

# proSense™ Phase Monitor Relays

by AUTOMATIONDIRECT



**PMRU**



**PMRR**



**PMRRL**

## Phase Monitor Relays

Phase monitor relays provide protection against premature equipment failure caused by voltage faults on 3-Phase systems. All ProSense phase monitor relays are designed to be compatible with typical Wye or Delta systems. Phase monitor relays protect against single phasing regardless of any regenerative voltages.

### PMRU Series

The PMRU Series phase monitor relays utilize a microprocessor-based design to provide protection against phase loss, phase reversal, phase unbalance, undervoltage and overvoltage. The PMRU is a universal voltage product that works on any 3-phase system voltage from 208 to 480V. These devices are designed to be compatible with typical Wye or Delta systems. In Wye systems, a connection to a neutral is not required. PMRU Series products protect against unbalanced voltages or single phasing regardless of any regenerative voltages.

The relay is energized when the phase sequence and all voltages are correct. Any one of five fault conditions will de-energize the relay. Re-energization is automatic upon correction of the fault condition. A manual reset option is available if a momentary N.C. switch is wired to the appropriate terminals (See "Manual Reset" wiring diagram on page 5). A multi-color LED indicates normal condition and also provides specific fault indication to simplify troubleshooting.

The PMRU Series offers a variety of user-adjustable settings. The percent phase unbalance is adjustable from 2 to 10% and also has a "Disable" setting for those applications where poor voltage conditions could cause nuisance tripping. The undervoltage drop-out can be set at 80 to 95% of operating voltage (overvoltage setting is fixed at 110% of nominal). The adjustable time delay

drop-out on undervoltage (0.1 to 20 seconds) eliminates nuisance tripping caused by momentary voltage fluctuations. There is also an adjustable time delay (1 to 300 seconds) on both power up and restart after a fault has been cleared.

### PMRR Series

The PMRR Series phase monitor relays provide protection against phase reversal in a compact low-cost design. One relay will work on any 3-phase system from 208V to 480V. This relay is designed to be compatible with most Wye or Delta systems. In Wye systems, a connection to a neutral is not required.

The relay is energized and the LED on when the sequence is correct. Any fault will de-energize the relay and turn off the LED. Re-energization is automatic upon correction of the fault condition.

### PMRRL Series

The PMRRL Series phase monitor relays provide protection against phase loss, phase reversal and undervoltage. These relays are designed to be compatible with typical Wye or Delta systems. In Wye systems, a connection to a neutral is not required. Phase monitor relays protect against single phasing regardless of any regenerative voltages.

The relay is energized and the LED is on when all three phases are present in the correct sequence at a voltage level above the undervoltage setting. The undervoltage drop-out can be set at 75 to 95% of operating voltage. Any fault will instantaneously de-energize the relay and turn off the LED. Re-energization is automatic upon correction of the fault condition.

## Reference Guide

The reference guide below provides general information on the different versions of Phase Monitor Relays offered by AutomationDirect.com (see Product Selection on the following pages for further details).

Series	Mounting Style	Phase Loss	Phase Reversal	Phase Unbalance	Under Voltage	Over Voltage	Time Delay on Undervoltage	Approvals*	See Page
PMRR	Plug-in*		✓					cURus	3
PMRRL	Plug-in*	✓	✓		✓ (adj.)		50 ms fixed	cURus	3
PMRU	Plug-in*	✓	✓	✓ (adj.)	✓ (adj.)	✓ (fixed)	0.1-20 seconds	cURus, CE	3

\* In addition to the above approvals, all plug-in products are also UL Listed when used with the appropriate (70169-D) socket.

# prSense™ Phase Monitor Relays

AutomationDirect

## Features

### PMRU

- Universal voltage range of 208 to 480VAC, 3-phase systems
- Protects against phase loss, phase reversal, phase unbalance, undervoltage and overvoltage
- Variety of user-selectable and adjustable settings for flexibility in 3-phase protection
- Automatic or Manual Reset
- Multi-Color LED indicates normal condition and provides fault indication to simplify troubleshooting
- Compact plug-in case utilizing industry-standard 8-pin octal socket
- 10A SPDT output contacts

### PMRR

- Protects against phase reversal
- Works with 208-480V 3-phase systems
- LED indicates both normal and fault conditions
- Compact plug-in case utilizing industry-standard 8-pin octal socket
- 10A SPDT output contacts

### PMRRL

- Protects against phase loss, phase reversal and undervoltage
- Undervoltage setting is adjustable from 75-95% of nominal
- LED indicates both normal and fault conditions

