

# Russelectric

## 5 KV AUTOMATIC TRANSFER SWITCH

TYPE RMVT  
400A and 600A

With Model 2000 Control



RMVT

# 5 KV High Speed Open Transition Switch

- First Medium Voltage Automatic Transfer Switch tested to UL Standard 1008
- Russelectric Model 2000 user-programmable, microprocessor based control system
- Adjustable center-off time delay
- Electromagnetically actuated contactors
- Lifetime sealed arc suppression system
- Isolated with high dielectric polyester glass insulation throughout
- 3 pole construction

Russelectric Medium Voltage Automatic Transfer Switches (RMVT) are modern, high-speed switching devices designed to transfer electrical loads from a normal power source to an emergency power source upon reduction or loss of voltage and to retransfer loads when normal power is restored.

The Russelectric RMVT uses a sealed, high-speed, electromagnetically-actuated contactor assembly to perform an automatic open transition transfer.

All of the operational functions of the RMVT are controlled by Russelectric's Model 2000 Automatic Transfer Control System.

Russelectric transfer switches are tested to UL Standard 1008. Russelectric subjects its transfer switches to the most demanding performance test program, with closing and withstand short circuit ratings surpassing the minimum requirements specified by UL 1008.

All transfer switches are thoroughly inspected both mechanically and electrically under simulated operating conditions before shipment.

All bus bars are fabricated copper, silver-plated in accordance with UL and ANSI standards. Enclosures are fabricated with code gauge steel to meet UL and other applicable standards.

