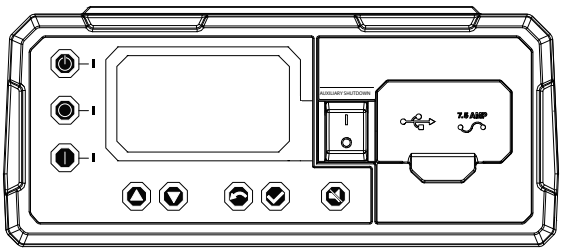
GENERAC®

Owner's Manual

Power Zone 410® Controller



SAVE THIS MANUAL FOR FUTURE REFERENCE

⚠ CALIFORNIA WARNING

This product can expose you to chemicals including 1,3–butadiene, a carcinogen and reproductive toxicant, which are known to the State of California to cause cancer and birth defects or other reproductive harm. For more information, go to: www.p65warnings.ca.gov

(W000809)

Table of Contents

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Section 1: Introduction and Safety

Introduction

Thank you for purchasing a Generac Power Systems Inc. product. This unit has been designed to provide high performance, efficient operation, and years of use when maintained correctly.

The information in this manual is accurate based on products produced at the time of publication. The manufacturer reserves the right to make technical updates, corrections, and product revisions at any time without notice.

Power Zone® is a registered trademark of GENERAC MOBILE PRODUCTS, LLC.

Safety Rules

The manufacturer cannot anticipate every possible circumstance that might involve a hazard. The warnings in this manual, and on tags and decals affixed to the unit are, therefore, not all inclusive. If using a procedure, work method or operating technique that the manufacturer does not specifically recommend, verify that it is safe for others. Also make sure the procedure, work method or operating technique utilized does not render the equipment unsafe.

Throughout this publication, and on tags and decals affixed to the unit, DANGER, WARNING, CAUTION and NOTE blocks are used to alert personnel to special instructions about a particular operation that may be hazardous if performed incorrectly or carelessly. Observe them carefully. Their definitions are as follows:

⚠DANGER

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

(D000001)

⚠WARNING

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

(W000002)

⚠CAUTION

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

(C000003)

NOTE: Notes contain additional information important to a procedure and will be found within the regular text of this manual.

These safety warnings cannot eliminate the hazards that they indicate. Common sense and strict compliance with the special instructions while performing the action or service are essential to preventing accidents.

General Hazards

DANGER

Asphyxiation. Running engines produce carbon monoxide, a colorless, odorless, poisonous gas. Carbon monoxide, if not avoided, will result in death or serious injury.

(D000103)

DANGER

Loss of life. Property damage. Installation must always comply with applicable codes, standards, laws and regulations. Failure to do so will result in death or serious injury.

(D000190)

WARNING

Moving Parts. Keep clothing, hair, and appendages away from moving parts. Failure to do so could result in death or serious injury.

(W000111)

WARNING

Moving Parts. Do not wear jewelry when starting or operating this product. Wearing jewelry while starting or operating this product could result in death or serious injury.

(W000115)

WARNING

Sudden start-up. Always set the safety disconnect switch to MANUAL before working on equipment. Failure to do so could result in death or serious injury.

(W000194)

WARNING

Personal Injury. Do not insert any object through the air cooling slots. Generator can start at any time and could result in death, serious injury, and unit damage.

(W000142)

WARNING

Vision Loss. Eye goggles are required to be worn when using this machine. Failure to wear eye goggles could result in permanent vision loss.

(W000101)

WARNING

Vision loss. Eye protection is required when servicing unit. Failure to do so could result in vision loss or serious injury.

(W000377)

WARNING

Hearing Loss. Hearing protection is recommended when using this machine. Failure to wear hearing protection could result in permanent hearing loss.

(W000107)

WARNING

Equipment damage. Only qualified service personnel may install, operate, and maintain this equipment. Failure to follow proper installation requirements could result in death, serious injury, and equipment or property damage.

(W000182)

WARNING

Risk of Burn. Use protective gloves when handling hot parts. Failure to do so could result in serious injury.

(W000386)

WARNING

Hot Surfaces. When operating machine, do not touch hot surfaces. Keep machine away from combustibles during use. Hot surfaces could result in severe burns or fire.

(W000108)

WARNING

Risk of injury. Do not operate or service this machine if not fully alert. Fatigue can impair the ability to service this equipment and could result in death or serious injury.

(W000215)

WARNING

Asphyxiation. Always use a battery operated carbon monoxide alarm indoors and installed according to the manufacturer's instructions. Failure to do so could result in death or serious injury.

(W000178)

⚠CAUTION

Equipment or property damage. Do not block air intake or restrict proper air flow.Doing so could result in unsafe operation or damage to unit.

(C000229)

Fire and Explosion Hazards

⚠DANGER

Explosion and fire. Fuel and vapors are extremely flammable and explosive. No leakage of fuel is permitted. Keep fire and spark away. Failure to do so will result in death or serious injury.

(D000192)

⚠WARNING

Risk of Fire. Hot surfaces could ignite combustibles, resulting in fire. Fire could result in death or serious injury.

(W000110)

Electrical Hazards

⚠DANGER

Electrocution. In the event of electrical accident, immediately shut power OFF. Use non-conductive implements to free victim from live conductor. Apply first aid and get medical help. Failure to do so will result in death or serious injury.

(D000145)

⚠DANGER

Electrocution. Water contact with a power source, if not avoided, will result in death or serious injury.

(D000104)

⚠DANGER

Electrocution. Contact with bare wires, terminals, and connections while generator is running will result in death or serious injury.

(D000144)

⚠DANGER

Electrocution. Verify electrical system is properly grounded before applying power. Failure to do so will result in death or serious injury.

(D000152)

⚠WARNING

Electrical shock. Disconnect battery ground terminal before working on battery or battery wires. Failure to do so could result in death or serious injury.

(W000164)

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Section 2: General Information

Introduction

The Power Zone 410 Control Panel is an electronic control box which functions as an advanced standby generator controller.

Specialized programs are built into the Power Zone 410 Control Panel to allow customers to configure spare I/O (inputs/outputs) to their own needs. Some pre-defined functions can be user customized from measurements to alarms to special functionality.

Features

The Generac Power Zone Digital Control Platform is a fully integrated and multipurpose family of controllers for Generac's generator systems.

Standard Features

- 128 x 64 Graphical Display with Heater
- Multi-Lingual
- Full System Status
- Three-Phase Sensing Digital Voltage Regulator
- Full Range Standby Operation
- Full System Status
  - Three-Phase AC Volts
  - Three-Phase Amps
  - kW
  - Power Factor
  - Oil Pressure
  - Water Temperature
  - Oil Temperature*
  - Oil Level*
  - Fuel Pressure and Level
  - Engine Speed
  - Battery Voltage
  - Alternator Frequency
  - Time
  - Date
  - Line Power and Gen Power
  - Run Hours
  - Service Reminders
  - Fault History (Alarm Log)
- Remote Communications
- Programmable Auto Crank
- Emergency Stop
- On/Off Manual Switch
- Not in Auto Flashing Light
- Selectable Low Speed Exercise
- NFPA 110 Capable**
- 5 A Integrated Battery Charger***

Standard Protections

- Low Oil Pressure
- Low Coolant Level
- High/Low Coolant Temperature
- Oil Temperature
- Over/Under Speed
- Over/Under Voltage
- Over Frequency
- Over Current
- Over Load
- Battery Voltage
- Battery Charger Current
- Phase-to-Phase and Phase-to-Neutral Short Circuits (I^2T Algorithm)
- Ground Fault*
- Electrical Fan Protection*
- Loadshed*
- Field Calibration for Voltage and Current

* If equipped; when available

** See modular NFPA 110 components section

*** Operation disabled when optional 10A Battery Charger is installed

Display

- Easy Menu Structure
- Multi-Lingual
- On Screen Editable Parameters
- Key Function Monitoring
  - Three-Phase Voltage, Amperage, kW, kVa, and kVAr
  - Average or Line to Neutral Voltage Measurements
  - Frequency
  - RPM
  - Engine Coolant Temperature

- Engine Oil Pressure
- Engine Oil Temperature
- Battery Voltage
- Warning and Alarm Indication
- Diagnostics
- Maintenance Events/Information
- Hourmeter

Control Panel

- AUTO/OFF/MANUAL
  - Operation Through Onboard Buttons or Optional Key Switch
  - Indication Through Display Screen and LEDs
- Audible Alarm and SILENCE†
- Auxiliary Shutdown Rocker Switch
- Not in AUTO Indication

† If equipped; see modular NFPA 110 components section.

Voltage Regulation (Single or Three-Phase Module Options)

- Digital Control
- Three-Phase Sensing
- Variable V/F Slope Settings
- Negative Power Limit
- Loss of Sensing Protection
- Fault Protection (I2T Function)
- High Voltage Limit
- Low Voltage Limit
- Maximum Power Limit
- ±0.5% Voltage Regulation
- ±0.5% Stability
- Governor Functionality
- Speed Control through ECM Integration
- Soft Start Ramping (Multiple Steps)

Communication Ports

- 2 RS-232
- 2 RS-485
- 1 CANBus

Qualification Testing

- Life Test in Environmental Chamber
- Temperature Rating -40 °C to +70 °C
- Vibration Tested and Protected

Connections ‡

- 16 Analog Inputs
- 6 AC Voltage Sensing Inputs
- 3 CT Inputs
- 30 Digital Inputs
- 17 Digital Outputs
- Comms Ports
  - 1 CANbus Port
  - 1 USB Port (for Configuration Transfer and Firmware Upgrades)
  - 1 RS-485 Modbus Master Port (for External RAP/RRP/External I/O Modules)
  - 1 RS-485 Modbus Slave Port (for other uses, e.g. Building Management)
  - 2 RS-232 Communication Ports

‡ Actual I/O may vary due to configuration.

Codes And Standards

- UL 6200
- CE
- NFPA 110 Capable

Modular NFPA 110 Components§

- Remote Annunciator
- NFPA Accessory Module
  - Key Switch
  - Alarm Horn
  - Emergency Stop
- 10A External Battery Charger

NOTE: When equipped, the Key Switch will function in replacement of the AUTO, OFF, and MANUAL mode buttons. Buttons A, B, and C as seen in ***Figure 2-3*** will be inoperable.

§ If equipped; not standard on all models

Panel Setup

The Power Zone 410 Control Panel controller is setup in the factory to match the product it is shipped with and generally no changes are required. For spares purposes the controller can be re-configured in the field using Display functions.

To change the function of the panel, the only way to get a basic setup for a product is to use the controller's display. This will setup all the basic parameters and just leave customization and calibration to be done. Contact an Industrial Authorized Service Dealer (IASD) for other customizations not available through the display.

