



General Description

Integrating the operation of onsite generators, utility services, automatic transfer switches, generator controls, and distribution equipment into a fully functioning system requires the engineering expertise and dedication to quality that is Kohler® paralleling switchgear.

Kohler's PD-series paralleling switchgear provides an industry-leading platform for command and control of multiple power sources. Designed to be integrated with Kohler generator sets or combined with other major brands of generation equipment, the PD-series delivers outstanding reliability along with the most intuitive user interface in the industry.

PD-Series Switchgear Applications						
	UL 891		UL 1558		Med. Voltage	
Model	ATS	Utility	ATS	Utility	ATS	Utility
PD-2000	PD-2100	PD-2200	—	—	—	—
PD-3000	—	—	PD-3100	PD-3200	—	—
PD-4000	—	—	—	—	PD-4100	PD-4200

Standard Features

- 15 in. color graphical user interface (touch screen), Windows® industrial PC-based
- Digital real (kW) and reactive (kVAR) load sharing
- Digital synchronizer
- User-definable generator management
- User-definable load management
- Modbus® protocol communication via RS-485 or Ethernet
- Internal web server
- Complete system metering, annunciation, settings, and control functions through touch screen interface
- Event monitoring and logging
- Power and mechanical trend measurements

Available Applications

- Emergency standby
- Prime power
- Base load (peak shave)
- Import mode (peak shave)
- Isolate (interruptible rate)

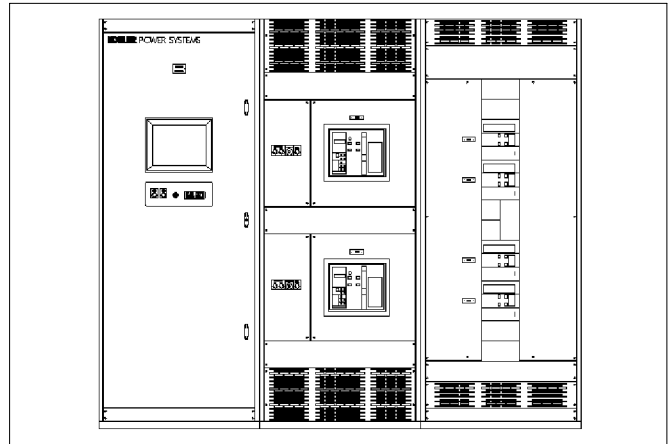
Windows® is a registered trademark of Microsoft® Corporation.

System Configurations

PD-2000 Series

The PD-2000 series product offering is UL 891 listed and allows for extreme flexibility in design while providing a strong standard for safety and performance. Features include:

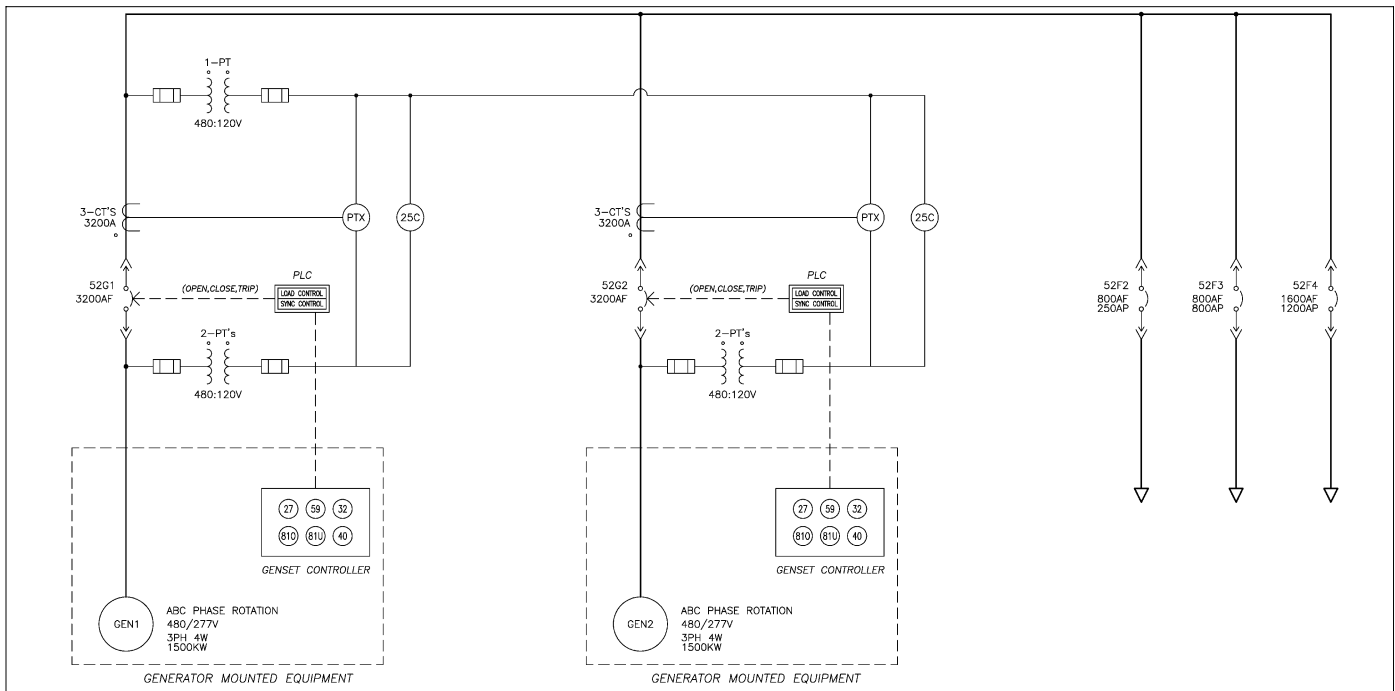
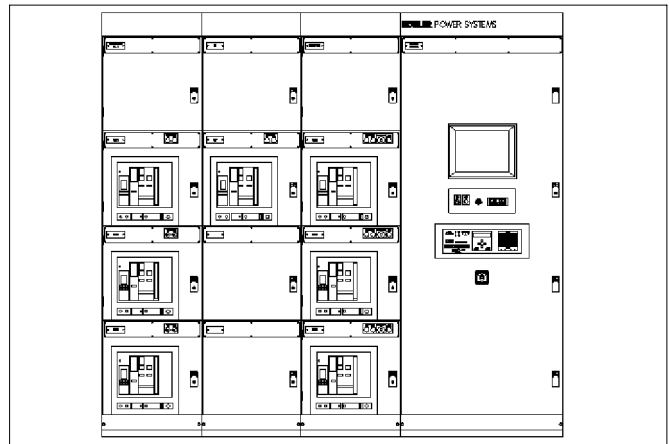
- PD-series digital system control standard
- Rear access standard, front access available
- Shallow depth (36-42 in. available)
- UL 489 fixed or drawout breakers for generator sets, utility, and distribution
- Molded-case breakers available for distribution
- Bus ratings through 10,000 amps/150 kA withstand
- Complete selection of breaker manufacturers, trip options, and power monitoring
- NEMA 1, NEMA 3R walk-up and walk-in available



PD-3000 Series

Offering the highest standard in bus withstand and breaker ratings, the PD-3000 series is listed under UL 1558. Featuring drawout breakers as standard, the PD-3000 series is designed with reliability and serviceability in mind. Features include:

- PD-series digital system control standard
- UL 1066 drawout breakers for generator sets, utility, and distribution
- Complies with ANSI C37.20.1
- Bus ratings through 10,000 amps/200 kA withstand
- Complete selection of breaker manufacturers, trip options, and power monitoring
- NEMA 1, NEMA 3R walk-up and walk-in available