- Compact plug-in case utilizing industry-standard 8-pin octal socket
- 10A SPDT output contacts

### Agency Approvals

- cURus, File number E191059
- UL Listed, File number E191059
- CE, EN60947-1, EN60947-5-1 (PMRU Series Only)
- RoHS



ProSense Series Phase Monitor Relays					
Part Number	Description	Pcs/Pkg	Wt (lb)	Price	Use With
<b>PMRU-1C-480A*</b>	Phase monitor relay, provides protection against phase reversal, phase loss, phase unbalance, undervoltage, and overvoltage; 10A SPDT output contacts, 8-pin octal base. Works with 3-phase systems from 208V to 480V.	1	0.4	<--->	70169-D or 750-2C-SKT
<b>PMRR-1C-480A*</b>	Phase monitor relay, provides protection against phase reversal; 10A SPDT output contacts, 8-pin octal base. Works with 3-phase systems from 208V to 480V.	1	0.3	<--->	70169-D or 750-2C-SKT
<b>PMRRL-1C-208A</b>	Phase monitor relay, provides protection against phase reversal, phase loss and undervoltage; 10A SPDT output contacts, 8-pin octal base. Works with 208V 3-phase systems.	1	0.3	<--->	70169-D or 750-2C-SKT
<b>PMRRL-1C-240A</b>	Phase monitor relay, provides protection against phase reversal, phase loss and undervoltage; 10A SPDT output contacts, 8-pin octal base. Works with 240V 3-phase systems.	1	0.3	<--->	70169-D or 750-2C-SKT
<b>PMRRL-1C-480A*</b>	Phase monitor relay, provides protection against phase reversal, phase loss and undervoltage; 10A SPDT output contacts, 8-pin octal base. Works with 480V 3-phase systems.	1	0.3	<--->	70169-D or 750-2C-SKT
<b>70169-D</b>	Relay socket, 10A at 600V, 8-pin octal configuration. Can be mounted on 35mm DIN rail or directly mounted to the panel.	1	0.1	<--->	-----
<b>750-2C-SKT</b>	Relay socket, 5A at 600V, 8-pin octal configuration. Can be mounted on 35mm DIN rail or directly mounted to the panel.	1	0.1	<--->	-----

\* Requires a 600V socket when used on system voltages greater than 300 volts, such as the 70169-D or 750-2C-SKT

Technical Specifications					
	PMRU-1C-480A	PMRR-1C-480A	PMRRL-1C-208A	PMRRL-1C-240A	PMRRL-1C-480A
<b>Input Voltage Range**</b>	208-480 VAC 50/60Hz (+/-20%)	208-480 VAC 50/60Hz (+10/-25%)	208 VAC 50/60Hz (+10/-25%)	240 VAC 50/60Hz (+10/-25%)	480 VAC 50/60Hz (+10/-25%)
<b>Phase Loss</b>	Unit trips on total loss of one or more of the three phases (A,B,C)	N/A	Unit trips on total loss of one or more of the three phases (A,B,C)		
<b>Phase Reversal</b>	Unit trips if sequence of the three phases is anything other than A-B-C	N/A	Unit trips if sequence of the three phases is anything other than A-B-C		
<b>Phase Unbalance</b>	Adjustable from 2 to 10%	N/A			
<b>Undervoltage</b>	Adjustable from 80 to 95% of nominal voltage	N/A	Unit trips when the average of all three line phases is less than the adjusted set point*		
<b>Overvoltage</b>	Fixed at 110% of Nominal	N/A	N/A	N/A	N/A
<b>Output Contacts</b>	SPDT: 10A at 240 VAC/30 VDC Max	SPDT: 10A at 240 VAC Max			
<b>Life*</b>	Mechanical: 10,000,000 Electrical: 100,000	Mechanical: 100,000 Electrical: 100,000			
<b>Response Times</b>	See table 2 on page e4	Pick-up: 50ms, Drop out: 50ms			
<b>Power Consumption</b>	3 VA				
<b>Temperature</b>	-28° to 65°C (-18 to 149°F)				
<b>Mounting</b>	8-pin octal socket requires a 600 V rated socket when used on system voltages greater than 300 V				
<b>Indicator LED</b>	See table 1 on page e4	Red LED on when all conditions are normal and off when a fault condition has occurred			
<b>Reset</b>	Standard reset is automatic upon correction of fault or when a momentary-contact N.C. switch is wired across the Manual Reset terminals (6 & 7), the unit switches to manual reset mode and remote manual reset is available	Standard reset is automatic upon correction of fault.			
<b>Approvals</b>	cURus, CE (PMRU series only), RoHS, (cULus when used with socket 70169-D)				

\* Resistive load

\*\* Fusing is not required by code but if fusing is used we recommend 2 Ampere MCL2 fuse between the phase monitor relay and the three phases.



