

Operation

Industrial Generator Set



Models:

KD700-KD4000
KD1250-4, KD2500-4, KD3250-4

Controller:

APM603

KOHLER®

TP-7141 6/23d

⚠ WARNING: This product can expose you to chemicals, including carbon monoxide and benzene, 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

⚠ WARNING: Breathing diesel engine exhaust exposes you to chemicals known to the State of California to cause cancer and birth defects or other reproductive harm.

- Always start and operate the engine in a well-ventilated area.
- If in an enclosed area, vent the exhaust to the outside.
- Do not modify or tamper with the exhaust system.
- Do not idle the engine except as necessary.

For more information go to www.P65warnings.ca.gov/diesel

Product Identification Information

Product identification numbers determine service parts. Record the product identification numbers in the spaces below immediately after unpacking the products so that the numbers are readily available for future reference. Record field-installed kit numbers after installing the kits.

Generator Set Identification Numbers

Record the product identification numbers from the generator set nameplate(s).

Model Designation _____

Specification Number _____

Serial Number: _____

Controller Identification

Record the controller description from the generator set operation manual, spec sheet, or sales invoice.

Controller Description _____

Engine Identification

Record the product identification information from the engine nameplate.

Manufacturer _____

Model Designation _____

Serial Number _____

Accessory Number	Accessory Description

Accessory Number	Accessory Description

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Safety Precautions and Instructions

IMPORTANT SAFETY INSTRUCTIONS. Electromechanical equipment, including generator sets, transfer switches, switchgear, and accessories, can cause bodily harm and pose life-threatening danger when improperly installed, operated, or maintained. To prevent accidents be aware of potential dangers and act safely. Read and follow all safety precautions and instructions. **SAVE THESE INSTRUCTIONS.**

This manual has several types of safety precautions and instructions: Danger, Warning, Caution, and Notice.



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



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



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

NOTICE

NOTICE is used to address practices not related to physical injury.

Safety decals affixed to the equipment in prominent places alert the operator or service technician to potential hazards and explain how to act safely. The decals are shown throughout this publication to improve operator recognition. Replace missing or damaged decals.

Accidental Starting

	<p>Accidental starting. Can cause severe injury or death.</p> <p>Disconnect the battery cables before working on the generator set. Remove the negative (-) lead first when disconnecting the battery. Reconnect the negative (-) lead last when reconnecting the battery.</p>
	

Disabling the generator set. Accidental starting can cause severe injury or death. Before working on the generator set or equipment connected to the set, disable the generator set as follows: (1) Press the generator set off/reset button to shut down the generator set. (2) Disconnect the power to the battery charger, if equipped. (3) Remove the battery cables, negative (-) lead first. Reconnect the negative (-) lead last when reconnecting the battery. Follow these precautions to prevent the starting of the generator set by the remote start/stop switch.

Battery

	<p>Explosion. Can cause severe injury or death. Relays in the battery charger cause arcs or sparks.</p> <p>Locate the battery in a well-ventilated area. Isolate the battery charger from explosive fumes.</p>
	

Engine Backfire/Flash Fire

 WARNING	Risk of fire. Can cause severe injury or death. Do not smoke or permit flames or sparks near fuels or the fuel system.
	

Servicing the fuel system. A flash fire can cause severe injury or death. Do not smoke or permit flames or sparks near the fuel injection system, fuel line, fuel filter, fuel pump, or other potential sources of spilled fuels or fuel vapors. Catch fuels in an approved container when removing the fuel line or fuel system.

Servicing the air cleaner. A sudden backfire can cause severe injury or death. Do not operate the generator set with the air cleaner removed.

Combustible materials. A fire can cause severe injury or death. Generator set engine fuels and fuel vapors are flammable and explosive. Handle these materials carefully to minimize the risk of fire or explosion. Equip the compartment or nearby area with a fully charged fire extinguisher. Select a fire extinguisher rated ABC or BC for electrical fires or as recommended by the local fire code or an authorized agency. Train all personnel on fire extinguisher operation and fire prevention procedures.

Combustible materials. A fire can cause severe injury or death. If using generator heaters during storage, remove combustible materials such as covers from contact with the heater or from areas where heat could potentially cause a fire.

Exhaust System

 WARNING	Carbon monoxide. Can cause severe nausea, fainting, or death. The exhaust system must be leakproof and routinely inspected.
	

Generator set operation. Carbon monoxide can cause severe nausea, fainting, or death. Carbon monoxide is an odorless, colorless, tasteless, nonirritating gas that can cause death if inhaled for even a short time. Avoid breathing exhaust fumes when working on or near the generator set. Never operate the generator set inside a building unless the exhaust gas is piped safely outside. Never operate the generator set where exhaust gas could accumulate and seep back inside a potentially occupied building.

Carbon monoxide symptoms. Carbon monoxide can cause severe nausea, fainting, or death. Carbon monoxide is a poisonous gas present in exhaust gases. Carbon monoxide is an odorless, colorless, tasteless, nonirritating gas that can cause death if inhaled for even a short time. Carbon monoxide poisoning symptoms include but are not limited to the following:

- Light-headedness, dizziness
- Physical fatigue, weakness in joints and muscles
- Sleepiness, mental fatigue, inability to concentrate or speak clearly, blurred vision
- Stomachache, vomiting, nausea

If experiencing any of these symptoms and carbon monoxide poisoning is possible, seek fresh air immediately and remain active. Do not sit, lie down, or fall asleep. Alert others to the possibility of carbon monoxide poisoning. Seek medical attention if the condition of affected persons does not improve within minutes of breathing fresh air.

Fuel System

 WARNING	Explosive fuel vapors. Can cause severe injury or death.
 	Use extreme care when handling, storing, and using fuels.

The fuel system. Explosive fuel vapors can cause severe injury or death. Vaporized fuels are highly explosive. Use extreme care when handling and storing fuels. Store fuels in a well-ventilated area away from spark-producing equipment and out of the reach of children. Never add fuel to the tank while the engine is running because spilled fuel may ignite on contact with hot parts or from sparks. Do not smoke or permit flames or sparks to occur near sources of spilled fuel or fuel vapors. Keep the fuel lines and connections tight and in good condition. Do not replace flexible fuel lines with rigid lines. Use flexible sections to avoid fuel line breakage caused by vibration. Do not operate the generator set in the presence of fuel leaks, fuel accumulation, or sparks. Repair fuel systems before resuming generator set operation.

Fuel tanks. Explosive fuel vapors can cause severe injury or death. Gasoline and other volatile fuels stored in day tanks or subbase fuel tanks can cause an explosion. Store only diesel fuel in tanks.

Hazardous Noise

 CAUTION	Hazardous noise. Can cause hearing loss.
	Never operate the generator set without a muffler or with a faulty exhaust system.

Engine noise. Hazardous noise can cause hearing loss. Generator sets not equipped with sound enclosures can produce noise levels greater than 105 dBA. Prolonged exposure to noise levels greater than 85 dBA can cause permanent hearing loss. Wear hearing protection when near an operating generator set.

Hazardous Voltage/Moving Parts

 DANGER	Hazardous voltage. Will cause severe injury or death.
	Disconnect all power sources before opening the enclosure.

 DANGER	Hazardous voltage. Moving parts. Will cause severe injury or death.
 	Operate the generator set only when all guards and electrical enclosures are in place.

Grounding electrical equipment. Hazardous voltage will cause severe injury or death. Electrocution is possible whenever electricity is present. Ensure you comply with all applicable codes and standards. Electrically ground the generator set, transfer switch, and related equipment and electrical circuits. Turn off the main circuit breakers of all power sources before servicing the equipment. Never contact electrical leads or appliances when standing in water or on wet ground because these conditions increase the risk of electrocution.

Disconnecting the electrical load. Hazardous voltage will cause severe injury or death. Disconnect the generator set from the load by turning off the line circuit breaker or by disconnecting the generator set output leads from the transfer switch and heavily taping the ends of the leads. High voltage transferred to the load during testing may cause personal injury and equipment damage.

 WARNING	<p>Hazardous voltage. Backfeed to the utility system. Can cause property damage, severe injury, or death.</p>
	<p>If the generator set is used for standby power, install an automatic transfer switch to prevent inadvertent interconnection of standby and normal sources of supply.</p>

Electrical backfeed to the utility. Hazardous backfeed voltage can cause severe injury or death. Install a transfer switch in standby power installations to prevent the connection of standby and other sources of power. Electrical backfeed into a utility electrical system can cause severe injury or death to utility personnel working on power lines.

Short circuits. Hazardous voltage/current will cause severe injury or death. Short circuits can cause bodily injury and/or equipment damage. Do not contact electrical connections with tools or jewelry while making adjustments or repairs. Remove all jewelry before servicing the equipment.

Installing the battery charger. Hazardous voltage will cause severe injury or death. An ungrounded battery charger may cause electrical shock. Connect the battery charger enclosure to the ground of a permanent wiring system. As an alternative, install an equipment grounding conductor with circuit conductors and connect it to the equipment grounding terminal or the lead on the battery charger. Install the battery charger as prescribed in the equipment manual. Install the battery charger in compliance with local codes and ordinances.

Connecting the battery and the battery charger. Hazardous voltage will cause severe injury or death. Reconnect the battery correctly, positive to positive and negative to negative, to avoid electrical shock and damage to the battery charger and battery(ies). Have a qualified electrician install the battery(ies).

Welding on the generator set. Can cause severe electrical equipment damage. Before welding on the generator set perform the following steps: (1) Remove the battery cables, negative (-) lead first. (2) Disconnect all engine electronic control module (ECM) connectors. (3) Disconnect all generator set controller and voltage regulator circuit board connectors. (4) Disconnect the engine battery-charging alternator connections. (5) Attach the weld ground connection close to the weld location.

Hot Parts

 WARNING	<p>Hot engine and exhaust system. Can cause severe injury or death.</p>
	<p>Do not work on the generator set until it cools.</p>

This manual provides operation instructions for the generator set models listed on the front cover when equipped with the **APM603 controller**.

This manual contains generator set operation instructions for readers with user-level or operator-level access to the APM603 controller. Selected accessory information is also included.

Refer to the generator set maintenance manual and the engine operation manual for scheduled maintenance information.

The information (including illustrations) in this publication represents data available at the time of print. Kohler Co. reserves the right to change this publication and the products represented without notice and without any obligation or liability whatsoever.

Read this manual and carefully follow all procedures and safety precautions to ensure proper equipment operation and to avoid bodily injury. Read and follow the Safety Precautions and Instructions section at the beginning of this manual. Keep this manual with the equipment for future reference.

The equipment service requirements are very important for safe and efficient operation. Inspect the parts often and perform required service at the prescribed intervals. Maintenance work must be performed by appropriately skilled and suitably trained maintenance personnel familiar with generator set operation and service.

List of Related Materials

Separate literature contains installation and maintenance information not provided in this manual. Figure 1 lists the available literature part numbers.

The engine electronic controls indicate engine fault codes in addition to the generator set controller. The engine operation and service literature provide information for identifying engine fault codes.

Literature part numbers are subject to change. For the latest literature part numbers, see the generator set parts list.

Literature Description	Literature Part No.	
Generator Set Installation Manual, KD Models	TP-7153	
Generator Set Maintenance Manual, KD Models	TP-7143	
Engine Operation and Maintenance Manual, KD18L06, KD750	33521059301	
Engine Operation and Maintenance Manual, KD27V12, KD800-KD1000	33521029401	
Engine Operation and Maintenance Manual, KD36V16, KD1250-KD1350	33521029701	
Engine Operation and Maintenance Manual, KD45V20, KD1250-KD1750	33521030001	
Engine Operation and Maintenance Manual, KD62V12, KD2000-KD2500	33521030301	
Engine Operation and Maintenance Manual, KD83V16, KD2800-KD3250	33521030601	
Engine Operation and Maintenance Manual, KD103V20, KD3500-KD4000	33521030901	
Generator Set/Controller Wiring Diagram Manuals	Original	With Updated Digital 8 I/O Module
KD700-KD750 (APM603)	NA	TP-7262
KD800-KD1000	TP-7144	TP-7252
KD1250A-KD1350, KD1250-4 (single starter)	TP-7145	TP-7253
KD1250A-KD1350, KD1250-4 (redundant starter)	TP-7145	TP-7254
KD1500-KD1750 (single starter)	TP-7146	TP-7255
KD1500-KD1750 (redundant starter)	TP-7146	TP-7256
KD2000-KD2500, KD2500-4 (single starter)	TP-7147	TP-7257
KD2000-KD2500, KD2500-4 (redundant starter)	TP-7147	TP-7258
KD2800-KD3250; KD3250-4 (single starter)	TP-7148	TP-7259
KD2800-KD3250; KD3250-4 (redundant starter)	TP-7148	TP-7260
KD3500-KD4000	TP-7170	TP-7261
Commissioning and Setup Manual, APM603	TP-7131	
Communication Protocol Operation Manual, APM603	TP-7151	
Service Manual, APM603 Controller	TP-7149	
SiteTech™ Software Manual	TP-6701	
Remote Serial Annunciator III (RSA III) Instructions	TT-1625	

Figure 1 Related Literature

Abbreviations

This publication makes use of numerous abbreviations. Typically, the word(s) are spelled out along with the abbreviation in parentheses when shown for the first time in a section. Appendix A, Abbreviations, also includes many abbreviation definitions.

SiteTech™ Software

A personal computer and Kohler SiteTech™ software may be required for programming the controller if the factory default settings are not appropriate for the application. SiteTech software is also needed for assigning configurable inputs/outputs and for updating the controller application code. Kohler SiteTech software is available only to Kohler-trained and authorized distributors and dealers. Contact your local distributor/dealer for assistance.

Service Assistance

For professional advice and conscientious service, please contact your nearest Kohler distributor or dealer.

- Visit the Kohler Co. website at KOHLERPower.com.
- Look at the labels and decals on your Kohler product or review the appropriate literature or documents included with the product.
- Call toll free in the US and Canada 1-800-544-2444.
- Outside the US and Canada, call the nearest regional office.

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Section 1. Controller Specifications and Features

1.1 Introduction

The specification sheet for each generator set provides model-specific generator and engine information. The controller specification sheet provides specifications for this controller. Refer to the respective specification sheet for data not supplied in this manual. Refer to the generator set service manual, installation manual, engine operation manual, and engine service manual for additional specifications.

1.2 Controller Specifications

APM603 Controller	
Power source with circuit protection	12 or 24VDC
Power draw	800 mAmps at 12VDC 400 mAmps at 24VDC
Humidity range	5-95% non-condensing
Operating temperature	-40° to 70°C (-40° to 158°F)
Storage temperature	-40° to 85°C (-40° to 185°F)

1.3 Controller Features

The controller features include the annunciator LED, touchscreen display, USB ports, buttons and controls, and terminal blocks. See Figure 2 for an illustration of the controller front panel.

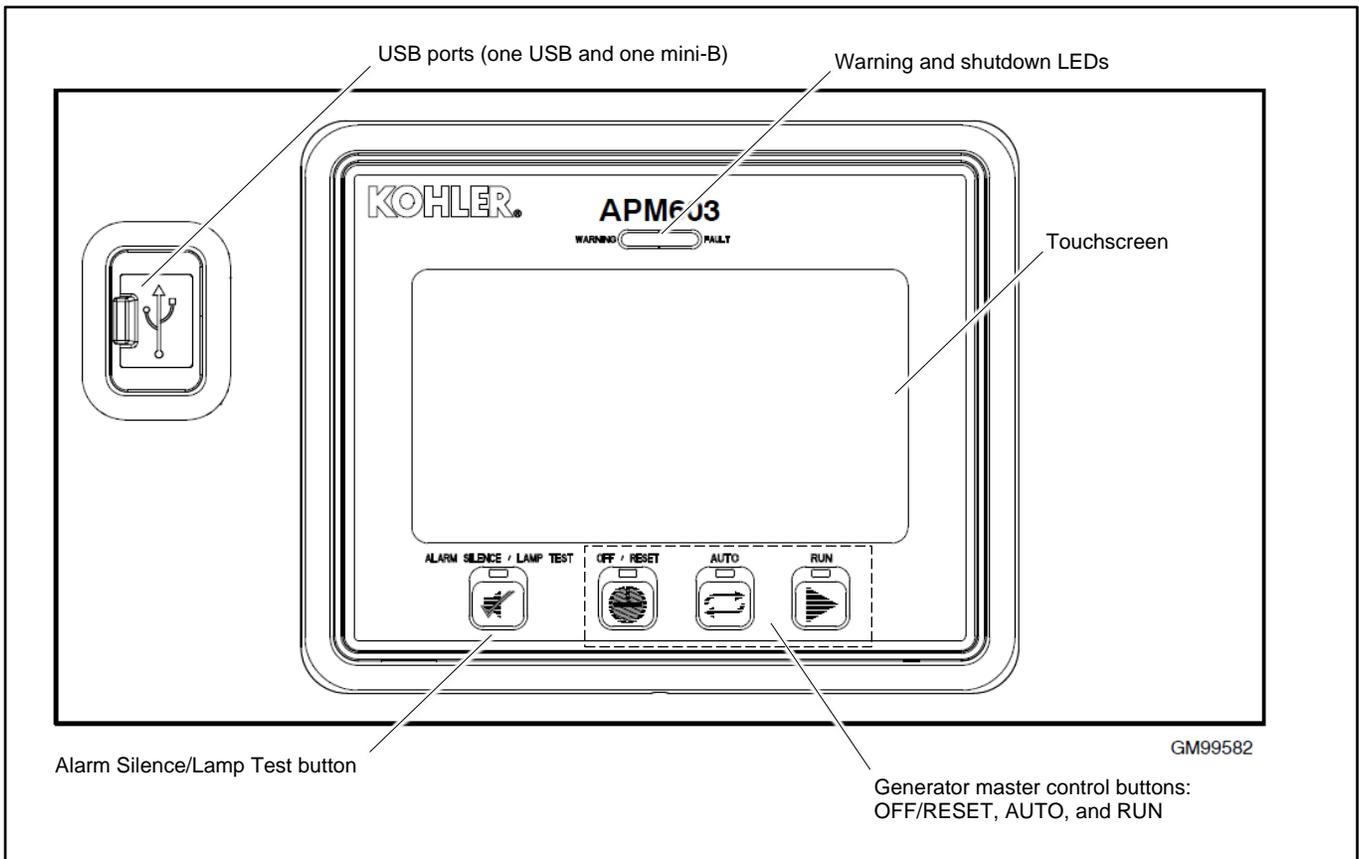


Figure 2 APM603 Controller

Controller Features:

- Large color touchscreen provides:
 - Intuitive operation
 - System status and metering displays
 - Data logging and trending
 - Event display and fault reset
- Master control buttons with status LEDs
- Fault LEDs:
 - Yellow = Warning
 - Red = Shutdown
- Alarm horn and alarm silence button with LED
- USB connector for downloading data files, uploading files, and data logging
- Mini USB connector for controller setup using a PC with SiteTech™ software

The controller features, accessories, and menu displays depend upon the engine electronic control module (ECM) setup and features.

1.3.1 Switches and Controls

Alarm Horn. The alarm horn alerts the operator or other attendants that a warning or shutdown condition exists.

Alarm (Horn) Silence. The alarm silence button turns off the alarm horn at the operator's discretion.

Restore alarm horn switches at all locations, including those on remote annunciators, after correcting the fault condition and resetting the controller. See *Resetting the Controller*, in this manual.

Generator Set Master Control (OFF/RESET-AUTO-RUN). These buttons reset the controller fault LEDs and start/stop the generator set. See the *Operation* section for additional information.

Note:

If a manual key switch is installed, most button operations are supplanted by the key switch position. The LEDs on the controller will continue to display the OFF, AUTO, and RUN modes. The OFF/RESET button will reset the controller. See *Manual Key Switch* in the *Accessories* section of this manual for more information.

LED Test. Press and hold the Alarm Silence/Lamp Test button to test the controller indicator LEDs and fault LEDs.

1.3.2 Annunciator LEDs

The controller has red and yellow annunciator fault LEDs that provide visual indication that a warning or shutdown is active. In addition, each master control button has a status-indicating LED. See Figure 3.

LED/Button	LED Color	Description
Alarm (Fault) LED	Yellow (Warning) or Red (Shutdown)	Yellow LED indicates a fault condition that does not shut down the generator set. Correct all system warnings as soon as practical. Red LED indicates that the generator set has shut down because of a fault condition. The unit will not start until the condition is corrected and the controller is reset.
Off/Reset Button	Blue	Indicates the generator set is stopped.
Auto Button	Blue (System Ready)	Indicates the system is in standby mode and detects no faults. The unit is ready to start by remote command.
Run Button	Blue	Indicates the generator set is cranking or running from a local command.
Alarm Silence Button	Orange	Indicates the alarm horn is silenced.

Figure 3 Annunciator LEDs

1.3.3 Touchscreen Display

The touchscreen display provides generator set and engine data, parameter settings, system status, and fault information. Some values will display zero or N/A (not available) if the generator set is not running.

The main menus are listed below. Within each main menu are multiple submenus as described in the Operation Section.

- Metering
- Setup
- Data Log
- Paralleling (if enabled)
- Active Events (Bell icon)
- Controller Settings

Figure 4 shows the important parts of the touchscreen.

- Two tabs in the upper left corner allow the viewer to toggle between two independent screens.
- The navigation menu on the left side of the screen can be expanded and contracted as shown.
- The bell icon at the upper right indicates active alerts. Touch to view active events and event history.
- The controller settings icon allows access to settings such as display brightness and date/time. This icon also contains the link to the logon screen for the different access levels.
- A scroll bar appears on the right side of the screen when there are multiple pages that can be viewed or accessed.
- The boxes on the bottom of the Home screens allow the viewer to move between two screens.

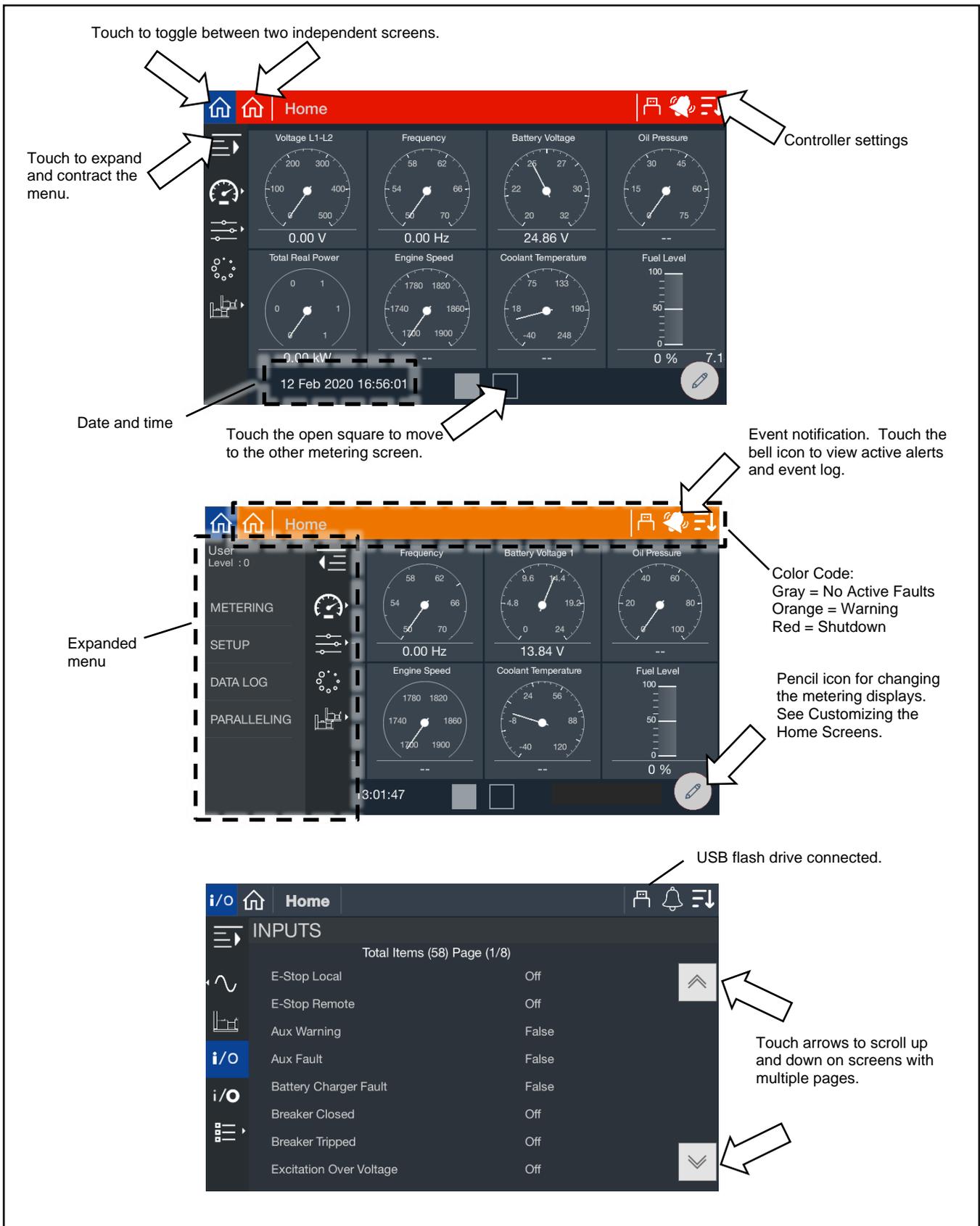


Figure 4 Screen Features and Functions

1.3.4 Access Levels

Note:

Have setup and adjustments of the controller performed only by an authorized Kohler distributor. The setup and adjustments are password protected.

Different access levels are used to protect the controller from inadvertent changes that can adversely affect the generator set operation. Access levels are described in Figure 5. The current access level is shown in the upper left corner of the screen when the navigation menu is expanded as shown in Figure 6. The User level is the default level.

Some parameter settings are displayed at the user level but require operator access or higher to change the setting. Password-controlled access is granted to trained, qualified Kohler distributors and dealers. See the Controller Settings Section for instructions to log on at the Operator or Distributor access level.

After a set amount of time, the access automatically returns to the User level. The default session time duration is one hour. The session time can be changed in the Controller Settings menu.

Access Level	Password Required	Description
User (0)	None	Can start and stop the generator set. Can navigate through the controller menus and view, but not change, the settings..
Operator (1)	9879	Allows trained maintenance personnel to adjust selected settings.
Technician (2)	Yes	Allows trained and authorized Kohler distributors or dealers to adjust controller settings.
Factory (3)	Yes	For factory use only.

Figure 5 Access Levels



Figure 6 Access Level Indication

1.4 Run Relay

The run relay is provided as standard equipment with the APM603 controller. The run relay energizes only when the generator set runs. Use the auxiliary run relay kit to control air intake and radiator louvers, alarms, and/or other signaling devices. Refer to the generator set wiring diagrams for connections.

Section 2. Inputs and Outputs

The controller is equipped with the standard, dedicated inputs and outputs shown in Figure 7 and Figure 8. These inputs and outputs are factory set and cannot be adjusted.

Inputs Tier 2	Inputs Tier 4	Input Type
Auxillary Fault (Shutdown)	Auxillary Fault (Shutdown)	Digital Input
Auxillary Warning	Auxillary Warning	
Battery Charger Fault	Battery Charger Fault	
Breaker Closed	Breaker Closed	
Breaker Tripped/Open	Breaker Tripped/Open	
Fuel Leak Alarm	Fuel Leak Alarm	
High Fuel Level Switch Warning	High Fuel Level Switch Warning	
Idle Switch	Idle Switch	
Low Fuel Level Switch	Low Fuel Level Switch	
Low Oil Level	Low Oil Level Switch Warning	
Remote Emergency Stop	Remote Emergency Stop	
Remote Reset	Remote Reset	
Reserved Factory Use	Load Bank Fault	
Reserved Factory Use	Power Supply 1 Fault	
Reserved Factory Use	Power Supply 2 Fault	
Remote Engine Start	Remote Engine Start	Two-Wire Input
Speed Bias	Speed Bias	Analog Voltage Input, Scalable up to +/- 10 VDC
Voltage Bias	Voltage Bias	

* Only with remote-mounted electrically operated circuit breakers.

Figure 7 Standard Dedicated User Inputs

Outputs Tier 2	Outputs Tier 4	Output Type
Close Breaker	Close Breaker	Digital Output
Common Failure	Common Failure	
EPS Supplying Load	EPS Supplying Load	
Generator Running	Generator Running	
Horn	Horn	
Low Coolant Temperature	Low Coolant Temperature	
Not In Auto	Not In Auto	
System Ready	System Ready	
Trip Breaker/Shunt Trip	Trip Breaker/Shunt Trip	
Reserved Factory Use	Load Bank Control	

* Only with remote-mounted electrically operated circuit breakers.

Figure 8 Standard Dedicated User Outputs

An optional Digital Input/Output Module kit is available. The kit provides additional inputs and outputs that are configurable. See the Accessories section for more information. A personal computer and Kohler SiteTech™ software are required for assigning input and output functions to the inputs and outputs on the I/O modules. SiteTech is available to Kohler authorized distributors and dealers.

3.1 Prestart checklist

To ensure continued satisfactory operation, perform the following checks or inspections before or at each startup, as designated, and at the intervals specified in the service schedule. In addition, some checks require verification after the unit starts.

 DANGER	<p>Hazardous voltage. Moving parts. Will cause severe injury or death.</p> <p>Operate the generator set only when all guards and electrical enclosures are in place.</p>
 	

Note:

Use the procedures in this document after the generator set has been installed according to the instructions in the generator set Installation Manual.

<p>Air Cleaner. Check for a clean and installed air cleaner element to prevent unfiltered air from entering engine.</p>
<p>Air Inlets. Check for clean and unobstructed air inlets.</p>
<p>Battery. Check for tight battery connections. Consult the battery manufacturer's instructions regarding battery care and maintenance.</p>
<p>Coolant Level. Check the coolant level according to the cooling system maintenance information. Note: Block Heater Damage. The block heater will fail if the energized heater element is not immersed in coolant. Fill the cooling system before turning on the block heater. Run the engine until it is warm, and refill the radiator to purge the air from the system before energizing the block heater.</p>
<p>Diesel Exhaust Fluid (DEF) Tank, if equipped. Ensure that there is an adequate DEF supply; keep the DEF tank full. When filling, watch that the DEF tank is not overfilled.</p>
<p>Drive Belts. Check the belt condition and tension of the radiator fan, water pump, and battery charging alternator belt(s) according to the drive belt system maintenance information.</p>
<p>Enclosure Doors, if equipped. Check that the service access doors are closed and secured. Leaving the doors open can interfere with the cooling air flow and create excessive noise. Check that the enclosure door to the load connection panel is closed and secured. Some units have a micro switch safety feature that will trip (by shunt trip) the main line circuit breaker if the load connection panel is open.</p>
<p>Exhaust System. Check for exhaust leaks and blockages. Check the silencer and piping condition and check for tight exhaust system connections.</p> <ul style="list-style-type: none"> • Inspect the exhaust system components (exhaust manifold, exhaust line, flexible exhaust, clamps, silencer, and outlet pipe) for cracks, leaks, and corrosion. • Check for corroded or broken metal parts and replace them as needed. • Check for loose, corroded, or missing clamps and hangers. Tighten or replace the exhaust clamps and/or hangers as needed. • Check that the exhaust outlet is unobstructed. • Visually inspect for exhaust leaks (<i>blowby</i>). Check for carbon or soot residue on exhaust components. Carbon and soot residue indicates an exhaust leak. Seal leaks as needed.
<p>Fuel Level. Check the fuel level and keep the tank(s) full to ensure adequate fuel supply. (diesel models)</p>
<p>Lamp Test. Press and hold the lamp-test button for 1 second to verify all controller LEDs are operational.</p>
<p>Oil Level. Check the oil level. Maintain the oil level at or near, not over, the full mark on the dipstick.</p>
<p>Operating Area. Check for obstructions that could block the flow of cooling air. Keep the air intake area clean. Do not leave rags, tools, or debris on or near the generator set.</p>
<p>Radiator. Check that the radiator fins and air inlets/outlets are clean of leaves, insects, dirt, and other debris. Use compressed air to clear the obstructed passages as needed.</p>
<p>Visual Inspection. Walk around the generator set and look for leaking fluids, loose or dangling wiring, and loose or missing hardware. Repair as needed before starting the generator set. Repeat the visual inspection routinely while the unit is running.</p>

3.2 Generator Set Operation

The controller allows operation of the generator set as detailed below.

3.2.1 Starting and Stopping Functions

There are three primary modes of operation, selected by pressing the controller buttons.

Button	Description
OFF/RESET	Press the OFF/RESET button to stop the generator set immediately, with no engine cooldown. The generator set remains off and will not respond to a remote start signal. Press and HOLD the OFF/RESET button for 3 seconds to reset an active fault (shutdown). Be sure to identify and correct the problem that caused the shutdown before clearing the fault.
AUTO	Press AUTO to place the generator set into automatic (standby) mode. The generator set will respond to remote start and remote stop signals.
RUN	Press the RUN button to start the generator set. The generator set runs until the OFF/RESET or AUTO button is pressed or until a fault condition causes the generator set to shut down.

Figure 9 Controller Button Operation

Notes:

- The alarm horn sounds and the Not-In-Auto Warning display appears whenever the generator set is not in the AUTO mode.
- The transient start/stop function of the controller prevents accidental cranking of the rotating engine. The generator set stops and recranks when the OFF/RESET button is momentarily pressed and then the RUN button is pressed.
- The controller provides up to 30 seconds of programmable cyclic cranking and up to 60 seconds rest with up to 6 cycles. The default setting is 15 seconds cranking and 15 seconds rest for 3 cycles. An authorized Kohler distributor or dealer can make cyclic cranking adjustments using SiteTech™ software.

3.2.1.1 Starting and Stopping Functions, Parallel Operation

The modes of operation for a generator set that is part of a multi-unit paralleled system are shown below. Select the modes by pressing the controller buttons as shown.

Button	Description
OFF/RESET	Press the OFF/RESET button to stop the generator set immediately, with no engine cooldown. The generator set remains off and will not respond to a remote start signal. Press and hold the OFF/RESET button for 3 seconds to reset an active fault (shutdown). Be sure to identify and correct the problem that caused the shutdown before clearing the fault.
RUN	Press the RUN button to start the generator set. No other generator sets in the system will start.
AUTO	Press AUTO to place the generator set into automatic (standby) mode. The generator set will respond to remote start and remote stop signals. The generator set will start and run when a start signal is received via a remote start, local auto-start, or communications-based start. All generator sets in the system (connected by PGEN paralleling communications and in Standby Mode by pressing AUTO) will start when any one of the generator sets receives a start signal. However, any generator set in the system that is not in AUTO mode will not start. If Generator Management is on, the generator set may shut down after a period of time. When the start signal is removed, the generator set will shut down with the appropriate engine cooldown.
AUTO-RUN	Press AUTO and RUN together for a system start signal. All generator sets in the system start and run, close to bus, synchronize, parallel, share load, etc. Some generator sets may shut down after a period of time (indicated by Generator Management) but they remain in Standby Mode ready to start and run if needed.
AUTO-OFF	Press AUTO and OFF together to remove a system start signal, if AUTO-RUN is active. All generator sets in the system open their breakers, enter engine cooldown, shut down, and enter Standby Mode. Closing the remote start contacts has no effect. Generator sets in the system will enter Standby Mode. Note: Pressing AUTO and OFF together stops the generator sets only if there are no other system start signals present.

3.2.2 Start Signal

When the generator set is in AUTO mode, it can respond to a start signal. A start signal can include any of the following:

- A remote start signal via contacts 3 and 4 (closing a contact between 3 and 4 on terminal block TB-12), typically received from an automatic transfer switch (ATS) or a remote panel. A closed contact across 3 and 4 takes precedence over all other start signals. If the generator set is already running, it will keep running and the original source of that start signal will be ignored.
- System Start (AUTO-START). Press AUTO and RUN simultaneously to send a start signal.
- Communications-based start command from SiteTech™ or a Modbus-based remote panel.

3.2.3 Stop Signal

A stop signal can include any of the following:

- Removal of start signal via contacts 3 and 4 (opening the contact between 3 and 4).
- System Stop (AUTO-OFF). Press AUTO and OFF simultaneously on any controller in the system to send a stop signal to cancel the system start.

Note:

Pressing AUTO and OFF simultaneously has no effect if the system start is not active or if the system is receiving a start signal from another source.

- Communications-based stop command from SiteTech™ or a Modbus-based remote panel.

3.2.4 Engine Cooldown

The engine cooldown cycle runs the generator set with no load to allow hot engine components time to cool slowly before the engine is stopped.

When the generator set is running in AUTO mode, an engine cooldown cycle begins when the remote start input is deactivated or a stop signal is received.

The cooldown cycle runs until the cooldown temperature is reached or a predetermined amount of time expires. The cooldown time and cooldown temperature are adjustable parameters. See the Engine Setup section for more information about the engine cooldown settings.

Note:

No engine cooldown cycle occurs if the OFF button is pressed or if a fault occurs. The shutdown is immediate. If possible, run the generator set without load for at least 5 minutes to ensure adequate engine cooldown.

3.2.4.1 DEF Injector Cooldown (Tier 4)

NOTICE

Injector damage. Cutting power to the exhaust aftertreatment system can damage the injectors. Rewiring the emergency stop voids the warranty. If power is cut to the exhaust aftertreatment system during operation or the cooling process, inspect injectors for damage and replace if needed.

Note:

When the operator presses the OFF button or the emergency stop button, or a shutdown fault occurs, the generator set shuts down immediately and does not enter low idle cooldown. Only the DEF injector cooldown will continue to function and protect the injectors from damage.

Tier 4 generator sets (KD1250-4, KD2500-4, and KD3250-4) use low idle cooldown and DEF injector cooldown to prevent damage to the DEF injectors. When running in AUTO, removal of the start/stop signal initiates a low idle cooldown. The generator set controller automatically lowers the frequency to low idle during the low idle cooldown until exhaust temperatures reach 220°C (428°F) or for 10 minutes of operation (whichever comes first). Injector cooldown occurs at the same time, and the DEF pump continues to pump DEF through the injectors even after the engine stops.

Low idle cooldown is the preferred shutdown option for tier 4 generator sets and only occurs when the generator set is running in AUTO. If the operator starts the generator set by pressing the RUN button, the preferred shut-down method is to switch to AUTO to allow a low idle cooldown.

In addition to a low idle cooldown, the EATS system utilizes a DEF injector cooldown where the DEF pump continues to pump DEF through the injectors as the engine aftertreatment system (EATS) cools. The EATS initiates a DEF injector cooldown when the operator presses the OFF button or the emergency stop button, the generator set receives a remote stop signal, or a shutdown fault occurs.

3.2.5 Emergency Stop

Note:

Use the emergency stop switch(es) for emergency shutdowns only. Use the generator set OFF/RESET button for normal shutdowns.

The emergency stop switch shuts down the generator set immediately. The controller fault LED lights and the unit shuts down without running the engine cooldown cycle.

Use the following procedure to reset the generator set after shutdown by a local or remote emergency stop switch. Refer to the Controller Resetting procedure to restart the generator set following a fault shutdown.

Procedure to Reset the Generator Set after Emergency Stop

1. Investigate and correct the cause of the emergency stop.
2. Reset the emergency stop switch.
3. Press and hold the generator set OFF/RESET button for 3 seconds.
4. After resetting all faults using the controller reset procedure, press the generator set RUN and/or AUTO button to restart the generator set. The generator set will not crank until the reset procedure is completed.

3.2.5.1 Emergency Stop (Tier 4)

NOTICE

Injector damage. Cutting power to the exhaust aftertreatment system can damage the injectors. Rewiring the emergency stop voids the warranty. If power is cut to the exhaust aftertreatment system during operation or the cooling process, inspect injectors for damage and replace if needed.

When the emergency stop button is pressed, a tier 4 generator set immediately shuts down and the EATS initiates a DEF injector cooldown where DEF is pumped through the injectors.

The emergency stop switch is factory wired on tier 4 generator sets to keep the EATS powered when the emergency stop button is pressed. The emergency stop switch will only remove power from the base generator set. Rewiring of the emergency stop switch will affect the warranty of EATS components. If rewiring the emergency stop switch is necessary, contact an authorized Kohler distributor or dealer.

Note:

Pressing the emergency stop switch cuts power to the heating components of the EATS. If power is not returned, DEF in the DEF lines, DEF tank, and DEF components can freeze, blocking the DEF flow and causing an inducement (reduction in engine torque).

3.2.5.2 EATS Electrical Disconnect (Tier 4)

The EATS electrical disconnect is located on the lower electrical box. The EATS electrical disconnect is a manually operated switch that functions as a stop switch for the EATS. When the EATS electrical disconnect is turned off, power is cut to the FDS pump and the DEF line heaters.

IMPORTANT! The EATS electrical disconnect should typically be in the ON position even when the generator set is not running. If needed, the EATS electrical disconnect should only be turned off when the EATS active light is off or in an emergency situation. If the EATS electrical disconnect is ever turned OFF while the EATS active light is still on, then damage to the DEF injectors is likely. If the EATS electrical disconnect is turned off, the ECU and the controller report a fault. If power is not returned to the DEF line heaters in cold weather conditions, DEF lines can freeze and cause blockage.

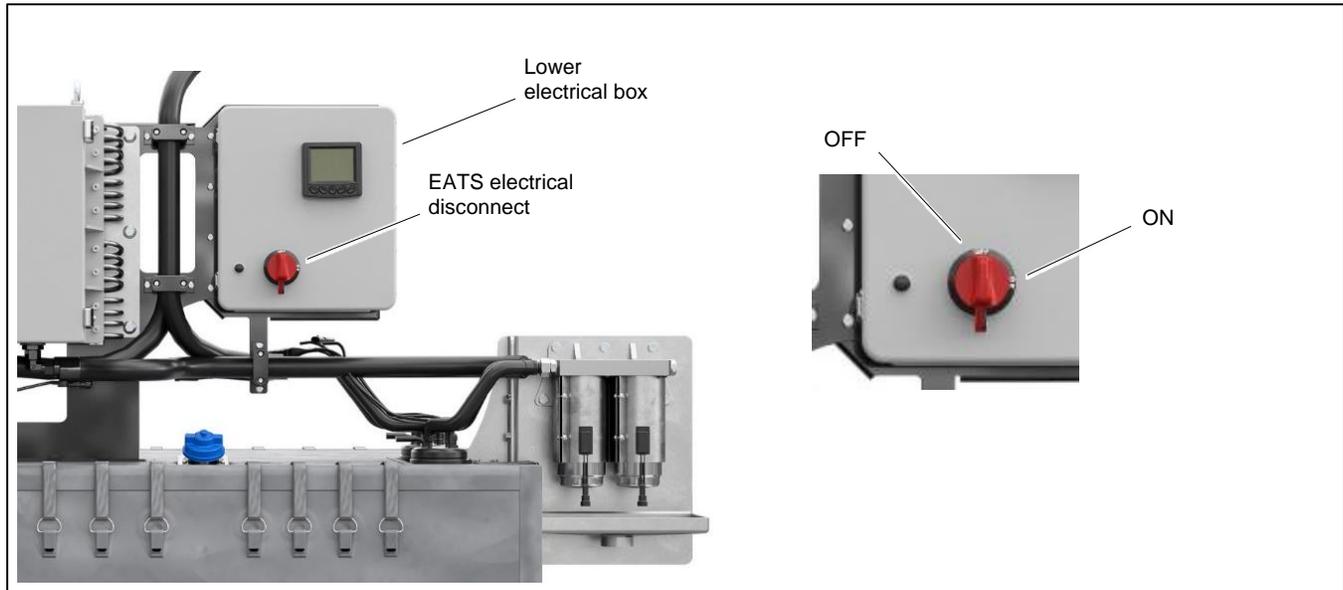


Figure 10 EATS Electrical Disconnect

3.3 Operation in Cold Weather Climates

Cold weather operation should be addressed in areas where the ambient temperatures fall below freezing, 0°C (32°F). The following items are recommended for cold weather starting and/or operation when the unit is located in an enclosure or unheated structure. Have a licensed electrician install 120 VAC, 15 amp outlets as needed if not already in the immediate area.

Refer to the engine operation manual regarding engine oil viscosity, fuel composition, and coolant mixture recommendations.

- The **engine block heater** is generally recommended for most units when operated below 0°C (32°F) and required as part of NFPA 110. Refer to the generator set specification sheet for temperature recommendations in available options.
- A **battery heater** is generally recommended for most units when operated below 0°C (32°F). Refer to the respective specification sheet for model availability.
- An **alternator heater** to prevent moisture and frost buildup is available for some generator sets.
- **Heater tape** is recommended when the generator set is equipped with a closed crankcase ventilation system and operated at or below 50% of rated load. Wrap the UL/CSA compliant heater tape around the crankcase canister/breather system hose that runs from the crankcase to the air intake and use cable ties as needed to secure the heater tape. If the heater tape is within 152 mm (6 in.) of the exhaust system, use thermal insulation material to protect the heater tape.

Note:

Tier 4 generator sets (KD1250-4, KD2500-4, KD3250-4) are equipped with DEF line heaters, DEF tank heaters, and DEF component heaters. These EATS heating components are standard on tier 4 generator sets. To prevent freezing and blocking of the DEF flow, power should always be supplied to these EATS heaters. Ensure that the EATS electrical disconnect switch is closed (in the ON position), the emergency stop is released, and that power is provided through the AC power supplies. Refer to the Engine Aftertreatment System installation and Application manual for electrical requirements and installation details. Refer to the following subsection on EATS electrical disconnect in this manual for operation instructions.

3.4 Exercising Generator Set

 DANGER	Hazardous voltage. Moving parts. Will cause severe injury or death. Operate the generator set only when all guards and electrical enclosures are in place.
 	

NOTICE

For generator sets with **exhaust aftertreatment systems (EATS)**, never operate under no-load or low-load conditions. To prevent hydrocarbon buildup in the EATS components, use a load bank or the building design to maintain the minimum load and minimum exhaust temperature. For operation and requirements, refer to the Exhaust Aftertreatment System Installation and Application Manual.

To verify performance and operational readiness; operate (exercise) the generator set periodically.

The operator should perform all the prestart checks before starting the manual exercise procedure. Start the generator set according to the starting procedure in the Controller Operation Modes section, Controller Operation. While the generator set is operating, listen for a smooth-running engine and visually inspect the generator set for fluid or exhaust leaks.

The generator set controller does not provide weekly scheduled exercise periods. For scheduled exercise periods, refer to the automatic transfer switch literature (if equipped). When the generator set does not have an automatic transfer switch with an exercise option, perform the exercise in the presence of an operator.

Generator set exercise is typically performed under **load** (33% or greater); however, for some facilities, **no-load** (0% load), and **low-load** (0–33% load) exercise may be required. See the following subsection, *Conscious Care™, No-Load and Low-Load Exercise*, for proper operation procedures.

See the generator set maintenance manual for on-load test, which is performed under load, and start test, which is performed under no load or low load. Perform these tests while exercising the generator sets.

3.4.1 Conscious Care™, No-Load and Low-Load Exercise

NOTICE

Over time, hydrocarbon buildup can damage the engine and reduce engine performance.

- After 12 hours of cumulative low-load operation or at a minimum of once annually, the generator set must operate under load for 30-60 minutes and maintain the exhaust temperature at rated kW listed on generator set specification sheet for 30 minutes minimum.
- Generator sets with exhaust aftertreatment systems (EATS) should never operate under no-load or low-load conditions because of exhaust temperature requirements.

KD series generator sets qualify for the Conscious Care™ maintenance program, which reduces fuel consumption and carbon emissions through no- or low-load exercise.

Hydrocarbon buildup and deposits typically occur when regularly operating the engine at no load or low load for extended periods of time, which is intensified by operation at low ambient temperatures. High exhaust temperatures, obtained during loaded operation, burn off these hydrocarbons and deposits. When combined with an annual loaded operation and proper maintenance procedures, no-load and low-load operation can be used without hydrocarbon buildup or engine damage.

Two options are available with the Conscious Care™ maintenance program:

- **Monthly exercise** at no load or low load
- **Extended exercise** at no load or low load, exercise every 4 months

Important:

Conscious Care maintenance program is not available for generator sets with exhaust aftertreatment systems (EATS).

The Conscious Care™ maintenance program requires a service agreement to ensure that proper operation and maintenance procedures are followed. Contact an authorized Kohler distributor or dealer to sign up for a service agreement.

Monthly Exercise with Conscious Care™

- Exercise under no-load or low load for a minimum of 10 minutes. Refer to the maintenance procedure Start Test to check generator set operation.
 - Period between exercise intervals must not exceed 1 month.
- Reduce the test intervals of the engine components, particularly the crankcase breather oil circuit.
- Perform maintenance operations more often, particularly the exhaust drainage operations.
- Analyze the oil, if necessary.
- Regularly perform loaded exercise for a minimum duration of 30–60 minutes.
 - Maintain the exhaust temperature at the rated kW stated on the generator set specification sheet for a minimum of 30 minutes.
 - Perform loaded exercise after 12 hours of cumulative no-load and low-load operation. Refer to the maintenance procedure, On-Load Test, to check generator set operation.

Extended Exercise (4-month intervals) with Conscious Care™

Exercising the generator set every four months further reduces fuel emissions and fuel consumption; however, additional preparation and requirements must be taken to ensure reliable starts. In addition to the previous list, see the following list of requirements and recommendations for extended exercise with Conscious Care™:

Required:

- Period between exercise intervals must not exceed 4 months.
- No biofuels or biofuel blends
- Alternator heater
- With engine models **KD62V12, KD83V16, KD103V20**, idle start at point of exercise is required.