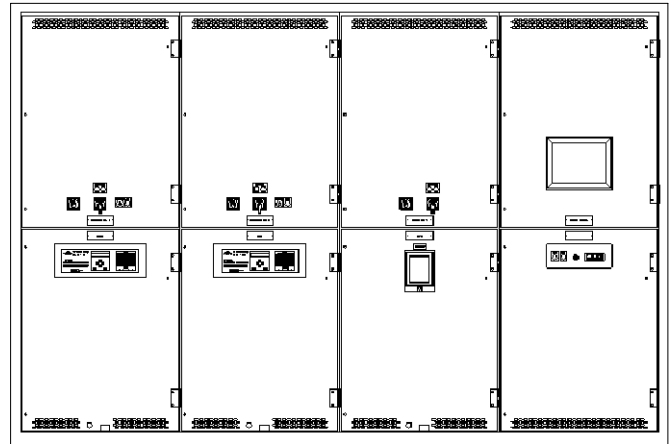
System Configurations, continued

PD-4000 Series

Medium voltage generation applications continue to grow with distributed generation and large standby systems leading the way. Available through 15 kV, the PD-4000 series utilizes the strength of the digital control system combined with utility grade protective relays for a complete system solution.

Features include:

- PD-series digital system control standard
- UL MV switchgear listing through 15 kV
- Complies with ANSI metal-clad switchgear requirements
- Bus and breaker ratings through 3000 amps
- Complete selection of breaker manufacturers, protective relay options, power monitoring, neutral grounding resistors and control battery systems
- NEMA 1, NEMA 3R walk-up and shelter aisle available



ED-Series

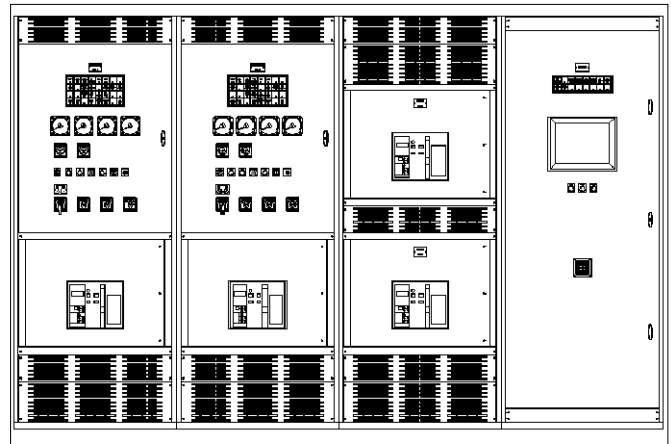
Kohler Power Systems seeks to provide the widest selection of products available in the market as well as meeting the diverse needs of our customers. With this goal in mind, we offer the ED paralleling series.

Combining the PD-series controls with more traditional features, the ED-series is available in all configurations. With the ED product line, the customer may choose from a wide variety of options including:

- Analog meters
- Window light annunciators
- Selector switches, pushbuttons, etc.
- Sync scope, lights on swing panel

In most cases, ED product is designed with the same PLC logic and touch screen interface allowing system setup and monitoring while also providing the user with a more traditional interface.

Kohler's desire to provide the owner with the system they want, rather than a standard off-the-shelf product, drives our engineers to bring ideas to the table to improve, simplify, and ensure the reliability of your system.



Applications

PD-series paralleling switchgear is extremely versatile and can be configured for *on the fly* operational mode change. Kohler's patented field-configurable operation modes can allow the owner to select a system that will provide soft-load closed transition emergency operation today and extended parallel/peak shave in the future without significant modifications.

Typical applications for the PD-series include:

Standby

ATS Start (PD-2100, PD-3100, PD-4100)

A start signal from an automatic transfer switch or other control device starts all generator sets. The generators synchronize and connect to the paralleling bus.

Utility Breaker Sensing Start (PD-2200, PD-3200, PD-4200)

In many systems, transfer switches are not present. When the utility fails, the utility breaker opens. The PLC logic starts the generator sets and connects them to the generator set paralleling bus. When the required number of generator sets are online, the tie breaker closes.

Return of Utility

After utility power is restored, the return-to-utility sequence starts. Several options are available for return of utility power.

ATS Transfer: Standard, delayed transition, or closed transition switches can restore the load to the utility source.

Circuit Breaker Transfer: Where a system does not employ automatic transfer switches, the system breakers can effect transfer in multiple modes:

Open Transfer: The tie breaker opens and, after a time delay, the utility breaker closes.

Rapid CT Transfer: The generator bus synchronizes to the utility. When synchronized, the utility breaker closes and the generator bus tie breaker opens, allowing an overlap of not more than 100 ms.

