

DESCRIPTIVE BULLETIN

Zenith TruCommand PSG

Paralleling switchgear



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Paralleling switchgear concept

Paralleling is an operation in which multiple power sources, usually two or more generator sets, are connected and synchronized to a common bus.

Why parallel?

There are several advantages to be realized when employing paralleling switchgear in an electrical design such as reliability, flexibility, ease of uninterrupted maintenance and cost savings. It is because of these advantages that paralleling switchgear has become one of the best choices for meeting today's critical power requirements.

Reliability

Systems in which part of the load is very critical may be best served by paralleling one or more generator sets. Under parallel operation the generator sets are started either sequentially or simultaneously. The first set to reach the proper parameters will assume the most critical portion of the load, with the remaining sets picking up lower priority loads.

Further benefits may be realized by adding a load shedding application, where the failure of one generator set will not interrupt power to the critical loads, because less important loads can be dropped off the line.

Flexibility

Paralleling power sources allows for a wide variety of choices in the generation, distribution and utilization of the system's power.

Uninterruptible maintenance

When a one engine-generator set is out of service for maintenance or repair, having others synchronized on the same bus can provide the needed back-up power, should an outage occur.

Capital cost savings

Savings can be realized on the application when a number of smaller generator sets would be less expensive than one large set, or when the load makes it impractical to divide into several sections, each with its own generator.

Operational cost savings

Savings can also occur on the operation side when generator set life is extended from being used only when needed to support the load. Also, when it is anticipated that the load will grow significantly in the future, the capital investment can be reduced by starting with small sets and paralleling additional units as load increases dictate.

Why Zenith TruCommand PSG?

Zenith TruCommand PSG has become the leader in supplying solutions to simple and very complex systems due to its design flexibility.

Since the inception of paralleling switchgear, many successful Zenith TruCommand PSG installations have been supplied with a focus on providing reliability.

Zenith TruCommand PSG has evolved and adapted to the changing technologies in engine generator design, switchgear controls and monitoring systems. It reflects ABB's continuing commitment to reliable solutions for critical power applications.

PSG system

PSG controls and devices

At the heart of a paralleling switchgear (PSG) solution is a control system that coordinates system monitoring of utility, generator and breaker status with switchgear breaker controls.

Components of these systems include:

- Programmable logic controllers, multiple if using a hot backup/standby scheme
- Generator control modules
- Control power supplies
- Provisions for field wiring
- Annunciator panels
- Protective relays
- HMI panels
- Test switches
- Analog or digital meters: voltage, current, frequency, power factor, synchroscope
- Manual control operators: auto/manual, breaker control, 86 lockout, metering selector switches, status pilot lights, light test
- Synchronizer and load control devices
- Controller and display programming

Integrated or stand-alone

Control devices and wiring for Zenith TruCommand PSG can be installed as either integrated or segregated. With integrated controls, the devices are installed in available instrumentation compartments in the switchgear lineups. Integrated controls eliminates wiring that would be otherwise required if the controls were external to the switchgear, but require allocating space for the switchgear instrumentation compartments that will contain them.

With segregated controls, the devices and wiring are installed in standalone cabinets that can be installed at a distance from the switchgear or at the end of the lineup(s). Because these cabinets are not part of the switchgear lineup, there is no need to add instrument compartment space to accommodate control devices. Segregated control cabinets are certified to UL508A for Industrial Control Panels.

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01
PSG control
cabinet interior





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02

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02
Zenith TruCommand PSG
in LV switchgear with
integrated controls

PSG operator interface panels

A Master HMI panel can be useful to paralleling switchgear systems for user access and monitoring. The key control and monitoring functions in these systems include metering, annunciation, controlling breakers and engine generators in automatic operations, as well as manual.

The Zenith TruCommand PSG Operator Interface Panel (OIP) is ideal for simpler systems. Since status of the system can be viewed in front of the line-up, including all source metering, alarm, shutdown and status annunciation, the operator is not required to utilize the OIP to cycle through any screens for the system control and monitoring. The user is only required to use the touch panel for system testing purposes, non-critical settings and timing adjustments, and limited manual control redundant to the hardwired switches.