Below are examples of some of the configurations adjustable using the display:

- Setting Display Contrast
- Setting System Time and Date
- Setting Up/Enabling Internal Exercise

Customization

Other customization and calibrations are done through configuration files. Configuration files are generated at the factory and not all are accessible using the controller.

Engine Management

The engine management module is very similar to that used in the manufacturer's other products. It controls engine cranking, engine starting, engine running, and engine stopping. These functions are performed to a set of “rules.”

NOTE: The engine management module is ECM dependent and may vary.

Engine Definition

- **Preheat Time** - The time preheat is applied for before cranking if enabled.
- **Start Detection RPM** - The engine must reach this rpm before disengaging the starter.
- **Crank Time** - The maximum time in seconds which each crank will last.
- **Alarm Hold-off Time** - The time after starting at which the hold-off alarms become enabled.
- **Engine Warm Up Time** - The engine will run for at least this time before issuing the “Accept load” signal.
- **Target Frequency** - The target generator frequency (Hz).
- **Target Voltage** - The target generator voltage (V rms).
- **Preheat Enable** - The following four options are selectable (only for diesel):
  - Preheat disabled
  - Preheat before cranking
  - Preheat during cranking
  - Preheat before and during cranking
- **Engine Cool Down Time** - The generator will run for the programed amount of time after remote start becomes inactive.
- **Pause Between Cranks Time** - The time between each successive crank operation.
- **Number of Start Attempts** - The maximum number of times the engine will attempt to start (crank) before faulting out with overcrank.
- **Load Accept Frequency** - The generator must reach this frequency before issuing the “Accept load” signal.
- **Load Accept Voltage** - The generator must reach this voltage before issuing the “Accept load” signal.

Table 2-1. Engine Settings

Parameter	Units
Preheat Time	(S)econds
Start Detection RPM	RPM
Crank Time	S
Alarm Hold-Off Time	S
Engine Warm Up Time	S
Target Frequency	Hz
Target Voltage	V rms
Preheat Enable	-
Engine Cool Down Time	S
Pause Between Cranks Time	S
Number of Start Attempts	-
Load Accept Frequency	Hz
Load Accept Voltage	V rms

Starting and Stopping Sequence Diagrams

NOTE: Shutdown alarms will cause the engine to turn off or not start.

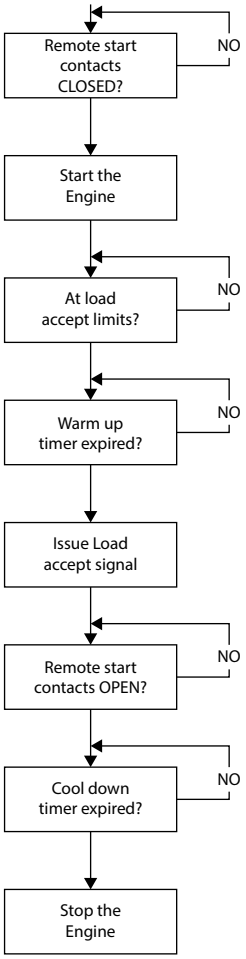

Figure 2-1. 2-Wire Starting and Stopping Sequence Key Switch in AUTO Position

NOTE: A remote start signal will terminate exercise and proceed to normal running mode.

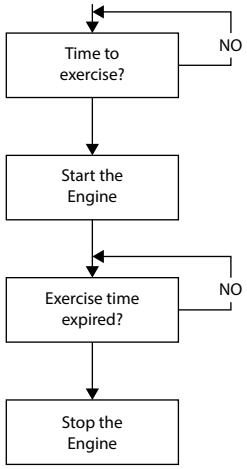

Figure 2-2. Exercise Without Transfer Starting and Stopping Sequence Key Switch in AUTO Position

NOTE: Shutdown alarms will cause the engine to turn off or not start.

Controller

See ***Figure 2-3***. The controller consists of an LCD and buttons to navigate through screens, make selections, and start or stop the generator.

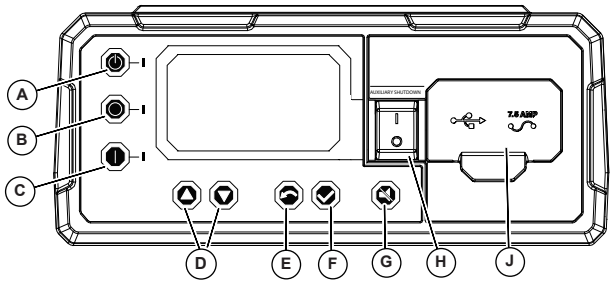

Figure 2-3. Front Panel Display

A	AUTO mode
B	OFF mode
C	MANUAL mode
D	Navigation arrows
E	ESCAPE
F	ENTER
G	SILENCE
H	Generator Emergency shutdown
J	USB port and 7.5 A fuse

Navigation

Use the navigation arrows ( ) to navigate between the screens. Use the ESCAPE button ( ) to go back to

the previous screen or selection and use the ENTER button ( ) to confirm a selection.

Screens

See ***Figure 2-4***. There are six screen types which contain all available pages. Each page may contain sub-pages containing additional information or settings to modify.

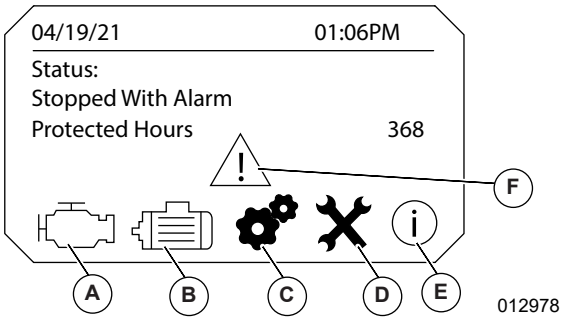

Figure 2-4. Home Screen

A	***Engine Screen***
B	***Power Screen***
C	***Setting Screen***
D	***Dealer Screen***
E	***Info Screen***
F	***Alarm Screen***

NOTE: The Dealer Screen can only be accessed using credentials.

NOTE: Any data or values shown on the screens throughout this manual are for reference only.

Install Wizard Screens

The Wizard Screens are displayed at controller start-up only in following cases:

- Unit is not activated.
- User initiated factory reset (remote Modbus command or through dealer edit menu).
- User initiated reboot to power-up wizard command (remote Modbus command or through dealer edit menu).

See ***Figure 2-5***. Use page 1 to set the language for the screens.

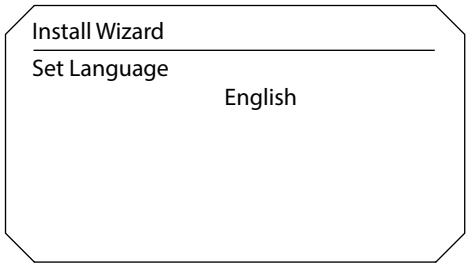

Figure 2-5. Install Wizard Screen (Page 1)

See ***Figure 2-6***.

1. Use page 2 to select whether a configuration is to be loaded.
2. If configuration is to be loaded, once selecting Yes and inserting the USB flash drive, the available configuration files on the USB flash drive will display.
3. Select the correct configuration file and press Enter.

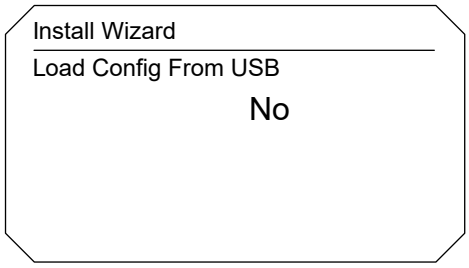

Figure 2-6. Install Wizard Screen (Page 2)

See ***Figure 2-7***. This screen will display only if the unit is not activated. Use page 3 to activate the unit or choose to run in MANUAL mode ( ) only. Activation is required to run the unit in AUTO mode ( ).

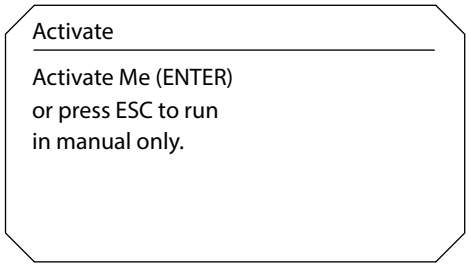

Figure 2-7. Install Wizard Screen (Page 3)

See ***Figure 2-8***. This screen will display only if the unit is not activated. Use page 4 to enter the unit serial number and activation code. See the unit owner's manual to locate the unit serial number. The activation code can be obtained at ***www.activategen.com***

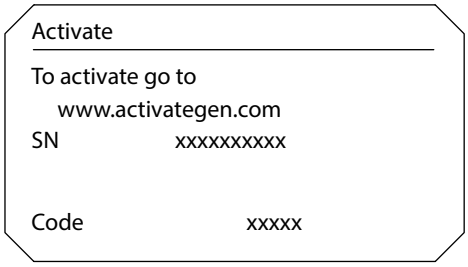

Figure 2-8. Install Wizard Screen (Page 4)

See ***Figure 2-9***. Page 5 will display only if an incorrect activation code was entered. Three attempts are given to enter the correct code.

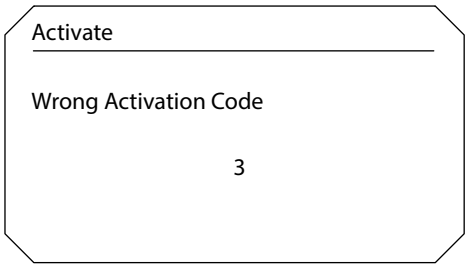

Figure 2-9. Install Wizard Screen (Page 5)

See ***Figure 2-10***. Use page 6 to set the date and time to appear on the Home Screen.

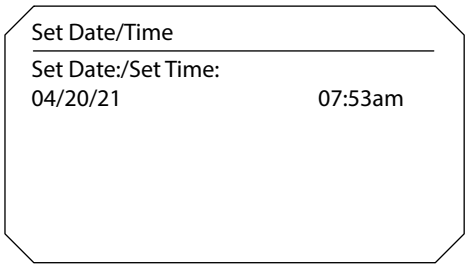

Figure 2-10. Install Wizard Screen (Page 6)

See ***Figure 2-11***. This screen will display only if Vcode settings have never been set. Use page 7 to set the fuel type to liquid propane or natural gas.

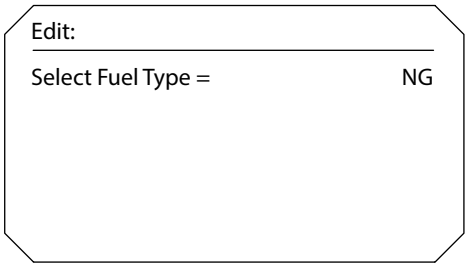

Figure 2-11. Install Wizard Screen (Page 7)

See ***Figure 2-12***. This screen will display only if Vcode settings have never been set. Use page 8 to configure quiet test, set exercise time and duration, and transfer frequency.

