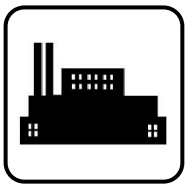
Operation

Industrial Generator Sets



Models:

KD700-KD4000

Controller:
APM802

KOHLER®

TP-7070 6/23h

⚠ 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 _____

Engine Identification

Record the product identification information from the engine nameplate.

Manufacturer _____

Model Designation _____

Serial Number _____

Controller Identification

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

Controller Description _____

Controller Serial Number _____

Alternator Identification

Record the alternator model number from the generator set nameplate(s).

Alternator Model _____

Accessory Number	Accessory Description

Accessory Number	Accessory Description

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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

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

⚠ WARNING

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

⚠ CAUTION

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

⚠ WARNING	**Accidental starting.** **Can cause severe injury or death.** 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.
	

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) Shut down the generator set. (2) Place the controller in Out of Service mode. (3) Press the emergency stop button. (4) Disconnect the power to the battery charger, if equipped. (5) 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

WARNING	
	**Sulfuric acid in batteries.** **Can cause severe injury or death.** Wear protective goggles and clothing. Battery acid may cause blindness and burn skin.

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

Battery electrolyte is a diluted sulfuric acid. Battery acid can cause severe injury or death. Battery acid can cause blindness and burn skin. Always wear splashproof safety goggles, rubber gloves, and boots when servicing the battery. Do not open a sealed battery or mutilate the battery case. If battery acid splashes in the eyes or on the skin, immediately flush the affected area for 15 minutes with large quantities of clean water. Seek immediate medical aid in the case of eye contact. Never add acid to a battery after placing the battery in service, as this may result in hazardous spattering of battery acid.

Battery acid cleanup. Battery acid can cause severe injury or death. Battery acid is electrically conductive and corrosive. Add 500 g (1 lb.) of bicarbonate of soda (baking soda) to a container with 4 L (1 gal.) of water and mix the neutralizing solution. Pour the neutralizing solution on the spilled battery acid and continue to add the neutralizing solution to the spilled battery acid until all evidence of a chemical reaction (foaming) has ceased. Flush the resulting liquid with water and dry the area.

Battery gases. Explosion can cause severe injury or death. Battery gases can cause an explosion. Do not smoke or permit flames or sparks to occur near a battery at any time, particularly when it is charging. Do not dispose of a battery in a fire. To prevent burns and sparks that could cause an explosion, avoid touching the battery terminals with tools or other metal objects. Remove all jewelry before servicing the equipment. Discharge static electricity from your body before touching batteries by first touching a grounded metal surface away from the battery. To avoid sparks, do not disturb the battery charger connections while the battery is charging. Always turn the battery charger off before disconnecting the battery connections. Ventilate the compartments containing batteries to prevent accumulation of explosive gases.

Battery short circuits. Explosion can cause severe injury or death. Short circuits can cause bodily injury and/or equipment damage. Disconnect the battery before generator set installation or maintenance. Remove all jewelry before servicing the equipment. Use tools with insulated handles. Remove the negative (–) lead first when disconnecting the battery. Reconnect the negative (–) lead last when reconnecting the battery. Never connect the negative (–) battery cable to the positive (+) connection terminal of the starter solenoid. Do not test the battery condition by shorting the terminals together.

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 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.

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.

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.

Draining the fuel system. Explosive fuel vapors can cause severe injury or death. Spilled fuel can cause an explosion. Use a container to catch fuel when draining the fuel system. Wipe up spilled fuel after draining the system.

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.

WARNING 	**Hazardous voltage. Backfeed to the utility system.** **Can cause property damage, severe injury, or death.** 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.

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.

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).

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.

Engine block heater. Hazardous voltage will cause severe injury or death. The engine block heater can cause electrical shock. Remove the engine block heater plug from the electrical outlet before working on the block heater electrical connections.

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.

Testing live electrical circuits. Hazardous voltage or current will cause severe injury or death. Have trained and qualified personnel take diagnostic measurements of live circuits. Use adequately rated test equipment with electrically insulated probes and follow the instructions of the test equipment manufacturer when performing voltage tests. Observe the following precautions when performing voltage tests: (1) Remove all jewelry. (2) Stand on a dry, approved electrically insulated mat. (3) Do not touch the enclosure or components inside the enclosure. (4) Be prepared for the system to operate automatically. *(600 volts and under)*

Servicing the generator set when it is operating. Exposed moving parts will cause severe injury or death. Keep hands, feet, hair, clothing, and test leads away from the belts and pulleys when the generator set is running. Replace guards, screens, and covers before operating the generator set.

Heavy Equipment

WARNING	
	**Lifting eye failure.** **Improper lifting can cause severe injury or death and equipment damage** Do not lift the generator set from the engine or alternator eyes. Never stand under a unit being lifted. Always maintain a safe distance from the unit being lifted. See the lifting instructions in the installation manual that was provided with the unit.

Hot Parts

WARNING	
	**Hot coolant and steam.** **Can cause severe injury or death.** Before removing the pressure cap, stop the generator set and allow it to cool. Then loosen the pressure cap to relieve pressure. Fill system before starting unit.

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

Servicing the alternator. Hot parts can cause severe injury or death. Avoid touching the alternator field or exciter armature. When shorted, the alternator field and exciter armature become hot enough to cause severe burns.

Servicing the exhaust system. Hot parts can cause severe injury or death. Do not touch hot engine parts. The engine and exhaust system components become extremely hot during operation.

Notice

NOTICE

Parallel Operation. This product includes features intended to support operation in parallel with the utility grid, but these features have not been evaluated for compliance with specific utility interconnection protection standards or requirements.

NOTICE

Canadian installations only. For standby service connect the output of the generator set to a suitably rated transfer switch in accordance with Canadian Electrical Code, Part 1.

This manual provides generator set operation, maintenance, and basic troubleshooting instructions. A separate controller operation manual contains detailed controller operation information.

Wiring diagram manuals are available separately. Refer to the engine operation manual for generator set engine scheduled maintenance information.

Information 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 to 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 controller operation instructions, engine and alternator maintenance, and accessory information not provided in this manual. Figure 1 lists the available literature part numbers.

Several engine manufacturers provide engines with electronic controls. These 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. For the latest literature part numbers, see the respective generator set parts catalog.

Manual Description	**Literature Part No.**	
APM802 Controller Spec Sheet	G6-152	
Generator Set Installation Manual, KD Models	TP-7153	
Generator Set Maintenance Manual, KD Models	TP-7143	
Controller and Generator Set Service Manual	TP-7079	
Engine Operation and Maintenance Manual, KD18L06, KD700-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	
Alternator, Voltage Regulator, KD700	TP-7271	
Alternator, Voltage Regulator, KD700-KD1750 Wye/600 V	TP-7073	
Alternator, Voltage Regulator, KD1250-KD3250 Wye/600 V/4160 V	TP-7075	
Alternator, Voltage Regulator, KD2000-KD4000 6600-13800 V	TP-7076	
Alternator, Voltage Regulator, KD2000-KD2500 Wye/600 V	TP-7078	
Generator Set/Controller Wiring Diagram Manual w/APM802	**Original**	**With Updated Digital 8 I/O Module**
KD700-KD750 (APM603)	NA	TP-7262
KD700-KD750 (APM802)	NA	TP-7263
KD800-KD1000	TP-7106	TP-7242
KD1250A-KD1350 (single starter)	TP-7117	TP-7243
KD1250A-KD1350 (redundant starter)	TP-7117	TP-7244
KD1500-KD1750 (single starter)	TP-7071	TP-7245
KD1500-KD1750(redundant starter)	TP-7071	TP-7246
KD2000-KD2500(single starter)	TP-7107	TP-7247
KD2000-KD2500(redundant starter)	TP-7107	TP-7248
KD2800-KD3250 (single starter)	TP-7108	TP-7249
KD2800-KD3250 (redundant starter)	TP-7108	TP-7250
KD3500-KD4000	TP-7169	TP-7251
Remote Serial Annunciator III (RSA III)	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.

Nameplate Location

Generator sets and their components (engine, alternator) are identified with decals or nameplates. For future reference during routine maintenance or to order service parts, copy the model number, serial number, and specification number from the generator set nameplate into the spaces provided in the product information section on the inside front cover of this manual. The generator set nameplate is typically located on the alternator assembly as shown below.

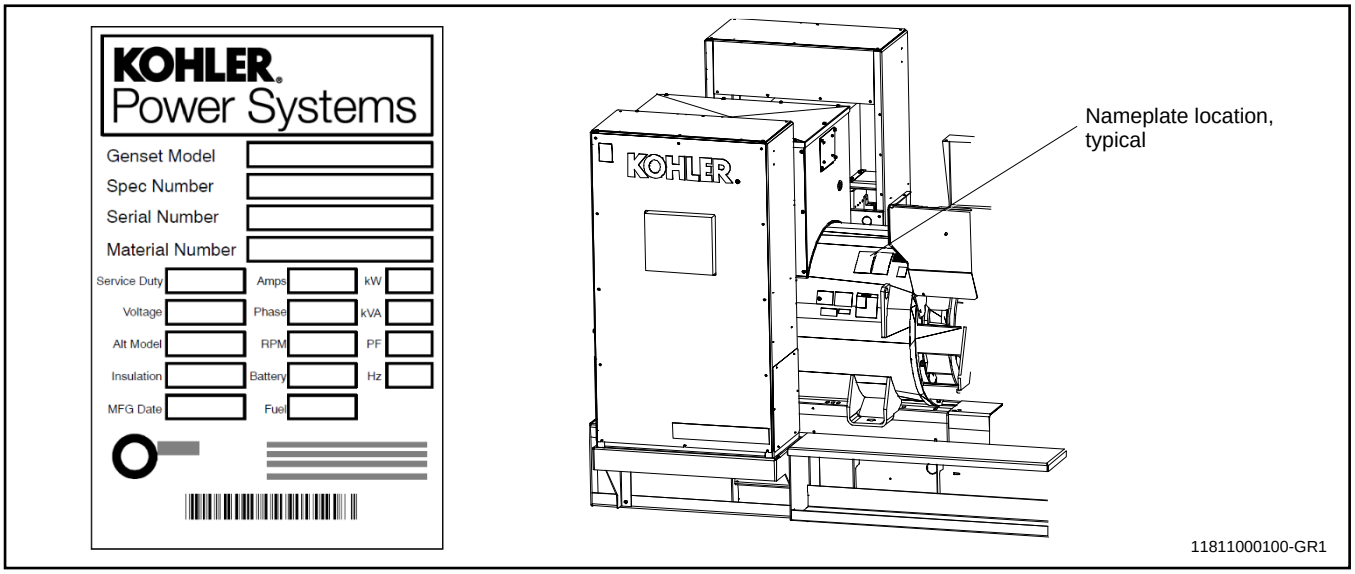

Figure 2 Generator Set Nameplate and Location, Typical

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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East China Regional Office, Shanghai
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Fax: (86) 21 6288 0550

India, Bangladesh, Sri Lanka

India Regional Office
Bangalore, India
Phone: (91) 80 3366208
(91) 80 3366231
Fax: (91) 80 3315972

Japan, Korea

North Asia Regional Office
Tokyo, Japan
Phone: (813) 3440-4515
Fax: (813) 3440-2727

1.1 Introduction

The spec sheets for each generator set provide model specific generator and engine information. The controller spec sheet provides specifications for the controller. Refer to the respective spec 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

1.2.1 Controller Specifications

- Power Supply Requirements:
  - Nominal voltage: 24 VDC, reverse polarity protected
  - 240 VAC/60Hz customer-supplied; factory wiring to basic electrical package available
- Operating Temperature: - 40°C to 70°C (- 104°F to 158°F)
- Storage Temperature: - 40°C to 70°C (- 104°F to 158°F)
- Humidity: 5% to 95% non-condensing
- Protection Index:
  - IP65 Front
  - IP20 Rear
- Standards:
  - NFPA 99
  - NFPA 110, Level 1
  - CSA 282-09
  - UL 508
  - IEC/EN60068-2-52 (salt spray)
  - CE Directive

1.2.2 Display and Touchscreen

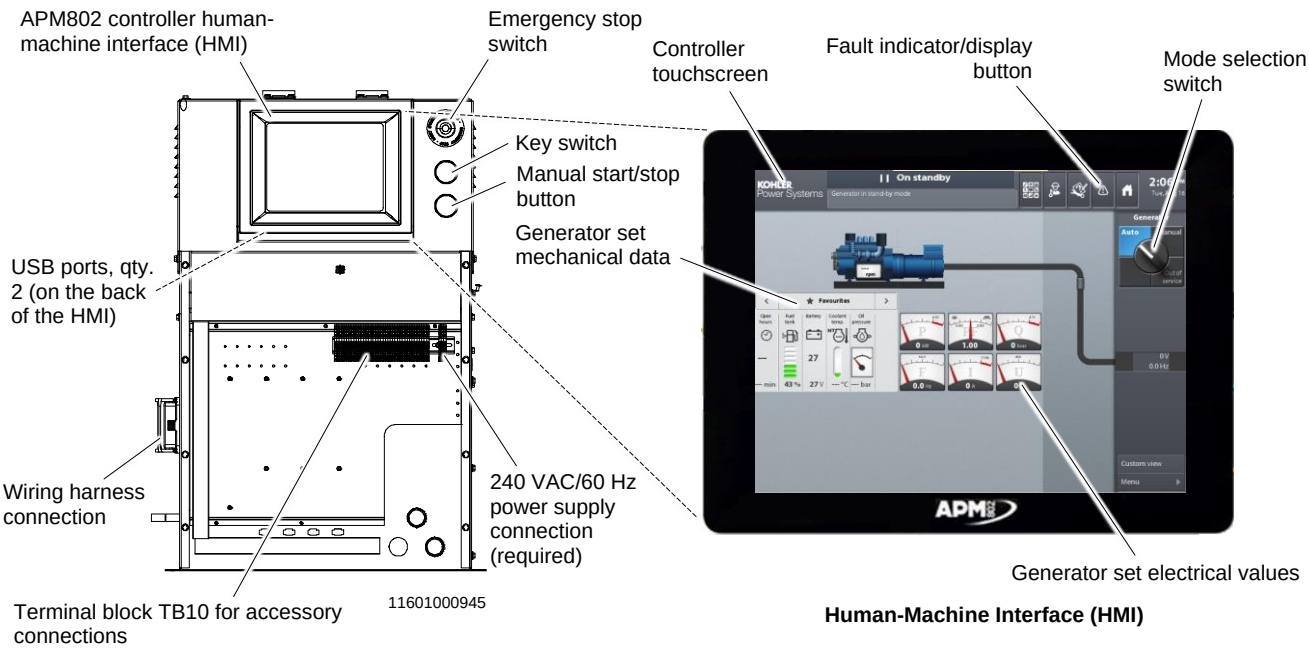
- Type: XGA TFT LED LCD
- Screen Size: 305 mm (12 inches)
- Viewing Angle: 140° horizontal and vertical
- Languages: English, French

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

1.3 Controller Features

The controller features include a 307 mm (12.1 inch) touchscreen with backlight and wide viewing angle (140° horizontal and vertical) and terminal blocks for input and output connections. See Figure 3 for an illustration of the controller front panel and the customer connection area. Controller features include:

- 12-inch touchscreen with backlight and wide viewing angle for easy local access to data.
- System settings are password-protected.
- Measurements selectable in metric or English units.
- User language is selectable (English or French).
- Graphic displays show generator set mechanical values including operating hours, fuel level (where applicable), battery voltage, coolant temperature, oil pressure, and oil temperature.
- Meter displays provide a visual representation of generator electrical values including power (kW), power factor, reactive power (kVAR), frequency, voltage, and current (amps).
- Two USB ports allow connection of a flash drive, mouse, or keypad.
- Electrical data, mechanical data, and system settings can be saved to a flash drive.
- Recording feature allows data collection of key values.
- Ethernet port allows connection to a PC type computer and/or Ethernet switch.
- Serial (RS-485) port.
- The controller supports Modbus® RTU and TCP protocols.
- Real time clock with battery back-up.
- See the controller specification sheet or operation manual for input and output specifications.



Note:
Covers have been removed for illustration.

Figure 3 APM802 Controller and Customer Connection Box

Modbus® is a registered trademark of Schneider Electric.

1.3.1 Connections

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

Inputs and outputs from the controller base module are brought out to TB10 in the connection box. See the figure titled: APM802 Controller and Customer Connection Box for the terminal block location. Do not connect directly to the controller base module (except for the Ethernet 3 connection).

TB10 Terminal Strip for input and output connections. See the generator set wiring diagram for connections. Inputs and outputs are factory-set; the default settings are shown in the Base Module Inputs and Outputs Section.

240 VAC Power Connection. The installer must connect a 240 VAC power source for the controller heater. See Controller Features Section and the wiring diagram for the 240 VAC power connections to TB10.

Mini USB Connectors for connection to a PC for firmware updates or saving data files. Two USB ports are located on the back of the controller's human-machine interface (HMI). See Figure 4. Lift the hinged panel to access the USB ports.

Ethernet 3 port on the base module can be connected to a personal computer or network to allow remote monitoring using VNC.

Additional input and output connections are available with optional module kits. See the Accessories section for accessory connection details.

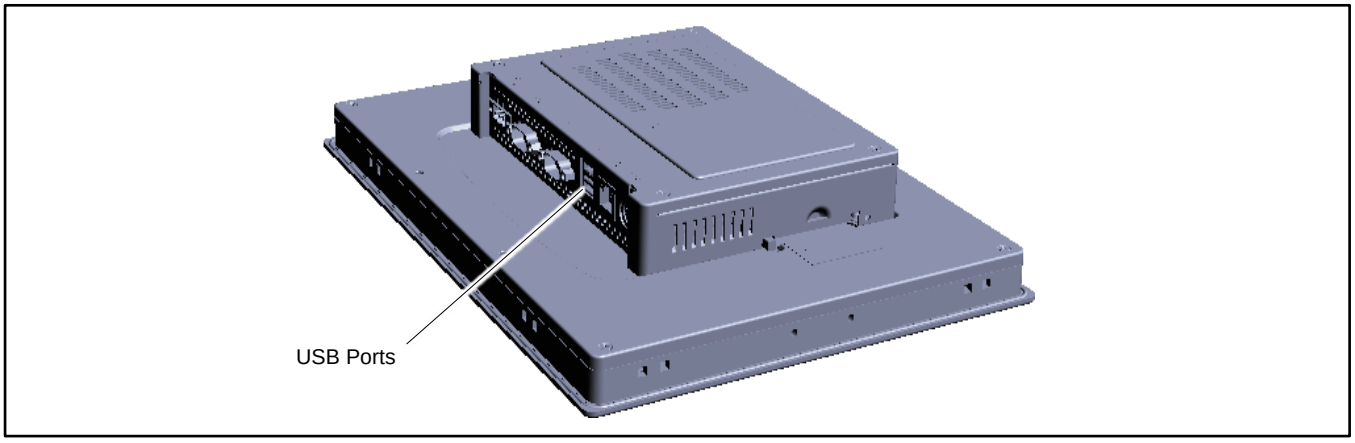


Figure 4 USB Ports (back of HMI)

1.3.2 Modbus Connections

Use RS-485 cable for Modbus RTU connections. Belden #9841 or equivalent shielded, twisted-pair cable is recommended. See Figure 5. See the generator set wiring diagram for the Modbus connection location on TB10.

The controller also supports Modbus TCP over Ethernet. Connect to the RJ45 port labeled Ethernet 3 on the controller's base module.

The controller communicates using Modbus® as a slave connection with the Modbus® master initiating the communication. The controller seeks the system and alternator parameters and diagnostic information then responds back to the Modbus® master.

Note:
Only one Modbus® master can be connected to the controller. Examples include the remote serial annunciator and switchgear applications.

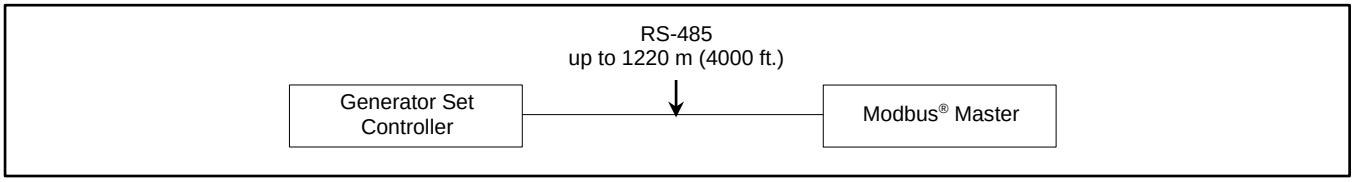


Figure 5 Modbus® Connections

1.3.3 Optional Keyswitch and Manual Start/Stop Button

Some controllers are equipped with the optional keyswitch and manual start/stop button shown in Figure 6. See the Controller Features Section for the location on the controller assembly.

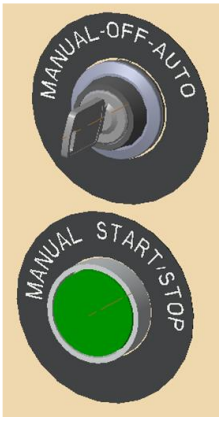


Figure 6 Optional Keyswitch and Manual Start/Stop Button

Keyswitch. The keyswitch disables the mode pushbutton on the controller touchscreen. The touchscreen will display the operation mode, but the mode cannot be changed using the touchscreen if the controller is equipped with the keyswitch. The keyswitch positions are described in Figure 7. See the Controller Operation Modes section for more information on controller operation modes.

Manual Start/Stop Button. When the keyswitch is in the Manual position, pressing the Start/Stop button will start and stop the generator set.

Note:
Pressing the manual stop button shuts down the generator set immediately, without running the engine cooldown cycle. Running the generator set without load for 5 minutes before stopping manually is recommended.

Position	Description
Manual	Allows generator set start and stop using the manual pushbutton.
Off	Places the generator set in OFF/Out of Service mode. The generator set will not start, even if a remote start command is received or the Start button is pressed.
Auto	Automatic operation allows a remote switch or automatic transfer switch to start and stop the generator set.

Figure 7 Keyswitch Positions

1.4 NFPA Requirements

In order to meet NFPA 110, Level 1 requirements, the generator set controller monitors the engine/generator functions and faults shown below.

Engine functions:

- Overcrank
- Low coolant temperature warning
- High coolant temperature warning
- High coolant temperature shutdown
- Low oil pressure shutdown
- Low oil pressure warning
- Overspeed
- Low fuel level *
- Low coolant level
- EPS supplying load
- High battery voltage
- Low battery voltage
- Air damper indicator

General functions:

- Master switch not in auto
- Battery charger fault †
- Contacts for local and remote common alarm
- Audible alarm silence switch
- Remote emergency stop

* Function requires optional input sensors or kits.

1.5 Parameter Settings

Controller parameter settings are factory-set and password-protected. Selected settings are shown in Figure 8. If changes are required, contact your distributor.

Parameter	Setting
Preheat duration*	0 s
Air-preheater maximum delay (at each start attempt)*	30 s
Number of starting attempts	3
Time between starting attempts	15 s
Fault inhibition time in starting phase	10 s
Auxiliaries start time	5 s
Generators starting maximum delay (Dead Bus synchronizing)	5 s
Generator cooling time	300 s (5 min.)
Generator immobilization time	5 s
Ventilation time after generator stopped	10 s
* Parameter settings not applicable for KD2000-KD4000	

Figure 8 Factory Settings

1.6 Base Module Inputs and Outputs

The inputs and outputs on the base module are factory set. See Figure 9 and Figure 10 for base module input and output factory settings. For optional input/output module settings, see the Accessories section.

Note:
Make customer connections to TB10 in the connection box. See the generator set wiring diagram for details.

Inputs		Factory Setting
Digital Inputs	DI0	Remote Start
	DI1	Low Fuel Level Switch
	DI2	Breaker Open Status
	DI3	Remote Reset
	DI4	Aux Shutdown
	DI5	High Fuel Level Switch
	DI6	Aux Warning
	DI7	Low Oil Level
	DI8	Battery Charger Fault
	DI9	Fuel Leak Alarm
	DI10	Idle Mode
	DI11	GFCI Tripped
	DI12	Remote Speed Adjust Enable
	DI13	Key Switch Enable
	DI14	Load Shed Enable
	DI15	Overcrank Test
	DI16	Reserved for Factory Use
	DI17	Emergency Stop
Analog Input	AI0-	Remote Speed Adjust (+/- 10 VDC)
	AI0+	
Resistive Input	RES0-	Ambient Air Temperature
	RES0+	

Figure 9 APM802 Base Module Input Factory Settings

Outputs		Output Relay Configuration	Factory Setting
Digital Outputs	DO0	Form C	Common Fault
	DO1	Form C	System Ready
	DO2	Form C	Common Warning
	DO3	Form C	Reserved for Factory Use
	DO4	Form A	Horn
	DO5	Form A	Low Coolant Temp Warning
	DO6	Form A	Shunt Trip
	DO7	Form A	Not in Auto
	DO8	Form A	BCA Excitation
	DO9	Form A	Generator Running
	DO10	Form A	EPS supplying Load
	DO11	Form A	ECU Fault Reset
	DO12	Form A	Low Oil Pressure
	DO13	Form A	High Coolant Temp
	DO14	Form A	Low Coolant Level Fault
	DO15	Form A	Low Fuel Level
	DO16	Form A	Start Button Illuminate
	DO17	Form A	Watchdog

Figure 10 APM802 Base Module Output Factory Settings

2.1 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	
	**Hazardous voltage. Moving parts. Will cause severe injury or death.** Operate the generator set only when all guards and electrical enclosures are in place.

Air Cleaner. Check for a clean and installed air cleaner element to prevent unfiltered air from entering engine.

Air Inlets. Check for clean and unobstructed air inlets.

Battery. Check for tight battery connections. Consult the battery manufacturer's instructions regarding battery care and maintenance.

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.

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.

Enclosure Doors, if equipped. Check that the service access doors are closed and secured. Leaving the doors open will create excessive noise.

Exhaust System. Check for exhaust leaks and blockages. Check the silencer and piping condition and check for tight exhaust system connections.

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 (blowby). Check for carbon or soot residue on exhaust components. Carbon and soot residue indicates an exhaust leak. Seal leaks as needed.

Fuel Level. Check the fuel level and keep the tank(s) full to ensure adequate fuel supply.

Controller Check. Touch the controller screen to verify that it turns on. The controller screen dims automatically after a period of time with no activity.

Oil Level. Maintain the oil level at or near, not over, the full mark on the dipstick.

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.

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.

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. This visual inspection should be routinely done while the unit is running.

