

# Motor and Pump Protection Relays

## 777 Series

### 3-Phase Current & Voltage Monitor



## Description

The 777 unit is a fully-programmable, electronic overload relay designed to protect any motor drawing 2-800 full load A (external CTs are required above 90 A). The 777 (family of products) is used for 3-phase, 200-480 V ac applications, with several specialized units for other voltage ranges and unique applications. Common applications include conveyor 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, voltage, phase loss and reversal, voltage and current unbalance, power monitoring, and underload based on current — all in one package. For standalone applications, the units incorporate a 3-digit LED display that is used for programming, providing real-time operational information, and displaying diagnostic codes to aid in troubleshooting a fault condition. The units also feature a communications network port that can be used with communication modules listed in the 777 accessories section to form a Modbus, DeviceNet\*, Profibus, or Ethernet network. Up to 99 units can be remotely monitored and controlled from a PC, PLC, or SCADA system, and data logging through a PC with the optional Solutions software. This capability allows for a simple, cost-effective way to meet new requirements for arc-flash safety.

\*Subtrol and DeviceNet are trademarks of their respective owners.

## Features & Benefits

| FEATURES                                         | BENEFITS                                                                                                                                                 |
|--------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Built-in display</b>                          | Visual indication for programming, viewing real-time voltage or current, and last fault code                                                             |
| <b>Programmable voltage and current settings</b> | Allows usage on wide range of systems                                                                                                                    |
| <b>3 selectable restart options</b>              | Choose from automatic, semi-automatic, or manual to best meet individual application needs                                                               |
| <b>3 programmable restart delay timers</b>       | Program separate restart delay time for rapid cycle protection, motor cool down, and dry-well recovery                                                   |
| <b>Remote display compatibility</b>              | Increases safety through remote display of real-time data and fault history without the need to open the cabinet. Aids with arc flash safety regulations |
| <b>Flexible reset</b>                            | Reset can be done through a push button on the relay or remotely with optional 777-MRSW or OL-Reset remote reset kit                                     |

## Applications

- Conveyor systems
- HVAC equipment
- Saws and grinders
- Fan motors

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### Specifications

#### Functional Characteristics

|                                                                |                                                             |
|----------------------------------------------------------------|-------------------------------------------------------------|
| Frequency                                                      | 50/60 Hz                                                    |
| TC- Overcurrent Trip Class<br>(777 Plus Series units)          | 02-60, J02-J60, L00-L60 or Off                              |
| TC- Overcurrent Trip Class<br>(77C, 777 non-Plus Series units) | 5, 10, 15, 20, 30 (J prefix enables jam protection feature) |

#### Output Characteristics

##### Output Contact Rating (SPDT - Form C):

|                                  |                         |
|----------------------------------|-------------------------|
| Pilot duty rating                | 480 VA @ 240 V ac, B300 |
| General purpose                  | 10 A @ 240 V ac         |
| Pilot duty rating for HVR models | 470 VA @ 600 V ac, B600 |

#### General Characteristics

##### Ambient Temperature Range:

|           |                                    |
|-----------|------------------------------------|
| Operating | -20 °C to 70 °C (-4 °F to 158 °F)  |
| Storage   | -40 °C to 80 °C (-40 °F to 176 °F) |

#### 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)                |
| Maximum Input Power | 10 W                                   |
| Pollution Degree    | 3                                      |
| Class of Protection | IP20                                   |
| Relative Humidity   | 10–95 %, non-condensing per IEC 68-2-3 |
| Terminal Torque     | 7 in.-lbs.                             |

