



Operator Manual

Controller

PowerCommand® 3.3 Control

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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.

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 the equipment.

DANGER

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

WARNING

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

CAUTION

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

NOTICE

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

1.2 General Information

This manual should form part of the documentation package supplied by Cummins Power Generation 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

Coolant under pressure.

Hot coolants under pressure can cause severe scalding.

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

⚠ WARNING

Moving parts.

Can cause severe personal injury or death.

Make sure all protective guards are properly in place before starting the generator set.

⚠ WARNING

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.

⚠ WARNING

Operation of equipment.

Is unsafe when mentally or physically fatigued.

Do not operate equipment in this condition, or after consuming any alcohol or drug.

⚠ WARNING

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

Flammable liquids.

Can cause fire or explosion.

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

⚠ WARNING

Generator sets in operation mode emit noise.

Exposure to noise can cause hearing damage

Wear appropriate ear protection at all times.

⚠ WARNING

Hot metal parts.

Can cause severe burns.

Avoid contact with the radiator, turbo charger, and exhaust system.

⚠ WARNING

Maintaining or installing a generator set.

Can cause severe personal injury.

Wear personal protective equipment such as safety glasses, protective gloves, hard hats, steel-toed boots, and protective clothing when working on equipment.

⚠ WARNING

Ethylene glycol.

Used as engine coolant, is toxic to humans and animals.

Clean up coolant spills and dispose of used antifreeze in accordance with local environmental regulations.

⚠ WARNING

Starting fluids, such as ether.

Can cause explosion and generator set engine damage.

Do not use.

⚠ WARNING

Accidental or remote starting.

Accidental starting of the generator set while working on it can cause severe personal injury or death.

To prevent accidental or remote starting while working on the generator set, disconnect the negative (-) battery cable at the battery using an insulated wrench.

⚠ CAUTION

Cleaning materials.

Loose cleaning materials can become entangled in moving parts or cause a fire hazard.

Make sure that all cleaning materials are removed from the generator set before operating the generator.

⚠ CAUTION

Combustible materials.

A build up of combustible materials under the generator set can present a fire hazard.

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

⚠ CAUTION

Accumulated grease and oil.

Can cause overheating and engine damage presenting a potential fire hazard.

Keep the generator set clean and makes sure oil leaks are repaired promptly.

⚠ CAUTION

Maintenance and service procedures.

Service access doors on generator sets can be heavy.

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

⚠ CAUTION***Obstructions.***

Articles left against the generator set or close by may restrict the air flow and cause over heating or a fire hazard.

Keep the generator set and the surrounding area clean and free from obstructions. Remove any debris from the set and keep the floor clean and dry.

NOTICE

Keep multi-class ABC fire extinguishers handy. 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 applicable region.)

NOTICE

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

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***Improper operation and maintenance.***

Can lead to severe personal injury, or loss of life and property, by fire, electrocution, mechanical breakdown, or exhaust gas asphyxiation.

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

⚠ WARNING***Lifting and repositioning of the generator set.***

Incorrect lifting can result in severe personal injury, death, and/or equipment damage.

Lifting must only be carried out using suitable lifting equipment, shackles, and spreader bars, in accordance with local guidelines and legislation, by suitably trained and experienced personnel. For more information, contact your authorized distributor

1.3.1 Moving Parts Can Cause Severe Personal Injury Or Death

- Keep your 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

NOTICE

On an enclosed generator set, the canopy doors must be locked before re-positioning, and they must remain locked during transportation and siting.

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

Energized circuits.

Any work with exposed energized circuits with potentials of 50 Volts AC or 75 Volts DC or higher poses a significant risk of electrical shock and electrical arc flash. These silent hazards can cause severe injuries or death.

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 the lockout/tagout 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. Safety) 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 to 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 Power Generation accepts no responsibility for providing the means of isolation.

1.4.2 Medium Voltage Equipment (601 V to 15 kV)

- 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.
- Be sure all fuel supplies have a positive shutoff valve.
- Be 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 Spillage

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

1.5.2 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.

1.5.3 Do Not Operate in Flammable and Explosive Environments

Flammable vapor can cause an engine to overspeed 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 Power Generation 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 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.
- Be sure the unit is well ventilated.

1.6.1 Exhaust Precautions

WARNING

Hot pipes.

Hot exhaust pipes and charge air pipes can cause severe personal injury or death from direct contact, or from fire hazard.

Wear appropriate PPE when working on hot equipment and avoid physical contact where possible.

WARNING

Hot exhaust gases.

Can cause burns resulting in severe personal injury.

Wear personal protective equipment when working on equipment.

WARNING

Inhalation of exhaust gases.

Breathing exhaust fumes can result in serious personal injury or death.

Be sure deadly exhaust gas is piped outside and away from windows, doors, or other inlets to buildings. Do not allow to accumulate in habitable areas

WARNING

Contaminated insulation.

Is a fire risk which can result in severe personal injury and equipment damage.

Remove any contaminated insulation and dispose of 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.

2 Introduction

WARNING

Hazardous voltage.

Can cause severe personal injury or death and equipment damage.

Generator electrical output connections must be made by a trained and experienced electrician in accordance with the installation instructions and all applicable codes.

WARNING

Electrical generating equipment.

Can cause severe personal injury or death.

Generator sets must be installed, certified, and operated by trained and experienced person in accordance with the installation instructions and all applicable codes.

2.1 About This Manual

This manual is a supplement to the generator set operator manual. It is not a replacement.

The information in this manual replaces the controller information in the generator set operator manual. The rest of the information in the generator set operator manual is still required to operator the generator set safely and correctly.

WARNING

Do not discard the generator set operator manual. It is still required to operator the generator set safely and correctly.

Cummins Power Generation (CPG) cannot accept any liability whatsoever for problems arising as a result of following recommendations in this manual.

The information contained within the manual is based on information available at the time of going to print. In line with Cummins Power Generation policy of continuous development and improvement, information may change at any time without notice. The users should therefore make sure that before commencing any work, they have the latest information available.

Users are respectfully advised that it is their responsibility to employ competent persons to carry out any installation work in the interests of good practice and safety. Consult your authorized distributor for further installation information. It is essential that the utmost care is taken with the application, installation and operation of any engine due to their potentially hazardous nature. Careful reference should also be made to other Cummins Power Generation literature. A generator set must be operated and maintained properly if you are to expect safe and reliable operation.

Should you require further assistance contact your authorized distributor.

2.2 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.

AmpSentry, INSITE, and InPower are trademarks of Cummins Inc. PowerCommand is a registered trademark of Cummins Inc.

ABBR.	DESCRIPTION	ABBR.	DESCRIPTION
AC	Alternating Current	LCT	Low Coolant Temperature
AMP	AMP, Inc., part of Tyco Electronics	LED	Light-emitting Diode
ANSI	American National Standards Institute	MFM	Multifunction Monitor
ASTM	American Society for Testing and Materials (ASTM International)	Mil Std	Military Standard
ATS	Automatic Transfer Switch	NC	Normally Closed
AVR	Automatic Voltage Regulator	NC	Not Connected
AWG	American Wire Gauge	NFPA	National Fire Protection Agency
CAN	Controlled Area Network	NO	Normally Open
CB	Circuit Breaker	NWF	Network Failure
CE	Conformité Européenne	OEM	Original Equipment Manufacturer
CFM	Cubic Feet per Minute	OOR	Out of Range
CGT	Cummins Generator Technologies	OORH / ORH	Out of Range High
CMM	Cubic Meters per Minute	OORL / ORL	Out of Range Low
CT	Current Transformer	PB	Push Button
DC	Direct Current	PCC	PowerCommand® Control
DPF	Diesel Particulate Filter	PGI	Power Generation Interface
ECM	Engine Control Module	PGN	Parameter Group Number
ECS	Engine Control System	PI	Proportional/Integral
EMI	Electromagnetic interference	PID	Proportional/Integral/Derivative
EN	European Standard	PLC	Programmable Logic Controller
EPS	Engine Protection System	PMG	Permanent Magnet Generator
E-Stop	Emergency Stop	PT	Potential Transformer
FAE	Full Authority Electronic	PTC	Power Transfer Control
FMI	Failure Mode Identifier	PWM	Pulse-width Modulation
FSO	Fuel Shutoff	RFI	Radio Frequency Interference
Genset	Generator Set	RH	Relative Humidity
GCP	Generator Control Panel	RMS	Root Mean Square
GND	Ground	RTU	Remote Terminal Unit
HMI	Human-machine Interface	SAE	Society of Automotive Engineers
IC	Integrated Circuit	SPN	Suspect Parameter Number
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

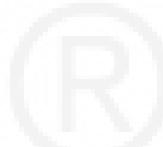
2.3 How to Obtain Service

When the generator set requires servicing, contact your nearest Cummins Power Generation distributor. To contact your local Cummins Power Generation distributor refer to the [**Global Addresses**](#) section contained within this document. When contacting your distributor, always supply the complete Model, Specification, and Serial Number as shown on the nameplate.

A large, semi-transparent watermark of the Cummins logo is centered on the page. It features the word "Cummins" in a bold, sans-serif font, with each letter partially enclosed in a circle. The logo is oriented diagonally from the bottom-left towards the top-right. In the bottom right corner of the logo, there is a registered trademark symbol (®).



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3 Control System - PowerCommand® 3.3 MLD

3.1 Control System Description

The control system is used to start and stop the generator set from the display screen in either Manual or Auto mode. It is suitable for stand alone or paralleling generator sets in both standby and prime-power applications, providing full generator set monitoring capability and protection. It monitors the engine for temperature, oil pressure and speed, and provides voltage and current metering. In the event of a fault the unit indicates the fault type and automatically shuts down the generator set on critical faults.

All indicators, control buttons and the display screen are on the face of the operator panel as illustrated in the following figure.

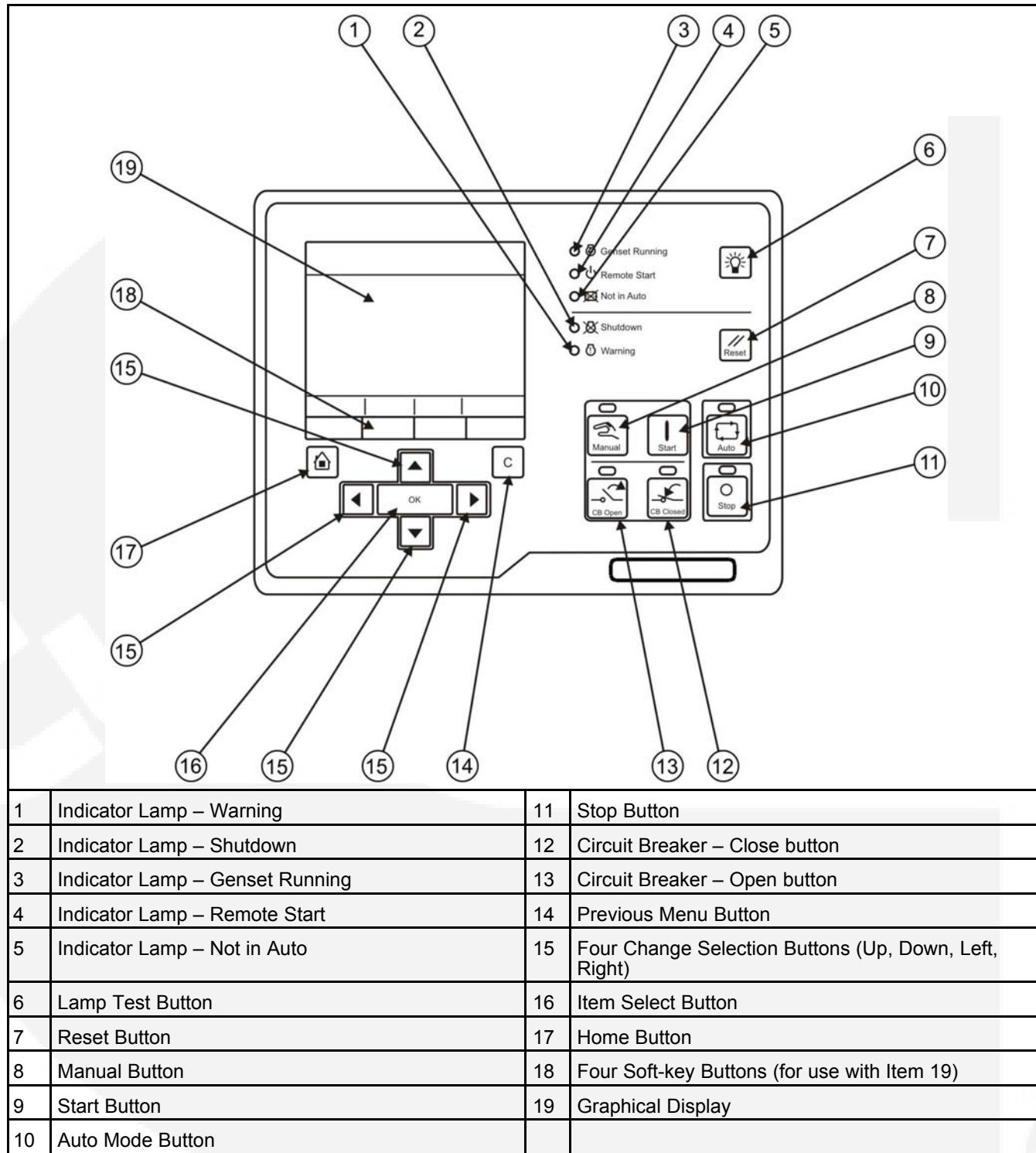
There are two fault level signals generated by the control system as follows:

- Warning: signals an imminent or non-critical fault for the engine. The control provides an indication only for this condition.
- Shutdown: signals a potentially critical fault for the engine. The control immediately takes the engine off-load and automatically shuts it down.

The standard control system operates on 12 or 24 VDC battery power. The auxiliary equipment operates on LV AC power. The history data is stored in non-volatile memory and is not deleted if battery power is lost.

3.2 Operator Panel

[Figure 1 on page 14](#) shows the features of the front panel. It includes eight lamp indicators; the graphical display with nine buttons used to navigate through the menus; and six control mode buttons. This display panel enables the Operator to look at the status, adjust the settings, and start and stop the generator set .

**FIGURE 1. OPERATOR PANEL**

3.2.1 Lamp Indicators

[Figure 1 on page 14](#) shows the front panel of the Operator Panel with the five lamp indicators.

3.2.1.1 Warning

This amber lamp is lit whenever the control detects a Warning condition. This lamp is automatically shut off when the Warning condition no longer exists.

3.2.1.2 Shutdown Status

This red lamp is lit when the control detects a Shutdown condition. The generator set cannot be started when this lamp is on. After the condition has been corrected, the lamp can be reset by first pressing the Stop button and then the Reset button.

3.2.1.3 Not in Auto

This red lamp is lit when the control is NOT in Auto.

3.2.1.4 Remote Start

This green lamp indicates the control is receiving a Remote Run signal. The Remote Run signal has no effect unless the generator set is in Auto.

3.2.1.5 Generator Set Running

The green lamp is lit when 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.

3.2.2 Panel Buttons

3.2.2.1 Lamp (LED) Test Button

Press this button to test the lamps (LEDs). All of the lamps should turn on for five seconds.

Press and hold this for three seconds to turn on or off (to toggle) an external panel lamp.

3.2.2.2 Reset Button



Press this to reset any active faults.

If the condition(s) that caused an existing shutdown fault still exists, the generator set generates the fault again.

If the condition(s) that caused an existing warning fault still exists, the generator set generates the fault again, but the operator panel stops displaying it in the graphical display.

3.2.2.3 Stop Button



Press this button to put the generator set into the Off mode. This disables Auto and Manual modes. The green lamp above this button lights when the generator set is in the Off mode.

If the generator set is running, in either Manual or Auto mode, and the Stop button is pressed, the engine shuts down.

Refer to [Section 4.5.1](#) and [Section 4.5](#) for more information on stopping in Auto or Manual mode.

NOTICE

If possible, hot shutdown under load should be avoided to help prolong the reliability of the generator set.

3.2.2.4 Manual Button



Press this button to put the generator set into the Manual mode. The Start button must then be pressed within ten seconds. Failure to do this results in the control mode defaulting, putting the generator set into the Off mode.

The green lamp above this button is lit when the generator set is in Manual mode.

NOTICE

If Mode Change access password feature is enabled, the password must be entered before pressing the Start button. See [Section 3.2.13](#).

3.2.2.5 Start Button



When the Manual button is pressed, this Start button must be pressed within ten seconds to start the generator set. The generator set starts up normally but without the Time Delay to Start.

In other modes, this button has no effect.

NOTICE

If the Start button is not pressed within the ten seconds of pressing the Manual button, the generator set mode changes to the Off mode automatically.

Refer to [Section 4.4.4](#) and [Section 4.4.6](#) for more information on starting in Auto or Manual mode.

3.2.2.6 Auto Button



Press this button to put the generator set into the Auto mode. In this mode, the generator set is controlled by a remote switch or device (e.g. transfer switch).

The green lamp above this button lights when the generator set is in Auto mode.

Refer to [Section 4.4.3](#) and [Section 4.4.5](#) for more information on putting generator set in Auto or Manual mode.

3.2.2.7 CB (Circuit Breaker) Open Button



This button is for use in Manual mode only. When pressed it will enable the generator set circuit breaker to open and disconnect from the load.

3.2.2.8 CB (Circuit Breaker) Closed Button



This button is for use in Manual mode only. When pressed it will enable the generator set circuit breaker to close when the set is up to speed and voltage and therefore ready to accept the load.

NOTICE

This button has no effect unless the bus is dead, or the generator set is synchronized with the other source.

3.2.3 Graphical Display and Buttons

[Figure 2 on page 17](#) shows the graphical display and the relevant menu selection buttons.

The graphical display is used to view menus of the menu-driven operating system. System messages (communication, event, and fault) are also shown on the display.

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

Display Panel	Description
1	Control status
2	Active fault or screen name
3	Interactive Screen or Menu
4	Additional functions and page up or down availability
5	Selection buttons relevant to Section 4
6	Selection change or accept buttons

FIGURE 2. GRAPHICAL DISPLAY WITH TYPICAL SCREENSHOT

3.2.3.1 Control Status

Displays the status of the controller, see Item 1 of [Figure 2](#).

TABLE 1. CONTROL STATUS

Status	Description
Ready	This is the default state. The controller is ready to start the generator set, or it has started one of the start sequences but has not started the engine yet.
Starting	The controller is starting the engine in one of the start sequences, and the engine speed is greater than zero.
Idle Warmup	The controller is raising the engine speed to idle speed, or the engine is running at idle speed in one of the start sequences.
Rated Freq and Voltage	The controller is raising the engine speed to rated speed; the generator set is running at rated speed and voltage; or the controller has started one of the stop sequences but has not started reducing the engine speed yet.
Idle Cooldown	The controller is reducing the engine speed to idle speed, or the engine is running at idle speed in one of the stop sequences.
Stopping	The controller is stopping the engine, and the engine speed is still greater than zero.
Emergency Stop	There is an active shutdown fault.
Setup Mode	The controller is in Setup mode.
Wait to Powerdown	The controller is ready to enter Powerdown mode, but another device is sending a System Wakeup signal.
Off	The controller is in the process of entering power-down mode. The controller is performing some last-second checks.
Demo Mode	The controller is running a demonstration. Every screen is available in the demonstration, and any changes you make in the demonstration will have no effect on the controller. To end the demonstration, the Operator Panel must be turned off.

3.2.3.2 Active Fault or Screen Name

Displays the screen name and information about the last active shutdown fault, see Item 2 of [Figure 2](#). If there are no active shutdown faults, it displays the last active warning fault.

If there is an active fault, the operator panel displays the following information about it:

- Fault type
- Event/fault code
- Name of the controller that detected the fault e.g. the engine ECM unit. This is blank if the controller 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 the Reset button is pressed.

TABLE 2. ACTIVE FAULT OR SCREEN NAME

Fault Type	Description
Warning	This is a warning fault. (See Chapter 5 on page 83)
Derate	This is a derate fault. (See Chapter 5 on page 83)

Shutdown	This is a shutdown fault that initiates a Shutdown Without Cooldown sequence. (See Chapter 5 on page 83)
Shutdown with Cooldown	This is a shutdown fault that initiates a Shutdown With Cooldown sequence

3.2.3.3 Interactive Screen or Menu

Displays information relevant to the screen name, see Item 3 of [Figure 2](#). You can view the operating values for the generator set, navigate through screen and adjust parameters (if permitted).

The default screen is the Genset Data screen.

The following table explains how the operator panel displays when the value of a specific parameter is missing, unexpected, or outside the range allowed for the parameter.

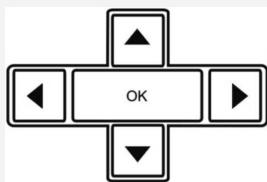
Operator Panel	Description
NWF	Network Failure - There is a PCCNet network failure or a CAN (ECM) failure
OORL	Out Of Range Low - The value is less than the lowest allowed value for this parameter
OORH	Out Of Range High - This value is greater than the highest allowed value for this parameter
---	This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

3.2.3.4 Additional Functions Indicators

Indicates if additional information or further sub-menus are available by up or down arrows (\blacktriangle and \blacktriangledown), see Item 4 and 5 of [Figure 2](#). If that particular page or menu has no additional information, then no arrow will be visible at this time.

For example if the graphical display is not big enough to display the screen at one time an up and/or down arrow (\blacktriangle and \blacktriangledown) will be visible. Press the appropriate selection button beneath the graphical display to look at the previous or next page of information in that screen.

3.2.4 Menu Navigation Buttons



Four momentary buttons are used to navigate and change the selection in the graphical display.

Press the OK button to select the item that is currently highlighted in the graphical display:

- If the selected item is a menu item, this opens the 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 graphical display runs the action or prompts you for a password.

3.2.4.1 Home Button



Press this to return to the main menu at any time.

NOTICE

If you have not pressed the OK button before pressing the button, any changes made will not be saved.

3.2.4.2 Previous Menu Button



Press this button to return to the previous menu.

NOTICE

If you have not pressed the OK button before pressing the **C** button, any changes made will not be saved.

3.2.5 Initial Operator Menu

[Figure 3 on page 22](#) shows the initial menu which is displayed over two pages. Use the soft-key buttons below the up and down arrows (\blacktriangle and \blacktriangledown) to toggle between the two pages.

Use the soft-key buttons below Genset, Alternator, or Engine to short-cut to those menus.

Pressing the Home button from any screen will return the display to the main menu screens.

3.2.5.1 Initial Menu Data

This menu displays the information available through the menus.