2.2 Operation in Cold Weather Climates

Cold weather operation is generally considered ambient temperatures 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 240 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 respective spec sheet for temperature recommendations in available options.
- The **controller heater** is required for operation below - 20°C (- 4°F). The controller heater is a standard feature. Make sure that 240 VAC power for the heater is connected as shown on the generator set wiring diagram.
- A **battery heater** is generally recommended for most units when operated below 0°C (32°F). Refer to the respective spec sheet for model availability.
- An **alternator heater** to prevent moisture and frost buildup is available for most generator sets.

2.3 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.

2.3.1 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 aftertreament 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.

2.4 Generator Set Operation

2.4.1 Start Signal

A start signal includes the following:

- Remote start signal via contacts 3 and 4 when the controller is in AUTO mode. The remote start contacts may be connected to an ATS (used during a power outage, exercise period, etc.) or a remote panel.
- Engine Start signal from the controller. Put the controller into Manual mode. Then press the Engine Start button on the screen.

Note:
The engine crank cycle is 15 seconds cranking and 15 seconds rest for 3 cycles.

2.4.2 Stop Signal

A stop signal includes the following:

- Removal of start signal via contacts 3 and 4 when the controller is in AUTO mode. The remote start contacts may be connected to an ATS (used during a power outage, exercise period, etc.) or a remote panel.
- Engine Stop signal from the controller when it is in Manual mode. Press the Engine Stop button on the screen.
- Emergency Stop signal. See the Emergency Stop section.

2.4.3 Engine Cooldown

Engine Cooldown 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. Also, if stopping due to a remote stop signal, a cooldown cycle begins. The engine runs for 5 minutes in the cooldown cycle.

Note:
No engine cooldown cycle occurs if the Engine Stop button is pressed (in manual mode), the Emergency Stop button is pressed, or if a fault occurs. The shutdown is immediate. If possible, run the generator set without load for 5minutes to ensure adequate engine cooldown.

2.4.4 Emergency Stop

Use the controller emergency stop switch for immediate emergency shutdown.

The emergency stop switch bypasses the engine cooldown cycle and immediately shuts down the generator set.

Note:
Use the emergency stop switch(es) for emergency shutdowns only. Use the controller’s Manual mode or a remote stop switch for normal shutdowns.

The controller alarm (fault) button flashes red and the unit shuts down when the local emergency stop switch is activated (pressed).

Use the following procedure to reset the generator set after shutdown by a local or remote emergency stop switch.

1. Investigate and correct the cause of the emergency stop.
2. Reset the controller emergency stop switch by pulling the switch dial outward and/or reset the remote emergency stop switch (if equipped).
3. Reset the fault on the APM802 controller. See the Events section for instructions.
4. After resetting all faults using the controller reset procedure, place the controller into Auto mode or use Manual mode to restart the generator set. The generator set will not crank until the reset procedure completes.

2.4.5 Idle Mode

The generator set controller must be in AUTO mode for idle mode operation. Idle mode requires a customer-supplied idle switch connected across terminals 5 and 6 on terminal block TB10.

When the idle switch on contacts 5 and 6 closes, the engine runs at low speed (1000 RPM) for 5 minutes. The engine then ramps up to normal speed and voltage and continues to run until the idle switch opens. After the idle switch opens, the engine continues to run through the cooldown cycle and then shuts down.

2.5 Controller Operation Modes

The controller operation includes several types of starting and stopping functions. There are three primary modes of operation, selected from the controller touchscreen or the optional keyswitch:

- **Auto** (Automatic mode)
- **Manual**
- **Out of Service** (Off mode)

See Figure 11 for the location of the mode selection switch on the controller touchscreen. See the Optional Keyswitch and Manual Start/Stop Button section for more information about the optional keyswitch.

The **Emergency Stop** button and the optional remote emergency stop switch will stop the generator set immediately, with no engine cooldown period.

The three operation modes are summarized in the Operation Mode Summary table and briefly described in the following sections.

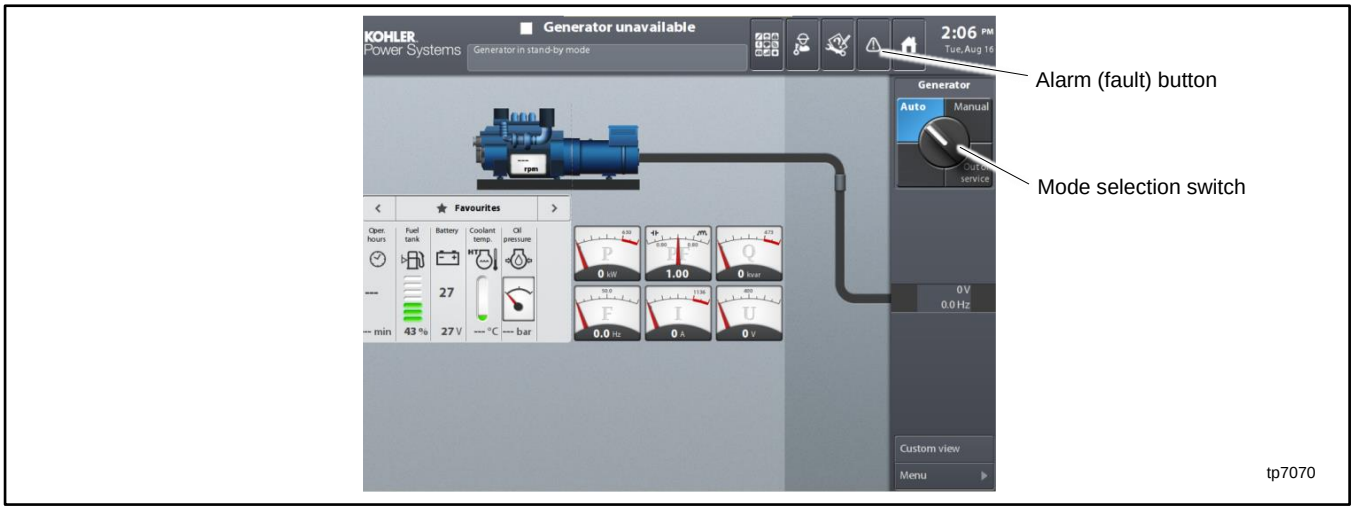


Figure 11 Controller Mode Selection Switch

Operating Mode	Action/Event	Operation	Notes
AUTO	Press Auto or place the optional keyswitch into the AUTO position (if equipped).	Responds to remote start/stop commands from an ATS or remote start panel. *	Auto is the recommended mode.
	Idle switch on contacts 5 and 6 closes.	Engine runs at 1000 RPM for 5 minutes, then ramps up to normal speed and voltage. *	Customer-supplied idle switch is required for idle mode operation. Controller must be in Auto for idle mode operation.
	Idle switch on contacts 5 and 6 opens.	Engine runs through the 5 minute cooldown, then shuts down.	
	A warning condition occurs.	Fault button flashes orange. Horn may sound, if connected.	See the Events section for instructions to view faults and warnings (alarms).
	A fault condition occurs.	Generator set shuts down and the fault button flashes red. The mode changes to Out of Service mode. Horn may sound, if connected.	

MANUAL	Press Manual or place the optional keyswitch into the Manual position (if equipped).	Engine can only be started and stopped using the engine start/stop buttons on the touchscreen or the manual start/stop button (if equipped). *	Engine start/stop is controlled manually by the operator. If equipped with the optional keyswitch and manual Start/Stop button, the engine start and stop buttons on the controller touchscreen are disabled. Use the manual Start/Stop button. Wait 5 minutes after opening the circuit breaker for engine cooldown before pressing Engine Stop.
	Press the Engine Start button or the manual Start/Stop button (if equipped).	Starts the engine if there are no active faults. *	
	Press the Engine Stop button or the manual Start/Stop button (if equipped).	Stops the engine immediately, with no engine cooldown.	
OUT OF SERVICE	Press the Out of Service button or place the optional keyswitch into the OFF position (if equipped).	Stops the engine immediately, with no cooldown. System is locked and generator startup is not possible.	Put the generator set into Out of Service (OFF) mode and disable the generator set during maintenance or service.
	Generator set shuts down on a fault.		A fault shutdown automatically puts the generator into Out of Service Mode. See the Events section for instructions to view and reset faults (shutdowns or warnings).
* The E-Stop button overrides the manual engine start/stop buttons and remote start signals. The engine will not start if the E-Stop button is activated.			

Figure 12 Operation Mode Summary

2.5.1 Out of Service Mode

Pressing the Out of Service button on the controller touchscreen disables the generator set to prevent starting during generator set maintenance or service. The generator set remains off and will not respond to a remote start signal. If the generator set is running, pressing the Out of Service button immediately shuts off the generator set, with no engine cooldown.

If a fault causes the generator set to shut down, the controller automatically enters the Out of Service mode.

Note:
To disable the generator set before servicing, shut down the generator set, place in Out-of-Service mode, and disconnect the batteries negative (-) lead first.

2.5.2 Manual Mode

In manual mode, engine start and stop are controlled manually by the operator using the Engine Start and Engine Stop buttons on the controller's touchscreen. If the controller is equipped with an optional keyswitch and manual start/stop button, use the start/stop button for manual operation in the procedures below.

Manual start procedure, with optional keyswitch

1. Turn the key to the Manual position. check that the controller touchscreen shows that the unit is in MANUAL mode.
2. Check the mechanical parameters (battery voltage, etc.) and verify that there are no faults.
3. To start the generator set, press the manual Start/Stop button. The engine speed, voltage, and frequency will be displayed on the controller screen.

Manual start procedure, without optional keyswitch

1. Press and hold the Manual button on the controller's touchscreen until Manual turns green.
2. Release the Manual button. The Engine Start button appears on the controller touchscreen.
3. Check the mechanical parameters (battery voltage, etc.) and verify that there are no faults.
4. To start the generator set, press Engine Start on the controller touchscreen. The engine speed, voltage, and frequency will be displayed on the controller screen.

Manual stop procedure

Note:
Pressing Engine Stop causes the generator set engine to stop immediately, without running the engine cooldown cycle.

The controller must be in Manual mode. Follow these steps to allow engine cooldown before stopping the generator set.

1. Remove the load from the generator set.
2. Wait five minutes to allow the engine to cool down.
3. To stop the generator set, press Engine Stop on the controller touchscreen or press the manual Start/Stop button (if equipped).

2.5.3 Auto Mode (Standby or System Ready)

The generator set is waiting for a start signal. The generator set will start and run when a start signal is received via a remote start signal or a local start signal.

The generator set will start when it receives a start signal. If the generator set is not in Automode, it will not start.

When the start signal is removed, the generator set will continue to run through the engine cooldown cycle, and then shut down.

Idle Mode

If the generator set is equipped with an idle mode switch across contacts 5 and 6, the engine can operate in idle mode. When the idle mode switch closes, the engine runs at low speed (1000 RPM) for 5 minutes and then ramps up to normal speed and voltage. Idle Mode is displayed in the status message area on the controller screen. When the idle mode switch opens, the engine runs through the cooldown cycle and then shuts down.

The controller must be in Auto mode for idle mode operation.

2.6 Load Shed

The manual key switch/ load shed module is available as an optional kit.

The load shed function drives outputs to four Form C dry contacts to remove non-critical loads. If the generator set load reaches or exceeds the level set in power threshold #9, loads are shed until the total load drops below the threshold level.

Loads are added again when the total load drops below the level in threshold #9. Factory-set time delays ensure that the load is stable before loads are shed or added. Load 1 is shed first and added last. Load 4 is shed last and added first.

The load shed level is set in Power Threshold 9 on the APM802 controller. The factory default setting for threshold 9 is 90%. The threshold setting can be changed in Screen 1.2 after logging in with the operator's password. See the Operator Login and the Menu 1- Settings sections.

Do not connect critical loads to the load shed outputs. Only connect low-priority loads that can be disconnected when necessary.

Connection

Controllers with load shed capability are equipped with a Manual Key Switch/Load Shed digital I/O Module, which is factory-installed in the first position. Connect up to four non-critical loads to Load Shed Outputs 1 through 4 on the Manual Key Switch/Load Shed Module. See Figure 14. The load shed outputs are Form C contacts. Connect to the normally open (NO) or normally closed (NC) contacts as required for the application.

Load	Power Threshold *	Load Shed (Disconnect) Time Delay	Load Add (Reconnect) Time Delay	Displayed as
1	#9	5 seconds	60 seconds	O #0
2	#9	5 seconds	45 seconds	O #1
3	#9	5 seconds	30 seconds	O #2
4	#9	5 seconds	15 seconds	O #3
* Default setting = 90%. Power threshold setting can be changed by the technician.				

Figure 13 Load Shed Settings

Operation

The outputs are activated and loads are shed when the total generator set load reaches the level set in power threshold #9. Load 1 (output #0) is shed first. Additional outputs are activated every 5 seconds as shown in Figure 13 until the total load drops to the threshold value or all four non-critical loads are shed. Messages on the main screen will indicate that load shed outputs 1 through 4 are active.

If all four loads are shed, the generator set will continue to run if the load remains at or below 100% of the rated load.

When the generator set load drops below the level in threshold 9, the outputs are deactivated one at a time starting with Load 4 (output #3), reconnecting the loads. Adjust the loads, if necessary to avoid cyclic adding and shedding around the threshold #9 level.

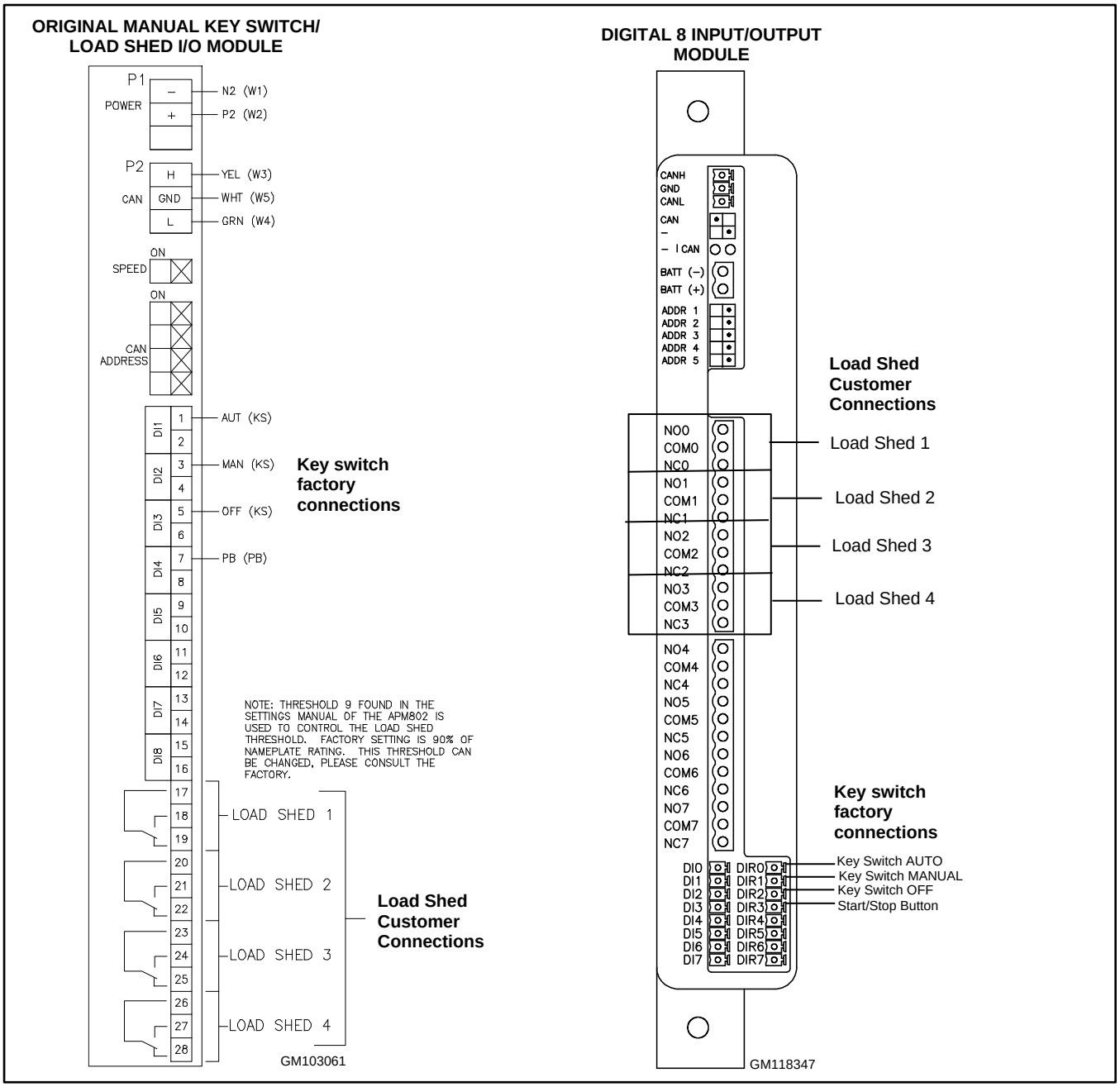


Figure 14 Load Shed Output Connections

2.7 HMI Screen Layout

2.7.1 Home Screen

The home screen of the APM802 controller's human-machine interface (HMI) contains status messages, navigation buttons, data displays, and controls described briefly in the following sections. See Figure 15.

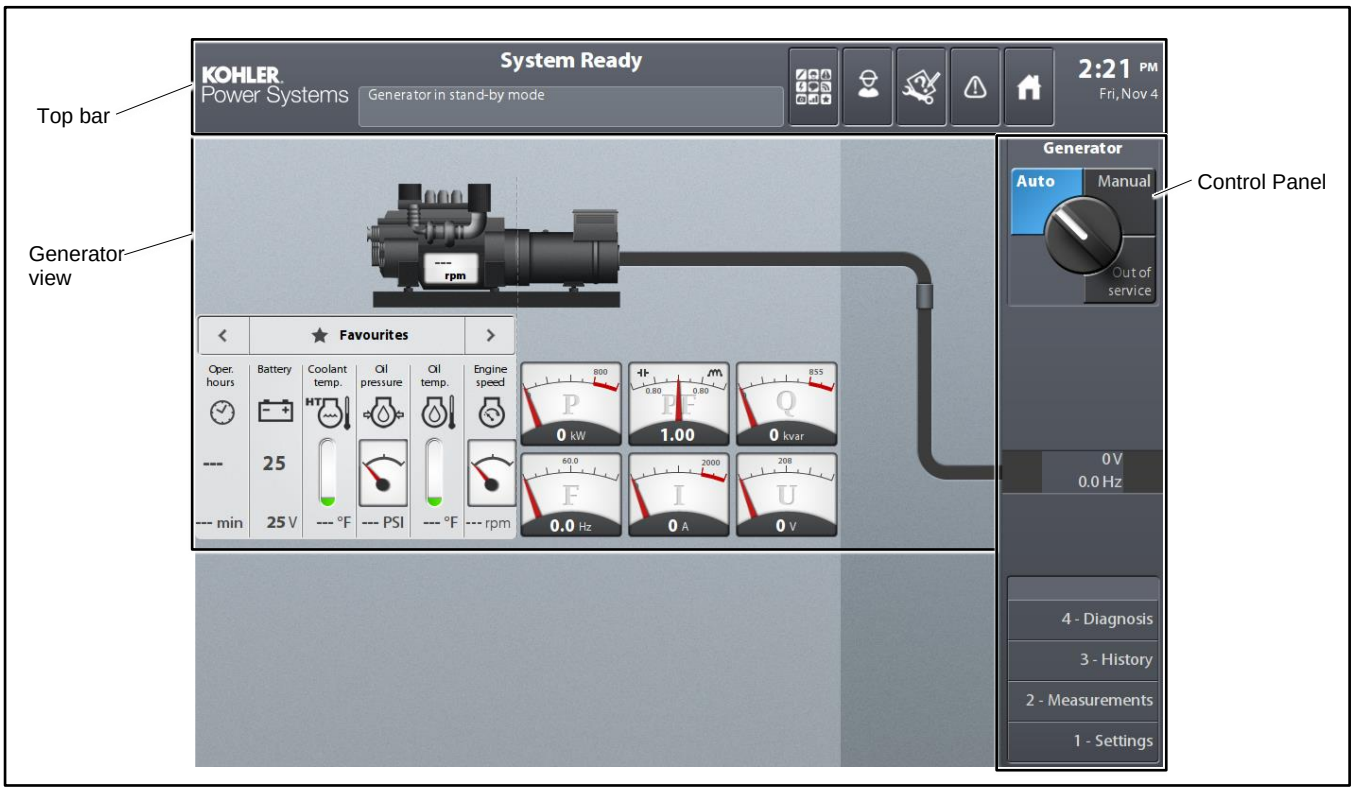


Figure 15 Home Screen

2.7.2 Top Bar

The top bar is always present. It displays system information and status messages, and includes shortcut buttons for quick access to other screens.

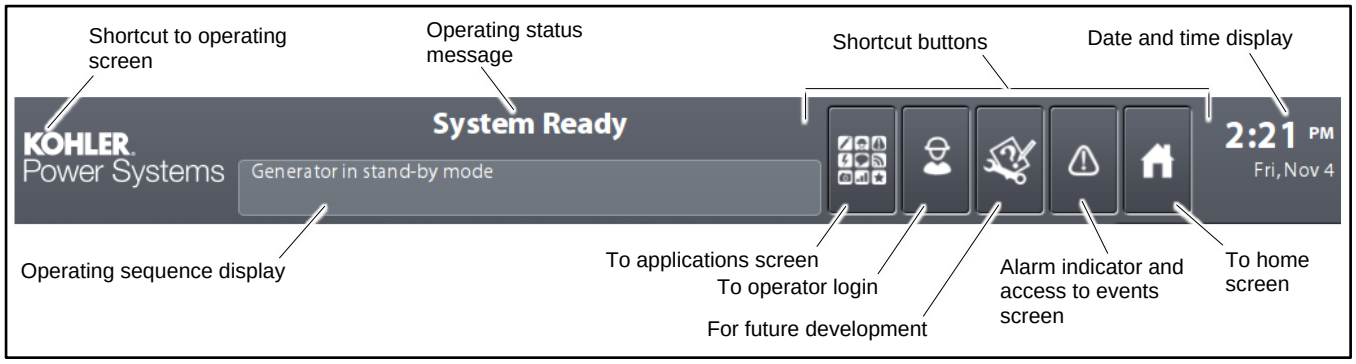


Figure 16 Top Bar

2.7.3 Generator View

The generator view displays engine mechanical data and alternator electrical data. When in manual mode, the Engine Start button also appears. See Figure 17.

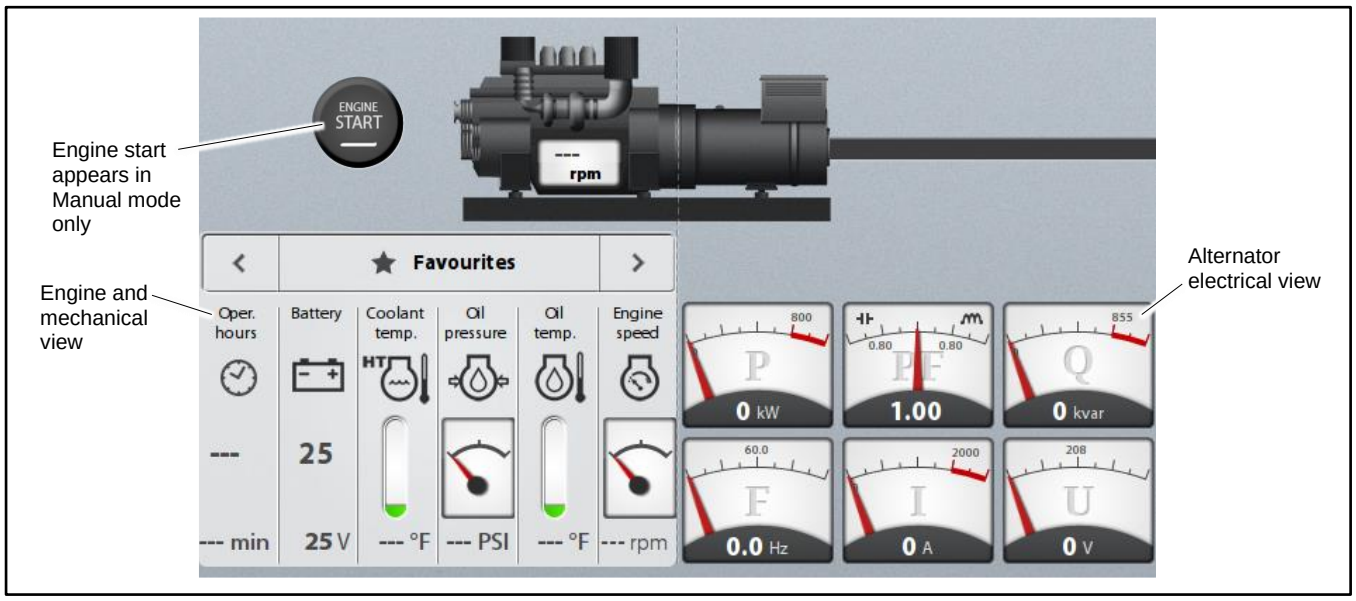


Figure 17 Generator View

2.7.4 Control Panel

The control panel includes the generator set master switch and other controls. See Figure 18.

