MotorSaver®
ELECTRONIC MOTOR CONTROL & PROTECTION

PumpSaver®
ELECTRONIC PUMP CONTROL & PROTECTION

A solid line of products withstanding the test of time.

MADE IN USA

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2011

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SymCom's History

Based out of Rapid City, SD, SymCom has been a leader in electronic control and protection since 1974. We design and manufacture an array of:

- **Overload Relays**
- **Motor and Pump Controls**
- **Custom Electronic Controls**
- **Intrinsically-Safe Relays**
- **Current and Voltage Monitors**
- **Communication Modules**
- **Load Sensors**

SymCom's new building located on Disk Drive in Rapid City, SD.

Our reputation is built on innovation that exceeds our customers' expectations while maintaining the highest of quality and the most reasonable prices in the industry. We top this off with first-class technical support through our internally staffed help desk and a full 5-year warranty.

SymCom's Growth

SymCom's growth over the past year has been astounding, highlighted by the purchase of SSAC, a New York based manufacturer of timers and other electronic control products. The acquisition of SSAC has led to the expansion of our business base, product lines, and development, as well as our manufacturing capabilities.


SymCom's new manufacturing floor.

Our rapid pace of growth has led to the need for a larger Rapid City facility. In December of 2010, SymCom purchased the former Sanmina-SCI property located on Disk Drive. Along with the current SymCom line, plans are underway for Rapid Molding, an injection molding, tooling and diemaking company, to also be housed in the 200,000+ square foot facility.

Come visit our website! It features our products and contains a special section that explains which of our products are best suited for the different industries. You can also download a complete copy of this catalog. This is our way of providing you with the information you need 24 hours a day, 7 days a week.

MotorSaver® ELECTRONIC MOTOR CONTROL & PROTECTION
PumpSaver® ELECTRONIC PUMP CONTROL & PROTECTION
Proudly made in USA

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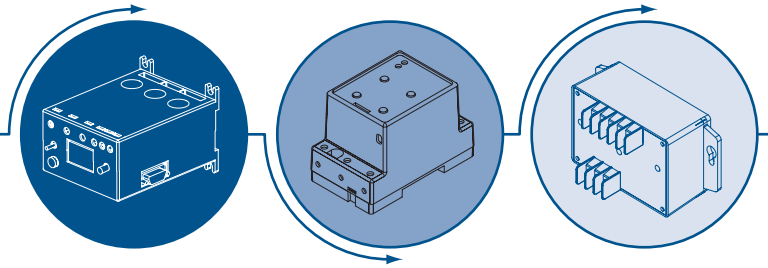
Overload Relays



Monitoring, control, and protection are critical and necessary functions in motor and pumping applications. SymCom's single-phase and three-phase UL listed enhanced overload relays monitor for both line-side voltage problems and load-side current faults, providing an added layer of protection over voltage monitors and other basic overload relays. All SymCom overload relays are user configurable and cover a wide range of voltages and currents, making them the most versatile in the industry. A standard feature of the entire family of SymCom overload relays is a communications port which provides easy connectivity to a SCADA system, PLC, or virtually any network. The communications port also provides easy connectivity to SymCom's Remote Monitors, that can be mounted in the door of the control panel to comply with arc flash regulations.

Product Selection Matrix

MODEL	High Voltage	Low Voltage	Phase Loss	Phase Reversal	Voltage Unbalance	Contactor Failure	Low Current Trip	Low Power Trip	High Power Trip	Overcurrent Trip (Trip Class)	Linear Overcurrent Trip	Current Unbalance	Subtrol High Temp. Trip*	12.5-800A with CTs	1-9 Amps without external CTs	2-90 Amps without external CTs	2-800 Amps full range	100-240 VAC	200-480 VAC	340-480 VAC	500-600 VAC	277V Relay	600V Relay	Use with rotary phase converter
777-P2	•	•	•	•	•	•	•	**	**	•	•	•					•		•			•			
777 (replaced by 777-P2)																								
777-P (replaced by 777-P2)																								
777-P1 (replaced by 777-P2)																								
777-LR-P2	•	•	•	•	•	•	•	**	**	•	•	•		•	•				•			•			
777-LR-P (replaced by 777-LR-P2)																								
777-LR (replaced by 777-LR-P2)																								
777-HVR-LR-P2	•	•	•	•	•	•	•	**	**	•	•	•		•	•					•			•		
777-HVR-LR (replaced by 777-HVR-LR-P2)																								
777-HVR-P2	•	•	•	•	•	•	•	**	**	•	•	•					•			•			•		
777-HVR (replaced by 777-HVR-P2)																								
777-MV-P2	•	•	•	•	•	•	•	**	**	•	•	•		•					•			•			
777-MV (replaced by 777-MV-P2)																								
777-575-P2	•	•	•	•	•	•	•	**	**	•	•	•					•				•	•			
777-575 (replaced by 777-575-P2)																								
777-575-P (replaced by 777-575-P2)																								
777-575-P1 (replaced by 777-575-P2)																								
777-575-FT (replaced by 777-575-P2)																								
777-575-LR-P2	•	•	•	•	•	•	•	**	**	•	•	•		•	•						•	•			
777-575-LR (replaced by 777-575-LR-P2)																								
777-HRG-P2	•	•	•	•	•	•	•	**	**	•	•	•				•			•			•			
777-LR-HRG-P2	•	•	•	•	•	•	•	**	**	•	•	•		•					•			•			
777-575-HRG-P2	•	•	•	•	•	•	•	**	**	•	•	•				•					•	•			
777-575-LR-HRG-P2	•	•	•	•	•	•	•	**	**	•	•	•		•							•	•			
777-FT	•	•	•	•	•	•	•			•	•	•					•		•			•			
777-575-FT	•	•	•	•	•	•	•			•	•	•					•				•	•			
777-TS	•	•	•	•	•	•	•			•		•	•				•		•			•			
777-LR-TS	•	•	•	•	•	•	•			•		•	•		•				•			•			
777-575-TS	•	•	•	•	•	•	•			•		•	•				•				•	•			
777VA-02	•	•	•	•	•	•	•	**	**	•	•	•					•		•			•			•
777VA-03	•	•	•	•	•	•	•	**	**	•	•	•					•		•			•			
77C	•	•				•	•			•							•	•				•			
77C-LR	•	•				•	•			•					•			•				•			
777-HVR-SP	•	•				•	•			•							•		•				•		

* Subtrol is a registered trademark of Franklin Electric Co., Inc.
** Network programmable ONLY

Accessories

- *Communications Modules (see pgs. 10-12)*
- *RM-1000/RM-2000 (remote displays) (see ps. 13-14)*
- *Solutions Software (see pg. 15)*
- *Manual Remote Reset Kit (see pg. 68)*

Available Models:

77C
77C-LR
777-HVR-SP
777-P2
777-LR-P2
777-HVR-P2
777-HVR-LR-P2
777-575-P2
777-MV-P2
777-575-LR-P2
777-HRG-P2
777-LR-HRG-P2
777-575-HRG-P2
777-575-LR-HRG-P2
777-FT
777-575-FT
777-TS
777-LR-TS
777-575-TS
777VA-02
777VA-03

DEMOS:

777-P2-DEMO (777-P2 Demo only)
777-P2-DEMO-1 (777-P2 demo with CIO-EN Ethernet Module)
777-P2-DEMO-2 (777-P2 demo, CIO-EN and RM-1000 Remote Monitor)
777-P2-DEMO-3 (777-P2 demo, CIO-EN, RM-1000 and RM-2000 Remote Monitors)

The Model 777 / 77C

is a fully programmable electronic overload relay designed to protect any motor drawing 2-800 full load amps (external CTs are required above 90 amps). The 77C (family of products) is for single-phase 100-240 VAC applications and the 777 (family of products) is for 3-phase 200-480 VAC applications, with several specialized units for other voltage ranges and unique applications. Common applications include conveyer systems, HVAC equipment, saws and grinders, fan motors, and almost any pumping application. Some unique applications include use with a Subtrol® equipped Franklin submersible motor to detect high motor temperatures and applications where a fast linear trip is required.

All of the overload relays provide unsurpassed protection by combining overload, underload, voltage and power monitoring functions in one package. The overload relays have a 3-digit display for viewing real-time voltage and current and for displaying the last or active fault code (to simplify diagnostics) when tripped for a fault condition. The units can be used as a stand-alone product or the communications port can be used to form a Modbus, DeviceNet, Profibus, or Ethernet network to monitor up to 99 units from a PC, PLC, or SCADA system, and for data logging through a PC with SymCom's Solutions software (see page 15).

The communications port can also be used for remote monitoring (see SymCom's remote monitors on page 13 and 14) to improve safety for personnel by allowing them to monitor and control motor operation without opening the electrical cabinet. This capability allows for a simple, cost-effective way to meet new requirements for arc-flash safety.

See Appendix A, Figures 1 - 4 for typical wiring diagrams.

Features

- *Built-in 3-digit display for programming, real-time info, and diagnostics*
- *Programmable voltage and current settings/parameters*
- *Programmable restart control (automatic, semi-automatic, or manual)*
- *3 separate programmable restart delay timers (rapid-cycle protection, motor cool down and dry-well recovery)*
- *Run-hour meter (available via network or remote displays)*
- *Reset pushbutton (and optional remote reset pushbutton)*
- *Current/last fault indication on 3-digit display*
- *Last four faults (with characteristics) available via network or remote displays*
- *Network communications (Modbus, DeviceNet, Profibus, or Ethernet)*
- *Optional remote displays satisfy arc-flash safety requirements*

Model 777 Product Line

single-phase and 3-phase current & voltage monitor, on-board display, optional communications to PLC/SCADA/monitoring systems

-P2 *The 777-P2 protects 200-480VAC, 2-800 full load amp (FLA) motors and provides protection from overvoltage and undervoltage, overcurent and undercurrent and unbalanced voltage or unbalanced current through adjustable setpoints. Provides adjustable Trip Class (TC) settings that include settings from 2-60, with or without "jam" protection, and linear TC from <1 sec. to 60 seconds. The fast linear TC is ideal for applications where very short trip delays are needed to prevent chain drives and other drive linkages from breaking in an overload or jam situation (ex. sewage clarifiers, mixers, augers, conveyors). This family of products also includes network programmable alarm setpoints and high and low power trip points (programmable through a network or SymCom's Solutions Software).*

-LR (Low Range) *The 777-LR-P2 is specifically designed for use with 1-9 FLA motors to ease installation when wired directly, or for 12.5-800 FLA motors with use of external CTs.*

-HVR *The 777-HVR-P2 is required when a CPT (control power transformer) is not used on a 480V system. It has a 340-480VAC range, a relay rated at 470VA @ 600VAC pilot duty, and is commonly used in pumping applications to save the cost and extra wiring associated with a CPT.*

-HRG *The 777-HRG-P2 / 777-LR-HRG-P2 are overload relays, designed for a high resistance ground sytem, that incorporates an internal zero-sequence CT (HRG) or an external zero-sequence CT (LR-HRG) to detect ground faults. The HRG is only for 2-90 FLA and is wired directly. The LR-HRG is only for 12.5-800 FLA and requires the use of external CTs that correspond with the built-in multipliers.*

-MV *The 777-MV-P2 is specifically designed for medium voltage applications where both PTs (potential transformers) and CTs (current transformers) are used. It has a 115-230VAC nominal voltage range and built-in multipliers for 25:5, 50:5, 100:5, …CTs. The voltage unbalance, single-phase and reverse-phase protection can be disabled to accommodate applications where only one PT is used.*

-575 *The 777-575-P2 has a nominal 500-600VAC range and 240V relay. They are commonly used in Canada and the Northeast US where 575V utility power services are common.*

-VA-02 *The 777VA-02 has RD1 setpoints of 2-500 minutes and UCTD setpoints of 2-60 minutes. (Part number was 777-RD1M-UCTDM).*

-VA-03 *The 777VA-03 is specifically designed for use with static and rotary single to 3-phase converters. Voltage unbalance protection is disabled and the high and low voltage trip features apply only to the utility supplied power. This allows the 777 to ignore the severely unbalanced voltages that are inherent to unloaded phase converters. (Part number was 777-PH.)*

-SP *The 777-HVR-SP is specifically designed for single-phase, 480VAC applications . It has a high voltage relay rated at 480VA @ 600VAC pilot duty to handle systems with no control power transformer.*

-FT *The 777-FT is intended for applications where a fast linear trip is required. It has an overcurrent trip delay that can be set to less than 500ms, to be used in applications where very short trip delays are needed to prevent chain drives and other drive linkages from breaking in an overload or jam situation. Ofen times these are referred to as shock relays. Some applications include sewage clarifiers, mixers, augers and conveyors. The trip delay can be set to as long as 70 seconds, so the 777-FT can also be used in certain applications when a slower than normal trip is desired, such as motor test panels in a rewind shop. The 777-FT also features an adjustable motor acceleration time and overcurrent trip delay time when using the fast linear trip mode.*

-TS *The 777-TS is specifically designed for use with a Subtrol®-equipped Franklin submersible motor to detect high motor temperatures.*

-DEMO *SymCom offers demo packages for the Model 777 family and Remote Monitors. These demos are powered via one power adapter (included) and are very easy to set up for use as sales tools or for training purposes. Four packages of the MotorSaver and four of the PumpSaver versions are available ranging from the basic model 777 up to a complete package including the Ethernet module and both remote monitors. Which package to choose will depend on your markets and/or product focus.)*

Specifications

Electrical

Nominal Input Voltage

777-P2, 777-LR-P2, 777-HRG-P2	*200-480VAC*
777-TS, 777-LR-TS, 777-LR-HRG-P2	*200-480VAC*
777VA-02, 777VA-03	*200-480VAC*
77C, 77C-LR, 777-MV-P2	*100-240VAC*
777-HVR-P2, 777-HVR-LR-P2	*340-480VAC*
777-HVR-SP	*340-480VAC*
777-575-P2, 777-575-LR-P2, 777-575-HRG-P2	*500-600VAC*
777-575-TS, 777-575-LR-HRG-P2	*500-600VAC*
Frequency	*50/60Hz*

Motor Full Load Amp Range

77C-LR, 777-LR-TS	*1-9A*
777-LR-P2, 777-575-LR-P2, 777-HVR-LR-P2	*1-9A & 12.5-800A with external CTs*
777-LR-HRG-P2, 777-575-LR-HRG-P2	*12.5-800A (external CTs required, external zero-seq. CT required)*
777-HRG-P2, 777-575-HRG-P2	*2-90A only*
777-MV-P2	*12.5-800A with CTs*
77C, 777-P2, 777-575-P2	*2-800A (external CTs required above 90A)*
777-HVR-P2	*2-800A (external CTs required above 90A)*
777-TS, 777-575-TS, 777VA-02	*2-800A (external CTs required above 90A)*
777VA-03, 777-HVR-SP	*2-800A (external CTs required above 90A)*
TC- Overcurrent Trip Class (777 Plus Series units)	*02-60, J02-J60, L00-L60 or Off*
TC- Overcurrent Trip Class (77C, 777 non-Plus Series units)	*5, 10, 15, 20, 30 (J prefix enables jam protection feature)*
Short Circuit Rating	*100kA*
Maximum Input Power	*10 W*
Output Contact Rating SPDT (Form C)	*Pilot duty rating: 480VA @ 240VAC, General purpose: 10A @ 240VAC 470VA @ 600VAC for HVR Models*

Accuracy

Voltage	*±1%*
Current	*±3%(<100 amps direct)*
GF Current	*±15%*
Timing (777 Plus Series units)	*±0.5 second*
Timing (77C, 777 non-Plus Series units)	*5% ±1 second*

Repeatability

Voltage	*±0.5% of nominal voltage*
Current	*±1% (<100 amps direct)*

Safety Marks

UL	*UL508, UL1053*
CE	*IEC 60947-1, IEC 60947-5-1*
CSA	*C22.2*

Standards Passed

Electrostatic Discharge (ESD)	*IEC 61000-4-2, Level 3, 6kV contact, 8kV air*
Radio Frequency Immunity (RFI), Conducted	*IEC 61000-4-6, Level 3 10V/m*
Radio Frequency Immunity (RFI), Radiated	*IEC 61000-4-3, Level 3 10V/m*
Fast Transient Burst	*IEC 61000-4-4, Level 3, 3.5kV input power*
Surge	
IEC	*61000-4-5, Level 3, 2kV line-to-line; Level 4, 4kV line-to-ground*
ANSI/IEEE	*C62.41 Surge and Ring Wave Compliance to a level of 6kV line-to-line*
Hi-potential Test	*Meets UL508 (2 x rated V +1000V for 1 minute)*
Vibration	*IEC 68-2-6, 10-55Hz, 1mm peak-to-peak, 2 hours, 3 axis*
Shock	*IEC 68-2-27, 30g, 3 axis, 11ms duration, half-sine pulse*

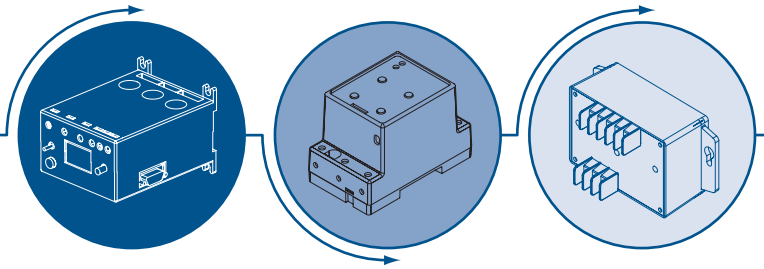
Mechanical

Dimensions	*3.1"H x 5.1"D x 3.9"W*
Weight	*1.2 lbs.*
Maximum Conductor Size (with insulation) Through 777	*0.65"*

Environmental

Temperature Range	*Ambient Operating: -20° to 70°C (-4° to 158°F) Ambient Storage: -40° to 80°C (-40° to 176°F)*
Pollution Degree	*3*
Class of Protection	*IP20, NEMA 1 (Finger Safe)*
Relative Humidity	*10-95%, non-condensing per IEC 68-2-3*

Power Monitors



Many pumping applications require advanced power monitoring and control. SymCom enhanced power monitors provide all of the protections and features included with an enhanced overload relay, but are designed specifically for applications where there is not much change in current between a load and no load condition. This family of enhanced power monitors provides optimum protection in these adverse situations by monitoring for subtle changes in voltage, current and power factor to distinguish between changing load conditions.

Features

- *UL, cUL, and CE listed*
- *RS485 Modbus communication*
- *RM-1000 & RM-2000 compatible*
- *Diagnostic display*
- *Manual reset*
- *4-20mA scalable output signal (777-AccuPower only)*
- *Network communications*

Product Selection Matrix

MODEL	High Voltage	Low Voltage	Phase Loss	Phase Reversal	Voltage Unbalance	Contactor Failure	Low Current Trip	Low Power Trip	High Power Trip	Overcurrent Trip (Trip Class)	Linear Overcurrent Trip	Current Unbalance	12.5-800 A with CTs	1-9 Amps	3-15 Amps	2-800 Amps	200-480VAC	340-480VAC	500-600VAC	277V Relay	600V Relay	Displays Output Shaft Power
777-KW/HP-P2	•	•	•	•	•	•	**	•	**	•	•	•				•	•			•			
777-KW/HP (replaced by 777-KW/HP-P2)																						
777-KW/HP-P (replaced by 777-KW/HP-P2)																						
777-LR-KW/HP-P2	•	•	•	•	•	•	**	•	**	•	•	•	•	•			•			•		
777-LR-KW/HP (replaced by 777-LR-KW/HP-P2)																						
777-LR-KW/HP-P (replaced by 777-LR-KW/HP-P2)																						
777-MLR-KW/HP-P2	•	•	•	•	•	•	**	•	**	•	•	•			•		•			•			
777-MLR-KW/HP (replaced by 777-MLR-KW/HP-P2)																						
777-HVR-KW/HP-P2	•	•	•	•	•	•	**	•	**	•	•	•				•		•			•		
777-HVR-KW/HP (replaced by 777-HVR-KW/HP-P2)																						
777-575-KW/HP-P2	•	•	•	•	•	•	**	•	**	•	•	•				•			•	•			
777-575-KW/HP (replaced by 777-575-KW/HP-P2)																						
777-AccuPower	•	•	•	•	•	•		•	•	•		•				•	•			•		•

** Network programmable ONLY.

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Model 777-KW/HP-P2 Product Line

3-phase current & voltage monitor, on-board display, optional communications, ***underpower trip for more accurate/faster motor protection versus undercurrent trip***

Available Models:

777-KW/HP-P2
777-LR-KW/HP-P2
777-HVR-KW/HP-P2
777-575-KW/HP-P2
777-MLR-KW/HP-P2

DEMOS:

777-KW/HP-P2-DEMO (777-KW/HP-P2 Demo only)
777-KWHP-P2-DEMO1 (777-KW/HP-P2 demo with CIO-EN Ethernet Module)
777-KWHP-P2-DEMO2 (777-KW/HP-P2 demo, CIO-EN and RM-1000 Remote Monitor)
777-KWHP-P2-DEMO3 (777-KW/HP-P2 demo, CIO-EN, RM-1000 and RM-2000 Remote Monitors)

The Model 777-KW/HP-P2 Series

has the underload trip, adjustable on the face of the unit, based on power, while all the other products in the 777 family provide an undercurrent trip.

The underpower trip feature is desirable anytime the current vs. load characteristic is non-linear or has little change. In general terms, smaller motors and slow speed motors have little change in current over the normal load range. Larger motors that are running light loads will also show small current changes over the operating load range.

KW/HP products should be used with all small centrifugal motors and fractional horsepower motors when underload protection is needed and with most motors under 3hp. Also use KW/HP products when the motor is derated (Ex: Coal bed methane well with a 7.5hp submersible pump on a 10hp motor.) Other typical applications are mixer motors up to 50hp and beyond that run at less than 1800 rpm, magdrive pumps and can pumps. If in doubt, underpower can be used anytime in place of undercurrent protection.

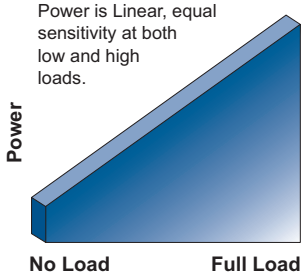
The 777-KW/HP-P2 can display kilowatts and horsepower and a high power trip feature that can be enabled over a network. The high power trip is useful added protection for positive displacement pumps in a restricted flow (dead-head) condition.
See Appendix A, Figures 1 & 2 for typical wiring diagrams.

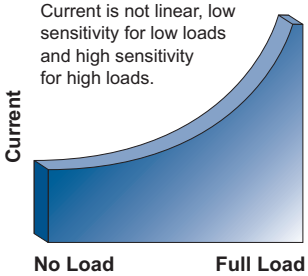
-LR (Low Range) *The 777-LR-KW/HP-P2 is specifically designed for use with 1-9 FLA motors to ease installation when wired directly, or for 12.5-800 FLA motors with use of external CTs.*

-HVR *The 777-HVR-KW/HP-P2 is required when a CPT (control power transformer) is not used on a 480V system. It has a 340-480VAC range, a relay rated at 480VA @ 600VAC pilot duty, and is commonly used in pumping applications to save the cost and extra wiring associated with a CPT.*

-575 *The 777-575-KW/HP-P2 has a nominal 500-600VAC range and 240V relay. They are commonly used in Canada and the Northeast US where 575V utility power services are common.*

-MLR *The 777-MLR-KW/HP-P2 is used in applications that have a 3-15 full load amp range, and is wired directly without the need to loop conductors or use external CTs.*





Features

- *Low power protection*
- *High power protection*
- *Overcurrent (overload)*
- *High voltage*
- *Low voltage*
- *Current unbalance*
- *Voltage unbalance*
- *Ground fault detection*
- *Modbus communication*
- *Built-in 3-digit display for setup and diagnostics*
- *Network communications*

Model 777-KW/HP-P2

3-phase current & voltage monitor, on-board display, optional communications, ***underpower trip for more accurate/faster motor protection versus undercurrent trip***

Specifications

Electrical

Nominal Input Voltage

777-KW/HP-P2	*200-480VAC (3-phase)*
777-LR-KW/HP-P2, 777-MLR-KW/HP-P2	*200-480VAC (3-phase)*
777-HVR-KW/HP-P2	*340-480VAC (3-phase)*
777-575-KW/HP-P2	*500-600VAC (3-phase)*

Current

777-KW/HP-P2	*2-800A (external CTs required above 90A)*
777-HVR-KW/HP-P2, 777-575-KW/HP-P2	*2-800A (external CTs required above 90A)*
777-LR-KW/HP-P2	*1-9A & 12.5-800A with external CTs*
777-MLR-KW/HP-P2	*3-15A*
Frequency	*50/60Hz*
TC-Overcurrent Trip Class	*02-60, J02-J60, L00-L60 or OFF*
Short Circuit Rating	*100kA*
Maximum Input Power	*10 W*
Output Contact Rating SPDT (Form C)	*Pilot duty rating: 480VA @ 240VAC* *General purpose: 10A @ 240VAC*

Accuracy

Voltage	*±1%*
Current	*±3% (<100 A Direct)*
Power	*±4% (<100 A Direct)*
GF Current	*±15%*
Timing	*±0.5 second*

Repeatability

Voltage	*±0.5% of nominal voltage*
Current	*±1% (<100 amps direct)*
Power	*±2%*

Safety Marks

UL	*UL508, UL1053*
CE	*IEC 60947-1, IEC 60947-5-1*
CSA	*C22.2*

Standards Passed

Electrostatic Discharge (ESD)	*IEC 61000-4-2, Level 3, 6kV contact, 8kV air*
Radio Frequency Immunity (RFI), Conducted	*IEC 61000-4-6, Level 3 10V/m*
Radio Frequency Immunity (RFI), Radiated	*IEC 61000-4-3, Level 3 10V/m*
Fast Transient Burst	*IEC 61000-4-4, Level 3, 3.5 kV input power*
Surge	
IEC	*61000-4-5, Level 3, 2kV line-to-line; Level 4, 4kV line-to-ground*
ANSI/IEEE	*C62.41 Surge and Ring Wave Compliance to a level of 6kV line-to-line*
Hi-potential Test	*Meets UL508 (2 x rated V +1000V for 1 minute)*
Vibration	*IEC 68-2-6, 10-55Hz, 1mm peak-to-peak, 2 hours, 3 axis*
Shock	*IEC 68-2-27, 30g, 3 axis, 11ms duration, half-sine pulse*

Mechanical

Dimensions	*3.1"H x 5.1"D x 3.9"W*
Weight	*1.2 lbs.*
Maximum Conductor Size (with insulation) Through 777	*0.65"*

Environmental

Temperature Range	*Ambient Operating: -20° to 70°C (-4° to 158°F)* *Ambient Storage: -40° to 80°C (-40° to 176°F)*
Pollution Degree	*3*
Class of Protection	*IP20, NEMA 1 (Finger Safe)*
Relative Humidity	*10-95%, non-condensing per IEC 68-2-3*

Model 777-AccuPower

3-phase current & voltage monitor, on-board display, ***calculates motor output power with optional 4-20mA communications***

Part No. 777-AccuPower

The Model 777-AccuPower

is a fully-programmable 3-phase motor and pump protection relay. It allows motor hp rating, full load amps, efficiency and power factor to be entered and will accurately calculate motor output power. This is most useful with mag-drive pumps or process applications where the process power is desired over the utility power. Voltage, current and power measurements can be displayed as well as fault information and setpoints. The built-in display simplifies troubleshooting and allows the user to easily and precisely configure setpoints. The 777-AccuPower can be used with SymCom's 4-20mA Output Module to give an analog signal proportional to output shaft power. See Appendix A, Figures 1 & 2 for typical wiring diagrams.

Features

- *Motor output power measurement*
- *3 separate restart timers for rapid-cycle protection, motor cool down and dry-well recovery*
- *Built-in 3-digit display for setup and diagnostics*
- *Last fault indication on display*
- *Last 4 faults available on network or remote displays*
- *Optional remote displays (RM-1000 or RM-2000) via Modbus communications*
- *Limited Modbus capabilities*
- *Adjustable underload trip delay (network only)*
- *Power factor measurement (network readable)*
- *Run-hour meter (network readable)*
- *4-20mA scalable output signal*

Protects 3-Phase motors from:

- *Loss of any phase (single-phasing)*
- *Phase-reversal*
- *Underload*
- *Overcurrent*
- *Single-phase current*
- *Current unbalance*
- *Contact failure*
- *Rapid cycling*

Specifications

Electrical

Nominal Input Voltage . . . . . 190-480VAC, (standard)
Frequency. 50/60Hz
Motor Full Load Amp Range . . . . 2-800A (external CTs required over 90A)
TC- Overcurrent Trip Class 5, 10, 15, 20, 30
(J prefix enables jam protection feature)
Short Circuit Rating. 100kA
Maximum Input Power . . . . . 10 W
Output Contact Rating SPDT (Form C)
. . . . . Pilot duty: 480VA @ 240VAC
. . . . . General purpose: 10A @ 240VAC
Accuracy
Measured Horsepower/Kilowatt
Typical. . . . . ±3%**
Voltage . . . . . ±1%
Current . . . . . ±3%(<100 amps direct)
GF Current . . . . . ±15%
Timing. . . . . 5% ±1 second
Repeatability
Voltage . . . . . ±0.5% of nominal voltage
Current . . . . . ±1% (<100 amps direct)
Safety Marks
UL. UL508, UL1053
CE. . . . . IEC 60947-1, IEC 60947-5-1
CSA C22.2

Standards Passed
Electrostatic Discharge (ESD)
IEC 61000-4-2, Level 3, 6kV contact, 8kV air
Radio Frequency Immunity (RFI), Conducted
IEC 61000-4-6, Level 3 10V/m
Radio Frequency Immunity (RFI), Radiated
IEC 61000-4-3, Level 3 10V/m
Fast Transient Burst
IEC 61000-4-4, Level 3, 3.5 kV input power
Surge
IEC 61000-4-5 Level 3, 2kV line-to-line;
Level 4, 4kV line-to-ground
ANSI/IEEE C62.41 Surge and Ring Wave Compliance
to a level of 6kV line-to-line

Mechanical

Dimensions. . . . . 3.1"H x 5.1"D x 3.9"W
Weight . . . . . 1.2 lbs.
Max. conductor size thru 777.. . . 0.65" with insulation

Environmental

Temperature Range
Ambient Operating: . . . . . -40° to 70°C (-40° to 158°F)
Ambient Storage: . . . . . -40° to 80°C (-40° to 176°F)
Pollution Degree: 3
Class of Protection: . . . . . IP20, NEMA 1 (finger safe)
Relative Humidity: . . . . . 10-95%, non-condensing per IEC 68-2-3
**On a well balanced system within recommended current range.

Communication Modules

communication link to PLC/SCADA/monitoring systems

Available Models:

RS485MS-2W
COM 4-20

The RS485MS-2W Communication Module

is required to enable the Modbus communications function on Model 77x-type products. This module is required when the RM-1000, RM-2000 or other Modbus capable device is used with 77x-type products.

Specifications

- Optical isolation from line potentials
- Powered by the 77x product
- RS-485 compliant bus drive capability
- Remote reset input connection
- Power connection for the Model RM-1000

The Com 4-20mA Output Module

is intended for use with ONLY the Model 777-AccuPower output power monitor. The module will send a 4-20mA signal proportional to the output power. It can also be used to send the input power by setting the efficiency setting on the 777-AccuPower monitor to one. This module allows communication to a PLC with an analog input and no Modbus input.

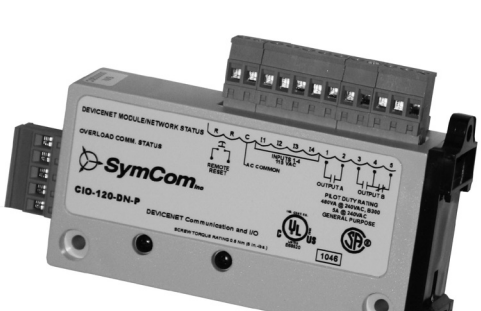
Specifications

- Self powered
- Scalable 4-20mA output proportional to Hp or kW
- Signal can be used for displays, controllers, or PLCs

Communication Adapters

- *RS485-RS232 conv. with cable & plug*
- *RS485-USB conv. with cable & plug/RS232:USB conv.*

actual unit may vary from picture



The CIO-DN-P / CIO-120-DN-P Modules

are convenient and cost-effective Devicenet™ interfaces capable of providing discrete control and monitoring of motor starters, drives and other devices over a Devicenet™ network..

Benefits:

- *Can be used in both new and existing installations*
- *Can be used as stand-alone or with a 777-P series unit*
- *Reduced field wiring. Unpluggable terminal block connection for network.*
- *Ease in system startup and commissioning*
- *Compact size*
- *DIN rail or surface mountable*
- *Additional remote reset input to reset 777-P*
- *Flexible addressing standard*

Specifications

- Four Digital Inputs + 1 Dedicated Reset Input
  - 12-24VDC/Dry contact type (CIO-DN-P)
  - 90-130VAC, 50/60Hz (CIO-120-DN-P)
- Two relay outputs (1Form A, 1 Form C)
  - 5A @ 240VAC General Purpose, 480VA @ 240VAC Pilot Duty

The CIO-777-PR Module

is a convenient and cost-effective Profibus interface capable of providing discrete control and monitoring of motor starters, drives and other devices over a Profibus network.