TABLE 3. INITIAL MENU DATA

Name	Description
History/About	Use this screen to view historical information about your generator set.
Faults:	If there are no active Faults, these screens will not be available.
Active Shutdowns	Use this screen to view active Shutdown faults.
Active Warning	Use this screen to view active Warning faults.
History	Use this screen to view faults that have been cleared.
Paralleling Status	Use this screen to view the bus, circuit breakers, and paralleling states.
Genset Data	Use this screen to view the status of the generator set.
Alternator Data	Use this screen to view the status of the alternator.
Engine Data	Use this screen to view the status of the engine.
Advanced Status:	

Name	Description
Genset	Use this screen to view power, energy, phase difference, and other detailed generator set information.
Controller	Use this screen to view sequences of operation, configurable inputs and outputs, and other detailed controller information.
Engine	Use this screen to view pressures, voltages, temperatures, and other detailed engine information.
Help	Use this screen to obtain more information regarding the operator panel.
Setup Menus:	
Adjust	The use of these screens is restricted to authorized personnel only.
Genset Setup	
Paralleling Setup	
OEM Setup	
PCCnet Setup	
Modbus Setup	
Display Options	
Clock Setup	
Configurable IO	
Calibration	
Save/Reserve	

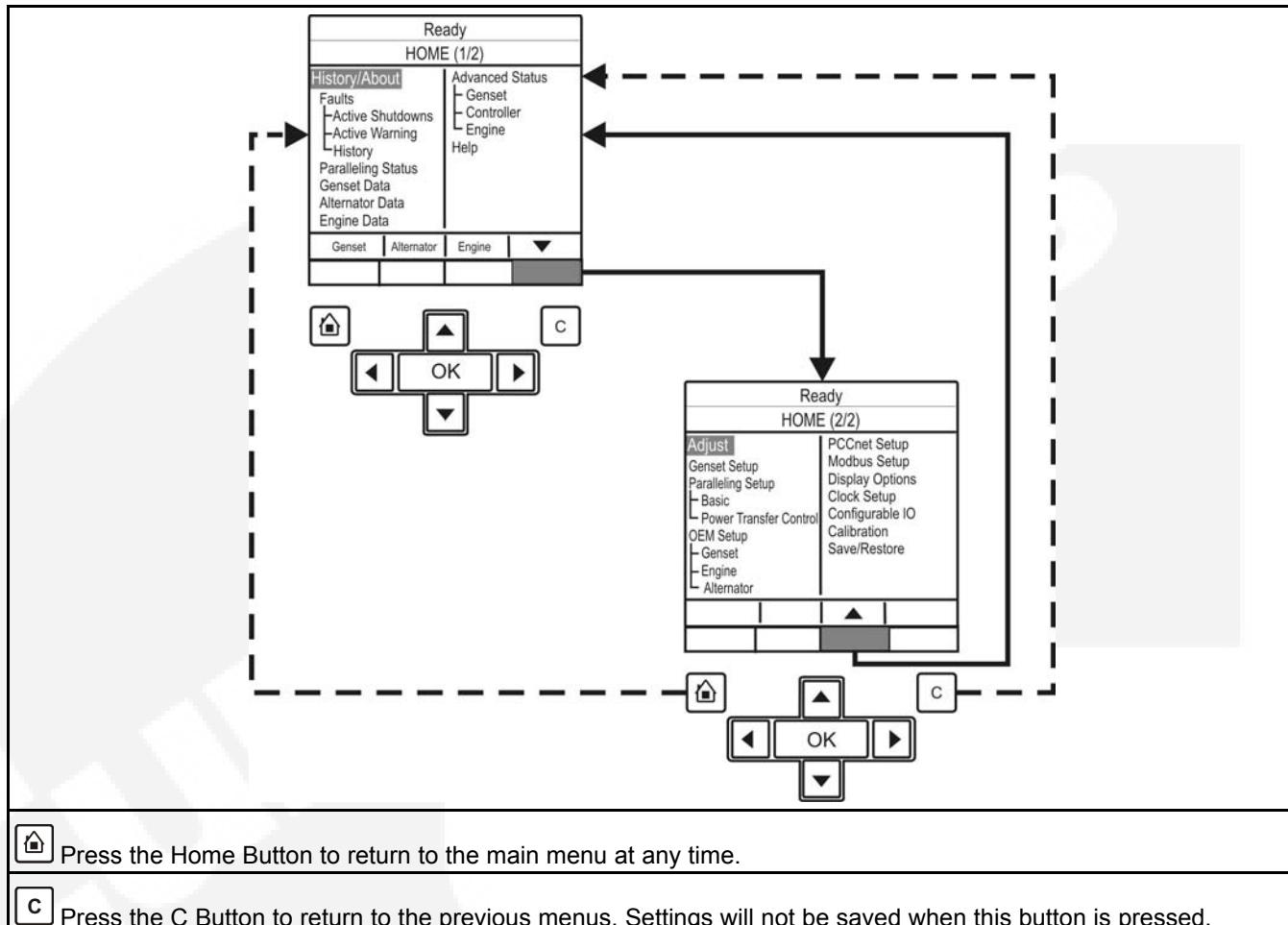
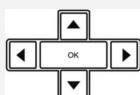


FIGURE 3. INITIAL OPERATOR MENU

3.2.6 Generator Set Data Operator Menu

[Figure 4](#) shows a block representation of a typical Genset Data menu. To navigate from the Home menu (HOME [1/2]), press the soft-key button below the function button indicating Genset. This will take you directly to the Genset menu.



The Genset Data menu is displayed on two pages. Use the two soft-key buttons below the up and down arrows (\blacktriangle and \blacktriangledown) to toggle between the pages.

3.2.6.1 Generator Set Data

Use this menu to look at the status of the generator set.

TABLE 4. GENERATOR SET DATA

PARAMETER	DESCRIPTION
Alternator	
Genset LL Average Voltage	Genset Line to Line average voltage
Genset Average Current	Genset average current
Genset Total kW	Genset total kW
Genset Total Power Factor	Genset L1 power factor
Genset Frequency	Genset 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 genset KW rating.
Genset Application kVA rating	The genset KVA rating.
Genset Application Nominal Current	The value of the genset application nominal current.
Genset Standby	
Genset Standby kW rating	KW rating for the genset in Standby configuration.
Genset Standby kVA rating	KVA rating for the genset in Standby configuration.
Genset Standby Nominal Current	The value of the genset standby nominal current.

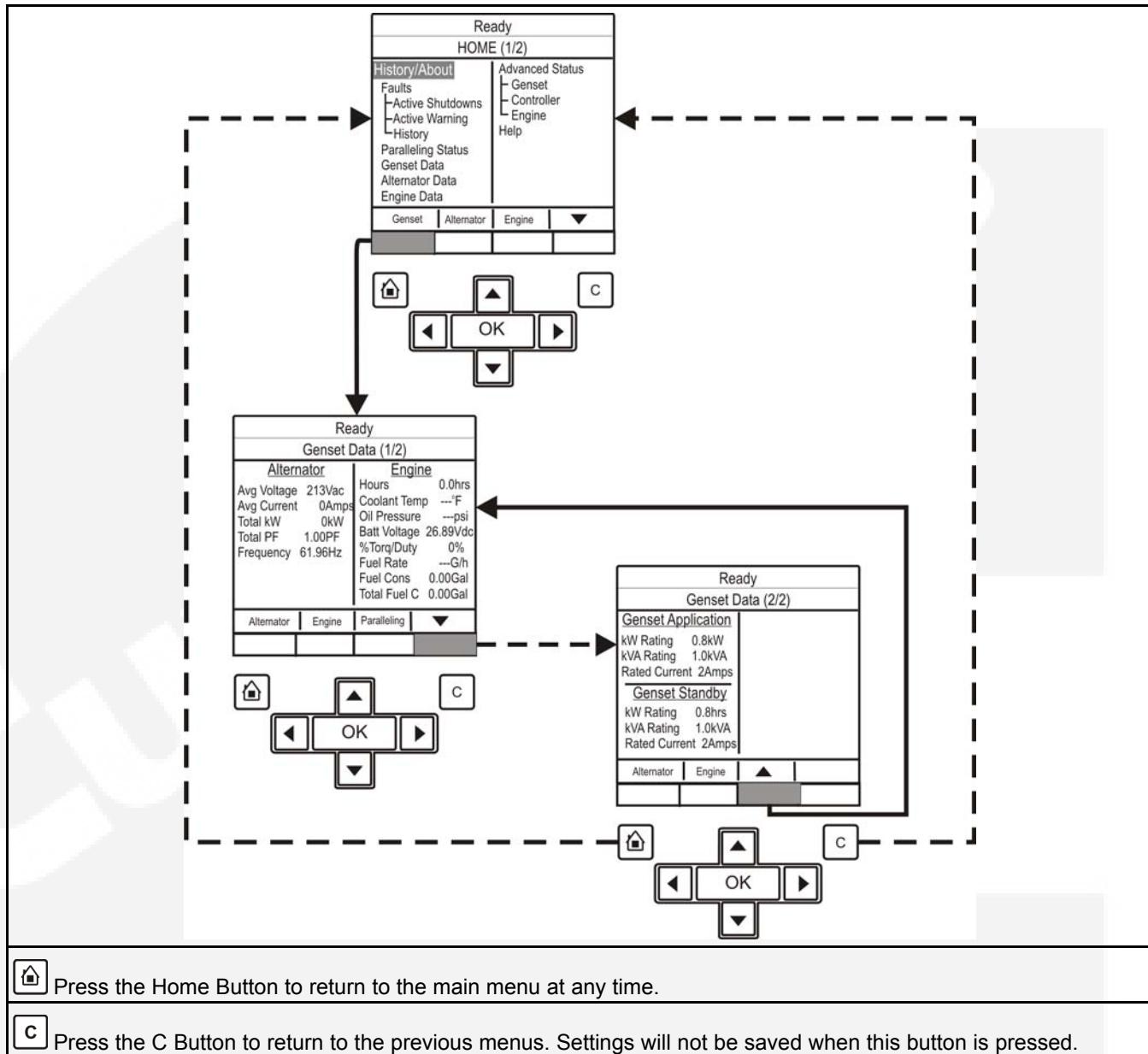


FIGURE 4. GENSET DATA MENU - TYPICAL DATA

3.2.7 Engine Data Operator Menu

[Figure 5 on page 26](#) shows a block representation of a typical Engine Data menu. To navigate from the Home menu (HOME [1/2]), press the soft-key button below the function button indicating Engine. This will take you directly to the Engine menu.

The Engine Data menu is displayed on one page.

3.2.7.1 Engine Data

Use this menu to look at the status of the engine.

TABLE 5. ENGINE DATA (LBNG GENSET ENABLE IS SET TO DISABLE)

Name	Description
Oil Pressure	Monitor point for the Oil Pressure Allowed values: 0~145 psi.
Boost Pressure	Monitor point for the Boost Absolute Pressure Allowed values: 0~148 psi.
Coolant Pressure	Monitor point for the Coolant Pressure Allowed values: 0~145 psi.
Fuel Supply Pressure	Monitor point for the Fuel Supply Pressure Allowed values: 0~145 psi.
Fuel Outlet Pressure	Monitor point for the Fuel Outlet Pressure Allowed values: 0~36404 psi.
Crankcase Pressure	Monitor point for the Crankcase Pressure Allowed values: -35.67~38 psi.
Barometric Absolute Pressure	Monitor point for the Barometric Absolute Pressure Allowed values: 0~37 psi.
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.

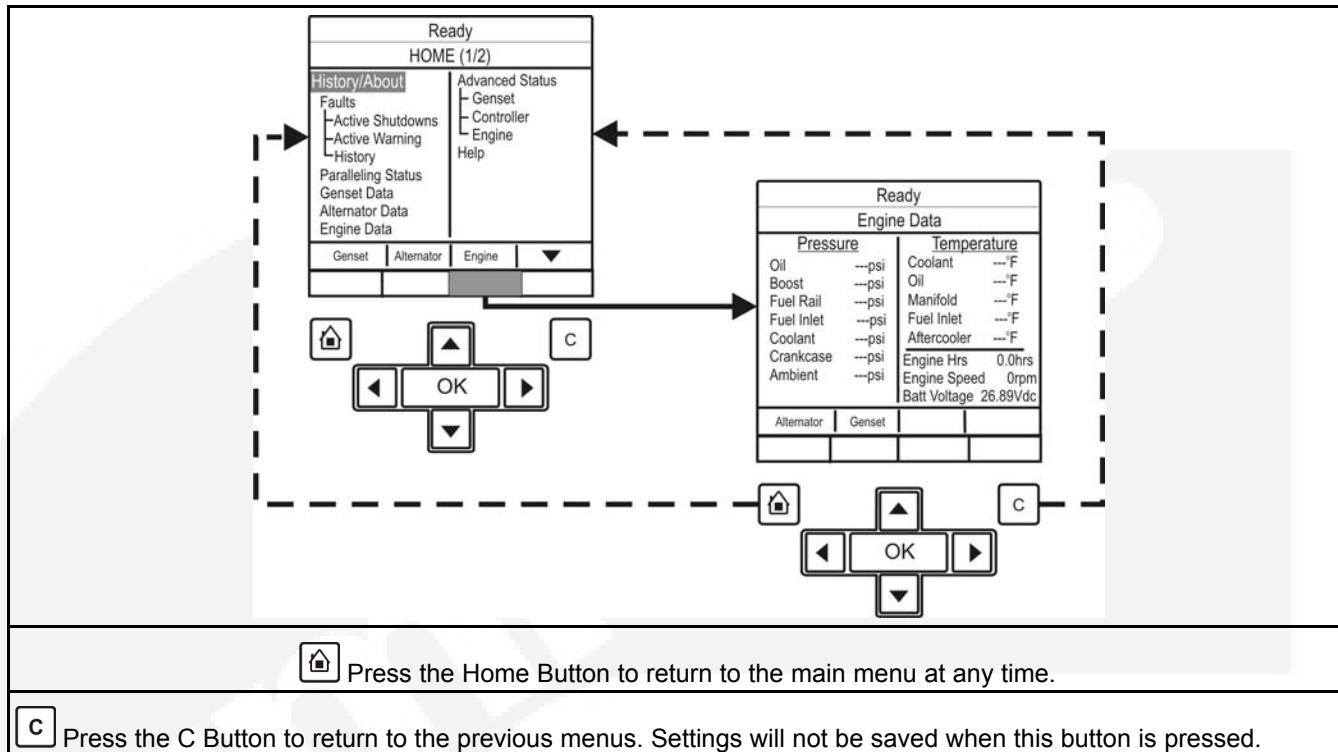


FIGURE 5. ENGINE DATA MENU - TYPICAL DATA

3.2.8 History/About Menu

[Figure 6 on page 28](#) shows a block representation of a typical History/About menu.

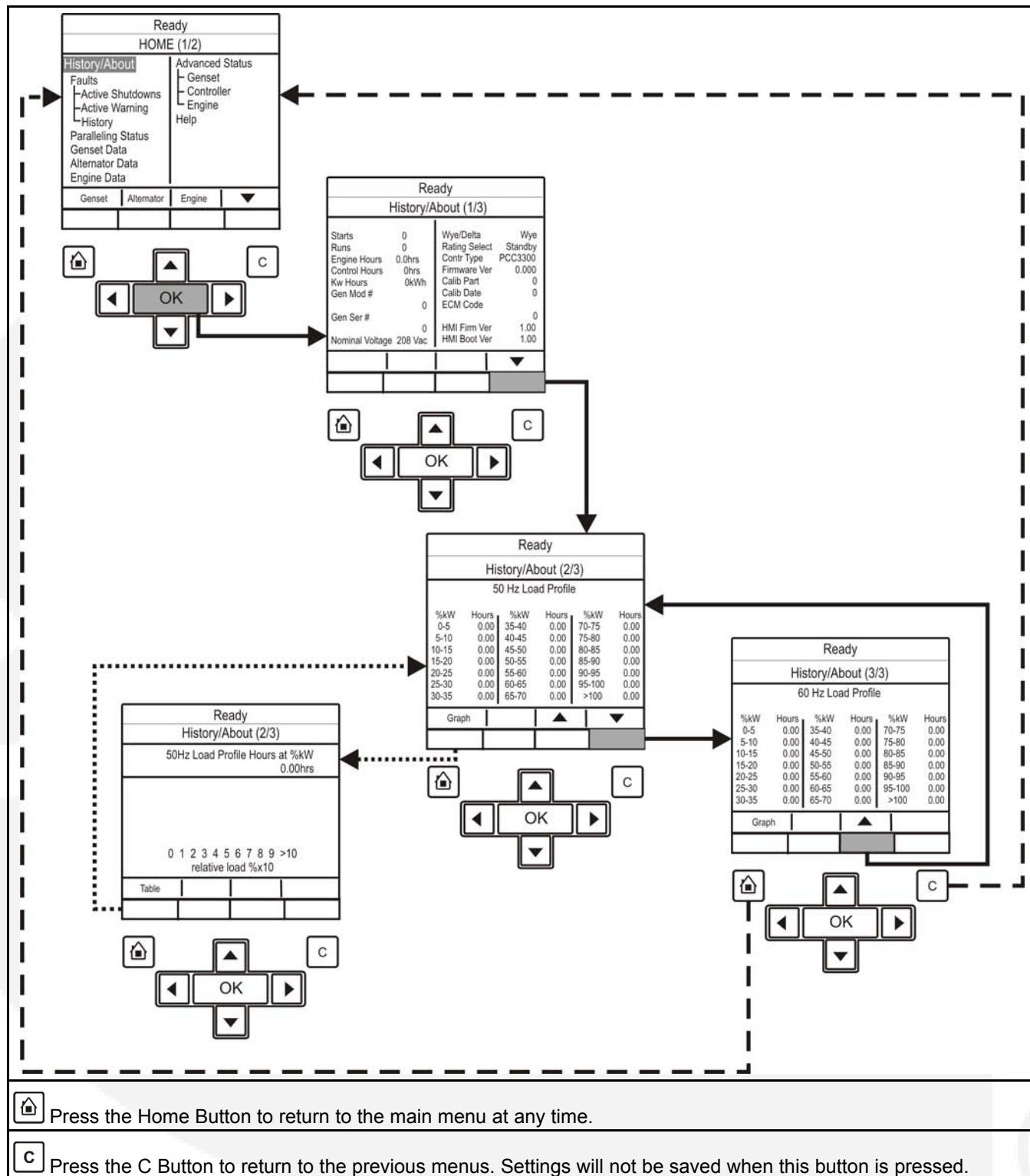
To navigate from the Home menu, toggle down until the History/About line of text is highlighted and press the OK button. This information is displayed over three pages. Use the two soft-key buttons below the up and down arrows (\blacktriangle and \blacktriangledown) to toggle between the pages.

This screen displays the historical information about the generator set.

TABLE 6. HISTORY/ABOUT

Name	Description
Start Attempts (Starts)	Total number of start attempts Allowed values: 0~65535
Total Number of Runs (Runs)	Total number of generator set runs Allowed values: 0~65535
Engine Running Time (Engine Hours)	Total engine run time in hours
Controller On Time (Control Hours)	Controller ON time in hours, Upper limit is 136 years Allowed values: 0~4294967291 hours
Generator Set Total Net (Kw Hours)	Generator set total net kWh accumulation Allowed values: -2147483648~2147483643 kWh
Generator Set Model Number (Gen Mod #)	Number identifying the model of this generator set (Password level: 2)

Name	Description
Generator Set Serial Number (Gen Ser #)	Serial number identifying this generator set
Generator Set Nominal Voltage (Nominal Voltage)	Generator set nominal line-line voltage (Password level: 1) Allowed values: 1~45000 Vac (Default: 1 Vac)
Generator Set Delta/Wye Connection (Wye/Delta)	Delta or Wye for generator set connection (Password level: 1) Allowed values: Delta, Wye (Default: Wye)
Application Rating Select (Rating Select)	Selects generator set's standby/prime/base application rating (Password level: 1) Allowed values: Standby, Prime, Base (Default: Standby)
Controller Device Type (Contr Type)	Used by the PC Tool Allowed values: PCC3300, PCC3300 with Masterless Load Demand (MLD)
Calibration Part Number (Calib Part)	The unique calibration part number loaded into this control (Password level: 3)
Calibration Revision Date (Calib Date)	The revision date of the calibration part number loaded into this control (Password level: 3)
Firmware Version Number (Contr H/ ver)	Version of S/W loaded into this control, obtained from PCC Filename

**FIGURE 6. HISTORY/ABOUT MENU - TYPICAL DATA**

3.2.9 Alternator Data Operator Menu

[Figure 7 on page 31](#) shows a block representation of a typical Alternator Data menu. To navigate from the Home menu (HOME [1/2]), press the soft-key button below the function button indicating Alternator. This will take you directly to the Alternator menu.

The Alternator Data menu is displayed on one page.

3.2.9.1 Alternator Data

Use this menu to look at the status of the alternator. This menu displays line-to-line voltage, line-to-neutral voltage, current, and generator set power (in kVA). Some values are not available, dependent on the number of phases (one or three) and whether or not the application has current transformers.

TABLE 7. ALTERNATOR DATA

Parameter	Description
Genset L1L2 Voltage	Genset L1L2 voltage
Genset L1N Voltage	Genset L1N voltage
Genset L1 Current	Monitors the genset L1 current value
Genset L1 kW	Genset L1 kW
Genset L1 KVA	Genset L1 kVA
Genset L1 Power Factor	Genset L2 power factor Allowed values: -1.28~1.27 PF
Genset L2L3 Voltage	Genset L2L3 voltage
Genset L2N Voltage	Genset L2N voltage
Genset L2 Current	Genset L2 current
Genset L2 kW	Genset L2 kW Allowed values: -32768~32762 kW
Genset L2 KVA	Genset L2 kVA
Genset L2 Power Factor	Genset L2 power factor Allowed values: -1.28~1.27 PF
Genset L3L1 Voltage	Genset L3L1 voltage
Genset L3N Voltage	Genset L3N voltage
Genset L3 Current	Genset L3 current
Genset L3 kW	Genset L3 kW Allowed values: -32768~32762 kW
Genset L3 KVA	Genset L3 kVA Allowed values: 0~4294967.29 kVA
Genset L3 Power Factor	Genset L3 power factor Allowed values: -1.28~1.22 PF
Genset Total kW	Genset total kW
Genset Total KVA	Genset total kVA
Genset Total Power Factor	Genset L1 power factor
Genset Frequency	Genset frequency

Parameter	Description
AVR PWM Command	The AVR PWM software command. Linear relationship between counts and % duty cycle with 10000 counts=100% duty cycle
Genset Neutral Current	Genset neutral current NOTICE This is not displayed if the neutral current is not available.
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 °F
Drive End Bearing Temperature (Aux101)	Monitor point for the Drive End Bearing Temp input from the I/O Module. Allowed values: -32767~32762 °F
Alternator Temperature 1 (Aux101)	Monitor point for the Alternator Temp 1 input from the Aux 101 I/O Module. Allowed values: -32767~32762 °F
Alternator Temperature 2 (Aux101)	Monitor point for the Alternator Temp 2 input from the Aux 101 I/O Module. Allowed values: -32767~32762 °F
Alternator Temperature 3 (Aux101)	Monitor point for the Alternator Temp 3 input from the Aux 101 I/O Module. Allowed values: -32767~32762 °F

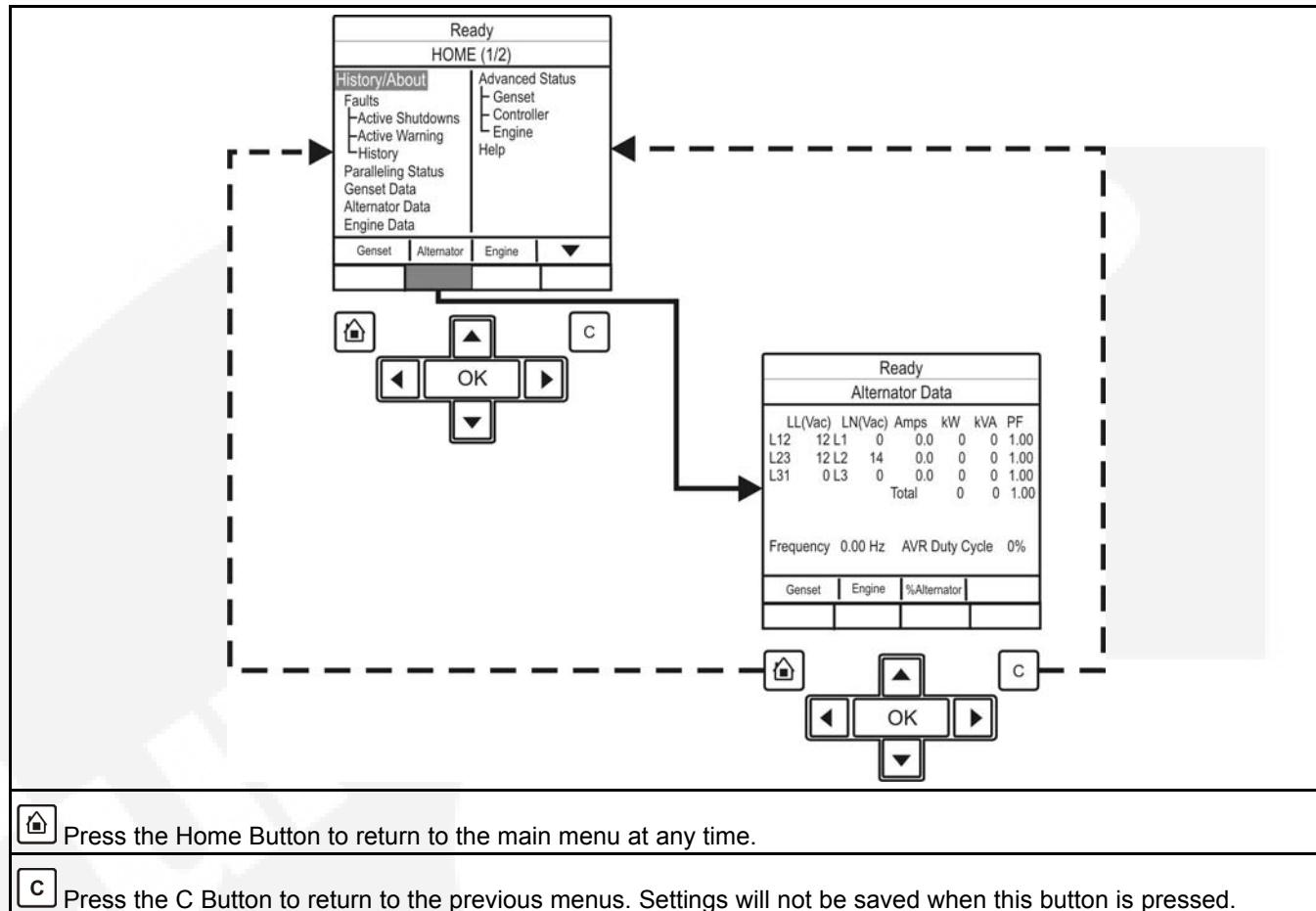


FIGURE 7. ALTERNATOR DATA MENU - TYPICAL DATA

3.2.10 Faults and Warnings Menus

The Faults and Warning menu is divided into three main sub-sections; Shutdown Faults (Active Shutdowns); Warning Faults (Active Warnings); and Faults History (showing up to thirty-two faults that have been cleared).