In some cases, critical facilities may be suitable for additional system monitoring, troubleshooting and remote accessibility. Operators in this case will require a more advanced Master HMI in addition to the system hardwired meters, switches and annunciation. The Zenith TruCommand PSG Advanced Control System is recommended for these cases.

Standard Operator Interface Panel (OIP)

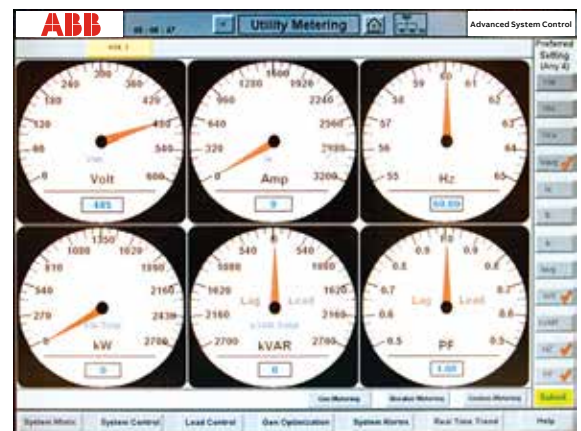
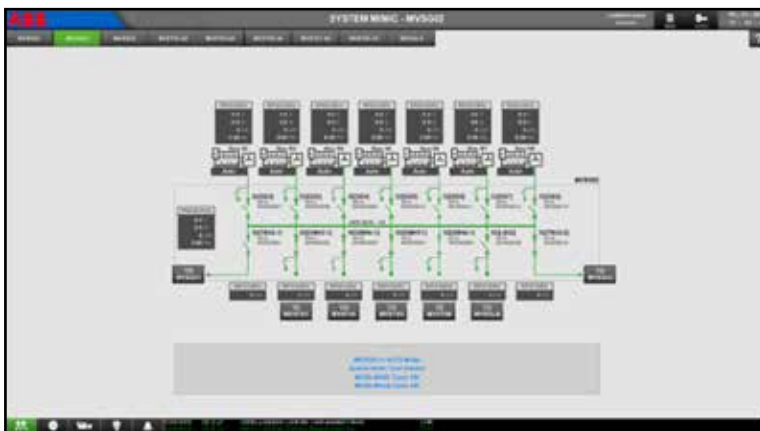
- Intuitive interface makes operation simple. Little or no learning curve is required to operate the system

- A main screen with navigation buttons and non-system critical button/switches
- System testing screen allowing the operator to manually initiate automatic system testing operations
- Generator interface settings latched into the PLC control system upon entry
- System load add/shed manual control redundant to hardwired manual control switches in master control
- Generator optimization settings latched into the PLC control system upon entry

Optional Advanced Control System (ACS) for special applications

- Full functions of OIP with the addition of SCADA capabilities
- Optionally Internet capable - allows remote access via web
- Online controllable / programmable (behind customer's own firewall)
- Advanced Event Logging & Source Trending allows statistical root cause analysis
- Duplicates System & Generator Annunciation
- Remote system diagnostics
- Alarm and maintenance messaging, including predictive maintenance
- Graphical user interface. Intuitive and user friendly. Requires no computer experience
- Password protection. Capable of hundreds of levels of authority