#### Standards Passed

|                                                             |                                                                                  |
|-------------------------------------------------------------|----------------------------------------------------------------------------------|
| Electrostatic Discharge (ESD)                               | IEC 61000-4-2, Level 3, 6 kV contact, 8 kV air                                   |
| Radio Frequency Immunity (RFI),<br>Conducted                | IEC 61000-4-6, Level 3, 10 V/m                                                   |
| Radio Frequency Immunity (RFI),<br>Radiated                 | IEC 61000-4-3, Level 3, 10 V/m                                                   |
| Fast Transient Burst                                        | IEC 61000-4-4, Level 3, 3.5 kV input power                                       |
| Short Circuit                                               | 100 kA                                                                           |
| Surge                                                       | 61000-4-5, Level 3, 2 kV line-to-line; Level 4, 4 kV line-to-ground              |
| IEC                                                         | C62.41 Surge and Ring Wave Compliance to a level of 6 kV line-to-line            |
| ANSI/IEEE                                                   | Meets UL508 (2 x rated V +1000 V for 1 minute)                                   |
| Hi-potential Test                                           | IEC 68-2-6, 10–55 Hz, 1 mm peak-to-peak, 2 hours, 3 axis                         |
| Vibration                                                   | IEC 68-2-27, 30g, 3 axis, 11 ms duration, half-sine pulse                        |
| Shock                                                       |                                                                                  |
| Maximum Conductor Size<br>(with insulation) through 777/77C | 0.65"                                                                            |
| Dimensions                                                  | <b>H</b> 77.47 mm (3.05"); <b>W</b> 97.79 mm (3.85"); <b>D</b> 128.27 mm (5.05") |
| Weight                                                      | 1.56 lbs. (24.96 oz., 707.6 g)                                                   |
| Mounting Method                                             | Surface mount (4 - #8 screws) or DIN-rail mount                                  |

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### Certification & Compliance

|            |                              |
|------------|------------------------------|
| <b>UL</b>  | UL508, UL1053 (File #E68520) |
| <b>CSA</b> | C22.2                        |
| <b>CE</b>  | IEC 60947-1, IEC 60947-5-1   |

### Ordering Information

| MODEL             | LINE VOLTAGE | MOTOR FULL AMP RANGE                       | DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|-------------------|--------------|--------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 777-P2            | 200–480 V ac | 2–800 A (external CTs required above 90 A) | Provides low and high power trip*, linear overcurrent trip, and 480 VA @ 240 V ac output SPDT relay contacts                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| 777-LR-P2         | 200–480 V ac | 1–800 A (external CTs required above 9 A)  | Protects low range motors when wired directly or with 10-800 FLA with use of external CTs                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| 777-HVR-P2        | 340–480 V ac | 2–800 A (external CTs required above 90 A) | Provides low and high power trip*, linear overcurrent trip, and 470 VA @ 600 V ac output SPDT relay contacts. Required when a control power transformer (CPT) is not used with a 480 V system                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| 777-HVR-LR-P2     | 340–480 V ac | 1–800 A (external CTs required above 9 A)  | Provides low and high power trip*, linear overcurrent trip, and 470 VA @ 600 V ac output SPDT relay contacts. Required when a control power transformer (CPT) is not used with a 480 V system                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| 777-575-P2        | 500–600 V ac | 2–800 A (external CTs required above 90 A) | Provides low and high power trip*, linear overcurrent trip, and 480 VA @ 240 V ac output SPDT relay contacts. Used in Canada and NE USA where 575 V utility power services are common                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| 777-575-LR-P2     | 500–600 V ac | 1–800 A (external CTs required above 9 A)  | Provides low and high power trip*, linear overcurrent trip, and 480 VA @ 240 V ac output SPDT relay contacts. Used in Canada and NE USA where 575V utility power services are common                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| 777-MV-P2         | 100–240 V ac | 10–800 A with external CTs                 | Provides low and high power trip*, linear overcurrent trip, and 480 VA @ 240 V ac output SPDT relay contacts. Designed for Medium Voltage applications where both PTs and CTs are used. Has built in multipliers for 25.5, 50.5, 100.5 CTs. The voltage unbalance, single-phase and reverse phase protection can be disabled for applications where only one of the PTs are used                                                                                                                                                                                                                                                              |