3.2.10.1 Shutdown Fault Menu

[Figure 8 on page 32](#) shows a block representation of a typical Shutdown Fault menu.

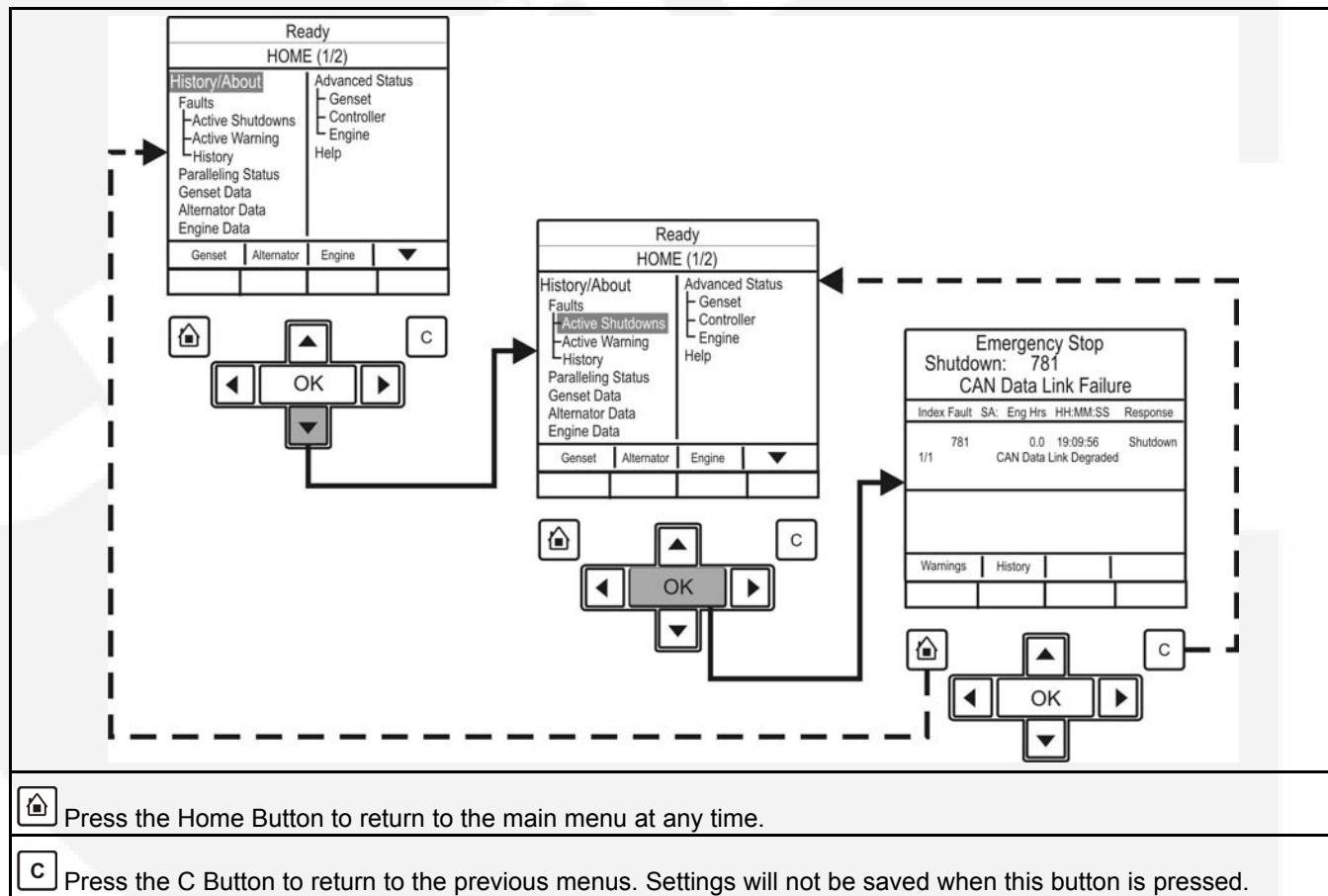
To navigate from the Home menu, toggle down until the Faults-Active Shutdowns line of text is highlighted, and press the OK button.

This will display information regarding the Shutdown fault(s). Use the two soft-key buttons below the up and down arrows (▲ and ▼) to toggle between the pages.

This screen displays up to five faults. The same event/fault code may appear multiple times if detected by different sources.

TABLE 8. 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

**FIGURE 8. SHUTDOWN FAULTS MENU - TYPICAL DATA**

3.2.10.2 Fault Messages

FIGURE 9. FAULT MESSAGE DISPLAY SCREEN

A Fault message is an indicator of a Warning or Shutdown condition. It includes the fault number, and a short description. It also includes where the fault occurred if the generator set control did not detect the fault and is simply reporting the fault. [Chapter 5 on page 83](#) provides a list of the fault codes, types, and message displayed.

Active and acknowledged faults may be viewed in the Faults menu.

3.2.10.3 Fault Acknowledgement

Shutdown faults must be acknowledged after the fault has been corrected. If in Auto or Manual mode, the control must be set to Stop mode (Off). Faults are cleared from the control panel display by pressing the Reset button.

Faults are re-announced if they are detected again after being acknowledged. Refer to [Section 3.2.2.2 on page 15](#).



3.2.10.4 Warning Fault Menu

Figure 10 shows a block representation of a typical Warning Fault menu.

To navigate from the Home menu, toggle down until the Faults - Warning Fault line of text is highlighted and press the OK button. This will then display information regarding the current fault. Use the two soft-key buttons below the up and down arrows (\blacktriangle and \blacktriangledown) to toggle between the pages.

This menu displays up to thirty-two faults. The same event/fault code may appear multiple times if detected by different sources.

TABLE 9. 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

Name	Description
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

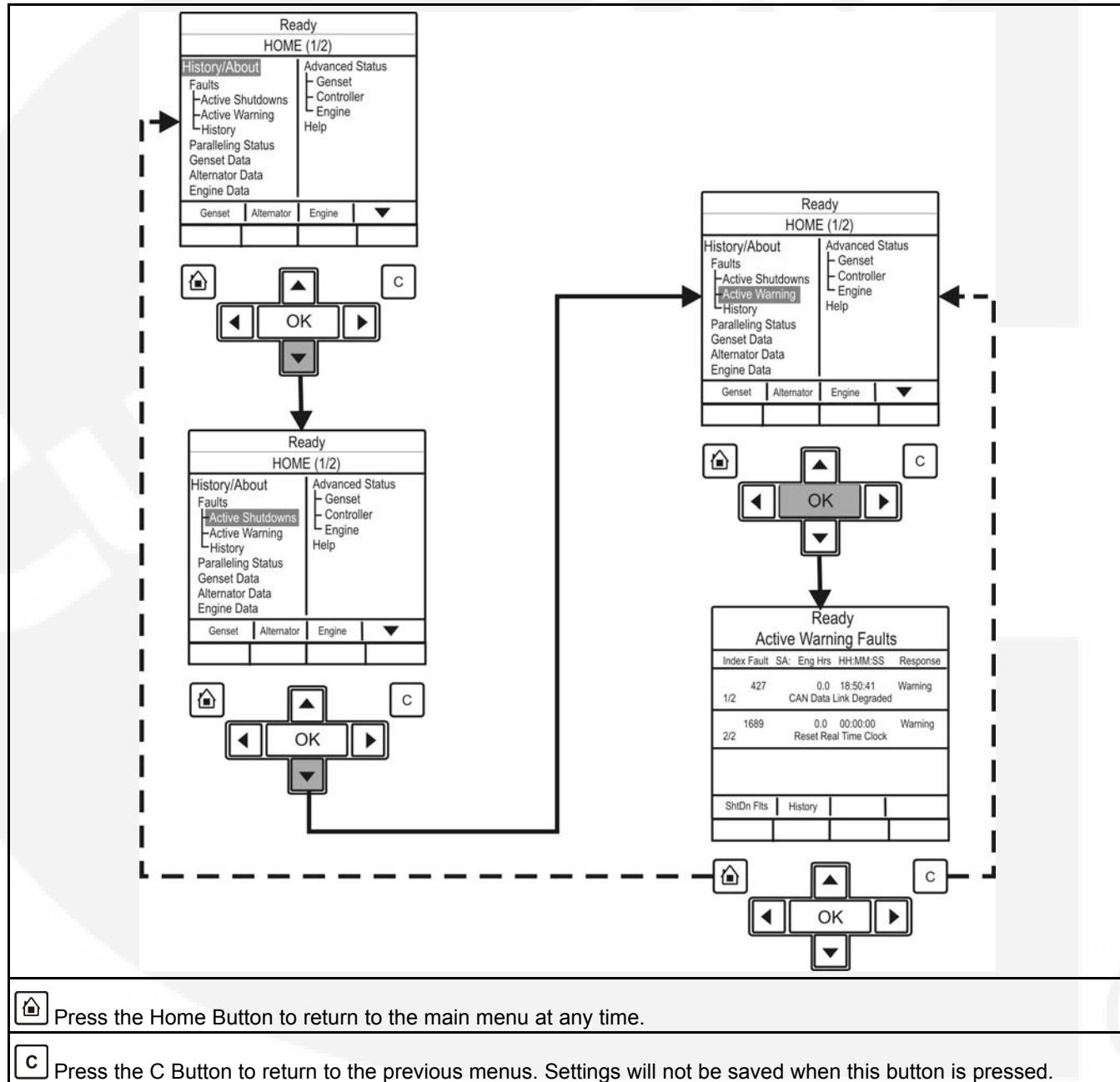


FIGURE 10. WARNING FAULT MENU - TYPICAL DATA

3.2.10.5 Faults History Data Operator Menu

[Figure 11 on page 36](#) shows a block representation of a typical Fault History menu.

To navigate from the Home menu, toggle down until the Faults -History line of text is highlighted and press the OK button. This will then display information regarding the fault(s) history. Use the two soft-key buttons below the up and down arrows (\blacktriangle and \blacktriangledown) to toggle between the pages.

This menu displays up to thirty-two faults. The same event/fault code may appear multiple times if detected by different sources.

Name	Description
Index	This is the index number of the fault.
Fault	This is the Fault code.
SA	This is the controller that identified the fault. It is blank if the PowerCommand® 3.3 control identified the fault.
Engine Hrs	This is how many hours the engine had run (not necessarily continuously) when the fault was generated.
MM/DD/YY	This is the date the fault was generated.
HH/MM/SS	This is the time the fault was generated.
	The name of the fault appears below the rest of the information.

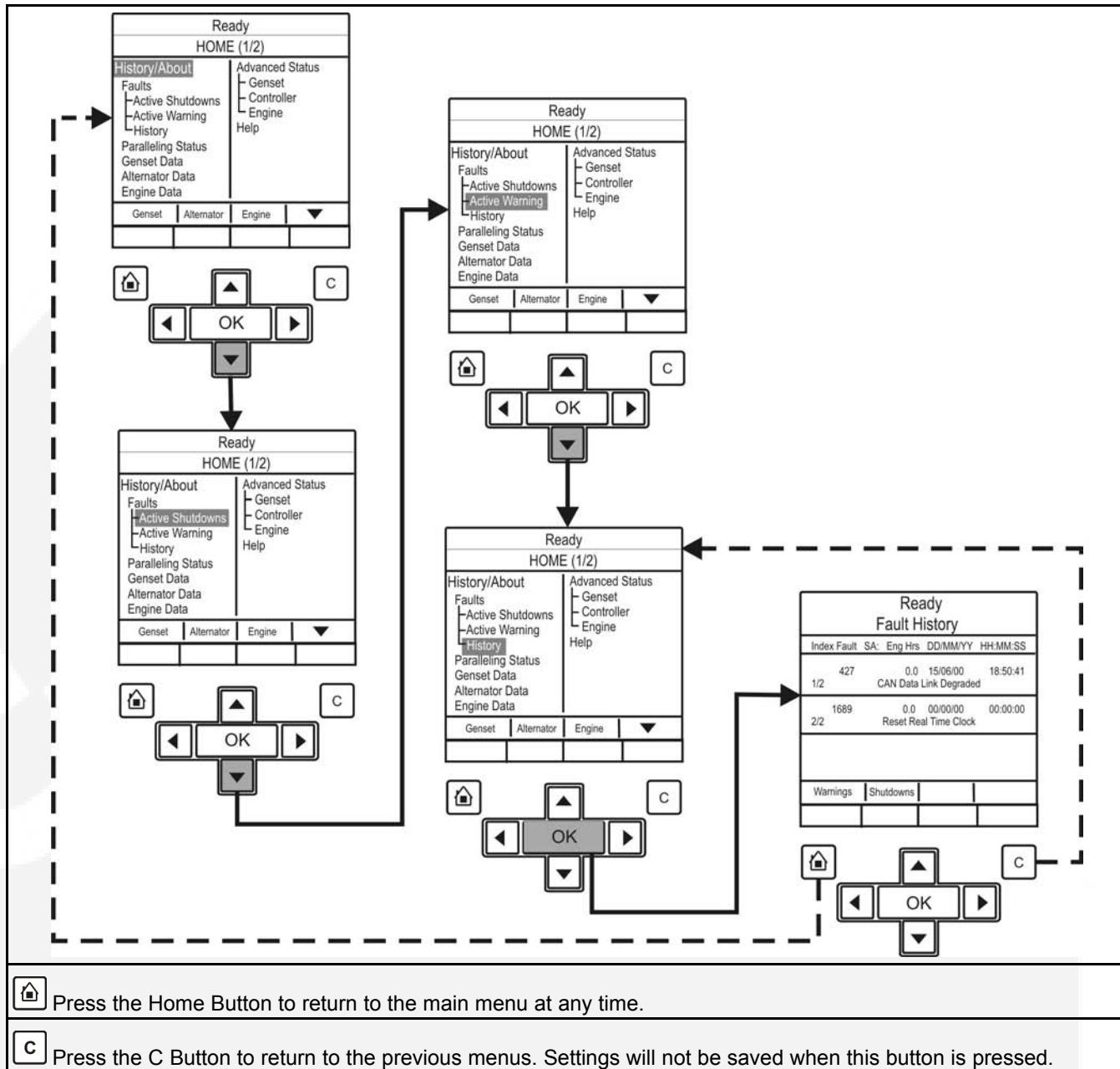


FIGURE 11. HISTORY FAULT MENU - TYPICAL DATA

3.2.11 Paralleling Status Menu

[Figure 12 on page 42](#), [Figure 13 on page 43](#), and [Figure 14](#) show block representations of a typical Paralleling Status menu. This screen varies according to the application type. See [Section 4.9.3 on page 61](#).

In the HOME (1/2) menu, using the up and down arrows, toggle down until the Paralleling Status text is highlighted.

With the Paralleling Status line of text highlighted, press the OK button. This will then display the Paralleling Status Menu (if the generator set application type is not Standalone).

Use the two soft-key buttons below the up and down arrows [\blacktriangle and \blacktriangledown] to page through the six pages of the Paralleling Status menu.

TABLE 10. PARALLELING STATUS

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
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

Parameter	Description
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
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

Parameter	Description
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)
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)

Parameter	Description
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 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)
Load Demand State	Indicates the status of load demand operation 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

Parameter	Description
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
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 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) 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