Company Information

Systems Overview

Programmable Controllers

Field I/O

Software

C-more & other HMI

Drives

Soft Starters

Motors & Gearbox

Steppers/Servos

Motor Controls

Proximity Sensors

Photo Sensors

Limit Switches

Encoders

Current Sensors

Pressure Sensors

Temperature Sensors

Pushbuttons/Lights

Process

Relays/Timers

Comm.

Terminal Blocks & Wiring

Power

Circuit Protection

Enclosures

Tools

Pneumatics

Appendix

Product Index

Part #

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## PMRU LED Indication

Table 1 - LED Indication	
PMRU Series LED Status*	Indicator
Green Steady	Normal/Relay ON
Green Flashing	Power Up/Restart Delay
Red Steady	Unbalance
Red Flashing	Undervoltage/Overvoltage
Amber Steady	Reversal
Amber Flashing	Loss
Green/Red Alternating	Undervoltage/Overvoltage Trip Pending
Red/Amber Alternating	Nominal Voltage Set Error

*Note: If LED does not remain illuminated or does not flash after a fault on PMRU unit, there is a loss situation of either Phase A or C. When Phase A or C is restored the LED functions normally.*

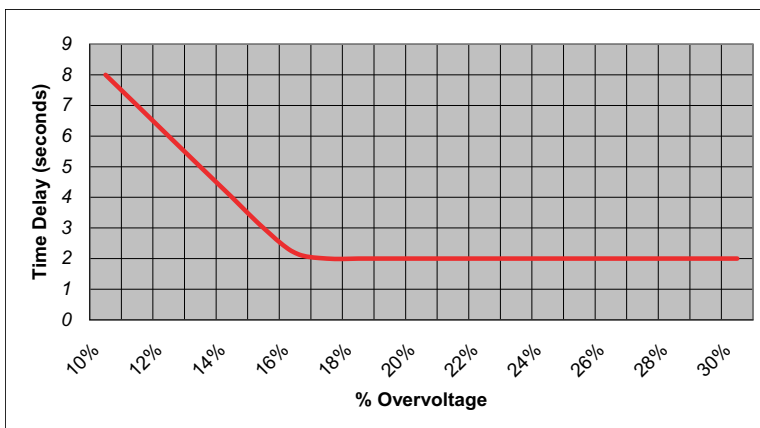
## PMRU Response Time

Table 2 - Response Times	
<b>Power up and restart after fault</b>	1-300 seconds adjustable
<b>Drop-out Due to Fault</b>	
<b>Phase Loss and Reversal</b>	100ms fixed
<b>Phase Unbalance</b>	2 seconds fixed
<b>Undervoltage</b>	0.1 - 20 seconds adjustable
<b>Overvoltage</b>	Fixed time based on inverse time curve (See Chart 1 Below)

## PMRRL Undervoltage

Table 3 - Undervoltage Rating	
<b>PMRRL-1C-208A</b>	156-198V
<b>PMRRL-1C-240A</b>	180-230V
<b>PMRRL-1C-480A</b>	360-460V

## Chart 1 - Overvoltage Inverse Time Curve



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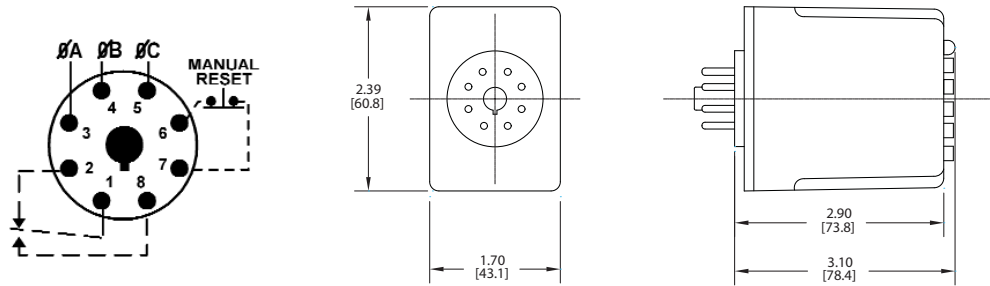
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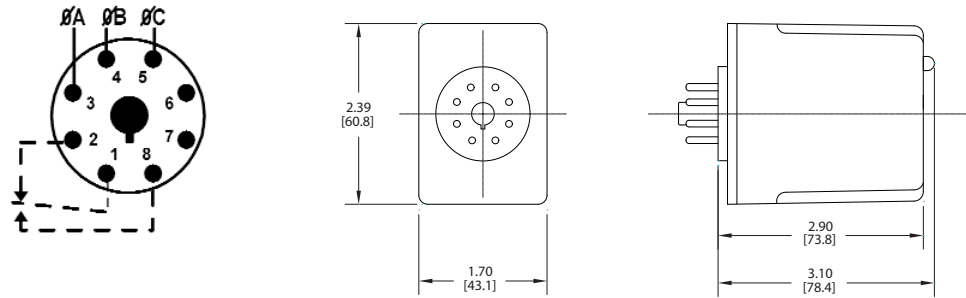
Part # Index