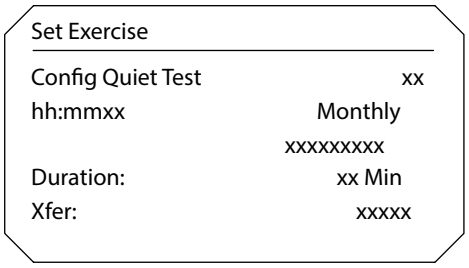

Figure 2-12. Install Wizard Screen (Page 8)

Engine Screen

The pages within the Engine Screen contain information for viewing only. Use the navigation arrows ( ) to navigate between the screens.

See ***Figure 2-13***. Page 1 displays the generator RPM, coolant level, coolant temperature, and unit run time.

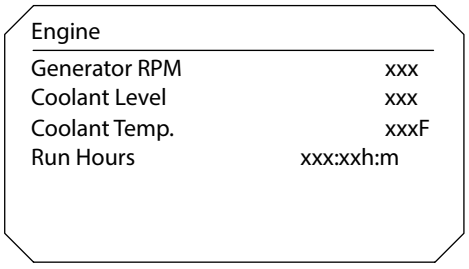

Figure 2-13. Engine Screen (Page 1)

See ***Figure 2-14***. Page 2 displays the engine oil temperature, oil pressure, oil level ("N/A" is displayed instead of "xxx %" when oil sensor is not detected), and fuel level ("Fuel Level" is displayed for diesel units, "Gas Pressure" is displayed for propane and natural gas units).

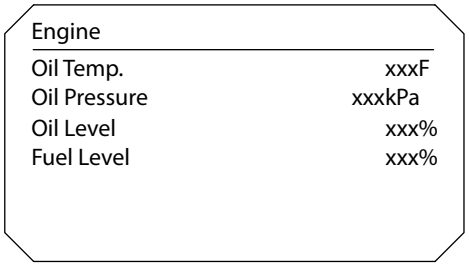

Figure 2-14. Engine Screen (Page 2)

See ***Figure 2-15***. Page 3 displays the battery volts, internal battery charge amps, external battery charger status (OFF = not connected, ON = connected), and battery condition for the battery charger.

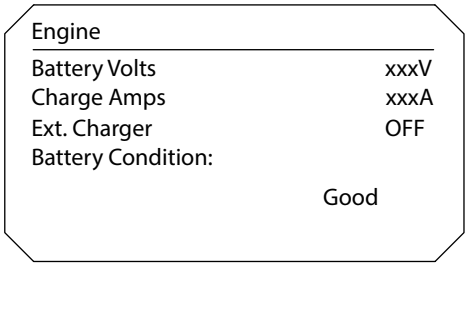

Figure 2-15. Engine Screen (Page 3)

Power Screen

See ***Figure 2-16***. Page 1 displays the measured phase-to-neutral voltages and calculated average phase-to-phase voltage.

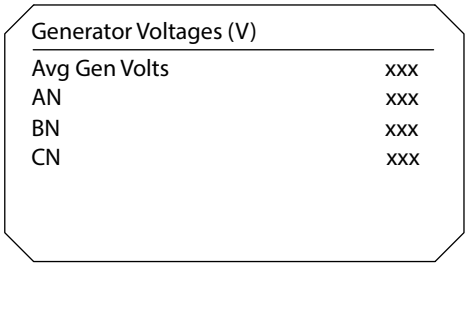

Figure 2-16. Power Screen (Page 1)

See ***Figure 2-17***. Page 2 displays average generator current in Amps.

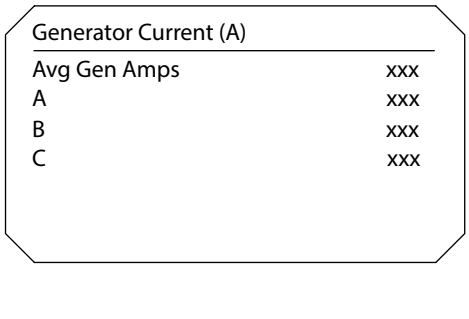

Figure 2-17. Power Screen (Page 2)

See ***Figure 2-18***. Page 3 displays the generator kW, kVA, kVAR, and power factor.

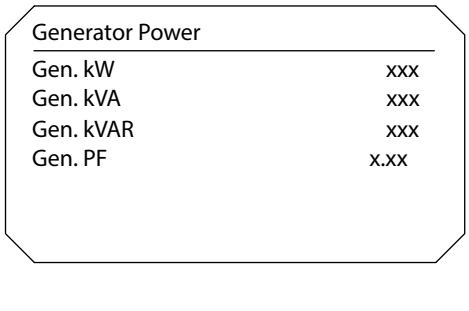

Figure 2-18. Power Screen (Page 3)

See ***Figure 2-19***. Page 4 displays the measured phase-to-neutral voltages and calculated average phase-to-phase voltage.

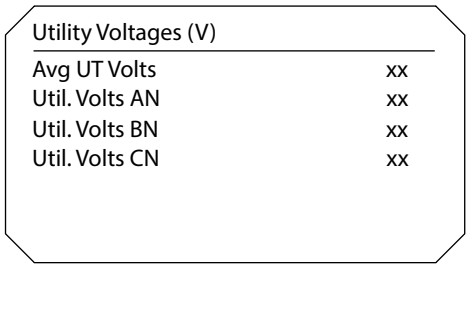

Figure 2-19. Power Screen (Page 4)

See ***Figure 2-20***. Page 5 displays total kWh, last kWh, and generator Hz.

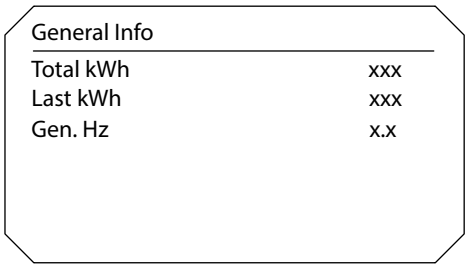

Figure 2-20. Power Screen (Page 5)

Setting Screen

The pages within the Setting Screen contain settings which can be modified by the user. See ***Modify a Page Setting*** to modify a page setting.

See Figure ***Figure 2-21***. Use page 1 to adjust unit voltage, and set language, date/time, and exercise schedule.

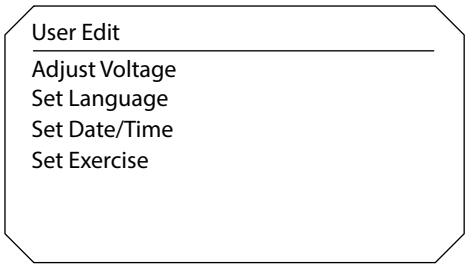

Figure 2-21. Setting Screen (Page 1)

See ***Figure 2-22***. Use page 2 to update firmware, set a startup delay timer, set a warmup timer, and select fuel type.

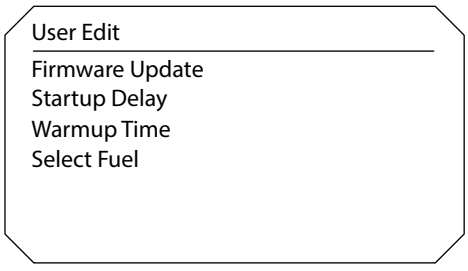

Figure 2-22. Setting Screen (Page 2)

See ***Figure 2-23***. Use page 3 to view when the next battery maintenance is due, perform a lamp test, and enable or disable Chicago code.

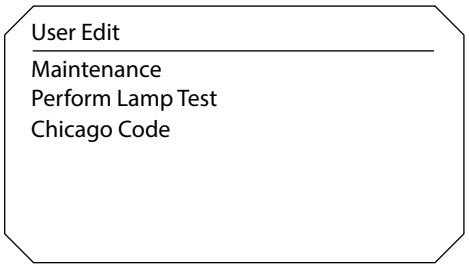

Figure 2-23. Setting Screen (Page 3)

See ***Figure 2-24***. Use page 4 to change the LCD brightness and contrast.

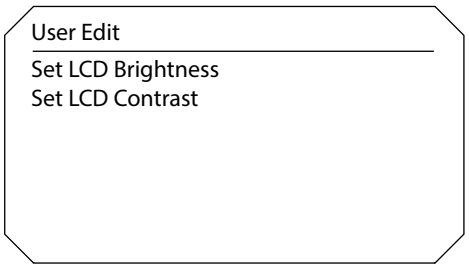

Figure 2-24. Setting Screen (Page 4)

Dealer Screen

The Dealer Screen and sub-pages require credentials to access and contain settings which can be modified only by the dealer or factory. Contact an IASD to modify any settings not shown in the User menus.

"Gateway" Sub-Pages

See ***Figure 2-25***. Use page 1 to view the status of the Gateway and Ethernet. Page 1 is also used to perform a factory reset for the Gateway, enable or disable Restore Dflt Nw Configuration, enable or disable wired or wireless network, and to view the Gateway IP address.

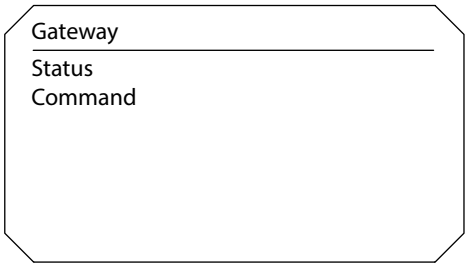

Figure 2-25. Gateway (Page 1)

Info Screen

The pages within the Info Screen contain information for viewing only. Use the navigation arrows ( ) to navigate between the screens.

See ***Figure 2-26***. Page 1 displays the alarm log, run log, maintenance log, and general information about the generator, battery condition, hardware/firmware version, and I/O Extender versions.

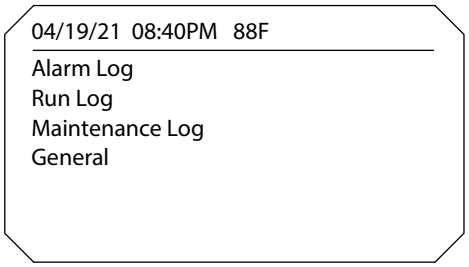

Figure 2-26. Info Screen (Page 1)

"Alarm Log" Sub-Page

See ***Figure 2-27***. Use this page to view a list of alarms and warnings which have been triggered organized by time and date.

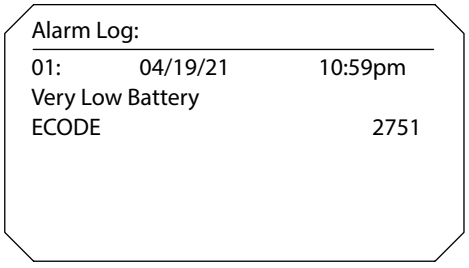

Figure 2-27. Alarm Log

"Run Log" Sub-Page

See ***Figure 2-28***. Use this page to view a list of run occurrences organized by time and date.

