvoltage	Warning
1225	Genset Undervoltage	Warning
1226	Genset Frequency	Warning
1242	DUAL_ACCEL_CONFORMANCE_ERROR	Shutdown
1243	Engine Derated	Derate
1244	Engine Normal Shutdown	Shutdown w/Cooldown
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

Event/Fault Code	Description	Severity
1257	Ctrl Mod ID In State Fail	Shutdown
1274	Heavy_Knock_Error_10_(B5)	Shutdown w/Cooldown
1275	Knock Cyl 10 (B5) OORL	Warning
1276	Knock Cyl 10 (B5) OORH	Warning
1277	Knock Cyl 11 (A6) OORL	Warning
1278	Knock Cyl 11 (A6) OORH	Warning
1279	Knock 12 (B6) High Warning	Warning
1281	Heavy_Knock_Error_12_(B6)	Shutdown w/Cooldown
1282	Knock Cyl 12 (B6) OORL	Warning
1283	Knock Cyl 12 (B6) OORH	Warning
1284	Knock 13 (A7) High Warning	Warning
1285	Continuous_Light_Knock_Error_13_(A7)	Shutdown w/Cooldown
1286	Heavy_Knock_Error_13_(A7)	Shutdown w/Cooldown
1287	Knock Cyl 13 (A7) OORL	Warning
1288	Knock Cyl 13 (A7) OORH	Warning
1289	Knock 14 (B7) High Warning	Warning
1291	Heavy_Knock_Error_14_(B7)	Shutdown w/Cooldown
1292	Knock Cyl 14 (B7) OORL	Warning
1293	Knock Cyl 14 (B7) OORH	Warning
1294	Knock 15 (A8) High Warning	Warning
1295	Continuous_Light_Knock_Error_15_(A8)	Shutdown w/Cooldown
1296	Heavy_Knock_Error_15_(A8)	Shutdown w/Cooldown
1297	Knock Cyl 15 (A8) OORL	Warning
1298	Knock Cyl 15 (A8) OORH	Warning
1299	Knock 16 (B8) High Warning	Warning
1311	Heavy_Knock_Error_18_(B9)	Shutdown w/Cooldown
1312	Configurable Input #2	Event
1317	Configurable Input #13	Event
1318	Configurable Input #14	Event

Event/Fault Code	Description	Severity
1322	kW Load Setpoint OOR High	Warning
1323	kW Load Setpoint OOR Low	Warning
1324	kVAR Load Setpoint OOR High	Warning
1325	kVAR Load Setpoint OOR Low	Warning
1328	Genset Breaker Tripped	Warning
1336	Cooldown Complete	Shutdown
1338	Knock Cyl 18 (B9) OORL	Warning
1339	Knock Cyl 18 (B9) OORH	Warning
1352	Knock 20 (B10) High Warning	Warning
1353	Continuous_Light_Knock_Error_20_(B10)	Shutdown w/Cooldown
1354	Heavy_Knock_Error_20_(B10)	Shutdown w/Cooldown
1355	Knock Cyl 20 (B10) OORL	Warning
1356	Knock Cyl 20 (B10) OORH	Warning
1357	Oil Remote Level Low	Warning
1362	Oil Filter Restriction Error	Warning
1363	Intake Manf 1 Press Low	Warning
1367	High Prefilter Oil Press	None
1368	Low Prefilter Oil Press	None
1376	Camshaft Speed Error	Warning
1387	J1939 Eng Commanded Shutdown: Condition Exists	Event
1411	High Out Freq Adjust Pot	Warning
1412	High Droop Adjust Pot	Warning
1416	Fail To Shutdown	Warning
1417	Power Down Failure	Warning
1418	High Gain Adjust Pot	Warning
1427	Overspeed Relay Error	Warning
1428	LOP Relay Error	Warning
1429	HET Relay Error	Warning
1431	Pre-LOP Relay Error	Warning
1432	Pre-HET Relay Error	Warning
1433	Local Emergency Stop	Shutdown
1434	Remote Emergency Stop	Shutdown
1435	Low Coolant Temperature	Warning

Event/Fault Code	Description	Severity
1438	Fail To Crank	Shutdown
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 Voltages 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 Overfrequency	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
1474	ECM Software mismatch	Shutdown w/Cooldown
1475	First Start Backup	Warning
1483*	Common Alarm	Event
1517	Failed Module Shutdown	Shutdown
1518	Failed Module Warning	Warning
1519	At Least One Module Has: Least Severe Fault	None

Event/Fault Code	Description	Severity
1521	Exhaust Gas Temp 3 (A2) OORH	Warning
1522	Exhaust Gas Temp 5 (A3) OORH	Warning
1523	Exhaust Gas Temp 7 (A4) OORH	Warning
1524	Exhaust Gas Temp 9 (A5) OORH	Warning
1525	Exhaust Gas Temp 11 (A6) OORH	Warning
1526	Exhaust Gas Temp 13 (A7) OORH	Warning
1527	Exhaust Gas Temp 15 (A8) OORH	Warning
1528	Exhaust Gas Temp 17 (A9) OORH	Warning
1529	Exhaust Gas Temp 2 (B1) OORH	Warning
1531	Exhaust Gas Temp 6 (B3) OORH	Warning
1532	Exhaust Gas Temp 8 (B4) OORH	Warning
1533	Exhaust Gas Temp 10 (B5) OORH	Warning
1534	Exhaust Gas Temp 12 (B6) OORH	Warning
1535	Exhaust Gas Temp 14 (B7) OORH	Warning
1536	Exhaust Gas Temp 16 (B8) OORH	Warning
1537	Exhaust Gas Temp 18 (B9) OORH	Warning
1540	Common Warning	Event
1541	Common Shutdown	Event
1545	EPS Backup Channel Lost	Warning
1546	EPS Main Channel Lost	Warning
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
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
1572	Continuous_Light_Knock_Error_19_(A10)	Shutdown w/Cooldown
1573	Configurable Input #1	Event
1574	Heavy_Knock_Error_19_(A10)	Shutdown w/Cooldown
1575	Knock Cyl 19 (A10) OORL	Warning

Event/Fault Code	Description	Severity
1576	Knock Cyl 19 (A10) OORH	Warning
1579	Continuous_Light_Knock_Error_12_(B6)	Shutdown w/Cooldown
1581	Continuous_Light_Knock_Error_14_(B7)	Shutdown w/Cooldown
1582	Continuous_Light_Knock_Error_16_(B8)	Shutdown w/Cooldown
1583	Heavy_Knock_Error_16_(B8)	Shutdown w/Cooldown
1584	Knock Cyl 16 (B8) OORL	Warning
1585	Knock Cyl 16 (B8) OORH	Warning
1586	Knock 17 (A9) High Warning	Warning
1587	Continuous_Light_Knock_Error_17_(A9)	Shutdown w/Cooldown
1588	Heavy_Knock_Error_17_(A9)	Shutdown w/Cooldown
1589	Knock Cyl 17 (A9) OORL	Warning
1591	Knock Cyl 17 (A9) OORH	Warning
1592	Knock 18 (B9) High Warning	Warning
1593	Continuous_Light_Knock_Error_18_(B9)	Shutdown w/Cooldown
1594	Knock 19 (A10) High Warning	Warning
1597	ECM Device/Component	None
1618	Exhaust Gas Temp, Cyl 1 (A1) OORH	Warning
1619	Exhaust Gas Temp, Cyl 4 (B2) OORH	Warning
1622	Inj 9 Solenoid Low Curr	Warning
1636	Intake Manif Press 2 OORH	Warning
1637	Intake Manif Press 2 OORL	Warning
1689	Real Time Clock Power	Warning
1695	Sensor Supply 5 High	Warning
1696	Sensor Supply 5 Low	Warning
1737	CAN_Throttle_Internal_Failure_Error	Shutdown w/Cooldown
1738	CAN_Throttle_Internal_Fault_Error	Warning
1739	Engine Throttle Control Condition Exists	Warning
1741	CAN_Throttle_High_Temp_Warning_Error	Warning
1742	CAN_Throttle_Temp_Limiting_Error	Warning

Event/Fault Code	Description	Severity
1743	Throttle Ctrl 2 OOR High	Shutdown w/Cooldown
1744	Throttle Ctrl 2 OOR Low	Shutdown w/Cooldown
1745	Throttle Ctrl 2 Incorrect	Shutdown w/Cooldown
1746	Throttle Ctrl 2 Out of Adjustment	Shutdown w/Cooldown
1747	Throttle Ctrl 2 Bad Device	Shutdown w/Cooldown
1748	Throttle Ctrl 2 Root Unknown	Warning
1749	Throttle Ctrl 2 Condition Exists	Warning
1751	Throttle Ctrl 2 Warning High	Warning
1752	Throttle Ctrl 2 Moderate High	Warning
1753	Fuel Shutoff 2 OOR High	Warning
1754	Fuel Tmp 2 OOR High	Warning
1755	Fuel Tmp 2 OOR Low	Warning
1756	Gas Flow 2 OOR High	Warning
1757	Gas Flow 2 OOR Low	Warning
1758	Gas Flow 2 Incorrect Data	Warning
1759	FCV 2 Pos Feedback Incorrect	Shutdown w/Cooldown
1761	FCV_Actuator_Error_1761	Shutdown w/Cooldown
1765	FCV 2 In Pr OOR High	Warning
1766	FCV 2 In Pr OOR Low	Warning
1767	FCV 2 Out Pr OOR High	Warning
1768	FCV 2 Out Pr OOR Low	Warning
1769	E_Shutd Indication OORH	Warning
1771	E_Shutd Indication OORL	Warning
1772	Eng Derate Request OORH	Warning
1773	Eng Derate Request OORL	Warning
1774	Oil Priming Pump OORH	Warning
1775	Oil Priming Pump OORL	Warning
1778	Engine_Heater_Control_Driver_High_Error	Warning
1779	Engine_Heater_Control_Driver_Low_Error	Warning
1781	Shutd Request OOR High	Warning

Event/Fault Code	Description	Severity
1782	Shutd Request OOR Low	Warning
1783	Coolant_Pump_Control_Driver_High_Error	Warning
1784	Coolant_Pump_Control_Driver_Low_Error	Warning
1785	Oil_Priming_Pump_Manual_Override_Input_On	Warning
1786	Oil_Priming_Pump_Stuck_On_Error	Warning
1787	Post_Lube_Oil_Priming_Error	Warning
1788	Maintenance_Lube_Oil_Priming_Error	Warning
1789	Pre_Start_Lube_Oil_Priming_Error	Shutdown w/Cooldown
1791	Failure_To_Meet_Load_Speed_Error	Shutdown w/Cooldown
1792	Idle when CB Closed	Warning
1793	Speed/Posit sensor out of Adj	Warning
1794	Fire Detected	Shutdown
1795	Compressor_Bypass_Position_High_Error	Warning
1796	Compressor_Bypass_Position_Low_Error	Warning
1797	Compressor Bypass ctrl OORH	Warning
1798	Compressor Bypass ctrl OORL	Warning
1799	CB_Position_Err_Status	Warning
1811	HIGH_SIDE_DRV2_High_Control_Error (VPS)	Warning
1812	HIGH_SIDE_DRV2_Low_Control_Error (VPS)	Warning
1813	Valve_Proving_System_Test_Failed_Warning_Error	Warning
1814	Valve_Proving_System_Test_Failed_Shutdown_Error	Shutdown w/Cooldown
1815	RLY14_High_Control_Error	Warning
1816	Oil PreHtr Ctrl OOR Low	Warning
1817	Oil_Pre-Heater_Tripped_Error	Warning
1818	Oil_Pre-Heater_Not_Warming_Error	Warning
1819	Common AC Aux CB tripped	Warning
1821	Min_FSO_Speed_Error	Shutdown w/Cooldown
1822	LT Coolant Level Low Shutdown Error	Shutdown w/Cooldown
1823	LT Coolant Level Low Warning Error	Warning
1824	Idle_Rated_Trans_Oil_Temp_Low_Error	Warning
1825	Dirty_Oil_Level_Error	Warning

Event/Fault Code	Description	Severity
1826	ECM Software incompatible	Shutdown w/Cooldown
1827	Fuel_Inlet_Pressure_High_Error	Warning
1828	Fuel_Inlet_Pressure_Low_Error	Warning
1829	Vent_Gas_Valve_Error	Shutdown w/Cooldown
1831	Upstream_FSO_Valve_Error	Shutdown w/Cooldown
1832	Downstream_FSO_Valve_Error	Shutdown w/Cooldown
1833	Engine_Heater_Trip_Error	Warning
1834	Coolant_Pump_Trip_Error	Warning
1835	Oil_Priming_Pump_Tripped_Error	Warning
1836	LCP_(LT)_Low_Serious_Error	Shutdown w/Cooldown
1837	Permanent_FS_Cam_Sync_Lost_Error	Shutdown w/Cooldown
1838	Partial_Engine_Overload_Shutdown_Error	Shutdown w/Cooldown
1839	Fuel_Supply_Pressure_High_Error	Warning
1841	Fuel_Supply_Pressure_Low_Error	Warning
1842	Radiator_Fan_Trip_Error	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 w/Cooldown
1852	Pre-High H2O In Fuel	Warning
1853	Annunciator Input 1 Fault	None
1854	Annunciator Input 2 Fault	None
1855	Annunciator Input 3 Fault	None
1858	Exhaust Aft Inlet O2 OOR High	Warning
1859	Exhaust Aft Inlet O2 OOR Low	Warning
1861	Exhaust Aft Inlet O2 Incorrect	Warning
1862	Exhaust Aft Out O2 OOR High	Warning
1863	Exhaust Aft Outlet O2 OOR Low	Warning

Event/Fault Code	Description	Severity
1864	Exhaust Aft Outlet O2 Incorrect	Warning
1866	EGR_DP_AUTOZERO_ERROR	Warning
1891	Change Oil	Warning
1893	CAN EGR Valve Comm	Warning
1894	CAN VGT Comm Error	Warning
1895	EGA_DL_MISMATCH_ERROR	Warning
1896	EGR DL Valve Stuck	Warning
1899	Low EGR Dif Pressure	Warning
1911	Inj Metering 1 Press High	Warning
1912	Utility Loss Of Phase	Warning
1913	Genset Loss Of Phase	Warning
1914	Utility Phase Rotation	Warning
1915	Genset Phase Rotation	Warning
1916	Sync Check OK	Event
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
1943	CBR_DENSITY_DERATE_ERROR_ID	Event
1944	HMI113 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
1984	Int Man 2 Tmp Moderate High	Warning
1985	Int Man 3 Tmp Moderate High	Warning
1986	Int Man 4 Tmp Moderate High	Warning
1992	Crankshaft Sensor High	Shutdown
1999	Maximum Parallel Time	Warning
2111	Coolant_Inlet_Temperature_(LT)_High_Error	Warning
2112	Coolant_Inlet_Temperature_(LT)_Low_Error	Warning
2113	CIT_(LT)_High_Warning_Error	Warning

Event/Fault Code	Description	Severity
2114	CIT_(LT)_High_Serious_Error	Shutdown
2115	LT_Coolant_Pressure_High_Error	Warning
2116	LT_Coolant_Pressure_Low_Error	Warning
2117	LCP_(LT)_Low_Warning_Error	Warning
2121	Exhaust_Temp_1_(A1)_High_Warning_Error	Warning
2122	Exhaust_Temp_3_(A2)_High_Warning_Error	Warning
2123	Exhaust_Temp_5_(A3)_High_Warning_Error	Warning
2124	Exhaust_Temp_7_(A4)_High_Warning_Error	Warning
2125	Exhaust_Temp_9_(A5)_High_Warning_Error	Warning
2126	Exhaust_Temp_11_(A6)_High_Warning_Error	Warning
2127	Exhaust_Temp_13_(A7)_High_Warning_Error	Warning
2128	Exhaust_Temp_15_(A8)_High_Warning_Error	Warning
2129	Exhaust_Temp_17_(A9)_High_Warning_Error	Warning
2131	Exhaust_Temp_2_(B1)_High_Warning_Error	Warning
2132	Exhaust_Temp_4_(B2)_High_Warning_Error	Warning
2133	Exhaust_Temp_6_(B3)_High_Warning_Error	Warning
2134	Exhaust_Temp_8_(B4)_High_Warning_Error	Warning
2135	Exhaust_Temp_10_(B5)_High_Warning_Error	Warning
2136	Exhaust_Temp_12_(B6)_High_Warning_Error	Warning
2137	Exhaust_Temp_14_(B7)_High_Warning_Error	Warning
2138	Exhaust_Temp_16_(B8)_High_Warning_Error	Warning
2139	Exhaust_Temp_18_(B9)_High_Warning_Error	Warning
2141	Start_Air_Pressure_High_Error	Warning
2142	Start_Air_Pressure_Low_Error	Warning
2143	SAP_Overpressure_Error	Warning
2144	Exhaust Temp 16 (B8) High Serious Error	Shutdown w/Cooldown
2145	Exhaust Temp 18 (B9) High Serious Error	Shutdown w/Cooldown
2146	EGT 17 (A9) OOR Low	Warning
2147	EGT 18 (B9) OOR Low	Warning
2154	Oil_Filter_Outlet_Pressure_High_Error	Warning
2155	Oil_Filter_Outlet_Pressure_Low_Error	Warning
2157	Int Man 2 Tmp Abnormal Rate	Shutdown w/Cooldown

Event/Fault Code	Description	Severity
2158	Int Man 3 Tmp Abnormal Rate	Shutdown w/Cooldown
2159	Int Man 4 Tmp Abnormal Rate	Shutdown w/Cooldown
2185	Sensor Supply 4 High	Warning
2186	Sensor Supply 4 Low	Warning
2188	Exhaust O2 OOR High	Warning
2191	ST_Throttle_Press_Err_Status	Warning
2192	Exhaust O2 OOR Low	Warning
2193	HT Coolant Level Moderate High	Warning
2215	Fuel Pump Press Low	Warning
2216	SAE J1939 Data Link 2 Engine Network - Abnormal Update Rate	Warning
2217	RAM_Image_Word_Error	Warning
2219	Exhaust O2 Moderate High	Warning
2221	Exhaust O2 Moderate Low	Warning
2231	Knock Cyl 1 (A1) OORH	Warning
2232	Knock Cyl 2 (B1) OORH	Warning
2233	Knock Cyl 3 (A2) OORH	Warning
2234	Knock Cyl 4 (B2) OORH	Warning
2235	Knock Cyl 5 (A3) OORH	Warning
2236	Knock Cyl 6 (B3) OORH	Warning
2237	Knock Cyl 7 (A4) OORH	Warning
2238	Knock Cyl 8 (B4) OORH	Warning
2239	Knock Cyl 9 (A5) OORH	Warning
2249	Injector Metering Rail 1 Pressure - Data Valid But Below Normal Operating Range - Most Severe Level	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
2272	EGR_DL_POS_SENSOR_ERROR	Warning
2273	EGR_DELTA_P_OOR_HIGH_ERROR	Warning
2274	EGR_DELTA_P_OOR_LOW_ERROR	Warning
2279	Knock 11 (A6) High Warning	Warning

Event/Fault Code	Description	Severity
2281	Knock 11 (A6) Moderate High	Shutdown w/Cooldown
2282	Knock 11 (A6) Critical High	Shutdown w/Cooldown
2292	APC Flow High	Warning
2293	APC Flow Low	Warning
2298	Fuel Shutoff 2 OOR Low	Warning
2311	EFI Control Valve Fail	Warning
2313	Fuel Control Valve Error	Warning
2315	Red Lamp OOR High	Warning
2316	Amber Lamp OOR High	Warning
2317	Amber Lamp OOR Low	Warning
2322	Engine Camshaft Speed/Pos None Fault	Event
2328	Utility Available	Event
2331	Utility Undervoltage	Warning
2332	Utility Connected	Event
2333	Genset Connected	Event
2335	AC Voltage Sensing Lost (Excitation Fault)	Shutdown
2336	Bad Checksum	Shutdown
2342	Too Long In Idle	Warning
2346	CBR_TFC_DERATE_ERROR_ID	Event
2349	EGR_DL_MOTOR_OPEN_ERROR	Warning
2351	EGR_DL_MOTOR_SHORT_ERROR	Warning
2357	EGR_DL_MOTOR_LOCK_ERROR	Warning
2358	Utility Overvoltage	Warning
2359	EGR_DELTA_P_IR_HIGH_ERROR	Warning
2375	EGR_ORIFICE_TMPTR_OOR_HIGH_ERROR	Warning
2376	EGR_ORIFICE_TMPTR_OOR_LOW_ERROR	Warning
2377	High Fan Control Voltage	Warning
2396	Utility Breaker Fail To Close	Warning
2397	Utility Breaker Fail To Open	Warning
2427	Fuel_Outlet_Pressure_High_Error	Warning
2428	Fuel_Outlet_Pressure_Low_Error	Warning
2431	Knock 1 (A1) High Warning	Warning
2432	Knock 2 (B1) High Warning	Warning

Event/Fault Code	Description	Severity
2433	Knock 3 (A2) High Warning	Warning
2434	Knock 4 (B2) High Warning	Warning
2435	Knock 5 (A3) High Warning	Warning
2436	Knock 6 (B3) High Warning	Warning
2437	Knock 7 (A4) High Warning	Warning
2438	Knock 8 (B4) High Warning	Warning
2439	Knock 9 (A5) High Warning	Warning
2441	Knock 10 (B5) High Warning	Warning
2448	COOLANT_LEVEL_MODERATELY_LOW	Warning
2453	Total Real Power Circuit OORH	Warning
2454	Total Real Power Circuit OORL	Warning
2455	Speed_Bias_Low_Error	Warning
2456	Speed_Bias_High_Error	Warning
2457	Max_Total_Misfire_Error	Shutdown w/Cooldown
2458	Cylinder_2_(B1)_Total_Misfire_Error	Warning
2459	Cylinder_4_(B2)_Total_Misfire_Error	Warning
2461	Cylinder_6_(B3)_Total_Misfire_Error	Warning
2462	Cylinder_8_(B4)_Total_Misfire_Error	Warning
2463	Cylinder_10_(B5)_Total_Misfire_Error	Warning
2464	Cylinder_12_(B6)_Total_Misfire_Error	Warning
2465	Cylinder_14_(B7)_Total_Misfire_Error	Warning
2466	Cylinder_16_(B8)_Total_Misfire_Error	Warning
2467	Cylinder_18_(B9)_Total_Misfire_Error	Warning
2469	Cylinder_1_(A1)_Total_Misfire_Error	Warning
2471	Cylinder_3_(A2)_Total_Misfire_Error	Warning
2472	Cylinder_5_(A3)_Total_Misfire_Error	Warning
2473	Cylinder_7_(A4)_Total_Misfire_Error	Warning
2475	Cylinder_9_(A5)_Total_Misfire_Error	Warning
2476	Cylinder_11_(A6)_Total_Misfire_Error	Warning
2477	Cylinder_13_(A7)_Total_Misfire_Error	Warning
2478	Cylinder_15_(A8)_Total_Misfire_Error	Warning
2479	Cylinder_17_(A9)_Total_Misfire_Error	Warning
2482	Start_Before_Ready_Error	Shutdown w/Cooldown

Event/Fault Code	Description	Severity
2483	Continuous_Starter_Failure_Error	Shutdown w/Cooldown
2484	Exhaust Temperature 1 (A1) Abnormal Rate	Shutdown w/Cooldown
2485	Exhaust Temperature 3 (A2) Abnormal Rate	Shutdown w/Cooldown
2486	Exhaust Temperature 5 (A3) Abnormal Rate	Shutdown w/Cooldown
2487	Exhaust Temperature 7 (A4) Abnormal Rate	Shutdown w/Cooldown
2488	Exhaust Temperature 9 (A5) Abnormal Rate	Shutdown w/Cooldown
2489	Exhaust Temperature 11 (A6) Abnormal Rate	Shutdown w/Cooldown
2491	Exhaust Temperature 13 (A7) Abnormal Rate	Shutdown w/Cooldown
2492	Exhaust Temperature 15 (A8) Abnormal Rate	Shutdown w/Cooldown
2493	Exhaust Temperature 17 (A9) Abnormal Rate	Shutdown w/Cooldown
2494	Exhaust Temperature 2 (B1) Abnormal Rate	Shutdown w/Cooldown
2495	Exhaust Temperature 4 (B2) Abnormal Rate	Shutdown w/Cooldown
2496	Exhaust Temperature 6 (B3) Abnormal Rate	Shutdown w/Cooldown
2497	Exhaust Temperature 8 (B4) Abnormal Rate	Shutdown w/Cooldown
2498	Exhaust Temperature 10 (B5) Abnormal Rate	Shutdown w/Cooldown
2499	Exhaust Temperature 12 (B6) Abnormal Rate	Shutdown w/Cooldown
2511	Exhaust Temperature 14 (B7) Abnormal Rate	Shutdown w/Cooldown
2512	Exhaust Temperature 16 (B8) Abnormal Rate	Shutdown w/Cooldown
2513	Exhaust Temperature 18 (B9) Abnormal Rate	Shutdown w/Cooldown
2514	Exhaust Temperature 19 (A10) Abnormal Rate	Shutdown w/Cooldown
2515	Exhaust Temperature 20 (B10) Abnormal Rate	Shutdown w/Cooldown

Event/Fault Code	Description	Severity
2517	Compressor_Outlet_Pressure_High_Error	Warning
2518	Compressor_Outlet_Pressure_Low_Error	Warning
2521	Bank_Id_Error	Shutdown w/Cooldown
2522	Continuous_Light_Knock_Error_1_(A1)	Shutdown w/Cooldown
2523	Continuous_Light_Knock_Error_2_(B1)	Shutdown w/Cooldown
2524	Continuous_Light_Knock_Error_3_(A2)	Shutdown w/Cooldown
2525	Continuous_Light_Knock_Error_4_(B2)	Shutdown w/Cooldown
2526	Continuous_Light_Knock_Error_5_(A3)	Shutdown w/Cooldown
2527	Continuous_Light_Knock_Error_6_(B3)	Shutdown w/Cooldown
2528	Continuous_Light_Knock_Error_7_(A4)	Shutdown w/Cooldown
2529	Continuous_Light_Knock_Error_8_(B4)	Shutdown w/Cooldown
2531	Continuous_Light_Knock_Error_9_(A5)	Shutdown w/Cooldown
2532	Continuous_Light_Knock_Error_10_(B5)	Shutdown w/Cooldown
2539	High Voltage Bias	Warning
2541	Low Voltage Bias	Warning
2544	ECM_Overtemp_Error	Shutdown w/Cooldown
2545	Keysw Reset Required	Warning
2553	Engine Oil Level Low Warning Error	Warning
2555	Low GHC 1 Voltage	Warning
2556	High GHC 1 Voltage	Warning
2567	DG_Air_Compressor_Trip_Error	Warning
2568	Gas Supply Pressure Critical High	Shutdown w/Cooldown
2569	Gas Supply Pressure Critical Low	Shutdown w/Cooldown
2586	Spark Plug 1 (A1) High Warning	Event
2587	Spark Plug 2 (B1) High Warning	Event

Event/Fault Code	Description	Severity
2588	Spark Plug 3 (A2) High Warning	Event
2589	Spark Plug 4 (B2) High Warning	Event
2591	Spark Plug 5 (A3) High Warning	Event
2592	Spark Plug 6 (B3) High Warning	Event
2593	Spark Plug 1 (A1) Low Warning	Event
2594	Spark Plug 2 (B1) Low Warning	Event
2595	Spark Plug 3 (A2) Low Warning	Event
2596	Spark Plug 4 (B2) Low Warning	Event
2597	Spark Plug 5 (A3) Low Warning	Event
2598	Spark Plug 6 (B3) Low Warning	Event
2619	Auxiliary input 1 Active- Condition Exists	Event
2621	Aux101 0 Input 2 Fault	Event
2622	Aux101 0 Input 3 Fault	Event
2623	Aux101 0 Input 4 Fault	Event
2624	Aux101 0 Input 5 Fault	Event
2625	Aux101 0 Input 6 Fault	Event
2626	Aux101 0 Input 7 Fault	Event
2627	Aux101 0 Input 8 Fault	Event
2628	Aux102 0 Expansion Input 9 Fault	Event
2629	Aux102 0 Expansion Input 10 Fault	Event
2631	Aux102 0 Expansion Input 11 Fault	Event
2632	Aux102 0 Expansion Input 12 Fault	Event
2643	Throttle Pos 2 Feedback OOR High	Warning
2644	Throttle Pos 2 Feedback OOR Low	Warning
2646	HT Coolant Temperature Condition Exists	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 Ack : Most severe Fault	Warning
2678	Charging Alternator Fail	Warning
2724	Gas Supply Pr Moderate High	Warning
2725	Gas Supply Pr Moderate Low	Warning
2727	SAE J1939 Data Link 2 Engine Network - Abnormal Update Rate	Warning

Event/Fault Code	Description	Severity
2737	Exh Gas Tmp Critical High	Shutdown w/Cooldown
2738	ETHER_INJ_LOW_CTRL_ERROR	Warning
2739	ETHER_INJ_HIGH_CTRL_ERROR	Warning
2752	Throttle Actuator - Shorted High	Shutdown w/Cooldown
2766	Bank_A_CCD_Failed_Error	Shutdown w/Cooldown
2767	Bank_B_CCD_Failed_Error	Shutdown w/Cooldown
2768	CAN Parent Communication Incorrect	Shutdown w/Cooldown
2769	CAN Child Com Incorrect	Shutdown w/Cooldown
2774	EGR_DP_CLOGGED_TUBES_ERROR	Warning
2779	Utility Unloaded Event	Event
2789	COT_Low_Error	Warning
2793	COT_Low_Serious_Error	Shutdown w/Cooldown
2794	Ign Shutd Relay OOR High	Warning
2795	Ign Shutd Relay OOR Low	Warning
2796	Partial_Engine_Overload_Warning_Error	Warning
2797	Inlet Gas Diff Pressure OOR High	Warning
2798	Inlet Gas Diff Pressure OOR Low	Warning
2799	IMOP_Compressor_Outlet_Presure_Delta_Error	Shutdown w/Cooldown
2811	IMOP_Compressor_Outlet_Pressure_Maximum_Error	Shutdown w/Cooldown
2812	Throttle Control Actuator Error	Shutdown w/Cooldown
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

Event/Fault Code	Description	Severity
2837	Exhaust_Temp_1_(A1)_Deviation_Error	Warning
2838	Exhaust_Temp_3_(A2)_Deviation_Error	Warning
2839	Exhaust_Temp_5_(A3)_Deviation_Error	Warning
2841	Exhaust_Temp_7_(A4)_Deviation_Error	Warning
2842	Exhaust_Temp_9_(A5)_Deviation_Error	Warning
2843	Exhaust_Temp_11_(A6)_Deviation_Error	Warning
2844	Exhaust_Temp_13_(A7)_Deviation_Error	Warning
2845	Exhaust_Temp_15_(A8)_Deviation_Error	Warning
2846	Exhaust_Temp_17_(A9)_Deviation_Error	Warning
2847	Exhaust_Temp_2_(B1)_Deviation_Error	Warning
2848	Exhaust_Temp_4_(B2)_Deviation_Error	Warning
2849	Exhaust_Temp_6_(B3)_Deviation_Error	Warning
2851	Exhaust_Temp_8_(B4)_Deviation_Error	Warning
2852	Exhaust_Temp_10_(B5)_Deviation_Error	Warning
2853	Exhaust_Temp_12_(B6)_Deviation_Error	Warning
2854	Exhaust_Temp_14_(B7)_Deviation_Error	Warning
2855	Exhaust_Temp_16_(B8)_Deviation_Error	Warning
2856	Exhaust_Temp_18_(B9)_Deviation_Error	Warning
2857	Turbo_1_Overspeed_Critical_Error	Shutdown w/Cooldown
2858	Turbo_2_Overspeed_Critical_Error	Shutdown w/Cooldown
2859	Alt Heater Ctrl OOR High	Warning
2861	Alt Heater Ctrl OOR Low	Warning
2862	Gen Alternator 1st Start Cond Exists	Warning
2863	Genset to Engine Com Incorrect	Shutdown w/Cooldown
2864	FSO_NON_High_Control_Error	Shutdown w/Cooldown
2866	FCV_Position_High_Error	Warning
2867	FCV_Position_Low_Error	Warning
2868	Engine_Heater_Over-Temperature_Alarm_Error	Warning
2869	HT Cool Temp Driver OOR High	Warning
2871	HT Cool Temp Driver OOR Low	Warning
2872	HT Cool Temp Driver Cond Exists	Warning
2873	LT Cool Temp Driver OOR High	Warning

Event/Fault Code	Description	Severity
2874	LT Cool Temp Driver OOR Low	Warning
2875	LT Cool Temp Driver Cond Exists	Warning
2876	WarninjgComp_Surge_Shutdown_Error	Shutdown w/Cooldown
2877	Comp_Surge_Derate_Error	Warning
2882	Aux101 1 Input 1 Fault	Event
2883	Aux101 1 Input 2 Fault	Event
2884	Aux101 1 Input 3 Fault	Event
2885	Aux101 1 Input 4 Fault	Event
2886	Aux101 1 Input 5 Fault	Event
2887	Aux101 1 Input 6 Fault	Event
2888	Aux101 1 Input 7 Fault	Event
2889	Aux101 1 Input 8 Fault	Event
2891	Aux102 1 Expansion Input 9 Fault	Event
2892	Aux102 1 Expansion Input 10 Fault	Event
2893	Aux102 1 Expansion Input 11 Fault	Event
2894	Aux102 1 Expansion Input 12 Fault	Event
2895	PCCnet Device Failed	Warning
2896	Critical PCCnet Dev Fail	Shutdown
2912	Voltage Reconnect Switch Position Error	Shutdown
2913	Voltage Reconnect Switch Operated In Running	Shutdown
2914	Genset AC Meter Failed	Shutdown
2915	Genset Bus AC Meter Failed	Warning
2916	Utility AC Meter Failed	Warning
2917	High Genset Bus Voltage	Warning
2918	Utility Voltage OOR Warning	Warning
2919	Utility Current OOR Warning	Warning
2921	High Genset Bus Current	Warning
2922	High Genset Neutral Curr	Warning
2923	High Genset Bus kW	Warning
2924	High Genset Bus kVAR	Warning
2925	High Genset Bus kVA	Warning
2926	Utility kW OOR Warning	Warning
2927	Utility kVAR OOR Warning	Warning

Event/Fault Code	Description	Severity
2928	Utility kVA OOR Warning	Warning
2931	AUX101 Device ID Fault	Shutdown
2932	AUX101 Oil Temp OOR High	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
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
2961	EGR_TORQUE_DERATE_ERROR	Event
2962	EGR_RPM_DERATE_ERROR	Warning
2963	HT Coolant Temperature Warning High	Event
2965	Genset Available	Event
2971	Test/Exercise Fault	None
2972	Field Overload	Shutdown

Event/Fault Code	Description	Severity
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
2994	MC68302_Error	Warning
2995	Int Man Pressure 1 Critical High	Shutdown w/Cooldown
2996	Int Man Pressure 1 Moderate High	Warning
2997	Exhaust O2 Critical Low	Shutdown w/Cooldown
3111	Excessive_Mech_Vibration_1_(A1)	Shutdown w/Cooldown
3112	Excessive_Mech_Vibration_2_(B1)	Shutdown w/Cooldown
3113	Excessive_Mech_Vibration_3_(A2)	Shutdown w/Cooldown
3114	Excessive_Mech_Vibration_4_(B2)	Shutdown w/Cooldown
3115	Excessive_Mech_Vibration_5_(A3)	Shutdown w/Cooldown
3116	Excessive_Mech_Vibration_6_(B3)	Shutdown w/Cooldown
3117	Excessive_Mech_Vibration_7_(A4)	Shutdown w/Cooldown
3118	Excessive_Mech_Vibration_8_(B4)	Shutdown w/Cooldown
3119	Excessive_Mech_Vibration_9_(A5)	Shutdown w/Cooldown
3121	Excessive_Mech_Vibration_10_(B5)	Shutdown w/Cooldown

Event/Fault Code	Description	Severity
3122	Excessive_Mech_Vibration_11_(A6)	Shutdown w/Cooldown
3123	Excessive_Mech_Vibration_12_(B6)	Shutdown w/Cooldown
3124	Excessive_Mech_Vibration_13_(A7)	Shutdown w/Cooldown
3125	Excessive_Mech_Vibration_14_(B7)	Shutdown w/Cooldown
3126	Excessive_Mech_Vibration_15_(A8)	Shutdown w/Cooldown
3127	Excessive_Mech_Vibration_16_(B8)	Shutdown w/Cooldown
3128	Excessive_Mech_Vibration_17_(A9)	Shutdown w/Cooldown
3129	Excessive_Mech_Vibration_18_(B9)	Shutdown w/Cooldown
3131	Secondary Engine Overspeed	Shutdown
3139	ASO Solenoid out of range high	Warning
3141	ASO Solenoid out of range low	Warning
3226	Base Load	Event
3227	Peak Shave	Event
3262	Spark Plug 7 (A4) High Warning	Event
3263	Spark Plug 7 (A4) Low Warning	Event
3264	Spark Plug 8 (B4) High Warning	Event
3265	Spark Plug 8 (B4) Low Warning	Event
3266	Spark Plug 9 (A5) High Warning	Event
3267	Spark Plug 9 (A5) Low Warning	Event
3268	Spark Plug 10 (B5) High Warning	Event
3269	Spark Plug 10 (B5) Low Warning	Event
3271	Spark Plug 11 (A6) High Warning	Event
3272	Spark Plug 11 (A6) Low Warning	Event
3273	Spark Plug 12 (B6) High Warning	Event
3274	Spark Plug 12 (B6) Low Warning	Event
3275	Spark Plug 13 (A7) High Warning	Event
3276	Spark Plug 13 (A7) Low Warning	Event
3277	Spark Plug 14 (B7) High Warning	Event
3278	Spark Plug 14 (B7) Low Warning	Event

Event/Fault Code	Description	Severity
3279	Spark Plug 15 (A8) High Warning	Event
3281	Spark Plug 15 (A8) Low Warning	Event
3282	Spark Plug 16 (B8) High Warning	Event
3283	Spark Plug 16 (B8) Low Warning	Event
3284	Spark Plug 17 (A9) High Warning	Event
3285	Spark Plug 17 (A9) Low Warning	Event
3286	Spark Plug 18 (B9) High Warning	Event
3287	Spark Plug 18 (B9) Low Warning	Event
3288	Exhaust Aft Outlet Oxygen Relay OORH	Warning
3289	Exhaust Aft Outlet Oxygen Relay OORL	Warning
3291	Exhaust Aft Inlet Oxygen Relay OORH	Warning
3292	Exhaust Aft Inlet Oxygen Relay OORL	Warning
3293	Exhaust Oxygen Relay OORH	Warning
3294	Exhaust Oxygen Relay OORL	Warning
3362	Power Conservation Control OORH	Warning
3363	Power Conservation Control OORL	Warning
3364	Power Conservation Control Cond Exists	Warning
3365	External Air Pressure Low Warning Error	Warning
3379	Engine ECU Temperature - Data Valid But Above Normal Operating Range -Moderately Severe Level	Warning
3384	Manifold_Absolute_Pressure_2_High_Error	Warning
3391	Manifold_Absolute_Pressure_2_Low_Error	Warning
3392	Int Man Pressure 2 Critical High	Shutdown w/Cooldown
3393	Int Man Pressure 2 Moderate High	Warning
3397	Low Gearbox Oil Pressure - Condition Exists	Shutdown
3398	High Gearbox Oil Pressure - 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
3416	Start System Fault - Condition Exists	Warning

Event/Fault Code	Description	Severity
3417	Alternator Heater Trip Fault - Condition Exists	Warning
3457	Loss of Bus Voltage Sensing	Warning
3458	Knock Engine Derate	Warning
3475	Engine Electronic Fuel Valve #2 OORH	Warning
3476	Engine Electronic Fuel Valve #2 OORL	Warning
3479	Start - Inhibit Shutdown Fault Event	Shutdown
3481	Start - Inhibit Warning Fault Event	None
3482	Off Load Running Fault	Shutdown
3483	High Alternator Temperature 1 Shutdown Fault	Shutdown
3484	High Alternator Temperature 2 Shutdown Fault	Shutdown
3485	High Alternator Temperature 3 Shutdown Fault	Shutdown
3486	High Drive End Bearing Temperature Shutdown Fault	Shutdown
3487	High Non-Drive End Bearing Temp Shutdown Fault	Shutdown
3489	Compressor Bypass Actuator Error	Warning
3491	Oil Filter Restriction High	Shutdown w/Cooldown
3499	Throttle Actuator 2 - Special Instruction	Shutdown w/Cooldown
3511	Throttle Actuator 2 - Shorted High	Shutdown w/Cooldown
3512	Throttle Actuator 2 - Shorted Low	Shutdown w/Cooldown
3513	Negative Sequence Overcurrent	Warning
3514	Throttle Actuator - Shorted Low	Shutdown w/Cooldown
3515	Throttle Actuator - Special Instruction	Shutdown w/Cooldown
3521	Throttle Actuator - Temperature Low	Warning
3522	Throttle Actuator 2 - Temp Low	Warning
3599	Ground Current OOR Warning	Warning
3611	Custom Overcurrent Fault	Warning
3629	Device Calibration Update Recommended	Warning
3631	Device Calibration Update Required	Shutdown
3722	Boost Pressure Bank Imbalance Fault Due to Closed ASOV or other restriction	Shutdown
3869	LVRT Device Error	Warning
3871	LVRT Abnormal Rate	Warning

