

# PHASE MONITOR RELAYS

## PRODUCT SUMMARY



Phase Monitor Relays provide protection against premature equipment failure caused by voltage faults on 3 Phase systems. All Macromatic Phase Monitor Relays are designed to be compatible with most Wye or Delta systems with no connection to Neutral required. Phase Monitor Relays protect against single phasing regardless of any regenerative voltages.

The Reference Guide below provides general information on the different versions of Phase Monitor Relays offered by Macromatic (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
PCP	Plug-in *		✓					UL US	6
PLP	Plug-in *	✓	✓					UL US	6
PAP	Plug-in *	✓	✓		✓ (adj.)		50ms fixed	UL US	8
PMP	Plug-in *	✓	✓	✓ (adj.)	✓ (adj.)	✓ (fixed)	0.1 - 20 sec.	UL US CE	10
PMP-FA	Plug-in *	✓	✓	✓ (fixed)	✓ (fixed)	✓ (fixed)	4 seconds fixed	UL US CE	12
PMD	Surface	✓	✓	✓ (adj.)	✓ (adj.)	✓ (fixed)	0.1 - 20 sec.	UL US CE	14

\* In addition to the above approvals, all Plug-in Products are also UL Listed when used with the appropriate Macromatic socket.

### PROTECTION

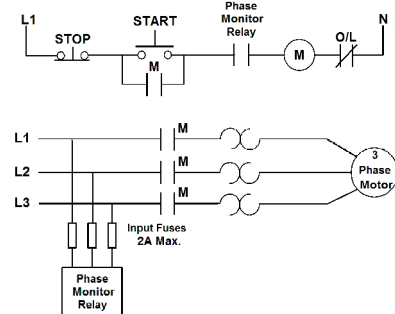
Depending on the unit selected, it will protect three phase equipment against:

- ◆ **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 contact. This condition would result in a motor drawing locked rotor current during start-up. In addition, a three 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 three phase motor to run in the opposite direction. This may cause damage 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 three 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 three phase system drop simultaneously.
- ◆ **overvoltage** - when voltage in all three lines of a three phase system increase simultaneously.

### TYPICAL CONNECTIONS

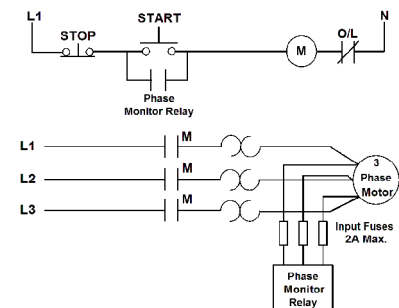
#### Line Side Monitoring

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


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



# PHASE MONITOR RELAYS

## PHASE LOSS, PHASE REVERSAL, PHASE UNBALANCE, AND UNDER/OVER VOLTAGE PMP SERIES PLUG-IN

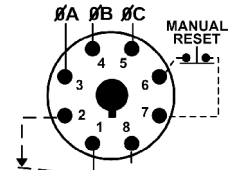


- ◆ Universal voltage range of 208-480V on PMPU provides the flexibility to cover a variety of applications with one unit
- ◆ Protects against phase loss, phase reversal, phase unbalance, undervoltage and overvoltage
- ◆ Variety of user-selectable and adjustable settings for the ultimate in three-phase protection
- ◆ Automatic & Manual Reset in Same Unit
- ◆ Multi-Color LED indicates normal condition and provides specific fault indication to simplify troubleshooting
- ◆ Compact plug-in case utilizing industry-standard 8 pin octal socket
- ◆ 10A SPDT output contacts
- ◆  (with appropriate socket)

The PMP Series Phase Monitor Relays utilize a microprocessor-based design to provide protection against phase loss, phase reversal, phase unbalance, undervoltage and overvoltage. The PMPU is a universal voltage product that works on any three-phase system voltage from 208-480V (a separate 120V version is available). These devices are designed to be compatible with most Wye or Delta systems with no connection to Neutral required. PMP 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. As standard, re-energization is automatic upon correction of the fault condition. Manual reset is available if a momentary N.C. switch is wired to the appropriate terminals. A multi-color LED indicates normal condition and also provides specific fault indication to simplify troubleshooting.

The PMP Series offers a variety of user-adjustable settings. The percent phase unbalance is adjustable from 2-10%, 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 80-95% of operating voltage (overvoltage setting is fixed at 110% of nominal). The adjustable time delay drop-out on undervoltage (0.1-20 seconds) eliminates nuisance tripping caused by momentary voltage fluctuations. There is also an adjustable time delay (1-300 seconds) on both power up and restart after a fault has been cleared.