Soft Transfer: The generator bus synchronizes to the utility. When synchronized, the utility breaker closes. The switchgear soft-unloads the generator sets and then opens the generator bus tie breaker.

Prime Power

A system-start signal starts all generator sets. The generator sets synchronize and connect to the generator set paralleling bus.

Isolate (Interruptible Rate)

A system-start signal starts all generator sets. The generator sets synchronize and connect to the generator set paralleling bus. With all generator sets online, the generator bus synchronizes to the utility and the generator bus tie breaker closes. The generator sets ramp up to assume system load. When the power flow across the utility breaker reaches a preset level, the utility breaker opens.

Base Load Generators (Peak Shave)

A system-start signal starts the generator sets. The generator sets synchronize and connect to the generator set paralleling bus. With all generator sets connected, the generator bus parallels to the utility and the generator bus tie breaker closes. The generator sets soft-load to a preset, user-adjustable kW level.

Generator set output remains constant and utility power fluctuates to supply the difference between the generator set output and the load requirement. When the generator set output exceeds the system load requirements, the excess power is exported to the utility.

Import (Peak Shave)

A system-start signal starts the generator sets. The generator sets synchronize and connect to the generator paralleling bus. With all generator sets connected, the generator bus parallels to the utility and the generator bus tie breaker closes. The generator sets soft-load to a preset, user-adjustable kW power flow across the utility breaker. The power flow to the utility remains constant and the generator set power output fluctuates to meet the requirements of the load.

The system imports a set power level from the utility. If the load requirement exceeds the generator set rating, the generator set produces its rated power and the utility supplies the difference.

Touch Screen Interface

The PD-series of digital switchgear incorporates a high resolution graphical interface (HMI) to provide control and monitoring of all system parameters in one location.

The operator interface software is configured in a user-friendly format with direct access to multiple levels of control and monitoring.

User programming is performed through a password-protected pop-up keypad available on all screens. Each system includes:

- System one-line overview
- Generator control
- Generator monitoring
- Generator management
- Load management

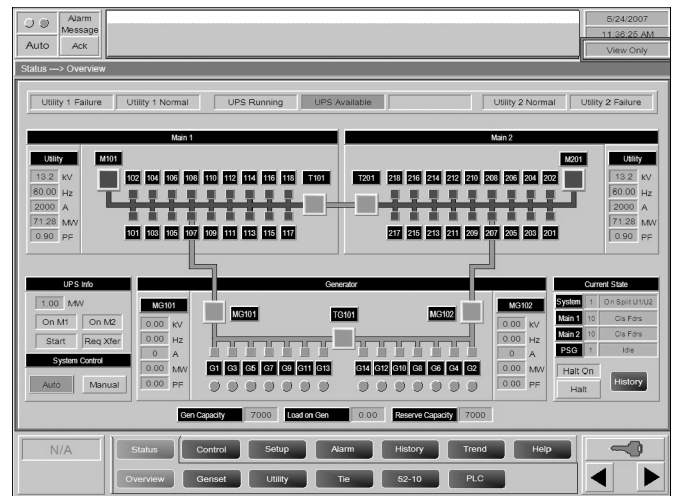
System One-Line Overview

The one-line overview screen displays system status through animation, color indications, system feedback, and operating parameters. The screen is customized to show all equipment and components installed at the site, including breaker status. The screen includes:

Breaker Status: System breakers including generator paralleling and distribution. Color indications include open/close and automatic/manual control.

Generator Sets: Generator running or offline, individual generator voltage, frequency, current, kilowatts, power factor, total generator bus kilowatts, and master control annunciator windows (indications/alarms).

General: The overview summarizes active alarms, system status, communications operation, date, time, authorization level, and through an address bar, determination of where you are in the system. An easy-to-navigate tab system and scroll buttons provide an intuitive interface.