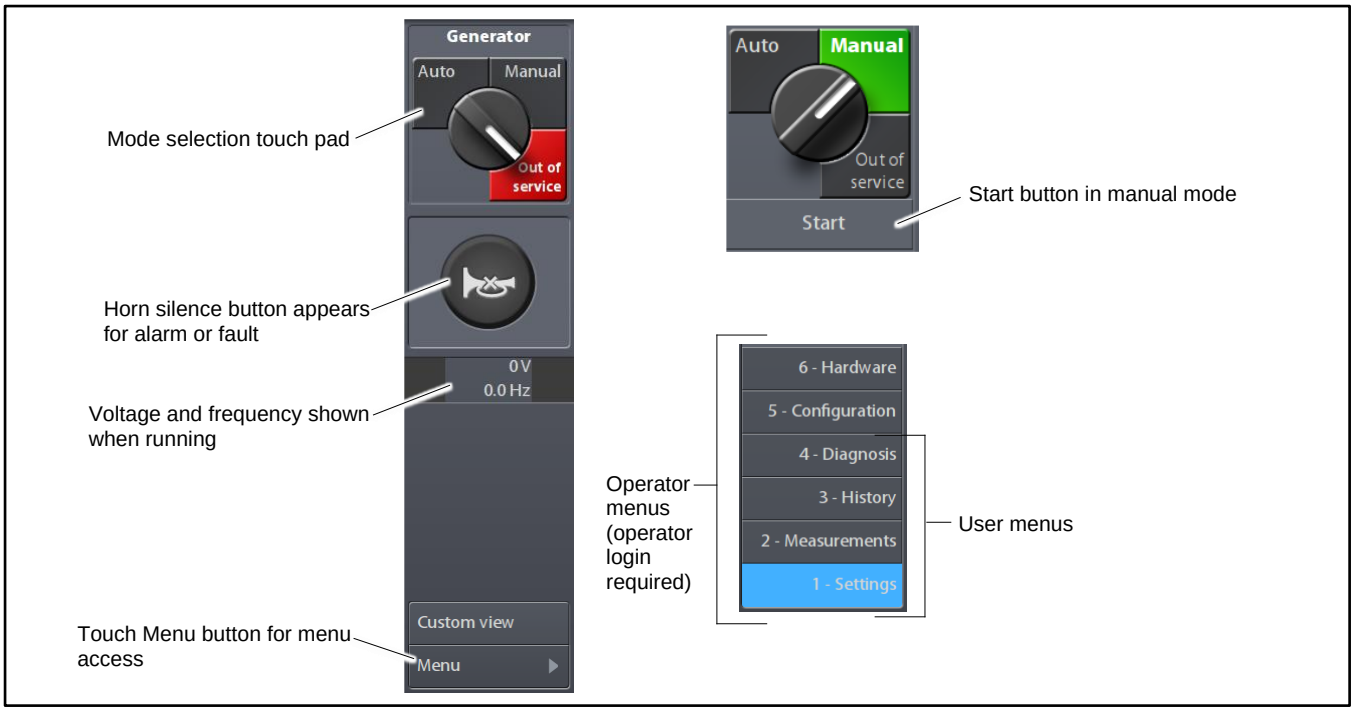


Figure 18 Control Panel

2.7.5 Custom View Button

On medium voltage units equipped with thermocouple modules, touch the custom view button to see alternator temperature readings from the thermocouple modules.

If no thermocouple modules are installed, 32°F (or 0°C) is displayed for all temperatures. If nothing is connected to one channel on a thermocouple module, - 58°F (or - 50°C) is displayed.

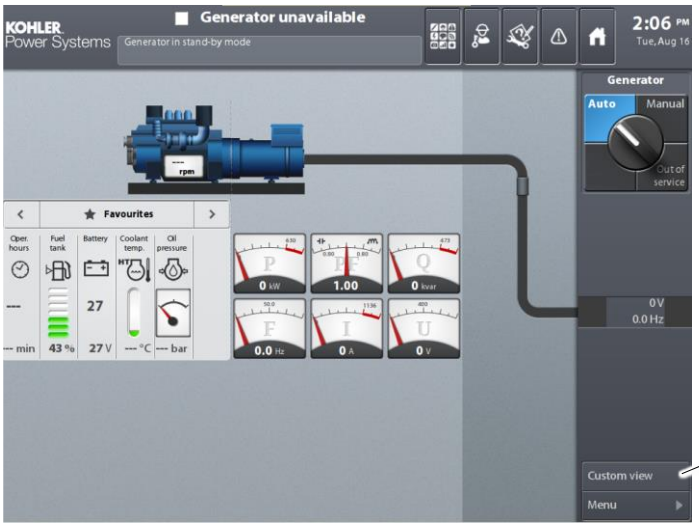


Figure 19 Custom View Button

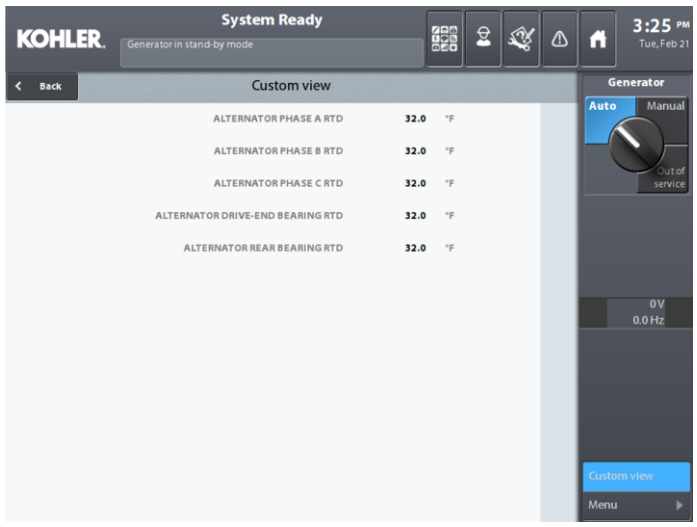


Figure 20 Custom View Temperature Display

2.8 Operator Login

Some functions require logging in as an operator.

1. Touch the Operator button. See Figure 22.
2. Use the virtual keypad to enter the login (1966).

Note:
When logging on as operator 1966, a password is not required.

When logged in as an Operator, the Modify button appears on screens where settings can be changed. See Figure 21 for an example.

The operator is automatically logged out after 10 minutes.

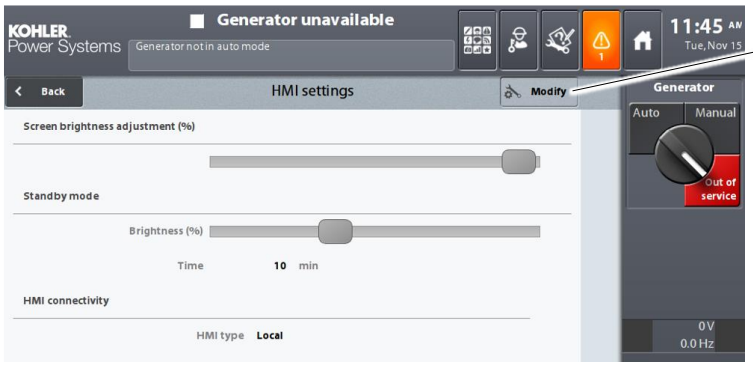


Figure 21 Modify Button

Figure 22 Operator Login

2.9 Data Displays

2.9.1 Generator Mechanical Values

Overview display

It is possible to display up to 6 mechanical values at the same time. By default, the following values are displayed:

- Working hours counter (number of operating hours)
- Fuel level (daily service tank or main tank)
- Starter battery voltage
- Coolant temperature (HT coolant temperature in the case of a dual circuit engine)
- Oil pressure
- Oil temperature

The display area showing six mechanical values is called the Favorites page. The content of this page can be altered at any time. Each mechanical value is represented by an information bar containing the information shown in Figure 23.

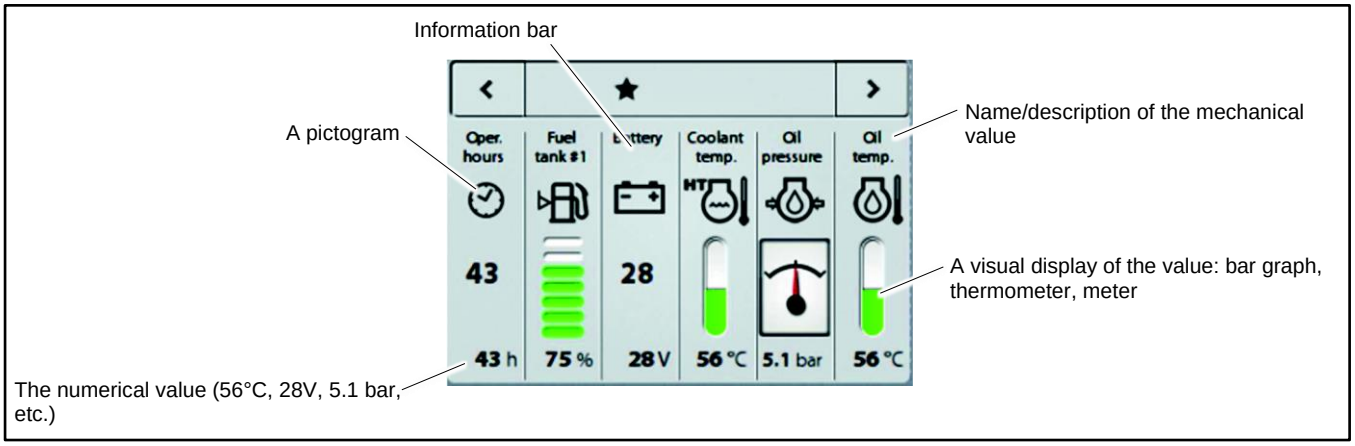


Figure 23 Favorites Page

The mechanical values can be scrolled through page by page. Press the < and > buttons to scroll through the pages. See Figure 24.

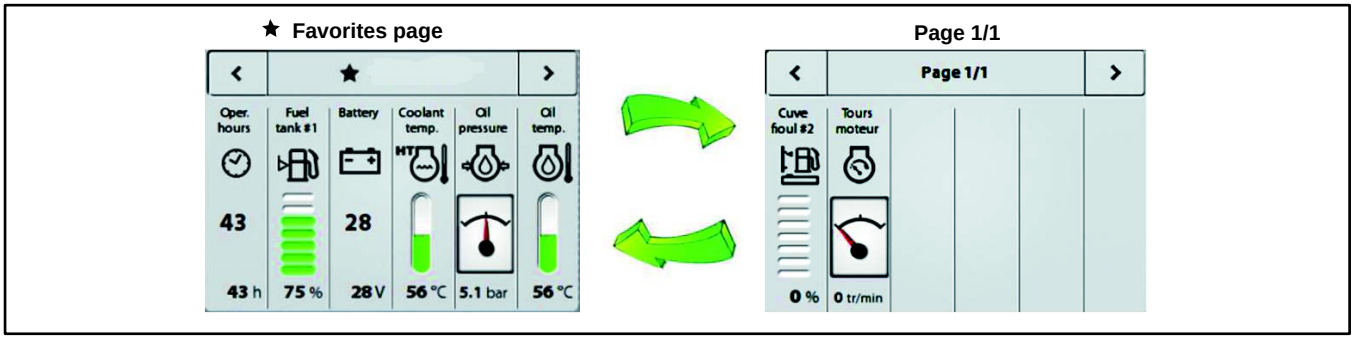


Figure 24 Scrolling within the Favorites Page

Detailed View

Pressing any area on an information bar on one of the mechanical value pages gives access to a detailed view of the selected mechanical value.

The example below shows a user pressing on the Oil pressure information bar.

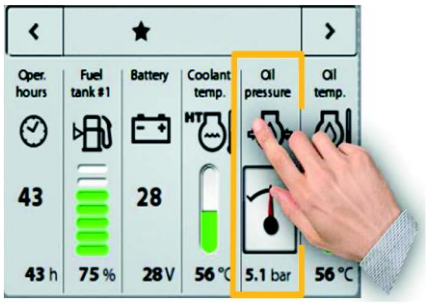


Figure 25 Information Bar Selection

Figure 26 Detailed Mechanical Values

From an overview display of 6 mechanical values, we switch to a detailed display of 3 mechanical values.

Three tabs also appear: Fuel, Engine, and Cooling. The mechanical values are all classed under these three tabs.

Under each tab, the mechanical values displayed can be accessed by pressing the < or > buttons in succession.

Once you zoom into each mechanical value, 2 or 3 additional buttons appear:

Favorites button

The **Favorites (+★)** button is used to select the 6 mechanical values most useful to the user. See Figure 27.

If the **Favorites (+★)** button is blue, the mechanical values appear on the ★ **Favorites** page (limited to six values).

If the **Favorites (+★)** button is gray, the mechanical values do not appear in the ★ **Favorites** page, but in another page.

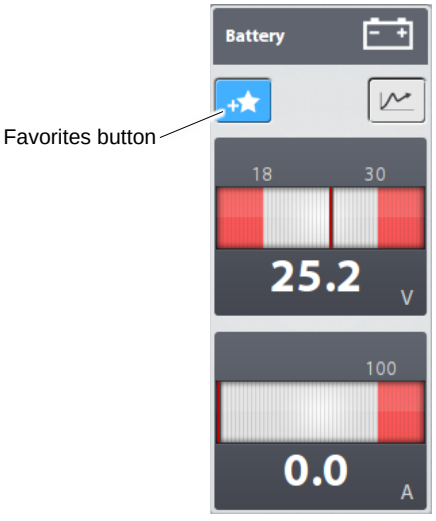


Figure 27 Favorites Button in the Detailed View

2.9.2 Generator Electrical Values

Overview display

Six electrical values are displayed and shown as meters. See Figure 28.

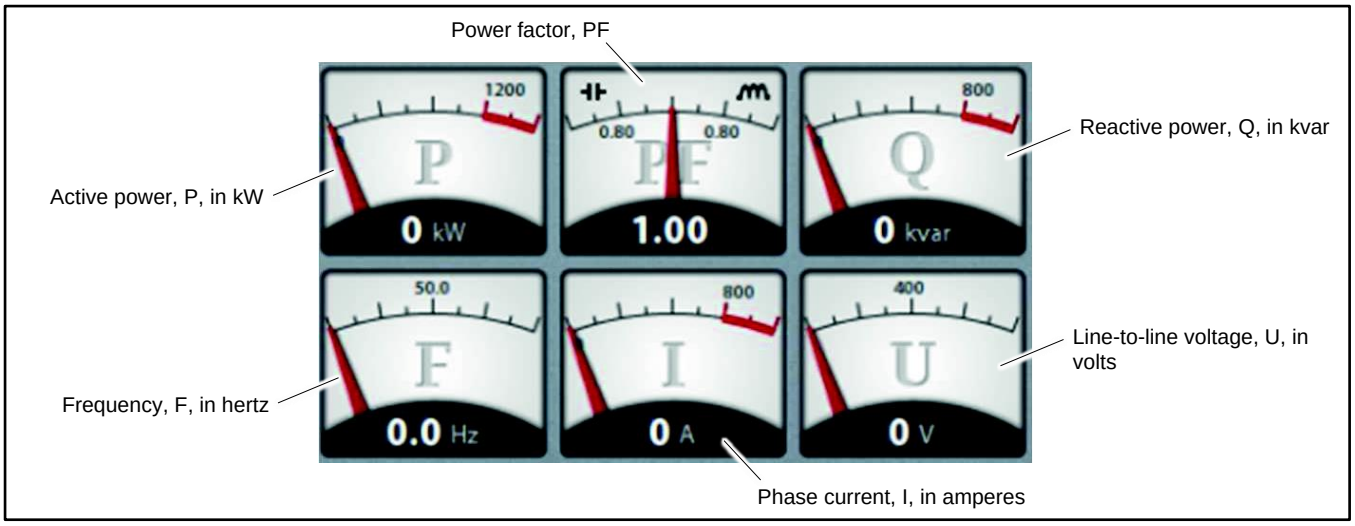


Figure 28 Electrical Values

Detailed display

Touching any area of a meter gives access to an expanded view of the selected electrical value. For an example, see Figure 29 and Figure 30.

- From an overview display of 6 electrical values, we switch to a detailed display of 3 electrical values.
- The electrical values which are not displayed can be accessed by pressing the > or < buttons in succession.

Figure 29 Electrical Values and Touching on Active Power

Figure 30 Detailed Electrical Values

2.9.3 Curve Display

When you zoom into each mechanical or electrical value, the Curve button appears. Touch the Curve button to view the change over a variable period in real time of one of the 6 electrical values of the overview display.

Figure 31 shows the location of the Curve button. See Figure 32 for an example of a curve display.

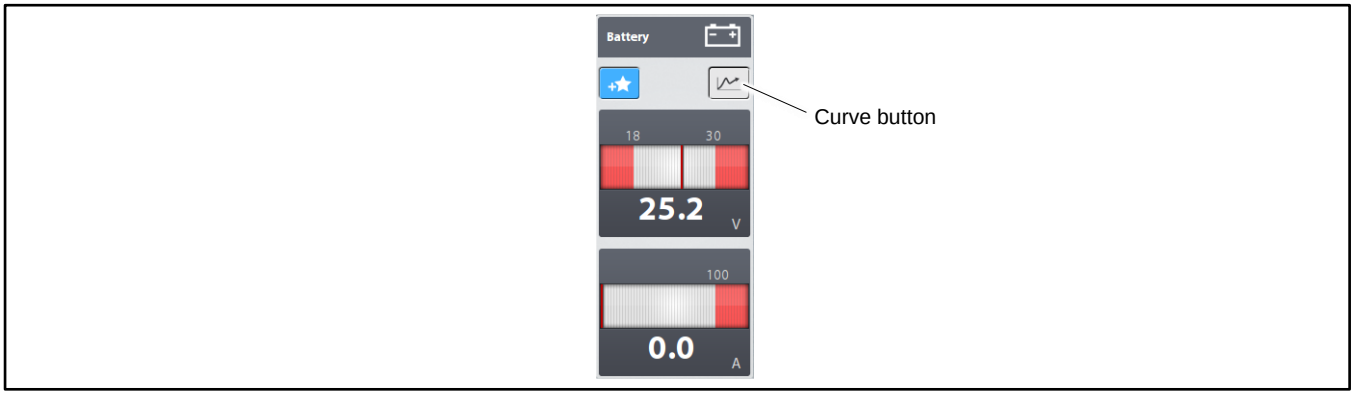


Figure 31 Curve Button on the Detailed View

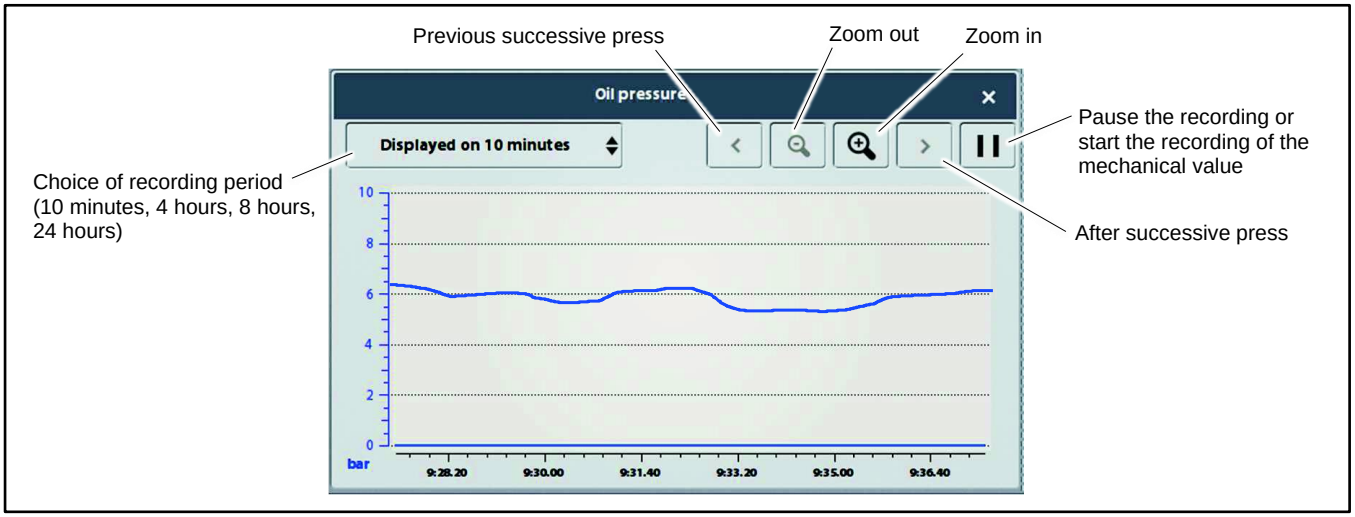


Figure 32 Oil Pressure Curve (example)

Touch the recording period to select the time period:

- 10 minutes: record values every 1 second
- 4 hours: record values every 30 seconds

- 8 hours: record values every 1 minute
- 24 hours: record values every 3 minutes

On any curve displayed on the screen, inserting a USB key into the HMI port makes the USB key button appear. See Figure 33. Pressing this button automatically saves:

- A curve data file (.csv) containing the information (data points) described in the Saved Electrical and Mechanical Data section.
- An image of the selected window in png format. See Figure 33 for an example showing the battery window.

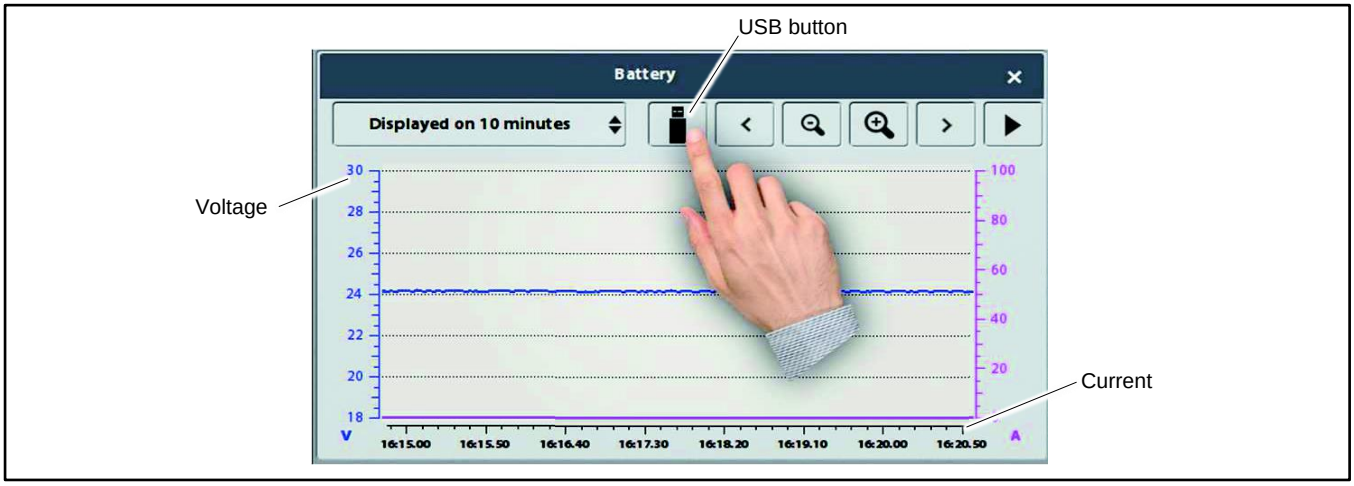


Figure 33 Curve Window (battery data is shown for this example)

Touch the Back (<) button to return to the overview display. See Figure 34 for the location of the Back button.

Figure 34 Back Button

2.9.4 Saved Electrical and Mechanical Data

The recording on a USB stick provides a curve data file (.csv) containing the information shown in Figure 35.

Depending on the engine type and sensors installed on the generator set, some of the 14 mechanical values may not be used. In that case, 0 will appear in the Excel table for the value or values concerned.

For electrical values, the voltage input U2 of the regulation module is present in the Excel table even though this input is not used.

The markers I3.x.x and I5.x.x correspond to the analog variable numbers (see the Menu 4-Diagnosis section).

All of this information is saved according to 4 different time periods:

- 10 minutes: record values every 1 second
- 4 hours: record values every 30 seconds
- 8 hours: record values every 1 minute
- 24 hours: record values every 3 minutes

Mechanical value	**Notes**
I5.35: U bat #1	Battery voltage 1
I5.36: I bat #1	Battery current 1
I5.10: Engine speed	
I5.21: Daily tank fuel level	
I5.20: Engine cooling circuit coolant level	
I5.15: Fuel temperature	
I5.16: Oil temperature	
I5.13: Engine cooling circuit coolant temperature	
I5.14: Charge air cooling circuit coolant temperature	
I5.17: Charge air temperature	
I5.24: Oil pressure	
I5.25: Low fuel pressure	
I5.27: Charge air pressure	
I5.115: ECU: Estimated instant fuel consumption	
I5.131: ECU: Common rail fuel pressure	
I5.110: ECU: Engine speed	
I5.138: ECU: ECU voltage supply	
I5.139: ECU: Engine running hours (hours)	
I5.140: ECU: Engine running hours (seconds)	
Electrical value (on generator set side)	**Notes**
I3.1.50: Frequency - Input1 - Reg #1	On input U1 of regulation module 1
I3.1.55: U23 Line- to- line voltage - Input1 - Reg #1	On input U1 of regulation module 1
I3.1.57: I1 Current - Input1 - Reg #1	On input U1 of regulation module 1
I3.1.64: Total active power - Input1 - Reg#1	On input U1 of regulation module 1
I3.1.68: Total reactive power - Input1 - Reg#1	On input U1 of regulation module 1
I3.1.72: Total cosphi - Input1 - Reg #1	On input U1 of regulation module 1

Figure 35 Saved Data

2.10 Events

The controller displays status, alarm(warning), and fault (shutdown) messages. See Figure 36 for a list of possible alarms and faults.

Internal Number	Description	Alarm (Warning)	Fault (Shutdown)
M3.10	Common fault		X
M3.16	Common warning	X	
M3.17	GFCI tripped	X	
M3.18	Over frequency fault (81H)		X
M3.19	Under frequency fault (81l)		X
M3.20	Over voltage fault (59)		X
M3.21	Under voltage fault (27)		X
M3.22	Overload active power warning (32PH)	X	
M3.24	Reverse active power fault (32RP)		X
M3.25	Overload reactive power warning (32QH)	X	
M3.26	Reverse reactive power fault (32RQ)		X
M3.27	Over current fault (51)		X
M3.29	Thermal overload fault		X
M3.30	Low cranking voltage	X	
M3.31	Low controller temperature	X	
M3.42	Genset output greater than 80% of rated	X	
M3.43	Load shed 1 active	X	
M3.44	Load shed 2 active	X	
M3.45	Load shed 3 active	X	
M3.46	Load shed 4 active	X	
M3.63	Idle mode cancelled before idle timeout	X	
M3.66	Alternator winding temperature warning	X	
M3.67	Alternator winding temperature fault		X
M3.68	Alternator bearing temperature warning	X	
M3.69	Alternator bearing temperature fault		X
M3.76	Not in auto warning	X	
M3.77	Power plant out of service fault		X
M3.80	Emergency push button engaged fault		X
M3.107	Under speed fault		X
M3.108	Over speed fault		X
M3.109	Speed detection fault		X
M3.113	Low engine coolant level fault		X
M3.116	Engine coolant temperature warning	X	
M3.117	Engine coolant temperature fault		X
M3.124	Low coolant temperature warning	X	
M3.128	Low oil level warning	X	
M3.132	Lube (engine) oil pressure warning	X	
M3.133	Lube (engine) oil pressure fault		X
M3.134	Lube (engine) oil temperature warning	X	
M3.135	Lube (engine) oil temperature fault		X
M3.142	Speed detection first starter warning	X	
M3.143	Speed detection second starter warning	X	
M3.153	Low fuel level	X	
M3.154	Fuel level critically low	X	
M3.155	High fuel level	X	
M3.156	Fuel daily tank very high level warning	X	
M3.158	Fuel leak alarm	X	
M3.192	First starter warning	X	
M3.193	Overcrank		X
M3.198	Battery charger fault	X	

Internal Number	Description	Alarm (Warning)	Fault (Shutdown)
M3.200	Low battery voltage	X	
M3.201	High battery voltage	X	
M3.212	APM internal battery warning	X	
M3.550	Engine CAN bus communication fault		X
M3.553	Regulation module 1 communication fault		X
M3.567	APM802 watchdog		X
M3.720	Analog sensor fault input AI #0	X	
M3.721	Analog sensor fault input AI #1	X	
M3.722	Analog sensor fault input AI #2	X	

Figure 36 Warning and Shutdown Messages

2.10.1 Faults and Alarms

Press the Alarm button shown in Figure 37 to view a list of generator set events, including status messages, alarms, and faults.