## Wiring and Dimensions

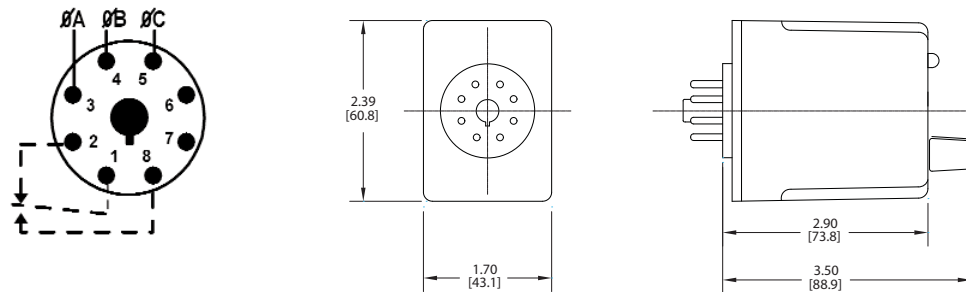
**PMRU-1C-480A**



**PMRR-1C-480A**



**PMRRL-1C-208A, PMRRL-1C-240A, PMRRL-1C-480A**



*All Dimensions in Inches (Millimeters)*

## Protection

Depending on the unit selected, it will protect 3-phase equipment against:

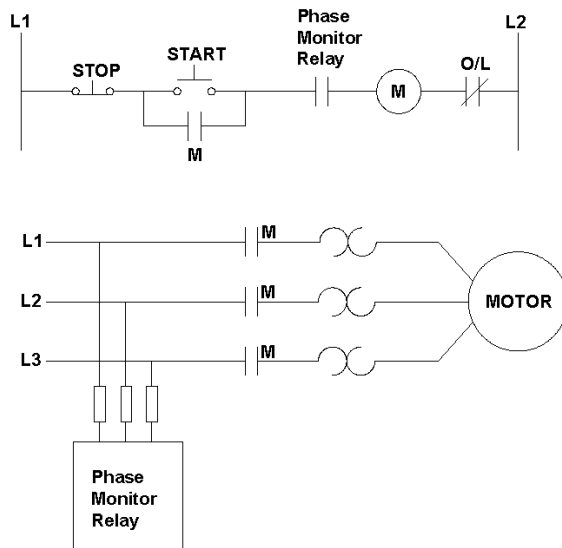
- **Phase loss** - total loss of one or more of the three phases. Also known as “single phasing.” Typically caused by a blown fuse, broken wire, or worn contacts. This condition would result in a motor drawing locked rotor current during start-up. In addition, a 3-phase motor will continue to run after losing a phase, resulting in possible motor burn-out.
- **Phase reversal** - reversing any two of the three phases will cause a 3-phase motor to run in the opposite direction. This may cause dam-

age to driven machinery or injury to personnel. The condition usually occurs as a result of mistakes made during routine maintenance or when modifications are made to the circuit.

- **Phase unbalance** - unbalance of a 3-phase system occurs when single phase loads are connected such that one or two of the lines (phases) carry more or less of the load. This could cause motors to run at temperatures above published ratings.
- **Undervoltage** - when voltage in all three lines of a 3-phase system drop simultaneously.
- **Overvoltage** - when voltage in all three lines of a 3-phase system increase simultaneously.