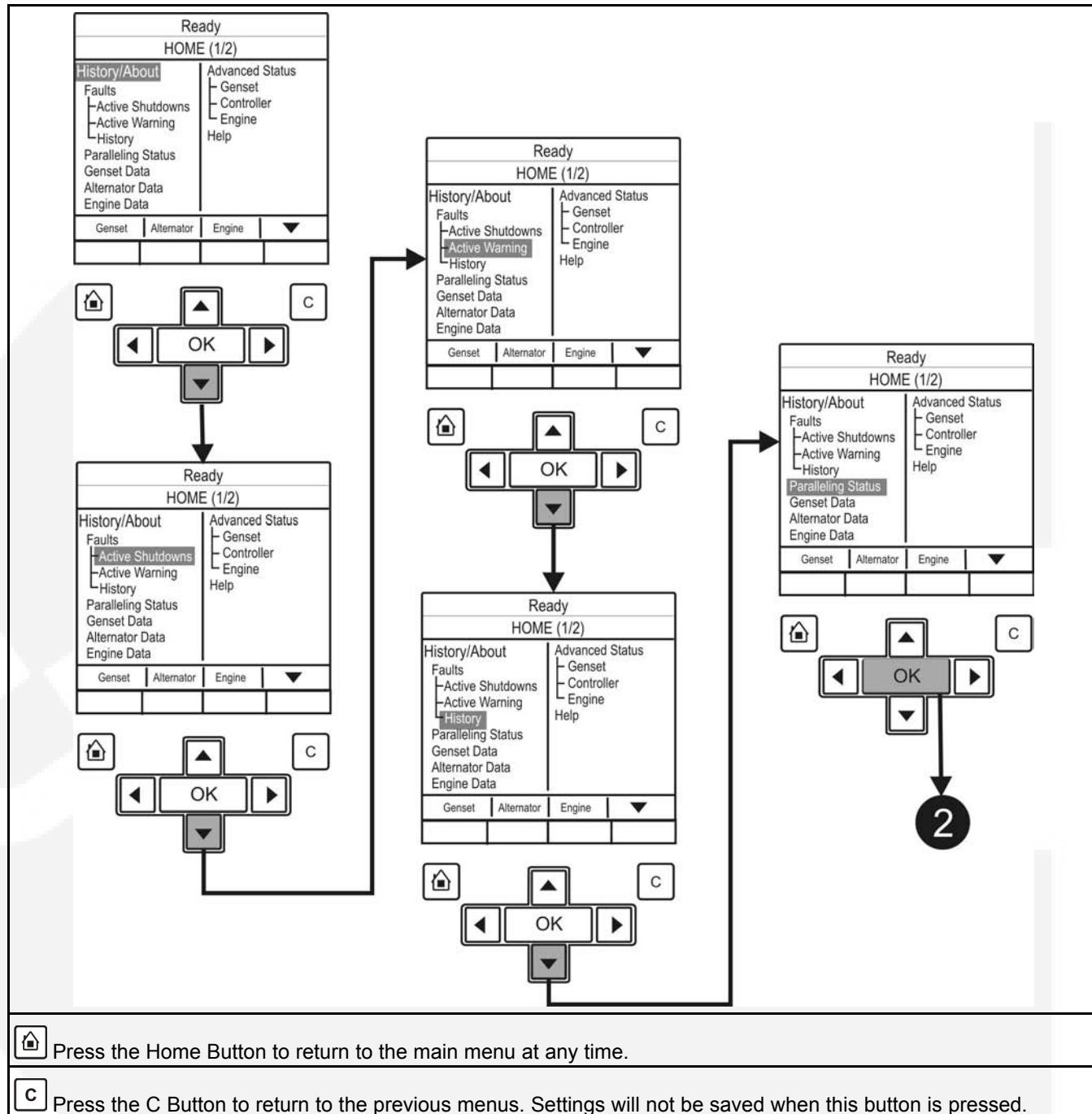


FIGURE 12. PARALLELING STATUS DATA MENU - TYPICAL DATA

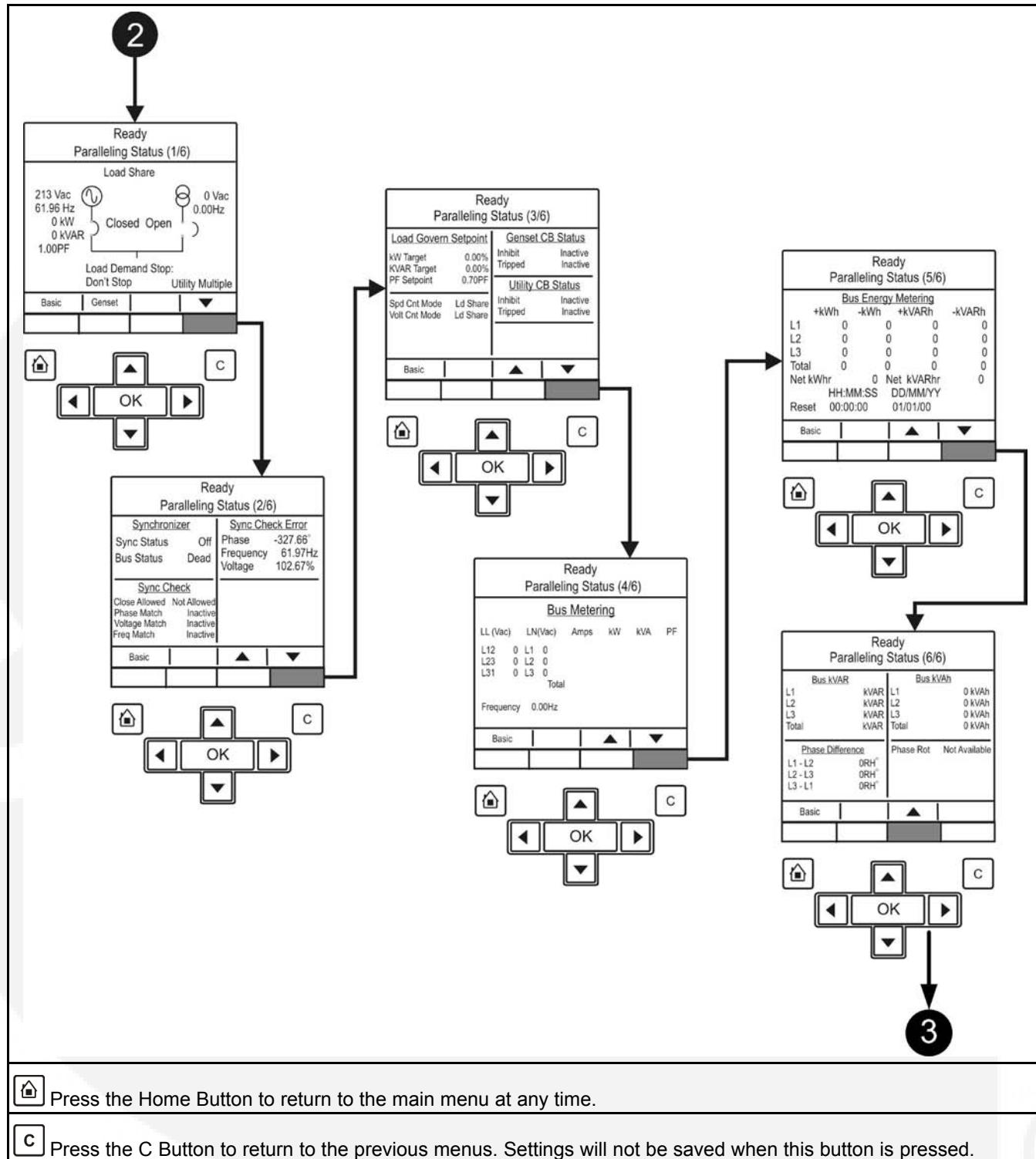
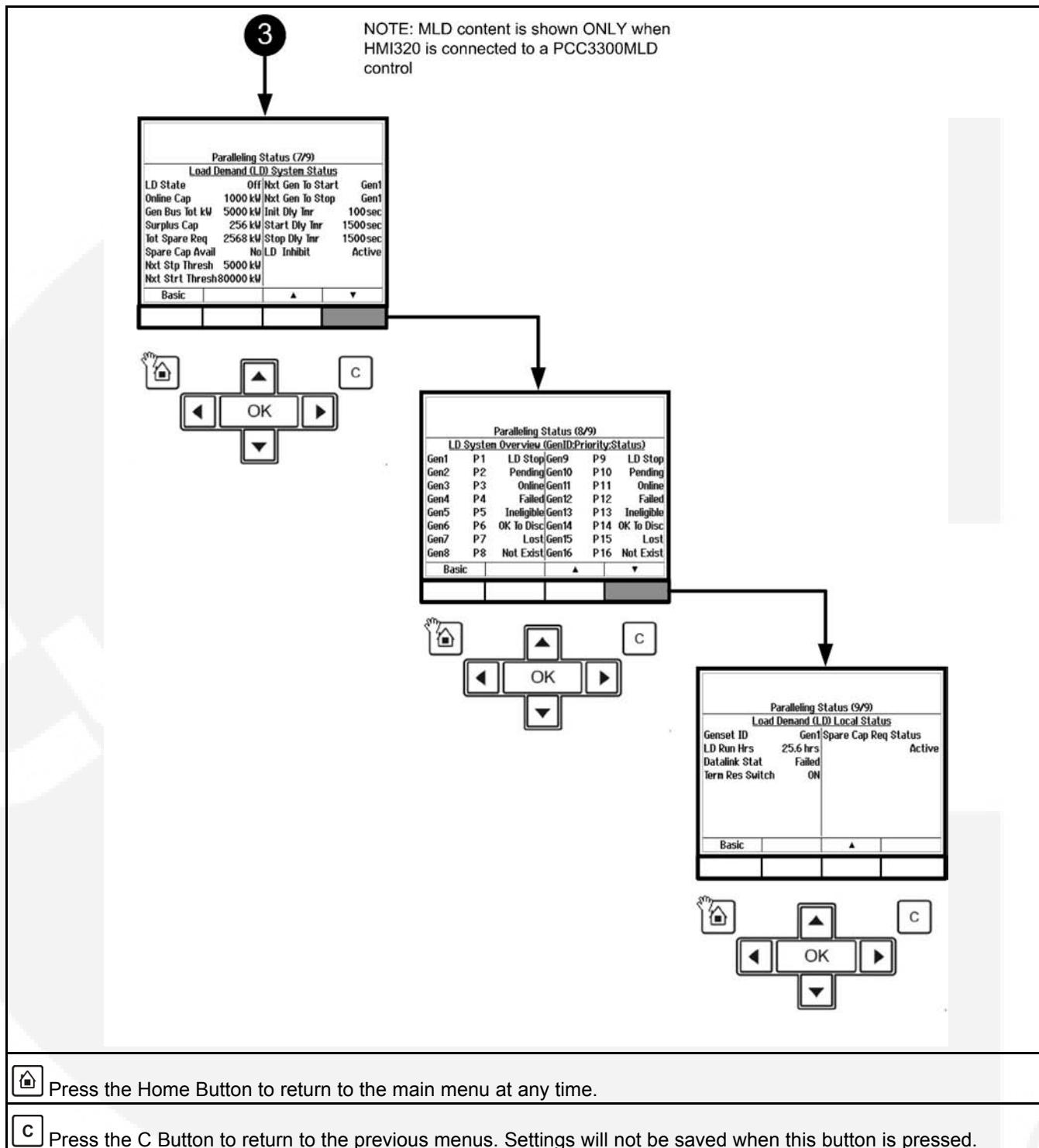


FIGURE 13. PARALLELING STATUS DATA MENU - TYPICAL DATA



Press the Home Button to return to the main menu at any time.

Press the C Button to return to the previous menus. Settings will not be saved when this button is pressed.

FIGURE 14. PARALLELING STATUS DATA MENU - TYPICAL DATA

3.2.12 Advanced Status and Generator Set Setup Menus

The Advanced Status and Generator Set Setup Menus include advanced information and setup access for the generator set. This information is intended for qualified service and site personnel only. The adjustment of these sub menus may require a USER password. If a password is required the USER password menu will appear when you try to access this data or modify the menu. Refer to [Section 3.2.13.2](#).

NOTICE

Should any of the settings located in the setup menus require amendment of change, please contact an authorized service center.

3.2.13 Passwords and Mode Change Access

3.2.13.1 Entering the Mode Change Access Password

The Mode Change submenus are intended for qualified service personnel and site personnel only, and by default will require an Access password. If a password is required, the Mode Change – Access Password menu will appear when you try to switch between Auto, Manual Run, or Stop modes.

To enter the mode access password:

1. With the first character highlighted, press the up and down arrow buttons until the required value is displayed.
2. Press the left arrow button to move to the next numeric character.
3. Repeat steps 1 and 2 until all characters of the Access Password are correct.
4. After you have completed entering the password, press the OK button.

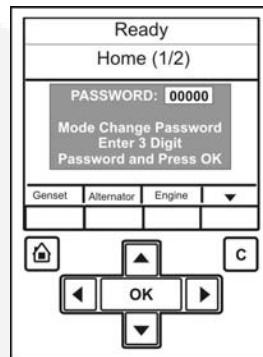


FIGURE 15. MODE CHANGE ACCESS PASSWORD DISPLAY SCREEN

NOTICE

If an incorrect password is entered, the Operator menu that was displayed before Auto, Manual Run, or Stop mode was selected is re-displayed.

3.2.13.2 Passwords

It is possible for the operator to view every parameter in the graphical display; however, a password may be required before adjustment of a parameter is permitted. The generator set will prompt you if a password is required and inform you of the level of password required.

Level	Description	Comment
0	No password	None required
1	Operator password	Restricted
2	Service password	Restricted
3	Engineering password	Restricted

4 Operation - PowerCommand® 3.3 MLD

4.1 Safety

WARNING

Carbon monoxide.

Exhaust gases contain carbon monoxide, an odorless and colorless gas. Carbon monoxide is poisonous and can cause unconsciousness and death. Symptoms of carbon monoxide poisoning include: Dizziness, Nausea, Headache, Weakness and Sleepiness, Throbbing in Temples, Muscular Twitching, Vomiting, Inability to Think Coherently.

If any symptoms are experienced, get out into fresh air immediately. If symptoms persist, seek medical attention. Shut down the unit and do not operate until it has been inspected and repaired. Protection against carbon monoxide inhalation includes proper installation and regular, frequent visual and audible inspections of the complete exhaust system.

WARNING

Hazardous voltage.

Contacting energized electrical components can cause severe personal injury or death by electrocution.

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.

CAUTION

Hazardous (stored) voltage.

Voltages are present which can cause electrical shock, resulting in personal injury.

Only technically qualified personnel should open the control housing. Even with the power removed, improper handling of components can cause electrostatic discharge and damage circuit board components.

Only trained and experienced personnel should carry out generator set operations. Before operating the system, the operator should become familiar with all health and safety procedures, warnings, cautions, precautions, and the other documentation supplied with the generator set. (See [Chapter 1 on page 1](#)). Observe all of the WARNINGS and CAUTIONS at all times .

NOTICE

Before operating the generator set become familiar with the equipment and how it is operated (including all controls, manually operated valves, and alarm devices). Safe and efficient operation can only be achieved if the plant is operated correctly.

4.2 Introduction

This section describes the operation of the generator set. The text should be read in conjunction with the System Overview and the Control System Sections of this manual.

All indicators, control switches/buttons, and graphical display are located on the face of the Operator Panel as illustrated in [Figure 1 on page 14](#).

4.3 Generator Set Operation

WARNING

Combustible vapors.

Do not operate an engine where there are or can be combustible vapors.

These vapors can be sucked through the air intake system and cause engine acceleration and overspeeding, which can result in a fire, an explosion, personal injury and extensive property damage.

Correct care of your engine will result in longer life, better performance, and more economical operation.

Numerous safety devices may be available, such as air intake shutoff devices, to minimize the risk of overspeeding in which an engine, because of application, might operate in a combustible environment (from a fuel spill or gas leak, for example). Cummins Power Generation does not know how you will use your engine. The equipment owner and operator, therefore, is responsible for safe operation in a hostile environment. Consult your authorized distributor for further information.

NOTICE

Cummins Power Generation recommends the installation of an air intake shutoff device or a similar safety device to minimize the risk of overspeeding where an engine will be operated in a combustible environment.

NOTICE

Long periods of idling (more than ten minutes) can damage an engine. Do not idle the engine for excessively long periods.

4.3.1 Sequence of Operation

The generator set is run Automatically using a Remote Start signal, or Manually using the generator set control panel buttons. LEDs are provided on the operator panel to indicate the operating run mode of the generator set. The PowerCommand® 3.3 control initiates a starter cranking signal and will perform an automatically sequenced manual start, under a complete engine protection system combined with full monitoring capability. If a fault is sensed at Start-up, the engine is locked out and will not start.

The choice of Auto or Manual Run mode is decided by authorized personnel during the generator set initial setup. An access password is required to switch between the Auto, Manual Run, or Off modes, and this facility may be permitted or denied by the authorized personnel during the initial setup of the generator set.

4.4 Starting

NOTICE

One operator should be in complete charge, or working under the direction of someone who is in charge. Remember that, upon starting the engine, cables and switchgear will become energized, possibly for the first time. Furthermore, equipment that does not form part of the generator set installation may become electrically charged. Only authorized and competent personnel should carry out this work.

NOTICE

Do not use the Emergency Stop switch to shut down an engine unless a serious fault develops. The Emergency Stop push-switch must not be used for a normal shut-down as this will prevent a cooling down run in which the lubricating oil and engine coolant carry the heat away from the engine combustion chamber and bearings in a safe manner.

NOTICE

Avoid off-load running for other than short periods. A minimum loading of 30% is recommended. This loading will help to prevent the build up of carbon deposits in the injectors, due to unburnt fuel, and reduce the risk of fuel dilution of the engine lubricating oil. The engine must be shut down as soon as possible after the appropriate functions have been checked.

Before attempting to start the generator set, the operator should read through this entire manual and the specific engine manual provided as part of the documentation pack supplied with the generator set. It is essential that the operator be completely familiar with the generator set and the PowerCommand® control.

The following sub-sections cover the systems used to start and stop the generator set.

Before starting the generator set, make sure that exhaust and fuel fittings are tight and properly positioned, and that proper maintenance and pre-start checks have been performed.

During starting automatic checks are carried out for the integrity of various protection systems. The PowerCommand® control will not allow the generator set to continue the starting sequence if the integrity of a sensor is considered to be in doubt.

The generator set can be configured for a number of starting cycles (one to seven) with set times for crank and rest periods for all starting modes (manual/remote). The default setting is for three start cycles, composed of fifteen seconds of cranking and 30 seconds of rest.

NOTICE

The number of starting cycles, and the crank and rest times are set from within the Setup menu. Trained and experienced service personnel are required to change the default setting. Contact your authorized distributor.

4.4.1 Initial Pre-start Checks

WARNING

Hazardous voltage.

Electricity presents special hazards of severe personal injury or death.

Even after generator set shutdown, an electrical shock hazard may still exist, caused by induced or residual voltage within the alternator or cables. Some interfaces may display zero voltage even when voltages are present. Personnel must be well trained and experienced to work with distribution voltages.

WARNING

Coolant under pressure.

Hot coolant under pressure can cause severe scalding.

Do not attempt to remove a radiator pressure cap while the generator set is running, or is stationary but hot. Hot coolant is under pressure in the radiator system. Always allow it to cool before releasing the pressure and removing the cap.

Before starting, be sure competent personnel have made the following checks to ensure that the unit is ready for operation:

- Generator Set Grounding – Grounding (Earthing) must be checked prior to performing service or inspection procedures that may expose personnel to conductors normally energized with voltages greater than 600 volts. Contact your authorized distributor.
- Megger and Insulation Testing – This must be performed on all generator sets before initial start-up and after the generator set Grounding Procedure has been completed. Insulation testing for low voltage (less than 600 volts) generator sets is recommended by Cummins Power Generation. These tests are used to verify that the windings are dry before the generator set is operated, and to develop a base line for future test comparisons. Contact your authorized distributor.

NOTICE

When Megger testing an alternator, failure to protect the voltage regulator, control and diodes could result in permanent damage to one or more of the electronic components.

- Lubrication – Check the engine lubrication oil level and ensure that the correct level is always maintained.

NOTICE

Generator sets may be shipped dry. They must be filled with the correct type and quantity of oil before use. Be sure to check oil level before initial start. Failure to fill to the recommended level can result in equipment damage.

- Coolant – Check the engine coolant level and ensure that the level is always maintained at the coolant expansion tank. Fill the cooling system to the bottom of the fill neck in the radiator fill or expansion tank. Do not check while the engine is hot.

NOTICE

It is essential that Cummins Power Generation's recommendations for the correct type and concentration of anti-freeze and DCA inhibitor are complied with. Warranty claims for damage will be rejected if the incorrect mix has been used. Consult your authorized distributor for the correct anti-freeze specifications and concentration for your operating conditions.

NOTICE

Some radiators have two fill necks, both of which must be filled after the cooling system has been drained.

NOTICE

Generator sets may be shipped dry. They must be filled with the correct type and quantity of coolant before use. Be sure to check coolant level, or levels, before initial start.

4.4.2 Operator's Pre-start Checks

⚠ WARNING

Electrical short circuit.

Electrical short circuit may result in catastrophic failure, severe personal injury and death. Generators must be dry before the generator set is operated.

⚠ WARNING

Coolant under pressure.

Hot coolant under pressure can cause severe scalding.

Do not attempt to remove a radiator pressure cap while the generator set is running, or is stationary but hot. Hot coolant is under pressure in the radiator system. Always allow it to cool before releasing the pressure and removing the cap.

- Fuel Supply – Make sure the fuel tank is filled to the normal level with clean water-free fuel and that the fuel system is primed and all the valves required for operation are open. Make sure there are no leaks and that all fittings are tight .
- Lubrication – With the engine stationary, check the engine lubrication oil level and ensure that the correct level is always maintained.
- Coolant – Check the engine coolant level and make sure that the level is always maintained at the coolant expansion tank. Fill the cooling system to the bottom of the fill neck in the radiator fill or expansion tank. Do not check while the engine is hot.

NOTICE

Some radiators have two fill necks, both of which must be filled when the cooling system has been drained.

- Cooling Air Inlet/Outlets – Make sure that the cooling air inlets/outlets are unobstructed.

- Exhaust Outlet – Make sure that exhaust components are secured and not warped; that the exhaust outlet is unobstructed; that no combustible materials are near the system, and gases are discharged away from building openings. Make sure that there are no leaks and that all fittings are tight.
- Batteries – Make sure that the batteries are charged and that all connections are correct and tight.
- Auxiliary AC Supplies – Make sure that all auxiliary equipment is receiving power from the customer's supply.
- Emergency Stop – Make sure that the emergency stop button is fully operational.

4.4.3 Selecting Manual Run Mode

NOTICE

When changing modes, the generator set may start or stop without warning (For example: Auto Mode may have been selected with no mains (utility) power available). Make sure there is no danger to personnel or equipment should the generator set start or stop when changing modes.

Press the Manual button  and then (within ten seconds) the Start button . This bypasses the 'Time Delay to Start' function; activate the engine control system and the starting system.

If the engine does not start, the starter disengages after a specified period of time and the controller indicates a 'Fail to Start' shutdown.

The generator set can be configured for one to seven starting cycles with set times for crank and rest periods for all starting modes (manual/remote). The default setting is for three start cycles, composed of fifteen seconds of cranking and thirty seconds of rest.

NOTICE

The InPower service tool or access to the Setup menu is required to change the cycle number, and the crank and rest times. Contact your authorized distributor for assistance.

To clear a Fail to Start shutdown, press the Stop button  and then press the Reset button .

Before attempting to restart, wait two minutes for the starter motor to cool and then repeat the starting procedure. If the engine does not run after a second attempt, refer to [Chapter 5 on page 83](#).

4.4.4 Starting at Operator Panel (Manual Run Mode)

NOTICE

Make sure that all Pre-start Checks are carried out before starting the generator set. Do not attempt to start the generator set until it is safe to do so. Warn all others in the vicinity of the generator set and the connected load equipment that the generator set is about to start.

To start the generator set in the Manual Run mode, press the Manual button  on the Operator Panel, and then press the Start button  within ten seconds. Failure to press the Start button within this time will result in the generator set changing to the Off mode. (Refer also to [Section 4.4.3 on page 52](#)).

NOTICE

If the mode change access password feature has been enabled, enter the access password when prompted. (See [Section 3.2.13](#)).

The PowerCommand® control will initiate a starter cranking signal and will perform an automatically sequenced manual start, under a complete engine protection system combined with full monitoring capability. This will activate the engine control system and the starting procedure. The starter will begin cranking, and after a few seconds the engine will start and the starter will disconnect.

Should the engine fail to start, the starter will disengage after a specified period of time and the control will indicate a Fail to Start shutdown.

To clear a Fail to Start shutdown, press the Stop button  and then press the Reset button . Before attempting to re-start wait a minimum of two minutes for the starter motor to cool and then repeat the starting procedure. If the engine does not run after a second attempt, refer to [Chapter 5 on page 83](#).

To disable Manual mode, change to Auto or Off mode. If the generator set is running when it leaves Manual mode, it will continue to run if Auto mode has been selected and the remote start signal is active. If there is no active remote start signal, the generator set will stop.

4.4.5 Selecting Auto Mode

NOTICE

When changing modes, the generator set can start or stop without warning. Make sure there is no danger to personnel or equipment should the generator set start or stop when changing modes.

NOTICE

Make sure that it is safe to do so before proceeding to change the mode.

Press the Auto button.  This allows the generator set to be started from a remote switch or device (e.g. transfer switch).

In response to the Remote Start, the control lights the Remote Start indicator and initiates the starting sequence. This start incorporates a Time Delay to Start function.

NOTICE

The InPower service tool or access to the Setup menu is required to change the cycle number, and the crank and rest times. Contact your authorized distributor for assistance.

NOTICE

Should a remote start signal be received, the generator set starts automatically. Make sure there is no danger to personnel or equipment should the generator set start without warning.

The starting/stopping sequence for a remote start is as follows:

1. A remote start signal is received at the customer connection on the generator set. This input signal is received from a transfer switch, a remote start switch, etc.
2. The Time Delay to Start (0-300 seconds) begins.
3. When the Time Delay to Start has expired, the engine starts. Once it has reached its rated speed and voltage, the generator set is available for use.
4. When the remote start signal is removed, a Time Delay to Stop (0-600 seconds) begins. This time delay is used to transfer the load (if connected to another power source) and let the engine cool down.
5. When the Time Delay to Stop has expired, the engine stops.

NOTICE

If the emergency stop or control off button is pressed at any time during the starting/stopping sequence, the engine immediately stops, bypassing the cooldown sequence.

4.4.6 Starting from Remote Location (Auto Mode)

NOTICE

Make sure that all Pre-start Checks are carried out before starting the generator set. Do not attempt to start the generator set until it is safe to do so. Warn all others in the vicinity that the generator set is about to start.

To start the generator set in the Auto Run mode, select the Auto button  from the Operator Panel. (Refer also to [Section 4.4.5 on page 53](#)).

Only on receipt of a remote start signal, and after a Time Delay to Start, will the PowerCommand® control initiate the starting sequence as above.

The Remote Start LED will be lit.

There are two start modes that are selectable for the Remote Start input; one for non-emergency start and the other for emergency start. In the non-emergency start, the control will complete the warm-up at idle. In the emergency mode, the generator set will omit the warm-up stage and proceed directly to rated speed and voltage.

In response to the Remote Start signal, or the control detects the loss of the Utility voltage, the control lights the Remote Start indicator and initiates the starting sequence as described in [Section 4.4.4 on page 52](#), except for the following:

- In Auto position, the control will complete the Time Delay to Start (0 to 300 seconds) for a non-emergency start signal only.

NOTICE

If the mode change access password feature has been enabled, enter the access password when prompted. (See [Section 3.2.13 on page 45](#))

To disable Auto mode, change to Manual or Stop mode. Refer to [Section 4.5](#).

4.4.7 Cold Starting with Loads

NOTICE

Make sure that all Pre-start Checks are carried out before starting the generator set. Do not attempt to start the generator set until it is safe to do so. Warn all others in the vicinity that the generator set is about to start.

Use a coolant heater if a separate source of power is available. The optional heater available from Cummins Power Generation will help provide reliable starting under adverse weather conditions. Be sure the voltage of the separate power source is correct for the heater element rating.

Cummins Power Generation recommends equipping standby generator sets (life safety systems) with engine water jacket coolant heaters to maintain the coolant at a minimum of 32 °C (90 °F) and, for most applications, accept the emergency load in ten seconds or less. Although most Cummins Power Generation generator sets will start in temperatures down to -32 °C (-25 °F) when equipped with engine water jacket coolant heaters, it might take more than ten seconds to warm the engine up before a load can be applied when ambient temperatures are below 4 °C (40 °F).

To advise the Operator of a possible delay in accepting the load, the Low Coolant Temp (code 1435) message, in conjunction with illumination of the Warning LED, is provided. The engine cold sensing logic initiates a warning when the engine water jacket coolant temperature falls below 21 °C (70 °F). In applications where the ambient temperature falls below 4 °C (40 °F), a cold engine may be indicated even though the coolant heaters are connected and functioning correctly. Under these conditions, although the generator set may start, it may not be able to accept load within ten seconds. When this condition occurs, check the coolant heaters for correct operation. If the coolant heaters are operating correctly, other precautions may be necessary to warm the engine before applying a load.

4.5 Stopping

NOTICE

The access password may be required before initiating the Off button sequence. Refer to [Section 3.2.13](#).

NOTICE

Run the generator set at no load for three to five minutes before stopping. This allows the lubricating oil and engine coolant to carry heat away from the combustion chamber and bearings.

4.5.1 Selecting Off Mode

⚠ WARNING

When changing modes, the generator set can stop without warning. Make sure there is no danger to personnel or equipment should the generator set stop when changing modes.

Press the Stop button  to put the generator set into the Off mode. This disables Auto and Manual modes.

If the generator set is running, in either Manual or Auto mode, and the Stop button is pressed, the engine will shut down. This action may include a cooldown run.

⚠ CAUTION

Do not perform a hot shutdown under load; a hot shutdown will result in engine damage.

4.5.2 Stopping at Operator Panel (Manual Mode)

If the generator set was started at the Operator Panel in Manual mode, press the Stop button  once to put the generator set into a Cooldown run after which the set will enter the Off mode.

Press the Stop button  twice will stop the generator set immediately, without a Cooldown run, after which the set will enter the Off mode.

NOTICE

If possible, hot shutdown under load should be avoided to help prolong the reliability of the set. A hot shutdown may result in a Hot Shutdown Warning.

4.5.3 Stopping from Operator Panel (Auto Mode)

If the generator set was started in Auto mode, press the Stop button  once to stop the generator set immediately, without a Cooldown run, after which the generator set will enter the Off mode.

If possible re-start the generator set in Manual mode with the circuit breaker open, and allow to stop with a Cooldown run.

NOTICE

If possible, hot shutdown under load should be avoided to help prolong the reliability of the set. A hot shutdown may result in a Hot Shutdown Warning.

NOTICE

When MLD is enabled, stopping a generator set may cause one or more stopped generator sets to start.

4.5.4 Stopping from Remote Location (Auto Mode)

If the control receives a remote stop signal, the generator set completes its normal shutdown sequence incorporating a Cooldown run (Refer to [Section 4.4.5](#)). (The remote stop signal is actually the removal of the remote start signal to the control).

