



russelectric.com

# Power control systems for virtually any control strategy

#### **Power Control Systems for:**

**Emergency generator control** 

Emergency generator control with load demand sensing

Emergency generator control with utility paralleling

Prime power

**Cogeneration generator control** 

Low-voltage (600 volt) and medium-voltage (5 kV and 15 kV) applications



#### Controls for emergency power, peak shaving, utility paralleling, and prime power/cogeneration

Russelectric custom designs and builds low- and medium-voltage power control systems to meet the stringent performance and reliability requirements of data centers, hospitals, airports, communications, energy, defense, and other mission critical facilities.

In addition to controlling emergency power, systems can be designed for a variety of sophisticated control schemes such as peak shaving, load curtailment, and utility paralleling using live-source closed-transition retransfer and system test to avoid disturbing the load. Prime power and cogeneration systems are also available. Systems include sensors to monitor volts, amps, watts, frequency, and other electrical power data as well as controls for automatic prime mover starting/stopping, status, and alarm annunciation; synchronizing; and priority load control. Load demand for fuel management and other controls are available as options.

Controls can be furnished for any major manufacturer's engine generator sets.

#### **Emergency generator control systems**

- Upon receipt of loss of normal power source signal from automatic transfer equipment, system automatically sends command to start engine generators.
- The first generator set to reach pre-set voltage and frequency is connected to the bus by closing its circuit breaker.
- System permits first priority loads to transfer to the connected engine generator set, while delaying the transfer of lower priority loads until additional generator capacity has been connected.
- System manages random paralleling of remaining generator sets to the emergency bus through their individual synchronizers and circuit breakers.
- System signals lower priority loads to transfer to the emergency power system as generator sets are added to the bus.

- System manages the shedding of low priority loads if a generator set fails during emergency operation, thereby assuring continuous power to the high priority loads.
- Upon receipt of signal from transfer equipment that it has retransferred to the normal source, system alerts generator sets to disconnect and shut down.
- Alarm and failure system, including annunciation, automatically shuts down an engine generator if required.
- Redundant PLCs ensure uninterrupted automatic system control — even if one fails.
- System design allows manual start and synchronization of generator sets if automatic controls malfunction.
- LCD HMI touchscreen displays, system one-line, alarms, setpoints, etc.
- Optional load demand sensing determines the number of engine generators in operation based on the actual load.



### Emergency generator control and utility paralleling systems

Russelectric utility paralleling systems offer all the functionality of an emergency generator control system, plus:

- Paralleling of generator sets with the utility (upon return of the utility source after power interruption).
- System testing in closed-transition mode with no interruption of the load. Generators are paralleled with the utility and the load is transferred to them. Upon completion of testing, the load is retransferred through closedtransition to the utility source without disturbance.
- Choice of either momentary (100 msec or less) paralleling with the utility or sustained paralleling for soft-loading.
- Configurable for utility-sponsored peak shaving or load curtailment programs.

#### Prime power and cogeneration systems

While their construction is similar to that of emergency generator control systems, prime power and cogeneration systems differ in their operation because the only power source available to them is engine generators. In such systems, load demand sensing is required to determine the number of engine generators needed in operation to serve the load.

For suggested system specifications, contact your local Russelectric sales representative or the factory.



# Designed and built for mission critical facilities



#### Low-voltage systems

# The first fully UL-listed power control systems

Russelectric was the industry leader in obtaining UL listing for its power control systems. All Russelectric low-voltage power control systems (600 volts and below) are UL listed under UL 1558 and/ or 891. In addition, all systems are designed and built in accordance with applicable ANSI, IEEE, NEMA, cUL, and CSA standards.

## Designed for maximum safety and operating simplicity

Systems are designed to provide maximum protection for operators and maintenance personnel and to minimize the danger of operator error. Drawout modules, metal-enclosed construction, segregation of controls from power elements, and separately accessible grounded compartments are all part of Russelectric's design safety philosophy.