| 777-HRG-P2        | 200–480 V ac | 2–90 A only                                | Provides low and high power trip*, linear overcurrent trip, and 480 VA @ 240 V ac output SPDT relay contacts. Designed for high resistance grounding systems that incorporate an external zero-sequence CT that correspond with the built in multipliers to detect ground faults                                                                                                                                                                                                                                                                                                                                                              |
| 777-LR-HRG-P2     | 200–480 V ac | 10–800 A (external CTs required, external  | Overload relays designed for high resistance grounding systems that incorporate an external zero-sequence CTs that correspond with the built in multipliers to detect ground faults                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| 777-575-HRG-P2    | 500–600 V ac | 2–90 A only                                | Provides low and high power trip*, linear overcurrent trip, and 480 VA @ 240 V ac output SPDT relay contacts. Used in Canada and NE USA where 575V utility power services are common. Designed for high resistance grounding systems that incorporate an external zero-sequence CT that correspond with the built in multipliers to detect ground faults                                                                                                                                                                                                                                                                                      |
| 777-575-LR-HRG-P2 | 500–600 V ac | 10–800 A with external CTs                 | Provides low and high power trip*, linear overcurrent trip, and 480 VA @ 240 V ac output SPDT relay contacts. Used in Canada and NE USA where 575V utility power services are common. Designed for high resistance grounding systems that incorporate an external zero-sequence CT that correspond with the built in multipliers to detect ground faults                                                                                                                                                                                                                                                                                      |
| 777-FT            | 200–480 V ac | 2–800 A (external CTs required above 90 A) | Provides linear overcurrent trip and 480 VA @ 240 V ac output SPDT relay contacts. Also known as shock relay, it is designed for fast linear trip applications. Overcurrent trip delay can be set ranging from less than 500 ms–70 seconds. Low trip delay is ideal in chain drive and drive linkage applications to prevent breaking in overload or jam situations. Other applications include sewage clarifiers, mixers, augers, and conveyors. Longer trip delay is ideal for motor test panels in rewind shops. Also includes adjustable motor acceleration time and overcurrent trip delay time when the faster linear trip mode is used |
| 777-TS            | 200–480 V ac | 2–800 A (external CTs required above 90 A) | Provides 480 VA @ 240 V ac output SPDT relay contacts. For use with Subtrol** equipped Franklin submersible motors to detect high motor temperatures                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| 777-LR-TS         | 200–480 V ac | 1–9 A only                                 | Provides 480 VA @ 240 V ac output SPDT relay contacts. For use with Subtrol** equipped Franklin submersible motors to detect high motor temperatures                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| 777-575-TS        | 500–600 V ac | 2–800 A (external CTs required above 90 A) | Provides 480 VA @ 240 V ac output SPDT relay contacts. For use with Subtrol** equipped Franklin submersible motors with nominal 500–600 V ac range to detect high motor temperatures                                                                                                                                                                                                                                                                                                                                                                                                                                                          |