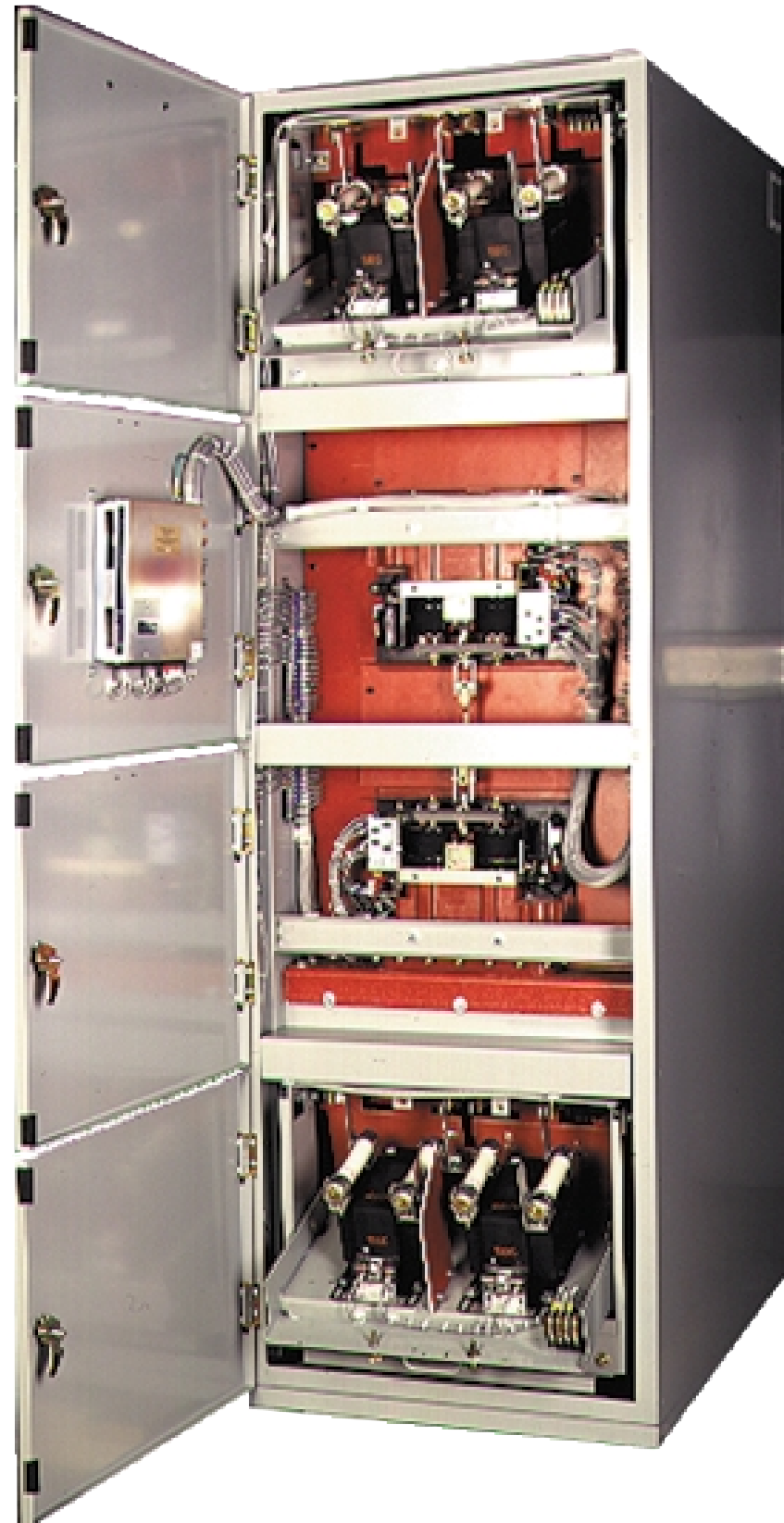
## Adjustable Center-Off Time Delay

The RMVT provides an adjustable center-off time delay. The default time delay between opening and closing is 3 seconds but can be reset via the front panel display and keypad.

Center-off positioning is ideal for sophisticated load shed control schemes and to prevent false triggering and latch-up of Silicon Controlled Rectifier (SCR) power devices when they are transferred between two asynchronous power sources.

## Electromagnetically-Actuated Contactors

The RMVT operating mechanism consists of electromagnetic linear actuators that provide reliable, trouble-free closing and also hold the contactors in the closed position, within a sealed, pressurized enclosure to prevent arcing.



## Reliable, Long-Life Arc Suppression System

An innovative, proprietary arc suppression scheme minimizes the effects of arcing and results in a very reliable, low maintenance switching assembly. All active components are housed within a sealed, epoxy resin enclosure that provides high strength, resistance to electromagnetic stress, and superior dielectric strength.

## Accessible Control Components and Wiring

Control components and wiring can be replaced without removing the transfer switch from its enclosure.

Tracing of the electrical circuitry is simplified by the neatly arranged, flame retardant, 600 volt SIS switchboard wiring.

## Operator Programmable Control

The Russelectric Model 2000 is preprogrammed with default settings at the factory to control all of the functions of the automatic transfer switch, including standard accessories and accessories as specified by the purchaser. All parameters may be reset by the operator to meet system specifications.

A front panel Liquid Crystal Display (LCD) and keypad allow the operator to program and monitor various ATS operational functions.

Menu-driven step-by-step procedures simplify the operation and minimize operator error. Provisions are made for remote monitoring and control through a serial communications port.

The controller senses the normal source and emergency source voltages, provides LED indicators to show whether the ATS is in the normal or emergency position, and confirms that the CPU is running.

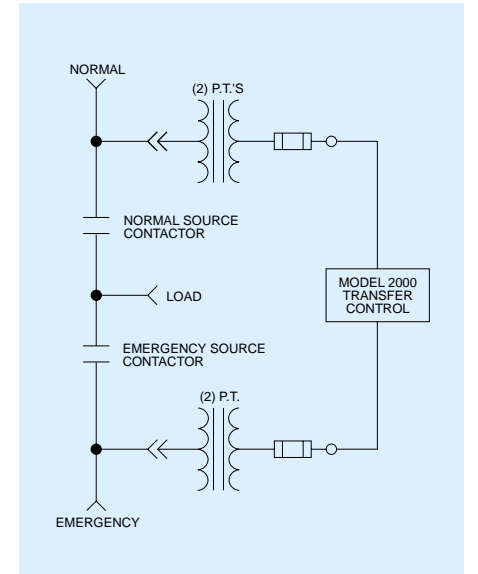
A 20-character, 4-line LCD display and a 5 x 5 character tactile keyboard allows easy access to the control system; and is used to select items from main and submenus, to set up adjustable parameters, control the ATS, obtain operational status, and set up optional accessories.

The controller allows the operator to perform secondary functions such as load test, automatic ATS exercise without transfer, and peak shave. All functions are performed via menu access on the front of the enclosure to provide the protection of a closed enclosure door.

The microprocessor board provides memory management, two asynchronous serial ports, battery backed real-time clock, and microprocessor supervisor (watchdog/power fail circuit).

Default setup information and calibration data are stored on nonvolatile EPROM. Changes to default setup information and calibration are stored on EEPROM.