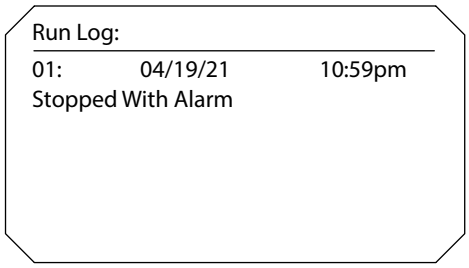

Figure 2-28. Run Log

"Maintenance Log" Sub-Page

See ***Figure 2-29***. Use this page to view a list of maintenance occurrences organized by time and date.

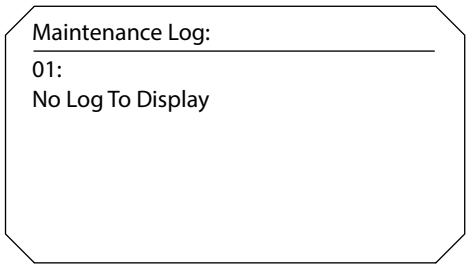

Figure 2-29. Maintenance Log

"General Info" Sub-Pages

See ***Figure 2-30***. Use page 1 to view generator status, serial number, and run hours.

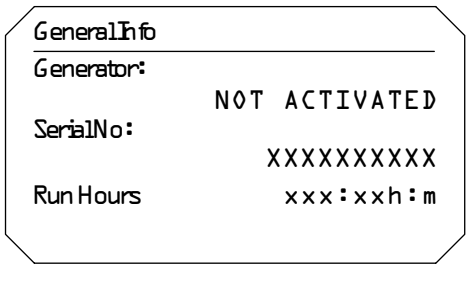

Figure 2-30. General Info (Page 1)

See ***Figure 2-31***. Use page 2 to view battery condition.

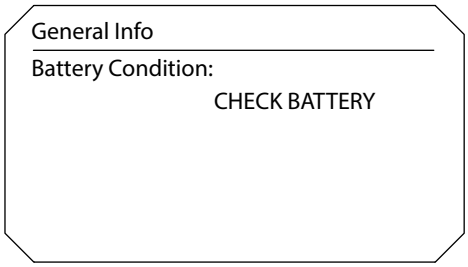

Figure 2-31. General Info (Page 2)

See ***Figure 2-32***. Use page 3 to view the currently installed versions of hardware, bootloader, firmware, and firmware build.

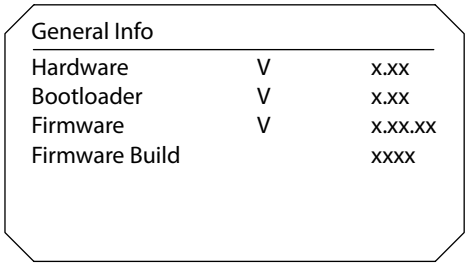

Figure 2-32. General Info (Page 3)

See ***Figure 2-33***. Use page 4 to view the currently installed versions of the Engine Control Unit (ECU) and Electronically Erasable Programmable Read-only Memory (EEPROM). The ECU version will display as "Unknown" if controller doesn't receive version from ECU. It will display as "N/A" if unit is not configured for ECU.

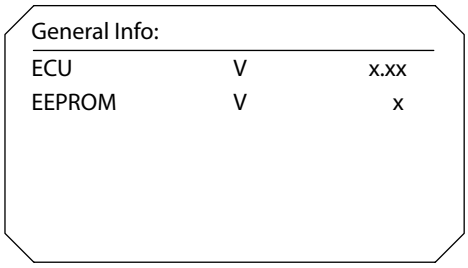

Figure 2-33. General Info (Page 4)

See ***Figure 2-34***. Use page 5 to view the currently installed versions of I/O Extender hardware and firmware.

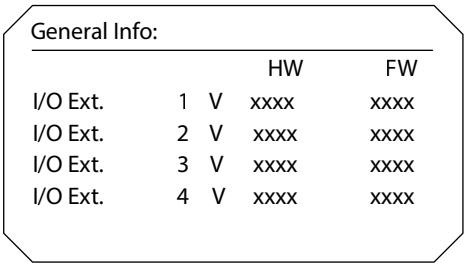

Figure 2-34. General Info (Page 5)

Alarm Screen

See ***Figure 2-35***. The Alarm Screen contains information for viewing only. Use the navigation arrows ( ) to scroll through alarms. Press STOP ( ) and then ENTER ( ) while on the Alarm Screen to clear all alarms present.

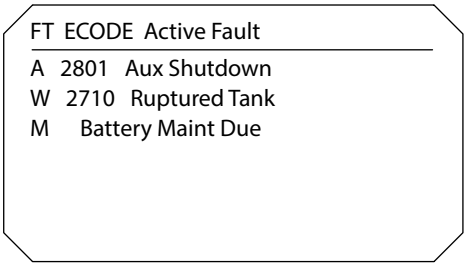

Figure 2-35. Alarm Screen (Page 1)

Modify a Page Setting

1. See ***Figure 2-36***. Verify the desired setting is highlighted on the page and press the ENTER button ( ).

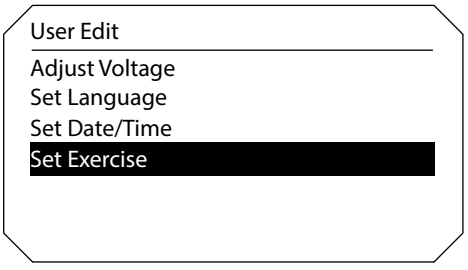

Figure 2-36. Highlight Page Setting

2. See ***Figure 2-37***. Press the ENTER button again to highlight the value if needed. If multiple settings are

available, continue pressing the ENTER button until the desired value is highlighted.

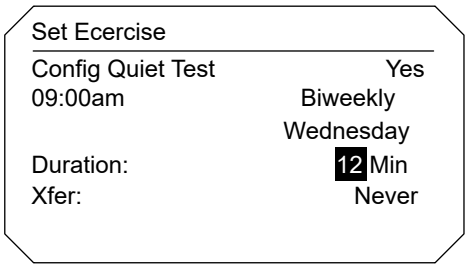

Figure 2-37. Highlight Desired Value

3. Use the navigation arrows ( ) to change the value.
4. To confirm the change, press the ENTER button until the previous page is displayed as shown in ***Figure 2-36***. To cancel the change, press the ESCAPE button ( ) until the previous page is displayed.

Battery Charger Logic

The Power Zone 410 controller comes equipped with a 12V 5A internal battery charger. The internal battery charger is enabled once on startup, and when the battery voltage drops below 12.7 V for at least five seconds. The internal charger is also enabled when an external charger is faulted, or the battery system is incorrectly configured. When enabled, the charger outputs as much current as the batteries can take up to the max current for a full charge cycle of 26 hours.

The charger is disabled after completing the charge cycle. Additionally, the charger is disabled when the genset is cranking or running, the battery voltage is less than 7 V or greater than 16 V, or if the system has been configured for an external battery charger.

At the end of a full charge cycle, the internal charger performs a battery health check. If the battery voltage is measured less than 12.5 V then a charger fault is raised. If the digital input GOT_T1 is disconnected, a Battery Charger Missing AC fault will be raised indicating the internal charger does not have power.

There are two types of faults which can be detected when using an external charger. The first is the fault indicated by the digital input EXT CHARGER FAILED. This fault indicates the external charger has lost power. The second fault occurs when the external charger has power but is not outputting current. This triggers when the battery voltage drops to 12.7 V while the external charge current is below 250 mA. This condition must persist for at least three seconds before a fault is raised. When the external charger is in a fault state, the battery charger will revert to the internal charger so battery charging continues for 12V systems only.

Battery System Configuration	24 V System Digital Input	External Charger Digital Input	Battery Voltage Selection Setting
12 V	Disconnected	Connected/ Disconnected	12 V
24 V	Connected	Connected	24 V
Invalid Configuration	Connected	Connected/ Disconnected	12 V
Invalid Configuration	Connected	Disconnected	24 V
Invalid Configuration	Disconnected	Connected	24 V
Invalid Configuration	Disconnected	Disconnected	24 V

Loadshed Logic

When enabled, if the generator becomes overloaded, prior to a shutdown alarm on overload, the generator will decrease engine speed to create a frequency drop of 3 Hz. This will enable a Generac Energy Management device to perform its loadshed sequence by recognizing the dip in frequency.

Loadshed Before Return to Utility

Loadshed before a return to utility is factory disabled, but can be enabled once Loadshed logic is enabled. This feature is available in Firmware Version 1.15 and higher.

When enabled, when utility power has returned and the generator is in the return to utility countdown before commanding the transfer switch to return to utility, the generator will start a load shed event by reducing the frequency to trigger Generac Energy Management devices to “shed” their associated loads before returning to target frequency and commanding the transfer switch to return to utility. This verifies the managed load is off before the transfer to utility, which is intended to prevent certain undesirable conditions for the given load.