All systems are designed for unattended automatic operation, but include controls for manual operation. Designs provide accessibility for maintenance, troubleshooting, and component replacement. All systems are factory tested for functionality prior to shipment. Interconnect wiring diagrams enable the proper interfacing of systems with the prime mover and other equipment.

## Manufactured, assembled, and tested entirely in-house

Russelectric manufactures complete systems in-house. All enclosures, bus, and other structural components are fabricated and fully assembled in Russelectric plants. Factory testing of complete systems is performed prior to shipment.

#### The highest quality components

Components are selected to assure the reliable operation of these critical systems. Utility-grade instruments — 1% accuracy, 41/2" scale-type — provide both accuracy and visibility. Heavy-duty, switchboard-type control switches are rated 25 amps minimum. Protective relays for generator and utility power are utility-grade in drawout cases.

UL-listed power circuit breakers with stored energy closing mechanisms

provide 5-cycle (maximum) closing for paralleling. Drawout circuit breakers simplify maintenance.









#### **Dual PLCs for Control Redundancy | A**

С

All Russelectric systems are equipped with dual PLC controls for fully redundant operation. Both controls perform the same operations at the same time, ensuring no interruption of control should one of them malfunction.

Programmed at the factory, these industrial-quality PLCs are equipped with nonvolatile memory and can be reprogrammed in the field. Large LCD touchscreen operator interface is included. Custom data acquisition and remote reporting are available.

PLC controls are accessed through a user-friendly operator interface with a high-contrast, color TFT LCD touchscreen display for fast, easy input.

The HMI comes with a user-accessible compact flash bay as well as preinstalled software and cloning, partitioning, and recovery utilities.

#### Buswork | B

All bus is formed, cut, and punched before being silver-plated to guarantee

the integrity of the plating and ensure maximum performance.

#### Drawout Circuit Breakers | C

All circuit breakers are enclosed in drawout compartments. Self-aligning mating contacts ensure proper connections. Safety interlocks and closed door racking are standard.

#### Instrument and Control Wiring | D

Flame-retardant SIS switchboard-type instrument and control wiring is neatly harnessed and labeled at both ends with permanent sleeve markers. Premiumquality cage clamp connectors ensure wiring consistency and ease of troubleshooting. Instruments, control devices, and wiring are separated from high-voltage compartments by grounded metal barriers.

#### **Rugged Enclosures**

Every Russelectric enclosure is built to NEMA standards from heavy-gauge steel with gussets, reinforcements, and welded corners for strength and rigidity. All have tough, electrostatic powder coat finishes for corrosion-resistance. Standard indoor or weatherproof outdoor enclosures can be furnished.

#### **Hinged Doors and Interior Lighting**

All Russelectric medium-voltage switchgear is manufactured with hinged doors front and rear. Full-length hinges support doors and door-mounted equipment in full 90° open position without sagging or misalignment. All doors have positive stops and control section doors have keyed locking handles.

Control cubicles are equipped with interior lighting, which is activated automatically when the cubicle door is opened.

# Backed by 24-Hour Factory Field Service

Russelectric's reliable system designs are backed by a factory-direct field service organization available on a 24-hour, 365-day basis. Pre-commissioning coordination, start-up, and system training are included with every control system.

# Uncompromising design, meticulous manufacturing,



#### Medium-voltage systems

### Heavy-duty, metal-clad medium-voltage systems

Russelectric has four decades of experience in the design and construction of medium voltage (5-15kV) power control switchgear and transfer switchgear.

### The first fully UL-listed power control systems

Russelectric was the industry leader in obtaining UL listing for its power control systems. All Russelectric medium-voltage power control systems (operating above 600 volts and below 15kV) are listed per UL category Circuit Breakers and Metal-Clad Switchgear — Over 600 Volts (DLAH). In addition, all Russelectric medium-voltage switchgear is designed, manufactured, and tested to meet or exceed stringent IEEE, NEMA, and ANSI standards.

### Designed for maximum safety and operating simplicity

Systems are designed to provide maximum protection for operators and maintenance personnel and to minimize the danger of operator error. Drawout modules, metal-clad construction, segregation of controls from power elements, and separately accessible grounded compartments are all part of Russelectric's design safety philosophy.