Note:

APM802 controller must be updated to firmware version 1.11 or greater. Contact your authorized distributor or dealer to verify idle start availability.

Recommended:

- Monthly cranking to lubricate components
- Redundant starters (if available)
- Redundant batteries
- Redundant battery chargers
- With engine models **KD18L06, KD27V12, KD36V16, KD45V20**, idle start at point of exercise is recommended but not required.

3.5 Load Bank Operation (Tier 4)

Tier 4 generator sets (KD1250-4, KD2500-4, KD3250-4) require a minimum exhaust temperature to prevent hydrocarbon buildup on the SCR. To control exhaust temperatures, a minimum load is maintained either through a load bank or the building design. See the Exhaust Aftertreatment System Installation and Application Manual listed under Related Literature.

- When the hydrocarbon (HC) level reaches the specified limit (default setting is 25%), the APM603 issues a high hydrocarbon warning that the load needs to increase in order to reduce hydrocarbon buildup.
- At 50% the APM603 will report a critically high warning and command the load bank to turn on. When the APM603 commands the load bank to turn on, the load bank has 2 minutes to be connected to the generator set.
 - If after 2 minutes the APM603 does not detect the load bank size as the minimum load, then the generator set will issue a Load Bank Malfunction Warning.
 - If applying the load bank exceeds 90% of the generator set the output rating, the APM603 will not command the load bank to turn on.
- In paralleling applications, the APM603 will either bring another generator set on line and remove the generator set that has high hydrocarbon levels off line, or apply the load bank depending on how many generator sets are currently online and how many generator sets are offline in standby.
 - In APM603 paralleling applications, the load bank must be applied to the generator set side of the motorized breaker.
 - See Paralleling section in this manual for addition information on load bank operation in paralleling applications.
- If switchgear is used to manage the hydrocarbon buildup, the switchgear system must keep the hydrocarbon below the trip points set in the APM603.

3.6 Warnings and Faults

Yellow and red LEDs above the controller's touchscreen indicate warnings and faults.

An inhibit time or time delay may affect warnings and faults.

Inhibit time: This time delay prevents the fault from triggering immediately when the engine starts. The inhibit time allows the engine to come up to speed and stabilize before triggering a fault. For example, the low oil pressure fault event typically has an inhibit time of 10 seconds to allow oil pressure in the engine to build up.

Time Delay. This time delay prevents a fault from triggering immediately when a condition is first detected. This delay prevents nuisance warnings or shutdowns caused by momentary changes in the signal, which could be false signals or electrical noise. For example, the overvoltage fault event typically has a time delay of 30 seconds. The overvoltage condition must be detected for 30 seconds before the fault is triggered.

3.6.1 Yellow System Warning LED and Fault Messages

The yellow WARNING LED turns on and the alarm horn sounds to indicate a warning but does not shut down the generator set. See the following subsection, Notifications (Bell Icon), for a list of fault and warning events and messages.

Press the Alarm Silence button to silence the alarm horn at the operator's discretion. If the controller is set up for an NFPA 110 application, press the AUTO button before silencing the alarm horn.

Warnings are automatically cleared from the controller when the condition is corrected.

When a system warning continues, it may lead to a fault and cause a system shutdown.

3.6.2 Red System Fault Shutdown LED and Fault Messages

When a fault condition is detected, the red system FAULT LED turns on, the alarm horn sounds, and the unit shuts down. See the following subsection, Notifications (Bell Icon), for a list of fault shutdown messages.

Use the Alarm Silence button to silence the alarm horn at the operator's discretion. If the controller is setup for an NFPA 110 application, press the AUTO button before silencing the alarm horn.

Refer to the subsection Resetting the Controller for information to reset a system shutdown.

3.6.3 Fault, Notice, and Status Displays

New warning or shutdown messages appear in a banner across the top of the screen. See Figure 11. Touch ACKNOWLEDGE ALL to close the banner. Touch VIEW ACTIVE ALERTS or the Bell icon to see a list of all active faults.

Warnings and shutdowns appear on the Active Alerts screen and become part of the event log. The Event Log also includes status messages.

- Shutdown messages are written in red and include a red symbol with an X.
- Warning messages are yellow and include a yellow triangle with an ! symbol.
- Status messages are written in white.

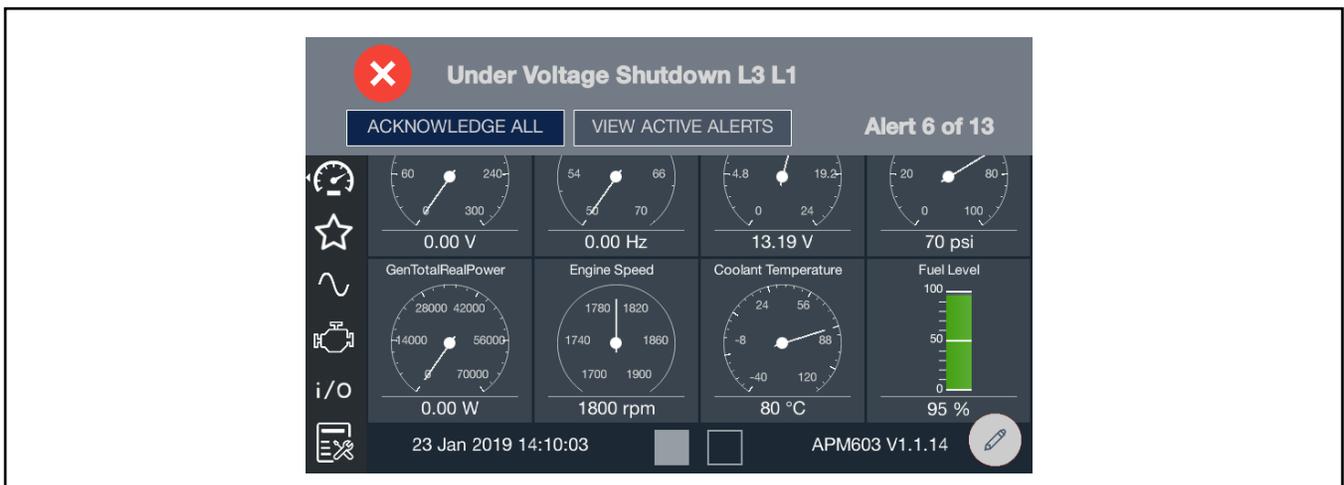


Figure 11 Fault Message Banner

3.6.4 Notifications (Bell icon)

The bell icon provides quick access to the Event Log. If the bell appears straight up and down, there are no active warnings or faults. If the bell is “ringing,” indicated by the bell at an angle with waves, there is at least one active warning or fault. The breadcrumb bar at the top of the page also changes color if there are active warnings or faults. If there are no active warnings or faults, the area is gray. If a warning is active, it is yellow. If a fault is active, it is red.

Touch the Bell icon to review active alerts and the event log. Event details lists the name, severity, and time and date for the event. Touch View Snapshot to see data captured 7.5 seconds before and after the event. The items displayed in the Snapshot are factory selected. For example, in Figure 13 the generator power is displayed for each warning and fault.

When a fault is indicated, be sure to identify and correct the cause of the fault before resetting the controller. Contact an authorized Kohler distributor or dealer for service, if necessary.

When the fault condition has been corrected, press and hold the OFF/RESET button for 3 seconds to clear the fault from the controller. If the fault occurs again, contact an authorized Kohler distributor or dealer for service. Do not start the generator set until the condition has been corrected.

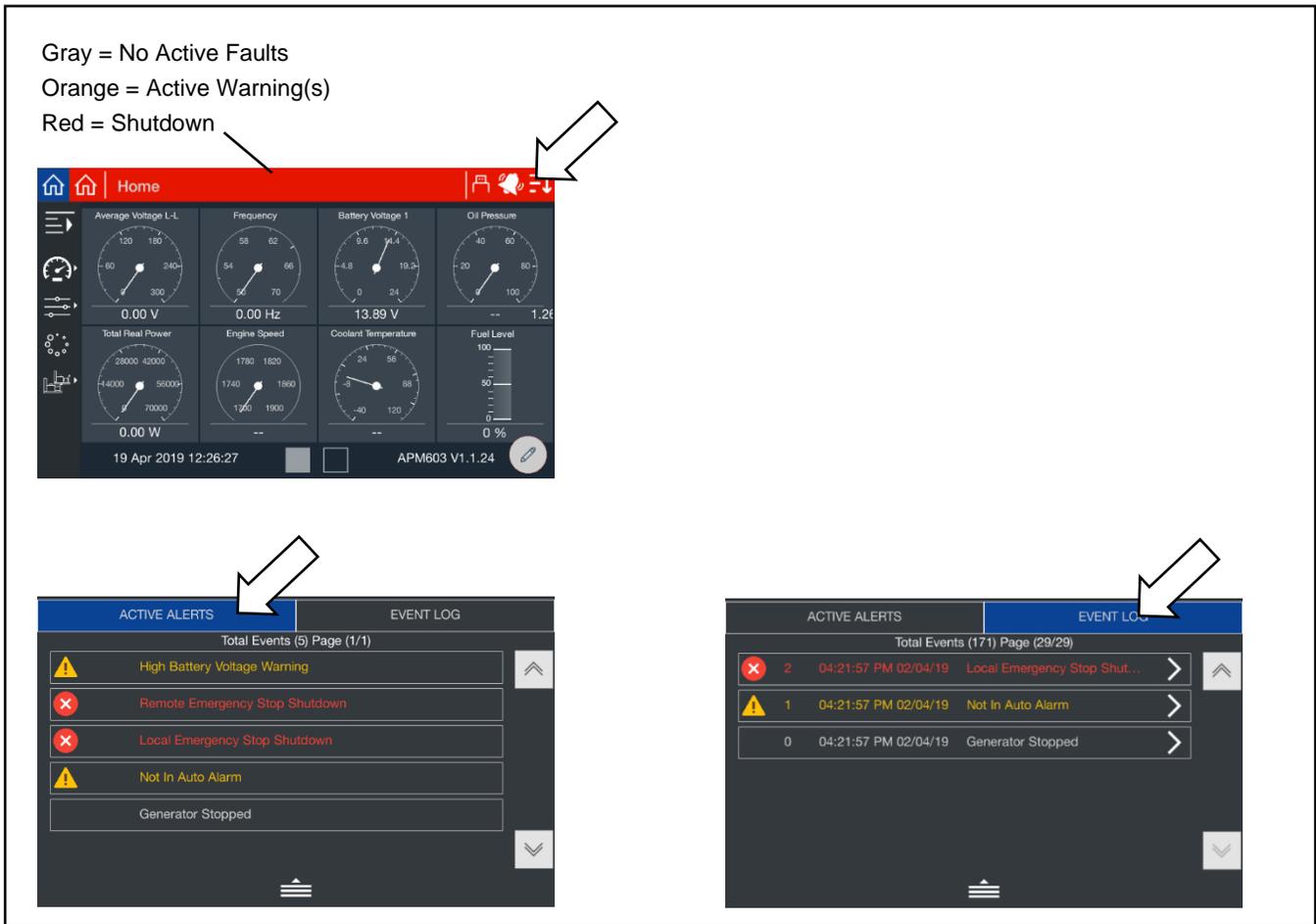


Figure 12 Notifications (Active Alerts and Event Log)

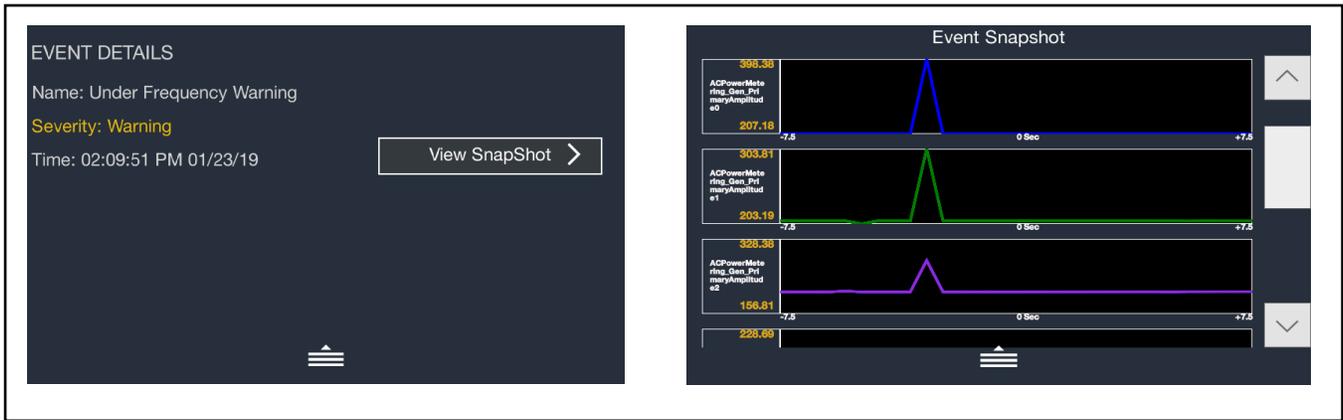


Figure 13 Event Details and Snapshot

Event Log:

This menu allows the user to review up to 10,000 entries of generator set system events including shutdowns, warnings, notices, and status events with date and time stamp.

A message is sent each time there is a change in a monitored engine condition (i.e. fault becomes active, fault is cleared). Upon broadcast of this message, the controller will request another message that contains the following information for each fault:

- SPN (Suspect Parameter Number) is a 3-to-5 digit code that represents an engine component. Refer to the engine Operation Manual for a list of SPN codes.
- FMI (Failure Mode Indicator) is a two-digit code that represents the type of fault that occurred (i.e. short circuit, value is high).

For generator events, see the Event Configuration section. For a list of engine events and FMI codes, see the Engine Data Appendix.

3.6.5 EATS Inducement Notifications (Tier 4 Generator Sets)

For tier 4 generator sets (KD1250-4, KD2500-4, KD3250-4), engine aftertreatment system (EATS) warnings and shutdown faults, when active, appear at the top of the page. If the icons are not visible, there are no active DEF warnings or faults. These icons indicate low DEF fluid, poor DEF quality, poor SCR conversion, or component failure. If action is not taken, a reduction in engine torque occurs. Orange icons indicate warnings, and red icons indicate shutdown faults. See Figure 14. For details about system inducements, refer to the Engine Aftertreatment System Installation and Application manual listed under Related Literature.



Figure 14 EATS Inducement Icons

3.7 Resetting the Controller (Following System Shutdown)

Use the following procedure to restart the generator set after a system shutdown. This procedure includes the resetting of the optional remote annunciator.

Refer to the Emergency Stop Section to reset the generator set after an emergency stop.

1. Disconnect the generator set load using the line circuit breaker or automatic transfer switch.
2. Correct the cause of the fault shutdown or warning. See the Safety Precautions and Instructions section of this manual before proceeding.
3. Reset the fault by pressing and holding the OFF/RESET button for 3 seconds.
4. Start the generator set by pressing the RUN button.
5. When equipped, the remote annunciator alarm horn sounds. Press the ALARM SILENCE/LAMP TEST button to stop the alarm horn. The alarm silenced LED turns on if the alarm is silenced.
6. Allow the generator set to run long enough to verify that the fault condition has been corrected.
7. Press the generator set OFF/RESET button to stop the generator set.
8. Press the generator set AUTO button.
9. Silence the controller alarm horn by pressing the ALARM SILENCE button.
10. Reconnect the generator set load via the line circuit breaker or automatic transfer switch.
11. When equipped, the remote annunciator alarm horn sounds. Press the ALARM SILENCE/LAMP TEST button to stop the alarm horn. The alarm silence LED turns on if the alarm is silenced.

3.8 Controller Settings

Touch the down arrow icon at the upper right corner of the screen to access the controller settings.

- Display Brightness
Adjusts the brightness of the controller's touchscreen display. Touch the sun icons at either end of the bar to increase or decrease the brightness of the display.
- LED Brightness
Adjusts the brightness of the Warning and Fault LEDs above the display. Touch the sun icons at either end of the bar to increase or decrease the brightness of the LEDs.
- Date/Time
Set the date, time, and time zone at the controller's location. The date and time are displayed on the Home screens and are used in the event log and for data logging.
- Language.
For future development. At this time, English is the only available option.
- Controller Session Login Timeout
Controls the session time for access levels above the user level. The access level returns to the lowest (user) level after the session timeout to prevent unauthorized access after an operator or service technician has finished working.
- Access Level
This is where an operator or technician can log into the controller using an Operator or Technician password. The Operator and Technician level passwords allow access to view and change settings that are not available at the default user level. See the Access Levels Section for more information.

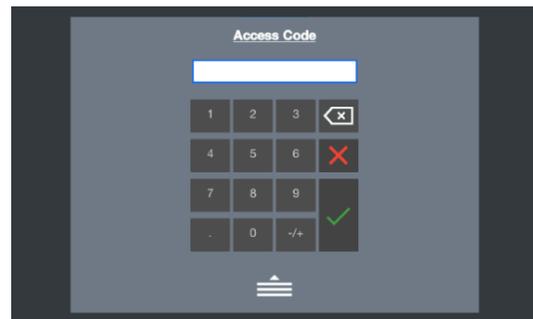
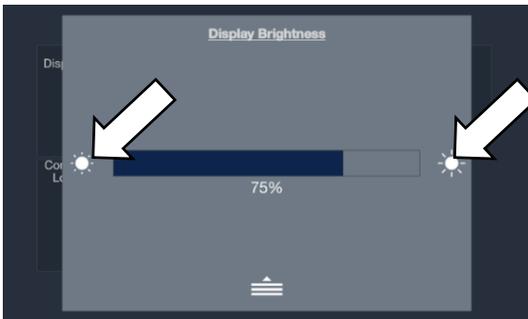
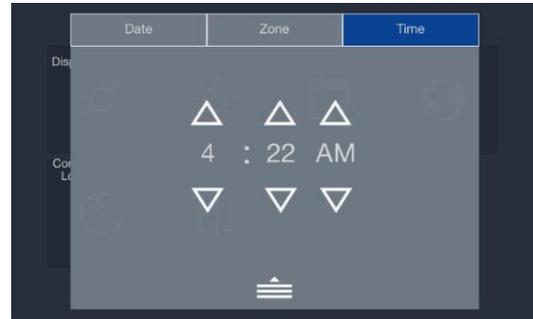


Figure 15 Controller Settings and Access Levels

3.9 Screen Shots

It is possible to save screen shots showing the controller display. Screen shots showing the controller display can be saved to a flash drive. The screens shots are saved as .png files, which can be viewed using a photo viewer on your PC.

Refer to the Controller Features Section for the locations of the USB port and the Alarm Silence/Lamp Test button on the controller, if necessary.

Procedure to Create Screen Shot Files

1. Insert a flash drive into the USB port on the front of the APM603 controller.
2. Check for the flash drive symbol near the top of the screen, which shows that the controller recognizes the flash drive.
3. Navigate to the desired screen and press the Alarm Silence/Lamp Test button once.
4. Wait at least 5 seconds to allow the png file to be saved to the flash drive. If the flash drive has an LED indicator, wait for the LED to stop flickering.
5. If multiple screen shots are needed, repeat steps 2 and 3 for each screen.
6. Remove the flash drive from the controller and insert it into a USB port on your PC. Open the files to verify that the screen shots were saved correctly.



Figure 16 Flash Drive Symbol

3.10 Menu Navigation

The APM603 controller provides menus and submenus that display controller settings, generator set status, and paralleling information. The following list shows the locations of the menus and submenus on the controller.

- Metering
 - Favorites
 - Electrical
 - Generator
 - Inputs
 - Outputs
 - Battery Charger (N/A for KD models)
 - Engine
 - Overview (Tier 4 only)
 - Fuel (Tier 4 only)
 - Temperature (Tier 4 only)
 - Pressures (Tier 4 only)
 - Aftertreatment (Tier 4 only)
 - Op Records
 - Load Management
 - Overview
 - Status
 - System
 - Load
 - Setup Details
- Setup
 - Electrical
 - Generator
 - Battery Charger (N/A for KD models)
 - Paralleling
 - Engine
 - Communications
 - Event Config
 - Genset Info
- Data Log
- Paralleling (only appears if paralleling screens are enabled under Setup>Electrical>Paralleling)
 - Metering
 - Overview
 - Status
 - Details GEN 1-4
 - Details GEN 5-8
 - PGEN
 - Setup
 - PGEN
 - Protect Relay
 - Gen Management
 - Overview
 - Status
 - System
 - Generator
 - Setup Details

Section 4. Metering Menu and Screens

4.1 Metering Screens

The metering screens allow the user to view generator set status and operation records. The home screens display frequently-viewed parameters including generator set voltage, frequency, current and power, as well as engine data such as RPM and oil pressure. The home screens can be modified to display your choice of up to 16 system parameters using four different display formats.

The Favorites screen provides another way to display your choice of data. Separate favorites screens can be set up for each access level: user, operator, and technician.

The metering screens are designed for viewing only. Settings cannot be changed through the metering screens.

The metering screens display:

- Favorites
- Electrical, including generator set, inputs, outputs, and battery charger
- Engine
- Operation records
- Load Management



Figure 17 Metering Menu, Expanded

4.1.1 Home

At startup, the controller displays the home screen shown in Figure 18. Two home screens showing up to 16 different generator set values can be displayed. Touch the square buttons at the bottom of the screen to move between the two home screen displays.

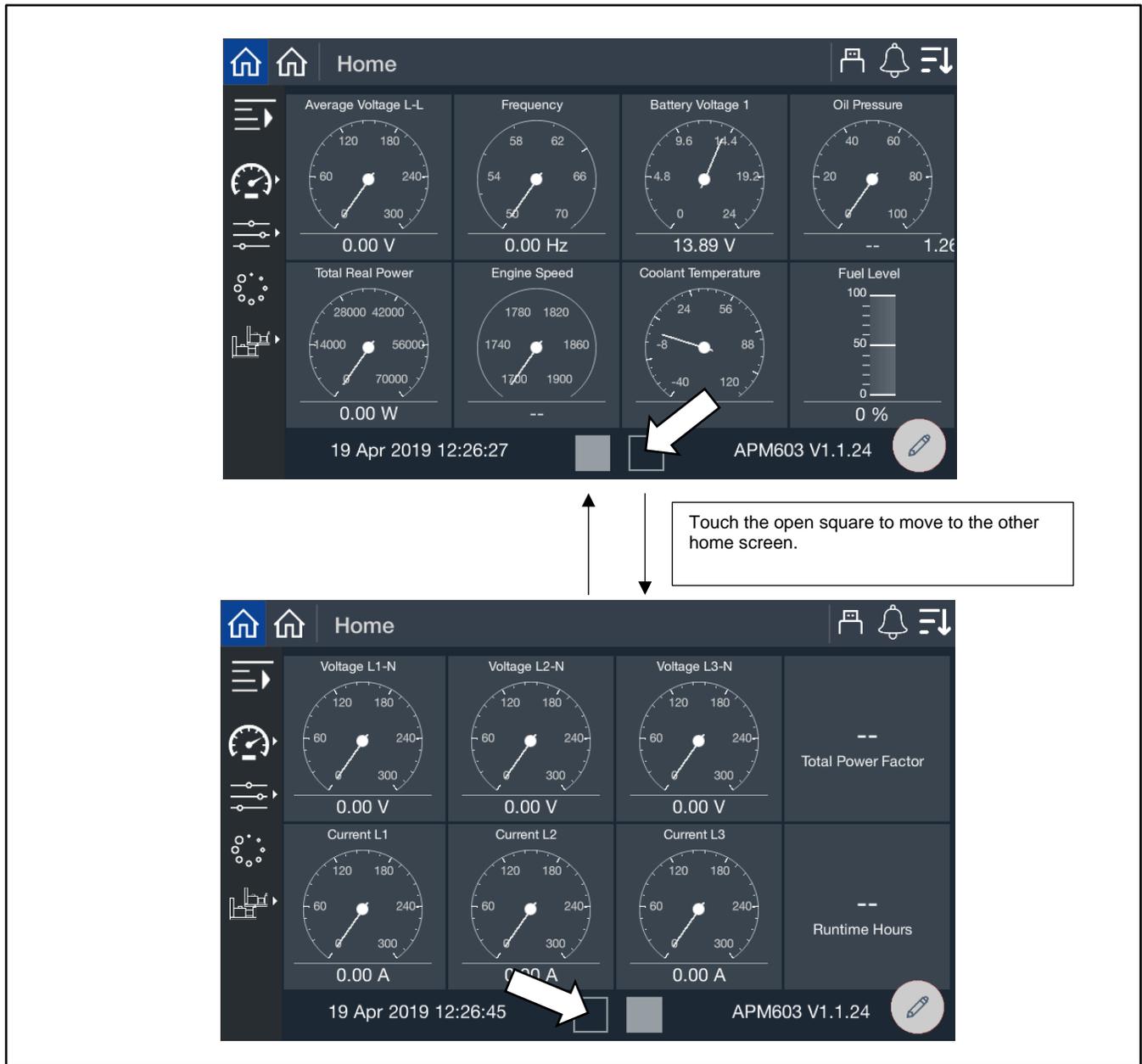


Figure 18 Home Screens

The parameters shown below are displayed on the home screens by default. Follow the instructions in the next section to change the parameters displayed. Up to 16 system parameters can be selected for display on the two Home screens.

Default Parameters
Average Voltage L to L
Frequency
Battery Voltage
Oil Pressure
Total Real Power
Speed
Coolant Temperature
Fuel Level
Voltage L1-N
Voltage L2-N
Voltage L3-N
Total Power Factor
Current L1
Current L2
Current L3
Runtime Hours

Figure 19 Default Parameters Shown on the Home Screens

4.1.2 Customizing the Home Screens

The displayed values and the gauge styles for the Home screens can be changed as desired.

To add a gauge, there must be at least one empty space available on the screen. It may be necessary to remove a gauge to create an empty space. When any gauge is removed, the remaining gauges shift to fill the vacated space, and the new open space will appear at the end of the second screen. To change the order of the gauges, it is necessary to remove the gauges using the trash can icon and then replace them in the desired order.

Choose up to 16 values from the following categories:

- Electrical – Generator
- Electrical – Inputs
- Electrical – Outputs
- Electrical – Battery Charger 1 (no battery charger data is available for KD models)
- Electrical – Battery Charger 2 (no battery charger data is available for KD models)
- Engine
- Engine – Overview (Tier 4 only)
- Engine – Fuel (Tier 4 only)
- Engine – Temperature (Tier 4 only)
- Engine – Pressures (Tier 4 only)
- Engine – Aftertreatment (Tier 4 only)
- Operation Records
- Load Management
- Paralleling

Full gauge, half gauge, vertical gauge, or tile (text only) styles are available.

Procedure to Remove Gauges from the Home Screens

Refer to Figure 20 during this procedure.

1. Touch the pencil icon.
2. Touch the trash can icon. Trash cans will then appear on each tile.
3. Touch the trash can for the gauge (or gauges) to be removed.
4. Touch the green check mark. Notice that the last position is now empty.

The numbers below correspond to the numbered steps in the Procedure to Remove Gauges from the Home Screen.



Figure 20 Removing Gauges from the Home Screen

Procedure to Add New Gauges to the Home Screen

Refer to Figure 21 during the following procedure.

1. Touch the pencil icon.
2. Touch the + icon.
3. Select the category for the parameter to be displayed.
4. Touch the parameter.
5. Four gauge styles will appear. Touch to choose the style.
6. The new gauge is added. Notice that the newly added gauge appears in the last open space.

Note:

A maximum of 16 values can be displayed. One or more blank tiles must be available before gauges can be added.

The numbers below correspond to the numbered steps in the Procedure to Add New Gauges to the Home Screen.

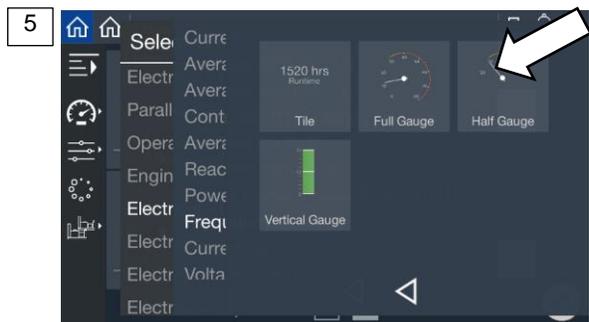


Figure 21 Adding Gauges to the Home Screen

4.1.3 Favorites

The Favorites screen allows the user, operator, and technician to view selected parameters from different categories on one screen.

Procedure to View Favorites

1. Touch Metering or the gauge symbol.
2. Touch Favorites or the star symbol.
3. Favorite parameters are displayed.

The numbers below correspond to the numbered steps in the Procedure to View Favorites.

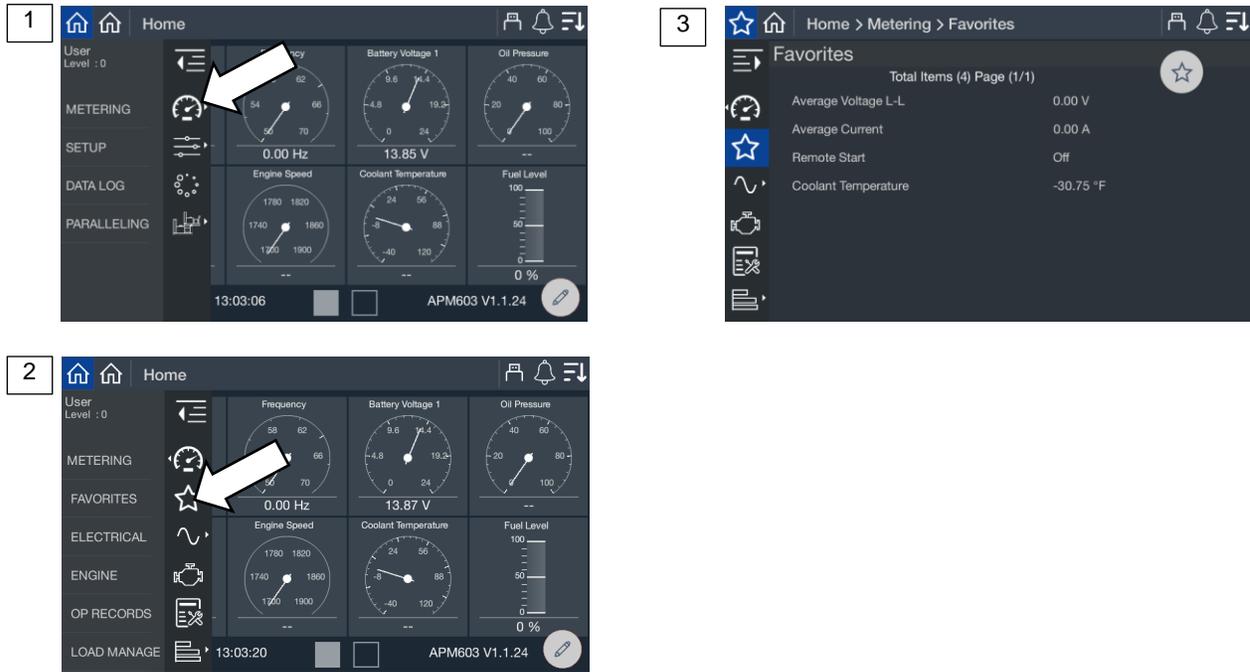


Figure 22 Metering, Favorites

A user can select the parameters to display in the Favorites screen. A different set of favorites can be selected for each access level. The operator and technician can select different favorites than the user. There is no limit to the number of favorites that can be selected. See Figure 23 for instructions to select parameters from nine different categories:

- Electrical – Generator
- Electrical – Inputs
- Electrical – Outputs
- Electrical – Battery Charger 1 (no battery charger data is available for KD models)
- Electrical – Battery Charger 2 (no battery charger data is available for KD models)
- Engine
- Operation Records
- Load Management
- Paralleling

Note:

The parameters are listed on the Favorites screen in the order selected.

Procedure to Select Favorites

First, go to the Favorites screen as described in Figure 22.

1. Touch the Star icon in the upper right corner of the screen.
2. Touch the category.
3. Touch the stars for one or more parameters to be included in the Favorites display. The selected stars turn solid white.
4. Touch the left arrow symbol to close the selection box. Repeat steps 2 and 3 for other categories.
5. Observe that the selected parameters are now displayed in the order they were selected.

The numbers below correspond to the numbered steps in the Procedure to Select Favorites.

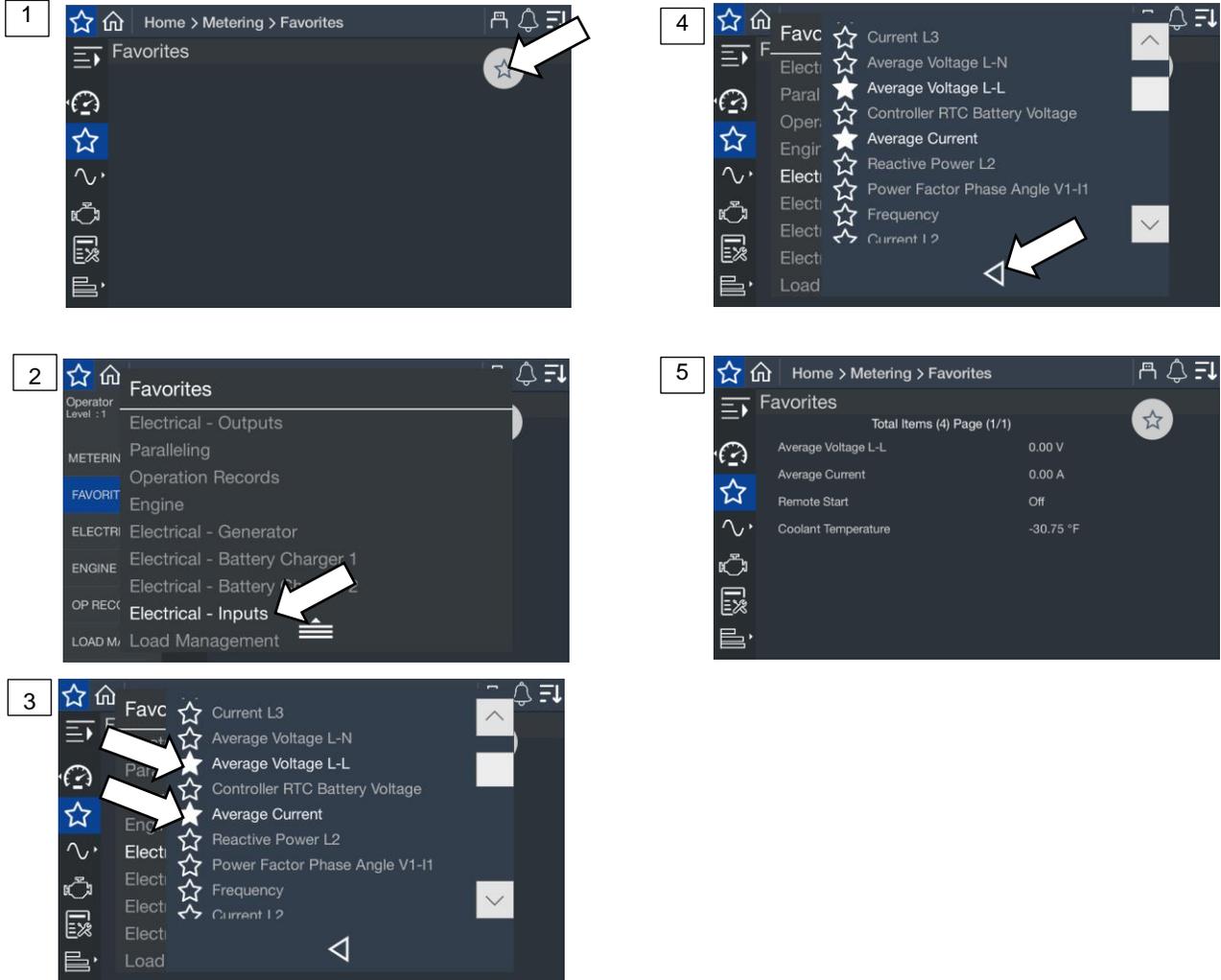


Figure 23 Selecting Favorites

4.2 Electrical

4.2.1 Metering Screens, Electrical, Generator

The Generator Metering screens display generator set electrical information such as output voltage, frequency, current, and other electrical data listed in Figure 25. The metering screens display information only. Parameter settings cannot be changed from the metering screens.

Procedure to View Generator Electrical Metering Screens

1. In the navigation panel on the left side of the screen, touch Metering or the gauge symbol.
2. Touch Electrical or the sine wave symbol.
3. Touch Generator or the generator symbol.
4. Touch the arrows on the right side of the screen to scroll through the electrical metering screens.

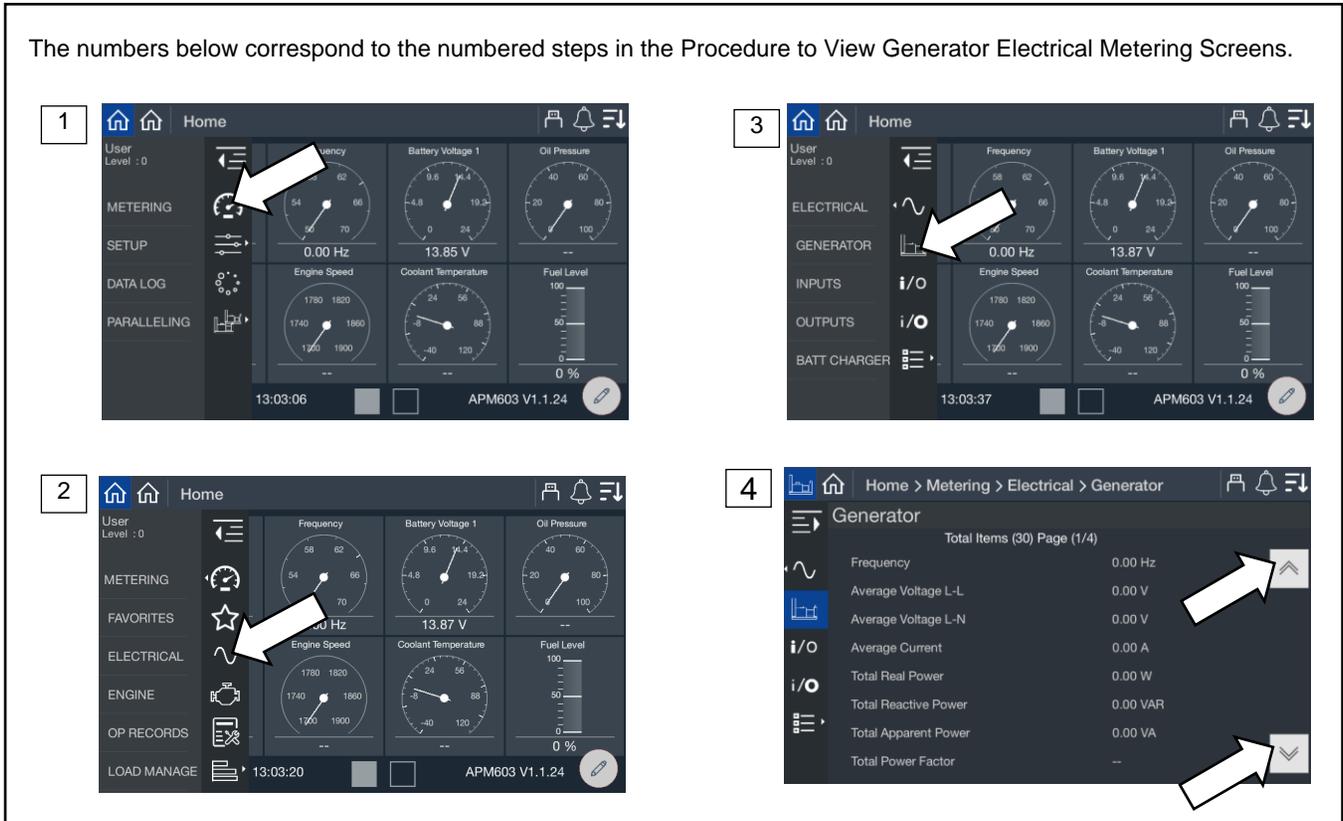


Figure 24 Electrical Metering Screen

The generator metering screen displays the values shown below.

Parameter	Units
Frequency	Hz
Average Voltage L-L	V
Average Voltage L-N	V
Three Phase Average Current	kA
Total Real Power	kW
Total Reactive Power	kVAR
Total Apparent Power	kVA
Total Power Factor	
Battery Voltage *	V
Controller RTC Battery Voltage	V
Voltage L1-L2	V
Voltage L2-L3	V
Voltage L3-L1	V
Voltage L1-N	V
Voltage L2-N	V
Voltage L3-N	V
Current L1	A or kA
Current L2	A or kA
Current L3	A or kA
Real Power L1	kW
Real Power L2	kW
Real Power L3	kW
Reactive Power L1	kVAR
Reactive Power L2	kVAR
Reactive Power L3	kVAR
Apparent Power L1	kVA
Apparent Power L2	kVA
Apparent Power L3	kVA
Voltage Phase Angle L1-L2	Degrees
Voltage Phase Angle L1-L3	Degrees
* On units with redundant starters, battery voltage is displayed for two batteries.	

Figure 25 Generator Metering Data

4.2.2 Input Metering

Input status is displayed on the Metering, Electrical, Inputs screen.

The standard, dedicated inputs are listed in the previous section Inputs and Outputs. Optional input/output modules are available. I/O Module 0 inputs and outputs are factory set. I/O Module 1 outputs are also factory set. I/O Module 1 inputs and I/O Module 2 inputs and outputs are configurable.

A personal computer and Kohler SiteTech™ software are required to assign input functions to the inputs on the I/O modules. SiteTech is available to Kohler authorized distributors and dealers.

Procedure to View Input Status

1. In the navigation panel on the left side of the screen, touch Metering or the gauge symbol.
2. Touch Electrical or the sine wave symbol.
3. Touch Inputs or the i/o symbol with the bold i.
4. Touch the up and down arrows on the right side of the screen to view the inputs.

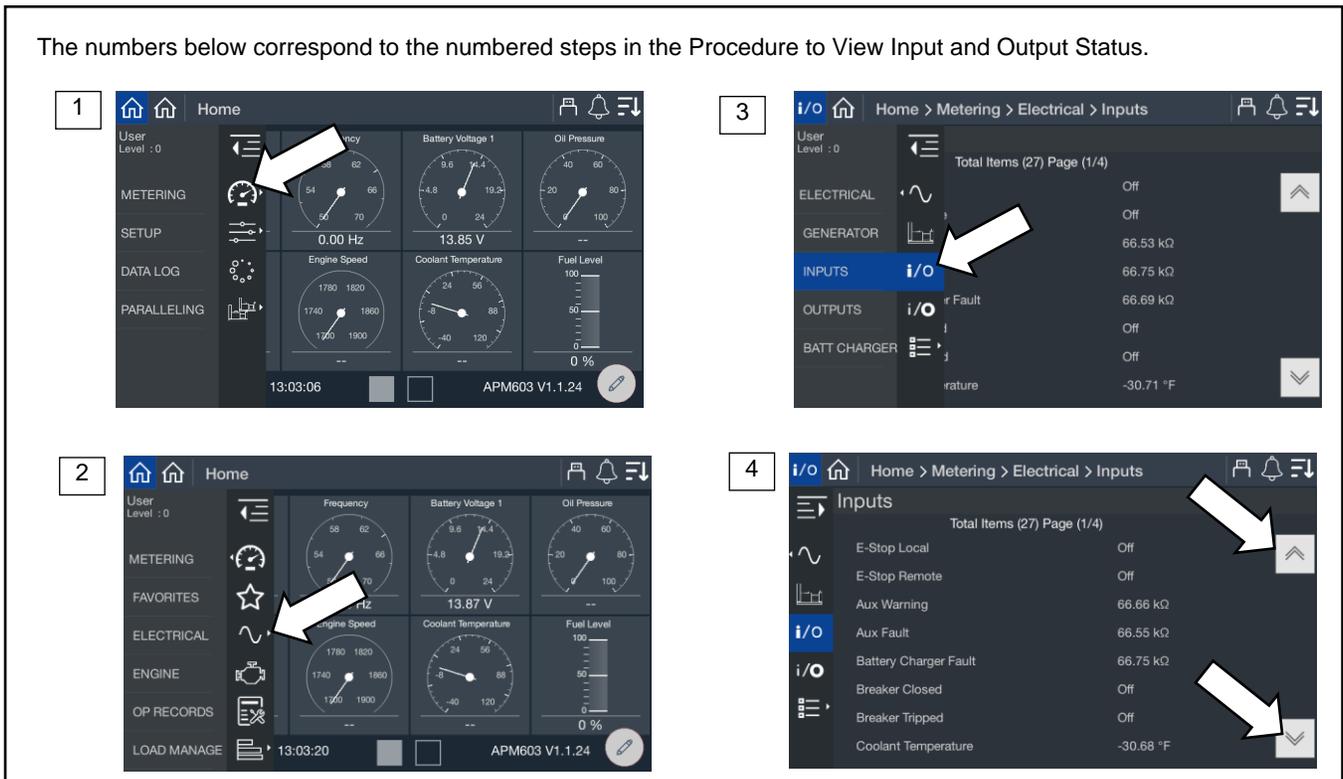


Figure 26 Inputs Metering Screen

Parameter	Values	Parameter	Values
E-Stop Local	Yes/No	Key Switch Auto	On/Off
E-Stop Remote	Yes/No	Key Switch Run	On/Off
Battery Charger Fault	True/False	Remote Start	On/Off
Breaker Closed	Yes/No	OFF Button	On/Off
Breaker Tripped/Open	Yes/No	RUN Button	On/Off
Coolant Temperature	°F or C	AUTO Button	On/Off
Idle Mode Start	On/Off	Speed Bias	V
Fuel Level	%	Voltage Bias	V
Fuel Leak Alarm	On/Off	I/O Module 0 Digital Inputs 0-7	On/Off
Low Fuel Level Switch	True/False	I/O Module 1 Digital Inputs 0-7	On/Off
Ground Fault Relay	On/Off	I/O Module 2 Digital Inputs 0-7	On/Off

Figure 27 Inputs Included in the Inputs Metering Screen

4.2.3 Output Metering

The Electrical Metering screen for outputs displays the status of the outputs.

The standard, dedicated outputs are listed in Section 2. Optional I/O Modules are available.

A personal computer and Kohler SiteTech™ software are required to assign output functions to the programmable outputs on the I/O module. SiteTech is available to Kohler authorized distributors and dealers.

Procedure to View Output Status

1. In the navigation panel on the left side of the screen, touch Metering or the gauge symbol.
2. Touch Electrical or the sine wave symbol.
3. Touch outputs or the i/o symbol with the bold letter o.
4. Touch the up and down arrows on the right side of the screen to view the outputs.

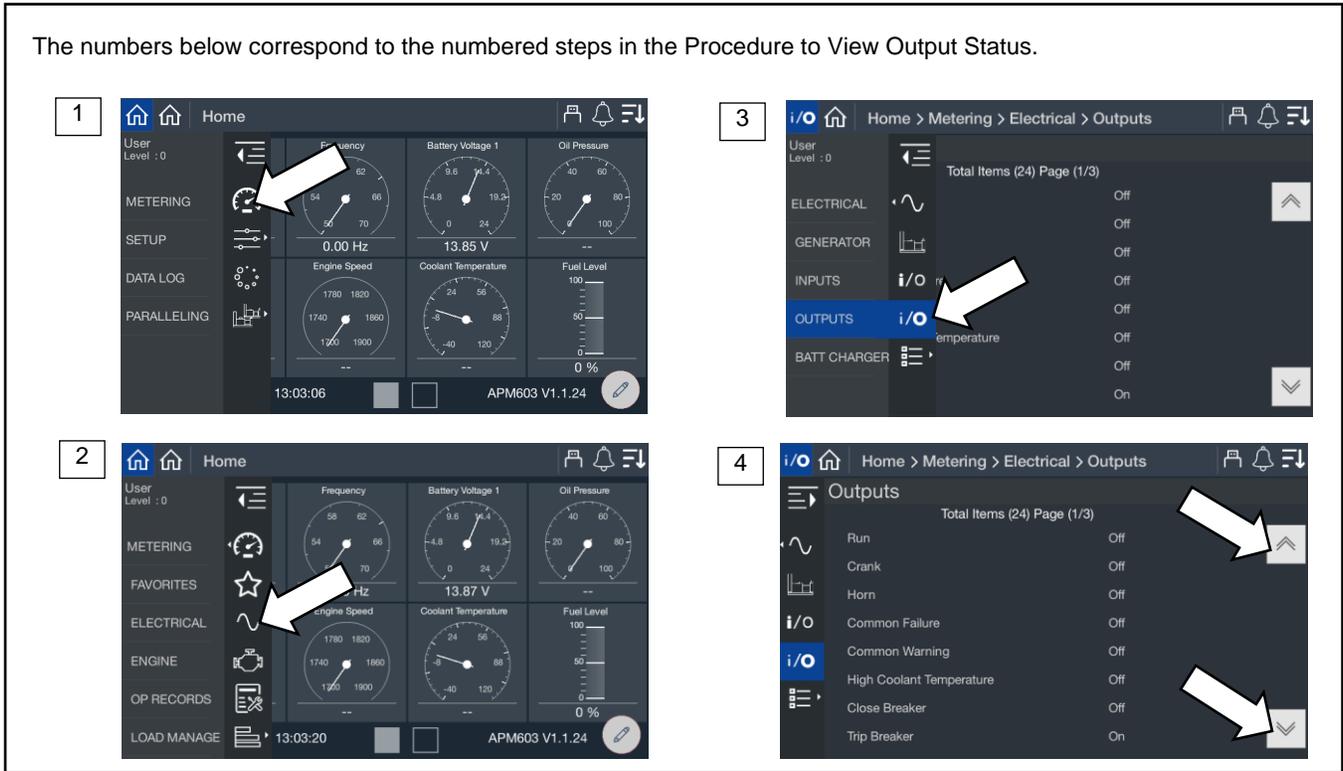


Figure 28 Outputs Metering Screen

Output	Units/Value
Run/Generator Running	On/Off
BCA Excitation	On/Off
Horn	On/Off
Common Failure/Fault	On/Off
Common Warning	On/Off
High Coolant Temperature	On/Off
Close Breaker	On/Off
Trip Breaker	On/Off
Alternator Excitation	%
I/O Module 0 Digital Outputs0-7	On/Off
I/O Module 1 Digital Outputs0-7	On/Off
I/O Module 2 Digital Outputs0-7	On/Off

Figure 29 Outputs Displayed in the Outputs Metering Screen

4.2.4 Battery Charger

The electrical metering screens for battery chargers are not applicable for model KD generator sets.