Menu Map

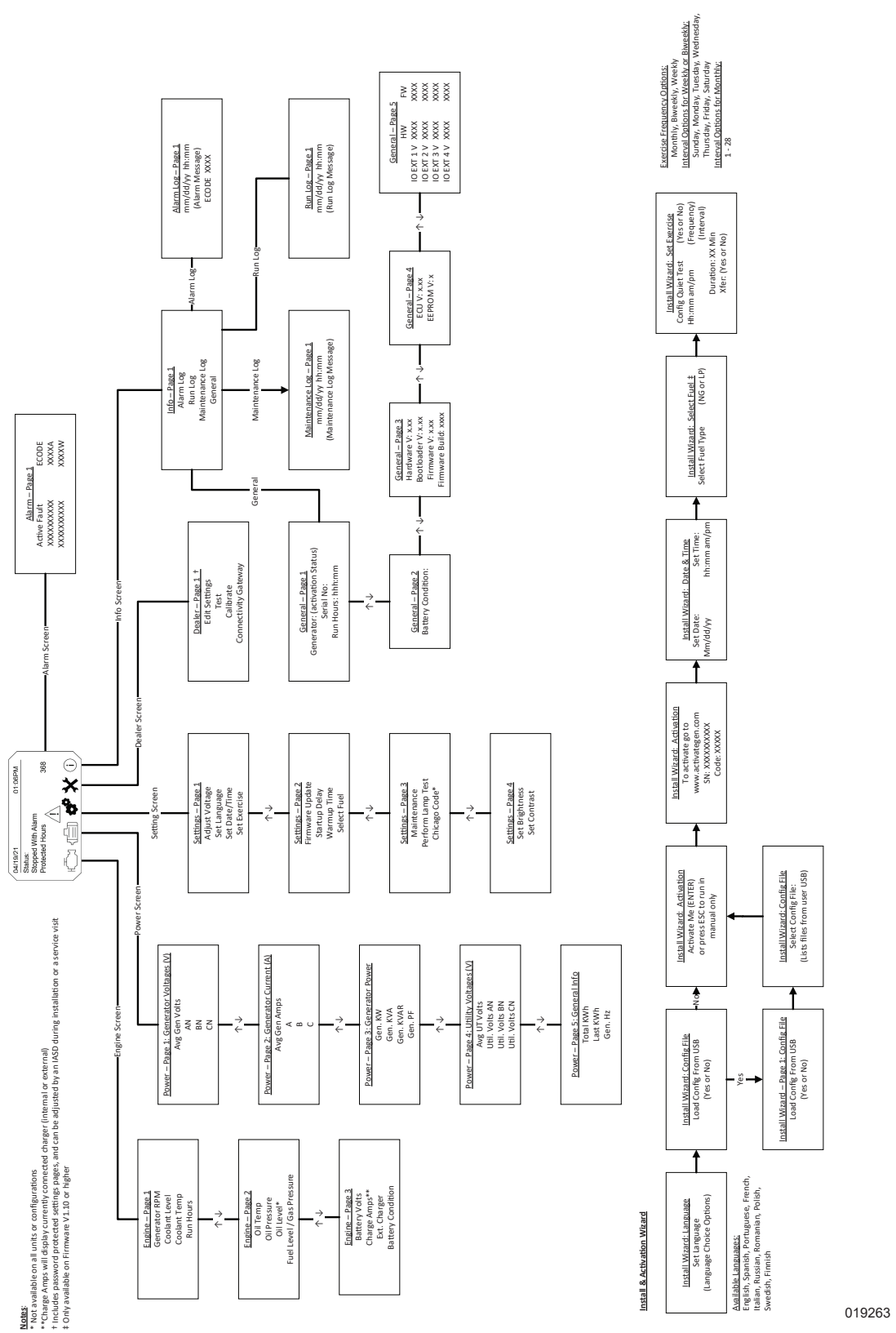

Figure 2-38. Power Zone 410 Menu Map

Section 3: Input/Output and Connector Info

Analog Inputs

Default Signal Name	Range/Level/Type	Connection
Oil Level	0 to 3.3 V (3.3 V supplied via 499 Ω resistor)	J5-16
Internal Battery Charge Voltage Monitor	0 to 16 V (battery charge voltage)	J10-1 V+ J10-4
External Battery Charger Current	0 to 5V (external charger current)	J5-17
Battery Voltage Monitor	0 to 35 V	J10-3 V+ J10-4
Phase B Generator Current	0 to 3 A RMS (generator phase B current sense)	J3-6 (+) J3-7 (-)
Coolant Temperature	0 to 3.3 V (3.3 V supplied via 499 Ω resistor)	J3-10
Phase A Generator Current	0 to 3 A RMS (generator phase A current sense)	J3-4 (+) J3-5 (-)
Phase C Generator Voltage	0 to 600 V RMS (generator phase C voltage)	J8-3 line J8-4 neutral
Phase B Generator Voltage	0 to 600 V RMS (generator phase B voltage)	J8-2 line J8-4 neutral
Phase A Generator Voltage	0 to 600 V RMS (generator phase A voltage)	J8-1 line J8-4 neutral
Throttle Position	0 to 3.3 V	J2-1 signal J2-3 return
Oil Temperature	0 to 3.3 V (3.3 V supplied via 499 Ω resistor)	J3-10 signal J3-11 return
Phase C Generator Current	0 to 3 A RMS (generator phase C current sense)	J3-8 (+) J3-9 (-)
Phase A Utility Voltage	0 to 600 V RMS (utility phase A voltage)	J8-6 line J8-5 neutral
Phase B Utility Voltage	0 to 600 V RMS (utility phase B voltage)	J8-7 line J8-5 neutral
Phase C Utility Voltage	0 to 600 V RMS (utility phase C voltage)	J8-8 line J8-5 neutral
Fuel Pressure/Fuel Level	0 to 5 V (5 V supplied via 499 Ω resistor on J3-15)	J3-16 signal J3-17 return
Oil Pressure	0 to 5 V (5 V supplied via 50 mA fuse on J3-12)	J3-13 signal J3-14 return

Digital Inputs

Default Signal Name	Range/Level	Connection
Coolant Level	0 to 5 V (switched 5 V clock signal)	J5-23 coolant+ J5-24 coolant
Spare/Chicago Code	0 to 5 V	J3-18
Theft/Door Alarm	0 to 5 V (door closed pulled to GND)	J5-7
Ruptured Tank	0 to 5 V	J5-1
External Charger	0 to 5 V (ext charger pulled to GND)	J5-8
2Wire Start 1	0 to 5 V (Normally Open)	J5-3
2Wire Start 2	0 to 5 V (Normally Closed)	J5-4
Transfer Position 1	0 to 5 V (Generator)	J5-5
Transfer Position 2	0 to 5 V (Utility)	J5-6
Auxiliary Shutdown	0 to 5 V	J5-19 (In) J5-20/J5-21 (Loop)
External Charger Failed	0 to 5 V	J5-22
24 V System	0 to 5 V	J5-18

Digital Outputs

Default Signal Name	Range/Level	Connection
Engine Preheat (Diesel)	Relay Contacts (30 V, 5 A max)	J10-9
Fuel On Relay	Relay Contacts (30 V, 5 A max)	J10-8
Start On Relay	Relay Contacts (30 V, 5 A max)	J10-7
Low Fuel Level (Diesel) Dual Fuel 1 (Gaseous)	Open Drain (+VBATT, 1.7 A device limited)	J5-13
High Fuel Level (Diesel) Dual Fuel 2 (Gaseous)	Open Drain (+VBATT, 1.7 A device limited)	J5-14
Audible Alarm	Open Drain (+VBATT, 1.7 A device limited)	J9-6
Alarm Relay	Relay Contacts (30 V, 5 A max)	J10-5 J10-6
Spare Digital Output	Open Drain (+VBATT, 1.7 A device limited)	J10-13
Engine Control Unit Relay	Relay Contacts (30 V, 5 A max)	J10-12
Utility Transfer Relay	12Vdc, 400mA	J10-16

Default Signal Name	Range/Level	Connection
Generator Transfer Relay	12Vdc, 400mA	J10-14 J10-15
Throttle Drive (PWM signal)	Open Drain (+VBATT, 1.7 A device limited)	J2-6
Throttle Enable	Open Drain (+VBATT, 1.7 A device limited)	J2-7
Automatic Voltage Regulation	Field+	J1-4
Automatic Voltage Regulation	Field-	J1-2

Connector Pin Descriptions

DIGITAL/ANALOGS

J5 24 Pin	Signal	Board Connection Description	Wire #
1	Ruptured Tank	5 V pullup	567
2	2-wire (ret)	GND	0
3	2-wire Start(1)	5 V pullup (NO)	183
4	2-wire Start(2)	5 V pullup (NC)	183A
5	Xfer Position1	5 V pullup (GEN)	525
6	Xfer Position2	5 V pullup (UTILITY)	524
7	Theft	5 V pullup (door closed pulled to GND)	A1
8	Extern Charger	5 V pullup (ext charger pulled to GND)	BC1
9	TriclopsYEL	Open collector with 240 Ω resistor	819
10	TriclopsGRN	Open collector with 240 Ω resistor	817
11	TriclopsRED	Open collector with 240 â„¦ resistor	818
12	Triclops+5V	+5 V for Triclops with 50 mA fuse	820
13	DualFuel1/Low Fuel Lvl	NG/LO_FUEL (open drain)	502
14	DualFuel2/High Fuel Lvl	LP/HI_FUEL (open drain)	730
15	Oil Temp(analog)	3.3 V pullup via 499 Ω resistor	523
16	Oil Level(analog)	3.3 V pullup via 499 Ω resistor	–
17	Ext Charger Current	Voltage from external charger	803
18	SYSTEM24V	5 V pullup	–
19	Rocker In (Auxillary Shutdown)	5 V pullup on switch terminal	R15
20	Rocker Loop	Switch dry contact	15
21	Rocker Loop	Switch dry contact	15
22	ExternalChargerFail	5 V pullup	505

J5 24 Pin	Signal	Board Connection Description	Wire #
23	CoolantLvl(+)	Switched analog input	573V
24	CoolantLvl(-)	Switched analog input	573R

CAN/CURRENT/ANALOGS

J3 18 Pin	Signal	Board Connection Description	Wire #
1	Can-HI	120 Ω between CAN HI & CAN LO	743
2	Can-LO	120 Ω between CAN HI & CAN LO	744
3	Can-Shield	–	SHLD
4	CurrentA(+)	–	398A
5	CurrentA(-)	–	399A
6	CurrentB(+)	–	399B
7	CurrentB(-)	–	399B
8	CurrentC(+)	–	398C
9	CurrentC(-)	–	399C
10	CoolantTemp(analog)	max input 3.3 V	68V
11	CoolantTemp(ret)	–	68R
12	Oil Pressure(+5V)	Fused for 50 mA	69V
13	Oil Pressure(analog)	max input 5.0 V	69S
14	Oil Pressure(ret)	–	69R
15	FuelPressure/Level(+5)	+5 V through 499 Ω resistor	590
16	FuelPressure/Level(signal)	Feedback from pot or switch	575
17	FuelPressure/Level(ret)	Sender Return/Ground	591
18	Spare DigIn/Chicago Code	5 V pullup	735

USER

J9 8 Pin	Signal	Board Connection Description	Wire #
1	E-Stop 12V	Dry contact	–
2	E-Stop In	Dry contact	–
3	KeyswitchPresent(in)	5 V pullup	–
4	KeyswitchPresent(gnd)	Wire Loop from Keyswitch Present(in)	–
5	+12V Alarm	–	–
6	Audible Alarm	Open drain	–
7	Keyswitch(1)	5 V pullup	–
8	Keyswitch(2)	5 V pullup	–

POWER/RELAYS

J10 16 Pin	Signal	Board Connection Description	Wire #
1	+12VBatt	On board 7.5 Amp fuse	SPLICE 4
2	+12VBatt	On board 7.5 Amp fuse	SPLICE 4
3	+VBatt	Externally fuse for 10 A	SPLICE 11
4	GND	–	GND
5	Alm Relay	Alarm relay contact	SPLICE 2
6	Alm Relay	Alarm relay contact	AHC-1
7	Start Relay	Relay contact connected to +VBATT	C01-4
8	Fuel Relay	Relay contact connected to +VBATT	CO1-6
9	Enrichment/Preheat	Relay contact connected to +VBATT, 5 A fuse	150
10	Analog Out(signal)	–	–
11	Analog Out(ret)	–	–
12	ECU On	Relay contact connected to +VBATT, 5 A fuse	395A
13	Spare DigOut/Fan Out	Open drain	244
14	Xfer(12V)	–	194
15	Xfer Drive/AMF(1)	–	23A
16	AMF(2)	Relay contact pulls to GND	23B