A rechargeable NiCad battery provides 5 VDC power to the controller during the engine start timing cycle when no AC or DC power is available.

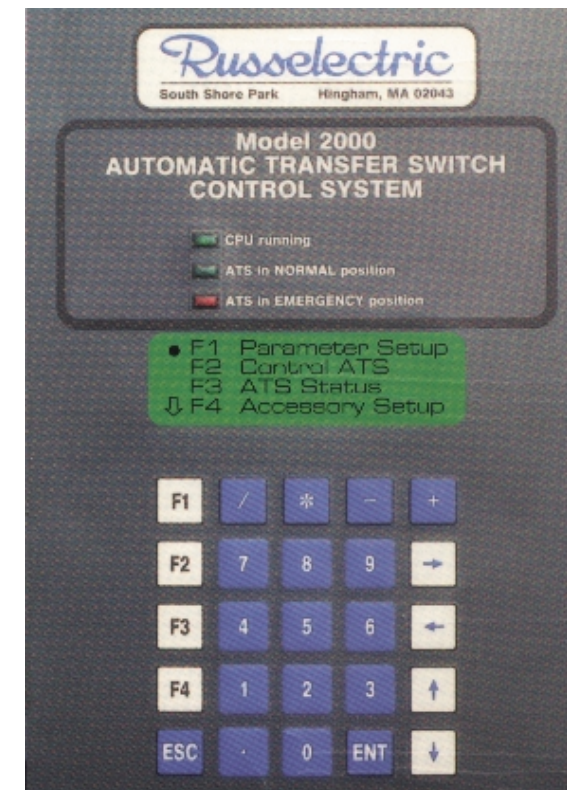


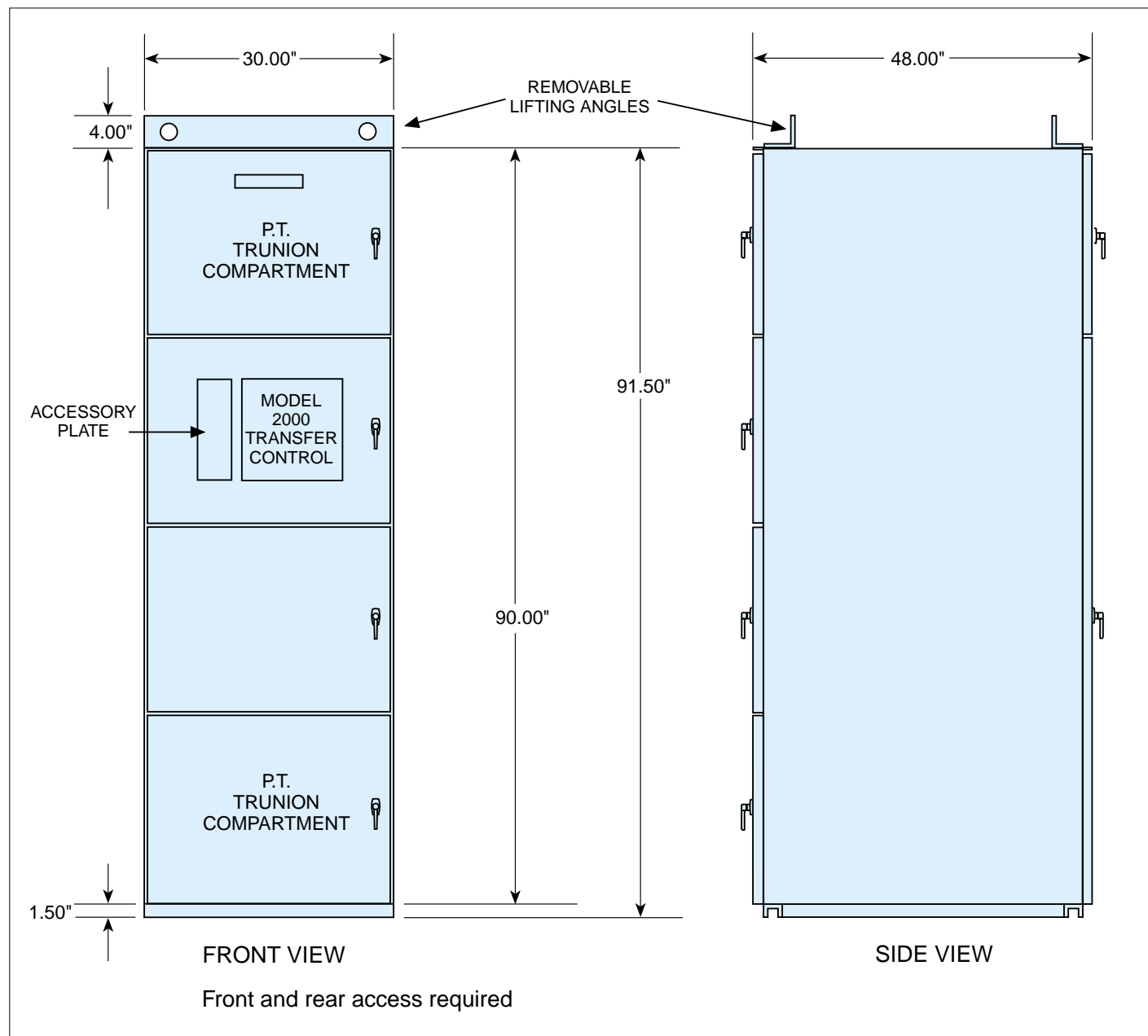
Self-diagnostics perform periodic checks of the memory, I/O, and communications systems, and invokes a software reset if required when an error is detected. A watchdog timer circuit invokes a hardware reset if program execution exceeds 1.6 seconds.