4.3 Engine

The Engine Metering screen displays the engine data shown in Figure 31.

Procedure to View the Engine Metering Screen

1. In the navigation panel on the left side of the screen, touch Metering or the gauge symbol.
2. Touch Engine or the engine symbol.
3. Observe the engine data shown on the screen.

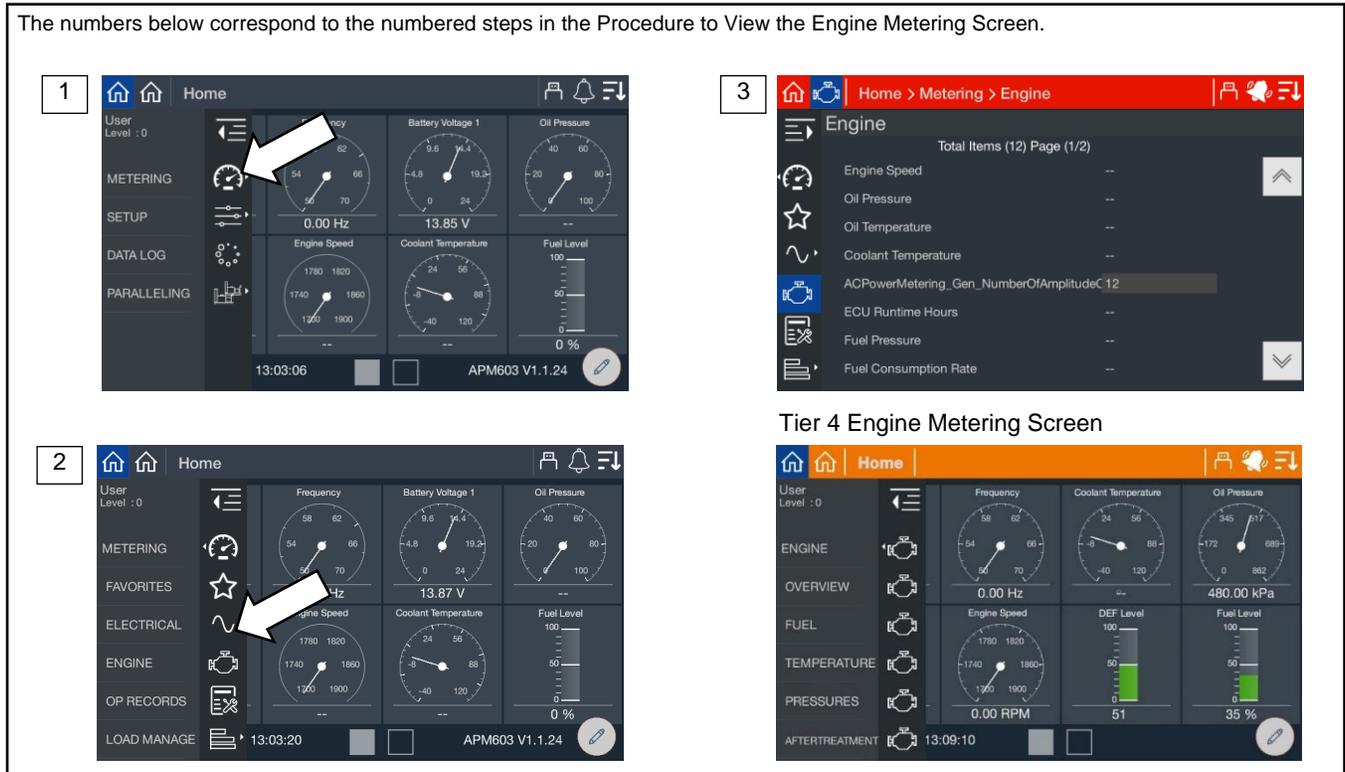


Figure 30 Metering, Engine

Tier 2 Generator Models	
Item	Units
Engine Speed	RPM
Oil Pressure	PSI
Oil Temperature	°F or °C
Coolant Temperature	°F or °C
Crankcase Pressure	PSI/kPa
Intake Manifold Pressure	PSI
Intake Manifold Temperature	°F or °C
Intercooler Coolant Temperature (K175 engines only)	°F or °C
Ambient Temperature	°F or °C
ECU Runtime Hours	Hours
Fuel Pressure	PSI/kPa
Common Rail Fuel Pressure	PSI/kPa
Fuel Temperature	°F or °C
Fuel Consumption Rate	Gallons/hour

Tier 4 Generator Models	
Item	Units
Frequency	Hz
Coolant Temp	°F or °C
Oil Pressure	PSI or kPa
Engine Speed	RPM
DEF Level	%
Fuel Level	%

Figure 31 Engine Metering Data

4.3.1 Overview

The Overview Metering screen displays the overview data shown in Figure 33.

Note:

This menu is only available on Tier 4 generator sets.

Procedure to View the Engine Overview Metering Screen

1. In the navigation panel on the left side of the screen, touch Metering or the gauge symbol.
2. Touch Engine or the engine symbol.
3. Touch Overview.
4. Observe the data shown on the screen.

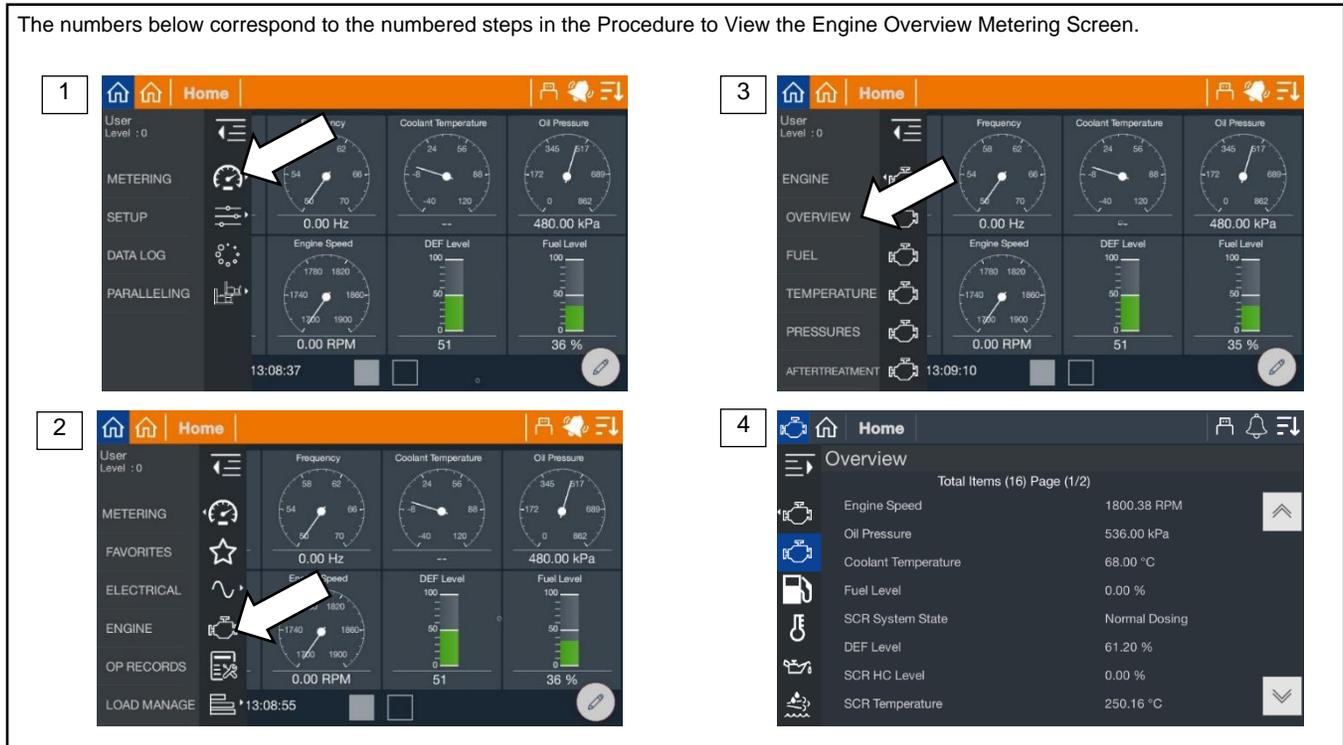


Figure 32 Metering, Engine Overview

Tier 4 Generator Sets	
Item	Units
Engine Speed	RPM
Oil Pressure	PSI or kPa
Coolant Temp	°F or °C
Fuel Level	%
Run Time Hours	Hours
SCR System State	ScrSytemStates
DEF Level	%
SCR HC Level	%
SCR Temperature	°F or °C
Coolant Level	
Aftercooler Coolant Level	
ECU Battery Voltage	V
ECU Keyswitch Voltage	V
SCR Operator Inducement Severity Level	
Engine Derate Is Active	Yes/No
NOx Control Torque Limit	%
Engine Operating State	EngOperatingStates

Figure 33 Engine Overview

4.3.2 Fuel

The Fuel Metering screen displays the fuel data shown in Figure 35.

Note:

This menu is only available on Tier 4 generator sets.

Procedure to View the Engine Fuel Metering Screen

1. In the navigation panel on the left side of the screen, touch Metering or the gauge symbol.
2. Touch Engine or the engine symbol.
3. Touch Fuel.
4. Observe the data shown on the screen.

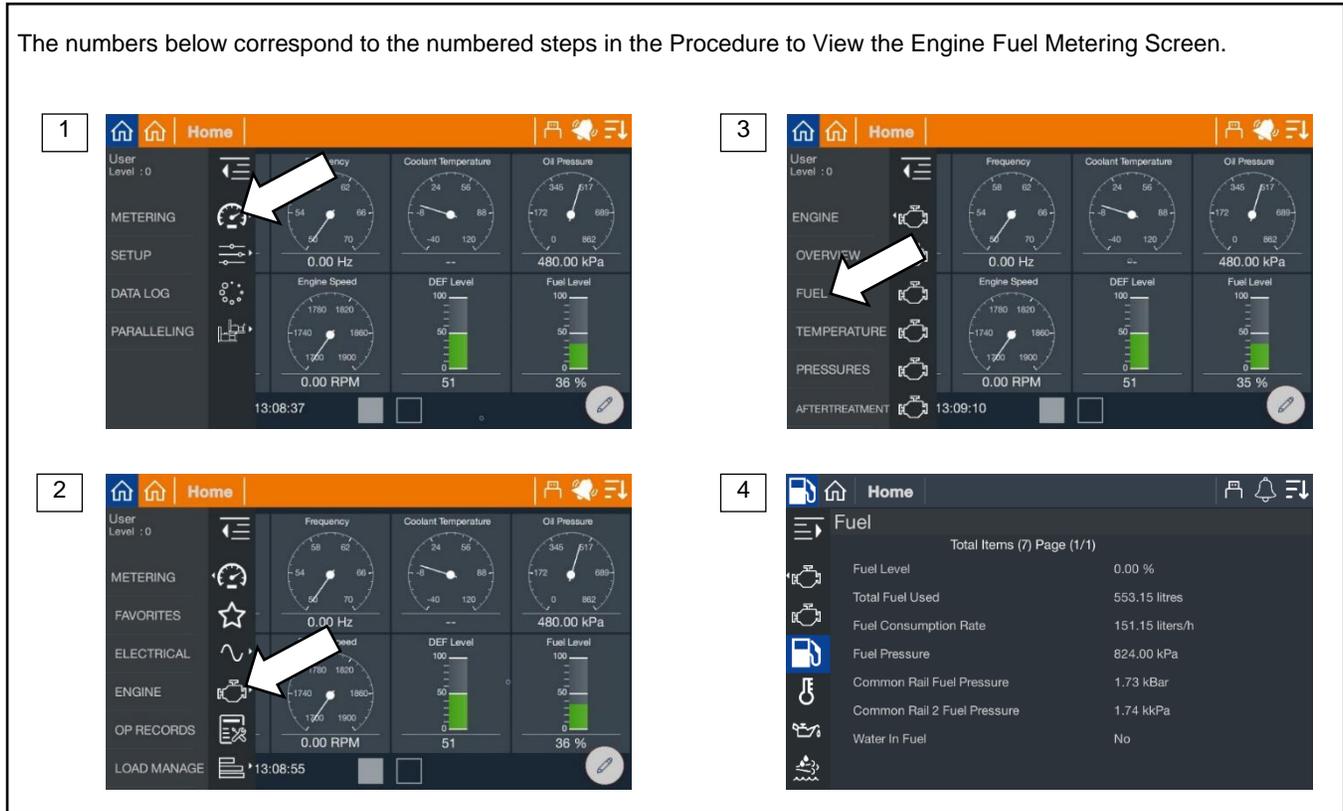


Figure 34 Metering, Engine Fuel

Tier 4 Generator Sets	
Item	Units
Fuel Level	%
Total Fuel Used	litres
Fuel Consumption Rate	L/Hr
Fuel Temperature	°F or °C
Fuel Pressure	PSI or kPa
Common Rail Fuel Pressure	Bar
Common Rail 2 Fuel Pressure	Bar
Water In Fuel	Yes/No

Figure 35 Fuel Metering Data

4.3.3 Temperature

The Temperature Metering screen displays the Temperature data shown in Figure 37.

Note:

This menu is only available on Tier 4 generator sets.

Procedure to View the Engine Temperature Metering Screen

1. In the navigation panel on the left side of the screen, touch Metering or the gauge symbol.
2. Touch Engine or the engine symbol.
3. Touch Temperature.
4. Observe the data shown on the screen.

The numbers below correspond to the numbered steps in the Procedure to View the Temperature Metering Screen.

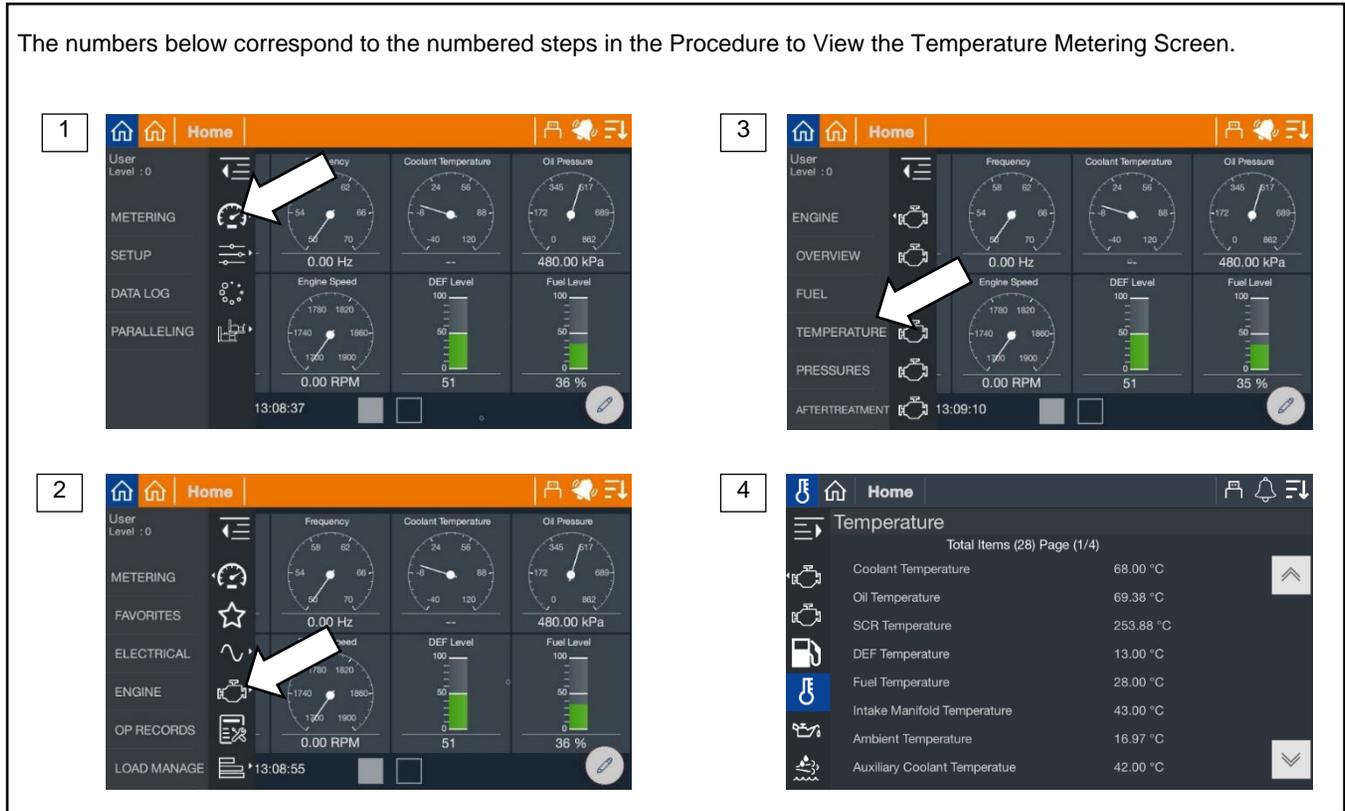


Figure 36 Metering, Engine Temperature

Item	Unit
Coolant Temperature	°F or °C
Oil Temperature	°F or °C
SCR Temperature	°F or °C
DEF Temperature	°F or °C
Fuel Temperature	°F or °C
Intake Manifold Temperature	°F or °C
Ambient Temperature	°F or °C
Auxiliary Coolant Temperature	°F or °C
ECU Temperature	°F or °C
Turbo 1 Turbine Intake Temperature	°F or °C
Turbo 2 Turbine Intake Temperature	°F or °C
Turbo 1 Compressor Intake Temperature	°F or °C
Exhaust Gas Port 1 Temperature	°F or °C
Exhaust Gas Port 2 Temperature	°F or °C
Exhaust Gas Port 3 Temperature	°F or °C
Exhaust Gas Port 4 Temperature	°F or °C
Exhaust Gas Port 5 Temperature	°F or °C
Exhaust Gas Port 6 Temperature	°F or °C
Exhaust Gas Port 7 Temperature	°F or °C
Exhaust Gas Port 8 Temperature	°F or °C
Exhaust Gas Port 9 Temperature	°F or °C
Exhaust Gas Port 10 Temperature	°F or °C
Exhaust Gas Port 11 Temperature	°F or °C
Exhaust Gas Port 12 Temperature	°F or °C
Exhaust Gas Port 13 Temperature	°F or °C
Exhaust Gas Port 14 Temperature	°F or °C
Exhaust Gas Port 15 Temperature	°F or °C
Exhaust Gas Port 16 Temperature	°F or °C

Figure 37 Engine Temperature Metering Data

4.3.4 Pressure

The Pressure Metering screen displays the pressure data shown in.

Note:

This menu is only available on Tier 4 generator sets.

Procedure to View the Engine Pressure Metering Screen

1. In the navigation panel on the left side of the screen, touch Metering or the gauge symbol.
2. Touch Engine or the engine symbol.
3. Touch Pressure.
4. Observe the data shown on the screen.

The numbers below correspond to the numbered steps in the Procedure to View the Pressure Metering Screen.

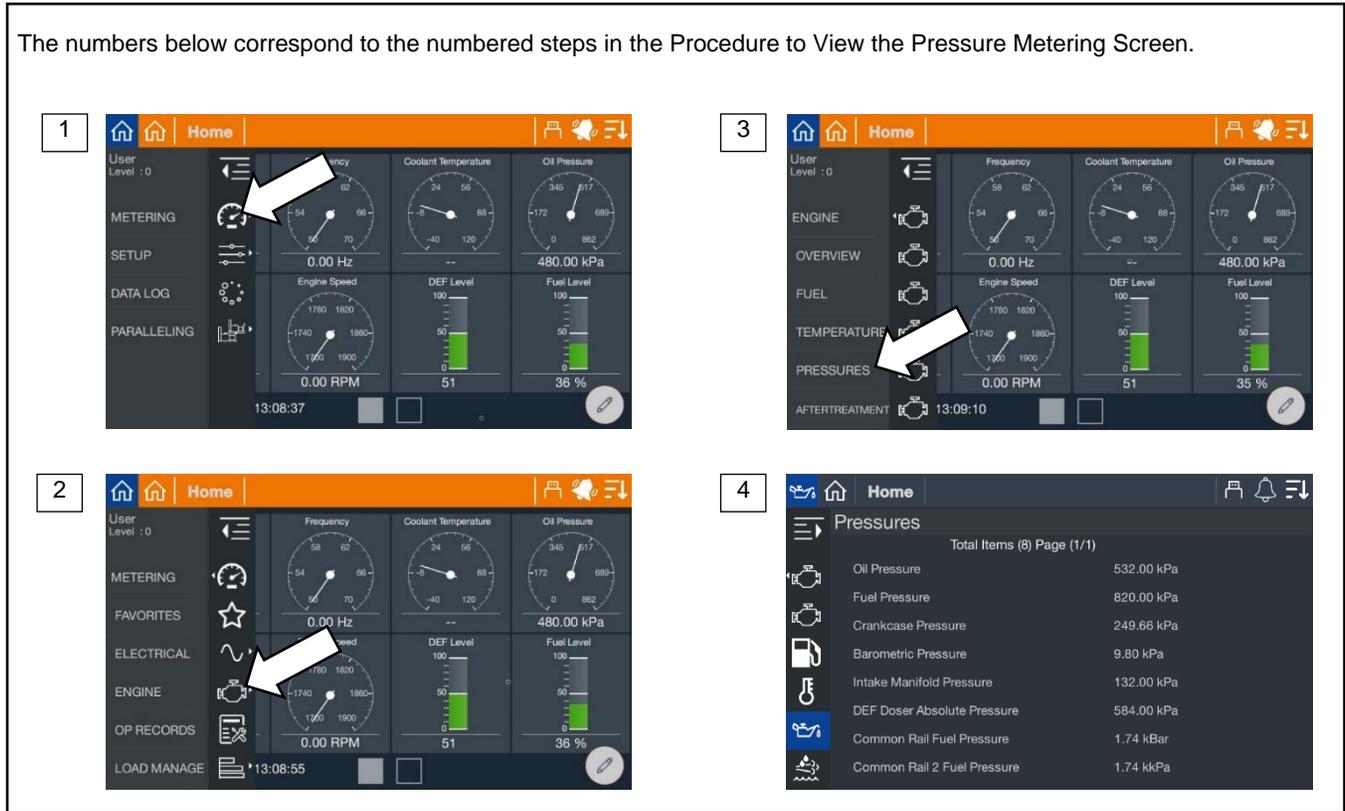


Figure 38 Metering, Engine Pressure

Item	Unit
Oil Pressure	PSI or kPa
Fuel Pressure	PSI or kPa
Crankcase Pressure	PSI or kPa
Barometric Pressure	PSI or kPa
Intake Manifold Pressure	PSI or kPa
DEF Doser Absolute Pressure	PSI or kPa
Common Rail Fuel Pressure	Bar
Common Rail 2 Fuel Pressure	Bar

Figure 39 Engine Pressure Metering Data

4.3.5 Aftertreatment

The Aftertreatment Metering screen displays the aftertreatment data shown in Figure 41.

Note:

This menu is only available on Tier 4 generator sets.

Procedure to View the Engine Aftertreatment Metering Screen

1. In the navigation panel on the left side of the screen, touch Metering or the gauge symbol.
2. Touch Engine or the engine symbol.
3. Touch Aftertreatment.
4. Observe the data shown on the screen.

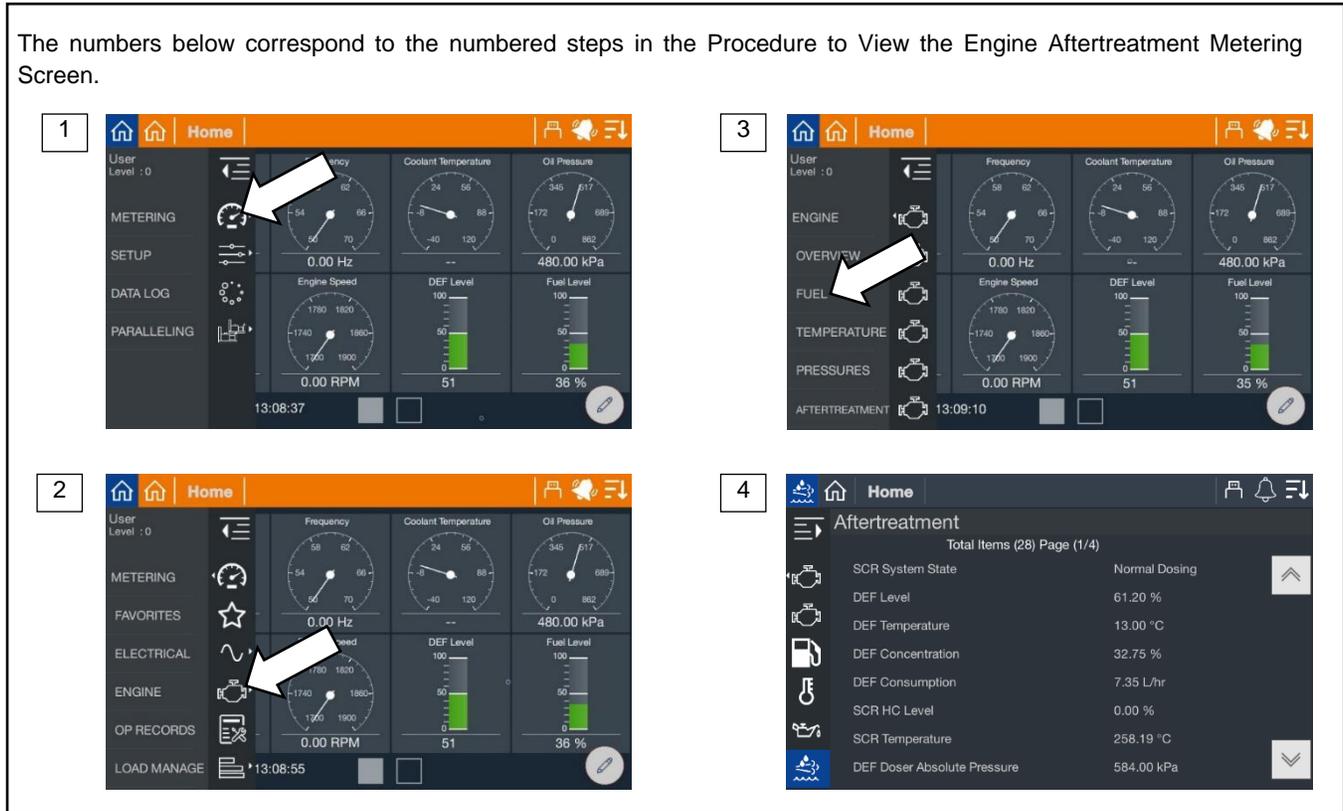


Figure 40 Metering, Engine Aftertreatment

Item	Units
SCR System State	ScrSytemStates
DEF Level	%
DEF Temperature	°F or °C
DEF Concentration	%
DEF Consumption	L/Hr
SCR HC Level	%
SCR Temperature	°F or °C
DEF Doser Absolute Pressure	PSI or kPa
DEF Doser Pump Speed	RPM
DEF Doser Pump Command	%
Engine Derate Is Active	Yes/No
NOx Control Torque Limit	%
SCR Operator Inducement Severity Level	
SCR Defrost Complete	Yes/No
DEF Defrost Complete	Yes/No
DEF Level Inducement State	AftertreatmentInducementState
System Failure Inducement State	AftertreatmentInducementState
DEF Level Time To Next Inducement	Min
System Failure Time To Next Inducement	Min
SCR Exhaust Gas Mass Flow	kg/Hr
DEF Line Heater 1	On/Off
DEF Line Heater 2	On/Off
Aftertreatment 1 Intake NOx	ppm
Aftertreatment 1 Outlet NOx	ppm
Aftertreatment 2 Outlet NOx	ppm
Aftertreatment 3 Outlet NOx	ppm
Aftertreatment 1 Outlet NH3	ppm
Aftertreatment 2 Outlet NH3	ppm
Aftertreatment 3 Outlet NH3	ppm

Figure 41 Aftertreatment Metering Data

4.4 Operation Records

The Op Records screen displays generator set operation records such as engine run time, last start date, and other information shown in Figure 43.

To reset the maintenance records after performing scheduled oil changes and other maintenance tasks, log in as Technician. The password is required.

Procedure to View Operation Records

1. In the navigation panel on the left side of the screen, touch Metering or the gauge symbol.
2. Touch Op Records or the notepad symbol.
3. Touch the up and down arrows on the right side of the screen to scroll through the generator set operation records.

The numbers below correspond to the numbered steps in the Procedure to View Operation Records.



Figure 42 Metering Screen, Operation (Op) Records

Parameter	Units
Total Run Time Hours	Hours
Total Loaded Hours	Hours
Total Unloaded Hours	Hours
Total kW Hours	kWh
Controller Hours	Hours
Controller Run Time Hours	Hours
ECU Run Time Hours	Hours
Number of Starts	
Number of Crank Attempts	
Last Crank Duration	Seconds
Last Start Run Time Duration	Hours
Last Start Time of Day	
Last Start Date (Day)	
Last Start Date (Month)	
Last Start Date (Year)	
Last Stop Time of Day	
Last Stop Date (Day)	
Last Stop Date (Month)	
Last Stop Date (Year)	
Total Run Time Since Maintenance	Hours
Loaded Hours Since Maintenance	Hours
Unloaded Hours Since Maintenance	Hours
kW Hours Since Maintenance	kWh
Reset Maintenance Records *	Yes/No *
* The Technician password is required to reset maintenance records.	

Figure 43 Operation Records

4.5 Load Management

Load management allows a generator set to support load which may occasionally exceed the rated capacity of the generator set.

Note:

Life safety and critical loads should never be connected to a device that is managed as a priority through load management. Load management should only be used on loads that can be turned on and off as required to allow the generator system to operate reliably for life safety and critical loads that are always connected.

In single-generator set applications, load management may shed unimportant but highly demanding loads when the generator set is overloaded, preventing a power outage caused by the generator set going offline.

In paralleling systems, load management permits the bus to stay at rated voltage and frequency while an additional generator set is synchronizing to it. It ensures the total load on the bus does not exceed the total capacity of the generators online at a given moment. Load management may shed lower priority loads in the event that a generator fails or the system is waiting for a generator to synchronize and close to the bus.

The load management function in the generator set controller supports up to 16 load control priorities. In a single-generator set application, the system will be limited to 16 (8 for each D8IOM) load control priorities for KD models. In paralleling systems, the full 16 load control priorities can be used. These priorities generate internal notices for the add and shed conditions. The internal notices are generated any time a load is add or shed, but they will only operate a load control relay if they are configured to a digital output.

Optional I/O modules are required for load management connections.

- For KD models, one or two digital input/output modules (DIOMs) are required, providing up to 8 or 16 outputs (4 per original DIOM or 8 per updated D8IOM) to be accessed and configured to control up to 16 loads (each load priority can interrupt several devices) from a single generator.
- For non-KD Models, the optional 4 input / 15 output relay module is required, providing up to 14 RDO outputs to be accessed and configured to control up to 14 loads (each load priority can interrupt several devices) from a single generator.

In paralleling applications, up to 16 load priorities can be accessed and the load priorities can be divided among all of the generator sets. For instance, Generator #1 can support Load Priorities 1 and 4, Generator #2 can support Priorities 2 and 5 and Generator #3 can support Priorities 3 and 6. This configuration requires the optional relay module on each generator and permits partial load control functionality even if one controller is powered down or fails (redundancy).

Load Priority 1 is shed last and added first. The priorities are added in increasing sequence and shed in decreasing sequence.

All load priorities are immediately shed when load control is initiated. Load control is initiated when the system receives a start signal (a system start, a remote start, or a start by communication). In a paralleling application, the controller can receive a start signal from any generator set which is connected to the PGEN communication network. Pressing RUN on the controller will not cause the loads to shed.

All loads are added immediately when load control is de-activated. Load control is de-activated when the start signal is removed.

Load management adds loads based on the capacity of the system—loads will add more quickly if the available capacity is higher.

Load management sheds loads based on the degree of overload of the system—loads will shed more quickly as the degree of the system overload increases.

Note:

If paralleling and using generator management, the Generator Management Start Percentage setting should be significantly lower than the Overload Shed Threshold so that additional generator sets will come online before a load is shed. Go to the Gen Management group in SiteTech to adjust the Generator Management Start Percentage setting. The Overload Shed Threshold can be adjusted at Metering>Load Manage>Status>System. See the Load Management Setup Section for more information.

An under frequency event or overload event will also shed load. If a load priority is shed due to one of these events, the load management system can be configured to leave the priorities as shed until a related event occurs to allow them to be add back. This prevents the system from entering a shed and add cycle. For example, if the load is shed due to overload and removing the load removes the overload condition, if the load is added back it could cause the overload condition again and shed the load again.

The load control will shed subsequent loads more quickly if shedding a load did not remove the overload or underfrequency condition.

In a single-generator set application the load management logic uses the generator metering.

In a paralleling application the load management logic uses the bus metering. The priorities are set as a system so the load management settings are identical in each controller and each controller will shed and add a given load priority at the same time.

In a paralleling application where Generator Management is used, some generator sets may be shut down (turned Off) by the Generator Management. Even if the generator set is Off, it will manage load priorities as part of the system, performing a load add and load shed as needed. This may seem contrary to intuition, but the generator sets are acting as a system. If voltage and frequency of the paralleling bus are adequate, and Load Add accumulators are met, the loads will be enabled, even if a particular generator set is shut down by the Generator Management.

4.5.1 Metering, Load Management Overview Screen

The overview provides a simple graphical view of the load management system.

Procedure to View Load Management Overview

1. In the navigation panel on the left side, touch Metering or the gauge symbol.
2. Touch Load Manage or the three horizontal bars symbol.
3. Touch Overview or the globe symbol.
4. Observe the load management status.

The numbers below correspond to the numbered steps in the Procedure to View Load Management Overview.



Figure 44 Metering Screens, Load Management Overview

The loads are listed in order of priority. If the loads were provided a custom name during the system set up, the name will appear. If not, the name will appear as Priority X, where X is the priority number.

Note:

Custom names for loads can be set up through SiteTech™. Contact a Kohler authorized distributor or dealer.

If a load is in the process of being add or shed, the load will have an indication of % until that occurs. It is shown as a percentage since the time varies based on the capacity available. When the % reached 100%, the load management will initiate the add or shed.

The key at the bottom of the display shows the current load as well as the total online capacity and available capacity. If a generator is offline (either due to a shutdown via Generator Management or a fault or the generator is not communicating via PGEN), unavailable capacity will be shown as well.

Total Load is the value of all the loads on the system. This includes loads that are not assigned a priority and are always connected.

Online Capacity is the capability of the system with all the generators that are currently online. For a single-generator set application, this is the total capacity of the generator. For a paralleling system, this is the sum of capacity for all online generators.

Available Capacity indicates the difference between the Online Capacity and the Total Load. It is remaining capacity available for additional loads to be potentially added.

4.5.2 Metering, Load Management, Status

The status screens provide a listing of the load management metered values as well as key settings for reference.

4.5.2.1 Status, System

The Load Management System Status provides indication of key settings and values related to the overall operation of the load management system.

Procedure to View Load Management System Status

1. In the navigation panel on the left side, touch Metering or the gauge symbol.
2. Touch Load Manage or the three horizontal bars symbol.
3. Touch Status or the list icon.
4. Touch System or the list icon.

The numbers below correspond to the numbered steps in the Procedure to View Load Management System Status.

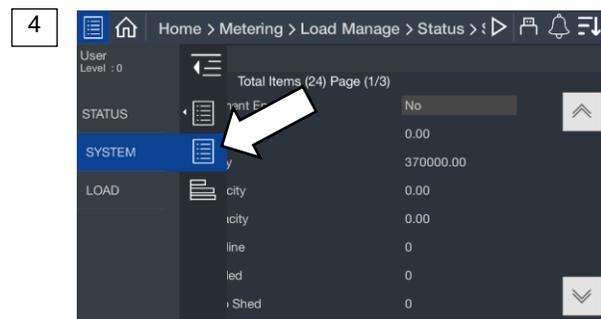
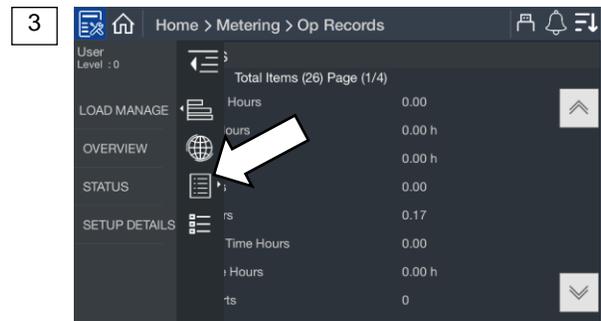


Figure 45 Metering, Load Management, Status, System

Parameter	Units
Load Management Enabled	Yes/No
Total Load	kW
Online Capacity	kW
Available Capacity	kW
Total Bus Capacity	kW
Generators Online	
Generators Failed	
Next Priority to Shed	
Time Based Load Add Enabled	Yes/No
Time Based Add Time	Seconds
Time Based Load Add Timer Active	Yes/No
kW Capacity Add Threshold	%
kW Capacity Add Accumulator	%
Require Reset After kW Shed	Yes/No
Overload Shed Threshold	%
Overload Shed Accumulator	%
Under Frequency Shed Threshold	%
Under Frequency Shed Accumulator	%
Require Reset After UF Shed	Yes/No
Under Frequency Inhibit Enabled	Yes/No
Under Frequency Inhibit Time	Seconds
Under Frequency Inhibit Time Remaining	Seconds
New Gen Online As Reset	Yes/No
Stage Loads After Utility Return	Yes/No

Figure 46 Load Management System Status Parameters

Load Management Enabled indicates a Yes if the load management system is being used on the generator or paralleling system. If No, load management is not being used and will not drive any of the outputs.

Total Load indicates the value of all the loads on the system. This includes loads that are not assigned a priority and are always connected.

Online Capacity indicates the capability of the system with all the generators that are currently online. For a single-generator set application, this is the total capacity of the generator. For a paralleling system, this is the sum of capacity for all online generators.

Available Capacity indicates the difference between the Online Capacity and the Total Load. It is remaining capacity available for additional loads to be potentially added.

Generators Online indicates the number of generators online. For a single-generator set application, this will be 1. For paralleling systems, it will be the total number of generators that are on the closed to the bus.

Generators Failed indicates in a paralleling system if any of the generators on PGEN are in a shutdown (fault) condition. Note that as long as the controller is still communicating on PGEN, load management can control the outputs on the controller for a generator this is in a shutdown condition. For a single-generator set application this will be 0.

Next Priority to Shed indicates the priority number of the next load that will be shed should the system enter a condition that requires a load shed.

Time Based Load Add Enabled indicates if the Time Based Load Add functionality is enabled. This function will add the loads in the priority order based on time once the system has reached an acceptable voltage and frequency. This technique does not consider load capacity or expected kW for each priority. The loads are staged sequentially at a time interval defined by the Time Based Load Add Time. For example, if the Time Based Load Add Time is set to 10 seconds, once the system reaches an acceptable voltage and frequency, a 10 seconds timer will start. When that time expires, Priority 1 will be added. The 10 second timer will start again and Priority 2 will be added when it expires. This will continue until all priorities are added.

Note:

Time Based Load Add does not consider the capacity of the generator set or generator system or the expected load of each priority before adding and may overload the system. If an under frequency or overload shed becomes active, Time Based Load Add will abort and not add any additional loads.

Time Based Load Add sheds all priorities at startup. It is not configurable to shed fewer loads.

Time Based Load Add Time is the amount of time between each load priority addition when using Time Based Load Add.

Time Based Load Add Timer Active indicates if a timer is currently in use and the system is preparing to add a load when the timer expires. If this is Yes, the system will add a load when it expires. If this is No, no additional loads will be added based on Time Based Load Add.

kW Capacity Add Threshold sets the maximum total load that the load management system will intentionally add to the generator set or generator system. To determine whether adding the next priority load will push the system over the threshold, the resulting total is calculated by adding the expected load to the current load. For example, if the threshold is set at 90%, the current load is at 70% of total capacity, and adding the next priority load will add 15% of total capacity, adding the load will put the system at 85% of total capacity, which is below the threshold. The kW Capacity Add Accumulator will start. If adding the load would put the system at 92% capacity, the load will not be added.

The total load may exceed the kW Capacity Add Threshold value if the power required by a load is higher than the expected kW.

kW Capacity Add Accumulator indicates progress until the next priority load will be added. The timer starts if adding the next priority load will not exceed the kW Capacity Add Threshold for the system. Load management will add the next priority load when the kW Capacity Add Accumulator reaches 100%.

The kW Capacity Add Accumulator is a weighted timer. The Accumulator will speed up or slow down depending upon the available capacity and the expected kW. The time required will increase as the calculated total load increases and will decrease as the calculated total load decreases.

Require Reset After kW Shed forces the system to lock out adding loads if an overload shed occurs. The overload shed is not expected to operate, so an overload condition is an indication of a misconfiguration of the system (such as an incorrect expected kW load level for a priority). Requiring a reset prevents load cycling due to a misconfiguration. See New Gen Online As Reset.

Overload Shed Threshold is an indication of the amount of overload a system can experience before load shed initiates. For example, if this is set to 100%, if the total load exceeds 100% then the Overload Shed Accumulator starts. Load management will shed the next priority load when the Overload Shed Accumulator reaches 100%.

Overload Shed Accumulator is an indication of progress until the load will be shed due to an overload situation.

The time to shed a priority will increase as the overload condition increases and will decrease as the overload condition decreases. The Accumulator is not a fixed time but will speed up or slow down depending upon the overload.

Under Frequency Shed Threshold is the frequency droop (operation below nominal) allowed before the system will shed a load. For example, if this is set to 90% and the frequency of the generator drops below 90% of nominal then the Under Frequency Shed Accumulator starts. When the Under Frequency Shed Accumulator reaches 100%, load management will shed the next priority load.

Under Frequency Shed Accumulator is an indication of progress until the load will be shed due to an under frequency situation.

The time to shed a priority will increase as the under frequency condition increases and will decrease as the under frequency condition decreases. The Accumulator is not a fixed time but will speed up or slow down depending upon the amount exceeding the under frequency threshold.

Require Reset After UF Shed forces the system to lock out adding loads if an under frequency shed occurs. The under frequency shed is not expected to operate, so an under frequency condition is an indication of a misconfiguration of the system (such as an incorrect expected kW load level for a priority). Requiring a reset prevents load cycling due to a misconfiguration. See New Gen Online as Reset.

Under Frequency Inhibit Enabled indicates if the load management system will ignore any under frequency conditions for a period of time as the generator is starting up. This allows the system to reach the rated voltage and frequency before the under frequency shed is detected and forces a load shed.

Note:

This setting is only necessary on applications where some of the load priorities are not shed on start up.

Under Frequency Inhibit Time is the period of time during start up when an under frequency condition is ignored. This is only applicable if the Under Frequency Inhibit is enabled.

Under Frequency Inhibit Time Remaining indicates the amount of time left before the under frequency shed logic will begin operating.

New Gen Online as Reset allows the load management to see an additional generator connecting the paralleling bus as a reset condition. If a load was shed based on an overload shed or under frequency shed, the load will now be considered for addition again if the kW Capacity threshold is met.

Stage Loads After Utility Return reduces the inrush loading to the utility when returning loads after a power failure. This is used to reduce fluctuations in the utility voltage during a transition from the generator system to the utility when the utility source impedance is relatively high. The loads are added based on Time Based Add Time settings.

4.5.2.2 Load Management Status, Load

The Load Management Status Load screen provides indication of the shed status for each load priority.

Procedure to View Load Management Status, Load

1. In the navigation panel on the left side, touch Metering or the gauge symbol.
2. Touch Load Manage or the three horizontal bars symbol.
3. Touch Status or the list icon.
4. Touch Load or the horizontal bars icon.

The numbers below correspond to the numbered steps in the Procedure to View Load Management Status, Load.

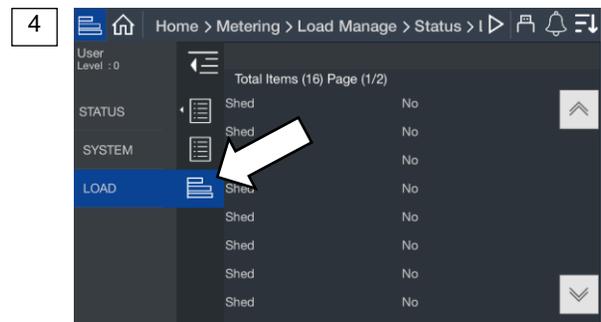
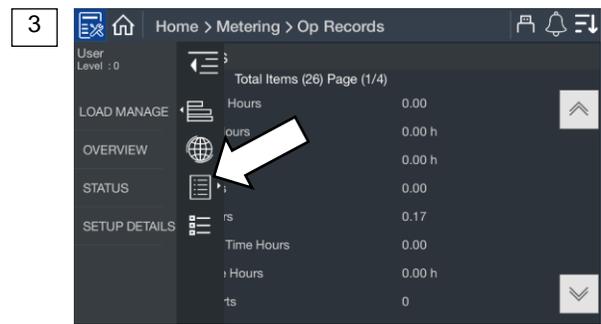


Figure 47 Load Management Status, Load

Parameter	Units
Priority 1 Load Shed	Yes/No
Priority 2 Load Shed	Yes/No
Priority 3 Load Shed	Yes/No
Priority 4 Load Shed	Yes/No
Priority 5 Load Shed	Yes/No
Priority 6 Load Shed	Yes/No
Priority 7 Load Shed	Yes/No
Priority 8 Load Shed	Yes/No
Priority 9 Load Shed	Yes/No
Priority 10 Load Shed	Yes/No
Priority 11 Load Shed	Yes/No
Priority 12 Load Shed	Yes/No
Priority 13 Load Shed	Yes/No
Priority 14 Load Shed	Yes/No
Priority 15 Load Shed	Yes/No
Priority 16 Load Shed	Yes/No

Figure 48 Load Shed Status Parameters

A Yes indicates the load is currently shed due to load management. A No indicates that load management is not requiring the load to be shed. If load management indicates No and the load is not powered, there are other issues in the system.

4.5.3 Load Management Setup Details

The setup details screen provides a table view of key settings for the load management configuration.

Procedure to View Load Management Setup Details

1. In the navigation panel on the left side, touch Metering or the gauge symbol.
2. Touch Load Manage or the three horizontal bars symbol.
3. Touch Setup Details or the details symbol.

The numbers below correspond to the numbered steps in the Procedure to View Load Management Setup Details.

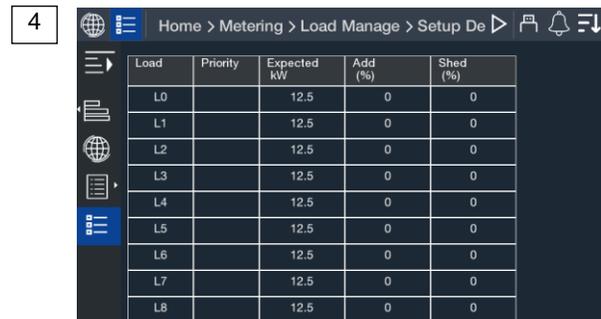
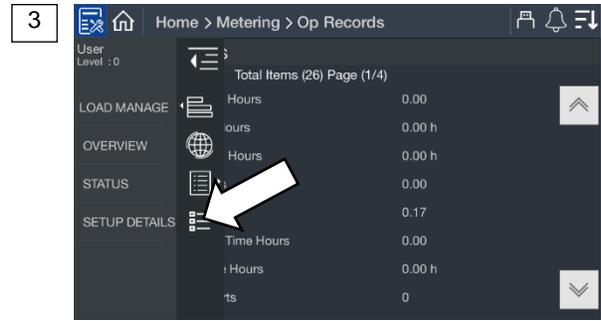


Figure 49 Metering, Load Management, Setup Details

The loads are listed in order of priority. If the loads were provided a custom name during the system set up, the name will appear. If not, the name will appear as Priority X, where X is the priority number.

Note:

Custom names for loads can be set up through SiteTech. Contact a Kohler authorized distributor or dealer.

The table indicates the expected kW for each load.

5.1 Setup Menus

Parameter settings are loaded onto the controller using a configuration file. Configuration files are created and loaded at the factory. Configuration files are created according to the model and options ordered for each generator set. Custom configuration files can be provided on request if the default settings are not correct for the application.