THROTTLE

J2 10 Pin	Signal	Board Connection Description	Wire #
1	Position Signal	Analog input	766
2	Position 3V3	Filtered +3.3 V	765
3	Position Ret	Filtered GND	767
4	–	–	–
5	Speed(12V)	+12 V supply to MPU module	79V
6	Throttle PWM	Open drain	769
8	–	–	–
9	Speed(ret)	Ground to MPU Module	SHLD
10	Speed(signal)	Speed input signal from MPU Module	79S

COMMS1

J6 8 Pin	Signal	Board Connection Description	Wire #
1	GND (filtered comms)	–	–
2	GND	–	SHLD
3	+12VBATT	–	–
4	GND (filtered comms)	–	SHLD

J6 8 Pin	Signal	Board Connection Description	Wire #
5	RS4851_N	Standard RS-485	391
6	RS4851_P	Standard RS-485	390
7	RS232-RX2	Standard RS-232	–
8	RS232-TX2	Standard RS-232	–

COMMS2

J4 8 Pin	Signal	Board Connection Description	Wire #
1	GND (filtered comms)	–	–
2	GND	–	SHLD
3	+12VBATT	–	–
4	GND (filtered comms)	–	SHLD
5	RS4852_N	Standard RS-485	391B
6	RS4852_P	Standard RS-485	390B
7	RS232-RX4	Standard RS-232	387
8	RS232-TX4	Standard RS-232	388

AVR

J1 4 Pin	Signal	Board Connection Description	Wire #
1	DPE1	–	2
2	FIELD(-)	–	1
3	DPE2	–	6
4	FIELD(+)	–	4

USB

J11 16 Pin	Signal	Board Connection Description	Wire #
1	VBUS	Switch +5 V VBUS	–
2	USB D(-)	–	–
3	USB D(+)	–	–
4	GND	–	–
5	Shield	–	–
6	Shield	–	–

VOLTAGES

J8 8 Pin	Signal	Board Connection Description	Wire #
1	GEN A	–	S1
2	GEN B	–	S2
3	GEN C	–	S3
4	GEN Neutral	–	00

J8 8 Pin	Signal	Board Connection Description	Wire #
5	UTIL Neutral	–	T00
6	UTIL A	–	T1
7	UTIL B	–	T2
8	UTIL C	–	T3

CHARGER

J7 2 Pin	Signal	Board Connection Description	Wire #
1	HOT	Internal Charger AC Input	L1
2	Neutral	Internal Charger Neutral Input	NEU

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Section 4: Internal Alarms/Warnings

Power Zone 410 Service Tool

Power Zone 410 Service Tool

Additional interfacing for configuration and setup is available to an IASD using the Power Zone 410 Service Tool PC Application, available for download on GenService.

Available configurations include:

- AVR Tuning
- Governor Tuning (Diesel and G9.0L units only)
- Trending
- Logs
- I/O Extender Configuration
- Remote Annunciator and Relay Panel Configuration
- Fuel Level Offset and Slope (Diesel units only)

Further information on the Power Zone 410 Service Tool can be found in the application's Help menu.

Alarm Displays and Descriptions

NOTE: Some of the alarms and warnings listed below may be engine or displacement of fuel related issues.

NOTE: Alarms and Warnings listed are applicable on Firmware Version 1.15 and higher.

E-Code	Displayed Alarm	Alarm/ Warning	Description
134	Emissions/Airfuel DTC	W	O2 sensor stuck open/closed DTC logged in eeprom. Warning will clear after engine runs with no DTC codes three times.
500	Invalid VCODE Configuration	A	Invalid Voltage Code setting
501	Missing Config - VCODE	A	Configuration Not Set - VCODE
502	Missing Config - Parameter Group	A	Configuration Not Set - Parameter Group
503	Missing Config - Exercise	A	Configuration Not Set - Exercise
504	Missing Config - Fuel Type	A	Configuration Not Set - Fuel Type
505	Missing Config - Governor	A	Diesel: Configuration Not Set - GOV CODE Gaseous: Configuration Not Set - GOV CODE, EMISSIONS CODE
506	Configuration Mismatch	A	Alarm Voltage configuration set in controller does not match voltage configuration for installed Voltage Configuration Cartridge (VCC).
1000	Controller Fault	A	The system has experienced an internal fault. Contact an IASD.
1001	Controller Fault	A	The system has experienced an internal fault. Contact an IASD.
1005	Watchdog Timeout	A	**Watchdog Timout**—An internal watchdog timeout occurred. Controller will reboot and transition to the same key state it was previously in and resume operation.
1006	Controller Fault	A	**An Exception Occured**—Controller will reboot and transition to the same key state it was in before and resume operation.
1007	Controller Fault	A	An Internal Error Occurred—Controller will reboot and transition to the same key state it was in before and resume operation.
1100	Overcrank	A	Default—Engine/Starter Problem The default for overcrank alarm, because of the nature of cranking there is almost no insight into the cause of an overcrank alarm with the current sensors.

E-Code	Displayed Alarm	Alarm/ Warning	Description
1200	Overspeed	A	**Prolonged** Over 72 Hz for 3 seconds.
1205	Overspeed	A	**Instantaneous—**Over 75 Hz for 1 second. Possible causes: broken stepper wire.
1208	Overspeed	A	Frequency (DPE measured) > 20% of target frequency for 5 seconds.
1300	Low Oil Pressure	A	Occurred while running—DefaultThe default extended alarm for low oil pressure. Check the oil level.
1301	Low Oil Pressure	W	Check the oil level.
1400	High Temperature	A	**Air Flow Impeded / Flow Issue—**Check the inlet/outlet for debris. Coolant temp greater than 246 ºF (119 ºC) for 1 second. Check coolant sensor circuit for correct operation.
1403	Engine Coolant Temperature	W	**High Coolant Temp—**Data valid but above normal operating range; least severe level
1404	Engine Coolant Temperature	W	**Low Coolant Temp—**Data valid but below normal operating range; least severe level
1405	Engine Coolant Temperature Sensor Open	W	Coolant Temp Sensor is not reporting any change in value even when unit is running. The reported value is also stuck at minimum, indicating sensor is wiring is stuck open.
1521	RPM Sensor	A	Missing Pulses during Running While running, no tooth pulses for 75 consecutive milliseconds. Possible causes: RPM sensor alignment, low battery
1522	RPM Sensor	A	After crank command, RPM and DPE frequency both read 0. Possible cause - failed motor.
1523	RPM Sensor	A	After crank command flywheel teeth count and DPE freqency both read 0. Possible cause - failed motor.
1524	RPM Sensor	A	Fault conditions: • When Overcurrent PID Control is not active, Flywheel sense is not valid, DPE frequency is valid & RPM from DPE frequency & Flywheel RPM differ by 100 rpm or more for 300 ms. • When Overcurrent PID Control is not active & both Flywheel sense, DPE frequency are not valid for 300 ms. • When Overcurrent PID Control is active & Flywheel sense is not valid for 40 ms.
1600	Underspeed	A	Unit Overloaded or Fuel System issue <83.3% speed (60 Hz) or <66.6% speed (50 Hz) for 30 seconds. Unit is overloaded slowing engine speed. Possible cause: highly inductive loads, actuator, or fuel supply.
1800	Overvoltage	A	Prolonged three seconds of over 10% above nominal.
1801	Overvoltage	A	Instantaneous Set by an instantaneous measurement 30% over nominal.
1900	Undervoltage	A	Prolonged Undervoltage; Generator voltage below 80% of nominal for 10+ seconds.
1901	Undervoltage	A	Instantaneous Generator voltage less than 15V. Hold off time of two seconds.
1902	Undervoltage	A	Both Zero Crosses missing Undervoltage due to faulty excitation winding, or zero cross circuit, or circuit in general. Both zero crosses must be missing for 1.5 seconds. Possible cause: loose wiring, field boost hardware failure.

E-Code	Displayed Alarm	Alarm/ Warning	Description
1906	Undervoltage	A	Single Zero Cross missing Undervoltage due to faulty excitation winding, or zero cross circuit, or circuit in general. One zero cross missing for greater than 1.5 seconds. Possible cause: field boost hardware failure.
1907	Undervoltage	A	After resuming from a loadshed event (i.e., generator is commanded at full speed again), still undervoltage because of overload condition.
2000	Transfer Switch Position Error	A	**Transfer Switch Position**—Both Gen and Utility stuck open.
2001	Transfer Switch Position Error	A	**Transfer Switch Position**—Both Gen and Utility stuck closed.
2002	Transfer Switch Position Error	A	**Transfer Switch Position**—Gen stuck closed/Utility stuck open.
2003	Transfer Switch Position Error	A	**Transfer Switch Position**—Gen stuck open/Utility stuck closed.
2060	3 Wire Switch Position Error	A	3 Wire Start NO NC switches are not in desired position.
2070	Keypad Missing	A	Keypad is missing.
2098	Wire Error	A	**Miswired**—Generator Xfer Enabled Output has been miswired.
2099	Wire Error	A	**Miswired**—Incorrect DC AC wiring hook up.
2100	Overload Remove Load	A	Overload CT's (2 Alternator Output Current Transformers) Output current measured value is above threshold. Possible cause: overload.
2101	Overload Remove Load	A	Overload (DPE Style Field Current Method) Field Current measured value is above threshold. Possible cause: overload
2109	Ground Fault	A	Ground + Neutral Current is above threshold.
2111	Overload Overcurrent	A	When current exceeds 150% of rated current (most likely because of P-P or P-N short), control PID tries to prevent the unit from stalling by running at 300% rated current load.
2112	Overload I2T	A	I2T based detection - gen output current above rated limit accumulates to 300% within 11 seconds
2501	Bosch	A	Stuck Open Command and position feedback not matching or taking too much time to achieve. Governor in open position for greater than one second. Possible causes: governor wire loose, governor module
2502	Bosch	A	Stuck Closed Command and position feedback not matching or taking too much time to achieve. Governor in closed position (commanded otherwise) for greater than one second. Possible cause: governor wire loose, governor module
2670	CAN Bus	A	Problem with CANbus interface. There is a 1 second holdoff on startup. If no message received for 1 second, alarm activated.
2674	12/24V Battery Config Error	W	Dealer Config and the Digital Input for confirming a 12/24 V Battery Type system mismatch.
2675	I/O Ext. 1 Loss of Comm	W	No response from I/O Extender for 3 seconds after a hold-off duration of 30 seconds.
2676	I/O Ext. 2 Loss of Comm	W	No response from I/O Extender for 3 seconds after a hold-off duration of 30 seconds.
2677	I/O Ext. 3 Loss of Comm	W	No response from I/O Extender for 3 seconds after a hold-off duration of 30 seconds.