All systems are designed for unattended automatic operation, but include controls for manual operation. Designs provide accessibility for maintenance, troubleshooting, and component replacement.

All systems are factory tested for functionality prior to shipment. Interconnect wiring diagrams enable the proper interfacing of systems with the prime mover and other equipment.

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All Russelectric systems are equipped with dual PLC controls for fully redundant operation. Both controls perform the same operations at the same time, ensuring no interruption of control should one of them malfunction.

Programmed at the factory, these industrial-quality PLCs are equipped with nonvolatile memory and can be reprogrammed in the field. Large LCD touchscreen operator interface is included. Custom data acquisition and remote reporting are available.

### Manufactured, assembled, and tested entirely in-house

Russelectric manufactures complete systems in-house. All bus, enclosures, and other structural components are fabricated and fully assembled in Russelectric plants. Factory testing of complete systems is performed prior to shipment.

#### The highest quality components

Components are selected to assure the reliable operation of these critical systems. Utility-grade instruments — 1% accuracy, 41/2" scale-type — provide both accuracy and visibility. Heavy-duty, switchboard-type control switches are rated 25 amps minimum. Protective relays for generator and utility power are utility-grade in drawout cases.

UL-listed power circuit breakers with stored energy closing mechanisms provide 5-cycle (maximum) closing for paralleling. Drawout circuit breakers simplify maintenance.

# and exceptional field service









#### Buswork | F

All bus is formed, cut, and punched before being insulated with highdielectric epoxy coating to guarantee the integrity of the insulation and ensure maximum performance. Busbars pass through track-resistant, polyester glass barriers between cubicles. Main bus joints have silver-plated connections and are insulated with preformed boots.

#### **Drawout circuit breakers**

All circuit breakers are enclosed in drawout compartments. Self-aligning mating contacts ensure proper connections. Safety interlocks and closed door racking are standard. Stationary contacts have automatic shutter covers for safety.

#### **Current transformers**

Current transformers are located behind an automatic shutter barrier that isolates the primary disconnects when the breaker is in the disconnect position. Up to 12 CTs per breaker can be accommodated — 2 per phase on both the line and load sides. CTs are front-accessible when the shutter barrier is removed.

#### Potential transformers and control power transformers | G

All potential transformers are drawout and barrier-protected. Dry-type control power transformers with single-phase ratings through 15kVA are mounted in a drawout tray for easy access. Higher rated or 3-phase CPTs are stationary mounted.

#### Instrument and control wiring | H

Flame-retardant SIS switchboard-type instrument and control wiring is neatly harnessed and labeled at both ends with permanent sleeve markers. Premium-quality cage clamp connectors ensure wiring consistency and ease of troubleshooting. Instruments, control devices, and wiring are separated from high-voltage compartments by grounded metal barriers.

#### **Bus/cable connection compartment**

Two-breaker vertical cable compartments have space for termination of two 750 MCM cables per phase including stress cone makeup. Compartments can be factory-configured with power cable exits top or bottom. Solderless compression cable connectors are provided.

#### **Rugged enclosures**

Every Russelectric enclosure is built to NEMA standards from heavy-gauge steel with gussets, reinforcements, and welded corners for strength and rigidity. All have tough, electrostatic powder coated finishes for corrosion-resistance. Standard indoor or weatherproof outdoor enclosures can be furnished.

#### Hinged doors and interior lighting

All Russelectric medium-voltage switchgear is manufactured with hinged doors front and rear. Full-length hinges support doors and door-mounted equipment in full 90° open position without sagging or misalignment. All doors have positive stops and control section doors have keyed locking handles.

Control cubicles are equipped with interior lighting, which is activated automatically when the cubicle door is opened.

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# Custom SCADA for Remote Monitoring of All Power System Functions

Russelectric custom SCADA systems allow users to monitor system operation, acknowledge alarms, and review PLC setpoints and alarm history. Screens are custom designed for individual power control systems, providing the most accurate, realistic representation possible.