Benefits:

- *Can be used in both new and existing installations*
- *Can be used as stand-alone or with a 777-P series unit*
- *Reduced field wiring. Simple 9-Pin sub-D connection for network*
- *Ease in system startup and commissioning*
- *Compact size*
- *DIN rail or surface mountable*
- *Flexible addressing standard*

Specifications

- Four Digital Inputs + 1 Dedicated Reset Input
  - 24VDC/Dry contact type
- Two relay outputs (1Form A, 1 Form C)
  - 5A @ 240VAC General Purpose, 480VA @ 240VAC Pilot Duty

Communication Modules

communication link to PLC/SCADA/monitoring systems

The CIO-MB / CIO-120-MB Modules

are convenient and cost-effective Modbus-RTU interfaces capable of providing discrete control and monitoring of an overload relay over a Modbus network.

Benefits:

- *Can be used in both new and existing installations*
- *Can be used as stand-alone or with a 777-P series unit*
- *Can be re-configured to work with standard 777 units*
- *Reduced field wiring. Unpluggable terminal block connection for network.*
- *Ease in system startup and commissioning*
- *Compact size*
- *DIN rail or surface mountable*
- *Additional remote reset input to reset 777-P*
- *Flexible addressing standard*

Specifications

- Four Digital Inputs + 1 dedicated reset input
- 12-24VDC dry contact type (CIO-MB)
- 90-130VAC, 50/60Hz dry contact type (CIO-120-MB)
- 2 relay outputs (1 Form A, 1 Form C)
  5A @ 240VAC General Purpose, 480VA @ 240VAC Pilot Duty

The CIO-EN Module (non-POE)

is a convenient and cost-effective Modbus-TCP and Modbus-RTU interface capable of providing discrete control and monitoring of an overload relay over a Modbus network.

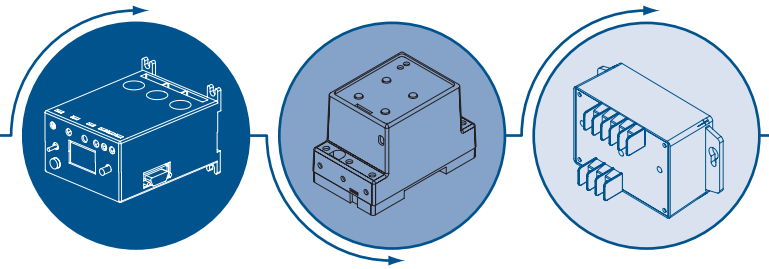
Benefits:

- *Can be used in both new and existing installations*
- *Can be used as stand-alone or with a 777-P series unit*
- *Can be re-configured to work with standard 777 units*
- *Reduced field wiring. Simple Ethernet™ jack connection for network*
- *10 Base-T Ethernet™ compatible*
- *Additional Modbus port and Modbus message assembly feature for block reads*
- *Ease in system startup and commissioning*
- *Compact size*
- *DIN rail or surface mountable*
- *Additional remote reset input to reset 777-P*
- *Flexible addressing standard*

Specifications

- Four Digital Inputs + 1 dedicated reset input
  12-24VDC dry contact type
- 2 relay outputs (1 Form A, 1 Form C)
  5A @ 240VAC General Purpose, 480VA @ 240VAC Pilot Duty

Remote Monitoring Devices



Available Models:

RM-1000
RM-1000-3R
RM-1000 NEMA 4

The RM-1000

is a motor-monitoring device to be used in conjunction with SymCom's Model 777 family of products (excluding the P1 Series), 77C family of products and the Model 601 voltage monitors, via Modbus protocol with a communications module. The RM-1000/777 motor management system combines unsurpassed electronic motor protection and critical, user-friendly, motor monitoring.

The RM-1000 can monitor up to 16 MotorSaver® and/or PumpSaver® units through an RS-485 network using Modbus RTU protocol. A second communication port allows monitoring and control of up to 99 MotorSaver® and/or PumpSaver® units from a computer, PLC, DCS or SCADA system and can be accessed from the host computer or PLC with the RM-1000 acting as a repeater for any of its motor protectors. In addition to the monitoring functions, the RM-1000 can be used to reset a tripped MotorSaver® or PumpSaver®.

The RM-1000 is easily mounted on the front of a panel or motor control center and improves safety for service and operations personnel by allowing them to control and monitor the device without opening the electrical cabinet. Using the RM-1000 is a simple, cost-effective method of satisfying the new requirements for arc-flash safety. The enclosure and keypad assembly is water and ultraviolet light resistant. The enclosure is NEMA 3R or NEMA 4X (optional) rated. The RM-1000 and RM-1000 NEMA 4 also carry a UL Type 12 rating, whereas the RM-1000-3R does not carry the UL Type 12 rating due to added weep holes. The added weep holes in the RM-1000-3R make it suitable for applications subjected to condensing moisture/humidity. See Appendix A, Figure 5 for a typical wiring diagram.

Features

Displays:
- *Individual line currents and average current*
- *Current unbalance*
- *Individual phase voltages and average voltage*
- *Voltage unbalance*
- *Present fault trip reason and restart timer status*
- *Last four faults*
- *MotorSaver® and/or PumpSaver® setpoints*
- *Run-hours on each motor*
- *Warning of pending (imminent) faults*

Controls:
- *Reset run-hour meter*
- *Reset MotorSaver® or PumpSaver®*
- *Clear last fault in MotorSaver® or PumpSaver®*
- *Change setpoints from the RM-1000*

Convenience:
- *Power from RS485MS-2W communications module*
- *Monitor up to 16 777s with one display*
- *NEMA 3R outdoor rated*
- *Secondary steel enclosure available (see pg 66 for details)*

Specifications

Control Power ..... 12-24VDC (Supplied by RS485MS-2W)
Maximum Input Power 100mA

Communication ..... Port #1 for 777(s)	**Port #2 for PC, PLC, etc.**
Baud Rate 1200-28800	1200-28800
Setup ..... None, Odd, or Even Parity	None, Odd, or Even Parity
..... 1 or 2 Stop Bits	1 or 2 Stop Bits
Protocol ..... Modbus RTU	Modbus RTU
Serial Interface RS-485	RS-485
Available Addresses ..... 1-99 (max 16 per RM-1000)	Responds to all port #1 addresses

Environment
Class of Protection
RM-1000, RM-1000 NEMA 4 ..... UL Type 3R and/or 12, NEMA 4X (optional)
RM-1000-3R ..... NEMA 3R only
Ambient Operating Temperature ..... -40° to 70°C (-40° to 158°F)
Ambient Storage Temperature ..... -40° to 70°C (-40° to 158°F)
Humidity ..... Up to 85%, non-condensing

Safety Marks
UL ..... UL508 (#E68520)
CE ..... IEC 60947-6-2

Enclosure
Dimensions ..... 3.619" H x 4.544" W X 0.9" D
Weight ..... 6 oz.
Material ..... Black polycarbonate
Display ..... Liquid Crystal with extended temp. range
Size ..... 2 rows x 16 characters
Keypad ..... Six 0.5" stainless steel dome buttons for tactile feedback
Mechanical Life ..... 100,000 actuations
Overlay Material ..... Polyester
UV Exposure
w/o degradation ..... 2000 hrs
Terminal ..... Depluggable terminal block
Panel Thickness ..... 0.030" min, 0.120" max

RM-2000

remote monitoring, real-time clock, precise fault details, kwH

Available Models:

RM-2000
RM-2000-CBM+
RM-2000-RTDW

The RM-2000

is a motor-monitoring device to be used in conjunction with SymCom's Model 777 family of products (excluding the P1 Series), 77C family of products and the Model 601 voltage monitors, via Modbus protocol with a communications module. The RM-2000/777 motor management system combines unsurpassed electronic motor protection and critical, user-friendly, motor monitoring.

The RM-2000 has membrane keypad controls which allow both monitoring and control of a 777 MotorSaver® through an RS-485 network using Modbus RTU protocol. A second communication port allows monitoring and control of up to 99 RM-2000 devices from a PLC, DCS, or SCADA system or a PC with Solutions software installed. The RM-2000 will act as a repeater for its motor protector when accessed from the host computer or PLC. In addition to the monitoring functions, the RM-2000 can be used to reset a tripped MotorSaver® or PumpSaver®.*

The RM-2000 is easily mounted on the front of a panel or motor control center and improves safety for service and operations personnel by allowing them to control and monitor the device without opening the electrical cabinet. Using the RM-2000 is a simple, cost-effective method of satisfying the new requirements for arc-flash safety. The enclosure and keypad assembly is water and ultraviolet light resistant.

See Appendix A, Figure 6 for a typical wiring diagram.

** Not good with the 777-P1 series.*

Features

Displays:

- *Average current, individual line currents and current unbalance*
- *Current to ground*
- *Average voltage, line-line voltages and voltage unbalance*
- *Instantaneous power*
- *Power factor*
- *Last four faults*
- *All parameters programmed into 777 MotorSaver®*
- *Remaining restart delay times*

Controls:

- *Start and stop buttons*
- *Key lock input to prevent setpoint changes*
- *Change 777 setpoints from keypad*

The RM-2000 is also equipped with a real-time clock, which allows access to the following motor management information (most readings can be reset):

- *Total motor run-time*
- *Time and date of last four faults, along with voltage and current at time of trip*
- *Time and date of last 10 motor starts*
- *Total number of motor restarts*
- *Minimum time between any two starts with time and date*
- *Run-time since last start*
- *kWh consumed*
- *kVARs consumed*

Specifications

Control Voltage	115VAC ±10%; 50/60Hz	
Transient Protection (Internal)	2500V for 10ms	
Maximum Input Power	3 W	
Communication	**Port #1 for 777**	**Port #2 for PC, PLC, etc.**
Baud Rate	1200-28800	1200-28800
Setup	Even Parity	None, Odd, or Even
	1 Stop Bit	Parity 1 or 2 Stop Bits
Protocol	Modbus RTU	Modbus RTU
Serial Interface	RS-485	RS-485
Available Addresses	01	A01-A99

Real-time Clock

Battery Back-up Life	10 years @ 25°C without external power
Last fault memory	Stores up to 4 faults with time and date stamp, includes voltages and currents at time of trip
Configuration	Two independent electro-mechanical form C (SPDT)
Contact Material	Silver/Tin Oxide
Pilot Duty Rating	240VA @ 120VAC
General Purpose Rating	5A @ 120VAC

Environment

Class of Protection	UL Type 3R and/or 12
Ambient Operating Temp.	-20° to 70°C (-4° to 158°F)
Ambient Storage Temp.	-30° to 70°C (-22° to 158°F)
Humidity	Up to 85%, non-condensing

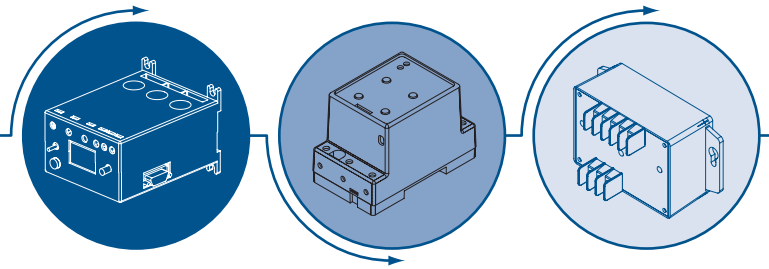
Safety Marks

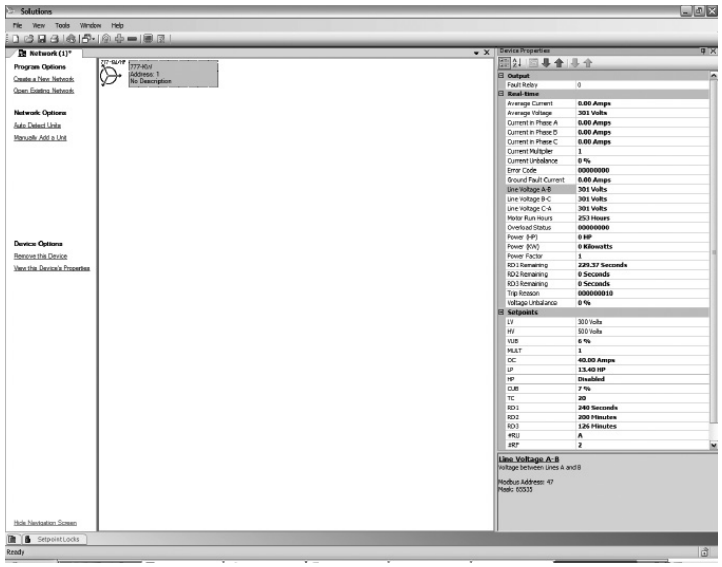
UL	UL508 (#E68520)
CE	IEC 60947-6-2

Enclosure

Dimensions	6" W x 6 3/8" H x 1 1/16" D
Weight	1.2 lbs.
Material	Black polycarbonate
Display	Liquid crystal with extended temp. range
Size	2 rows x 20 characters
Lighting	LED Backlight
Keypad	Eight 0.5" stainless steel dome buttons for tactile feedback
Mechanical Life	100,000 actuations
Overlay Material	Polyester
UV Exposure w/o degradation	2000 hrs.
Terminal	Depluggable terminal block

Solutions Software





Solutions is a software application that provides the ability to configure and monitor Modbus (Solutions-M) or DeviceNet™ (Solutions-D) networks. SymCom's Solutions Software features include data logging, real-time data monitoring and fault and event monitoring. Devices can be added and configured manually or the software can scan an existing network to identify devices which can be used as is or reconfigured by the user. Setpoints for each device can be uploaded and downloaded for easy monitoring and reconfiguration. Solutions-M supports both RS-485 and TCP/IP networks. Solutions-D provides support for all DeviceNet™ capable SymCom devices and most other DeviceNet™ devices, including DeviceNet™ scanners.

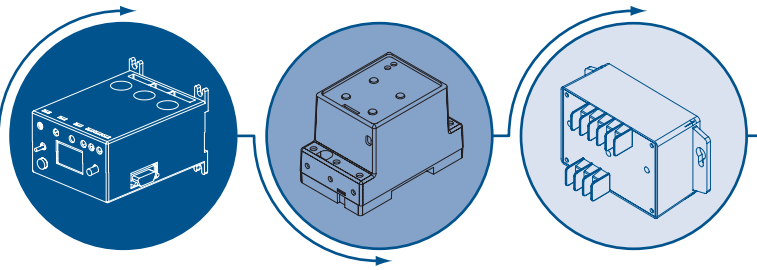
Available Models:

Solutions-M
Solutions-D

Requirements

- Microsoft Windows XP or higher
- Microsoft .net Framework 2.0 (provided with Solutions)
- 300 MB of hard drive space
- RS-485 to RS-232 converter (with 1 available serial port) for Solutions-M ***or*** RS-485 to USB converter (with 1 available USB port) for Solutions-M
- USB to CAN converter (with 1 available USB port) for Solutions-D

Ground Fault Monitor



The 601-CS-D-P1

3-phase Power Monitor is a fully programmable electronic power monitor designed to monitor 3-phase systems. The 601-CS-D-P1 has a single relay that can be configured as a general purpose network output or to trip on ground faults. The 601-CS-D-P1 monitors ground fault current, phase currents, phase voltages, power factor and frequency. The RS485MS-2W communications module allows the 601-CS-D-P1 to communicate using the Modbus RTU protocol. The Modbus connection can be used to monitor power parameters, setup the device or control the fault relay. A DeviceNet™ Communications I/O module (CIO-601CS-DN-P1) is available as well. This CIO module only works with the 601-CS-D-P1 unit. It is used for sending the information from the 601-CS-D-P1 over a DeviceNet™ network. It also provides I/O capabilities and the ability to set the parameters of the 601-CS-D-P1.

***Note: This product must be used with an external Zero-Sequence CT for proper operation (not included).*

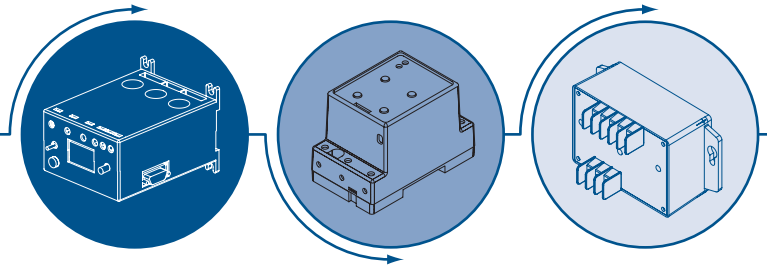
Features

- *Ground fault warning (enable/delay)*
- *Ground fault trip (enable/trip delay)*
- *Ground fault motor acceleration (enable/trip delay)*
- *Modbus communications watchdog*

Specifications

3-Phase Line Voltage 200-480VAC
Frequency 50/60Hz
Motor Full Load Amp Range . . . . . 0.5-175A (direct)
176-800A (CTs required)
Input Ground Fault Current 0.5-10A
Maximum Input Power . . . . . 10 W
Output Contact Rating
SPDT . . . . . 480VA @ 240VAC Pilot Duty
10A @ 240VAC Gen. Purpose
Expected Life
Mechanical . . . . . 1×10^6 operations
Electrical . . . . . 1×10^5 operations at rated load
Accuracy at 25° C (77° F)
Voltage . . . . . ±1%
Current . . . . . ±3% (<175A direct)
GF Current . . . . . ±3%
Repeatability
Voltage . . . . . ±0.5% of nominal voltage
Current . . . . . ±1% (<175A direct)
Safety Marks
UL . . . . . UL508 (#E68520)
CE . . . . . IEC 60947-1, IEC 60947-5-1
Standards Passed
Electrostatic Discharge (ESD) . . . . . IEC 61000-4-2, Level 3, 6kV contact, 8kV air
Radio Frequency Immunity, Conducted . . . . IEC 61000-4-6, Level 3 10V
Radio Frequency Immunity, Radiated . . . . . IEC 61000-4-3, Level 3, 10 V/m
Fast Transient Burst . . . . . IEC 61000-4-4, Level 3, 3.5kV input power
Surge Immunity
IEC . . . . . IEC 61000-4-5, Level 3, 2kV line-to-line; Level 4, 4kV line-to-ground
ANSI/IEEE . . . . . C62.41 Surge and Ring Wave Compliance to a level of 6kV line-to-line
High Potential Test . . . . . Meets UL508 (2 x rated V +1000V for 1 minute)
Short Circuit Rating . . . . . 100kA RMS, SYM, 600VAC max.
Mechanical
Dimensions . . . . . 3.0" H x 3.6" W x 5.1" D
Terminal Torque . . . . . 7in.-lbs.
Weight . . . . . 1.2 lbs.
Max Conductor Size . . . . . 0.65" with insulation
Environmental
Temperature Range . . . . . -20° to 70°C (-4° to 158°F)
Pollution Degree 3
Class of Protection . . . . . IP20, NEMA 1 (Finger Safe)
Relative Humidity . . . . . 10-95%, non-condensing per IEC 68-2-3

3-Phase Voltage Monitors



All SymCom voltage monitors are microcontroller based and are factory calibrated for highly accurate and precise voltage measurements to provide high sensitivity while minimizing nuisance tripping. The high accuracy and precision of these devices allows them to detect a single-phase condition or voltage unbalance even with regenerated voltages present. Uncalibrated devices require low sensitivity to voltage faults to prevent nuisance trips, thus may not trip in the presence of regenerated voltages.

SymCom voltage monitors are built with transformer power supplies which makes them highly resistant to damage caused by small voltage transients on the power system. Other types of power supplies such as switching, resistor limited and capacitor limited, are typically more easily damaged by transients.

Features

- *Monitor 3-phase voltage*
- *Mounted in panel*
- *Monitor for phase reversal*

Protects 3-Phase motors from:

- *High and low voltage*
- *Voltage unbalance*
- *Loss of any phase (single-phasing)*
- *Phase-reversal*
- *Contact failure*
- *Rapid cycling*

3-Phase Voltage Monitors

variety of mounting methods and phase protection options

Product Selection Matrix

MODEL	Low Voltage	Phase-Reversal	Voltage Unbalance	Single-Phasing	Frequency Shift	High Voltage	Contact Failure	Rapid Cycling	Diagnostic LEDs	Variable Trip Point	Variable Restart Delay	Variable Trip Delay	Variable Voltage Unbalance	Manual Reset	DPDT Relay	10 Amp General Purpose	15 Amp General Purpose	470VA @ 600VAC Pilot Duty	480VA @ 240VAC Pilot Duty	8 Amp General Purpose NO	8 Amp General Purpose NC	Dual Range 190-480VAC	100V Range 95-120VAC	200V Range 190-240VAC	400V Range 380-480VAC	600V Range 475-600VAC	Voltage Band Monitor
80		●							●							●				●								
102A	●	●	●	●					●							●				●								
102A-2	●	●	●	●				●	●		●			●		●				●								
102A-3	●	●	●	●					●			●				●				●								
102A-9	●	●	●	●		●			●							●				●								
102-600	●	●	●	●					●							●				●						●		
201A	●	●	●	●					●							●				●								
201A-9	●	●	●	●		●			●							●				●								
201A-AU	●	●	●	●		●		●	●	●	●	●	●	●		●				●								
201-575-AU	●	●	●	●		●		●	●	●	●	●	●	●		●										●		
201-100-DPDT	●	●	●	●					●						●	●●				●								
201-200-DPDT	●	●	●	●					●						●	●●					●							
201-100-DPDT-60mS	●	●	●	●					●						●	●●				●								
201-200-DPDT-60mS	●	●	●	●					●						●	●●					●							
202	●	●	●	●		●		●	●		●			●		●				●								
202-RP		●							●							●				●								
202-575-RP		●							●							●				●						●		
250A	●	●	●	●		●		●	●		●			●	●	●●				●								
250-600	●	●	●	●		●		●	●		●			●	●	●●				●						●		
350-200	●	●	●	●					●								●			●								
350-200-2	●	●	●	●				●	●		●			●			●			●								
350-200-2-6	●	●	●	●				●	●		●			●	●	●	●			●								
350-200-2-8*	●	●	●	●				●	●		●				●		●●			●								
350-200-2-9	●	●	●	●		●		●	●		●			●			●			●								
350-400	●	●	●	●					●							●		●							●			
350-400-2	●	●	●	●				●	●		●			●		●		●							●			
350-400-2-5	●	●	●	●				●	●		●			●		●●		●							●			
350-400-2-6	●	●	●	●				●	●		●			●	●	●	●		●						●			
350-400-2-8*	●	●	●	●				●	●		●				●		●●		●						●			
350-400-2-9	●	●	●	●		●		●	●		●			●		●		●							●			
350-600	●	●	●	●					●							●		●								●		
350-600-2	●	●	●	●				●	●		●			●		●		●								●		
350-600-2-6	●	●	●	●				●	●		●			●	●	●	●		●							●		
350-600-2-8*	●	●	●	●				●	●		●				●		●●		●							●		
350-600-2-9	●	●	●	●		●		●	●		●			●		●		●								●		
355-200	●	●	●	●		●		●	●	●	●	●	●	●			●			●					●			
355-400	●	●	●	●		●		●	●	●	●	●	●	●		●		●							●			
355-400-5	●	●	●	●		●		●	●	●	●	●	●	●	●	●●		●							●			
355-600	●	●	●	●		●		●	●	●	●	●	●	●		●		●								●		
455	●	●	●	●		●	●	●	●	●	●	●	●	●		●				●								
455-575	●	●	●	●		●	●	●	●	●	●	●	●	●		●				●						●		
455-480R	●	●	●	●		●	●	●	●	●	●	●	●	●		●		●							●			
460	●	●	●	●		●		●	●	●	●	●				●				●								
460-OEM	●	●	●	●		●		●	●	●	●	●				●				●								
460-L	●	●	●	●		●		●	●		●					●				●								
460L-OEM	●	●	●	●		●		●	●		●					●				●								
460-14	●	●	●	●		●		●	●	●	●	●			●				●	●								
460-575-14	●	●	●	●		●		●	●	●	●	●			●				●	●						●		
460-15	●	●	●	●		●		●	●	●	●	●			●				●●									
460-MR	●	●	●	●		●		●	●	●	●	●	●			●				●								
460-575	●	●	●	●		●		●	●	●	●	●				●										●		
460-VBM	●	●	●	●		●		●	●	●	●	●				●				●								●
601**	●	●	●	●	●	●		●	●	●	●	●	●			●				●								
601-575**	●	●	●	●	●	●		●	●	●	●	●	●			●										●		

* These units are not equipped with manual reset as indicated on the label.
** Indicates units have RS-485 Modbus communication capability and digital display
●● Indicates two relays

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Part No. 80

The Model 80

is designed to continuously monitor phase rotation of 3-phase systems. Critical applications include fan motors, scroll compressors, grinders, conveyor systems, elevators and escalators. A solid-state phase-sensing circuit drives an internal electro-mechanical relay which is energized when proper phase rotation is applied. An LED indicator illuminates when phase rotation is correct. Reset is automatic.

See Appendix A, Figures 7 & 8 for typical wiring diagrams.

Features

- *Run light to indicate ABC sequence*
- *Universal input voltage*
- *CSA & CSA-NRTL/C approved*

Protects 3-Phase motors from:

- *Reverse phase*

Specifications

Input Power	
3-phase line voltage	171-264VAC (200V Input) 342-528VAC (400V Input)
Frequency	50/60 Hz
Maximum Input Power	5 W
Ouput Ratings	
Relay contact rating	10 Amps Gen. Purpose at 240VAC
Response Time	0.5 second
Environmental	
Temperature Range	-20° to 60°C (-4° to 140°F)
Safety Marks	
CSA	LR46510

Model 102A

3-phase voltage/phase monitor, high voltage option, panel mount, adjustable or manual restart delay

Available Models:

102A
102A-2
102A-3
102A-9
102-600

2 - Variable Restart Delay (Manual, 2-300 seconds)
3 - Variable Trip Delay (2-30 seconds)
9 - High Voltage Detection

The Model 102A

is a 3-phase, auto-ranging, dual-range voltage monitor that protects 190-480 VAC, 50/60Hz motors regardless of size. The product provides a user selectable nominal voltage setpoint and the voltage monitor automatically selects between the 200V and 400V range.*

A unique microcontroller-based voltage and phase-sensing circuit constantly monitors the 3-phase voltages to detect harmful power line conditions. When a harmful condition is detected, the MotorSaver's output relay is deactivated after a specified trip delay. The output relay reactivates after power line conditions return to acceptable levels. The Model 102A includes advanced single LED diagnostics. Five different light patterns distinguish between faults and normal conditions.

See Appendix A, Figures 9 & 10 for typical wiring diagrams.

Features

- *Low voltage trip*
- *Optional high voltage trip*
- *Single-phase trip*
- *Reverse-phase trip*
- *Fixed 6% voltage unbalance trip*
- *Single LED diagnostics*
- *Separate indicators for:*
  Power-up restart delay
  Reverse-phase trip
  Good voltage/relay energized
  Unbalance/single-phase trip
  High/low voltage trip

Specifications

3-Phase Line Voltage
102A 190-480VAC
102-600 . . . . . 475-600VAC
Frequency 50*/60Hz
Low Voltage (% of setpoint)
Trip 90%
Reset 93%
Voltage Unbalance (NEMA)
Trip 6%
Reset 4.5%
Trip Delay Time
Low/High Voltage . . . . . 4 seconds (standard)
Unbalance & Phasing Faults . . . . . 2 seconds
Restart Delay Time
After a Fault . . . . . 2 seconds (standard)
After a Complete Power Loss . . . . . 2 seconds (standard)

Output Contact Rating
SPDT . . . . . 480VA @ 240VAC Pilot Duty
10A @ 240VAC General Purpose
Temperature Range . . . . . -40° to 70°C (-40° to 158°F)
Safety Marks
UL . . . . . UL508 (#E68520)
Transient Protection (Internal) . IEC 61000-4-5; 1995 ±6kV
Maximum Input Power . . . . . 5 W
Weight . . . . . 14 oz.
Available Options
(2) Adjustable Restart Delay . . . . . Manual, 2-300 seconds
(3) Adjustable Trip Delay . . . . . 2-30 seconds
(Phasing and unbalance trip delay remains at 2 seconds)
(9) High Voltage Operating Points
Trip (% of Setpoint) 110%
Reset (% of Setpoint) 107%

*Note: 50Hz will increase all delay timers by 20%.

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Model 201A

*3-phase voltage/phase monitor, **8-pin socket mount**, optional high voltage trip*

The Model 201A

is a 3-phase, auto-ranging, dual-range voltage monitor that protects 190-480 VAC, 50/60Hz motors regardless of size. The product provides a user selectable nominal voltage setpoint and the voltage monitor automatically selects between the 200V and 400V range. The Model 201A includes advanced single LED diagnostics, where five different light patterns distinguish between faults and normal conditions.

This unique microcontroller-based voltage and phase-sensing device constantly monitors the 3-phase voltages to detect harmful power line conditions. When a harmful condition is detected, the MotorSaver's output relay is deactivated after a specified trip delay. The output relay reactivates after power line conditions return to acceptable levels.
See Appendix A, Figures 11& 12 for typical wiring diagrams.

Available Models

201A
201A-9

Features

- *Low voltage trip*
- *Single-phase trip*
- *Reverse-phase trip*
- *Fixed 6% voltage unbalance trip*
- *Single LED diagnostics*
- *High voltage trip (-9 option)*
- *8-pin plug-in; DIN rail or surface mount*
- *Separate indicators for:*
  Power-up restart delay
  Reverse-phase trip
  Good voltage/relay energized
  Unbalance/single-phase trip
  High/low voltage trip

Must use Model OT08 socket for UL Rating!

Specifications

3-Phase Line Voltage 190-480VAC
Frequency 50/60Hz
Low Voltage (% of setpoint)
Trip 90%
Reset 93%
Voltage Unbalance (NEMA)
Trip 6%
Reset 4.5%
Optional High Voltage (% of setpoint)
Trip 110%
Reset 107%
Trip Delay Time
High/Low Voltage Fault ..... 4 seconds
Unbalance & Phasing Faults ..... 2 seconds
Restart Delay Time
After a Fault ..... 2 seconds
After a Complete Power Loss ..... 2 seconds

Output Contact Rating
SPDT ..... 480VA @ 240VAC Pilot Duty
10A @ 240VAC General Purpose
Temperature Range ..... -40° to 70°C (-40° to 158°F)
Safety Marks
UL ..... UL508 (#E68520)
CE ..... IEC 60947-6-2
Transient Protection (Internal) ..... 2500V for 10 ms
Maximum Input Power ..... 5 W
Weight ..... 9 oz.
Socket Available ..... Model OT08 (UL Rating 600V)
The 600V socket can be surface mounted or installed on DIN Rail.

Model 201A-AU

3-phase voltage/phase monitor, 8-pin socket mount, ***adjustable trip/restart delays & voltage unbalance percentage***

Available Models:

201A-AU
201-575-AU
201A-AU-OT (sold with OT08 socket)
201-575-AU-OT (sold with OT08 socket)

Must use Model OT08 socket for UL Rating!

The Model 201A-AU

is a 3-phase, auto-ranging, dual-range voltage monitor that protects 190-480 VAC, 50/60Hz motors regardless of size. The product provides a user selectable nominal voltage setpoint and the voltage monitor automatically selects between the 200V and 400V range. The Model 201A-AU includes advanced single LED diagnostics, where five different light patterns distinguish between faults and normal conditions. Adjustment knobs allow the user to set a 1-30 second trip delay, a manual restart or1-500 second restart delay and a 2-8% voltage unbalance trip point.

This unique microcontroller-based voltage and phase-sensing device constantly monitors the 3-phase voltages to detect harmful power line conditions. When a harmful condition is detected, the MotorSaver's output relay is deactivated after a specified trip delay. The output relay reactivates after power line conditions return to acceptable levels.

See Appendix A, Figures 13 & 14 for typical wiring diagrams.

Features

- *8-pin plug-in; DIN rail or surface mountable*
- *Manual reset option provides last fault detection*
- *Auto-ranging voltage*
- *Advanced LED diagnostics*
- *Adjustable voltage unbalance trip setting*
- *Adjustable trip & restart delay settings*

Protects 3-Phase motors from:

- *Loss of any phase (single-phasing)*
- *Low voltage*
- *High voltage*
- *Voltage unbalance*
- *Phase reversal*
- *Rapid cycling*

Specifications

3-Phase Line Voltage
201A-AU 190-480VAC
201-575-AU 475-600VAC
Frequency 50/60Hz
Low Voltage (% of setpoint)
Trip ..... 90% ±1%
Reset ..... 93% ±1%
High Voltage (% of setpoint)
Trip ..... 110% ±1%
Reset ..... 107% ±1%
Voltage Unbalance (NEMA)
Trip ..... 2-8% adjustable
Reset ..... Trip Setting Minus 1% (5-8%)
Trip Setting Minus 0.5% (2-4%)
Trip Delay Time
High, Low and Unbalanced Voltage ..... 1-30 seconds adjustable
Single-Phasing Faults ..... 1 second fixed
Restart Delay Time
After a Fault ..... Manual, 1-500 seconds adj.
After a Complete Power Loss ..... Manual, 1-500 seconds adj.
Output Contact Rating
1-Form C ..... 10A @ 240VAC General Purpose
480VA @ 240VAC Pilot Duty, B300
Maximum Input Power ..... 5 W
Weight ..... 9 oz.