03
The Zenith TruCommand
PSG Operator Interface
Panels (OIP)



System applications

Emergency or standby power

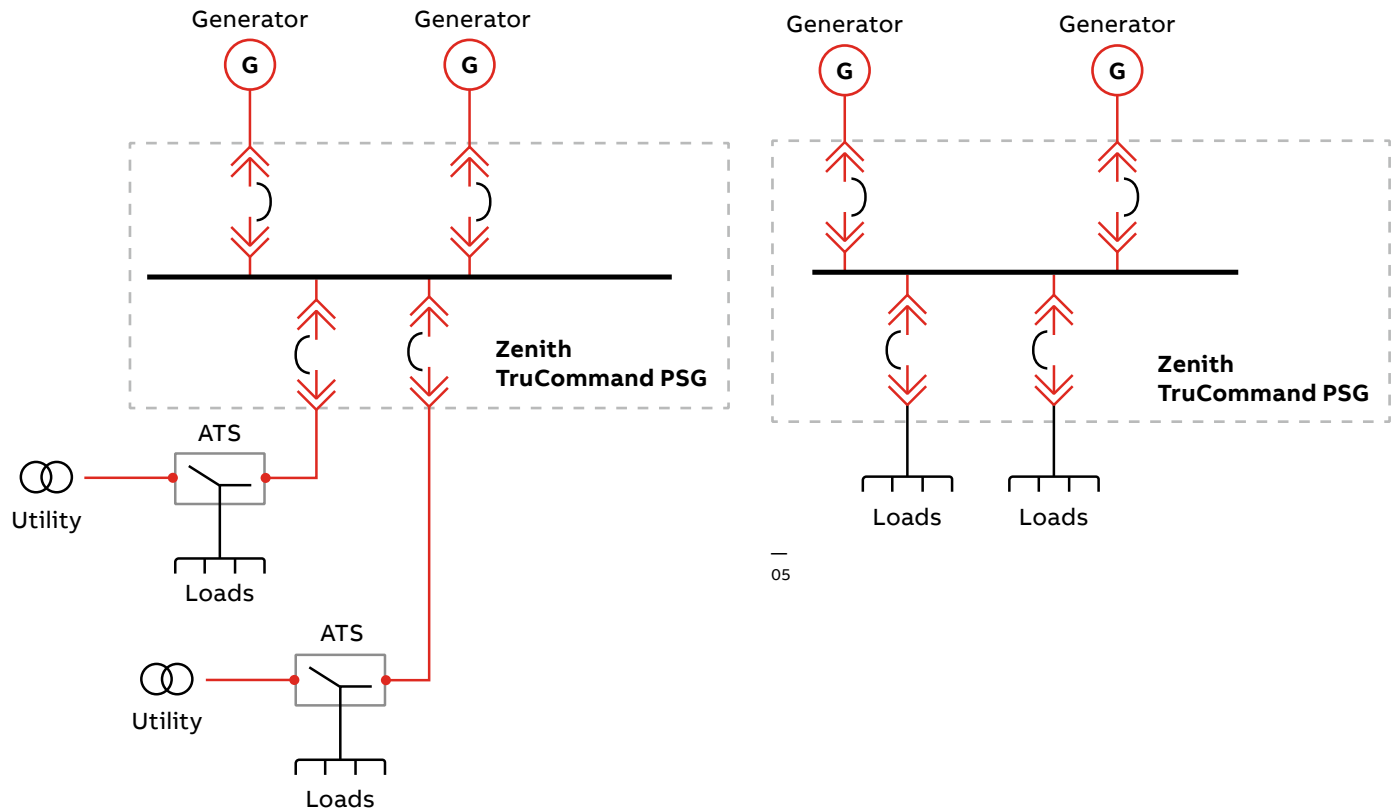
The emergency system is used to supply power to building loads during a power failure. Paralleling switchgear controls the system transfer to generators and return back to normal sequences of operations. Paralleling switchgear controls the addition of load on/off generators (load add/shed). Transfers between utilities and generators occur in open transition or passive momentary closed transition (no active synchronization of sources). These systems typically consist of paralleling switchgear and automatic transfer switches of which ABB has a wide variety for many applications.