E-Code	Displayed Alarm	Alarm/ Warning	Description
2678	I/O Ext. 4 Loss of Comm	W	No response from I/O Extender for 3 seconds after a hold-off duration of 30 seconds.
2679	External Charger Failure	W	External Charger is enabled and the External Charger Fail digital input is True for 3 seconds.
2680	Low Fuel Level	W	Low fuel level is triggered when the low fuel switch is triggered for 1 minute. The sensor triggers at 20% fuel remaining.
2681	Extremely Low Fuel Level	A	Fuel Level is less than 10%.
2682	Diesel High Fuel Level	W	Fuel Level above 90% full
2683	External Warning - 1	W	System detected a common warning indicator true for 1 second from one of the configured external source I/O Extender.
2684	External Warning - 2	W	System detected a common warning indicator true for 1 second from one of the configured external source I/O Extender.
2685	Fluid Basin Overfill	W	Fluid basin overfill indicator is true for 1 second from one of the configured external source I/O Extender.
2686	Fluid Basin Missing	W	Fluid basin missing indicator is true for 5 seconds from one of the configured external source I/O Extender.
2687	MLCB Aux Contact	W	Generator Main line circuit breaker (MLCB) is open or tripped
2688	Enclosure Damper Actuator is stuck	A	Enclosure damper actuator is stuck
2689	Fluid detected in tertiary containment	A	Fluid detected in tertiary containment.
2690	Low Fuel Pressure	W	Low fuel pressure is triggered when the switch is active. The switch is designed to trigger when pressure falls below 5.2 in H^2O +/- 0.4 in (below 0.19 psi).
2691	Critical High Fuel Level	W	Fuel level greater than the configured high fuel level set point for more than 1 second. Default Set point - 95%
2692	DI Warning	W	System detected warning on a configured IO Extender Digital Input - Fault message will indicate which Digital Input status triggered the alarm.
2710	Ruptured Tank	A	The system detected fuel in the outer basin tank and has triggered the alarm.
2720	Low Coolant	A	Low coolant digital input detected low coolant for greater than 5 seconds.
2725	High Oil Temperature	A	Triggers when oil temperature is > 320 °F (160 °C) while the engine is running. Has a 10 second hold-off.
2735	Low Oil Level	A	Triggers when oil level is below limit, detected after a 60 sec hold-off since startup.
2740	Check Engine	W	Engine type specific (emissions certified gas units). If an O2 sensor exists and is faulted (O^2 sensor stuck open/closed) for 90 seconds, this will trigger as an emissions failure. This warning will clear after engine runs with no O2 sensor faults (stuck open/closed) for 4 minutes.
2745	Lid Open/Theft Alarm	W	Lid or door is open.
2746	SPI Flash Abuse	W	Controller wrote to the SPI Flash more than 500 times in less than 4 minutes.

E-Code	Displayed Alarm	Alarm/ Warning	Description
2747	Test Warning	W	Test Warning - can be triggered by writing "1" to Modbus reg 1625. Warning will auto-clear after 60 seconds.
2750	Low Battery	W	Low battery voltage is less than 12.1VDC for 1 minute.
2751	Very Low Battery	A	The system detected battery voltage level < 9.0 for 60 seconds and has triggered the alarm.
2760	Battery Problem	W	Battery is >16V or charge current is >600 mA at end of 18 hour charge cycle, which is started after battery voltage falls to <12.5V or the controller is initially powered. This indicates battery may be bad.
2770	Charger Warning	W	Battery voltage is above 16.1Vdc at any time. Also, can be set due to Battery voltage is less than 12.5Vdc after completing 26 hour charge cycle.
2780	Charger Missing AC	W	During charging, AC input to battery charger missing for greater than 5 minutes.
2790	SEEPROM Abuse	W	Controller wrote to the EEPROM more than 500 times in less than 4 minutes.
2793	Config EEPROM CRC Mismatch	W	Config computed CRC unequal to stored EEPROM CRC.
2800	ESTOP Pressed/ AUX Shutdown	A	The system detected the Generator Emergency Shutdown Switch button was pressed and shutdown. E-Stop can also be set for AUX shutdown.
2801	Auxiliary Shutdown	A	The system detected an auxiliary shutdown or onboard rocker switch on Power Zone 410 front panel button was pressed and prompted a shutdown. Shutdown detected when pressed for greater than 300 ms
2802	External Common Alarm - 1	A	System detected a common shutdown alarm indicator true for 1 second from one of the configured I/O Extender modules.
2803	External Common Alarm - 2	A	System detected a common shutdown alarm indicator true for 1 second from one of the configured I/O Extender modules.
2804	External Common Alarm - 3	A	System detected a common shutdown alarm indicator true for 1 second from one of the configured I/O Extender modules.
2805	General I/O Alarm	A	Alarm detected on any digital input of connected IO Extender configured as General Alarm.
2806	Shutdown Inhibit Active	W	NFPA20 Shutdown Inhibit is enabled and active. This warning indicates that shutdown alarms will be inhibited per NFPA20 requirement.
3000	ECU Faulted	A	**Hardware Match Error** — Alarm SPN/FMI not supported by Genset Controller.
3001	ECU Faulted	A	**Speed Match Error —** Speed Command Mismatch - ECU not running at commanded speed.
3002	ECU Faulted	A	**Fuel Match Error —** Fuel Command Mismatch - ECU not operating on the commanded Fuel Type.
3003	ECU Faulted	A	**ECU shutdown —** ECU initiated Emergency Shutdown but no DTC received by Controller.
3015	ECU Faulted	W	**Hardware Match Error —** Warning SPN/FMI not supported by Genset Controller.
3100	Engine Throttle Valve 1 Position 1	A	**Throttle Body Air —** Data valid but above normal operating range; high severe level.
3101	Engine Throttle Valve 1 Position 1	A	**Throttle Body Air —** Data valid but above normal operating range; high severe level.
3102	Engine Throttle Valve 1 Position 1	A	**Throttle Body Air —** Data erratic, intermittent, or incorrect.

E-Code	Displayed Alarm	Alarm/ Warning	Description
3103	Engine Throttle Valve 1 Position 1	A	**Throttle Body Air —** Voltage above normal range; shorted to high source.
3104	Engine Throttle Valve 1 Position 1	A	**Throttle Body Air —** Voltage below normal range; shorted to low source; open circuit.
3107	Engine Throttle Valve 1 Position 1	A	**Throttle Body Air —** Mechanical system not responding correctly.
3115	Engine Throttle Valve 1 Position 1	W	**Throttle Body Air —** Data valid but above normal operating range; least severe level.
3117	Engine Throttle Valve 1 Position 1	W	**Throttle Body Air —** Data valid but above normal operating range; least severe level.
3200	Engine Fuel Delivery Pressure	A	**High Fuel Pressure —** Data valid but above normal operating range; high severe level.
3201	Engine Fuel Delivery Pressure	A	**Low Fuel Pressure —** Data valid but above normal operating range; high severe level.
3202	Engine Fuel Delivery Pressure	A	**Fuel Pressure Fault —** Data erratic, intermittent, or incorrect.
3203	Engine Fuel Delivery Pressure	A	**Fuel Pressure Fault —** Voltage above normal range; shorted to high source.
3204	Engine Fuel Delivery Pressure	A	**Fuel Pressure Fault —** Voltage below normal range; shorted to low source; open circuit.
3215	Engine Fuel Delivery Pressure	W	**High Fuel Pressure —** Data valid but above normal operating range; least severe level.
3217	Engine Fuel Delivery Pressure	W	**Low Fuel Pressure —** Data valid but below normal operating range; least severe level.
3300	Engine Oil Pressure	A	**High Oil Pressure —** Data valid but above normal operating range; high severe level.
3301	Engine Oil Pressure	A	**Low Oil Pressure —** Data valid but below normal operating range; high severe level.
3302	Engine Oil Pressure	A	**Oil Pressure Fault —** Data erratic, intermittent, or incorrect.
3303	Engine Oil Pressure	A	**Oil Pressure Fault —** Voltage above normal range; shorted to high source.
3304	Engine Oil Pressure	A	**Oil Pressure Fault —** Voltage below normal range; shorted to low source; open circuit.
3315	Engine Oil Pressure	W	**High Oil Pressure —** Data valid but above normal operating range; least severe level.
3317	Engine Oil Pressure	W	**High Oil Pressure —** Data valid but below normal operating range; least severe level.
3400	Engine Intake Manifold #1 Pressure	A	**High MAP —** Data valid but above normal operating range; high severe level.
3401	Engine Intake Manifold #1 Pressure	A	**Low MAP —** Data valid but below normal operating range; high severe level.
3402	Engine Intake Manifold #1 Pressure	A	**MAP Fault —** Data erratic, intermittent, or incorrect.

E-Code	Displayed Alarm	Alarm/ Warning	Description
3403	Engine Intake Manifold #1 Pressure	A	**MAP Fault —** Voltage above normal range; shorted to high source.
3404	Engine Intake Manifold #1 Pressure	A	**MAP Fault —** Voltage below normal range; shorted to low source; open circuit.
3415	Engine Intake Manifold #1 Pressure	W	**High MAP —** Data valid but above normal operating range; least severe level.
3417	Engine Intake Manifold #1 Pressure	W	**Low MAP —** Data valid but below normal operating range; least severe level.
3500	Engine Intake Manifold 1 Temperature	A	**High MAP Temp —** Data valid but above normal operating range; high severe level.
3501	Engine Intake Manifold 1 Temperature	A	**Low MAP Temp —** Data valid but below normal operating range; high severe level.
3502	Engine Intake Manifold 1 Temperature	A	**MAP Temp Fault —** Data erratic, intermittent, or incorrect.
3503	Engine Intake Manifold 1 Temperature	A	**MAP Temp Fault —** Voltage above normal range; shorted to high source.
3504	Engine Intake Manifold 1 Temperature	A	**MAP Temp Fault —** Voltage below normal range; shorted to low source; open circuit.
3515	Engine Intake Manifold 1 Temperature	W	**High MAP Temp —** Data valid but above normal operating range; least severe level.
3517	Engine Intake Manifold 1 Temperature	W	**Low MAP Temp —** Data valid but below normal operating range; least severe level.
3600	Engine Air Filter 1 Differential Pressure	A	**Check Air Filter —** Data valid but above normal operating range; high severe level.
3601	Engine Air Filter 1 Differential Pressure	A	**Check Air Filter —** Data valid but below normal operating range; high severe level.
3602	Engine Air Filter 1 Differential Pressure	A	**Air Filter Sensor Fault —** Data erratic, intermittent, or incorrect.
3603	Engine Air Filter 1 Differential Pressure	A	**Air Filter Sensor Fault —** Voltage above normal range; shorted to high source.
3604	Engine Air Filter 1 Differential Pressure	A	**Air Filter Sensor Fault —** Voltage below normal range; shorted to low source; open circuit.
3615	Engine Air Filter 1 Differential Pressure	W	**Check Air Filter —** Data valid but above normal operating range; least severe level.