The values displayed in the Setup Menus are parameter settings. They are not actual measured values. Refer to the Metering Displays for measured values.

The Setup Menus display the controller configuration settings as shown in the following sections. Some of the settings can be adjusted by an operator, installer, or service technician with Operator access or higher.

The setup screens include:

- Electrical, including generator, battery charger, and paralleling
- Engine
- Communication
- Event Configuration
- Genset Info



Figure 50 Setup Menu

5.1.1 Changing Settings

Some settings can be changed by an operator or service technician with Operator access or higher. Settings that can be changed are highlighted in blue when an operator or higher level password has been entered.

Note:

Have setup and adjustments of the generator set controller performed only by an authorized Kohler distributor. The setup and adjustments are password protected.

General Procedure to Change Settings (for authorized Kohler distributors or service technicians)

1. Use an external flash drive or SiteTech to export the configuration data and save the file for future reference, if needed. See the APM603 Controller Service Manual for instructions.
2. Go to Controller Settings and log in with the Operator or Technician level password. See the Controller Settings section for instructions.

Note:

The access level login expires after 1 hour. See the Controller Settings Section for instructions to change the session duration, if necessary.

3. In the navigation menu on the left side of the screen, touch Setup.
4. Touch the desired category (Electrical, Engine, etc.)

5. Touch the desired subcategory.
6. The settings are displayed. Settings that can be changed appear in a blue box.
7. Touch the blue box with the setting that you wish to change. A keypad window opens on the screen.
8. Use the keypad to enter the new setting and touch the green arrow.
9. Check the setting for the new value.

Notes:

There may be clicking sounds coming from the controller when some settings are changed. Some changes may require the controller to restart.

5.2 Electrical Setup

5.2.1 Generator Electrical Setup

The generator setup screens display generator electrical settings such as system voltage, frequency, kW ratings, and other electrical data listed in Figure 52.

Procedure to View Generator Setup Parameters

1. In the navigation menu on the left side of the screen, touch Setup or the settings symbol.
2. Touch Electrical or the sine wave symbol.
3. Touch Generator or the generator symbol.

The numbers below correspond to the numbered steps in the Procedure to View Generator Setup Parameters.

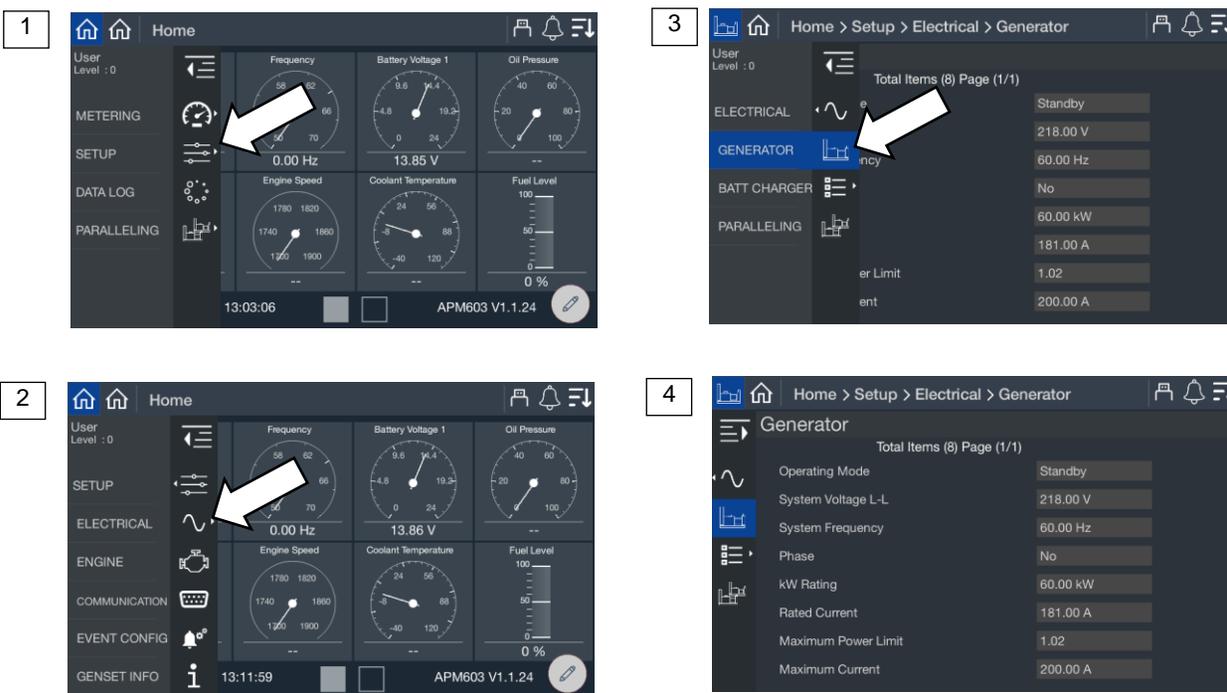


Figure 51 Generator Setup Screen

Parameter	Units	Write Access	Notes
System Voltage L-L	V	Technician	
System Voltage L-N	V	Technician	
System Frequency	Hz	N/A	Factory-set to 50 or 60 Hz
Phase	None	Technician	Single Phase, Single Phase Dogleg, Three Phase Wye, or Three Phase Delta
kW Rating	kW	Technician	
Rated Current	A	Technician	
Voltage Adjust	V	Operator	
Speed Adjust	RPM	Operator	
Operating Mode	None	N/A	Factory-set to Standby or Prime
Maximum Power Limit	kW	N/A	102% of Standby Rating, 112% of Prime Rating
Maximum Current	A	N/A	Factory configured

Figure 52 Generator Settings, Electrical Setup

5.2.2 Battery Charger Setup Screens

The battery charger setup screens do not apply to model KD generator sets. Refer to the Installation and Operation Manual provided with the battery charger for setup and operation instructions.

5.2.3 Paralleling Setup

The paralleling setup screen indicates if the system has onboard paralleling enabled and if the speed and voltage bias inputs are configured.

Note:

The Paralleling menu will appear on the Home screen if Paralleling Enabled is set to Yes in this menu.

Procedure to View Paralleling Setup Parameters

1. In the navigation menu on the left side of the screen, touch Setup or the settings symbol.
2. Touch Electrical or the sine wave symbol.
3. Touch Paralleling or the two generator symbol.
4. Observe the paralleling parameters.

The numbers below correspond to the numbered steps in the Procedure to View Paralleling Setup Parameters.

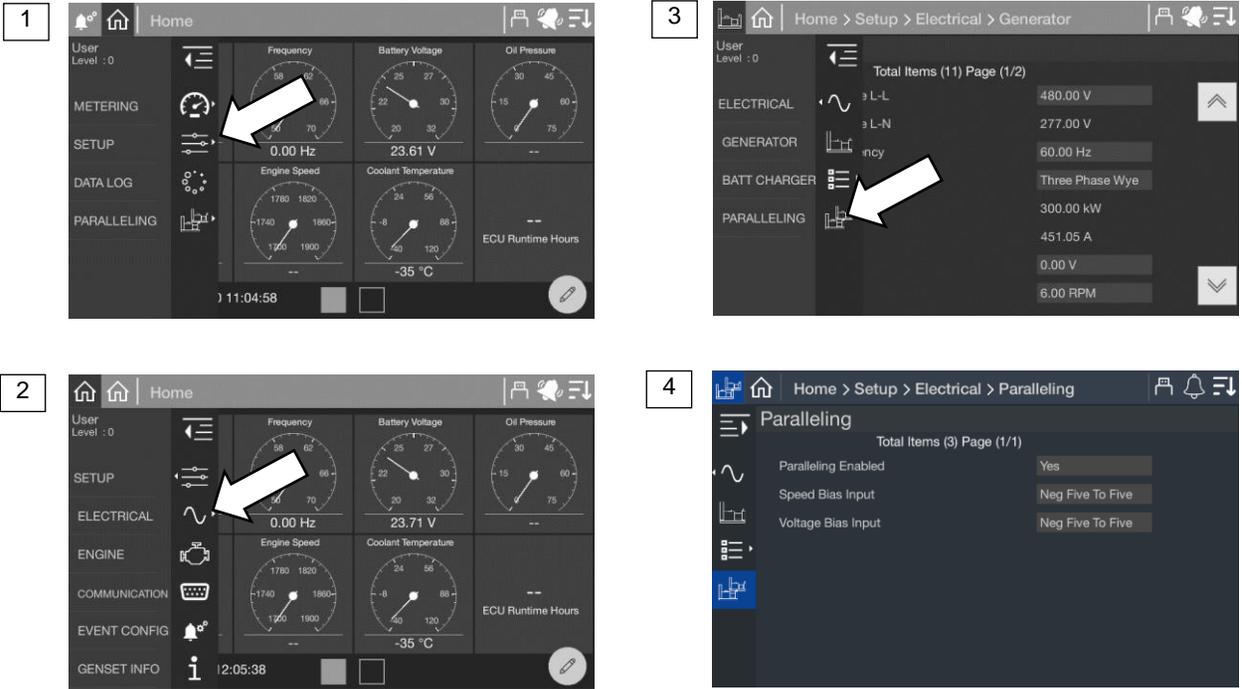


Figure 53 Paralleling Setup Screen

Parameter	Units	Write Access Level
Paralleling Enabled	Yes/No	Technician
Speed Bias Input	Off	Operator
Voltage Bias Input	0 to 5 Neg (-) 5 to 5 0 to 10 Neg (-)10 to 10	Operator

Figure 54 Paralleling Setup Parameters, Electrical Setup

5.3 Engine Setup

The Engine Setup screen includes the engine settings shown below.

Procedure to View Engine Settings

1. In the navigation panel on the left side of the screen, touch Setup or the setup symbol.
2. Touch Engine or the engine symbol.
3. Touch the arrows to scroll through the screens.

The numbers below correspond to the numbered steps in the Procedure to View Engine Settings.



Figure 55 Setup Screen, Engine

Parameter	Units	Write Access Level
ECU Power Override	On/Off	Operator
Generator Rated Speed	RPM	N/A
Crank Disconnect Speed	RPM	N/A
Start Aid Time	Seconds	Technician
Cranking Start Aid Time	Seconds	Technician
Crank On Time	Seconds	Technician
Crank Off Time	Seconds	Technician
Crank Cycle Limit	Integer	Technician
Cooldown Time Limit	Seconds	Technician
Cooldown Temp Limit	Degrees (F)	Technician

Figure 56 Engine Setup Parameters

ECU Power Override provides power to the engine's ECU without cranking the engine. This feature may be turned on for some troubleshooting or service procedures; otherwise, it should be off.

Engine Speed displays the target engine speed. Typically, this is 1800 RPM but may be adjusted if the system is required to operate at a slightly modified speed.

Crank Turning Speed is the limit between engine rotating and engine stopped. When the engine speed (RPM) is above this limit, the controller considers the engine to be turning. Until the speed falls below this limit, the controller will prevent reengagement of the starter.

Start Aid Time displays the time programmed to allow the engine starting aid to warm up before cranking the engine.

Cranking Start Aid Time indicates the time programmed to allow operation of a preheat or ether system during the engine crank cycle.

Crank On Time indicates the time allocated for generator set crank in seconds, from 10 to 30 seconds.

Crank Off Time indicates the time allocated for generator crank pause in seconds, from 1 to 60 seconds.

Crank Cycle Limit indicates the allowed number of crank attempts before the system indicates that crank failed, from 1 to 6 cycles.

Cooldown Time Limit indicates the amount of time allocated for the engine cooldown period.

Cooldown Temp Limit indicates the required temperature the engine must reach during cooldown before the engine will shut off.

Note:

When the engine is signaled to stop, it will continue to run through the cooldown cycle unless the unit is OFF or a shutdown fault occurs. In a paralleling application, if a shutdown occurs the generator will still perform a cool down for a period of time defined by Trip to Shutdown Delay in Protective Relay functions.

The cool down will run until the engine reaches the cooldown temperature limit or the cooldown time expires, whichever happens first. If you want to skip a cool down, set the Time Limit to 0. To force the unit to run the full Time Limit every time, set the Temp Limit to an extremely low number that cannot possibly be achieved before the Time Limit expires.

5.4 Setup, Communication Screen

The communication setup screen provides a list of Modbus and network communication settings.

Procedure to view Communication Setup:

1. In the navigation panel on the left side, touch Setup or the settings symbol.
2. Touch Communication or the serial connector symbol.
3. Touch the arrows on the right to scroll through the communication settings.

The numbers below correspond to the numbered steps in the Procedure to View Communications Setup.

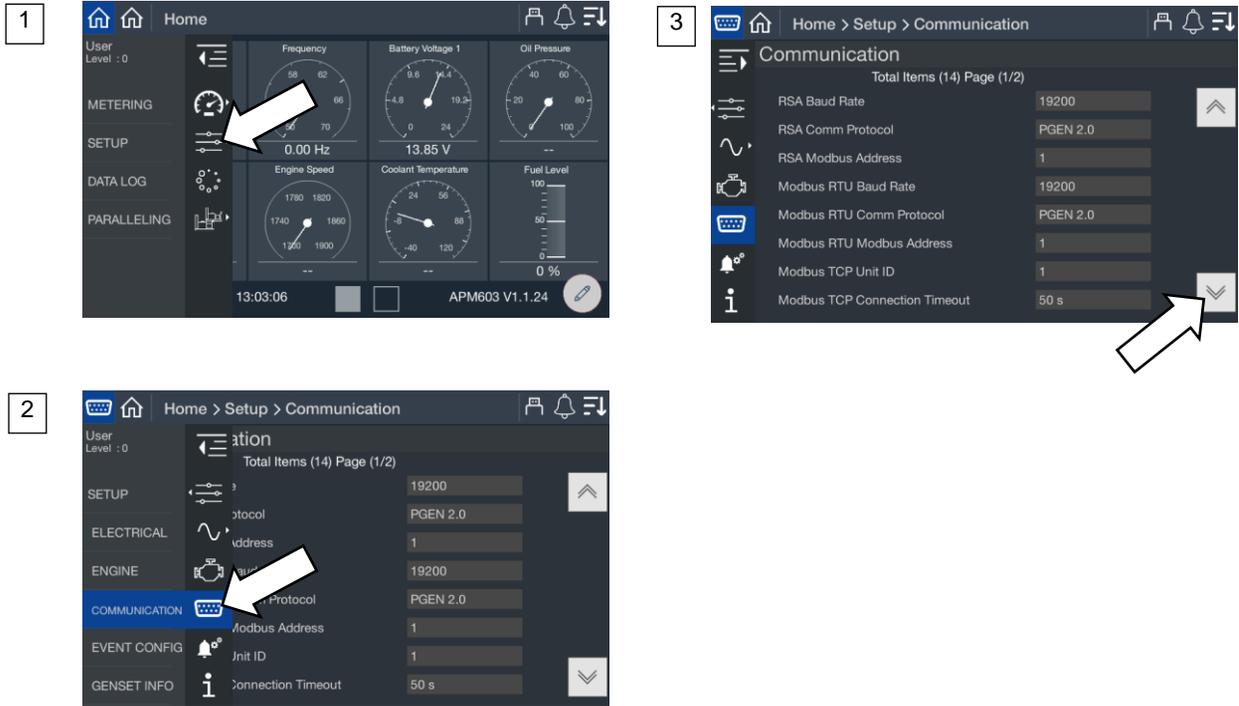


Figure 57 Setup, Communication, Modbus

The following Modbus interfaces are available:

Connection	Description	Customer Connection Terminals
RS-485 isolated	Dedicated connection for paralleling (PGEN)	TB12-8, 9, 10
RS-485 isolated	For connection to Modbus devices	TB12-19, 20, 21
RS-485 non-isolated	For connection to the RSA III remote serial annunciator	TB12-22, 23, 24
RJ-45 Ethernet connection	For Modbus TCP, SNMP, and BACnet®	Ethernet module

BACnet® is a registered trademark of ASHRAE.

The communication protocol for each port is factory set and not adjustable. Operator-level access is required to change the other communication settings. Contact a Kohler authorized distributor or dealer for assistance.

Communication Protocol

The RS-485 ports are factory-set for the communication protocol applicable to each port.

Baud Rates

The following baud rates can be selected. All devices in the Modbus network must use the same baud rate.

- None
- 9600 bps
- 19200bps
- 38400 bps
- 57600 bps
- 115200 bps

Modbus Address

Each generator set controller in a system must have a unique Modbus® address.

Modbus TCP Unit ID

A unit ID is required for Modbus over TCP communication (Ethernet). The unit ID for TCP communication is analogous to the Modbus address for serial communication.

Parameter	Write Access Level
RSA Baud Rate	Operator
RSA Comm Protocol	Factory-set
RSA Modbus Address	Operator
Modbus RTU Baud Rate	Operator
Modbus RTU Comm Protocol	Factory-set
Modbus RTU Modbus Address	Operator
Modbus TCP Unit ID	Operator
DHCP Enabled	Operator
IP Address	Operator
Subnet Mask	Operator
Default Gateway	Operator
DNS Server 1	Operator
DNS Server 2	Operator
Modbus TCP Connection Timeout	Operator

Figure 58 Communication Settings

Modbus® Communications

The controller communicates using Modbus® as a slave connection with the Modbus® master initiating the communication. The controller seeks the parameters and diagnostic information then responds back to the Modbus® master. In addition, the controller accepts information to alter controller parameters including generator set starting and stopping. Refer to the List of Related Materials for available Modbus® literature.

Note:

Only one Modbus® master can be connected to the controller when using Modbus RTU. Examples include the remote serial annunciator, monitoring software, and switchgear applications.

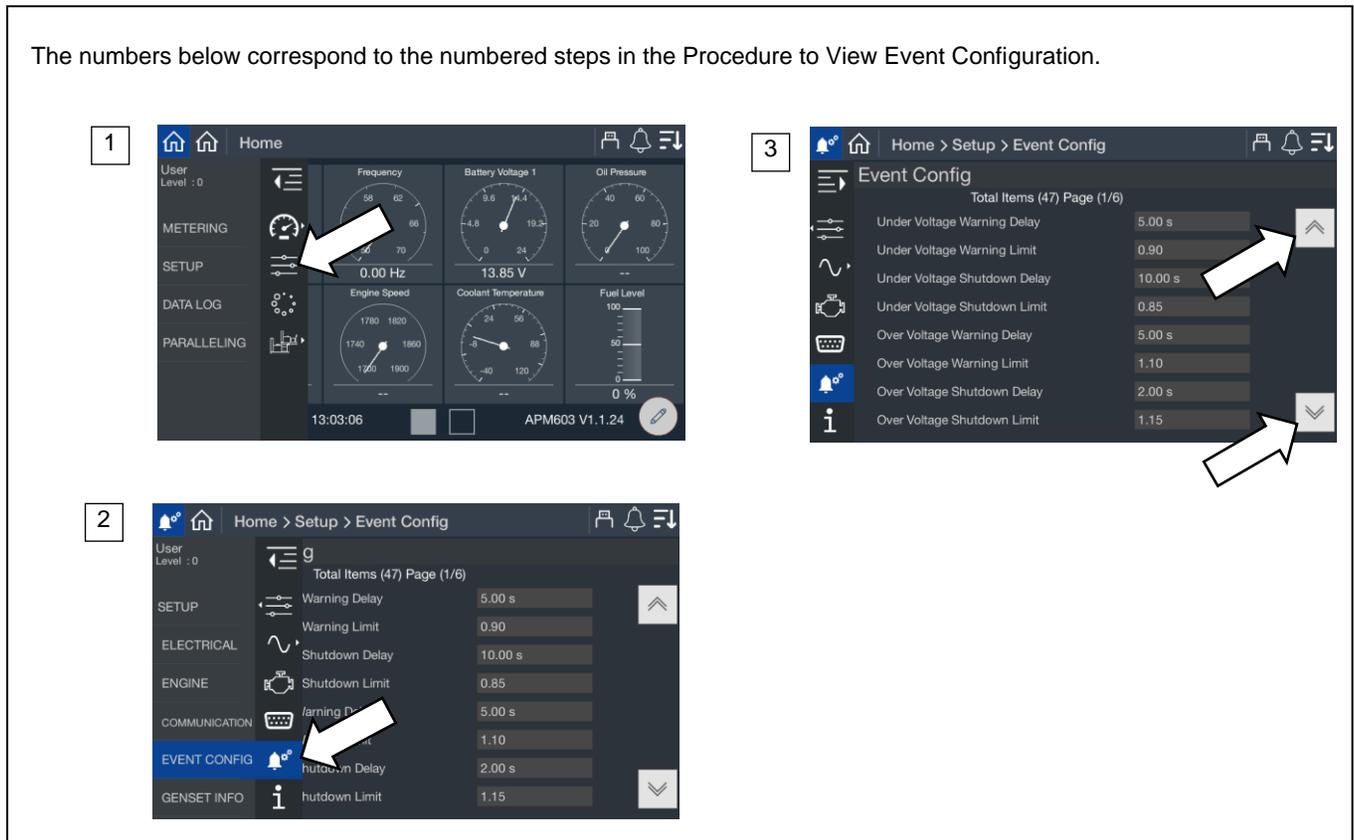
Modbus® is a registered trademark of Schneider Electric USA, Inc.

5.5 Event Configuration

The Event Configuration (Config) screen displays the setup of fault messages (warnings and shutdowns). Time delays, warning limits, and shutdown limits for the faults are shown.

Procedure to View Event Configuration

1. In the navigation panel on the left, touch Setup.
2. Touch Event Config or the bell symbol with gears.
3. Touch the up and down arrows on the right to scroll through the event settings.



Tier 2 Generator Sets (KD700-KD4000)		
Event	Units	Write Access
Under Voltage Warning Delay	Seconds	Operator
Under Voltage Warning Limit	%	Operator
Under Voltage Shutdown Delay	Seconds	Operator
Under Voltage Shutdown Limit	%	Operator
Over Voltage Warning Delay	Seconds	Operator
Over Voltage Warning Limit	%	Operator
Over Voltage Shutdown Delay	Seconds	Operator
Over Voltage Shutdown Limit	%	Operator
Under Frequency Warning Delay	Seconds	Operator
Under Frequency Warning Limit	%	Operator
Under Frequency Shutdown Delay	Seconds	Operator
Under Frequency Shutdown Limit	%	Operator
Over Frequency Warning Delay	Seconds	Operator
Over Frequency Warning Limit	%	Operator
Over Frequency Shutdown Delay	Seconds	Operator
Over Frequency Shutdown Limit	%	Operator
Over Power Warning Delay	Seconds	Operator
Over Power Warning Limit	%	Operator
Over Power Shutdown Delay	Seconds	Operator
Over Power Shutdown Limit	%	Operator
Over Current Warning Delay	Seconds	Operator
Over Current Warning Limit	%	Operator
Over Current Shutdown Delay	Seconds	Operator
Over Current Shutdown Limit	%	Operator
AC Signal Recovery Time	Seconds	Operator
Over Speed Shutdown Delay	Seconds	Operator
Over Speed Shutdown Limit	%	Operator
Low Battery Voltage Warning Delay	Seconds	Operator
Low Battery Voltage Warning Limit	%	Operator
High Battery Voltage Warning Delay	Seconds	Operator
High Battery Voltage Warning Limit	%	Operator
Weak Cranking Battery Delay	Seconds	Operator
Weak Cranking Battery Limit	%	Operator
Battery Voltage Event Recovery Delay	Seconds	Operator
Low RTC Battery Delay	Seconds	Operator
Low RTC Battery Limit	%	Operator
EPS Supplying Load Delay	Seconds	Operator
EPS Supplying Load On Limit	%	Operator
EPS Supplying Load Off Limit	%	Operator
Low Fuel Level Warning Limit	%	Operator
Critically Low Fuel Level Warning Limit	%	Operator
Low Fuel Level Shutdown Limit	%	Operator
High Fuel Level Warning Limit	%	Operator
Fuel Level Delay	Seconds	Operator

Tier 4 Generator Sets (KD1250-4, KD2500-4, KD3250-4)		
Event	Units	Write Access
Under Voltage Warning Delay	Seconds	Operator
Under Voltage Warning Limit	%	Operator
Under Voltage Shutdown Delay	Seconds	Operator
Under Voltage Shutdown Limit	%	Operator
Over Voltage Warning Delay	Seconds	Operator
Over Voltage Warning Limit	%	Operator
Over Voltage Shutdown Delay	Seconds	Operator
Over Voltage Shutdown Limit	%	Operator
Under Frequency Warning Delay	Seconds	Operator
Under Frequency Warning Limit	%	Operator
Under Frequency Shutdown Delay	Seconds	Operator
Under Frequency Shutdown Limit	%	Operator
Over Frequency Warning Delay	Seconds	Operator
Over Frequency Warning Limit	%	Operator
Over Frequency Shutdown Delay	Seconds	Operator
Over Frequency Shutdown Limit	%	Operator
Over Power Warning Delay	Seconds	Operator
Over Power Warning Limit	%	Operator
Over Power Shutdown Delay	Seconds	Operator
Over Power Shutdown Limit	%	Operator
Over Current Warning Delay	Seconds	Operator
Over Current Warning Limit	%	Operator
Over Current Shutdown Delay	Seconds	Operator
Over Current Shutdown Limit	%	Operator
AC Signal Recovery Time	Seconds	Operator
Over Speed Shutdown Delay	Seconds	Factory
Over Speed Shutdown Limit	%	Factory
Low Battery Voltage Warning Delay	Seconds	Operator
Low Battery Voltage Warning Limit	%	Operator
High Battery Voltage Warning Delay	Seconds	Operator
High Battery Voltage Warning Limit	%	Operator
Weak Cranking Battery Delay	Seconds	Operator
Weak Cranking Battery Limit	%	Operator
Battery Voltage Event Recovery Delay	Seconds	Operator
EPS Supplying Load Delay	Seconds	Operator
EPS Supplying Load On Limit	%	Operator
EPS Supplying Load Off Limit	%	Operator
Low Fuel Level Warning Limit	%	Operator
Critically Low Fuel Level Warning Limit	%	Operator
Low Fuel Level Shutdown Limit	%	Operator
High Fuel Level Warning Limit	%	Operator
Fuel Level Delay	Seconds	Operator
Maximum Power Warning Delay	Seconds	Operator
Enable Fuel Level Events	On/Off	Operator

Low RTC Battery indicates the Real Time Clock battery voltage that the voltage must drop below for a low RTC battery condition to be indicated.

EPS Supplying Load On Limit and Off Limit define the % of load the generator must be supplying to be considered supplying load.

Low Fuel Level and **Critically Low Fuel Level** define the fuel level limits as a percentage that must be met before indication is provided.

High Fuel Level indicates the fuel level limit to be exceeded before indication is provided.

Battery Charger Fault indicates if a fault is detected by the battery charger.

Low DEF Level Warning Limit and **Low DEF Level Shutdown Limit** (tier 4 generator sets only) are customer configurable parameters that define the points at which the controller issues a Low DEF Level Warning or a Low DEF Level Shutdown.

Low DEF Level Warning (tier 4 generator sets only) provides an advanced warning that DEF is low and the operation should add DEF. **Low DEF Level Shutdown** shuts down the generator set to avoid an inducement.

Load Bank Power Rating (tier 4 generator sets only) specifies the amount of load in kW that the load bank will add to the system to reduce hydrocarbon levels.

High HC Warning Active Limit (tier 4 generator sets only) initiates an advanced warning indicating that the operator needs to increase load to avoid hydrocarbon buildup on the SCR. If the hydrocarbon levels continue to increase, the controller will apply the load bank.

Critically High HC Warning Active Limit notifies the operator that the load bank is not effectively reducing the hydrocarbon levels in the SCR. Failure by the operator to immediately correct the issue will result in engine torque reduction.

High HC Warning Delay and **Critically High HC Warning Delay** (tier 4 generator sets only) indicates the period of time from when hydrocarbon levels exceed the warning limit to when the warning is issued. If hydrocarbon levels fall below the warning limit during the delay period, then the warning is not issued.

Load Bank Malfunction Delay (tier 4 generator sets only) indicates the period of time from the generator set kW output level falling below the load bank kW rating to the warning being issued. If the generator set kW output level increases above the load bank kW rating, then the malfunction warning is not issued.

5.5.1 Generator Set Information (Genset Info)

The GENSET INFO screen displays information about the generator set, including the model and serial number, and engine and alternator information. The generator set information is loaded at the factory or read from the engine ECM. The GENSET INFO data cannot be changed in the field.

Procedure to View Generator Set Information

1. In the navigation menu on the left side of the screen, touch Setup.
2. Touch Genset Info or the *i* symbol.
3. Observe the generator set serial number and other information.

The numbers below correspond to the numbered steps in the Procedure to View Generator Set Information.

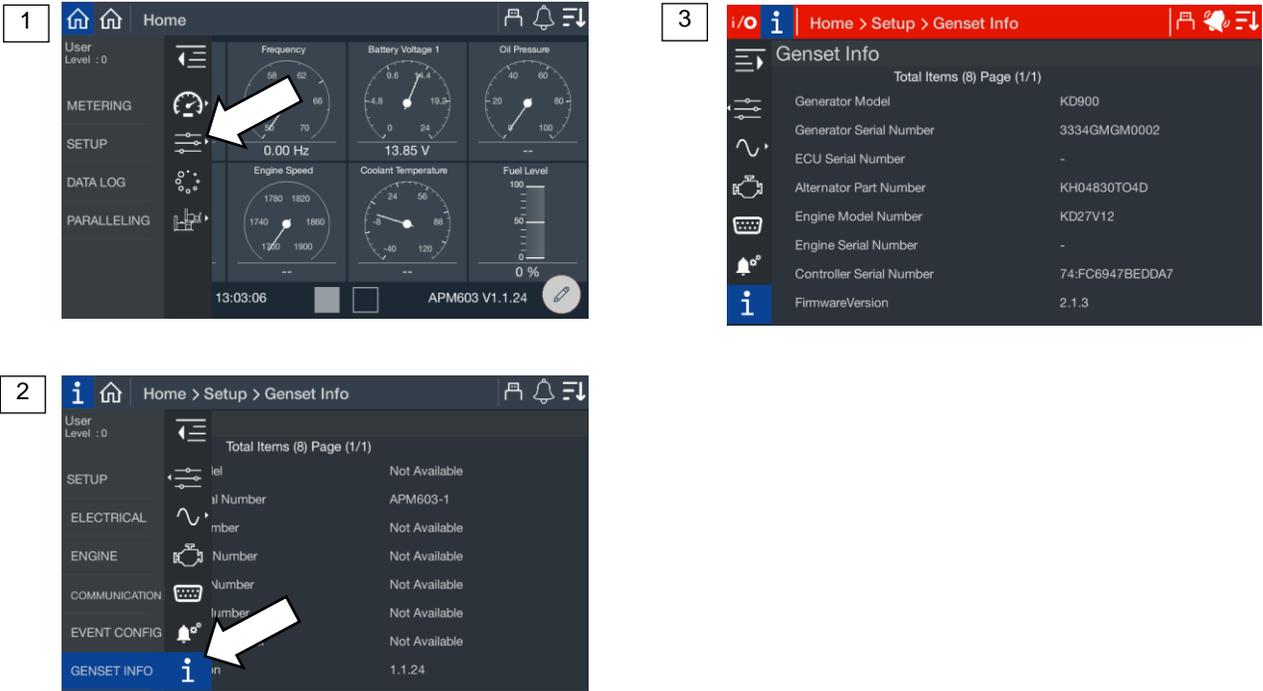


Figure 61 Genset Info Screen

Generator Set Information
Generator Model
Generator Serial Number
ECU Serial Number
Alternator Part Number
Engine Model Number
Engine Serial Number
Controller Serial Number
Firmware Version

Figure 62 Generator Set Information (Genset Info)

5.6 Data Log Screens

Data log files can be created and saved to a flash drive.

Before starting the data log, insert a flash drive into the USB port on the front of the controller. When the controller recognizes the flash drive, the symbol appears at the top of the screen. Select one or more parameters to log over a period of time, and select the log rate (intervals from once per second to once a day).

The data logger will collect data until STOP is selected on the screen or until the flash drive runs out of memory.

When complete, remove the flash drive from the controller and insert it into a personal computer to view the data files. The data file name includes the date, an alpha-numeric code, and the .csv extension. The file can be opened using a spreadsheet program like Microsoft Excel. A word-processing program or Notepad can also open the file. The data entries in the file are time- and date-stamped.

Data Logging Procedure

Refer to Figure 63 during this procedure.

1. Check for the flash drive symbol at the top of the screen to verify that the controller recognizes the flash drive installed in the USB port.
2. In the navigation menu on the left side of the screen, touch Data Log.
3. Confirm that USB Connected appears on the screen. Touch the Circle icon with three dots near the upper right corner of the screen. A list of categories opens.
4. Touch to select a category. A list of parameters within that category opens.
5. Touch each parameter that you want to log. Multiple parameters from different categories can be logged at the same time. A check mark appears in the boxes for the selected parameters. Touch the left arrow at the bottom to close the selection window. Repeat steps 4 and 5 for other categories and parameters as needed. The parameters to be logged are listed on the left side of the screen.
6. Click on the blue box labeled Log Rate, located in the lower right corner of the screen. The Data Logger Sample Rate window opens.
7. Select the desired log rate and touch the up arrow to close the window. The new log rate appears in the blue box at the bottom of the screen.
8. Touch START LOG to begin collecting data. Data Log In Progress is displayed. The data is stored to the flash drive.
9. Touch STOP to end the data logging process. Wait at least 5 seconds to allow the data to be written to the files before removing the flash drive from the controller.

Note:

If the flash drive memory becomes full, the controller will stop logging data.

To view the data, insert the flash drive into your PC and open the .csv file.

The numbers below correspond to the numbered steps in the Data Logging Procedure.

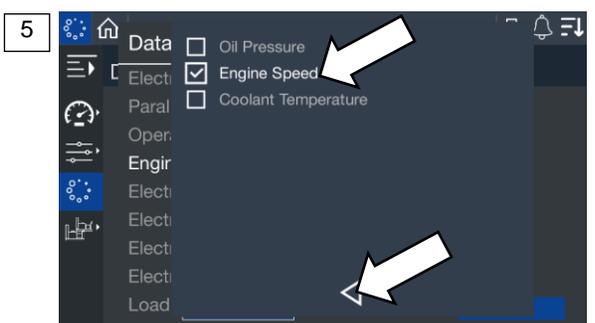
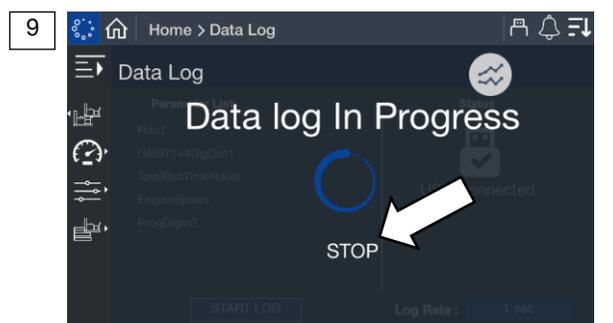
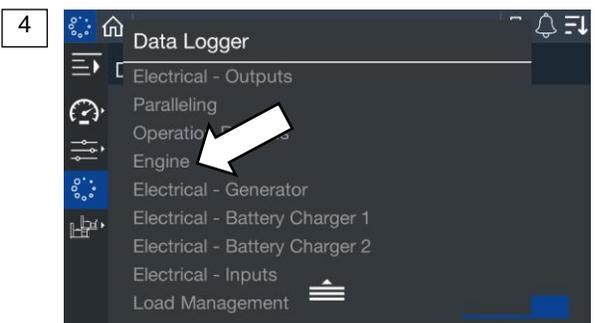
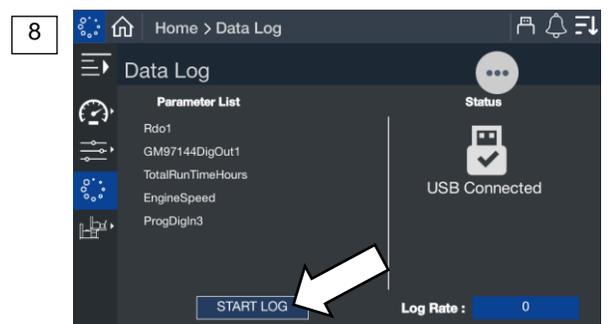
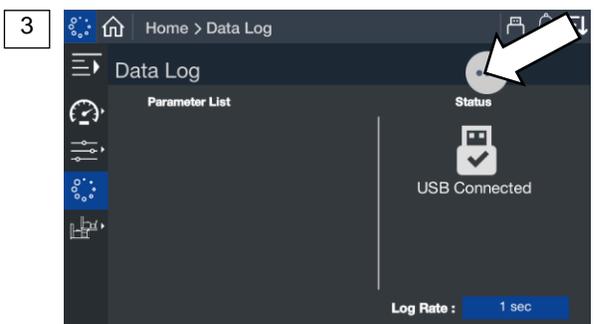
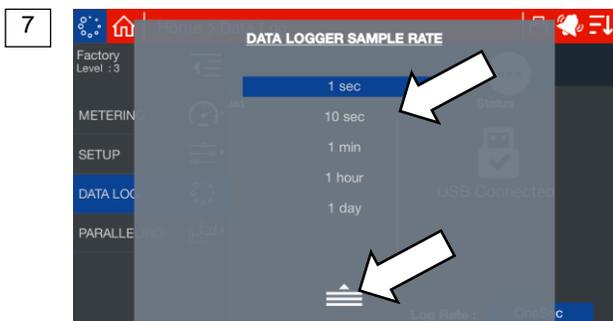
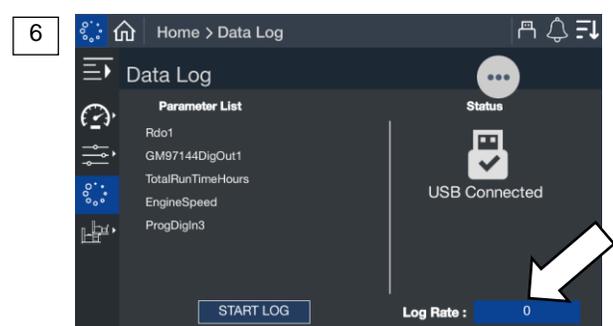


Figure 63 Data Logging

6.1 Introduction

Note:

The Paralleling menu will appear if Paralleling Screens Enabled is set to Yes in the Setup>Electrical>Paralleling menu.

While it may be common for a facility to install a single large generator to meet its power needs, paralleling two or more generators offers a number of practical benefits and advantages over a single-generator system.

Redundancy

The redundancy provided by the paralleling of two or more generators delivers greater reliability and flexibility than a single generator can provide. In critical applications, having more than one generator connected to the bus at all times ensures continuous generator power in the unlikely event that a generator fails.

Efficiency

Instead of one large generator that might operate inefficiently at a low power level, several small generators can be paralleled together and turned on and off as necessary to more efficiently support the varying demands of the load.

How Paralleling Works

When a loss of utility power occurs, almost every system responds with the basic sequence shown here.

1. **Engine Start Delay.** A timer starts when there is a loss of utility. If utility returns before the timer expires, the system does not start. If the utility outage is long enough for the timer to expire, the system will commit to transferring to generator power.
2. **Start / Start-Up Load Shed.** All available generators start. If the system is designed to supply power to loads as soon as one generator is online (typical for systems serving critical and life-safety loads), low-priority loads are shed or are inhibited from transferring. This prevents the first-on generator from being overloaded.
3. **First Generator Breaker Closes.** The first generator to reach the rated voltage and frequency closes to the bus. First-on logic prevents multiple generators from simultaneously closing to the bus. The bus is now energized, and power is available to the load. Low-priority loads may remain shed.
4. **Synchronization.** The incoming generator's voltage, frequency and phase are matched to the running bus. When matched, the generator paralleling breaker closes.
5. **Second Generator Breaker Closes/Load Sharing.** Additional generator power is available to the load. The system's load-sharing controls actively control the kW and kVAR output of each generator in order to proportionally share the load (maintain the same percent load on each generator) and maintain rated frequency and voltage.
6. **Load Management.** As additional generators close to the bus, more power is available for the load. The load management system actively adds loads based on available bus capacity.
7. **Generator Management.** Generator management optimizes the number of online generators based on the load, starting and stopping as required. Generators are sequenced on in order of operator-assigned priority (or based on runtime) and taken off in reverse priority. Defined setpoints determine the percent load level and time delay at which the generator set will be brought on or taken offline.

Synchronization

The automatic synchronizer matches the incoming generator's output (waveform) to the running bus. When the voltage, frequency and phase are all matched, the synchronizer will close the incoming generator's breaker.

Voltage Match. The synchronizer adjusts the incoming generator's voltage to match the running bus.

Frequency Match. The synchronizer adjusts the engine speed for the incoming generator to match the frequency of the running bus.

Phase Match. The synchronizer adjusts the engine speed for the incoming generator to match the phase of the running bus. When all three are matched, the two sine waves will be the same.

Tier 4 Load Bank Operation During Paralleling

Parallel operation for a tier 4 generator set is similar to parallel operation for tier 2 generator set with the exception of the load bank. Tier 4 generator sets use load banks to prevent hydrocarbon buildup. To utilize the load bank properly, the APM603 makes some additional calculations related to the load of the generator sets in parallel.

- The load bank will only be applied in parallel with the customer's load when applying the load will result in the total kW of the generator set being at or greater than the kW rating of the load bank and the total kW output of the generator set with the load bank's load will not exceed 90% of the generator set's rated capacity.
- When the HC levels of one generator set (running in parallel with multiple generator sets) needs to be reduced, and adding the load will not result in the total kW output of the generator set being at or greater than the kW rating of the load bank, then the following will occur:
 - The APM603 will generate a "Go Offline for Regen Warning."
 - The generator set will have 90 seconds to shed its load and go offline.
 - Once the generator set goes offline the load bank will be activated.
- When the generator is running and the HC buildup is over 50%, the controller will do one of the following depending on status of the paralleling breaker, availability of other generator sets, and the bus capacity and other parameter settings:
 - If the paralleling breaker is open, then the controller will activate the load bank.
 - If the breaker is closed then the controller will do one of the following based on the following conditions:
 - If this is the only generator online, and there is enough remaining available power on the generator to power the load bank and total power output of the generator with the load bank does not exceed 90% of the generator's rated power, then the load bank will be activated.
 - If this is the only generator online, and there is not enough remaining available power on the generator to power the load bank and be under 90% of the generator's rated power, then the load bank will be inactive.
 - If there are multiple generators online and the sum of the powers is more than the rating of the load bank and less than 90% of the generator's rated power, then the load bank will be activated. The sum of the powers is a combination of the following:
 - Current output power of the generator set without the load bank connected.
 - Power rating of the load bank divided by the number of generator sets online.
 - If there are multiple generators online and the sum of the powers is more than the rating of the load bank and exceeds 90% of the generator's rated power, then the load bank will not be activated. The sum of the powers is a combination of the following:
 - Current output power of the generator without the load bank connected.
 - Power rating of the load bank divided by the number of generators online.
 - If there are multiple generators online and the sum of the powers is less than the rating of the load bank, then the generator will shed its loads and go offline and then apply the load bank. The sum of the powers is a combination of the following:
 - Current output power of the generator without the load bank connected.
 - Power rating of the load bank divided by the number of generators online.
- While the generator is running and the load bank is active, and the HC Level drops at or below 0% the generator will do the following:
 - Deactivate the load bank and clear the regen active event.
 - Resume normal operation.
- Stopping the generator while the load bank is active, will result in the following:
 - Load Bank shall immediately go inactive.
 - Aftertreatment Regen Active Warning event shall clear immediately.

- High HC Level Warning shall remain in its current state until the HC drops to or below the clear threshold.
- Load Bank Control Malfunction Warning shall remain in its current state until the generator has been restarted with appropriate amount of load to clear the event.
- Stopping the generator remotely, will cause the generator to go into Low Idle Cooldown.
- Stopping the generator using the OFF button, E-Stop, or any shutdown event, will cause the generator to immediately shutdown and bypass the Low Idle Cooldown.

6.2 Metering

This section provides a list of paralleling metering screens that display the status of the paralleling system and generators within that system. Metering screens are display screens only; there are no adjustable parameters in the metering screens.

6.2.1 Paralleling, Metering, Overview

The overview provides a simple graphical view of the paralleling system.

Procedure to View Paralleling Overview

1. In the navigation panel on the left side, touch Paralleling or the symbol of two generators.
2. Touch Metering or the gauge symbol.
3. Touch Overview or the globe symbol.
4. Observe the Overview graphic, which is described below.



Figure 64 Paralleling, Metering, Overview Screen

From the overview screen, you get a simplified view of the status of each generator and the paralleling bus. Each generator in the system is shown on either the right side or left side of the display. If the generators were provided a custom name during the system set up, the name will appear. If not, the name will appear as Gen X, where X is the system assigned generator number.

Note:

Custom names for generators can be set up through SiteTech™. Contact a Kohler authorized distributor or dealer.

The top of the display provides a key to explain the color designation.

- A generator shown in green with lines through it is running. It may or may not be on the bus depending upon the status of the electrically operated breaker or contactor.
- A generator in solid green is in standby and disconnected from the bus. The generator is ready to start as required.
- A generator in blue is in cool down. It is disconnected from the bus but still running.
- A generator in yellow has a warning. This generator may be running and connected to the bus or it may be in cooldown or it could be in standby waiting for a start signal.
- A generator in red has a shutdown fault. It is not running, not connected to the bus and not available for paralleling.

Along with each color, a text description is provided to indicate the generator status.

Note:

The fact that a generator is not running does not automatically mean it has a fault. Generator Management may shut down a generator when it is not needed.

The lines on the display indicate the status of the bus and electrically operated breaker or contactor.

- Green indicates that the component is not powered.
- Red indicates the component is powered.

Each generator has a breaker symbol to indicate if the electrically operated breaker or contactor is open or closed. When the breaker is open, the breaker symbol does not appear connected to the bus lines and the breaker symbol is green. When the breaker is closed, the breaker symbol will appear connected to the bus lines and the breaker symbol will be red.

As soon as one generator closes to the bus, the bus line up the center of the display will show as red. As each generator closes, the bus line changes to red.

The bottom of the display shows the frequency, load and voltage of the bus. It does not show the information for a single generator but each generator closed to the bus should have a matching frequency and voltage. Each generator closed to the bus will share load so that each generator has an equal percentage loaded.

6.2.2 Paralleling, Metering Status

The status screens provide a listing of the paralleling metered values.

The Paralleling System Status provides indication of key settings and values related to the overall operation of the paralleling system.

Procedure to View Paralleling System Status Metering

1. In the navigation panel on the left side, touch Paralleling or the symbol with two generators.
2. Touch Metering or the gauge symbol.
3. Touch Status or the list symbol.
4. Touch the up and down arrows on the right to view the status parameters, which are described below.

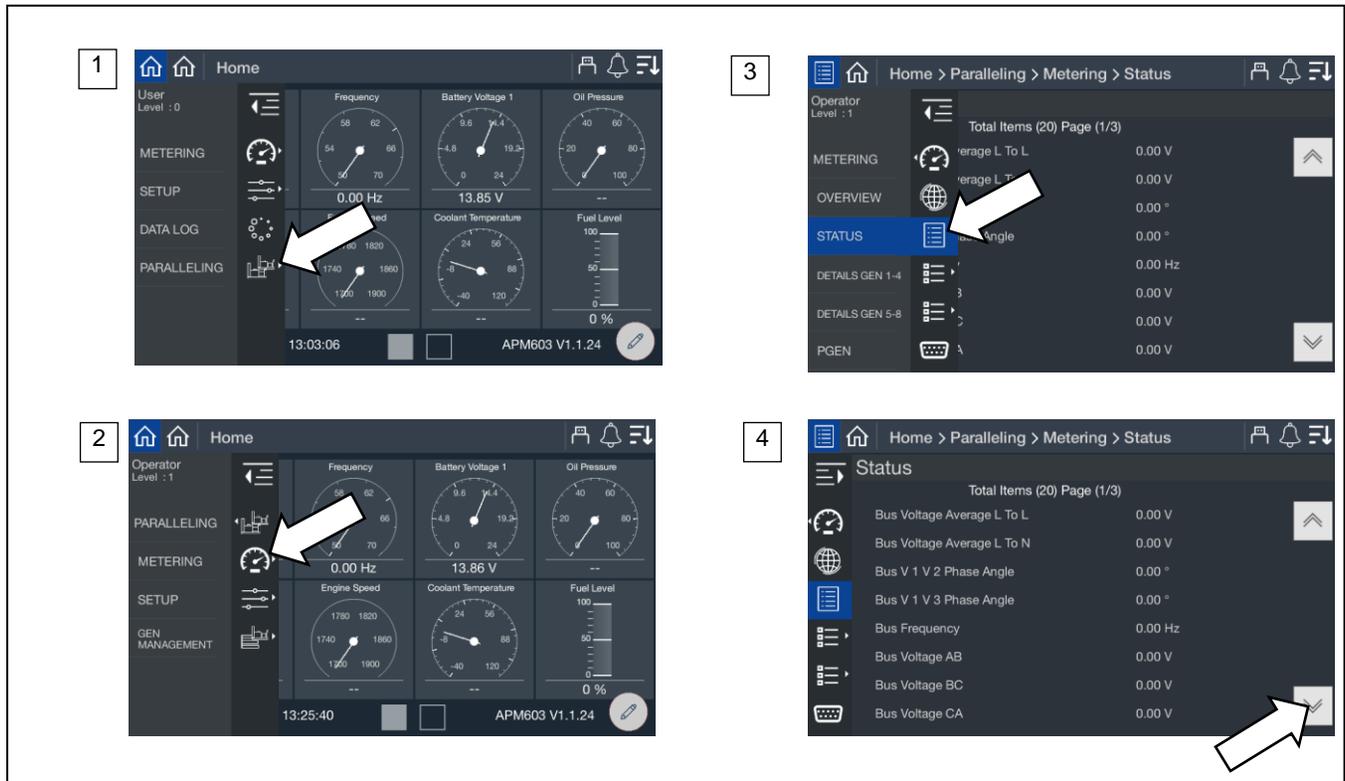


Figure 65 Paralleling, Metering Status Screen

Parameter	Units
Bus Voltage Average L to L	V
Bus Voltage Average L to N	V
Bus L1 L2 Phase Angle	Degrees
Bus L1 L3 Phase Angle	Degrees
Bus Frequency	Hz
Bus Voltage L1 L2	V
Bus Voltage L2 L3	V
Bus Voltage L3 L1	V
Bus Voltage L1 L0	V
Bus Voltage L2 L0	V
Bus Voltage L3 L0	V
Paralleling State	
Start Active	Yes/No
Synch Active	Yes/No
In Sync	Yes/No
Frequency Matched	Yes/No
Phase Matched	Yes/No
Voltage Matched	Yes/No
Close Breaker	True/False
Trip Breaker	True/False

Figure 66 Paralleling Metering Status Parameters

The electrical metering of the bus is shown. If the generator is not closed to the bus but trying to synchronize, the generator is adjusting the speed and voltage outputs to match the voltage, frequency and phase of the bus in order to close.