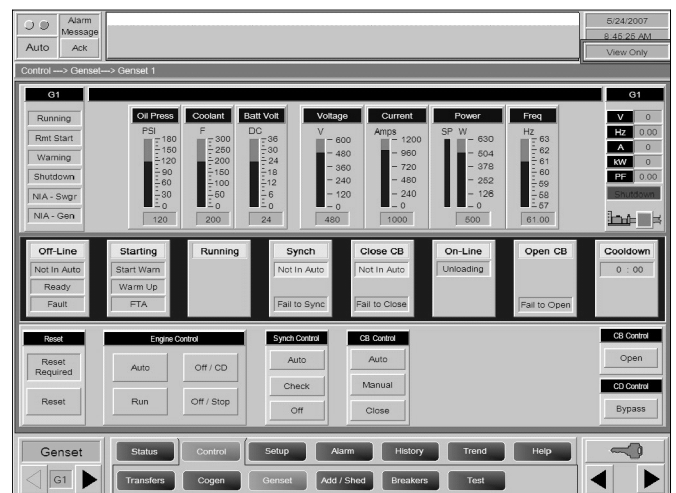


Generator Control

The generator set control screen provides a graphical interface to a specific generator set's operation. Simple and complete, the generator control screen provides a familiar environment for operators while incorporating digital benefits. The generator control screen includes:

- Generator and bus monitoring of voltage and frequency for manual paralleling
- Generator output monitoring
- Digital sync-scope and phase/voltage differential indications
- Generator control switch with four positions: automatic, run, off/CD (cool down), and off/SD (shutdown)
- Synchronizer control switch with three positions: automatic, check (manual paralleling), and off
- Speed and voltage adjust switches: up/down adjustments with digital indication of setting for manual paralleling

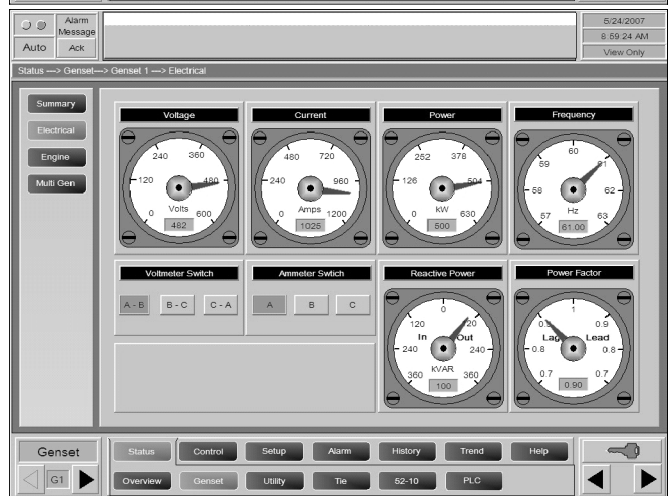
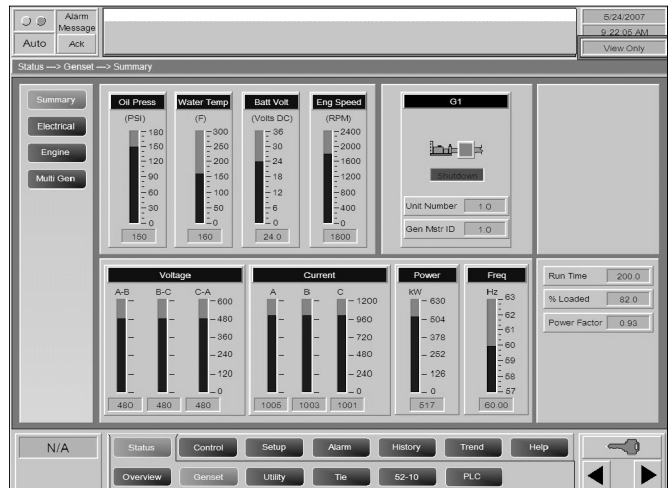
The user may move from one generator to another through the push of a single button.