Enclosure ..... Polycarbonate
Safety Marks
•UL ..... UL508 (#E68520)
•CE ..... IEC 60947-6-2
Standards Passed
•Electrostatic Discharge (ESD) ..... IEC 61000-4-2, Level 3, 6kV contact, 8kV air
•Radio Frequency Immunity, Radiated ..... 150 MHz, 10V/m
•Fast Transient Burst ..... IEC 61000-4-4, Level 3, 3.5kV input power & controls
Surge
•IEC ..... IEC 61000-4-5, Level 3, 4kV line-to-line; Level 4, 4kV line-to-ground
•ANSI/IEEE ..... C62.41 Surge and Ring Wave Compliance to a level of 6kV line-to-line
•Hi-potential Test ..... Meets UL508 (2 x rated V +1000V for 1 minute)
Environmental
Temperature Range ..... Ambient Operating: -40° to 70°C (-40° to 158°F)
Ambient Storage: -40° to 80°C (-40° to 176°F)
Relative Humidity ..... 10-95%, non-condensing per IEC 68-2-3
Socket Available ..... Model OT08 (UL Rating 600V)
The 600V socket can be surface mounted or installed on DIN Rail.

Model 201-xxx-DPDT

3-phase voltage/phase monitor, 11-pin socket mount, ***two isolated Form C relays***

Available Models:

201-100-DPDT
201-200-DPDT
201-100-DPDT-60mS
201-200-DPDT-60mS

Must use Model OT11 socket for UL Rating!

The Model 201-xxx-DPDT

is an 11-pin octal base plug-in voltage monitor designed to protect 3-phase motors regardless of size. The 201-100-DPDT is used on 95-120VAC, 50/60Hz motors and the 201-200-DPDT is used on 190-240VAC, 50/60Hz motors to prevent damage caused by incoming voltage problems. The units feature two isolated sets of contacts that are ideal for use with two control circuits with different voltages.

The unique microcontroller-based voltage and phase-sensing circuit constantly monitors the voltages to detect harmful power line conditions. When a harmful condition is detected, the MotorSaver's output relays are deactivated after a specified trip delay. The output relays reactivate after power line conditions return to an acceptable level and a specified amount of time has elapsed (restart delay). The trip delay prevents nuisance tripping due to rapidly fluctuating power line conditions.

This unit is also available with a shorter trip delay and faster restart delay. The 201-xxx-DPDT-60mS has a trip delay of 0.5 seconds and a restart delay of 60 milliseconds.
See Appendix A, Figure 15 for a typical wiring diagram.

Features

- *Low voltage protection*
- *Single-phase protection*
- *Reverse-phase protection*
- *Voltage unbalance protection*
- *Two isolated Form C relays (DPDT)*
- *Diagnostic LED*
- *11-pin plug-in; DIN rail or surface mount*

Specifications

3-Phase Line Voltage
201-100-DPDT, 201-100-DPDT-60mS 95-120VAC
201-200-DPDT, 201-200-DPDT-60mS 190-240VAC
Frequency 50/60Hz
Low Voltage (% of setpoint)
Trip . . . . . 90% ±1%
Reset . . . . . 93% ±1%
Voltage Unbalance
Trip 6%
Reset. 4.5%
Trip Delay Times
Low Voltage . . . . . 4 seconds
Unbalance, Phasing Faults . . . . . 2 seconds
Models with -60ms option . . . . . 0.5 second
Restart Delay Times
After a Fault or Complete Power Loss . . . 2 seconds
Models with -60mS option . . . . . 60 milliseconds

Output Contact Rating
DPDT . . . . . 480VA @ 240VAC Pilot Duty
10A @ 240VAC Gen. Purpose
Temperature Range . . . . . -40° to 70°C (-40° to 158°F)
Maximum Input Power . . . . . 5 W
Weight . . . . . 1.2 lbs.
Safety Marks
UL. . . . . UL508 (#E68520)
CE. . . . . IEC 60947-6-2
Standards Passed
Electrostatic Discharge (ESD) . . . . . IEC 61000-4-2, Level 3, 6kV contact, 8kV air
Radio Frequency Immunity, Radiated 150MHz, 10V/m
Fast Transient Burst . . . . . IEC 61000-4-4, Level 3, 2.5kV input power and controls
Socket Available . . . . . Model OT11 (UL Rated 300V)
The 300V socket can be surface mounted or installed on DIN Rail.

Models 202, 202-RP

3-phase voltage/phase monitor, panel mount, adjustable or manual restart delay (-RP reverse-phase protection only)

Available Models:

202
202-RP
202-575-RP

The Model 202

is a 3-phase, auto-ranging, dual-range voltage monitor that protects 190-480 VAC, 50/60Hz motors regardless of size. The product provides a user selectable nominal voltage setpoint and the voltage monitor automatically selects between the 200V and 400V range.*

This unique microcontroller-based voltage and phase-sensing device constantly monitors the 3-phase voltages to detect harmful power line conditions. When a harmful condition is detected, the MotorSaver's output relay is deactivated after a specified trip delay. The output relay reactivates after power line conditions return to acceptable levels. The Model 202 includes advanced single LED diagnostics. Five different light patterns distinguish between faults and normal conditions.

The Model 202-RP

monitors the phase rotation of 3-phase systems and trips on reverse phase only. Critical applications include fan motors, scroll compressors, grinders, conveyor systems, elevators and escalators. The status light turns green and the relay is activated when rotation is correct.

See Appendix A, Figures 16 & 17 for typical wiring diagrams.

Features

- *Quick mounting with single screw*
- *Small package, ideal for assembly into panels*
- *Standard ¼" quick connects*
- *Adjustable restart delay*

Protects 3-Phase motors from:

- *Loss of any phase (single-phasing)*
- *High and low voltage*
- *Voltage unbalance*
- *Phase reversal*

Models 202-RP & 202-575-RP:

- *Protects from reverse phase only*

Specifications

3-Phase Line Voltage

202, 202-RP	190-480VAC
202-575-RP	475-600VAC
Frequency	50*/60Hz
Phase Sequence	ABC
Low Voltage (% of setpoint)	
Trip	90%
Reset	93%
High Voltage (% of setpoint)	
Trip	110%
Reset	107%
Voltage Unbalance (NEMA)	
Trip	6%
Reset	4.5%
Trip Delay Time	
High and Low Voltage	4 seconds
Unbalance & Phasing Faults	2 seconds
Restart Delay Time	
After a Fault	Manual, 2-300 seconds adj.
After a Complete Power Loss	Manual, 2-300 seconds adj.
Output Contact Rating	
SPDT	480VA @ 240VAC Pilot Duty 10A @ 240VAC Gen. Purpose
Transient Protection	IEC 61000-4-5, ±4kV
Maximum Input Power	5 W
Weight	12 oz.
Trip & Reset Accuracy	±1%
Repeatability	±0.5%
Input to Output Dielectric	1960 Vrms min.
Termination	0.25" Male Quick Connect
Humidity	95% Relative Non Condensing
Operating Temperature	-40° to 70°C (-40° to 158°F)

*Note: 50Hz will increase all delay timers by 20%.
CE Pending

Model 250A

3-phase voltage/phase monitor, panel mount, adjustable or manual restart delay, ***2 Form C relay contacts***

Available Models:

250A
250-600

The Model 250A

is a 3-phase, auto-ranging, dual-range voltage monitor that protects 190-480 VAC, 50/60Hz motors regardless of size. The product provides a user selectable nominal voltage setpoint and the voltage monitor automatically selects between the 200V and 400V range.*

This unique microcontroller-based voltage and phase-sensing device constantly monitors the 3-phase voltages to detect harmful power line conditions. When a harmful condition is detected, the MotorSaver's output relay is deactivated after a specified trip delay. The output relay reactivates after power line conditions return to acceptable levels. The Model 250A includes advanced single LED diagnostics. Five different light patterns distinguish between faults and normal conditions.

See Appendix A, Figure 18 for a typical wiring diagram.

Features

- *Low voltage trip*
- *High voltage trip*
- *Single-phase trip*
- *Reverse-phase trip*
- *Fixed 6% voltage unbalance trip*
- *Single LED diagnostics*
- *Adjustable restart delay*
- *Manual reset selection*
- *DPDT relay output*
- *Separate indicators for:*
  - *Power-up restart delay*
  - *Reverse-phase trip*
  - *Good voltage/relay energized*
  - *Unbalance/single-phase trip*
  - *High/low voltage trip*

Specifications

3-Phase Line Voltage
250A 190-480VAC
250-600 . . . . . 475-600VAC
Frequency 50*/60Hz
Low Voltage (% of setpoint)
Trip 90%
Reset 93%
High Voltage (% of setpoint)
Trip 110%
Reset 107%
Voltage Unbalance (NEMA)
Trip 6%
Reset 4.5%
Trip Delay Time
Low Voltage, High Voltage . . . . . 4 seconds
Unbalance, Phasing Faults . . . . . 2 seconds

Restart Delay Time
After a Fault or Complete Power Loss . . . Manual, 2-300 seconds adj.
Output Contact Rating (Pilot Duty)
DPDT . . . . . 480VA @ 240VAC Pilot Duty
10A @ 240VAC Gen. Purpose
Transient Protection (Internal) . . . . . IEC 61000-4-5;1995 ±6kV
Maximum Input Power . . . . . 5 W
Operating Temperature . . . . . -40° to 70°C (-40° to 158°F)

Weight . . . . . 14 oz.
Safety Marks
UL . . . . . UL508 (#E68520)

*Note: 50Hz will increase all delay timers by 20%.

Model 350

3-phase voltage/phase monitor, panel mount, ***optional 1 or 2 15A rated relay contacts***

Available Models:

350-200	350-400-2-8**
350-200-2	350-400-2-9
350-200-2-6	350-600
350-200-2-8**	350-600-2
350-200-2-9	350-600-2-6
350-400	350-600-2-8**
350-400-2	350-600-2-9
350-400-2-5	
350-400-2-6	

2 - Variable Restart Delay (Manual, 2-300 seconds)
5 - DPDT Relay
6 - 2 Relays (1) 10A, (1) 15A
8 - 2 Relays (2) 15A
9 - High Voltage Detection

The Model 350

is a heavy-duty voltage monitor. This product should be used when high current relays or dual contacts are required, or 480V controls are used. Since the Model 350 uses heavy-duty relays, it comes in fixed voltage range models rather than a dual auto-ranging version like the Model 250.

The Model 350-200 has a 15A general purpose contact. The Model 350-400 provides a Form C (SPDT) relay rated to switch up to 600V, allowing the use of 480V controls, eliminating the need for a control power transformer to step the voltage down to 120-240V. Several two Form C (DPDT) models are also available.

The Model 350 microcontroller-based family of products are low cost yet highly advanced solutions to heavy-duty problems. The Model 350 includes advanced single LED diagnostics. Five different light patterns distinguish faults and normal operating conditions. Other options such as high voltage trip, adjustable trip delay and adjustable restart delay are available. See Appendix A, Figure 19 for a typical wiring diagram.

Features

- *Low voltage trip*
- *Optional high voltage trip*
- *Single-phase trip*
- *Reverse-phase trip*
- *Fixed 6% voltage unbalance trip*
- *Single LED diagnostics*
- *Separate indications for:*
  - *Power-up restart delay*
  - *Reverse-phase trip*
  - *Good voltage/relay energized*
  - *Unbalance/single-phase trip*
  - *High/low voltage trip*

Specifications

3-Phase Line Voltage

350-200	190-240VAC
350-400	380-480VAC
350-600	475-600VAC
Frequency	50*/60Hz

Low Voltage (% of setpoint)

Trip	90%
Reset	93%

Voltage Unbalance (NEMA)

Trip	6%
Reset	4.5%

Trip Delay Time

Low Voltage	4 seconds
Unbalance & Phasing Faults	2 seconds

Restart Delay Time

After a Fault	2 seconds
After a Complete Power Loss	2 seconds

Output Contact Rating

SPDT (350-200)	480VA @ 240VAC Pilot Duty 15A General Purpose
SPDT (350-400, 350-600)	470VA @ 600VAC
DPDT (-6 Option)	1-10A General Purpose 480VA @ 240VAC Pilot Duty 1-15A General Purpose 480VA @ 240VAC Pilot Duty 1hp @ 240VAC
DPDT (-8 Option)	2-15A General Purpose 480VA @ 240VAC Pilot Duty 1hp @ 240VAC

Transient Protection (Internal)	IEC 61000-4-5;1995 ±6kV
Maximum Input Power	5 W

Operating Temperature

Ambient Operating	-40° to 70° C (-40° to 158°F)
Ambient Storage	-40° to 80° C (-40° to 176°F)

Safety Marks

UL	UL508 (#E68520)
Weight	1.5 lbs.

Special Options on Model 350

High Voltage (% of setpoint) (option 9)

Trip	110%
Reset	107%
Variable Restart Delay	Manual, 2-300 seconds adj.

*Note: 50Hz will increase all delay timers by 20%.

** These units are not equipped with Manual Reset.

Model 355

3-phase voltage/phase monitor, panel mount, adjustable trip/restart delays & voltage unbalance percentage, ***optional 2 each 480V-rated relays***

Available Models:

355-200
355-400
355-400-5
355-600

The Model 355

is a 3-phase voltage monitor with adjustable trip and restart delay, adjustable voltage unbalance and multiple diagnostic lights. It is perfect for heavy-duty applications that need both protection and simple user-friendly diagnostics. Applications include pump panels, commercial HVAC, oil rigs and others.

The Model 355 uses microcontroller technology to monitor incoming voltage and de-energize its output relay if power problems exist. The Model 355 can protect motors from damage caused by single-phasing, high and low voltage, phase reversal and voltage unbalance. It has four diagnostic LEDs that clearly show overvoltage, undervoltage, voltage unbalance, reverse-phase and normal conditions.

The Model 355-200 is equipped with a heavy-duty 10A general purpose SPDT relay. The Model 355-400 and 355-600 are equipped with a 470VA @ 600VAC pilot duty SPDT relay. A high voltage (600V) DPDT relay output option is available with the 400V model.
See Appendix A, Figures 20 & 21 for typical wiring diagrams.

Features

- *Standard high voltage relay for 400V and 600V ranges*
- *Multiple LEDs provide diagnostics*
- *Adjustable trip and restart delays*

Protects 3-Phase motors from:

- *Loss of any phase (single-phasing)*
- *Low voltage*
- *High voltage*
- *Voltage unbalance (adjustable setpoint)*
- *Phase reversal*

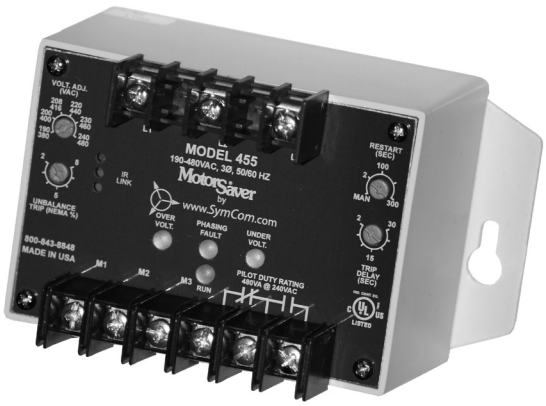
Specifications

3-Phase Line Voltage
355-200 . . . . . 190-240VAC
355-400 . . . . . 380-480VAC
355-600 . . . . . 475-600VAC
(Specify voltage range)
Frequency 50*/60Hz
Low Voltage (% of setpoint)
Trip . . . . . 90% ±1%
Reset . . . . . 93% ±1%
High Voltage (% of setpoint)
Trip . . . . . 110% ±1%
Reset . . . . . 107% ±1%
Voltage Unbalance (NEMA)
Trip . . . . . 2-8% adjustable
Reset . . . . . Trip setting minus 1%
Trip Delay Time
Low & High Voltage and Unbalance. . . 2-30 seconds adjustable
Single-phasing Faults (>25% UB) . . . . . 2 seconds

Restart Delay Time
After a Fault or Power Loss . . . . . Manual, 2-300 seconds adjustable
Output Contact Rating
SPDT (355-200) . . . . . 480VA at 240VAC Pilot Duty
10A General Purpose
SPDT (355-400, 355-600) . . . . . 470VA @ 600VAC Pilot Duty
10A General Purpose or
1hp @ 240VAC
DPDT (-5 Option) . . . . . 2-10A General Purpose
470VA @ 600VAC Pilot Duty
Safety Marks
UL . . . . . UL508 (#E68520)
Transient Protection (Internal) . 2500V for 10 ms
Repeat Accuracy
Fixed Conditions . . . . . ±0.1%
Maximum Input Power . . . . . 6 W
Weight . . . . . 1 lb.
*Note: 50Hz will increase all delay times by 20%.

Model 455

3-phase voltage/phase monitor, panel mount, ***has add'l voltage inputs for monitoring load side of contactor for contactor failure & works with Informer-MS diagnostic tool***



The Model 455 now has an infrared LED to communicate with the new Informer-MS. Just aim the handheld diagnostic tool at the 455 to get valuable information such as real-time voltage and voltage unbalance on both line and load sides, motor run hours, last 20 faults, last 32 motor starts, high and low voltage trip points, voltage unbalance trip point, restart and trip delay settings, MotorSaver® status and more!

The Model 455

3-phase voltage monitor combines load and line side monitoring to alert the user of contactor failure or impending contactor failure. The line side monitoring will protect the motor from damaging line side conditions prior to the motor starting. With other line-load side voltage monitors, the motor must be started before a voltage problem is detected. With the Model 455, the motor is fully protected at all times. The motor will not start when a power problem is present.

The Model 455 is a 3-phase, auto-ranging, dual-range voltage monitor that protects 190-480 VAC, 50/60Hz motors regardless of size. The product provides a user selectable nominal voltage setpoint and the voltage monitor automatically selects between the 200V and 400V range. Other adjustments include a 2-30 second trip delay, a 2-300 second restart delay (and manual restart) and a voltage unbalance trip point adjustment from 2-8%.*

Four LEDs indicate the status of the Model 455: run light, undervoltage, overvoltage and phasing fault. The Model 455 is a load and line side monitor that does not require a separate power source for its electronics, making it much easier to install.
See Appendix A, Figures 22 & 23 for typical wiring diagrams.

Available Models:

455
455-480R
455-575

Features

- *Load side monitoring of contactor*
- *Multiple LEDs for diagnostics, special indicators for overvoltage, undervoltage and phasing faults*
- *Prevents rapid cycling by monitoring contactor or starter*
- *Infrared LED to communicate with Informer-MS*

Protects 3-Phase motors from:

- *Contact failure*
- *Loss of any phase (single-phasing) on the load or line side*
- *Low voltage*
- *High voltage*
- *Voltage unbalance (adjustable setpoint)*
- *Phase reversal*
- *Rapid cycling*

Specifications

3-Phase Line Voltage
455 . . . . . 190-480VAC
455-575 . . . . . 475-600VAC
455-480-R. 380-480VAC
Frequency 50*/60Hz
Low Voltage (% of setpoint)
Trip . . . . . 90% ±1%
Reset . . . . . 93% ±1%
High Voltage (% of setpoint)
Trip . . . . . 110% ±1%
Reset . . . . . 107% ±1%
Voltage Unbalance (NEMA)
Trip . . . . . 2-8% adjustable
Reset . . . . . Trip setting minus 1%
Trip Delay Time
Low & High Voltage and Unbalance. . . 2-30 seconds adjustable
Single-phasing Faults (>25% UB) . . . . . 2 seconds fixed

Restart Delay Time
After a Fault . . . . . Manual, 2-300 seconds adj.
After a Complete Power Loss . . . . . Manual, 2-300 seconds adj.
After a Motor Shut-down . . . . . Manual, 2-300 seconds adj.
Output Contact Rating
SPDT . . . . . 480VA @ 240VAC Pilot Duty
10A General Purpose
SPDT High Voltage Relay (-480R) . . . . 470VA @ 600VAC Pilot Duty
Safety Marks
UL. . . . . UL508 (#E68520)
Transient Protection (Internal) . . IEC 61000-4-5;1995 ±6kV
Repeat Accuracy
•Fixed Conditions . . . . . ±0.1%
Maximum Input Power . . . . . 6 W
Weight . . . . . 14 oz.
*Note: 50Hz will increase all delay times by 20%.

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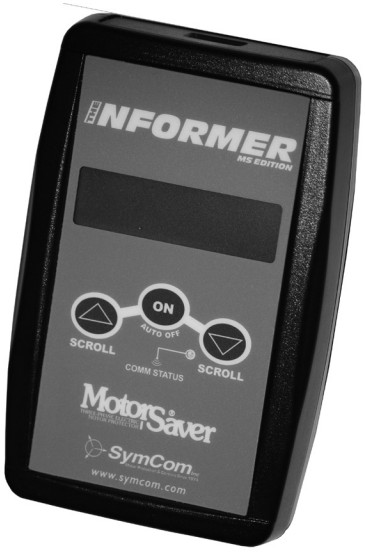
Informer-MS

wireless hand-held diagnostic tool reads model 455 to display last 20 fault causes, real-time voltage/phase & much more



Part No. Informer-MS

The Informer-MS

is a handheld diagnostic tool designed for use with MotorSaver® Model 455 equipped with an infrared LED transmitter.*

The Informer-MS uses an infrared receiver to read valuable information transmitted from the Model 455, which can be helpful for troubleshooting the system. A green communication status light indicates the Informer-MS is receiving data from the MotorSaver®. If communication is lost, the Informer-MS will display the last values it received.*

The Informer-MS displays:

- *Real-time, line and load side voltage*
- *Real-time, line and load side voltage unbalance*
- *Motor run hours*
- *Last 20 faults*
- *Last 32 motor starts*
- *High and low voltage trip points*
- *Voltage unbalance trip point*
- *Restart and trip delay settings*
- *Voltage at last fault*

**Model 455s manufactured after 03/01/06 are equipped with the infrared LED transmitter. Models manufactured prior to this date are not compatible with the new Informer-MS.*

An infrared adapter can be purchased to allow communication with the Model 455 without opening the panel door.

Specifications

Power
Input . . . . . 9 Volts DC (requires one 9-volt alkaline battery)
Maximum Input . . . . . 0.25 W
Auto Shut-off . . . . . 2 minutes
Operating Temp. . . . . . 0 to 60°C
Communication
Signal. . . . . Infrared
Range . . . . . 1-8 ft.
Data Update. . . . . 4 seconds
Accuracy
Voltage . . . . . ±2%
Resolution
Voltage 1.0VAC
Display . . . . . Liquid crystal
Size . . . . . 2 rows x 16 characters
Keypad . . . . . Three 0.5" buttons
Mechanical Life. . . . . 500,000 actuations
Overlay Material. . . . . Lexan
Enclosure
Dimensions. . . . . 5.50" H x 3.6" W x 1.125" D
Weight . . . . . 6 oz. (w/out battery)
Material . . . . . Black ABS

Model 460 Product Line

3-phase voltage monitor, ***din rail mount****, adj trip/restart delays & V unbalance %, and* ***options for 2 individual contacts, adj high/low voltage trip pts & much more***

Available Models:

460
460-L
460-14
460-575-14
460-15
460-575
460-MR
460-VBM

The Model 460*

is a 3-phase, auto-ranging, dual-range voltage monitor that protects 190-480 VAC, 50/60Hz motors regardless of size. The product provides a user selectable nominal voltage setpoint and the voltage monitor automatically selects between the 200V and 400V range. The 460's wide operating range, combined with UL and CE compliance, enables quick access to domestic and global markets.

This unique microcontroller-based voltage and phase-sensing device constantly monitors the 3-phase voltages to detect harmful power line conditions. When a harmful condition is detected, the MotorSaver's output relay is deactivated after a specified trip delay. The output relay reactivates after power line conditions return to an acceptable level for a specified amount of time (restart delay). The trip and restart delays prevent nuisance tripping due to rapidly fluctuating power line conditions.

The Model 460 automatically senses whether it is connected to a 190-240V, 60Hz system, a 440-480V, 60Hz system or a 380-416V, 50Hz system. An adjustment is provided to set the nominal line voltage from 190-240 or 380-480VAC. Other adjustments include a 1-30 second trip delay, a 1-500 second restart delay and a 2-8% voltage unbalance trip point.
See Appendix A, Figure 24 for a typical wiring diagram.
See Appendix A, Figure 25 for a typical wiring diagram for the 460-14 & 460-15.

** This product can be ordered in a bulk pack of 20 units, wrapped in bubble wrap with one installation guide. Part numbers for these are 460-OEM & 460L-OEM.*

Features

- *DIN rail or surface mountable*
- *Manual reset option provides last fault detection*
- *Auto-ranging voltage*
- *Advanced LED diagnostics*
- *Adjustable voltage unbalance trip setting*
- *Adjustable trip & restart delay settings*

Protects 3-Phase motors from:

- *Loss of any phase (single-phasing)*
- *Low voltage*
- *High voltage*
- *Voltage unbalance*
- *Phase reversal*
- *Rapid cycling*

-L *The 460-L is a three-phase voltage monitor, similar to a 460, but without the adjustable voltage unbalance and variable trip delay. These are fixed at 6% for unbalance and 4 seconds for high, low and unbalanced voltage and 1 second for single phase.*

-575 *The 460-575 is intended for incoming power sources between 470VAC and 600VAC. Most commonly used in Eastern Canada and on generation units that generate 600VAC power.*

-MR *The 460-MR is used for any application that needs to have an external manual reset button. It is equipped with a two-prong connection to hook to a normally open pushbutton, which can be mounted outside a panel, therefore eliminating the need to open the panel to reset the unit.*

-14 *The 460-14 has two sets of contacts, 1 form A and 1 form B, for differing applications where two different voltages may be required, such as 5VDC for an input to a PLC and 115VAC for an alarm.*

-15 *The 460-15 has two sets of contacts, 2 form A, for applications where two different units are to be controlled at once, such as a unit that has separate contacts for a compressor and a fan.*

-VBM *The 460-VBM is designed so the user can set specific low and high voltage trip points. They also have a 1-30 second trip delay and 1-500 second restart delay. The voltage unbalance is fixed at 6%.*

Specifications

3-Phase Line Voltage
460, 460L, 460-MR,. 190-480VAC
460-14, 460-15. . . . . 190-480VAC
460-VBM 190-480VAC
460-575 . . . . . 475-600VAC
Frequency 50/60Hz
Low Voltage (% of setpoint)
Trip. . . . . 90% ±1%
Reset . . . . . 93% ±1%
High Voltage (% of setpoint)
Trip. . . . . 110% ±1%
Reset . . . . . 107% ±1%
Voltage Unbalance (NEMA)
Trip. . . . . 2-8% adjustable
Reset . . . . . Trip setting minus 1% (5-8%)
Trip setting minus 0.5% (2-4%)
460L. . . . . 6% UB fixed (4.5% reset)
Trip Delay Time
Low, High and Unbalanced Voltage. . . . . 1-30 seconds adjustable
460L. . . . . 4 seconds fixed
Single-Phase Faults (>25% UB) . . . . . 1 second fixed
Restart Delay Time
After a Fault. . . . . 1-500 seconds adjustable
After a Complete Power Loss . . . . . 1-500 seconds adjustable
Output Contact Rating
Form C. . . . . 10A @ 240VAC General Purpose
480VA @ 240VAC, B300 Pilot Duty
Form A & Form B . . . . . 8A @ 240VAC General Purpose
360VA @ 240VAC, B300 Pilot Duty
Maximum Input Power . . . . . 6 W

Weight . . . . . 14 oz.
Enclosure. . . . . Polycarbonate
Terminal Torque. . . . . 6 in.-lbs.
Wire Type . . . . . Stranded or solid 12-20 AWG, one per terminal
Safety Marks
UL. . . . . UL508 (#E68520)
CE. . . . . IEC 60947-6-2
Standards Passed
Electrostatic Discharge (ESD) . . . . . IEC 61000-4-2, Level 3, 6kV contact, 8kV air
RFI, Radiated. . . . . 150 MHz, 10V/m
Fast Transient Burst . . . . . IEC 61000-4-4, Level 3, 3.5kV
input power & controls
Surge
IEC . . . . . IEC 61000-4-5, Level 3, 4kV line-to-line;
Level 4, 4kV line-to-ground
ANSI/IEEE. . . . . C62.41 Surge and Ring Wave Compliance
to a level of 6kV line-to-line
Hi-potential Test. . . . . Meets UL508 (2 x rated V +1000V for 1 minute)
Environmental
Temperature Range. . . . . Ambient Operating: -40° to 70°C (-40° to 158°F)
Ambient Storage: -40° to 80°C (-40° to 176°F)
Class of Protection . . . . . IP20, NEMA 1 (finger safe)
Relative Humidity. . . . . 10-95%, non-condensing per IEC 68-2-3
Special Options
Manual Reset (-MR). . . . . External momentary pushbutton required.

Model 601

3-phase voltage & frequency monitor, ***on-board display, adjustable trip delay, optional communications*** *to PLC/SCADA/monitoring systems*

Available Models:

601
601-575

The Model 601

is a fully-programmable voltage monitor designed to protect 3-phase motors. It can be used as a stand-alone product or networked with an RM-1000, RM-2000, PLC, computer or SCADA system.

When a harmful condition is detected, the MotorSaver's output relay is deactivated after the specified trip delay. The output relay reactivates after power line conditions return to an acceptable level for the programmed restart delay (RD2).

The following 11 setpoints can be viewed from the 3-digit LED display or from a networked device: low voltage, high voltage, voltage unbalance, low frequency, high frequency, trip delay for voltage/frequency faults, trip delay for single-phase faults, rapid-cycle timer (RD1), restart delay after all faults (RD2), type of restart after all faults (manual or automatic), and RS-485 address. Six parameters can be viewed as the motor is running: L1-L2 voltage, L2-L3 voltage, L1-L3 voltage, average voltage, percent voltage unbalance and frequency.

When used with the RS485MS-2W communications module, the Model 601 can communicate with most modbus RTU master devices. Voltage conditions can be monitored and setpoints can be changed remotely using SymCom's Solutions software, an RM-1000, RM-2000 or other device.
See Appendix A, Figure 26 for a typical wiring diagram.

Specifications

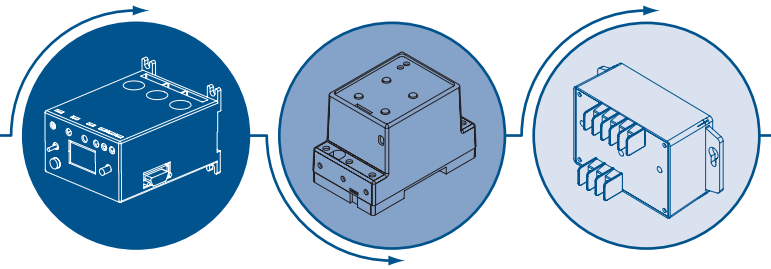
Nominal Input Voltage
601 ..... 190-480VAC
601-575 ..... 500-600VAC
Frequency 50/60Hz
Programmable Operating Points
LV - Low Voltage Threshold ..... 170V (450V**) - HV Setting
HV- High Voltage Threshold ..... LV Setting - 528V (660V**)
VUB - Voltage Unbalance Threshold .. 2-15% or off
LF - Low Frequency Threshold ..... 35Hz - HF Setting
HF - High Frequency Threshold ..... LF Setting - 75Hz
TD1 - Trip Delay for Voltage/
Unbalance/Frequency Faults. ..... 1-50 seconds
TD2 - Trip Delay for
Single-Phase Faults ..... 1-50 seconds
RD1 - Rapid-Cycle Timer ..... 0, 2-500 seconds
RD2 - Restart Delay After All Faults.. 2-500 seconds
#RF - Type of Restart ..... Manual or Automatic
ADDR - RS-485 Address..... A01-A99
Fixed Reset Points
Overvoltage Reset..... 97% of HV Setting
Low Voltage Reset ..... 103% of LV Setting
Voltage Unbalance Reset..... UB Setting -1%
Low Frequency Reset ..... LF Setting +0.6Hz
High Frequency Reset ..... HF Setting -0.6Hz

Physical Specifications
Output Contact Rating ..... 480VA @ 240VAC (Pilot Duty)
Transient Protection (Internal) ..... 2500V for 10 ms
Safety Marks
UL..... UL508 (#E68520)
Accuracy
Voltage ..... ±1%
Timing..... 5% ±1 second
Repeatability
Voltage ..... ±0.5%
Temperature Range ..... -20° to 70°C
Dimensions ..... 3.0" H x 5.1" D x 3.6" W
Maximum Input Power 5W
Weight ..... 1.2 lbs.

SymCom's Model 601 can be preprogrammed prior to installation by applying at least 120V to the L1 and L2 terminals.