Event/Fault Code	Description	Severity
3872	LVRT Count Error	Warning
3873	LVRT Count Error	Shutdown
3874	LVRT Stuck On	Warning
3875	LVRT Detection Error	Warning
3915	Comp Wast Act Out of Cal	Warning
3919	Comp Wast Act Temp Warning Hi	Warning
3921	Comp Wast Act Mech Sys Out of Adj	Warning
3922	Comp Wast Act OOR Hi	Warning
3923	Comp Wast Act OOR Lo	Warning
3924	Utility Reverse Pwrs	Warning
3925	Comp Wast Act Pos Incorrect	Warning
4484	ASO shutdown commaned however engine failed to stop	Shutdown
4533	After treatment 1 Diesel Oxidation Catalyst Intake Temperature Sensor Circuit - Voltage above normal, or shorted to high source	Warning
4534	After treatment 1 Diesel Oxidation Catalyst Intake Temperature Sensor Circuit - Voltage below normal, or shorted to low source	Warning
4615	Engine Fuel Delivery Pressure - Data Valid But Above Normal Operating Range - Most Severe Level	Shutdown
4617	Thr Delta Pr OOR Hi	Warning
4618	Thr Delta Pr OOR Lo	Warning
4619	Int Man 2 PR Incorrect	Warning
4621	Comp Out Pr Incorrect	Warning
4622	FCV In Pr Incorrect	Warning
4623	FCV 2 In Pr Incorrect	Warning
4624	FCV Out Pr Incorrect	Warning
4625	FCV 2 Out Pr Incorrect	Warning
4626	Exh Back Pr Incorrect	Warning
4627	HTC Eng in Tmp OOR Hi	Warning
4628	HTC Eng In Tmp Moderate Hi	Warning
4629	HTC Eng In Tmp Critical Hi	Warning
4631	Thr Delta Pr Incorrect	Shutdown/Stop
4695	MIL Ctrl Data Com Incorrect	Warning
4696	Crankcase Pressure 2 Sensor Circuit – Voltage above normal, or shorted to high source	Warning

Event/Fault Code	Description	Severity
4714	MIL Condition Exists	Warning
4729	Intake Manifold Vacuum Detected - Bank 1	Shutdown
4761	Genset Voltage Sensing MCB Shutdown Fault	Shutdown
4862	Engine Knock - Special Instructions	Shutdown
4872	System Network Failure	Warning
4873	Genset Failed to Come Online	Warning
4874	Load Demand SW Version Incompatibility	Warning
4875	Genset Ineligible for Load Demand	None
4876	Genset Lost on System Network	Warning
4877	System Settings not Synchronized	Warning
4878	Check System Network Installation	Warning
4879	Load Demand Setup Error	Warning
4881	System Genset ID Conflict	Warning
4882	Genset Bus Overload	Warning
4883	Prelube Cycle failed	Warning
4884	Prelube Pump Stuck ON	Warning
4885	Fuel Supply Pump Not Responding	Shutdown
4886	Fuel Pump Voltage Moderate Lo	Warning
4887	Fuel Supply Voltage Below Normal	Shutdown
4888	Fuel Supply Temp: Moderate Hi	Shutdown
4889	Fuel Supply Temp Critical Hi	Shutdown
4891	Fuel Supply Pump Root Unknown Cause	Warning
4892	Fuel Supply Pump Update Rate Error	Warning
4893	Fuel Filter Press Moderate Hi	Warning
4894	Fuel Supply Pump Calib Error	Warning
4927	Fuel Valve 1 Bad Device	Warning
4928	Fuel Valve 1 Power Supply Data Incorrect	Warning
4929	Fuel Valve 1 Power Supply OORH	Warning
4931	Fuel Valve 1 Power Supply OORL	Warning
4932	Fuel Valve 1 Temp Above Normal	None
4933	Fuel Valve 1 Position Data Error	None
4934	Fuel Valve 1 Voltage OORH	Warning
4935	Fuel Valve 1 Voltage OORL	Warning
4936	Fuel Valve 1 Unknown Cause	Warning

Event/Fault Code	Description	Severity
4937	Fuel Valve 1 Calib Error	Warning
4941	Starter Control Voltage OORH	Warning
4942	Starter Control Voltage OORL	Warning
4943	Failed To Crank Condition Exists	Warning
4944	Failed To Start Condition Exists	Warning
4945	Uncommanded Crank Cond Exists	Warning
4946	Engine Crank Without Prelube Condition Exists	None
4951	Maintain ECU Power Lamp OOR High	Warning
4952	Maintain ECU Power Lamp OOR Low	Warning
4956	Turbocharger Actuator S/W Out of Calibration	Warning
4957	Variable Geometry Turbocharger Actuator Software	Warning
4958	Fuel Valve 1 Data Incorrect	Warning
4959	Fuel Valve 1 Cond Exists	None
4961	Fuel Valve 1 Update Rate Error	None
5114	Intake Manifold Vacuum Detected – Bank 2	Shutdown
5119	Fuel Pump Oil Pressure Sensor OORH	Warning
5121	Fuel Pump Oil Pressure Sensor OORL	Warning
5122	Fuel Pump Oil Pressure Sensor Data Incorrect	Warning
5123	Injector Solenoid 19 Low Current	Warning
5124	Injector Solenoid 20 Low Current	Warning
5134	Unknown Shutdown at Idle	Shutdown
5135	Genset Overload	Shutdown
5145	Load Demand Genset Bus Failure	Warning
5148	Allow Start Override Active Cond Exists	Warning
5149	Prelube Cycle failed during Non-Emergency start	Shutdown
5151	Intake air restriction indicator 1 active	Warning
5152	Intake air restriction indicator 2 active	Warning
5153	Intake air restriction indicator 3 active	Warning
5154	Intake air restriction indicator 4 active	Warning
5155	Low Battery 1 Voltage	Warning
5156	Low Battery 2 Voltage	Warning
5157	Low Battery 3 Voltage	Warning
5158	Low Battery 4 Voltage	Warning
5159	Weak Battery 1	Warning

Event/Fault Code	Description	Severity
5161	Weak Battery 2	Warning
5162	Weak Battery 3	Warning
5163	Weak Battery 4	Warning
5164	Battery Charger 2 Failed Fault	Warning
5165	Battery Charger 3 Failed Fault	Warning
5166	Battery Charger 4 Failed Fault	Warning
5177	VGT Actuator Driver Circuit Abnormal update rate	Warning
5178	Crankcase Pressure 2 Data Incorrect	Warning
5182	AUX101 0 Input 1 Fault	E
5221	ASO Position Switch mismatch	Shutdown
5258	Genset Voltage Sensing MCB Protection Warning	Warning
5283	High Battery 1 Voltage	Warning
5284	High Battery 1 Voltage	Warning
5285	High Battery 1 Voltage	Warning
5286	High Battery 1 Voltage	Warning
5287	Starter Air Supply Pressure Low	Warning
5288	Starter Air Tank Volume Low	Warning
5291	Operator E-Stop Active	Shutdown
5292	Max time exceeded since last ASOV System test	Warning
5362	Aftertreatment System Normal Shutdown Request	Shutdown w/Cooldown
5363	Aftertreatment system Datalink Degraded	Warning
5365	Fuel System on Secondary Source - Condition Exists	Warning
5366	High Water in Fuel Sensed by Indicator 2 - Warning	Warning
5367	High Water in Fuel Sensed by Indicator 2-Shutdown	Shutdown
5377	AUX101-3 Communication Lost Fault	Warning
5378	AUX101-4 Communication Lost Fault	Warning
5386	AT1 DOC Intake Temperature Error	Warning
5387	AT1 DOC Intake Temperature Most Severe Level	Shutdown
5388	AT1 DOC Intake Temp Moderately Severe Level	Shutdown
5389	AT1 DOC Intake Temperature Least Severe Level	Warning
5391	AT DOC Temperature Sensor Module - Abnormal	Warning
5392	AT DOC Temperature Sensor Module - Bad device	Warning
5393	AT DOC Temperature Sensor Module OOR High	Warning

Event/Fault Code	Description	Severity
5394	AT DOC Temperature Sensor Module OOR Low	Warning
5395	AT DOC Temp Sensor Root Cause Not Known	Warning
5396	AT DOC Temperature Sensor Module High	Warning
5397	L-N Short Circuit Shutdown	Shutdown
5398	L-L Short Circuit Shutdown	Shutdown
5399	AmpSentry Maintenance Mode Active	None
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
5489	ECM Write Failed – Multiple Tools connected to ECM	Warning
5491	ECM Write Failed – Unknown Reason	Warning
5492	OTIS Read Failed – Unknown Reason	Warning
5493	ECM Write Failed – Data Save Failure	Warning
5529	Prelube Setup Fault - Condition Exists	Warning
5531	Cam Position Frequency Mismatch	Shutdown
5576	Engine Air Filter Differential Press Least Severe	Warning
5585	Fuel Filter Differential Press Moderately Severe	Warning
5617	AT1 DOC System - Special Instructions	Shutdown w/Cooldown
5631	SCR Sys Cleaning Inhibited due to System Timeout	None
5632	SCR Sys Cleaning Inhibited due to Inhibit Switch	None
5637	Unknown Shutdown at Startup	Shutdown
5669	Intake Manifold Over Pressure - Condition Exists	Shutdown
5711	AT DEF Replenishment Failure	Warning
5713	Dead Battery Warning	Warning
5714	Primary Starting System Failed	Warning
5718	Memory Write Failed	Warning
5719	Power Lost During Memory Save	Warning
5720	Auto Trims Memory Save Failure	Warning
5721	Manual Trims Save Failed	Shutdown
5722	Manual Trims Save Failed	Shutdown
5723	Paralleling Cable Not Detected - Condition Exists	None
5732	Alternator Auto Lube System Failed	Warning
5733	DC prelube system failed	Warning

Event/Fault Code	Description	Severity
5777	Diesel Exhaust Fluid Pressure 2 - Data Erratic	Warning
5723	Paralleling Cable Not Detected	Event
5862	Engine Diesel Fuel Metering Valve Position Sensor Circuit -Voltage Above Normal or Shorted to High Source	Warning
5863	Engine Diesel Fuel Metering Valve P Err	Warning
5875	ECUs Reported DTCs Affecting Operation - Data Valid But Above Normal Operating Range - Most Severe Level	Shutdown
5876	Other ECUs Reported DTCs Affecting Operation - Data Valid But Above Normal Operating Range - Moderately Severe Level	Warning
5877	Diagnostic Trouble Codes Affecting Operation - Data Valid But Above Normal Operating Range - Least Severe Level	Event
5879	"Throttle_Driver_Feedback_High_Error"	Warning
5881	"Throttle_Driver_Feedback_Low_Error"	Warning
5882	Copy - "Throttle_Driver_Feedback_Low_Error"	Warning
5886	"Oil Heater System Failed"	Warning
5949	SAE J1939 Data Link 2 Eng Network Special Instructions	Shutdown
6251	Exhaust Gas Temperature Bank Imbalance - Data Valid But Above Normal Operating Range - Moderately Severe Level	Warning
6252	Exhaust Gas Temperature Bank Imbalance - Data Valid But Above Normal Operating Range - Most Severe Level	Shutdown
6253	Control Module Identification Input State Error - Special Instructions	Warning
6487	Nominal Voltage Setup OOR	Shutdown
6573	Engine Diesel Fuel Metering Valve Temperature - Data Valid But Above Normal Operating Range - Moderately Severe Level	Warning
6574	Engine Diesel Fuel Metering Valve Temperature - Data Valid But Above Normal Operating Range - Most Severe Level	NONE
6598	At Least One Uncleared ECS Shutdown Fault Exists	Warning
6638	Cold Start Idle - Active	None
6719	Engine Fuel Delivery Pressure - Data Valid But Above Normal Operating Range - Most Severe Level	Shutdown
6778	Nominal Voltage Mismatch-MLD	Shutdown
6818	Alternate Frequency Mismatch-MLD	Shutdown
6875	Under Excitation Fault	Shutdown
7548	Engine Friction Below Baseline - Least Severe	None

Event/Fault Code	Description	Severity
7549	Engine Friction Below Baseline - Moderately Severe	Warning
7551	Engine Friction Above Baseline - Least Severe	None
7552	Engine Friction Above Baseline - Moderately Severe	Warning
7553	Engine Friction Devn Above Baseline - Mod Severity	Warning
7554	Engine Friction Devn Above Baseline - Most Severe	Shutdown
7555	Alternator Feedback Power Loss	Shutdown
7892	Start Signal Integrity Failure	Warning
9945	Injector_6_Circuit_2_Error	Warning
9946	Injector_5_Circuit_2_Error	Warning
9947	Injector_4_Circuit_2_Error	Warning
9948	Injector_3_Circuit_2_Error	Warning
9949	Injector_2_Circuit_2_Error	Warning
9951	Injector_1_Circuit_2_Error	Warning
9971	ECM Derate Fault	Event
9973	Watchdog Reset Occurrence	Event

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 - Danfoss™ 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 voltage 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 voltage) if the FC is active. If FC441 is not active, relace the harness.
2. Button 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 navigate 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 voltage 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 displayed 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.
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- 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.

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- 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

<p>Part number 382275800 - Male Deutsch/AMP/Metri-Pack test lead Part number 382291700 - Female Deutsch/AMP/Metri-Pack test lead</p>

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.

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- 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.
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- 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.

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- 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.

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- 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 12-16 V on a 12 VDC system and 24-32 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 12-16 VDC in a 12 VDC system or 24-32 VDC in a 24 VDC system. Verify that the battery voltage matches the voltage that the control is calibrated for. If the generator set 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 > CtrlId 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 cooldown and 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 1247 - Engine Quiet Shutdown

Logic:

Engine Quiet Shutdown fault has occurred in the engine ECM.

Possible Causes:

1. Engine Quiet Shutdown fault.

Diagnosis and Repair:

1. Engine Quiet Shutdown fault.
 - a. Event/Fault code 1247 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 1247; then troubleshoot the shutdown fault(s) (Reference the Engine Service Manual)

10.8.45 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).

10.8.46 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.

10.8.47 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.

10.8.48 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.

10.8.49 Code 1322 - kW Setpoint OOR Hi

Logic:

If the "KW Load Setpoint OOR Check Enable" is enabled and the "KW Load Setpoint OOR High Limit" has been exceeded for the time that is registered in the "KW Load Setpoint OOR Time" the generator set control will display event/fault code 1322.

Possible Causes:

1. Wiring issue.
2. "Load Govern KW Setpoint RC Enable" is incorrectly set.

Diagnosis and Repair:

1. Wiring issue.
 - a. Ensure that the KW Load Setpoint analog input (configurable analog Input #1) is not shorted high or disconnected. On the control, the KW Load Setpoint analog input is located at:
TB9 – 1 Sense
TB9 – 2 Return
2. "Load Govern KW Setpoint RC Enable" is incorrectly set.
 - a. The "Load Govern KW Setpoint RC Enable" limits the KW Load Govern voltage input from 0 - 5 volts, when set to "Enable" (at TB9-1 and TB9-2); if the voltage input into the KW Load Govern input exceeds 5 VDC, the generator set control locks the KW output to zero since the control logic states that the voltage input is out of range, and displays event/fault code 1322. When the "Load Govern KW Setpoint RC Enable" parameter is set to "Disable" a greater input voltage than 5 VDC is recognized; a 24 VDC input is treated as a 5 VDC input. To change the "Load Govern KW Setpoint RC Enable" parameter appropriately for the application, on the display go to: **Setup > Paralleling Setup > Basic > Load Govern KW Setpoint RC Enable** and set appropriately.

10.8.50 Code 1323 - kW Setpoint OOR Lo

Logic:

If the "KW Load Setpoint OOR Check Enable" is enabled and the KW Load Setpoint analog input is below the "KW Load Setpoint OOR Low Limit" for the time that is registered in the "KW Load Setpoint OOR Time" the generator set control will display event/fault code 1323.

Possible Causes:

1. Wiring issue.
2. KW Load Setpoint input voltage is too low.

Diagnosis and Repair:

1. Wiring issue.
 - a. Ensure that the KW Load Setpoint analog input (configurable analog Input #1) is not shorted low, or disconnected. On the control, the speed bias analog input is located at:
TB9 – 1 Sense
TB9 – 2 Return
2. KW Load Setpoint input voltage is too low.
 - a. If the voltage input at TB9-1 and TB9-2 is below the "KW Load Setpoint OOR Low Limit", the control will register that input as shorted low. Ensure that the voltage input at TB9-1 and TB9-2 is greater than "KW Load Setpoint OOR Low Limit". To verify the voltage value of the "KW Load Setpoint OOR Low Limit" check the parameter section.

10.8.51 Code 1324 - kVAR Setpoint OOR Hi

Logic:

If the "KVAR Load Setpoint OOR Check Enable" is enabled and the KVAR Load Setpoint analog input exceeds the "KVAR Load Setpoint OOR High Limit" parameter for the time that is registered in the "KVAR Load Setpoint OOR Time"; the generator set control will display event/fault code 1324.

Possible Causes:

1. Wiring issue.
2. "Load Govern KVAR Setpoint RC Enable" is incorrectly set.

Diagnosis and Repair:

1. Wiring issue.
 - a. Ensure that the KVAR Load Setpoint analog input (configurable analog Input #2) is not shorted high or disconnected. On the control, the voltage bias analog input is located at:
TB9 – 3 Sense
TB9 – 2 Return
2. "Load Govern KVAR Setpoint RC Enable" is incorrectly set.
 - a. The "Load Govern KVAR Setpoint RC Enable" limits the KVAR Load Govern voltage input from 0 - 5 volts, when set to "Enable" (at TB9-3 and TB9-2); if the voltage input into the KVAR Load Govern input exceeds 5 VDC, the generator set control locks the KVAR output to zero since the control logic states that the voltage input is out of range, and displays event/fault code 1324. When the "Load Govern KVAR Setpoint RC Enable" parameter is set to "Disable" a greater input voltage than 5 VDC is recognized; a 24 VDC input is treated as a 5 VDC input. To change the "Load Govern KVAR Setpoint RC Enable" parameter appropriately for the application, on the display go to: **Setup > Paralleling Setup > Basic > Load Govern KVAR Setpoint RC Enable** and set appropriately.

10.8.52 Code 1325 - kVAR Setpoint OOR Lo

Logic:

If the "KVAR Load Setpoint OOR Check Enable" is enabled and the KVAR Load Setpoint analog input is below the "KVAR Load Setpoint OOR Low Limit" for the time that is registered in the "KVAR Load Setpoint OOR Time", the generator set control will display event/fault code 1325.

Possible Causes:

1. Wiring issue.
2. KVAR Load Setpoint input voltage is too low.

Diagnosis and Repair:

1. Wiring issue.
 - a. Ensure that the KVAR Load Setpoint analog input (configurable analog Input #2) is not shorted low. On the control, the KVAR Load Setpoint analog input is located at:
TB9 – 3 Sense
TB9 – 2 Return

2. KVAR Load Setpoint input voltage is too low.
 - a. If the voltage input at TB9-3 and TB9-2 is below the "KVAR Load Setpoint OOR Low Limit", the control will register that input as shorted low. Ensure that the voltage input at TB9-3 and TB9-2 is greater than "KVAR Load Setpoint OOR Low Limit". To verify the voltage value of the "KVAR Load Setpoint OOR Low Limit" check the parameter section.

10.8.53 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.

10.8.54 Code 1336 - Cooldown Complete

Logic:

Genset runs for cool down period once the Shutdown with cooldown fault is initiated by PCC.

Possible Causes:

1. When PCC activates shutdown with cooldown condition.
2. Event/Fault code 1336 is activated when the cool down stop sequence has finished (initiated by PCC as controlled shutdown sequence)

Diagnosis and Repair:

1. Diagnostic and Repair steps of respective shutdown with Cooldown fault needs to be followed.

10.8.55 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.

10.8.56 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.

10.8.57 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

10.8.58 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.

10.8.59 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.

10.8.60 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.
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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

<p>Each generator set barring interface is different; verify a means of barring per your generator set service manual.</p>

- 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.

10.8.61 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".

10.8.62 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.

10.8.63 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 °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. "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.

10.8.64 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.

10.8.65 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.

10.8.66 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.

10.8.67 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 allow 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. 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 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.
 - b. Measure the output of the 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 AVR is faulty; replace the AVR.
 6. 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, stop the generator set, 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.

10.8.68 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.

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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 applicationIf 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).
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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.

10.8.69 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 caused by the load. Motors, Uninterruptible Power Supply (UPS), Variable Frequency Drive (VFD), Medical Diagnostic Imaging 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).

10.8.70 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.

10.8.71 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.

10.8.72 Code 1452 - Genset CB Fail To Close**Logic:**

The base board sends the Generator set CB a close command, but Generator set 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 Genset CB Close command.
2. Incorrectly selected Genset CB Position Contacts and/or incorrectly wired status feedback.
3. Faulty Generator set circuit breaker.

Diagnosis and Repair:

1. Incorrectly wired Genset CB Close command.
 - Check the wiring from the Genset CB Close Command output on the base board to the generator circuit breaker.
 - The Genset CB Close Command output on the base board is a NO Relay at TB5-1 and TB5-2 (Common). When the relay on the base board is closed, the Genset Breaker should be closed.
 - The output of TB5-1 and TB5-2 should match the status of the Generator set CB Close command.

Go to **Advanced Status > Advanced Controller Status > Genset CB Close Command**, and ensure that the status of Genset CB Close Command matches the output.

2. Incorrectly selected Genset CB Position Contacts and/or incorrectly wired status feedback.
 - a. The CB position sensing can be set up as single or dual sensing in the base board.

Go to **Setup > Paralleling Setup > Basic > Genset Breaker Position Contacts**, and check if the base board is set up as single or dual sensing.
 - b. The CB Status Feedback on InPower should match the status of the CB position.

Go to **Paralleling Status > Paralleling Status-Isolated Bus > Genset CB Position Status**, and ensure that the status of the CB position matches the connection. If it does not, check the wiring of the CB position status from the generator circuit breaker to the base board.

 - If the CB position sensing is set up as single, verify the following connection:
 - CB A (NO)
 - Status at TB10-7
 - Return at TB10-2

- If the CB position sensing is set up as dual, verify the following connection:
 - CB A (NO)
 - Status at TB10-7
 - Return at TB10-2
 - CB B (NC)
 - Status at TB10-8
 - Return at TB10-2

NOTICE
<p>The input status at CB A (NO) and CB B (NC) should be opposite; one input is open while the other is closed. If they are the same, check the wiring between the Generator set circuit breaker and the CB status input on the base board.</p>

3. Faulty Generator set CB.

- Refer to the appropriate circuit breaker service manual.

10.8.73 Code 1453 - Genset CB Fail To Open

Logic:

The base board sends the Generator set circuit breaker (CB) an open command, but the Generator set 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 Genset CB Open command.
2. Incorrectly selected Genset CB Position Contacts and/or incorrectly wired status feedback.
3. Faulty Generator set CB.

Diagnosis and Repair:

1. Incorrectly wired Genset CB Open command.
 - Check the wiring from the Genset CB Open Command output on the base board to the generator circuit breaker.
 - The Genset CB Open Command output on the base board is a NC Relay at TB5-5 and TB5-4 (Common). When the relay on the base board is open, the Generator set Breaker should be open.
 - The output of TB5-5 and TB5-4 should match the status of the Genset CB Open command.

Go to **Advanced Status > Advanced Controller Status > Genset CB Open Command**, and ensure that the status of Genset CB Open Command matches the output.
2. Incorrectly selected Genset CB Position Contacts and/or incorrectly wired status feedback.
 - a. The CB position sensing can be set up as single or dual sensing in the base board.

Go to **Setup > Paralleling Setup > Basic > Genset Breaker Position Contacts**, and check if the base board is set up as single or dual sensing.
 - b. The CB Status Feedback on InPower should match the status of the CB position.

Go to **Paralleling Status > Paralleling Status-Isolated Bus > Genset CB Position Status**, and ensure that the status of the CB position matches the connection. If it does not, check the wiring of the CB position status from the generator circuit breaker to the base board.

- If the CB position sensing is set up as single, verify the following connection:
 - CB A (NO)
 - Status at TB10-7
 - Return at TB10-2
- If the CB position sensing is set up as dual, verify the following connection:
 - CB A (NO)
 - Status at TB10-7
 - Return at TB10-2
 - CB B (NC)
 - Status at TB10-8
 - Return at TB10-2

NOTICE

The input status at CB A (NO) and CB B (NC) should be opposite; one input is open while the other is closed. If they are the same, check the wiring between the Generator set circuit breaker and the CB status input on the base board.

3. Faulty Generator set CB.
 - Refer to the appropriate circuit breaker service manual.

10.8.74 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 Generator set CB.

Diagnosis and Repair:

1. Mismatch in the Genset position sensing.
 - a. Verify the wiring of the CB position status from the Generator set 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 > 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 Generator set 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 Generator set 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 Status-Isolated Bus > Genset CB Position Status**, and ensure that the status of the CB position matches the connection.
2. Faulty Generator set CB.
 - a. Refer to the Generator set CB Service Manual.

10.8.75 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 generator set is set up to operate in the following generator set 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 > 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: **Setup > Paralleling Status-Isolated Bus > Utility CB Position Status**, and ensure that the status of the CB position matches the connection.
3. Faulty Utility CB.
 - a. Refer to the Utility CB Service Manual.

10.8.76 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.

10.8.77 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 generator set 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 > find Genset Bus L12 Voltage Calibration, Genset Bus L23 Voltage Calibration, and Genset Bus L31 Voltage Calibration**, and if appropriate, change the Bus Voltage to reflect the voltage shown on the meter.

To view and adjust the generator set frequency, go to: **Setup > Adjust > Frequency Adjust** and if appropriate, adjust the generator set frequency to reflect the frequency shown on the bus 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 generator set 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 generator set 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.

10.8.78 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.

10.8.79 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 Imaging 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.

10.8.80 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 generator set.
2. Improperly set Leading Power Factor.

Diagnosis and Repair:

1. Improper voltage calibration of the generator set.
 - a. If the generator set is not operating in droop paralleling mode, go to step 2.

Using a voltmeter, measure the AC voltage of the Electric Bus to which the generator set is paralleled (voltage of the Generator set Bus or the Utility). Then measure the output voltage of the generator set and ensure that the generator set output voltage is +3 VAC/-0 VAC that of the source to which the generator set is paralleled. Event/fault code 1461 is a result of the generator set not matching or exceeding the voltage of the electric bus, which causes the generator set to import current from the electric bus (Reverse KVAR).

To access the voltage calibration menu on the operator panel, go to **Setup > Adjust > Voltage Adjust**, and increase the generator set 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 generator set). Correct connections if faulty.
3. Improperly set Leading Power Factor.
 - a. If Loss of excitation occurs when the generator set 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 generator set is low. Motors, Uninterruptible Power Supply (UPS), Variable Frequency Drive (VFD), Medical Diagnostic Imaging 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 generator set to lose control of the output voltage of the generator set. 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 generator set shuts down on event/fault code 1461. Revisit the generator set sizing process if the power factor is leading 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 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.

10.8.81 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.

10.8.82 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:

$$\text{Frequency to Speed} = 120 / \text{Number of poles of the Alternator}$$
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.

10.8.83 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.

10.8.84 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.

10.8.85 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.

10.8.86 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.

10.8.87 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.

10.8.88 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.

10.8.89 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.

10.8.90 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.

10.8.91 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.

10.8.92 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.

10.8.93 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.

10.8.94 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.

10.8.95 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.

10.8.96 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.

10.8.97 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.

10.8.98 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.

10.8.99 Code 1917 - Fuel Level High

Logic:

The "Fuel Level % (AUX 101)" input has gone above the "High Fuel Level Threshold (AUX 101)" for the time in the "High Fuel Level Time (AUX 101)" setting.

Possible Causes:

1. Check for fuel tank overflow.
2. Fuel sender incorrectly wired.
3. Faulty fuel sender.
4. The "High Fuel Set/Clear Time" parameter is configured incorrectly.

Diagnosis and Repair:

1. Fuel Tank Overflow.
 - a. Check for continuous fuel filling, if so then Stop the fuel filling.

2. Check the wiring of the fuel sensor.
 - a. Ensure that the sender is correctly wired to the base board. Check for any opened wiring from the fuel sensor to the input on the base board that is configured for the "Fuel Level". If open wiring is found, correct the wiring.
3. Faulty fuel sender.
 - a. Measure the resistance between the fuel 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 above the recommended threshold when the fuel tank is full.
4. The "High Fuel Set/Clear Time" parameter is configured incorrectly.
 - a. Check the high fuel level setup parameter. To access the input configuration on the operator panel go to **Setup > Genset Setup** and set the "High Fuel Set/Clear Time" parameter appropriately for the application.

10.8.100 Code 1918 - Fuel Level Low

Logic:

The "Fuel Level % (AUX 101)" input has gone below the "Very Low Fuel Level Threshold (AUX 101)" for the time in the "Very Low Fuel Level Time (AUX 101)" setting.

Possible Causes:

1. Check for low fuel in tank.
2. Fuel sender incorrectly wired.
3. Faulty fuel sender.
4. The "Very 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 the 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 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 "Very 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 "very low Fuel Set/Clear Time" parameter appropriately for the application.

10.8.101 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 activate 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.

10.8.102 Code 1978 - Speed Bias OOR High

Logic:

Input Voltage to the speed bias input has been sensed as Out-Of-Range for Higher limit (default-(+5Vdc)).

Possible Causes:

1. Over voltage applied at Input.
2. Improper threshold setting.
3. Faulty Analog channel.

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).

10.8.103 Code 1979 - Speed Bias OOR Low

Logic:

Input Voltage to the speed bias input has been sensed as Out-Of-Range for Lower limit (default-(-5Vdc)).

Possible Causes:

1. Loose connections at Input.
2. Improper threshold setting
3. Faulty Analog channel.

Diagnosis and Repair:

1. Loose connections.
 - a. Check with multi-meter for voltage applied and take corrective action for low voltage.
2. Improper threshold setting.
 - a. Set proper value of parameter "Speed Bias OOR Low Limit".
3. Fault Analog Channel.
 - a. Replace the fault PCC3300 board.

10.8.104 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.

10.8.105 Code 2111 - LT Cool Temp OOR High (AUX 101)

Logic:

Coolant temperature sensor (AUX 101) signal voltage is out of range – open circuit

Possible Causes:

1. Faulty coolant temperature sensor connections (AUX 101)
2. Faulty coolant temperature sensor (AUX 101)
3. Improper connections at AUX 101 J11 connector

Diagnosis and Repair:

1. Faulty Coolant temperature sensor connections (AUX 101)

Inspect the coolant temperature sensor and the harness connector pins.

 - a. Disconnect the connector pins 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 coolant temperature sensor (AUX 101)

Check the resistance of the sensor.

- a. Disconnect the connector pins from the coolant temperature sensor.
- b. Measure the resistance between the AUX 101 coolant temperature's signal pin and the return pin.
- c. Refer the appendix X below for the coolant temperature ranges.

Note: Sensor part number

3. Improper connections at AUX 101 J11 connector

- a. Inspect the AUX101 J11 connector pins for open or short circuit visually and take corrective action if required.
- b. Refer AUX101 manual for J11 connector and current source connection details

10.8.106 Code 2112 - LT Cool Temp OOR Low (AUX 101)

Logic:

Coolant temperature sensor (AUX 101) signal voltage is out of range – short circuit

Possible Causes:

1. Faulty coolant temperature sensor connections (AUX 101)
2. Faulty coolant temperature sensor (AUX 101)
3. Improper connections at AUX 101 J11 connector.

Diagnosis and Repair:

1. Faulty Coolant temperature sensor connections (AUX 101)

Inspect the coolant temperature sensor (AUX 101) connection and the harness connector pins.

- a. Disconnect the connector pins 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 Coolant temperature sensor (AUX 101)

Check the resistance of the sensor.

- a. Disconnect the connector pins from the coolant temperature sensor.
- b. Measure the resistance between the AUX 101 coolant temperature's signal pin and the return pin.
- c. Refer the appendix X below for the coolant temperature ranges.

Note: Sensor part number

3. Improper connections at AUX 101 J11 connector

- a. Inspect the AUX101 J11 connector pins for open or short circuit visually and take corrective action if required.
- b. Refer AUX101 manual for J11 connector and current source connection details

10.8.107 Code 2114 - LT Cool Temp Critical High (AUX 101)

Logic:

Coolant temperature connected at AUX 101 has exceeded the High LTA Temperature Threshold (Aux101) shutdown continuously for High LTA Temperature Time (Aux101).

Possible Causes:

1. Inaccurate coolant temperature sensor (Aux101)
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 probe. If the two readings are reasonably close, then the sensor is reading correctly.
 - d. If the two readings are not reasonably closed, then check the conditions at sensor end connected to AUX 101.
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 enabled, disable it.
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.

10.8.108 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.

10.8.109 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.

10.8.110 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.

10.8.111 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 than 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.

10.8.112 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.

10.8.113 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 > Utility CB Close Command**, 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 > 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: **Setup > Paralleling Status-Isolated Bus > Utility CB Position Status**, and ensure that the status of the CB position matches the connection.

2. Faulty Utility CB.
 - a. Refer to the Utility CB Service Manual.

10.8.114 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 command; go to **Advanced Status > Advanced Controller Status > Utility CB Open Command**, and ensure that the status of the Utility CB Open 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 > 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: **Setup > Paralleling Status-Isolated Bus > Utility CB Position Status**, and ensure that the status of the Utility CB position matches the connection.

2. Faulty Utility CB.
 - a. Refer to the Utility CB Service Manual.

10.8.115 Code 2539 - High Voltage Bias

Logic:

Input Voltage to the voltage bias input has been sensed as Out-Of-Range for Higher limit (default-(+5Vdc)).

Possible Causes:

1. Over voltage applied at Input.
2. Improper threshold setting.
3. Faulty Analog channel.

Diagnosis and Repair:

1. Over Voltage.
 - a. Check with multi-meter for voltage applied and take corrective action for over voltage.
2. Improper threshold settings.
 - a. Set proper value of "Voltage Bias OOR High Limit".
3. Fault Analog channel.
 - a. Replace the faulty PCC3300 board.

10.8.116 Code 2541 - Low Voltage Bias

Logic:

Input Voltage to the voltage bias input has been sensed as Out-Of-Range for Lower limit (default-(-5Vdc)).

Possible Causes:

1. Input voltage not sensed properly due to loose connections.
2. Faulty input circuit section.

Diagnosis and Repair:

1. Input voltage not sensed properly due to loose connections
 - a. Check the connections and properly tight them. Measure the Input voltage with multi-meter to ensure voltage is measured correctly.
2. Fault input circuit section.
 - a. Repair for the damaged hardware circuit.
 - b. Replace the faulty sensor.

10.8.117 Code 2545 - Keyswitch Reset Required

Logic:

CAN datalink communication has been lost between the generator set 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 generator set 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 > Adjust > 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.

10.8.118 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	<i>AUX101 0 Input 1 Fault</i>	2882	<i>AUX101 1 Input 1 Fault</i>
2621	<i>AUX101 0 Input 2 Fault</i>	2883	<i>AUX101 1 Input 2 Fault</i>
2622	<i>AUX101 0 Input 3 Fault</i>	2884	<i>AUX101 1 Input 3 Fault</i>
2623	<i>AUX101 0 Input 4 Fault</i>	2885	<i>AUX101 1 Input 4 Fault</i>
2624	<i>AUX101 0 Input 5 Fault</i>	2886	<i>AUX101 1 Input 5 Fault</i>

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.

10.8.119 Code XXXX - Aux102 #m Expansion Input #n Fault

Where:

m=0,1

n=9, 10, 11, 12

XXXX is defined below:

Fault (XXXX)	Description	Fault (XXXX)	Description
2628	AUX102 0 Expansion Input 9 Fault	2891	AUX102 0 Expansion Input 9 Fault
2629	AUX102 0 Expansion Input 10 Fault	2892	AUX102 0 Expansion Input 10 Fault
2631	AUX102 0 Expansion Input 11 Fault	2893	AUX102 0 Expansion Input 11 Fault
2632	AUX102 0 Expansion Input 12 Fault	2894	AUX102 0 Expansion Input 12 Fault

Logic:

AUX102 device #m Expansion Input #n Fault is Active

Possible Causes:

1. Condition for which “AUX102 device #m Expansion Input #n” is configured for is Active.
2. “AUX102 device #m Input #n 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 “AUX102 device #m Expansion Input #n” is configured for is Active.
 - a. Check the condition for which “AUX102 device #m Expansion Input #n” has been configured for; ex. If “AUX102 device #m Expansion Input #n” 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. “AUX102 device #m Input #n 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 “AUX102 device #m Expansion Input #n”. Ensure the switch input setting is correctly set. If “AUX102 device #m Input #n Function Pointer” parameter is set to default and if “AUX102 device #m Input #n Active State Selection” is set to ‘active closed’, input #n will become active. e.g. input 2 (event/fault code 1312) will become active when TB1-14 pin (input 2) and ground (e.g. TB1-15) are connected (shorted) together.

If “AUX102 device #m Input #n Function Pointer” parameter is set to default and if “AUX101 device #m Analog Input #n Sensor Type” is set to ‘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 Pin (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 > Active State Sel (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.

10.8.120 Code 2653/2657 – Exhaust Stack Temp Right/Left Bank Above Threshold

Logic:

Exhaust Stack Temperature of Right/Left Bank has exceeded the Exhaust Stack Temperature 2/1 threshold (AUX101) continuously for High Exhaust Stack Temperature 2/1 Time (AUX101).

Possible Causes:

1. Inaccurate Exhaust Stack temperature sensor.
2. Fault simulation feature is enabled.
3. Incorrect threshold setting.
4. Engine Issue.

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 Exhaust stack temperature sensor.
 - b. Connect the InPower.
 - c. Compare the Exhaust stack 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.
 - d. If the two readings are not reasonably close, then check the conditions at sensor end connected either to AUX101 or ECM.
2. Verify that the fault simulation feature is not enabled.
 - a. Connect InPower.
 - b. Verify that the fault simulation is NOT enabled for the Exhaust Stack temperature sensor by connecting to the PCC via InPower. If fault simulation is Enabled, disabled it.
3. Check Threshold settings.
 - a. Connect InPower.
 - b. Verify that the fault threshold is within the normal operating range for Exhaust Stack temperature sensor. Refer to the engine manual for correct threshold values, and make the appropriate changes using InPower.
4. Engine Issue.
 - a. If sensor and thresholds are found OK, then refer engine manual.

10.8.121 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.

10.8.122 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.

10.8.123 Code 2677 - Fail to Stop

Logic:

Generator Set continues to run after receiving shutdown command from the controller.

Possible Causes:

1. Stuck Fuel Shut-off Actuator.
2. Generator Set is operating in a fuel rich environment.
3. Keyswitch Short.
4. Governor Failure.

Diagnosis and Repair:

1. Stuck Fuel Shut-off Actuator
 - a. Check the wiring harness for damage, shorts, or abrasions. Repair as necessary.

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- b. Check for corded, bent, broken, pushed back, expanded, or loose pins.
 - c. Check that the fuel shut-off valve is not mechanically stuck. Use a light tapping with a plastic or rubber mallet to dislodge a stuck actuator.
 - d. Refer to the Engine Service manual.
2. Generator Set is operating in a fuel rich environment
 - a. Check ventilation. Ventilate area to disperse combustible gasses.
 3. Keyswitch Short
 - a. Check wiring harness for damage, shorts, or abrasions. Repair as necessary.
 - b. Check for corroded, bent, broken, pushed back, expanded, or loose pins.
 4. Governor Failure
 - a. Check wiring harness for damage, shorts, or abrasions. Repair as necessary.
 - b. Check for corroded, bent, broken, pushed back, expanded or loose pins.
 - c. Refer to the Engine Service manual.

10.8.124 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.

10.8.125 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.

10.8.126 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.

10.8.127 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: $(\text{Genset Nominal Voltage} / \text{Genset PT Primary voltage}) * \text{Genset PT Secondary voltage} > 600 \text{ VAC}$, 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: $(\text{Genset Nominal Voltage} / \text{Genset PT Primary voltage}) * \text{Genset PT Secondary voltage} > 600 \text{ VAC}$, 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 than 600 VAC.

10.8.128 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: $\text{If } (\text{Genset Nominal Voltage} / \text{Genset PT Primary voltage}) * \text{Genset PT Secondary voltage} < (\text{Nominal voltage} *.5)$, 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: $(\text{Genset Nominal Voltage} / \text{Genset PT Primary voltage}) * \text{Genset PT Secondary voltage} < (\text{Nominal voltage} *.5)$, 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 $(\text{Genset Bus Nominal Voltage} *.5)$ VAC.

10.8.129 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: $\text{If } (\text{Genset Bus Nominal Voltage} / \text{Genset Bus PT Primary voltage}) * \text{Genset Bus PT Secondary voltage} > 600 \text{ VAC}$, 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: $(\text{Genset Bus Nominal Voltage} / \text{Genset Bus PT Primary voltage}) * \text{Genset Bus PT Secondary voltage} > 600 \text{ VAC}$, 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.