- A status message communicates the state of the generator set (example: appearance of Stop mode).
- An alarm (warning) signals an impending problem (example: coolant temperature alarm). The alarm button flashes orange. See Figure 38. A warning (alarm) appears in orange on the screen and does not cause the generator to shut down.
- A fault shuts down the generator set (example: oil pressure fault). The alarm button flashes red. See Figure 39. A fault appears in red on the screen and causes the generator to shut down (instantly or delayed, depending on the programmed incidence).
- A number on the alarm button indicates the number of active faults and/or alarms.

There are some exceptions. A specific fault message on the HMI screen may be processed as an alarm by the PLC, so there is no engine shutdown.

Press the stop horn button. The horn (if equipped) turns off and the stop horn button disappears. The alarm button stops flashing and turns orange.

Press the alarm button. A list of the last three active alarms that have not been reset is displayed. See Figure 40. Alarms and faults are listed in chronological order.

Figure 37 Alarm Button

Figure 38 Appearance of an Alarm (warning)

Figure 39 Appearance of a Fault (shutdown)

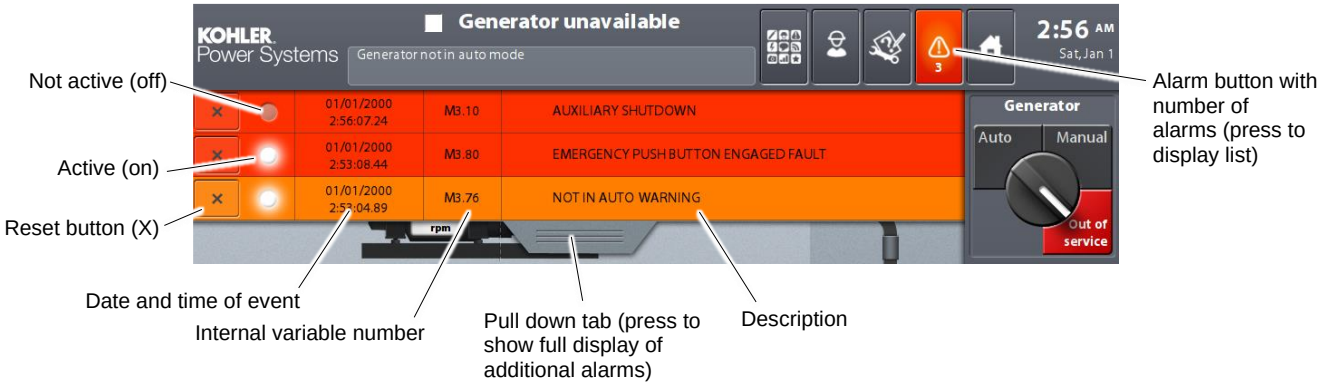


Figure 40 Fault and Alarm List (three most recent faults or alarms)

Press the pull- down tab for access to a full screen display of any other additional alarms. See Figure 41.

The full screen brings up the following:

- < Back button on the operating screen
- Drop-down menu A
- Drop-down menu B
- X button (general reset)
- Complete list of active faults and/or faults not reset

The 4th alarm in Figure 41 shows a fault that is managed as an alarm.

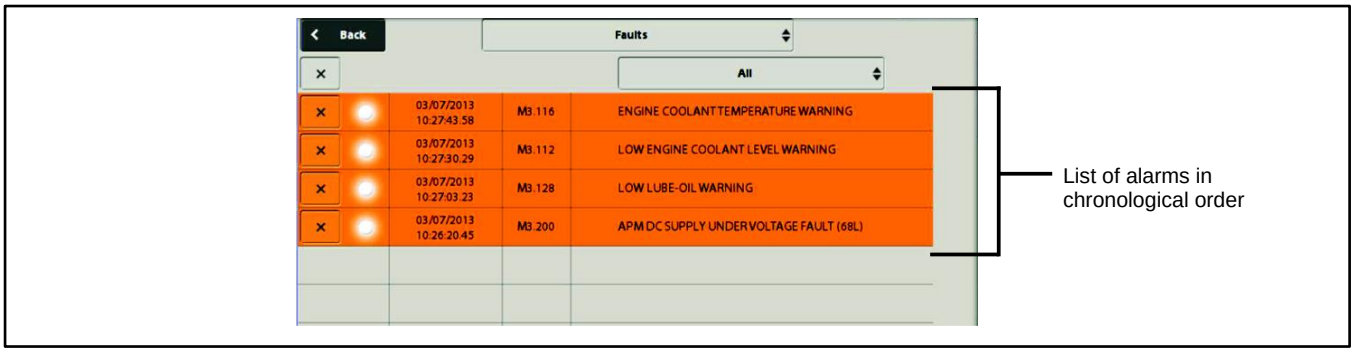


Figure 41 Full Screen with Latest Alarms

2.10.2 Resetting an Alarm

An alarm indicates that a problem has occurred, but the generator is still able to run. Always correct an alarm condition before it leads to a fault that will shut down the generator set. See the Safety Precautions and Instructions section of this manual before proceeding to correct an alarm condition. Contact an authorized distributor or dealer for service, if necessary.

An alarm turns off when the cause of the alarm is resolved:

- The operator may correct the condition that is causing the alarm.
- The alarm condition may resolve itself; for example, the temperature drops, resolving a high temperature alarm.

After the condition is resolved and the alarm turns off, RESET the alarm by pressing the X button. See Figure 42.

If the alarm does not appear on the list of the last three alarms, touch the pull-down tab to display additional alarms.

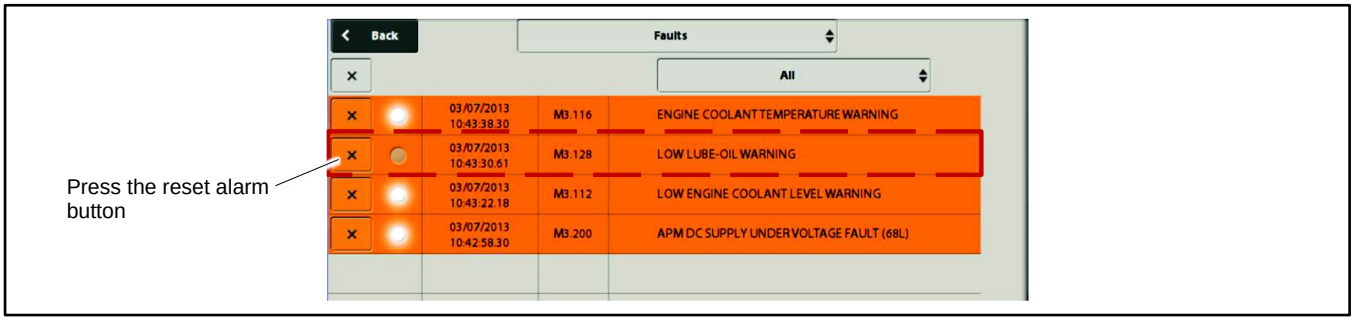


Figure 42 Resetting an Alarm

2.10.3 Resetting a Fault

A fault turns off when the cause of the alarm is resolved by one of the two following methods:

- The operator has corrected the condition that is causing the fault.
- The fault condition has resolved itself; for example, the temperature drops, resolving a high temperature fault.

Note:
The generator set must not be restarted until the fault condition is identified and corrected.

Always identify and correct the cause of a fault shutdown before resetting the controller. See the Safety Precautions and Instructions section of this manual before proceeding to correct a fault condition. Contact an authorized distributor or dealer for service, if necessary.

To reset a fault, first correct the fault condition. The fault indicator will turn off. Then press the X button next to the individual fault. See Figure 43.

Note that it is also possible to reset a fault from the tab of the last 3 alarms, if this fault is one of the 3 most recent alarms.

Emergency Stop Fault

Manually pressing the emergency stop button causes a fault. After the emergency stop button is unlocked, the fault indicator will turn off, and it will then be possible to reset this fault with the X button.

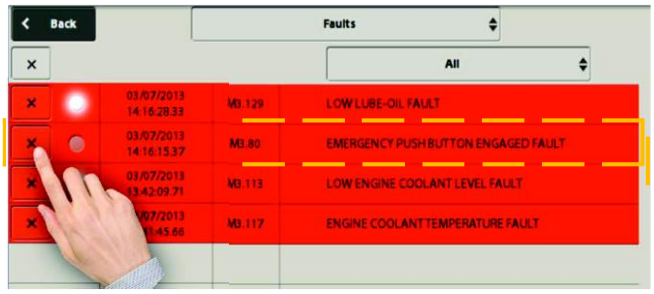


Figure 43 Resetting a Fault

2.10.4 Consulting Status Messages

Reviewing the status messages is possible at any time. Depending on the status type, the APM802 will log different messages:

- Appearance
- Disappearance
- Appearance/Disappearance
- Present/Not present
- Open/Close
- On/Off
- Start/End

After pressing the Alarm button, and if no fault or alarm is present, select Status messages history in drop-down menu A. See Figure 44 and Figure 45.

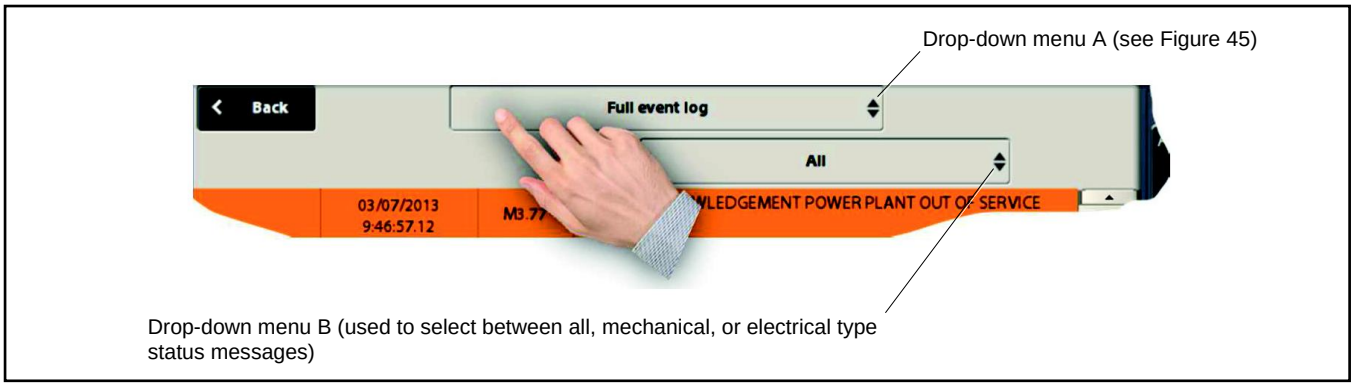


Figure 44 Drop-down Menus

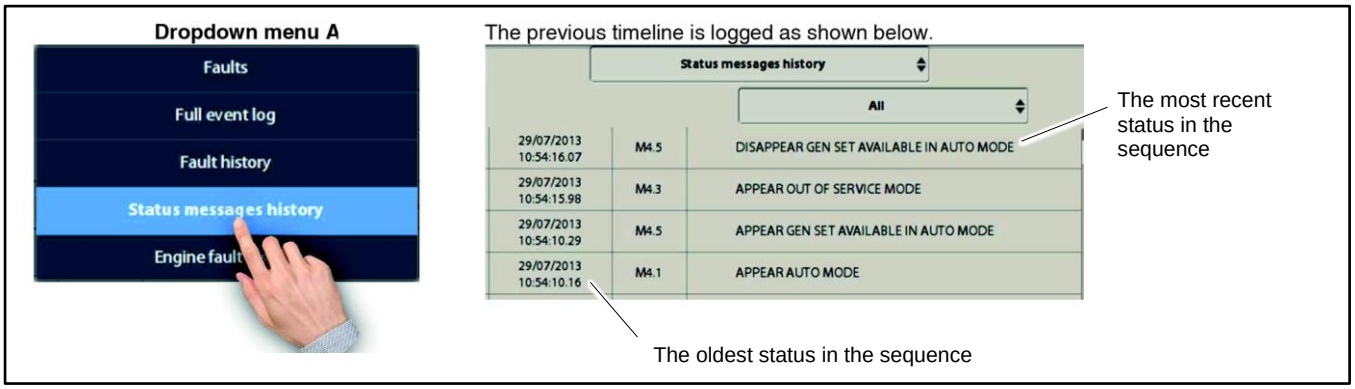


Figure 45 Drop-down Menu A

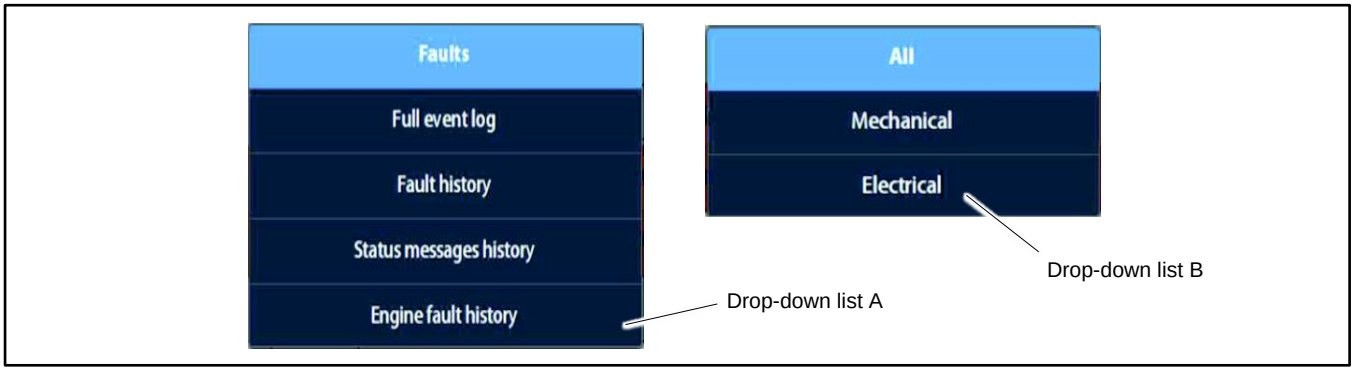


Figure 46 Drop-down Lists A and B

2.10.5 Full Event Log

To view all events (status messages, alarms, and faults, active or reset), select Full event log from drop-down list A, and select All from drop-down list B. See Figure 47 for an example of the full event log.

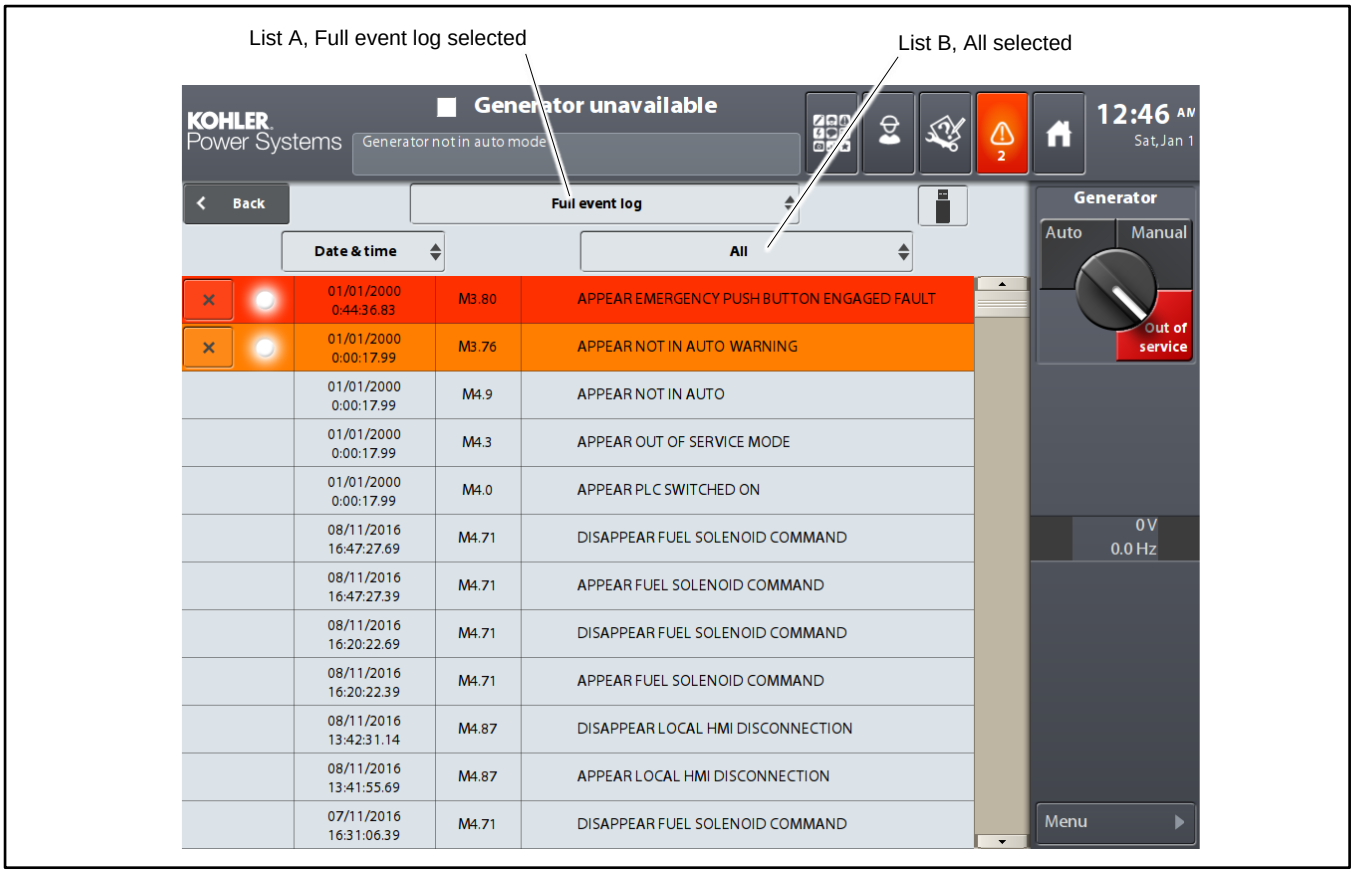


Figure 47 Full Event Log

2.11 Applications

Touch the Applications button in the top bar to open the Applications screen. See Figure 48. From this screen, you can access the screens listed in Figure 49. Note that access to some screens requires logging on as an operator.

Figure 48 Applications Screen

Screen	Description	Operator	User
Reference	Information on the administrative characteristics of the installation: name of the site, case reference, software versions, etc.	X	X
Region settings	Used to set the user language, the date, the time, the mechanical units used, insert a customer- specific logo	X	X
HMI settings	Used to adjust the screen brightness in standby mode, and the calibration of the touch panel	X	X
Restart	Used to reboot the HMI module	X	
Display cleaning	Used to lock the screen for 20 seconds to allow cleaning without adversely affecting operation	X	X
Firmware update	Used for the software update for the HMI module	X	
Screenshot	Used to take a screenshot to capture the installation at a given moment	X	X
Ladder tools	Used to view additional equations	X	
Save parameters	Used to save the parameters of the application onto a USB key	X	X
Upload parameters	Used to load parameters from a USB key	X	X

Figure 49 Screens Accessed from the Applications Screen

2.11.1 Reference

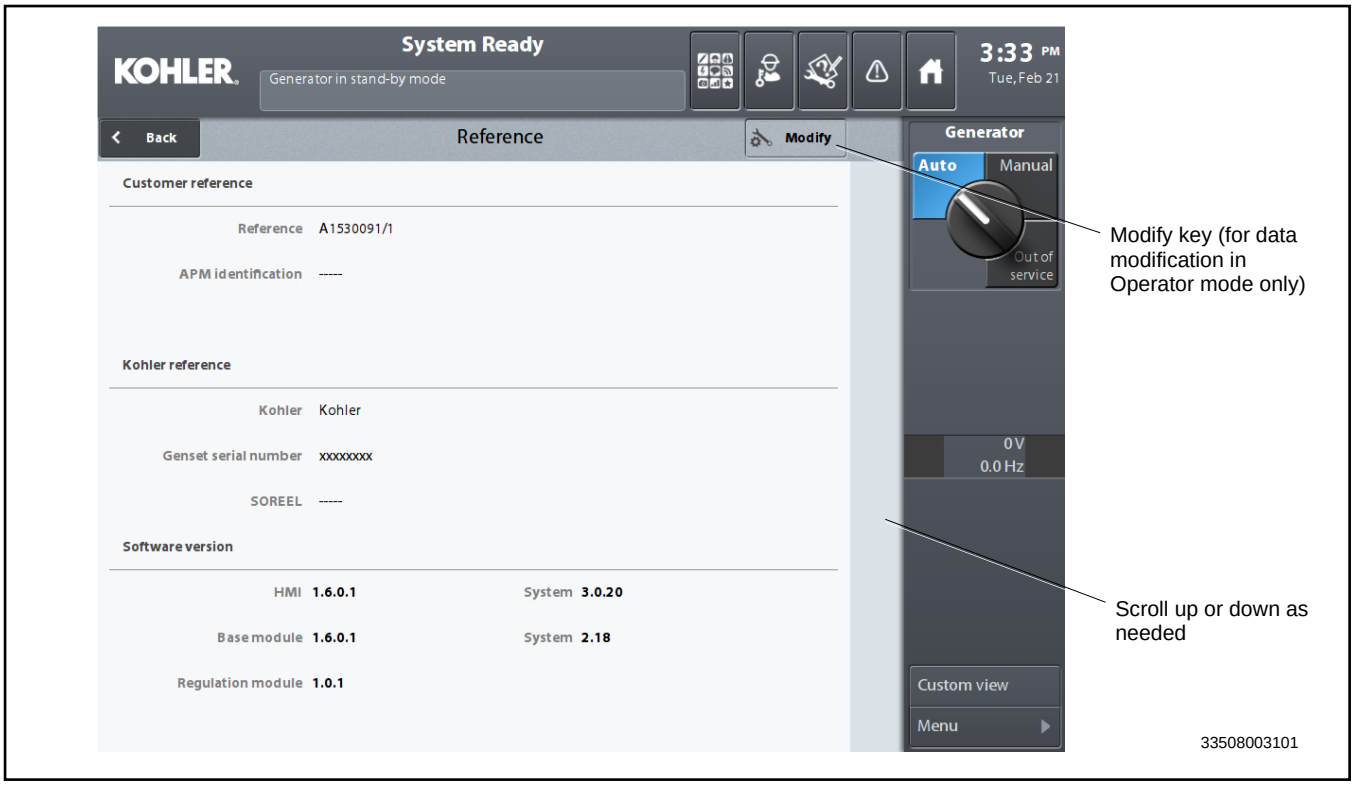


Figure 50 Reference Screen

Title	Description and Possible Settings (or selections)
Customer reference	
Reference	Customer case name (for example: computer center)
APM identification	Option of assigning a name to the HMI (for example: GS parking number 1)
Kohler reference	
Reference	Commercial case reference (manufacturer's side)
Genset serial number	Generator set serial number associated with the HMI
Software version	
HMI	HMI module firmware version
System	HMI module OS version
Base module	Base module firmware version
System	Base module OS version
Regulation module	Regulation module firmware version X179

2.11.2 Region Settings

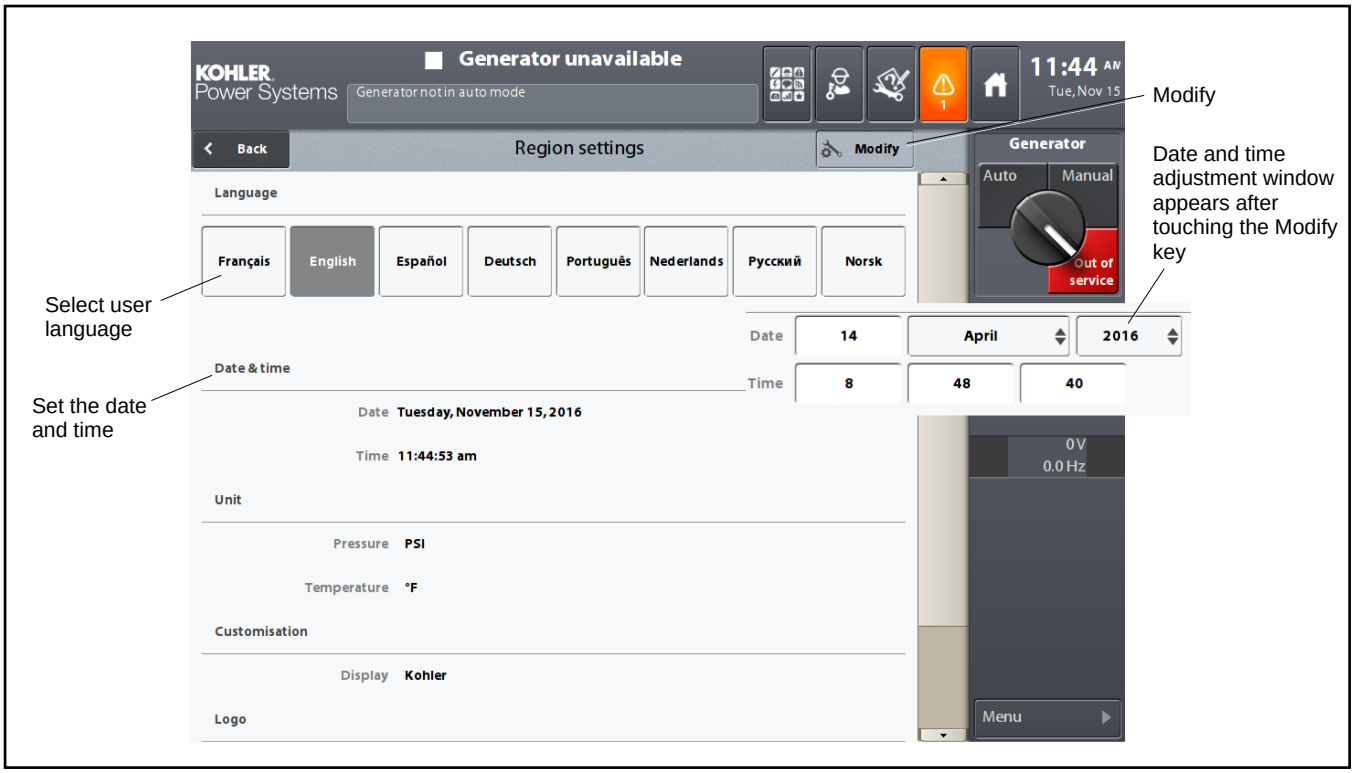


Figure 51 Region Settings Screen

Title	Description and Possible Settings (or selections)
Pressure	Selection of the pressure display: bar, PSI
Temperature	Selection of the temperature display: °C , °F
Customization	
Display	Selection of the logo at the top left of the screen
Logo	Upload an image in JPEG or PNG format (see below)

Adding a logo

1. Press the Modify button. An additional *Upload* key appears.
2. On a USB key, create a directory called E:\ apm802 \ icon and copy the logo* to be inserted into the main screen of the HMI.
3. Insert the USB key into the appropriate port and press the *Load* key.
4. In the window shown in Figure 52, press the central field, select the desired image and confirm.
5. The image appears next to the *Upload* key (a *Delete* key also appears to delete or replace the image on the screen).
6. Press on *Apply*. The logo then appears under the 4-position switch.