**575V Model

Single-Phase Voltage Monitors



All of SymCom's single-phase voltage monitors are micro-controller based and are factory calibrated for highly accurate and precise voltage measurements to provide high sensitivity while minimizing nuisance tripping. They are built with transformer power supplies, which makes them highly resistant to damage caused by small voltage transients on the power system. Other types of power supplies such as switching, resistor limited and capacitor limited are typically more easily damaged by transients.

Features

- *Monitor single-phase voltage*
- *Panel mounted*

Product Selection Matrix

Model	Low Voltage	High Voltage	Variable Restart Delay	Variable Trip Delay	Manual Reset	DPDT Relay	10 Amp General Purpose	480VA @ 240VAC Pilot Duty	OT08 Socket Style	470VA @ 600VAC Pilot Duty	Diagnostic LEDs
50R-100	●						●	●			●
50R-100-2	●		●		●		●	●			●
50R-200	●						●	●			●
50R-200-2	●		●		●		●	●			●
50R-200-3	●			●			●	●			●
50R-200-2-9	●	●	●		●		●	●			●
50R-400	●						●	●		●	●
50R-400-2	●		●		●		●	●		●	●
50R-400-3	●			●			●	●		●	●
50R-400-2-9	●	●	●		●		●	●		●	●
201-100-SP	●						●	●	●		●
201-200-SP	●						●	●	●		●
201-200-SP-T-9	●	●					●	●	●		●
201-100-SP-DPDT	●					●	●●	●●	●		●
201-200-SP-DPDT	●					●	●●	●●	●		●
202-200-SP	●	●	●		●		●	●			●
202-200-SP-NHV	●		●		●		●	●			●
460-100-SP	●	●	●				●	●			●
460-200-SP	●	●	●				●	●			●

●● Indicates two relays

Model 50R

single-phase voltage monitor, panel mount, optional high voltage, variable restart or trip delay

The Model 50R

single-phase voltage monitor has a voltage-sensing circuit which constantly monitors the single-phase power for a low voltage condition. Single-phase motors on fans, compressors, air conditioners, heat pumps, well pumps, sump pumps and small conveyor motors are all applicable to the Model 50R.

When a harmful condition is detected, the MotorSaver's output relay is deactivated after a specified trip delay. The output relay reactivates after power line conditions return to an acceptable level and a specified amount of time has elapsed (restart delay). The trip delay prevents nuisance tripping due to rapidly fluctuating power line conditions.

See Appendix A, Figure 27 for a typical wiring diagram.

Available Models:

50R-100
50R-100-2
50R-200
50R-200-2
50R-200-3
50R-200-2-9
50R-400
50R-400-2
50R-400-3
50R-400-2-9

Optional Features

- *High voltage protection*
- *Variable restart delay*
- *Variable trip delay*

2 - Variable Restart Delay (Manual, 2-300 seconds)
3 - Variable Trip Delay (2-30 seconds)
9 - High Voltage Detection

Specifications

Line Voltage
50R-100 ..... 95-120VAC
50R-200 ..... 190-240VAC
50R-400**..... 380-480VAC
**Comes standard with 470VA @ 600VAC relay.
Frequency 50*/60Hz
Low Voltage
Trip (% of setpoint) 90%
Reset (% of setpoint)..... 93%
Delay Time (Nominal)
Trip..... 4 seconds
Restart (low voltage)..... 2 seconds
Restart (complete power loss)..... 2 seconds

Output
SPDT ..... 10A General Purpose
or 480VA @ 240VAC Pilot Duty
Transient Protection (Internal) ..... IEC 61000-4-5; 1995 ±6kV
Weight ..... 1 lb.
Safety Marks
•UL..... UL508 (#E68520)
•CE..... IEC 60947-6-2
Special Options
Variable Time Delay Restart ..... Manual, 2-300 seconds
Variable Trip Delay..... 2-30 seconds
High Voltage Operating Points (Option 9)
Trip (% of Setpoint)..... 110%
Reset (% of Setpoint)..... 107%

*Note: 50Hz will increase all delay timers by 20%

Model 201-xxx-SP

single-phase voltage/phase monitor, ***8-pin socket mount***

Available Models:

201-100-SP
201-200-SP
201-200-SP-T-9

The Model 201-xxx-SP

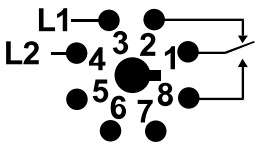
is an 8-pin octal-base, plug-in voltage monitor designed to protect single-phase motors regardless of size. The 201-100-SP is used on 95-120VAC, 50/60Hz motors to prevent damage caused by low voltage. The Model 201-200-SP is used on 190-240VAC, 50/60Hz motors. The 201-200-SP-T-9 is a pin-for-pin replacement for a Time Mark® #260 Series voltage monitor. High voltage protection is included in the 201-200-SP-T-9.

The unique microcontroller-based voltage and voltage-sensing circuit constantly monitors the voltage to detect harmful power line conditions. When a harmful condition is detected, the MotorSaver's output relay is deactivated after a specified trip delay. The output relay reactivates after power line conditions return to an acceptable level and a specified amount of time has elapsed (restart delay). The trip delay prevents nuisance tripping due to rapidly fluctuating power line conditions.
See Appendix A, Figure 28 for a typical wiring diagram.

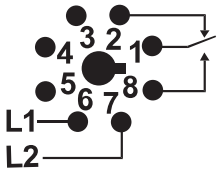
Features

- *Diagnostic LED*
- *8-pin plug in; DIN rail or surface mount*

Must use Model OT08 socket for UL Rating!



Pin-out 1
(201-xxx-SP)
(view of socket)



Pin-out 2
(201-200-SP-T-9)
(view of socket)

Specifications

Single-Phase Line Voltage
201-100-SP 95-120VAC
201-200-SP, 201-200-SP-T-9 . . . . . 190-240VAC
Frequency 50/60Hz
Low Voltage (% of setpoint)
Trip 90%
Reset 93%
For 201-200-SP-T-9 only: High Voltage (% of setpoint)
Trip 110%
Reset 107%
Trip Delay Time
High/Low Voltage Fault . . . . . 4 seconds
Restart Delay Time
After a Fault . . . . . 2 seconds
After a Complete Power Loss . . . . . 2 seconds
Maximum Input Power . . . . . 5 W
Transient Protection (Internal) . 2500V for 10 ms

Weight . . . . . 9 oz.
Output Contact Rating (SPDT)
Pilot Duty . . . . . 480VA @ 240VAC
General Purpose. . . . . 10A @ 240VAC
Temperature Range . . . . . .
Safety Marks
UL. . . . . UL508 (#E68520)
Socket Available . . . . . Model # OT08 (UL Rating 600V)
The 600V socket can be surface mounted or installed on DIN Rail.

Model 201-xxx-SP-DPDT

single-phase voltage/phase monitor, 8-pin socket mount, ***two isolated Form C relays***

Available Models:

201-100-SP-DPDT
201-200-SP-DPDT

The Model 201-xxx-SP-DPDT

is an 8-pin octal-base, plug-in voltage monitor designed to protect single-phase motors regardless of size. The 201-100-SP-DPDT is used on 95-120VAC, 50/60Hz motors to prevent damage caused by low voltage. The 201-200-SP-DPDT is used on 190-240VAC, 50/60Hz motors. The units feature two isolated sets of contacts that are ideal for use with two control circuits with different voltages.

The unique microcontroller-based voltage and voltage-sensing circuit constantly monitors the voltage to detect harmful power line conditions. When a harmful condition is detected, the MotorSaver's output relays are deactivated after a specified trip delay. The output relays reactivate after power line conditions return to an acceptable level and a specified amount of time has elapsed (restart delay). The trip delay prevents nuisance tripping due to rapidly fluctuating power line conditions.

See Appendix A, Figure 29 for a typical wiring diagram.

Features

- *Low voltage protection*
- *Two isolated Form C relays (DPDT)*
- *Diagnostic LED*
- *8-pin plug in; DIN rail or surface mount*

Must use Model OT08 socket for UL Rating!

Specifications

3-Phase Line Voltage
201-100-SP-DPDT 95-120VAC
201-200-SP-DPDT 190-240VAC
Frequency 50/60Hz
Low Voltage (% of setpoint)
Trip . . . . . 90% ±1%
Reset . . . . . 93% ±1%
Trip Delay Times
Low Voltage . . . . . 4 seconds
Restart Delay Times
After a Fault or Complete Power Loss . . . 2 seconds
Output Contact Rating
DPDT . . . . . 480VA @ 240VAC Pilot Duty
10A @ 240VAC Gen. Purpose
Maximum Input Power . . . . . 5 W
Weight . . . . . 9 oz.

Safety Marks
UL . . . . . UL508 (#E68520)
CE . . . . . IEC 60947-6-2
Standards Passed
Electrostatic Discharge (ESD) . . . . . IEC 61000-4-2, Level 3, 6kV contact, 8kV air
Radio Frequency Immunity, Radiated 150MHz, 10V/m
Fast Transient Burst . . . . . IEC 61000-4-4, Level 3, 3.5kV input power and controls

Model 202-200-SP

single-phase voltage monitor, panel mount, adjustable or manual restart delay

Available Models:

202-200-SP
202-200-SP-NHV

The Model 202-200-SP

voltage monitor is designed to protect single-phase motors regardless of size. It can be used with 190V-240VAC, 50/60Hz motors to prevent damage caused by incoming power problems.

A unique microcontroller-based voltage-sensing circuit constantly monitors the voltage to detect harmful power line conditions. When a harmful condition is detected, the MotorSaver's output relay is deactivated after a specified trip delay. The output relay reactivates after power line conditions return to an acceptable level and a specified amount of time has elapsed (restart delay). The trip delay prevents nuisance tripping due to rapidly fluctuating power line conditions.

See Appendix A, Figures 30 & 31 for typical wiring diagrams.

Features

- *Protects single-phase motors from:*
  - *High and low voltage (low voltage only for 202-200-SP-NHV)*
  - *Rapid cycling*
- *Quick mounting with single screw*
- *Small package, ideal for assembly into panels*
- *Standard 1/4" quick connects*

Specifications

Single-Phase Line Voltage
202-200-SP, 202-200-SP-NHV 190-240VAC
Frequency 50*/60Hz
Low Voltage (% of setpoint)
Trip 90%
Reset 93%
High Voltage (% of setpoint) (Not available on -NHV model)
Trip 110%
Reset 107%
Trip Delay Time
High and Low Voltage ..... 4 seconds
Restart Delay Time
After a fault or
complete power loss ..... Manual, 2-300 seconds adjustable
Output Contact Rating
SPDT ..... 480VA @ 240VAC Pilot Duty
10A @ 240VAC Gen. Purpose
Safety Marks
UL ..... UL508 (#E68520)

Transient Protection ..... IEC 61000-4-5, ±4kV
Maximum Input Power ..... 5 W
Weight ..... 8 oz.
Trip & Reset Accuracy ..... ±1%
Repeatability ..... ±0.5%
Input to Output Dielectric ..... 1960 Vrms (min.)
Termination ..... 0.25" Male Quick Connect
Humidity ..... 95% Relative Non Condensing
Operating Temperature ..... -40° to 70°C
CE Pending
UL Recognized ..... File # E68520
*Note: 50Hz will increase all delay timers by 20%.

Model 460-xxx-SP

*single-phase voltage monitor, **din rail mount**, adjustable restart delay*

The Model 460-100-SP

is used on 95-120VAC, 50/60Hz single-phase motors and the 460-200-SP is used on 190-240VAC, 50*/60Hz single-phase motors to protect them from damaging high and low voltage conditions. An adjustment knob allows the user to set a 1-500 second restart delay. The variable restart delay is also a power-up delay and can be utilized to stagger-start motors on the same system.*

A unique microcontroller-based, voltage-sensing circuit constantly monitors the voltage to detect harmful power line conditions. When a harmful condition is detected, the MotorSaver's output relay is deactivated after a specified trip delay. The output relay reactivates after power line conditions return to an acceptable level and a specified amount of time has elapsed (restart delay). The trip delay prevents nuisance tripping due to rapidly fluctuating power line conditions.
See Appendix A, Figure 32 for a typical wiring diagram.

Available Models:

460-100-SP
460-200-SP

Features

- *Protects from low and high voltage*
- *DIN rail or surface mountable*
- *LED Diagnostics*
- *Adjustable restart delay setting*

Specifications

Single-Phase Line Voltage
460-100-SP 95-120VAC
460-200-SP 190-240VAC
Frequency 50*/60Hz
Low Voltage (% of setpoint)
Trip . . . . . 90% ±1%
Reset . . . . . 93% ±1%
High Voltage (% of setpoint)
Trip . . . . . 110% ±1%
Reset . . . . . 107% ±1%
Trip Delay Time
Low or High Voltage . . . . . 4 seconds fixed
Restart Delay Time
After a Fault . . . . . 1-500 seconds adjustable
After a Complete Power Loss . . . . . 1-500 seconds adjustable
Output Contact Rating
1-Form C . . . . . 10A General Purpose @ 240VAC
Pilot Duty 480VA @ 240VAC, B300
Maximum Input Power . . . . . 6 W
Weight . . . . . 14 oz.
Enclosure . . . . . Polycarbonate
Terminal Torque . . . . . 6 in.-lbs.
Wire Type . . . . . Stranded or solid
12-20 AWG, one per terminal

Safety Marks
UL . . . . . UL508 (#E68520)
CE . . . . . IEC 60947-6-2
Standards Passed
Electrostatic Discharge (ESD) . . . . . IEC 61000-4-2, Level 3, 6kV contact, 8kV air
Radio Frequency Immunity,
Radiated . . . . . 150 MHz, 10V/m
Fast Transient Burst . . . . . IEC 61000-4-4, Level 3,
3.5 kV input power & controls
Surge
IEC . . . . . IEC 61000-4-5, Level 3, 4kV line-to-line;
Level 4, 4kV line-to-ground
ANSI/IEEE . . . . . C62.41 Surge and Ring Wave
Compliance to a level of 6kV line-to-line
Hi-potential Test . . . . . Meets UL508
(2 x rated V +1000V for 1 minute)
Environmental
Temperature Range . . . . . Ambient Operating: -40° to 70°C (-40° to 158°F)
Ambient Storage: -40° to 80°C (-40° to 176°F)
Class of Protection . . . . . IP20, NEMA 1 (finger safe)
Relative Humidity . . . . . 10-95%, non-condensing per IEC 68-2-3

*Note: 50 Hz will increase all delay timers by 20%

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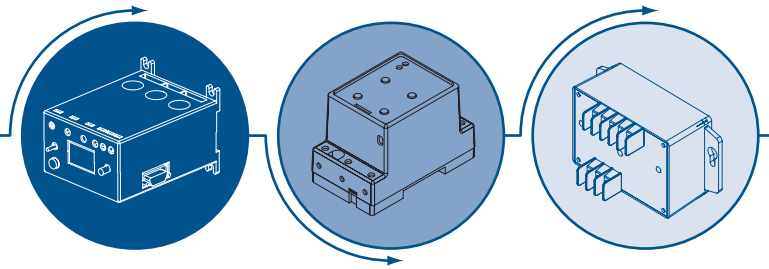
Current Monitors



Current Monitors have many advantages over voltage monitors because they provide protection against both supply line and load side faults when the motor is running. They protect against single-phasing and current unbalance problems that can be caused by voltage supply problems, bad contactors, loose wiring, bad wires or damaged motors. They also provide very reliable overload and underload protection.

Current monitors are used to detect heater element failure, loss of load, peak power loads, runway and radio tower light failure, feed rate, dull bits and blades, conveyor load jams, current demand level and to keep tooling loads at their most efficient point.

Features

- *Diagnostic Display*
- *Trip Delay*
- *Rapid-cycle Timer, Power-up Timer*
- *Dry-well Timer*
- *Overcurrent Timer*
- *Motor Acceleration*
- *Remote Manual Reset*

Protects 3-Phase motors from:

- *Overcurrent*
- *Undercurrent*
- *Current unbalance*
- *Rapid cycling*
- *Single-phasing*
- *Phase reversal*

Product Selection Matrix

MODEL	Phase Loss	Phase Reversal	Undercurrent	Overcurrent	Current Unbalance	Rapid Cycling	Diagnostic Display	Trip Delay	RD1 Rapid-Cycle Timer, Power-Up Timer	RD2 Overcurrent Restart Delay Timer	RD3 Undercurrent/Dry-well Restart Delay Timer	#RF Number of Restarts After All Faults (except UC fault*)	#RU Number of Restarts After an UC Fault	Motor Acceleration Time	Remote Manual Reset
520CS-115	●	●	●	●	●	●	●	●	●	●	●	●		●	●
520CP-115	●	●	●	●	●	●	●	●	●	●	●	●			●
520CP-230	●	●	●	●	●	●	●	●	●	●	●	●			●
520CP-460	●	●	●	●	●	●	●	●	●	●	●	●			●

* Includes UC fault on 520CS units

Requires external current transformers (sold separately).

Model 520CS

3-phase current monitor, ***programmable motor acceleration trip delay from 0-50 seconds***

Part No. 520CS-115

The Model 520CS

is a fully-programmable, microcontroller-based, current-sensing device designed to monitor 3-phase pumps. Unlike the Model 520CP which is designed to work with motors that have ramp-up times of 4 seconds or less, the Model 520CS has a programmable motor acceleration time that can be set from 0-50 seconds.

Three external current transformers must be utilized in conjunction with the Model 520CS. The following nine parameters can be set and viewed from the 3-digit alphanumeric display: overcurrent trip point, undercurrent trip point, current unbalance trip point, trip delay, rapid-cycle timer (RD1), overload restart delay (RD2), underload restart delay (RD3), number of starts after a fault and motor acceleration time. Last fault diagnostic is also viewable. When a harmful condition is detected, the MotorSaver's output relay is deactivated after the specified trip delay. The output relay reactivates after the appropriate RD2 or RD3 timer has expired. Overcurrent, undercurrent and current unbalance are ignored during the motor acceleration period; however, if the motor is started on a single-phase or a reverse-phase condition, the Model 520CS deactivates its output relay in 0.5 second.

See Appendix A, Figure 33 for a typical wiring diagram.

RD1 - restart delay on power-up and rapid-cycle timer
RD2 - restart delay after all faults except undercurrent
RD3 - restart delay after undercurrent

Features

- *Motor acceleration trip delay*

Protects 3-Phase motors from:

- *Overcurrent*
- *Undercurrent*
- *Current unbalance*
- *Rapid cycling*
- *Single-phasing*
- *Phase reversal*

Specifications

Control Voltage 100-130VAC
Frequency 50*/60Hz
Maximum Full Scale Current . . . . 5 Amps (max.)
Fixed Operating Points
Reverse-Phase Trip Delay. . . . . 0.5 second
Single-Phase Trip Delay . . . . . 0.5 second
Temperature Range . . . . . 0° to 70°C
Output Contact Rating
SPDT . . . . . 480VA at 240VAC Pilot Duty
10A General Purpose
Safety Marks
UL. . . . . UL508 (#E68520)

Transient Protection (Internal) . . . 2500V for 10 ms
Maximum Input Power. . . . . 5 W
Repeat Accuracy Trip Point. . . . . ±2%
Repeat Accuracy Timing . . . . . ±25%, ±1 second
Weight . . . . . 2 lbs.
*Note: 50Hz will increase all delay timers by 20%

Requires external current transformers (sold separately).

Model 520CP

3-phase current monitor, ***for use with motors having ramp up times of 4 seconds or less,*** *second relay optional on 115VAC version*

Available Models:

520CP-115
520CP-230
520CP-460
520CP-115-RX-30
520CP-115-RX-56

RD1 - restart delay on power-up and rapid-cycle timer
RD2 - restart delay after all faults except undercurrent
RD3 - restart delay after undercurrent

The Model 520CP

is a fully-programmable, microcontroller-based, current-sensing device designed to monitor 3-phase pumps or systems with ramp-up times of 4 seconds or less. Applications include submersible pumps, booster pumps, reverse osmosis systems, centrifugal pumps, vertical turbine pumps, oil well pumps, chemical pumps or other similar systems.

Three external current transformers must be utilized in conjunction with the Model 520CP. The following nine setpoints can be set and viewed from the 3-digit alphanumeric display: overcurrent trip point, undercurrent trip point, current unbalance trip point, trip delay, rapid-cycle timer (RD1), overload restart delay (RD2), underload restart delay (RD3), number of starts after an overload and number of restarts after an underload fault. Last fault diagnostic is also viewable. When a harmful condition is detected, the MotorSaver's output relay is deactivated after the specified trip delay. The output relay reactivates after the appropriate RD2 or RD3 timer has expired. If the pump is started on a single-phase or a reverse-phase condition, the Model 520CP deactivates its output relay in 0.5 second.

See Appendix A, Figure 33 for a typical wiring diagram.

Features

Protects 3-Phase motors from:

- *Overcurrent*
- *Undercurrent*
- *Current unbalance*
- *Rapid cycling*
- *Single-phasing*
- *Phase reversal*

520-115-RX-30 *- The 520CP unit has two output relays that work independently of each other. The right relay energizes on start up and the left relay energizes on a fault after all restart attempts are exhausted. (RD1 in minutes)*

520CP-115-RX-56 *- This 520CP unit has two output relays that work in unison. Unit displays 'nc' (no current) when the current of the motor equals '0' for more than 4 seconds. (RD1 in minutes)*

Specifications

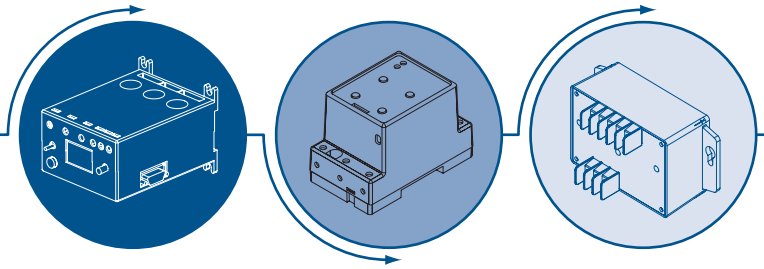
Control Voltage

520CP-115	100-130VAC
520CP-230	200-250VAC
520CP-460	400-500VAC
Frequency	50*/60Hz
Maximum full scale current	5 Amps (max.)
Fixed Operating Point	
Reverse & Single-Phase Trip Delay	0.5 second
Trip Point Accuracy	±2%
Timing Accuracy	±25%, ±1 second
Temperature Range	0° to 70°C
Output Contact Rating	
SPDT (Model -115, -230)	480VA at 240VAC Pilot Duty 10A General Purpose
SPDT (Model -460)	470VA at 600VAC 10A General Purpose
Safety Marks	
UL	UL508 (#E68520)
Transient Protection (Internal)	2500V for 10 ms
Maximum Input Power	5 W
Weight	2 lbs.
Options (additional cost)	DPDT Relay Contacts

*Note: 50Hz will increase all delay timers by 20%

Requires external current transformers (sold separately).

Pump Controllers



Pump Controllers are innovative products for controlling a single pump or multiple pumps. Some models can be used to detect pump seal leaks and motor overheating on submersible pumps. Other models can be used as a five-channel pump controller or five-channel switch to support all popular industry standard multi-pump configurations.

Features

- *UL 508 listed (plug-in types must use an OT08-PC or RB08-PC octal base socket manufactured by Custom Connector to qualify as UL listed)*
- *DIN rail or surface mountable*
- *Finger-safe terminals*
- *LED status indicators*

Product Selection Matrix

MODEL	UL508	Isolated Relays	1 Input	2 Inputs	5 Inputs	4.7 - 100 kΩ Adjustable	10 kΩ Fixed	Form C Isolated Relay	Form C Relay	Form A Relay	Selectable Inverted Logic	Duplex	Triplex	Quadplex	Simplex
PC-102-CICI-DL	●	●		●		●		●●			●	●			
PC-102-CICI-LT	●	●		●		●		●●			●	●			
PC-105	●	●			●		●		●	●*	●	●	●	●	
PC-100-LLC-CZ	●			●		●		●	●						
PC-200-LLC-CZ	●			●		●		●	●						
PC-100-LLC-GM	●			●		●		●	●						
PC-200-LLC-GM	●			●		●		●	●						
460-15-100-LLS	●		●			●				●●					●
460-15-100-SLD	●		●			●				●●	●				●
201-100-SLD	●		●			●		●	●						●

* Denotes 4 relays
●● Denotes 2 relays

Product Selection Matrix

MODEL	Duplex Pumping	DPDT	Manual Switch
ALT-(xxx)-S	●		
ALT-(xxx)-S-SW	●		●
ALT-(xxx)-X	●		
ALT-(xxx)-X-SW	●		●
ALT-100-1-SW	●	●	●
ALT-200-1-SW	●	●	●
ALT-100-3-SW	●		●
ALT-200-3-SW	●		●
50R-400-ALT	●		●

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Model PC-102

either a ***dual seal-leak detector (-DL)*** *or* ***seal-leak & over-temperature detector (-LT),***
adjustable seal-leak sensitivity

The PC-102

-DL *is a dual seal-leak detector. The inputs are used to sense seal failures on pumps. When water is detected, the associated output relay is energized. The input logic may be selected to be direct or inverted by using DIP switches on the side of the device.*

-LT *is a seal-leak and over-temperature detector. The seal-leak input is used to sense seal failures on submersible pumps while the temperature input is used to detect motor overheating. Both can be configured to suit the probes of your choice. The seal input logic may be selected to be direct or inverted by using DIP switches on the side of the device.*

Both units have two form-C isolated output relays and two LEDs, which illuminate when each associated output relay is energized.

The sensitivity adjustment (4.7k-100kOhms) allows you to define the input impedence at which the output relays will change state. The sensitivity for the over-temperature detector can be set to 4k Ohms with use of the DIP switches.

Available Models:

PC-102CICI-DL
PC-102CICI-LT

Features

- *Compact design*
- *Finger-safe terminals*
- *DIN rail or surface mountable*
- *Two Form C isolated contacts with LED status indicators*
- *Invertible relay logic*
- *Configurable over-temperature reset (PC-102CICI-LT)*

Specifications

Supply Voltage . . . . . 120VAC nominal
Frequency 50/60Hz
Sensitivity 4.7k-100kΩ
Input Logic . . . . . Direct or inverted
Debounce Time Delay . . . . . 0.5 or 2 seconds
Relay Output Rating (2 Form C isolated)
Pilot Duty. . . . . 180VA @120VAC, C150
General Purpose . . . . . 5A @240VAC
Depluggable Connector. . . . . Phoenix Contact-Series MSTB plugs
Output Relay Status Indicators . . LEDs
Weight . . . . . 9 oz.
Maximum Input Power . . . . . 2 W
Standards Passed
Electrostatic Discharge (ESD) . . . . . IEC 61000-4-2, Level 3, 6kV contact, 8kV air.
Radio Frequency Immunity (RFI) . . . . . IEC 61000-4-3, Level 3, 10V/m
Fast Transients. . . . . IEC 61000-4-4, Level 3, 4kV input power
2kV Inputs/Outputs

Safety Marks
UL. . . . . UL508 (File #E68520)
cUL. . . . . C22.2 No. 14
Operating Temperature. . . . . -20 to 55° C (-4° to 131° F)
Wire range . . . . . 12-20 AWG

Model PC-105

pump controller with ***duplex, triplex or quadplex functionality or 5-channel relay***

Part No. PC-105

The PC-105

is a 5-channel pump controller designed to handle multiple pump applications. Alternatively, it can operate as a 5-channel switch.

The PC-105s control functions support all of the popular industry-standard multi-pump configurations.

It can indicate low, high and out-of-sequence alarms and use alternating and non-alternating pump control. The non-alternating pump can be used as a jockey pump or emergency pump.

Using the built-in DIP switches, individual pumps can be disabled when taken out of service for repair or maintenance.

Features

- *Low, high and out-of-sequence alarms*
- *Variable time delay / lag pump delay from 2-255 seconds*
- *Duplex SPS (separate pump stop) pump control*
- *Duplex, triplex or quadplex pump control*
- *Pump-up or pump-down functions*
- *External silence, reset and alternation configuration*
- *Five-channel relay configuration*
- *DIN rail or surface mountable*

Specifications

Supply Voltage 120VAC
Frequency 50*/60Hz
Relay Output Rating
Pilot Duty ..... 480VA @ 240VAC, B300
General Purpose ..... 7A @ 240VAC
Operating Temperature ..... -20° to 55°C (-4° to 131° F)
Weight ..... 1.2 lbs.
Maximum Input Power ..... 4 W
Wire range ..... 12 to 20 AWG
Recommended Terminal Torque ..... 6 in.-lbs. (max.)
Pump In-rush delay ..... 2 seconds
Standards Passed
Electrostatic Discharge (ESD) ..... IEC 61000-4-2, Level 3, 6kV contact, 8kV air.
Radio Frequency Immunity (RFI) ..... IEC 61000-4-3, Level 3, 10V/m
Fast Transients ..... IEC 61000-4-4, Level 3, 4kV input power
2kV Inputs/Outputs
Safety Marks
UL UL508
cUL ..... C22.2 No. 14

*Note: 50Hz will increase all delay timers by 20%.

Model PC-xxx-LLC-CZ / PC-xxx-LLC-GM

liquid level control, 8-pin plug-in for two probe input with SPDT output

Available Models:

PC-100-LLC-CZ
PC-200-LLC-CZ
PC-100-LLC-GM
PC-100-LLC-GM-OT (sold with OT08 socket)
PC-200-LLC-GM
PC-200-LLC-GM-OT (sold with OT08 socket)

Must use Model OT08 socket for UL Rating!

The PC-xxx-LLC-CZ & PC-xxx-LLC-GM

are liquid level control relays used to control conductive liquid pumping operations in a pump-up or pump-down application. The units come in two different voltage ranges (see specs below).

The units have an adjustable sensitivity knob (4.7k to 100k ohms) that is set according to the resistance level at which you want the probes (sold separately) to sense the conductive liquid. The units have a built-in debounce time delay that prevents the relay from energizing if the probe resistance momentarily goes above or below the sensitivity setpoint (due to liquid splashing in the tank).

The units operate their internal relay based on inputs from a high and low probe and a common reference (when a conductive tank is used) or common probe (when a non-conductive tank is used).
See Appendix A, Figures 34 & 35 for typical wiring diagrams.

PC-xxx-LLC-GM

- *Compatible with Gems' Series 16M general purpose control*

PC-xxx-LLC-CZ

- *Compatible with Crouzet's PNR & PNRU series liquid level control*

Features

- *One unit serves pump-up and pump-down applications*
- *Adjustable sensitivity knob (4.7 to 100K ohms)*
- *Debounce time delay (2 seconds)*
- *Single or dual probe inputs (plus a common reference)*

Specifications

Supply Voltage
PC-100-LLC-CZ, PC-100-LLC-GM . . . 95-120VAC
PC-200-LLC-CZ, PC-200-LLC-GM . . . 190-240VAC
Frequency 50/60Hz
Probe Sense Voltage . . . . . 5vdc pulsed
Debounce Time Delay . . . . . 2 seconds
Probe Sensitivity . . . . . 4.7k to 100k Adjustable
Output Contact Rating
Pilot Duty . . . . . 480VA @ 240VAC
General Purpose . . . . . 10A @240VAC
Ambient Operating Temp . . . . . -40° to 70° C (-40° to 158° F)
Weight . . . . . 9 oz.
Maximum Input Power . . . . . 5 W
Standards Passed
Electrostatic Discharge (ESD) . . . . . IEC 61000-4-2, Level 3, 6kV contact, 8kV air.
Radio Frequency Immunity (RFI) 150MHz, 10V/m
Fast Transients . . . . . IEC 61000-4-4, Level 3, 2kV input power and controls
Safety Marks
UL . . . . . UL508 (File #E68520)
CE IEC60947-6-2
Weight . . . . . 9 oz.

Socket Available . . . . . Model OT08 (UL Rating 600V)
The 600V socket can be surface mounted or installed on DIN Rail.

Model 460-15-100-LLS

*single-channel **liquid level sensor**, din rail mount, adjustable debounce timer*

Part No. 460-15-100-LLS

The Model 460-15-100-LLS

is a liquid level sensor to detect the presence of conductive liquids. A probe is mounted at the desired tank level and connected to the PumpSaver®. When the probe is submersed, the PumpSaver's output contacts will change state as soon as the debounce time expires. The adjustable debounce timer is intended to prevent nuisance actuating due to waves or splashing in the tank.

Relay logic can be inverted so the PumpSaver's output contacts change state when the probe is no longer submersed. This makes the unit versatile for use in pump-up and pump-down applications.
See Appendix A, Figure 36 for a typical wiring diagram.