10.8.130 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: $(\text{Genset Bus Nominal Voltage} / \text{Genset Bus PT Primary voltage}) * \text{Genset Bus PT Secondary voltage} < (\text{Genset Bus Nominal voltage} * .5)$, 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: $(\text{Genset Bus Nominal Voltage} / \text{Genset Bus PT Primary voltage}) * \text{Genset Bus PT Secondary voltage} < (\text{Genset Bus Nominal voltage} * .5)$, 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.

10.8.131 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: $(\text{Utility Nominal Voltage} / \text{Utility PT Primary voltage}) * \text{Utility PT Secondary voltage} > 600 \text{ VAC}$, 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: $(\text{Utility Nominal Voltage} / \text{Utility PT Primary voltage}) * \text{Utility PT Secondary voltage} > 600 \text{ VAC}$, 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.

10.8.132 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: $\text{If } (\text{Utility Nominal Voltage} / \text{Utility PT Primary voltage}) * \text{Utility PT Secondary voltage} < (\text{Utility Nominal voltage} * .5)$, 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: $\text{If } (\text{Utility Nominal Voltage} / \text{Utility PT Primary voltage}) * \text{Utility PT Secondary voltage} < (\text{Utility Nominal voltage} * .5)$, 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 $(\text{Utility Nominal Voltage} * .5) \text{ VAC}$.

10.8.133 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.

10.8.134 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.

10.8.135 Code 2912 - Reconnection Switch Operated 1

Logic:

The Voltage Selector Switch position was changed while the generator set was operating. The PCC controller shut down the generator set to prevent the alternator from being damaged.


If the generator door is opened while the generator is running, the door switch triggers an immediate shutdown sequence. Only if the door switch is bypassed, could it produce this fault.

Possible Causes:

1. The Voltage Selector Switch position was changed while the generator set was running.
2. Faulty wiring. Loose or poor connections on the Voltage Selector Switch position circuit.

Diagnosis and Repair:

1. Confirm that the Voltage Selector Switch is in the appropriate position and matches the frequency setting on the HMI screen. Only move the Voltage Selector Switch position with the generator set off.

 WARNING
<p>Electrical Shock Changing the position of the selector switch while the generator set is running causes high AC voltage arcing and/or shorting, which can cause serious personal injury to operating personnel, damage to the switch, the generator set, or the connected equipment. Never change the position of the voltage selector switch while the generator set is running</p>

2. Make sure all connections are tight and in the correct orientation on the Voltage Selector Switch and PCC control. Verify that there are no open or short circuits on any of the wiring.

10.8.136 Code 2913 - Reconnection Switch Operated 2

Logic:

The PCC controller failed to recognize the Voltage Selector Switch position, or the Voltage Selector Switch position does not match the frequency that has been selected on the HMI.

Possible Causes:

1. The Voltage Selector Switch is not locked into a Voltage Selector Switch position.
2. The Voltage Selector switch was disconnected.
3. Faulty wiring, loose, or missing connections on the Voltage Selector Switch position circuit.

Diagnosis and Repair:

1. Move the Voltage Selector Switch to a voltage/frequency position. There is a detent in each Voltage Selector Switch position which can be felt when the position is engaged.
2. Check the Voltage Selector Switch connector. Verify the connector is in good condition and there is a tight connection.

NOTICE

50 Hz operation is only supported with the Voltage Selector Switch in the 480 VAC, 60HZ/400 VAC, 50 Hz position.

3. Make sure all connections are tight and in the correct orientation on the Voltage Selector Switch and PCC Control. Verify that there are no open or short circuits on any of the wiring.

10.8.137 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).

10.8.138 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.

10.8.139 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.

10.8.140 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.

10.8.141 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.

10.8.142 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)

$$\text{Primary CT: Secondary CT} = 133 : (1 \text{ or } 5 \text{ Amps}).$$

- 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.

10.8.143 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.

10.8.144 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 generator set 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 generator set 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 > Genset CT Secondary Current**, and set the parameter appropriately for the application.

3. Faulty CT.
 - a. If the above is satisfactory, check the CT and replace if faulty.

10.8.145 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.

10.8.146 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.

10.8.147 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.

10.8.148 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.

10.8.149 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.

10.8.150 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.

10.8.151 Code 2931 - Aux101 Device ID Fault

Logic:

AUX101 Device ID fault is Active.

Possible Causes:

1. More than one AUX101 Devices, has same device ID configuration.
2. Faulty AUX101.

Diagnosis and Repair:

1. More than one AUX101 Devices, has same device ID configuration.
 - a. Check the device nos. on 'device no. indicator' to see if all the devices have unique numbers in PCCnet network, rather than same device ID.
 - b. If the device ID's are same for more than one AUX101, than manually change the device ID with Switch S1 on AUX101 and make them Unique. (Refer 5.3.4.2.1 section for changing of Device ID).

2. Faulty AUX101.
 - a. If AUX101 device ID gets locked or we are unable to change the Device ID manually, then replace the AUX101 module.

10.8.152 Code 2932 - Aux101 Oil Temp OOR High Fault

Logic:

Oil Temperature sensor (AUX101) is Out of Range – open circuit.

Possible Causes:

1. Faulty oil temperature sensor connection (AUX101).
2. Faulty oil temperature sensor (AUX101).
3. In-proper connections at AUX101 J11 connector..

Diagnosis and Repair:

1. Faulty oil temperature sensor connection (AUX101).

Inspect oil temperature sensor (AUX101) connection and the harness connector pins.

 - a. Disconnect the harness connector from oil temperature sensor.
 - b. Inspect for corroded 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 oil temperature sensor (AUX101).

Check the resistance of the sensor.

 - a. Disconnect the harness connector from the oil temperature sensor.
 - b. Measure the resistance between the oil temperature's signal pin and the return pin.
 - c. Refer to the Appendix E below for oil temperature ranges.

NOTE: Sensor Part No - 0193-0529-XX
3. In-proper connections at AUX101 J11 connector.
 - a. Inspect the AUX101 J11 connector pins for open or short circuit visually and take corrective action if required.
 - b. Refer AUX101 manual for J11 connector and current source connection details.

10.8.153 Code 2933 - Aux101 Oil Temp OOR Low Fault

Logic:

Oil Temperature sensor (AUX101) is Out of Range – short circuit.

Possible Causes:

1. Faulty oil temperature sensor connection (AUX101).
2. Faulty oil temperature sensor (AUX101).
3. In-proper connections at AUX101 J11 connector.

Diagnosis and Repair:

1. Faulty oil temperature sensor connection (AUX101).

Inspect oil temperature sensor (AUX101) connection and the harness connector pins.

- a. Disconnect the connector pins from oil temperature sensor.
- b. Inspect for corroded 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 oil temperature sensor (AUX101).

Check the resistance of the sensor.

- a. Disconnect the connector pins from the oil temperature sensor.
- b. Measure the resistance between the AUX101 oil temperature's signal pin and the return pin.
- c. Refer to the Appendix E below for oil temperature ranges.

NOTE: Sensor Part No - 0193-0529-XX

3. In-proper connections at AUX101 J11 connector.

- a. Inspect the AUX101 J11 connector pins for open or short circuit visually and take corrective action if required.
- b. Refer AUX101 manual for J11 connector and current source connection details.

10.8.154 Code 2934 - Ambient Temp OOR High

Logic:

Ambient Temperature sensor (AUX101) is Out of Range – open circuit.

Possible Causes:

1. Faulty Ambient temperature sensor connection (AUX101).
2. Faulty ambient temperature sensor (AUX101).
3. In-proper connections at AUX101 J11 connector.

Diagnosis and Repair:

1. Faulty Ambient temperature sensor connection (AUX101).

Inspect ambient temperature sensor (AUX101) connection and the harness connector pins.

- a. Disconnect the connector pins from ambient temperature sensor.
- b. Inspect for corroded 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 Ambient temperature sensor (AUX101).

Check the resistance of the sensor.

- a. Disconnect the connector pins from the ambient temperature sensor.

- b. Measure the resistance between ambient temperature sensor's signal pin and the return pin.
- c. Refer to the Appendix E below for ambient temperature ranges.

NOTE: Sensor Part No - 0193-0529-XX

3. In-proper connections at AUX101 J11 connector.
 - a. Inspect the AUX101 J11 connector pins for open or short circuit visually and take corrective action if required.
 - b. Refer AUX101 manual for J11 connector and current source connection details.

10.8.155 Code 2935 - Ambient Temp OOR Low

Logic:

Ambient Temperature sensor (AUX101) is Out of Range – short circuit.

Possible Causes:

1. Faulty Ambient temperature sensor connection (AUX101).
2. Faulty Ambient temperature sensor (AUX101).
3. In-proper connections at AUX101 J11 connector.

Diagnosis and Repair:

1. Faulty Ambient temperature sensor connection (AUX101).

Inspect ambient temperature sensor (AUX101) connection and the harness connector pins.

- a. Disconnect the connector pins from ambient temperature sensor.
- b. Inspect for corroded 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 Ambient temperature sensor (AUX101).

Check the resistance of the sensor.

- a. Disconnect the connector pins from the ambient temperature sensor.
- b. Measure the resistance between the ambient temperature sensor's signal pin and the return pin.
- c. Refer to the Appendix E below for ambient temperature ranges.

NOTE: Sensor Part No - 0193-0529-XX

3. In-proper connections at AUX101 J11 connector.
 - a. Inspect the AUX101 J11 connector pins for open or short circuit visually and take corrective action if required.
 - b. Refer AUX101 manual for J11 connector and current source connection details.

10.8.156 Code 2936 - Fuel Level OOR High

Logic:

Fuel Level Sensor (AUX101) is Out of Range – open circuit.

Possible Causes:

1. Faulty fuel level sensor connection (AUX101).
2. Faulty fuel level sensor (AUX101).
3. In-proper connections at AUX101 J11 connector.

Diagnosis and Repair:

1. Faulty fuel level sensor connection (AUX101).

Inspect fuel level sensor (AUX101) connection and the harness connector pins.

- a. Disconnect the connector pins from fuel level sensor.
- b. Inspect for corroded 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 fuel level sensor (AUX101).

Check the resistance of the sensor.

- a. Disconnect the connector pins from the fuel level sensor.
- b. Measure the resistance between fuel level sensor's signal pin and the return pin.
- c. Note the "Fuel Level Zero Percent Resistance (AUX101) {Trim} = 600 Ohm (Default, Range = 600 – 2500)" and "Fuel Level 100 Percent Resistance (AUX101) {Trim} = 2200 Ohm (Default, Range = 601 – 2500)" for fuel level ranges.
- d. Measured resistance value of fuel level sensor should be in above defined ranges. e.g. If Fuel Level is set to 0%, then measured resistance should be 600 Ohm \pm tolerance limits (as specified in fuel level sensor datasheet). If Fuel Level is set to 100%, then measured resistance should be 2200 Ohm \pm tolerance limits (as specified in fuel level sensor datasheet).

3. In-proper connections at AUX101 J11 connector.

- a. Inspect the AUX101 J11 connector pins for open or short circuit visually and take corrective action if required.
- b. Refer AUX101 manual for J11 connector and current source connection details.

10.8.157 Code 2937 - Fuel Level OOR Low**Logic:**

Ambient Temperature sensor (AUX101) is Out of Range – short circuit.

Possible Causes:

1. Faulty fuel level sensor connection (AUX101).
2. Faulty fuel level sensor (AUX101).
3. In-proper connections at AUX101 J11 connector.

Diagnosis and Repair:

1. Faulty fuel level sensor connection (AUX101).

Inspect fuel level sensor (AUX101) connection and the harness connector pins.

- a. Disconnect the connector pins from fuel level sensor.

- b. Inspect for corroded 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 fuel level sensor (AUX101).
- Check the resistance of the sensor.
- a. Disconnect the connector pins from the fuel level sensor.
 - b. Measure the resistance between the fuel level sensor's signal pin and the return pin.
 - c. Note the "Fuel Level Zero Percent Resistance (AUX101) {Trim} = 600 Ohm (Default, Range = 600 – 2500)" and "Fuel Level 100 Percent Resistance (AUX101) {Trim} = 2200 Ohm (Default, Range = 601 – 2500)" for fuel level ranges.
 - d. Measured resistance value of fuel level sensor should be in above defined ranges. e.g. If Fuel Level is set to 0%, then measured resistance should be 600 Ohm ± tolerance limits (as specified in fuel level sensor datasheet). If Fuel Level is set to 100%, then measured resistance should be 2200 Ohm ± tolerance limits (as specified in fuel level sensor datasheet).
3. In-proper connections at AUX101 J11 connector.
- a. Inspect the AUX101 J11 connector pins for open or short circuit visually and take corrective action if required.
 - b. Refer AUX101 manual for J11 connector and current source connection details.

10.8.158 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.

10.8.159 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.

10.8.160 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".

10.8.161 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.

10.8.162 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.

10.8.163 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.

10.8.164 Code 2946/2947 - Exhaust Stack Temp 2/1 OOR Low

Logic:

Exhaust Stack Temperature 2/1 sensor (AUX101) is Out of Range – short circuit.

Possible Causes:

1. Faulty exhaust stack temperature 2/1 sensor connection (AUX101).
2. Faulty exhaust stack temperature 2/1 sensor (AUX101).
3. In-proper connections at AUX101 J11 connector.

Diagnosis and Repair:

1. Faulty exhaust stack temperature 2/1 sensor connection (AUX101).
Inspect exhaust stack temperature 2/1 sensor (AUX101) connection and the harness connector pins.
 - a. Disconnect the harness connector from exhaust stack temperature 2/1 sensor.
 - b. Inspect for corroded 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 exhaust stack temperature 2/1 sensor (AUX101).
Check the resistance of the sensor.
 - a. Disconnect the harness connector from the exhaust stack temperature 2/1 sensor.
 - b. Measure the resistance between the exhaust stack temperature 2/1 sensor's signal pin and the return pin.
 - c. Refer to the Appendix F below for exhaust stack temperature 2/1 ranges.

NOTE: Sensor Part No - 0193-0446-XX
3. In-proper connections at AUX101 J11 connector.
 - a. Inspect the AUX101 J11 connector pins for open or short circuit visually and take corrective action if required.
 - b. Refer AUX101 manual for J11 connector and current source connection details.

10.8.165 Code 2948/2949 – High Exhaust Stack Temperature 2 / High Exhaust Stack Temperature

Logic:

Exhaust Stack Temperature of Right/Left Bank has exceeded the Exhaust Stack Temperature 2/1 threshold (AUX101) continuously for High Exhaust Stack Temperature 2/1 Time (AUX101).

Possible Causes:

1. Inaccurate Exhaust Stack temperature sensor.
2. Fault simulation feature is enabled.
3. Incorrect threshold setting.
4. Engine Issue.

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 Exhaust stack temperature sensor.
 - b. Connect the InPower.
 - c. Compare the Exhaust stack 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.
 - d. If the two readings are not reasonably close, then check the conditions at sensor end connected either to AUX101 or ECM.
2. Verify that the fault simulation feature is not enabled.
 - a. Connect InPower.
 - b. Verify that the fault simulation is NOT enabled for the Exhaust Stack temperature sensor by connecting to the PCC via InPower. If fault simulation is Enabled, disabled it.
3. Check Threshold settings.
 - a. Connect InPower.
 - b. Verify that the fault threshold is within the normal operating range for Exhaust Stack temperature sensor. Refer to the engine manual for correct threshold values, and make the appropriate changes using InPower.
4. Engine Issue.
 - a. If sensor and thresholds are found OK, then refer engine manual.

10.8.166 Code 2951/2954/2957 – Alternator Temp 1/2/3 OOR High

Logic:

Alternator Temperature 1/2/3 sensor (AUX101) is Out of Range – open circuit.

Possible Causes:

1. Faulty Alternator Temperature 1/2/3 sensor connection (AUX101).
2. Faulty Alternator Temperature 1/2/3 sensor (AUX101).
3. In-proper connections at AUX101 J11 connector.

Diagnosis and Repair:

1. Faulty Alternator Temperature 1/2/3 sensor connection (AUX101).

Inspect Alternator Temperature 1/2/3 sensor (AUX101) connection and the harness connector pins.

 - a. Disconnect the connector pins from Alternator Temperature 1/2/3 sensor.
 - b. Inspect for corroded 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 Alternator Temperature 1/2/3 sensor (AUX101).
Check the resistance of the sensor.
 - a. Disconnect the connector pins from the Alternator Temperature 1/2/3 sensor.
 - b. Measure the resistance between the AUX101 Alternator Temperature 1/2/3 sensor's signal pin and the return pin.
 - c. Refer to the Alternator Manual (PT100) for Alternator Temperature 1/2/3 ranges.
 3. In-proper connections at AUX101 J11 connector.
 - a. Inspect the AUX101 J11 connector pins for open or short circuit visually and take corrective action if required.
 - b. Refer AUX101 manual for J11 connector and current source connection details.

10.8.167 Code 2952/2955/2958 – Alternator Temp 1/2/3 OOR Low

Logic:

Alternator Temperature 1/2/3 sensor (AUX101) is Out of Range – short circuit.

Possible Causes:

1. Faulty Alternator Temperature 1/2/3 sensor connection (AUX101).
2. Faulty Alternator Temperature 1/2/3 sensor (AUX101).
3. In-proper connections at AUX101 J11 connector.

Diagnosis and Repair:

1. Faulty Alternator Temperature 1/2/3 sensor connection (AUX101).
Inspect Alternator Temperature 1/2/3 sensor (AUX101) connection and the harness connector pins.
 - a. Disconnect the connector pins from Alternator Temperature 1/2/3 sensor.
 - b. Inspect for corroded 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 Alternator Temperature 1/2/3 sensor (AUX101).
Check the resistance of the sensor.
 - a. Disconnect the connector pins from the Alternator Temperature 1/2/3 sensor.
 - b. Measure the resistance between Alternator Temperature 1/2/3 sensor's signal pin and the return pin.
 - c. Refer to the Alternator Manual (PT100) for Alternator Temperature 1/2/3 ranges.
3. In-proper connections at AUX101 J11 connector.
 - a. Inspect the AUX101 J11 connector pins for open or short circuit visually and take corrective action if required.
 - b. Refer AUX101 manual for J11 connector and current source connection details.

10.8.168 Code 2953/2956/2959 – High Alternator Temp 1/2/3

Logic:

Alternator Temperature 1/2/3 connected at AUX101 has exceeded the High Alternator Temperature 1/2/3 threshold (AUX101) warning continuously for High Alternator Temperature 1/2/3 Time (AUX101).

OR

Alternator Temperature 1/2/3 connected at AUX101 has exceeded the High Alternator Temperature 1/2/3 shutdown threshold continuously for High Alternator Temperature 1/2/3 Shutdown Time.

Possible Causes:

1. Inaccurate Alternator Temperature 1/2/3 sensor (AUX101).
2. Fault simulation feature is enabled.
3. Incorrect threshold setting.
4. Alternator Issue.

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 Alternator Temperature 1/2/3 sensor.
 - b. Connect the InPower.
 - c. Compare the Alternator Temperature 1/2/3 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.
 - d. If the two readings are not reasonably close, then check the conditions at sensor end connected either to AUX101 or ECM.
2. Verify that the fault simulation feature is not enabled.
 - a. Connect InPower.
 - b. Verify that the fault simulation is NOT enabled for the Alternator Temperature 1/2/3 sensor by connecting to the PCC via InPower. If fault simulation is Enabled, disabled it.
3. Check Threshold settings.
 - a. Connect InPower.
 - b. Verify that the fault threshold is within the normal operating range for Alternator Temperature 1/2/3 sensor. Refer to the Alternator manual for correct threshold values, and make the appropriate changes using InPower.
4. Alternator Issue.
 - a. If all the above settings are found OK, then refer alternator manual.

10.8.169 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.).

10.8.170 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".

10.8.171 Code 2978 - Intake Manifold Temp 1 OOR Low

Logic:

Intake Manifold Temperature 1 sensor (AUX101) is Out of Range – short circuit.

Possible Causes:

1. Faulty intake manifold temperature 1 sensor connection (AUX101).
2. Faulty intake manifold temperature 1 sensor (AUX101).
3. In-proper connections at AUX101 J11 connector.

Diagnosis and Repair:

1. Faulty intake manifold temperature 1 sensor connection (AUX101).

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- Inspect intake manifold temperature 1 sensor (AUX101) connection and the harness connector pins.
- a. Disconnect the harness connector from intake manifold temperature 1 sensor.
 - b. Inspect for corroded 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 intake manifold temperature 1 sensor (AUX101).
- Check the resistance of the sensor.
- a. Disconnect the harness connector from the intake manifold temperature 1 sensor.
 - b. Measure the resistance between the intake manifold temperature 1 sensor's signal pin and the return pin.
 - c. Refer to the Appendix E below for intake manifold temperature 1 ranges.
- NOTE: Sensor Part No - 0193-0529-XX**
3. In-proper connections at AUX101 J11 connector.
- a. Inspect the AUX101 J11 connector pins for open or short circuit visually and take corrective action if required.
 - b. Refer AUX101 manual for J11 connector and current source connection details.

10.8.172 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".

10.8.173 Code 2981 – Drive End Bearing Temp OOR High

Logic:

Drive End Bearing Temperature sensor (AUX101) is Out of Range – open circuit.

Possible Causes:

1. Faulty Drive End Bearing Temperature sensor connection (AUX101).
2. Faulty Drive End Bearing Temperature sensor (AUX101).
3. In-proper connections at AUX101 J11 connector.

Diagnosis and Repair:

1. Faulty Drive End Bearing Temperature sensor connection (AUX101).
Inspect Drive End Bearing Temperature sensor (AUX101) connection and the harness connector pins.
 - a. Disconnect the harness connector from Drive End Bearing Temperature sensor.
 - b. Inspect for corroded 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 Drive End Bearing Temperature sensor (AUX101).
Check the resistance of the sensor.
 - a. Disconnect the harness connector from the Drive End Bearing Temperature sensor.
 - b. Measure the resistance between the Drive End Bearing Temperature sensor's signal pin and the return pin.
 - c. Refer to the Alternator Manual (PT100) for Drive End Bearing Temperature ranges.
3. In-proper connections at AUX101 J11 connector.
 - a. Inspect the AUX101 J11 connector pins for open or short circuit visually and take corrective action if required.
 - b. Refer AUX101 manual for J11 connector and current source connection details.

10.8.174 Code 2982 - Drive End Bearing Temp OOR Low

Logic:

Drive End Bearing Temperature sensor (AUX101) is Out of Range – short circuit

Possible Causes:

1. Faulty Drive End Bearing Temperature sensor connection (AUX101).
2. Faulty Drive End Bearing Temperature sensor (AUX101).
3. In-proper connections at AUX101 J11 connector.

Diagnosis and Repair:

1. Faulty Drive End Bearing Temperature sensor connection (AUX101).

Inspect Drive End Bearing Temperature sensor (AUX101) connection and the harness connector pins.

- a. Disconnect the harness connector from Drive End Bearing Temperature sensor.
- b. Inspect for corroded 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 Drive End Bearing Temperature sensor (AUX101).

Check the resistance of the sensor.

- a. Disconnect the harness connector from the Drive End Bearing Temperature sensor.
- b. Measure the resistance between the Drive End Bearing Temperature sensor's signal pin and the return pin.
- c. Refer to the Alternator Manual (PT100) for Drive End Bearing Temperature ranges.

3. In-proper connections at AUX101 J11 connector.

- a. Inspect the AUX101 J11 connector pins for open or short circuit visually and take corrective action if required.
- b. Refer AUX101 manual for J11 connector and current source connection details.

10.8.175 Code 2983 – High Drive End Bearing Temperature

Logic:

Drive End Bearing Temperature connected at AUX101 has exceeded the High Drive End Bearing Temperature threshold (AUX101) warning continuously for High Drive End Bearing Temperature Time (AUX101).

OR

Drive End Bearing Temperature connected at AUX101 has exceeded the High Drive End Bearing Temperature Shutdown threshold (AUX101) continuously for High Drive End Bearing Temperature Shutdown Time (AUX101).

Possible Causes:

1. Inaccurate Drive End Bearing Temperature sensor (AUX101).
2. Fault simulation feature is enabled.
3. Incorrect threshold setting.
4. Alternator Issue.

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 Drive End Bearing Temperature sensor.
 - b. Connect the InPower.
 - c. Compare the Drive End Bearing 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.
 - d. If the two readings are not reasonably close, then check the conditions at sensor end connected either to AUX101 or ECM.
2. Verify that the fault simulation feature is not enabled.
 - a. Connect InPower.
 - b. Verify that the fault simulation is NOT enabled for the Drive End Bearing Temperature sensor by connecting to the PCC via InPower. If fault simulation is Enabled, disabled it.
3. Check Threshold settings.
 - a. Connect InPower.
 - b. Verify that the fault threshold is within the normal operating range Drive End Bearing Temperature sensor. Refer to the Alternator manual for correct threshold values, and make the appropriate changes using InPower.
4. Alternator Issue.
 - a. If all the above settings are found OK, then refer alternator manual.

10.8.176 Code 2984 - Non-Drive End Bearing Temp OOR High

Logic:

Non-Drive End Bearing Temperature sensor (AUX101) is Out of Range – open circuit.

Possible Causes:

1. Faulty Non-Drive End Bearing Temperature sensor connection (AUX101).
2. Faulty Non-Drive End Bearing Temperature sensor (AUX101).
3. In-proper connections at AUX101 J11 connector.

Diagnosis and Repair:

1. Faulty Non-Drive End Bearing Temperature sensor connection (AUX101).

Inspect Non-Drive End Bearing Temperature sensor (AUX101) connection and the harness connector pins.

 - a. Disconnect the harness connector from Non-Drive End Bearing Temperature sensor.
 - b. Inspect for corroded 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 Non-Drive End Bearing Temperature sensor (AUX101).

Check the resistance of the sensor.

- a. Disconnect the harness connector from the Non-Drive End Bearing Temperature sensor.
 - b. Measure the resistance between the Non-Drive End Bearing Temperature sensor's signal pin and the return pin.
 - c. Refer to the Alternator Manual (PT100) for Non-Drive End Bearing Temperature ranges.
3. In-proper connections at AUX101 J11 connector.
 - a. Inspect the AUX101 J11 connector pins for open or short circuit visually and take corrective action if required.
 - b. Refer AUX101 manual for J11 connector and current source connection details.

10.8.177 Code 2985 - Non-Drive End Bearing Temp OOR Low

Logic:

Non-Drive End Bearing Temperature sensor (AUX101) is Out of Range – short circuit.

Possible Causes:

1. Faulty Non-Drive End Bearing Temperature sensor connection (AUX101).
2. Faulty Non-Drive End Bearing Temperature sensor (AUX101).
3. In-proper connections at AUX101 J11 connector.

Diagnosis and Repair:

1. Faulty Non-Drive End Bearing Temperature sensor connection (AUX101).

Inspect Non-Drive End Bearing Temperature sensor (AUX101) connection and the harness connector pins.

- a. Disconnect the harness connector from Non-Drive End Bearing Temperature sensor.
 - b. Inspect for corroded 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 Non-Drive End Bearing Temperature sensor (AUX101).

Check the resistance of the sensor.

 - a. Disconnect the harness connector from the Non-Drive End Bearing Temperature sensor.
 - b. Measure the resistance between the Non-Drive End Bearing Temperature sensor's signal pin and the return pin.
 - c. Refer to the Alternator Manual (PT100) for Non-Drive End Bearing Temperature ranges.
 3. In-proper connections at AUX101 J11 connector.
 - a. Inspect the AUX101 J11 connector pins for open or short circuit visually and take corrective action if required.
 - b. Refer AUX101 manual for J11 connector and current source connection details.

10.8.178 Code 2986 - High Non-Drive End Bearing Temperature

Logic:

Non-Drive End Bearing Temperature connected at AUX101 has exceeded the High Non-Drive End Bearing Temperature threshold (AUX101) warning continuously for High Non-Drive End Bearing Temperature Time (AUX101).

OR

Non-Drive End Bearing Temperature connected at AUX101 has exceeded the High Non-Drive End Bearing Temperature Shutdown threshold (AUX101) continuously for High Non-Drive End Bearing Temperature Shutdown Time (AUX101).

Possible Causes:

1. Inaccurate Non-Drive End Bearing Temperature sensor (AUX101).
2. Fault simulation feature is enabled.
3. Incorrect threshold setting.
4. Alternator Issue.

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 Non-Drive End Bearing Temperature sensor.
 - b. Connect the InPower.
 - c. Compare the Non-Drive End Bearing 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.
 - d. If the two readings are not reasonably close, then check the conditions at sensor end connected either to AUX101 or ECM.
2. Verify that the fault simulation feature is not enabled.
 - a. Connect InPower.
 - b. Verify that the fault simulation is NOT enabled for the Non-Drive End Bearing Temperature sensor by connecting to the PCC via InPower. If fault simulation is Enabled, disabled it.
3. Check Threshold settings.
 - a. Connect InPower.
 - b. Verify that the fault threshold is within the normal operating range of Non-Drive End Bearing Temperature sensor. Refer to the Alternator manual for correct threshold values, and make the appropriate changes using InPower.
4. Alternator Issue.
 - a. If all the above settings are found OK, then refer alternator manual.

10.8.179 Code 2992 - Intake Manifold Temp 1 OOR High

Logic:

Intake Manifold Temperature 1 sensor (AUX101) is Out of Range – open circuit.

Possible Causes:

1. Faulty intake manifold temperature 1 sensor connection (AUX101).
2. Faulty intake manifold temperature 1 sensor (AUX101).
3. In-proper connections at AUX101 J11 connector.

Diagnosis and Repair:

1. Faulty intake manifold temperature 1 sensor connection (AUX101).

Inspect intake manifold temperature 1 sensor (AUX101) connection and the harness connector pins.

- a. Disconnect the harness connector from intake manifold temperature 1 sensor.
- b. Inspect for corroded 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 intake manifold temperature 1 sensor (AUX101).

Check the resistance of the sensor.

- a. Disconnect the harness connector from the intake manifold temperature 1 sensor.
- b. Measure the resistance between the intake manifold temperature 1 sensor's signal pin and the return pin.
- c. Refer to the Appendix E below for intake manifold temperature 1 ranges.

NOTE: Sensor Part No - 0193-0529-XX

3. In-proper connections at AUX101 J11 connector.

- a. Inspect the AUX101 J11 connector pins for open or short circuit visually and take corrective action if required.
- b. Refer AUX101 manual for J11 connector and current source connection details.

10.8.180 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".

10.8.181 Code 3131 - Secondary Engine Overspeed

Logic:

This fault is specially added for Oil and Gas applications.

If any discrete Output is configured for Air Shutoff Valve Control and the engine speed exceeds 'Secondary Overspeed Trip Speed' threshold, the shutdown fault becomes Active.

Fault indicates that the engine speed has exceeded the primary fuel system's maximum speed limit.

Possible Causes:

1. Incorrect threshold setting.
2. Gas leakage in engine surroundings

Diagnosis and Repair:

1. Check threshold settings.
 - a. Connect InPower.
 - b. Verify that any of the discrete inputs is configured for 'Air Shutoff Valve Control'.
 - c. Verify that the 'Secondary Overspeed Trip Speed 50Hz' and 'Secondary Overspeed Trip Speed 60Hz' thresholds are set correctly for respective frequency selection.
2. Gas leakage in engine surroundings.
 - a. Check for any gas leakage in the surrounding atmosphere of the Engine.
 - b. Take appropriate action to stop the leakage.

10.8.182 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.

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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.

10.8.183 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.

10.8.184 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.

10.8.185 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.

10.8.186 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.

10.8.187 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.

10.8.188 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.

10.8.189 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.

10.8.190 Code 3416 - Start System

See the troubleshooting procedures for fault code 359 or 1438.

10.8.191 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 heater 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.

10.8.192 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.

10.8.193 Code 3483/3484/3485 – High Alternator Temp 1/2/3 Shutdown Fault

Logic:

Alternator Temperature 1/2/3 connected at AUX101 has exceeded the High Alternator Temperature 1/2/3 threshold (AUX101) warning continuously for High Alternator Temperature 1/2/3 Time (AUX101).

OR

Alternator Temperature 1/2/3 connected at AUX101 has exceeded the High Alternator Temperature 1/2/3 shutdown threshold continuously for High Alternator Temperature 1/2/3 Shutdown Time.

Possible Causes:

1. Inaccurate Alternator Temperature 1/2/3 sensor (AUX101).
2. Fault simulation feature is enabled.
3. Incorrect threshold setting.
4. Alternator Issue.

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 Alternator Temperature 1/2/3 sensor.
 - b. Connect the InPower.
 - c. Compare the Alternator Temperature 1/2/3 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.
 - d. If the two readings are not reasonably close, then check the conditions at sensor end connected either to AUX101 or ECM.
2. Verify that the fault simulation feature is not enabled.
 - a. Connect InPower.
 - b. Verify that the fault simulation is NOT enabled for the Alternator Temperature 1/2/3 sensor by connecting to the PCC via InPower. If fault simulation is Enabled, disabled it.
3. Check Threshold settings.
 - a. Connect InPower.
 - b. Verify that the fault threshold is within the normal operating range for Alternator Temperature 1/2/3 sensor. Refer to the Alternator manual for correct threshold values, and make the appropriate changes using InPower.
4. Alternator Issue.
 - a. If all the above settings are found OK, then refer alternator manual.

10.8.194 Code 3486 – High Drive End Bearing Temperature Shutdown Fault

Logic:

Drive End Bearing Temperature connected at AUX101 has exceeded the High Drive End Bearing Temperature threshold (AUX101) warning continuously for High Drive End Bearing Temperature Time (AUX101).

OR

Drive End Bearing Temperature connected at AUX101 has exceeded the High Drive End Bearing Temperature Shutdown threshold (AUX101) continuously for High Drive End Bearing Temperature Shutdown Time (AUX101).

Possible Causes:

1. Inaccurate Drive End Bearing Temperature sensor (AUX101).
2. Fault simulation feature is enabled.
3. Incorrect threshold setting.
4. Alternator Issue.

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 Drive End Bearing Temperature sensor.
 - b. Connect the InPower.
 - c. Compare the Drive End Bearing 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.
 - d. If the two readings are not reasonably close, then check the conditions at sensor end connected either to AUX101 or ECM.
2. Verify that the fault simulation feature is not enabled.
 - a. Connect InPower.
 - b. Verify that the fault simulation is NOT enabled for the Drive End Bearing Temperature sensor by connecting to the PCC via InPower. If fault simulation is Enabled, disabled it.
3. Check Threshold settings.
 - a. Connect InPower.
 - b. Verify that the fault threshold is within the normal operating range Drive End Bearing Temperature sensor. Refer to the Alternator manual for correct threshold values, and make the appropriate changes using InPower.
4. Alternator Issue.
 - a. If all the above settings are found OK, then refer alternator manual.

10.8.195 Code 3487 - High Non-Drive End Bearing Temperature Shutdown Fault

Logic:

Non-Drive End Bearing Temperature connected at AUX101 has exceeded the High Non-Drive End Bearing Temperature threshold (AUX101) warning continuously for High Non-Drive End Bearing Temperature Time (AUX101).

OR

Non-Drive End Bearing Temperature connected at AUX101 has exceeded the High Non-Drive End Bearing Temperature Shutdown threshold (AUX101) continuously for High Non-Drive End Bearing Temperature Shutdown Time (AUX101).

Possible Causes:

1. Inaccurate Non-Drive End Bearing Temperature sensor (AUX101).
2. Fault simulation feature is enabled.
3. Incorrect threshold setting.
4. Alternator Issue.

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 Non-Drive End Bearing Temperature sensor.
 - b. Connect the InPower.
 - c. Compare the Non-Drive End Bearing 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.
 - d. If the two readings are not reasonably close, then check the conditions at sensor end connected either to AUX101 or ECM.
2. Verify that the fault simulation feature is not enabled.
 - a. Connect InPower.
 - b. Verify that the fault simulation is NOT enabled for the Non-Drive End Bearing Temperature sensor by connecting to the PCC via InPower. If fault simulation is Enabled, disabled it.
3. Check Threshold settings.
 - a. Connect InPower.
 - b. Verify that the fault threshold is within the normal operating range of Non-Drive End Bearing Temperature sensor. Refer to the Alternator manual for correct threshold values, and make the appropriate changes using InPower.
4. Alternator Issue.
 - a. If all the above settings are found OK, then refer alternator manual.

10.8.196 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 location in the alternator terminal box.
2. Check connections for the CT wiring are from pin 40-45 on the terminal block inside the alternator terminal box.
3. Verify 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.

10.8.197 Code 3599 – Ground Current OOR Warning

Logic:

The Ground Current is above the “Ground Current Adjust” parameter for the time in the “Ground Current OOR Delay” time parameter.

Possible Causes:

1. CT ratio is too small or the CTs are not the sized correctly for the genset voltage and kW rating.
2. Ground current is above the “Ground Current Adjust” parameter.
3. Faulty CT.

Diagnosis and Repair:

1. CT ratio is too small or the CTs are not the sized correctly for the genset voltage and kW rating.
 - a. See event/fault code 2814.
2. Ground current is above the “Ground Current Adjust” parameter.
 - a. Measure the Ground current input into the control board with current probe at Ground CT installed at site. The maximum value of current going into the control CTs should not be more than the value of the “Ground CT Primary Current” value that the control is calibrated for. For example, if Primary setting in the control is 1 Amp, current going into the control should not be more than 1 Amp. To access the Ground CT Primary Current configuration menu on the operator panel go to **Setup > OEM Setup > OEM Alt Setup >** and set the “Ground CT Primary Current” parameter appropriately for the application.
3. Faulty CT.
 - a. If the above is satisfactory, check the Ground CT and replace if faulty.

10.8.198 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.

10.8.199 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.

10.8.200 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.

10.8.201 Code 3664 – Genset Config Mismatch

Logic:

For Voltage Reconnect trim as Enabled and genset configuration set as Single Phase then if Customer Input #n (n=1 to 33) configured as Paralleling Cable detect is ACTIVE OR BUS is LIVE with Genset CB position OPEN (or Bus is LIVE for > 5 sec when CB transitions from close to open), Shutdown fault becomes Active.

Possible Causes:

1. Incorrect trim settings.
2. Incorrect CB position.

Diagnosis and Repair:

1. Incorrect trim settings.
 - a. Connect InPower.
 - b. For Voltage Reconnect Trim as Enabled, Customer Input #n (n=1 to 33) Function configured as Parallel Cable Detect and Genset connection as Single Phase are mutually Exclusive.
2. Incorrect CB Position.
 - a. Ensure there is no additional genset/Utility is connected over the bus.

10.8.202 Code 4358 – Setup Mode Shutdown

Logic:

For Genset in Setup Mode if user gives the run command, shutdown fault becomes Active.

Possible Causes:

1. Incorrect trim settings.

Diagnosis and Repair:

1. Incorrect trim settings.
 - a. Connect InPower.
 - b. Verify that when genset is in 'Controller Mode = Setup' then user is not supposed to give the RUN command.

10.8.203 Code 4872 - System Network Failure

Logic:

The generator set has lost network communications with all generator sets on the s-CAN network.

MLD Response:

When this fault is present all generator sets will start and connect to the bus, but will not operate load demand. The Load Demand State will change to Halted. If three or more generator sets exist on the network, the other generator sets in the system rather than the generator set with this warning will have Generator Set Lost on System Network (4876). If only two generator sets exist on the network, both will show this warning.

Possible Causes:

1. Incorrectly wired connections on the s-CAN network.
2. Improper installation of the s-CAN network.

10.8.203.1 Code 4872 - Diagnosis and Repair

1. Make sure that s-CAN network wires are securely landed in TB3 and have no external damage.

Verify that:

- a. s-CAN shield ground is landed securely in TB3-1.

- b. s-CAN isolated ground is landed securely in TB3-2.
 - c. s-CAN L is landed securely in TB3-3.
 - d. s-CAN H is landed securely in TB3-4.
2. Verify a proper installation of the s-CAN communication cable.
- a. If using local termination resistors in the board, verify that only the termination resistors of the generator sets that are at both ends of the system are on, the termination resistors of the rest of the boards should be off.
 - b. Verify the interconnection harness (s-CAN cable) of the s-CAN bus to make sure there is no interruption of the s-CAN signal to the generator set that is affected.
 - c. If using external terminator resistors, disconnect power from the PCC 3300 board and measure ohms between TB3-3 and TB3-4, should get 55 to 65 ohms indicating that a 120 ohm resistor is on each end of the system.
 - d. If using local termination resistors in the board, isolate the board from the network and measure the resistance between TB3-3 and TB3-4. The resistance should be between 110 and 130 ohms.
 - e. Verify that the cable used for s-CAN network meets the J1939-11 standards (type Belden 3106A) or equivalent.
 - f. Verify that the total length of the s-CAN bus is no longer than 200 meter.
 - g. Refer to [Section 10.9](#) for additional details on how troubleshoot CAN network.

NOTICE

If an external termination resistor is being used, the switch activated termination resistor on the PCC3300MLD control should be turned Off. The combination of active switch-activated and external termination resistors must be 2.

10.8.204 Code 4873 - Generator Set Failed to Come Online

Logic:

A generator set running on MLD mode failed to come online within the load demand generator set failed delay period.

MLD Response:

If available, another generator set will start up to replace the generator set that failed to come online.

Possible Causes:

1. The generator set that failed to come online has an active shutdown that prevented the generator set from starting, or the generator set is having trouble starting (low battery, out of fuel, and etc.).
2. The generator sets on the s-CAN network have different settings.
3. The time delay (LD Time Delay) is set too short.
4. The expected-to-come-online generator set has trouble synchronizing to the bus.
5. The generator set CB inhibit signal to the generator set is active which prevents the breaker from closing.