The system contains 3-phase, over/under voltage, over/under frequency, phase sequence detection and phase differential monitoring for both normal and emergency sources.

The controller uses industry standard open architecture communication protocol for high speed serial communications via multidrop connection to other controllers and to a master terminal.

The Accessory Setup and Service Screens allow accessory installation and changes to the system setup, calibration, and diagnostic functions. A password is required to limit access to qualified and authorized personnel.





### Specifications 5 kV Automatic Transfer Switch

Ratings	400 Ampere	600 Ampere
Withstand, short-time (3 Seconds)	10.0 KA rms.	10.0 KA rms.
Voltage, Nominal	4160 V	4160 V
Voltage, Maximum	4.78 kV	4.78 kV
Dielectric Withstand (1 minute)	19 kV	19 kV
Dielectric Withstand (impulse)	60 kV	60 kV

## Automatic Transfer Switch Accessory List

This is a condensed list. Full detail on accessories is included in the specifications. See pages 7-8. **Accessories shown in bold face are available through software within the microprocessor control.** Accessories shown in light face are optional hardware accessories and must be specified with order.

- STD Under voltage and frequency sensing of normal source.**
- STD Under voltage and frequency sensing of emergency source.**
- 1d Time delay to override momentary normal source power outages to delay engine start signal and transfer switch operation.**
- 1dx Time delay to override momentary normal source power outages to delay transfer switch operation.**
- 2a Time delay on retransfer to normal (do not use with ACC.6a).**
- 2b Time delay on transfer to emergency.**
- 2c Time delay to override momentary normal source power outages to delay engine start signal and transfer switch operation (do not use with a two utility source switch).
- 2d Time delay to control contact transition time on transfer to either source.**
- 2e Engine overrun to provide unloaded engine operation after retransfer to normal.**
- 4b Over voltage and frequency sensing of normal source.**
- 5a Load test switch to simulate normal power failure.**
- 5al Lever operated switch same as 5a.
- 5at Toggle operated switch same as 5a.
- 5ak Key operated switch same as 5a.
- 5c Provisions for remote load test switch to simulate normal power failure.**
- 5d Override switch to bypass the automatic transfer switch controls so that the transferred switch will remain indefinitely connected to the emergency power source regardless of the condition of the normal power source.**
- 5dl Lever operated switch same as 5d.
- 5dt Toggle operated switch same as 5d.
- 5dk Key operated switch same as 5d.
- 6a Push button retransfer to normal.
- 6b Push button to bypass time delay on retransfer to normal.**
- 6bp Push button to bypass time delay on retransfer to normal.
- 7 Contact to close on failure of normal source to initiate engine starting or other customer functions.**
- 7x Normal source available. Output relay contacts wired to terminal strip.
- 8 Contact to open on failure of normal source for customer functions.**
- 9a Green LED to indicate switch in normal position.**
- 9ax Amber LED to indicate normal power available.
- 9b Red LED to indicate switch in emergency position.**
- 9bx Amber LED to indicate emergency power available.
- 11a Plant exerciser to automatically exercise generating plant without load transfer.**
- or
- 11b Plant exerciser to simulate a normal power failure and transfer the load to the generators.**
- or
- 11c Plant exerciser to automatically exercise generating plant with load/no load switch.**
- 11cl Plant exerciser, same as 11c but with lever switch.
- 11d Plant exerciser, same as 11c but with 2 position exercise on/off switch.
- 11dk Plant exerciser, same as 11d but with key switch.
- 12a Four-position selector switch with "load test", "automatic", "off", and "hand crank" positions.
- 12b Two-position selector switch to select either automatic or manual retransfer to normal operation, with push button retransfer to normal.