Features

- *DIN rail or surface mountable*
- *Unique probe protection algorithm*
- *Invertible relay logic for use in pump-up and pump-down applications*
- *Adjustable debounce timer*
- *Microcontroller based*
- *2 relay contacts*
- *LED status indicators*

Specifications

Control Voltage . . . . . 110/120VAC nominal
Frequency 50*/60Hz
Sensitivity 100kΩ
Debounce Time Delay . . . . . 2-60 seconds
Output contact Rating – DPST (two Form A)
Pilot Duty . . . . . 360VA @ 240VAC
General Purpose . . . . . 8A @ 240VAC
Maximum Input Power . . . . . 2 W
Weight . . . . . 1 lb. (max.)
Enclosure . . . . . Polycarbonate
Terminal
Torque . . . . . 6 in.-lbs.
Wire . . . . . AWG 12-20 AWG
Safety Marks
UL UL508
Standards Passed
Electrostatic Discharge (ESD) . . . . . IEC 61000-4-2, Level 3, 6kV contact, 8kV air
Radio Frequency Immunity, Radiated . . . 150MHz, 10 V/m
Fast Transient Burst IEC . . . . . 61000-4-4, Level 3, 3.5kV input power and controls
Surge
IEC . . . . . IEC 61000-4-5, Level 3, 4kV line-to-line; Level 4, 4kV line-to-ground
ANSI/IEEE . . . . . C62.41 Surge and Ring Wave Compliance to a level of 6kV line-to-line
Hi-Potential Test . . . . . Meets UL508 (2 x rated V + 1000 V for 1 minute)
Environmental
Temperature Range
Ambient Operating . . . . . -40° to 70°C (-40° to 158°F)
Ambient Storage . . . . . -40° to 80°C (-40° to 176°F)
Class of Protection . . . . . IP20, NEMA 1 (finger safe)
Relative Humidity . . . . . 10-95%, non-condensing per IEC 68-2-3

*Note: 50Hz will increase all delay timers by 20%

Model 460-15-100-SLD

single-channel seal-leak detector, din rail mount, adjustable sensitivity setpoint

Part No. 460-15-100-SLD

The Model 460-15-100-SLD

is a seal-leak detector to sense seal failures on submersible pumps. A microcontroller-based relay that monitors the shaft seal of a submersible pump motor. A resistive probe is installed in the seal cavity. If water leaks into the pump, the resistance measured by the probe decreases. When the resistance drops below the sensitivity setpoint, the unit will trip and the relay contacts will change state. Output relay logic can be reversed by removing an external jumper. The unit will automatically reset when a fault is cleared.

See Appendix A, Figure 37 for typical wiring diagram.

Features

- *DIN rail or surface mountable*
- *Unique probe protection algorithm*
- *Invertible relay logic*
- *4.7k to 100kΩ adjustable sensitivity*
- *Microcontroller based*
- *2 relay contacts*
- *LED status indicator*

Specifications

Control Voltage ..... 110/120VAC nominal
Frequency 50*/60Hz
Sensitivity 4.7k-100kΩ
Output contact Rating – DPST (two Form A)
Pilot Duty ..... 360VA @ 240VAC
General Purpose ..... 8A @ 240VAC
Maximum Input Power ..... 2 W
Weight ..... 1 lb. (max.)
Enclosure ..... Polycarbonate
Terminal
Torque ..... 6 in.-lbs.
Wire ..... AWG 12-20 AWG
Safety Marks
UL UL508
Standards Passed
Electrostatic Discharge (ESD) ..... IEC 61000-4-2, Level 3, 6kV contact, 8kV air
Radio Frequency Immunity, Radiated ..... 150MHz, 10 V/m
Fast Transient Burst IEC ..... 61000-4-4, Level 3, 3.5kV input power and controls
Surge
IEC ..... IEC 61000-4-5, Level 3, 4kV line-to-line; Level 4, 4kV line-to-ground
ANSI/IEEE ..... C62.41 Surge and Ring Wave Compliance to a level of 6kV line-to-line
Hi-Potential Test ..... Meets UL508 (2 x rated V + 1000 V for 1 minute)
Environmental
Temperature Range
Ambient Operating ..... -40° to 70°C (-40° to 158°F)
Ambient Storage ..... -40° to 80°C (-40° to 176°F)
Class of Protection ..... IP20, NEMA 1 (finger safe)
Relative Humidity ..... 10-95%, non-condensing per IEC 68-2-3

*Note: 50Hz will increase all delay timers by 20%

Model 201-100-SLD

single-channel seal-leak detector, 8-pin socket mount, adjustable sensitivity setpoint

Part No. 201-100-SLD

The Model 201-100-SLD

is an 8-pin plug-in style seal-leak detector to sense seal failures on submersible pumps. A microcontroller-based relay that monitors the shaft seal of a submersible pump motor. A resistive probe is installed in the seal cavity. If water leaks into the pump, the resistance measured by the probe decreases. When the resistance drops below the sensitivity setpoint, the unit will trip and the relay contacts will change state. The unit will automatically reset when a fault is cleared.

See Appendix A, Figure 38 for a typical wiring diagram.

Features

- *LED status indicator*
- *Compact plug-in design*
- *DIN rail or surface mountable via octal base*

Must use Model OT08 socket for UL Rating

Specifications

Control Voltage . . . . . 110/120VAC nominal
Frequency 50/60Hz
Sensitivity 4.7k-100kΩ
Output contact Rating – SPDT
Pilot Duty . . . . . 480VA @240VAC
General Purpose . . . . . 10A @240VAC
Maximum Input Power . . . . . 5 W
Weight . . . . . 9 oz.
Enclosure . . . . . Polycarbonate
Safety Marks
UL . . . . . UL508 (#E68520)
CE . . . . . IEC 60947-6-2
Standards Passed
Electrostatic Discharge (ESD) . . . . . IEC 61000-4-2, Level 3, 6kV contact, 8kV air
Radio Frequency Immunity, Radiated . 150MHz, 10V/m
Fast Transient Burst . . . . . 61000-4-4, Level 3, 3.5kV input power and controls

Surge
IEC . . . . . IEC 61000-4-5, Level 3, 4kV line-to-line; level 4, 4kV line-to-ground
ANSI/IEEE . . . . . C62.41 Surge and Ring Wave Compliance to a level of 6kV line-to-line
Hi-Potential Test . . . . . Meets UL508 2 x rated V + 1000 V for 1 minute)

Temperature Range
Ambient Operating . . . . . -40° to 70°C (-40° to 158°F)
Ambient Storage . . . . . -40° to 80°C (-40° to 176°F)
Relative Humidity . . . . . 10-95%, non-condensing per IEC 68-2-3

Model ALT

8-pin plug-in, single or dual float input, with or without manual switch

Available Models:

ALT-24-S
ALT-24-S-SW
ALT-115-S
ALT-115-S-SW
ALT-115-X
ALT-115-X-SW
ALT-230-S
ALT-230-S-SW
ALT-230-X
ALT-230-X-SW

The Model ALT

alternating relays are used to alternate between two loads. The ALT is commonly used in duplex pumping applications to balance the runtime of both pumps.

The Model ALT-S

is used in single high-level float applications. When the float switch opens, the alternating relay changes state, forcing the other pump to run the next time the float closes.
See Appendix A, Figure 39 for a typical wiring diagram.

The Model ALT-X

has an internal cross-connected relay and is used in dual high-level float applications. These floats are commonly referred to as lead and lag floats. The pumps alternate as in the ALT-S version but the cross-connected relay configuration allows both pumps to run simultaneously when both the lead and lag floats are closed.

These relays are also available with a built-in switch (SW option) that is used to manually force one of the pumps to run every time the float switch is closed. This is helpful when a pump has been removed for repair or for test purposes. In the case of the Model ALT-X-SW, the switch essentially forces one pump to be the lead pump, while still allowing the second to run when both floats are closed. All Model ALT relays have a built-in debounce feature that prevents the relay from changing state if the switch or float contact bounces momentarily.
See Appendix A, Figure 40 for a typical wiring diagram.

Must use Model OT08 socket for UL Rating!

Specifications

Supply Voltage
24VAC 20-26VAC
115VAC 95-125VAC
230VAC 195-250VAC
Supply Current. 40mA
Operating Temperature . . . . . -40° to 50°C (-40° to 122°F)
Maximum Input Power . . . . . 5 W
Contact Rating . . . . . 480VA @ 240VAC
Debounce Time Delay . . . . . 0.5 second

Control Input Impedance (min).)
24 . . . . . 10kΩ
115 . . . . . 56kΩ
230 . . . . . 100kΩ
Safety Marks
UL. . . . . UL508 (#E68520)
Socket Available. . . . . Model OT08 (UL Rating 600V)
The 600V socket can be surface mounted or installed on DIN Rail.

Model ALT-xxx-1-SW / ALT-xxx-3-SW

11-pin plug-in for single float input with DPDT output / 8-pin plug-in for three float input with dual load output

Available Models:

ALT-100-1-SW
ALT-200-1-SW
ALT-100-3-SW
ALT-200-3-SW

The Model ALT-xxx-1-SW and ALT-xxx-3-SW

are used to alternate between two loads and are commonly used in duplex pump-up and pump-down applications to balance the runtime of both pumps.

The ALT-xxx-1-SW alternating relays are 11-pin octal base plug-ins, available in two different single-phase voltage ranges. The ALT-100-1-SW is used for 95-120VAC applications and the ALT-200-1-SW is used for 190-240VAC applications. Both models are designed for a single float input and feature two isolated Form C relays (DPDT) outputs with two LEDs to indicate the energized loads.

The ALT-xxx-3-SW alternating relays are 8-pin octal base plug-ins, available in two different single-phase voltage ranges. The ALT-100-3-SW is used for 95-120VAC applications and the ALT-200-3-SW is used for 190-240VAC applications. Both models are designed for three float inputs (lead, lag and stop floats). The lead and lag floats actuate latching relays that release when the stop float actuates. The units feature two LEDs to indicate the energized load(s).

The ALT relays have a built-in debounce time delay that prevents the relay from changing state if the float momentarily bounces, and they have a built-in switch to manually force a specific load (pump) to operate each time the input float closes. This is helpful when performing periodic maintenance or pump repair.
See Appendix A, Figure 41 & 42 for typical wiring diagrams.

Features

- *Debounce time delay*
- *LED load indicators*
- *Built-in switch to manually force a specific load (pump) to operate*

Must use Model OT08 or OT11 socket for UL Rating!

Specifications

Supply Voltage
ALT-100-1-SW, ALT-100-3-SW 95-120VAC
ALT-200-3-SW, ALT-200-3-SW 190-240VAC
Frequency 50/60Hz
Output Relay (DPDT)
DPDT . . . . . 480VA @ 240VAC Pilot Duty
10A @ 240VAC General Purpose
Debounce Time Delay
ALT-100-1-SW, ALT-200-1-SW . . . . . 1 second
ALT-100-3-SW, ALT-200-3-SW . . . . . 5 seconds
Ambient Operating Temp . . . . . -40° to 70° C (-40° to 158° F)
Maximum Input Power . . . . . 5 W

Standards Passed
Electrostatic Discharge (ESD) . . . . . IEC 61000-4-2, Level 3, 6kV contact, 8kV air
Radio Frequency, Radiated 150MHz, 10V/m
Fast Transient Burst . . . . . IEC 61000-4-4, Level 3, 3.5kV input power and controls
Safety Marks
UL . . . . . UL508 (#E68520)
CE . . . . . IEC 60947-6-2
Weight . . . . . 9 oz.
Sockets Available
Model OT08 . . . . . UL Rating 600V
Model OT11 . . . . . UL Rating 300V
The sockets can be surface mounted or installed on DIN Rail.

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Model 50R-400-ALT

480VAC application, panel mount

Part No. 50R-400-ALT

The Model 50R-400-ALT

alternating relays are used to alternate between two loads, most commonly in duplex pumping and compressor applications to balance the runtime of both loads.

When used in single float applications, the alternating relay changes state after the float switch opens, forcing the other pump to run the next time the float closes. When used in dual float applications, the alternating relay will allow both pumps to run simultaneously when the lead and lag floats are both closed.*

An adjustment knob provides the option to force one pump to run every time the float switch is closed. This is helpful when one pump has been removed for repair or for test purposes.

A built-in debounce feature prevents the alternating relay from changing state if the float contact bounces momentarily.
See Appendix A, Figure 43 for a typical wiring diagram.

* The alternating relay will not switch states while current is flowing. Switching will only occur after current has been sensed, followed by loss of current for the duration of the debounce time delay.

Features

- *Alternates between two loads*
- *Solid-state reliability*
- *Debounce time delay*
- *Compatible with single or dual float applications*

Specifications

Supply Voltage 380-480VAC
Supply Current 40mA
Control Input Impedance (min) . 1MΩ
Contact Rating ..... 470VA @ 600VAC
General Purpose Relay Rating... 10A
Debounce Time Delay ..... 1 second
Safety Marks
UL..... UL508 (#E68520)
Maximum Input Power ..... 5 W

Model ACBC-120

Alarm Controller and Battery Charger for pump control panels

Available Models:

ACBC-120
ACBC-120-SD (sold with SD12 socket)

Must use Model SD12-PC socket for UL Rating!

The Model ACBC-120

is a dual purpose alarm controller/battery charging unit. When there is a loss of 120VAC power, the ACBC-120's primary function as an alarm controller activates. When this power loss occurs, input power is switched to a 12VDC, lead-acid, rechargeable backup battery and a 12VDC alarm consisting of a strobe light and/or a horn is activated. The horn follows a 2 second on/2 second off pattern with a "horn silence" option to turn the sound off. An LED indicator on the unit also signals that the device has entered the alarm mode.

When 120VAC input is present the alarm circuit can be tested and the unit's secondary function as a 12VDC backup battery charger is activated. In fast charge mode, the unit has the capability to source up to 100mA of charging current. However, the device normally charges at a current of 14mA in maintenance mode. The alarm circuit can be tested by pressing the "test" button located on the front of the unit or by activating an external switch via the "alarm contact" pin.

The device has the ability to signal low battery voltage if the voltage drops below 10.5VDC. The device can also detect if no battery is present or if the battery is connected backwards. In either of these cases, the ACBC-120 will signal a battery error and will not attempt to charge.

See Appendix A, Figure 44 for a typical wiring diagram.

Features

- *Controls 12VDC alarm circuit (strobe light and/or horn)*
- *Maintains 12VDC battery charge (fast charge mode and maintenance mode)Trip delay timer*
- *Battery fault detection and reverse polarity protection*
- *LED indicates unit's status*
- *Press-to-test capability*

Specifications

Supply Voltage
AC Input Voltage . . . . . 120V ±10%
Frequency 50/60Hz
AC input Current . . . . . 0.018A (max.) 0.003 (typical)
AC Input Power. . . . . 2.4W (max.) fast charge current
0.4W (typical) maint. charge current

Output
Strobe Light Alarm Output. . . . . 12VDC@1A (max.)
Horn Alarm Output. . . . . 12VDC@1A (max.)

Battery Charging Characteristics
Acceptable Battery Type . . . . . 12V lead-acid rechargeable
Fast Charge Current . . . . . 100mA ±10%
Maintenance Charge Current . . . . . 14mA ±50%
Low Battery Alert Level 10.5V

Ambient Operating Temp . . . . . -40° to 60° C (-40° to 140° F)

Standards Passed
Electrostatic Discharge (ESD) . . . . . IEC 61000-4-2, Level 3, 6kV contact, 8kV air
Radio Frequency, Radiated. 150MHz, 10V/m
Fast Transient Burst . . . . . IEC 61000-4-4, Level 4, 4kV input lines; 4kV signal lines

Safety Marks
UL. . . . . UL508 (#E68520)
CE. . . . . IEC 60947-6-2
Weight . . . . . 9 oz.

Sockets Available
Model SD12-PC . . . . . UL Rating 600V

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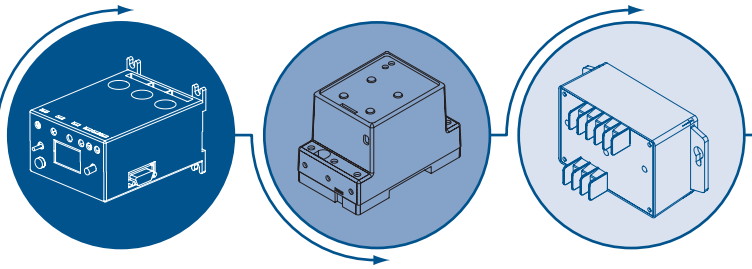
Intrinsically-Safe Relays/Controllers



An Intrinsically-Safe Switch is an isolated UL913 listed device used to interface between hazardous and non-hazardous areas. The input circuitry is designed to never supply excessive energy thus greatly reducing the likelihood of a spark. Provides intrinsically-safe circuits in the following locations: Division I and II, Class I, Groups A, B, C, D; Class II, Groups E, F, G and Class III hazardous locations.

Features

- *Compact design*
- *Finger-safe terminals*
- *DIN rail or surface mountable*
- *LED contact state indicator(s)*
- *Isolated output relay*

Product Selection Matrix

MODEL	UL 913	1 Channel	2 Channel	3 Channel	4 Channel	5 Channel	Selectable Inverted Logic	5 Amp General Purpose	7 Amp General Purpose	8 Amp General Purpose	DIN Rail Mountable	Surface Mountable	Octal Base	Output Status Lights	Probe Resistance 10k Ohms	Probe Resistance 100k Ohms
ISS-100	•	•								•	•	•		•		
ISS-101	•	•								•	•	•	•	•		
ISS-102AA-DCS	•		•					•			•	•		•		•
ISS-105-ISO	•					•	•		•		•	•		•	•	
ISS-105-ISO-3	•			•			•		•		•	•		•	•	
ISS-105-ISO-4	•				•		•		•		•	•		•	•	
ISS-105-ISO-F	•					•	•		•		•	•		•	•	

MODEL	2 Inputs	2 Outputs	Latching Logic	Selectable Inverted Logic	5 Amp General Purpose	DIN Rail Mountable	Surface Mountable	100K Ohm Fixed	4.7-100K Ohm Adjustable	Isolated Relay	MSHA Evaluated
ISS-102C-M-LC	•		•		•	•	•	•			•
ISS-102CCI-M-MC	•	•	•	•	•	•	•		•	•	•

MODEL	UL 913	2 Inputs	5 Inputs	2 Outputs	5 Outputs	Latching Logic	Selectable Inverted Logic	5 Amp General Purpose	7 Amp General Purpose	DIN Rail Mountable	Surface Mountable	100k Ohm Resistance Fixed	4.7-100k Ohm Adjustable	10k Ohm Fixed	Isolated Form C Relay	Form A Relay
ISS-102A-LC	•	•				•		•		•	•	•				•
ISS-102ACI-MC	•	•		•		•	•	•		•	•		•		•	•
ISS-105	•		•		•	•	•		•	•	•			•	•	•*

* Denotes 4 relays

Models ISS-100/ISS-101

single-channel intrinsically-safe switch, either din rail mount (100) or 8-pin socket mount (101)

Part No. ISS-100

Part No. ISS-101

Must use Model OT08 socket with
Model ISS-101 for UL Rating!

The Model ISS-100 & ISS-101

switches are UL 913 listed as an associated apparatus for interfacing between hazardous and non-hazardous areas. These units must be installed in a non-hazardous area.

Features

ISS-100

- *Compact design*
- *Finger-safe terminals*
- *DIN rail or surface mountable*
- *LED state indicator*
- *Isolated output relay for PLC or control voltage*

ISS-101

- *Compact design*
- *LED state indicator*
- *DIN rail or surface mountable via common octal-base package*
- *Pop-in replacement for other manufacturers' parts*
- *Isolated output relay for PLC or control voltage*

Specifications

Supply Voltage 90-120VAC
Relay Output Rating
General Purpose..... 8A @120VAC
Pilot Duty ..... 180VA @120VAC, C300
Relay Contact Life (Electrical) ..... 100,000 cycles min. @ rated load
Relay Contact Life (Mechanical) ..... 10,000,000 cycles
Operating Temperature..... -20° to 55°C (-4° to 131° F)
Weight..... 8 oz.
Maximum Input Power ..... 1.5 W
Wire range..... 12 to 20 AWG
Recommended Terminal Torque.... 3.5 to 4.5 in.-lbs. (max. 6 in.-lbs.)
Provides intrinsically-safe circuits in the following locations: ..... Division I and II
Class I, Groups A,B,C,D;
Class II, Groups E,F,G;
and Class III

Entity Parameters..... V_{oc} = 16.8V
I_{sc} = 1.2mA
L_a = 100mH
C_a = 0.39uF
$Po = \frac{Voc * Isc}{4}$

Standards Passed
Electrostatic Discharge (ESD) ..... IEC 61000-4-2, Level 3, 6kV contact, 8kV air.
Radio Frequency Immunity (RFI) ..... IEC 61000-4-3, Level 3, 10V/m
Fast Transients..... IEC 61000-4-4, Level 3, 4kV input power
Safety Mark
UL ..... UL913 Sixth Edition

Model ISS-102

two-channel *intrinsically-safe switch, din rail mount, options include switch only (-DCS), single latching output (-LC), or multi-function controller (-MC)*

Available Models:

ISS-102A-LC (Latching Controller)
ISS-102AA-DCS (Dual Channel Switch)
ISS-102ACI-MC (Multi-function Controller)
ISS-102C-M-LC (MSHA* evaluated)
ISS-102CCI-M-MC (MSHA* evaluated)

* Mine Safety and Health Administration

The ISS-102

SymCom's Model ISS-102 two-channel, intrinsically-safe switch is designed for multiple uses including a pump-up/pump-down (latching) controller or two-channel switch. Two LEDs indicate the state of the intrinsically-safe inputs and output relays and user-selectable options are available including a variable resistance threshold for float inputs.The ISS-102 enclosure is surface mountable but is also compatible with DIN rail (35mm).

-LC *Each input channel is active when the corresponding switch is closed. When the lag input (CH2) is activated, the output closes. Applying latching logic, the output contact remains closed until the lead (CH1) and the lag (CH2) inputs are deactivated. Sensitivity is fixed at 100kOhms with a debounce time delay of 2 seconds.*

-DCS *This dual-channel switch has a debounce delay feature of 0.5 seconds. Resistance probes or switches can be used on its inputs. Two LEDs illuminate the output state of either form A relay. Sensitivity is fixed at 100kOhms with a debounce time delay of 0.5 seconds.*

-MC *By selecting the proper functionality through the dip switches, you can define a pump-up or pump-down, single or dual channel non-latching switch. The sensitivity adjustment (4.7k-100kOhms) allows you to define the input impedance at which the output relays (one form A & one form C) will change state, with a debounce time delay of 0.5 or 2 seconds.*

Features

- *Compact design*
- *Finger-safe terminals*
- *DIN rail or surface mountable*
- *LED state indicator*
- *2 input channels*

Specifications

Supply Voltage 120VAC
Relay Output Rating
General Purpose..... 5A @120VAC
Pilot Duty ..... 180VA @120VAC, C150
Relay Contact Life (Electrical)..... 100,000 cycles min. @ rated load
Relay Contact Life (Mechanical) ..... 10,000,000 cycles
Debounce Time ..... 0.5 or 2 seconds
Operating Temperature..... -20° to 55°C (-4° to 131° F)
Weight..... 9 oz.
Maximum Input Power ..... 2 W
Wire range..... 12 to 20 AWG
Recommended Terminal Torque... 3.5 to 4.5 in.-lbs. (max. 6 in.-lbs.)
Provides intrinsically-safe circuits in the following locations:..... Division I and II, Class I, Groups A,B,C,D; Class II, Groups E,F,G; and Class III

Entity Parameters..... V_{oc} = 16.8V, I_{sc} = 1.2mA, L_a = 100mH, C_a = 0.39uF Po=$\frac{Voc*Isc}{4}$

Standards Passed
Electrostatic Discharge (ESD)..... IEC 61000-4-2, Level 3, 6kV contact, 8kV air.
Radio Frequency Immunity (RFI) ..... IEC 61000-4-3, Level 3, 10V/m
Fast Transients..... IEC 61000-4-4, Level 3, 4kV input power
Safety Mark ..... UL913 Sixth Edition
(except Models ISS-102C-M-LC & ISS-102CCI-M-MC which have been evaluated by MSHA)
Output Replay Type:
ISS-102A-LC ..... One Form A
ISS-102AA-DCS ..... Two Form A
ISS-102ACI-MC..... One Form A & One isolated Form C
ISS-102C-M-LC..... One Form C
ISS-102CCI-M-MC ..... Two Form C (one isolated)

Model ISS-105

five-channel intrinsically-safe switch, din rail mount, programmable for alternating/control of 2, 3 or 4 pumps or 5-channel relay, optional 5-channel switch only (-ISO)

Available Models:

ISS-105 (Intrinsically-Safe & Pump Controller)
ISS-105-ISO (Intrinsically-Safe Only)
ISS-105-ISO-3 (3-Channel Intrinsically-Safe Only)
ISS-105-ISO-4 (4-Channel Intrinsically-Safe Only)
ISS-105-ISO-F (Intrinsically-Safe Only with Fast Trip Relays)

The ISS-105 IS Super Cell

is a "smart" five-channel intrinsically safe relay and pump controller. The IS Super Cell can be configured for a wide variety of applications including alternating or non-alternating duplex, duplex separate pump stop (SPS), triplex and quadplex applications. It can be set up for pump-up or pump-down applications or can be used as a five-channel relay.

The IS Super Cell has a long list of features that are needed for multiple pump applications. The IS Super Cell can indicate low, high and out-of-sequence alarms. If an out-of-sequence alarm occurs, the skipped pump(s) will be started as intended. The Model ISS-105 can be set up to do non-alternating control, alternating control and alternating control with one non-alternating pump. The non-alternating pump is intended for use with an emergency or jockey pump. The IS Super Cell can start an emergency pump once every 50 cycles to keep it working freely. Using the built-in DIP switches, individual pumps can be disabled when taken out of service for repair or maintenance.

Features

- *5 intrinsically-safe input channels meeting UL913 Sixth Edition*
- *4 normally open output relays and 1 SPDT output relay*
- *Field selectable pump control options*
- *Duplex pump control*
- *Duplex SPS (separate pump stop) pump control*
- *Triplex pump control*
- *Quadplex pump control*
- *Out-of-sequence alarm*
- *High and/or low alarm options depending on the number of pumps and settings*
- *Audible alarm output*
- *Meets IEC EMC standards for Electrical Fast Transients (EFT), Electrostatic Discharge (ESD) and Radio Frequency Immunity (RFI)*
- *DIN rail or surface mountable*
- *User-selectable alternator/non-alternator option*
- *Non-alternating pump option for emergency or jockey applications*
- *Pump disable switches*
- *Adjustable lag pump delay for all pumping modes*
- *Adjustable delay-on-make/break timer in five-channel relay mode*
- *Finger-safe terminals*

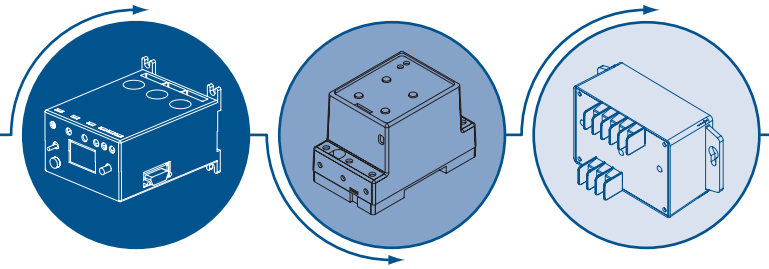
Specifications

Supply Voltage	120VAC
Frequency	50*/60Hz
Relay Output Rating	
General Purpose	7A @ 240VAC
Pilot Duty	480VA @ 240VAC, B300
Relay Contact Life (Electrical)	100,000 cycles min. @ rated load
Relay Contact Life (Mechanical)	10,000,000 cycles
Operating Temperature	-40° to 55°C (-40° to 131° F)
Weight	1.2 lbs.
Maximum Input Power	5 W
Wire range	12 to 20 AWG
Recommended Terminal Torque	3.5 to 4.5 in.-lbs. (max. 6 in.-lbs.)
Provides intrinsically-safe circuits in the following locations:	Division I and II Class I, Groups A,B,C,D; Class II, Groups E,F,G; and Class III

Entity Parameters	V_{oc} = 16.8V I_{sc} = 1.2mA L_a = 100mH C_a = 0.39uF	Po=Voc*Isc / 4
Standards Passed		
Electrostatic Discharge (ESD)	IEC 61000-4-2, Level 3, 6kV contact, 8kV air.	
Radio Frequency Immunity (RFI)	IEC 61000-4-3, Level 3, 10V/m	
Fast Transients	IEC 61000-4-4, Level 3, 4kV input power 2kV Inputs/Outputs	
Safety Mark		
UL	UL913 Sixth Edition	

*Note: 50Hz will increase all delay timers by 20%.

Single-Phase PumpSavers

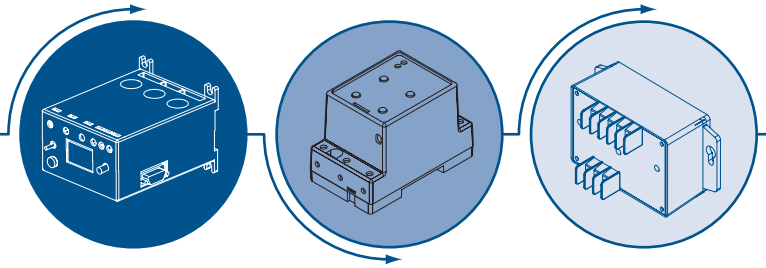


Our line of single-phase PumpSavers provide ideal protection from dry-well and dead-head situations, as well as overload, over and undervoltages and rapid cycling. The 77C family of overload relays provide this same protection and much more with programmable parameters, diagnostic display of fault codes to aid in troubleshooting and remote communication capability.

SEE OUR NEW SINGLE-PHASE PUMPSAVER CATALOG FOR OUR FULL LINE OF SINGLE-PHASE PUMPSAVERS (AVAILABILITY SUBJECT TO CHANGE).

TABLE OF CONTENTS

Load Sensors



SymCom's load sensors are designed to be adaptable to many different applications. They utilize a CT (current transformer) inside the unit to read the current of the equipment being monitored. The Model LSR-0 is a self-powered unit used as a proof relay. The LSRX and LSRX-C units are also self-powered proof relays with either 0.25" fast-on connectors (LSRX) or depluggable connectors (LSRX-C) for use in OEM equipment. The LSR-24, 115 and 230 load sensors use external power to help determine feed rates, tool wear, loss of prime on pumps, mixer viscosity and all types of overload and underload conditions. LSRU load sensors come in many different configurations, such as overcurrent and undercurrent or either overcurrent or undercurrent with variable trip, restart or extended restart delay settings. These units also require an external power source. All LSRU models are 115VAC input power, except the LSRU-24-AL-2 and LSRU-24-AL-3, which are 24VAC input power.

Features

- *Surface mountable*
- *10A relay (except LSRX, LSRX-C)*
- *Variable trip points (except LSR-0, LSRX, LSRX-C)*

Product Selection Matrix

MODEL	Adjustable Overcurrent	Fixed Undercurrent (Proof Relay)	Adjustable Undercurrent	Manual Reset Selection	Variable Trip Point	Variable Restart Delay	Extended Restart Delay (Minutes)	Variable Trip Delay	10 Amp Relay	Self-Powered	Alarm Logic (Latching)	Motor Control Logic (Momentary Trip)
LSR-0		●							●	●	●	
LSR-24	●		●		●				●		●	
LSR-115	●		●		●				●		●	
LSR-230	●		●		●				●		●	
LSRU-24-AL-2	●		●		●				●		●	
LSRU-24-AL-3	●		●		●				●		●	
LSRU-115-AL-1.5	●		●		●				●		●	
LSRU-115-AL-2	●		●		●				●		●	
LSRU-115-AL-3	●		●		●				●		●	
LSRU-115-FC-1.5	●		●		●				●			
LSRU-115-OT-1.5	●				●			●	●			●
LSRU-115-OT-2	●				●			●	●			●
LSRU-115-OT-3	●				●			●	●			●
LSRU-115-OR-1.5	●			●	●	●			●			
LSRU-115-OR-2	●			●	●	●			●			
LSRU-115-UE-2			●	●	●	●	●		●			●
LSRU-115-UT-2			●		●			●	●			●
LSRU-115-UT-3			●		●			●	●			●
LSRU-115-UR-2			●	●	●	●			●			
LSRU-115-UR-3			●	●	●	●			●			
LSRU-115-OU-1.5	●		●		●				●			●
LSRU-115-OU-2	●		●		●				●			●
LSRU-115-OU-3	●		●		●				●			●
LSRX		●								●		
LSRX-C		●								●		

Part No. LSR-0

The Model LSR-0

is a self-powered load sensor intended for use as a proof relay. It is used to verify that current is flowing as intended. It has a guaranteed 15A pull-in current and 2.5A drop-out current. Proof relays are typically used to interlock fans, compressors, motors, heating elements and other devices. The LSR-0 is self-powered, that is, it draws its power from the wire being monitored so it does not require separate control power wiring.

See Appendix A, Figure 45 for a typical wiring diagram.

Specifications

Max Current Ratings ..... 135A continuous
Turn-on Threshold ..... Fixed, 15A (max.)*
Turn-off Threshold ..... 2.5A (min.)
Safety Marks ..... CSA, CSA-NRTL/C (LR46510)
Power ..... Induced from conductor
Isolation ..... 600VAC rms
Relay Output Rating ..... 480VA @ 240VAC Pilot Duty, 10A General Purpose

*Conductors may be looped for smaller motor applications.

Caution: This product should not be relied upon solely for safety of life or safety applications.