10.8.204.1 Code 4873 - Diagnosis and Repair

1. Locate the generator set that Failed to come online (Indicated as Failed on the Load Demand System Status Screen) and troubleshoot any active fault on the generator set by referring to the specific troubleshooting procedure for the active fault. Check for any problems that might prevent the generator set for starting (low battery, out of fuel, and etc.).

NOTICE

If the generator set is eventually able to come online, it will no longer appear as failed on the Paralleling Status (8/9) screen.

2. Verify system settings are In sync by using Inpower service tool or by setting (Sync System Settings) to Yes in HMI paralleling setup screen 7 of 9. (See [Section 7.6.7.](#))
3. Verify that the load demand generator set fail Delay (LD Gen Fail Delay) is not set lower than the time the generator set takes to normally come online, depending on what type of generator set on the system; the time required for a generator set to come online will vary. Increase this time delay as required.
4. If the generator set that fails to synchronize to the system has an active fault code 1457 Fail To Synchronize, reference fault code 1457 to troubleshoot the fault.
5. If any of the configurable inputs on the PCC are set to a Generator Set CB inhibit, verify that those configurable inputs are not active.

NOTICE

The default input for generator set CB inhibit is TB10-11.

10.8.205 Code 4874 - Load Demand Software Version Incompatibility

Logic:

There is an incompatibility in MLD versions, between two or more generator sets on the s-CAN network.

NOTICE

MLD does not require all generator sets to have the same software version to operate. This fault is independent of software version; however the two may be linked.

MLD Response:

All generator sets will start up but Load Demand State (LD State) will indicate the generator set as halted, MLD no longer operates.

Possible Causes:

1. Generator sets in the MLD system have different MLD versions that are incompatible.

NOTICE

MLD does not require all generator sets to have the same software version to operate.

10.8.205.1 Code 4874 - Diagnosis and Repair

1. Perform an update calibration on each generator set in the network to the latest released calibration, starting at the generator set with the oldest software version until the issue is resolved.

10.8.206 Code 4875 - Generator Set Ineligible for Load Demand

Logic:

A networked generator set on the s-CAN Network has transitioned to Ineligible.

NOTICE

By default the response of this fault is set to None. The fault response for this fault must be set to warning for this fault to be declared.

MLD Response:

If a generator set becomes ineligible for load demand the MLD system bus will bring the next priority generator set online. When the ineligible generator set is again eligible, the MLD system will again utilize that generator set based on its assigned priority and start and stop generator set as required.

Possible Causes:

1. Generator set not in auto
2. Load demand Generator set Enable (trim) set to disable.
3. The generator set does not have a remote start command
4. Inadequate generator set application
5. Active shutdown on the generator set
6. Load demand stop input is active
7. Generator set circuit breaker Inhibit command is active

10.8.206.1 Code 4875 - Diagnosis and Repair

Find the generator set with LD State status set to Ineligible, HMI320 Paralleling Status menu (page 7 of 9) and verify that all conditions for a generator set to be eligible for use in load demand are met. Troubleshoot each condition as follows:

1. Make sure that the generator set is running in Auto mode by setting the control switch position to Auto.
2. Verify with InPower or through the HMI paralleling/Basic setup 9/9 menu that the LD Gen Enable trim is set to Enable.
3. Verify if the generator set is getting a remote start command via wired input, system remote start, or through a Modbus command. The Remote Start LED on the HMI320 will be on or blinking when a valid Remote Start command exists.
4. Make sure that the Generator Set Application type is set to Isolated Bus.
5. Verify that there are no active shutdowns on the generator set with this fault code, if there is an active shutdown troubleshoot accordingly.
6. Verify that the Load Demand Stop Input/Modbus command is Inactive.

NOTICE

The default input for Load Demand Stop is Configurable Input 31.

7. If any of the configurable inputs on the PCC are set to a Generator Set CB inhibit, verify that those configurable inputs are not active.

NOTICE

The default input for generator set CB inhibit is TB10-11.

10.8.207 Code 4876 - Generator Set Lost on System Network

Network communications have been lost to one or more generator sets, but the network is still active (two or more generator sets are still communicating). This fault can only occur if three or more generator sets exist on the s-CAN network.

NOTICE

If only one generator set lost communications with all generator sets on the network, that generator set will indicate a System Network Failure (4872) warning, while the rest of the generator sets indicate a Generator Set Lost on System Network (4876) fault.

NOTICE

If a break occurs between two groups of communication generator sets, each group may continue to communicate within their group. In this scenario the disconnected groups of networked generator sets will indicate all generator sets of the disconnected group as Lost.

MLD Response:

All generator sets will start. The Load Demand state will change to halted. The generator set(s) that is/are no longer communicating on the network will be indicated as Lost.

Possible Causes:

1. Incorrectly wired connections on the s-CAN network.
2. Improper installation of the s-CAN network.
3. Power is lost to one or more generator sets on the s-CAN network.
4. An improper update calibration was performed on the generator set and it is no longer functioning.

10.8.207.1 Code 4876 - Diagnosis and Repair

1. Make sure that s-CAN network wires are securely landed in TB3 and have no external damage.

Verify that:

 - a. s-CAN shield ground is landed securely in TB3-1.
 - b. s-CAN isolated ground is landed securely in TB3-2.
 - c. s-CAN L is landed securely in TB3-3.
 - d. s-CAN H is landed securely in TB3-4.
2. Verify a proper installation of the s-CAN communication cable.
 - a. If using local termination resistors in the board, verify that only the termination resistors of the generator sets that are at both ends of the system are on, the termination resistors of the rest of the boards should be off.
 - b. Verify the interconnection harness (s-CAN cable) of the s-CAN bus to make sure there is no interruption of the s-CAN signal to the generator set that is affected.

- c. If using external terminator resistors, disconnect power from the PCC 3300 board and measure ohms between TB3-3 and TB3-4, should get 55 to 65 ohms indicating that a 120 ohm resistor is on each end of the system.
- d. If using local termination resistors in the board, isolate the board from the network and measure the resistance between TB3-3 and TB3-4. The resistance should be between 110 and 130 ohms.
- e. Verify that the cable used for s-CAN network meets the J1939-11 standards (type Belden 3106A) or equivalent.
- f. Verify that the total length of the s-CAN bus is no longer than 200 meter.
- g. Refer to [Section 10.9](#) for additional details on how troubleshoot CAN network.

NOTICE

If an external termination resistor is being used, the switch activated termination resistor on the PCC3300MLD control should be turned Off. The combination of active switch-activated and external termination resistors must be 2.

3. Verify that all generator sets on the network have adequate battery voltage, HMI320s are communicating and displaying information, and LEDs on the PCC3300 are active.
4. Verify that the generator set control functions (generator set starts and stops, and HMI320 is showing valid information). Perform an update or initial calibration if required.

NOTICE

See [Section 7.6.8](#) for information on how to remove and return a generator set to the network.

10.8.208 Code 4877 - System Settings Not Synchronized

Logic:

There is a discrepancy between system settings on the system network (s-CAN). A Synchronize System Settings (Sync System Settings) operation from a generator set controller with the desired settings is needed to clear the fault .

MLD Response:

The MLD system will decide which generator set to turn on and off based on the system settings in the 'acting master'. This will be the generator set with the lowest priority communicating to network. Operation of the system may not be consistent when viewed from all HMI screens.

Possible Causes:

1. One or more of the following changes happened to the s-CAN network:
 - a. An updated calibration
 - b. System Settings Status (System Settings Status) is set to Out of Sync
 - c. A new generator set was added to the s-CAN network
 - d. System settings were modified while the generator set was running and, the control has lost power or battery was disconnected while running.

10.8.208.1 Code 4877 - Diagnosis and Repair

1. Go to a generator set with the desired settings and Synchronize (broadcast) system setting from that generator set. The synchronization can be done through the HMI Paralleling/Basic Setup menu (7/9) or by using the service tool.

10.8.209 Code 4878 - Check System Network Installation

Logic:

Switch S1 is switched On in more than two controls in the s-CAN Network, or the s-CAN Network Datalink status has been active for at least 20 seconds and a degraded system network connection has been detected by the controller due to errors in communication detected on the s-CAN network.

MLD Response:

The MLD system will continue to run with this warning active. MLD data updates may be delayed.

This warning provides early detection of potential issues on the s-CAN bus. If uncorrected, this fault may progress into more serious network failure (i.e. code 4872 or code 4876).

Possible Causes:

1. Incorrectly wired connections on the s-CAN network.
2. Improper installation of the s-CAN network.

10.8.209.1 Code 4878 - Diagnosis and Repair

1. Make sure that s-CAN network wires are securely landed in TB3 and have no external damage.

Verify that:

- a. s-CAN shield ground is landed securely in TB3-1.
 - b. s-CAN isolated ground is landed securely in TB3-2.
 - c. s-CAN L is landed securely in TB3-3.
 - d. s-CAN H is landed securely in TB3-4.
2. Verify a proper installation of the s-CAN communication cable.
 - a. If using local termination resistors in the board, verify that only the termination resistors of the generator sets that are at both ends of the system are on, the termination resistors of the rest of the boards should be off.
 - b. Verify the interconnection harness (s-CAN cable) of the s-CAN bus to make sure there is no interruption of the s-CAN signal to the generator set that is affected.
 - c. If using external terminator resistors, disconnect power from the PCC 3300 board and measure ohms between TB3-3 and TB3-4, should get 55 to 65 ohms indicating that a 120 ohm resistor is on each end of the system.
 - d. If using local termination resistors in the board, isolate the board from the network and measure the resistance between TB3-3 and TB3-4. The resistance should be between 110 and 130 ohms.
 - e. Verify that the cable used for s-CAN network meets the J1939-11 standards (type Belden 3106A) or equivalent.
 - f. Verify that the total length of the s-CAN bus is no longer than 200 meter.
 - g. Refer to [Section 10.9](#) for additional details on how troubleshoot CAN network.

NOTICE

If an external termination resistor is being used, the switch activated termination resistor on the PCC3300MLD control should be turned Off. The combination of active switch-activated and external termination resistors must be 2.

10.8.210 Code 4879 - Load Demand Setup Error

Logic:

An improper %kW or kW setup condition exists with regard to Load Demand Settings.

MLD Response:

All generator sets will turn on.

Possible Causes:

1. Improper setup of Load demand settings.

10.8.210.1 Code 4879 - Diagnosis and Repair

1. Verify that Load demand settings are set correctly :
 - a. Verify system settings are In sync through the HMI Paralleling/Basic Setup Menu (7/9) or using the service tool.
 - b. From the HMI Paralleling/Basic Setup Menu (7/9) or from the service tool, determine the setting of the Load Demand Threshold Method (Threshold Method):
 - If the Load Demand Threshold Method (Threshold Method) is %kW, make sure the Load Demand Start Threshold (%kW) (Start Thresh %kW) is greater than the Load Demand Stop Threshold (%kW) (Stop Thresh %kW) by at least 5%. See [Table 118](#) for details on how to change these values.
 - If the Load Demand Threshold Method (Threshold Method) is kW, make sure Load Demand Stop Threshold (kW) (Stop Thresh kW) is greater than Load Demand Start Threshold (kW) (Start Thresh kW). See [Table 118](#) for details on how to change these values.
 - c. After the changes are made, set Synchronize System Settings (Sync System Settings) to Yes, to propagate settings to all generator sets in the network.

10.8.211 Code 4881 - System Generator Set Identification Conflict

Two or more generator sets in the s-CAN network have the same generator set identification (Genset ID).

MLD Response:

All generator sets will start. The Load Demand State (LD State) will change to Halted.

Possible Causes:

1. One or more of the following situations may have occurred on the s-CAN network:
 - Two or more generator sets in the system network have the same generator set ID
 - A generator set was added to the network with the same ID as an existing generator
 - The PCC3300 control was replaced on a generator set with the same ID as an existing generator set
 - More than one generator set control is connected and set to default (Gen1).

10.8.211.1 Code 4881 - Diagnosis and Repair

1. Make sure each generator set in the network has a unique generator set identification (Genset ID) assigned to it. Genset ID is a local setting, and must be changed/set on each generator set. After the changes are made, set Synchronize System Settings (Sync System Settings) to Yes to propagate settings to all generator sets in the network.

10.8.212 Code 4882 - Generator Set Bus Overload

The generator set AC bus became overloaded while running in MLD mode. A single overloaded generator set will trigger this fault .

MLD Response:

All generator sets will start up.

If bus overload leads to a bus failure, all generator sets will attempt to start or restart.

MLD operation will resume once all generator sets are online and the Load Demand Initial Delay (LD Initial Delay) has expired.

Possible Causes:

1. The system settings are not synchronized
2. System load exceeds the system capacity.
3. Load Demand settings are not properly configured to respond to changes in load on the system leading to a generator set bus overload
 - Load Demand start delay timers are set incorrectly (too long)
 - Load Demand Stop delay timers are set incorrectly (too short)
 - Load Demand Stop threshold is set incorrectly (too low)
4. System Remote start is set to enable, and the generator set with the single remote start input is removed or lost on the s-CAN network.
5. One or more online generator sets stopped due to a shutdown failure.
6. One or more generator sets on the network has an active de-rate condition.
7. Generator sets are not sharing load equally (imbalanced)
8. Incorrect generator set synchronizer settings which delay sets from being added to the AC bus.
9. Generator set and/or paralleling time delays may be set too long, which delays the generator set being added to the AC bus on a load increase (i.e. Idle warm-up time, Time delay to start, start to rated ramp time, rated to idle ramp time, idle to rated ramp time, load share ramp time, etc.).

10.8.212.1 Code 4882 - Diagnosis and Repair

1. Verify that Load demand settings are set correctly :
 - a. Verify system settings are In sync through the HMI Paralleling/Basic Setup Menu (7/9) or using the service tool.
 - b. From the HMI Paralleling/Basic Setup Menu (7/9) or from the service tool, determine the setting of the Load Demand Threshold Method (Threshold Method):
 - If the Load Demand Threshold Method (Threshold Method) is %kW, make sure the Load Demand Start Threshold (%kW) (Start Thresh %kW) is greater than the Load Demand Stop Threshold (%kW) (Stop Thresh %kW) by at least 5%. See [Table 118](#) for details on how to change these values.

- If the Load Demand Threshold Method (Threshold Method) is kW, make sure Load Demand Stop Threshold (kW) (Stop Thresh kW) is greater than Load Demand Start Threshold (kW) (Start Thresh kW). See [Table 118](#) for details on how to change these values.
 - c. After the changes are made, set Synchronize System Settings (Sync System Settings) to Yes, to propagate settings to all generator sets in the network.
2. Verify that the load requested is within the generator sets network capacity. Utilize the spare capacity request feature when enabling large power consuming loads.
 3. Load Demand settings are not properly configured to respond to changes in load on the system leading to a generator set bus overload
 - Load Demand start delay timers are set incorrectly (too long)
 - Load Demand Stop delay timers are set incorrectly (too short)
 - Load Demand Stop threshold is set incorrectly (too low)

Verify each Load Demand parameter is correctly set to meet the needs of the system.

4. Determine if System remote start is being used. If this is set to enable and there is a network failure on the s-CAN network, all generator sets in the network will shutdown as they will lose their remote start command. Refer to [Section 7.6.5](#) and [Section 7.6.6.1](#) for additional details on the system remote start feature, see Code 4872 - System Network Failure ([Section 10.8.203](#)), Code 4876 - Generator Set Lost on System Network ([Section 10.8.207](#)), or Code 4878 - Check System Network Installation ([Section 10.8.209](#)) for information on how to diagnose and repair s-CAN network failures.
5. Locate the generator set that failed to come online or stopped due to a shutdown and troubleshoot any active fault on the generator set by referring to the specific troubleshooting procedure for the active fault.
6. If any of the following fault codes are active; Code 1464 - Load Dump, Code 1444 - kW Overload, or Code 1448 - Underfrequency, refer to [Section 10.8.81](#), [Section 10.8.65](#), or [Section 10.8.69](#) diagnosis and repair sections to troubleshoot the fault.
7. Make sure that load share lines and KVAR lines are connected properly as following:
 - a. Ensure kW load share line on generator set is connected to kW load share line on the next generator set on the bus on all generator sets on the network. (See [Section 5.2.18](#) for connection information).
 - b. Ensure that KVAR load share line on generator set is connected to KVAR load share line on the next generator set on the bus on all generator sets on the network. (See [Section 5.2.18](#) for connection information).
 - c. Ensure that kW load share lines and KVAR load share lines have are not shorted or opened.
 - d. Make sure that load sharing parameters are correctly configured. See [Table 140](#).
 - e. If Code 1459 - Reverse Power is active, refer to [Section 10.8.79](#) diagnosis and repair section for troubleshooting the fault.
8. Verify that the synchronizer is performing correctly. See [Section 7.2.2](#). If Code 1457 - Fail To Synchronize is active, refer to [Section 10.8.77](#) to troubleshoot the fault.
9. Evaluate the following time delay settings and consider reducing them:
 - Idle warm-up time
 - Time delay to start
 - Start to rated ramp time
 - Rated to idle ramp time
 - Idle to rated ramp time

- Load share ramp time

10.8.213 Code 5134 – Unknown Shutdown at Idle Fault

Logic:

During genset starting when PCC is in 'Disengage Starter OR Pre-Ramp OR Ramp OR Idle' states and Engine RPM is sensed as 0 then Unknown Shutdown at Idle fault becomes active.

Possible Causes:

1. Engine runs out of Fuel or Engine Stalls with no fault being declared by ECM.
2. On receiving start command PCC senses 'Charging Alternator Voltage' above 'Charging Alternator Starter Disconnect Voltage Threshold' and disengages the starter even before cranking.

Diagnosis and Repair:

1. Engine runs out of Fuel or Engine Stalls with no fault being declared by ECM.
 - a. Check fuel system of the engine.
 - b. Check fuel levels.
 - c. Check ECM calibration or refer Engine Manual.
2. On receiving start command PCC senses 'Charging Alternator Voltage' above 'Charging Alternator Starter Disconnect Voltage Threshold' and disengages the starter even before cranking.
 - a. Check charging alternator starter Disengage voltage threshold.
 - b. If it is found as 9V increase it to 10 - 11V for 12V system.
 - c. If it is found as 18V increase it to 20 - 21V for 24V system.
 - d. Snapshot for existing 'Charging Alternator Disconnect Voltage' settings:

Parameter	Value	Units	Time Last Read
12V Charging Alternator Disconnect Voltage	9.0	Volts	01/01/2015 12:26:08:43
Memory Corruption Status	ALL_OKAY		01/01/2015 12:26:08:31
Ready to Load/ATS Output	Driver On		01/01/2015 12:26:08:37
Ready to Load/ATS Output Override Command	Driver Off		01/01/2015 12:26:08:25
Ready to Load/ATS Output Override Enable	Disable		01/01/2015 12:26:08:32
Start Time Delay	0	seconds	01/01/2015 12:26:08:38
Cycle Crank Attempts	3		01/01/2015 12:26:08:26
Cycle Crank Engage Time	15	seconds	01/01/2015 12:26:08:34
Cycle Crank Rest Time	30	seconds	01/01/2015 12:26:08:40
Time Delay to Stop	0	seconds	01/01/2015 12:26:08:28
Charging Alternator Voltage for Starter Disconnect	18.0	Volts	01/01/2015 12:26:08:35
24V Charging Alternator Voltage for Starter Disconnect	18.0	Volts	01/01/2015 12:26:08:41
Starter Disconnect Speed	450	rpm	01/01/2015 12:26:08:29

- e. Snapshot for modified 'Charging Alternator Disconnect Voltage' settings:

Parameter	Value	Units	Time Last Read
12V Charging Alternator Disconnect Voltage	11.0	Volts	01/01/2015 12:29:26.73
Memory Corruption Status	ALL_OKAY		01/01/2015 12:29:26.60
Ready to Load/ATS Output	Driver Off		01/01/2015 12:29:26.66
Ready to Load/ATS Output Override Command	Driver Off		01/01/2015 12:29:26.54
Ready to Load/ATS Output Override Enable	Disable		01/01/2015 12:29:26.62
Start Time Delay	0	seconds	01/01/2015 12:29:26.68
Cycle Crank Attempts	3		01/01/2015 12:29:26.56
Cycle Crank Engage Time	15	seconds	01/01/2015 12:29:26.63
Cycle Crank Rest Time	30	seconds	01/01/2015 12:29:26.69
Time Delay to Stop	0	seconds	01/01/2015 12:29:26.57
Charging Alternator Voltage for Starter Disconnect	21.0	Volts	01/01/2015 12:29:26.65
24V Charging Alternator Voltage for Starter Disconnect	21.0	Volts	01/01/2015 12:29:26.71
Starter Disconnect Speed	450	rpm	01/01/2015 12:29:26.59

10.8.214 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.

10.8.215 Code 5145 - Load Demand Generator Set Bus Failure

Logic:

The generator set AC bus fails while Load Demand is running (AC Bus < 20% of Nominal).

MLD Response:

All generator sets will restart.

MLD operation will resume once all generator sets are online and the initial Load Demand Start Delay Timer (Start Dly Tmr) has expired.

Possible Causes:

1. System load exceeded system capacity.
2. One or more online generator sets had a shut down failure.
3. System Remote Start is set to enable, and the generator set with the single Remote Start input is removed or lost on the s-CAN network.
4. Load Demand settings are not properly configured to respond to changes in load on the system leading to a generator set bus overload
 - Load Demand start delay timers are set incorrectly (too long)
 - Load Demand Stop delay timers are set incorrectly (too short)
 - Load Demand Stop threshold is set incorrectly (too low)
5. Low load and MLD settings result in the system having only one generator set online followed by a generator set shutdown. (Loss of remote start, generator set fault, etc.)

10.8.215.1 Code 5145 - Diagnosis and Repair

1. If fault code 4882 - Generator Set Bus Overload is active, refer to [Section 10.8.212.1](#) for troubleshooting the fault.
2. Locate the generator set that failed to come online (Indicated as Failed on the Load Demand System Status Screen) and troubleshoot any active fault on the generator set by referring to the specific troubleshooting procedure for the active fault.
3. Determine if System remote start is being used. If this is set to enable and there is a network failure on the s-CAN network, all generator sets in the network will shutdown as they will lose their remote start command. Refer to [Section 7.6.5](#) and [Section 7.6.6.1](#) for additional details on the system remote start feature, see [Section 10.8.203](#) (Code 4872), [Section 10.8.207](#) (Code 4876) , or [Section 10.8.209](#) (Code 4878) for information on how to diagnose and repair s-CAN network failures.
4. Load Demand settings are not properly configured to respond to changes in load on the system leading to a generator set bus overload
 - Load Demand start delay timers are set incorrectly (too long)
 - Load Demand Stop delay timers are set incorrectly (too short)
 - Load Demand Stop threshold is set incorrectly (too low)

Verify each Load Demand parameter is correctly set to meet the needs of the system.

5. Set the Load Demand Stop Threshold (kW) (Stop Thresh kW) to a value greater than the rating of a single generator set to ensure system redundancy.

10.8.216 Code 5149 – Prelube Cycle failed during Non-Emergency Start

Logic:

When Prelube function feature is Enabled with Crank After Prelube Mode, then for ECS/ECM as Owner of Prelube function if it is detected that Prelube Cycle has failed, Shutdown fault becomes Active.

Possible Causes:

1. Prelube function is Enabled when not required.
2. Prelube system issue.

Diagnosis and Repair:

1. Prelube function is Enabled when not required.
 - a. Connect InPower.
 - b. Verify the 'Prelube Function Enable' feature is required to be Enabled, if not required Disable it.
2. Prelube system issue.
 - a. Refer Engine manual for details.

10.8.217 Code 5151/5152/5153/5154 – Intake air restriction indicator 1/2/3/4 active

Logic:

If any Discrete Input #n (n=1 to 33) Function is configured for 'Intake air restriction indicator #n (n=1 to 4) active' and that Discrete Input is Active, Warning fault becomes Active.

Possible Causes:

1. Incorrect trim settings.
2. Intake air Filters are choked/clogged.

Diagnosis and Repair:

1. Incorrect trim settings.
 - a. Connect InPower.
 - b. Verify that Customer Input #n (n=1 to 33) Function is configured for Valid Intake Air restriction indicator #m (m=1 to 4) if required, else it should not be configured for Intake Air restriction indicator #m (m=1 to 4).
2. Intake air Filters are choked/clogged.
 - a. Clean/Replace the filters.
 - b. Refer engine manual for filter specific information.

10.8.218 Code 5155/5156/5157/5158 – Low Battery 1/2/3/4 Voltage

Logic:

If AUX101 (1, 2, 3, 4) Analog channels 7 or 8 configured for monitoring additional battery packs required by genset, then if battery voltage goes below Low Battery #n (n=1 to 4) Voltage threshold continuously for set time, warning fault becomes Active.

Possible Causes:

1. Refer fault Code 441 (Low Battery Voltage) for possible causes.

Diagnosis and Repair:

1. Refer fault code 441 (Low Battery Voltage) for Diagnosis and repair.

10.8.219 Code 5159/5161/5162/5163 – Weak Battery 1/2/3/4

Logic:

When the engine is starting (cranking) and AUX101 (1, 2, 3, 4) Analog channels 7 or 8 configured for monitoring additional battery packs required by genset, then if battery voltage goes below “Weak Battery Voltage Threshold” continuously for “Weak Battery Voltage Set Time”, warning fault becomes Active.

Possible Causes:

1. Refer fault Code 1442 (Weak Battery) for possible causes.

Diagnosis and Repair:

1. Refer fault code 1442 (Weak Battery) for Diagnosis and repair.

10.8.220 Code 5164/5165/5166 – Battery Charger 2/3/4 Failed Fault

Logic:

If any Discrete Input #n (n=1 to 33) Function is configured for ‘Battery Charger #n (n=2 to 4) Failed Switch’ and that Discrete Input is Active, warning fault becomes Active.

Possible Causes:

1. Refer fault Code 2993 (Battery Charger Failed) for possible causes.

Diagnosis and Repair:

1. Refer fault code 2993 (Battery Charger Failed) for Diagnosis and repair.

10.8.221 Code 5283/5284/5285/5286 – High Battery 1/2/3/4 Voltage

Logic:

If AUX101 (1, 2, 3, 4) Analog channels 7 or 8 configured for monitoring additional battery packs required by genset, then if battery voltage goes above High Battery #n (n=1 to 4) Voltage threshold continuously for set time, warning fault becomes Active.

Possible Causes:

1. Refer fault Code 442 (High Battery Voltage) for possible causes.

Diagnosis and Repair:

1. Refer fault code 442 (High Battery Voltage) for Diagnosis and repair.

10.8.222 Code 5287 – Starter Air Supply Pressure Low

Logic:

When 'Starter Air Supply Pressure Low Fault Switch' is ACTIVE continuously for 'Starter Air Supply Pressure Low Fault Set Time', Warning fault becomes Active.

Possible Causes:

1. Low pneumatic pressure.
2. Switch wiring defective.
3. Faulty switch.

Diagnosis and Repair:

1. Low pneumatic pressure
 - a. Check the pneumatic system and take appropriate action.
2. Switch wiring defective.
 - a. Check for the wiring of switch with controller and repair for any defects.
3. Faulty switch.
 - a. Check for incorrect switch pressure setting and correct it.
 - b. Check for Damaged switch and Replace if required.

10.8.223 Code 5288 – Starter Air Tank Volume Low

Logic:

When 'Starter Air Tank Volume Low Fault Switch' is ACTIVE continuously for 'Starter Air Tank Volume Low Fault Set Time', Warning fault becomes Active.

Possible Causes:

1. Low pneumatic pressure.
2. Switch wiring defective.
3. Faulty switch.

Diagnosis and Repair:

1. Low pneumatic pressure
 - a. Check the pneumatic system and take appropriate action.
2. Switch wiring defective.
 - a. Check for the wiring of switch with controller and repair for any defects.
3. Faulty switch.
 - a. Check for incorrect switch level setting and correct it.
 - b. Check for Damaged switch and Replace if required.

10.8.224 Code 5377 – AUX101-3 Communication Lost Fault

Logic:

When “AUX101-3 Enable” feature is Enabled and communication between the genset control and AUX101-3 is lost continuously for 3 seconds, Warning fault becomes Active.

Possible Causes:

1. The AUX101-3 has lost power or failed.
2. Check ‘AUX101-3 Enable’ is Enabled without any AUX module.

Diagnosis and Repair:

1. The AUX101-3 has lost power or failed.
 - a. Check the communication wiring from the base board to AUX 101 board. Correct if required.
 - b. Check the supply wires from the base board to AUX101 board. Correct if required.
 - c. If board is faulty replace it.
2. Check ‘AUX101-3 Enable’ is Enabled without any AUX module.
 - a. Connect InPower.
 - b. Check if “AUX101-3 Enable” is Enabled but no AUX module is connected, then Disable it.

10.8.225 Code 5378 – AUX101-4 Communication Lost Fault

Logic:

When “AUX101-4 Enable” feature is Enabled and communication between the genset control and AUX101-4 is lost continuously for 3 seconds, Warning fault becomes Active.

Possible Causes:

1. The AUX101-4 has lost power or failed.
2. Check ‘AUX101-4 Enable’ is Enabled without any AUX module.

Diagnosis and Repair:

1. The AUX101-4 has lost power or failed.
 - a. Check the communication wiring from the base board to AUX 101 board. Correct if required.
 - b. Check the supply wires from the base board to AUX101 board. Correct if required.
 - c. If board is faulty replace it
2. Check ‘AUX101-4 Enable’ is Enabled without any AUX module.
 - a. Connect InPower.
 - b. Verify “AUX101-4 Enable” is Enabled but no AUX module is connected, then Disable it.

10.8.226 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.

10.8.227 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.

10.8.228 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.

10.8.229 Code 5489 – ECM Write Failed – Multiple Tools connected to ECM

Logic:

When genset controller requests for the extended session to write engine control (ECM) parameters through PGN 218 but it doesn't get the acknowledgement from ECM even after 3 attempts, Warning fault becomes Active.

NOTICE

This fault is specific for OTIS (Open Tool Interface Specification) Application

Possible Causes:

1. Attempts to write ECM parameters simultaneously via multiple tools.

Diagnosis and Repair:

1. Attempts to write ECM parameters simultaneously via multiple tools.
 - a. Check if multiple tools (e.g. Insite, Calterm) are connected. Ensure to have only one tool connected at a time and others are disconnected.

10.8.230 Code 5491 – ECM Write Failed – Unknown Reason

Logic:

When genset controller got the extended session write access, but is not able to write due to Calibration compatibility issue between ECM and PCC, Warning fault becomes Active.

NOTICE

This fault is specific for OTIS (Open Tool Interface Specification) Application.

Possible Causes:

1. Calibration compatibility issue.

Diagnosis and Repair:

1. Calibration compatibility issue.
 - a. Calibrate the PCC and ECM with latest calibrations.

10.8.231 Code 5492 – ECM Read Failed – Unknown Reason

Logic:

When genset controller is requesting for reading the parameters from Engine controller (ECM) through PGN 218, but it doesn't get the acknowledgement from ECM even after 3 attempts, Warning fault becomes Active.

NOTICE

This fault is specific for OTIS (Open Tool Interface Specification) Application.

Possible Causes:

1. Calibration compatibility issue.

Diagnosis and Repair:

1. Calibration compatibility issue.
 - a. Calibrate the PCC and ECM with latest calibrations.

10.8.232 Code 5493 – ECM Write Failed – Data Save Failure

Logic:

When genset controller executing the data save Routine, but it doesn't get the acknowledgement from ECM even after 3 attempts, Warning fault becomes Active.

NOTICE

This fault is specific for OTIS (Open Tool Interface Specification) Application.

Possible Causes:

1. Datasave didn't completed before Keyswitch datasave timer expired.
2. Keyswitch B+ lost before data saving.

Diagnosis and Repair:

1. Datasave didn't completed before Keyswitch datasave timer expired.
 - a. Retry to save the save the data again.
2. Keyswitch B+ lost before data saving.
 - a. Ensure battery supply is not disconnected immediately after stop or shutdown.

10.8.233 Code 5529 – Prelube Setup Fault – Condition Exists

Logic:

When Prelube Owner is ECS and if a mismatch is found for Prelube Type parameters between PCC and ECM such that "Prelube_Control_Prelube_Type" is not set as 'PLB_PRESTART or PLB_BOTH (Prestart/Periodic)', Warning fault becomes Active.

NOTICE

This fault is for OTIS (Open Tool Interface Specification) ECM OTIS Prelube Interface

Possible Causes:

1. Parameter setting issue.

Diagnosis and Repair:

1. Parameter setting issue.
 - a. Ensure that PCC and ECM settings for 'Prelube_Control_Prelube_Type' should be 'PLB_PRESTART or PLB_BOTH'.

10.8.234 Code 5531 - Cam Switch Frequency Mismatch (Shutdown)

Logic:

The frequency selected on the Voltage Reconnect Switch position does not match the frequency selected on the HMI.

Possible Causes:

1. The frequency selected on the HMI does not match the frequency selected on the Voltage Reconnect Switch.

Diagnosis and Repair:

1. Select the correct frequency on the HMI based on the frequency selected on the Voltage Reconnect Switch position. Cycle generator set power after making the proper adjustments.

NOTICE

50 Hz operation is only supported with the Voltage Reconnect Switch in the 480VAC, 60HZ/400VAC, 50 Hz position.

10.8.235 Code 5637 – Unknown Shutdown at Startup

Logic:

During genset starting when PCC goes in 'Rated' state and Engine RPM is sensed as 0 continuously for 1 second, then Unknown Shutdown at startup fault becomes active.

Possible Causes:

1. Engine runs out of Fuel or Engine Stalls with no fault being declared by ECM.
2. On receiving start command PCC senses 'Charging Alternator Voltage' above 'Charging Alternator Starter Disconnect Voltage Threshold' and disengages the starter even before cranking.

Diagnosis and Repair:

1. Engine runs out of Fuel or Engine Stalls with no fault being declared by ECM.
 - a. Check fuel system/fuel levels of the engine.
 - b. Check ECM calibration and refer Engine Manual.

2. On receiving start command PCC senses 'Charging Alternator Voltage' above 'Charging Alternator Starter Disconnect Voltage Threshold' and disengages the starter even before cranking.
 - a. Check charging alternator starter Disengage voltage threshold.
 - b. If it is found as 9V increase it to 10 - 11V for 12V system.
 - c. If it is found as 18V increase it to 20 - 21V for 24V system.

10.8.236 Code 5711 - DEF Replenishment Failure (Warning)

Logic:

The PCC controller commanded the auxiliary DEF pump "on", but the DEF level sensor in the onboard DEF tank did not report an increase in the DEF level. The default setting is for the PCC control to command the auxiliary DEF pump "on" when the DEF tank capacity reaches 15% and "off" when the DEF tank capacity reaches 65%.

Possible Causes:

1. The auxiliary DEF line is restricted, frozen, or not connected.
2. The auxiliary DEF electrical connector or wiring is missing, shorted, or has an open circuit.
3. Failure of the auxiliary DEF system or pump.
4. Faulty wiring, fuse, or relay in the generator set auxiliary DEF control circuit.
5. The DEF level sensor is not reading correctly.

Diagnosis and Repair:

1. Verify that the DEF line is connected and free of any obstructions. If the line is frozen, make sure the DEF line heater is connected and functioning properly. Refer to the manufacturer of the auxiliary DEF system for additional troubleshooting.
2. Verify that the auxiliary DEF electrical connector and wiring is connected, and that all connections are secure and free of corrosion. Verify there are no open circuits or shorts in the auxiliary DEF wiring. Refer to the manufacturer of the auxiliary DEF system for additional troubleshooting.
3. Refer to the manufacturer of the auxiliary DEF system for troubleshooting.
4. Make sure fuses, relays, and wiring are not faulty. Check for open and short circuits. Refer to the appropriate wiring diagram for the location of these components.
5. Check for fault codes related to the DEF tank. Resolve any fault codes that are present. If none found, check the condition of the DEF level sensor.

10.8.237 Code 5713 – Dead Battery Warning

Logic:

When Dead Battery Diagnostic is Active and Secondary Starter Configuration Enable is Enabled, then if 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, Warning fault becomes active.

Possible Causes:

1. Refer fault Code 1443 (Dead Battery) for possible causes.

Diagnosis and Repair:

1. Refer fault code 1443 (Dead Battery) for Diagnosis and repair.

10.8.238 Code 5714 – Primary Starting System Failed

Logic:

When Primary Starting System Failed Diagnostic is Active and Secondary Starter Configuration Enable is Enabled, then if during cranking, the genset doesn't start due to primary starter failure (linked to fail to start, fail to crank or low, weak and dead battery scenarios) and secondary starter is used for genset starting operation, Warning fault becomes active.

Possible Causes:

1. Primary Starter Failure.

Diagnosis and Repair:

1. Primary Starter Failure.
 - a. Check the Primary starter wiring. If found loose/faulty, take necessary action.
 - b. Check primary starter if faulty, replace/repair it. Refer Starter Manual for details.
 - c. Refer "Fail to Start (FC-359), Fail to Crank (FC-1438), Low Battery (FC-441), Weak Battery (FC-1442), Dead Battery (FC-1443)" faults diagnostics and repair for respective fault scenarios.

10.8.239 Code 5718 – Memory Write Failed

Logic:

When saving trims in manual or auto, then if the write process to Manual Trims Block1 or Manual Trims Block2 or Auto Trims Block1 or Auto Trims Block2 failed even after 3 attempts, Warning fault becomes active.

Possible Causes:

1. B+ supply lost during trims saving.

Diagnosis and Repair:

1. B+ supply lost during trims saving.
 - a. Ensure battery supply is not disconnected immediately after stop or shutdown.

10.8.240 Code 5719 – Power Lost During Memory Save

Logic:

When saving trims in manual or auto, then if there is checksum mismatch in Manual Trims Block1 or Auto Trims Block1 i.e. while writing Block1, it gets corrupted might due to power loss and Block2 has old values, Warning fault becomes active.

Possible Causes:

1. B+ supply lost during trims saving.

Diagnosis and Repair:

1. B+ supply lost during trims saving.
 - a. Ensure battery supply is not disconnected immediately after stop or shutdown.

10.8.241 Code 5721 – Auto Trims Save Failed

Logic:

When saving trims in auto, then if there is checksum mismatch in Auto Trims Block and its copy, Warning fault becomes active.

Possible Causes:

1. B+ supply lost during trims saving.

Diagnosis and Repair:

1. B+ supply lost during trims saving.
 - a. Ensure battery supply is not disconnected immediately after stop or shutdown

10.8.242 Code 5722 – Manual Trims Save Failed

Logic:

When saving trims in manual, then if there is checksum mismatch in Manual Trims Block and its copy, Warning fault becomes active.

Possible Causes:

1. B+ supply lost during trims saving.

Diagnosis and Repair:

1. B+ supply lost during trims saving.
 - a. Ensure battery supply is not disconnected immediately after stop or shutdown.

10.8.243 Code 5723 - Paralleling Cable Not Detected - Condition Exists

Logic:

If the paralleling cable is not detected, the PCC controller operates the generator set in standalone mode. If the paralleling cable is connected (detected), the PCC controller operates the generator set in paralleling mode.

This fault code does not display on the HMI but is logged in the PCC control fault history (which can be seen using InPower).

This event always occurs when the generator set is operated in standalone mode. No troubleshooting is required.

10.8.244 Code 6487 - Nominal Voltage Setup OOR

Logic:

If voltage limits under OEM alternator setup is not in the correct order and if nominal voltage is not between certain voltage limits, the generator set control will display event/fault code 6487.

Possible Causes:

1. Voltage limits under OEM alternator setup is not in the correct order.
2. Nominal voltage is not between certain voltage limits.

Diagnosis and Repair:

1. Gather Setup Information

Use InPower to check and record the following:

- Under **Setup > Genset Setup**, check and record that the **Single/3 Phase Connection** is **Single Phase** or **Three Phase**.
- Under **Setup > OEM Setup > OEM Alt. Reconnection Setup**, record the **Nominal Voltage**.

2. Check Single Phase Parameters

a. If the **Single/3 Phase Connection** is **Single Phase**, use InPower to check and record the following:

- Under **Setup > OEM Setup > Alternator OEM**, record the value shown for **Single phase Genset nom voltage high limit (HL)**.
- Under **Setup > OEM Setup > Alternator OEM**, record the value shown for **Nominal Voltage (NV)**.
- Under **Setup > OEM Setup > Alternator OEM**, record the value shown for **Single phase Genset nom voltage low limit (LL)**.

b. Compare the recorded values. Relationships should be as follows:

HL >= NV >= LL

c. If the relationships are not as stated, make changes to the **Single phase Genset nom voltage high limit** or **Single phase Genset nom voltage low limit**.

