

APM603



The APM603 generator set controller provides advanced control, system monitoring, and system diagnostics for a single generator set or paralleling multiple generator sets. The APM603 interfaces the generator set to other power system equipment and network management systems using standard industry network communications. It uses a patented hybrid voltage regulator and unique software logic to manage alternator thermal overload protection as well as serve as an overcurrent protective relay, features normally requiring additional hardware. The APM603 controller meets NFPA 110, Level 1.

Display, Interface, and Accessibility

- A 7.5-inch color TFT touchscreen for easy local access to data.
 - Overview can be customized to show critical data at a glance.
 - Create a custom favorites list for quick access to important data
- Measurements are selectable in metric or English units.
- Supports Modbus® protocol through serial bus and Ethernet networks, and supports SNMP and BACnet® through Ethernet networks.

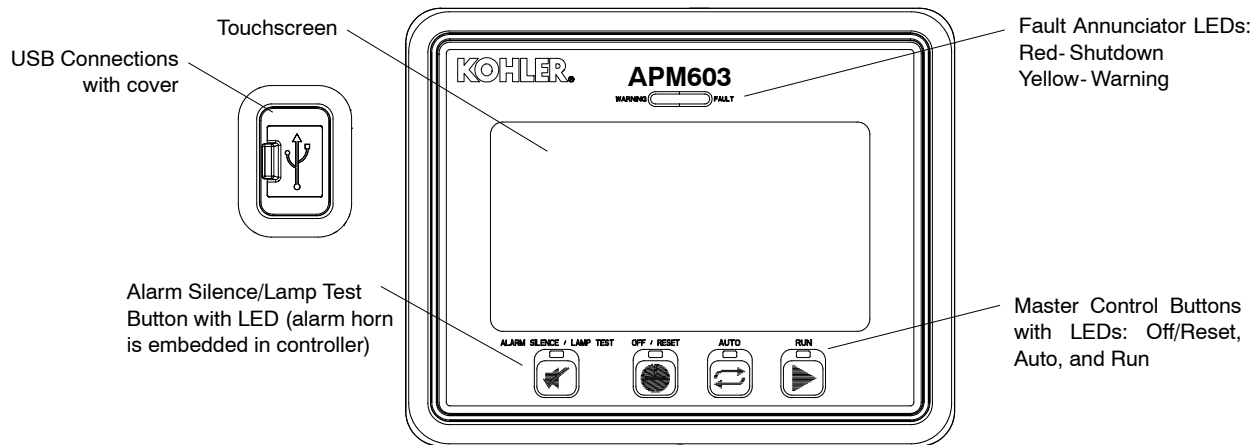
Global Support

- Sales, installation, and service support from more than 800 Kohler and SDMO service providers around the world.

Onboard Diagnostics

- Immediate visibility of warnings and faults with text description and code display.
 - 15 seconds of critical data are captured around each warning and fault
 - Critical data can be viewed on the display and downloaded
- Store up to 3000 events locally along with historical data logging of successful starts.
 - Accurate timestamp from real-time clock
 - Event log can be downloaded
- Data logging of customized parameter list for report generation and advanced troubleshooting
 - Store to external USB drive for easy transfer to another device

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BACnet® is a registered trademark of ASHRAE.



Controller Features

AC Output Voltage Regulator Adjustment	Maximum of $\pm 10\%$ of the system voltage
Alarm Silence	For NFPA-110 application or user convenience
Alternator Protection	Generator set overload and short circuit protection
Automatic Restart	After a failed start attempt
Cyclic Cranking	Programmable
ECM Diagnostics	Displays engine ECM fault codes and descriptions for engine troubleshooting
Engine Start Aid	Control for an optional engine starting aid
Environmentally Sealed Membrane Keypad	Three master control buttons with lights: Off/Reset, Auto, and Run
Integrated Hybrid Voltage Regulator, Patented High-Speed Digital Design	$\pm 0.25\%$ no-load to full-load regulation with three-phase RMS sensing
Lamp Test	Verifies functionality of the indicator lights
Real-time Clock	Includes battery back-up to retain date and time through controller power cycle
Remote Reset	Allows remote fault resets and restarting of the generator set
Remote Monitoring Panel	Compatible with the Kohler® Remote Serial Annunciator
Run Time Hourmeter	Displays generator set run time
Run Relay	Indicates that the generator set is running
Time Delay Engine Cooldown (TDEC)	Time delay before the generator set shuts down
Time Delay Engine Start (TDES)	Time delay before the generator set starts

Communication

USB Port	(1) Mini-USB port for PC connection (1) USB port for storage device
Serial (RS-485) Port	(1) Non-isolated for RSA III (1) Isolated for Modbus devices (1) Isolated for paralleling communication
Ethernet Port	(1) RJ45 for Modbus TCP, SNMP, and BACnet