The generator set will stop after completing the following Cooldown sequence:

- Time Delay to Stop function (zero to 600 seconds)
- Cooldown at Idle (zero to ten minutes) or longer, if necessary to obtain normal operating temperature before shutdown.

The set will remain in the Auto mode, and subject to a remote start signal, unless the Stop button is pressed. If this button is pressed the set will enter the Off mode.

NOTICE

The InPower service tool or access to the Setup menus is required to enable and change the time delay start/stop settings. Contact your authorized distributor for assistance.

4.5.5 Emergency Stop (Code 1433 or 1434)

The Local Emergency Stop button is situated on the front of the Operator Panel. This is a mechanically latched switch that will unconditionally stop the engine when pressed, bypassing any time delay to stop. Push this button in for Emergency Shutdown of the engine.

NOTICE

If the engine is not running, pushing the button in will prevent the starting of the engine, regardless of the start signal source (Manual or Auto - remote).

When the Stop Button is pressed, the display panel will indicate the Shutdown condition by illuminating the red Shutdown status LED  and displaying the following message on the graphical LCD display:

Fault Number: 1433 LOCAL EMERGENCY STOP

A Remote Emergency Stop button may be incorporated within the installation. If this Remote Emergency Stop button is activated, the following message will be displayed;

Fault Number: 1434 REMOTE EMERGENCY STOP

To reset:

1. Pull, or twist and pull the button out.
2. Press the Stop button on the Operator Panel to acknowledge this action.
3. Press the Reset button.
4. Press the Auto or Manual Run button, as previously determined. (See [Section 3.2.12](#)).

⚠ CAUTION

Do not use an Emergency Stop button to shut down an engine unless a serious fault develops. The Emergency Stop button must not be used for a normal shut-down as this will prevent a cooling down run in which the lubricating oil and engine coolant carry away heat from the engine combustion chamber and bearings in a safe manner.

⚠ CAUTION

Make sure that the cause of the Emergency Stop is fully investigated and remedied before a fault Reset and generator Start are attempted.

NOTICE

An external Emergency Stop button is situated in close proximity to the Operator Panel viewing window. (Rental units only).

4.6 Frequency Changing

⚠ WARNING

Incorrect voltage and frequency.

Saving settings that do not correspond to the power supply can cause severe personal injury and equipment or property damage.

Adjusting the voltage and frequency settings must only be done by technically trained and experienced service personnel and must only be adjusted to correspond to the parameters of the installed input power supply.

NOTICE

Any change to the frequency settings must only be carried out by the rental fleet owner.

Within the PowerCommand® control Set-up menu is the option to select 50 Hz or 60 Hz running. This option is Password protected and is determined at the initial setting up of the set.

The Set-up menu is used to control the displaying of a further menu that allows for adjusting the generator set frequency settings.

The Frequency menu is designed only for use with rental sets. Changing the parameters on this menu MUST ONLY be done by trained service personnel.

4.7 Battle Short Mode

Battle Short mode is not a distinct mode of operation. The PowerCommand® 3.3 control is still in the Off, Manual, or Auto mode while Battle Short mode is active. The PowerCommand® 3.3 control still follows the appropriate sequence of operation to start and stop the generator set. Battle Short mode is a generator set mode of operation that prevents the generator set from being shutdown by all but a few, select, critical shutdown faults.

The purpose of Battle Short mode is to satisfy local code requirements, where necessary. To use this feature, the necessary software must be installed at the factory when the PowerCommand® 3.3 control is purchased. Only authorized service personnel can enable this feature. When shipped from the factory, this feature is disabled.

NOTICE

The Battle Short feature must be enabled or disabled using the InPower Service tool.

⚠ WARNING

Use of the Battle Short mode feature can cause a fire or electrical hazard, resulting in severe personal injury or death and/or property and equipment damage. Operation of the set must be supervised during battle short operation.

This feature must only be used during supervised, temporary operation of the generator set. The faults that are overridden when in Battle Short mode can affect generator set performance, or cause permanent engine, alternator or connected equipment damage.

⚠ CAUTION

If this mode of operation is selected, the protection of load devices will be disabled. Cummins Power Generation will not be responsible for any claim resulting from the use of this mode.

⚠ CAUTION

All shutdown faults, including those overridden by Battle Short, must be acted upon immediately to ensure the safety and well being of the operator and the generator set.

Battle Short is turned on or off with an external switch connected to one of the two customer configured inputs or a soft switch on the operator panel.

When enabled, Battle Short switch input can be set using a Setup menu. To turn Battle Short mode on using the soft switch in the operator panel, Battle Short must be set to Operator Panel and enabled using the InPower Service Tool. (Default is Inactive).

When Battle Short mode is enabled, the Warning status indicator lights, and code 1131 – Battle Short Active – is displayed.

The PowerCommand® 3.3 generates warning fault 2942 – Shutdown Override Fail – if the Battle Short Switch is active but any of the other conditions are not met.

When Battle Short mode is enabled and an overridden shutdown fault occurs, the shutdown lamp remains lit even though the set continues to run. Fault code 1416 – Fail to Shutdown – is displayed. If the fault is acknowledge, the fault message is cleared from the display but remains in the Fault History file as long as Battle Short mode is enabled.

Battle Short is suspended and a shutdown occurs immediately if any of the following critical shutdown faults occur:

TABLE 11. 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

4.8 Power On and Sleep Modes

The operating modes of the control panel and operating software are Power On and Sleep.

4.8.1 Power On Mode

In this mode, power is continuously supplied to the control panel. The control's operating software and control panel lamps/graphical display remain active until the Sleep mode is activated.

4.8.2 Sleep Mode

Sleep mode is used to reduce battery power consumption when the control is not being used and it is in the Off or Auto mode. In this mode, the control's operating software is inactive and the lamps and graphical display on the control panel are all off.

When all conditions are met (i.e. no unacknowledged faults and the control is in the Off/Auto mode), the sleep mode activates after five minutes of keypad inactivity. This length of time is configurable.

To activate the control and view the menu display without starting the generator set, press any control button.

NOTICE

Sleep mode can be enabled/disabled. Some operating modes and control features require the control to be powered at all times, i.e. MLD and Remote Monitoring. Removing power from the control may impact the operation of these features. Contact your authorized distributor for options and assistance.

4.9 Paralleling Operation

4.9.1 Speed and Voltage Matching

Once the generator set has achieved nominal voltage and frequency, the set is ready to be paralleled with the busbar supply. Each generator set is paralleled completely independently of any others.

The PowerCommand® 3.3 control unit monitors both the incoming supply and the busbar voltage and frequency. It adjusts the incoming supply to match the busbar supply over a wide span of busbar parameters. Synchronization is achieved under full control and at the correct phase coincidence.

In Automatic mode, the PowerCommand® 3.3 control receives a breaker close signal when synchronization has been achieved, and signals the main breaker to close. In Manual mode, the main breaker is closed to connect the generator set to the busbars by using the breaker Close button.

NOTICE

The PowerCommand® 3.3 control performs a synchronization check in both Manual and Auto modes before allowing the generator set circuit breaker to close.

4.9.2 Operation When in Parallel

When in parallel with the busbar supply, the generator set voltage and frequency are dependent upon the busbar parameters and the control is changed to kW and kVAR load management.

Each generator set is individually controlled by a separate PowerCommand® 3.3 control.

Apart from the protection systems, there is no common coupling between generator sets. This allows for any set, or its relevant controls, to be under maintenance without affecting the others.

When the control system detects that the generator set is up to speed and voltage, the load ramps from the mains to the generator set. The engine governor control system keeps the electrical output within the correct parameters.

4.9.3 Generator Set Application Type

Generator set application type is the primary setting for configuring the paralleling features of the PowerCommand® 3.3 control. [Table 12](#) provides more information about each generator set application type. It indicates how the generator set can run in parallel and what paralleling states or processes are available together with how much control the PowerCommand® 3.3 control has over the circuit breakers.

TABLE 12. OVERVIEW OF GENERATOR SET APPLICATION TYPES; PARALLELING STATES AND 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	
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			
Generator Set CB trip	Yes	Yes				
Generator Set CB Control			Yes	Yes	Yes	Yes
Utility CB Control						Yes

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

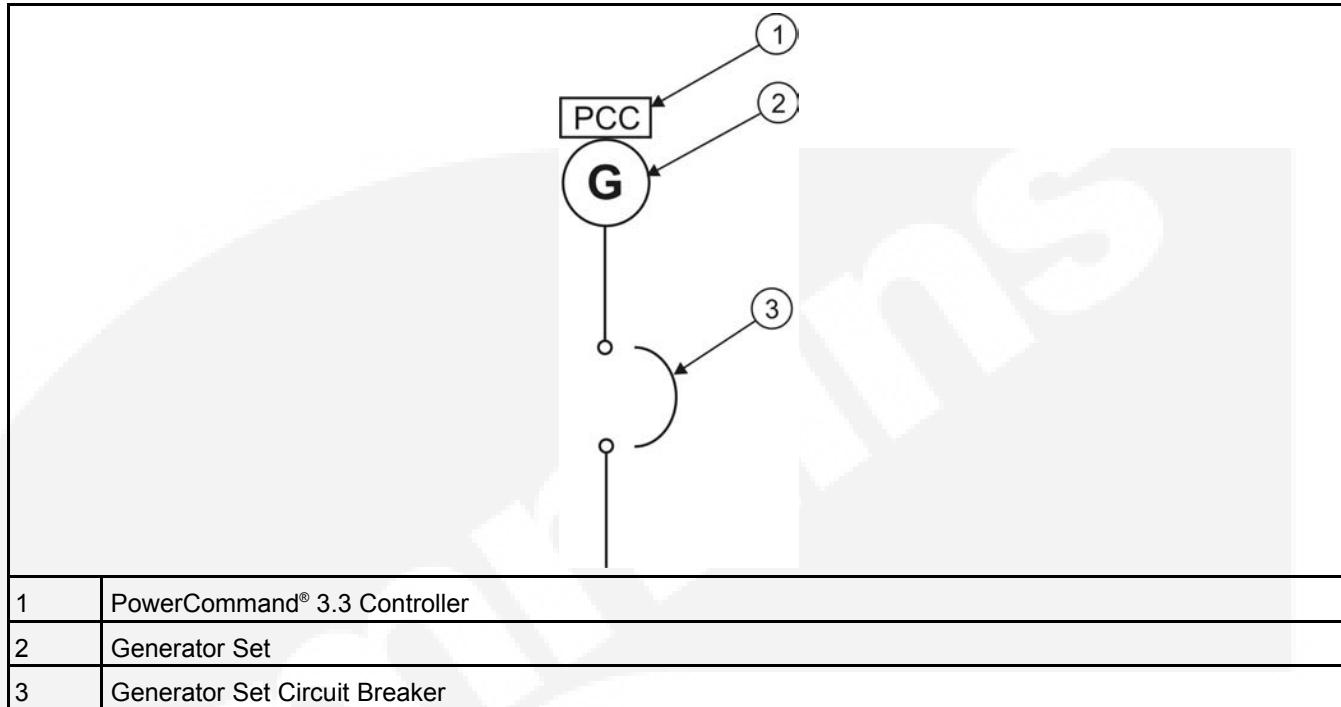
- Synchronizer Only: The generator set is not running in parallel with other generator sets or with the utility, but the PowerCommand® 3.3 control can synchronize its voltage, frequency and phase with one other power source. This is typically for use in applications with transfer switches which use fast-close transitions but do not have a built in synchronizer.
- In Power Transfer Control: The PowerCommand® 3.3 controls the generator set's circuit breaker and utility circuit breaker to ensure the load has power. The PowerCommand® 3.3 control does not control the utility circuit breaker in any other generator set application type.

NOTICE

The PowerCommand® 3.3 control does not support paralleling in a Single-Phase configuration. If Single/3-Phase Configuration is set to Single-Phase, the generator set application type is Standalone.

4.9.3.1 Standalone Application

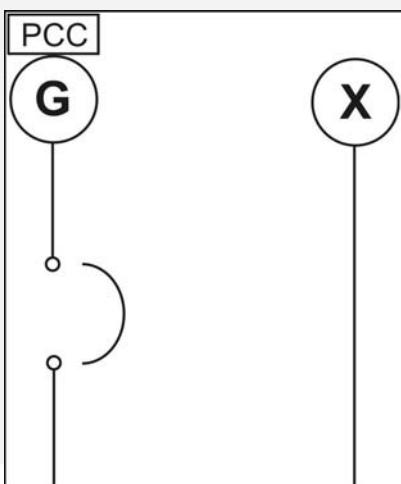
In the generator set application shown in [Figure 16](#), the generator set is not running in parallel with other sets or with the utility. The controller is always in the Standby state and may be in either the Power On or Sleep mode.

**FIGURE 16. STANDALONE**

When the generator set is required to accept a load, the generator set must be started in either Manual or Auto mode. When the set has run up to speed, the circuit breaker must be closed in either the Manual or Auto mode to accept the load.

4.9.3.2 Synchronize Only

In the generator set application shown in [Figure 17](#), the generator set is not running in parallel with other sets or with the utility, but the PowerCommand® 3.3 control can synchronize the 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.

**FIGURE 17. SYNCHRONIZED ONLY**

The PowerCommand® 3.3 control is in the Standby paralleling state until event 1465 (Ready to Load) is active. Then the PowerCommand® 3.3 control synchronizes if all of the following conditions are met:

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

If any of these conditions are not met the PowerCommand® 3.3 control remains in the Standby paralleling state.

The Sync Enable Signal may come from the PowerCommand® 3.3 control's Sync Enable connection or Modbus networks. This signal becomes active when any of these sources are present and remains active until any of these conditions are changed. When this signal becomes active the PowerCommand® 3.3 control synchronizes with the live bus.

4.9.3.3 Isolated Bus Only

In the generator set application shown in [Figure 18](#), the generator set is running in parallel with other generator sets.

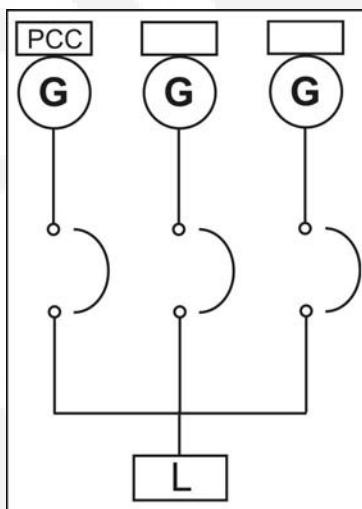


FIGURE 18. ISOLATED BUS ONLY – STANDBY PARALLELING STATE

The generator set is in the Standby paralleling state until event 1465 (Ready to Load) is active. The PowerCommand® 3.3 control then considers the current position of the generator set circuit breaker.

Before the PowerCommand® 3.3 control closes the generator set circuit breaker, all of the following conditions must be met:

- Initially the First Start process determines whether or not to close the generator set circuit breaker onto a dead bus when it is in parallel with other generator sets (provided the sets are in Auto setup).
- The generator set circuit breaker is then closed if the following conditions are met:
 1. There are no generator set circuit breaker Open requests.
 2. There is a generator set circuit breaker Close request.

If the PowerCommand® 3.3 control is in Manual mode, the CB Close button must be pressed.

NOTICE

The PowerCommand® 3.3 control inhibits closure of the paralleling breaker outside the sync-check window. Therefore the breaker close button can be operated even before synchronization, although the breaker will not close until a signal is sent from the PowerCommand® 3.3 control to allow it.

When all the above conditions are met and the generator set circuit breaker is closed, the generator set will parallel with the other generator sets to share the load.

In [Figure 19](#) the PowerCommand® 3.3 control is now in the Load Share paralleling state, all of the generator sets' circuit breakers are closed, so the load is now receiving power from all sources.

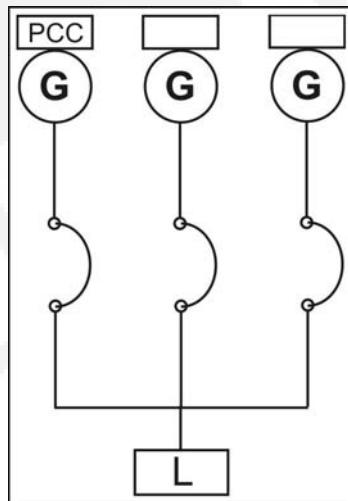
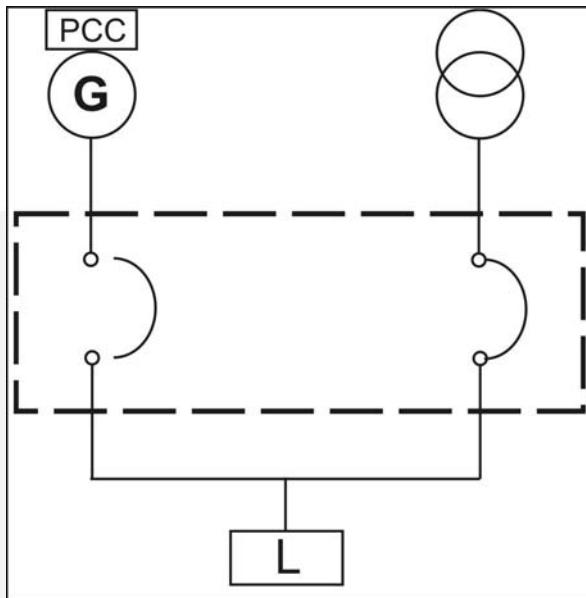


FIGURE 19. ISOLATED BUS ONLY - LOAD SHARE PARALLELING STATE

Open the generator set circuit breaker if there are any generator set circuit breaker Open requests. This will place the generator set back into the Standby paralleling state and therefore will no longer supply power to the load.

4.9.3.4 Power Transfer Control

In the generator set application shown in [Figure 20](#) (utility circuit breaker closed and taking the load), a single generator set runs in parallel with the utility; no other generators are connected. This is the only application whereby the PowerCommand® 3.3 control controls the utility circuit breaker as well as the generator set to make sure the load has continuous power.

**FIGURE 20. POWER TRANSFER CONTROL**

The PowerCommand® 3.3 controls the generator set, the generator set circuit breaker, and the utility circuit breaker to make sure the load has power. For example, the PowerCommand® 3.3 control monitors the utility; if the utility fails, the PowerCommand® 3.3 control starts the generator and transfers the load to the generator set. When the utility is available again, the PowerCommand® 3.3 control transfers the load to the utility and shuts down the generator. In this 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.

NOTICE

In this generator set application type, Utility Single Mode verify/configurable input #29 function pointer must be set to Default if the PowerCommand® 3.3 control is allowed to close the generator circuit breaker onto a dead bus.

The PTC operating mode determines the conditions under which the PowerCommand® 3.3 control opens and closes the generator set circuit breaker and the utility circuit breaker, as well as conditions under which the PowerCommand® 3.3 control starts and stops the generator set.

The PTC operating mode is related to the mode of operation. [Table 13](#) provides a summary of the relationships between the mode of operation and the PTC operating mode.

TABLE 13. 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

4.9.3.4.1 Exercise Mode

In this PTC operating mode the PowerCommand® 3.3 control responds to the Exercise signal. This operating mode is similar to the test PTC operating mode with the following exceptions:

- The Exercise signal replaces the Remote Start signal (the Remote Start signal must be inactive).
- If the Exercise Scheduler is active, Scheduler Program Run mode replaces Test With Load Enable.

4.9.3.4.2 Extended Parallel Mode

In this PTC operating mode, the PowerCommand® 3.3 control responds to the Extended Parallel signal. The PowerCommand® 3.3 control is in the PTC operating mode when all the following conditions are met:

- Single/3-phase connection is set to 3-phase.
- The PTC mode switch signal is inactive.
- The PowerCommand® 3.3 control is in Auto mode.
- The Extended Parallel signal is active.
- Extended Parallel Enable is set to enable.
- Utility circuit breaker Position Status is set to Closed, or the generator set is available and the generator circuit breaker position status is set to Closed.

4.9.3.4.3 Manual Mode

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

- The PTC mode switch signal is active.
- The PowerCommand® 3.3 control is in Manual mode.

When the PowerCommand® 3.3 control enters this PTC operating mode, it considers the current position of both the generator's and the utility's circuit breaker. However, the generator set must be started manually and the generator set's circuit breaker will not close to accept the load until the generator set is up to speed and voltage.

NOTICE

In the following sequences the PowerCommand® 3.3 control must be in the Standby Paralleling State unless otherwise stated and assumes that the PowerCommand® 3.3 control menus have been set for the correct paralleling parameters.

[Figure 21 on page 68](#), [Figure 22 on page 69](#), [Figure 23 on page 70](#) and [Figure 24 on page 70](#) illustrate the various conditions which may be set manually while in a paralleling state. In this instance, an operator controls how the load is shared by operating the circuit breakers on both the generator and the utility for the desired mode.

In [Figure 21 on page 68](#), the Utility has become unavailable while the generator set is in the Standby paralleling state.

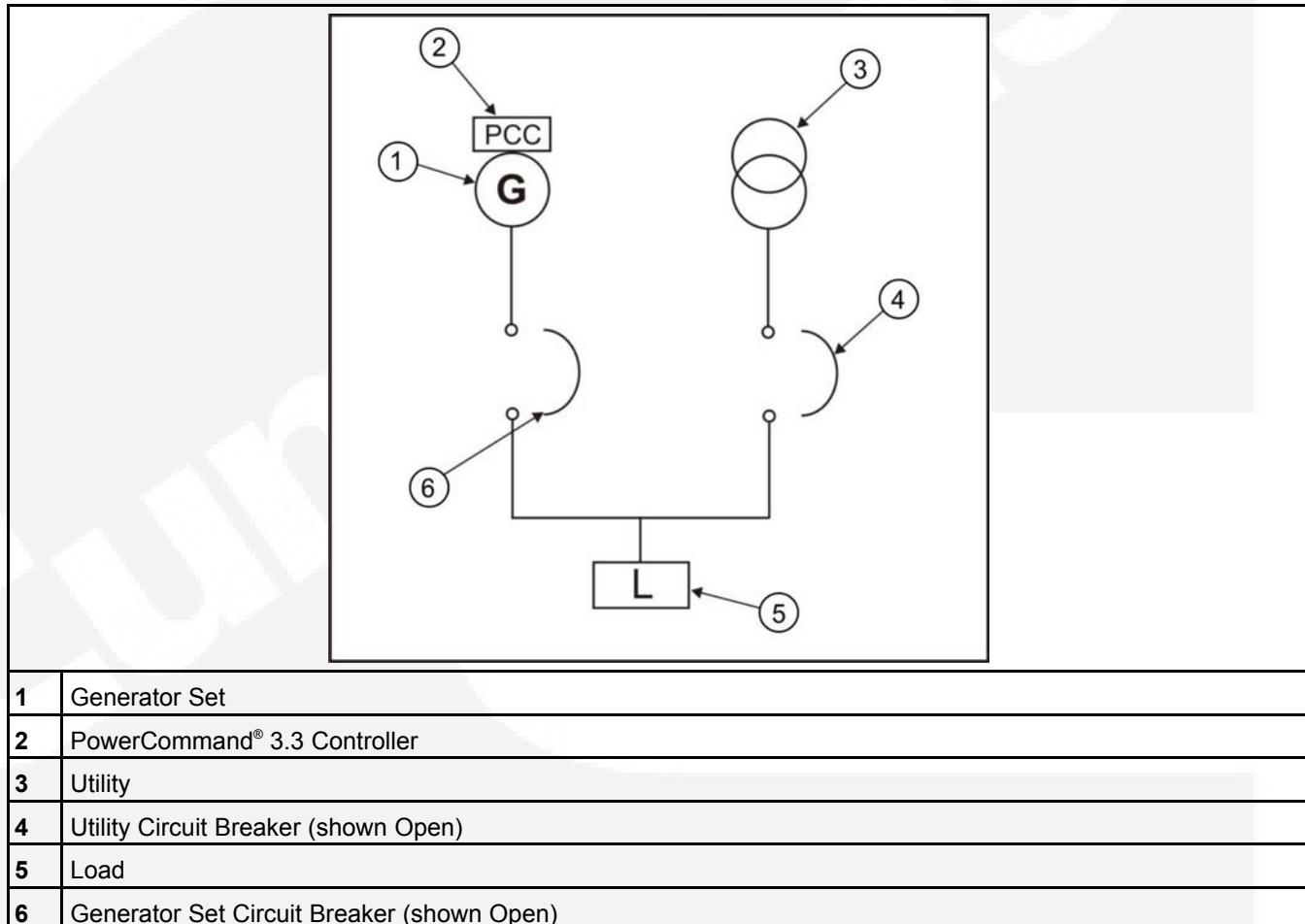


FIGURE 21. MANUAL MODE – CIRCUIT BREAKER CONTROL SEQUENCE 1

Start the generator set in Manual mode. When the generator set is up to speed and voltage, press the circuit breaker Close button to enable the generator set to accept the load.