Start Active indicates if the generator has a start signal. This signal could be from a transfer switch, from the control buttons on the front of the generator or through PGEN.

Synch Active indicates if the generator is trying to sync to the bus.

In Sync indicates if the generator has successfully synced to the bus. The generator has not yet closed to the bus. All three parameters that follow, Frequency Matched, Phase Matched and Voltage Matched must be Yes for In Sync to be Yes.

Frequency Matched indicates the difference between the generator set frequency and the bus frequency is within the acceptable window.

Phase Matched indicates the difference between the generator set phase and the bus phase is within the acceptable window.

Voltage Matched indicates the difference between the generator set voltage and the bus voltage is within the acceptable window.

Close Breaker indicates if the controller has commanded the electrically operated breaker or contactor to close.

Trip Breaker indicates if the controller has commanded the electrically operated breaker or contactor to trip based on a protective function.

6.2.3 Paralleling, Metering, Details

The Paralleling System Generator Details provides details for each generator in the system. It provides the ability to view key data on other generators in the system from a single generator.

Procedure to View Paralleling System Generator Metering

1. In the navigation panel on the left side, touch Paralleling or the symbol of two generators.
2. Touch Metering or the gauge symbol.
3. Touch Details Gen 1-4 or Details Gen 5-8 or the list symbol for either.
4. Touch the specific generator to view.
5. Touch the up and down arrows on the right to view the parameters, which are described below.

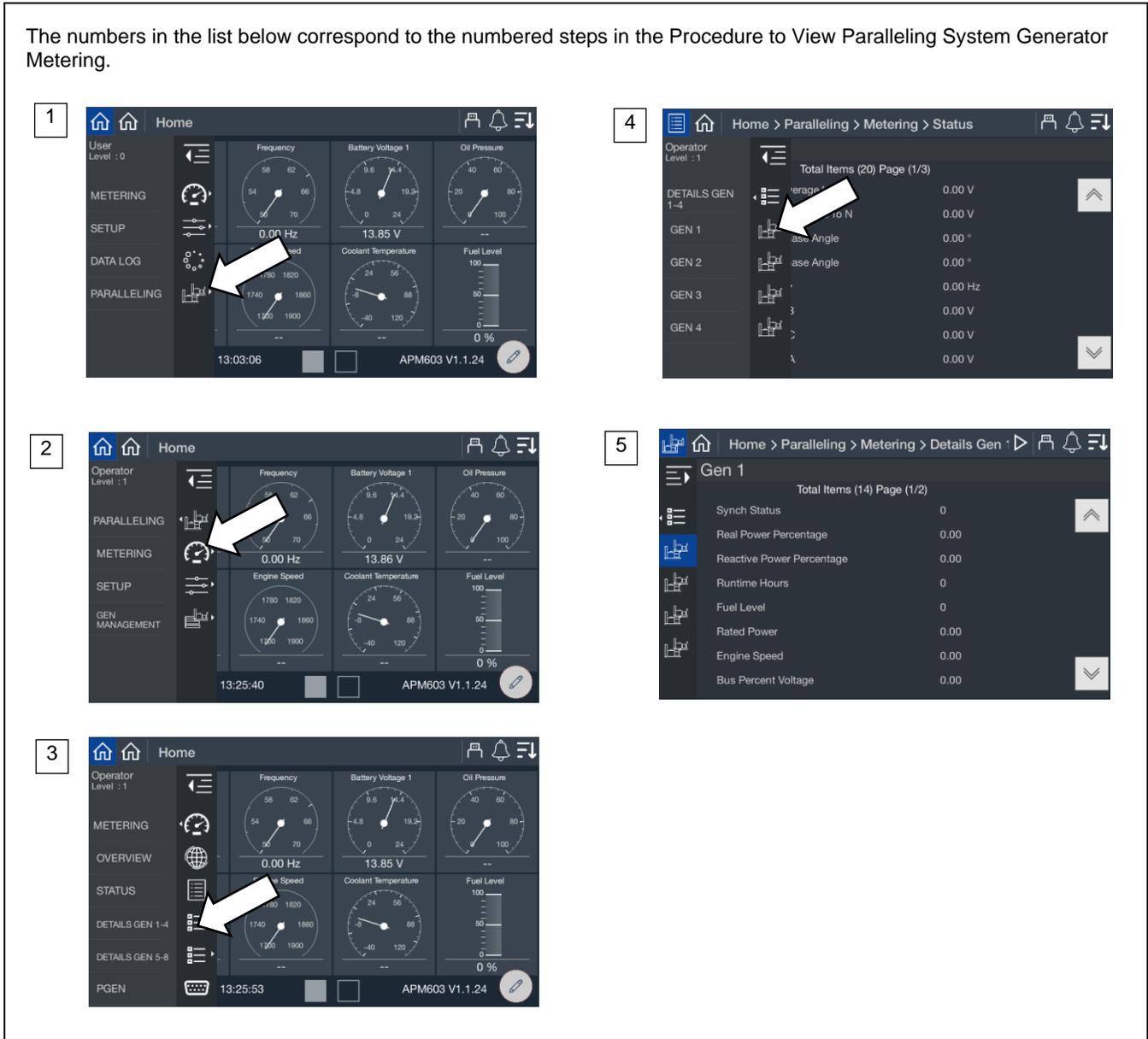


Figure 67 Paralleling, Metering, Details

Parameter	Units
Synch Status	
Real Power Percentage	%
Reactive Power Percentage	%
Run Time Hours	Hours
Fuel Level	%
Rated Power	kW
Engine Speed	RPM
Bus Percent Voltage	%
Connected	Yes/No
Was Connected	Yes/No
Online	Yes/No
Faulted	Yes/No
Bus Energized	Yes/No
Start Signal	Yes/No

Figure 68 Paralleling System Details Parameters

Synch Status indicates the synchronization status for the generator.

Real Power Percentage indicates the percentage load on the generator of real power (kW). All generators paralleled together should share load in order to have equal percentage.

Reactive Power Percentage indicates the percentage load on the generator of reactive power (kVAR). All generators paralleled together should share load in order to have equal percentage.

Run Time Hours indicates the total run time hours on the generator.

Fuel Level indicates the percentage of fuel level for the generator.

Rated Power indicates the rated power of the generator.

Engine Speed indicates the current engine speed for the generator.

Bus Percent Voltage indicates the measured voltage as percent of system voltage.

Connected indicates if the generator is connected through the PGEN communication with the other generators.

Was Connected indicates at one point the generator was connected through the PGEN communication with other generators but is not connected at this time.

Online indicates if the generator is currently closed to the paralleling bus.

Faulted indicates if the generator is faulted and not available for paralleling.

Note: If the controller is still communicating through PGEN with other generators, the load management implemented on the generator controller is still operational.

Bus Energized indicates if the generator is sensing that the bus has voltage and frequency.

Start Signal indicates if the generator has a start signal. This signal could be from a transfer switch, from the control buttons on the front of the generator or through PGEN.

6.2.4 Paralleling, Metering, PGEN

The PGEN metering provides details related to the paralleling system communication.

Procedure to view Paralleling PGEN Metering

1. In the navigation panel on the left side, touch Paralleling or the symbol of two generators.
2. Touch Metering or the gauge symbol.
3. Touch PGEN or the serial connector symbol.
4. Observe the PGEN information, which is described below.

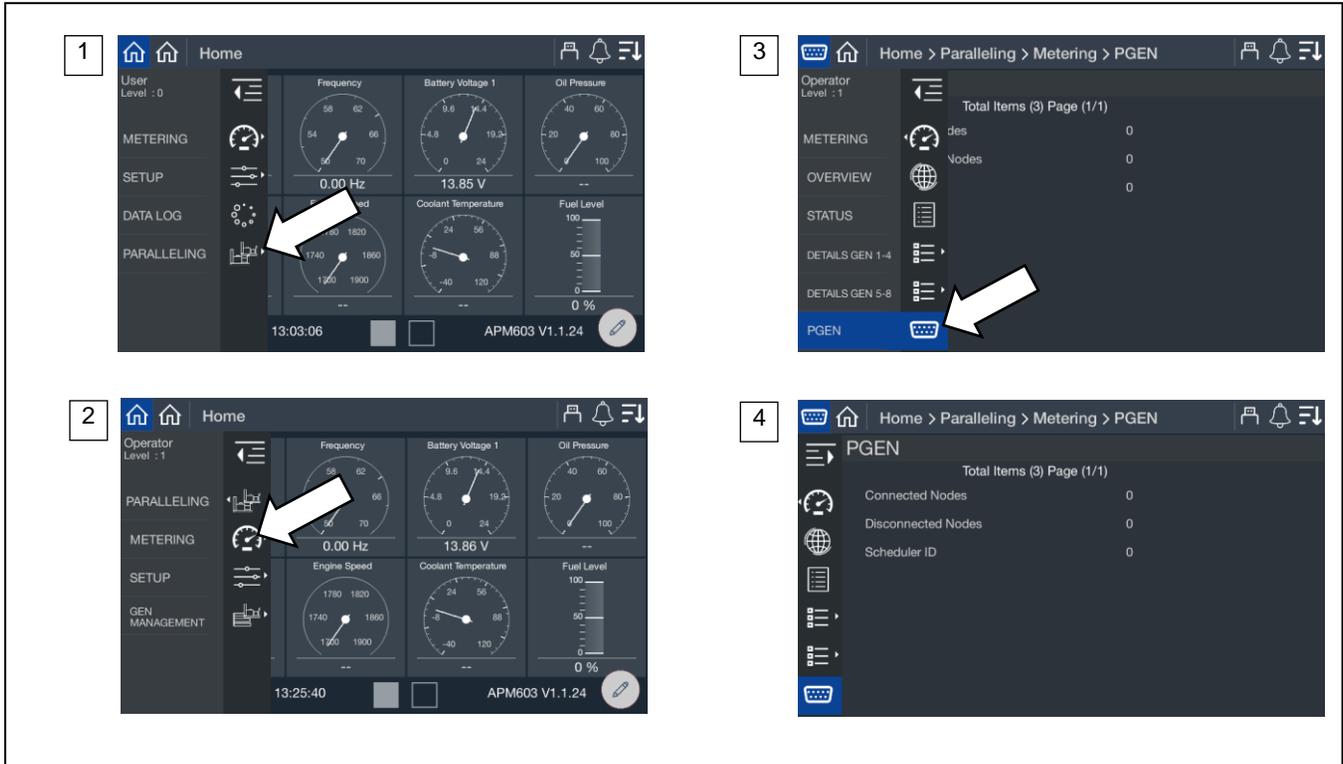


Figure 69 Paralleling, Metering, PGEN

PGEN Metering Parameters
Connected Nodes
Disconnected Nodes
Scheduler ID

Figure 70 PGEN Metering Parameters

Connected Nodes indicates how many generators are currently on the PGEN communication network. This should match the total number of paralleled generators in the system.

Disconnected Nodes indicates how many generators have been on the PGEN communication network before but are not communicating at this time. In a fully functioning system this would be 0. If a unit is out of service or the controller has stopped communicating, then there will be a value greater than 0.

Scheduler ID indicates which controller, based on PGEN ID, is the master in the system.

Note:

If a master scheduler controller stops communicating another controller takes over the as the Scheduler ID.

6.3 Setup

The screens in this section show the settings for systems using the onboard paralleling features.

Paralleling system setup and commissioning must be performed by a trained and authorized Kohler distributor or dealer. A separate Commissioning and Setup manual provides more information and instructions for setting up a paralleling system. See the List of Related Materials in this manual for the document part number for the Commissioning and Setup Manual for your unit.

Technician-level access is required to adjust the paralleling parameters on the controller display. Additional paralleling parameters are only accessible using SiteTech software. A personal computer (laptop) and Kohler SiteTech software are required to adjust these settings. SiteTech software is available only to Kohler authorized distributors and dealers.

6.3.1 Paralleling, Setup, PGEN

The Paralleling System PGEN provides indication of key settings related to the PGEN communication network.

Procedure to view Paralleling System PGEN Setup

1. In the navigation panel on the left side, touch Paralleling or symbol with two generators.
2. Touch Setup or the setup symbol.
3. Touch PGEN or the serial connector symbol.
4. Observe the PGEN parameters, which are described below.

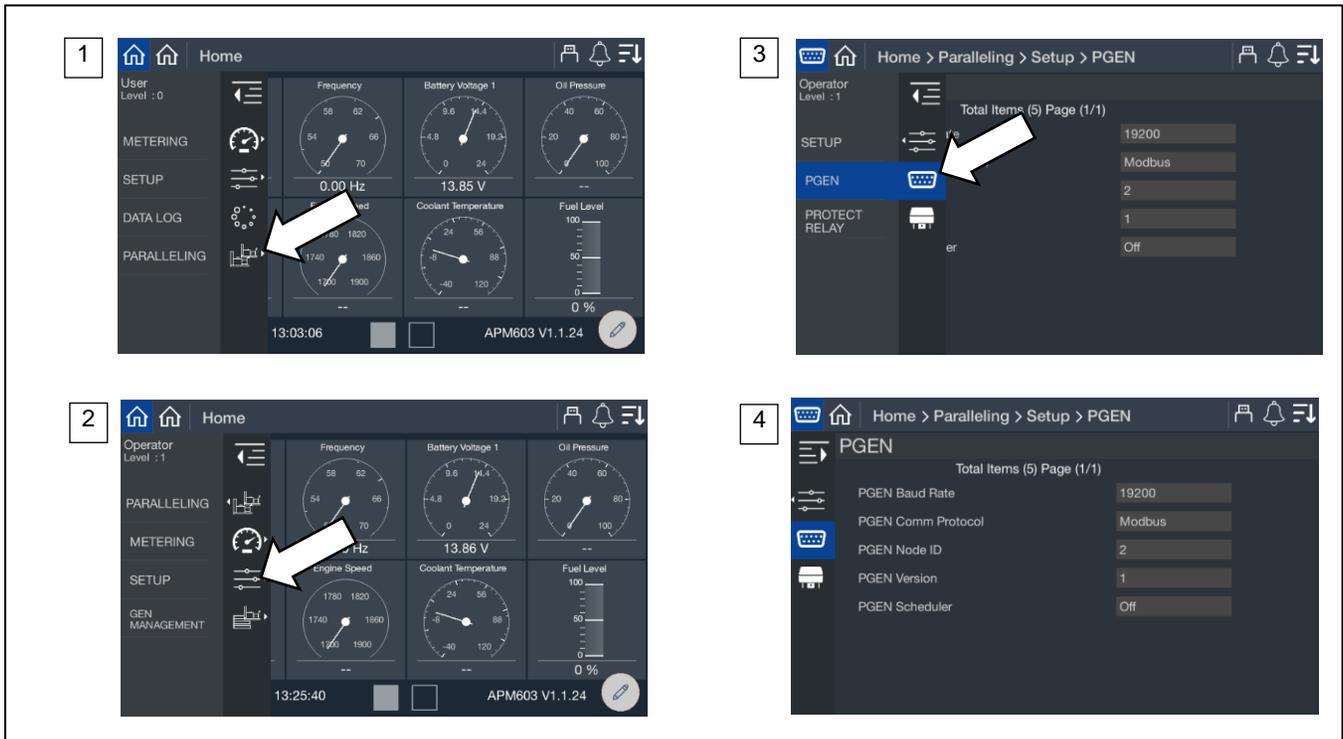


Figure 71 Paralleling, Setup, PGEN Screens

Parameter	Units	Write Access Level
PGEN Baud Rate	BPS	Factory set
PGEN Comm Protocol		Factory set
PGEN Node ID		Technician
PGEN Version		N/A
PGEN Scheduler	Yes/No	Technician

Figure 72 PGEN Setup Parameters

PGEN Baud Rate is fixed from the factory. All controllers must use the same baud rate and the rate is fixed for optimal performance.

PGEN Comm Protocol is fixed from the factory to support the same setting on all controllers in the system.

PGEN Node ID is unique for each controller in the system.

PGEN Version indicates the version of PGEN communication used in the system and is fixed from the factory.

PGEN Scheduler indicates Yes if the controller is the master scheduler in the system.

6.3.2 Paralleling, Setup, Protect Relay Screen

The Paralleling System Protective Relays provides indication of key settings related to the protective relay functions related to paralleling.

Procedure to View Paralleling System Protective Relays Setup

1. In the navigation panel on the left side, touch Paralleling or symbol with two generators.
2. Touch Setup or the setup symbol.
3. Touch Protect Relay or the relay symbol.
4. Touch the up and down arrows on the right to view the protective relay setup parameters, which are described below.

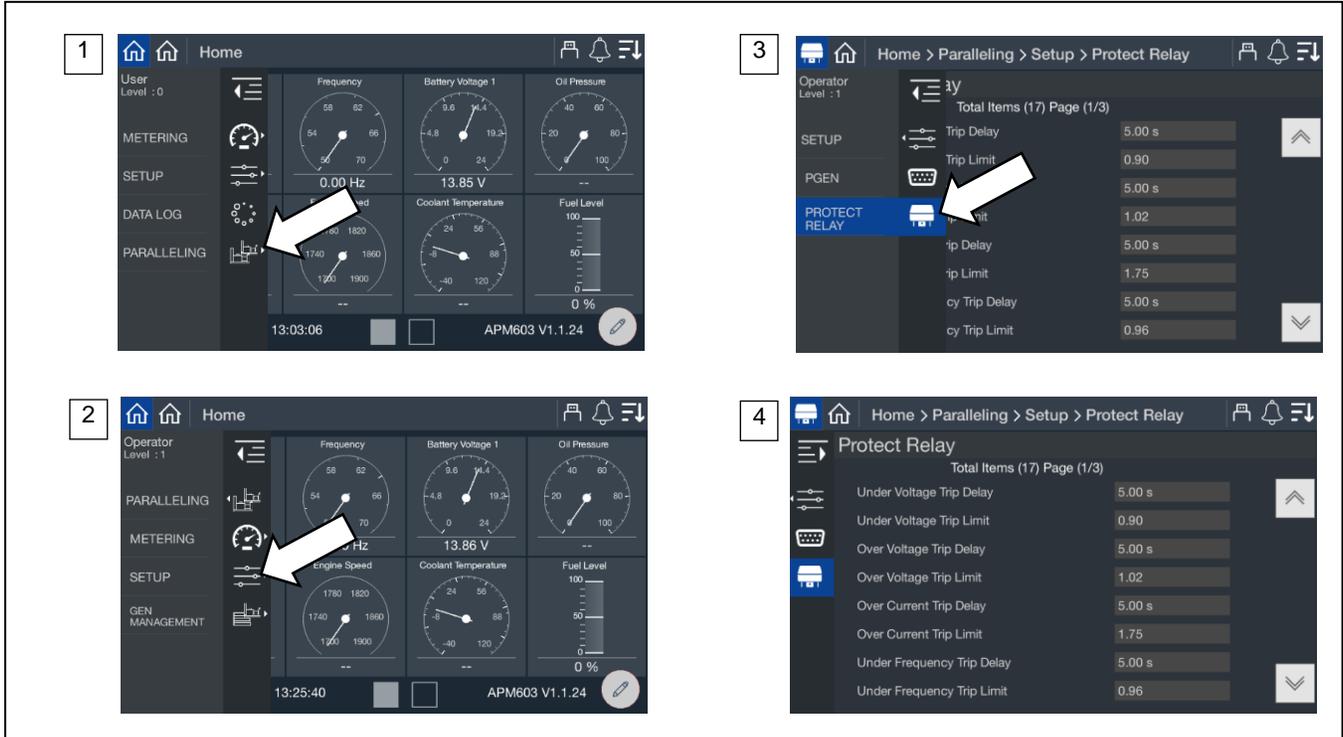


Figure 73 Paralleling, Setup, Protect Relay Screen

Parameters	Units	Write Access Level
Under Voltage Trip Delay	Seconds	Technician
Under Voltage Trip Limit	%	Technician
Over Voltage Trip Delay	Seconds	Technician
Over Voltage Trip Limit	%	Technician
Over Current Trip Delay	Seconds	Technician
Over Current Trip Limit	%	Technician
Under Frequency Trip Delay	Seconds	Technician
Under Frequency Trip Limit	%	Technician
Over Frequency Trip Delay	Seconds	Technician
Over Frequency Trip Limit	%	Technician
Over Power Trip Delay	Seconds	Technician
Over Power Trip Limit	%	Technician
Reverse Power Trip Delay	Seconds	Technician
Reverse Power Trip Limit	%	Technician
Reverse VAR Trip Delay	Seconds	Technician
Reverse VAR Trip Limit	%	
Trip to Shutdown Delay	Seconds	

Figure 74 Protective Relay Parameters

Trip to Shutdown Delay indicates the time allowed to clear the trip condition to avoid the shutdown. It also serves as a cooldown period for the generator in a case where the protective relay function is causing the trip.

6.4 Generator Management

Generator Management is intended to minimize wear and tear, fuel consumption, pollutant/sound emissions, and generated heat. It acts by signaling each generator set to stop when it is unneeded. If generator management for a generator set is disabled, the generator set will start (if already stopped by generator management) or or be prevented from turning off in the future.

Generator management sequences the generators off in an order determined by configuration parameters and operating conditions (load, runtime, fuel level). The highest order generator sets stop first (when load is low enough) and re-start last (when load is too high). The order can be viewed on the front panel of the controller, but can only be adjusted under certain conditions (see Gen Management Order later in this section).

The time to start a generator set (if the load increases) varies with the degree of overload as a percent of online capacity (the sum of rated power for those generators that are connected to the bus).

The time to stop a generator set (if the load is low enough) varies with the degree of load as a percent of total available capacity (the sum of rated power for all generators in the system whether connected to the bus or not). A generator with a fault or in Off mode is not considered available.

Note:

Receipt of a start signal will cause all generator sets to start, synchronize, and close to the bus.. If a generator set is faulted or manually stopped and then placed back in Auto, generator management will require the generator set to start and connect to the bus before it is permitted to stop again—even if generator management had previously signaled the generator set to stop.

The overview provides a simple graphical view of the generator management status.

Procedure to View Generator Management Overview

1. In the navigation panel on the left side, touch PARALLELING or the symbol of two generators.
2. Touch GEN MANAGEMENT or the three horizontal bars with a generator symbol.
3. Touch OVERVIEW or the globe symbol.
4. View the graphical display.



Figure 75 Paralleling Screens, Gen Management Overview

Understanding the Overview Screen

The generators are listed in order of priority. If the generators were provided a custom name during the system set up, the name will appear. If not, the name will appear as Gen X, where X is the system assigned generator number.

- Custom names for generators can be set up through SiteTech.
- Depending upon the Generator Management Mode, the priority of a generator can change over time. For example, if the mode is Fuel Level, as the fuel level of each generator changes the order of priority for each generator will change.

The top of the screen provides a key to explain the symbol and color designation used on the overview. A timer face in white indicates a timer is active to either turn a generator on or off. The timer face will appear on the line of the generator for which the timer applies. A red circle indicates the stop kW setting for the generator. A green arrow indicates the start kW setting for the generator. If a generator is running, it will show the stop setting. If a generator is stopped, it will show the start setting.

The key at the bottom of the display shows the current load as well as the total online capacity (green) and available capacity (yellow). If a generator is offline (either due to a shutdown via Generator Management or a fault, or the generator is not communicating via PGEN), the capacity of that generator is shown as unavailable (white). A vertical blue dotted line indicates the current load on the system.

6.4.1 Paralleling, Generator Management Status

The status screens provide a listing of the generator management metered values as well as key settings for reference.

6.4.1.1 Status, System

The Gen Management System Status provides indication of key settings and values related to the overall operation of the load management system.

Procedure to View Generator Management System Status

1. In the navigation panel on the left side, touch Paralleling or the symbol of two generators.
2. Touch Gen Manage or the three horizontal bars with a generator symbol.
3. Touch Status or the list symbol.
4. Touch System or the generator symbol.

The numbers below correspond to the numbered steps in the Procedure to View Paralleling System Status Metering.

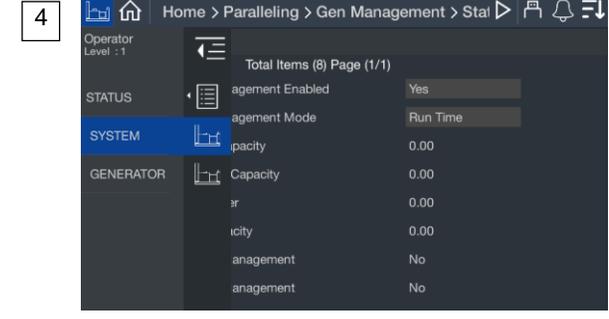


Figure 76 Paralleling Screens, Generator Management Status

Parameter	Units	Write Access Level
Generator Management Enabled	Yes/No	Technician
Generator Management Mode	See below	Technician
Total Online Capacity	kW	N/A
Total Available Capacity	kW	N/A
Total Bus Power	kW	N/A
Total Bus Capacity	kW	N/A
Remove for Maintenance	Yes/No	Operator

Figure 77 Generator Management Status Parameters

Generator Management Enabled indicates whether generator management is turned on for the generator.

Note:

This parameter can be set individually for each generator set and will inhibit the Generator Management Configuration Mismatch Warning for this generator set if set to OFF.

Note:

Disabling the generator management on one generator set in a paralleling system will not keep the other generator sets in the paralleling system from alarming if the generator management configuration of any of the other nodes differs from the disabled generator set.

Note:

Generator sets with Generator Management disabled are not taken into consideration for generator management on the other generator sets. It is not recommended to disable any of the generator sets in a paralleling system where generator management is intended to be used; the generator management may operate too many generator sets in these cases.

Generator Management Mode indicates which form of generator management is active. See Section 6.4.2 for descriptions of the available modes.

Total Online Capacity indicates the capability of the system with all the generators that are currently online.

Total Available Capacity indicates the difference between the Online Capacity and the Total Load.

Total Bus Power indicates the total load on the system.

Total Bus Capacity indicates the capability of the system if all the generators available were online.

Stop by Gen Management indicates whether the generator set has been stopped by the gen management function.

Start by Gen Management indicates whether the generator set has been started by the gen management function.

6.4.2 Gen Management Modes

The Gen Management Mode is the method that generator management uses to determine the starting and stopping order of the available generator sets. All of the generator sets in the system must have the same setting for this parameter for the generator management to operate correctly. This parameter can be set to one of the following:

Manual/Fixed. The order of the generator sets is manually set. In this mode, the order is set once by the user.

Note:

The controllers require that the order be valid. If two nodes share a common order or there is a gap in the order sequence, the controllers will attempt to re-sort the order until it is valid. If the order is not valid (automatic re-sorting failed) generator management will be disabled and all generator sets will run all of the time.

Run Time. The generator management start/stop order is determined by the runtime hours on the generator sets. In this mode, the order is determined to ensure that the generator set with the fewest runtime hours is the last to stop. Each subsequent order is assigned to generator sets with increasing runtime hours.

If a generator set is not running, the system will add the Run Time Threshold to the runtime hours for that generator set before it considers it in the order—this allows the generator sets to avoid starting and stopping continuously. The actual runtime will have to differ by more than the threshold to force the generator set order to switch (the stopped generator set will start, synchronize to the paralleling bus, and begin sharing load—the running generator set will soft-unload, disconnect from the bus, cool down and stop).

The generator management order is not user adjustable in runtime mode.

Note:

If the load on the system requires an additional generator set to start, the generator set with the most runtime hours will always be the first one to stop if the load decreases enough to permit it (the threshold is no longer taken into consideration as soon as the generator set is connected to the paralleling bus).

Fuel Level. The generator management start/stop order of the generator sets is determined by the level of the fuel in the tank which supplies each generator set. In this mode, the order is determined to ensure that the generator set with the most fuel is the last to stop. Each subsequent order is assigned to generator sets with decreasing fuel percentage.

If a generator set is running, the system will add the Fuel Level Threshold to the measured Fuel Level for that generator set before it considers it in the order. This allows the generator sets to avoid starting and stopping continuously. The actual fuel level will have to differ by more than the threshold to force the generator set order to switch. The stopped generator set will start,

synchronize to the paralleling bus, and begin sharing load. The running generator set will soft-unload, disconnect from the bus, cool down, and stop.

The generator management order is not user-adjustable in Fuel Level mode.

Note:

Fuel Level Order Selection mode requires separate fuel tanks for the generator sets and fuel level senders connected to the controller to operate. Operation of Fuel Level mode without sensors is not defined.

Note:

If the load on the system requires an additional generator set to start, the generator set with the lowest fuel level will always be the one to stop (the threshold is no longer taken into consideration as soon as the generator set is connected to the paralleling bus).

6.4.3 Gen Management System Status, Generator

The Gen Management System Generator provides details on each generator in the system. Each generator has a page of data so as you page down you will see the information for each generator on a single screen.

Procedure to View Generator Management System Generator

1. In the navigation panel on the left side, touch Paralleling or the symbol of two generators.
2. Touch Gen Manage or the three horizontal bars with a generator symbol.
3. Touch Status or the list symbol.
4. Touch Generator or the generator symbol.

The numbers below correspond to the numbered steps in the Procedure to View Generator Management System Status, Generator.

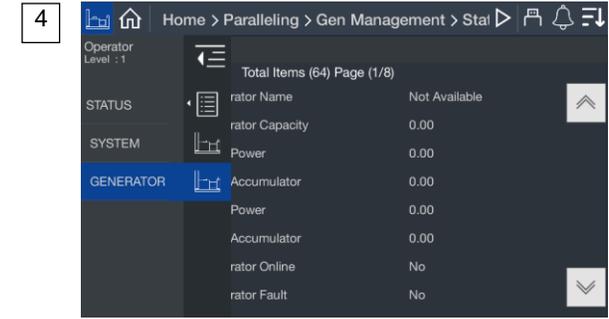


Figure 78 Paralleling, Gen Management, Status, Generator

Parameter	Units
Priority 1 Generator Name	String
Priority 1 Generator Capacity	kW
Priority 1 Start Power	kW
Priority 1 Start Accumulator	%
Priority 1 Stop Power	kW
Priority 1 Stop Accumulator	%
Priority 1 Generator Online	Yes/No
Priority 1 Generator Fault	Yes/No

Figure 79 Generator Management Status, Generator Parameters

Note:

The order of generators in this list is fixed by priority so if a generator priority is changed, its order in the list will change. The first value in the list is Generator Name to provide clarity as to which generator is referenced.

Generator Name is the descriptive name of the generator. If the generators were provided a custom name during the system set up, the name will appear. If not, the name will appear as Gen X, where X is the system assigned generator number.

Note:

Custom names for generators can be set up through SiteTech™. Contact a Kohler authorized distributor or dealer.

Generator Capacity indicates the rated capacity of the generator.

Start Power indicates the kW setting that needs to be exceeded in order for the generator management to begin a timer to add the generator back to the bus.

Start Accumulator is an indication of progress until generator management will start the generator.

Note:

The time to start will decrease as the load demand increases and will decrease as the load demand decreases. The Accumulator is not a fixed time but will speed up or slow down depending upon the load demand.

Stop Power indicates the lower limit kW setting for gen management. When the load drops below this kW limit, generator management starts a timer to stop the generator.

Stop Accumulator is an indication of progress until generator management will stop the generator.

Note:

The time to stop will decrease as the load demand decreases and will increase as the load demand decreases. The Accumulator is not a fixed time but will speed up or slow down depending upon the load demand.

Generator Online indicates if the generator is currently on the bus.

Generator Fault indicates if the generator has a fault and is not connected to the bus.

6.4.4 Paralleling, Gen Management, Setup Details

The setup details screen provides a table view of key settings for the generator management configuration. See Figure 80 for an illustration of the screen, which is located at PARALLELING>GEN MANAGEMENT>SETUP DETAILS.

Procedure to View Generator Management Setup Details

1. In the navigation panel on the left side, touch PARALLELING or the symbol of two generators.
2. Touch GEN MANAGEMENT or the three horizontal bars with a generator symbol.
3. Touch SETUP DETAILS or the details symbol.
4. View the setup details for each generator in the system.

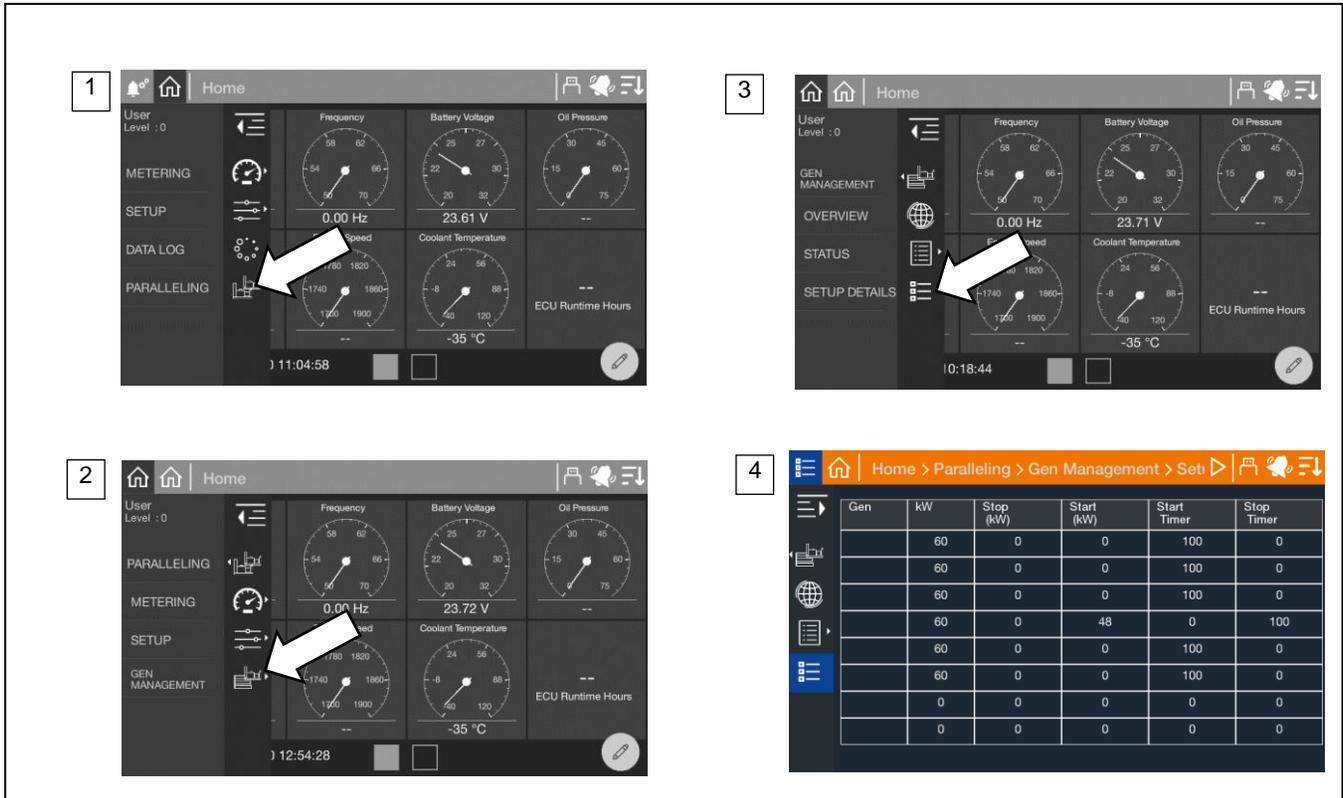


Figure 80 Paralleling Screens, Gen Management Setup Details

The generators are listed in order of priority. If the generators were provided a custom name during the system set up, the name will appear. If not, the name will appear as Gen X, where X is the system assigned generator number.

Note:

Custom names for generators can be set up through SiteTech.

The table indicates the kW Capacity of the generator along with the Start kW and Stop kW settings and the start and stop timer settings. Generator Start kW, Stop kW, Start Time and Stop Time can be adjusted using SiteTech. See Figure 81 for the SiteTech Group. Start and Stop kW values are calculated from the configuration parameters and the respective capacity values. The actual settings are made using percentages: parameters Start Percentage and Stop Percentage.

KOHLER APM 603		Parameters
Parameter	APM 603	
GenManagement Setting		
Generator Management Mode	Manual Fixed	
Start Percentage	80.00	
Stop Percentage	60.00	
Generator Management Enabled	Yes	
Min. LoadShed Priority	16	
Additional Gens Online	No	
Stability Delay	60	
Max. Runtime Difference	120.00	
Max. Fuel Level Difference	10	
Manual Order	1	
Start Time	5.00	
Stop Time	30.00	
Config Update Time Window	5.00	
Order Negotiation Time	5.00	

Figure 81 Generator Management Settings Adjustable in SiteTech

Section 7. Remote Monitoring Display, Tier 4 Only

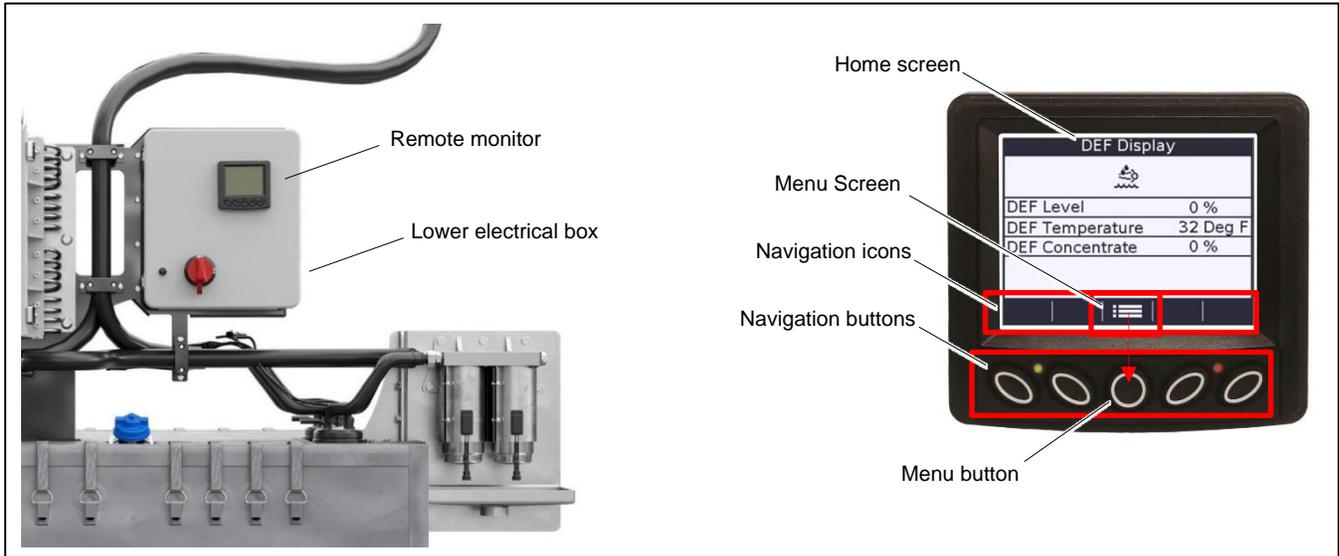


Figure 82 Remote Monitor Display

Tier 4 generator sets (KD1250-4, KD2500-4, KD3250-4) have a remote monitor display mounted on the door of the lower electrical box. See Figure 82. The remote monitoring screens are designed for viewing only. Settings cannot be changed through the remote monitoring screens. Note that the screen display shows navigation icons which correspond to the five navigation buttons directly below.

7.1 Home Screen

The DEF Display (Home) screen displays basic monitoring parameters. After 5 minutes of inactivity, the remote display will return to the DEF Display screen. The navigation of the remote monitor follows this basic layout:

- DEF Display (Home) Screen
 - Menu Screen
 - Engine Overview Screens (1 – 3)
 - Engine Fuel Screen
 - Engine Temperature Screens (1 – 4)
 - Engine Pressures Screens (1 – 2)
 - Engine Aftertreatment Screens (1 – 5)
 - Display Settings Screen

7.2 Menu Screen

The Menu screen on the remote monitor displays a selectable list of available engine metering screens. See Figure 84.

Note:

The navigation icons correspond to the navigation buttons directly below them.

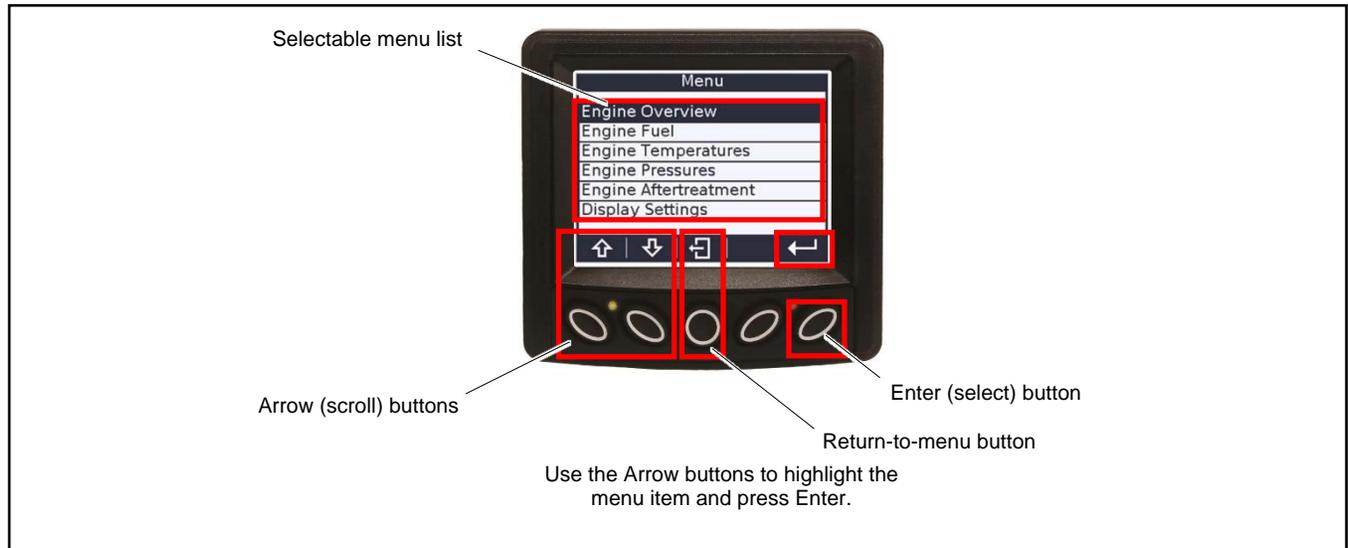


Figure 83 Menu Screen Navigation

Menu Items - Tier 4 Generator Models
Engine Overview
Engine Fuel
Engine Temperatures
Engine Pressures
Engine Aftertreatment
Display Settings

Figure 84 List of Selectable Menu Items

7.2.1 Overview

The Engine Overview screens (1–3) on the remote monitor displays the engine overview data shown in Figure 86.

Note:

The navigation icons correspond to the navigation buttons directly below them.

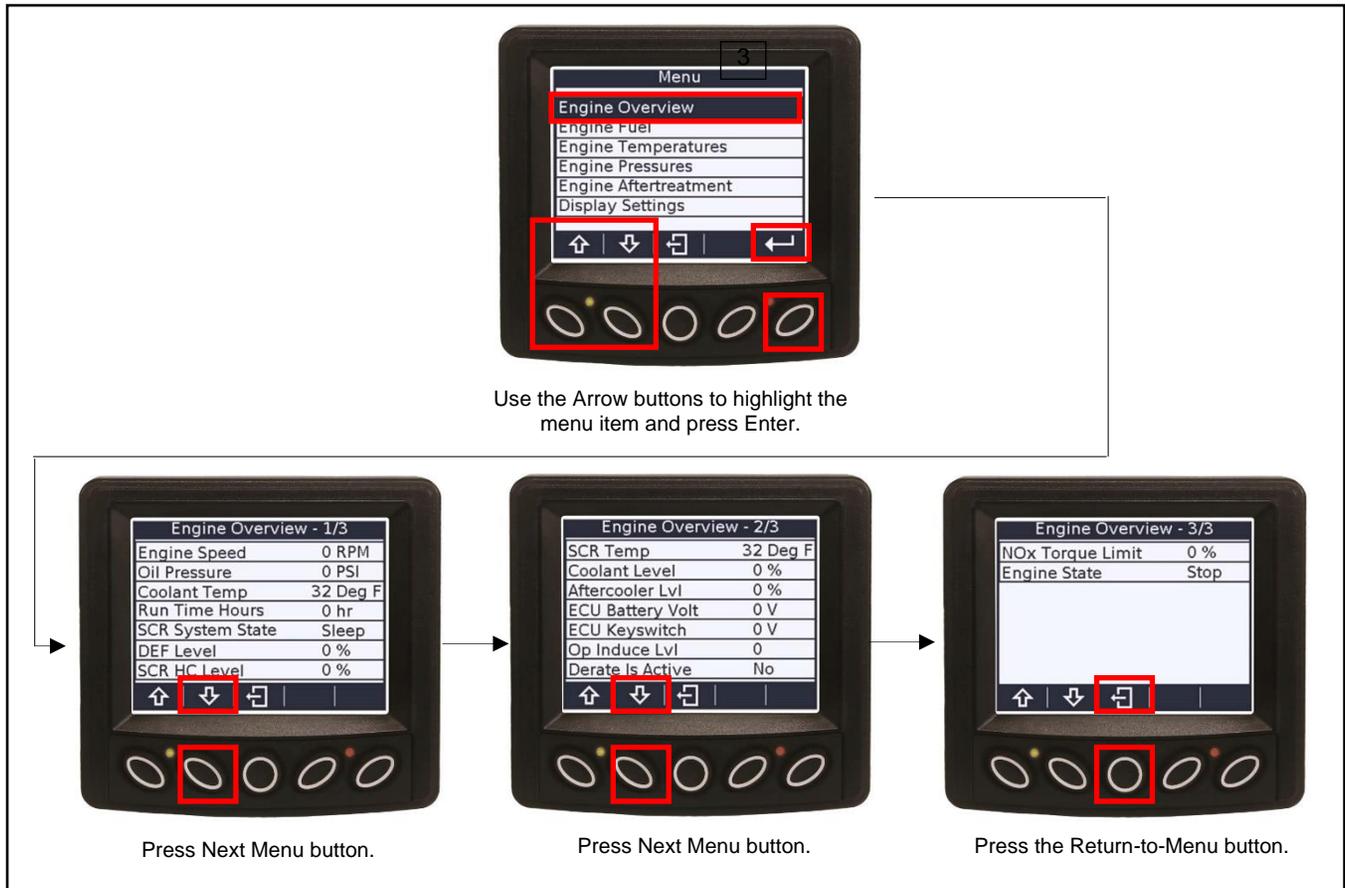


Figure 85 Engine Overview Navigation

Tier 4 Generator Models	
Item	Units
Engine Speed	RPM
Oil Pressure	kPa or PSI
Coolant Temp	Deg C or Deg F
Run Time Hours	hr
SCR System State	Sleep, Wake, Norm, Err, Purg, HProt, CProt, Stopg, Diag, Test, DnOk, Prim
DEF Level	%
SCR HC Level	%
SCR Temp	Deg C or Deg F
Coolant Level	%
Aftercooler Lvl	%
ECU Battery Volt	V
ECU Keyswitch	V
Op Induce Lvl	0,1,2,3,....
Derate Is Active	No/Yes
Nox Torque Limit	%
Engine State	Stop, Pre, Start, Warm, Run, Cool, Post

Figure 86 Engine Overview Data

7.2.2 Fuel

The Engine Fuel screen on the remote monitor displays the engine fuel data shown in Figure 88.

Note:

The navigation icons correspond to the navigation buttons directly below them.