#### **Basic SCADA System**

The basic SCADA system includes a dynamic one-line display with changing color codes to indicate real-time power switching device status and power source connections to loads. Event logging, alarm locking, and help screens are also included.

#### **Optional Enhancements Add Functionality**

Optional enhancements include highly detailed graphic displays of the physical arrangement of equipment, control panel close-ups, instrument displays indicating actual values, and the ability to initiate control functions.

An optional simulation system, based on SCADA system graphics, allows operator training off-line without affecting any operating system parameters.

#### **Basic SCADA Screens**



Engine generator status

| BU TRUSTER     |             | GA PWR CO, UT          | RITYA             | GAPWA                    | CO.UTRITYB  | Legend                   | 114141.0                        |
|----------------|-------------|------------------------|-------------------|--------------------------|---|--------------------------|---------------------------------|
|                |             |                        | COLUMN CLOSED WAS | NUMBER OF TAXABLE PARTY. | 1   |                          |                                 |
|                | LOAD COMBOL | READD TIME DELAT (see) | LOAD CONTROL      |                          | LOAD CONTROL  | RE ADD TIME<br>DELAY DOG | LOAD CONTROL<br>BYPANS SEQUENCE |
| MAD USUB-DA    | 0           | 0                      | 0                 | LIDIAZ MARY              | 0   | 0                        | 0                               |
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| MGC (101/85-28 | 1 1 1       | 1                      | 0                 | STRIAG WOD 2 (FUTS       | 0.1   | . 0 .                    | 10. TO 1                        |
| NO4 NOOJID-B   | 0           | 0                      | 0                 | USIAF MOD-8 (FUT)        |   |                          |                                 |
| Mole-Cockinal  | 1 1         | -                      | 1                 | DID BO MAN               |   | 1                        | 1                               |
| MEAT MAIN      |             |                        | 8                 | UB184 HOD 1              | 0   | 0                        | 8                               |
| MORE INCOMES   | 1.4 12      | 1.4                    | 0                 | Vener wop-z              | 9   | 0.0                      | 10.00                           |
| MBAL DONATER   | - e - 1     | 0 .                    | 0                 | UPIBE MOD X /FUT3        |   | 0                        |                                 |
| BEAL DOVATSA   |             |                        | - 0               | TABLET MOD. 4 (FAT)      |   | 1.1                      | 1                               |
| HOAD DRAFTE    | 0           | 0                      | 0                 | CREAT MAN                | 0.  | 0                        | 0                               |
| MONT FOREIA .  | 1 1 1       | 1                      | - 0               | MEDAA MOD-3              | 0   | 0 .                      | 1 1                             |
| MOAD MCC-ASB   | 0           | 0                      | D                 | UIDAS MOD 2              | 0   | 0                        | 0                               |
| HEAD DONLATER  |             | 1                      | 2                 | VALUE NOD 3 (FUTS        |   |                          | 10 1                            |
| MBATE POPLARA  | 0           | 0                      | 8                 | USSAF MOD-8 (FUTS        |   | - 10                     |                                 |
| HOALT MOVER    |             | 1.0.0                  | 0                 | LAUSED MAIN              | 0.1   | 0                        | 0                               |
| MORT MARY      | 0           | 0                      | 0                 | U8284 MOD 1              |   | 0                        | 0                               |
| MERA CON-BRA   | · 4         |                        | - P               | NUCLEY MOD 2             |   | 1 1 1                    | 10 4 11                         |
| MODE PONICA    | 0           | 0                      | 0                 | VIDDRE MOD 3 (FUT)       | 0   | 0                        | 0                               |
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| MORTO COLORD   |             | 1 1                    | 0                 |                          |   |                          |                                 |
| MODIT MEND     |             |                        | 0                 |                          |   | ESC - Close              | 5 P                             |

Load control sequence report

#### **Optional Simulator Screens**



Engine generator and system controls lineup



Control system and distribution lineup



System PLC setpoints



Annunciator panel (with illuminated status lamps and flashing lights)



Generator control cubicle instruments



Master cubicle meters with real-time values (selector switches operable from simulator console)

# Notes:

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