Model LSR-24

load sensor, Form C contacts to switch alarm circuits, contactors or any resistive or inductive load

The Model LSR-XXX

load sensors use current levels to determine feed rates, tool wear, loss of prime on pumps, mixer viscosity and all types of overload and underload conditions. They may also be used to stage pump motors, chillers and other machinery. These devices combine a current transformer (CT) with Form C (SPDT) relay contacts to switch alarm circuits, contactors or any resistive or inductive load. One simple screwdriver adjustment will calibrate the sensor for all single-phase or 3-phase applications up to 100hp. See Appendix A, Figure 46 for a typical wiring diagram.

Available Models:

LSR-24
LSR-115
LSR-230

Features

- *Fine adjustment with 20-turn pot*
- *Status LEDs*

Specifications

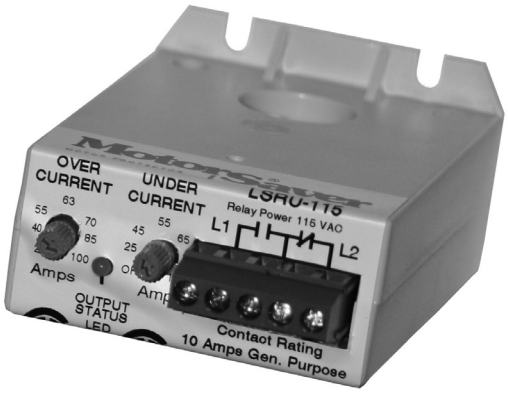
Control Power

LSR-24	24VAC
LSR-115	115VAC
LSR-230	230VAC
Max Current Ratings	135A max. continuous
Isolation	600VAC rms
Current Adjustment Range (Typical)	2-100A
Current Adjustment Range (Min-Max)	0.5-135A
Trip Setpoint	Adjustable to ±1% range
Hole Size	0.725" diameter
SPDT Relay Output	480VA @ 240VAC Pilot Duty, 10A General Purpose
Safety Marks	CSA, CSA-NRTL/C (LR46510)

Caution: This product should not be relied upon solely for safety of life or safety applications.

Model LSRU

load sensor, choice of three types of control logic and three amperage ranges



Available Models:

LSRU-24-AL-2
LSRU-24-AL-3
LSRU-115-AL-1.5
LSRU-115-AL-2
LSRU-115-AL-3
LSRU-115-FC-1.5
LSRU-115-OT-1.5
LSRU-115-OT-2
LSRU-115-OT-3
LSRU-115-OR-1.5
LSRU-115-OR-2
LSRU-115-UE-2
LSRU-115-UT-2
LSRU-115-UT-3
LSRU-115-UR-2
LSRU-115-UR-3
LSRU-115-OU-1.5
LSRU-115-OU-2
LSRU-115-OU-3

The Model LSRU

is a microcontroller-based family of load sensors. The LSRU family of products employ three basic types of control logic: motor control logic, alarm logic and feed control logic.
See Appendix A, Figure 47 for a typical wiring diagram.

Motor Control Logic

Several combinations of functions are available in the LSRU, including overcurrent and undercurrent or either overcurrent or undercurrent with variable trip, restart or extended restart delay settings. These various versions of the LSRU trip on the respective fault and then automatically reset after the restart delay expires, in preparation for the next motor start. LSRUs do not trip on undercurrent when the load turns off, this is recognized as a normal condition.

Alarm Logic

The LSRU-AL simply indicates whether the current is between the setpoints or outside of the setpoints. This product is best used with a PLC or other controller where status indication is desired.

Feed Control

The LSRU-FC is a load monitor intended to control feeder mechanisms in a variety of applications. It stops the feeder when the grinder, chipper, saw, auger, etc. nears overload. When the load is reduced to a preset level, the feeder is restarted.

O - Overcurrent Trip
U - Undercurrent Trip
T - Adj. Trip Delay (0.5-60 seconds)
R - Adj. Restart Delay (0.5-300 seconds, Manual)
E - Adj. Extended Restart Delay (2-300 minutes, Manual)

1.5 - 0-10Amps
2 - 5-25 Amps
3 - 25-100 Amps

Specifications

Control Power ..... 24VAC or 115VAC
Isolation ..... 600VAC rms
Hole Size ..... 0.725" diameter
Safety Marks ..... CSA, CSA-NRTL/C (LR46510)
Power ..... 2 Watts
Motor Acceleration Time ..... 2 seconds
SPDT Relay Output ..... 480VA @ 240VAC Pilot Duty, 10A General Purpose

Caution: This product should not be relied upon solely for safety of life or safety applications.

Model LSRX

self-powered load sensor, low-cost proof relay

The Model LSRX

is an AC current sensor designed to energize the output contact whenever 4.5 Amps or greater is present. The LSRX is used commonly as an AC current proof relay to indicate if a motor is operating. It can also be used to interlock fans, compressors and motors; to indicate equipment status such as feed rates, tool wear, loss of prime on pumps, mixer viscosity and all types of current sensing conditions or to stage pump motors, chillers, or other machinery.

This device combines a current transformer (CT), transducer and high current output relay together to switch alarm circuits, contactors and most resistive or inductive loads. The LSRX can perform the function of an auxiliary contact, yet has the advantages of universal application and isolation.

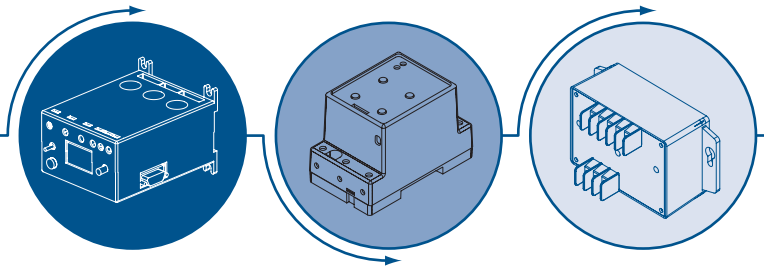
Available Models:

LSRX
LSRX-C
LSRX-OEM (10 pack)

Specifications

Operating Current	5-200A Continuous
Minimum Pull-in Current	4.5A (typical), 7.0A (max)*
Power	Induced from AC conductor
Relay Output Rating	480VA @ 240VAC, B300
	5A General Purpose
Electrical Life	$1x10^5$
Mechanical Life	$1x10^7$
Maximum Conductor Diameter	0.7 in.
Output Terminals	
LSRX	0.25" quick-connect fast-ons
LSRX-C	depluggable screw terminals
Wire Size	12-26 AWG
Torque Rating	4.5 in.-lbs.
Output Relay Status Indicator	LED
Safety Marks	
UL	UL508 Recognized (#E68520)
Weight	0.15 lbs.
Operating Temperature	-20° to 70°C (-4° to 158° F)

*Conductors may be looped for smaller motor applications.



Available Models:

T10-100 (115V)
T10-200 (230V)
T10-400 (460V)
T10S-400 (460V)

The Model T-10-(xxx)

on-delay timer is a solid-state electronic device that provides accurate and reliable timing for control circuits up to 460VAC. The T-10 features a user-selectable time delay from 6 seconds to 10 minutes (0.5 to 12 seconds on the T10S-400 model) and SPDT output contacts. When power is applied to the T-10, it immediately begins its timing cycle. During this time, the indicator LED alternates between red and green and the output contacts remain inactive. When the timing cycle is complete, the indicator LED turns solid green and the output contacts are activated. The output contacts will remain activated until power is removed from the T-10.

The SPDT contact ratings are 480V @ 240VAC on the 115V and 230V models and 470VA @ 600VAC on the 460V model.

Features

- *600V control relay on 460V models*

Specifications

3-phase line voltage
T10-100 . . . . . 115VAC
T10-200 . . . . . 230VAC
T10-400, T10S-400 . . . . . 460VAC
Frequency 50*/60Hz
Timing Range . . . . . 6 seconds to 10 minutes
T10S-400 . . . . . 0.5 seconds to 12 seconds
Repeat Accuracy
Fixed Condition . . . . . ±1%
Output Contact Rating (SPDT)
Pilot Duty . . . . . 480VA @ 240VAC (115 and 230V units)
. . . . . 470VA @ 600VAC (460V unit)
Safety Marks
UL . . . . . UL508 (#E68520)
Maximum Input Power . . . . . 5 W
Weight . . . . . 0.85 lb.

*Note: 50Hz will increase all delay timers by 20%.

Model CP-5

single-phase current monitor, adjustable trip delay, adjustable trip level, trips on undercurrent setpoint

Available Models:

CP-5-115
CP-5-460

The Model CP-5

is an undercurrent monitor designed to monitor one leg of a 3-phase system. It is commonly used as a tower monitor on center pivot irrigation systems to detect stalled or jammed towers to prevent overwatering.

The CP-5 has both an adjustable trip level and an adjustable trip delay timer. When the current is sensed, the Model CP-5 activates its output relay, thus starting the motor/pump. When the current in the monitored power line falls below the user-selectable trip point, the unit goes through a trip delay timer and then deactivates the output relay if the monitored current does not recover first.

See Appendix A, Figure 48 for a typical wiring diagram.

Features

- *Adjustable trip level*
- *Adjustable trip delay*

Specifications

Nominal Input Voltage
CP-5-115 ..... 115VAC
CP-5-460 ..... 460VAC
Frequency 50*/60Hz
Operating Points
Trip Level ..... 0-5 Amps
Trip Delay ..... 0-10 minutes
Restart ..... 1 second

Output Relay (SPDT)
Pilot Duty Contact Rating ..... 480VA @ 240VAC (115V units)
470VA @ 600VAC (460V unit)
Weight ..... 14 oz.
Safety Marks
UL ..... UL508 (#E68520)

*Note: 50Hz will increase all delay timers by 20%

Available Models:

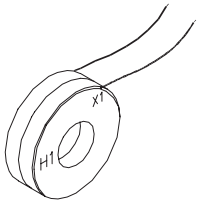
- CT-50-D-10
- CT-75-D-10
- CT-100-D-10
- CT-150-D-10
- CT-200-D-10
- CT-300-D-10
- CT-200-D-20
- CT-300-D-20
- CT-400-D-20
- CT-500-D-20

Current Transformers

SymCom offers a wide array of instrument rated current transformers.

Voltage class: 600V

BIL rating: 10kV



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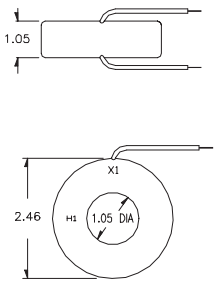

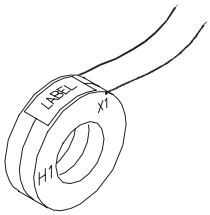

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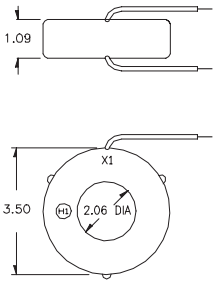

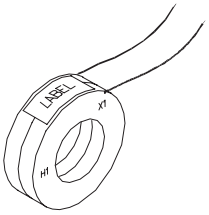

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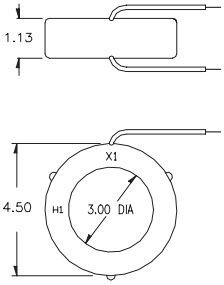


Available Models:

- CT-50-F-10
- CT-100-F-10
- CT-150-F-10
- CT-200-F-10
- CT-300-F-10
- CT-1200-F15
- CT-150-F-20
- CT-200-F-20
- CT-300-F-20
- CT-400-F-20
- CT-600-F-20
- CT-400-F-30
- CT-800-F-30

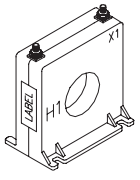
PART NUMBERS:

CT-xxx (xxx:5 current ratio)

-D/F (D-Donut Style, F-Footed Style)

-10/20/30 (10-1.0" window; 15-1.5" window; 20-2.0" window; 30-3.0" window)

BRASS TERMINALS WITH MOUNTING FEET



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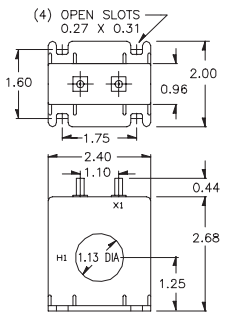

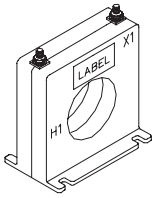

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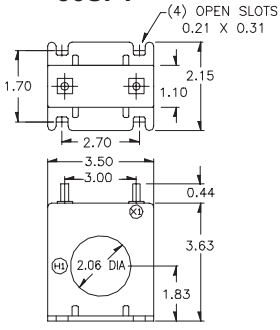

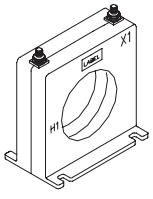

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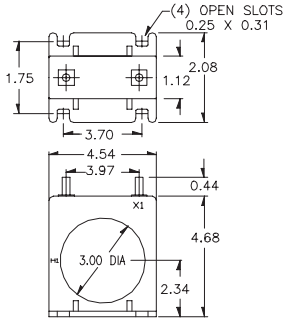


Auxiliary Products

enhanced ground fault protection, enclosures, diagnostic tool

Enclosure

Metal NEMA-3R electrical box (6" H x 6" W x 4" D) with lenses for single-phase PumpSaver® status lights

Part Number: NEMA-3R-L

The RM-1000-ENCL

is a steel enclosure for protecting a SymCom RM-1000 remote communications monitor from adverse affects of weather and vandalism, while allowing normal communications connections to the RM-1000 unit. Its superior design protects an RM-1000 from overexposure to UV sunlight as well as from hail during a storm, and it incorporates a seal around the opening in the back to seal the unit to the electrical box, keeping rain from contacting the RM-1000 connections. The enclosure also features a built-in padlock tab (padlock not included) to lock the cover to deter vandalism. (6.4" H x 6.3" W x 1.7" D)

Part Number: RM-1000-ENCL

Electronic Megohmmeter

The Model M-500 is an automatic, portable, battery-powered insulation tester. This unit is specifically designed as an inexpensive alternative to costly swing needle megohmmeters. The M-500 measures insulation resistance values of motors, generators and transformers up to 1000 megohms at 500VAC, indicating the condition of insulation on the zone scale. Its compact design and ease of use makes the M-500 a great diagnostic tool for motor rewind shops, electrical maintenance personnel and pump installers.

Part Number: M-500

Informer IR Kit

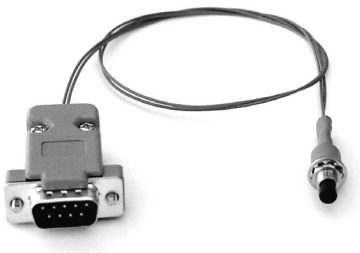
can be used with the MotorSaver® Model 455 and PumpSaver® Models 111-Insider-P and 231-Insider-P. It simply attaches to the face of the unit to provide remote diagnostics without opening the panel.

Part Number: IR Kit-36 (36" long)

The OL-RESET

allows the 777 line of MotorSaver® and PumpSaver® products to be manually reset without opening the panel door. Simply connect the module to the 777 communication port, connect a wire to each of the two applicable pins on the OL-RESET and to a normally-open push-button switch (sold separately). Mount the push-button switch in a convenient location.

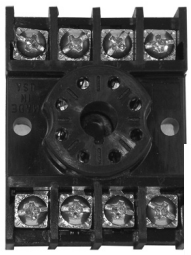
Part Number: OL-RESET



777 Manual Remote Reset Kit (24" long)

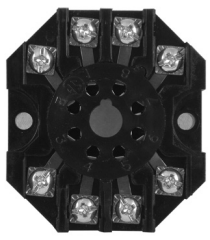
allows the 777 line of MotorSaver® and PumpSaver® products to be manually reset without opening the panel door. Simply connect the 9-pin adapter to the 777 communication port and mount the reset switch in a convenient location.

Part Number: 777-MRSW



OT08-PC

RB08-PC



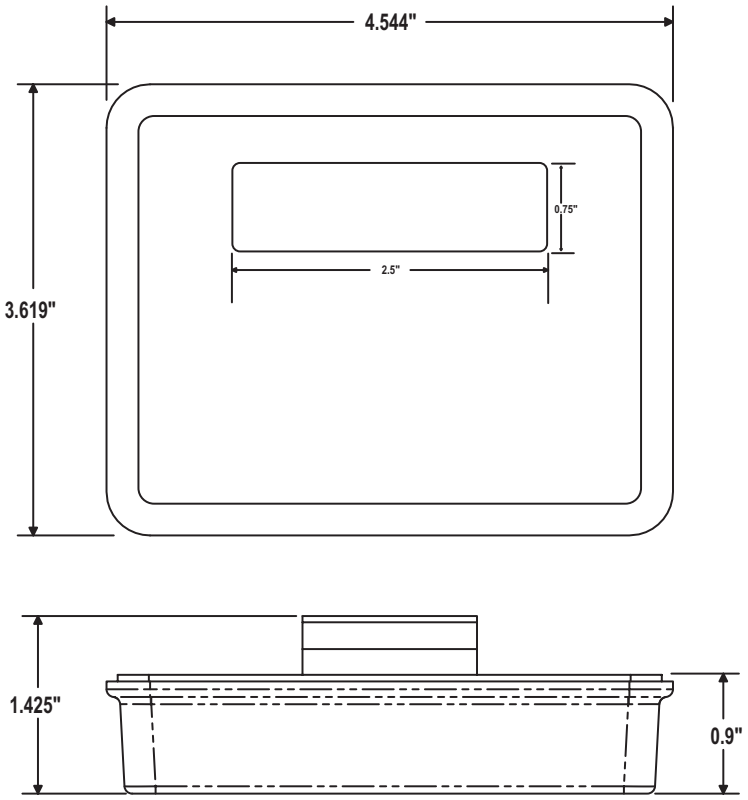
Octal Sockets

for plug-in units.

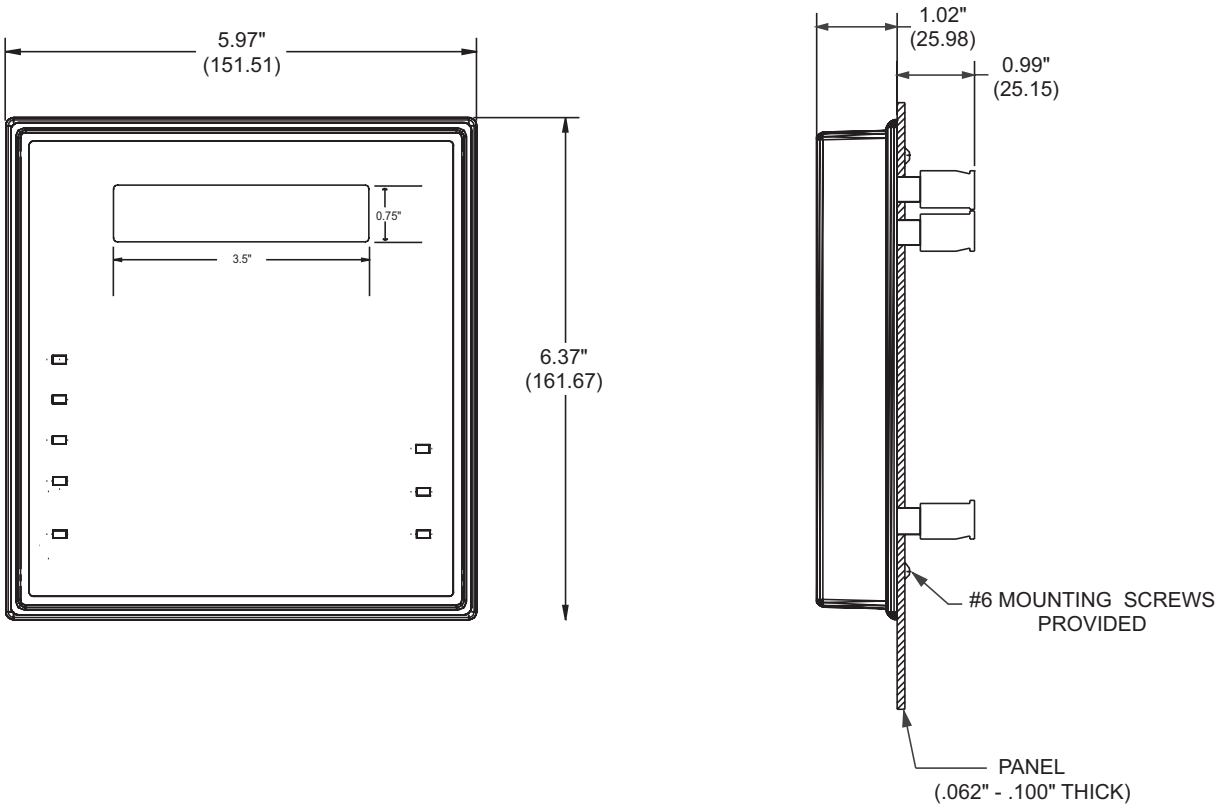
Part Numbers: OT08-PC (8-pin surface & DIN rail mountable)
RB08-PC (8-pin surface mountable)
OT11-PC (11-pin surface & DIN rail mountable)
SD12-PC (12-pin surface mountable)

Product Enclosure Dimensions

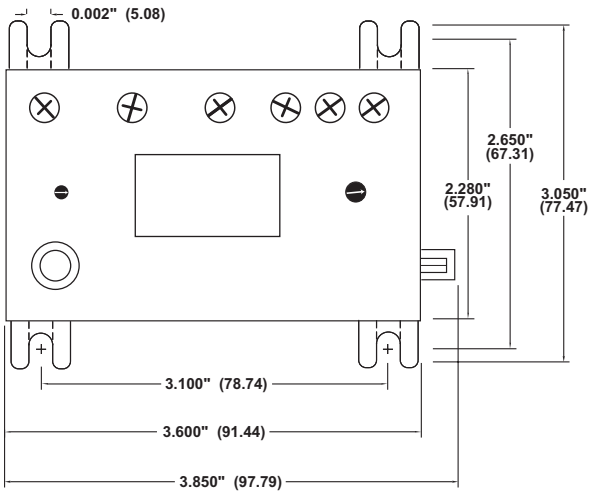
RM-1000

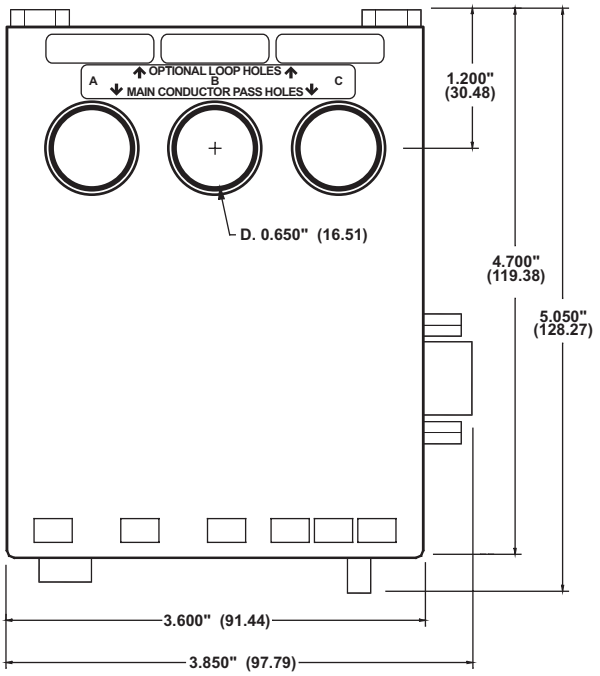


RM-2000

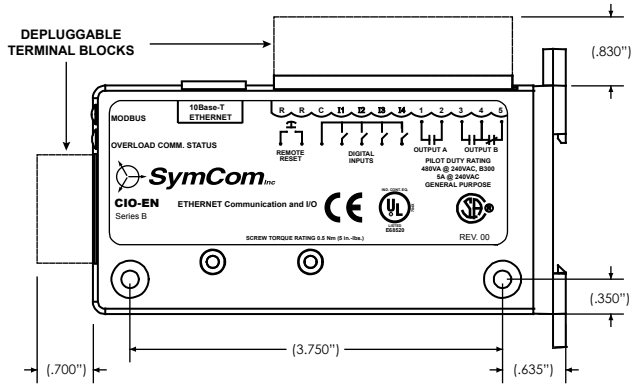


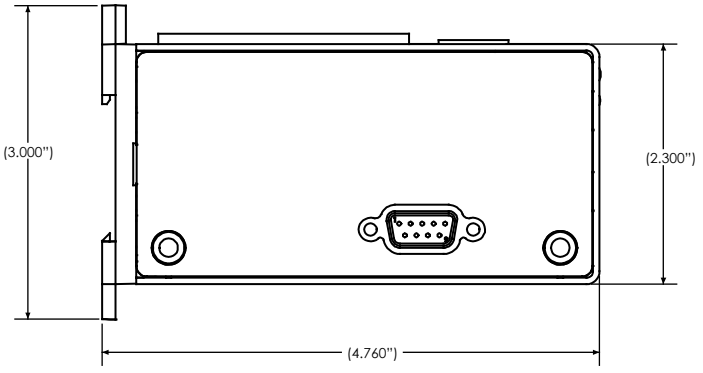
777, 77C, 601

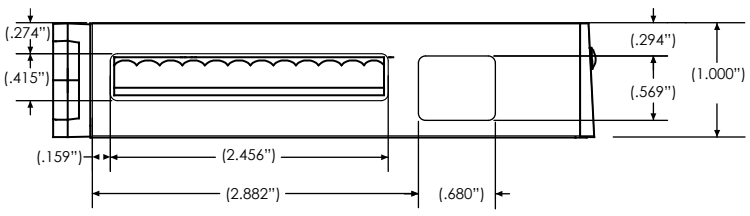


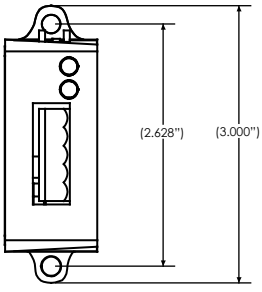


Communication Modules (CIO)



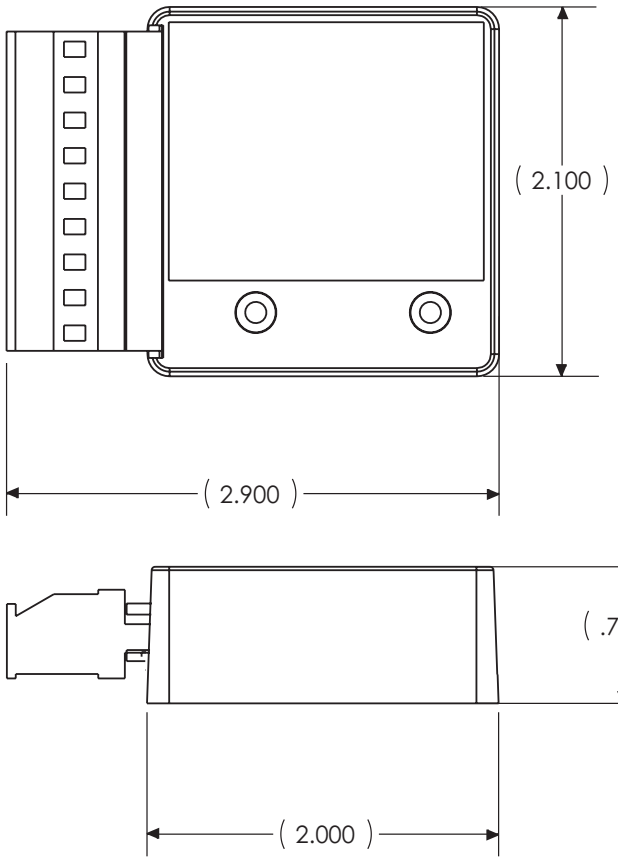






Product Enclosure Dimensions

Communication Modules (COM)



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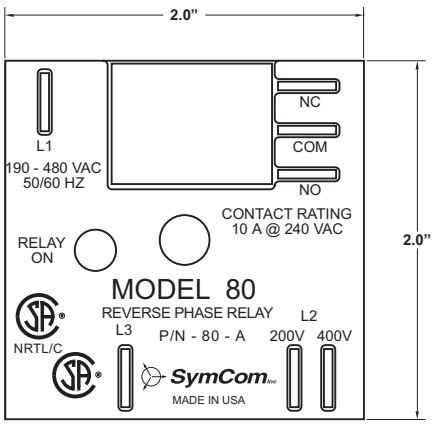
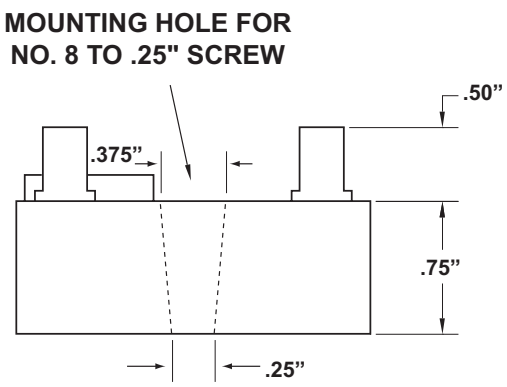
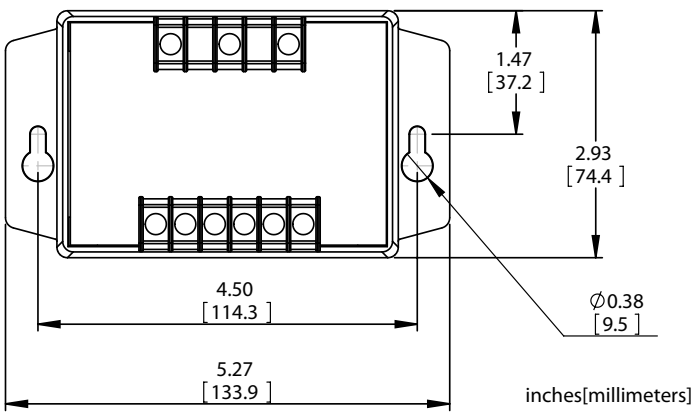
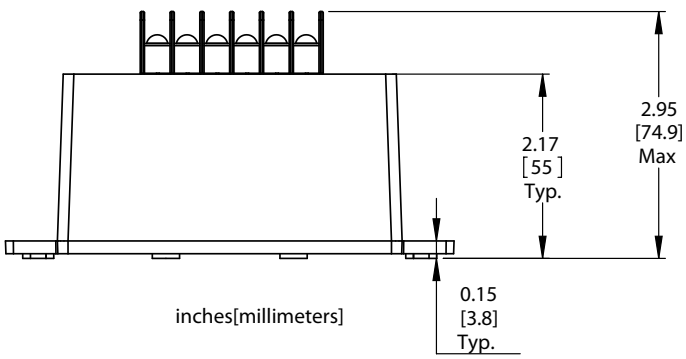