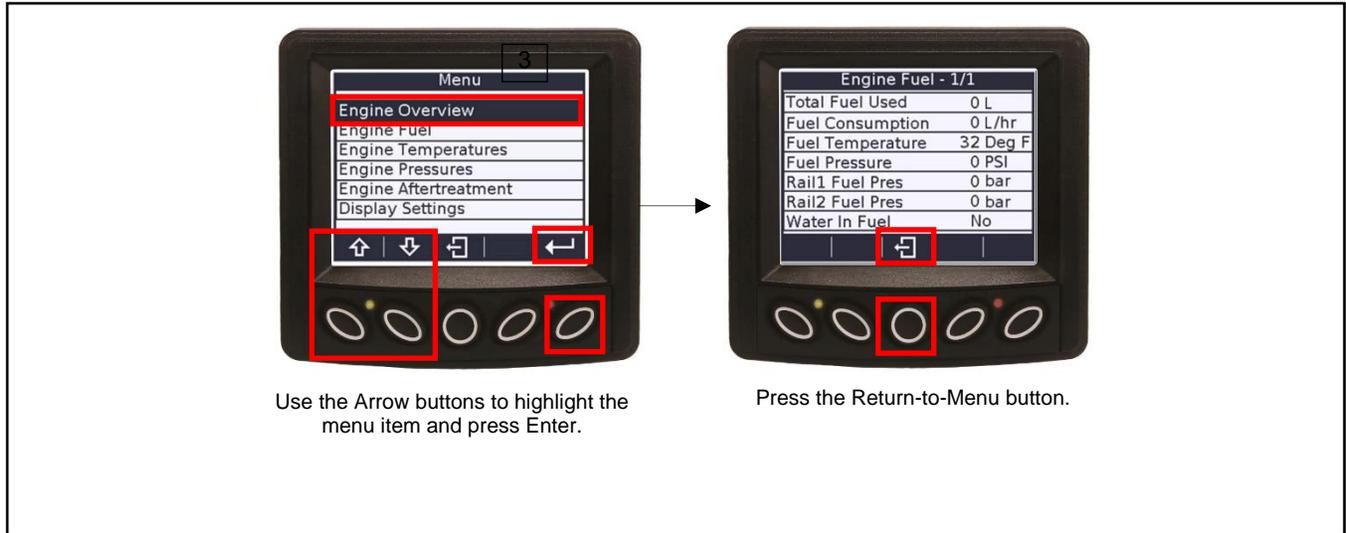


Figure 87 Engine Fuel Navigation

Tier 4 Generator Models	
Item	Units
Total Fuel Used	L
Fuel Consumption	L/hr
Fuel Temperature	Deg C or Deg F
Fuel Pressure	kPa or PSI
Rail 1 Fuel Pres	Bar
Rail 2 Fuel Pres	Bar
Water In Fuel	No/Yes

Figure 88 Engine Fuel Data

7.2.3 Temperature

The Engine Temperature screens (1–5) on the remote monitor displays the engine temperature data shown in Figure 90.

Note:

The navigation icons correspond to the navigation buttons directly below them.

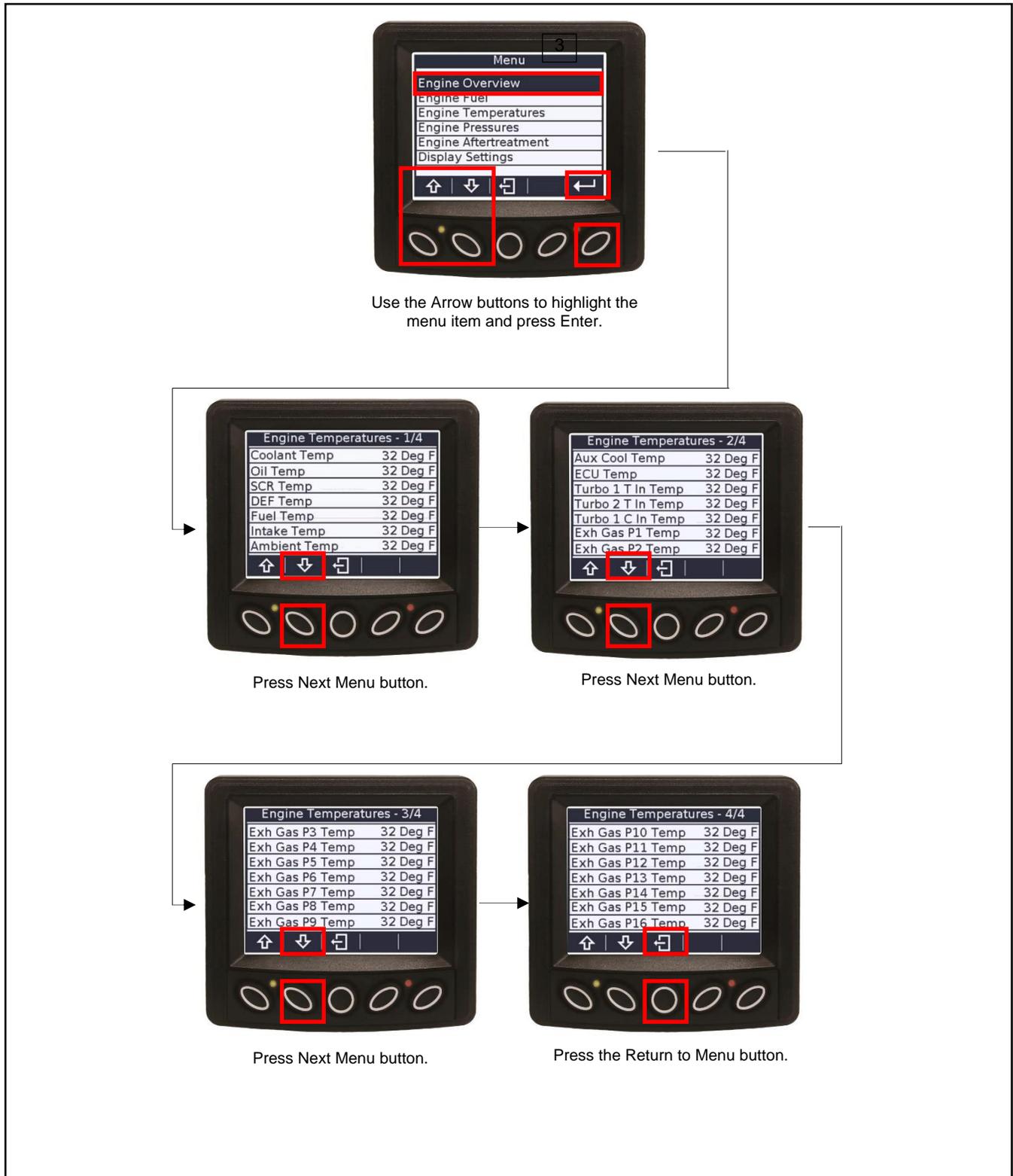


Figure 89 Engine Temperature Navigation

Tier 4 Generator Models	
Item	Units
Coolant Temp	Deg C or Deg F
Oil Temp	Deg C or Deg F
SCR Temp	Deg C or Deg F
DEF Temp	Deg C or Deg F
Fuel Temp	Deg C or Deg F
Intake Temp	Deg C or Deg F
Ambient Temp	Deg C or Deg F
Aux Cool Temp	Deg C or Deg F
ECU Temp	Deg C or Deg F
Turbo 1 T In Temp	Deg C or Deg F
Turbo 2 T In Temp	Deg C or Deg F
Turbo1 C In Temp	Deg C or Deg F
Exh Gas P1 Temp	Deg C or Deg F
Exh Gas P2 Temp	Deg C or Deg F
Exh Gas P3 Temp	Deg C or Deg F
Exh Gas P4 Temp	Deg C or Deg F
Exh Gas P5 Temp	Deg C or Deg F
Exh Gas P6 Temp	Deg C or Deg F
Exh Gas P7 Temp	Deg C or Deg F
Exh Gas P8 Temp	Deg C or Deg F
Exh Gas P9 Temp	Deg C or Deg F
Exh Gas P10 Temp	Deg C or Deg F
Exh Gas P11 Temp	Deg C or Deg F
Exh Gas P12 Temp	Deg C or Deg F
Exh Gas P13 Temp	Deg C or Deg F
Exh Gas P14 Temp	Deg C or Deg F
Exh Gas P15 Temp	Deg C or Deg F
Exh Gas P16 Temp	Deg C or Deg F

Figure 90 Engine Temperature Data

7.2.4 Pressure

The Engine Pressure screen on the remote monitor displays the engine pressure data shown in Figure 92.

Note:

The navigation icons correspond to the navigation buttons directly below them.

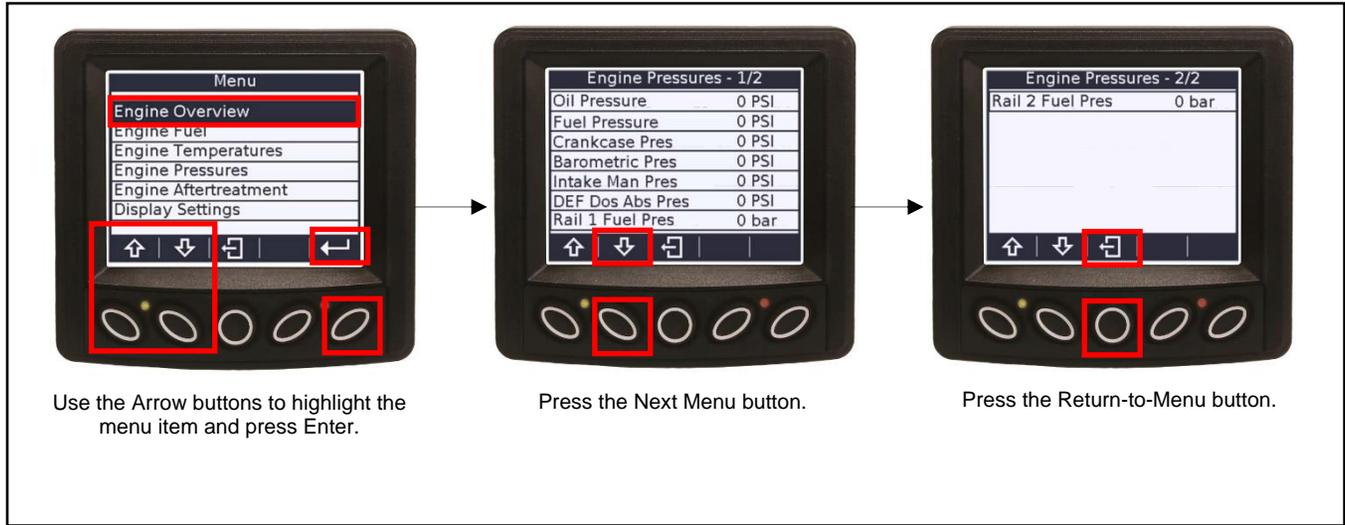


Figure 91 Engine Pressure Navigation

Tier 4 Generator Models	
Item	Units
Oil Pressure	kPa or PSI
Fuel Pressure	kPa or PSI
Crankcase Pres	kPa or PSI
Barometric Pres	kPa or PSI
Intake Man Pres	kPa or PSI
DEF Dos Abs Pres	kPa or PSI
Rail 1 Fuel Pres	Bar
Rail 2 Fuel Pres	Bar

Figure 92 Engine Pressure Data

7.2.5 Aftertreatment

The Engine Aftertreatment screens (1–5) on the remote monitor displays the engine aftertreatment data shown in Figure 94.

Note:

The navigation icons correspond to the navigation buttons directly below them.



Figure 93 Engine Aftertreatment Navigation

Tier 4 Generator Models	
Item	Units
SCR System State	Sleep, Wake, Norm, Err, Purg, Hprot, Cprot, Stopg, Diag, Test, DnOk, Prim
DEF Level	%
DEF Temp	Deg C or Deg F
DEF Concentrate	%
DEF Consumption	L/hr or gal/hr
SCR HC Level	%
SCR Temperature	Deg C or Deg F
DCU Ctrl Power	V
DEF Dos Abs Pres	kPa or PSI
DEF Dos Pump Spd	RPM
DEF Dos Pump Cmd	%
Derate Is Active	No/Yes
Nox Torque Limit	%
Op Induce Lvl	0,1,2,3,.....
SCR Defrost Done	No/Yes
DEF Defrost Done	No/Yes
DEF Induce State	None/Warn/Early/Sever
Fail Induce State	None/Warn/Early/Sever
System Fail Time Next Induce	min
SCR Exh Gas Flow	kg/h
DEF Line Heat 1	Off/On
DEF Line Heat 2	Off/On
AftrTrt1 In NOx	ppm
AftrTrt1 Out NOx	ppm
AftrTrt2 Out NOx	ppm
AftrTrt3 Out NOx	ppm
AftrTrt1 Out NH3	ppm
AftrTrt2 Out NH3	ppm
AftrTrt3 Out NH3	ppm

Figure 94 Engine Aftertreatment Data

7.2.6 Display Settings

On the User Settings screen, use the button interface to change brightness and contrast or units of measurement.

Note:

The navigation icons correspond to the navigation buttons directly below them.

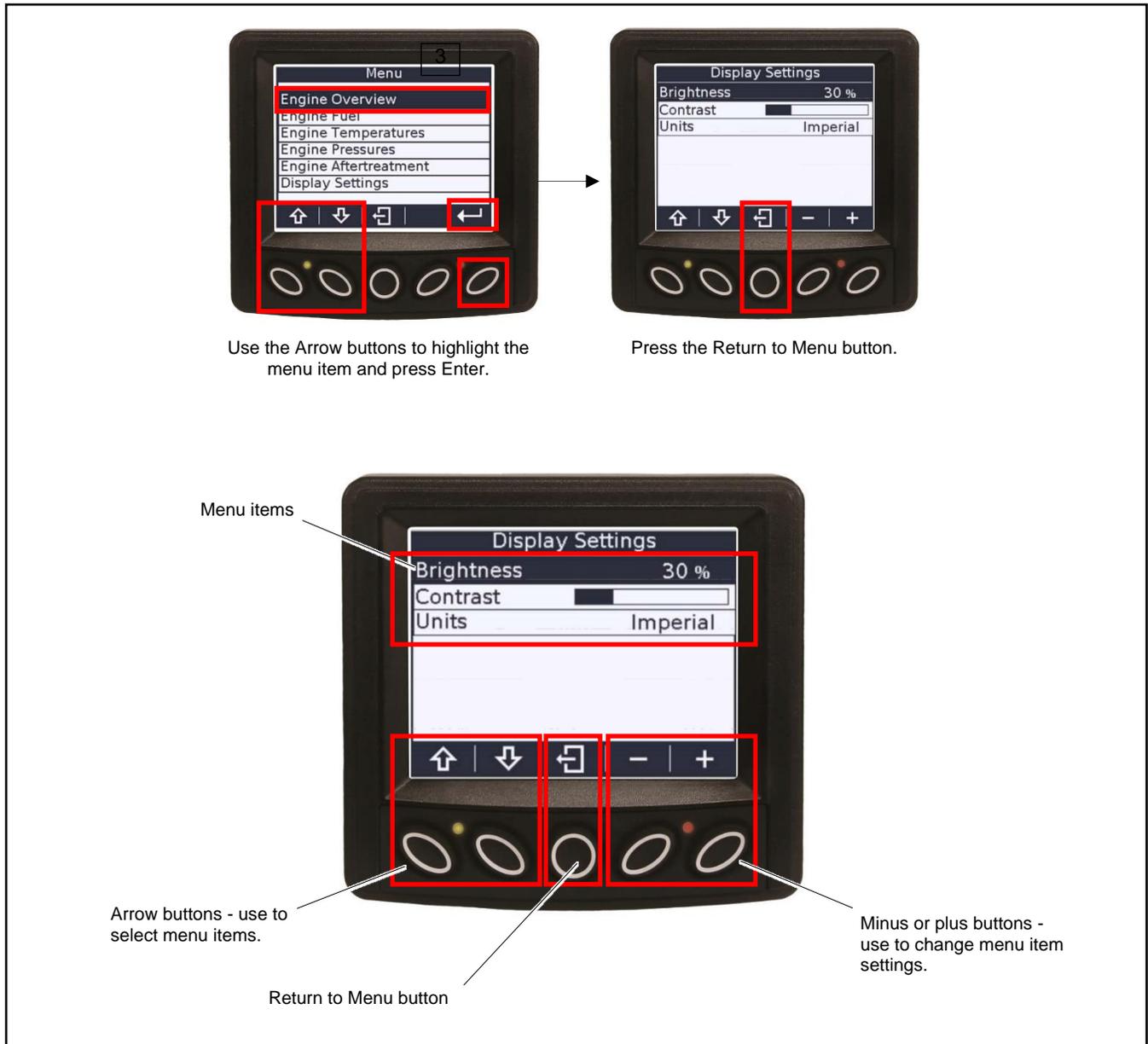


Figure 95 User Settings Navigation

User Setting Menu Items, Tier 4 Generator Models
Brightness
Contrast
Units

Figure 96 User Settings Menu

8.1 Introduction

This section contains generator set, controller, and general engine troubleshooting information. This section may refer to other literature for procedures and additional information. See the list of related materials in the Introduction of this manual for literature part numbers. The information in this section is a guideline for generator set operating technicians.

Corrective action and testing often require knowledge of electrical and electronic circuits. To avoid additional problems caused by incorrect repairs, have an authorized service distributor/dealer perform service.

Use the following charts to diagnose and correct common problems. First check for simple causes such as a dead engine starting battery or an open circuit breaker. The charts include a list of common problems, possible causes of the problem, recommended corrective actions, and references to detailed information or repair procedures.

Maintain a record of repairs and adjustments performed on the equipment. Use the record to help describe the problem and repairs or adjustments made to the equipment.

8.2 Generator Set and Controller

Refer to the following charts for generator set and controller troubleshooting. Generator set maintenance schedules and procedures are covered in the Generator Set Maintenance Manual. Some of the corrective actions may reference the alternator and/or controller service manual for additional troubleshooting information.

8.3 Engine

Refer to the following charts for general engine troubleshooting. Refer to the engine operation manual and/or engine service manual for all specific engine troubleshooting.

8.4 Transfer Switch

Some applications may use an automatic transfer switch. Some of the following charts may reference transfer switch components and/or literature. Refer to the transfer switch manuals as needed.

8.5 General Troubleshooting Chart

Trouble Symptoms		Probable Causes	Recommended Actions	Section or Publication Reference*
Does not crank	X	Controller circuit board(s) inoperative	Replace the controller. †	Gen. S/M
Cranks but does not start	X	Wiring fault	Check the wiring.	W/D
Starts hard		Controller fault	Troubleshoot the controller. †	Gen. S/M
No or low output voltage	X	Power to the controller is interrupted; no power to the controller.	Check for power battery power to the controller. If fuse does not auto-reset troubleshoot the controller wiring. †	W/D, Controller S/M
Stops suddenly	X	Controller master control buttons inoperative	Replace the controller. †	Controller S/M
Lacks power	X	Controller master control button in the OFF/RESET mode	Press the controller RUN or AUTO button.	Operation Section
Overheats		Engine start circuit open	Press the controller master control RUN button to test the generator set. Troubleshoot the engine start circuit and time delays.	Operation Section, W/D, Gen. I/M, S/M, ATS O/M, S/M
High fuel consumption		Emergency stop switch activated, if equipped	Reset the emergency stop switch. Check the remote emergency stop switch, if equipped.	Operation Section
Excessive or abnormal noise		Voltage regulation inoperative	Replace the junction box sensing fuses. If the fuse blows again, troubleshoot the controller. †	W/D, Gen. S/M
Displays error message/locks up	X	Controller firmware error	Review the controller display troubleshooting chart.	
Exercise run time and/or event records inoperative	X	Controller communication error	Verify that RS-485 cable shield wire is connected on only one end.	W/D

* Sec./Section - numbered section of this manual; ATS - Automatic Transfer Switch; Eng. - Engine; Gen. - Generator Set; I/M - Installation Manual; O/M - Operation Manual; M/M - Maintenance Manual; S/M - Service Manual; S/S - Spec Sheet; W/D - Wiring Diagram Manual
† Have an authorized service distributor/dealer perform this service.

Trouble Symptoms	Probable Causes	Recommended Actions	Section or Publication Reference*											
				Exercise run time and/or event records inoperative	Displays error message/locks up	Excessive or abnormal noise	High fuel consumption	Low oil pressure	Overheats	Lacks power	Stops suddenly	No or low output voltage	Starts hard	Cranks but does not start
Alternator														
		AC output circuit breaker open	Reset the breaker and check for AC voltage at the generator set side of the circuit breaker.											
X		Transfer switch test switch in the OFF position	Move the transfer switch test switch to the AUTO position.											ATS O/M
	X	Transfer switch fails to transfer load	Move the ATS test switch to the AUTO position. Troubleshoot the transfer circuit and time delays.											ATS O/M, S/M
	X	Wiring, terminals, or pin in the exciter field open	Check for continuity.											Gen. S/M, W/D
	X	Main field (rotor) inoperative (open or grounded)	Test and/or replace the rotor. †											Gen. S/M
	X	Stator inoperative (open or grounded)	Test and/or replace the stator. †											Gen. S/M
		Vibration excessive	Tighten loose components. †			X								
	X	Voltage regulator settings incorrect	Check and adjust the voltage regulator. †					X						
Electrical System (DC Circuits)														
X	X	Battery connections loose, corroded, or incorrect	Verify that the battery connections are correct, clean, and tight.											I/M or M/M
X	X	Battery weak or dead	Recharge or replace the battery. The spec sheet provides recommended battery CCA rating.											S/S
X	X	Starter/starter solenoid inoperative	Replace the starter or starter solenoid.											Eng. S/M
X		Engine harness connector(s) not locked tight	Disconnect the engine harness connector(s) then reconnect it to the controller.						X					W/D
		Fault shutdown	Identify and correct the fault condition. Then reset the fault on the controller.						X					Operation Section

* Sec./Section - numbered section of this manual; ATS - Automatic Transfer Switch; Eng. - Engine; Gen. - Generator Set; I/M - Installation Manual; O/M - Operation Manual; M/M - Maintenance Manual; S/M - Service Manual; S/S - Spec Sheet; W/D - Wiring Diagram Manual
† Have an authorized service distributor/dealer perform this service.

Trouble Symptoms	Probable Causes											Recommended Actions	Section or Publication Reference*	
	Exercise run time and/or event records inoperative	Displays error message/locks up	Excessive or abnormal noise	High fuel consumption	Low oil pressure	Overheats	Lacks power	Stops suddenly	No or low output voltage	Starts hard	Cranks but does not start			Does not crank
Engine														
X	X		X			X							Clean or replace the filter element.	Eng. O/M
X	X		X		X								Check the compression. †	Eng. S/M
			X		X								Reduce the electrical load. See the generator set spec. sheet for wattage specifications.	S/S
							X						Inspect the exhaust system. Replace damaged or broken exhaust system components. †	I/M
									X				Inspect the exhaust system. Tighten the loose exhaust system components. †	I/M
										X			Adjust the governor. †	Eng. S/M
						X							Adjust the valves †	Eng. S/M
							X						Tighten all loose hardware.	
X	X										X		Troubleshoot the engine ECM and/or sensors. †	Eng. O/M, Eng. S/M
Cooling System														
			X			X							Clean the air openings.	
							X						Restore the coolant to normal operating level.	M/M or Eng. O/M
						X							Tighten or replace the belt, if applicable. Replace the water pump.	Eng. O/M or S/M
								X					Allow the engine to cool down. Then troubleshoot the cooling system.	M/M, or Eng. O/M
									X				Restore the coolant to normal operating level.	M/M or Engine O/M
													Replace the thermostat.	Eng. S/M

* Sec./Section - numbered section of this manual; ATS - Automatic Transfer Switch; Eng. - Engine; Gen. - Generator Set; I/M - Installation Manual; O/M - Operation Manual;

M/M - Maintenance Manual; S/M - Service Manual; S/S - Spec Sheet; W/D - Wiring Diagram Manual

† Have an authorized service distributor/dealer perform this service.

Trouble Symptoms	Probable Causes	Recommended Actions	Section or Publication Reference*
Exercise run time and/or event records inoperative			
Displays error message/locks up			
Excessive or abnormal noise			
High fuel consumption			
Low oil pressure			
Overheats			
Lacks power			
Stops suddenly	X		
No or low output voltage			
Starts hard	X		
Cranks but does not start	X		
Does not crank			
Fuel System			
X	Fuel tank empty or fuel valve shut off	Add fuel and move the fuel valve to the ON position.	
X	Air in fuel system (diesel only)	Bleed the diesel fuel system.	Eng. O/M
X	Fuel filter restriction	Clean or replace the fuel filter.	M/M or Eng. O/M
X	Fuel or fuel injectors dirty or faulty (diesel only)	Clean, test, and/or replace the dirty or faulty fuel injector.†	Eng. S/M
X	Fuel solenoid inoperative	Troubleshoot the fuel solenoid.†	Eng. S/M
X	Fuel injection timing out of adjustment (diesel only)	Adjust the fuel injection timing.†	Eng. S/M
X	Fuel feed or injection pump inoperative (diesel only)	Rebuild or replace the injection pump.†	Eng. S/M
Lube System			
	Oil level low	Restore the oil level. Inspect the generator set for oil leaks.	M/M or Eng. O/M
	Low oil pressure shutdown	Check the oil level.	M/M or Eng. O/M
X	Crankcase oil type incorrect for ambient temperature	Change the oil. Use oil with a viscosity suitable for the operating climate.	M/M or Eng. O/M

* Sec./Section - numbered section of this manual; ATS - Automatic Transfer Switch; Eng. - Engine; Gen. - Generator Set; I/M - Installation Manual; O/M - Operation Manual; M/M - Maintenance Manual; S/M - Service Manual; S/S - Spec Sheet; W/D - Wiring Diagram Manual
† Have an authorized service distributor/dealer perform this service.

8.6 Controller Display and Voltage Regulation Troubleshooting Chart

Trouble Symptoms	Probable Causes	Recommended Actions	Section or Publication Reference*
Controller Display and Voltage Regulator			
Display is black/off	No/low battery charge	Recharge/replace battery	Generator M/M
Display is black/off	Controller requires reset	Disconnect and reconnect battery voltage to the controller	
Display locks up	No/low battery charge	Recharge/replace battery	Generator M/M
Output voltage ramps	Faulty or damaged exciter winding. Voltage ramp on startup is normal, but ramping past the target without recovering may indicate additional failures in the alternator or excitation circuit.	Troubleshoot alternator components †	Generator S/M
Output voltage unstable	Voltage regulation calibration incorrect	Readjust voltage regulation. †	Controller S/M

* Sec./Section - numbered section of this manual; ATS - Automatic Transfer Switch; Eng. - Engine; Gen. - Generator Set; I/M - Installation Manual; O/M - Operation Manual; M/M – Maintenance Manual; S/M - Service Manual; S/S - Spec Sheet; W/D - Wiring Diagram Manual
 † Have an authorized service distributor/dealer perform this service.

Section 9. Accessories

Accessories are available to help finalize installation, add convenience to operation and service, and establish state and local code compliance. This section describes controller-related accessories available at print time of this publication. See Figure 97. Obtain the most current accessory information from your local authorized service distributor/dealer.

Kit Description
Battery Charger
Input/ Output Modules
Manual Key Switch
Remote Emergency Stop
Remote Serial Annunciator
Shunt Trip Line Circuit Breaker

Figure 97 Optional Accessories

Some accessories are available as factory-installed kits only. Others are available as loose kits for installation in the field by a Kohler trained and authorized distributor or dealer. Accessory kits generally include installation instructions. See the wiring diagram manual for electrical connections. See the installation instructions and drawings supplied with the kit for information on kit mounting location.

9.1 Battery Chargers

Factory-installed battery charger kits are available for KD model generator sets with a single starter or redundant starters. The 20 Amp, 24 VDC Kohler High Frequency Battery Charger is used with these models.

The battery charger sends a fault message to the APM603 controller in the event of a battery charger fault. See TP-7072, Battery Charger Installation and Operation Manual, for information about fault conditions and for battery charger operation instructions.



Figure 98 Kohler High Frequency Battery Charger

9.2 Input/Output (I/O) Modules

The Digital 8 Input/Output Module Kit is available as an optional accessory. The modules are factory-installed in the customer connection box. Module power and CAN communication with the controller are factory-connected. The module CAN address is factory-set. Do not change the CAN address DIP switch settings.

The original DIOM provides 8 digital inputs and 4 digital (relay) outputs. The updated D8IOM adds more outputs, providing 8 digital inputs and 8 digital (relay) outputs. See Figure 99 to compare the original and updated designs. Full support of the new D8IOM requires firmware version 3.6 or later for the APM603 controller and version 1.11 or later for the APM802 controller.

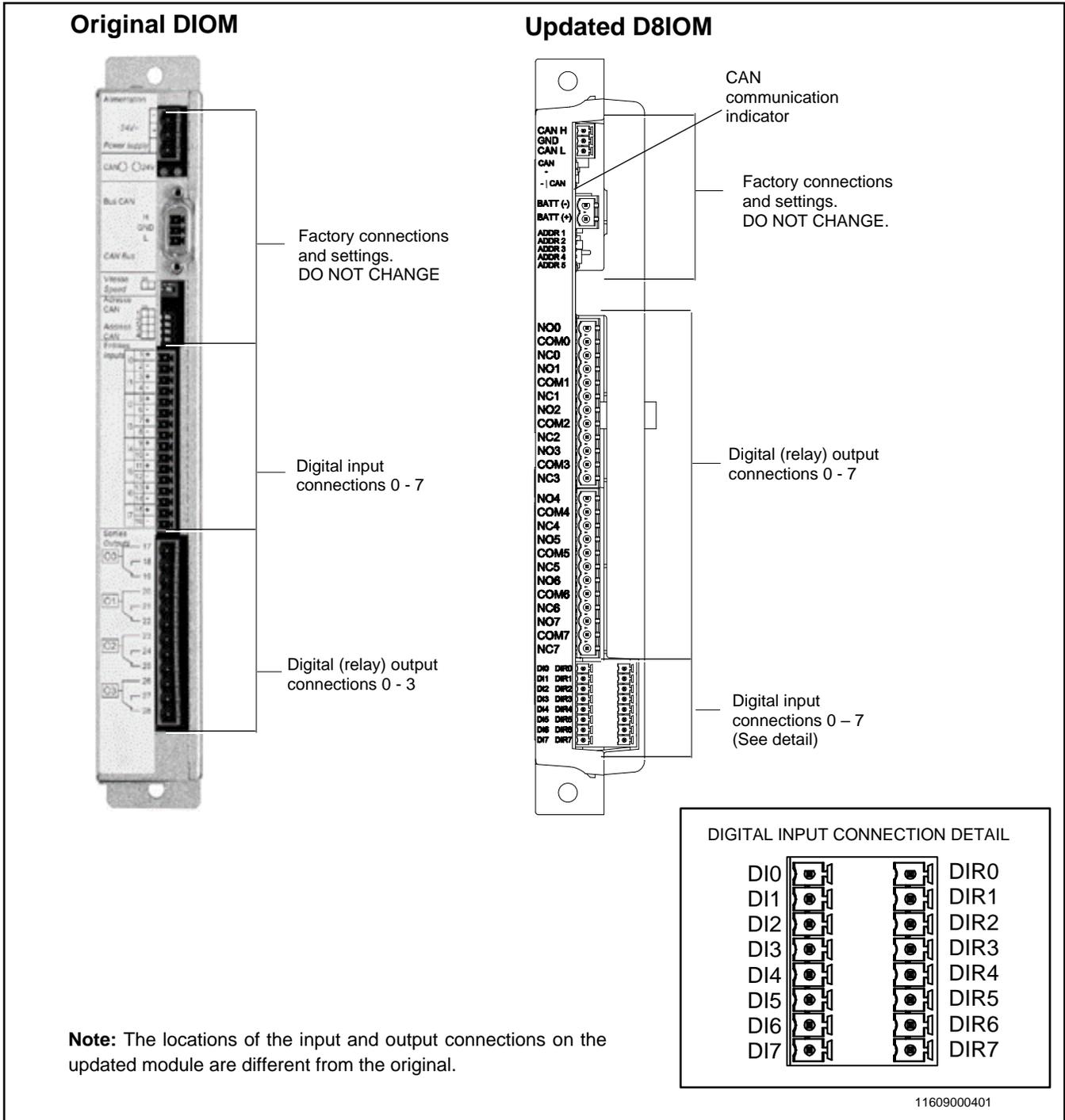


Figure 99 Digital Input/Output Modules, Original and Updated

See the table below for contact specifications. Refer to the D8IOM specification sheets, UL and CE versions, for additional specifications.

Inputs	
Number of inputs	8 configurable inputs
Input voltage	12 VDC / 24VDC
Contacts	Normally open (NO). Activates on ground connection
Connection	0.75 to 1.5 mm ² (20AWG-16AWG)
Inputs isolated	Yes
Outputs	
Number of outputs	Binary outputs for power: 8
Contacts	Form C, rated 3 A @ 250 VAC (UL version) Form C, rated 3 A @ 30 VDC (CE version)
Connections	0.75 to 1.5 mm ² (20AWG-16AWG)
Voltage	250 VAC maximum (UL version) 30 VDC (CE version)
Current	3 Amps maximum
Power	375 VA maximum (UL version) 90 W (CE version)
Number of operation cycles at full load	100 000
Minimum current:	10 mAmps

Figure 100 Input and Output Specifications (updated D8IOM)

The updated module is equipped with one diagnostic LED to show the status of CAN communication between the module and the generator controller. See Figure 101.

LED Description	LED Operation
CANbus 1 Communication LED	Flashing green: CAN communication is consistent. Steady green: No CAN communication. Off: No CAN communication.

Figure 101 CAN Communication Indicator

The DIOM kit includes two digital input/output modules, referred to as DIOM 1 and DIOM 2. The digital inputs and outputs on DIOM 1 and DIOM 2 can be configured by an authorized service technician. Contact your Kohler distributor with your requirements for digital inputs and outputs.

Digital Input/Output Module with the APM603

On KD Series Generators equipped with the APM603 controller, one base D8IOM is supplied as standard equipment. It is factory-installed and factory-configured. The base D8IOM connections and settings are not available to the customer.

Digital Inputs/Outputs	Factory Settings		
	Module 0 (not configurable)	Optional Module 1	Optional Module 2
Input DI0	Power Supply 1 Fault Warning	Configurable	Configurable
Input DI1	Power Supply 2 Fault Warning	Configurable	Configurable
Input DI2	Remote Reset	Configurable	Configurable
Input DI3	Auxiliary Shutdown	Configurable	Configurable
Input DI4	High Fuel Level Switch Warning	Configurable	Configurable
Input DI5	Auxiliary Warning	Configurable	Configurable
Input DI6	Low Oil Level Switch Warning	Configurable	Configurable
Input DI7	Reserved Factory Use	Configurable	Configurable
Output DO0	System Ready	Configurable	Configurable
Output DO1	Low Coolant Temp	Configurable	Configurable
Output DO2	Not In Auto	Configurable	Configurable
Output DO3	EPS Supplying Load	Configurable	Configurable
Output DO4	NA	Configurable	Configurable
Output DO5	NA	Configurable	Configurable
Output DO6	NA	Configurable	Configurable
Output DO7	NA	Configurable	Configurable

Figure 102 Digital 8 I/O Module Default Settings (Tier 2 and Tier 4 Generator Sets)

9.3 Manual Key Switch

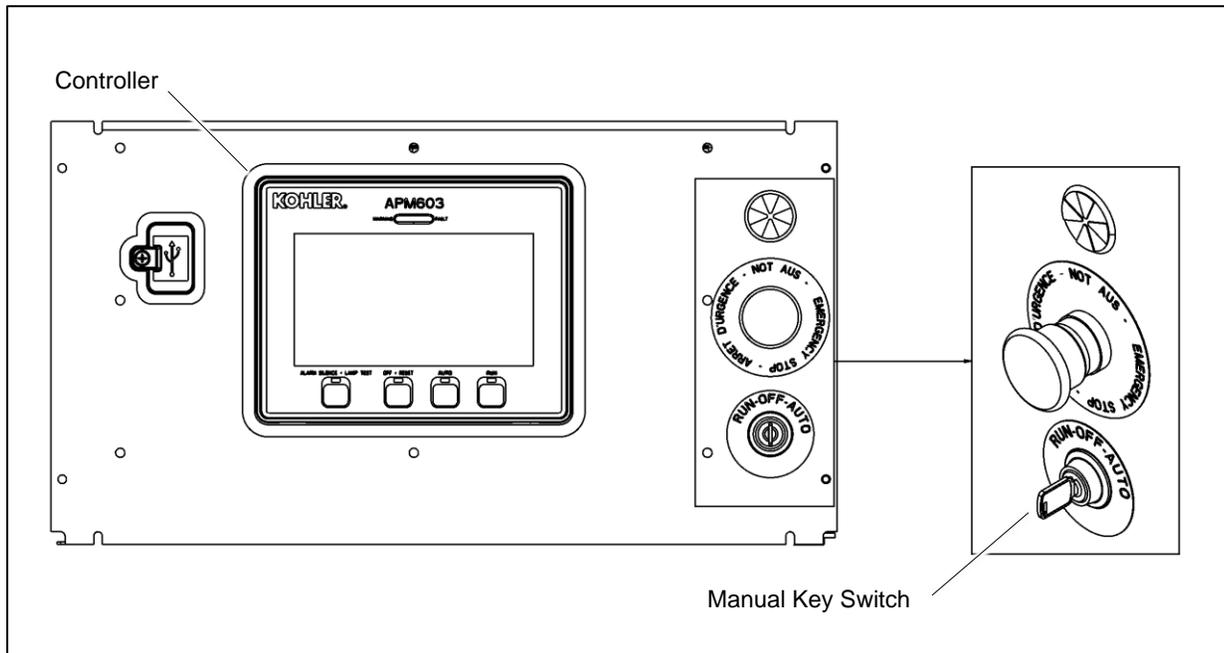


Figure 103 Manual Key Switch Location

Optional Key Switch

A three-position key switch is available. The key switch allows the controller to be locked in standby mode, which may be required by some local codes. See Figure 103 for the key switch location.

The RUN, OFF, and AUTO positions on the key switch operate as described below.

- **RUN**

When the key is moved to the RUN position, the generator set starts and runs. The generator will continue to run until the key is moved to the OFF or AUTO button position or until a fault condition causes the generator set to shut down.

- **OFF**

When the key is placed in the OFF position, the generator set shuts down immediately, without running the engine cooldown cycle. The generator set will not respond to remote start commands when the key is in the OFF position.

- **AUTO**

Moving the key to the AUTO position places the generator set in Standby mode. The generator set will start and run when a remote start signal is received. The key can be removed only when the switch is in AUTO, locking the generator set in standby mode. When the key is in the AUTO position, generator management may cause the generator to stop and go to a standby state.

Controller Pushbuttons

When the controller is equipped with the optional key switch, the functions of the pushbuttons on the controller are affected.

- For normal starting and stopping, the key switch overrides the pushbuttons on the controller.
 - When the key is in the RUN position, pressing OFF/RESET on the controller does not stop the generator set.
 - When the key switch is in the OFF position, pressing the RUN button on the controller will not start the generator set. Pressing AUTO + RUN simultaneously will signal the generator set to start.
- To clear a fault condition, press and hold the OFF/RESET button on the controller for 3 seconds. The key switch does not clear faults from the controller.
- The Alarm Silence/Lamp Test button function does not change when a key switch is installed.

Emergency Stop

The Emergency Stop button overrides the key switch and the controller pushbuttons. Pressing the Emergency stop button will shut down the generator set regardless of the key switch position. To clear the Emergency stop fault from the controller, first reset the E-stop switch and then press the OFF/RESET button on the controller for 3 seconds. A remote reset signal can be used, if so configured, to clear the E-Stop fault. The key switch cannot be used to clear the E-Stop fault.

9.4 Remote Emergency Stop Kit

The emergency stop (E-stop) kit allows immediate shutdown of the generator set from a remote location. If the emergency stop switch is activated, the EMERGENCY STOP lamp lights and the unit shuts down immediately, bypassing the engine cooldown cycle. Before attempting to restart the generator set, reset the emergency stop switch and reset the generator set by pressing and holding the OFF/RESET button for 3 seconds.

Two emergency stop kits are available. See Figure 104 and the following instructions.

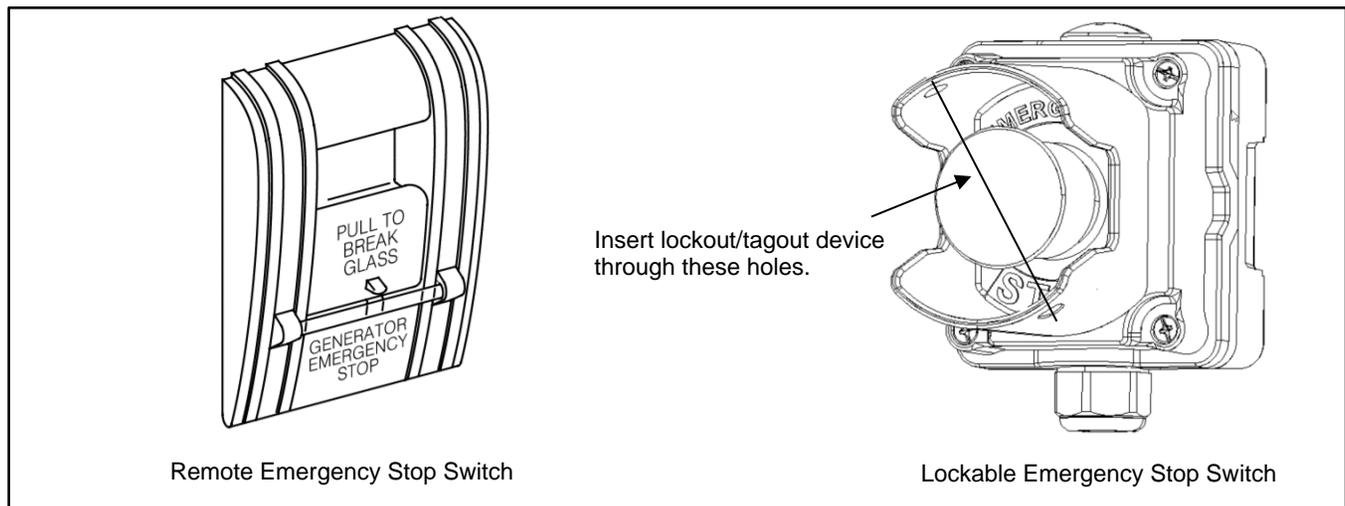


Figure 104 Remote Emergency Stop Switches

9.4.1 Remote emergency stop kit.

This switch uses a glass piece that must be replaced after activation.

1. To stop the generator set, pull down on the handle, breaking the glass piece.
2. To reset the emergency stop switch, return the handle to the original position and replace the glass piece with a new one.
3. Press and hold the controller's OFF/RESET button for 3 seconds.

Use the single glass piece located inside the switch for replacement and order additional glass pieces as service parts.

9.4.2 Lockable Emergency Stop Switch

This switch can be locked in the activated position to prevent generator set starting. Use a customer-provided locking device inserted into the holes in the shroud to lock the switch until the generator set can be operated safely.

Operation

Press the red STOP button to shut down the generator set in an emergency.

Using the emergency stop button bypasses the engine cooldown cycle, stopping the engine immediately. The emergency stop LED on the RSA III lights (if equipped) and the unit shuts down. The generator set cannot be restarted until the emergency stop switch(es) is/are reset.

Lockout/Tagout

The emergency stop button can be locked in the STOP position. Insert a lock through two openings in the yellow shroud to prevent the stop button from being pulled out. See Figure 104. Remove the lock for normal operation.

A lock is not required in order to keep the switch activated. The switch button will stay depressed until it is pulled out by the operator.

Resetting the Emergency Stop Switch

To reset the E-stop switch, remove the locking device and pull the button out. Reset the controller by pressing and holding the OFF/RESET button for 3 seconds.

9.5 Remote Serial Annunciator

The RSA III is an annunciator panel offered in several kit configurations to support Kohler power equipment. See Figure 105. The RSA III is a remote serial annunciator that monitors the status of the generator set and/or ATS from a remote location. The RSA III alerts the operator through visual and audible signals using LED indication and a horn. An alarm silence / lamp test switch is included.

The RSA III meets NFPA 110, Level 1 (2005) applications that require remote controls and alarms be powered by a storage battery such as the engine starting battery. AC adaptor kit GM62466-KP1 is available when NFPA is not required.

The front panel decals include areas that can be used to identify user-selected fault inputs and identify associated power system equipment.

An RSA III annunciator can be used for a single generator set or with a combination of a generator set and automatic transfer switch. In systems using more than a single RSA III, one must be designated as the master device to broadcast to additional RSA III annunciators, designated as slave devices. Up to five RSA III slave devices can be used with an RSA III master device. All RSA III annunciators are factory set as the master device, but can be changed to a slave device using a PC and SiteTech™ software that connects to the RSA III front panel via a universal serial bus (USB) connection.

The RSA II and RSA 1000 can be connected with the RSA III provided that the master remote annunciator is an RSA III.

Refer to TT-1625 Remote Serial Annunciator (RSA III) Kits for operation and installation instructions.

A personal computer with SiteTech™ software is required to make the RSA III functional. SiteTech is available to Kohler authorized distributors and dealers. Refer to TP-6701, SiteTech Software Operation Manual, for more information.

The RSA III kits include components for surface mounting or flush mounting.

Figure 106 shows the status of the system ready LED, generator set running LED, communication status LED, common fault LED, common fault output, and horn for each fault or status condition.

If a fault occurs, the RSA III horn activates and the corresponding LED illuminates. The following paragraphs describe specific features of the RSA III.

If the RSA III is used with an Ethernet communication network, order Modbus® Ethernet converter GM41143-KP2 and refer to TT-1405 Converters, Connections, and Controller Setup for Network Communication for system installation.

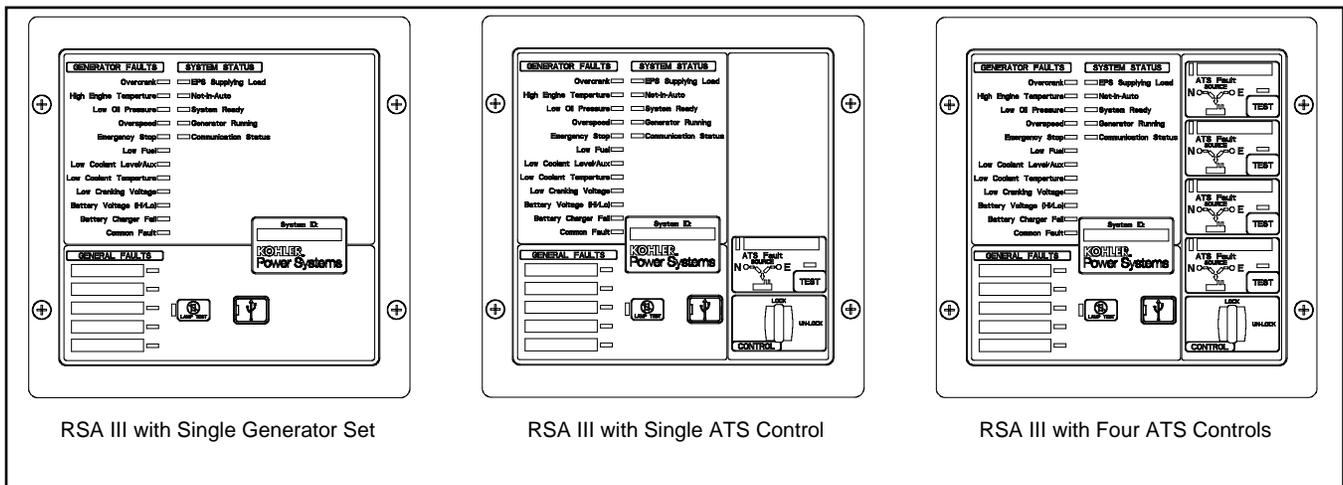


Figure 105 Remote Serial Annunciator (RSIII)

Fault and Status Condition	Fault LED	System Monitoring LEDs and Functions					
		System Ready LED	Generator Running LED	Communications Status LED	Common Fault LED	Common Fault Output	Horn
Overcrank (Shutdown)	Red SF	Red SF	Off	Green	Red SF	On	On
High Engine Temperature (Warning)	Yellow SF	Red SF	Green	Green	Yellow SF	On	On
High Engine Temperature (Shutdown)	Red SF	Red SF	Off	Green	Red SF	On	On
Low Oil Pressure (Warning)	Yellow SF	Red SF	Green	Green	Yellow SF	On	On
Low Oil Pressure (Shutdown)	Red SF	Red SF	Off	Green	Red SF	On	On
Overspeed (Shutdown)	Red SF	Red SF	Off	Green	Red SF	On	On
Emergency Stop	Red SF	Red SF	Off	Green	Red SF	On	On
Low Coolant Level/Aux (Shutdown)	Red SF	Red SF	Off	Green	Red SF	On	On
Low Coolant Temperature	Yellow SF	Red SF	Green or Off	Green	Yellow SF	On	On
Low Fuel (Level or Pressure)	Yellow SF	Red SF	Green or Off	Green	Yellow SF	On	On
Low Cranking Voltage	Yellow SF	Red SF	Off	Green	Yellow SF	On	On
Battery Voltage (Hi)	Yellow	Red SF	Green or Off	Green	Yellow SF	On	On
Battery Voltage (Lo)	Yellow SF	Red SF	Green or Off	Green	Yellow SF	On	On
Battery Charger Fail	Yellow SF	Red SF	Green or Off	Green	Yellow SF	On	On
Common Fault (Warning)	Yellow SF	Green	Green or Off	Green	Yellow SF	On	Off
Common Fault (Shutdown)	Red SF	Green	Green or Off	Green	Red SF	On	On
User-Defined Digital Input 1 (Warning)	Yellow SF	Green	Green or Off	Green	Off	Off	Off
User-Defined Digital Input 1 (Shutdown)	Red FF	Green	Green or Off	Green	Off	On	On
User-Defined Digital Input 2 (Warning)	Yellow SF	Green	Green or Off	Green	Off	Off	Off
User-Defined Digital Input 2 (Shutdown)	Red FF	Green	Green or Off	Green	Off	On	On
User-Defined Digital Input 3 (Warning)	Yellow SF	Green	Green or Off	Green	Off	Off	Off
User-Defined Digital Input 3 (Shutdown)	Red FF	Green	Green or Off	Green	Off	On	On
User-Defined Digital Input 4 (Warning)	Yellow SF	Green	Green or Off	Green	Off	Off	Off
User-Defined Digital Input 4 (Shutdown)	Red FF	Green	Green or Off	Green	Off	On	On
User-Defined Digital Input 5 (Warning)	Yellow SF	Green	Green or Off	Green	Off	Off	Off
User-Defined Digital Input 5 (Shutdown)	Red FF	Green	Green or Off	Green	Off	On	On
ATS Position N (RSA III with ATS only)	Green	Green	Green or Off	Green	Off	Off	Off
ATS Position E (RSA III with ATS only)	Red	Red SF	Green or Off	Green	Off	Off	Off
ATS Available N (RSA III with ATS only)	Green	Green	Green or Off	Green	Off	Off	Off
ATS Available E (RSA III with ATS only)	Red	Red SF	Green or Off	Green	Off	Off	Off
ATS Test (RSA III with ATS only, Test initiated at ATS)	Yellow	Green	Green or Off	Green	Off	Off	On
ATS Test (RSA III with ATS only, Test initiated at RSA)	Green	Green	Green or Off	Green	Off	Off	On
ATS Fault (RSA III with ATS only, No fault)	Green	Green	Green or Off	Green	Off	Off	On
ATS Fault (RSA III with ATS only, With fault)	Red FF	Red SF	Green or Off	Green	Off	Off	On
EPS Supplying Load	Green	Green	Green or Off	Green	Off	Off	Off
Not-In-Auto	Red FF	Red SF	Off	Green	Yellow SF	On	On
Communication Status (Loss - Master)	Red FF	Off	Off	Red FF	Off	On	On
Communication Status (Loss - Slave)	Red SF	Off	Off	Red SF	Off	On	On

Note: SF = Slow Flash (once per second), FF = Fast Flash (five times per second)

Figure 106 RSA III System Monitoring LEDs and Functions

9.6 Shunt Trip Line Circuit Breaker

A shunt-trip line circuit breaker provides a 12- or 24-DC volt solenoid within the line circuit breaker case that can energize the trip mechanism. This feature allows the circuit breaker to be tripped by a customer-selected fault or event such as alternator overload, overspeed, overvoltage, or defined common fault. The shunt-trip kit is factory-installed and connected to the circuit breaker. The output or event can be assigned using Kohler SiteTech software. SiteTech software is available to Kohler-authorized distributors and dealers.