The *Region settings* screen can also be accessed by touching in the date/time area of the top bar.

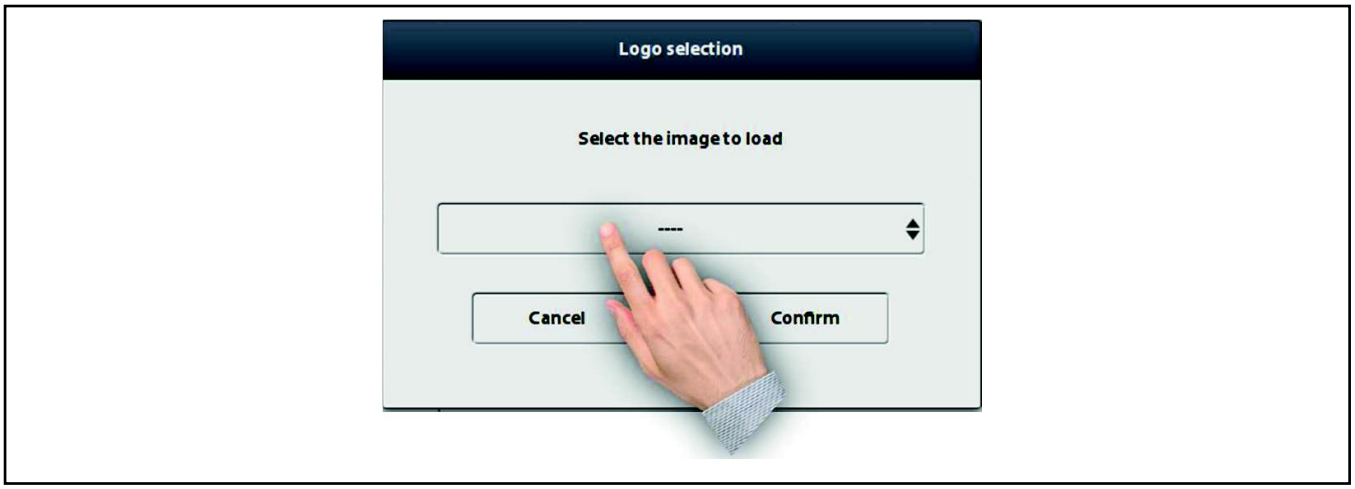


Figure 52 Selecting the Logo Image File

* The ideal image size for the logo is 170 x 100 pixels.

2.11.3 HMI Settings

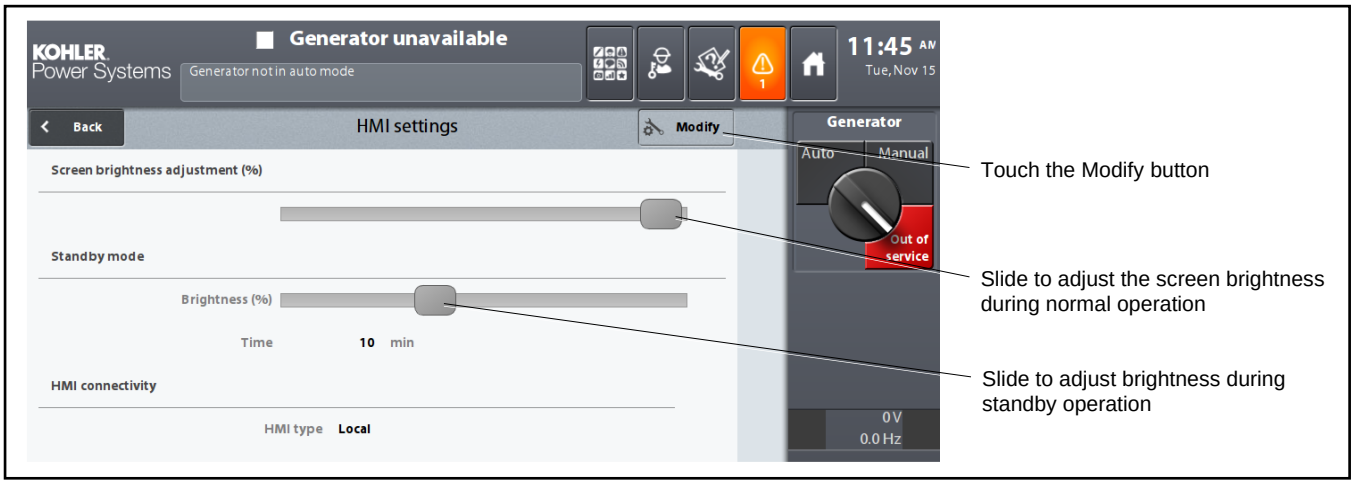
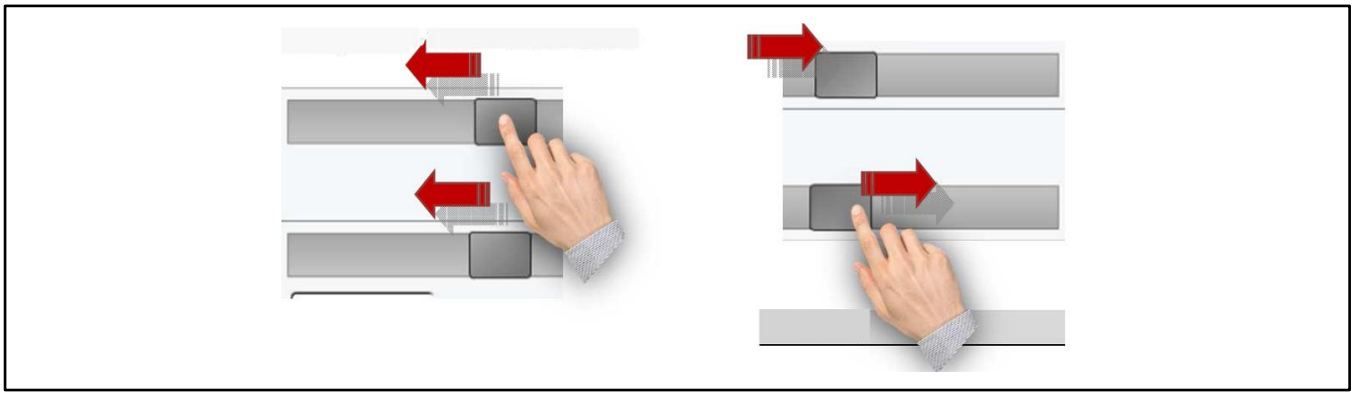


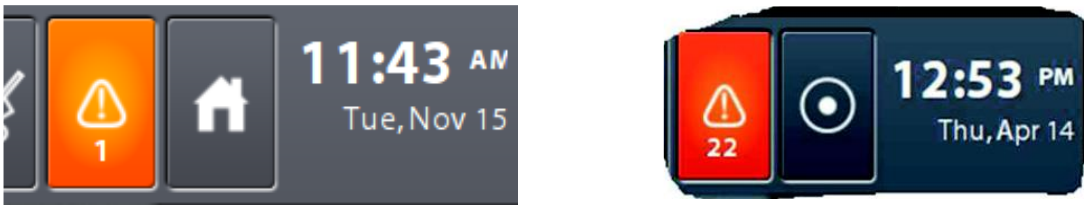
Figure 53 HMI settings

The sliders on this screen allow adjustment of the screen brightness during operation and standby. The two sliders are independent. However, if the brightness in operation mode is near the brightness in standby mode, then the setting of the second follows the first, as shown. Conversely, if the brightness is increased in standby mode, the brightness during use also increases.



Title	Description and possible settings (or selections)
Standby mode	
Time (min)	Delay before activation of screen standby mode: from 10 to 600 minutes
HMI connectivity	
HMI type *	Use of HMI connected to the base module: Local, Remote
Mode of operation †	Use of HMI for remote mode: Full access, Operation, Visualization
Display blue background of locked button (selector 0/1) ‡	When the selector is at 1, the HMI is connected using the access code (see section 9.4 - Identification)
Remote HMI number †	Remote HMI number: from 1 to 50 in a complete power plant, but limited to 9 HMIs for a base module
Addressing mode †	HMI addressing: System, Customer IP, DHCP
Eth1 IP address †	Permanent or temporary identification number for the HMI module connected to another base or to a network (for example: redundant ring)
Eth1 MAC address †	Unique permanent physical identification number, which is stored in the HMI module

∗ Several choices available for the parameter
† These parameters only appear if Remote has been selected
‡ This parameter only appears if Remote and Display have been selected



Local HMI **Remote HMI**

Figure 54 Home Buttons

The Home button on the Remote HMI looks different than the Home button on the local HMI. See Figure 54.

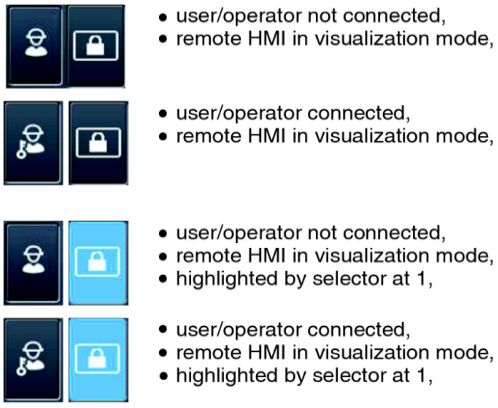


Figure 55 Remote HMI Indication

In the case of a Remote HMI in Visualization mode, the icons in Figure 55 show the various displays of key 2.

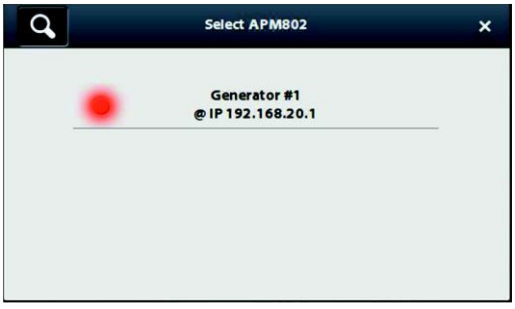


Figure 56 IP Address Display

In the case of a Remote HMI in Operation mode or in Full access mode, button 2 does not change appearance.

A remote HMI is connected to the Ethernet ring. When the Home button is pressed, a pop- up window appears the search for base modules connected to the ring is in progress.

At the end of the search, the IP addresses of the modules connected to the Ethernet ring are shown (see Figure 56). It is also possible to see whether one of the connected generator sets has a fault (red indicator).

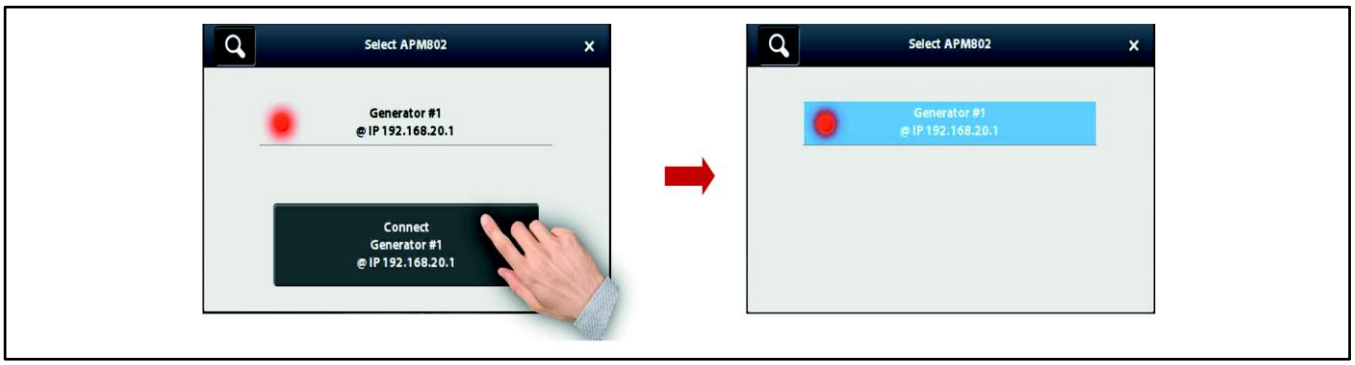


Figure 57 Selecting a Module from a Remote HMI

Select the base module to connect to (in the example, there is only one generator set). A *Connect Generator #1* button also appears.

Press the *Connect Generator #1* button. The window changes as shown in Figure 57.

Press the magnifying glass at the top left-hand of the screen to start a new search to select another module connected to the Ethernet ring.

2.11.4 Restart

Press the *Restart* icon to bring the window shown in Figure 58 to the front. Confirm the restart by pressing *OK*, or cancel the procedure by pressing *Cancel*.

This operation will trigger a complete restart of the HMI module.

Figure 58 Restart Window

2.11.5 Display Cleaning

Before wiping the screen, press the Display cleaning icon. The window shown in Figure 59 appears.

The entire screen is disabled for 20 seconds, allowing you to clean the touch panel.

After 20 seconds, the Applications screen appears again.

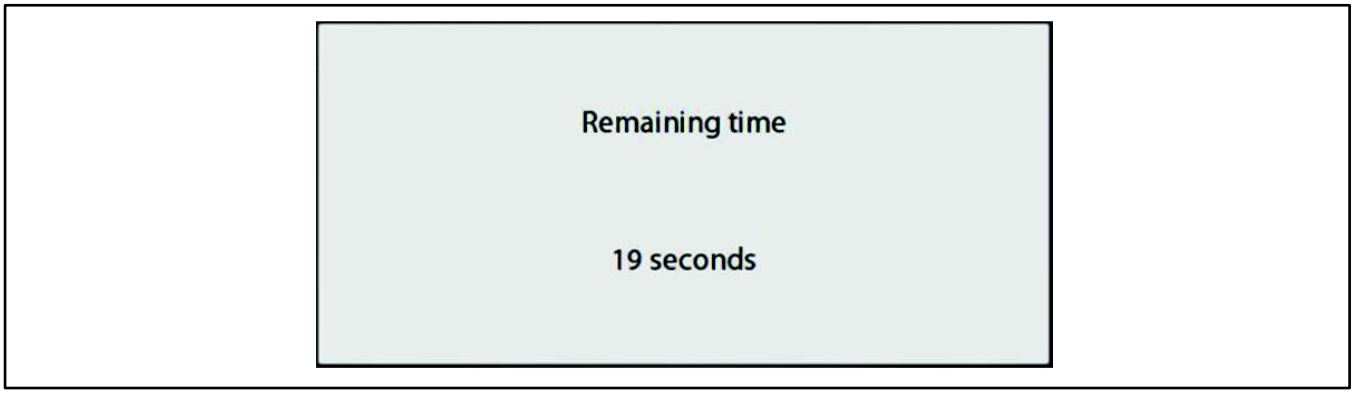


Figure 59 Display Cleaning Window

2.11.6 Firmware Update

Pressing the *Firmware update* icon carries out an update of the HMI firmware.

The update requires that a USB key is inserted into the port provided on the bottom of the HMI. See Figure 60.

Figure 60 USB Port Location on HMI Module

Firmware Update Procedure

1. Tap the selection field area (Figure 61) and select the desired software version.
2. Press OK to start the software update operation.

Figure 61 Firmware Update Screen

At the end of the update, the HMI will automatically restart.

For this update operation, the USB key must contain the following type of directory: E:\apm802\update. The software versions (or firmware) are of the following type: IHM_APM802_V1_x_x.z208.

Note:
The HMI firmware version number must match the firmware version installed in the base module.

2.11.7 Screenshot

Before taking a screenshot, it is necessary to insert a USB key in the port provided on the bottom of the HMI module. See the USB Port Location on HMI Module figure.

Pressing the *Screenshot* button enables the screenshot feature. The screenshot icon turns blue when enabled. Screenshot mode stays enabled until turned off. Return to the Applications screen and click on the camera button to turn off the screenshot mode.

The button shown in Figure 62, which symbolizes a camera, then appears at the top right of the screen.

Figure 62 Camera Button (for screenshots)

Go into the screen to be copied and press the camera button. The screenshot is automatically saved to the USB key in the directory “E:\apm802\screenshot.

Note:
During the time it takes to create the screenshot, the camera button remains blue.

Note:
The images are in PNG format. It is not possible to create a partial screenshot.

2.11.8 Ladder Tools

Ladder is a standardized graphic language which is very similar to a ladder diagram. Implemented in the base module of the APM802, it is used to define the PLC functions required for specific functions.

Pressing the *Ladder tools* icon takes you to the screen shown in Figure 63. See the Applications Screen figure for the location of the *Ladder tools* icon on the applications screen.

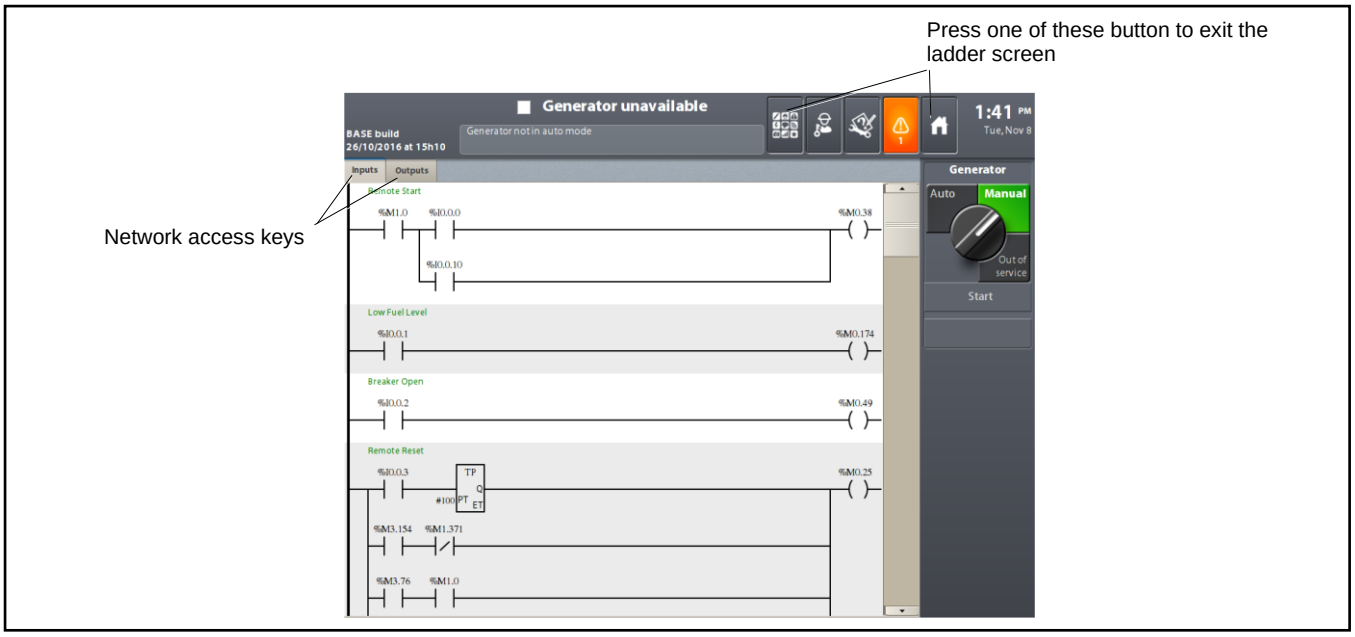


Figure 63 Ladder Screen

To exit the Ladder screen, press the Applications button or the Home button on the top bar.

Generally speaking, there will be at least 2 networks:

- The inputs network (accessed via the *Inputs* key)
- The outputs network (accessed via the *Outputs* key).

Depending on the complexity of the application, there may be an intermediate network.

The Inputs network defines all the input equations for the system. These inputs correspond to the physical inputs for the base module.

The #1 network defines all the intermediate equations used for the connection between inputs and outputs.

The Outputs network defines all the output equations for the system. These outputs correspond to the physical outputs for the base module. See Figure 65.

In all networks, press on the contact or the coil to access more information.

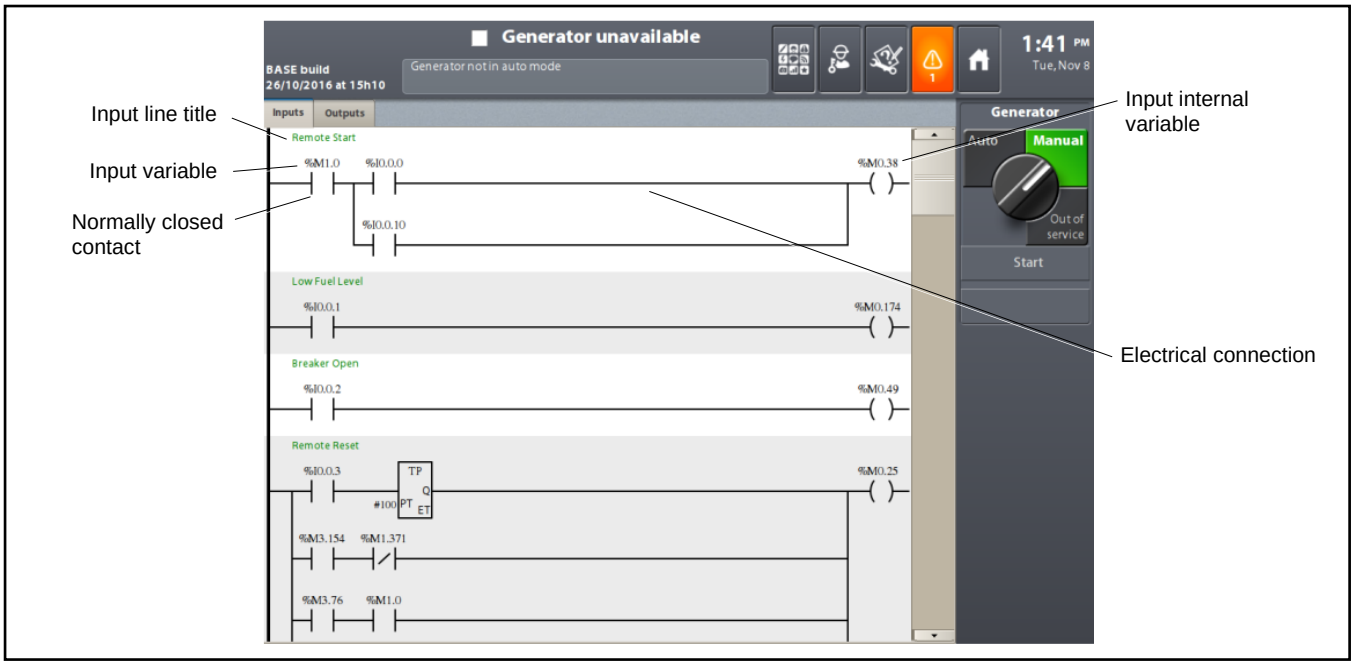


Figure 64 Inputs Network

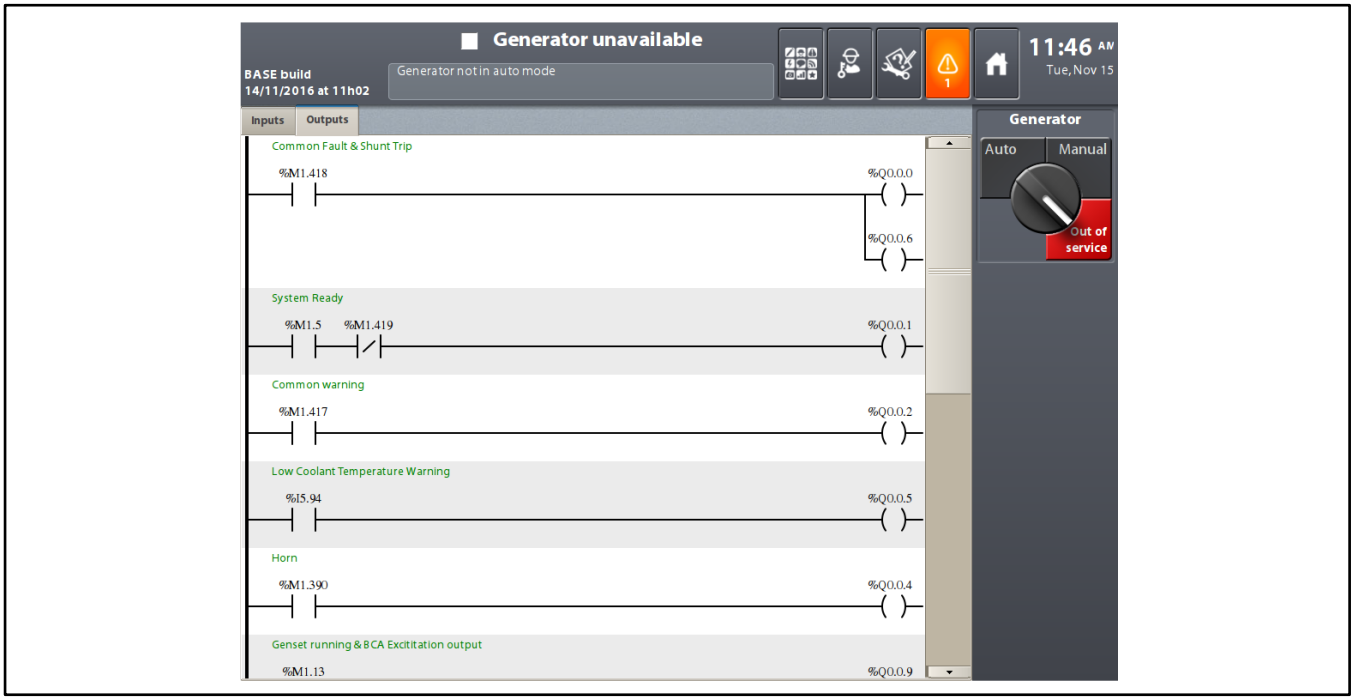


Figure 65 Outputs network

2.11.9 Save Parameters

1. Insert a USB key into the port on the bottom of the HMI module. See the USB Port Location on HMI Module figure.
2. Press on the Save Parameters icon; the screen shown in Figure 66. Saving starts automatically. When it is completed, the screen confirming that the save operation was performed successfully appears.
3. Press on OK to close the window.