- 12c Two-position selector switch to select either automatic or manual transfer operation, with push button retransfer to normal, push button transfer to emergency, operable only when two-position switch is in the manual position.**
- 12x Two-position selector switch to select either no commit or commit to transfer operation in the event of a normal power failure.**
- 12xl Two-position lever operated selector switch same as 12x.
- 12xk Two-position key operated selector switch same as 12x.
- 12dx (Special) Preferred source selector switch to select either source-1 or source-2 supply as the preferred source.
- 14a Auxiliary contact closed in normal position.
- 14b Auxiliary contact closed in emergency position.
- 14x Auxiliary contact to indicate ATS is in the center "off" position.
- 16t Switch to disconnect the engine starting contact (engine lockout). Toggle operated switch.
- 16l Lever operated switch same as 16t.
- 16k Key operated switch same as 16t.
- 17 Circuit for area protection.**
- 18a Analog ammeter to read current in phase two only of load circuit.
- 18b Analog ammeter with four-position selector switch marked off-1-2-3 to read current in all three phases of load circuit.
- 19a Analog voltmeter connected across phase one and phase three of the emergency source.
- 19b Analog voltmeter with four-position selector marked off 1-2, 2-3, 3-1. Three phase type to read phase-to-phase voltage of the emergency source.
- 19bd Digital voltmeter three phase type reading phase-to-phase voltage & frequency on the normal and the emergency source.**
- 19c Analog voltmeter with seven-position selector switch marked 3-1, 2-3, 1-2, off, 1, 2, 3. Three phase type to read phase-to-phase and phase-to-neutral voltage of emergency source.
- 21x Emergency source available. Output relay contacts wired to terminal strip.
- 23a (2) time delay contacts that open simultaneously prior to transfer in either direction.**
- 23b (2) Form "C" contacts that open simultaneously before transfer in either direction and reclose instantaneously after transfer.**
- 23c (2) Form "C" contacts that open simultaneously 5 seconds before transfer in either direction and reclose 5 seconds after transfer.**
- 26 Over voltage and frequency sensing of emergency source.**
- 28 Audible alarm to indicate switch in emergency position with alarm silence circuit and pilot light to indicate that alarm has been silenced.
- THS/ST1 Thermostat and strip heater assembly.
- BTR Block transfer function energized by 24VDC signal to prevent transfer to emergency.**
- BTRK Block transfer function energized by 24VDC signal to prevent transfer to emergency. Supplied with two-position spring return keyed operator to bypass the block transfer relay.
- LSR Load shed function energized by 24VDC signal to disconnect the load from the emergency source when an overload condition occurs.**
- LTR Load test function energized by 24VDC signal to simulate a normal power failure.**
- PSR Peak shave function energized by 24VDC signal. This function will start the emergency generator and transfer the ATS to the emergency source, reducing the utility supply to the building. After this peak shave signal is removed, the ATS will retransfer to the normal supply bypassing the retransfer time delay.**

\* select 11a, 11b, or 11c

† select 23a, 23b, or 23c

# RMVT Suggested Specifications

## PART 1—GENERAL

### 1.01 WORK INCLUDED

**A.** Automatic Transfer Switches

### 1.02 SYSTEM

**A.** Furnish the automatic transfer switches to automatically transfer between the normal and emergency power source.

### 1.03 APPLICABLE STANDARDS

**A.** The automatic transfer switches covered by these specifications shall be designed, tested, and assembled in strict accordance with all applicable standards of ANSI, U.L., IEEE and NEMA.

### 1.04 SUBMITTALS

**A.** Manufacturer shall submit shop drawings for review, which shall include the following, as a minimum:

1. Descriptive literature
2. Plan, elevation, side, and front view arrangement drawings, including overall dimension, weights and clearances, as well as mounting or anchoring requirements and conduit entrance locations.
3. Schematic diagrams.
4. Wiring diagrams.
5. Accessory list.