E-Code	Displayed Alarm	Alarm/ Warning	Description
3617	Engine Air Filter 1 Differential Pressure	W	**Check Air Filter —** Data valid but below normal operating range; least severe level.
3700	Engine Coolant Temperature	A	**High Coolant Temp —** Data valid but above normal operating range; high severe level.
3701	Engine Coolant Temperature	A	**Low Coolant Temp —** Data valid but below normal operating range; high severe level.
3702	Engine Coolant Temperature	A	**Coolant Temp Fault —** Data erratic, intermittent, or incorrect.
3703	Engine Coolant Temperature	A	**Coolant Temp Fault —** Voltage above normal range; shorted to high source.
3704	Engine Coolant Temperature	A	**Coolant Temp Fault —** Voltage below normal range; shorted to low source; open circuit.
3715	Engine Coolant Temperature	W	**High Coolant Temp —** Data valid but above normal operating range; least severe level.
3717	Engine Coolant Temperature	W	**Low Coolant Temp —** Data valid but below normal operating range; least severe level.
3802	Battery Potential / Power Input 1	A	Data erratic, intermittent, or incorrect.
3803	Battery Potential / Power Input 1	A	**High Battery Voltage —** Voltage above normal range; shorted to high source.
3804	Battery Potential / Power Input 1	A	**Low Battery Voltage —** Voltage below normal range; shorted to low source; open circuit.
3815	Battery Potential / Power Input 1	W	Data valid but above normal operating range; least severe level.
3817	Battery Potential / Power Input 1	W	Data valid but below normal operating range; least severe level.
3900	Engine Oil Temperature 1	A	**High Oil Temp —** Data valid but above normal operating range; high severe level.
3901	Engine Oil Temperature 1	A	**Low Oil Temp —** Data valid but above normal operating range; high severe level.
3902	Engine Oil Temperature 1	A	**Oil Temp Fault —** Data valid but below normal operating range; high severe level.
3903	Engine Oil Temperature 1	A	**Oil Temp Fault —** Data erratic, intermittent, or incorrect.
3904	Engine Oil Temperature 1	A	**Oil Temp Fault —** Voltage above normal range; shorted to high source.
3915	Engine Oil Temperature 1	W	**High Oil Temp —** Voltage below normal range; shorted to low source; open circuit.
3917	Engine Oil Temperature 1	W	**High Oil Temp —** Data valid but below normal operating range; least severe level.
4003	Engine Fuel Shutoff 1 Control	A	**Fuel System Fault —** Voltage above normal range; shorted to high source.
4004	Engine Fuel Shutoff 1 Control	A	**Fuel System Fault —** Voltage below normal range; shorted to low source; open circuit.
4100	Engine Position Sensor	A	**Crankshaft Sensor Fault —** Data valid but above normal operating range; high severe level.

E-Code	Displayed Alarm	Alarm/ Warning	Description
4101	Engine Position Sensor	A	**Crankshaft Sensor Fault —** Data valid but below normal operating range; high severe level.
4102	Engine Position Sensor	A	**Crankshaft Sensor Fault —** Data erratic, intermittent, or incorrect.
4103	Engine Position Sensor	A	**Crankshaft Sensor Fault —** Voltage above normal range; shorted to high source.
4104	Engine Position Sensor	A	**Crankshaft Sensor Fault —** Voltage below normal range; shorted to low source; open circuit.
4200	Engine Timing Sensor	A	**Crankshaft Sensor Fault —** Data valid but above normal operating range; high severe level.
4201	Engine Timing Sensor	A	**Crankshaft Sensor Fault —** Data valid but below normal operating range; high severe level.
4202	Engine Timing Sensor	A	**Crankshaft Sensor Fault —** Data erratic, intermittent, or incorrect.
4203	Engine Timing Sensor	A	**Crankshaft Sensor Fault —** Voltage above normal range; shorted to high source.
4204	Engine Timing Sensor	A	**Crankshaft Sensor Fault —** Voltage below normal range; shorted to low source; open circuit
4300	O2 Sensor	A	**Check O2 Sensor —** Data valid but above normal operating range; high severe level.
4301	O2 Sensor	A	**Check O2 Sensor —** Data valid but below normal operating range; high severe level.
4302	O2 Sensor	A	**Check O2 Sensor —** Data erratic, intermittent, or incorrect.
4303	O2 Sensor	A	**Check O2 Sensor —** Voltage above normal range; shorted to high source.
4304	O2 Sensor	A	**Check O2 Sensor —** Voltage below normal range; shorted to low source; open circuit.
4315	O2 Sensor	W	**Check O2 Sensor —** Data valid but above normal operating range; least severe level.
4317	O2 Sensor	W	**Check O2 Sensor —** Data valid but below normal operating range; least severe level.
4400	Engine Knock 1	A	**Engine Knock Sensor Fault —** Data valid but above normal operating range; high severe level.
4401	Engine Knock 1	A	**Engine Knock Sensor Fault —** Data valid but below normal operating range; high severe level.
4402	Engine Knock 1	A	**Engine Knock Sensor Fault —** Data erratic, intermittent, or incorrect.
4403	Engine Knock 1	A	**Engine Knock Sensor Fault —** Voltage above normal range; shorted to high source.
4404	Engine Knock 1	A	**Engine Knock Sensor Fault —** Voltage below normal range; shorted to low source; open circuit.
4415	Engine Knock 1	W	**Engine Knock Sensor —** Data valid but above normal operating range; least severe level.
4417	Engine Knock 1	W	**Engine Knock Sensor —** Data valid but below normal operating range; least severe level.
4502	Engine Ignition Coil #1	A	**Ignition Coil 1 Fault —** Data erratic, intermittent, or incorrect.
4503	Engine Ignition Coil #1	A	**Ignition Coil 1 Fault —** Voltage above normal range; shorted to high source.

E-Code	Displayed Alarm	Alarm/ Warning	Description
4504	Engine Ignition Coil #1	A	**Ignition Coil 1 Fault —** Voltage below normal range; shorted to low source; open circuit.
4507	Engine Ignition Coil #1	A	**Ignition Coil 1 Fault —** Mechanical system not responding correctly.
4602	Engine Ignition Coil #2	A	**Ignition Coil 2 Fault —** Data erratic, intermittent, or incorrect.
4603	Engine Ignition Coil #2	A	**Ignition Coil 2 Fault —** Voltage above normal range; shorted to high source.
4604	Engine Ignition Coil #2	A	**Ignition Coil 2 Fault —** Voltage below normal range; shorted to low source; open circuit.
4607	Engine Ignition Coil #2	A	**Ignition Coil 2 Fault —** Mechanical system not responding correctly.
4702	Engine Ignition Coil #3	A	**Ignition Coil 3 Fault —** Data erratic, intermittent, or incorrect.
4703	Engine Ignition Coil #3	A	**Ignition Coil 3 Fault —** Voltage above normal range; shorted to high source.
4704	Engine Ignition Coil #3	A	**Ignition Coil 3 Fault —** Voltage below normal range; shorted to low source; open circuit.
4707	Engine Ignition Coil #3	A	**Ignition Coil 3 Fault —** Mechanical system not responding correctly.
4802	Engine Ignition Coil #4	A	**Ignition Coil 4 Fault —** Data erratic, intermittent, or incorrect.
4803	Engine Ignition Coil #4	A	**Ignition Coil 4 Fault —** Voltage above normal range; shorted to high source.
4804	Engine Ignition Coil #4	A	**Ignition Coil 4 Fault —** Voltage below normal range; shorted to low source; open circuit.
4807	Engine Ignition Coil #4	A	**Ignition Coil 4 Fault —** Mechanical system not responding correctly.
4900	Engine Fuel Valve 1 Position	A	**Fuel Mixer —** Data valid but above normal operating range; high severe level.
4901	Engine Fuel Valve 1 Position	A	**Fuel Mixer —** Data valid but below normal operating range; high severe level.
4902	Engine Fuel Valve 1 Position	A	**Fuel Mixer —** Data erratic, intermittent, or incorrect.
4903	Engine Fuel Valve 1 Position	A	**Fuel Mixer —** Voltage above normal range; shorted to high source.
4904	Engine Fuel Valve 1 Position	A	**Fuel Mixer —** Voltage below normal range; shorted to low source; open circuit.
4907	Engine Fuel Valve 1 Position	A	**Fuel Mixer —** Mechanical system not responding correctly.
4915	Engine Fuel Valve 1 Position	W	**Fuel Mixer —** Data valid but above normal operating range; least severe level.
4917	Engine Fuel Valve 1 Position	W	**Fuel Mixer —** Data valid but below normal operating range; least severe level.
5003	Engine Charge Air Cooler 1 Bypass	A	**CAC —** Voltage above normal range; shorted to high source.
5004	Engine Charge Air Cooler 1 Bypass	A	**CAC —** Voltage below normal range; shorted to low source; open circuit.

E-Code	Displayed Alarm	Alarm/ Warning	Description
5100	Engine Speed	A	**RPM High —** Data valid but above normal operating range; high severe level.
5101	Engine Speed	A	**RPM Low —** Data valid but below normal operating range; high severe level.
5102	Engine Speed	A	**RPM Fault —** Data erratic, intermittent, or incorrect.
5107	Engine Speed	A	**RPM Fault —** Mechanical system not responding correctly.
5115	Engine Speed	W	**RPM High —** Data valid but above normal operating range; least severe level.
5117	Engine Speed	W	**RPM Low —** Data valid but below normal operating range; least severe level.
7620	High Manifold Intake Temp	A	The Manifold inlet temperature reached its maximum threshold limit.

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Section 5: Ground Fault Indication (If Equipped)

Introduction

This section describes the Ground Fault Indication (GFI) feature. To enable this feature, contact an IASD.

Power Zone 410 generators have CTs on all phases to provide phase current measurements. This data is used to calculate system current, powers, and power factor (PF). The new feature of indicating large ground fault currents will use data from the existing CTs to compute the current going to both ground and neutral. This value will be compared to the customer-defined threshold and will indicate when threshold is exceeded for a customer-defined delay time.

Requirements

- GFI function is an optional function and needs to be ordered with the system requirement.
- ONLY available to three-phase units.

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Part No. A0001458309 Rev. E 09/17/2025

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