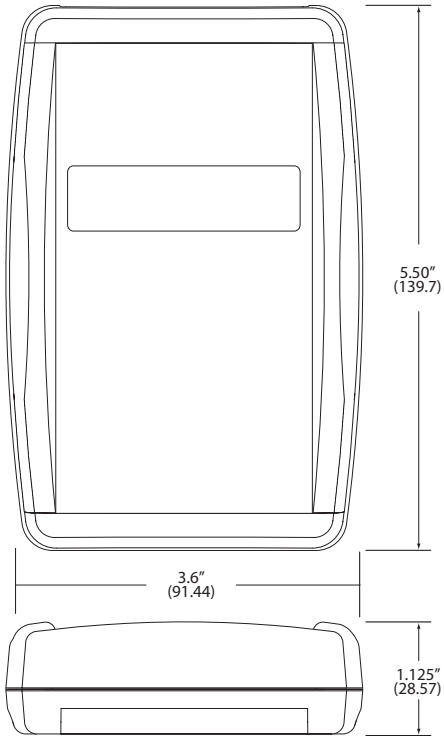


102, 250, 350, 355, 455
50R, CP-5, T10

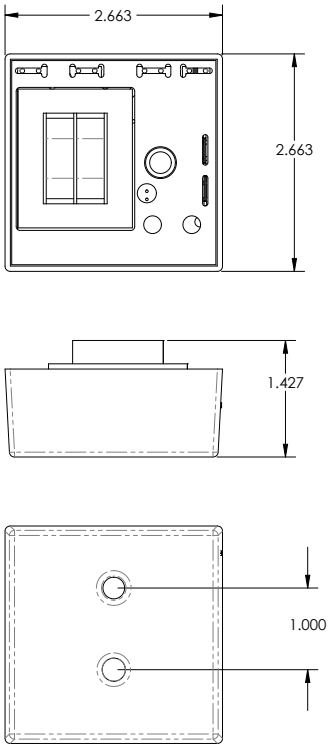




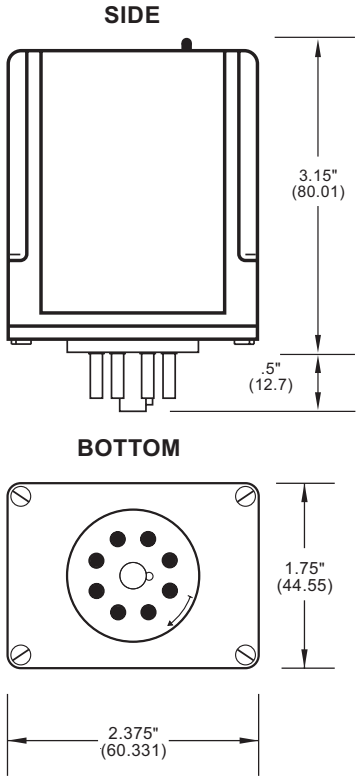
Informer, Informer-MS



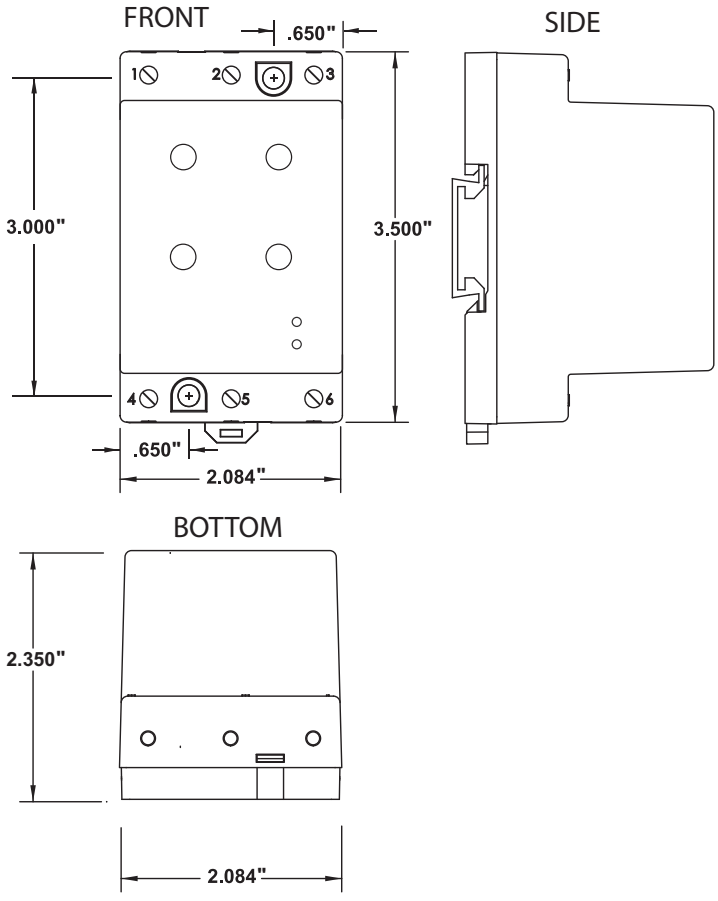
202, 202-RP, 202-SP



ALT, 201, ISS-101, PC-LLC, ACBC-120

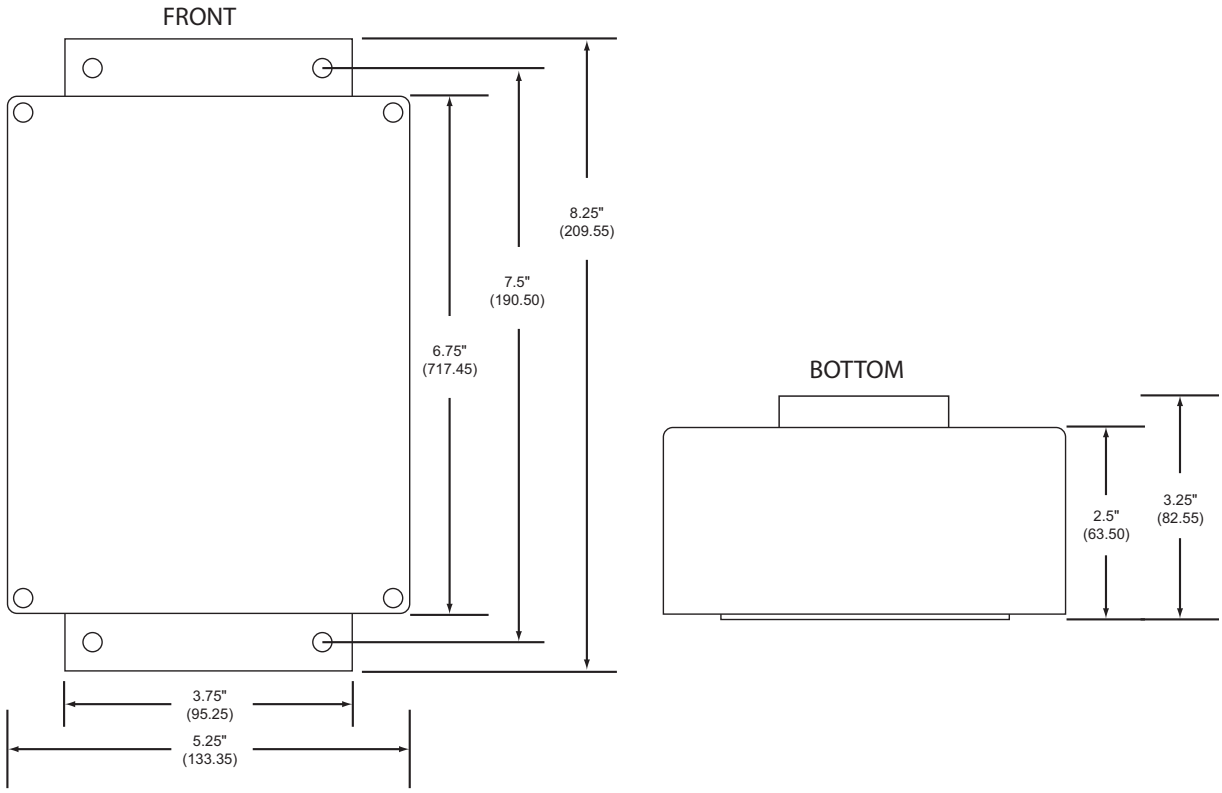


460, ISS-100, ISS-102, PC-102

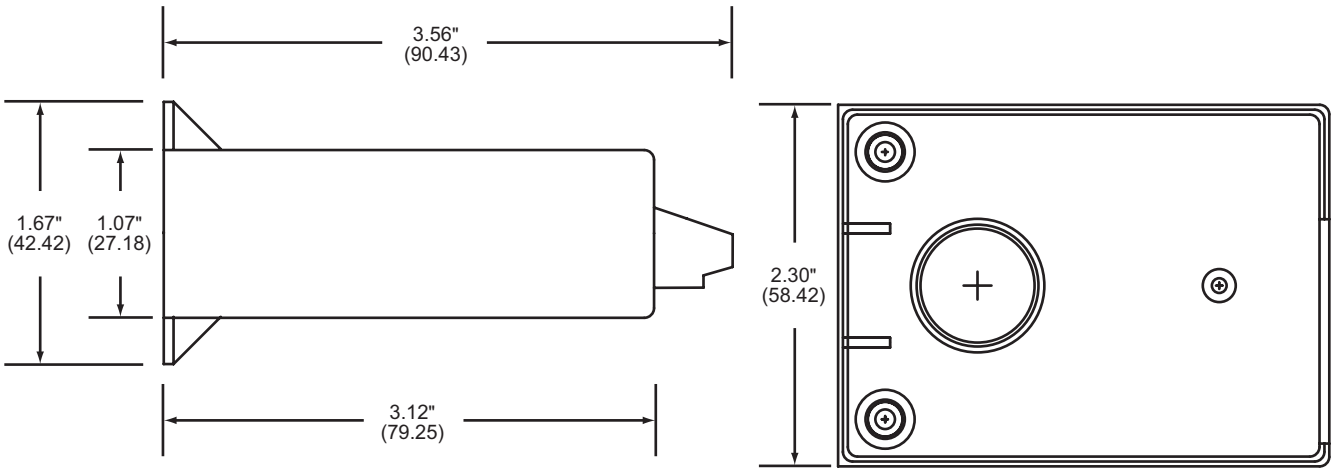


Product Enclosure Dimensions

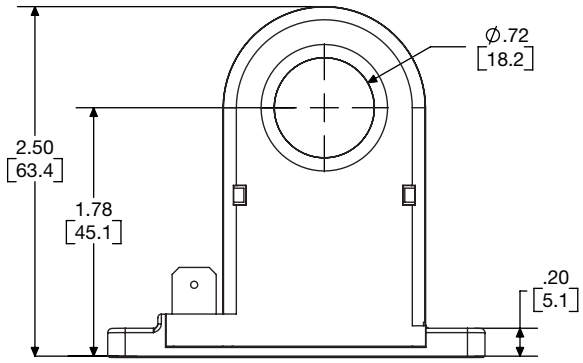
520-CP, 520-CS



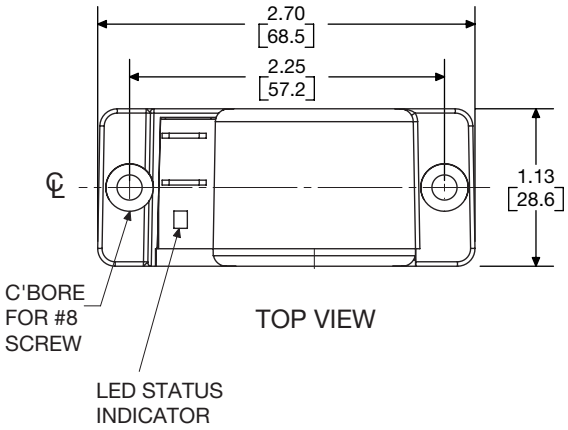
LSR, LSR-0, LS-524, LSRU



LSRX

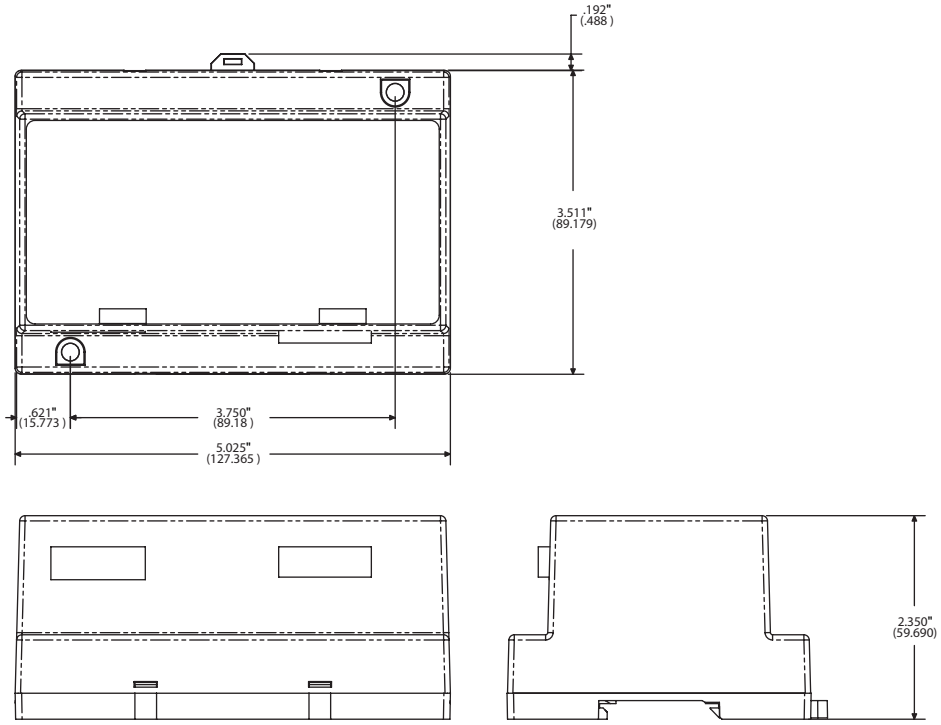


FRONT VIEW



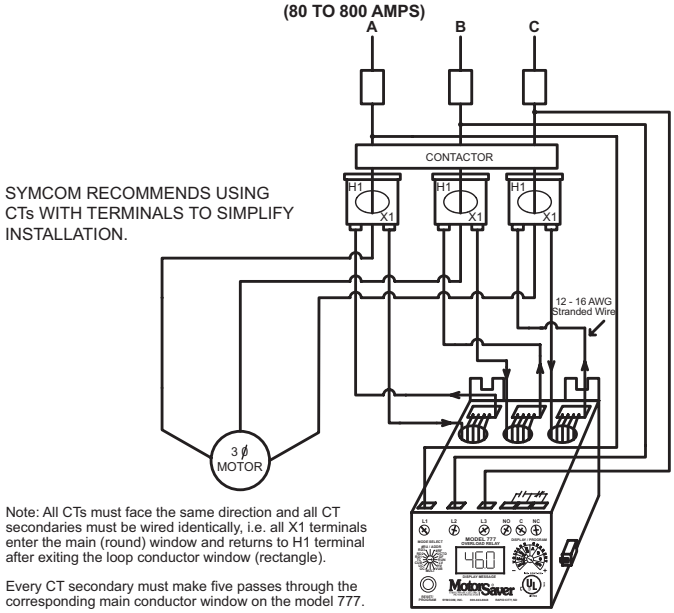
TOP VIEW

ISS-105, PC-105



Appendix A

CURRENT TRANSFORMER WIRING DIAGRAM FOR MODEL 777
(80 TO 800 AMPS)



Note: All CTs must face the same direction and all CT secondaries must be wired identically, i.e. all X1 terminals enter the main (round) window and returns to H1 terminal after exiting the loop conductor window (rectangle).

Every CT secondary must make five passes through the corresponding main conductor window on the model 777.

Figure 1

TYPICAL WIRING DIAGRAM FOR MODEL 777
(20 TO 90 amps)

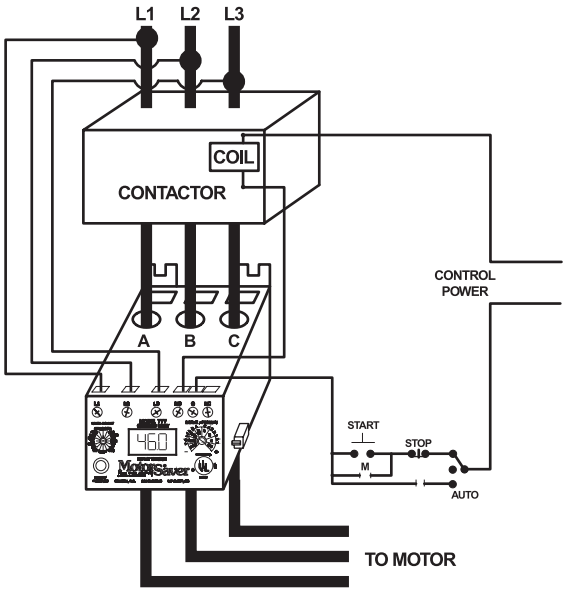


Figure 2

TYPICAL WIRING DIAGRAM FOR MODEL 77C
WITH MOTOR CONTROL

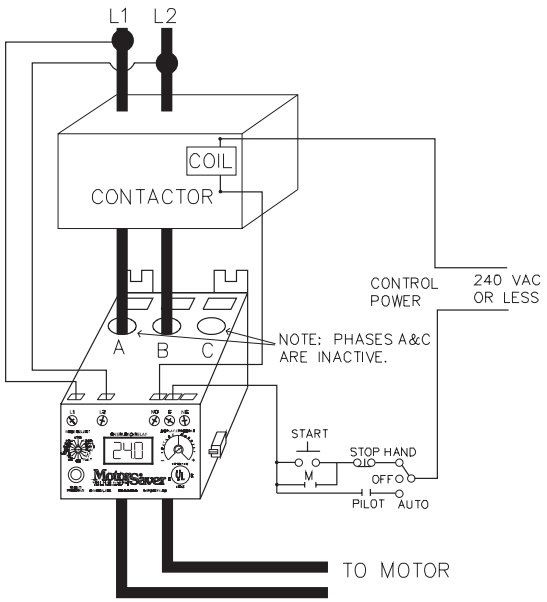


Figure 3

TYPICAL WIRING DIAGRAM FOR MODEL
77C WITH EXTERNAL CT

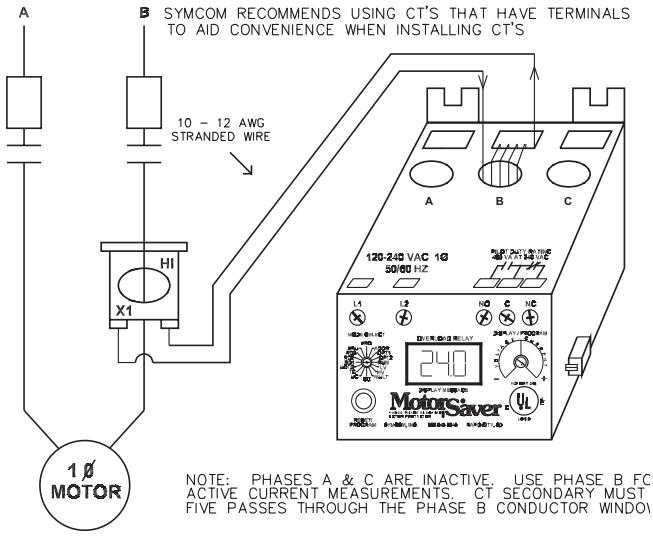


Figure 4

TYPICAL WIRING DIAGRAM FOR RM-1000

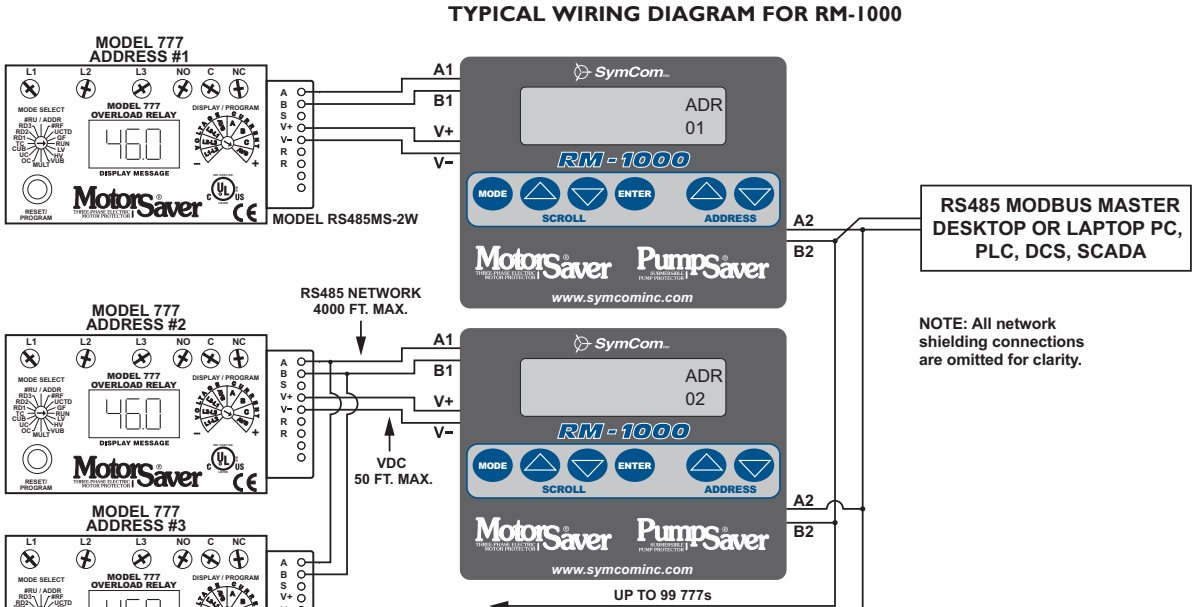


Figure 5

TYPICAL WIRING DIAGRAM FOR RM-2000

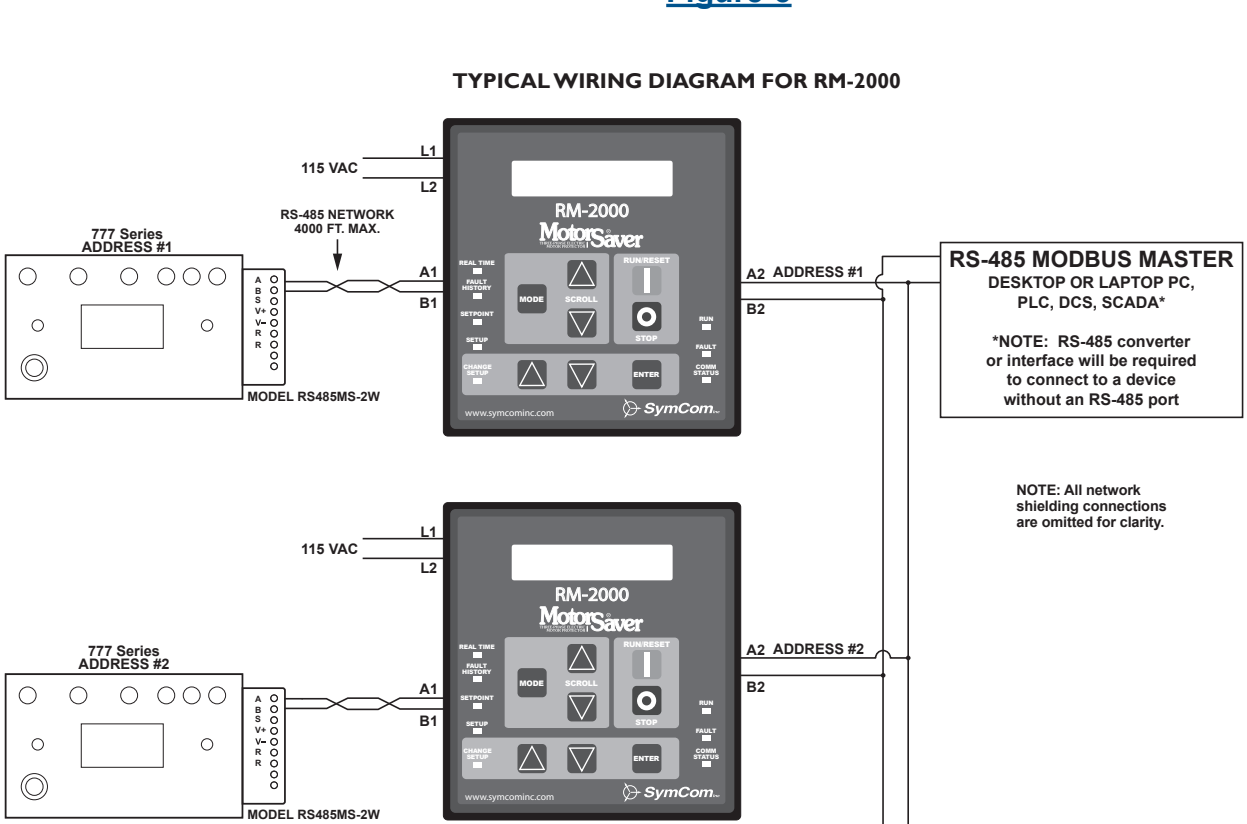


Figure 6

Appendix A

TYPICAL WIRING DIAGRAM FOR MODEL 80 (400VAC)

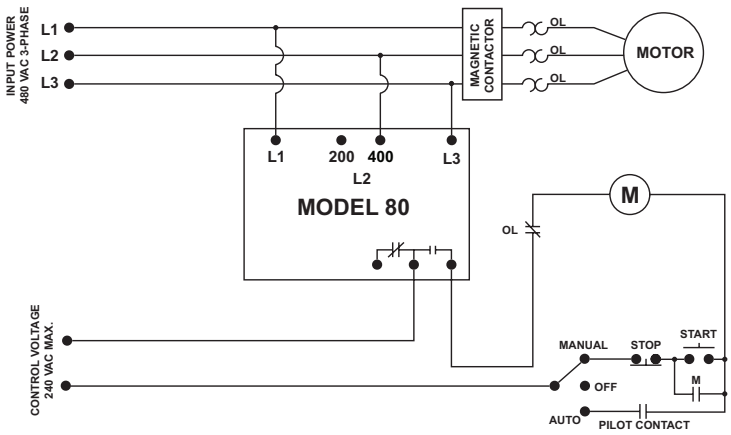


Figure 7

TYPICAL WIRING DIAGRAM FOR MODEL 80 (200VAC)