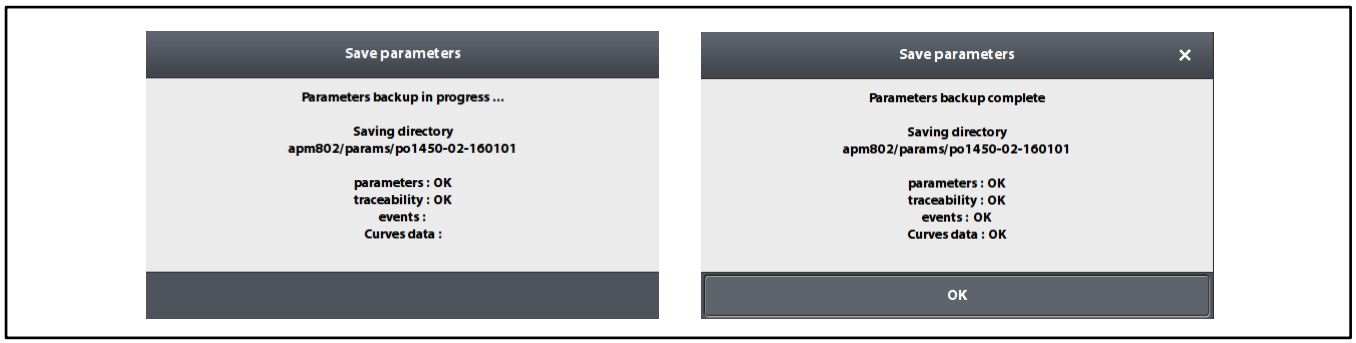


Figure 66 Save Parameters Windows

On the USB stick, four files are saved in a directory called *case number*:

- Parameters (file *****_params.x208)
- Traceability (file *****_apm_info.i208)
- Events (file *****_events.txt)
- Curve data (file *****_curve_data.csv)

where ***** is: 0_gs1_<genset serial number>_.

2.11.10 Upload Parameters

An authorized service technician can obtain and load parameter files following the instructions in the controller service manual.

Parameter files are specific to the individual generator set, as identified by the generator set serial number. Do not attempt to load parameters that have been saved from a different generator set.

2.12 Menus

Figure 67 shows the architecture of the screens accessible from the **Menu** button.

Menu >					
1-Settings	**2-Measurements**	**3-History**	**4-Diagnostic**	**5-Configuration**	**6-Hardware**
1.2	2.2	3.1	4.1	5.1	6.1
Power thresholds	Mechanical	Archiving	Variables	Application	Installation
1.5	2.3		4.2	5.1.1	6.1.1
Timers *	Generator electrical		Binary inputs	General	General
1.6	2.6		4.3	5.1.2	6.1.2
Auxiliaries	Harmonics		Binary outputs	Alarms	Generator set
1.8			4.4	5.1.3	6.1.3
Parameters			Regulation/Protection	Status messages	Regulator
			4.5	5.1.4	6.1.4
* Not used.			Regulation	Function key	Engine sensor
				5.1.5	6.1.5
				Custom view-Visualization	Auxiliaries
				5.1.6	6.2
				Custom view - Parameters	Base inputs/outputs
				5.1.7	6.2.1
				Main screen custom view	Configurable binary inputs
				5.1.8	6.2.2
				Time slots	Resistive inputs
				5.1.9	6.2.3
				Advanced setpoints	Analog inputs
				5.1.10	6.2.4
				Customer messages	Analog outputs
				5.2	6.3
				Generator	Extension inputs/outputs
				5.2.1	6.3.1
				Starting	CAN#1 inputs/outputs
				5.2.2	6.4
				Speed	Regulation/Protection
				5.2.3	6.4.1
				Excitation	General
				5.2.4	6.4.2
				Miscellaneous	Regulation modules
				5.2.5	6.5
				Timers	Communication
				5.3	6.5.1
				Regulation	Ethernet
				5.3.1	6.5.2
				Regulation parameters	Serial link
				5.3.2	
				Speed regulation PID	
				5.3.3	
				Voltage regulation PID	
				5.3.4	
				Synchronization PID	

Figure 67 Screen Architecture

Menu Access

Some menus are view-only and do not allow modifications. Some menus require the operator password to view and/or modify. See Figure 68 for menu access information.

1-Settings	**User**	**Operator ***
1.2 Power thresholds	View	Modify *
1.5 Timers (not used)	View	Modify *
1.6 Auxiliaries	View	Modify *
1.8 Parameters	View	Modify *
2-Measurements		
2.2 Mechanical	View	View
2.3 Generator electrical	View	View
2.6 Harmonics	View	View
3-History		
3.1 Archiving	View	Modify *
4-Diagnosis		
4.1 Variables	Modify	Modify
4.2 Binary Inputs	View	View
4.3 Binary Outputs	View	View
4.4 Regulation/protection		Modify *
4.5 Regulation		Modify *
5-Configuration		
5.1 Application		
5.1.1 General		View *
5.1.2 Alarms		View *
5.1.3 Status Messages		View *
5.1.4 Function Key		View *
5.1.5 Custom view-Visualization		View *
5.1.6 Custom view-Parameters		View *
5.1.7 Main screen custom view		View *
5.1.8 Time slots		View *
5.1.9 Advanced setpoints		View *
5.1.10 Customer messages		View *
5.2 Generator		
5.2.1 Starting		View *
5.2.2 Speed		View *
5.2.3 Excitation		View *
5.2.4 Miscellaneous		View *
5.2.5 Timers		View *
5.3 Regulation		
5.3.1 Regulation parameters		View *
5.3.2 Speed regulation PID		View *
5.3.3 Voltage regulation PID		View *
5.3.4 Synchronization PID		View *
5.4 Protection		

5.4.1 Low level		View *
5.4.4 Grid		View *
6-Hardware		
6.1 Installation		
6.1.1 General		View *
6.1.2 Generator		View *
6.1.3 Regulator		View *
6.1.4 Engine Sensor		View *
6.1.5 Auxiliaries		View *
6.2 Base inputs/outputs		
6.2.1 Configurable binary inputs		View *
6.2.2 Resistive inputs		View *
6.2.3 Analog inputs		View *
6.2.4 Analog outputs		View *
6.3 Extension inputs/outputs		
6.3.1 CAN inputs/outputs		View *
6.4 Regulation/protection		
6.4.1 General		View *
6.4.2 Regulation modules		View *
6.5 Communication		
6.5.1 Ethernet †		Modify *†
6.5.2 Serial link		Modify *

* Operator password (1966) is required to view and/or modify settings.
† Controller must be in Out of Service mode to modify these settings.

Figure 68 Menu Access

2.12.1 Menu 1-Settings

The 1-Settings menu can be accessed via the key with the same name.

- 1.2 Power Thresholds
- 1.5 Timers (not used)
- 1.6 Auxiliaries
- 1.8 Parameters

Changing Settings

Pressing the Modify button brings up text entry fields for settings that can be changed. See Figure 69.

Pressing in the text entry field brings up the alphanumeric keypad shown in Figure 70.

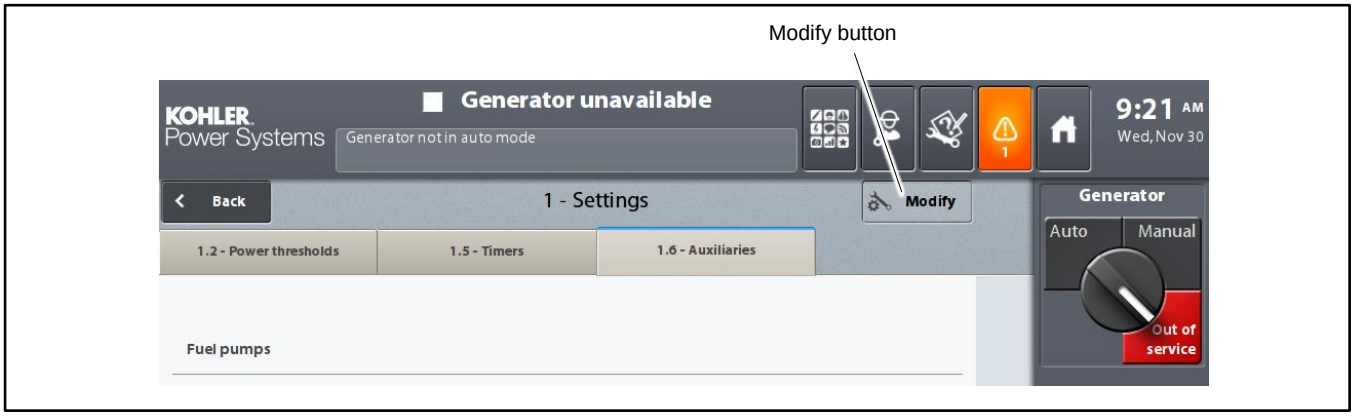


Figure 69 Modify Button

Figure 70 Keypad

Screen 1.2-Power thresholds

The 1.2-Power thresholds screen is used to set up to 10 active power thresholds. Threshold 9 is used for load shed.

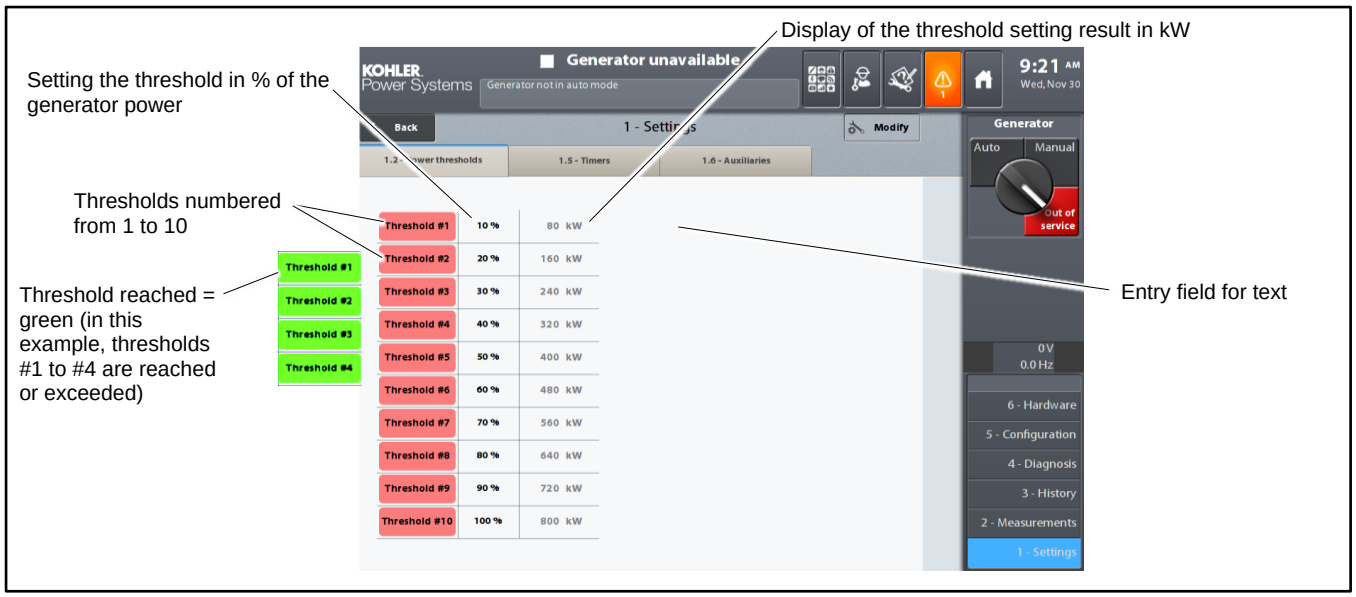


Figure 71 Power Thresholds Screen

Screen 1.6-Auxiliaries

The 1.6-Auxiliaries screen is used to set the auxiliary parameters for the generator set fuel warning levels.

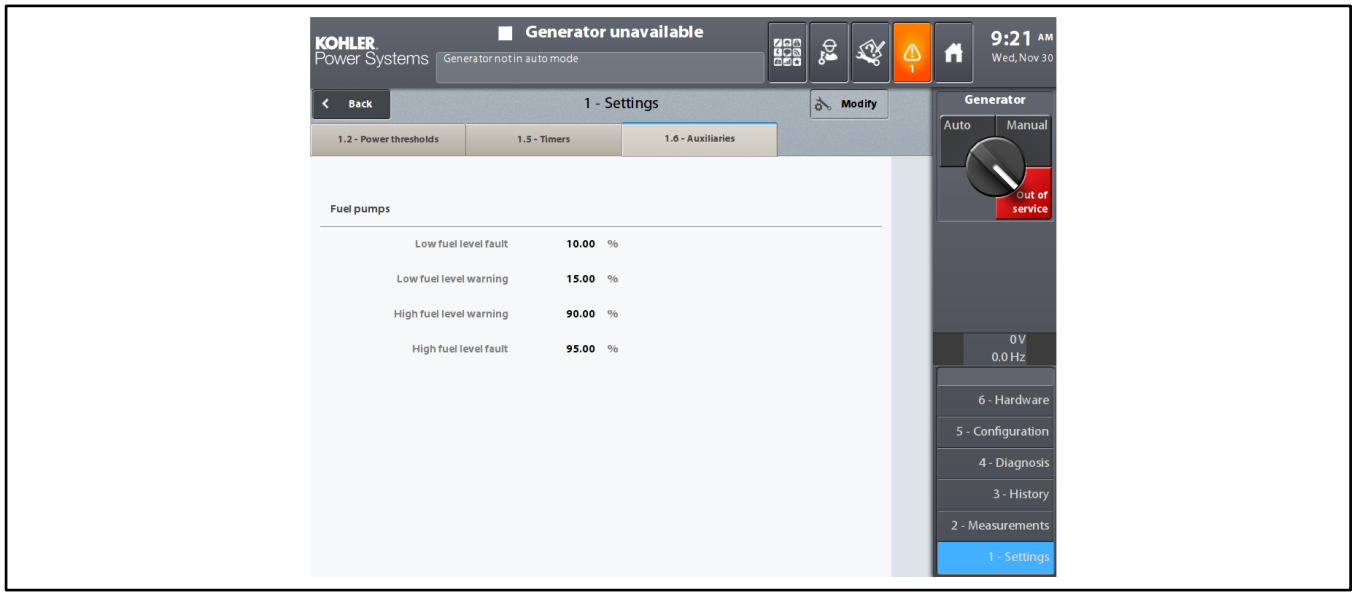


Figure 72 Auxiliaries screen

Title	Description and possible settings (or selections)
Fuel pumps	
Low fuel level fault (%)	Low fuel level at which the fault is triggered, expressed as a percentage
Low fuel level warning (%)	Low fuel level at which the alarm is triggered, expressed as a percentage
High fuel level warning (%)	High fuel level at which the alarm is triggered, expressed as a percentage
High fuel level fault (%)	High fuel level at which the fault is triggered, expressed as a percentage

Screen 1.8 Parameters

The 1.8-Parameters screen is used to set the engine speed (RPM). The speed can be adjusted by ±10RPM.

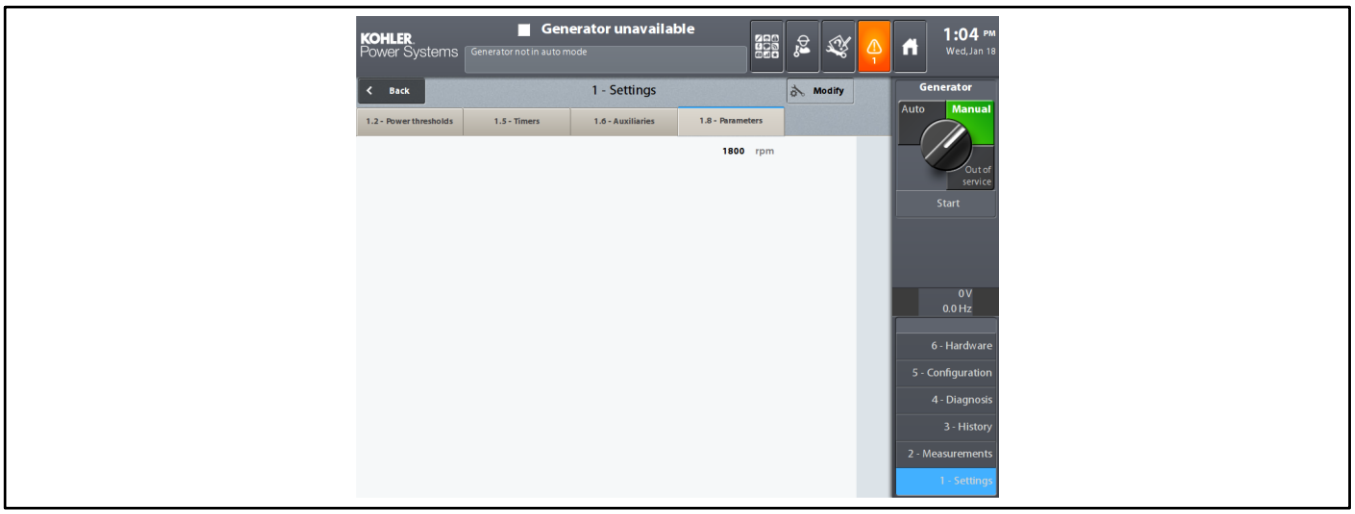


Figure 73 Parameters Screen

2.12.2 Menu 2-Measurements

The 2-Measurements menu can be accessed via the button with the same name. This gives access to the screens listed below.

- Screen 2.2-Mechanical
- Screen 2.3-Generator electrical
- Screen 2.6-Harmonics

Note:
The measurements menus are view-only; no modifications are possible from these menus.

Screen 2.2-Mechanical

The 2.2-Mechanical screen gives an overview of all the mechanical values for the associated generator.

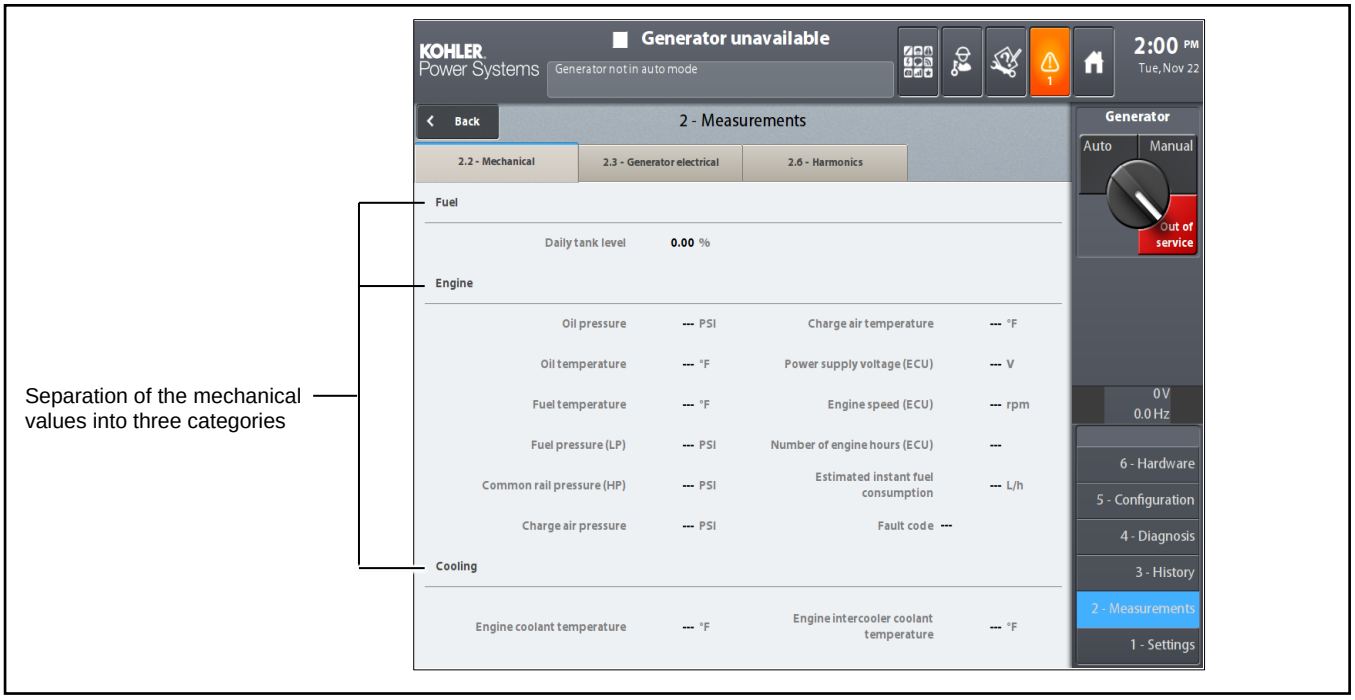


Figure 74 Mechanical Screen

Note:
Other values may be displayed depending on the engine selected in the 6.1.2 generator set screen.

Screen 2.3-Generator electrical

The 2.3-Generator electrical screen gives a detailed view of all the electrical values for the associated generator (on generator HMI only).

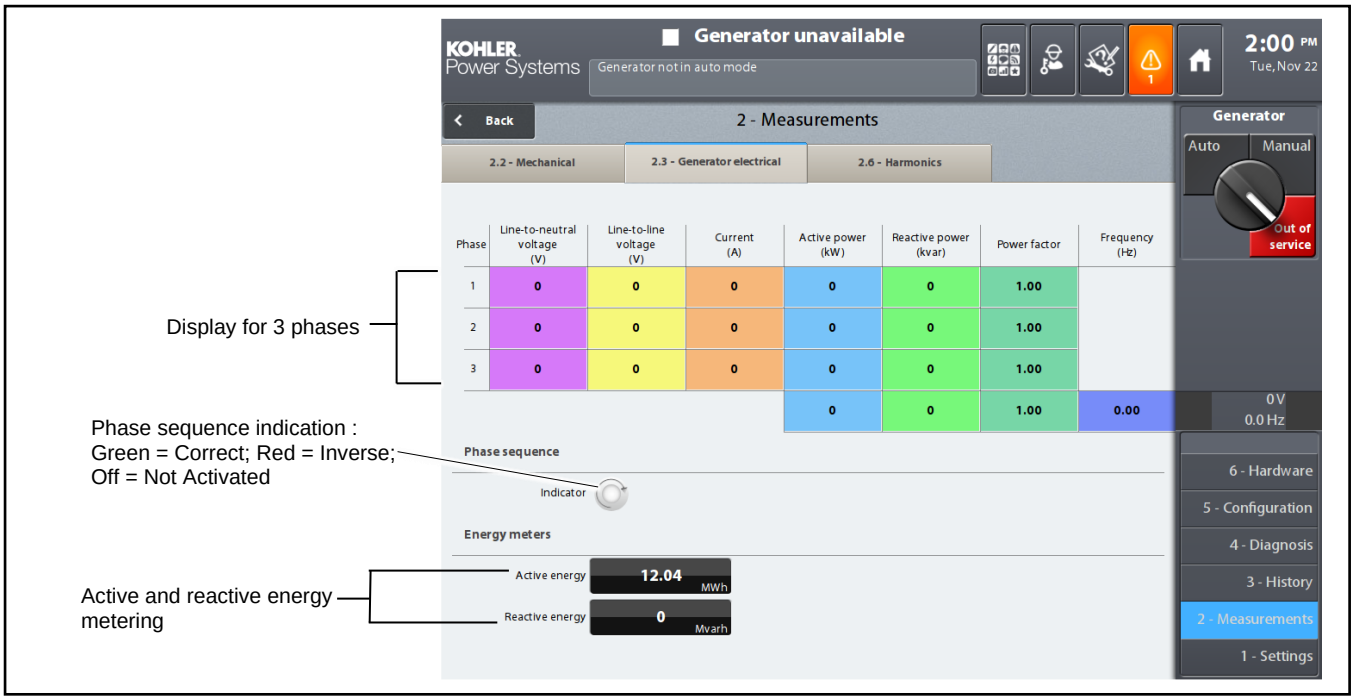


Figure 75 Generator Electrical Screen

Screen 2.6-Harmonics

The 2.6-Harmonics screen is used to monitor the change in harmonics in real time on the generator set.

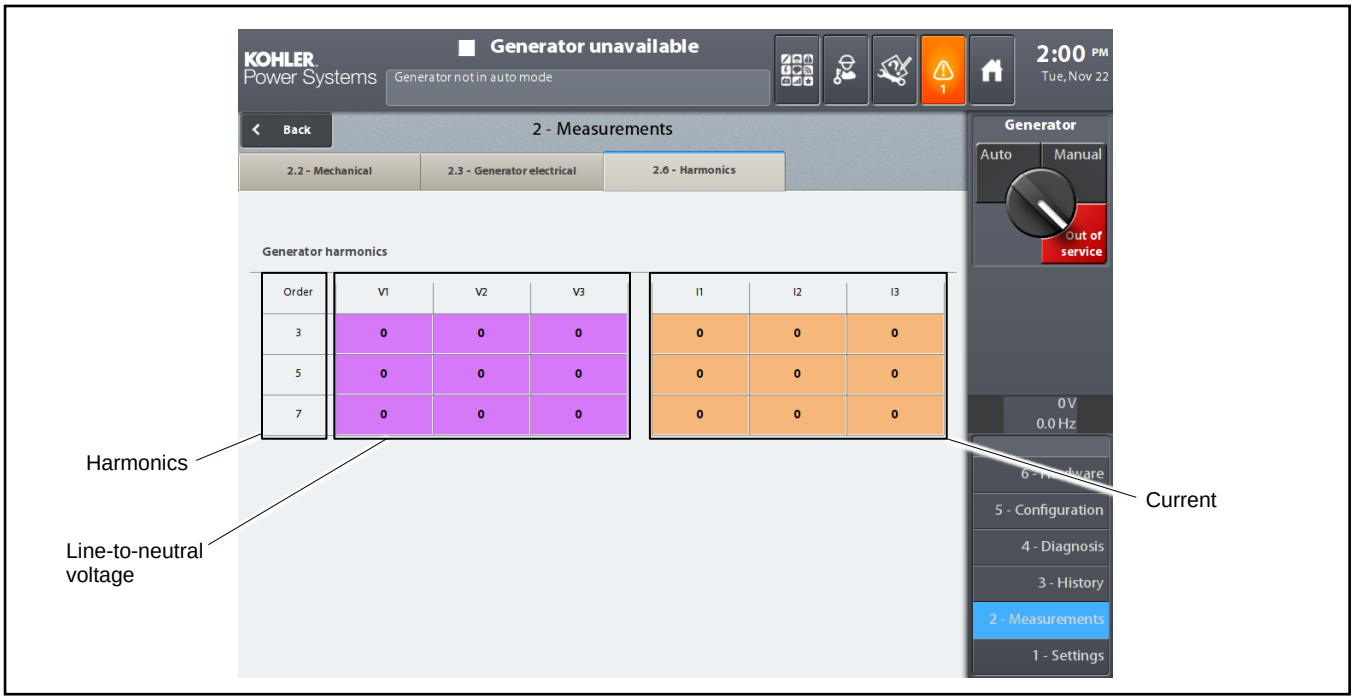


Figure 76 Harmonics Screen

2.12.3 Menu 3-History

The 3-History menu can be accessed via the key with the same name. It gives access to Screen 3.1-Archiving.