3. Check Three Phase Parameters

If the value of **Single/3 Phase Connection** is **Three Phase**:

a. Use InPower to check and record the following values:

- Under **Setup > OEM Setup > Alternator OEM**, record the value shown for **3ph high connection Genset nom voltage high limit (HNH)**.
- Under **Setup > OEM Setup > Alternator OEM**, record the value shown for **3ph high connection Genset nom voltage low limit (HNL)**.
- Under **Setup > OEM Setup > Alternator OEM**, record the value shown for **3ph low connection Genset nom voltage high limit (LNH)**.
- Under **Setup > OEM Setup > Alternator OEM**, record the value shown for **3ph low connection Genset nom voltage low limit (LNL)**.

b. Compare the recorded values. Relationships should be as follows:

HNH >= HNL >= LNH >= LNL

c. If the relationships are not as stated, make changes to the **3ph high connection Genset nom voltage high limit (HNH)**, **3ph high connection Genset nom voltage low limit (HNL)**, **3ph low connection Genset nom voltage high limit (LNH)**, or **3ph low connection Genset nom voltage low limit (LNL)**.

d. Determine the values to be adjusted.

i. Check and record the following:

- Under **Setup > OEM Setup > Alternator OEM**, record the value shown for **3ph high connection Genset nom voltage low limit (HNL)**.
- Under **Setup > OEM Setup > Alternator OEM**, record the value shown for **3ph low connection Genset nom voltage high limit (LNH)**.

- Under **Setup > OEM Setup > Alternator OEM**, record the value shown for **Nominal Voltage (NV)**.
- ii. Subtract the value recorded for NV from the value recorded for HNL. Record the result as HL ($HNL - NV = HL$).
- iii. Subtract the value recorded for NV from the value recorded for LNH. Record the result as LL ($LNH - NV = LL$).
- iv. Compare the values calculated for HL and LL:
 - If $HL < LL$, make changes to the **3ph high connection Genset nom voltage high limit** or **3ph high connection Genset nom voltage low limit** to get the following relationship:
 $HNL \geq NV \geq HNL$
 - If $HL > LL$, make changes to the **3ph low connection Genset nom voltage high limit** or **3ph low connection Genset nom voltage low limit** to get the following relationship:
 $LNH \geq NV \geq LNL$

10.8.245 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.

10.8.246 Code 6875 - Under Excitation

Logic:

AVR PWM Duty Cycle is lower than Under Excitation AVR Duty Cycle minimum Threshold (Default: 0.5%) for more than Under Excitation Threshold Time (Default: 1 second).

Diagnosis and Repair:

1. Calibration is out of date.
 - a. Update per the latest calibration to prevent nuisance faults.
2. Voltage Sensing Error

WARNING

Hazardous Voltage

Contact with high voltages can cause severe electrical shock, burns, or death.

Make sure that only personnel who are trained and qualified to work on this equipment are allowed to operate the generator set and perform maintenance on it.

- a. Check Potential Transformer (PT) Voltage Input and Output.

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.

- b. Check PT Size.

Use the following equation to determine if the correct PT for the application is installed:

$(\text{Generator Set Nominal Voltage} / \text{Generator Set PT Primary Voltage}) \times \text{Generator Set PT Secondary Voltage}$

- If the value is greater than 600 VAC, the PT ratio is too small.
- If the value is less than 1/2 the nominal voltage (Nominal Voltage x .5), the PT ratio is too large.

- c. Check the voltage input into the control board.

3. Faulty AVR Board

- a. Replace the AVR board if necessary.

4. Faulty Control Board

- a. Replace the control board if necessary.

10.8.247 Code 7548 - Engine Friction Baseline – Data Valid But Below Normal Operating Range (Least Severe Level)

Logic:

Engine warning fault has occurred in the engine ECM. This fault code is related to the Engine Friction Monitoring prognostic based on the relationship of the ECM commanded torque to the alternator feedback torque.

Refer to Engine Service manual for further troubleshooting.

10.8.248 Code 7549 - Engine Friction Baseline – Data Valid But Below Normal Operating Range (Moderately Severe Level)

Logic:

Engine warning fault has occurred in the engine ECM. This fault code is related to the Engine Friction Monitoring prognostic based on the relationship of the ECM commanded torque to the alternator feedback torque.

Refer to Engine Service manual for further troubleshooting.

10.8.249 Code 7551 - Engine Friction Baseline – Data Valid But Above Normal Operating Range (Least Severe Level)

Logic:

Engine warning fault has occurred in the engine ECM. This fault code is related to the Engine Friction Monitoring prognostic based on the relationship of the ECM commanded torque to the alternator feedback torque.

Refer to Engine Service manual for further troubleshooting.

10.8.250 Code 7552 - Engine Friction Baseline – Data Valid But Above Normal Operating Range (Moderately Severe Level)

Logic:

Engine warning fault has occurred in the engine ECM. This fault code is related to the Engine Friction Monitoring prognostic based on the relationship of the ECM commanded torque to the alternator feedback torque.

Refer to Engine Service manual for further troubleshooting.

10.8.251 Code 7553 - Engine Friction Deviation – Data Valid But Above Normal Operating Range (Moderately Severe Level)

Logic:

Engine warning fault has occurred in the engine ECM. This fault code is related to the Engine Friction Monitoring prognostic based on the relationship of the ECM commanded torque to the alternator feedback torque.

Refer to Engine Service manual for further troubleshooting.

10.8.252 Code 7554 - Engine Friction Deviation – Data Valid But Above Normal Operating Range (Most Severe Level)

Logic:

Engine shutdown fault has occurred in the engine ECM. This fault code is related to the Engine Friction Monitoring prognostic based on the relationship of the ECM commanded torque to the alternator feedback torque.

Please note that if engine friction monitor baseline was not reset from engine using Calterm/InSite after last major service event, the engine will be locked out and cannot start. PowerGen tools like InPower cannot reset this fault code. Refer to Engine Service manual for further troubleshooting.

Also note that some undetected generator set conditions could potentially trigger this shutdown fault code. This is because those generator set conditions can result in an alternator feedback torque (kW) error which is quickly changing with respect to ECM's learned torque ratio, thereby affecting the relationship upon which the ECM prognostic relies. Examples of generator set conditions are as follows:

Possible Causes:

1. Voltage Sensing Error
2. Current Sensing Error
3. Metering Calibration Adjustment (V, Frequency, A)
4. Faulty Control Board

Diagnosis and Repair:

1. Voltage Sensing Error

 **WARNING**

Hazardous Voltage

Contact with high voltages can cause severe electrical shock, burns, or death.

Make sure that only personnel who are trained and qualified to work on this equipment are allowed to operate the generator set and perform maintenance on it.

a. Check Potential Transformer (PT) Voltage Input and Output

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.

b. Check PT Size

Use the following equation to determine if the correct PT for the application is installed:

$$\left(\frac{\text{Generator Set Nominal Voltage}}{\text{Generator Set PT Primary Voltage}} \right) \times \text{Generator Set PT Secondary Voltage}$$

- If the value is greater than 600 VAC, the PT ratio is too small.
- If the value is less than 1/2 the nominal voltage (Nominal Voltage x .5), the PT ratio is too large.

c. Check the voltage input into the control board.

2. Current Sensing Error

a. Check the Current Transformers (CTs).

- Verify the CT polarity is correct.
- Verify the CT connections from the CTs to the input of the control board are correct.
- Verify CTs have the correct ratio for the application.

b. 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 with which the secondary is calibrated (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).

c. For installation instructions, refer to the Current Transformer Installation section or reference event/fault codes 2814 and 2815.

3. Metering Calibration Adjustment (V, Frequency, A)

a. Calibrate the generator set and bus voltage (all phases) in order to improve the voltage match performance as well as the metering accuracy. Ensure 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 generator set at the alternator; while through the display, ensure that the base board displays the same voltage and frequency shown on the meter.

To view and adjust the voltage, go to: **Setup > Calibration** and if appropriate, change the voltage to reflect the voltage shown on the meter.

To view and adjust the frequency, go to: **Setup > Adjust > Frequency Adjust** and if appropriate, change the frequency to reflect the frequency shown on the meter.

b. If paralleling, use a volt-meter to measure the AC voltage of the electric bus to which the generator set is paralleled (voltage of the Generator set Bus or the Utility). Then, measure the output voltage of the generator set and ensure that the generator set output voltage is +3 VAC/-0 VAC that of the source to which the generator set is paralleled. Event/fault code 1461 is a result of the generator set not matching or exceeding the voltage of the electric bus, which causes the generator set to import current from the electric bus (Reverse KVAR).

To access the voltage calibration configuration menu on the display, go to: **Setup > Calibration** and increase the generator set output voltage.

- c. Measure the generator set current input into the control board with a current probe at J22. The maximum value of current going into the control CTs should not be more than the value of the Genset CT Secondary Current value for which the control is calibrated. 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** and set the Genset CT Secondary Current parameter appropriately for the application.

4. Faulty Control Board
 - a. Replace the control board if necessary.

10.8.253 Code 7555 - Alternator Feedback Power – Special Instructions

Logic:

Engine shutdown fault has occurred in the engine ECM. This fault code is related to the Engine Friction Monitoring prognostic based on the relationship of the ECM commanded torque to the alternator feedback torque.

Refer to Engine Service manual for further troubleshooting.

10.8.254 Code 7558 - Engine Friction Deviation – Condition Exists

Logic:

Engine warning fault has occurred in the engine ECM. This fault code is related to the Engine Friction Monitoring prognostic based on the relationship of the ECM commanded torque to the alternator feedback torque.

Refer to Engine Service manual for further troubleshooting.

10.8.255 Code 7697 - Bank Cut-off FSO Failure - Condition Exists

Logic:

When engine is running on both banks and one of the fuel rail pressure switch starts malfunctioning.

Possible Causes:

1. Faulty or incorrect configurable output of PCC hardware.
2. Faulty relays.
3. Stuck Fuel Shut-Off (FSO) actuator.
4. Faulty fuel rail pressure switch of Bank A or Bank B.
5. Wiring connection from PCC to relay, FSO, and fuel rail pressure switch.

Diagnosis and Repair:

1. Faulty or Incorrect Configurable Output of PCC Hardware
 - a. Check if the configurable output is working properly using overrides for the assigned configurable output. If it works with overrides, the issue is with the hardware pins on the PCC. Repair the pins as necessary or use any other configurable output.

- b. Check the PCC wiring diagram or service manual and verify if configurable outputs have been configured correctly to the respective pins on the PCC board. If not, configure per the wiring diagram.

2. Faulty Relays

Check if any of the relays driven by configurable outputs are malfunctioning. Test the de-energized and energized conditions of the relay contacts. Check the resistance between each pole of the relay and the corresponding NC and NO contacts for that pole.

- All NC contacts should read 0 ohms to the corresponding pole.
- All NO contacts should read infinite resistance to the corresponding pole.

Replace the relay if not working.

3. Stuck Fuel Shut-Off (FSO) Actuator

- a. Check the wiring harness for damage, short, or abrasions. Repair as necessary.
- b. Check for corded, bent, broken, pushed back, expanded, or loose pins.
- c. Check that the fuel shut-off valve is not stuck mechanically. Tap lightly with a plastic or rubber mallet to dislodge a stuck actuator. Replace if faulty.
- d. Refer to the Engine service manual for additional checks on FSO.

4. Faulty Switch

- a. Using a multimeter, check the continuity between the fuel pressure switch terminals while the switch is in the closed position. If the multimeter shows infinite resistance, it means the switch is stuck in the open position. Replace the switch.
- b. Using a multimeter, check the continuity between the fuel pressure switch terminals while the switch is in the open position. If the multimeter shows 0 ohm, it means the switch is stuck in the closed position. Replace the switch.

5. Wiring Connection

Check the wiring connection from the PCC hardware pin to the relay, FSO, and the fuel rail pressure switch feedback wire for any damage, short, or abrasions. Repair as necessary.

10.8.256 Code 7823 - Cylinder Cut-Off System Failure – Condition Exists

Logic:

CCS failure condition when one bank is active but fuel rail pressure feedback is received from both banks.

Possible Causes:

1. Faulty fuel rail pressure switch of Bank A or Bank B.
2. Stuck Fuel Shut-Off (FSO) actuator.

Diagnosis and Repair:

1. Faulty Switch
 - a. Using a multimeter, check the continuity between the fuel pressure switch terminals while the switch is in the closed position. If the multimeter shows infinite resistance, it means the switch is stuck in the open position. Replace the switch.
 - b. Using a multimeter, check the continuity between the fuel pressure switch terminals while the switch is in the open position. If the multimeter shows 0 ohm, it means the switch is stuck in the closed position. Replace the switch.

2. Stuck Fuel Shut-Off (FSO) Actuator
 - a. Check the wiring harness for damage, short, or abrasions. Repair as necessary.
 - b. Check for corded, bent, broken, pushed back, expanded, or loose pins.
 - c. Check that the fuel shut-off valve is not stuck mechanically. Tap lightly with a plastic or rubber mallet to dislodge a stuck actuator. Replace if faulty.
 - d. Refer to the Engine service manual for additional checks on FSO.

10.8.257 Code 7824 - Cylinder Cut-Off System State and Feedback Mismatch - Condition Exists

Logic:

Cylinder Cut-Off System state and fuel rail pressure switch feedback mismatch.

Possible Causes:

1. Reverse connection of fuel rail pressure switch for Bank A and Bank B.

Diagnosis and Repair:

1. Reverse Connection

When the generator set is running, check the condition where Bank A is active but feedback is received from Bank B or vice versa.

For example, when CCS state shows "A Bank Active", the status of "CCS BankB Pressure Switch" will display "Active". This means that connections have been reversed.

To check these parameters in Inpower, go to **Setup > Cylinder Cutoff System**, and monitor the parameters.

To change the configurable input settings, go to **Setup > Configurable I/O**, and set the configurable inputs for Bank A and Bank B appropriately.

10.8.258 Code 7825 - Generator Total Real Power Sensing Failure – Condition Exists

Logic:

Indicates failure in generator set total real power sensing.

Possible Causes:

1. J12 connector on PCC 3300 board is loose or damaged.
2. Any connection(s) of CT wire removed/damaged.
3. Faulty CT.

Diagnosis and Repair:

1. Loose or Damaged J12 Connector on PCC 3300 Board
 - a. Check if the J12 connector is fitted properly on the PCC. If it is not, fix the connections.
 - b. Check the J12 connector for any damage, short, or abrasions. Repair as necessary.
2. Any Removed/Damaged CT Wire Connection(s)
 - Check the wiring harness for damage, short, or abrasions. Repair as necessary.

3. Faulty CT

- Check if there is any physical damage in the CT or if any of its connections are open. Repair or rectify as applicable.

10.8.259 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 remote start signal wiring
 - a. Check for improper wiring or a short/open circuit of a start signal integrity from ATS cabinet to configurable inputs of base board 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). See [Figure 94](#).
- 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. See [Figure 94](#).

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 PCC3300 S1 switch is used for network termination, see [Section 7.6.8](#), the resistance of the termination resistor can be measured directly across CAN H and CAN L on the PCC3300 control.

See [Section 7.6.8](#) for additional details on how to use the PCC3300 On-board terminating resistor switch S1.

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 PCC3300 S1 switch is used for network termination, see [Section 7.6.8](#) the resistance of the termination resistor can be measured directly across CAN H and CAN L on the PCC3300 control.

See [Section 7.6.8](#) for additional details on how to use the PCC3300 On-board terminating resistor switch S1.

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 109](#). The CAN wire shield should be terminated by a wire conductor and directly grounded at only one point of a given CAN cable segment.

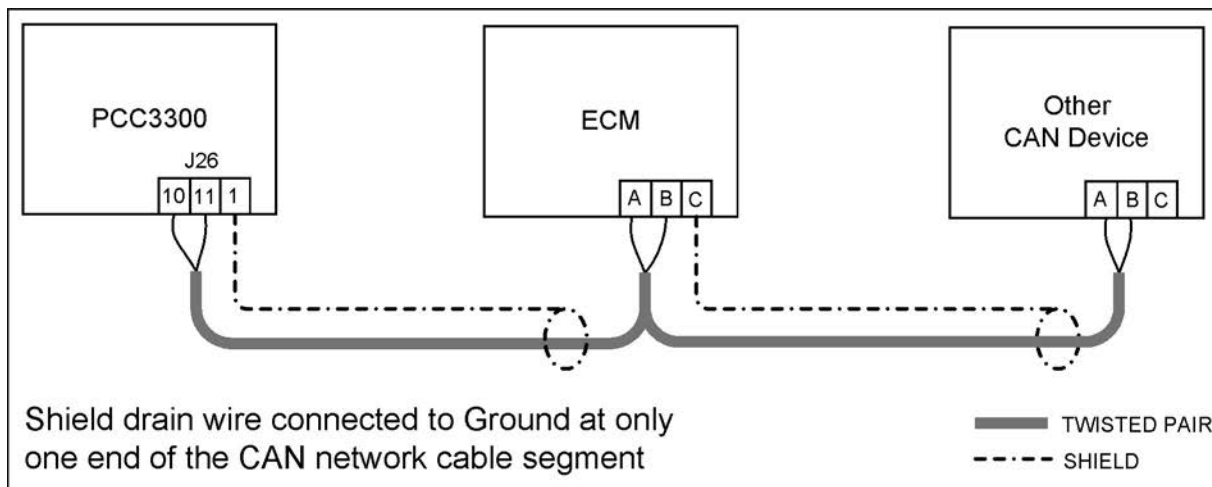


FIGURE 109. COMMON CAN, 2-WIRE PLUS SHIELD, CAN NETWORK

- 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 110](#). The CAN wire shield should be terminated by a wire conductor and directly grounded at only one point of a given CAN wiring segment.

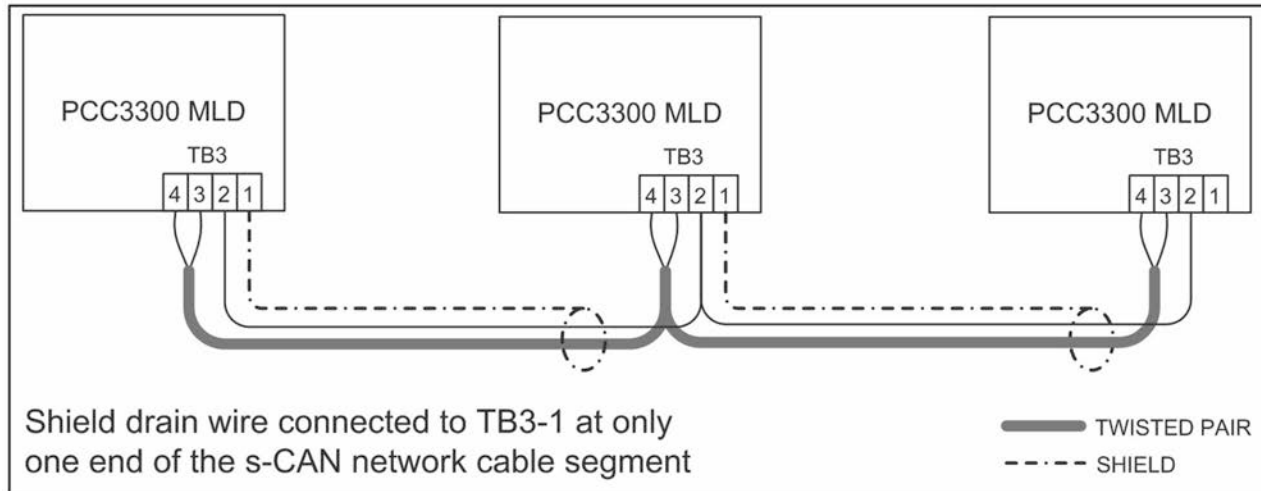


FIGURE 110. ISOLATED GROUND, 3-WIRE PLUS SHIELD, CAN NETWORK

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

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Appendix A. Schematics

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A.0 PCC Control Wire 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.

PCC COMMON CONNECTOR SCHEME WIRING DIAGRAM INDEX

MODEL	OEM CONNECTIONS		CUSTOMER CONNECTIONS		
	ECM BASED ENGINES	HYDRO-MECHANICAL BASED ENGINES	PCC NET	GENSET	PARALLELING
POWER COMMAND 1.1/1.2	SHEET 2	SHEET 3	SHEET 4	SHEET 5	NOT APPLICABLE
POWER COMMAND 2.2/2.3	SHEET 6	NOT APPLICABLE	SHEET 7	SHEET 8	NOT APPLICABLE
POWER COMMAND 3.3	SHEET 9	SHEET 10	SHEET 7	SHEET 8	SHEET 11 - 17

PCC UPGRADE DIAGRAMS		
LEGACY MODEL	OEM CONNECTIONS	CUSTOMER CONNECTIONS
PCC3100 - STANDARD DIESEL	SHEET 18	SHEET 19
PCC3100 - QST30 DIESEL	SHEET 20	SHEET 19

MODEL	NETWORK CONNECTIONS	CUSTOMER CONNECTIONS
POWER COMMAND 500/550	SHEET 21	SHEET 22

CUMMINS POWER GENERATION			
WD - CONTROL (PCC CCS)			
SITE CODE	PGF	D 0630-3440	SHEET 19 OF 23 REV P

FIGURE 111. 0630-3440 REVISION P, SHEET 1 (1 OF 20)

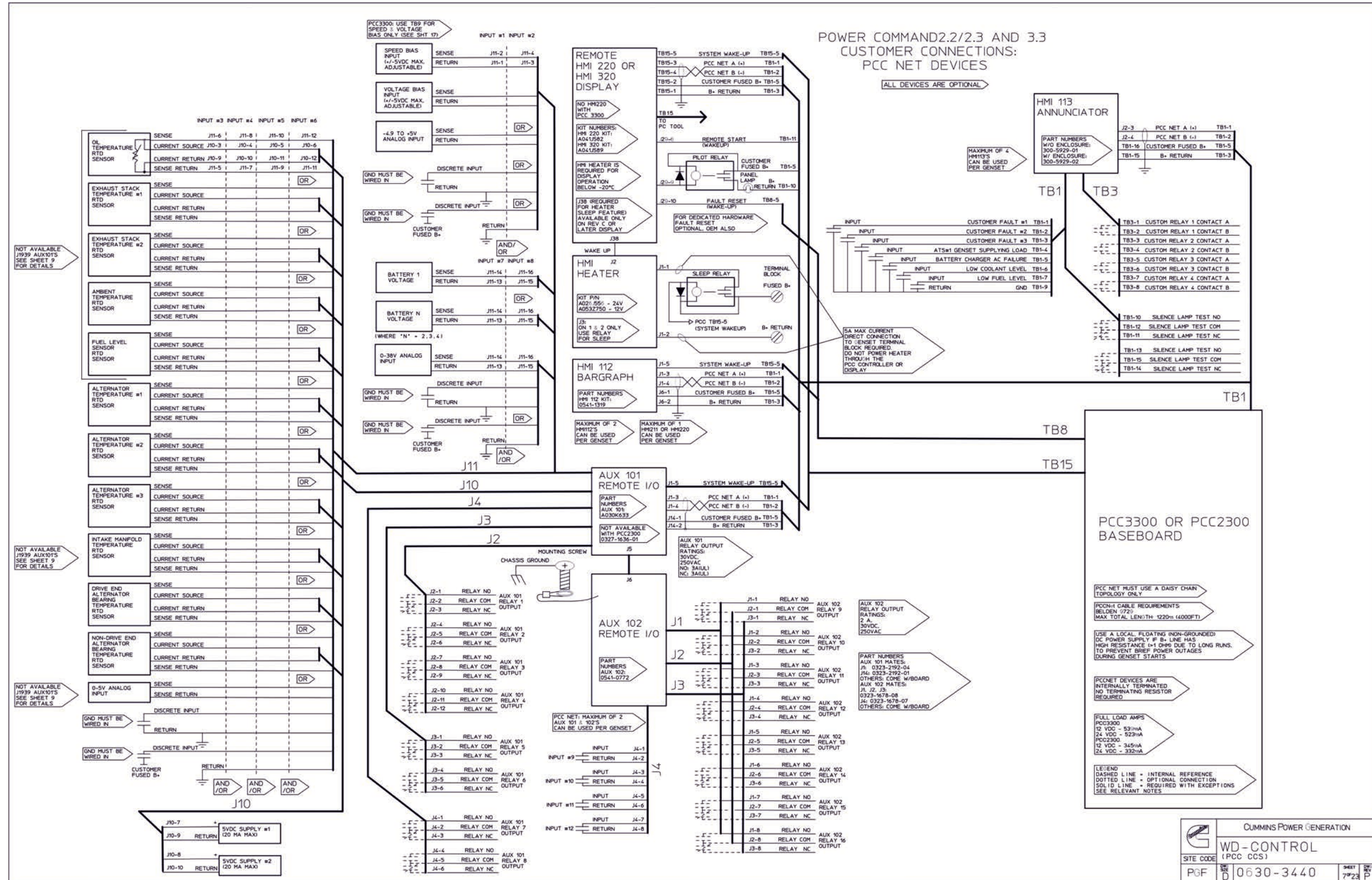


FIGURE 112. 0630-3440 REVISION P, SHEET 2 (7 OF 20)

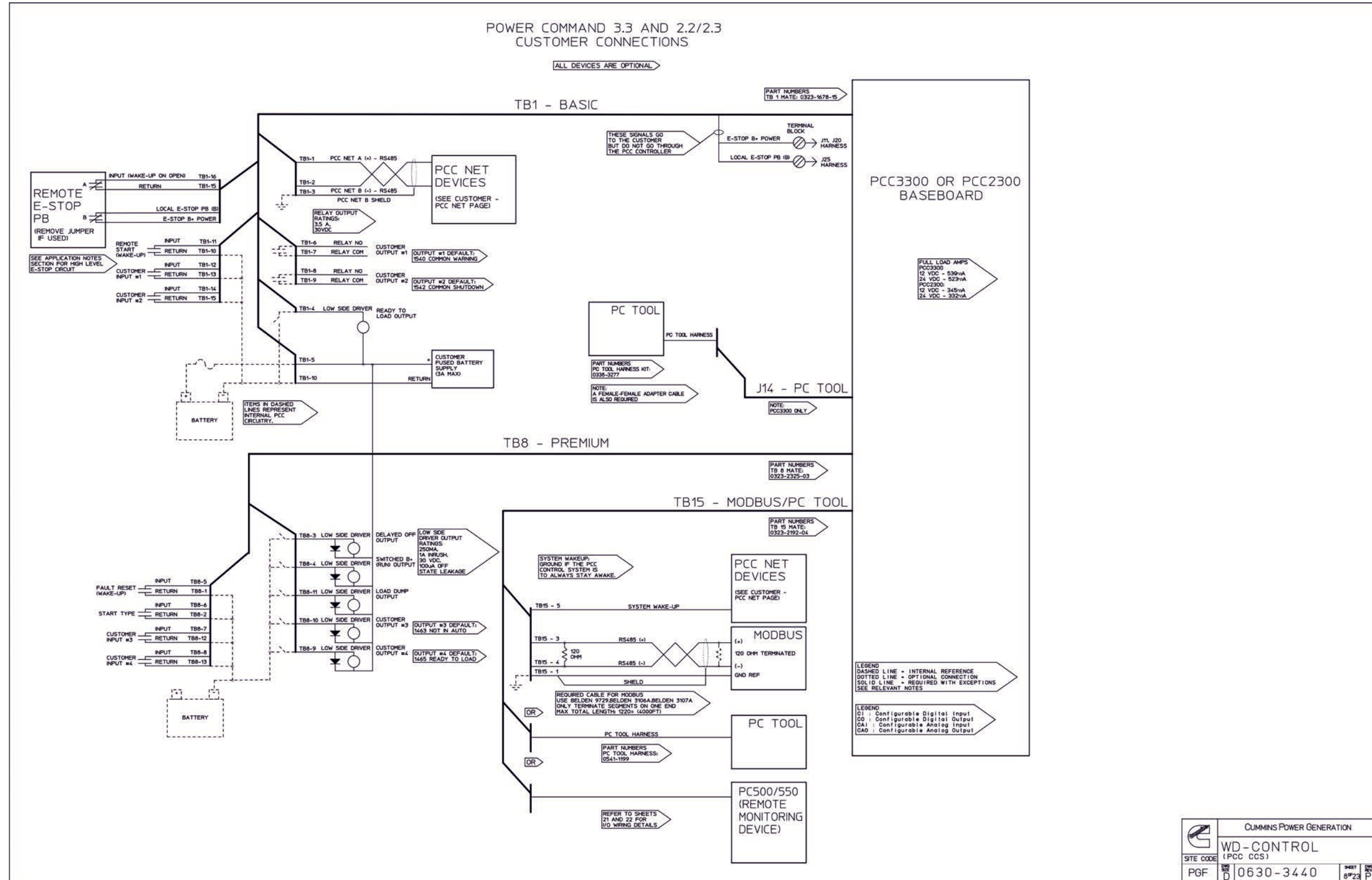


FIGURE 113. 0630-3440 REVISION P, SHEET 3 (8 OF 20)

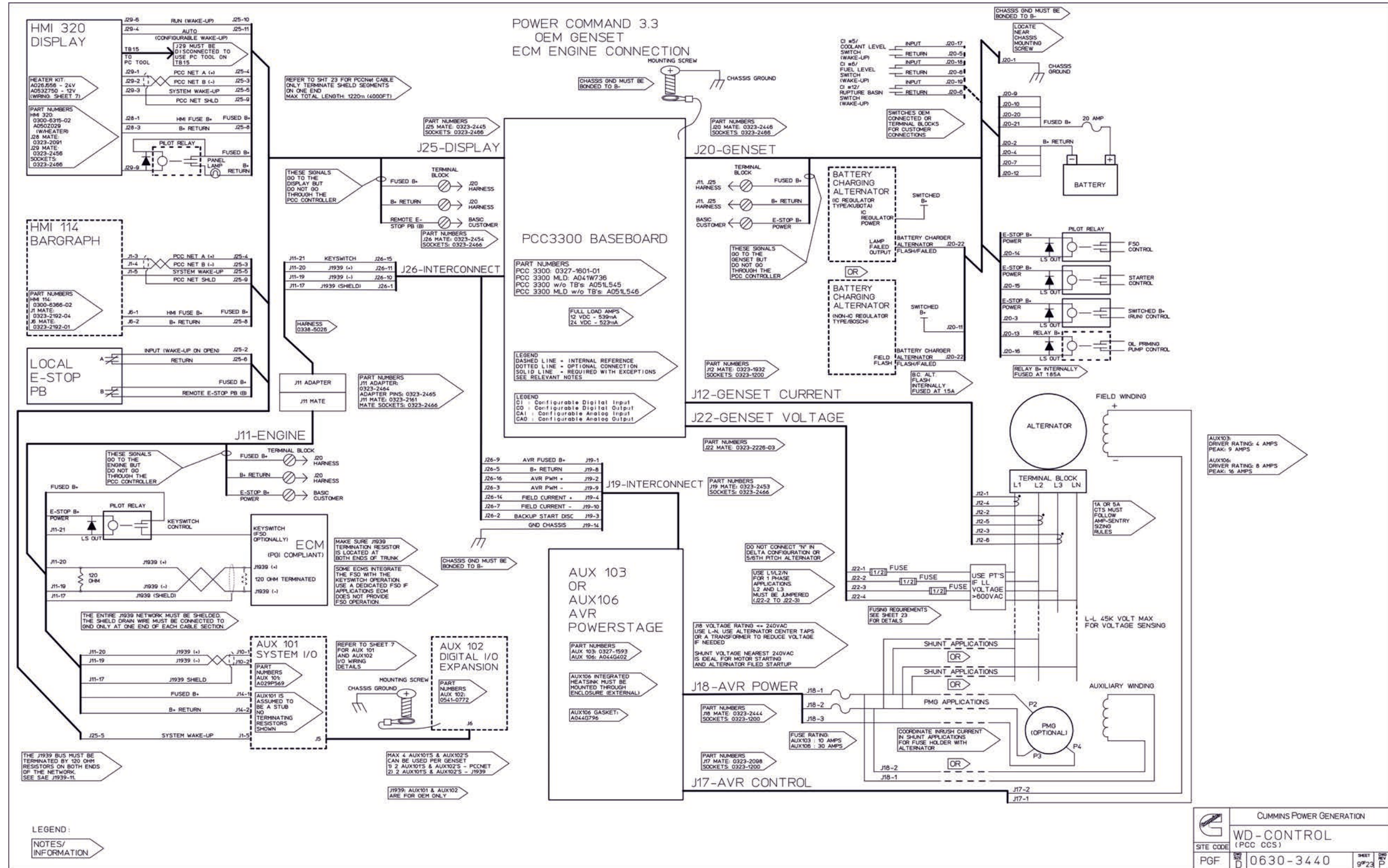


FIGURE 114. 0630-3440 REVISION P, SHEET 4 (9 OF 20)

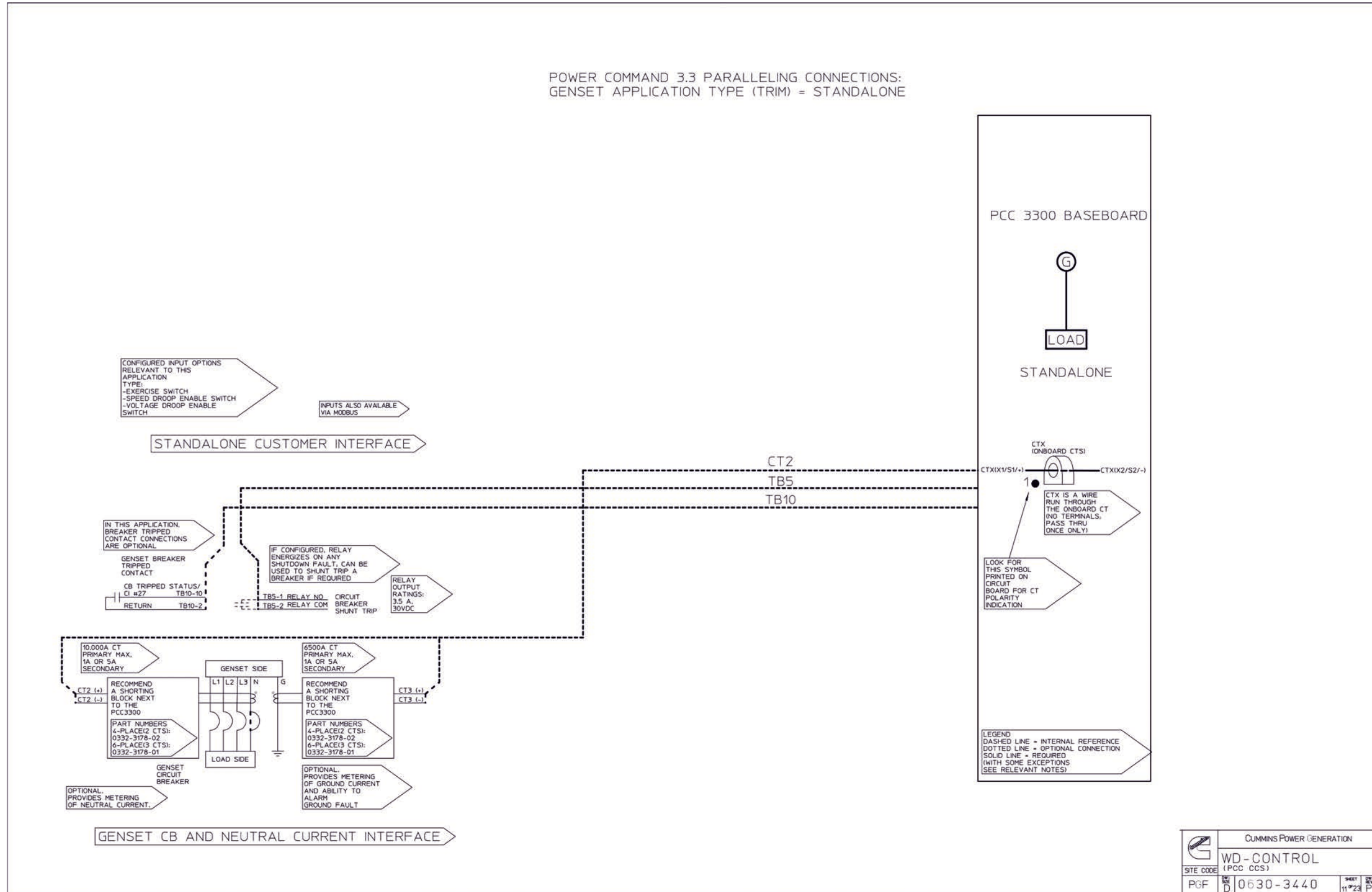


FIGURE 116. 0630-3440 REVISION P, SHEET 6 (11 OF 20)

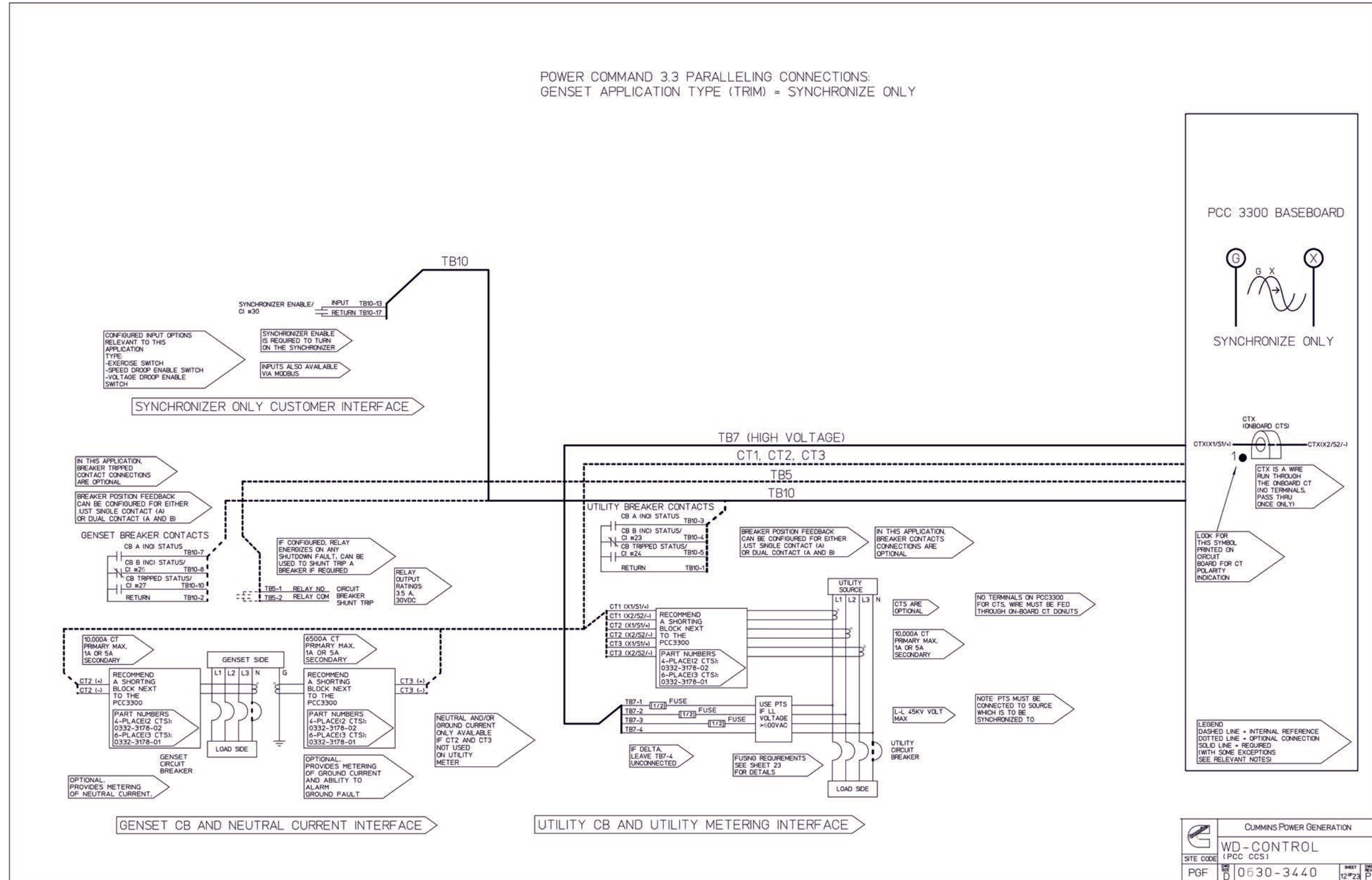


FIGURE 117. 0630-3440 REVISION P, SHEET 7 (12 OF 20)