NOTICE

The PowerCommand® 3.3 control inhibits closure of the paralleling breaker outside the sync-check window. Therefore, the breaker close button can be operated even before synchronization, although the breaker will not close until a signal is sent from the PowerCommand® 3.3 control to allow it.

In [Figure 22 on page 69](#), the generator set's circuit breaker is open while the utility circuit breaker is closed and is therefore accepting the load.

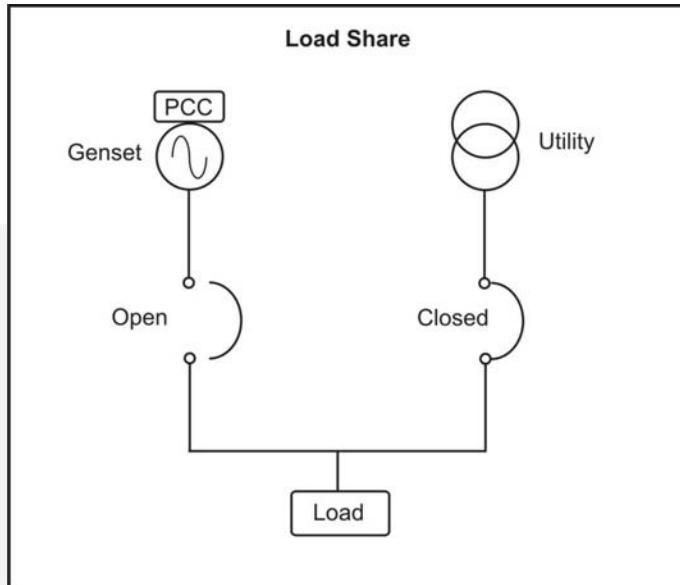


FIGURE 22. MANUAL MODE – CIRCUIT BREAKER CONTROL SEQUENCE 2

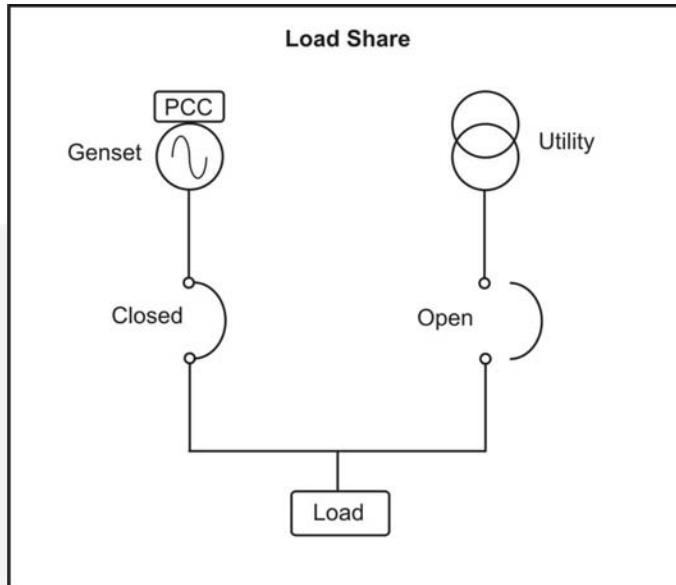
The generator's circuit breaker remains open while the utility circuit breaker is closed. The generator is running and the load is receiving power from the utility only. In this condition, the Transition Type must be set to hard or soft closed and the generator and utility must be fully synchronized.

NOTICE

Synchronization requires the Sync Enable signal to be present; otherwise, the PowerCommand® 3.3 control does not automatically synchronize the generator and the utility together.

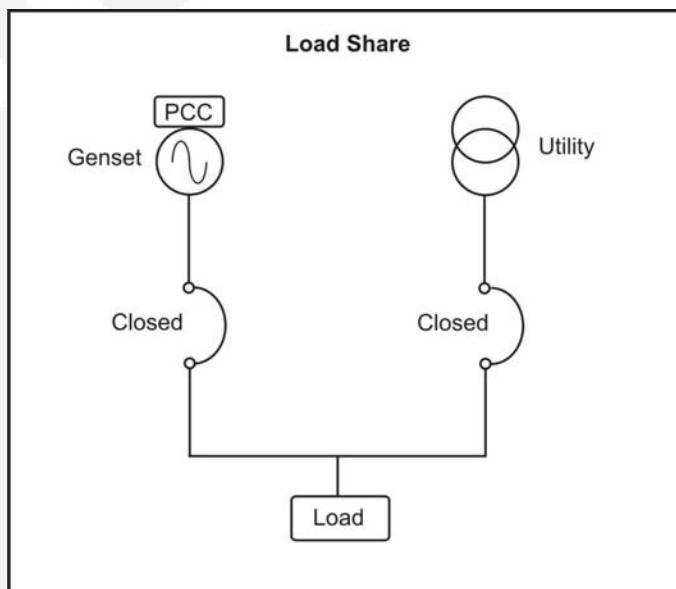
To progress further, the generator set circuit breaker closed button must be pressed. This will enable the generator set to load share with the utility.

In [Figure 23 on page 70](#), the generator set's circuit breaker is closed and the utility circuit breaker is open. The load in this instance is receiving power from the generator set only.

**FIGURE 23. MANUAL MODE – CIRCUIT BREAKER CONTROL SEQUENCE 3**

When the utility is again providing power, the utility circuit breaker can be closed.

In [Figure 24 on page 70](#), both generator set and utility are providing power for the load.

**FIGURE 24. MANUAL MODE – CIRCUIT BREAKER CONTROL SEQUENCE 4**

In this condition, the PowerCommand® 3.3 control is in the Load Govern paralleling state; both the generator and utility circuit breakers are closed, so the load is now receiving power from both sources. In this condition, the Transition Type is set to Open Transition and the Maximum Parallel Time (TDMO) has expired.

The Power Transfer menu also indicates if either/both utility and the generator set are available to accept a load. This will only be allowed if both sources are fully synchronized.

4.9.4 Utility Single

In this application, the generator is running in parallel with the utility. There are no other generators employed in this type of system.

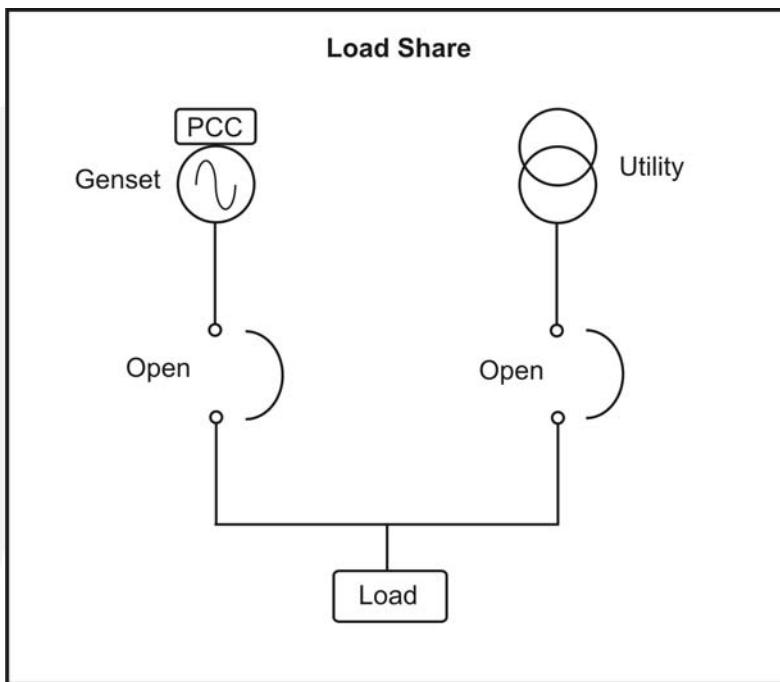


FIGURE 25. UTILITY - SINGLE MODE

The generator set is in the Standby paralleling state until event 1465 (Ready to Load) is active. The controller then considers the current position of both the generator set and the utility circuit breakers, as illustrated in [Figure 25 on page 71](#).

[Figure 26 on page 72](#), [Figure 27 on page 73](#), [Figure 28 on page 74](#) and [Figure 29 on page 75](#) illustrate the various conditions for each paralleling state.

NOTICE

In the following sequences, the PowerCommand® 3.3 control must be in the Standby Paralleling state unless otherwise stated and assumes that the PowerCommand® 3.3 control menus have been set with the correct paralleling parameters.

In [Figure 26 on page 72](#), the circuit breakers on both the generator and utility are open. The generator is running and power from the Utility is available. In this condition, the load is receiving no power from either source.

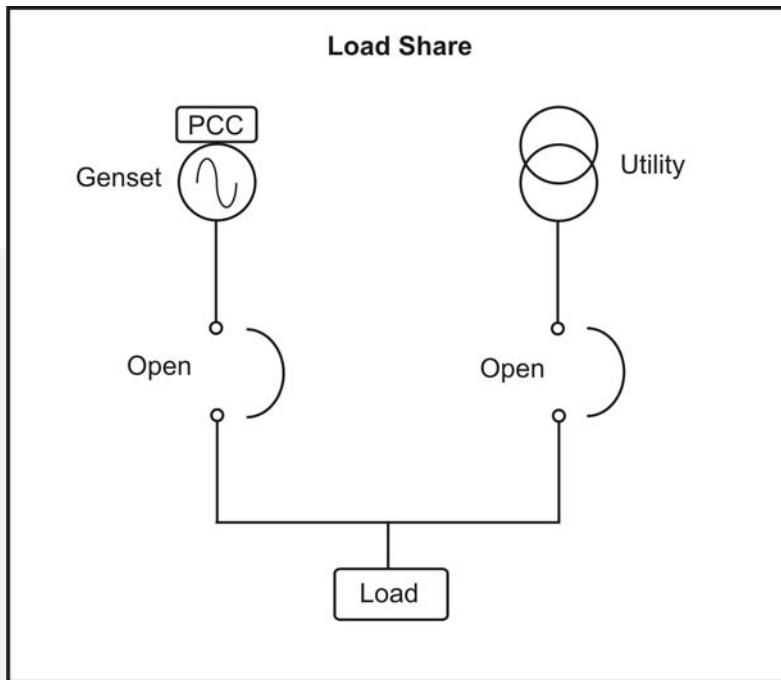


FIGURE 26. UTILITY SINGLE – SEQUENCE 1

Before the PowerCommand® 3.3 control closes the generator set circuit breaker, all of the following conditions must be met:

- There is a generator set circuit breaker Close request.
- There are no generator set circuit breaker Open requests.
- Utility Single Mode Verify/Configurable Input #29 Function Pointer is set to Default.
- Configurable Input #29 is active.

If the PowerCommand® 3.3 control is in Manual mode, the circuit breaker Close button must be pressed.

The generator set will then provide power for the load.

NOTICE

The PowerCommand® 3.3 control inhibits closure of the paralleling breaker outside the sync-check window. Therefore, the breaker close button can be operated even before synchronization, although the breaker will not close until a signal is sent from the PowerCommand® 3.3 control to allow it.

In [Figure 27 on page 73](#), the generator set is running with the circuit breaker open and the utility circuit breaker closed, providing power for the load.

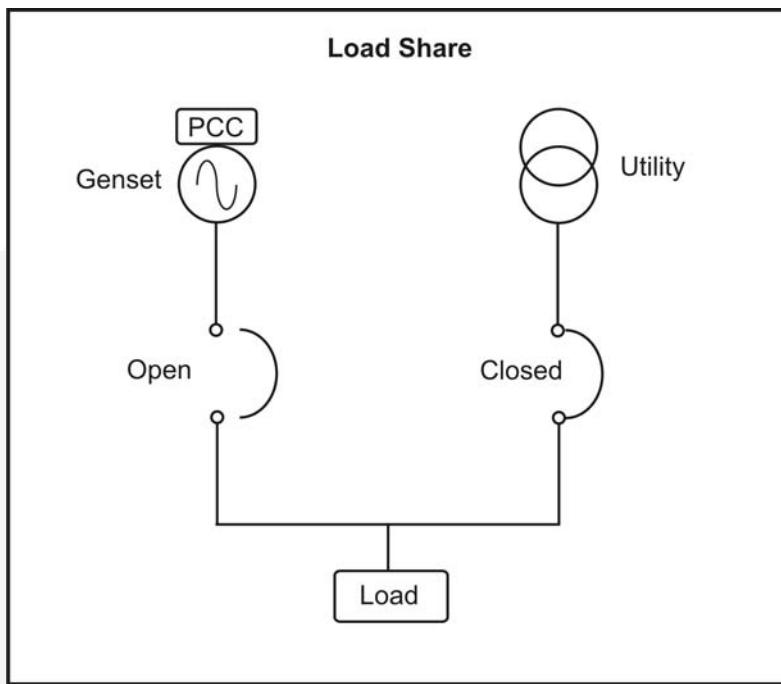


FIGURE 27. UTILITY SINGLE – SEQUENCE 2

The PowerCommand® 3.3 control will automatically initiate the Synchronize procedure, since it is synchronizing to the utility.

Before the PowerCommand® 3.3 control closes the generator set circuit breaker, both of the following conditions must be met:

- There are no generator set circuit breaker Open requests.
- There is a generator set circuit breaker Close request.

If the PowerCommand® 3.3 control is in Manual mode, the circuit breaker Close button must be pressed. The generator set will then load share with the utility.

In [Figure 28 on page 74](#), the utility circuit breaker is Open and the generator set is running with the circuit breaker closed, providing power for the load.

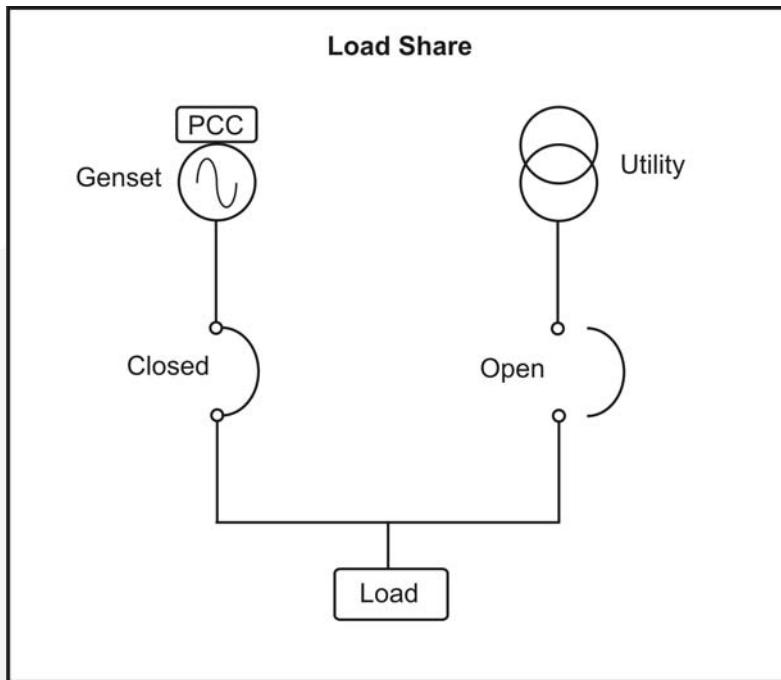


FIGURE 28. UTILITY SINGLE – SEQUENCE 3

When the utility is available, its circuit breaker may be closed and therefore available to supply power to the load. The generator set circuit breaker may then be opened, returning the generator set to the Standby paralleling state. The generator set will therefore no longer supply power to the load.

The Sync Enable input must be closed to enable the synchronizer, thereby allowing a re-transfer of load back to the utility.

NOTICE

Utility CB sync check and utility breaker controls are not part of the PowerCommand®3.3 control system.

NOTICE

In Manual mode, it will be necessary to press the CB Open button on the operator panel.

In this condition (see [Figure 29 on page 75](#)), the PowerCommand® 3.3 control is now in the Load Govern paralleling state. Both the generator and utility circuit breakers are closed; therefore, the load is now receiving power from both sources.

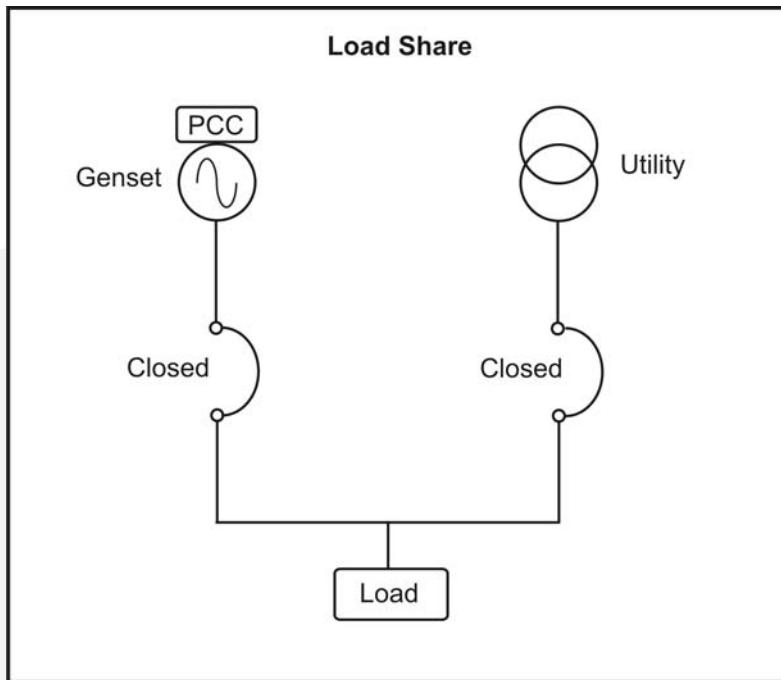


FIGURE 29. UTILITY SINGLE – SEQUENCE 4

Open the generator set circuit breaker if there are any generator set circuit breaker Open requests.

4.9.5 Utility Multiple

NOTICE

For paralleling with a PC 3.3 Controllar and Motorised Circuit Breaker, to avoid false tripping of the circuit breaker it is recommended to switch off the earth fault protection. The earth fault protection switch is located on the control panel .

In the generator set application shown in [Figure 30 on page 76](#), the generator set is running in parallel with other generator sets which in turn are running in parallel with the utility .

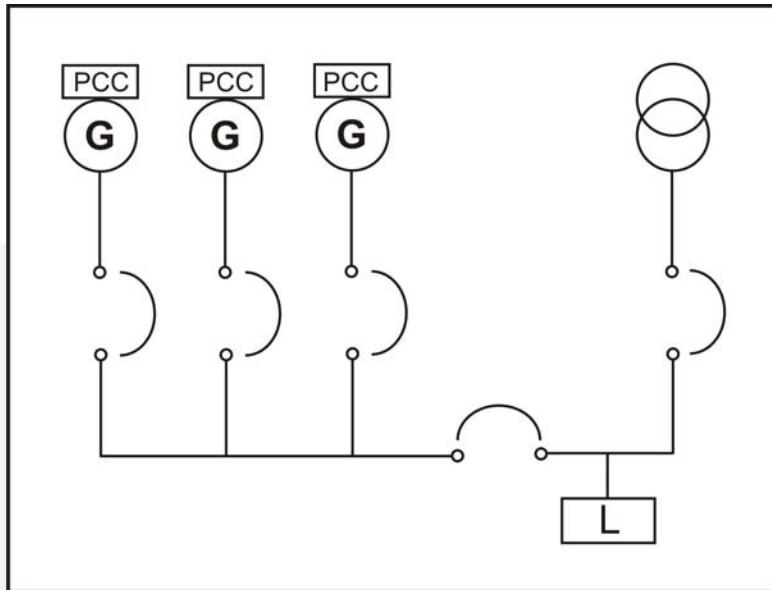


FIGURE 30. UTILITY MULTIPLE

The PowerCommand® 3.3 control is in the Standby paralleling state until Event 1465 (Ready to Load) is active. The PowerCommand® 3.3 control then considers the current position of the generator set circuit breaker and the utility circuit breaker, as illustrated in [Figure 30 on page 76](#). To ensure a seamless transfer of the load between the utility and generator set(s), a closed transition transfer switch is incorporated.

The generator sets may be in Auto or Manual setup. If in Auto setup, the First Start process will be available to enable a generator set to close the circuit breaker onto a dead bus. The remaining generator sets then wait for the bus to go live before synchronizing to it.

[Figure 31 on page 77](#), [Figure 32 on page 78](#), [Figure 33 on page 78](#) and [Figure 34 on page 79](#) illustrate the various conditions for each paralleling state.

NOTICE

In the following sequences, the PowerCommand® 3.3 control must be in the Standby Paralleling State unless otherwise stated and assumes that the PowerCommand® 3.3 control menus have been set with the correct paralleling parameters.

In [Figure 31 on page 77](#), the circuit breakers on both the generator and utility are open. The generator is running and power from the Utility is available. In this condition the load is receiving no power from either source.

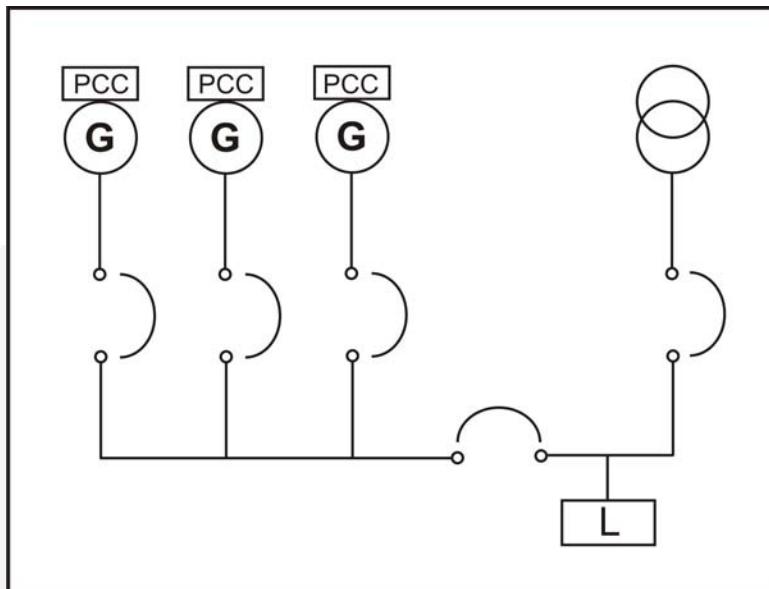


FIGURE 31. UTILITY MULTIPLE – SEQUENCE 1

Before the PowerCommand® 3.3 control closes the generator set circuit breaker, all of the following conditions must be met:

- Initially the First Start process determines whether or not to close the generator set circuit breaker onto a dead bus when it is in parallel with other generator sets (provided the sets are in Auto setup).
- The generator set circuit breaker is then closed if the following conditions are met:
 1. There are no generator set circuit breaker Open requests.
 2. There is a generator set circuit breaker Close request.