Screen 3.1-Archiving

The 3.1-Archiving screen is used to store certain parameters in the controller's memory.

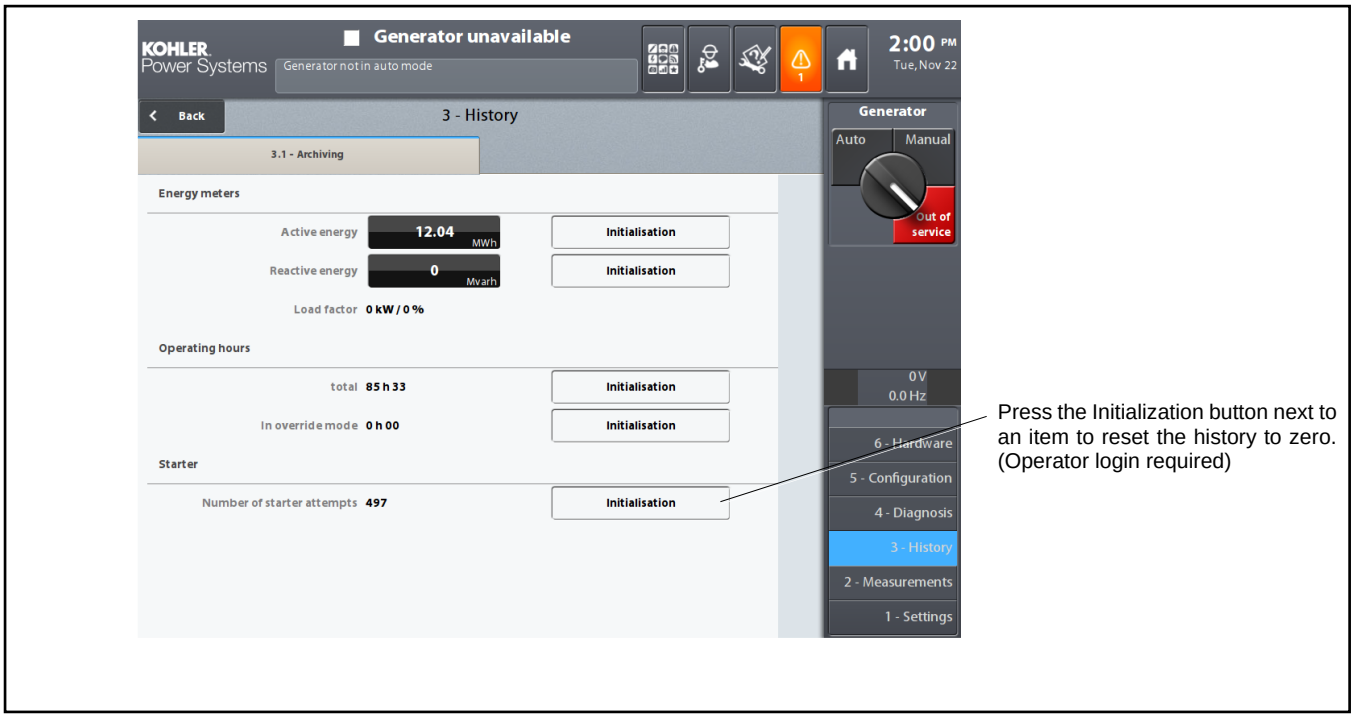


Figure 77 Archiving Screen

List of archived parameters:

Energy Meters

- Active energy (in MWh)
- Reactive energy (in Mvarh)

Operating hours

- Total (in hours)
- In override mode (in hours)

Starter

- Number of starter attempts

If the Operator is logged in with their access code or if the User has entered the code 1966 (access limited to ten minutes), then opposite each parameter, on the right of the screen, an Initialization button appears. See Figure 77.

Each button is used to reset the parameter concerned to zero or to initialize to a given value.

2.12.4 Menu 4-Diagnosis

The 4-Diagnosis menu can be accessed via the key with the same name. it gives access to the 5 screens below:

4.1-Variables

4.2-Binary inputs

4.3-Binary outputs

4.4-Regulation & Protection

4.5-Regulation

The Diagnosis menu may be used for troubleshooting by factory service support personnel. Active faults and events can be viewed using the alarm button or the Event Log. See the Events Section for more information.

Screen 4.1-Variables

The 4.1-Variables screen is used to read all the system variables, regardless of whether these are logic or analog variables.

When the screen is called up, no value is displayed. The keypad appears automatically at the bottom of the screen and is used to enter the name of the variable or variables to be consulted.

When the variable is a logic variable (values 0 or 1), then the color red or green [0 (off)=red, 1 (on)=green] is associated with the status of the variable.

See Figure 79 for variable identification.

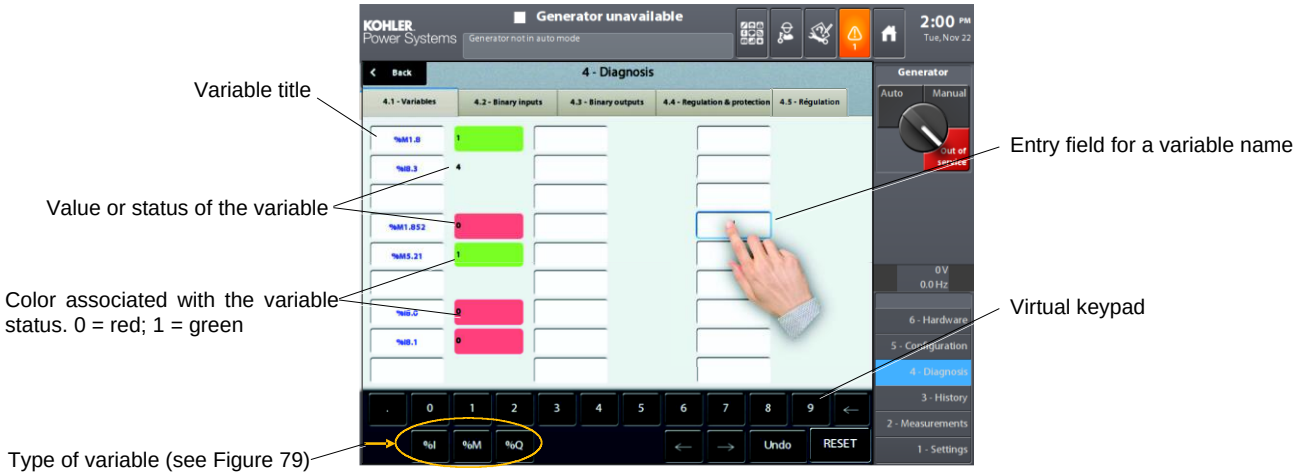


Figure 78 Variables Screen

Type	Enter on screen keypad	Enter on external keypad	Complete write access examples
Logic input variable	%I	I	I0.0.0
Analog input variable	%I	I	I5.21
Internal variable (input or output)	%M	M	M3.112
			M1.0
			M1.1
Logic output variable	%Q	Q	Q0.0.0
Analog output variable	%Q	Q	

Figure 79 Sample Variable Identification

Refer to the example in Figure 78 and the variables listed in Figure 80. Other variables and events are shown in the Saved Electrical and Mechanical Data and Events sections.

Title	Color	Name	State or value
%M3.112	Green	Low engine coolant warning	1
%I5.21		Fuel level	4
%M1.0	Red	Auto mode	0
%M1.1	Green	Manual mode	1
%I0.0.0	Red	Input #0 (base module)	0
%Q0.0.0	Red	Output #0 (base module)	0

Figure 80 Sample Variables Shown in Figure 78

Screen 4.2-Binary inputs

The 4.2-Binary inputs screen is used to get a quick overview of the following logic states:

- Eighteen binary inputs for the base module
- Eight binary inputs for each remote module connected to the base module

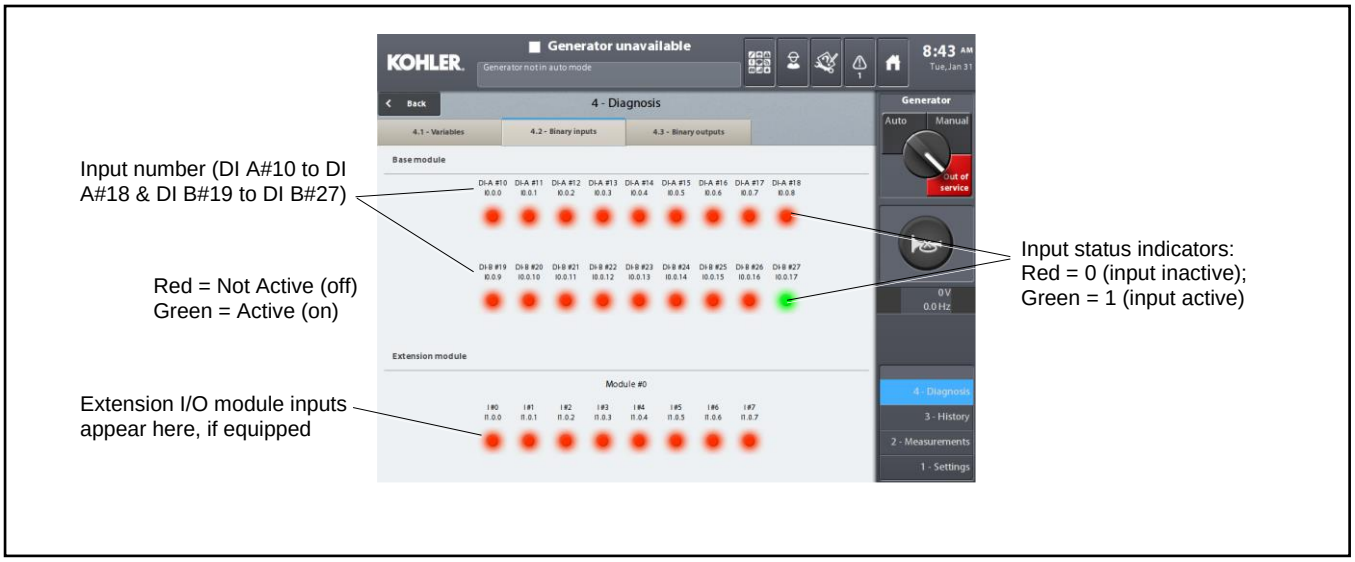


Figure 81 Binary Inputs Screen

Screen 4.3-Binary outputs

The 4.3-Binary outputs screen is used to get a quick overview of the following logic states:

- Eighteen base module outputs
- Eight outputs for each extension module connected to the base module

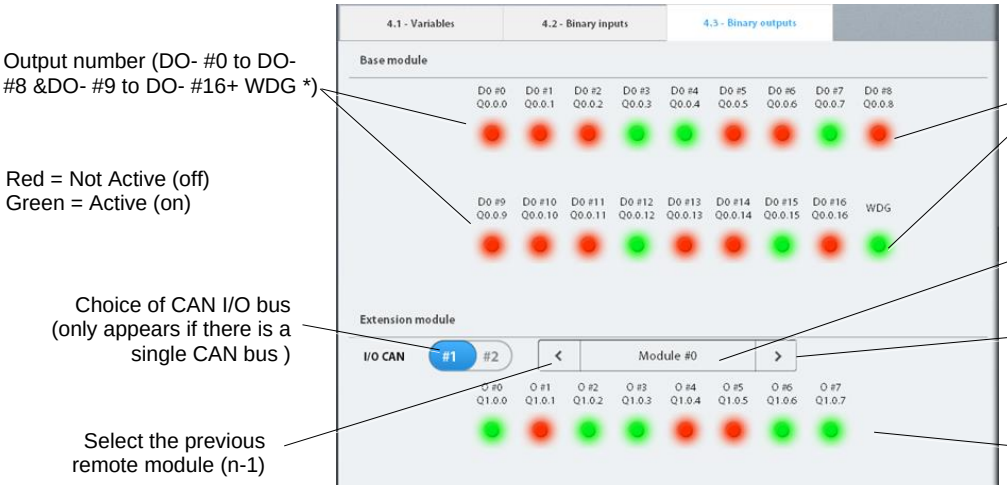


Figure 82 Binary Outputs Screen

Module #0 is reserved for the optional Manual Key Switch/Load Shed Module. Outputs #0 through #3 represent loads 1 through 4. When the output is deactivated, the output indicator is red and the load is connected. When an output is activated, the indicator turns green and the load is shed. See the Load Shed section for more information about the load shed function.

Screen 4.4-Regulation & protection

The 4.4-Regulation and protection screen is used to read all the internal variables for the regulation and protection modules.

Figure 83 Regulation and Protection Screen

The process for entering a regulation or protection variable is the same as for the 4.1-Mapping screen.

By default, the diagnostic table for the regulation and protection variables is already completed with the name of the current variables.

Screen 4.5-Regulation

The 4.5-Regulation screen is used to read all of the internal variables for the regulation modules.

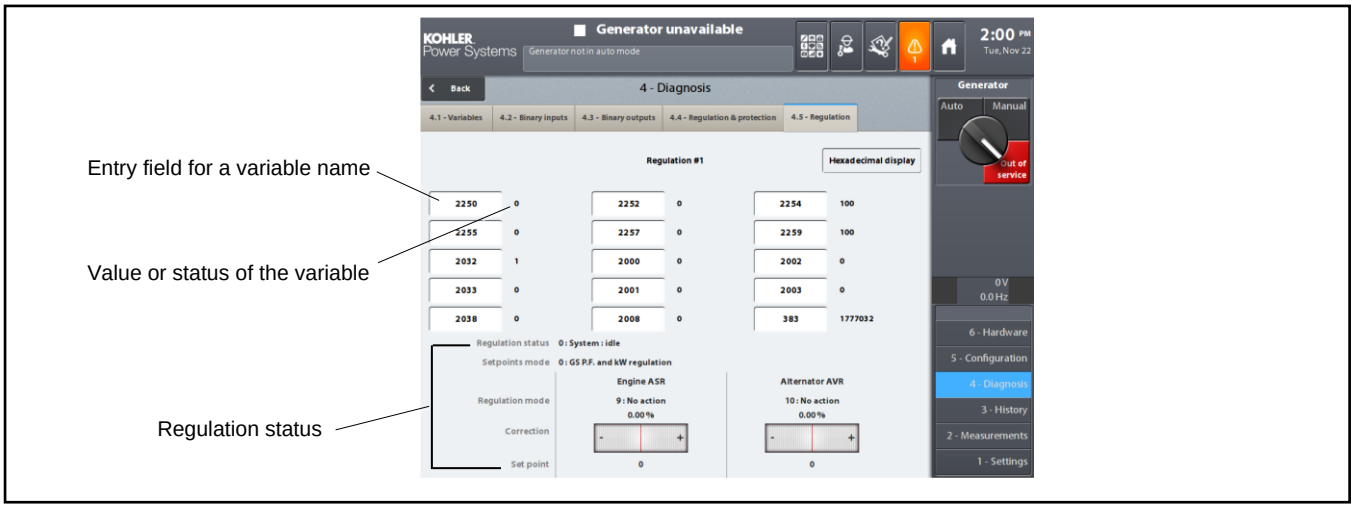


Figure 84 Regulation Screen

The virtual numeric keypad appears after the variable entry field has been pressed.

2.12.5 Menus 5 and 6

Except for menu 6.5, communication, menus 5 and 6 are view-only menus that can be seen when logged in as an operator (1966). The view-only menus are not shown in this document.

2.12.6 Menu 6.5-Communication

Screen 6.5.1-Ethernet

The **6.5.1-Ethernet** screen defines the computer addresses for the Ethernet connections for the base module and the HMI module.

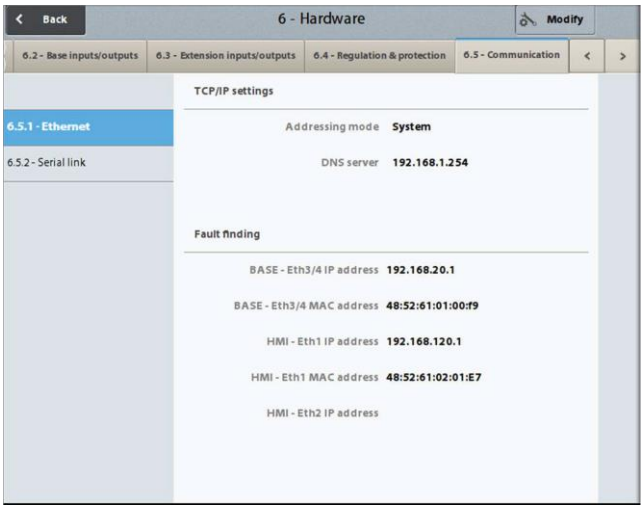


Figure 85 Ethernet Screen

The screen is accessible for modification at the operator level, but only for the *TCP/IP configuration* section.

Group	Title	Description and Possible Settings
TCP/IP Settings	Addressing mode *	Choice of address type for the TCP/IP connection: System, Customer IP, or DHCP. §
	DNS server	IP address of the DNS server. The DNS server is used to make the connection between an APM802 system and an IP address.
Fault Finding	Base-Eth3/4 IP address * ‡	Permanent or temporary identification number for the base module connected to another base or to a mains.
	Base-Eth3/4 MAC address * ‡	Unique permanent physical identification number, which is stored in the base module.
	HMI-Eth1 IP address * †	Permanent or temporary identification number for the HMI module connected to another base or to a mains.
	HMI-Eth1 MAC address * †	Unique permanent physical identification number, which is stored in the HMI module.
	HMI-Eth2 IP address	Not used.

* IP = Internet Protocol; MAC = Media Access Control.
† Eth1 = Ethernet port marked 1 at the rear of the HMI module
‡ Eth3/4 = Ethernet ports marked 3 or 4 on the front of the base module
§ DHCP: the DHCP protocol (Dynamic Host Configuration Protocol) allows an APM system to connect to a network, which dynamically assigns it an IP address

Figure 86 Ethernet Settings

Screen 6.5.2-Serial link

The **6.5.2-Serial link** screen defines the specifications of the RS485 type serial link available on the base module.

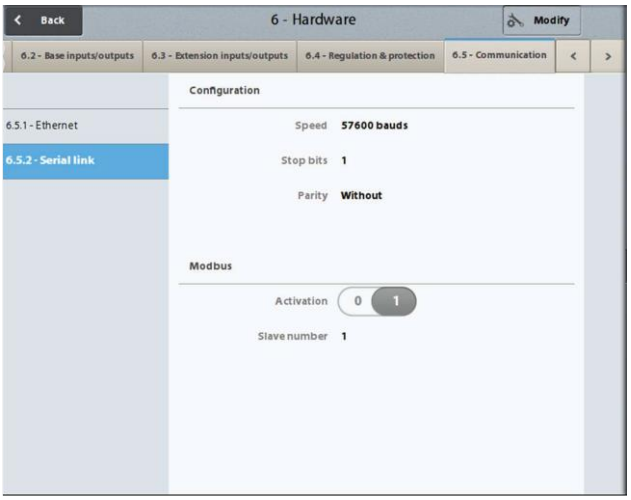


Figure 87 Serial Link Screen

The screen is accessible for modification at the operator level. Figure 88 shows the range of possible settings and the factory default settings, which are configured for communication with the RSA III remote serial annunciator.

Group	Parameter	Description and Possible Settings	Factory Settings
Configuration	Speed (baud rate) *	Communication speed: 9600, 19200, 38400, or 57600	19200
	Stop bits	1 or 2	1
	Parity	Without, odd, or even	Without
Modbus †	Activation (0/1 selector)	Set to 1 to activate the slave Modbus function	1 (Modbus slave)
	Slave number	Choice of sub-system number (address) on the RS-485 serial network: from 1 to 255 (only appears if the activation selector is set to 1)	1 (must match connected genset address on the RSA III)

* Baud rate= unit of measurement for the number of symbols transmitted per second
† Modbus is a communication protocol. It is formed of frames containing the address of the PLC in question, the function to be processed (read only, write access), the data, and the verification code called the cyclic redundancy check.

Figure 88 Serial Communication Settings

Section 3. Troubleshooting

3.1 Introduction

This section contains generator set, controller, general engine, and customer connection panel troubleshooting, diagnostic, and repair 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 and/or maintenance personnel.

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. If the procedures in this manual do not explain how to correct the problem, contact an authorized distributor/dealer. Use the record to help describe the problem and repairs or adjustments made to the equipment.

3.2 Generator Set and Controller

Refer to the following charts for generator set and controller troubleshooting. Some of the corrective actions may reference the alternator and/or controller service manual for additional troubleshooting information.

3.3 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.

3.4 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 respective transfer switch manuals as needed.

3.5 General Troubleshooting Chart

Trouble Symptoms													Controller and Emergency Stop Switch	Section or Publication Reference*
												Probable Causes	Recommended Actions	
Does not crank	Cranks but does not start	Starts hard	No or low output voltage	Stops suddenly	Lacks power	Overheats	Low oil pressure	High fuel consumption	Excessive or abnormal noise	Displays error message/locks up	Exercise run time and/or event records inoperative			
X	X											Controller circuit board(s) inoperative	Replace the controller's base module, if necessary.	Cont. S/M
X	X											Controller circuit board(s) Wiring fault	Check the wiring.	W/D
				X								Controller fault	Troubleshoot the controller. †	Cont. S/M
X	X			X								Controller fuse blown	Check for battery power to the controller and replace the fuse. If replacing the fuse doesn't fix the problem, troubleshoot the controller wiring. †	W/D
X												Controller HMI inoperative	Replace the controller HMI module, if necessary.	Cont. S/M
X												Controller in the OUT OF SERVICE mode	Change the operating mode on the controller.	Operation Section
X												Engine start circuit open	Start the engine with the controller in MANUAL mode 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
X				X								Emergency stop switch activated	Reset the emergency stop switch. Check the remote emergency stop switch, if equipped.	Operation Section
			X	X								Voltage regulation inoperative	Replace the junction box sensing fuses. If the fuse blows again, troubleshoot the controller. †	W/D, Alt. O/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*
Does not crank	Cranks but does not start	Starts hard	No or low output voltage	Stops suddenly	Lacks power	Overheats	Low oil pressure	High fuel consumption	Excessive or abnormal noise	Displays error message/locks up	Exercise run time and/or event records inoperative			
Alternator														
			X									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.	Alt. O/S/M, W/D
			X									Main field (rotor) inoperative (open or grounded)	Test and/or replace the rotor. †	Alt. O/S/M
			X									Stator inoperative (open or grounded)	Test and/or replace the stator. †	Alt. O/S/M
									X			Vibration excessive	Tighten loose components. †	—
			X	X								Voltage regulator settings incorrect	Check and adjust the voltage regulator. †	—
Electrical System (DC Circuits)														
X	X											Battery connections loose, corroded, or incorrect	Verify that the battery connections are correct, clean, and tight.	Troubleshooting Section
X	X											Battery weak or dead	Recharge or replace the battery. The spec sheet provides recommended battery CCA rating.	Troubleshooting Section, S/S
X	X											Starter/starter solenoid inoperative	Replace the starter or starter solenoid.	Eng. S/M
X				X								Engine harness connector(s) not locked tight	Disconnect the engine harness connector(s) then reconnect it to the controller.	W/D
				X								Fault shutdown	Identify and correct the fault condition. Then reset the fault on the controller.	Events 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*
Does not crank	Cranks but does not start	Starts hard	No or low output voltage	Stops suddenly	Lacks power	Overheats	Low oil pressure	High fuel consumption	Excessive or abnormal noise	Displays error message/locks up	Exercise run time and/or event records inoperative			
Engine														
	X	X			X			X				Air cleaner clogged	Clean or replace the filter element.	Maintenance Section
	X	X				X		X	X			Compression weak	Check the compression. †	Eng. S/M
			X		X	X		X	X			Engine overload	Reduce the electrical load. See the generator set spec sheet for wattage specifications.	S/S
									X			Exhaust system leak	Inspect the exhaust system. Replace damaged or broken exhaust system components. †	I/M
									X			Exhaust system not securely installed	Inspect the exhaust system. Tighten the loose exhaust system components. †	I/M
		X	X		X			X				Fault in engine’ s electronic system	Check fault records in engine ECU. †	Eng. O/M, KODIA O/M
					X				X			Valve clearance incorrect	Adjust the valves. †	Eng. O/M
									X			Vibration excessive	Tighten all loose hardware.	—
X	X			X						X	X	Engine ECM and/or sensors	Troubleshoot the engine ECU and/or sensors.	Eng. S/M
Cooling System														
						X		X				Air openings clogged	Clean the air openings.	—
						X						Coolant level low	Restore the coolant to normal operating level.	Eng. O/M
						X						Cooling water pump inoperative	Tighten or replace the belt (KD700-KD1000). Replace the water pump.	Eng. O/M or S/M
				X								High temperature shutdown	Allow the engine to cool down. Then troubleshoot the cooling system.	Maintenance Section, Eng. O/M
				X								Low coolant level shutdown, if equipped	Restore the coolant to normal operating level.	Eng. O/M
						X						Thermostat inoperative	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*
Does not crank	Cranks but does not start	Starts hard	No or low output voltage	Stops suddenly	Lacks power	Overheats	Low oil pressure	High fuel consumption	Excessive or abnormal noise	Displays error message/locks up	Exercise run time and/or event records inoperative			
Fuel System														
	X			X								Fuel tank empty or fuel valve shut off	Add fuel and move the fuel valve to the ON position.	—
	X	X			X							Air in fuel system	Bleed the diesel fuel system.	Maintenance Section
	X	X		X	X							Fuel filter restriction	Clean or replace the fuel filter.	Eng. O/M
	X	X			X							Fuel or fuel injectors dirty or faulty	Clean, test, and/or replace the dirty or faulty fuel injector. †	Eng. S/M
	X	X			X			X				Fuel injection timing out of adjustment	Adjust the fuel injection timing. †	Eng. S/M
	X				X			X				Fuel feed or injection pump inoperative	Rebuild or replace the injection pump. †	Eng. S/M
Lube System														
						X	X		X			Oil level low	Restore the oil level. Inspect the generator set for oil leaks.	Eng. O/M
				X								Low oil pressure shutdown	Check the oil level.	Eng. O/M
	X	X					X		X			Crankcase oil type incorrect for ambient temperature	Change the oil. Use oil with a viscosity suitable for the operating climate.	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.