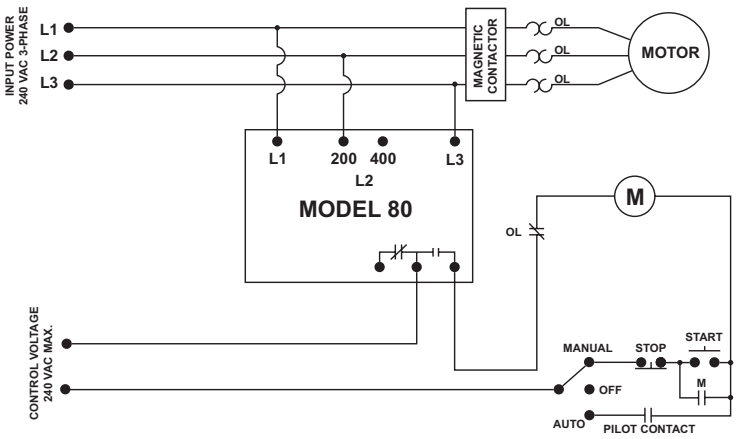


Figure 8

TYPICAL WIRING DIAGRAM FOR MODEL 102
WITH MOTOR CONTROL

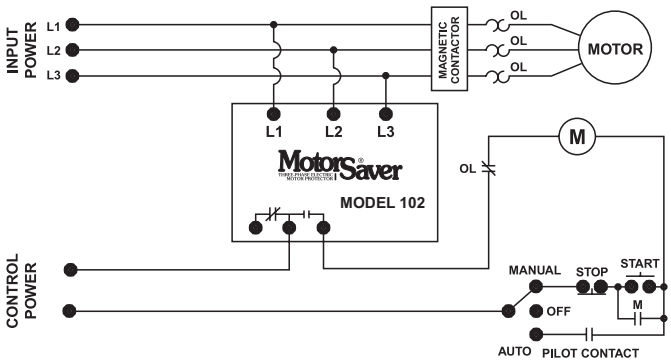


Figure 9

TYPICAL WIRING DIAGRAM FOR MODEL 102
WITH ALARM CONTROL

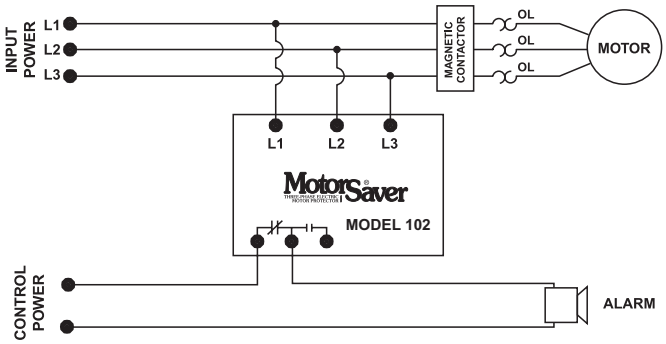


Figure 10

TYPICAL WIRING DIAGRAM FOR MODEL 201A
WITH MOTOR CONTROL

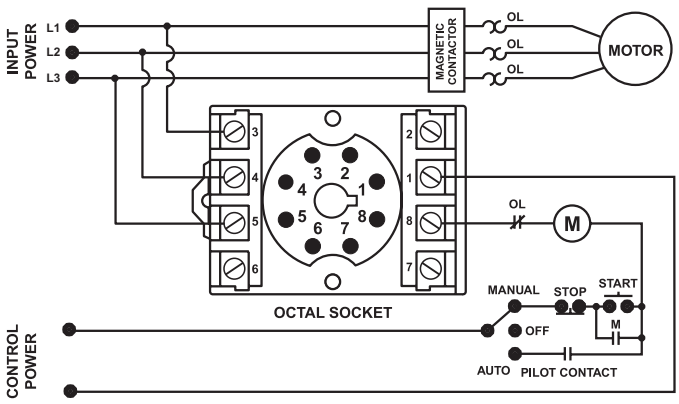


Figure 11

TYPICAL WIRING DIAGRAM FOR MODEL 201A
WITH ALARM CONTROL

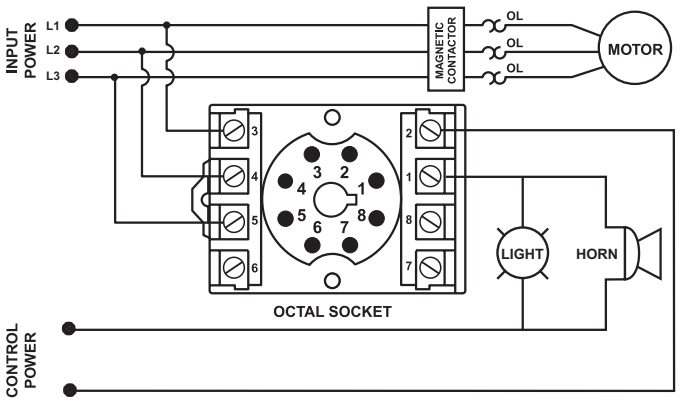


Figure 12

TYPICAL WIRING DIAGRAM FOR MODEL 201A-AU
WITH MOTOR CONTROL

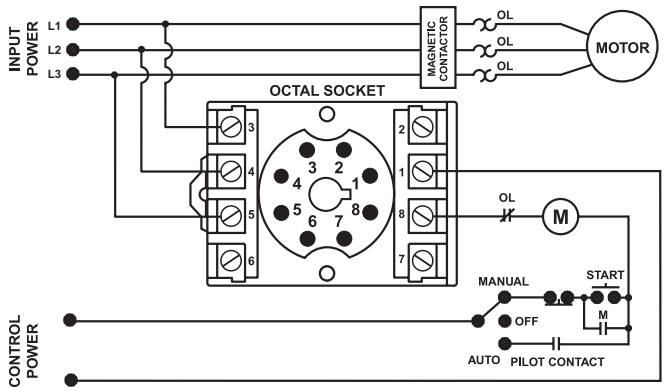


Figure 13

TYPICAL WIRING DIAGRAM FOR MODEL 201A-AU
WITH ALARM CONTROL

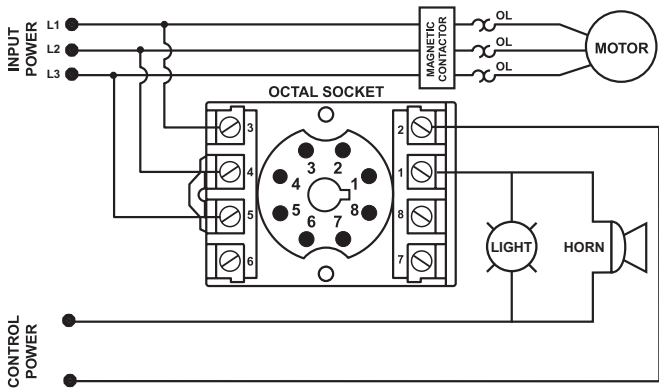


Figure 14

TYPICAL WIRING DIAGRAM FOR MODEL 201-xxx-DPDT

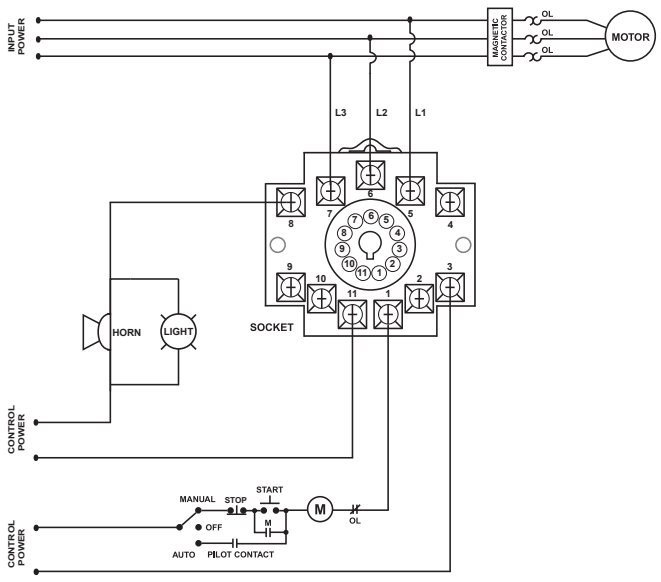


Figure 15

TYPICAL WIRING DIAGRAM FOR MODEL 202
WITH MOTOR CONTROL

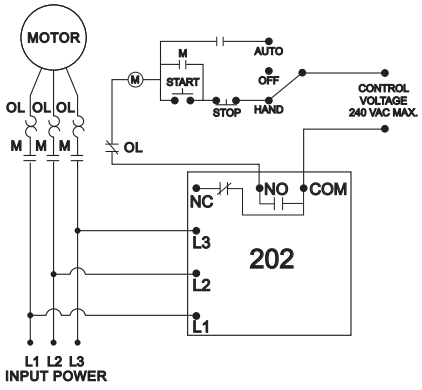


Figure 16

TYPICAL WIRING DIAGRAM FOR MODEL 202
WITH ALARM CIRCUIT

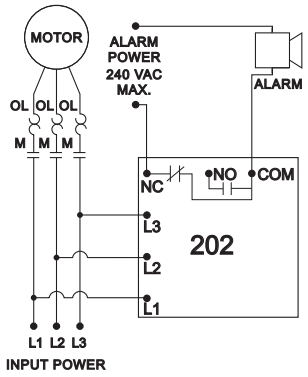


Figure 17

TYPICAL WIRING DIAGRAM FOR MODEL 250A

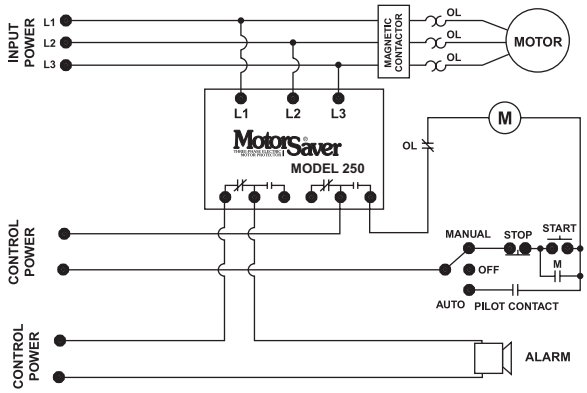


Figure 18

TYPICAL WIRING DIAGRAM FOR MODEL 350 WITH MOTOR CONTROL

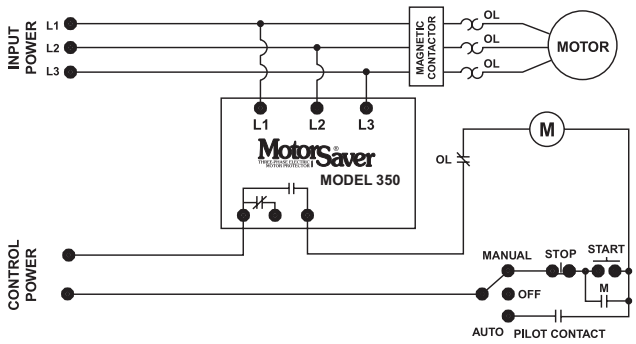


Figure 19

TYPICAL WIRING DIAGRAM FOR MODEL 355 WITH ALARM CONTROL

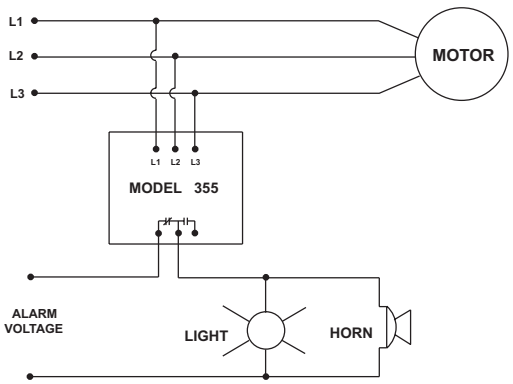


Figure 21

TYPICAL WIRING DIAGRAM FOR MODEL 455

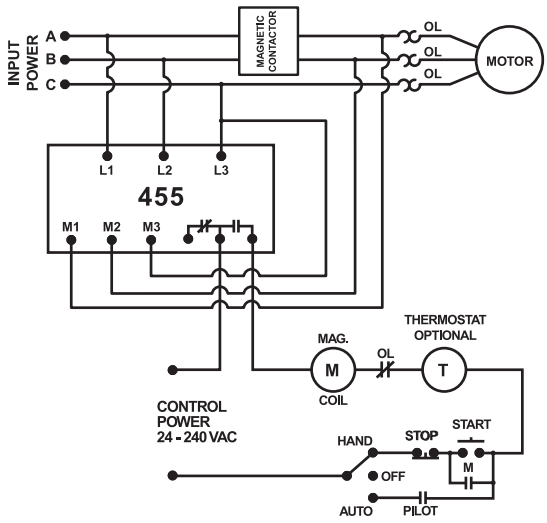


Figure 23

TYPICAL WIRING DIAGRAM FOR MODEL 355 WITH MOTOR CONTROL

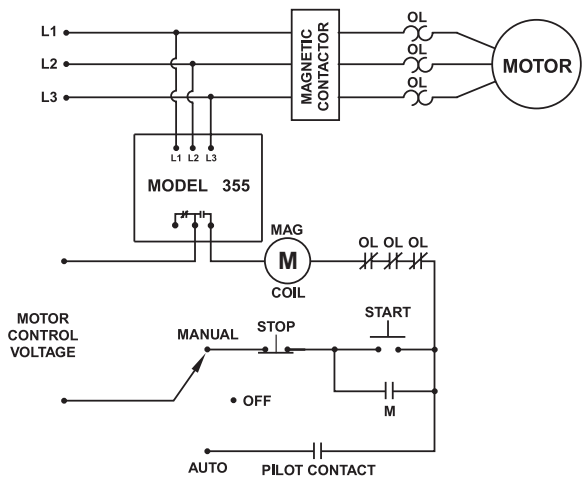


Figure 20

TYPICAL WIRING DIAGRAM FOR MODEL 455 WITH MOTOR CONTROL

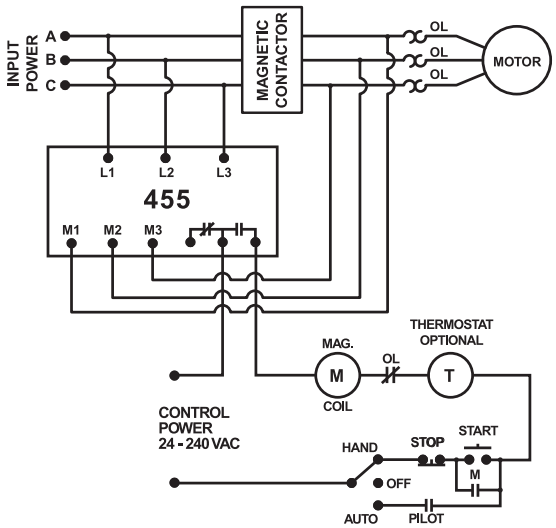


Figure 22

TYPICAL WIRING DIAGRAM FOR MODEL 460 WITH MOTOR CONTROL

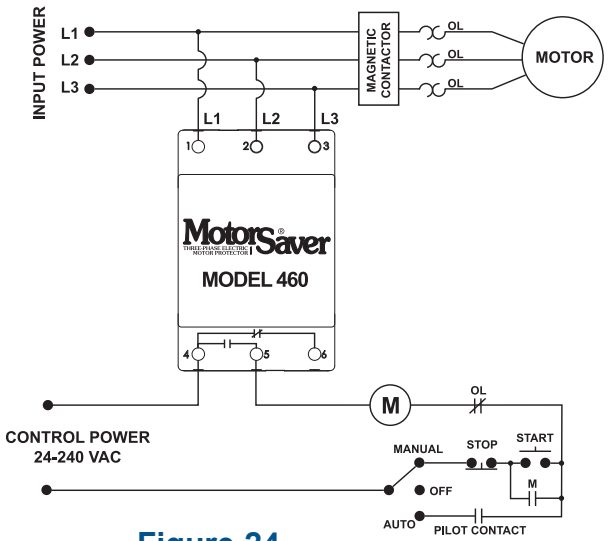


Figure 24

TYPICAL WIRING DIAGRAM FOR MODEL 460-14/15
WITH MOTOR CONTROL

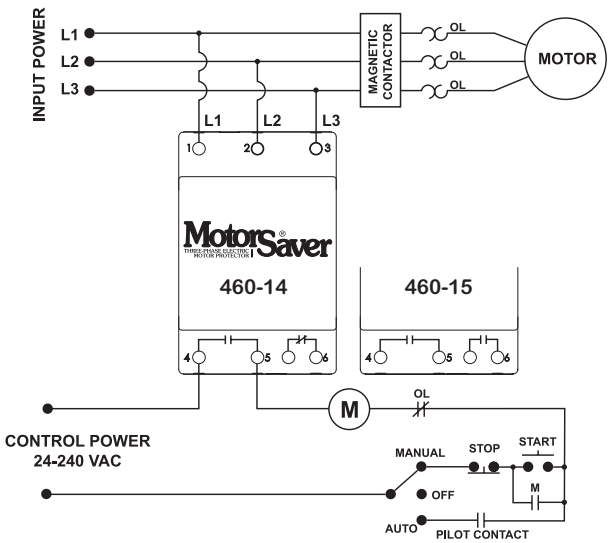


Figure 25

TYPICAL WIRING DIAGRAM FOR MODEL 601
WITH MOTOR CONTROL

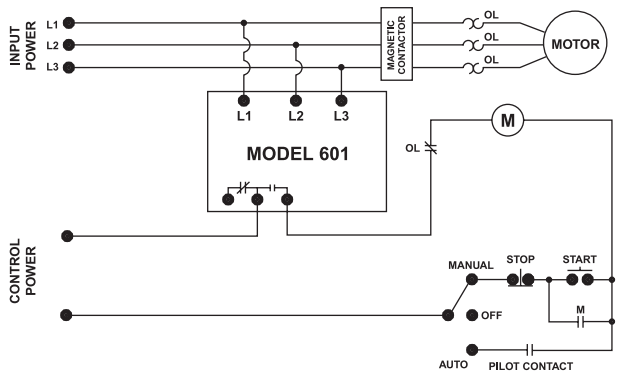


Figure 26

TYPICAL WIRING DIAGRAM FOR MODEL 50R
WITH MOTOR CONTROL

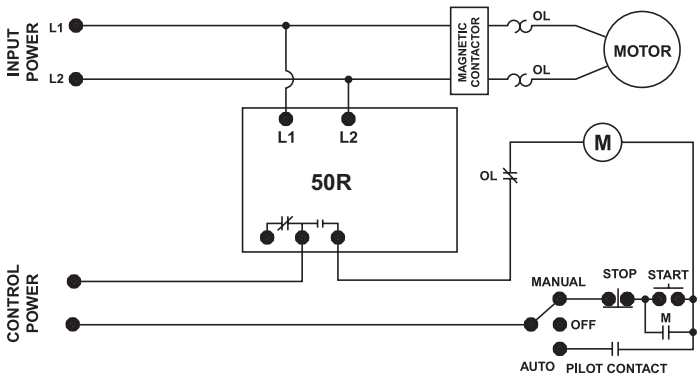


Figure 27

TYPICAL WIRING DIAGRAM FOR MODEL 201-SP
WITH MOTOR CONTROL

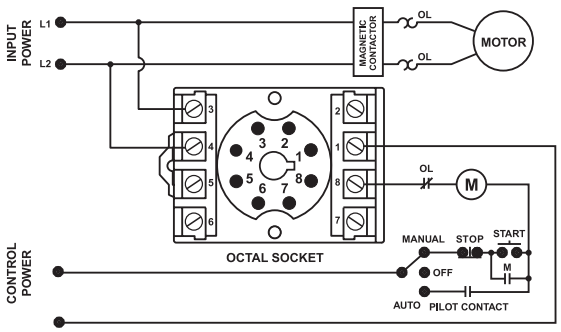


Figure 28

TYPICAL WIRING DIAGRAM FOR MODEL 201-xxx-SP-DPDT

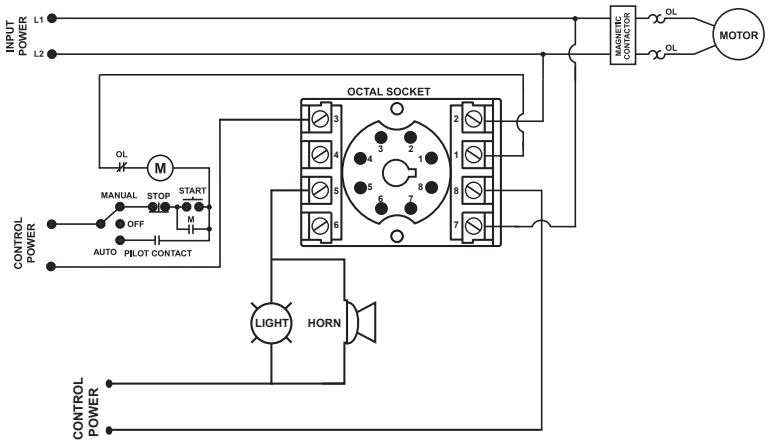


Figure 29

TYPICAL WIRING DIAGRAM FOR MODEL 202-200-SP
WITH ALARM CONTROL

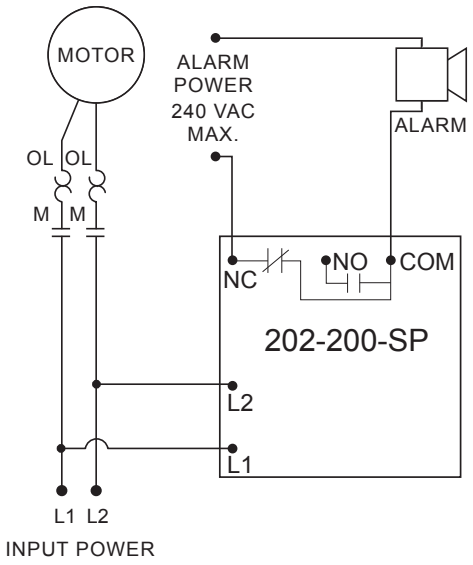


Figure 30

TYPICAL WIRING DIAGRAM FOR MODEL 202-200-SP
WITH MOTOR CONTROL

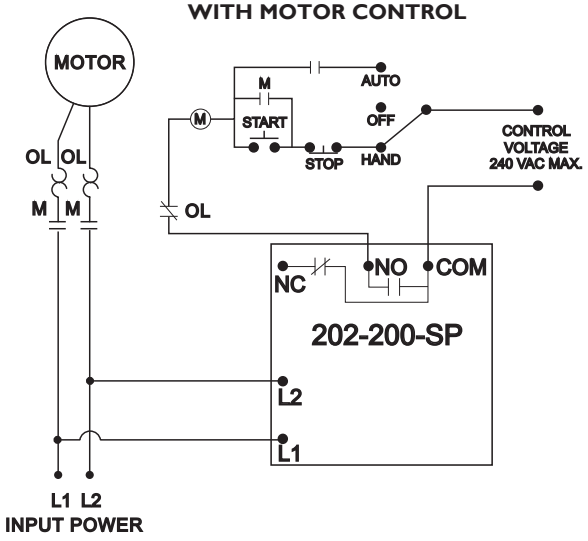


Figure 31

TYPICAL WIRING DIAGRAM FOR MODEL460-xxx-SP
WITH MOTOR CONTROL

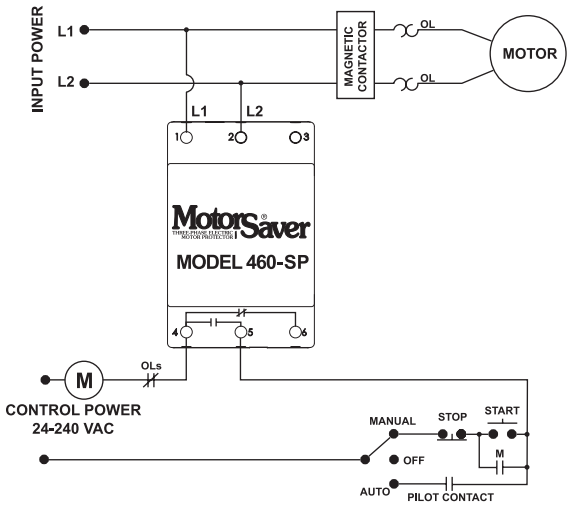


Figure 32

TYPICAL WIRING DIAGRAM FOR MODEL 520
WITH MOTOR CONTROL

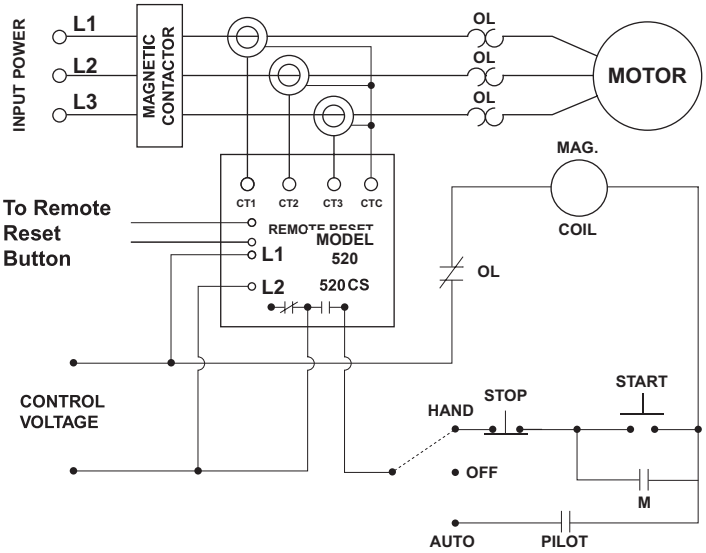


Figure 33

TYPICAL WIRING DIAGRAM FOR PC-xxx-LLC-CZ

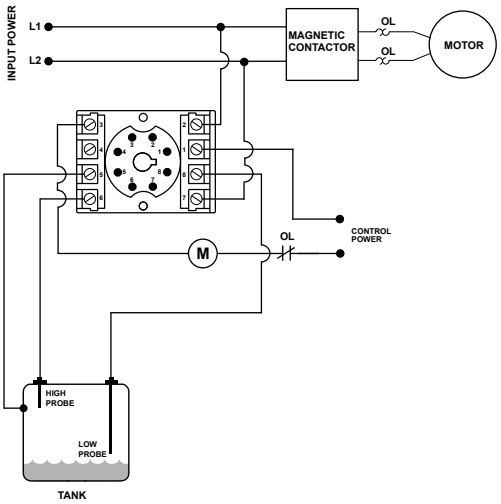


Figure 34

TYPICAL WIRING DIAGRAM FOR PC-xxx-LLC-GM

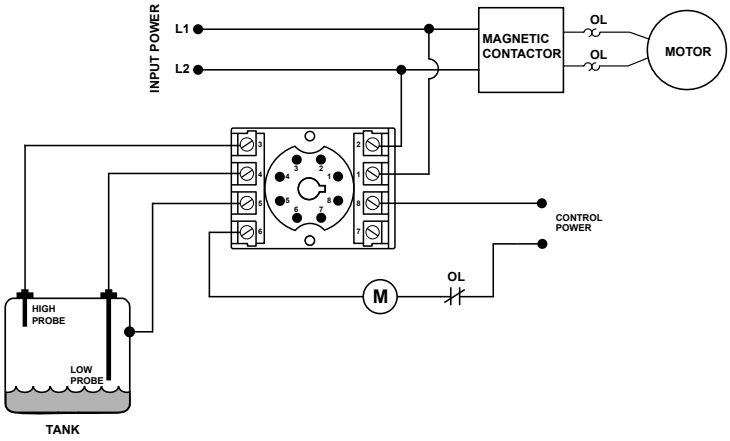


Figure35

TYPICAL WIRING DIAGRAM FOR MODEL 460-15-100-LLS

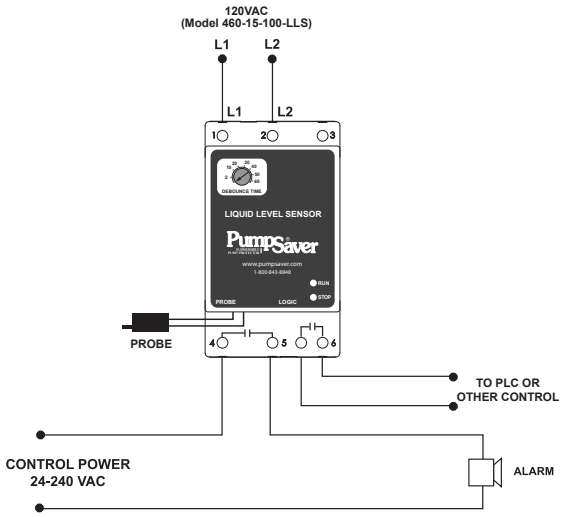


Figure 36

TYPICAL WIRING DIAGRAM FOR MODEL 460-15-100-SLD

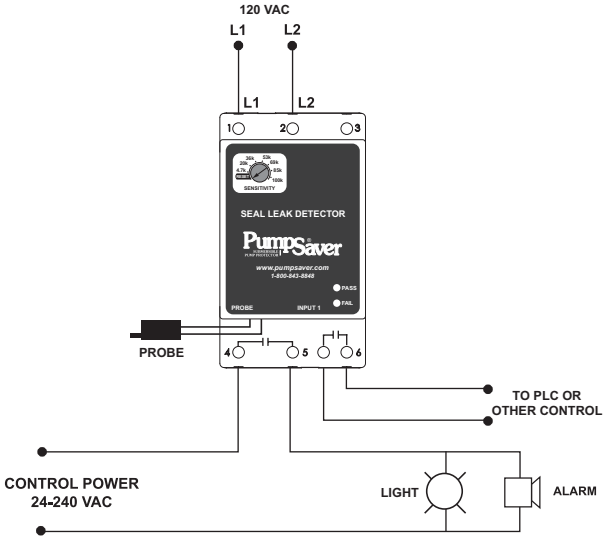


Figure 37

TYPICAL WIRING DIAGRAM FOR MODEL 201-xxx-SLD

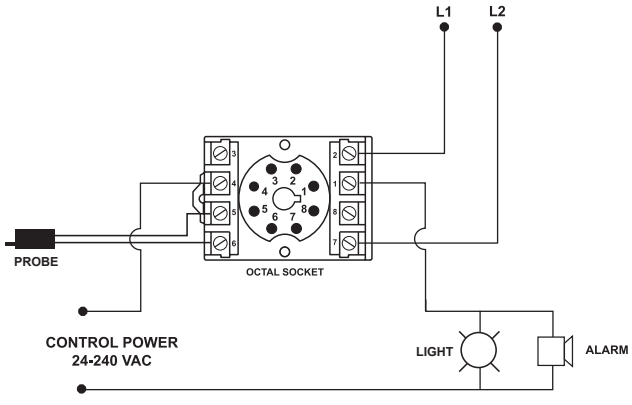


Figure 38

TYPICAL WIRING DIAGRAM FOR MODEL ALT-S

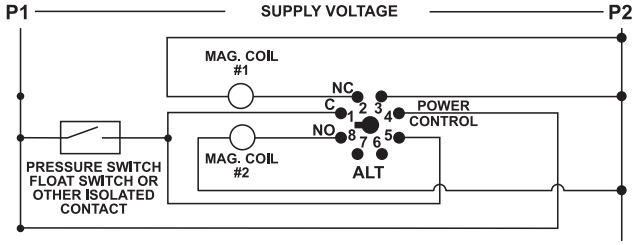


Figure 39

TYPICAL WIRING DIAGRAM FOR A MODEL ALT-X (CROSS CONNECTED)

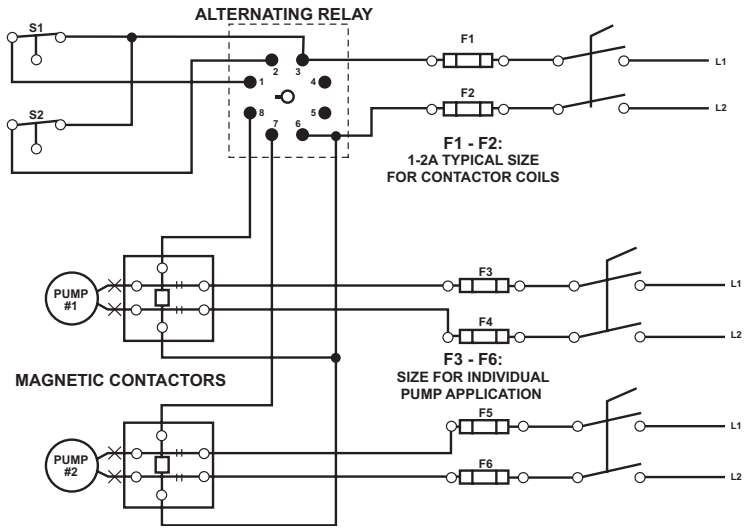


Figure 40

TYPICAL WIRING DIAGRAM FOR ALT-xxx-1-SW

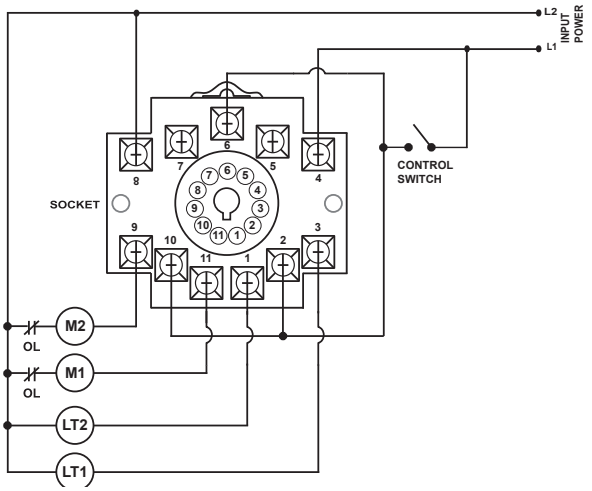


Figure 41

TYPICAL WIRING DIAGRAM FOR ALT-xxx-3-SW

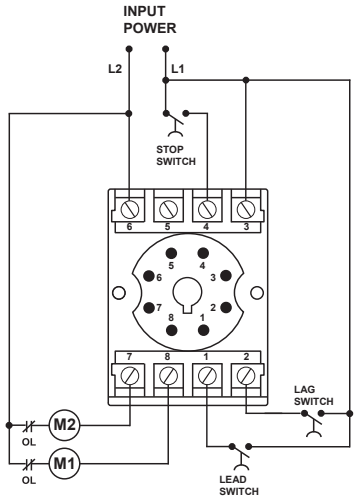


Figure 42

TYPICAL WIRING DIAGRAM FOR MODEL 50R-400-ALT

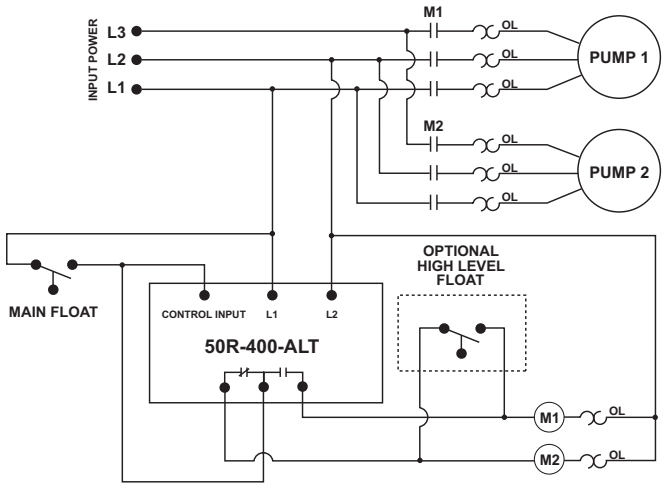


Figure 43

TYPICAL WIRING DIAGRAM ACBC-120

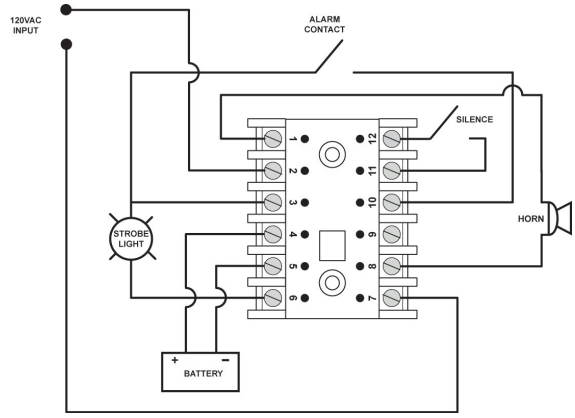
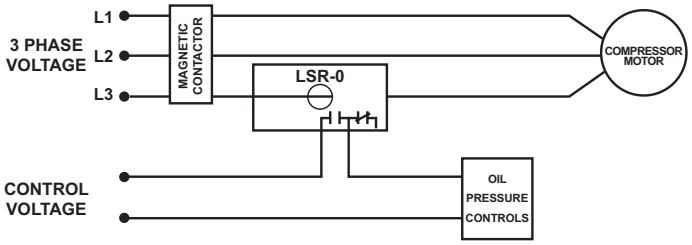


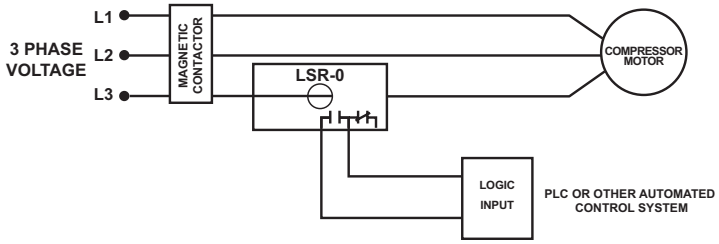
Figure 44

TYPICAL WIRING DIAGRAMS FOR MODEL LSR-0

TYPICAL WIRING DIAGRAM FOR REFRIGERATION AND OIL FAILURE CONTROL



TYPICAL WIRING DIAGRAM FOR BUILDING AUTOMATION



TYPICAL WIRING DIAGRAM FOR BUILDING AUTOMATION

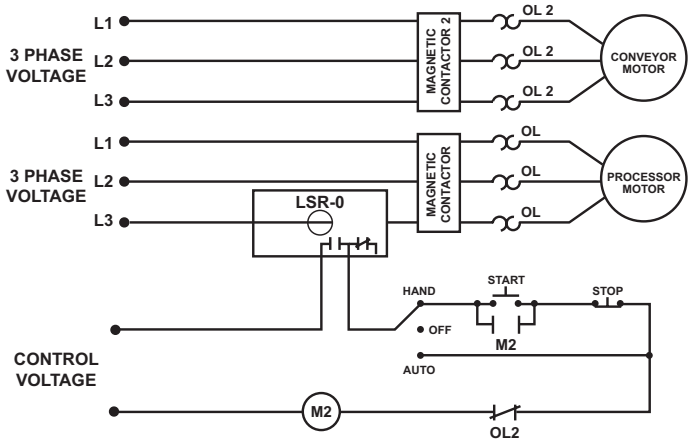
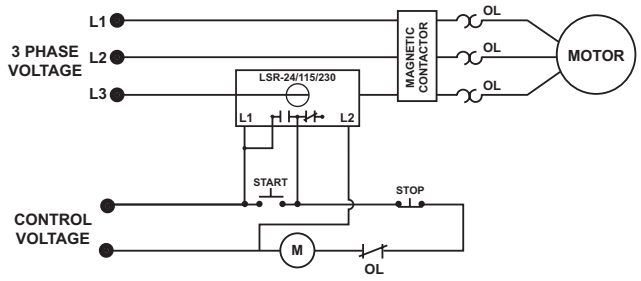


Figure 45

TYPICAL WIRING DIAGRAM FOR LOAD LOSS DETECTION



TYPICAL WIRING DIAGRAM FOR OVERLOAD DETECTION

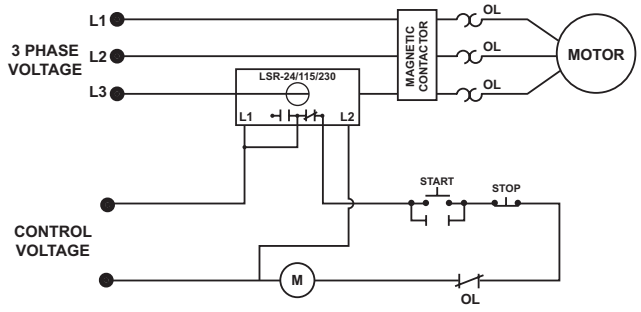


Figure 46

TYPICAL WIRING DIAGRAM FOR MODEL LSRU

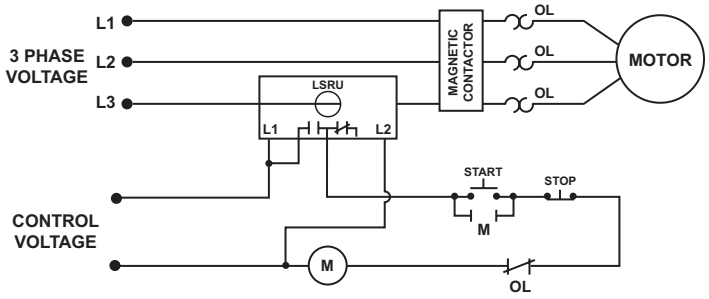


Figure 47

TYPICAL WIRING DIAGRAM FOR MODEL CP-5

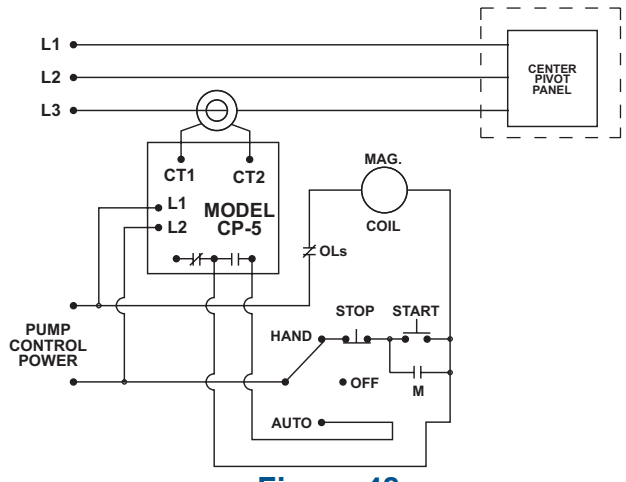


Figure 48

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