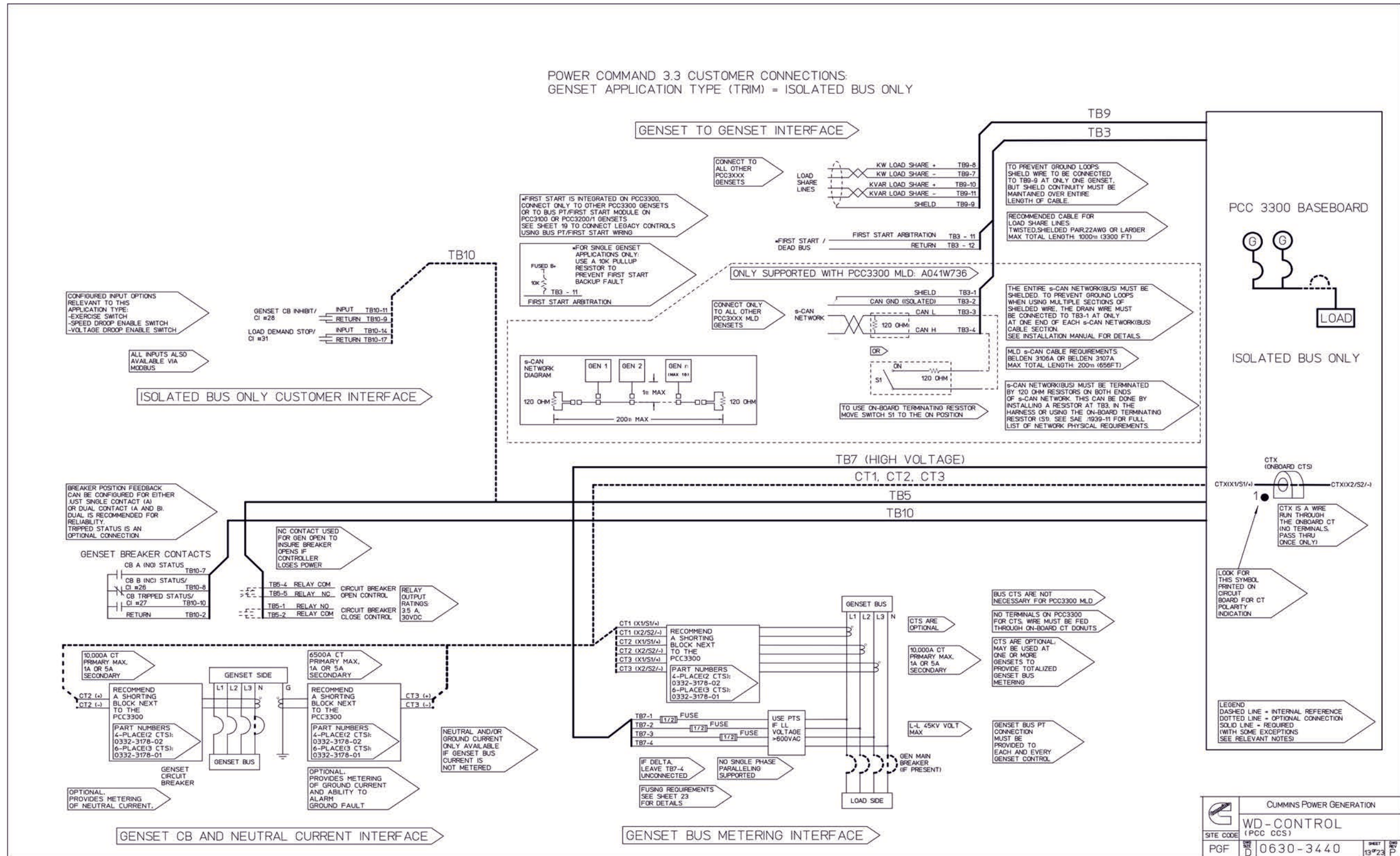


FIGURE 118. 0630-3440 REVISION P, SHEET 8 (13 OF 20)

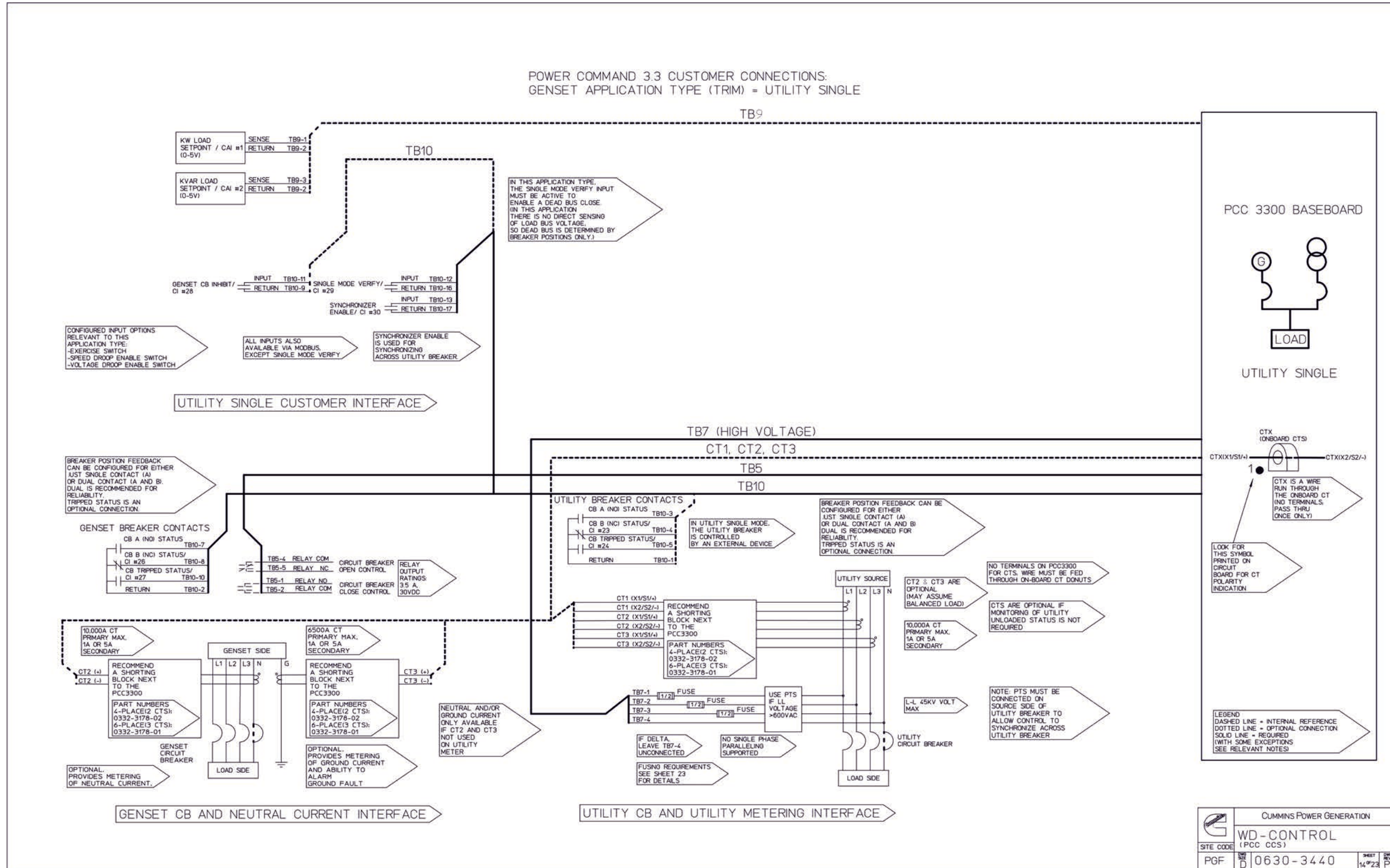


FIGURE 119. 0630-3440 REVISION P, SHEET 9 (14 OF 20)

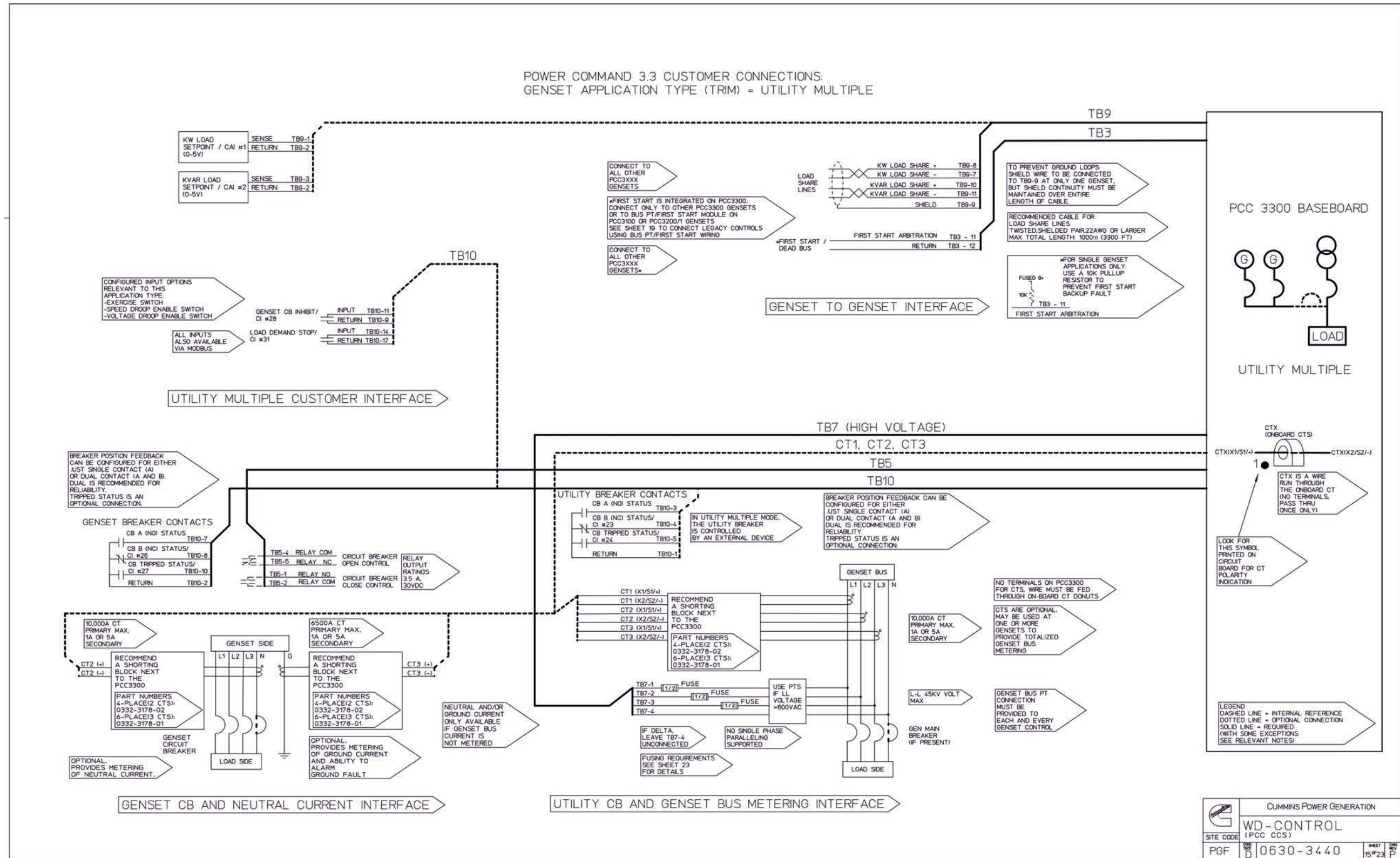
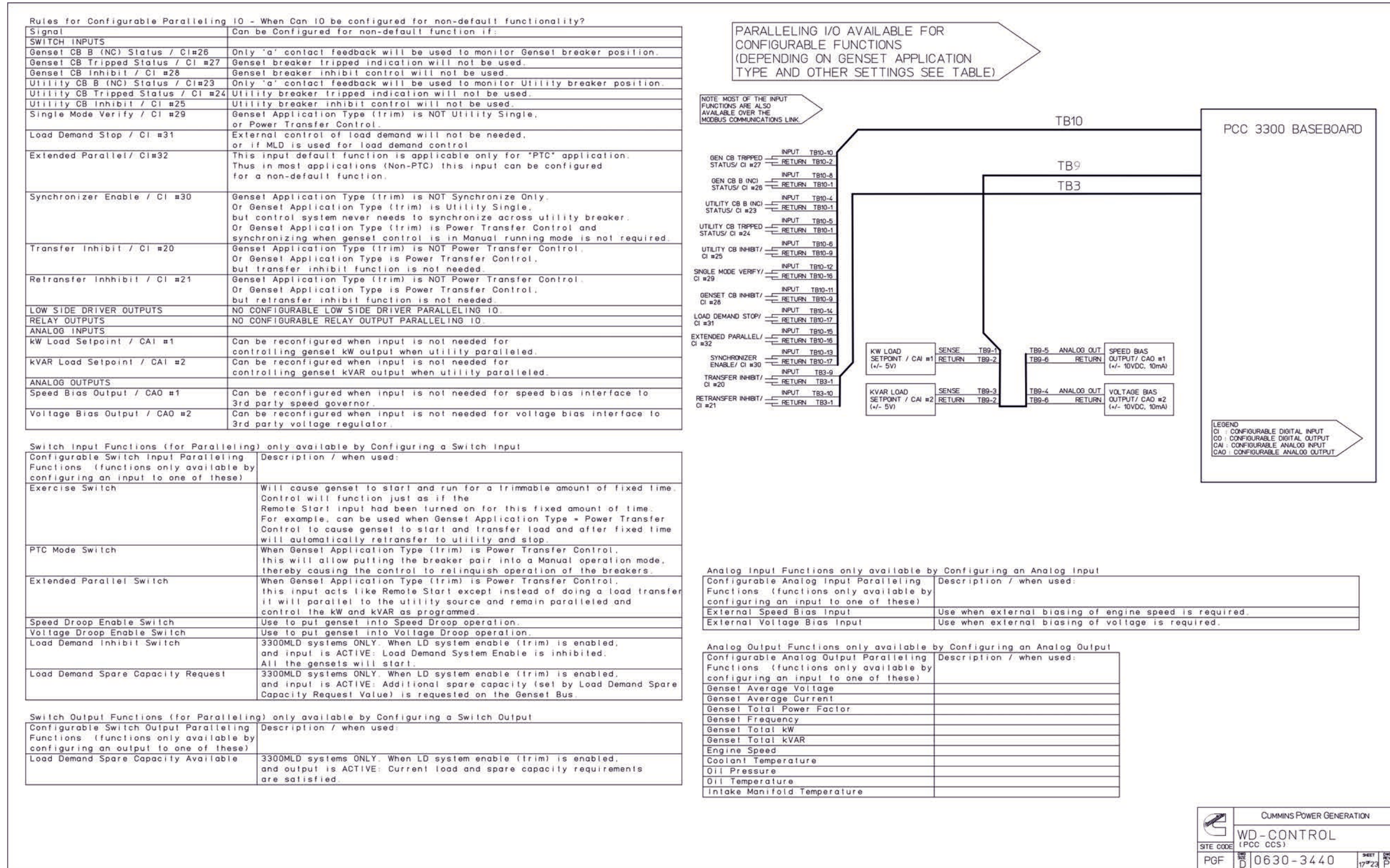


FIGURE 120. 0630-3440 REVISION P, SHEET 10 (15 OF 20)



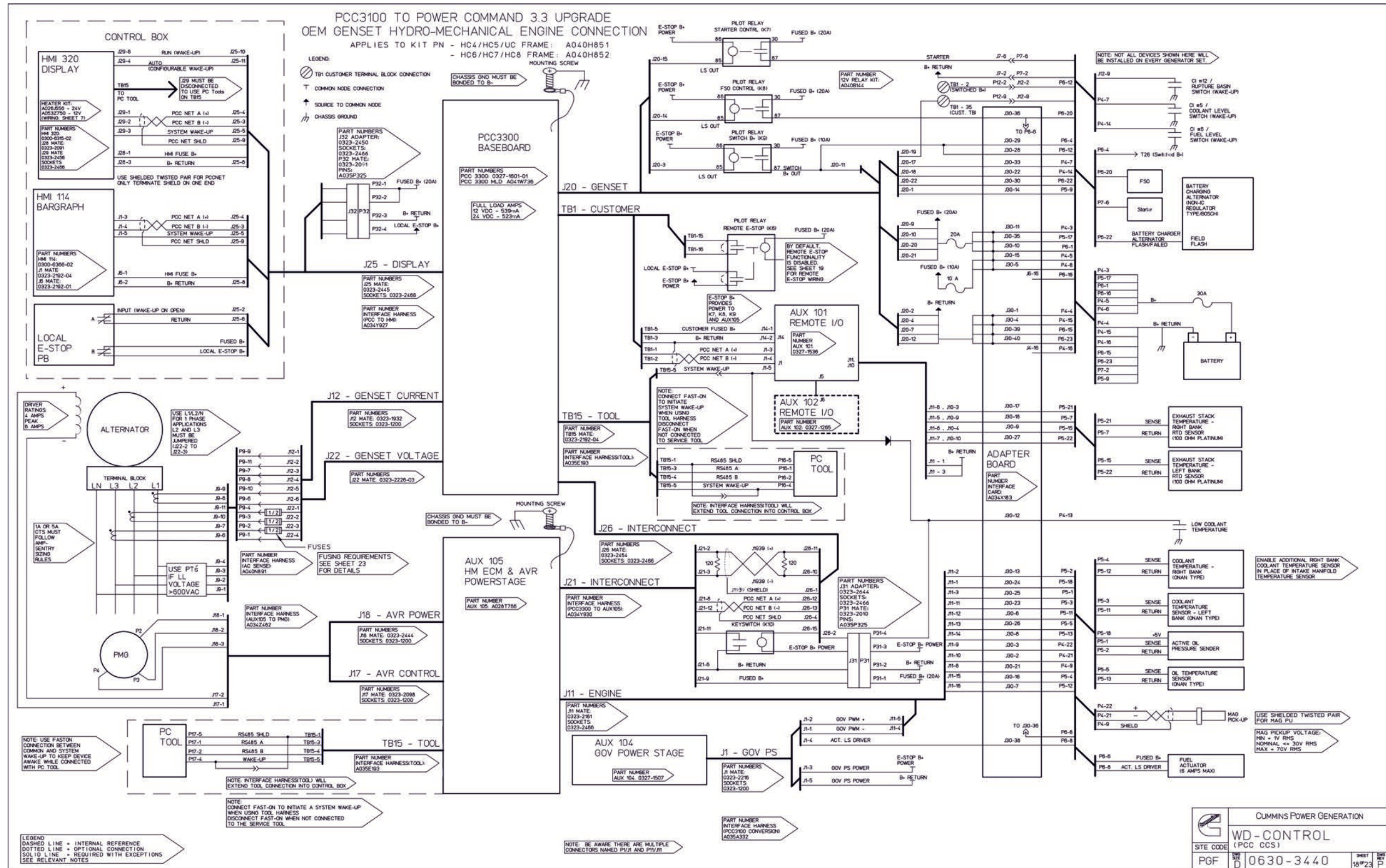


FIGURE 123. 0630-3440 REVISION P, SHEET 13 (18 OF 20)

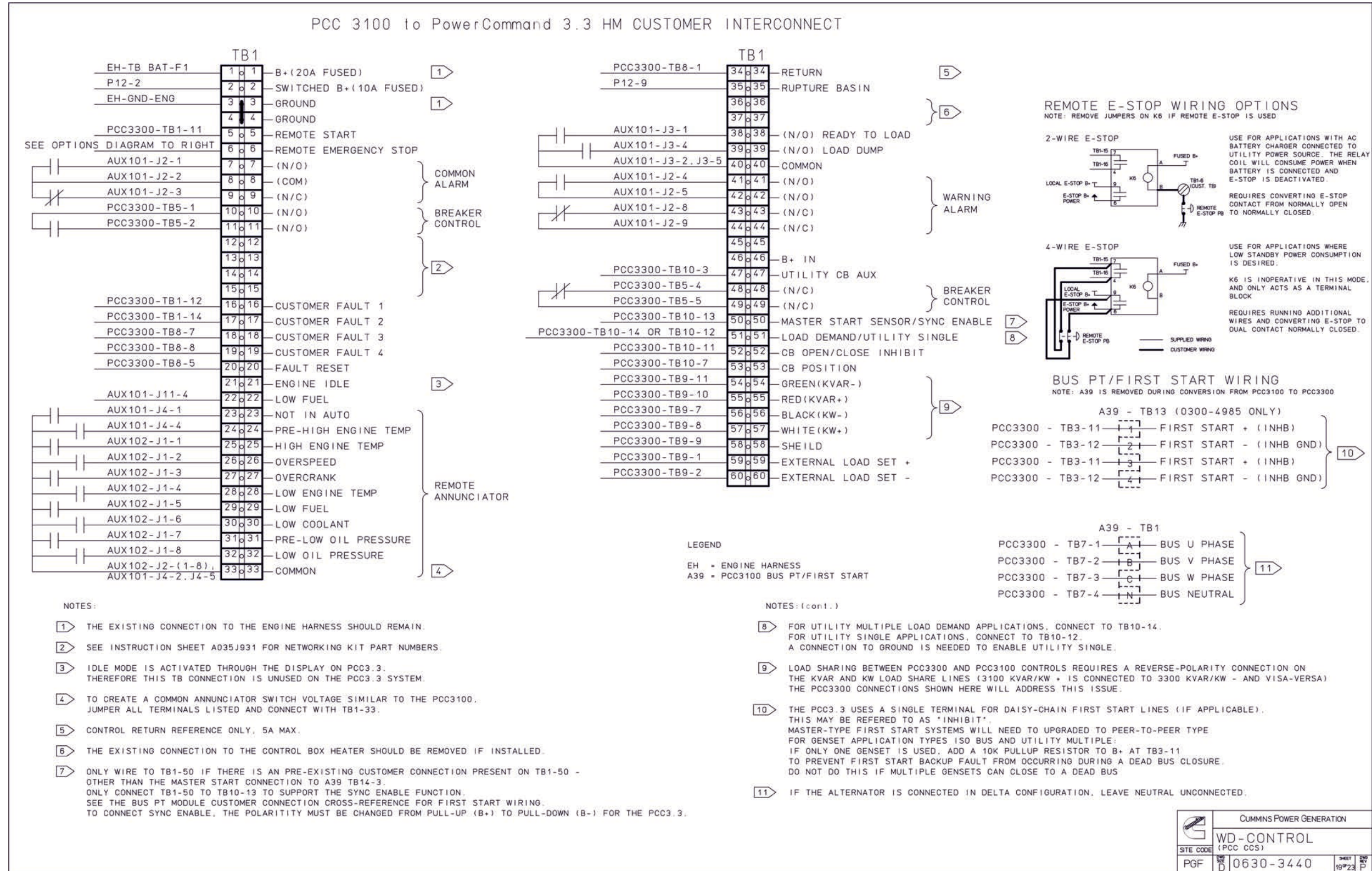


FIGURE 124. 0630-3440 REVISION P, SHEET 14 (19 OF 20)

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.

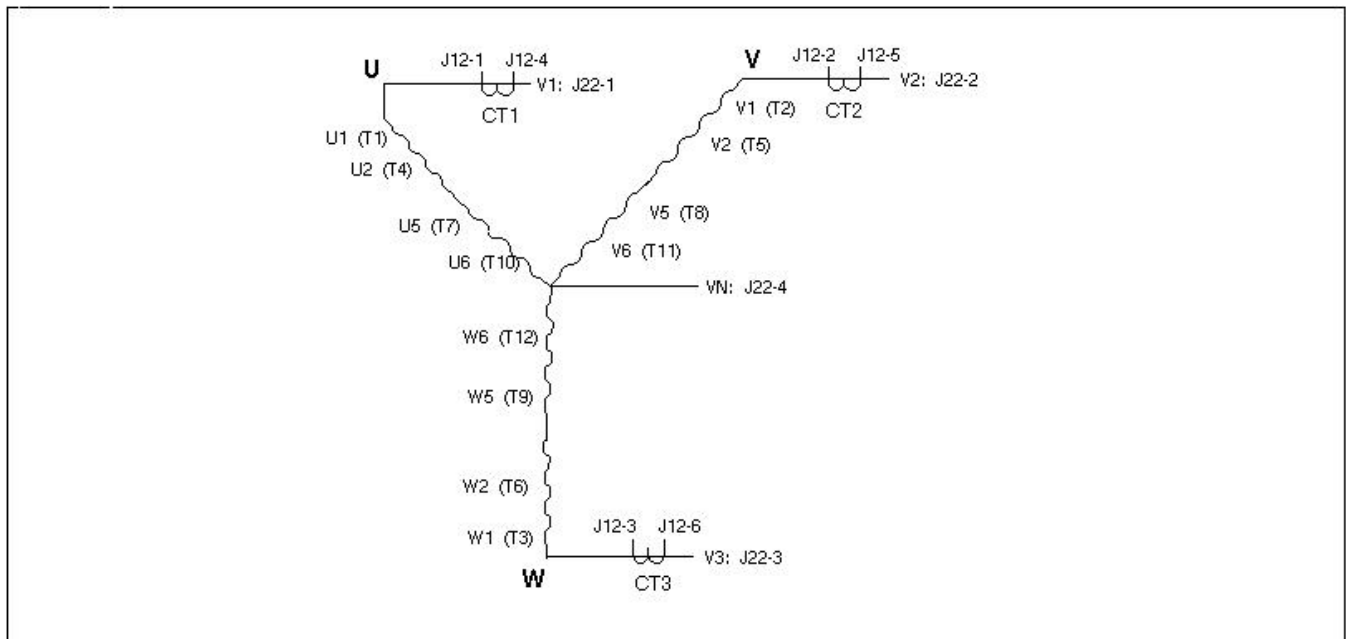


FIGURE 125. ALTERNATOR CONNECTIONS: SERIES STAR

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)

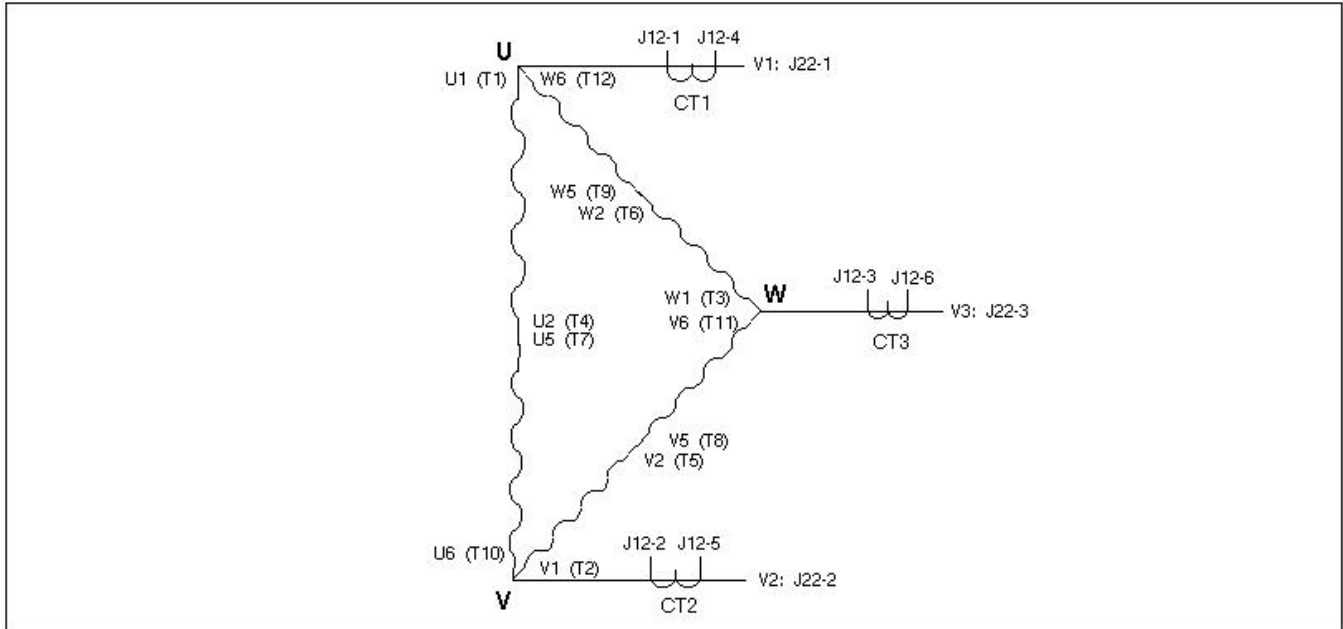


FIGURE 126. ALTERNATOR CONNECTIONS: SERIES DELTA

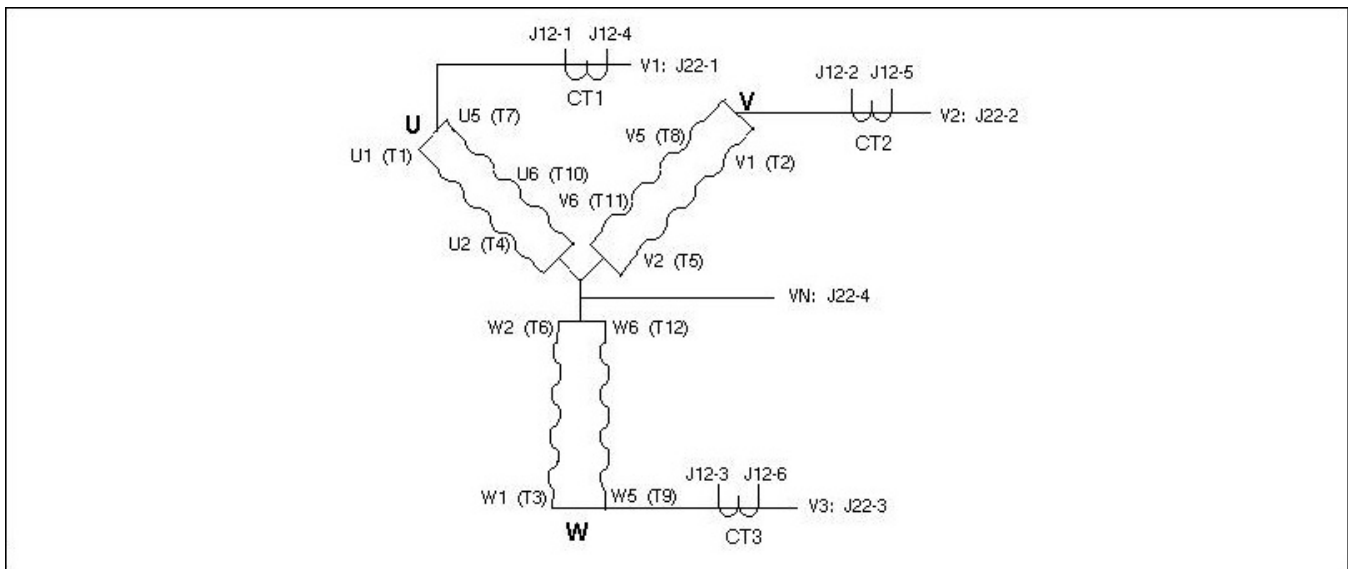


FIGURE 127. ALTERNATOR CONNECTIONS: PARALLEL STAR

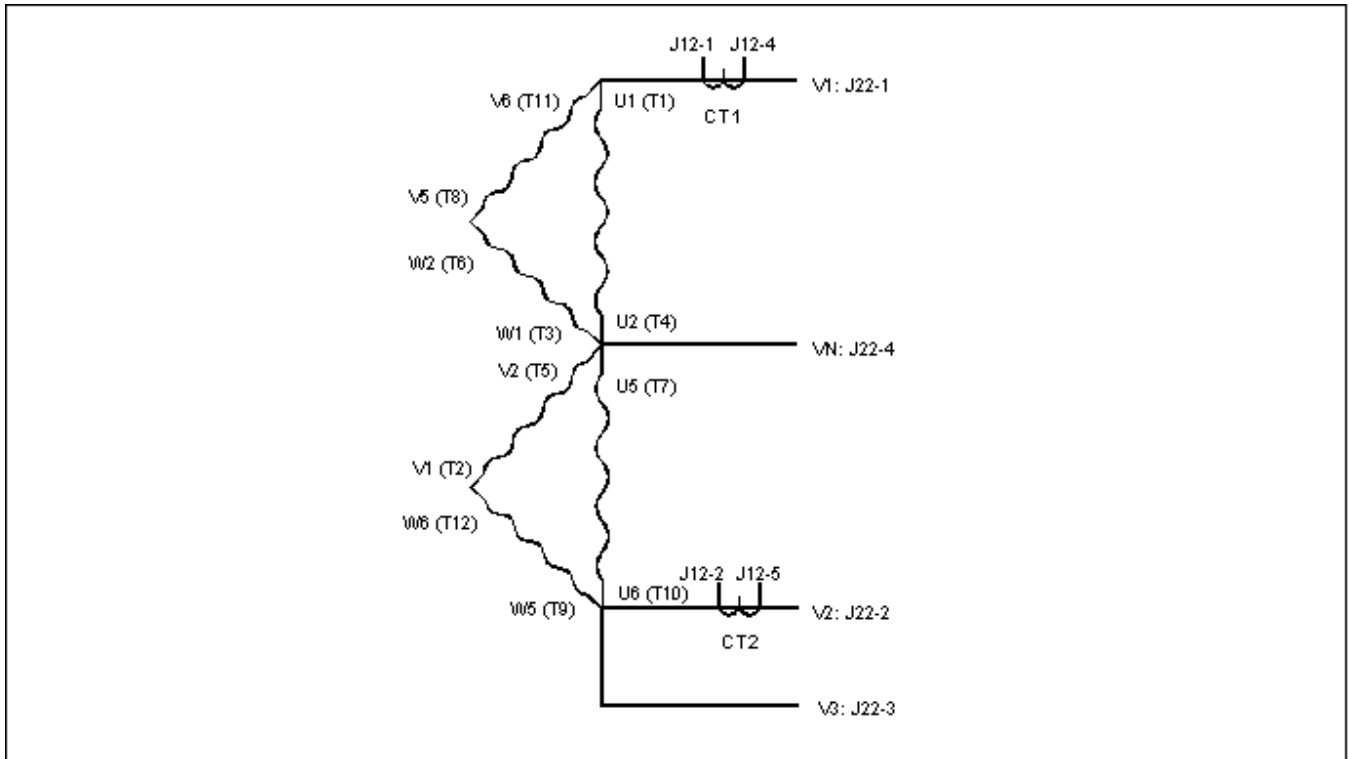


FIGURE 128. ALTERNATOR CONNECTIONS: DOUBLE DELTA

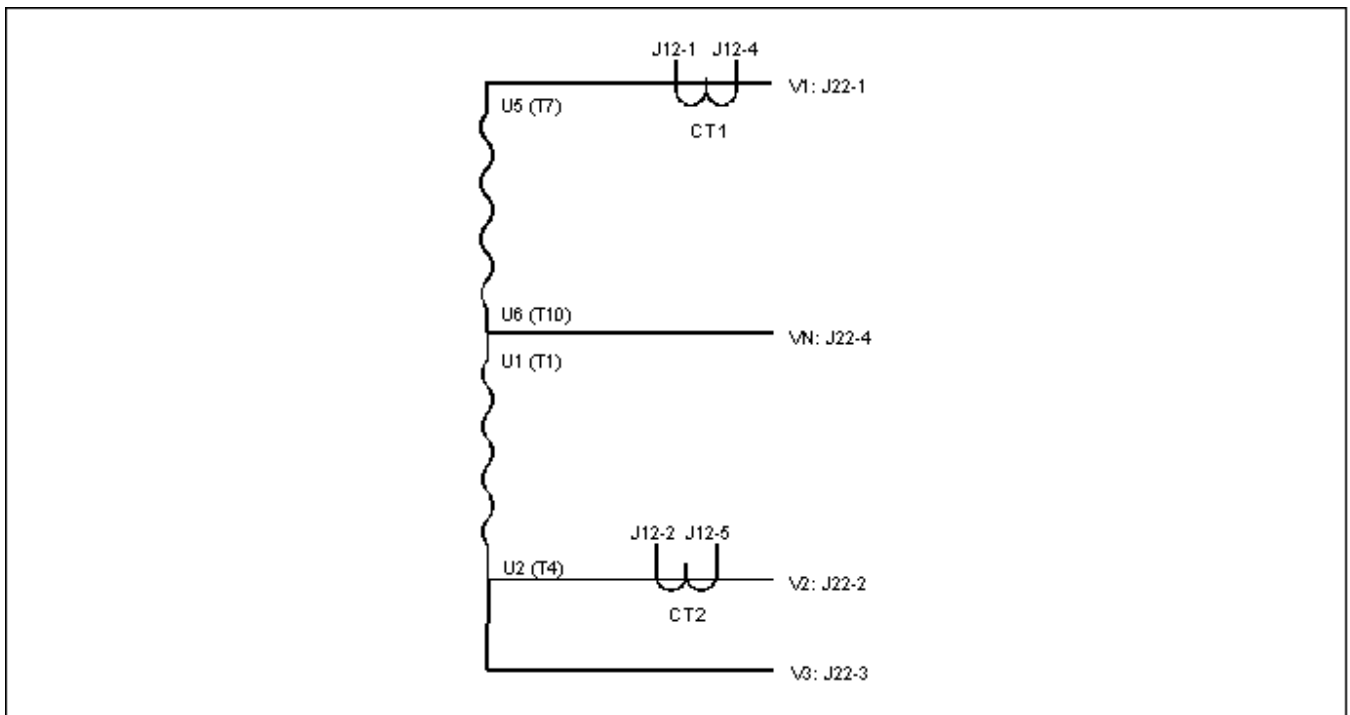


FIGURE 129. ALTERNATOR CONNECTIONS: SINGLE PHASE

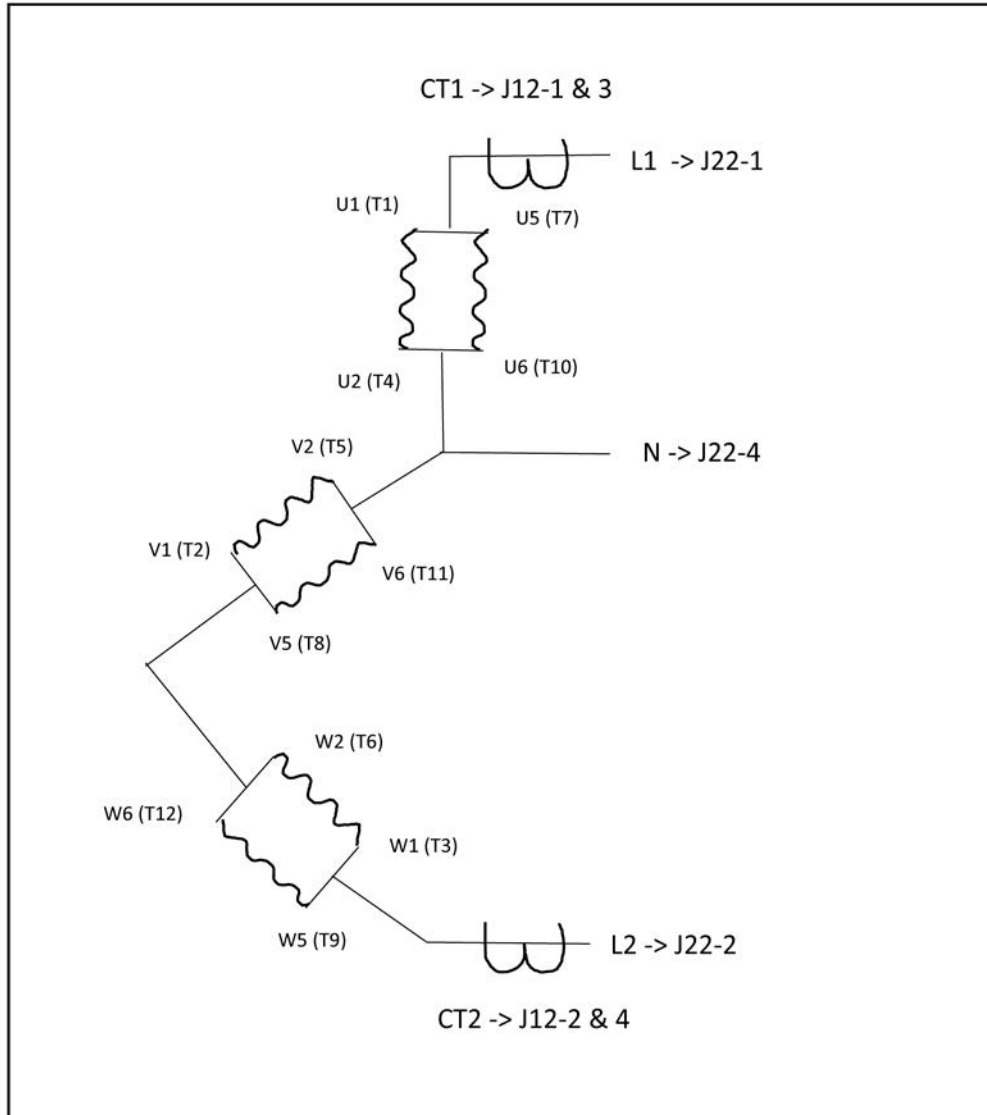


FIGURE 130. ALTERNATOR CONNECTIONS: PARALLEL ZIG ZAG ONE LINE

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.