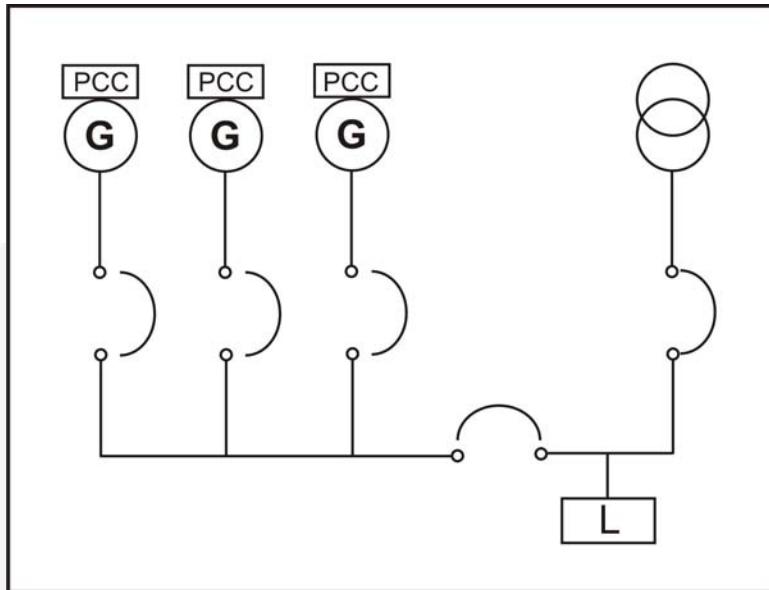
If the PowerCommand® 3.3 control is in Manual mode, the circuit breaker Close button must be pressed.

NOTICE

The PowerCommand® 3.3 control inhibits closure of the paralleling breaker outside the sync-check window. Therefore, the breaker close button can be operated even before synchronization, although the breaker will not close until a signal is sent from the PowerCommand® 3.3 control to allow it.

When all the above conditions are met and the generator set circuit breaker is Closed, the generator set will parallel with the other generator sets and/or the utility to share the load.

In [Figure 32 on page 78](#), the generator set is running with the circuit breaker open and the utility circuit breaker closed, providing power for the load.

**FIGURE 32. UTILITY MULTIPLE – SEQUENCE 2**

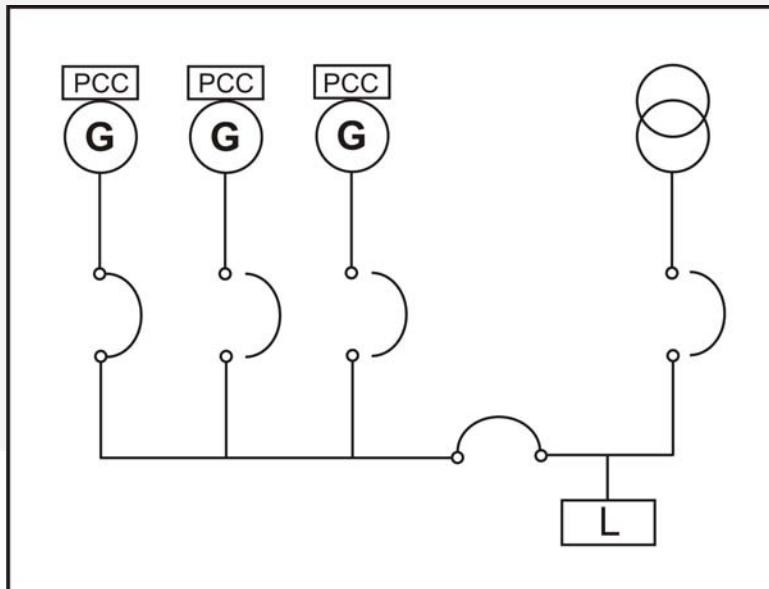
The PowerCommand® 3.3 control will automatically initiate the Synchronize procedure since it is synchronizing to the utility.

Before the PowerCommand® 3.3 control closes the generator set circuit breaker, all of the following conditions must be met:

- There are no generator set circuit breaker Open requests.
- There is a generator set circuit breaker Close request.

If the PowerCommand® 3.3 control is in Manual mode, the circuit breaker Close button must be pressed. The generator set will then load share with the utility.

In [Figure 33 on page 78](#), the utility circuit breaker is Open and a generator set is running with the circuit breaker Closed, providing power for the load.

**FIGURE 33. UTILITY MULTIPLE - SEQUENCE 3**

When the utility is again available to supply the load, open the generator set circuit breaker if there are any generator set circuit breaker Open requests. This will place the generator set back into the Standby paralleling state and therefore will no longer supply power to the load.

In [Figure 34 on page 79](#), the PowerCommand® 3.3 control is now in the Load Govern paralleling state. Both the generator and utility circuit breakers are closed, so the load is now receiving power from both sources.

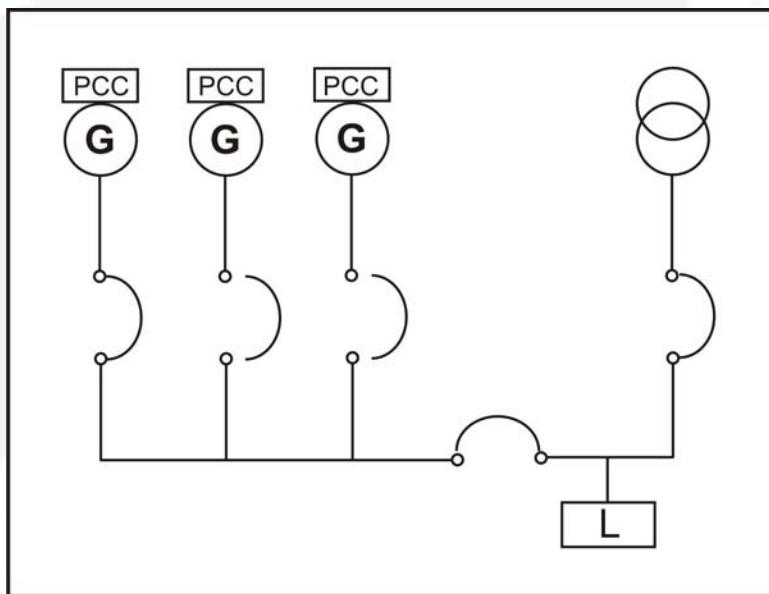


FIGURE 34. UTILITY MULTIPLE - SEQUENCE 4

Open the generator set circuit breaker if there are any generator set circuit breaker Open requests. This will place the generator set back into the Standby paralleling state and therefore will no longer supply power to the load.

4.9.6 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.

4.9.6.1 Load Demand 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.

4.9.6.1.1 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.

- 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 **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.

4.9.6.1.2 Fixed Priority Sequence

The fixed priority sequence allows the generator set priority to be manually assigned.

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.

4.9.6.2 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).

4.9.6.2.1 Load Demand Threshold Method (%kW)

The Load Demand Threshold Method (%kW) start and stop operation is as follows:

- The Load Demand Start Threshold (%kW) is the maximum ratio of load to capacity before starting the next generator set.
- The Load Demand Stop Threshold (%kW) is the minimum ratio of load to capacity before stopping the next generator set.

4.9.6.2.2 Load Demand Threshold Method (kW)

The Load Demand Threshold Method (kW) start and stop operation is as follows:

- The Load Demand Start Threshold (kW) (Start Thresh kW) is the minimum Load Demand Surplus Capacity (Surplus Cap) before starting the next generator set.
- The Load Demand Stop Threshold (kW) (Stop Thresh kW) is the maximum Load Demand Surplus Capacity (Surplus Cap) before stopping the next generator set.

4.9.6.3 Spare Capacity Request Value

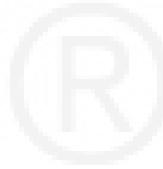
When large load transients are expected on the generator set AC bus the Load Demand Spare Capacity Request Value (Spare Cap Req) feature provides a mechanism to notify the Masterless Load Demand (MLD) network that additional capacity needs to be brought on line ahead of the load. When the Load Demand Spare Capacity Request Value (Spare Cap Req) input is Active, 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).

4.9.6.4 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.



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5 Troubleshooting

Fault code information, together with warning and shutdown information, is provided in this section to assist in locating and identifying the possible causes of faults in the generator set system .

Refer also to the Operator's engine specific manual. The engine manual contains additional information regarding the running and care of the generator set as well as specific equipment instructions that may differ from the standard generator set .

5.1 Control System

The generator set control system continuously monitors engine sensors for abnormal conditions, such as low oil pressure and high coolant temperature. If any of these conditions occur, the control will light a yellow Warning lamp or a red Shutdown lamp and will display a message on the graphical display panel. In the event of an engine shutdown fault (red Shutdown LED), the control will stop the engine immediately.

NOTICE

Refer to the control service manual listed in the Related Literature section for control troubleshooting.

5.2 Safety Considerations

Fault finding work, particularly in confined areas, should be carried out by two engineers working together. Read, understand and comply with all safety precautions listed within **IMPORTANT SAFETY INSTRUCTIONS** and observe all instructions and precautions throughout this manual, the Operator's engine specific manual, and the Health and Safety manual.

The installation of a generator set can be designed for remote starting. When troubleshooting a generator set that is shutdown make sure that the set cannot be accidentally re-started.

⚠ WARNING

High voltages are present when the generator set is running. Do not open the output box while the generator set is running.

⚠ WARNING

Some panel internal components may have live exposed terminations even if the generator set is not running. Isolate all external electrical supplies prior to access of the control panel.

⚠ WARNING

Contacting high voltage components can cause severe personal injury or death by electrocution. Keep the output box covers in place during troubleshooting. Only personnel qualified to perform electrical servicing should carry out testing and/or adjustments.

⚠ CAUTION

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

⚠ WARNING

Ventilate the battery area before working on or near the battery. Wear goggles. Stop the generator set and disconnect the battery charger before disconnecting the battery cables. Disconnect negative(–) cable first and reconnect last.

⚠ WARNING

Ignition of explosive battery gases can cause severe personal injury or death. Arcing at battery terminals, light switch or other equipment, flame, pilot lights and sparks, can ignite battery gas. Do not smoke, or switch inspection light on or off near battery. Discharge static electricity from body before touching batteries by first touching a grounded metal surface.

⚠ 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).

5.3 Fault Finding

⚠ WARNING

Troubleshooting procedures.

Troubleshooting procedures present hazards that can result in severe personal injury or death. Only qualified service personnel with knowledge of fuels, electricity, and machinery hazards should perform service procedures.

Review safety precautions listed within [Chapter 1 on page 1](#) of this manual together with the documentation supplied with the generator set.

Should a fault condition occur during operation, follow the procedures in the following tables to locate and correct the problem. For any symptom not listed, contact your authorized distributor for assistance.

Before starting any fault finding, ensure that the following basic checks are carried out:

- All switches and controls are in their correct positions
- Fuel system is connected and fuel is available
- The lubricating oil level is correct
- The coolant level is correct
- The radiator matrix is free from obstruction
- The battery charge condition is satisfactory and the connections are secure
- The generator set electrics and alternator connections are secure
- The panel connections are secure
- The protection circuits have been reset

- Blown fuses have been replaced
- Tripped contactors or circuit breakers have been reset

5.4 Status Indicators - PowerCommand 3.3

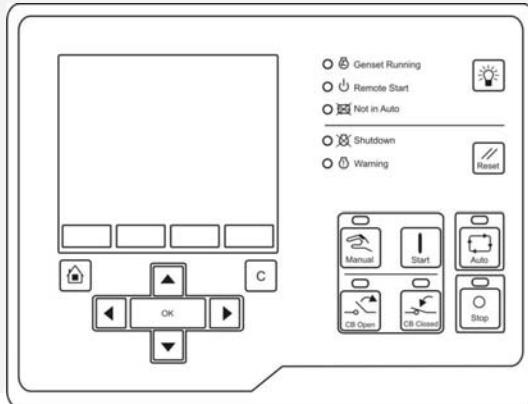


FIGURE 35. OPERATOR PANEL (HMI 320)

5.4.1 Not in Auto

This red lamp is lit when the control is NOT in Auto.

5.4.2 Remote Start

This green lamp indicates the control is receiving a Remote Run signal. The Remote Run signal has no effect unless the generator set is in Auto.

5.4.3 Warning

This amber lamp is lit whenever the control detects a Warning condition. This lamp is automatically shut off when the Warning condition no longer exists.

5.4.4 Shutdown Status

This red lamp is lit when the control detects a Shutdown condition. The generator set cannot be started when this lamp is on. After the condition has been corrected, the lamp can be reset by first pressing the Stop button and then the Reset button.

5.4.5 Generator Set Running

The green lamp is lit when 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.

5.5 Fault/Status Codes - PowerCommand 3.3

WARNING

warning

Troubleshooting procedures.

Troubleshooting procedures present hazards that can result in severe personal injury or death.

Only trained and experienced service personnel with knowledge of fuels, electricity, and machinery hazards should perform service procedures.

WARNING

warning

Accidental starting.

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 leads (negative [-] first).

NOTICE

Gaps in the code numbers are for codes that do not apply to this generator set. Some of the codes listed are feature dependent and will not be displayed by this control.

5.5.1 Fault Messages

A Fault message is an indicator of a Warning or Shutdown condition. It includes the fault type (Warning or Shutdown), fault number, and a short description. It also includes where the fault occurred if the generator set control did not detect the fault and is simply reporting the fault.

Active and acknowledged faults may be viewed in the Faults menu.

5.5.2 Fault Acknowledgement

Shutdown faults must be acknowledged after the fault has been corrected. If in Auto or Manual mode, the control must be set to Stop mode (Off). Faults are cleared from the control panel display by pressing the Reset button.

Faults are also acknowledged when in Auto mode and the remote start command is removed.

Faults are re-announced if they are detected again after being acknowledged.

NOTICE

Gaps in the code numbers are for codes that do not apply to this generator set. Some of the codes listed are feature dependent and will not be displayed by this control.

5.5.3 Fault Codes - PowerCommand® 3.3 MLD

TABLE 14. FAULT CODES

Code	Lamp	Displayed Message
111	Shutdown	Internal ECM Failure
115	Shutdown	Eng Crank Sensor Error
122	Warning	Manifold 1 Press High
123	Warning	Manifold 1 Press Low
124	Warning	Manifold 1 Press High
135	Warning	High Oil Rifle 1 Pressure
141	Warning	Low Oil Rifle 1 Pressure
143	Warning	Low Oil Rifle Pressure
144	Warning	High Coolant 1 Temp
145	Warning	Low Coolant 1 Temp
146	Derate	Pre-High Engine Coolant Temperature
151	Shutdown	High Coolant Temp
153	Warning	High Intake Manf 1 Temp
154	Warning	low Intake Manf 1 Temp
155	Shutdown	High Intake Manf 1 Temp
187	Warning	Sensor Supply 2 Low
195	Warning	High Coolant 1 Level
196	Warning	Low Coolant 1 Level
197	Warning	Low Coolant Level
212	Warning	High Oil 1 Temperature
213	Warning	Low Oil 1 Temperature
214	Shutdown	High Oil 1 Temp
219	Warning	Eng Oil Level Remote Reservoir: Least Severe Level
221	Warning	Air Pressure Sensor High
222	Warning	Air Pressure Sensor Low
223	Warning	Oil Burn Valve Sol Low
224	Warning	Oil Burn Valve Sol High
227	Warning	Sensor Supply 2 Low
228	Shutdown	Low Coolant Pressure
231	Warning	High Coolant Pressure
232	Warning	Low Coolant Pressure
233	Warning	HT Coolant Pressure Moderate Low
234	Shutdown	Crankshaft Speed High
235	Shutdown	Low Coolant Level

Code	Lamp	Displayed Message
236	Shutdown	Both Engine Speed Signals Lost
238	Warning	Sensor Supply 3 Low
239	Warning	Main Supply High
245	Warning	Fan Control Low
254	Shutdown	FSO PWM High Contorl Error
255	Warning	FSO PWM Low Control Error
259	Warning	Engine Fuel Shutoff Valve Stuck Open
261	Warning	High Fuel Temperature
263	Warning	High Fuel 1 Temperature
265	Warning	Low Fuel 1 Temperature
266	Shutdown	High Fuel Temperature
271	Warning	Low Fuel Pump Press
272	Warning	High Fuel Pump Press
281	Warning	Cylinder Press Imbalance
284	Warning	Eng Speed/Position Sensor: Voltage Below Normal
285	Warning	CAN Mux PGN Rate Error
286	Warning	CAN Mux Calibration Error
287	Warning	CAN Mux Accel Data Error
295	Warning	Key On Air Pressure Error
311	Warning	ACT1 FF Shorted HS TO LS Error
312	Warning	ACT5 Shorted HS TO LS Error
313	Warning	ACT3 RF Shorted HS TO LS Error
314	Warning	ACT6 Shorted HS TO LS Error
315	Warning	ACT2 FT Shorted HS TO LS_Error
319	Warning	RTC PWR Intr: Data Erratic Intermittent or Wrong
321	Warning	ACT4 RT Shorted HS TO LS Error
322	Warning	Inj 1 Solenoid Low Curr
323	Warning	Inj 5 Solenoid Low Curr
324	Warning	Inj 3 Solenoid Low Curr
325	Warning	Inj 6 Solenoid Low Curr
331	Warning	Inj 2 Solenoid Low Curr
332	Warning	Inj 4 Solenoid Low Curr
341	Warning	Engine Control Module Data Lost
342	Shutdown	Calibration Code Fail
343	Warning	ECM Hardware Failure
351	Warning	Injector Supply Failure

Code	Lamp	Displayed Message
352	Warning	Sensor Supply 1 Low
359	Shutdown	Fail to Start
378	Warning	Elect Fuel Inj Cntrl Valve Ckt: Curr Below Normal
379	Warning	Elect Fuel Inj Cntrl Valve Ckt: Curr Above Normal
386	Warning	Sensor Supply 1 High
394	Warning	Eng Timing Actuator Driver: Curr Below Normal
395	Warning	Eng Timing Actuator Driver: Curr Above Normal
396	Warning	Fuel Cntl Valve Solenoid Driver 2 Sensor Ckt: OC
397	Warning	Fuel Cntl Valve Solenoid Driver 2 -
398	Warning	Eng Timing Actuator Driver 2 Circuit: OC
399	Warning	Eng Timing Actuator Driver 2: Grounded Ckt
415	Shutdown	Low Oil Rifle Press
418	Warning	High H2O in Fuel
419	Warning	Intake Manifold Pres Bank Imbalance: Data Erratic
421	Derate	High Oil Temperature
422	Warning	Coolant Level Data Error
425	Warning	Oil Temperature Error
427	Warning	CAN Data Link Degraded
433	Warning	Intake Manifold Press Sensor Ckt: Data Erratic
435	Warning	Oil Pressure Switch Error
441	Warning	Low Battery 1 Voltage
442	Warning	High Battery 1 Voltage
449	Shutdown	Inj Metering 1 Press High
451	Warning	Inj Metering 1 Press High
452	Warning	Inj Metering 1 Press Low
482	Warning	Fuel Press Low: Valid But Below Normal: Mod Severe
488	Derate	High Intake Manf 1 Temp
496	Warning	Eng Speed Sensor 2 Supply Volt: Root Cause Unknown
546	Warning	Fuel Delivery Press High
547	Warning	Fuel Delivery Press Low
553	Warning	APC Pressure High
554	Warning	APC Pressure Error

Code	Lamp	Displayed Message
556	Shutdown	Crankcase Pressure High
559	Warning	Inj Metering 1 Press Low
611	Warning	Engine Hot Shut Down
686	Warning	Turbo 1 Speed Incorrect
689	Warning	Crankshaft Speed Error
697	Warning	ECM Temperature High
698	Warning	ECM Temperature Low
731	Warning	Crankshaft Mech Misalign
757	Warning	All Persistent Data Lost Error
778	Warning	EPS Backup Lost Sync Error
781	Shutdown	CAN Data Link Failure
782	Warning	SAE J1939 Data Link 2 Engine Network No Data Received – Condition Exists
783	Shutdown	Intake Manf 1 Rate Error
1117	Warning	Power Lost With Ignition On
1121	Warning	Fail To Disconnect
1122	Event	Rated To Idle Delay
1124	Warning	Delayed Shutdown
1131	Warning	Battle Short Active
1132	Warning	Controlled Shutdown
1139	Warning	UFD Injector 1 Error
1141	Warning	UFD Injector 2 Error
1142	Warning	UFD Injector 3 Error
1143	Warning	UFD Injector 4 Error
1144	Warning	UFD Injector 5 Error
1145	Warning	UFD Injector 6 Error
1219	Warning	Utility Breaker Tripped
1223	Warning	Utility Frequency
1224	Warning	Genset Overvoltage
1225	Warning	Genset Undervoltage
1226	Warning	Genset Frequency
1243	Derate	Engine Derated
1244	Shutdown	Engine Normal Shutdown
1245	Shutdown	Engine Shutdown Fault
1246	Warning	Unknown Engine Fault
1247	Shutdown	Unannounced Engine Shutdown
1248	Warning	Engine Warning
1256	Warning	Ctrl Mod ID In State Error

Code	Lamp	Displayed Message
1257	Shutdown	Ctrl Mod ID In State Fail
1312	Event	Configurable Input # 2
1317	Event	Configurable Input # 13
1318	Event	Configurable Input # 14
1322	Warning	kW Load Setpoint OOR High
1323	Warning	kW Load Setpoint OOR Low
1324	Warning	kVAR Load Setpoint OOR High
1325	Warning	kVAR Load Setpoint OOR Low
1328	Warning	Genset Breaker Tripped
1336	Shutdown	Cooldown Complete
1357	Warning	Oil Remote Level Low
1363	Warning	Intake Manf 1 Press Low
1367	Warning	High Prefilter Oil Press
1368	Warning	Low Prefilter Oil Press
1376	Warning	Camshaft Speed Error
1411	Warning	High Out Freq Adjust Pot
1412	Warning	High Droop Adjust Pot
1416	Warning	Fail To Shutdown
1417	Warning	Power Down Failure
1418	Warning	High Gain Adjust Pot
1427	Warning	Overspeed Relay Error
1428	Warning	LOP Relay Error
1429	Warning	HET Relay Error
1431	Warning	Pre-LOP Relay Error
1432	Warning	Pre-HET Relay Error
1433	Shutdown	Local Emergency Stop
1434	Shutdown	Remote Emergency Stop
1435	Warning	Low Coolant Temperature
1438	Shutdown	Fail To Crank
1439	Warning	Low Day Tank Fuel Switch
1441	Warning	Low Fuel Level
1442	Warning	Weak Battery
1443	Shutdown	Dead Battery
1444	Warning	Overload
1445	Shutdown	Short Circuit
1446	Shutdown	High AC Voltage
1447	Shutdown	Low AC Voltage
1448	Shutdown	Under Frequency

Code	Lamp	Displayed Message
1449	Warning	Over Frequency
1451	Warning	Gen/Bus Voltages Out of Calibration
1452	Warning	Genset Breaker Fail To Close
1453	Warning	Genset Breaker Fail To Open
1454	Warning	Genset Breaker Position Contact
1455	Warning	Utility Breaker Position Contact
1456	Warning	Bus Out Of Synchronizer Range
1457	Warning	Fail To Synchronize
1458	Warning	Sync Phase Rotation Mismatch Overfrequency
1459	Shutdown	Reverse Power
1461	Shutdown	Loss of Field (Reverse kVAR)
1463	Event	Not In Auto
1464	Warning	Load Dump Fault
1465	Event	Ready To Load
1469	Warning	Speed/Hz Mismatch
1471	Warning	Over Current
1472	Shutdown	Over Current
1475	Warning	First Start Backup
1483	Event	Common Alarm
1517	Shutdown	Failed Module Shutdown
1518	Warning	Failed Module Warning
1519	Warning	At Least One Module Has: Least Severe Fault
1540	Event	Common Warning
1541	Event	Common Shutdown
1548	Warning	Inj 7 Solenoid Low Curr
1549	Warning	Inj 8 Solenoid Low Curr
1551	Warning	Inj 7 Solenoid Low Curr
1552	Warning	Inj 7 Solenoid Low Curr
1553	Warning	Inj 7 Solenoid Low Curr
1554	Warning	Inj 7 Solenoid Low Curr
1555	Warning	Inj 7 Solenoid Low Curr
1556	Warning	Inj 7 Solenoid Low Curr
1557	Warning	Inj 7 Solenoid Low Curr
1573	Event	Configurable Input #1
1597	Warning	ECM Device/Component
1622	Warning	Inj 9 Solenoid Low Curr
1689	Warning	Real Time Clock Power