## PART 2—PRODUCTS

### 2.01 ACCEPTABLE MANUFACTURERS

**A.** Russelectric

### 2.02 CONSTRUCTION

#### A. General

1. The automatic transfer switch shall be furnished as shown on the drawings. Voltage and continuous current ratings shall be as shown.
2. The transfer switch shall be mounted in a NEMA 1 enclosure, unless otherwise indicated. Enclosures shall be fabricated from 12 gauge steel. The enclosure shall be sized to exceed minimum wire bending space required by UL 1008.
3. The transfer switch shall be equipped with an internal welded steel pocket, housing an operations and maintenance manual.
4. The transfer switch shall have both top and bottom cable access.
5. The main contacts shall be permanently sealed, maintenance-free, and shall be capable of being replaced without removing the main power cables.
6. All bolted bus connections shall have Belleville compression type washers.
7. When a solid neutral is required, a fully rated bus bar with required neutral lugs shall be provided.

**8.** Control components and wiring shall be easily accessible. All low voltage control wires shall be multiconductor 18 gauge 600 volt SIS switchboard type point to point harness. All control wire terminations shall be identified with tubular sleeve-type markers.

**9.** The switch shall be equipped with 90°C rated copper, NEMA 2 hole, long barrel, compression type lugs.

**10.** The complete transfer switch assembly shall be factory tested to ensure proper operation and compliance with the specification requirements. A copy of the factory test report shall be available upon request.

#### B. Automatic Transfer Switch

1. The transfer switch shall be double throw, actuated by two electric operators momentarily energized, and connected to the transfer mechanism. Minimum transfer time shall be 400 milliseconds.
2. The normal and emergency contacts shall be positively mechanically and interlocked electrically to prevent simultaneous closing. Main contacts shall be mechanically locked in both the normal and emergency positions.

#### C. Automatic Transfer Switch Controls

1. The transfer switch shall be equipped with a microprocessor-based control system, to provide all the operational functions of the automatic transfer switch. The controller shall have two asynchronous serial ports. The controller shall have a real time clock with Nicad battery back-up.
2. The CPU shall be equipped with self diagnostics which perform periodic checks of the memory I/O and communication circuits, with a watchdog/power fail circuit
3. The controller shall use industry standard open architecture communication protocol for high speed serial communications via multidrop connection to other controllers and to a master terminal with up to 4000 ft of cable, or further, with the addition of a communication repeater. The serial communication port shall be RS422/485 compatible.
4. The serial communication port shall allow interface to either the manufacturer's or the owner's furnished remote supervisory control.
5. The controller shall have password protection required to limit access to qualified and authorized personnel.
6. The controller shall include a 20 character, LCD display, with a keypad, which allows access to the system.

**7.** The controller shall include three phase over/under voltage, over/under frequency, phase sequence detection and phase differential monitoring on both normal and emergency sources.

**8.** The controller shall be capable of storing the following records in memory for access either locally or remotely:

- a. Number of hours transfer switch is in the emergency position (total since record reset).
- b. Number of hours emergency power is available (total since record reset).
- c. Total transfer in either direction (total since record reset).
- d. Date, time, and description of the last four source failures.
- e. Date of the last exercise period.
- f. Date of record reset.

#### D. Sequence of Operation

1. When the voltage on any phase of the normal source drops below 80% or increases to 120%, or frequency drops below 90%, or increases to 110%, or 20% voltage differential between phases occurs, after a programmable time delay period of 0-9999 seconds factory set at 3 seconds to allow for momentary dips, the engine starting contacts shall close to start the generating plant.
2. The transfer switch shall transfer to emergency when the generating plant has reached specified voltage and frequency on all phases.
3. After restoration of normal power on all phases to a preset value of at least 90% to 110% of rated voltage, and at least 95% to 105% of rated frequency, and voltage differential is below 20%, an adjustable time delay period of 0-9999 seconds (factory set at 300 seconds) shall delay retransfer to allow stabilization of normal power. If the emergency power source should fail during this time delay period, the switch shall automatically return to the normal source.
4. After retransfer to normal, the engine generator shall be allowed to operate at no load for a programmable period of 0-9999 seconds, factory set at 300 seconds.