Generator Monitoring

Detailed electrical and mechanical data for each generator is gathered on this screen. When paired with the 550 engine-mounted controller, hundreds of data points are available for each engine generator should the customer desire extended data. Standard information is represented in bar graph and digital readouts and includes:

- Generator Electrical: voltage (3-phase), frequency, kilowatts, current (3-phase), power factor
- Generator Mechanical: water temperature, oil pressure, engine speed, battery voltage
- General Information: running time, percentage loaded, number of starts
- User-defined settings display of critical faults and alarms

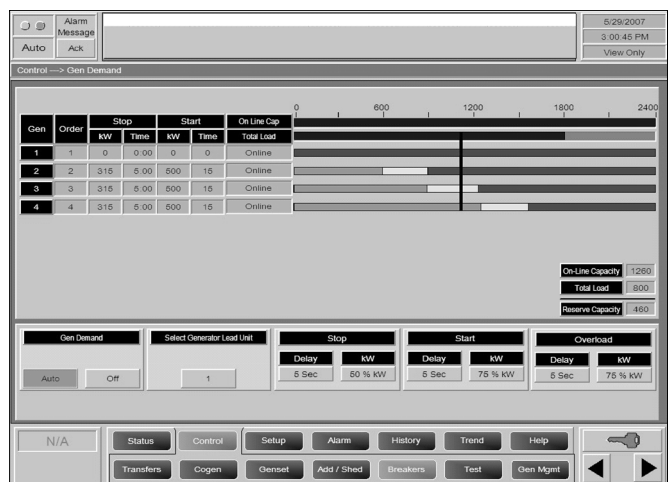


Generator Management

A standard feature of the PD-series, generator management allows the system to decide the appropriate number of generator sets required to feed the load. With user-definable parameters, this management system can be configured to:

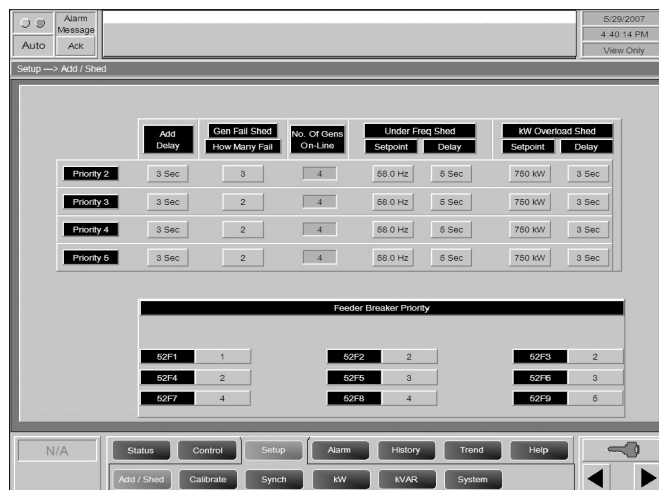
- Start the required number of generator sets for certain operations
- Run the generator sets in *available* mode for a preset period of time
- Optimize the number of running generator sets, shutting down those that are not required
- Bring additional capacity online based on load requirements

The system will then monitor total installation requirements and automatically bring generators online and offline as needed.



Load Management

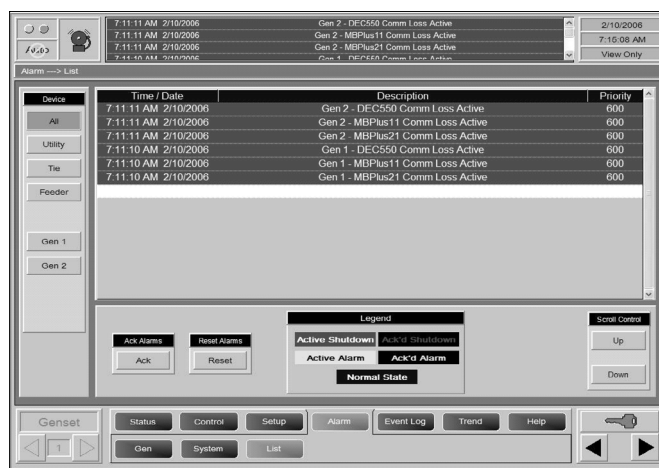
Another standard feature of the PD-series, and one that is often overlooked in specifications, is load management/load shedding. A multiple generator system must have the ability to add and remove loads depending on available generators and system requirements. The digital interface allows the user to select not only which loads are grouped into priorities (normally priorities 1 through 4) but when to bring them online after system start, when to remove those loads, and how to choose these actions through the number of generators available, operational mode, and generator monitoring of underfrequency or kilowatt demand.