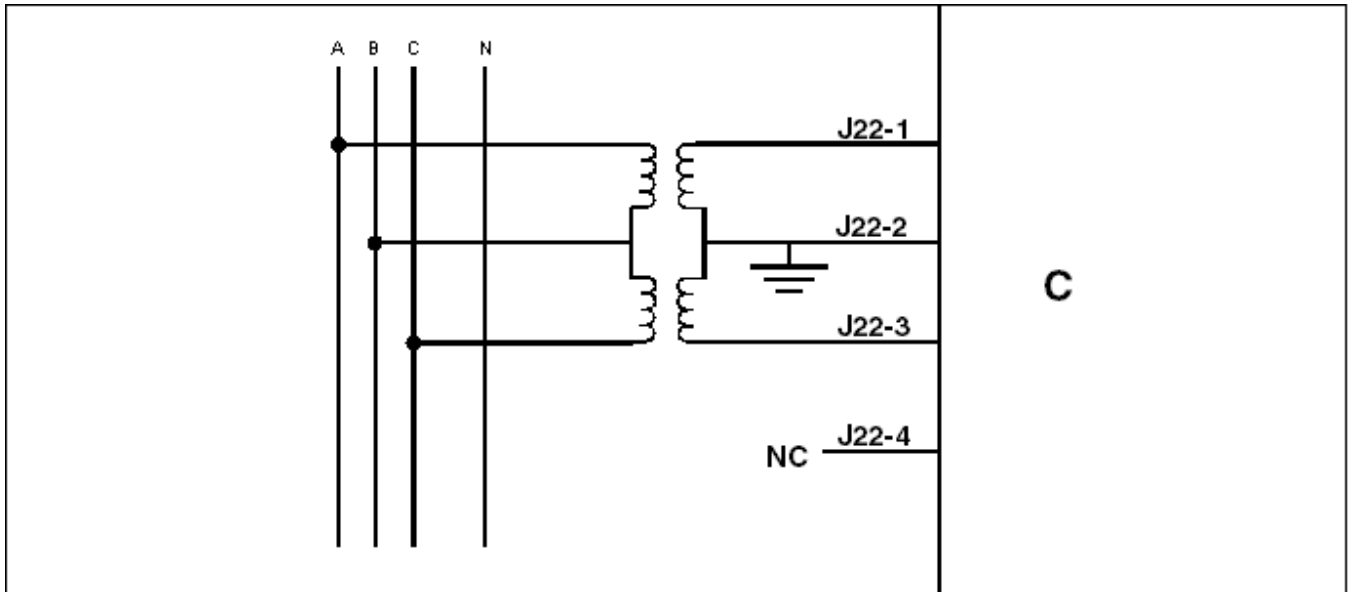


FIGURE 131. POTENTIAL TRANSFORMER CONNECTIONS IN 3-WIRE CONNECTIONS

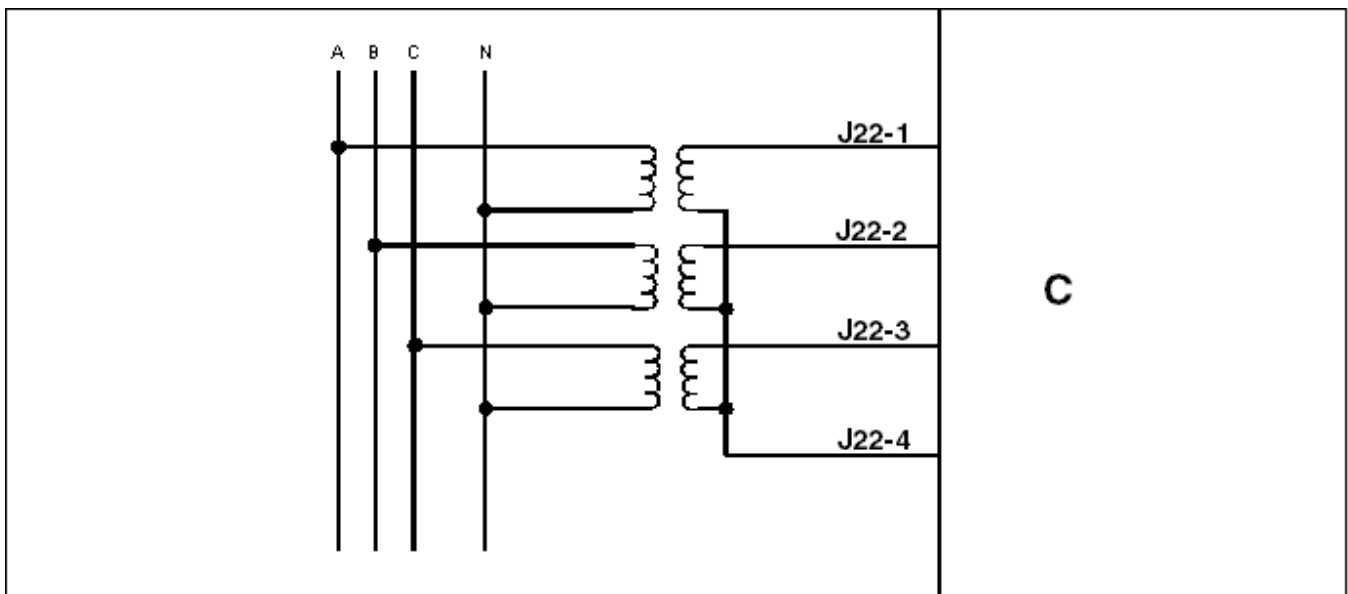


FIGURE 132. POTENTIAL TRANSFORMER CONNECTIONS IN 4-WIRE CONNECTIONS

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.

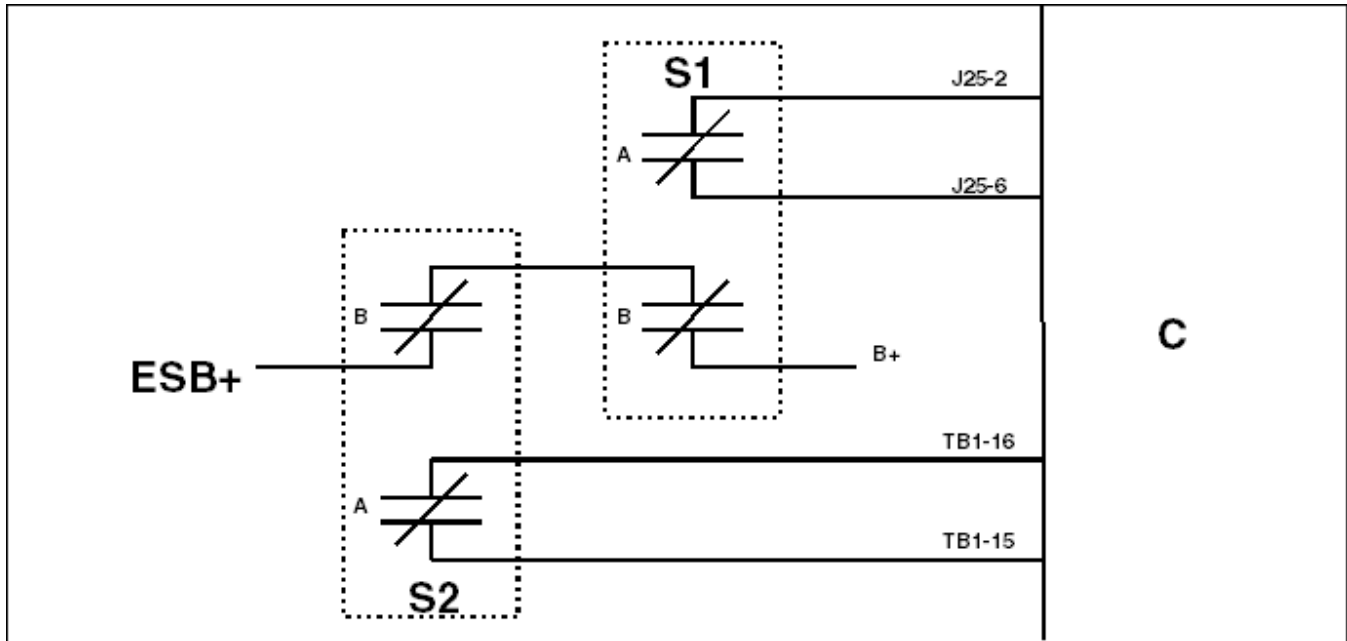


FIGURE 133. EMERGENCY STOP BUTTON WIRING DIAGRAM

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.

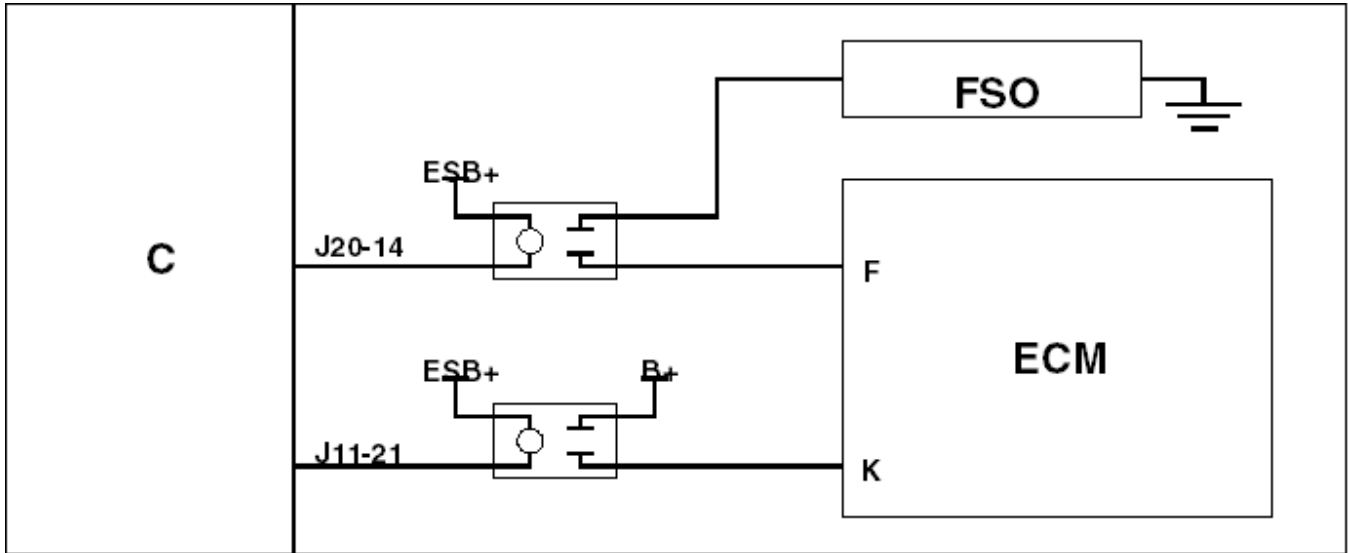


FIGURE 134. KEYSWITCH CONNECTIONS WHEN ECM CONTROLS FUEL SHUTOFF SOLENOID

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)

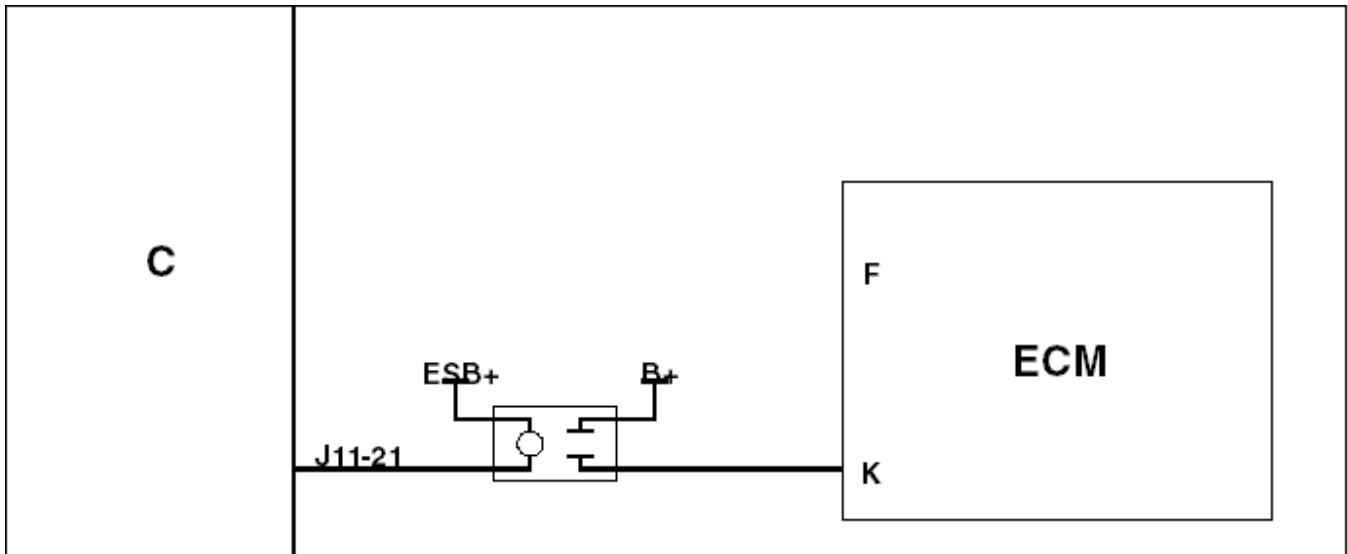


FIGURE 135. KEYSWITCH CONNECTIONS WHEN ECM DOES NOT CONTROL FUEL SHUTOFF SOLENOID

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. MLD Generator Set Start and Stop Examples

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Figure 139. MLD Example 3: Load Demand Total Spare Capacity Requested 668

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B.0 Assumptions for MLD Examples

NOTICE

Masterless Load Demand (MLD) System Settings for all examples:

- Load Demand Genset Enable (LD Gen Enable) set to Enable
- Load Demand System Enable (LD Sys Enable) set to Enable
- Remote Start (Sys Rmt Strt En) input set to Enable
- Load Demand Inhibit (LD Inhibit) signal is set to Inactive

NOTICE

For the purposes of this example MLD timers are not specified. In the following examples it is assumed that all applicable load demand timers will have expired before generator sets are add or removed from the system.

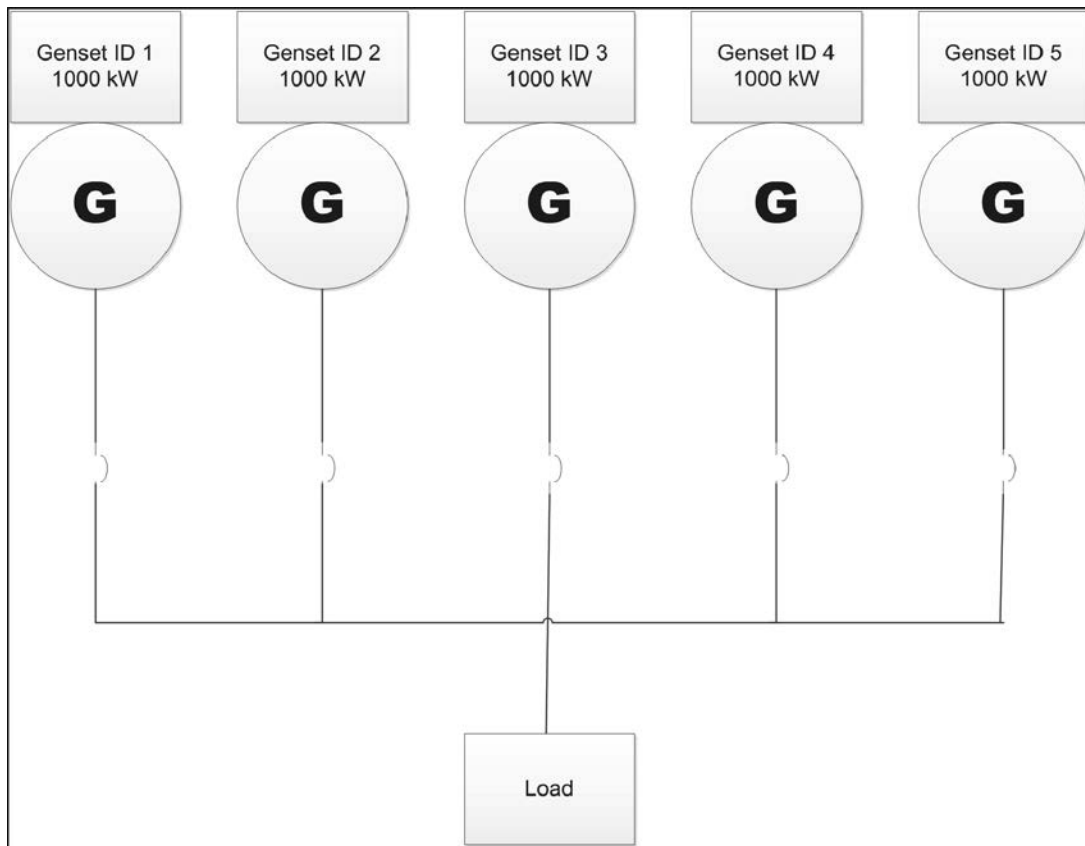


FIGURE 136. SYSTEM DIAGRAM FOR MLD EXAMPLES 1 THROUGH 4

B.1 MLD Example 1: Load Demand Threshold Method set to kW (Absolute Threshold Method)

This example demonstrates how the Masterless Load Demand (MLD) system responds to changes in load when the Load Demand Threshold Method (Threshold Method) is set to kW. This example applies for Load Demand Type (LD Type) is set to Fixed Priority (Priority) and Run Hours Equalization (Run Hr Eq) .

MLD settings for Example 1:

1. Set Load Demand Threshold Method (Threshold Method) to: kW
2. Set Load Demand Start Threshold (kW) (Start Thresh kW) to: 1500
3. Set Load Demand Stop Threshold (kW) (Stop Thresh kW) to: 1800
4. Set Synchronize System Settings (Sync System Settings) to: Yes

NOTICE

The Load Demand Stop Threshold (kW) (Stop Thresh kW) must be greater than the Load Demand Start Threshold (kW) (Start Thresh kW).

NOTICE

To ensure AC bus redundancy it is recommended that the Load Demand Stop Threshold (kW) (Stop Thresh kW) always be set greater then the application rating of a single generator set.

	Indicates generator set starts or stops											
Time (Hrs)	2	4	6	8	10	12	14	16	18	20	22	
Gen Bus Tot kW	Remote Strt	100	300	600	900	1200	1500	1800	2100	2400	2700	
Surplus Cap	5000	1900	1700	2400	2100	1800	2500	2200	1900	1600	2300	
# Gensets online	5	2	2	3	3	3	4	4	4	4	5	
Online Capacity	5000	2000	2000	3000	3000	3000	4000	4000	4000	4000	5000	
Nxt Strt Thresh		500	500	1500	1500	1500	2500	2500	2500	2500	3500	
Nxt Stp Thresh		0	0	200	200	200	1200	1200	1200	1200	2200	
Time (Hrs)	24	26	28	30	32	34	36	38	40	42	46	48
Gen Bus Tot kW	3000	2700	2400	2100	1800	1500	1200	900	600	300	100	0
Surplus Cap	2000	2300	2600	1900	2200	2500	1800	2100	2400	2700	1900	2000
# Gensets online	5	5	5	4	4	4	3	3	3	3	2	2
Online Capacity	5000	5000	5000	4000	4000	4000	3000	3000	3000	3000	2000	2000
Nxt Strt Thresh	3500	3500	3500	2500	2500	2500	1500	1500	1500	1500	500	500
Nxt Stp Thresh	2200	2200	2200	1200	1200	1200	200	200	200	200	0	0

FIGURE 137. MLD EXAMPLE 1: LOAD DEMAND THRESHOLD METHOD (THRESHOLD METHOD) SET TO KW

B.2 MLD Example 2: Load Demand Threshold Method set to %kW (Relative Threshold Method)

This example demonstrates how the MLD system responds to changes in load when the Load Demand Threshold Method (Threshold Method) is set to %kW. This example applies for Load Demand Type (LD Type) set to Fixed Priority (Priority) and Run Hours Equalization (Run Hr Eq).

MLD settings for Example 2

1. Set Load Demand Threshold Method (Threshold Method) to: %kW
2. Set Load Demand Start Threshold (%kW) (Start Thresh %kW) to: 80%
3. Set Load Demand Stop Threshold (%kW) (Stop Thresh %kW) to: 60%
4. Set Synchronize System Settings (Sync System Settings) to: Yes

NOTICE

The Load Demand Stop Threshold (%kW) (Stop Threshold %kW) has to be lower than the Load Demand Start Threshold (%kW) (Start Threshold %kW).

NOTICE

When the Load Demand Threshold Method (Threshold Method) is set to %kW, the Load Demand Start Threshold (%kW) (Start Threshold %kW) needs to be greater than the Load Demand Stop Threshold (%kW) (Stop Threshold %kW). This is different than when the Load Demand Threshold Method (Threshold Method) is set to kW where the Load Demand Stop Threshold (kW) (Stop Threshold kW) needs to be greater than the Load Demand Start Threshold (kW) (Start Threshold kW).

		☐ Indicates generator set starts or stops											
Time (Hrs)		2	4	6	8	10	12	14	16	18	20	22	
Gen Bus Tot kW	Remote Strt		100	300	600	900	1200	1500	1800	2100	2400	2700	
Surplus Cap		5000	900	700	400	1100	800	500	1200	900	1600	1300	
# Gensets online		5	☐ 1	1	1	☐ 2	2	2	☐ 3	3	☐ 4	4	
Online Capacity		5000	1000	1000	1000	2000	2000	2000	3000	3000	4000	4000	
Nxt Strt Thresh			800	800	800	1600	1600	1600	2400	2400	3200	3200	
Nxt Stp Thresh			0	0	0	600	600	600	1200	1200	1800	1800	
Time (Hrs)		24	26	28	30	32	34	36	38	40	42	44	46
Gen Bus Tot kW		3000	2700	2400	2100	1800	1500	1200	900	600	300	100	0
Surplus Cap		1000	1300	1600	1900	1200	1500	800	1100	400	700	900	1000
# Gensets online		4	4	4	4	☐ 3	3	☐ 2	2	☐ 1	1	1	1
Online Capacity		4000	4000	4000	4000	3000	3000	2000	2000	1000	1000	1000	1000
Nxt Strt Thresh		3200	3200	3200	3200	2400	2400	1600	1600	800	800	800	800
Nxt Stp Thresh		1800	1800	1800	1800	1200	1200	600	600	0	0	0	0

FIGURE 138. MLD EXAMPLE 2: LOAD DEMAND THRESHOLD METHOD (THRESHOLD METHOD) SET TO %kW

B.3 MLD Example 3: Load Demand Total Spare Capacity Requested

This example demonstrates how the MLD system responds to changes in load when the Load Demand Threshold Method (Threshold Method) is set to kW a Load Demand Total Spare Capacity Requested (Tot Spare Req) is Active . This example applies for Load Demand Type (LD Type) set to Fixed Priority (Priority) and Run Hours Equalization (Run Hr Eq).

MLD settings for Example 3

1. Set Load Demand Threshold Method (Threshold Method) to: kW
2. Set Load Demand Start Threshold (kW) (Start Thresh kW) to: 1500
3. Set Load Demand Stop Threshold (kW) (Stop Thresh kW) to: 1800
4. Set Load Demand Spare Capacity Requested (Tot Spare Req) to: 800
5. Set Synchronize System Settings (Sync System Settings) to: Yes

NOTICE

To avoid unnecessary generator set starting and stopping, once the Load Demand Spare Capacity Available output is Active, the load should be applied and then Total Spare Capacity Requested (Tot Spare Req) input should be removed within the Load Demand Genset Start Delay (LD Start Delay) period.

NOTICE

If the Spare Capacity Requested (Spare Cap Req) input is not removed when the load is added the control does not know if the load added was from the Total Spare Capacity Requested (Tot Spare Req) load, and will assume it to be general bus load increases and bring on the additional capacity if required to maintain available spare capacity.

NOTICE

This feature can also be used to increase the Load Demand Surplus Capacity (Surplus Cap) during certain conditions of operation where load fluctuations may be highest (i.e. This feature could be used to increase available surplus capacity during the work shift hours of the day).

NOTICE

When Load Demand Spare Capacity Available (Spare Cap Avail) output is active, the HMI320 will display the Load Demand Spare Capacity Available (Spare Cap Avail) as Yes.

800 kW load is turned on										
Spare Cap Req (Input) = Removed										
Spare Cap Avail (Output) = Active										
Spare Cap Req (Input) = Active										
Indicates genset starts or stops										
Gen Bus Tot kW	Remote Strt	100	300	600	900	1200	1200	1200	2000	2000
Surplus Cap	5000	1900	1700	2400	2100	1800	1800	2800	2000	2000
# Gensets online	5	2	2	3	3	3	3	4	4	4
Online Capacity	5000	2000	2000	3000	3000	3000	3000	4000	4000	4000
Nxt Strt Thresh		500	500	1500	1500	1500	1500	2500	2500	2500
Nxt Stp Thresh		0	0	200	200	200	200	1200	1200	1200
Spare Cap Req (Input)								Active	Active	Active
Spare Cap Avail (Output)								Active	Active	

FIGURE 139. MLD EXAMPLE 3: LOAD DEMAND TOTAL SPARE CAPACITY REQUESTED

B.4 MLD Example 4: Run Hours Equalization

This example demonstrates how the MLD system responds to changes in Load Demand Run Hours (LD Run Hrs) and load when the Load Demand Threshold Method (Threshold Method) is set to kW and the Load Demand Type (LD Type) is set to Run Hours Equalization (Run Hrs Eq) .

MLD settings for Example 4

1. Set Load Demand Type (LD Type) to: Run Hr Eq
2. Set Load Demand Start Threshold (kW) (Start Thresh kW) to: 1500
3. Set Load Demand Stop Threshold (kW) (Stop Thresh kW) to: 1800
4. Set Load Demand Run Hours Differential (Run Hrs Diff) to: 8
5. Set Load Demand Genset Run Hours (LD Run Hrs) to: 0 on all generator sets prior to enabling load demand
6. Set Synchronize System Settings (Sync System Settings) to: Yes

NOTICE

See [Section 7.6.2](#) for Load Demand Type (LD Type) set to Run Hours Equalization (Run Hrs Eq) theory of operation.

Indicates genset is offline (Stopped)												
Time (Hrs)	Hrs Eq Priority Shift				Hrs Eq Priority Shift				Hrs Eq Priority Shift			
	2	4	6	8	10	12	14	16	18	20	22	24
Gen Bus Tot kW	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400
Surplus Cap	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600
# Gensets online	3	3	3	3	3	3	3	3	3	3	3	3
Online Capacity	3000	3000	3000	3000	3000	3000	3000	3000	3000	3000	3000	3000
Nxt Gen To Start	Gen4	Gen4	Gen4	Gen4	Gen2	Gen2	Gen2	Gen2	Gen3	Gen3	Gen3	Gen3
Nxt Gen To Stop	Gen3	Gen3	Gen3	Gen3	Gen1	Gen1	Gen1	Gen1	Gen5	Gen5	Gen5	Gen5
Gen1 LD Run Hrs	2	4	6	8	10	12	14	16	16	16	16	16
Gen2 LD Run hrs	2	4	6	8	8	8	8	8	10	12	14	16
Gen3 LD Run Hrs	2	4	6	8	8	8	8	8	8	8	8	8
Gen4 LD Run hrs	0	0	0	0	2	4	6	8	10	10	12	14
Gen5 LD Run Hrs	0	0	0	0	2	4	6	8	10	10	12	14
Nxt Strt Thresh	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500
Nxt Stp Thresh	200	200	200	200	200	200	200	200	200	200	200	200
Maximum difference in genset LD Run Hours for all sets	2	4	6	8	8	8	8	8	8	8	8	8

Indicates system load change														
Time (Hrs)	Hrs Eq Priority Shift					Hrs Eq Priority Shift					Hrs Eq Priority Shift			
	26	28	30	32	34	36	38	40	42	44	46	48	50	52
Gen Bus Tot kW	1400	1400	1400	1400	1400	1400	1400	1600	1600	1600	1600	1600	1600	1600
Surplus Cap	1600	1600	1600	1600	1600	1600	1600	2400	2400	2400	2400	2400	2400	2400
# Gensets online	3	3	3	3	3	3	3	4	4	4	4	4	4	4
Online Capacity	3000	3000	3000	3000	3000	3000	3000	4000	4000	4000	4000	4000	4000	4000
Nxt Gen To Start	Gen2	Gen3	Gen3	Gen3	Gen3	Gen4	Gen4	Gen5	Gen5	Gen5	Gen5	Gen4	Gen4	Gen4
Nxt Gen To Stop	Gen4	Gen5	Gen5	Gen5	Gen5	Gen3	Gen3	Gen4	Gen4	Gen5	Gen5	Gen3	Gen3	Gen3
Gen1 LD Run Hrs	16	16	16	16	16	16	18	20	22	24	26	28	30	32
Gen2 LD Run hrs	16	16	16	16	16	16	18	20	22	24	26	28	30	32
Gen3 LD Run Hrs	10	12	14	16	18	20	22	24	26	28	30	32	34	36
Gen4 LD Run hrs	16	18	20	22	24	24	24	26	28	30	32	32	32	32
Gen5 LD Run Hrs	16	18	20	22	24	24	24	24	24	24	24	26	28	30
Nxt Strt Thresh	1500	1500	1500	1500	1500	1500	1500	2500	2500	2500	2500	2500	2500	2500
Nxt Stp Thresh	200	200	200	200	200	200	200	1200	1200	1200	1200	1200	1200	1200
Maximum difference in genset LD Run Hours for all sets	6	6	6	6	8	8	6	6	6	6	8	6	6	6

FIGURE 140. MLD EXAMPLE 4: RUN HOURS EQUALIZATION

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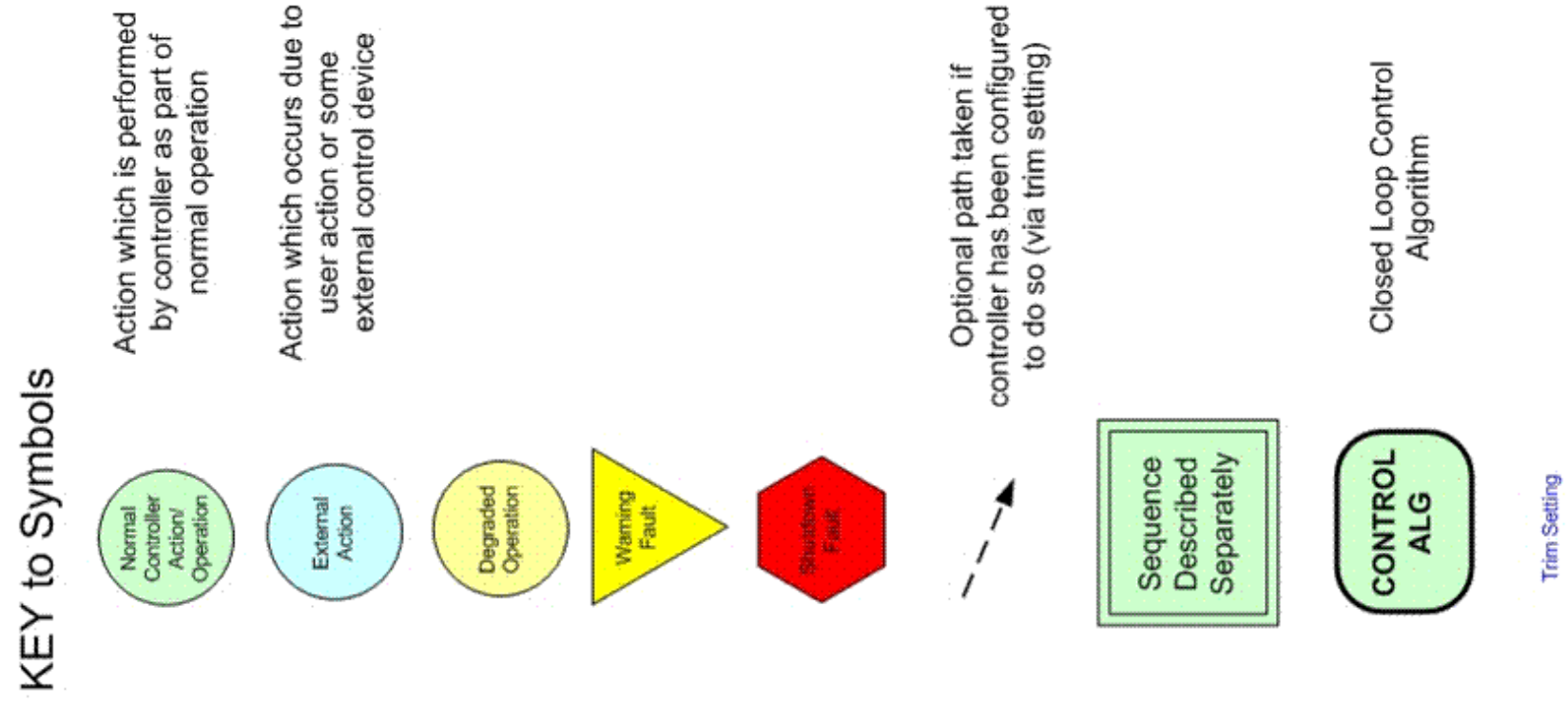
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PCC3300 PARALLELING OPERATING SEQUENCES



KEY:
 Green Fill = Normal Operation
 Yellow Fill = Warning Faults/Degraded Operation
 Red Fill = Shutdown Fault
 Blue Text = Trim Settings
 Double Border = see other sequence for details

FIGURE 141. PARALLELING SEQUENCES LEGEND

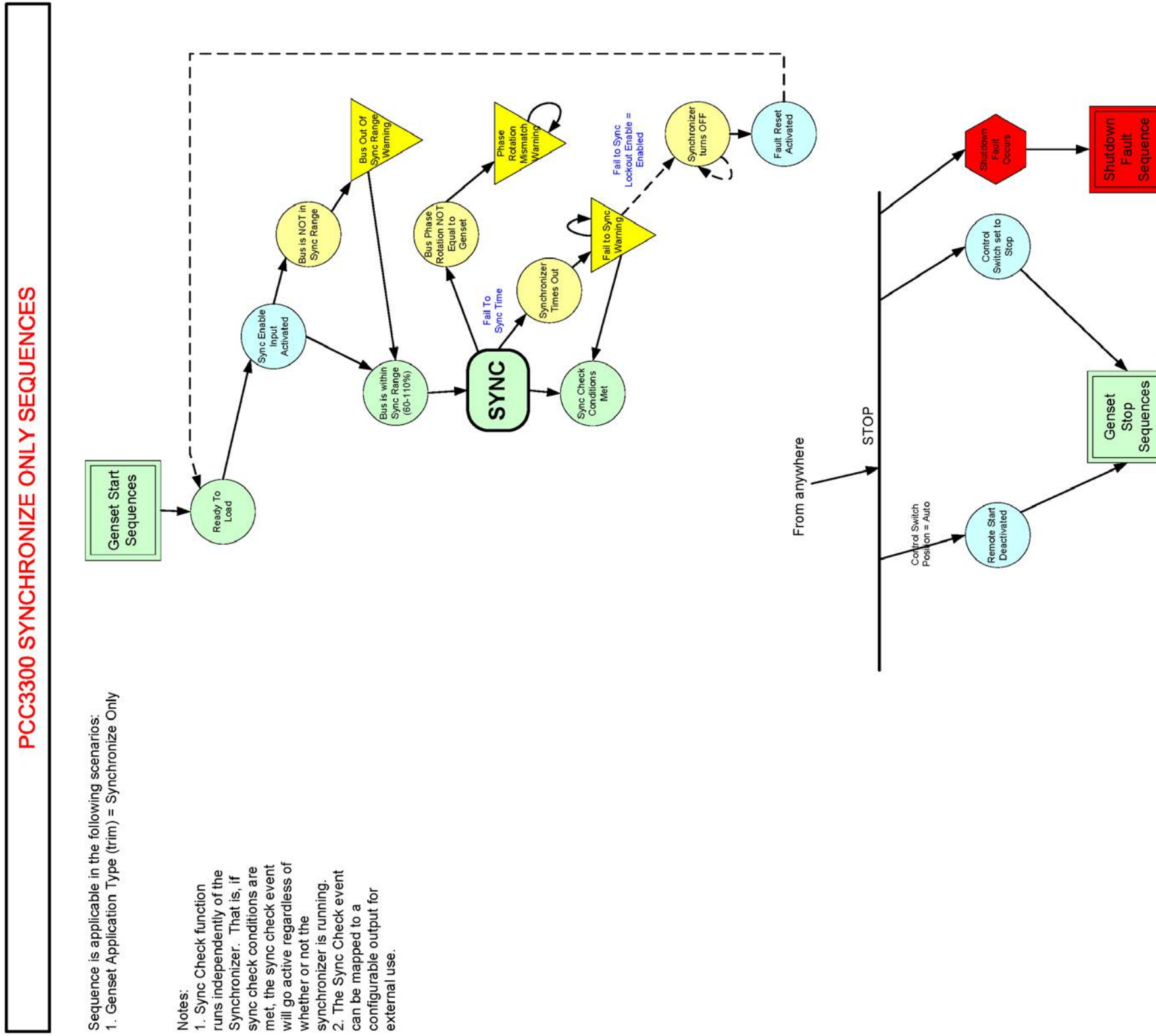


FIGURE 142. SYNCHRONIZE ONLY

PCC3300 ISOLATED BUS SEQUENCES

Sequence is applicable in the following scenarios:
1. Genset Application Type (trim) = Isolated Bus Only
2. Genset Application Type (trim) = Utility Multiple AND Utility Breaker is OPEN

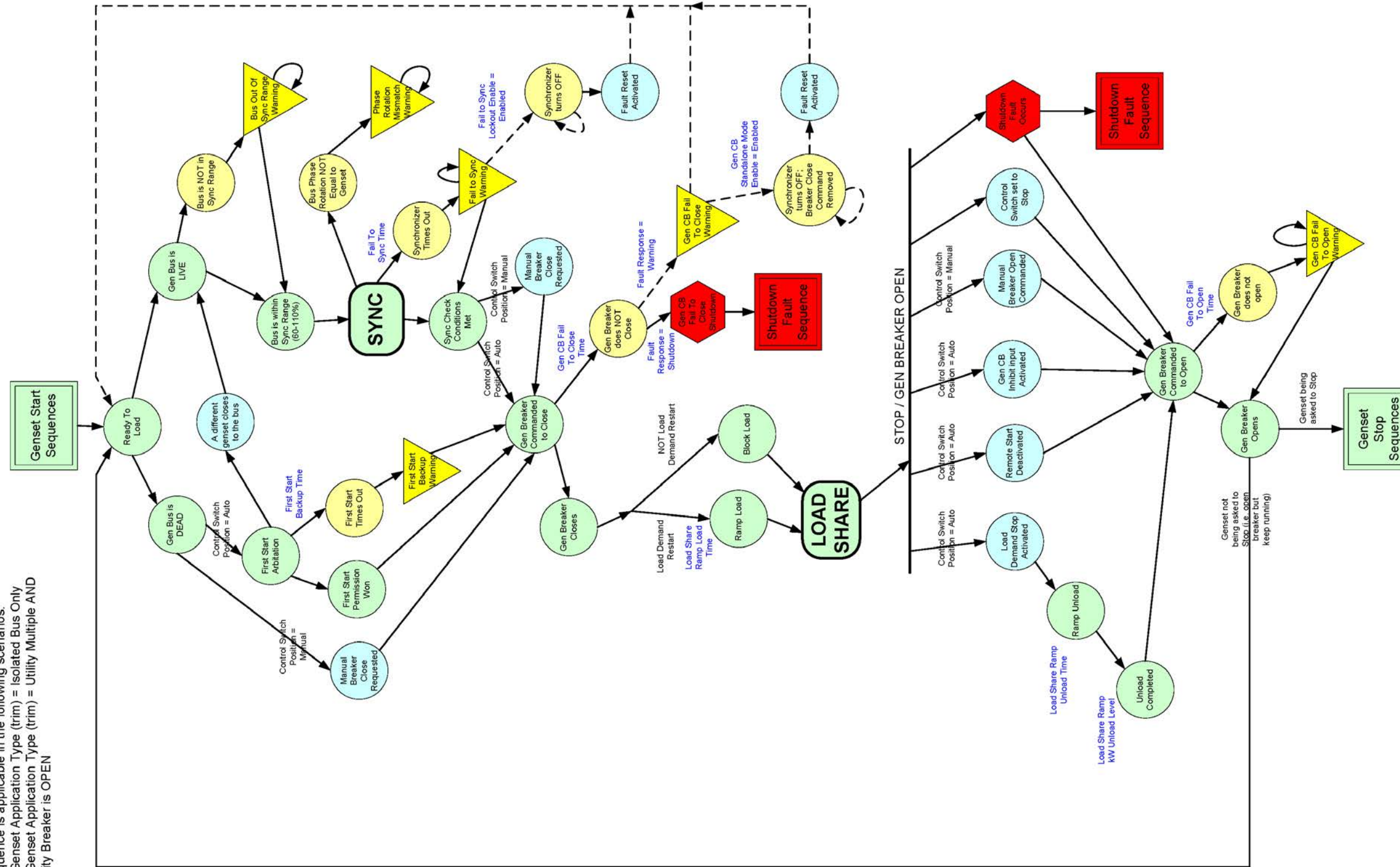


FIGURE 143. ISOLATED BUS ONLY

PCC3300 UTILITY SINGLE SEQUENCES – FROM GENSET START/STOP VIEWPOINT

Sequence is applicable in the following scenarios:
 1. Genset Application Type (trim) = Utility Single