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Emergency / standby
power with PSG

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05
Prime power with PSG

Prime power

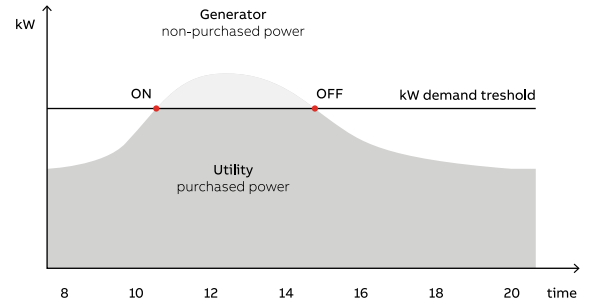
Onsite prime power systems are most often used where there is no utility source available. The required electricity is generated entirely on-site, typically at facilities such as island resorts, mines, mills or other remote locations. Since a utility is not available in prime power systems, automatic transfer switches and utility/tie breakers are not required. Generators are the only source of power. The system typically consists of a PSG system with no automatic transfer switch products.



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04

Parallel with utility

Parallel with utility systems are utilized whenever generators are to be actively synchronized and paralleled with utility sources for short or long durations. These systems are often also used for standby use as well. Zenith TruCommand PSG controls the generators transfer operations with the utility source(s) as well as the power management (loading controls) to direct power in the appropriate direction.

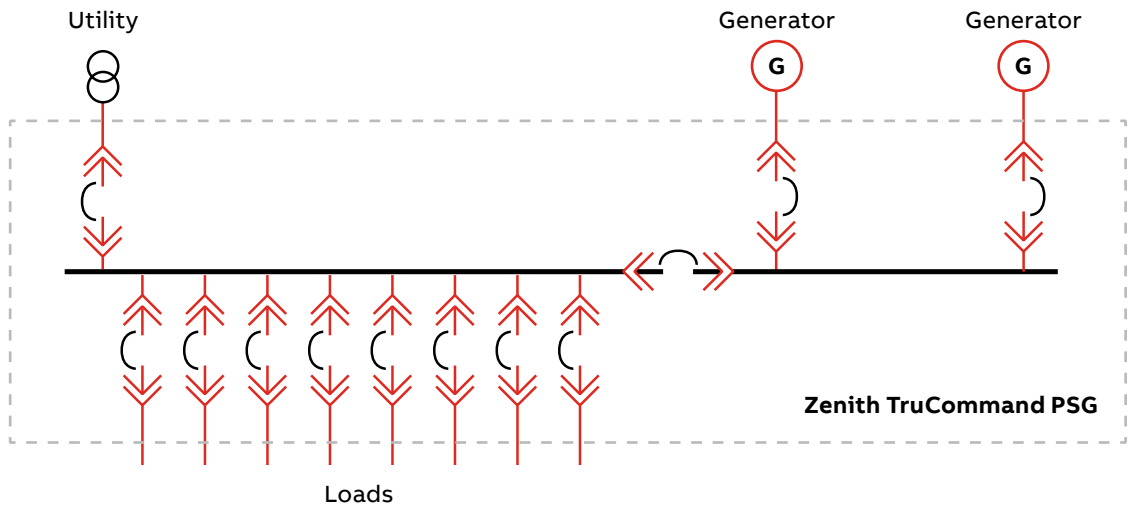


Transfers may occur in short duration (momentary closed transition), a somewhat longer duration (softload/unload closed transition), or a sustained duration (maintained parallel with utility). Power management in maintained parallel situations includes controlling import levels from utility, export levels to utility, or base load levels where generators are loaded to set amounts disregarding the import and export contribution from the utility.

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A "Peak Shaving"
application is sometimes
used to transfer non-
critical loads onto
generators during peak
utility demand hours

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07
PSG in utility-generator
parallel system



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07

Product platforms for MV

Medium voltage air insulated switchgear

For applications requiring ANSI MV switchgear, ABB offers a complete portfolio of metal-clad, non-arc-resistant and arc-resistant switchgear built to ANSI/IEEE standard C37.20.2.

ABB's non-arc-resistant metal-clad switchgear offering is the Advance® platform featuring current ratings up to 63 kA and 4000 A. Advance® 27 is available for 27 kV applications.