Event Log

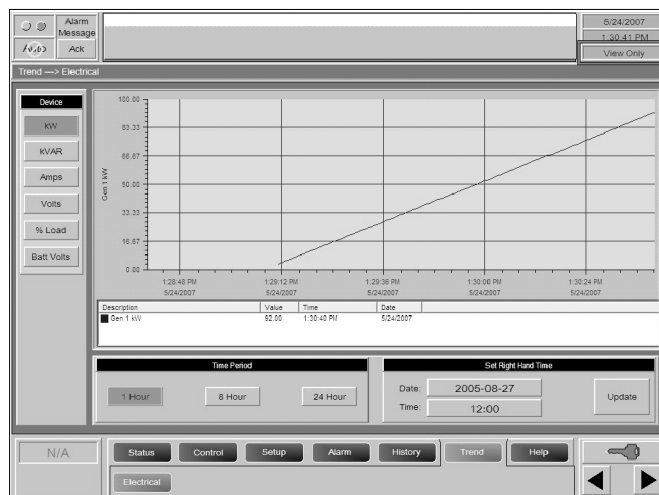
Each PD-series product provides monitoring of system events including alarms and operation. A minimum of 500 events are logged and date/time stamped providing the user and service personnel with valuable information.

Sort alarms and events by device to help determine the source of an issue.



Trending

Mechanical and electrical functions can be monitored and trending can be provided in both historic format and live during operation. The customer has the option to select from the standard package of points, or Kohler can customize the system for any needed monitoring.



Report Generation

The PD-series is capable of generating multiple reports that can be downloaded into spreadsheets via a network connection or through the use of a flash drive.

These reports include:

- Settings
- Operations
- Testing
- Operator inputs
- Alarms and events

Testing Record	
Installation	ABC Hospital Provided by Kohler Power Systems
Generator Set ID	Generator A
Operator	John Doe
Report Date	3/21/2007
Report Time	8:32:45 a.m.

Test 30 Minute Data	
Hour Meter	1235
L1 Volts	480
L2 Volts	480
L3 Volts	480
L1 Amps	565
L2 Amps	571
L3 Amps	563
Gen kW	375
Gen Load (%)	75
Freq.	60
Oil Press	58
Cool Temp	198
Exh Temp	750
Chgr Volts	14.6
Chgr Amps	1.5

Load Test Data	
Data	3/20/2007
Start Time	8:23:32 a.m.
Stop Time	9:32:56 a.m.
Total Runtime	1.1 hours
Transfer Time	6 seconds
Re-xfer Time	20.5 minutes
Cooldown Time	5 minutes

Test Start Data	
Hour Meter	1234
L1 Volts	482
L2 Volts	483
L3 Volts	484
L1 Amps	0
L2 Amps	0
L3 Amps	0
Gen kW	0
Gen Load (%)	0
Freq.	60
Oil Press	58
Cool Temp	120
Exh Temp	500
Chgr Volts	14.6
Chgr Amps	2

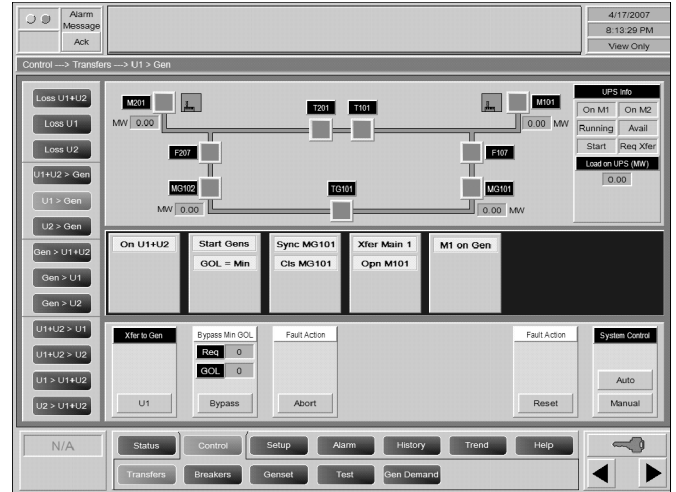
Test End Data	
Hour Meter	1235
L1 Volts	480
L2 Volts	480
L3 Volts	480
L1 Amps	562
L2 Amps	568
L3 Amps	570
Gen kW	375
Gen Load (%)	75
Freq.	60
Oil Press	58
Cool Temp	198
Exh Temp	750
Chgr Volts	14.6
Chgr Amps	0.8