Controller Specifications

Nominal voltage	12 or 24 VDC protected against reverse battery connection
Power	800 mAmps at 12 VDC 400 mAmps at 24 VDC
Operating Temperature	- 40°C to 70°C (- 40°F to 158°F)
Storage Temperature	- 40°C to 85°C (- 40°F to 185°F)
Humidity	5% to 95% non-condensing
Display Size, W x H	154 X 86 mm (6.0 x 3.4 inches)
Protection Index	IP65 Front

Paralleling Features

- Isochronous (real and reactive) load sharing with other APM603 controller equipped generator sets
 - Supports paralleling up to 8 generators
- Random first-on logic to prevent two or more generator sets from closing to a dead bus and provides the fastest response for a single generator online
- Automatic synchronizer with dead bus closing
- Soft loading and unloading for generator management and system control by closed-transition ATS with soft load/unload outputs.
- Protective relay functions:
 - Synch check (25C)
 - Over current (51)
 - Over frequency (81O)
 - Over power (32O)
 - Over voltage (59)
 - Reverse power (32R)
 - Reverse Reactive Power (32RQ)
 - Under frequency (81U)
 - Under voltage (27)
- Generator management to allow the start and stop of generators based on load demand or state of other generators
 - Fuel Level
 - Run Time
 - Manual Order
 - Time of Day
 - Efficiency
- Simplified paralleling system view from any generator controller in the system

Overcurrent Protective Relay

- Provides protection against fault conditions
- Uses thermal and instantaneous current limit settings for selective coordination
- Includes a maintenance mode for arc flash reduction per NEC 240.87

Load Management Features

- Programmable outputs included to command the connect and disconnect of loads based on generator or paralleling system state
 - Under frequency
 - Start up
 - Generators online
 - Priority demands
- Supports up to 16 loads per system
 - Can be used on a single generator system
 - Can be combined in a paralleling system for a total system load control capability
- Simplified load management system view from any generator controller in the system
- Load control requires the 4 input/15 output module (see Available Options)

Advanced Programmable I/O

- Configurable inputs and outputs can be programmed for customer specific use
- PLC-like capability for applying logic to customize generator system behavior

Troubleshooting Features

- 15 seconds of key data automatically captured around each warning and shutdown
 - Data can be exported for detailed analysis
 - Data can be viewed on controller for convenient on-site troubleshooting support
- Configurable data logger will allow you to select parameters to monitor
 - Data stored to USB device for flexibility on amount of data stored and ability to export for detailed analysis
 - Data capture controlled by user to allow capturing specific data required

NFPA 110 Requirements

In order to meet NFPA 110, Level 1 requirements, the generator set controller monitors the engine/generator functions/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
 - High engine speed
 - Low fuel (level or pressure) *
 - Low coolant level
 - EPS supplying load
 - High battery voltage
 - Low battery voltage
- General functions:
 - Master switch not in auto
 - Battery charger fault *
 - Lamp test
 - Contacts for local and remote common alarm
 - Audible alarm silence button
 - Remote emergency stop *

* Function requires optional input sensors or kits and is engine dependent, see Controller Displays as Provided by the Engine ECM.

Standards

The generator set controller has been tested and verified for compliance with the following standards.

- NFPA 99
- NFPA 110, Level 1
- CSA 282-09
- UL 6200
- ASTM B117 (salt spray test)

Controller Functions

The controller displays warning, shutdown, and status messages. **All functions are available as relay outputs.**

Warning causes the fault light to show yellow and sounds the alarm horn signaling an impending problem.

Shutdown causes the fault light to show red, sounds the alarm horn, and stops the generator set.

Event	Warning	Shutdown
Alternator Thermal Protection †		●
Battery Charger Fault *	▲	
CAN Option Board1 Comm Loss	▲	
Critically Low Fuel Level *	▲	
ECM Diagnostic Event	▲	
ECM Mismatch Shutdown †		●
Fuel Leak Alarm *	▲	
Gen OverPower Shutdown †		●
Gen OverPower Warning	▲	
High Battery Voltage Warning	▲	
High Coolant Temperature Shutdown †		●
High Coolant Temperature Shutdown ECM DTC †		●
High Coolant Temperature Warning	▲	
High Coolant Temperature Warning ECM DTC	▲	
High Fuel Level Warning *	▲	
High Oil Temperature Shutdown †		●
High Oil Temperature Warning	▲	
Local Emergency Stop Shutdown †		●
Loss ECM Comms Shutdown †		●
Loss Of Signal Low Coolant Level Voltage	▲	
Low Battery Voltage Warning	▲	
Low Coolant Level Shutdown		●
Low Coolant Temperature Warning	▲	
Low Fuel Level Shutdown * †		●
Low Fuel Level Warning * †	▲	
Low Oil Pressure Shutdown †		●
Low Oil Pressure Shutdown ECM DTC †		●
Low Oil Pressure Warning	▲	
Low Oil Pressure Warning ECM DTC	▲	
Low RTC Battery Voltage	▲	
Maintenance Reminder1	▲	
Maintenance Reminder2	▲	
Maintenance Reminder3	▲	
Not In Auto Alarm	▲	
OverCrank Shutdown †		●
OverCurrent Shutdown (L1, L2, L3) †		●
OverCurrent Warning (L1, L2, L3)	▲	
OverFrequency Shutdown †		●
OverFrequency Warning	▲	
OverPower Shutdown †		●
OverPower Warning	▲	
OverSpeed Shutdown †		●
OverVoltage Shutdown (L-L, L-N, each phase)		●
OverVoltage Warning (L-L, L-N, each phase)	▲	