\* Network programmable only

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### Accessories

#### RS485MS-2W Communication Module

(for limited Modbus capabilities) Required to enable the Modbus communications function on Model 77X-type products.

#### CIO-MB/CIO-120-MB Communication Module

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

#### CIO-DN-P/CIO-120-DN-P Communication Module

DeviceNet\* interfaces capable of providing discrete control and monitoring of motor starters, drives and other devices over a DeviceNet\* network.

#### CIO-777-PR Communication Module

Profibus interface capable of providing discrete control and monitoring of motor starters, drives and other devices over a Profibus network.

#### CIO-EN (non-POE) Communication Module

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

#### Communication Adapters

- RS485-RS232-Converter with cable & plug
- RS485-USB-Converter with cable & plug
- RS232-USB-Converter

Specifications match industry standard.

#### RM1000 Remote Monitor

The RM1000/777 motor management system combines unsurpassed electronic motor protection and critical, user-friendly, motor monitoring for up to 16 devices.

#### RM2000 Remote Monitor

The RM2000/777 motor management system combines unsurpassed electronic motor protection and critical, user-friendly, motor monitoring with event storage and real-time clock for date and time stamp.

#### Solutions Software: Solutions-M

Software features include data logging, real-time data monitoring and fault and event monitoring.

#### 777-MRSW Manual Remote Reset Kit

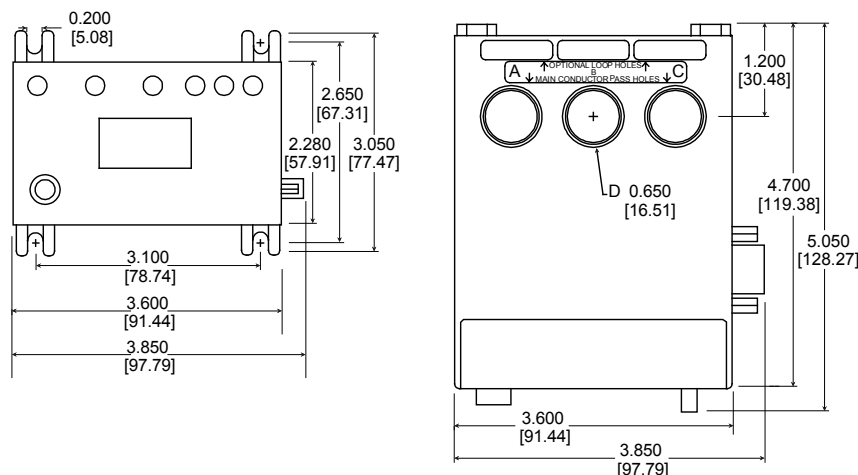
Allows the 777 line of MotorSaver® and PumpSaver® products to be manually reset without opening the panel door.

#### OL-Reset Manual Remote Reset Kit

Allows the 777 line of MotorSaver® and PumpSaver® products to be manually reset without opening the panel door.

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### Dimensions Inches (mm)

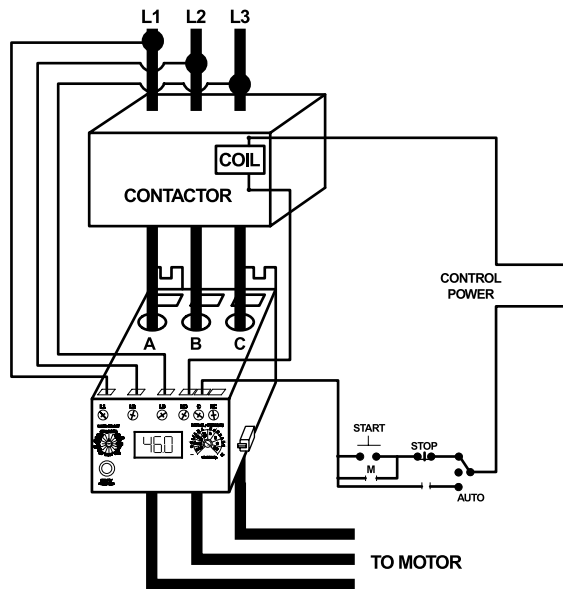


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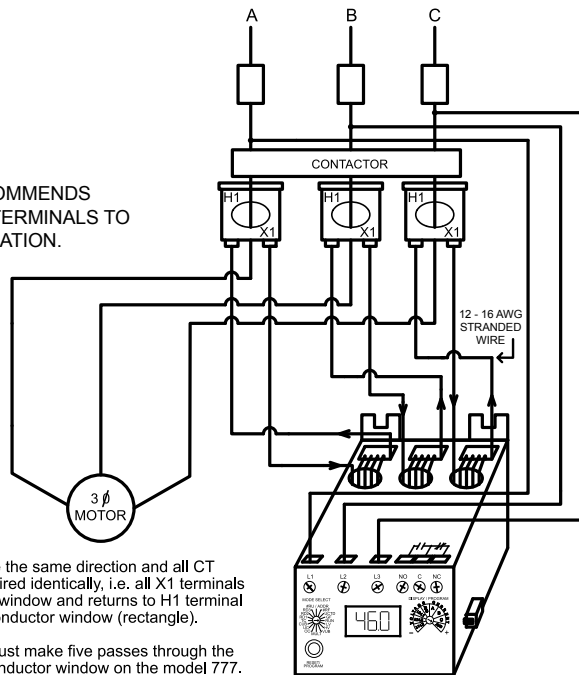
### Wiring Diagram

TYPICAL WIRING DIAGRAM FOR MODEL 777 (2–90 A)



CURRENT TRANSFORMER WIRING DIAGRAM FOR MODEL 777 (80–800 A)

LITTELFUSE RECOMMENDS USING CTs WITH TERMINALS TO SIMPLIFY INSTALLATION.



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.

Every CT secondary must make a single pass through the corresponding main conductor window on the LR versions of the 777 Plus Series.

**Disclaimer Notice** – Information furnished is believed to be accurate and reliable. However, users should independently evaluate the suitability of and test each product selected for their own applications. Littelfuse products are not designed for, and may not be used in, all applications. Read complete Disclaimer Notice at [www.littelfuse.com/product-disclaimer](http://www.littelfuse.com/product-disclaimer).