Active Screen Technology

The active screen system, unique to Kohler, incorporates a dynamic process flow chart that walks the operator through the actions of the system. The operator is provided choices and feedback along the way to provide clear understanding of the system.

The advantages include:

- Step-by-step instruction on the specific operational sequences
- Operator learns the system processes and what will happen next in the operation sequence
- Active screen presents the operator with options if the system fails to complete a process
- Metering area simplified to show only what is needed at each sequence step
- Clear information provided if troubleshooting is needed

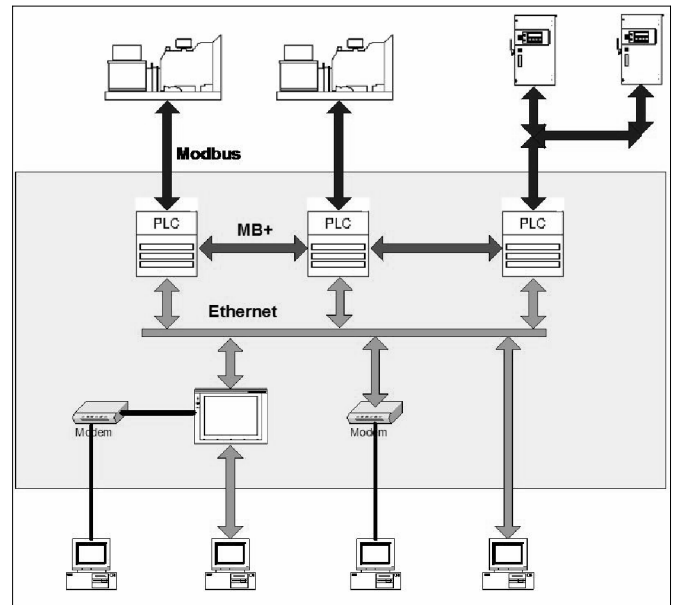


Communications

Each PD system is constructed with an integrated web server allowing remote monitoring and control through any Ethernet network. The PD network is integrated with the generator-mounted controllers, transfer switches, and other devices to provide the owner with remote data, monitoring, and control of his entire power system without the need for expensive custom software packages. The system screens may be viewed through a web browser and are identical to those featured on the system touch screens.

Modbus® is Kohler's standard protocol providing the industries' widest selection of compatible components as well as an open protocol for integration into existing systems.

Modbus® is utilized between generator sets, transfer switches, and other devices to monitor and control the system. Internal to the switchgear, Modbus® Plus is used to gain speed on the inter-PLC data network. A Modbus® port is available for external communications.



Modbus® is a registered trademark of Schneider Electric.

Additional Features

All Kohler paralleling switchgear is designed specifically for your project. Additional features and components can be incorporated. A sampling of those available are:

Controls:

- Power quality metering
- Transfer switch control screens
- SCADA systems

Low Voltage:

- Integrated breaker metering networks
- Insulated bus
- Seismic Zone construction

Medium Voltage:

- Distribution or station class lightning arrestors
- Station battery systems

Structure:

- Special environmental requirements for location, temperature, and humidity
- Complete walk-in switchgear houses with HVAC

Kohler's strength is the ability to design a complete, integrated system for your installation. Working with the engineer, contractor, and owner, the project team will be with you from concept to acceptance to ensure a smooth installation and, teamed with our distributors, to provide future service on the complete system.

DISTRIBUTED BY:

Availability is subject to change without notice. Kohler Co. reserves the right to change the design or specifications without notice and without any obligation or liability whatsoever. Contact your local Kohler® generator set distributor for availability.