Code	Lamp	Displayed Message
1695	Warning	Sensor Supply 5 High
1696	Warning	Sensor Supply 5 Low
1794	Shutdown with Cooldown	Fire Detected
1843	Warning	Crankcase Press High
1844	Warning	Crankcase Press Low
1845	Warning	H2O In Fuel Sens High
1846	Warning	H2O In Fuel Sens Low
1847	Shutdown w/Cooldown	Eng Coolant Temp - Shutdown w/Cool
1852	Warning	Pre-High H2O In Fuel
1853	Warning	Annunciator Input 1 Fault
1854	Warning	Annunciator Input 2 Fault
1855	Warning	Annunciator Input 3 Fault
1866	Warning	EGR DP Autozero Error
1891	Warning	Change Oil
1893	Warning	CAN EGR Valve Comm
1894	Warning	CAN VGT Comm Error
1895	Warning	EGA DL Mismatch Error
1896	Warning	EGR DL Valve Stuck
1899	Warning	Low EGR Dif Pressure
1911	Warning	Inj Metering 1 Press High
1912	Warning	Utility Loss Of Phase
1913	Warning	Genset Loss Of Phase
1914	Warning	Utility Phase Rotation
1915	Warning	Genset Phase Rotation
1916	Event	Sync Check OK
1917	Warning	Fuel Level High
1918	Shutdown	Fuel Level Low
1933	Warning	High EGR Data Link Volt
1934	Warning	Low EGR Data Link Volt
1935	Warning	EGR DL Cmd Source Err
1942	Warning	THD AZ Error
1944	Warning	HMI 113 Out Config Error
1961	Warning	High EGR DL EDU Temp
1974	Warning	Crankcase Press High
1978	Warning	Speed Bias OOR Hi
1979	Warning	Speed Bias OOR Lo
1992	Shutdown	Crankcase Sensor High

Code	Lamp	Displayed Message
1999	Warning	Maximum Parallel Time
2185	Warning	Sensor Supply 4 High
2186	Warning	Sensor Supply 4 Low
2215	Warning	Fuel Pump Press Low
2249	Warning	APC 2 Pressure Low
2261	Warning	Fuel Pump Press High
2262	Warning	Fuel Pump Press Low
2265	Warning	High Fuel Lift Pump Volt
2266	Warning	Low Fuel Lift Pump Volt
2272	Warning	EGR DL POS Sensor Error
2273	Warning	EGR Delta P OOR High Error
2274	Warning	EGR Delta P OOR Low Error
2292	Warning	APC Flow high
2293	Warning	APC Flow Low
2311	Warning	EFI Control Valve Fail
2328	Event	Utility Available
2331	Warning	Utility Undervoltage
2332	Event	Utility Connected
2333	Event	Genset Connected
2335	Shutdown	AC Voltage Sensing Lost (Excitation Fault)
2336	Shutdown	Bad Checksum
2342	Warning	Too Long In Idle
2349	Warning	EGR DL Motor Open Error
2351	Warning	EGR DL Motor Short Error
2357	Warning	EGR DL Motor Lock Error
2358	Warning	Utility Overvoltage
2359	Warning	EGR Delta P IR High Error
2375	Warning	EGR Orifice TMPTR OOR High Error
2376	Warning	EGR Orifice TMPTR OOR Low Error
2377	Warning	High Fan Control Voltage
2396	Warning	Utility Breaker Fail To Close
2397	Warning	Utility Breaker Fail To Open
2448	Warning	Coolant Level Moderately Low
2539	Warning	High Voltage Bias
2541	Warning	Low Voltage Bias
2545	Warning	Keysw Reset Required
2555	Warning	Low GHC 1 Voltage

Code	Lamp	Displayed Message
2556	Warning	High GHC 1 Voltage
2619	Warning	Aux101 0 Input 1 Fault
2621	Warning	Aux101 0 Input 2 Fault
2622	Warning	Aux101 0 Input 3 Fault
2623	Warning	Aux101 0 Input 4 Fault
2624	Warning	Aux101 0 Input 5 Fault
2625	Warning	Aux101 0 Input 6 Fault
2626	Warning	Aux101 0 Input 7 Fault
2627	Warning	Aux101 0 Input 8 Fault
2628	Warning	Aux102 0 Expansion Input 9 Fault
2629	Warning	Aux102 0 Expansion Input 10 Fault
2631	Warning	Aux102 0 Expansion Input 11 Fault
2632	Warning	Aux102 0 Expansion Input 12 Fault
2653	Warning	Exhaust St 2 Temp High
2657	Warning	Exhaust St 1 Temp High
2661	Shutdown	At Least One Unacknowledged Most Severe Fault 0 Condition Exists
2662	Warning	At Least One acknowledged: Most Severe Fault
2678	Warning	Charging Alternator Fail
2727	Warning	Critical CEN Not Accessible Error
2738	Warning	Ether INJ Low CTRL Error
2739	Warning	Ether INJ High CTRL Error
2774	Warning	EGR DP Clogged Tubes Error
2779	Event	Utility Unloaded Event
2814	Shutdown	Genset CT Ratio Low
2815	Warning	Genset CT Ratio High
2816	Shutdown	Genset PT Ratio Low
2817	Warning	Genset PT Ratio High
2818	Warning	Bus PT Ratio Low
2819	Warning	Bus PT Ratio High
2821	Warning	Utility PT Ratio Low
2822	Warning	Utility PT Ratio High
2882	Warning	Aux101 1 Input 1 Fault
2883	Warning	Aux101 1 Input 2 Fault
2884	Warning	Aux101 1 Input 3 Fault
2885	Warning	Aux101 1 Input 4 Fault
2886	Warning	Aux101 1 Input 5 Fault
2887	Warning	Aux101 1 Input 6 Fault

Code	Lamp	Displayed Message
2888	Warning	Aux101 1 Input 7 Fault
2889	Warning	Aux101 1 Input 8 Fault
2891	Warning	Aux102 1 Expansion Input 9 Fault
2892	Warning	Aux102 1 Expansion Input 10 Fault
2893	Warning	Aux102 1 Expansion Input 11 Fault
2894	Warning	Aux102 1 Expansion Input 12 Fault
2895	Warning	PCCNet Device Failed
2896	Shutdown	Critical PCCnet Dev Fail
2914	Shutdown	Genset AC Meter Failed
2915	Warning	Gen Bus AC Meter Failed
2916	Warning	Utility AC Meter Failed
2917	Warning	Gen Bus Voltage OOR Hi
2918	Warning	Utility Voltage OOR Hi
2919	Warning	Utility Current OOR Hi
2921	Warning	Gen Bus Current OOR Hi
2922	Warning	High Genset Neutral Curr
2923	Warning	Gen Bus kW OOR Hi
2924	Warning	Gen Bus kVAR OOR Hi
2925	Warning	Gen Bus kVA OOR Hi
2926	Warning	Utility kW OOR Hi
2927	Warning	Utility kVAR OOR Hi
2928	Warning	Utility kVA OOR Hi
2931	Shutdown	Aux101 Device ID Fault
2934	Warning	High Ambient Temp
2935	Warning	Low Ambient Temp
2936	Warning	Fuel Level High
2937	Warning	Fuel Level Low
2938	Warning	Earth/Ground Fault
2939	Warning	Modbus Failure
2941	Event	Remote Shutdown Fault Reset Occurrence
2942	Warning	Shutdown Override Fail
2943	Warning	Manual Sw Config Fail
2944	Warning	Auto Switch Config Fail
2945	Warning	Rupture Basin Switch
2946	Warning	Exhaust St 2 Temp Low
2947	Warning	Exhaust St 1 Temp Low
2948	Warning	Exhaust St 2 Temp High

Code	Lamp	Displayed Message
2949	Warning	Exhaust St 1 Temp High
2951	Warning	Alternator 1 Temp High
2952	Warning	Alternator 1 Temp Low
2953	Warning	Alternator 1 Temp High
2954	Warning	Alternator 2 Temp High
2955	Warning	Alternator 2 Temp Low
2956	Warning	Alternator 2 Temp High
2957	Warning	Alternator 3 Temp High
2958	Warning	Alternator 3 Temp Low
2959	Warning	Alternator 3 Temp High
2962	Warning	EGR RPM Derate Error
2965	Event	Genset Available
2971	Warning	Test/Exercise Fault
2972	Shutdown	Field Overload
2973	Warning	Charge Press IR Error
2977	Warning	Low Coolant Level 2 Sw
2978	Warning	Low Intake Manf 1 Temp
2979	Warning	High Alternator Temp Sw
2981	Warning	High Drive Bearing Temp
2982	Warning	Low Drive Bearing Temp
2983	Warning	High Drive Bearing Temp
2984	Warning	High Free Bearing Temp
2985	Warning	Low Free Bearing Temp
2986	Warning	High Free Bearing Temp
2992	Warning	High Intake Manf 1 Temp
2993	Warning	Battery Charger Sw Fail
3131	Shutdown	Secondary Engine Overspeed
3397	Shutdown	Low Gearbox Oil Pressure – Condition Exists
3398	Shutdown	High Gearbox Oil Pressure – Condition Exists
3399	Shutdown	Differential Fault – Condition Exists
3411	Warning	DC Power Supply Fault – Condition Exists
3412	Warning	GIB Isolator Open Fault – Condition Exists
3413	Warning	Radiator Fan Trip Fault – Condition Exists
3414	Warning	Ventilator Fan Trip Fault – Condition Exists

Code	Lamp	Displayed Message
3415	Warning	Louvres Closed Fault – Condition Exists
3416	Warning	Start System Fault – Condition Exists
3417	Warning	Alternator Heater Trip Fault – Condition Exists
3457	Warning	Loss of Bus Voltage Sensing
3479	Warning	Start-Inhibit Warning Fault Event
3481	Warning	Start-Inhibit Warning Fault Event
3482	Shutdown	Start-Inhibit Shutdown Fault
3483	Shutdown	High Alternator Temperature 1 Shutdown Fault
3484	Shutdown	High Alternator Temperature 2 Shutdown Fault
3485	Shutdown	High Alternator Temperature 3 Shutdown Fault
3486	Shutdown	High Drive End Bearing Temperature Shutdown Fault
3487	Shutdown	High Non-Drive End Bearing Temp Shutdown Fault
3513	Warning	Negative Sequence Overcurrent
3599	Warning	Ground Current OOR Warning
3611	Warning	Custom Overcurrent Fault
4872	Warning	System Network Failure (PCC3300 MLD controls only)
4873	Warning	Genset Failed to Come Online (PCC3300 MLD controls only)
4874	Warning	Load Demand SW Version Incompatibility (PCC3300 MLD controls only)
4875	Warning	Genset Ineligible for Load Demand (PCC3300 MLD controls only)
4876	Warning	Genset Lost on System Network (PCC3300 MLD controls only)
4877	Warning	System Settings not Synchronized (PCC3300 MLD controls only)
4878	Warning	Check System Network Installation (PCC3300 MLD controls only)
4879	Warning	Load Demand Setup Error (PCC3300 MLD controls only)
4881	Warning	System Genset ID Conflict (PCC3300 MLD controls only)
4882	Warning	Genset Bus Overload (PCC3300 MLD controls only)
5145	Warning	Load Demand Genset Bus Failure (PCC3300 MLD controls only)
9945	Warning	Injector 6 Circuit 2 Error

Code	Lamp	Displayed Message
9946	Warning	Injector 5 Circuit 2 Error
9947	Warning	Injector 4 Circuit 2 Error
9948	Warning	Injector 3 Circuit 2 Error
9949	Warning	Injector 2 Circuit 2 Error
9951	Warning	Injector 1 Circuit 2 Error

5.5.4 Troubleshooting Procedure for Fault Codes

TABLE 15. TROUBLESHOOTING PROCEDURES FOR FAULT CODES

Fault Code	Corrective Action – (if in doubt, call your authorized service technician)
CODE: 143	Indicates engine oil pressure has dropped below the warning trip point. If the generator set is powering critical loads and cannot be shut down, wait until the next shutdown period and then follow the fault code 415 procedure.
LAMP: Warning	
MESSAGE: Low Oil Rifle Pressure	
CODE: 144	Indicates the engine has begun to overheat and engine coolant temperature has risen to an unacceptable level. Increase in load or higher ambient temperature may cause a High Coolant Temp (151) shutdown. Review fault code 151 correction list for other possible causes.
LAMP: Warning	
MESSAGE: High Coolant 1 Temp	
CODE: 145	Engine coolant temperature is below the low coolant temperature warning threshold. If the generator set is powering critical loads and cannot be shut down, wait until the next shutdown period and then follow the fault code 1435 procedure.
LAMP: Warning	
MESSAGE: Low Coolant 1 Temp	
CODE: 146	Indicates the engine is operating near cooling system capacity. Increase in load or higher ambient temperature may cause a High Coolant Temp (151) shutdown. Review fault code 151 correction list for other possible causes.
LAMP: Derate	
MESSAGE: Pre-High Engine Coolant Temperature	
CODE: 151	Indicates the engine has overheated (coolant temperature has risen above the shutdown trip point or coolant level is low). Allow the engine to cool down completely before proceeding with the following checks:
LAMP: Shutdown	
MESSAGE: High Coolant Temp	<ol style="list-style-type: none"> 1. Look for possible coolant leakage points and repair if necessary. Check the coolant level and replenish if low. 2. Check for obstructions to cooling airflow and correct as necessary. 3. Check the fan belt and repair or tighten if necessary. 4. Check the blower fan and circulation pumps on remote radiator installations. 5. Reset the control and restart after locating and correcting the problem.
CODE: 155	Indicates the engine has overheated (intake manifold temperature has risen above the shutdown trip point). Large load or high ambient temperature may be the cause. Review fault code 151 correction list for other possible causes.
LAMP: Shutdown	
MESSAGE: High Intake Manf 1 Temp	

Fault Code	Corrective Action – (if in doubt, call your authorized service technician)
CODE: 196 LAMP: Warning MESSAGE: Low Coolant 1 Level	Indicates engine coolant level has fallen below the trip point. If the generator is powering critical loads and cannot be shut down, wait until the next shutdown period. If the engine can be stopped, allow the engine to cool down completely before proceeding: 1. Look for possible coolant leakage points and repair if necessary. Check coolant level and replenish if low. 2. Reset the control and restart after locating and correcting the problem.
CODE: 197 LAMP: Warning MESSAGE: Low Coolant Level	Indicates the engine coolant level has fallen below the trip point. If the generator is powering critical loads and cannot be shut down, wait until the next shutdown period. If the engine can be stopped, allow the engine to cool down completely before proceeding: 1. Look for possible coolant leakage points and repair if necessary 2. Check coolant level and replenish if low. 3. Reset the control and restart after locating and correcting the problem.
CODE: 235 LAMP: Shutdown MESSAGE: Low Coolant Level	Low Coolant Level input is active and the threshold response is set to Shutdown. Allow the engine to cool down completely before proceeding: 1. Look for possible coolant leakage points and repair if necessary. 2. Check the coolant level and replenish if low. 3. Reset the control and restart after locating and correcting the problem.
CODE: 359 LAMP: Shutdown MESSAGE: Fail To Start	Indicates a possible fault with the control or starting system (engine cranks but fails to start). Allow the engine to cool down completely before proceeding with the following checks: 1. Check for an empty fuel tank, fuel leaks, or blocked fuel lines and correct as required. 2. Check for a dirty fuel filter and replace if necessary. 3. Check for a dirty or blocked air filter and replace if necessary. 4. Clean and tighten all battery cable connections. 5. Discharged or defective battery. Recharge or replace. 6. Reset the control and restart after correcting the problem.
CODE: 415 LAMP: Shutdown MESSAGE: Low Oil Rifle press	Indicates the engine oil pressure has dropped below the shutdown trip point. Allow the engine to cool down completely before proceeding with the following checks: 1. Check the oil level, lines and filters. 2. If the oil system is OK but the oil level is low, replenish. 3. Reset the control and restart after locating and correcting the problem.
CODE: 427 LAMP: Warning MESSAGE: CAN Data Link Degraded	Communication between the engine control (ECM) and the PCC is severed. Allow the engine to cool down completely before proceeding: 1. Ensure the E-Stop button is not active. Reset the Local/Remote Emergency Stop.
CODE: 441 LAMP: Warning MESSAGE: Low Battery 1 Voltage	Indicates battery voltage is below 24 VDC and is approaching a low level at which unpredictable operation will occur. If the engine can be stopped, allow the engine to cool down completely before proceeding: 1. Clean battery terminals and tighten all connections. 2. Check the electrolyte level, top up and re-charge (if applicable) 3. Discharged or defective battery. Recharge or replace.

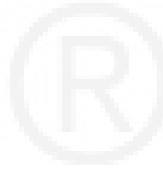
Fault Code	Corrective Action – (if in doubt, call your authorized service technician)
CODE: 442	Indicates the battery voltage to the control is approaching a high level (exceeding 32 VDC) at which damage to the control can occur. If the engine can be stopped, allow the engine to cool down completely before proceeding: <ol style="list-style-type: none"> 1. Clean the battery terminals and tighten all connections 2. Check the battery charge float level if applicable (lower float level).
LAMP: Warning	
MESSAGE: High Battery 1 Voltage	
CODE: 488	Indicates the engine has overheated (intake manifold temperature has risen above the shutdown trip point). Large load or high ambient temperature may be the cause. Review fault code 151 correction list for other possible causes.
LAMP: Derate	
MESSAGE: High Intake Manf 1 temp	
CODE: 611	Indicates that an engine hot shutdown has occurred (cooldown timers were bypassed). This condition will occur when the operator presses the Emergency Switch or presses the Stop button before the generator set completes the cooldown operation. (Generator set should run at 10% or less load for three minutes before engine shutdown). This type of hot shutdown should be avoided; it can cause possible loss of performance and engine damage.
LAMP: Warning	
MESSAGE: Engine Hot Shut Down	
CODE: 781	Communication between the engine control (ECM) and the PowerCommand® 3.3 control has been severed. <ol style="list-style-type: none"> 1. Ensure the E-Stop button is not active. Reset the Local/Remote Emergency Stop.
LAMP: Shutdown	
MESSAGE: CAN Data Link Failure	
CODE: 1131	Indicates that the control is in Battle Short mode (used to bypass several fault shutdowns therefore allowing generator set operation during emergencies). <ol style="list-style-type: none"> 1. If possible, investigate any fault codes that are being bypassed.
LAMP: Warning	
MESSAGE: Battle Short Active	
CODE: 1312, 1317, and 1318	The nature of the fault is an optional customer selection – configurable input #. Example inputs: Low Fuel Day Tank, Water In Fuel, Ground Fault, etc. Each of the fault functions can be programmed using InPower service tool or by accessing the Setup menu. If the engine can be stopped, allow the engine to cool down completely before proceeding: <ol style="list-style-type: none"> 1. Check the Input # requirements and correct if possible.
LAMP: Event	
MESSAGE: Configurable Input #2, 13, and 14	
CODE: 1416	Records (in the Fault History log) a bypassed shutdown fault while the generator set was in Battle Short mode (this is used to bypass several critical fault shutdowns therefore allowing generator set operation during emergencies). <ol style="list-style-type: none"> 1. Event/fault 1416 has been activated as a result of another active shutdown fault while the PowerCommand® 3.3 control is operating in Battle Short mode. If possible, troubleshoot this shutdown fault that is causing the generator set to shut down.
LAMP: Warning	
MESSAGE: Fail To Shutdown	
CODE: 1433/1434	Indicates a local or remote Emergency Stop has been activated. Emergency Stop shutdown status can be reset only at the local control panel. Allow the engine to cool down completely before proceeding with the following checks: <ol style="list-style-type: none"> 1. After locating and correcting problem, reset the local/remote Emergency Stop button as follows: <ol style="list-style-type: none"> a. De-activate (disable) the emergency stop button. b. Press the Stop button. c. Press the Reset button. d. Select the desired operating mode (manual or auto). 2. Check the Emergency Stop button is working correctly
LAMP: Shutdown	
MESSAGE: Local Emergency Stop/Remote Emergency Stop	

Fault Code	Corrective Action – (if in doubt, call your authorized service technician)
CODE: 1435	Indicates the engine coolant heater is not operating or is not circulating coolant. If the engine can be stopped, allow the engine to cool down completely before proceeding with the following checks:
LAMP: Warning	
MESSAGE: Low Coolant Temperature	<p>1. The coolant heater is not connected to a power supply. Check for a blown fuse or disconnected heater cable and correct as required.</p> <p>2. Look for possible coolant leaks and repair as required.</p> <p>3. Check for low coolant level and replenish if required.</p> <p>Generator set is not operating. This warning occurs when the engine coolant temperature is 21 °C (70 °F) or lower.</p>
	NOTICE
	In applications where the ambient temperature falls below 4 °C (40 °F), Low Coolant Temp may be indicated even though the coolant heaters are operating.
CODE: 1438	Indicates a possible fault with the control, speed sensing, or starting system. Allow the engine to cool down completely before proceeding with the following checks:
LAMP: Shutdown	
MESSAGE: Fail To Crank	<p>1. Indicates a possible fault with the control, speed sensing, or starting system. See code 441 for corrective action</p> <p>2. Ensure the Emergency Stop button is disengaged.</p>
CODE: 1439	Indicates the day tank fuel supply is running low. If the engine can be stopped, allow engine to cool down completely before proceeding with the following checks:
LAMP: Warning	
MESSAGE: Low Day Tank Fuel Switch	<p>1. Look for possible fuel leaks and repair as required.</p> <p>2. Check for low fuel level and replenish if required.</p>
CODE: 1441	Indicates the fuel level has gone below the threshold setting for the low fuel level against the time setting. If the engine can be stopped, allow the engine to cool down completely before proceeding with the following checks:
LAMP: Warning	
MESSAGE: Low Fuel Level	<p>1. Look for possible fuel leaks and repair as required.</p> <p>2. Check for low fuel level and replenish if required.</p>
CODE: 1442	Indicates that, during cranking, the battery voltage is at, or below the weak battery warning trip point for a time greater than, or equal to the weak battery set time. If the engine can be stopped, allow the engine to cool down completely before proceeding with the following checks:
LAMP: Warning	
MESSAGE: Weak Battery	<p>1. See code 441.</p>
CODE: 1443	During cranking, the battery voltage has dropped below the operating voltage of the PowerCommand® 3.3 control, which resets the PowerCommand® 3.3 control. After three consecutive resets, event/fault code 1443 becomes active. If the engine can be stopped, allow the engine to cool down completely before proceeding with the following checks:
LAMP: Shutdown	
MESSAGE: Dead Battery	<p>1. See code 441.</p>
CODE: 1448	Indicates that the generator set frequency has dropped below 90% of nominal for approximately ten seconds. Allow the engine to cool down completely before proceeding with the following checks:
LAMP: Shutdown	
MESSAGE: Under Frequency	<p>1. Check the fuel supply.</p> <p>2. Check the air intake supply.</p> <p>3. Check the load and correct any overload.</p>

CODE: 1449	Indicates that the generator set frequency has exceeded the Over Frequency threshold for the set time parameter. Allow the engine to cool down completely before proceeding with the following checks:
LAMP: Shutdown	
MESSAGE: Over Frequency	<ol style="list-style-type: none"> 1. Check the fuel supply. 2. Check the air intake supply. 3. Check the load and correct any overload.
CODE: 1852	Indicates that the water in the fuel is above normal and has reached the warning trip point. If the engine can be stopped, allow the engine to cool down completely before proceeding with the following checks:
LAMP: Warning	
MESSAGE: Pre-High H2O In Fuel	<ol style="list-style-type: none"> 1. Check fuel in tank (local or remote). 2. Drain and re-fill if necessary. Be aware of all Health and Safety, and environmental issues if draining tank.
CODE: 2977	Indicates the engine coolant level, in the second radiator, has fallen below the trip point. If the generator is powering critical loads and cannot be shut down, wait until the next shutdown period. If the engine can be stopped, allow the engine to cool down completely before proceeding:
LAMP: Warning	
MESSAGE: Low Coolant 2 Level	<ol style="list-style-type: none"> 1. Look for possible coolant leakage points and repair if necessary. Check coolant level and replenish if low. 2. Reset the control and restart after locating and correcting the problem.
CODE: 3416	Refer to fault codes 359 and 1438
LAMP: Warning	
MESSAGE: Start System Fault – Condition Exists	



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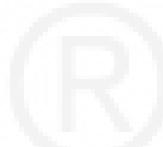


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