#### E. Automatic Transfer Switch Accessories

1. Programmable three phase undervoltage sensing of the normal source set to pickup at 90% and dropout at 80% of rated voltage and overvoltage sensing to pickup at 120% and dropout out at 110% of rated voltage. Programmable under frequency pickup at 95% and dropout at 90% and over frequency

to pickup at 110% and dropout at 105% of rated frequency. Programmable voltage differential between phases, set at 20%, and phase sequence monitoring.

**2.** Programmable three phase undervoltage sensing of the emergency source set to pickup at 90% and dropout at 80% of rated voltage and overvoltage sensing to pickup at 120% and dropout out at 110% of rated voltage. Programmable under frequency pickup at 95% and dropout at 90% and over frequency to pickup at 110% and dropout at 105% of rated frequency. Programmable voltage differential between phases set at 20%, and phase sequence monitoring.

**3.** Time delay for override of momentary normal source power outages (delays engine start signal and transfer switch operation). Programmable 0-9999 seconds. Factory set at 3 seconds, if not otherwise specified.

**4.** Time delay to control contact transition time on transfer to emergency source. Programmable 0-9999 seconds. Factory set at 3 seconds.

**5.** Time delay on retransfer to normal, programmable 0-9999 seconds, factory set at 300 seconds if not otherwise specified, with overrun to provide programmable 0-9999 second time delay, factory set at 300 seconds, unloaded engine operation after retransfer to normal.

**6.** Time delay on transfer to emergency, programmable 0-9999 seconds, factory set at 3 seconds.

**7.** A maintained type load test switch shall be included to simulate a normal power failure, keypad initiated.

**8.** A remote type load test switch shall be included to simulate a normal power failure, remote switch initiated.

**9.** A time delay bypass on retransfer to normal shall be included. Keypad initiated.

**10.** Contact, rated 10 Amps 30VDC, to close on failure of normal source to initiate engine starting.

**11.** Contact, rated 10 Amps 30VDC, to open on failure of normal source for customer functions.

**12.** Light emitting diodes shall be mounted on the microprocessor panel to indicate: switch is in normal position, switch is in emergency position and controller is running.

**13.** A plant exerciser shall be provided with (10) 7 day events, programmable for any day of the week and (24) calendar events, programmable for any month/day, to automatically exercise generating plant programmable in one minute increments.

Also included shall be selection of either "no load" (switch will not transfer) or "load" (switch will transfer) exercise period. Keypad initiated.

**14.** Provision to select either "no commit" or "commit" to transfer operation in the event of a normal power failure shall be included. In the "no commit position," the load will transfer to the emergency position unless normal power returns before the emergency source has reached 90% of its rated values (switch will remain in normal). In the "commit position" the load will transfer to the emergency position after any normal power failure. Keypad initiated.

**15.** Two auxiliary contacts rated 10 Amp, 120 volts AC shall be provided, one closed on normal, the other closed on emergency. Both contacts will be wired to a terminal strip for ease of customer connections.

**16.** A three phase digital LCD voltage readout, with 1% accuracy shall display all three separate phase to phase voltages simultaneously, for either the normal or emergency sources.

**17.** A digital LCD frequency readout with 1% accuracy shall display frequency for either the normal or emergency source.

**18.** An LCD readout shall display normal source and emergency source availability.

#### F. Specifiers Notes: The following accessories shall be available by simple activation, via the key pad, if required.

**1.** Include (2) time delay contacts that open simultaneously just (milliseconds) prior to transfer in either direction. These contacts close after a time delay upon transfer. Programmable 0-9999 seconds after transfer.

**2.** A block transfer function shall be included, energized from a 24VDC signal from the generator control switchgear, to allow transfer to emergency.

**3.** A load shed function shall be included, energized from a 24VDC signal from the generator control switchgear, to disconnect the load from the emergency source when an overload condition occurs.

**4.** A peak shave function shall be included, energized from a 24VDC signal from the generator control switchgear. This function will start the emergency generator and transfer the ATS to the emergency source reducing the utility supply to the building. After the peak shave signal is removed, the transfer switch will retransfer to the normal supply, bypassing the retransfer time delay.

## G. Approval

**1.** As a condition of approval, the manufacturer of the automatic transfer switches shall verify that their switches are listed by Underwriters Laboratories, Inc., Standard UL-1008.

Test procedures shall be in accordance with UL-1008, and testing shall be certified by Underwriters' Laboratories, Inc.

**2.** When conducting temperature rise tests to UL-1008, the manufacturer shall include post-endurance temperature rise tests to verify the ability of the transfer switch to carry full rated current after completing the overload and endurance tests.