SafeGear® and SafeGear® HD are the arc-resistant offerings featuring ratings up to 4000 A, 63 kA at 5 kV and 15 kV. Arc-resistant MV switchgear is type tested according to ANSI/IEEE C37.20.7, IEEE Guide for Testing Switchgear Rated up to 52 kV for Internal Arcing Faults.

ReliaGear® ND, ABB's narrow-design platform, benefits projects with space constraints. ReliaGear® ND features a 26-inch wide, two-high, stacked breaker frame design at 5 kV and 15 kV.

Medium voltage metal-clad switchgear ratings:

- 5 kV system: 4160 V typical, 25, 31.5, 40, 50 and 63 kA short circuit current
- 15 kV system: 12.47 kV, 13.2 kV, 13.8 kV, 14.4 kV typical, 25, 31.5, 40, 50 and 63 kA short circuit current
- 27 kV system: 19.2 kV, 24.9 kV, typical, 16 and 25 kA short circuit current
- 3 phase, 3 wire typical (4 wire special)
- 1200, 2000, 3000 A spring charged vacuum circuit breaker (4000 A available with forced air cooling)

- Magnetically actuated breakers 5 kV, 15 kV, up to 50 kA and 3000 A (4000 A forced air cooling); 27 kV, 16/25 kA, 1200 and 2000 A
- Up to 63 kA AIC, indoor or C37.20.2 outdoor enclosure requirements which exceed the requirements of NEMA 3R. Outdoor enclosures can be non-walk-in or sheltered aisle construction
- Rear primary connection, front secondary connection
- ANSI vacuum circuit breakers
- Bus and cables compartmentalized by metal barriers
- Insulated bus
- UL label; CSA certification also available

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08
Advance MV
switchgear

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09
Safegear MV
switchgear



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08



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09

Product platforms for LV

Low voltage switchgear

ABB offers low voltage switchgear in several product lines. These product lines are built to ANSI/IEEE C37.20.1 standards and carry UL1558 certification. Instrument compartments in LV switchgear may be used to integrate PSG controls, or separate control cabinets may be used.

ReliaGear LV SG switchgear is available for applications up to 5000 A horizontal bus and 100 kA short circuit current rating. It features SACE® Emax 2 power circuit breakers with Ekip trip units. The compact design is a leader in the marketplace and features a 15-inch wide feeder section for four-high feeders up to 1200 A.

MNS-SG is the Type 2B arc-resistant offering, certified to standard ANSI/IEEE C37.20.7 for arc-resistant testing. MNS-SG also uses SACE® Emax 2 circuit breakers with horizontal bus ratings up to 4000 A and 100 kA short circuit current rating at 600 V system voltage.

AKD-20 switchgear offers a solution using Entelliguard G power circuit breakers. Horizontal bus for AKD-20 is available up to 8,000 A with maximum breaker ratings of 6000 A. Short circuit current ratings for AKD-20 are 65 kA, 100 kA, and 150 kA.

Low voltage switchboard

ReliaGear SB switchboard may be used for a PSG solution in cases where front-access only applications are required or group-mounted molded case circuit breaker sections are desired. ReliaGear SB is built and certified to UL891 standards, with horizontal bus ratings ranging from 1200 A to 6000 A at 600 V. Short circuit current ratings up to 150 kA are available. Power circuit breakers used are both Entelliguard G or SACE® Emax 2 depending on the application. Molded case circuit breakers used in ReliaGear SB switchboard are SACE® Tmax XT ranging up to 400 A.

Additional features and options

- NEMA 3R outdoor enclosure
- Drawout circuit breaker design
- Light sensing arc mitigation relays
- Seismic rated construction
- Insulated bus
- Infrared viewing ports
- Front or rear access (switchboard)
- Power circuit breakers built to standard ANSI/IEEE C37.13 for low voltage AC power circuit breakers used in enclosures

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ReliaGear LV
switchgear with
SACE® Emax 2
breakers

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11
AKD-20 LV switchgear
with EntelliGuard G
breakers



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