## Typical Connections

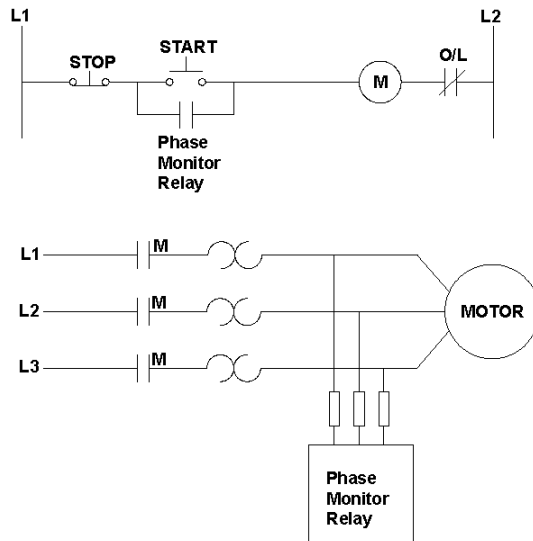
### Line Side Monitoring



### Line Side Monitoring

With the relay connected before the motor starter, the motor can be started in the reverse direction. However, the motor is unprotected against phase failures between the relay and the motor.

### Load Side Monitoring



### Load Side Monitoring

With the relay connected directly to the motor, the total feed lines are monitored. This connection should not be used with reversing motors.

# proSense™ 8-pin Octal Socket

by AUTOMATIONDIRECT



70169-D



750-2C-SKT

## Features

- 600V (Plug-in 3-phase monitor relays require a 600V-rated socket when used with system voltages greater than 300V)
- Mounts on 35mm DINrail
- Screw pressure wire clamp termination

## Agency Approvals

- cURus, File number E191059, E225080
- CE
- RoHS

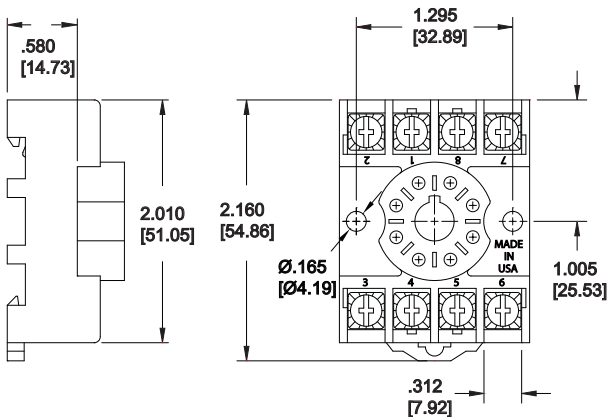


Octal Sockets for Motor Monitor Relays				
Part Number	Description	Pcs/Pkg	Wt (lb)	Price
70169-D	Relay socket, works with all phase monitor relays, 10A at 600 V rated, 8-pin octal configuration. Can be mounted on 35mm DIN rail or directly mounted to the panel.	1	0.1	<--->
750-2C-SKT	Relay socket, works with all phase monitor relays, 5A at 600 V rated, 8-pin octal configuration. Can be mounted on 35mm DIN rail or directly mounted to the panel.	1	0.1	<--->

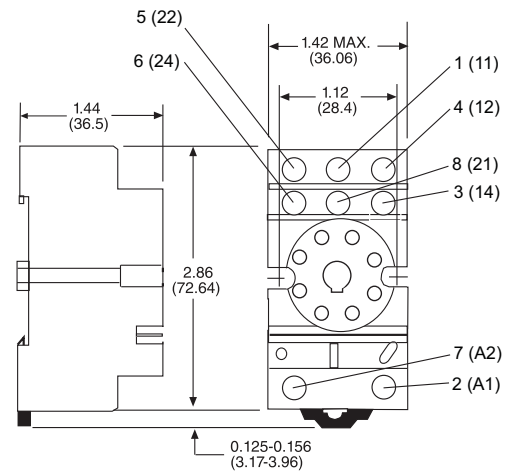
Technical Specifications						
Part Number	Voltage	Current	Screw Size	Screw wire size (capacity)	Screw wire torque	Screw chassis mounting torque
70169-D	600V	10A	6-32	1 or 2 #12-#22 AWB	6-7 Lb-in (12 Lb-in max)	7 Lb-in
750-2C-SKT	600V	5A	M3.5	(1) #12/ (2) #14 AWG	9 Lb-in	7Lb-in

## Dimensions

70169-D



750-2C-SKT

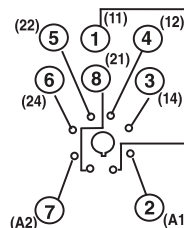


## Socket Pinouts

70169-D



750-2C-SKT



All Dimensions in Inches (Millimeters)