**3.** The microprocessor controller shall meet the following requirements:

- Storage temperature — 25°C to 85°C
- Operating temperature — 20°C to 70°C ambient
- Humidity 0 to 99% relative humidity, noncondensing
- Capable of withstanding infinite power interruptions
- Surge withstand per ANSI/IEEE C-37.90A-1978

**4.** Manufacturer shall provide copies of test reports upon request.

## H. Manufacturer

**1.** The transfer switch manufacturer shall employ a nationwide factory-direct, field service organization, on call 24-hours a day, 365 days a year.

**2.** The manufacturer shall include an 800 telephone number, for field service contact, affixed to each enclosure.

**3.** The manufacturer shall maintain records of each transfer switch, by serial number, for a minimum 20 years.

## PART 3 - EXECUTION

### 3.01 INSTALLATION

**A.** Automatic Transfer Switches shall be provided with adequate lifting means for ease of installation.

**B.** Provide access and working space as indicated or as required.

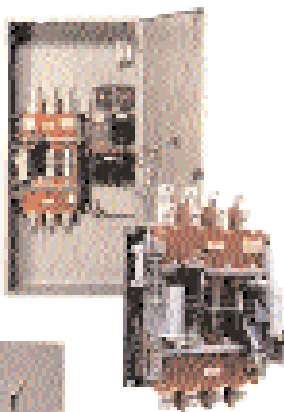
### 3.02 ADJUSTMENTS

**A.** Tighten assembled bolted connections with appropriate tools to manufacturer's torque recommendations prior to first energization.

# Russelectric

The Quality Choice for Critical Power Control and Protection

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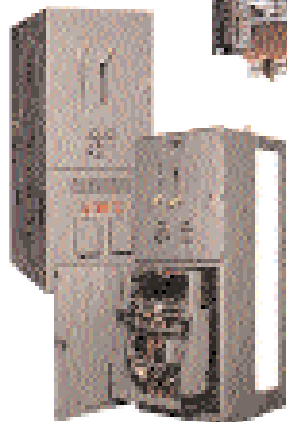


## AUTOMATIC TRANSFER SWITCHES

### **The Industry's Highest 3-Cycle Closing and Withstand Ratings**

Based on actual tests conducted by UL in accordance with UL Standard 1008 effective April 13, 1989, Russelectric Transfer Switches have the highest 3-cycle closing and withstand ratings of any transfer switches available today. They are not restricted to specific manufacturer's circuit breakers and may be applied without problems of coordination with different breaker types.

Russelectric Automatic Transfer Switches are available in ratings from 100A through 4000A, 3- and 4-pole configurations.



## BYPASS/ISOLATION SWITCHES

### **Operates Regardless of the Position or Condition of the Transfer Switch**

Russelectric combination Transfer and Bypass/Isolation Switches are identical load break devices and have the same 3-cycle closing and withstand ratings.

Operation of the Bypass/Isolation Switch is simple, involving only three simple steps. The transfer switch rolls out of its enclosure so it can be removed simply without unplugging or lifting.

Like the accompanying ATS, Russelectric Bypass/Isolation Switches are available in ratings from 100A through 4000A.



## POWER CONTROL SYSTEMS

### **Both Low and Medium Voltages to 23kV. First to be UL Listed and Labeled**

Russelectric custom designed Power Control Systems provide emergency power control, utility paralleling, prime power/cogeneration, and peak shaving.

Systems operating at 600 volts or less are listed under UL 1558 with 200,000A withstand for 4 cycles and 6000A main bus, and also under UL 891. Metal-clad switchgear systems for medium voltages of 5 and 15kV are also UL Listed and labeled up to and including 3000A main bus and 1000MVA. Russelectric Power Control Systems were the first in the U.S. to be labeled under the above UL Listings.



## HYBRID ROTARY UPS SYSTEMS

### **Low Input Harmonics, High Efficiency/Power Factor, and Low Source Impedance**

The RHS Dual Power Path System uses a static switch in parallel with a rectifier and inverter. In the primary path, input current harmonics are reduced to less than 3% THD. Power factor is improved, and optimum efficiency is achieved with the separately excited motor generator. The rectifier to inverter path provides frequency compensation and under-voltage power conditioning for compatibility with engine generators.

The RHS is available in module ratings to 1300kVA and can be paralleled for capacity or redundancy.

# Russelectric

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