Appendix A. Abbreviations

A, amp	ampere	blk. htr.	block heater	DAC	digital to analog converter
ABDC	after bottom dead center	BMEP	brake mean effective pressure	dB	decibel
AC	alternating current	bps	bits per second	dB(A)	decibel (A weighted)
A/D	analog to digital	br.	Brass	DC	direct current
ADC	advanced digital control; analog to digital converter	BTDC	before top dead center	DCR	direct current resistance
adj.	adjust, adjustment	Btu	British thermal unit	DEF	diesel exhaust fluid
ADV	advertising dimensional drawing	Btu/min.	British thermal units per minute	deg., °	degree
AGM	absorbent glass mat	C	Celsius, centigrade	dept.	department
Ah	amp-hour	cal.	Calorie	dia.	Diameter
AHWT	anticipatory high water temperature	CAN	controller area network	DI/EO	dual inlet/end outlet
AISI	American Iron and Steel Institute	CARB	California Air Resources Board	DIN	Deutsches Institut fur Normung e. V. (also Deutsche Industrie Normenausschuss)
ALOP	anticipatory low oil pressure	CAT5	Category 5 (network cable)	DIP	dual inline package
alt.	alternator	CB	circuit breaker	DPDT	double-pole, double-throw
Al	aluminum	CC	crank cycle	DPST	double-pole, single-throw
ANSI	American National Standards Institute (formerly American Standards Association, ASA)	cc	cubic centimeter	DS	disconnect switch
AO	anticipatory only	CCA	cold cranking amps	DVR	digital voltage regulator
APDC	Air Pollution Control District	ccw.	Counterclockwise	E2PROM, EEPROM	electrically-erasable programmable read-only memory
API	American Petroleum Institute	CEC	Canadian Electrical Code	E, emer.	emergency (power source)
approx.	approximate, approximately	cert.	certificate, certification, certified	EATS	Exhaust Aftertreatment System
APU	Auxiliary Power Unit	cfh	cubic feet per hour	ECM	electronic control module, engine control module
AQMD	Air Quality Management District	cfm	cubic feet per minute	EDI	electronic data interchange
AR	as required, as requested	CG	center of gravity	EFR	emergency frequency relay
AS	as supplied, as stated, as suggested	CID	cubic inch displacement	e.g.	for example (exempli gratia)
ASE	American Society of Engineers	CL	centerline	EG	electronic governor
ASME	American Society of Mechanical Engineers	cm	centimeter	EGSA	Electrical Generating Systems Association
assy.	Assembly	CMOS	complementary metal oxide substrate (semiconductor)	EIA	Electronic Industries Association
ASTM	American Society for Testing Materials	com	communications (port)	EI/EO	end inlet/end outlet
ATDC	after top dead center	coml	commercial	EMI	electromagnetic interference
ATS	automatic transfer switch	Coml/Rec	Commercial/Recreational	emiss.	Emission
auto.	Automatic	conn.	Connection	eng.	Engine
aux.	auxiliary	cont.	continued	EPA	Environmental Protection Agency
avg.	average	CPVC	chlorinated polyvinyl chloride	EPS	emergency power system
AVR	automatic voltage regulator	crit.	Critical	ER	emergency relay
AWG	American Wire Gauge	CRM	Common Rail Manifold	ES	engineering special, engineered special
AWM	appliance wiring material	CSA	Canadian Standards Association	ESD	electrostatic discharge
bat.	Battery	CT	current transformer	est.	estimated
BBDC	before bottom dead center	Cu	copper	E-Stop	emergency stop
BC	battery charger, battery charging	cUL	Canadian Underwriter's Laboratories	etc.	et cetera (and so forth)
BCA	battery charging alternator	cu. in.	cubic inch	exh.	exhaust
BCI	Battery Council International	cw.	Clockwise	ext.	external
BDC	before dead center	CWC	city water-cooled	F	Fahrenheit, female
BHP	brake horsepower	cyl.	Cylinder	FDS	Fluid Dosing System
blk.	black (paint color), block (engine)	D/A	digital to analog		

FHM	flat head machine (screw)	in.	inch	Lpm	liters per minute
fl. oz.	fluid ounce	in. H ₂ O	inches of water	LOP	low oil pressure
flex.	flexible	in. Hg	inches of mercury	LP	liquefied petroleum
freq.	frequency	in. Lb.	inch pounds	LPG	liquefied petroleum gas
FS	full scale	Inc.	incorporated	LS	left side
ft.	foot, feet	ind.	Industrial	L _{wa}	sound power level, A weighted
ft. lb.	foot pounds (torque)	int.	internal	LWL	low water level
ft./min.	feet per minute	int./ext.	internal/external	LWT	low water temperature
ftp	file transfer protocol	I/O	input/output	m	meter, milli (1/1000)
g	gram	IP	internet protocol	M	mega (10 ⁶ when used with SI units), male
ga.	gauge (meters, wire size)	ISO	International Organization for Standardization	m ³	cubic meter
gal.	gallon	J	joule	m ³ /hr.	cubic meters per hour
gen.	generator	JIS	Japanese Industry Standard	m ³ /min.	cubic meters per minute
genset	generator set	k	kilo (1000)	mA	milliampere
GFI	ground fault interrupter	K	kelvin	man.	manual
GND, ⊕	ground	kA	kiloampere	max.	maximum
gov.	governor	KB	kilobyte (2 ¹⁰ bytes)	MB	megabyte (2 ²⁰ bytes)
gph	gallons per hour	KBus	Kohler communication protocol	MCCB	molded-case circuit breaker
gpm	gallons per minute	kg	kilogram	MCM	one thousand circular mils
gr.	grade, gross	kg/cm ²	kilograms per square centimeter	meggar	megohmmeter
GRD	equipment ground	kgm	kilogram-meter	MHz	megahertz
gr. wt.	gross weight	kg/m ³	kilograms per cubic meter	mi.	mile
H x W x D	height by width by depth	kHz	kilohertz	mil	one one-thousandth of an inch
HC	hex cap	kJ	kilojoule	min.	minimum, minute
HCHT	high cylinder head temperature	km	kilometer	misc.	miscellaneous
HD	heavy duty	kOhm, kΩ	kilo-ohm	MJ	megajoule
HET	high exhaust temp., high engine temp.	kPa	kilopascal	mJ	millijoule
hex	hexagon	kph	kilometers per hour	mm	millimeter
Hg	mercury (element)	kV	kilovolt	mOhm, mΩ	milliohm
HH	hex head	kVA	kilovolt ampere	MOhm, MΩ	megohm
HHC	hex head cap	kVAR	kilovolt ampere reactive	MOV	metal oxide varistor
HP	horsepower	kW	kilowatt	MPa	megapascal
hr.	hour	kWh	kilowatt-hour	mpg	miles per gallon
HS	heat shrink	kWm	kilowatt mechanical	mph	miles per hour
hsg.	Housing	kWth	kilowatt-thermal	MS	military standard
HVAC	heating, ventilation, and air conditioning	L	liter	ms	millisecond
HWT	high water temperature	LAN	local area network	m/sec.	meters per second
Hz	hertz (cycles per second)	L x W x H	length by width by height	mtg.	mounting
IBC	International Building Code	lb.	pound, pounds	MTU	Motoren-und Turbinen-Union
IC	integrated circuit	lbm/ft ³	pounds mass per cubic feet	MW	megawatt
ID	inside diameter, identification	LCB	line circuit breaker	mW	milliwatt
IEC	International Electrotechnical Commission	LCD	liquid crystal display	μF	microfarad
IEEE	Institute of Electrical and Electronics Engineers	LED	light emitting diode	μF	microfarad
IMS	improved motor starting	Lph	liters per hour		

N, norm.	normal (power source)	PMG	permanent magnet generator	SCR	silicon controlled rectifier (electrical), selective catalytic reduction (exhaust emissions)
NA	not available, not applicable	pot	potentiometer, potential	s, sec.	second
nat. gas	natural gas	ppm	parts per million	SI	<i>Systeme international d'unites</i> , International System of Units
NBS	National Bureau of Standards	PROM	programmable read-only memory	SI/EO	side in/end out
NC	normally closed	psi	pounds per square inch	sil.	Silencer
NEC	National Electrical Code	psig	pounds per square inch gauge	SMTP	simple mail transfer protocol
NEMA	National Electrical Manufacturers Association	pt.	pint	SN	serial number
NiCd	nickel cadmium	PTC	positive temperature coefficient	SNMP	simple network management protocol
NFPA	National Fire Protection Association	PTO	power takeoff	SPDT	single-pole, double-throw
Nm	newton meter	PVC	polyvinyl chloride	SPST	single-pole, single-throw
NO	normally open	PVC	polyvinyl chloride	spec	specification
no., nos.	number, numbers	PWM	pulse width modulated, pulse width modulation	specs	specification(s)
NPS	National Pipe, Straight	qt.	quart, quarts	sq.	square
NPSC	National Pipe, Straight-coupling	qty.	quantity	sq. cm	square centimeter
NPT	National Standard taper pipe thread per general use	R	replacement (emergency) power source	sq. in.	square inch
NPTF	National Pipe, Taper-Fine	rad.	radiator, radius	SMS	short message service
NR	not required, normal relay	RAM	random access memory	SS	stainless steel
Ns	nanosecond	RDO	relay driver output	std.	standard
OC	overcrank	ref.	reference	stl.	Steel
OD	outside diameter	rem.	Remote	tach.	Tachometer
OEM	original equipment manufacturer	Res/Com	Residential/Commercial	TB	terminal block
OF	overfrequency	RFI	radio frequency interference	TCP	transmission control protocol
opt.	option, optional	RH	round head	TD	time delay
OS	oversize, overspeed	RHM	round head machine (screw)	TDC	top dead center
OSHA	Occupational Safety and Health Administration	rly.	Relay	TDEC	time delay engine cooldown
OSHPD	Office of Statewide Health Planning and Development (California)	rms	root mean square	TDEN	time delay emergency to normal
OV	overvoltage	rnd.	Round	TDES	time delay engine start
oz.	ounce	RO	read only	TDNE	time delay normal to emergency
p., pp.	page, pages	ROM	read only memory	TDOE	time delay off to emergency
PC	personal computer	rot.	rotate, rotating	TDON	time delay off to normal
PCB	printed circuit board	rpm	revolutions per minute	temp.	temperature
pF	picofarad	RS	right side	term.	Terminal
PF	power factor	RTDs	resistance temperature detectors	THD	total harmonic distortion
ph., ø	phase	RTU	remote terminal unit	TIF	telephone influence factor
PHC	Phillips® head Crimptiter (screw)	RTV	room temperature vulcanization	tol.	Tolerance
PHH	Phillips® hex head (screw)	RW	read/write	turbo.	Turbocharger
PHM	pan head machine (screw)	SAE	Society of Automotive Engineers	typ.	typical (same in multiple locations)
PLC	programmable logic control	scfm	standard cubic feet per minute	UF	underfrequency

UHF	ultrahigh frequency
UIF	user interface
UL	Underwriter's Laboratories, Inc.
UNC	unified coarse thread (was NC)
UNF	unified fine thread (was NF)
univ.	universal
URL	uniform resource locator (web address)
US	undersize, underspeed
UV	ultraviolet, undervoltage
V	volt
VAC	volts alternating current
VAR	voltampere reactive
VDC	volts direct current
VFD	vacuum fluorescent display
VGA	video graphics adapter
VHF	very high frequency
W	watt
WCR	withstand and closing rating
w/	with
WO	write only
w/o	without
wt.	weight
xfr	transformer

Tier 2 Engine Data (KD700 – KD4000)

The controller display showing engine information is dependent upon the engine manufacturer and the corresponding Engine Control Module (ECM). The following lists indicate the engine displays that are available for the KD series engines. This information is subject to change by the engine manufacturer.

Note:

Two lists are included in the appendix, one for tier 2 generator sets (KD700-KD4000) and a second for tier 4 generator sets (KD1250-4, KD2500-4, KD3250-4).

Controller Displays as Provided by the Engine ECM
Ambient temperature
Charge air pressure
Charge air temperature
Common rail fuel pressure
Coolant level
Coolant temperature
Crankcase pressure
Engine model number
Engine serial number
Engine speed
Fuel pressure
Fuel consumption rate
Fuel temperature
Intercooler coolant temperature (K175 engines only)
Oil pressure
Oil temperature
Run time hours

A message is sent each time there is a change in a monitored engine condition (i.e. fault becomes active, fault is cleared). Upon broadcast of this message, the controller will request another message that contains the following information for each fault:

- SPN (Suspect Parameter Number) is a 3-to 5-digit code that represents an engine component. See the Engine Operation Manual for SPN codes.
- FMI (Failure Mode Indicator) is a two-digit code that represents the type of fault that occurred (i.e. short circuit, value is high).

Tier 2 Engine Data (KD700 – KD4000)

The following chart shows the Diagnostic Troubleshooting Codes (DTC) from Engine Control Module (ECM) on the tier 2 KD series engines (KD700 – KD4000). The following table provides descriptions of system events and their types – warning, shutdown, status, or notice.

Tier 2 Engine Fault Codes (KD700-KD4000)			
Event ID	Type	Level	FMI
Fuel Supply Pressure	Severely Low	Warning	1
Fuel Supply Pressure	Shorted High	Warning	3
Fuel Supply Pressure	Shorted Low	Warning	4
Fuel Supply Pressure	Condition Exists	Warning	31
Water In Fuel	Severely High	Shutdown	0
Water In Fuel	Shorted High	Shutdown	3
Water In Fuel	Shorted Low	Shutdown	4
Water In Fuel	Open Circuit	Shutdown	5

Tier 2 Engine Fault Codes (KD700-KD4000)			
Event ID	Type	Level	FMI
Water In Fuel	Unknown Failure	Shutdown	11
Water In Fuel	Condition Exists	Shutdown	31
Oil Pressure	Severely Low	Shutdown	1
Oil Pressure	Plausibility	Shutdown	2
Oil Pressure	Shorted High	Shutdown	3
Oil Pressure	Shorted Low	Shutdown	4
Oil Pressure	Low	Warning	17
Oil Pressure	Condition Exists	Shutdown	31

Tier 2 Engine Fault Codes (KD700-KD4000)			
Event ID	Type	Level	FMI
Crankcase Pressure	Severely High	Shutdown	0
Crankcase Pressure	Shorted High	Shutdown	3
Crankcase Pressure	Shorted Low	Shutdown	4
Crankcase Pressure	High	Warning	15
Crankcase Pressure	Condition Exists	Shutdown	31
Intake Manifold Pressure	Severely High	Shutdown	0
Intake Manifold Pressure	Plausibility	Shutdown	2
Intake Manifold Pressure	Shorted High	Shutdown	3
Intake Manifold Pressure	Shorted Low	Shutdown	4
Intake Manifold Pressure	High	Shutdown	15
Intake Manifold Pressure	Condition Exists	Shutdown	31
Intake Manifold Temperature	Severely High	Shutdown	0
Intake Manifold Temperature	Shorted High	Shutdown	3
Intake Manifold Temperature	Shorted Low	Shutdown	4
Intake Manifold Temperature	Open Circuit	Shutdown	5
Intake Manifold Temperature	High	Warning	15
Intake Manifold Temperature	Condition Exists	Shutdown	31
Air Filter Pressure	Severely High	Warning	0
Air Filter Pressure	Unknown Failure	Warning	11
Air Filter Pressure	Condition Exists	Warning	31
Barometric Pressure	Plausibility	Warning	2
Barometric Pressure	Condition Exists	Warning	31
Coolant Temperature	Severely High	Shutdown	0
Coolant Temperature	Shorted High	Shutdown	3
Coolant Temperature	Shorted Low	Shutdown	4
Coolant Temperature	Open Circuit	Shutdown	5
Coolant Temperature	High	Warning	15
Coolant Temperature	Condition Exists	Shutdown	31
Coolant Level	Severely Low	Shutdown	1
Coolant Level	Shorted High	Shutdown	3
Coolant Level	Shorted Low	Shutdown	4
Coolant Level	Unknown Failure	Shutdown	11
Coolant Level	Low	Shutdown	17
Coolant Level	Condition Exists	Warning	31
Rail 1 Pressure	Severely High	Shutdown	0
Rail 1 Pressure	Shorted High	Shutdown	3
Rail 1 Pressure	Shorted Low	Shutdown	4

Tier 2 Engine Fault Codes (KD700-KD4000)			
Event ID	Type	Level	FMI
Rail 1 Pressure	Condition Exists	Shutdown	31
Ambient Air Temperature	Shorted High	Warning	3
Ambient Air Temperature	Shorted Low	Warning	4
Ambient Air Temperature	Open Circuit	Warning	5
Ambient Air Temperature	Condition Exists	Warning	31
Fuel Temperature	Severely High	Warning	0
Fuel Temperature	Shorted High	Warning	3
Fuel Temperature	Shorted Low	Warning	4
Fuel Temperature	Open Circuit	Warning	5
Fuel Temperature	Condition Exists	Warning	31
Oil Temperature	Severely High	Shutdown	0
Oil Temperature	Shorted High	Warning	3
Oil Temperature	Shorted Low	Warning	4
Oil Temperature	Open Circuit	Warning	5
Oil Temperature	High	Warning	15
Oil Temperature	Condition Exists	Warning	31
Engine Speed	Severely High	Shutdown	0
Engine Speed	Plausibility	Shutdown	2
Engine Speed	Shorted High	Shutdown	3
Engine Speed	Shorted Low	Shutdown	4
Engine Speed	Open Circuit	Shutdown	5
Engine Speed	Special Instructions	Shutdown	14
Engine Speed	Condition Exists	Shutdown	31
Proprietary Network 1	Open Circuit	Warning	5
Proprietary Network 1	Unknown Failure	Warning	11
Engine Position Sensor	Plausibility	Warning	2
Engine Position Sensor	Shorted High	Warning	3
Engine Position Sensor	Shorted Low	Warning	4
Engine Position Sensor	Open Circuit	Warning	5
Engine Position Sensor	Abnormal Signal	Warning	8
Engine Position Sensor	Special Instructions	Warning	14
Engine Position Sensor	Condition Exists	Warning	31
Engine Timing Sensor	Plausibility	Shutdown	2
Engine Timing Sensor	Shorted High	Shutdown	3
Engine Timing Sensor	Shorted Low	Shutdown	4
Engine Timing Sensor	Open Circuit	Shutdown	5
Engine Timing Sensor	Abnormal Signal	Shutdown	8

Tier 2 Engine Fault Codes (KD700-KD4000)			
Event ID	Type	Level	FMI
Engine Timing Sensor	Special Instructions	Shutdown	14
Engine Timing Sensor	Condition Exists	Shutdown	31
Primary J1939 Network 1	Open Circuit	Warning	5
Primary J1939 Network 1	Unknown Failure	Warning	11
Injector 1	Warning	Warning	0
Injector 1	Shorted High	Warning	3
Injector 1	Shorted Low	Warning	4
Injector 1	Open Circuit	Warning	5
Injector 1	Abnormal Signal	Warning	8
Injector 2	Warning	Warning	0
Injector 2	Shorted High	Warning	3
Injector 2	Shorted Low	Warning	4
Injector 2	Open Circuit	Warning	5
Injector 2	Abnormal Signal	Warning	8
Injector 3	Warning	Warning	0
Injector 3	Shorted High	Warning	3
Injector 3	Shorted Low	Warning	4
Injector 3	Open Circuit	Warning	5
Injector 3	Abnormal Signal	Warning	8
Injector 4	Warning	Warning	0
Injector 4	Shorted High	Warning	3
Injector 4	Shorted Low	Warning	4
Injector 4	Open Circuit	Warning	5
Injector 4	Abnormal Signal	Warning	8
Injector 5	Warning	Warning	0
Injector 5	Shorted High	Warning	3
Injector 5	Shorted Low	Warning	4
Injector 5	Open Circuit	Warning	5
Injector 5	Abnormal Signal	Warning	8
Injector 6	Warning	Warning	0
Injector 6	Shorted High	Warning	3
Injector 6	Shorted Low	Warning	4
Injector 6	Open Circuit	Warning	5
Injector 6	Abnormal Signal	Warning	8
Injector 7	Warning	Warning	0
Injector 7	Shorted High	Warning	3
Injector 7	Shorted Low	Warning	4
Injector 7	Open Circuit	Warning	5

Tier 2 Engine Fault Codes (KD700-KD4000)			
Event ID	Type	Level	FMI
Injector 7	Abnormal Signal	Warning	8
Injector 8	Warning	Warning	0
Injector 8	Shorted High	Warning	3
Injector 8	Shorted Low	Warning	4
Injector 8	Open Circuit	Warning	5
Injector 8	Abnormal Signal	Warning	8
Injector 9	Warning	Warning	0
Injector 9	Shorted High	Warning	3
Injector 9	Shorted Low	Warning	4
Injector 9	Open Circuit	Warning	5
Injector 9	Abnormal Signal	Warning	8
Injector 10	Warning	Warning	0
Injector 10	Shorted High	Warning	3
Injector 10	Shorted Low	Warning	4
Injector 10	Open Circuit	Warning	5
Injector 10	Abnormal Signal	Warning	8
Injector 11	Warning	Warning	0
Injector 11	Shorted High	Warning	3
Injector 11	Shorted Low	Warning	4
Injector 11	Open Circuit	Warning	5
Injector 11	Abnormal Signal	Warning	8
Injector 12	Warning	Warning	0
Injector 12	Shorted High	Warning	3
Injector 12	Shorted Low	Warning	4
Injector 12	Open Circuit	Warning	5
Injector 12	Abnormal Signal	Warning	8
Injector 13	Warning	Warning	0
Injector 13	Shorted High	Warning	3
Injector 13	Shorted Low	Warning	4
Injector 13	Open Circuit	Warning	5
Injector 13	Abnormal Signal	Warning	8
Injector 14	Warning	Warning	0
Injector 14	Shorted High	Warning	3
Injector 14	Shorted Low	Warning	4
Injector 14	Open Circuit	Warning	5
Injector 14	Abnormal Signal	Warning	8
Injector 15	Warning	Warning	0
Injector 15	Shorted High	Warning	3
Injector 15	Shorted Low	Warning	4

Tier 2 Engine Fault Codes (KD700-KD4000)			
Event ID	Type	Level	FMI
Injector 15	Open Circuit	Warning	5
Injector 15	Abnormal Signal	Warning	8
Injector 16	Warning	Warning	0
Injector 16	Shorted High	Warning	3
Injector 16	Shorted Low	Warning	4
Injector 16	Open Circuit	Warning	5
Injector 16	Abnormal Signal	Warning	8
Injector 17	Warning	Warning	0
Injector 17	Shorted High	Warning	3
Injector 17	Shorted Low	Warning	4
Injector 17	Open Circuit	Warning	5
Injector 17	Abnormal Signal	Warning	8
Injector 18	Warning	Warning	0
Injector 18	Shorted High	Warning	3
Injector 18	Shorted Low	Warning	4
Injector 18	Open Circuit	Warning	5
Injector 18	Abnormal Signal	Warning	8
Injector 19	Warning	Warning	0
Injector 19	Shorted High	Warning	3
Injector 19	Shorted Low	Warning	4
Injector 19	Open Circuit	Warning	5
Injector 19	Abnormal Signal	Warning	8
Injector 20	Warning	Warning	0
Injector 20	Shorted High	Warning	3
Injector 20	Shorted Low	Warning	4
Injector 20	Open Circuit	Warning	5
Injector 20	Abnormal Signal	Warning	8
Starter Relay	Shorted High	Warning	3
Starter Relay	Shorted Low	Warning	4
Starter Relay	Open Circuit	Warning	5
Starter Relay	Grounded Circuit	Warning	6
Starter Relay	Unknown Failure	Warning	11
Starter Relay	Condition Exists	Warning	31
Inlet Air Heater	Shorted High	Warning	3
Inlet Air Heater	Shorted Low	Warning	4
Inlet Air Heater	Open Circuit	Warning	5
Inlet Air Heater	Grounded Circuit	Warning	6
Inlet Air Heater	Unknown Failure	Warning	11
Inlet Air Heater 2	Shorted High	Warning	3

Tier 2 Engine Fault Codes (KD700-KD4000)			
Event ID	Type	Level	FMI
Inlet Air Heater 2	Shorted Low	Warning	4
Inlet Air Heater 2	Open Circuit	Warning	5
Inlet Air Heater 2	Grounded Circuit	Warning	6
Inlet Air Heater 2	Unknown Failure	Warning	11
Fuel Lift Pump	Plausibility	Shutdown	2
Injection Pump Control Valve	Shorted High	Shutdown	3
Injection Pump Control Valve	Shorted Low	Shutdown	4
Injection Pump Control Valve	Open Circuit	Shutdown	5
Injection Pump Control Valve	Grounded Circuit	Shutdown	6
Injection Pump Control Valve	Unknown Failure	Shutdown	11
ECU Temperature	Warning	Shutdown	0
ECU Temperature	High	Warning	15
ECU Temperature	Condition Exists	Shutdown	31
Cylinder Exhaust Temperature 1	Warning	Shutdown	0
Cylinder Exhaust Temperature 1	Plausibility	Warning	2
Cylinder Exhaust Temperature 1	Open Circuit	Warning	5
Cylinder Exhaust Temperature 1	Abnormal Data Rate	Warning	9
Cylinder Exhaust Temperature 1	Unknown Failure	Warning	11
Cylinder Exhaust Temperature 1	Device Failure	Warning	12
Cylinder Exhaust Temperature 1	Special Instructions	Warning	14
Cylinder Exhaust Temperature 1	High	Warning	15
Cylinder Exhaust Temperature 2	Warning	Shutdown	0
Cylinder Exhaust Temperature 2	Plausibility	Warning	2
Cylinder Exhaust Temperature 2	Open Circuit	Warning	5
Cylinder Exhaust Temperature 2	Abnormal Data Rate	Warning	9
Cylinder Exhaust Temperature 2	Unknown Failure	Warning	11
Cylinder Exhaust Temperature 2	Device Failure	Warning	12
Cylinder Exhaust Temperature 2	Special Instructions	Warning	14
Cylinder Exhaust Temperature 2	High	Warning	15
Cylinder Exhaust Temperature 3	Warning	Shutdown	0
Cylinder Exhaust Temperature 3	Plausibility	Warning	2
Cylinder Exhaust Temperature 3	Open Circuit	Warning	5
Cylinder Exhaust Temperature 3	Abnormal Data Rate	Warning	9
Cylinder Exhaust Temperature 3	Unknown Failure	Warning	11
Cylinder Exhaust Temperature 3	Device Failure	Warning	12
Cylinder Exhaust Temperature 3	Special Instructions	Warning	14

Tier 2 Engine Fault Codes (KD700-KD4000)			
Event ID	Type	Level	FMI
Cylinder Exhaust Temperature 3	High	Warning	15
Cylinder Exhaust Temperature 4	Warning	Shutdown	0
Cylinder Exhaust Temperature 4	Plausibility	Warning	2
Cylinder Exhaust Temperature 4	Open Circuit	Warning	5
Cylinder Exhaust Temperature 4	Abnormal Data Rate	Warning	9
Cylinder Exhaust Temperature 4	Unknown Failure	Warning	11
Cylinder Exhaust Temperature 4	Device Failure	Warning	12
Cylinder Exhaust Temperature 4	Special Instructions	Warning	14
Cylinder Exhaust Temperature 4	High	Warning	15
Cylinder Exhaust Temperature 5	Warning	Shutdown	0
Cylinder Exhaust Temperature 5	Plausibility	Warning	2
Cylinder Exhaust Temperature 5	Open Circuit	Warning	5
Cylinder Exhaust Temperature 5	Abnormal Data Rate	Warning	9
Cylinder Exhaust Temperature 5	Unknown Failure	Warning	11
Cylinder Exhaust Temperature 5	Device Failure	Warning	12
Cylinder Exhaust Temperature 5	Special Instructions	Warning	14
Cylinder Exhaust Temperature 5	High	Warning	15
Cylinder Exhaust Temperature 6	Warning	Shutdown	0
Cylinder Exhaust Temperature 6	Plausibility	Warning	2
Cylinder Exhaust Temperature 6	Open Circuit	Warning	5
Cylinder Exhaust Temperature 6	Abnormal Data Rate	Warning	9
Cylinder Exhaust Temperature 6	Unknown Failure	Warning	11
Cylinder Exhaust Temperature 6	Device Failure	Warning	12
Cylinder Exhaust Temperature 6	Special Instructions	Warning	14
Cylinder Exhaust Temperature 6	High	Warning	15
Cylinder Exhaust Temperature 7	Warning	Shutdown	0
Cylinder Exhaust Temperature 7	Plausibility	Warning	2
Cylinder Exhaust Temperature 7	Open Circuit	Warning	5
Cylinder Exhaust Temperature 7	Abnormal Data Rate	Warning	9
Cylinder Exhaust Temperature 7	Unknown Failure	Warning	11
Cylinder Exhaust Temperature 7	Device Failure	Warning	12
Cylinder Exhaust Temperature 7	Special Instructions	Warning	14
Cylinder Exhaust Temperature 7	High	Warning	15
Cylinder Exhaust Temperature 8	Warning	Shutdown	0
Cylinder Exhaust Temperature 8	Plausibility	Warning	2

Tier 2 Engine Fault Codes (KD700-KD4000)			
Event ID	Type	Level	FMI
Cylinder Exhaust Temperature 8	Open Circuit	Warning	5
Cylinder Exhaust Temperature 8	Abnormal Data Rate	Warning	9
Cylinder Exhaust Temperature 8	Unknown Failure	Warning	11
Cylinder Exhaust Temperature 8	Device Failure	Warning	12
Cylinder Exhaust Temperature 8	Special Instructions	Warning	14
Cylinder Exhaust Temperature 8	High	Warning	15
Cylinder Exhaust Temperature 9	Warning	Shutdown	0
Cylinder Exhaust Temperature 9	Plausibility	Warning	2
Cylinder Exhaust Temperature 9	Open Circuit	Warning	5
Cylinder Exhaust Temperature 9	Abnormal Data Rate	Warning	9
Cylinder Exhaust Temperature 9	Unknown Failure	Warning	11
Cylinder Exhaust Temperature 9	Device Failure	Warning	12
Cylinder Exhaust Temperature 9	Special Instructions	Warning	14
Cylinder Exhaust Temperature 9	High	Warning	15
Cylinder Exhaust Temperature 10	Warning	Shutdown	0
Cylinder Exhaust Temperature 10	Plausibility	Warning	2
Cylinder Exhaust Temperature 10	Open Circuit	Warning	5
Cylinder Exhaust Temperature 10	Abnormal Data Rate	Warning	9
Cylinder Exhaust Temperature 10	Unknown Failure	Warning	11
Cylinder Exhaust Temperature 10	Device Failure	Warning	12
Cylinder Exhaust Temperature 10	Special Instructions	Warning	14
Cylinder Exhaust Temperature 10	High	Warning	15
Cylinder Exhaust Temperature 11	Warning	Shutdown	0
Cylinder Exhaust Temperature 11	Plausibility	Warning	2
Cylinder Exhaust Temperature 11	Open Circuit	Warning	5
Cylinder Exhaust Temperature 11	Abnormal Data Rate	Warning	9
Cylinder Exhaust Temperature 11	Unknown Failure	Warning	11
Cylinder Exhaust Temperature 11	Device Failure	Warning	12
Cylinder Exhaust Temperature 11	Special Instructions	Warning	14
Cylinder Exhaust Temperature 11	High	Warning	15
Cylinder Exhaust Temperature 12	Warning	Shutdown	0
Cylinder Exhaust Temperature 12	Plausibility	Warning	2
Cylinder Exhaust Temperature 12	Open Circuit	Warning	5
Cylinder Exhaust Temperature 12	Abnormal Data Rate	Warning	9
Cylinder Exhaust Temperature 12	Unknown Failure	Warning	11

Tier 2 Engine Fault Codes (KD700-KD4000)			
Event ID	Type	Level	FMI
Cylinder Exhaust Temperature 12	Device Failure	Warning	12
Cylinder Exhaust Temperature 12	Special Instructions	Warning	14
Cylinder Exhaust Temperature 12	High	Warning	15
Cylinder Exhaust Temperature 13	Warning	Shutdown	0
Cylinder Exhaust Temperature 13	Plausibility	Warning	2
Cylinder Exhaust Temperature 13	Open Circuit	Warning	5
Cylinder Exhaust Temperature 13	Abnormal Data Rate	Warning	9
Cylinder Exhaust Temperature 13	Unknown Failure	Warning	11
Cylinder Exhaust Temperature 13	Device Failure	Warning	12
Cylinder Exhaust Temperature 13	Special Instructions	Warning	14
Cylinder Exhaust Temperature 13	High	Warning	15
Cylinder Exhaust Temperature 14	Warning	Shutdown	0
Cylinder Exhaust Temperature 14	Plausibility	Warning	2
Cylinder Exhaust Temperature 14	Open Circuit	Warning	5
Cylinder Exhaust Temperature 14	Abnormal Data Rate	Warning	9
Cylinder Exhaust Temperature 14	Unknown Failure	Warning	11
Cylinder Exhaust Temperature 14	Device Failure	Warning	12
Cylinder Exhaust Temperature 14	Special Instructions	Warning	14
Cylinder Exhaust Temperature 14	High	Warning	15
Cylinder Exhaust Temperature 14	Warning	Shutdown	0
Cylinder Exhaust Temperature 15	Plausibility	Warning	2
Cylinder Exhaust Temperature 15	Open Circuit	Warning	5
Cylinder Exhaust Temperature 15	Abnormal Data Rate	Warning	9
Cylinder Exhaust Temperature 15	Unknown Failure	Warning	11
Cylinder Exhaust Temperature 15	Device Failure	Warning	12
Cylinder Exhaust Temperature 15	Special Instructions	Warning	14
Cylinder Exhaust Temperature 15	High	Warning	15
Cylinder Exhaust Temperature 16	Warning	Shutdown	0
Cylinder Exhaust Temperature 16	Plausibility	Warning	2
Cylinder Exhaust Temperature 16	Open Circuit	Warning	5
Cylinder Exhaust Temperature 16	Abnormal Data Rate	Warning	9
Cylinder Exhaust Temperature 16	Unknown Failure	Warning	11
Cylinder Exhaust Temperature 16	Device Failure	Warning	12
Cylinder Exhaust Temperature 16	Special Instructions	Warning	14
Cylinder Exhaust Temperature 16	High	Warning	15

Tier 2 Engine Fault Codes (KD700-KD4000)			
Event ID	Type	Level	FMI
Cylinder Exhaust Temperature 17	Warning	Shutdown	0
Cylinder Exhaust Temperature 17	Open Circuit	Warning	5
Cylinder Exhaust Temperature 17	Abnormal Data Rate	Warning	9
Cylinder Exhaust Temperature 17	Unknown Failure	Warning	11
Cylinder Exhaust Temperature 17	Device Failure	Warning	12
Cylinder Exhaust Temperature 17	Special Instructions	Warning	14
Cylinder Exhaust Temperature 17	High	Warning	15
Cylinder Exhaust Temperature 18	Warning	Shutdown	0
Cylinder Exhaust Temperature 18	Open Circuit	Warning	5
Cylinder Exhaust Temperature 18	Abnormal Data Rate	Warning	9
Cylinder Exhaust Temperature 18	Unknown Failure	Warning	11
Cylinder Exhaust Temperature 18	Device Failure	Warning	12
Cylinder Exhaust Temperature 18	Special Instructions	Warning	14
Cylinder Exhaust Temperature 18	High	Warning	15
Cylinder Exhaust Temperature 19	Warning	Shutdown	0
Cylinder Exhaust Temperature 19	Open Circuit	Warning	5
Cylinder Exhaust Temperature 19	Abnormal Data Rate	Warning	9
Cylinder Exhaust Temperature 19	Unknown Failure	Warning	11
Cylinder Exhaust Temperature 19	Device Failure	Warning	12
Cylinder Exhaust Temperature 19	Special Instructions	Warning	14
Cylinder Exhaust Temperature 19	High	Warning	15
Cylinder Exhaust Temperature 20	Warning	Shutdown	0
Cylinder Exhaust Temperature 20	Open Circuit	Warning	5
Cylinder Exhaust Temperature 20	Abnormal Data Rate	Warning	9
Cylinder Exhaust Temperature 20	Unknown Failure	Warning	11
Cylinder Exhaust Temperature 20	Device Failure	Warning	12
Cylinder Exhaust Temperature 20	Special Instructions	Warning	14
Cylinder Exhaust Temperature 20	High	Warning	15
Turbo 1 Compressor Temperature	Shorted High	Shutdown	3
Turbo 1 Compressor Temperature	Shorted Low	Shutdown	4
Turbo 1 Compressor Temperature	Open Circuit	Shutdown	5
Turbo 1 Compressor Temperature	Condition Exists	Shutdown	31
Turbo 1 Compressor Pressure	Warning	Warning	0
Turbo 1 Compressor Pressure	Severely Low	Warning	1
Turbo 1 Turbine Temperature	Warning	Shutdown	0

Tier 2 Engine Fault Codes (KD700-KD4000)			
Event ID	Type	Level	FMI
Turbo 1 Turbine Temperature	Plausibility	Warning	2
Turbo 1 Turbine Temperature	Open Circuit	Warning	5
Turbo 1 Turbine Temperature	Unknown Failure	Warning	11
Turbo 1 Turbine Temperature	Device Failure	Warning	12
Turbo 1 Turbine Temperature	Special Instructions	Warning	14
Turbo 1 Turbine Temperature	High	Warning	15
Turbo 2 Turbine Temperature	Warning	Shutdown	0
Turbo 2 Turbine Temperature	Plausibility	Warning	2
Turbo 2 Turbine Temperature	Open Circuit	Warning	5
Turbo 2 Turbine Temperature	Unknown Failure	Warning	11
Turbo 2 Turbine Temperature	Device Failure	Warning	12
Turbo 2 Turbine Temperature	Special Instructions	Warning	14
Turbo 2 Turbine Temperature	High	Warning	15
Intercooler Coolant Temperature	Warning	Shutdown	0
Intercooler Coolant Temperature	Shorted High	Shutdown	3
Intercooler Coolant Temperature	Shorted Low	Shutdown	4
Intercooler Coolant Temperature	Open Circuit	Shutdown	5
Intercooler Coolant Temperature	High	Warning	15
Intercooler Coolant Temperature	Condition Exists	Shutdown	31
J1939 Network 2	Open Circuit	Warning	5
J1939 Network 2	Unknown Failure	Warning	11
Fuel Rail Leakage 1	Warning	Warning	0
Fuel Rail Leakage 1	Unknown Failure	Warning	11
Fuel Rail Leakage 1	Condition Exists	Warning	31
Fuel Rail Leakage 2	Warning	Warning	0
Fuel Rail Leakage 2	Unknown Failure	Warning	11
Fuel Rail Leakage 2	Condition Exists	Warning	31
Injector Rail 2 Pressure	Warning	Shutdown	0
Injector Rail 2 Pressure	Shorted High	Shutdown	3
Injector Rail 2 Pressure	Shorted Low	Shutdown	4
Injector Rail 2 Pressure	Condition Exists	Shutdown	31
Intake Manifold Temperature Hi Resolution	Warning	Shutdown	0
Intake Manifold Temperature Hi Resolution	Shorted High	Shutdown	3
Intake Manifold Temperature Hi Resolution	Shorted Low	Shutdown	4

Tier 2 Engine Fault Codes (KD700-KD4000)			
Event ID	Type	Level	FMI
Intake Manifold Temperature Hi Resolution	Open Circuit	Shutdown	5
Intake Manifold Temperature Hi Resolution	High	Warning	15
Intake Manifold Temperature Hi Resolution	Condition Exists	Shutdown	31
Main Radiator Coolant Level	Shorted High	Shutdown	3
Main Radiator Coolant Level	Shorted Low	Shutdown	4
Main Radiator Coolant Level	Unknown Failure	Shutdown	11
Main Radiator Coolant Level	Condition Exists	Shutdown	31
Alternate Low Idle Switch	Unknown Failure	Warning	11
Alternate Low Idle Switch	Condition Exists	Warning	31
Aftertreatment 1 Exhaust Gas Temperature 3	Warning	Shutdown	0
Aftertreatment 2 Exhaust Gas Temperature 3	Warning	Shutdown	0
ECM Power Supply Voltage	Severely Low	Warning	1
ECM Power Supply Voltage	High	Warning	15
ECM Power Supply Voltage	Low	Shutdown	17
ECM Power Supply Voltage	Condition Exists	Warning	31
Engine Aftercooler Coolant Level	Severely Low	Shutdown	1
Engine Aftercooler Coolant Level	Shorted High	Shutdown	3
Engine Aftercooler Coolant Level	Shorted Low	Shutdown	4
Engine Aftercooler Coolant Level	Unknown Failure	Shutdown	11
Engine Aftercooler Coolant Level	Condition Exists	Shutdown	31
Generator Speed Bias	Plausibility	Warning	2
Generator Speed Bias	Shorted High	Warning	3
Generator Speed Bias	Shorted Low	Warning	4
Generator Speed Bias	Condition Exists	Warning	31
Coolant Temperature 2	Special Instructions	Shutdown	14
Piston Cooling Oil Pressure	Severely Low	Shutdown	1
Piston Cooling Oil Pressure	Shorted High	Shutdown	3
Piston Cooling Oil Pressure	Shorted Low	Shutdown	4
Piston Cooling Oil Pressure	Low	Warning	17
Piston Cooling Oil Pressure	Condition Exists	Shutdown	31
Turbo Wastegate Actuator Command	Shorted High	Shutdown	3
Turbo Wastegate Actuator Command	Shorted Low	Shutdown	4

Tier 2 Engine Fault Codes (KD700-KD4000)			
Event ID	Type	Level	FMI
Turbo Wastegate Actuator Command	Open Circuit	Shutdown	5
Turbo Wastegate Actuator Command	Grounded Circuit	Shutdown	6
Turbo Wastegate Actuator Command	Unknown Failure	Shutdown	11
Fuel Rail Pressure Relief Valve	Shorted High	Shutdown	3
Fuel Rail Pressure Relief Valve	Shorted Low	Shutdown	4
Fuel Rail Pressure Relief Valve	Open Circuit	Shutdown	5
Fuel Rail Pressure Relief Valve	Grounded Circuit	Shutdown	6
Fuel Rail Pressure Relief Valve	Unknown Failure	Shutdown	11
Coolant Temperature 3	Warning	Shutdown	0
Coolant Temperature 3	Shorted High	Shutdown	3
Coolant Temperature 3	Shorted Low	Shutdown	4
Coolant Temperature 3	Open Circuit	Shutdown	5
Coolant Temperature 3	High	Warning	15
Coolant Temperature 3	Condition Exists	Shutdown	31
Water In Fuel 2	Warning	Shutdown	0
Water In Fuel 2	Shorted High	Shutdown	3
Water In Fuel 2	Shorted Low	Shutdown	4
Water In Fuel 2	Open Circuit	Shutdown	5
Water In Fuel 2	Unknown Failure	Shutdown	11
Water In Fuel 2	Condition Exists	Shutdown	31
Coolant Level 2	Shorted High	Shutdown	3
Coolant Level 2	Shorted Low	Shutdown	4
Coolant Level 2	Unknown Failure	Shutdown	11
Coolant Level 2	Condition Exists	Shutdown	31
Airfilter Pressure Switch Supply Out Of Range	Condition Exists	Warning	31
Common Rail PCV Opened Due To Overpressure	Unknown Failure	Warning	11
Common Rail Plausibility Error Of VCV Current	Unknown Failure	Shutdown	11
Common Rail Pressure Remains Above Setpoint	Unknown Failure	Shutdown	11
Common Rail Pressure Remains Below Setpoint	Unknown Failure	Shutdown	11
Common Rail Start Pressure Too Low	Unknown Failure	Warning	11
Common Rail 2 PCV Opened Due To Over Pressure	Unknown Failure	Warning	11
Common Rail 2 Plausibility Error Of VCV Current	Unknown Failure	Shutdown	11

Tier 2 Engine Fault Codes (KD700-KD4000)			
Event ID	Type	Level	FMI
Common Rail 2 Pressure Remains Above Setpoint	Unknown Failure	Shutdown	11
Common Rail 2 Pressure Remains Below Setpoint	Unknown Failure	Shutdown	11
Common Rail2 Start Pressure Too Low	Unknown Failure	Warning	11
Common Rail Pressure Sensor No Signal Variation	Unknown Failure	Shutdown	11
Common Rail Pressure Sensor 2 No Signal Variation	Unknown Failure	Shutdown	11
ECU Temperature Sensor 2 Supply Out Of Range	Condition Exists	Shutdown	31
ECU Temperature Sensor 3 Supply Out Of Range	Condition Exists	Shutdown	31
Cylinder Head Temperature Sensor Position Error	Condition Exists	Warning	31
Ignition Digital Input Supply Out Of Range	Condition Exists	Warning	31
Master Slave Injection Com Error	Plausibility	Shutdown	2
Pressure Control Valve 2 Current	Shorted High	Shutdown	3
Pressure Control Valve 2 Current	Shorted Low	Shutdown	4
Pressure Control Valve 2 Current	Open Circuit	Shutdown	5
Pressure Control Valve 2 Current	Grounded Circuit	Shutdown	6
Pressure Control Valve 2 Current	Unknown Failure	Shutdown	11
Monitoring System ECU Internal Safety Error	Unknown Failure	Shutdown	11
Monitoring System Emergency Stop Safety Error	Unknown Failure	Shutdown	11
Monitoring System Injector Safety Error	Unknown Failure	Shutdown	11
Monitoring System Starter Safety Error	Unknown Failure	Shutdown	11
Slave Digital Input Out Of Range	Unknown Failure	Warning	11
Slave Digital Input Out Of Range	Condition Exists	Warning	31
Starter Digital Input Supply Out Of Range	Unknown Failure	Warning	11
Starter Digital Input Supply Out Of Range	Condition Exists	Warning	31
Testbench Digital Input	Unknown Failure	Warning	11
Testbench Digital Input	Condition Exists	Warning	31
Volume Control Valve Current	Warning	Warning	0
Volume Control Valve Current	Severely Low	Warning	1
Volume Control Valve 2	Shorted High	Shutdown	3
Volume Control Valve 2	Shorted Low	Shutdown	4
Volume Control Valve 2	Open Circuit	Shutdown	5

Tier 2 Engine Fault Codes (KD700-KD4000)			
Event ID	Type	Level	FMI
Volume Control Valve 2	Grounded Circuit	Shutdown	6
Volume Control Valve 2	Unknown Failure	Shutdown	11
Volume Control Valve 2	Condition Exists	Shutdown	31
Starter Digital Input 2	Unknown Failure	Warning	11
Starter Digital Input 2	Condition Exists	Warning	31
Turbo Wastegate Actuator Low Side	Shorted High	Shutdown	3
Turbo Wastegate Actuator Low Side	Shorted Low	Shutdown	4
Starter Low Side	Shorted High	Warning	3
Starter Low Side 2	Shorted Low	Warning	4
Power Reduction Boost Pressure	Low	Shutdown	17
Heating Flange 1 Low Side	Shorted High	Warning	3
Heating Flange 1 Low Side 2	Shorted Low	Warning	4
Wastegate Valve Short Circuit	Condition Exists	Shutdown	31
Over Speed Test Switch	Unknown Failure	Warning	11
Droop Request Switch	Unknown Failure	Warning	11
Frm Disable Switch Supply	Unknown Failure	Warning	11
Frm Disable Switch Supply	Condition Exists	Warning	31
Volume Control Valve Low Side	Shorted High	Shutdown	3
Volume Control Valve Low Side	Shorted Low	Shutdown	4
Volume Control Valve Low Side 2	Shorted Low	Shutdown	4
Volume Control Valve Electrical Error	Unknown Failure	Shutdown	11
Pressure Control Valve Low Side	Shorted High	Shutdown	3
Pressure Control Valve Low Side	Shorted Low	Shutdown	4
Pressure Control Valve Low Side 2	Shorted Low	Shutdown	4
Volume Control Valve 2 Low Side	Shorted High	Shutdown	3
Volume Control Valve 2 Low Side	Shorted Low	Shutdown	4
Volume Control Valve 2 Low Side	Unknown Failure	Shutdown	11
Pressure Control Valve 2 Low Side	Shorted High	Shutdown	3
Pressure Control Valve 2 Low Side	Shorted Low	Shutdown	4
Pressure Control Valve 2 Low Side	Unknown Failure	Shutdown	11
Starter Locked Due To Over Temperature	Condition Exists	Warning	31
Heating Flange 2 Low Side	Shorted High	Warning	3
Heating Flange 2 Low Side 2	Shorted Low	Warning	4
Heating Flange Input 1	Shorted High	Warning	3
Heating Flange Input 1	Shorted Low	Warning	4

Tier 2 Engine Fault Codes (KD700-KD4000)			
Event ID	Type	Level	FMI
Heating Flange Input 1	Open Circuit	Warning	5
Heating Flange Input 1 Low Side	Shorted High	Warning	3
Heating Flange Input 1 Low Side	Shorted Low	Warning	4
Heating Flange Input 2	Shorted High	Warning	3
Heating Flange Input 2	Shorted Low	Warning	4
Heating Flange Input 2	Open Circuit	Warning	5
Heating Flange Input 2 Low Side	Shorted High	Warning	3
Heating Flange Input 2 Low Side	Shorted Low	Warning	4
ECU Com Error To Slave	Condition Exists	Warning	31
Starter 2	Shorted High	Warning	3
Starter 2	Shorted Low	Warning	4
Starter 2	Open Circuit	Warning	5
Starter 2	Grounded Circuit	Warning	6
Starter 2	Unknown Failure	Warning	11
Starter 2	Condition Exists	Warning	31
Starter 2 Low Side	Shorted High	Warning	3
Starter 2 Low Side 2	Shorted Low	Warning	4
Pressure Control Valve Short Circuit Load	Unknown Failure	Shutdown	11
Starter 1 Inhibition Due To Short Circuit	Unknown Failure	Warning	11
Starter 2 Inhibition Due To Short Circuit	Unknown Failure	Warning	11
Air Pressure Sensors Error	Condition Exists	Shutdown	31
Engine Can On Engine Connector Open Circuit	Open Circuit	Warning	5
Cylinder Head Temperature	High	Warning	15
Cylinder Head Temperature2	High	Shutdown	15
Slave Emission Relevant Error	Condition Exists	Warning	31
ECU Maximum Runtime Reached Without Reset	Condition Exists	Warning	31
Speed Sensors Sensor Position Inversion Error	Condition Exists	Warning	31
Starters Not Connected In The Output 1 To ECU	Condition Exists	Warning	31
Starters Not Connected In The Output2 To ECU	Condition Exists	Warning	31
Engine Mean Torque Last Day	High	Warning	15
Engine Mean Torque Last Hour	High	Warning	15
Engine Mean Torque During Life Time	High	Warning	15
ECU Data Recorder Was Triggered	Condition Exists	Warning	31

Tier 2 Engine Fault Codes (KD700-KD4000)			
Event ID	Type	Level	FMI
Engine Starter Activated But No Rotation	Condition Exists	Warning	31
Secondary Injection Control Unit ECU Error Msgs	Condition Exists	Warning	31

Tier 2 Engine Fault Codes (KD700-KD4000)			
Event ID	Type	Level	FMI
Error Msgs From Secondary Injection Control Unit	Condition Exists	Warning	31

Tier 4 Engine Data (KD1250-4, KD2500-4, KD3250-4)

The following chart shows the Diagnostic Troubleshooting Codes (DTC) from Engine Control Module (ECM) on the tier 4 KD series engines (KD1250-4, KD2500-4, KD3250-4). The following table provides descriptions of system events and their types – warning, shutdown.