Event	Warning	Shutdown
Protective Relay Shutdown OverCurrent †		●
Protective Relay Shutdown OverPower †		●
Protective Relay Shutdown ReversePower †		●
Protective Relay Shutdown Reverse VAR †		●
Protective Relay Trip OverCurrent	▲	
Protective Relay Trip OverFrequency	▲	
Protective Relay Trip OverPower	▲	
Protective Relay Trip OverVoltage	▲	
Protective Relay Trip Reverse Power	▲	
Protective Relay Trip Reverse VAR	▲	
Protective Relay Trip UnderFrequency	▲	
Protective Relay Trip UnderVoltage	▲	
Remote Emergency Stop Shutdown †		●
UnderFrequency Shutdown †		●
UnderFrequency Warning	▲	
UnderVoltage Shutdown (L-L, L-N, each phase) †		●
UnderVoltage Warning (L-L, L-N, each phase)	▲	
Weak Cranking Battery	▲	
Status Messages		
Auto Button Pressed		
EPS Supplying Power		
Generator Running		
Generator Started		
Generator Stopped		
GFCI Warning *		
Load Shed Overload		
Load Shed Under Frequency		
Off Button Pressed		
RSA Event Programmable Digital Inputs, 1-8		
Run Button Pressed		
* Function requires optional input sensors or kits		
† Items included with common fault shutdown		

Inputs and Outputs

Standard Dedicated User Inputs	Input Type
Remote Engine Start	Two-wire input
Auxiliary Fault (Shutdown)	Digital Input
Auxiliary Warning	
Battery Charger Fault	
Fuel Leak Alarm	
Low Fuel Level Switch	
Remote Emergency Stop	
Speed Bias	Analog Voltage Input, Scalable up to +/- 10 VDC
Voltage Bias	

Standard Dedicated User Outputs	Output Type
Run/Fuel	Relay Driver Output
Common Failure	
Common Warning	
High Coolant Temperature	
Close Breaker	
Trip Breaker / Shunt Trip	

Optional Configurable User Inputs and Outputs	
User Configurable Inputs	2 Analog, 0- 5 VDC 4 Dry Contact Digital
User Configurable Relay Outputs	14 NO/NC Relays 1 Common Fault Relay
Note: Programmable I/O is configurable by a Kohler-authorized technician	

Engine Data

The following data is communicated to the controller by the engine ECM.

Parameter	John Deere Engines
Intake air temperature	D
Coolant level	D
Coolant temperature	C/S/D
Engine model number	S
Engine serial number	S
Engine speed	C/S/D
Fuel pressure	C/S†
Fuel rate	S
Fuel temperature	S/D
Oil level	S†
Oil pressure	C/S/D

C = Value displayed on controller,
S = Value displayed in Site Tech,
D = ECU diagnostic is supported

† Controller uses local analog input to obtain this information.

NOTE: See the generator set specification sheet for engine model identification.

APM603 Available Options

- ☐ **Common Failure Relay** provides a relay output to signal a generator set fault.
- ☐ **Float/Equalize Battery Charger** available with 6 or 10 amp output for 12 or 24V DC voltage output. The 10 amp model provides NFPA 110 charging and alarming capability.
- ☐ **Electrically Operated Circuit Breakers**
 - For paralleling systems
 - Available generator-mounted or remote-mounted
 - 24VDC
- ☐ **Ground Fault Relay** provides a relay output to signal a ground fault is detected.
- ☐ **Input/Output Module** provides:
 - 2 analog inputs (0- 5 VDC)
 - 4 digital input connections with connection to ground
 - 14 relay output connections (Form C, rated 10A, 120V)
 - 1 common fault relay output (NO, rated 2A, 24VDC)
- ☐ **Key Switch** to allow selection of RUN, OFF and AUTO modes. Lockable in the AUTO position by removing the key.
- ☐ **Remote Emergency Stop Switch** available as a wall mounted panel to remotely shut down the generator set.
- ☐ **Remote Monitoring Panel.** The Kohler® Remote Serial Annunciator (RSA) enables the operator to monitor the status of the generator set from a remote location, which may be required for NFPA 99 and NFPA 110 installations, and up to four Automatic transfer switches.
- ☐ **Shunt Trip Wiring** provides relay outputs to trip a shunt trip circuit breaker and to signal the common fault shutdowns. Contacts rated at 10 amps at 28 VDC or 120 VAC.

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