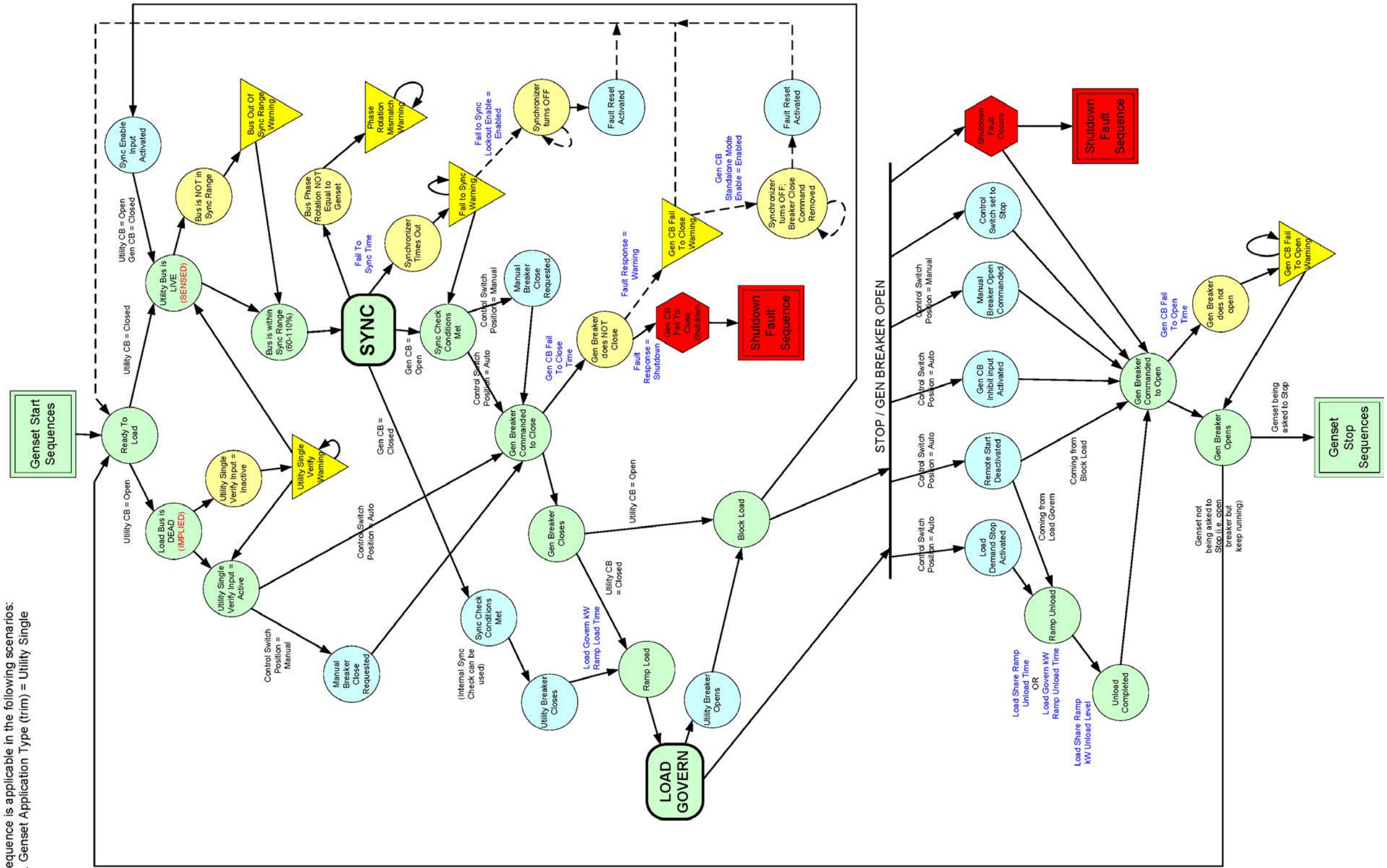


FIGURE 144. UTILITY SINGLE

PCC3300 UTILITY SINGLE SEQUENCES – FROM BREAKER STATE VIEWPOINT

Sequence is applicable in the following scenarios:
 1. Genset Application Type (trim) = Utility Single

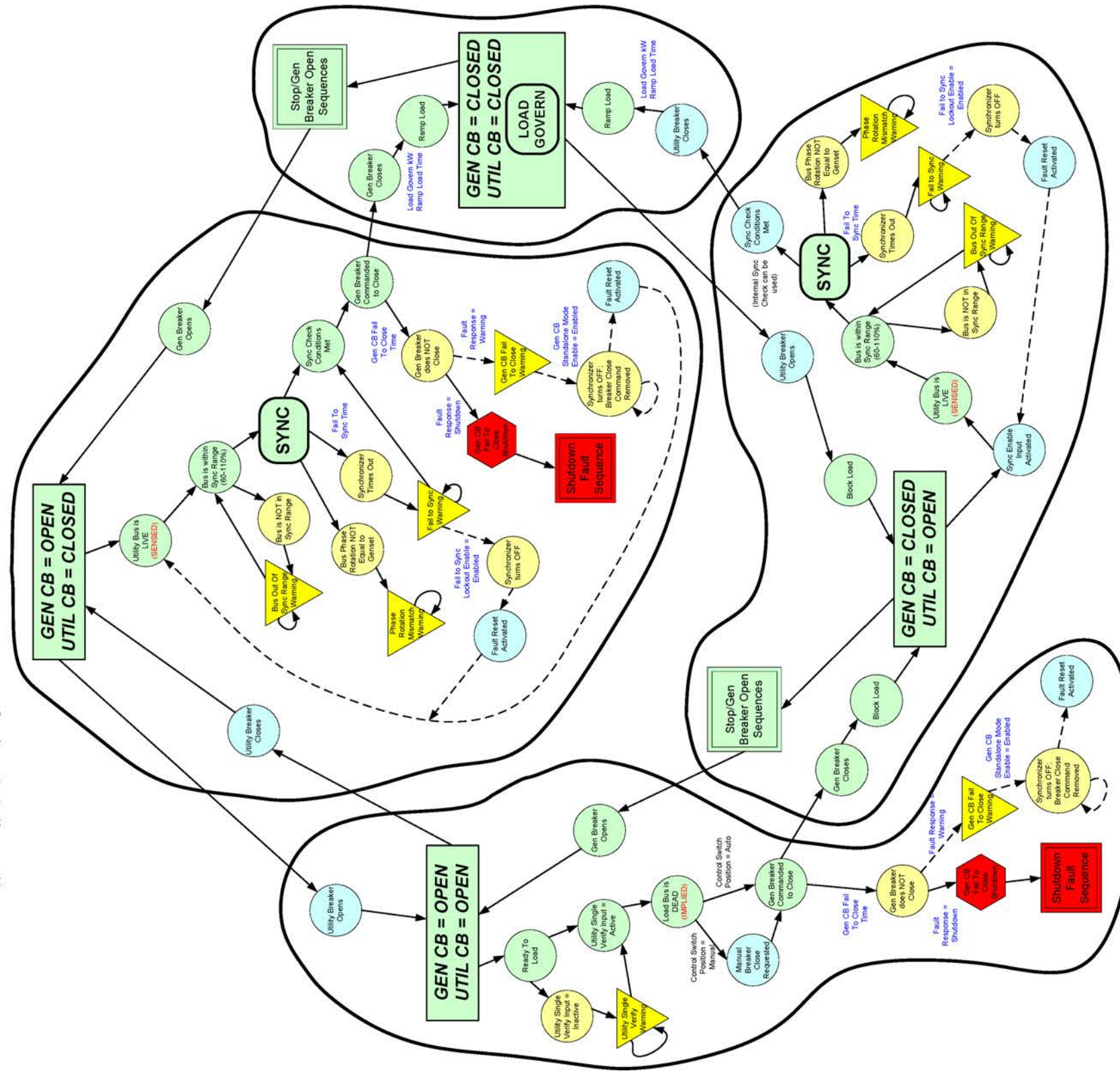
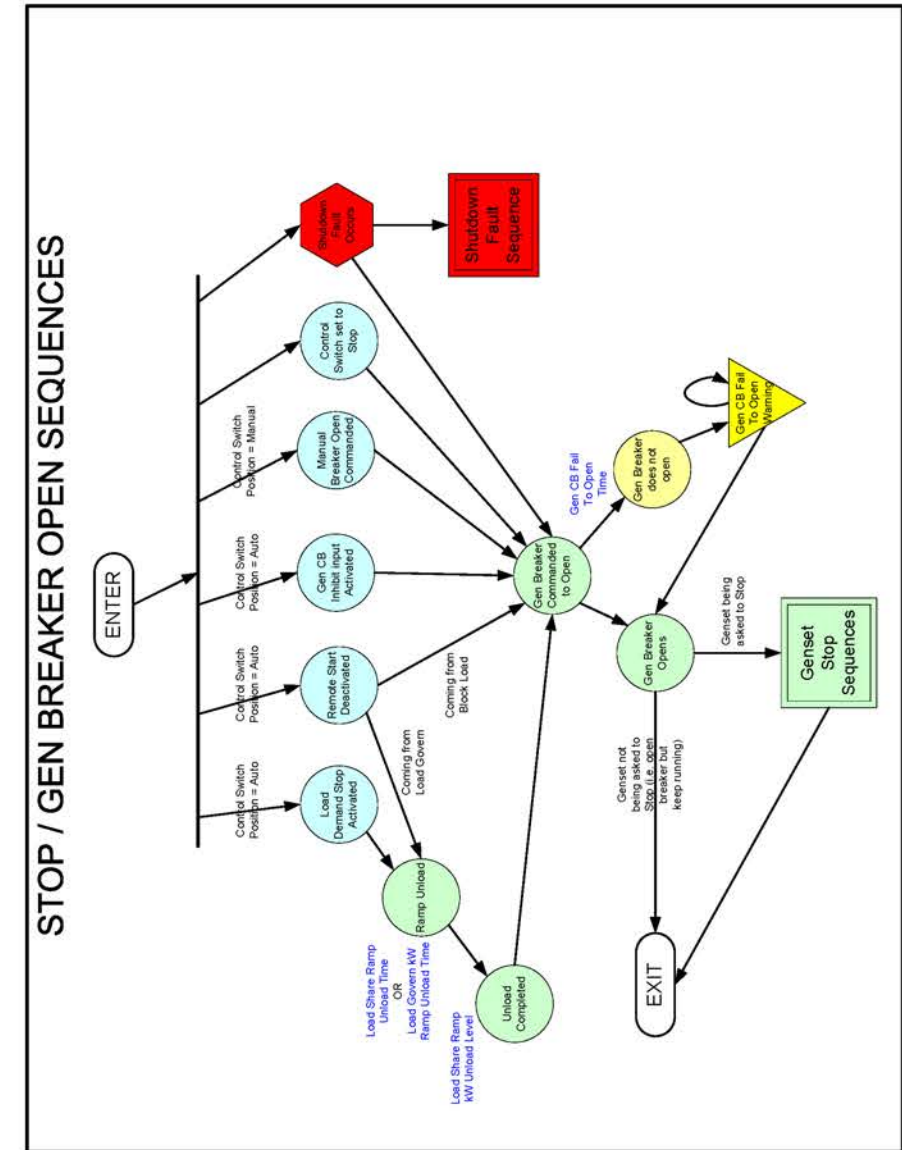


FIGURE 145. UTILITY SINGLE - BREAKER STATE VIEWPOINT



PCC3300 UTILITY MULTIPLE SEQUENCES

Sequence is applicable in the following scenarios:
 1. Genset Application Type (trim) = Utility Multiple

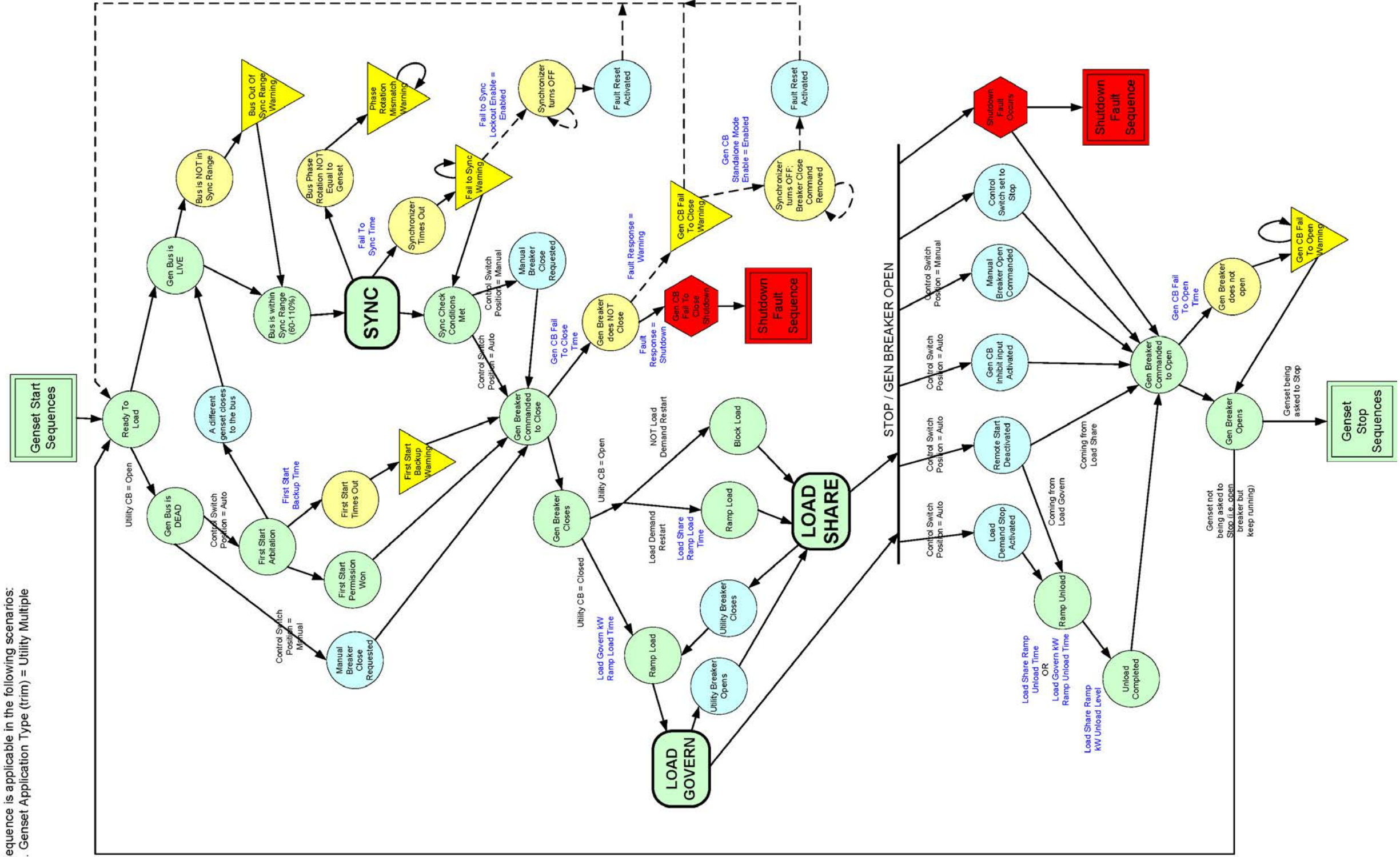


FIGURE 146. UTILITY MULTIPLE

PCC3300 POWER TRANSFER CONTROL – UTILITY FAIL/RETURN – OPEN TRANSITION

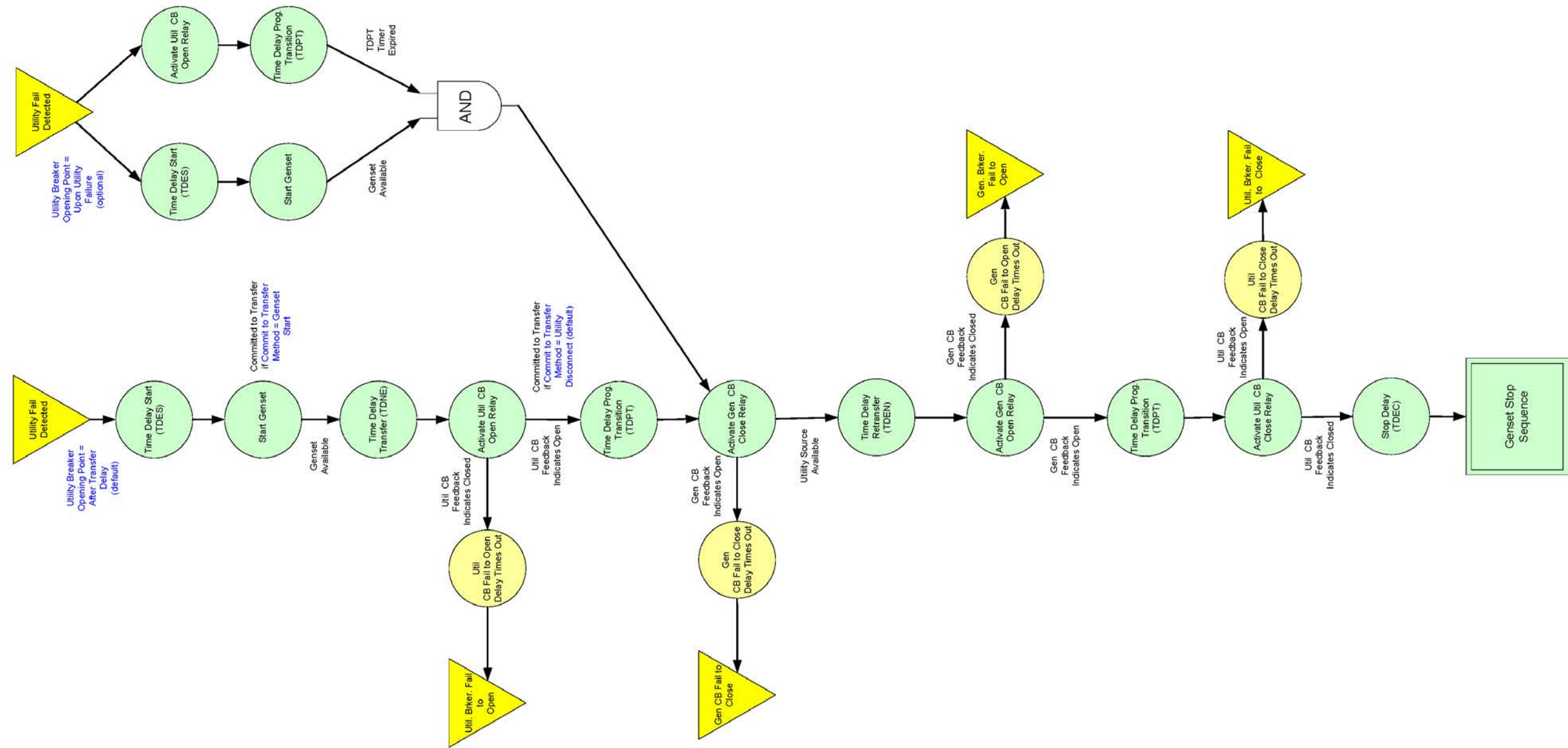


FIGURE 147. POWER TRANSFER CONTROL: UTILITY FAILURE/RETURN, OPEN TRANSITION

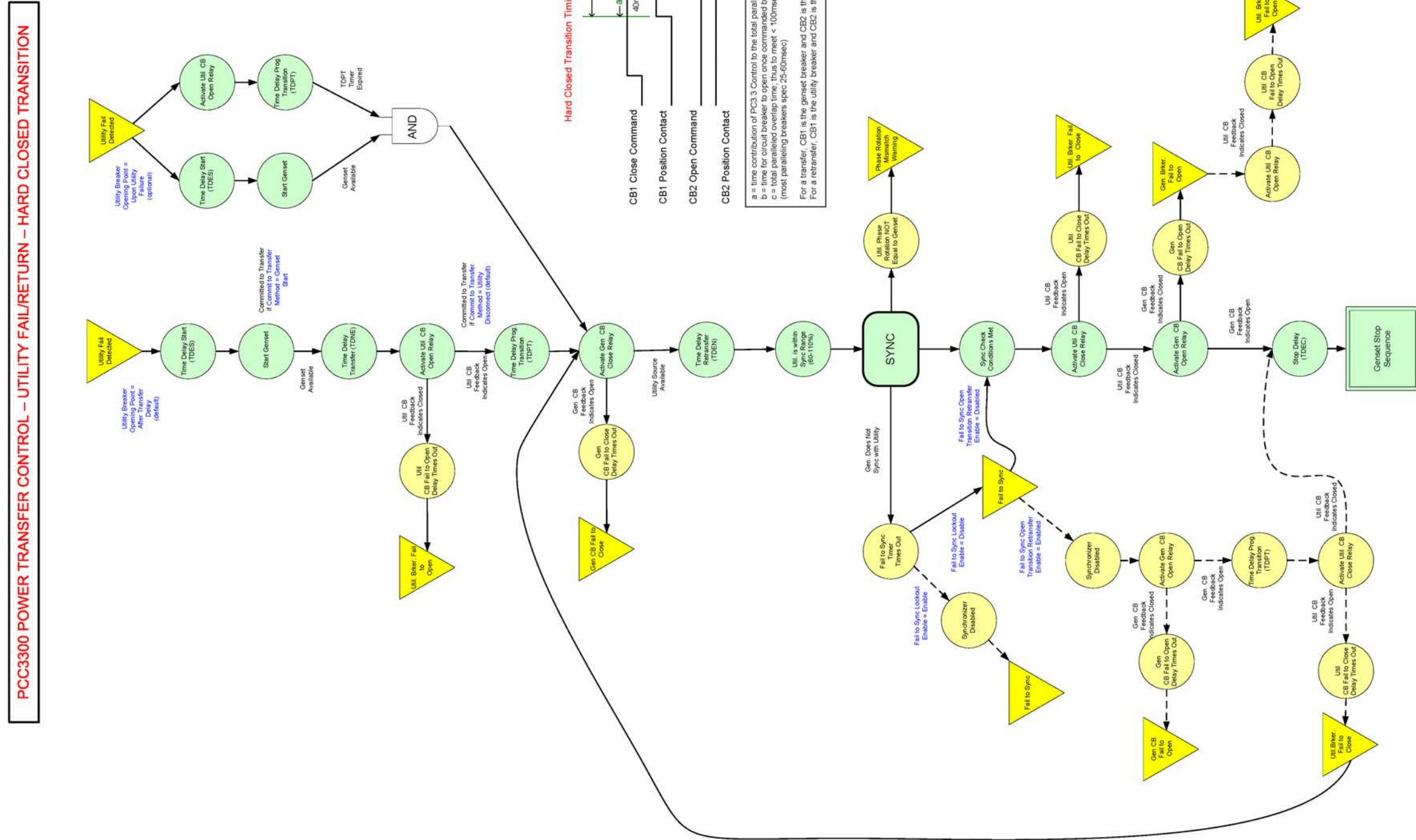


FIGURE 148. POWER TRANSFER CONTROL: UTILITY FAILURE/RETURN, HARD CLOSED TRANSITION

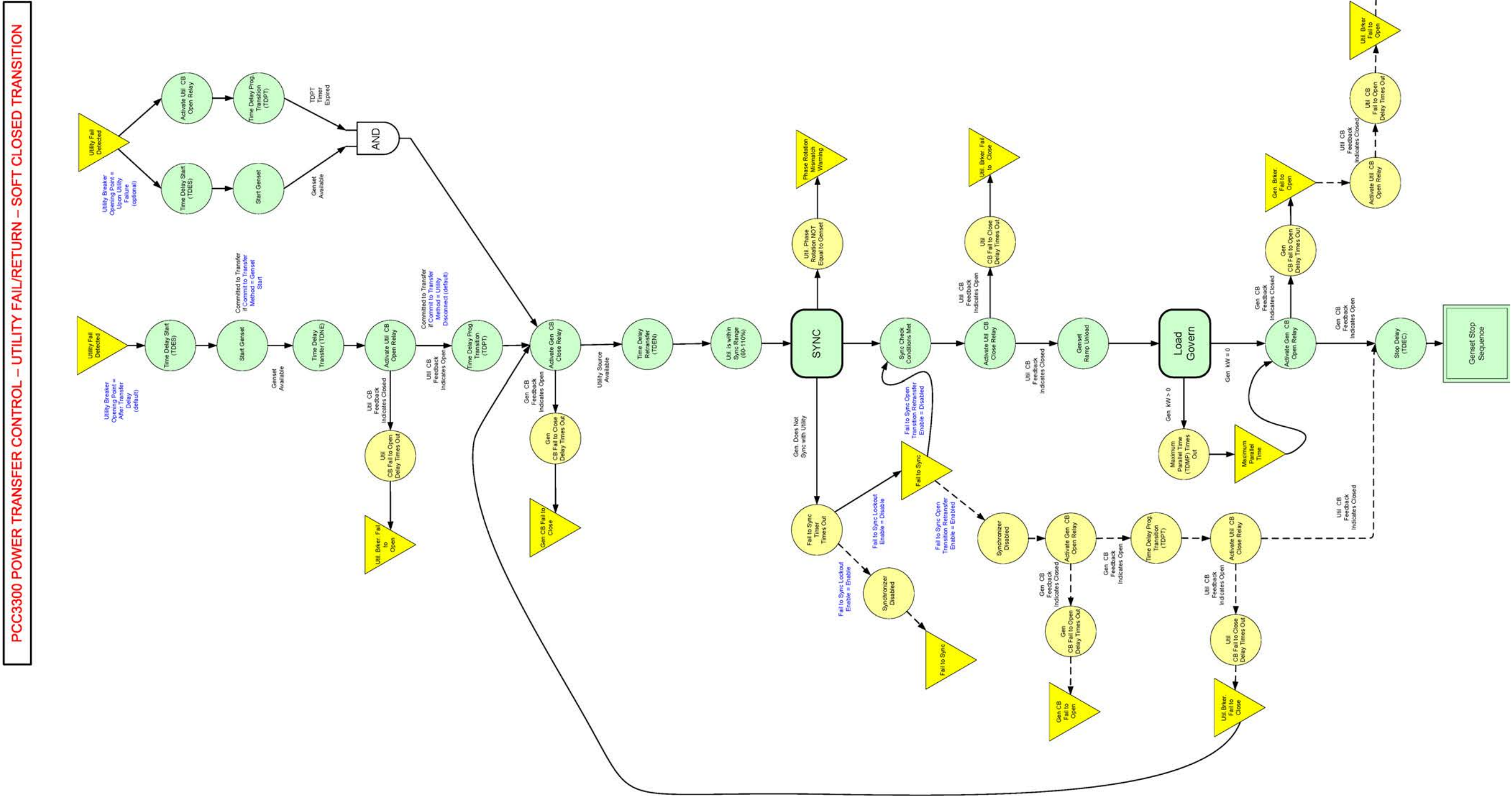


FIGURE 149. POWER TRANSFER CONTROL: UTILITY FAILURE/RETURN, SOFT CLOSED TRANSITION

PCC3300 POWER TRANSFER CONTROL – TEST/EXERCISE/SCHEDULER – OPEN TRANSITION

This sequence applies to:
 Test – With Load
 Test – Without Load
 Exercise – With Load
 Exercise – Without Load
 Scheduler – With Load
 Scheduler – Without Load

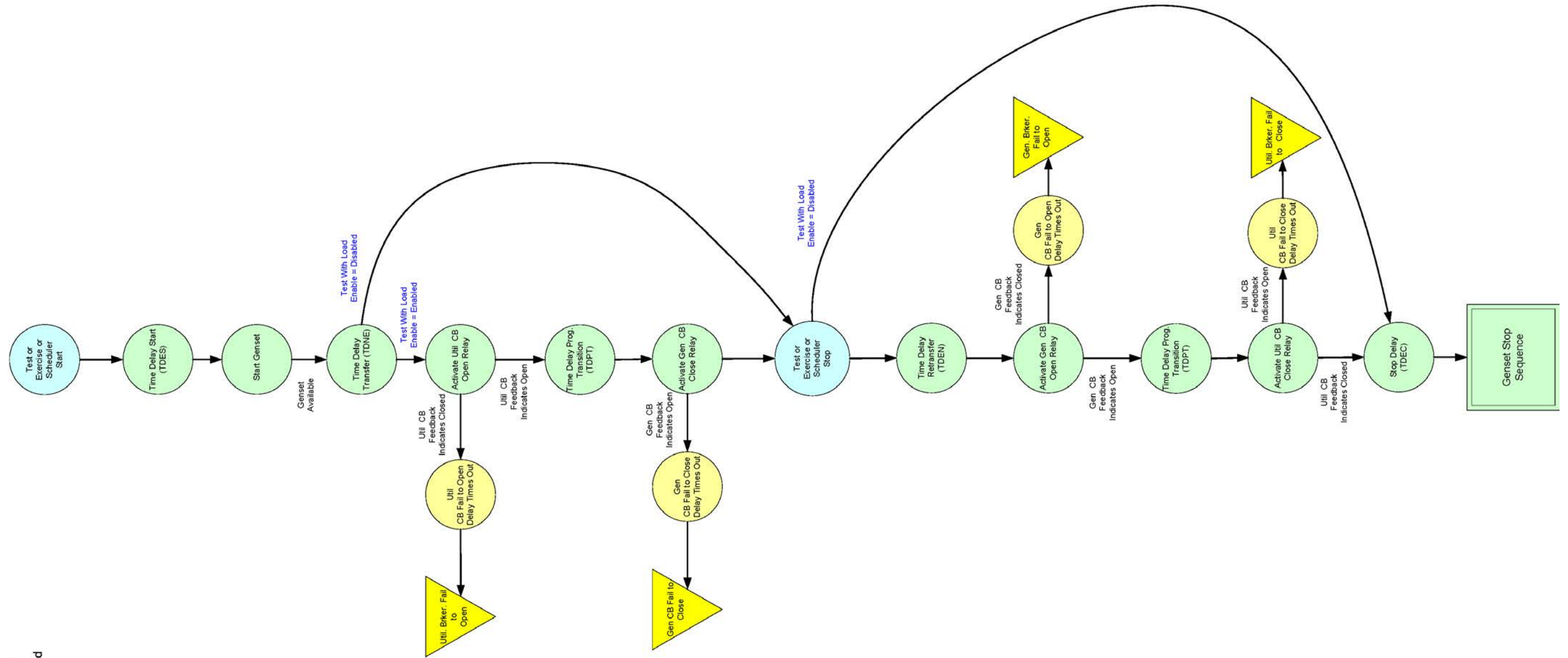


FIGURE 150. POWER TRANSFER CONTROL: TEST/EXERCISE/SCHEDULER, OPEN TRANSITION

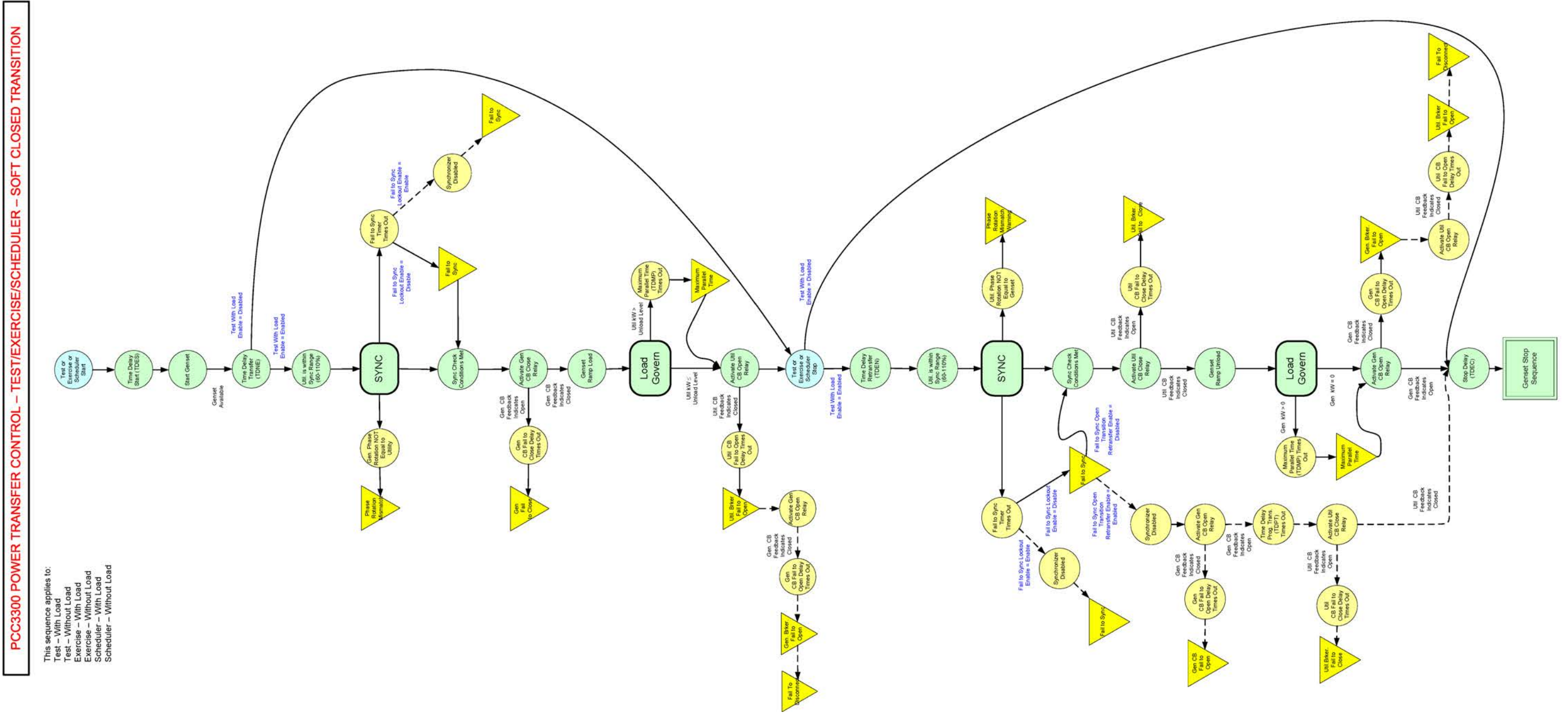


FIGURE 152. POWER TRANSFER CONTROL: TEST/EXERCISE/SCHEDULER, SOFT CLOSED TRANSITION

PCC3300 POWER TRANSFER CONTROL – EXTENDED PARALLEL

This sequence applies to:
 Extended Parallel Start
 Scheduler – Extended Parallel

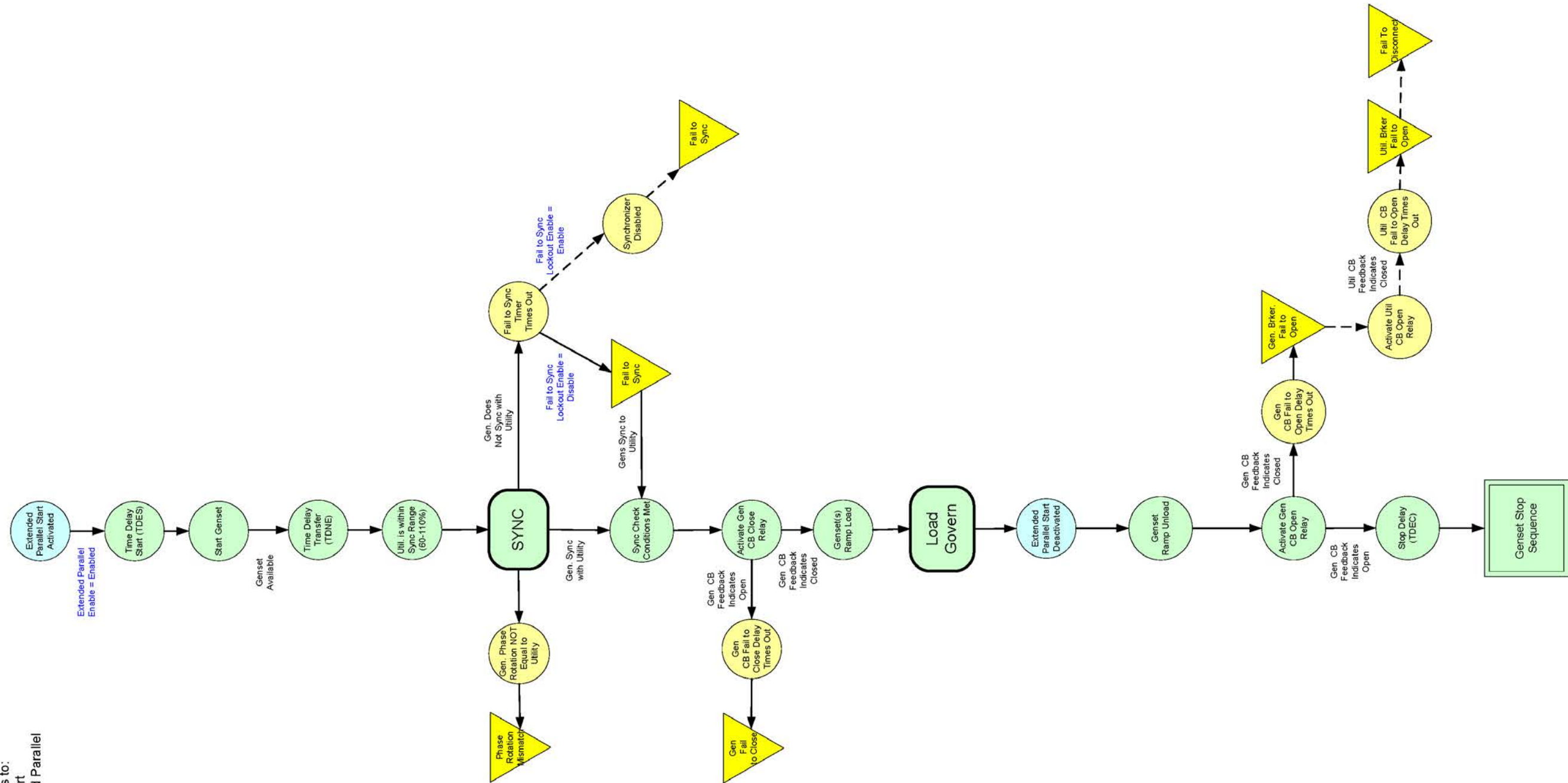


FIGURE 153. POWER TRANSFER CONTROL: EXTENDED PARALLEL

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TABLE 198. PART NUMBERS

PART DESCRIPTION	PART NUMBER
AUX101	A030K633
AUX102	0541-0772
AUX103 AVR Power Stage	0327-1593
AUX104 External Governor Power Module	0327-1507
AUX105 Control Assembly	A028T766
Emergency stop button	0308-1165
Fluke test leads "TL80A"	0541-1627
HMI112 (Bargraph)	0541-1319
HMI113 (No enclosure)	0300-5929-01
HMI113 (Enclosure)	0300-5929-02
HMI114 (Bargraph)	0300-6366-02
HMI114 (Bargraph software)	0326-7431
HMI320 (Operator Panel)	0300-6315-02
HMI320 Operator Panel software	0326-7431
HMI320 Operator Panel language software	0326-7449 0326-7450
HMI heater	A026J556
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 HMI320 (Operator Panel)	0300-6315-03
Remote HMI320 Operator Panel software	0326-7431
Remote HMI320 Operator Panel language software	0326-7449 0326-7450
PCC3300 Controller	0327-1601-01
PCC3300 Controller with Masterless Load Demand (MLD)	A041W736
PCC3300 Controller (For Training only)	0327-1601-02
PC-based service tool harness (InPower harness)	0541-1199

TABLE 200. PART NUMBERS FOR PCC CONNECTORS

CONNECTION	DESCRIPTION	HOUSING	PINS
CT1	Generator set bus/utility L1 current sensing		

CONNECTION	DESCRIPTION	HOUSING	PINS
CT2	Generator set bus/utility L2 or generator set neutral current sensing		
CT3	Generator set bus/utility L3 current sensing		
J12	CT input	0323-1932	0323-1200
J14	PC-based service tool interface		
J20	Generator set input and output	0323-2446	0323-2466
J22	PT input	0323-2226-03	
J25	Accessories input and output	0323-2445	0323-2466
J26	Interconnect (J11 and AUX103)	0323-2454	0323-2466
TB1	Customer input and output	0323-1678-15	
TB3	Customer input and output		
TB5	Circuit breaker control		
TB7	Generator set bus/utility voltage sensing		
TB8	Customer input and output	0323-2325-03	
TB9	Analog input and output		
TB10	Circuit breaker status		
TB15	Modbus, PC-based service tool interface	0323-2192-04	

TABLE 202. PART NUMBERS FOR AUX103 CONNECTORS

CONNECTION	DESCRIPTION	HOUSING	PINS
J17	AVR control	0323-2098	0323-1200
J18	AVR input	0323-2444	0323-1200
J19	Interconnect (PCC base board)	0323-2453	0323-2466

TABLE 204. PART NUMBERS FOR AUX104 CONNECTORS

CONNECTION	DESCRIPTION	HOUSING	PINS
J1	All connections	0323-2216	0323-1200

TABLE 206. PART NUMBERS FOR AUX105 CONNECTORS

CONNECTION	DESCRIPTION	HOUSING	PINS
J11	Engine input and output	0323-2161	0323-2466
J17	AVR control	0323-2098	0323-1200
J18	AVR input	0323-2444	0323-1200
J21	Power, CAN, PCCNet	0323-2455	0323-2466

CONNECTION	DESCRIPTION	HOUSING	PINS
TB15	Modbus, PC-based service tool interface	0323-2192-04	

TABLE 208. 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	

Appendix E. Ambient, Engine Oil, Intake Manifold Temperature Sensor Details

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TABLE 210. PART NO. 0193-0529-XX DETAILS

Part No.	Threading Design
0193-0529-01	3/8-18 NPTF
0193-0529-02	M14 X 1.5
0193-0529-03	M16 X 1.5

TABLE 212. SENSOR'S DEG F VS RESISTANCE DETAILS

Deg F	Resistance
0	700
10	735
20	770
30	810
40	848
50	887
60	928
70	970
80	1012
90	1056
100	1100
110	1148
120	1195
130	1245
140	1295
150	1347
160	1400
170	1455
180	1512
190	1570
200	1625
210	1685
220	1745
230	1804

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TABLE 214. PART NO. 0193-0446-XX DETAILS

Part No.	Flexible Cable Length
0193-0446-00	22.500
0193-0446-01	12.000
0193-0446-02	30.000
0193-0446-03	50.000

TABLE 216. SENSOR'S DEG F VS RESISTANCE DETAILS

Temp °C	Resistance
0	100.0
100	138.5
200	175.8
400	247.1
800	375.7

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