4.1 Accessories and Connections

Factory-installed accessories are available to help finalize installation, add convenience to operation and service, and establish state and local code compliance.

See Figure 89 for a list of available kits. Obtain the most current accessory information from your local authorized service distributor/dealer.

Kit Description
Battery Chargers
Analog Input/ Output Module
Digital Input/ Output Module
Thermocouple Input Module
Remote Emergency Stop
Remote Serial Annunciator

Figure 89 Optional Accessories

This section illustrates several accessories available at print time of this publication. Accessory kits generally include installation instructions. See wiring diagrams manual for electrical connections not shown in this section. See the installation instructions and drawings supplied with kit for information on kit mounting location.

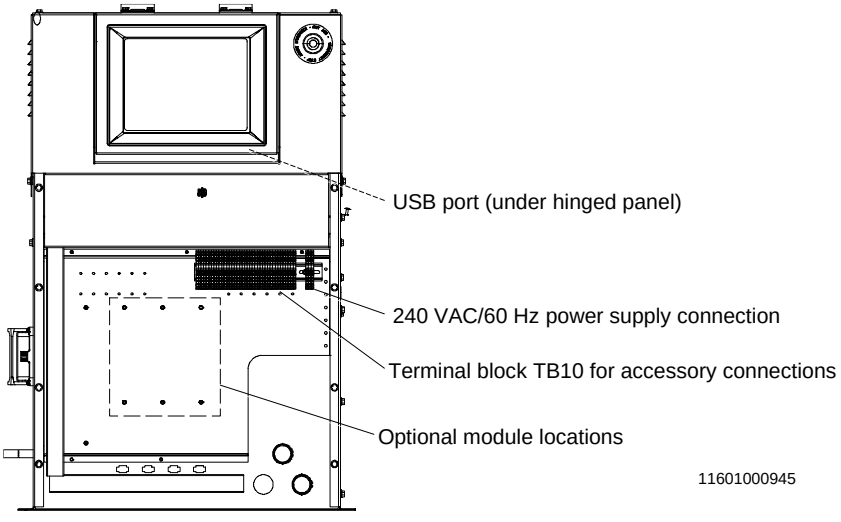
The instructions provided with the accessory kit supersede these instructions where there are differences. In general, run AC and DC wiring in separate conduit. Use shielded cable for all analog inputs. Observe all applicable national, state, and local electrical codes during accessory installation.

See the Accessory Connections section, and the generator set wiring diagrams for terminal identification.

4.2 Accessory Connections

Connect external optional accessories including alarms, battery chargers, thermocouples, and remote switches to the terminal block or modules in the customer connection box. See Figure 90. Do not attempt to connect directly to the APM802 controller or base module.

For specific information on accessory connections, refer to the accessory wiring diagrams in the wiring diagram manual and the instruction sheet accompanying the kit. See the generator set wiring diagram for TB10 connections.



Note:
Covers have been removed for illustration.

Figure 90 APM802 Controller and Customer Connection Box

4.3 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 is used with these models.

The battery charger sends a fault message to the APM802 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.

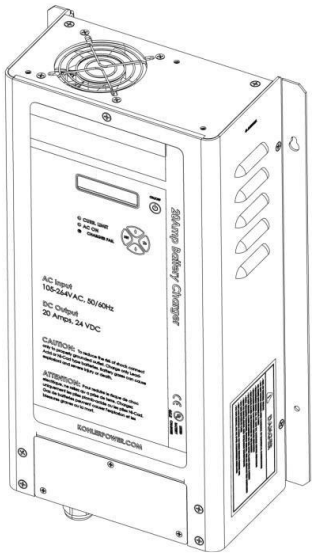


Figure 91 Kohler High Frequency Battery Charger

4.4 Input and Output Modules

The following factory-installed modules are available as optional accessories.

- Analog Input/Output Module
- Digital I/O Module
- Thermocouple Input Module

The modules are factory-installed in the customer connection box. Module power and CAN Bus communications with the controller are factory connected. The communication speed and module CAN addresses are factory set. Do not change the speed or CAN address DIP switch settings.

The modules are equipped with diagnostic LEDs that can be used for troubleshooting. See the Module Diagnostic LEDs figure.

4.4.1 Analog Input/Output Module

The Analog Input/Output (I/O) Module provides two output connections and four input connections. See Figure 92 for I/O specifications and Figure 93 for connections.

The factory default input and output settings are undefined. I/O settings can be loaded by an authorized service technician. Contact your Kohler distributor with your requirements for inputs and outputs.

Input/Output	Specifications	Connection
Input	0-20 mAmps Impedance 100 ohms	0.75 to 1.5 mm^2
Output	0-20 mAmps 100-600 ohms	0.75 to 1.5 mm^2

Figure 92 Analog Input/Output Specifications

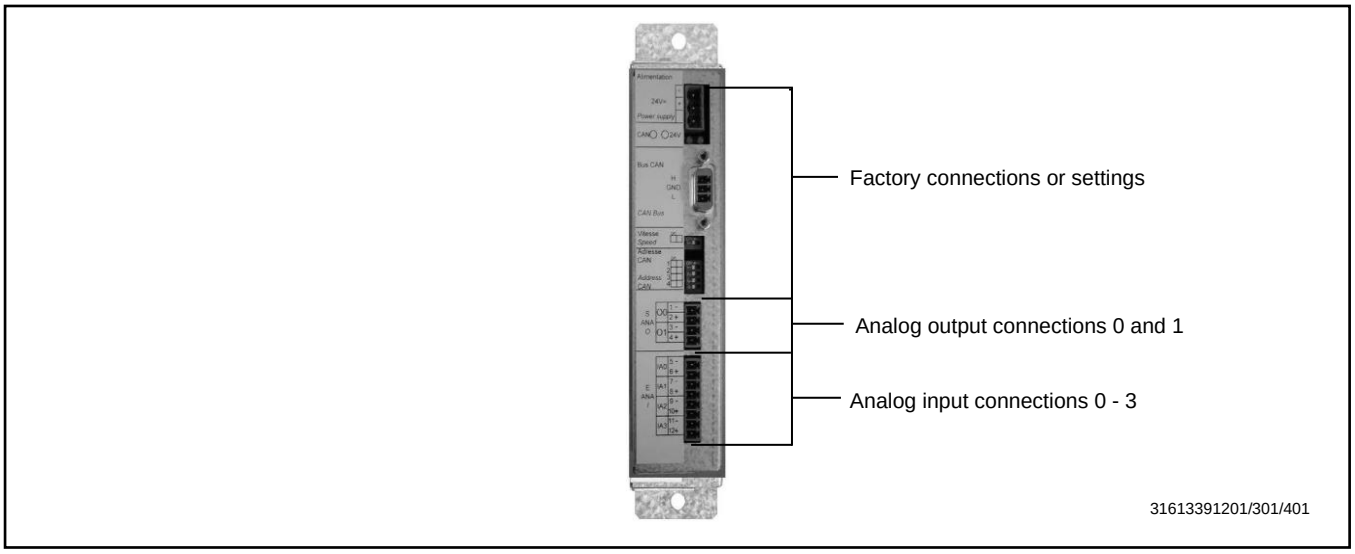


Figure 93 Analog Input/Output Module

LED	Description	LED Operation
1	Power LED	Green: The module is correctly powered. Off: Module is not powered.
2	Can bus 1 Communication LED	Flashing green: CAN communication is consistent. Steady green: No CAN communication. Off: No CAN communication.

Figure 94 Module Diagnostic LEDs

4.4.2 Digital Input/Output Module

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 95 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.

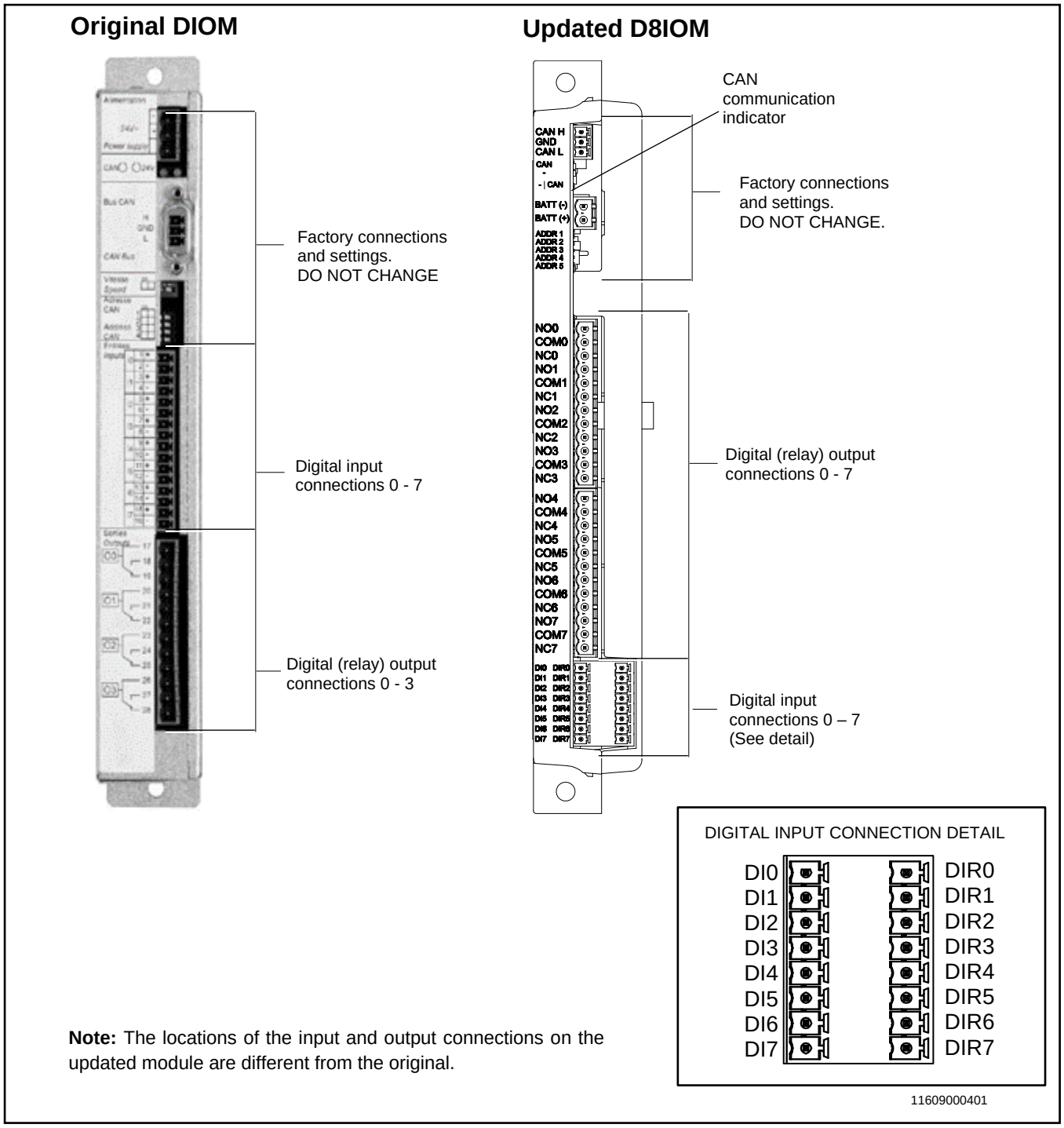


Figure 95 Digital Input/Output Modules, Original and Updated

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 mm2 (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 mm2 (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 96 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 97.

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

Figure 97 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 APM802

On KD Series generator sets with the APM802 controller, the Module #0 position is reserved for the Manual Key Switch/Load Shed module. Inputs and outputs are factory-set to the default settings shown in Figure 4-9.

The I/O settings for optional I/O module 1 are not defined at the factory. The digital inputs and outputs can be configured by an authorized service technician. Contact your Kohler distributor with your requirements for digital inputs and outputs.

	Factory Settings	
Digital Inputs/Outputs	**Module 0 (Key Switch/Load Shed Only)**	**Optional Module 1**
Input DI0	Key switch AUTO	Undefined
Input DI1	Key switch Manual	Undefined
Input DI2	Key switch OFF	Undefined
Input DI3	Start/Stop Button	Undefined
Input DI4	Reserved	Undefined
Input DI5	Reserved	Undefined
Input DI6	Reserved	Undefined
Input DI7	Reserved	Undefined
Output DO0	Load 1	Undefined
Output DO1	Load 2	Undefined
Output DO2	Load 3	Undefined
Output DO3	Load 4	Undefined
Output DO4	Reserved	Undefined
Output DO5	Reserved	Undefined
Output DO6	Reserved	Undefined
Output DO7	Reserved	Undefined

Figure 98 Digital 8 I/O Module Default Settings

4.4.3 Thermocouple Input Module

Up to three thermocouples can be connected to the Thermocouple Module. Type K or PT100 thermocouples can be connected. See Figure 99 for thermocouple specifications. See Figure 101 and Figure 102 for connections.

Medium voltage (larger than 600 volts) units are equipped with two thermocouple modules with the settings shown in Figure 100.

Temperature data can be viewed using the Custom View button on the controller. See the Custom View Button section. If no thermocouple modules are installed, all temperatures will display 32°F (0°C). If nothing is connected to a channel on a thermocouple module, -58°F (-50°C) is displayed.

Thermocouple Type	Temperature Range	Connection
PT100	0-200°C (32-392°F)	0.75 to 1.5 mm^2
K Thermocouple	-20-1000°C (-4-1832°F)	0.75 to 1.5 mm^2

Figure 99 Thermocouple Types and Connections

Thermocouple Module 1	Thermocouple Module 2
Phase A Temp	Front Bearing Temp
Phase B Temp	Rear Bearing Temp
Phase C Temp	User PT100 Temp

Figure 100 Thermocouple Module Default Settings for Medium Voltage Generators

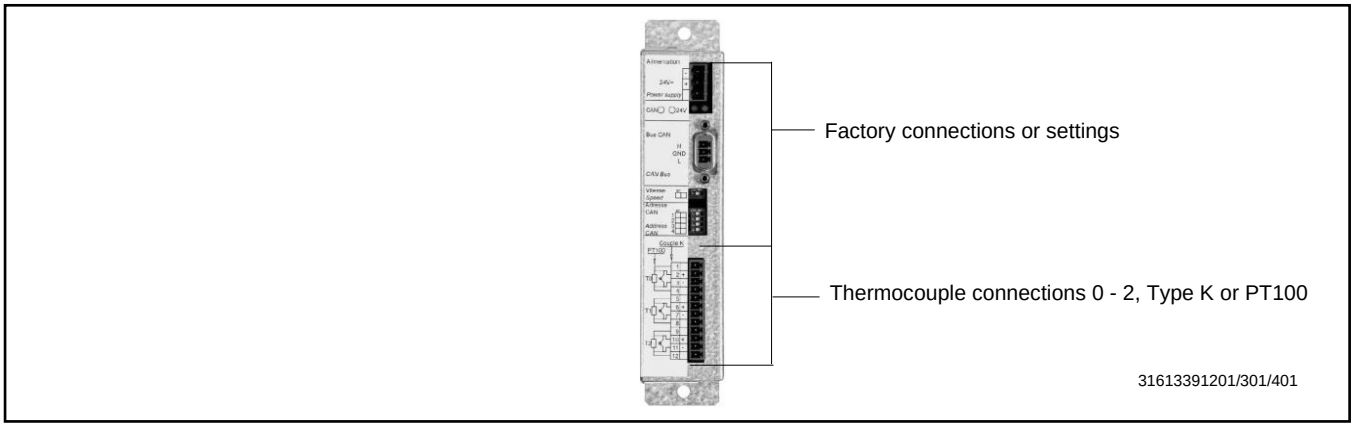


Figure 101 Thermocouple Module

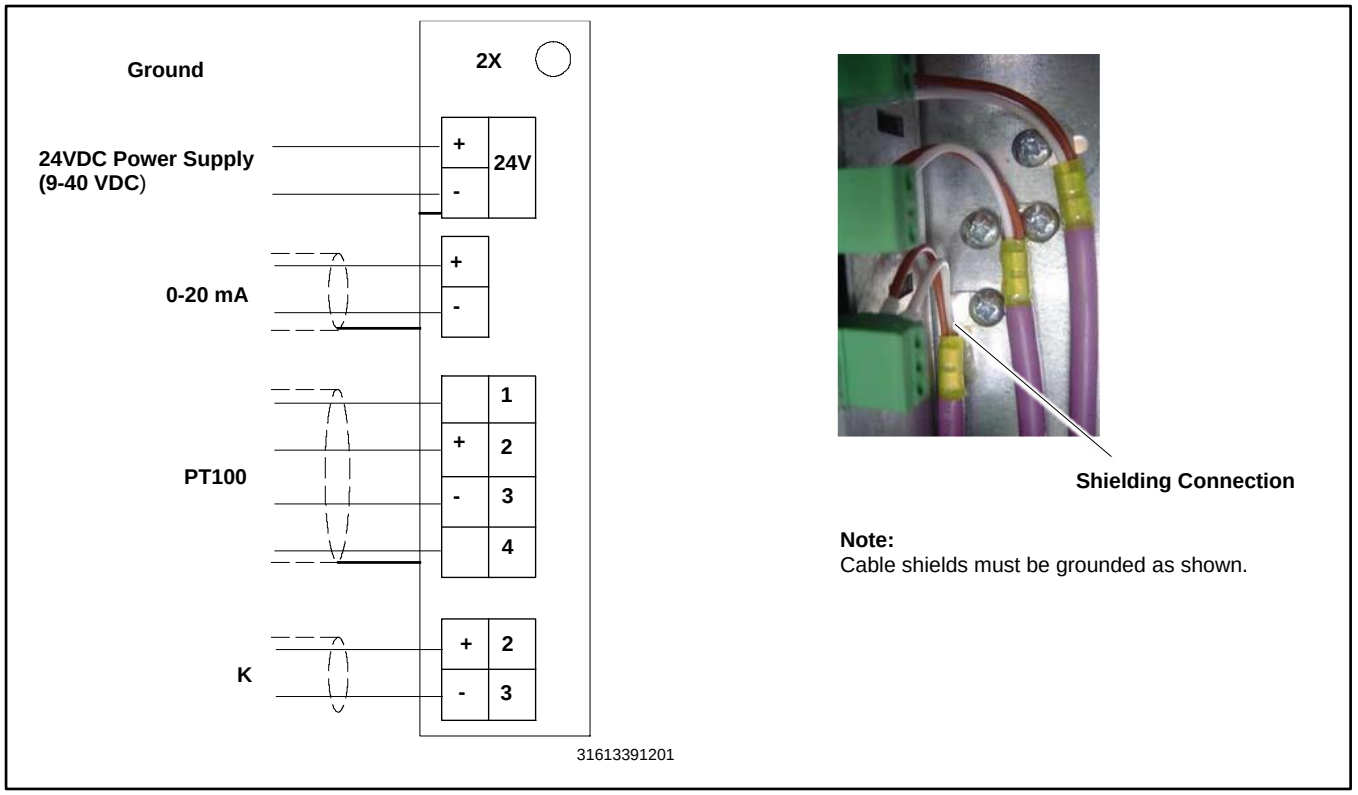


Figure 102 Connections

4.5 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 the Remote Emergency Stop Switches figure and the following instructions.

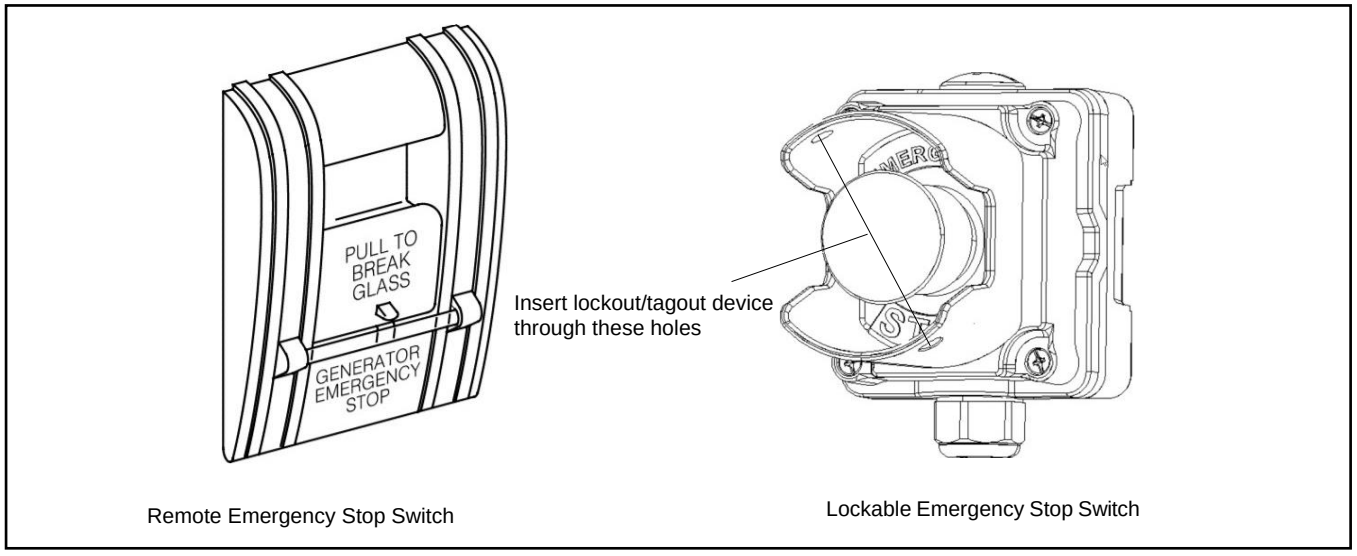


Figure 103 Remote Emergency Stop Switches

4.5.1 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.

4.5.2 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 103. 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.

4.6 Remote Serial Annunciator

RSA III is an annunciator panel offered in several kit configurations to support Kohler power equipment. The RSA III is a remote serial annunciator (Figure 104) that monitors the condition 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 and lamp test switch are 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.

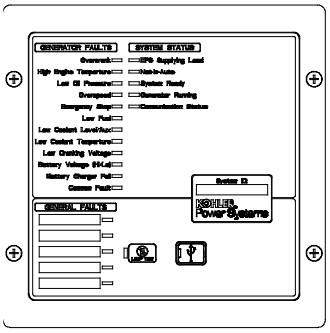
Connect the RSA III to the RS-485 connections on TB-10. See the Controller Features section and refer to the generator set wiring diagram for connections. The communication settings on the APM802 controller are factory-set for communication with the RSA III. See the Menu 6.5-Communication section, Screen 6.5.2 Serial Link.

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

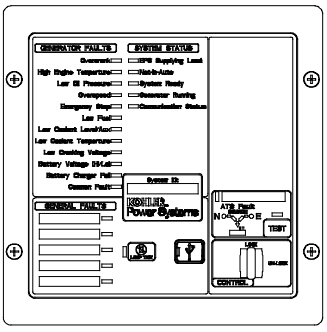
A PC with SiteTech™ software is required to make the RSA III functional. Use your SecurID to access KOHLERnet, click on the TechTools button, and follow the instructions to download the files. See TT-1625 and refer to TP-6701 SiteTech™ Software Operation Manual for more information.

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

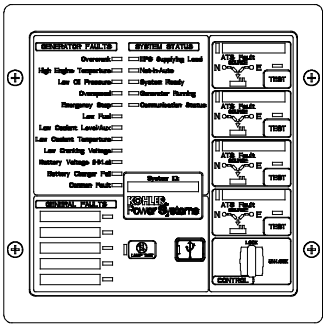
If the RSA III is used with an Ethernet communication network, order Modbus® Ethernet converter GM41143-KP2 and refer to TT-1405 Converters, Connections, and Controller Setup for Network Communication for system installation.



RSA III with Single Generator Set



RSA III with Single ATS Control



RSA III with Four ATS Controls

Figure 104 Remote Serial Annunciator (RSA III)

Figure 105 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.

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	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 Charger Fail	Yellow SF	Red SF	Green or Off	Green	Yellow SF	On	On
Battery Voltage (Hi)	Yellow Solid	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
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 Input #1 (Warning)	Yellow SF	Green	Green or Off	Green	Off	Off	Off
User Input #1 (Shutdown)	Red FF	Green	Green or Off	Green	Off	On	On
User Input #2 (Warning)	Yellow SF	Green	Green or Off	Green	Off	Off	Off
User Input #2 (Shutdown)	Red FF	Green	Green or Off	Green	Off	On	On
User Input #3 (Warning)	Yellow SF	Green	Green or Off	Green	Off	Off	Off
User Input #3 (Shutdown)	Red FF	Green	Green or Off	Green	Off	On	On
User Input #4 (Warning)	Yellow SF	Green	Green or Off	Green	Off	Off	Off
User Input #4 (Shutdown)	Red FF	Green	Green or Off	Green	Off	On	On
User Input #5 (Warning)	Yellow SF	Green	Green or Off	Green	Off	Off	Off
User 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 Fault (RSA III with ATS only)	Yellow SF	???	Green or Off	Green	Off	Off	On
ATS Fault (RSA III with ATS only)	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	Red 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 (1 second intervals), FF = Fast Flash (200 millisecond intervals)

Figure 105 System Monitoring LEDs and Functions

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		
bat.	Battery	CT	current transformer	ESD	electrostatic discharge
BBDC	before bottom dead center	Cu	copper	est.	estimated
BC	battery charger, battery charging	cUL	Canadian Underwriter's Laboratories	E-Stop	emergency stop
BCA	battery charging alternator	cu. in.	cubic inch	etc.	et cetera (and so forth)
BCI	Battery Council International	cw.	Clockwise	exh.	exhaust
BDC	before dead center	CWC	city water-cooled	ext.	external
BHP	brake horsepower	cyl.	Cylinder	F	Fahrenheit, female
blk.	black (paint color), block (engine)	D/A	digital to analog	FDS	Fluid Dosing System

FHM	flat head machine (screw)	in.	inch	Lpm	liters per minute
fl. oz.	fluid ounce	in. H_2O	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	*Systeme international d'unites*, 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/Coml	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
xfmr	transformer

Appendix B. Operating Hours and Service Log

Use the log below to keep a cumulative record of operating hours on your generator set and the dates required services were performed. Enter hours to the nearest quarter hour.

	Operating Hours		Service Record	
Date Run	Hours Run	Total Hours	Service Date	Service

	Operating Hours		Service Record	
Date Run	Hours Run	Total Hours	Service Date	Service

TP-7070 6/23h

Original Instructions (English)

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