Tier 4 Engine Fault Codes (KD1250-4, KD2500-4, KD3250-4)			
Event ID	Type	Level	FMI
Fuel Supply Pressure	Severely Low	Warning	1
Fuel Supply Pressure	Shorted High	Warning	3
Fuel Supply Pressure	Shorted Low	Warning	4
Fuel Supply Pressure	Condition Exists	Warning	31
Water In Fuel	Severely High	Shutdown	0
Water In Fuel	Shorted High	Shutdown	3
Water In Fuel	Shorted Low	Shutdown	4
Water In Fuel	Open Circuit	Shutdown	5
Water In Fuel	Unknown Failure	Shutdown	11
Water In Fuel	Condition Exists	Shutdown	31
Oil Pressure	Severely Low	Shutdown	1
Oil Pressure	Plausibility	Shutdown	2
Oil Pressure	Shorted High	Shutdown	3
Oil Pressure	Shorted Low	Shutdown	4
Oil Pressure	Low	Warning	17
Oil Pressure	Condition Exists	Shutdown	31
Crankcase Pressure	Severely High	Shutdown	0
Crankcase Pressure	Shorted High	Shutdown	3
Crankcase Pressure	Shorted Low	Shutdown	4
Crankcase Pressure	High	Warning	15
Crankcase Pressure	Condition Exists	Shutdown	31
Intake Manifold Pressure	Severely High	Shutdown	0
Intake Manifold Pressure	Shorted High	Shutdown	3
Intake Manifold Pressure	Shorted Low	Shutdown	4
Intake Manifold Pressure	High	Warning	15
Intake Manifold Pressure	Condition Exists	Shutdown	31
Intake Manifold Temperature	Severely High	Shutdown	0
Intake Manifold Temperature	Shorted High	Shutdown	3
Intake Manifold Temperature	Shorted Low	Shutdown	4
Intake Manifold Temperature	Open Circuit	Shutdown	5
Intake Manifold Temperature	High	Warning	15
Intake Manifold Temperature	Condition Exists	Shutdown	31
Air Filter Pressure	Severely High	Warning	0

Tier 4 Engine Fault Codes (KD1250-4, KD2500-4, KD3250-4)			
Event ID	Type	Level	FMI
Air Filter Pressure	Condition Exists	Warning	31
Barometric Pressure	Shorted High	Warning	3
Barometric Pressure	Grounded or Open Circuit	Warning	30
Barometric Pressure	Condition Exists	Warning	31
Coolant Temperature	Severely High	Shutdown	0
Coolant Temperature	Shorted High	Shutdown	3
Coolant Temperature	Shorted Low	Shutdown	4
Coolant Temperature	Open Circuit	Shutdown	5
Coolant Temperature	High	Warning	15
Coolant Temperature	Condition Exists	Shutdown	31
Coolant Level	Low	Shutdown	1
Coolant Level	Shorted High	Shutdown	3
Coolant Level	Shorted Low	Shutdown	4
Coolant Level	Unknown Failure	Shutdown	11
Coolant Level	Condition Exists	Shutdown	31
Rail 1 Pressure	Severely High	Shutdown	0
Rail 1 Pressure	Shorted High	Shutdown	3
Rail 1 Pressure	Shorted Low	Shutdown	4
Rail 1 Pressure	Condition Exists	Shutdown	31
Ambient Air Temperature	Shorted High	Warning	3
Ambient Air Temperature	Shorted Low	Warning	4
Ambient Air Temperature	Open Circuit	Warning	5
Ambient Air Temperature	Condition Exists	Warning	31
Fuel Temperature	Severely High	Warning	0
Fuel Temperature	Shorted High	Warning	3
Fuel Temperature	Shorted Low	Warning	4
Fuel Temperature	Open Circuit	Warning	5
Fuel Temperature	Condition Exists	Warning	31
Oil Temperature	Severely High	Shutdown	0
Oil Temperature	Shorted High	Warning	3
Oil Temperature	Shorted Low	Warning	4
Oil Temperature	Open Circuit	Warning	5
Oil Temperature	High	Warning	15
Oil Temperature	Condition Exists	Warning	31

Tier 4 Engine Fault Codes (KD1250-4, KD2500-4, KD3250-4)			
Event ID	Type	Level	FMI
Engine Speed	Severely High	Shutdown	0
Engine Speed	Plausibility	Shutdown	2
Engine Speed	Shorted High	Shutdown	3
Engine Speed	Shorted Low	Shutdown	4
Engine Speed	Open Circuit	Shutdown	5
Engine Speed	Special Instructions	Shutdown	14
Engine Speed	Condition Exists	Shutdown	31
Engine Position Sensor	Shorted High	Warning	3
Engine Position Sensor	Shorted Low	Warning	4
Engine Position Sensor	Open Circuit	Warning	5
Engine Position Sensor	Special Instructions	Warning	14
Engine Position Sensor	Condition Exists	Warning	31
Primary J1939 Network 1	Open Circuit		5
Primary J1939 Network 1	Unknown Failure		11
Injector 1	Shorted High	Warning	3
Injector 1	Shorted Low	Warning	4
Injector 1	Open Circuit	Warning	5
Injector 2	Shorted High	Warning	3
Injector 2	Shorted Low	Warning	4
Injector 2	Open Circuit	Warning	5
Injector 3	Shorted High	Warning	3
Injector 3	Shorted Low	Warning	4
Injector 3	Open Circuit	Warning	5
Injector 4	Shorted High	Warning	3
Injector 4	Shorted Low	Warning	4
Injector 4	Open Circuit	Warning	5
Injector 5	Shorted High	Warning	3
Injector 5	Shorted Low	Warning	4
Injector 5	Open Circuit	Warning	5
Injector 6	Shorted High	Warning	3
Injector 6	Shorted Low	Warning	4
Injector 6	Open Circuit	Warning	5
Injector 7	Shorted High	Warning	3
Injector 7	Shorted Low	Warning	4
Injector 7	Open Circuit	Warning	5
Injector 8	Shorted High	Warning	3
Injector 8	Shorted Low	Warning	4
Injector 8	Open Circuit	Warning	5

Tier 4 Engine Fault Codes (KD1250-4, KD2500-4, KD3250-4)			
Event ID	Type	Level	FMI
Injector 9	Shorted High	Warning	3
Injector 9	Shorted Low	Warning	4
Injector 9	Open Circuit	Warning	5
Injector 10	Shorted High	Warning	3
Injector 10	Shorted Low	Warning	4
Injector 10	Open Circuit	Warning	5
Injector 11	Shorted High	Warning	3
Injector 11	Shorted Low	Warning	4
Injector 11	Open Circuit	Warning	5
Injector 12	Shorted High	Warning	3
Injector 12	Shorted Low	Warning	4
Injector 12	Open Circuit	Warning	5
Injector 13	Shorted High	Warning	3
Injector 13	Shorted Low	Warning	4
Injector 13	Open Circuit	Warning	5
Injector 14	Shorted High	Warning	3
Injector 14	Shorted Low	Warning	4
Injector 14	Open Circuit	Warning	5
Injector 15	Shorted High	Warning	3
Injector 15	Shorted Low	Warning	4
Injector 15	Open Circuit	Warning	5
Injector 16	Shorted High	Warning	3
Injector 16	Shorted Low	Warning	4
Injector 16	Open Circuit	Warning	5
Injector 17	Shorted High	Warning	3
Injector 17	Shorted Low	Warning	4
Injector 17	Open Circuit	Warning	5
Injector 18	Shorted High	Warning	3
Injector 18	Shorted Low	Warning	4
Injector 18	Open Circuit	Warning	5
Injector 19	Shorted High	Warning	3
Injector 19	Shorted Low	Warning	4
Injector 19	Open Circuit	Warning	5
Injector 20	Shorted High	Warning	3
Injector 20	Shorted Low	Warning	4
Injector 20	Open Circuit	Warning	5
Starter Relay	Shorted High	Warning	3
Starter Relay	Shorted Low	Warning	4
Starter Relay	Open Circuit	Warning	5

Tier 4 Engine Fault Codes (KD1250-4, KD2500-4, KD3250-4)			
Event ID	Type	Level	FMI
Starter Relay	Condition Exists	Warning	31
Inlet Air Heater	Shorted High	Warning	3
Inlet Air Heater	Shorted Low	Warning	4
Inlet Air Heater	Open Circuit	Warning	5
Inlet Air Heater	Grounded Circuit	Warning	6
Inlet Air Heater 2	Shorted High	Warning	3
Inlet Air Heater 2	Shorted Low	Warning	4
Inlet Air Heater 2	Open Circuit	Warning	5
Inlet Air Heater 2	Grounded Circuit	Warning	6
Engine Test Mode Switch	Condition Exists	Warning	31
Fuel Lift Pump	Plausibility	Shutdown	2
Injection Pump Control Valve	Shorted High	Shutdown	3
Injection Pump Control Valve	Shorted Low	Shutdown	4
Injection Pump Control Valve	Open Circuit	Shutdown	5
Injection Pump Control Valve	Grounded Circuit	Shutdown	6
Injection Pump Control Valve	Unknown Failure	Shutdown	11
ECU Temperature	Severely High	Shutdown	0
ECU Temperature	High	Warning	15
ECU Temperature	Condition Exists	Shutdown	31
Cylinder Exhaust Temperature 1	Severely High	Shutdown	0
Cylinder Exhaust Temperature 1	Open Circuit	Warning	5
Cylinder Exhaust Temperature 1	Abnormal Data Rate	Warning	9
Cylinder Exhaust Temperature 1	Unknown Failure	Warning	11
Cylinder Exhaust Temperature 1	Device Failure	Warning	12
Cylinder Exhaust Temperature 1	Special Instructions	Warning	14
Cylinder Exhaust Temperature 1	Temperature 1 High	Warning	15
Cylinder Exhaust Temperature 2	Severely High	Shutdown	0
Cylinder Exhaust Temperature 2	Open Circuit	Warning	5
Cylinder Exhaust Temperature 2	Abnormal Data Rate	Warning	9
Cylinder Exhaust Temperature 2	Unknown Failure	Warning	11
Cylinder Exhaust Temperature 2	Device Failure	Warning	12
Cylinder Exhaust Temperature 2	Special Instructions	Warning	14
Cylinder Exhaust Temperature 2	High	Warning	15
Cylinder Exhaust Temperature 3	Severely High	Shutdown	0
Cylinder Exhaust Temperature 3	Open Circuit	Warning	5
Cylinder Exhaust Temperature 3	Abnormal Data Rate	Warning	9

Tier 4 Engine Fault Codes (KD1250-4, KD2500-4, KD3250-4)			
Event ID	Type	Level	FMI
Cylinder Exhaust Temperature 3	Unknown Failure	Warning	11
Cylinder Exhaust Temperature 3	Device Failure	Warning	12
Cylinder Exhaust Temperature 3	Special Instructions	Warning	14
Cylinder Exhaust Temperature 3	High	Warning	15
Cylinder Exhaust Temperature 4	Severely High	Shutdown	0
Cylinder Exhaust Temperature 4	Open Circuit	Warning	5
Cylinder Exhaust Temperature 4	Abnormal Data Rate	Warning	9
Cylinder Exhaust Temperature 4	Unknown Failure	Warning	11
Cylinder Exhaust Temperature 4	Device Failure	Warning	12
Cylinder Exhaust Temperature 4	Special Instructions	Warning	14
Cylinder Exhaust Temperature 4	High	Warning	15
Cylinder Exhaust Temperature 5	Severely High	Shutdown	0
Cylinder Exhaust Temperature 5	Open Circuit	Warning	5
Cylinder Exhaust Temperature 5	Abnormal Data Rate	Warning	9
Cylinder Exhaust Temperature 5	Unknown Failure	Warning	11
Cylinder Exhaust Temperature 5	Device Failure	Warning	12
Cylinder Exhaust Temperature 5	Special Instructions	Warning	14
Cylinder Exhaust Temperature 5	High	Warning	15
Cylinder Exhaust Temperature 6	Severely High	Shutdown	0
Cylinder Exhaust Temperature 6	Open Circuit	Warning	5
Cylinder Exhaust Temperature 6	Abnormal Data Rate	Warning	9
Cylinder Exhaust Temperature 6	Unknown Failure	Warning	11
Cylinder Exhaust Temperature 6	Device Failure	Warning	12
Cylinder Exhaust Temperature 6	Special Instructions	Warning	14
Cylinder Exhaust Temperature 6	High	Warning	15
Cylinder Exhaust Temperature 7	Severely High	Shutdown	0
Cylinder Exhaust Temperature 7	Open Circuit	Warning	5
Cylinder Exhaust Temperature 7	Abnormal Data Rate	Warning	9
Cylinder Exhaust Temperature 7	Unknown Failure	Warning	11
Cylinder Exhaust Temperature 7	Device Failure	Warning	12
Cylinder Exhaust Temperature 7	Special Instructions	Warning	14
Cylinder Exhaust Temperature 7	High	Warning	15
Cylinder Exhaust Temperature 8	Severely High	Shutdown	0
Cylinder Exhaust Temperature 8	Open Circuit	Warning	5
Cylinder Exhaust Temperature 8	Abnormal Data Rate	Warning	9

Tier 4 Engine Fault Codes (KD1250-4, KD2500-4, KD3250-4)			
Event ID	Type	Level	FMI
Cylinder Exhaust Temperature 8	Unknown Failure	Warning	11
Cylinder Exhaust Temperature 8	Device Failure	Warning	12
Cylinder Exhaust Temperature 8	Special Instructions	Warning	14
Cylinder Exhaust Temperature 8	High	Warning	15
Cylinder Exhaust Temperature 9	Severely High	Shutdown	0
Cylinder Exhaust Temperature 9	Open Circuit	Warning	5
Cylinder Exhaust Temperature 9	Abnormal Data Rate	Warning	9
Cylinder Exhaust Temperature 9	Unknown Failure	Warning	11
Cylinder Exhaust Temperature 9	Device Failure	Warning	12
Cylinder Exhaust Temperature 9	Special Instructions	Warning	14
Cylinder Exhaust Temperature 9	High	Warning	15
Cylinder Exhaust Temperature 10	Severely High	Shutdown	0
Cylinder Exhaust Temperature 10	Open Circuit	Warning	5
Cylinder Exhaust Temperature 10	Abnormal Data Rate	Warning	9
Cylinder Exhaust Temperature 10	Unknown Failure	Warning	11
Cylinder Exhaust Temperature 10	Device Failure	Warning	12
Cylinder Exhaust Temperature 10	Special Instructions	Warning	14
Cylinder Exhaust Temperature 10	High	Warning	15
Cylinder Exhaust Temperature 11	Severely High	Shutdown	0
Cylinder Exhaust Temperature 11	Open Circuit	Warning	5
Cylinder Exhaust Temperature 11	Abnormal Data Rate	Warning	9
Cylinder Exhaust Temperature 11	Unknown Failure	Warning	11
Cylinder Exhaust Temperature 11	Device Failure	Warning	12
Cylinder Exhaust Temperature 11	Special Instructions	Warning	14
Cylinder Exhaust Temperature 11	High	Warning	15
Cylinder Exhaust Temperature 12	Severely High	Shutdown	0
Cylinder Exhaust Temperature 12	Open Circuit	Warning	5
Cylinder Exhaust Temperature 12	Abnormal Data Rate	Warning	9
Cylinder Exhaust Temperature 12	Unknown Failure	Warning	11
Cylinder Exhaust Temperature 12	Device Failure	Warning	12
Cylinder Exhaust Temperature 12	Special Instructions	Warning	14
Cylinder Exhaust Temperature 12	High	Warning	15
Cylinder Exhaust Temperature 13	Severely High	Shutdown	0
Cylinder Exhaust Temperature 13	Open Circuit	Warning	5
Cylinder Exhaust Temperature 13	Abnormal Data Rate	Warning	9

Tier 4 Engine Fault Codes (KD1250-4, KD2500-4, KD3250-4)			
Event ID	Type	Level	FMI
Cylinder Exhaust Temperature 13	Unknown Failure	Warning	11
Cylinder Exhaust Temperature 13	Device Failure	Warning	12
Cylinder Exhaust Temperature 13	Special Instructions	Warning	14
Cylinder Exhaust Temperature 13	High	Warning	15
Cylinder Exhaust Temperature 14	Severely High	Shutdown	0
Cylinder Exhaust Temperature 14	Open Circuit	Warning	5
Cylinder Exhaust Temperature 14	Abnormal Data Rate	Warning	9
Cylinder Exhaust Temperature 14	Unknown Failure	Warning	11
Cylinder Exhaust Temperature 14	Device Failure	Warning	12
Cylinder Exhaust Temperature 14	Special Instructions	Warning	14
Cylinder Exhaust Temperature 14	High	Warning	15
Cylinder Exhaust Temperature 15	Severely High	Shutdown	0
Cylinder Exhaust Temperature 15	Open Circuit	Warning	5
Cylinder Exhaust Temperature 15	Abnormal Data Rate	Warning	9
Cylinder Exhaust Temperature 15	Unknown Failure	Warning	11
Cylinder Exhaust Temperature 15	Device Failure	Warning	12
Cylinder Exhaust Temperature 15	Special Instructions	Warning	14
Cylinder Exhaust Temperature 15	High	Warning	15
Cylinder Exhaust Temperature 16	Severely High	Shutdown	0
Cylinder Exhaust Temperature 16	Open Circuit	Warning	5
Cylinder Exhaust Temperature 16	Abnormal Data Rate	Warning	9
Cylinder Exhaust Temperature 16	Unknown Failure	Warning	11
Cylinder Exhaust Temperature 16	Device Failure	Warning	12
Cylinder Exhaust Temperature 16	Special Instructions	Warning	14
Cylinder Exhaust Temperature 16	High	Warning	15
Cylinder Exhaust Temperature 17	Severely High	Shutdown	0
Cylinder Exhaust Temperature 17	Open Circuit	Warning	5
Cylinder Exhaust Temperature 17	Abnormal Data Rate	Warning	9
Cylinder Exhaust Temperature 17	Unknown Failure	Warning	11
Cylinder Exhaust Temperature 17	Device Failure	Warning	12
Cylinder Exhaust Temperature 17	Special Instructions	Warning	14
Cylinder Exhaust Temperature 17	High	Warning	15
Cylinder Exhaust Temperature 18	Severely High	Shutdown	0
Cylinder Exhaust Temperature 18	Open Circuit	Warning	5
Cylinder Exhaust Temperature 18	Abnormal Data Rate	Warning	9

Tier 4 Engine Fault Codes (KD1250-4, KD2500-4, KD3250-4)			
Event ID	Type	Level	FMI
Cylinder Exhaust Temperature 18	Unknown Failure	Warning	11
Cylinder Exhaust Temperature 18	Device Failure	Warning	12
Cylinder Exhaust Temperature 18	Special Instructions	Warning	14
Cylinder Exhaust Temperature 18	High	Warning	15
Cylinder Exhaust Temperature 19	Severely High	Shutdown	0
Cylinder Exhaust Temperature 19	Open Circuit	Warning	5
Cylinder Exhaust Temperature 19	Abnormal Data Rate	Warning	9
Cylinder Exhaust Temperature 19	Unknown Failure	Warning	11
Cylinder Exhaust Temperature 19	Device Failure	Warning	12
Cylinder Exhaust Temperature 19	Special Instructions	Warning	14
Cylinder Exhaust Temperature 19	High	Warning	15
Cylinder Exhaust Temperature 20	Severely High	Shutdown	0
Cylinder Exhaust Temperature 20	Open Circuit	Warning	5
Cylinder Exhaust Temperature 20	Abnormal Data Rate	Warning	9
Cylinder Exhaust Temperature 20	Unknown Failure	Warning	11
Cylinder Exhaust Temperature 20	Device Failure	Warning	12
Cylinder Exhaust Temperature 20	Special Instructions	Warning	14
Cylinder Exhaust Temperature 20	High	Warning	15
Turbo 1 Compressor Temperature	Shorted High	Shutdown	3
Turbo 1 Compressor Temperature	Shorted Low	Shutdown	4
Turbo 1 Compressor Temperature	Open Circuit	Shutdown	5
Turbo 1 Compressor Temperature	Condition Exists	Shutdown	31
Turbo 1 Turbine Temperature	Severely High	Shutdown	0
Turbo 1 Turbine Temperature	Plausibility	Warning	2
Turbo 1 Turbine Temperature	Open Circuit	Warning	5
Turbo 1 Turbine Temperature	Unknown Failure	Warning	11
Turbo 1 Turbine Temperature	Device Failure	Warning	12
Turbo 1 Turbine Temperature	Special Instructions	Warning	14
Turbo 1 Turbine Temperature	Temperature High	Warning	15
Turbo 2 Turbine Temperature	Severely High	Shutdown	0
Turbo 2 Turbine Temperature	Plausibility	Warning	2
Turbo 2 Turbine Temperature	Open Circuit	Warning	5
Turbo 2 Turbine Temperature	Unknown Failure	Warning	11
Turbo 2 Turbine Temperature	Device Failure	Warning	12
Turbo 2 Turbine Temperature	Special Instructions	Warning	14

Tier 4 Engine Fault Codes (KD1250-4, KD2500-4, KD3250-4)			
Event ID	Type	Level	FMI
Turbo 2 Turbine Temperature	High	Warning	15
Intercooler Coolant Temperature	Severely High	Shutdown	0
Intercooler Coolant Temperature	Shorted High	Shutdown	3
Intercooler Coolant Temperature	Shorted Low	Shutdown	4
Intercooler Coolant Temperature	Open Circuit	Shutdown	5
Intercooler Coolant Temperature	High	Warning	15
Intercooler Coolant Temperature	Condition Exists	Shutdown	31
J1939 Network 2	Open Circuit	Warning	5
J1939 Network 2	Unknown Failure	Warning	11
Injector Rail 2 Pressure	Severely High	Shutdown	0
Injector Rail 2 Pressure	Shorted High	Shutdown	3
Injector Rail 2 Pressure	Shorted Low	Shutdown	4
Injector Rail 2 Pressure	Condition Exists	Shutdown	31
Engine Starter Mode	Unknown Failure	Shutdown	11
Aftertreatment 1 DEF Tank Level	Severely Low	Warning	1
Aftertreatment 1 DEF Tank Level	Plausibility	Warning	2
Aftertreatment 1 DEF Tank Level	Shorted High	Warning	3
Aftertreatment 1 DEF Tank Level	Shorted Low	Warning	4
Aftertreatment 1 DEF Tank Level	Level Low	Warning	17
Aftertreatment 1 DEF Tank Temperature	Severely High	Warning	0
Aftertreatment 1 DEF Tank Temperature	Severely Low	Warning	1
Aftertreatment 1 DEF Tank Temperature	Shorted High	Warning	3
Aftertreatment 1 DEF Tank Temperature	Shorted Low	Warning	4
Aftertreatment 1 DEF Tank Temperature	High	Warning	15
Aftertreatment 1 Intake Gas Sensor Heater	Mechanical Error	Warning	7
Aftertreatment 1 Intake NOx Sensor	Severely High	Warning	0
Aftertreatment 1 Intake NOx Sensor	Plausibility	Warning	2
Aftertreatment 1 Intake NOx Sensor	Shorted High	Warning	3
Aftertreatment 1 Intake NOx Sensor	Open Circuit	Warning	5
Aftertreatment 1 Intake NOx Sensor	Condition Exists	Warning	31
Aftertreatment 1 Intake O2 Sensor	Plausibility	Warning	2
Aftertreatment 1 Intake Gas Sensor Heater	Mechanical Error	Warning	7
Aftertreatment 1 Outlet NOx Sensor	Severely High	Warning	0
Aftertreatment 1 Outlet NOx Sensor	Plausibility	Warning	2

Tier 4 Engine Fault Codes (KD1250-4, KD2500-4, KD3250-4)			
Event ID	Type	Level	FMI
Aftertreatment 1 Outlet NOx Sensor	Shorted High	Warning	3
Aftertreatment 1 Outlet NOx Sensor	Open Circuit	Warning	5
Aftertreatment 1 Outlet NOx Sensor	Condition Exists	Warning	31
Aftertreatment 1 Outlet O2 Sensor	Plausibility	Warning	2
Aftertreatment 2 Outlet NOx Sensor	Severely High	Warning	0
Aftertreatment 2 Outlet NOx Sensor	Plausibility	Warning	2
Aftertreatment 2 Outlet NOx Sensor	Shorted High	Warning	3
Aftertreatment 2 Outlet NOx Sensor	Open Circuit	Warning	5
Aftertreatment 2 Outlet NOx Sensor	Mechanical Error	Warning	7
Aftertreatment 2 Outlet NOx Sensor	Unknown Failure	Warning	11
Aftertreatment 2 Outlet NOx Sensor	Condition Exists	Warning	31
Aftertreatment 1 DEF Tank Quality	Severely High	Warning	0
Aftertreatment 1 DEF Tank Quality	Severely Low	Warning	1
Aftertreatment 1 DEF Tank Quality	Unknown Failure	Warning	11
Turbo Compressor Bypass Actuator 1	Plausibility	Warning	2
Aftertreatment 1 DEF Temperature 2	Severely High	Shutdown	0
Aftertreatment 1 DEF Temperature 2	Severely Low	Shutdown	1
Aftertreatment 1 DEF Temperature 2	Shorted High	Shutdown	3
Aftertreatment 1 DEF Temperature 2	Shorted Low	Shutdown	4
Aftertreatment 1 DEF Temperature 2	High	Warning	15
Aftertreatment 1 DEF Concentration	Low	Warning	17
ECM Power Supply Voltage	Severely Low	Warning	1
ECM Power Supply Voltage	High	Warning	15
ECM Power Supply Voltage	Low	Shutdown	17
Turbo Compressor Bypass Actuator 1 Position	Plausibility	Warning	2
Turbo Compressor Bypass Actuator 1 Position	Condition Exists	Warning	31
Engine Aftercooler Coolant Level	Severely Low	Shutdown	1
Engine Aftercooler Coolant Level	Shorted High	Shutdown	3
Engine Aftercooler Coolant Level	Shorted Low	Shutdown	4
Engine Aftercooler Coolant Level	Unknown Failure	Shutdown	11
Engine Aftercooler Coolant Level	Condition Exists	Shutdown	31
Generator Speed Bias	Shorted High	Warning	3
Generator Speed Bias	Open Circuit	Warning	30
Generator Speed Bias	Condition Exists	Warning	31

Tier 4 Engine Fault Codes (KD1250-4, KD2500-4, KD3250-4)			
Event ID	Type	Level	FMI
Oil Prelube Pump	Shorted High	Warning	3
Oil Prelube Pump	Shorted Low	Warning	4
Aftertreatment 1 DEF Line Heater 1 State	Shorted High	Warning	3
Aftertreatment 1 DEF Line Heater 1 State	Shorted Low	Warning	4
Aftertreatment 1 DEF Line Heater 1 State	Open Circuit	Warning	5
Aftertreatment 1 DEF Line Heater 1 State	Grounded Circuit	Warning	6
Aftertreatment 1 DEF Line Heater 1 State	Unknown Failure	Warning	11
Aftertreatment 1 DEF Line Heater 2 State	Shorted High	Warning	3
Aftertreatment 1 DEF Line Heater 2 State	Shorted Low	Warning	4
Aftertreatment 1 DEF Line Heater 2 State	Open Circuit	Warning	5
Aftertreatment 1 DEF Line Heater 2 State	Grounded Circuit	Warning	6
Aftertreatment 1 DEF Line Heater 2 State	Unknown Failure	Warning	11
Aftertreatment 1 SCR Cat Intake Gas Temperature	Plausibility	Warning	2
Aftertreatment 1 SCR Cat Intake Gas Temperature	Shorted High	Warning	3
Aftertreatment 1 SCR Cat Intake Gas Temperature	Shorted Low	Warning	4
Aftertreatment 1 SCR Cat Intake Gas Temperature	Open Circuit	Warning	5
Aftertreatment 1 SCR Cat Intake Gas Temperature	High	Warning	15
Aftertreatment 1 SCR Cat Intake Gas Temperature	Condition Exists	Warning	31
Aftertreatment 1 SCR Conversion Efficiency	Severely Low	Warning	1
Aftertreatment 1 Outlet NH3	Condition Exists	Warning	31
Aftertreatment 1 Outlet NH3 Sensor Power	Unknown Failure	Warning	11
Aftertreatment 1 Outlet NH3 Gas Sensor Heater	Plausibility	Warning	2
Aftertreatment 2 SCR Cat Intake Gas Temperature	Shorted High	Warning	3
Aftertreatment 2 SCR Cat Intake Gas Temperature	Shorted Low	Warning	4
Aftertreatment 2 SCR Cat Intake Gas Temperature	Open Circuit	Warning	5
Aftertreatment 2 SCR Cat Intake Gas Temperature	Unknown Failure	Warning	11
Aftertreatment 2 SCR Cat Intake Gas Temperature	High	Warning	15
Aftertreatment 2 SCR Cat Intake Gas Temperature	Condition Exists	Warning	31

Tier 4 Engine Fault Codes (KD1250-4, KD2500-4, KD3250-4)			
Event ID	Type	Level	FMI
Aftertreatment 2 SCR Conversion Efficiency	Severely Low	Warning	1
Aftertreatment 2 Outlet NH3	Condition Exists	Warning	31
Aftertreatment 2 Outlet NH3 Sensor Power	Unknown Failure	Warning	11
Aftertreatment 2 Outlet NH3 Gas Sensor Heater	Plausibility	Warning	2
Turbo Compressor Bypass Actuator 1 Temperature Status	Severely High	Warning	0
Turbo Wastegate Actuator Command	Shorted High	Shutdown	3
Turbo Wastegate Actuator Command	Shorted Low	Shutdown	4
Turbo Wastegate Actuator Command	Open Circuit	Shutdown	5
Turbo Wastegate Actuator Command	Grounded Circuit	Shutdown	6
Turbo Wastegate Actuator Command	Unknown Failure	Shutdown	11
Turbo Compressor Bypass Actuator 1	Plausibility	Warning	2
Turbo Compressor Bypass Actuator 1	Unknown Failure	Warning	11
Turbo Compressor Bypass Actuator 1	Out of Calibration	Warning	13
Turbo Compressor Bypass Actuator 1	Condition Exists	Warning	31
Turbo Compressor Bypass Actuator 1	Plausibility	Warning	2
Turbo Compressor Bypass Actuator 1 Operation Status	Condition Exists	Warning	31
Fuel Rail Pressure Relief Valve	Shorted High	Shutdown	3
Fuel Rail Pressure Relief Valve	Shorted Low	Shutdown	4
Fuel Rail Pressure Relief Valve	Open Circuit	Shutdown	5
Fuel Rail Pressure Relief Valve	Grounded Circuit	Shutdown	6
Aftertreatment 1 DEF Dosing Unit Heater	Condition Exists	Shutdown	31
Emission Operator Inducement Severity	Severely High	Warning	0
Emission Operator Inducement Severity	Unknown Failure	Warning	11
Emission Operator Inducement Severity	Severity High	Warning	15
Emission Operator Inducement Severity	Moderately High	Warning	16
Water In Fuel 2	Severely High	Shutdown	0
Water In Fuel 2	Shorted High	Shutdown	3
Water In Fuel 2	Shorted Low	Shutdown	4
Water In Fuel 2	Open Circuit	Shutdown	5
Water In Fuel 2	Unknown Failure	Shutdown	11
Water In Fuel 2	Condition Exists	Shutdown	31
Aftertreatment DEF Doser Cooldown Interrupt	Condition Exists	Warning	31
Aftertreatment DEF Doser Purge Interrupt	Condition Exists	Warning	31

Tier 4 Engine Fault Codes (KD1250-4, KD2500-4, KD3250-4)			
Event ID	Type	Level	FMI
Common Rail PCV Opened Due To Overpressure	Unknown Failure	Warning	11
Common Rail Error Of VCV Current	Unknown Failure	Shutdown	11
Common Rail Pressure Remains Above Setpoint	Unknown Failure	Shutdown	11
Common Rail Pressure Remains Below Setpoint	Unknown Failure	Shutdown	11
Common Rail Start Pressure Too Low	Unknown Failure	Warning	11
Common Rail 2 PCV Opened Due To Over Pressure	Unknown Failure	Warning	11
Common Rail 2 Error Of VCV Current	Unknown Failure	Shutdown	11
Common Rail 2 Pressure Remains Above Setpoint	Unknown Failure	Shutdown	11
Common Rail 2 Pressure Remains Below Setpoint	Unknown Failure	Shutdown	11
Common Rail2 Start Pressure Too Low	Unknown Failure	Warning	11
Common Rail Pressure Sensor No Signal Variation	Unknown Failure	Shutdown	11
Common Rail Pressure Sensor 2 No Signal Variation	Unknown Failure	Shutdown	11
ECU Machine Digital Output 1	Shorted High	Warning	3
ECU Machine Digital Output 1	Shorted Low	Warning	4
ECU Machine Digital Output 1	Open Circuit	Warning	5
ECU Machine Digital Output 1	Grounded Circuit	Warning	6
ECU Machine Digital Output 1	Unknown Failure	Warning	11
ECU Temperature Sensor 2 Supply Out Of Range	Condition Exists	Shutdown	31
ECU Temperature Sensor 3 Supply Out Of Range	Condition Exists	Shutdown	31
Cylinder Head Temperature Sensor Position Error	Condition Exists	Warning	31
Master Slave Injection Com Error	Plausibility	Shutdown	2
Aftertreatment 1 Outlet NH3 Sensor Communication	Unknown Failure	Warning	11
Aftertreatment 1 Outlet NH3 Sensor Memory	Unknown Failure	Warning	11
Aftertreatment 1 Outlet NH3 Sensor Resistance	Unknown Failure	Warning	11
Aftertreatment 1 Outlet NH3 Sensor Module	Unknown Failure	Warning	11
Aftertreatment 1 Outlet NOx Sensor Status	Plausibility	Warning	2
Aftertreatment 1 Intake NOx Sensor Status	Plausibility	Warning	2

Tier 4 Engine Fault Codes (KD1250-4, KD2500-4, KD3250-4)			
Event ID	Type	Level	FMI
Aftertreatment NOx Sensor Installation Error	Unknown Failure	Warning	11
Pressure Control Valve 2 Current	Shorted High	Shutdown	3
Pressure Control Valve 2 Current	Shorted Low	Shutdown	4
Pressure Control Valve 2 Current	Open Circuit	Shutdown	5
Pressure Control Valve 2 Current	Grounded Circuit	Shutdown	6
Pressure Control Valve 2 Current	Unknown Failure	Shutdown	11
Aftertreatment SCR DEF Defrost Error	Unknown Failure	Shutdown	11
Volume Control Valve 2	Shorted High	Shutdown	3
Volume Control Valve 2	Shorted Low	Shutdown	4
Volume Control Valve 2	Open Circuit	Shutdown	5
Volume Control Valve 2	Grounded Circuit	Shutdown	6
Volume Control Valve 2	Condition Exists	Shutdown	31
Turbo Wastegate Actuator Side	Shorted High	Shutdown	3
Turbo Wastegate Actuator Side	Shorted Low	Shutdown	4
Derate Aftertreatment Protection Temperature	High	Warning	15
Power Reduction Boost Pressure	Low	Shutdown	17
Wastegate Valve Short Circuit	Condition Exists	Shutdown	31
Volume Control Valve Side	Shorted High	Shutdown	3
Volume Control Valve Side	Shorted Low	Shutdown	4
Pressure Control Valve Side	Shorted High	Shutdown	3
Pressure Control Valve Side	Shorted Low	Shutdown	4
Volume Control Valve 2 Side	Shorted High	Shutdown	3
Volume Control Valve 2 Side	Shorted Low	Shutdown	4
Pressure Control Valve 2 Side	Shorted High	Shutdown	3
Pressure Control Valve 2 Side	Shorted Low	Shutdown	4
Turbo Wastegate Module Communication Error	Plausibility	Shutdown	2
Heating Flange Input 1	Shorted High	Warning	3
Heating Flange Input 1	Shorted Low	Warning	4
Heating Flange Input 1	Open Circuit	Warning	5
Heating Flange Input 2	Shorted High	Warning	3
Heating Flange Input 2	Shorted Low	Warning	4
Heating Flange Input 2	Open Circuit	Warning	5
ECU Communication Error With Aftertreatment	Condition Exists	Warning	31

Tier 4 Engine Fault Codes (KD1250-4, KD2500-4, KD3250-4)			
Event ID	Type	Level	FMI
ECU Com Error To Slave	Condition Exists	Warning	31
Starter 2	Shorted High	Warning	3
Starter 2	Shorted Low	Warning	4
Starter 2	Open Circuit	Warning	5
Starter 2	Condition Exists	Warning	31
Pressure Control Valve Short Circuit Load	Unknown Failure	Shutdown	11
Starter 1 Inhibition Due To Short Circuit	Unknown Failure	Warning	11
Starter 2 Inhibition Due To Short Circuit	Unknown Failure	Warning	11
Air Pressure Sensors Error	Condition Exists	Shutdown	31
Aftertreatment Module Communication Error	Plausibility	Warning	2
Slave Emission Relevant Error	Condition Exists	Warning	31
Starters Not Connected In The Output 1 To ECU	Condition Exists	Warning	31
Starters Not Connected In The Output2 To ECU	Condition Exists	Warning	31
ECU Data Recorder Was Triggered	Condition Exists	Warning	31
Engine Starter Activated But No Rotation	Condition Exists	Warning	31
Aftertreatment SCR Carbon Buildup	Severely High	Warning	0
Aftertreatment SCR Carbon Buildup	High	Warning	15
Aftertreatment SCR DEF Defrost Time Exceeded	Condition Exists	Warning	31
Aftertreatment SCR DEF Injector 1	Shorted High	Warning	3
Aftertreatment SCR DEF Injector 1	Shorted Low	Warning	4
Aftertreatment SCR DEF Injector 2	Shorted High	Warning	3
Aftertreatment SCR DEF Injector 2	Shorted Low	Warning	4
Aftertreatment SCR DEF Injector 3	Shorted High	Warning	3
Aftertreatment SCR DEF Injector 3	Shorted Low	Warning	4
Aftertreatment SCR DEF Injector 4	Shorted High	Warning	3
Aftertreatment SCR DEF Injector 4	Shorted Low	Warning	4
Aftertreatment SCR DEF Injector 5	Shorted High	Warning	3
Aftertreatment SCR DEF Injector 5	Shorted Low	Warning	4
Aftertreatment SCR DEF Injector 6	Shorted High	Warning	3
Aftertreatment SCR DEF Injector 6	Shorted Low	Warning	4
Aftertreatment SCR DEF Injector 7	Shorted High	Warning	3
Aftertreatment SCR DEF Injector 7	Shorted Low	Warning	4

Tier 4 Engine Fault Codes (KD1250-4, KD2500-4, KD3250-4)			
Event ID	Type	Level	FMI
Aftertreatment SCR DEF Injector 8	Shorted High	Warning	3
Aftertreatment SCR DEF Injector 8	Shorted Low	Warning	4
Aftertreatment SCR DEF Pump Inlet Temperature	Severely High	Warning	0
Aftertreatment SCR DEF Pump Inlet Temperature	Severely Low	Warning	1
Aftertreatment SCR DEF Pump Inlet Temperature	Plausibility	Warning	2
Aftertreatment SCR DEF Pump Inlet Temperature	High	Warning	15
Aftertreatment SCR DEF Pump Outlet Pressure	Severely High	Warning	0
Aftertreatment SCR DEF Pump Outlet Pressure	Severely Low	Warning	1
Aftertreatment SCR DEF Pump Outlet Pressure	Plausibility	Warning	2
Aftertreatment SCR DEF Pump Outlet Pressure	High	Warning	15
Aftertreatment SCR DEF Pump Outlet Pressure	Moderately High	Shutdown	16
Aftertreatment SCR DEF Pump Outlet Pressure	Low	Warning	17
Aftertreatment SCR Common Rail DEF Pressure	Severely High	Warning	0
Aftertreatment SCR Common Rail DEF Pressure	Severely Low	Warning	1
Aftertreatment SCR Common Rail DEF Pressure	Plausibility	Warning	2
Aftertreatment SCR Common Rail DEF Pressure	High	Warning	15
Aftertreatment SCR Common Rail DEF Pressure	Moderately High	Shutdown	16
Aftertreatment SCR Common Rail DEF Pressure	Low	Warning	17
Aftertreatment SCR Primary DCU Sensor Supply	Shorted High	Shutdown	3
Aftertreatment SCR Primary DCU Sensor Supply	Shorted Low	Shutdown	4
Aftertreatment SCR Primary DCU Battery	Shorted High	Shutdown	3
Aftertreatment SCR Primary DCU Battery	Shorted Low	Shutdown	4
SCR Primary DCU Communication Error With ECU	Abnormal Data Rate	Warning	9
SCR Primary DCU Comm Error With Secondary DCU 1	Abnormal Data Rate	Warning	9
SCR Primary DCU CAN 1 Electrical Error	Plausibility	Warning	2

Tier 4 Engine Fault Codes (KD1250-4, KD2500-4, KD3250-4)			
Event ID	Type	Level	FMI
SCR Primary DCU CAN 2 Electrical Error	Plausibility	Warning	2
Aftertreatment SCR Secondary 1 DCU Battery	Shorted High	Warning	3
Aftertreatment SCR Secondary 1 DCU Battery	Shorted Low	Warning	4
Aftertreatment SCR Secondary 1 DCU Sensor Supply	Shorted High	Warning	3
Aftertreatment SCR Secondary 1 DCU Sensor Supply	Shorted Low	Warning	4
Aftertreatment SCR Secondary 2 DCU Battery	Shorted High	Warning	3
Aftertreatment SCR Secondary 2 DCU Battery	Shorted Low	Warning	4
Aftertreatment SCR Secondary 2 DCU Sensor Supply	Shorted High	Warning	3
Aftertreatment SCR Secondary 2 DCU Sensor Supply	Shorted Low	Warning	4
Aftertreatment 2 Outlet NH3 Sensor Communication	Unknown Failure	Warning	11
Aftertreatment 2 Outlet NH3 Sensor Resistance	Unknown Failure	Warning	11
Aftertreatment 2 Outlet NH3 Sensor Module	Unknown Failure	Warning	11
Aftertreatment 2 Outlet NH3 Sensor Memory	Unknown Failure	Warning	11
Aftertreatment 3 SCR Conversion Efficiency	Severely Low	Warning	1
Aftertreatment 4 SCR Conversion Efficiency	Severely Low	Warning	1
Smart Sensor Supply Relay 1	Shorted High	Warning	3
Smart Sensor Supply Relay 1	Shorted Low	Warning	4
Smart Sensor Supply Relay 1	Open Circuit	Warning	5
Smart Sensor Supply Relay 1	Grounded Circuit	Warning	6
Smart Sensor Supply Relay 1	Unknown Failure	Warning	11
Smart Sensor Supply Relay 2	Shorted High	Warning	3
Smart Sensor Supply Relay 2	Shorted Low	Warning	4
Smart Sensor Supply Relay 2	Open Circuit	Warning	5
Smart Sensor Supply Relay 2	Grounded Circuit	Warning	6
Smart Sensor Supply Relay 2	Unknown Failure	Warning	11
Smart Sensor Supply Relay 3	Shorted High	Warning	3
Smart Sensor Supply Relay 3	Shorted Low	Warning	4
Smart Sensor Supply Relay 3	Open Circuit	Warning	5
Smart Sensor Supply Relay 3	Grounded Circuit	Warning	6

Tier 4 Engine Fault Codes (KD1250-4, KD2500-4, KD3250-4)			
Event ID	Type	Level	FMI
Smart Sensor Supply Relay 3	Unknown Failure	Warning	11
NOx Sensors Installation Error	Unknown Failure	Warning	11

Tier 4 Engine Fault Codes (KD1250-4, KD2500-4, KD3250-4)			
Event ID	Type	Level	FMI
Production Test Mode Expired	Condition Exists	Shutdown	31

Appendix C. Alternator Protection

The controller has built-in thermal protection for the alternator. This feature functions similarly to a thermal circuit breaker. When the output current exceeds the nominal rating for a short period of time the condition causes the fault shutdown. The amount of time at which current is over the rating is inversely related to the amount of current above the nominal rating. In other words, the higher the current, the shorter the acceptable time.

The current and time limits are defined by actual test data and are maintained in the personality parameter file. Although the equation for detecting a fault is proprietary, some of the important limits are shown below for informational purposes.

Rated Current	Time Delay
200%	40 seconds
300%	10 seconds
425%	5 seconds
950%	1 second

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Original Instructions (English)

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