PROTECTS AGAINST	NOMINAL VOLTAGE▲ 50/60 Hz	PRODUCT NUMBER	WIRING/SOCKET ■
Phase Loss, Phase Reversal, Phase Unbalance, Undervoltage & Overvoltage	120V	PMP120	8 Pin Octal 70169-D 
	208-480V	PMPU *	

**DIAGRAM 104**

- ▲ Phase-to-Phase (Line-to-Line).
- \* Requires a 600V-rated socket when used on system voltages above 300V.
- See Pages 80 & 81 for **Sockets & Accessories**.



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# PHASE MONITOR RELAYS

## PHASE LOSS, PHASE REVERSAL, PHASE UNBALANCE, AND UNDER/OVER VOLTAGE

### PMP SERIES PLUG-IN

#### APPLICATION DATA & DIMENSIONS

#### APPLICATION DATA

##### **Phase Loss:**

Unit trips on loss of any Phase A, B or C.

##### **Phase Reversal:**

Unit trips if rotation (sequence) of the three phases is anything other than A-B-C.

##### **Undervoltage:**

Adjustable from 80-95% of nominal voltage. Unit trips when the average of all three lines is less than the adjusted set point for a period longer than the adjustable time delay drop-out.

##### **Overvoltage:**

Fixed at 110% of nominal voltage. Unit trips when the average of all three lines is greater than the fixed set point for a period longer than the time delay drop-out.

##### **Phase Unbalance:**

Adjustable from 2 - 10% unbalance. Unit trips when any one of the three lines deviates from the average of all three lines by more than the adjusted set point. There is also a "Disable" setting adjustment that will turn off the Phase Unbalance Protection if nuisance tripping is a problem.

##### **Output Contacts:**

SPDT: 10A @ 240V AC/30V DC, 1/2HP @ 240V AC

##### **Life:**

Mechanical: 10,000,000 operations

Full Load: 100,000 operations

##### **Response Times:**

Power Up & Restart After Fault: 1 - 300 seconds adjustable

Drop-out Due to Fault:

Phase Loss & Reversal	100ms fixed
Phase Unbalance	2 seconds fixed
Undervoltage	0.1 - 20 seconds adjustable
Overvoltage	Fixed Time Based on Inverse Time Curve

**Hysteresis:** 2 - 3%

**Load (Burden):** Less than 3VA

**Temperature:** -28° to 65°C (-18° to 149°F)

##### **Mounting:**

Uses an 8 pin octal socket. Requires a 600V-rated socket when used on system voltages greater than 300V (Macromatic Product Number 70169-D--see Page 80).

##### **Indicator LED:**

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

\* Applies to 208-480V units only.

##### **Reset:**

As standard, reset is automatic upon correction of fault. 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.

##### **Approvals:**

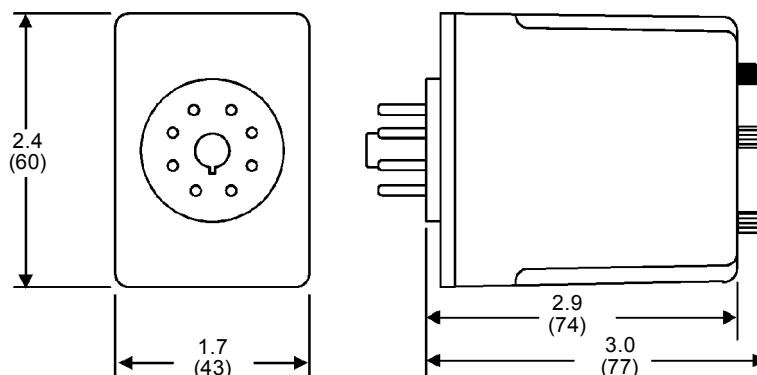


Low Voltage & EMC Directives  
EN60947-1, EN60947-5-1



with appropriate socket  
File #E109466

#### DIMENSIONS



All Dimensions in Inches (Millimeters)

# SOCKETS & ACCESSORIES

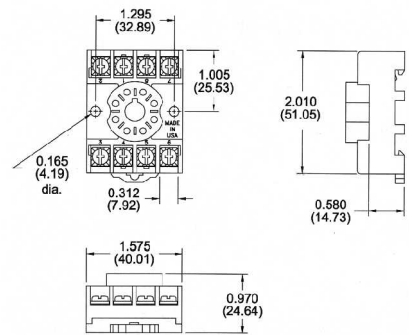
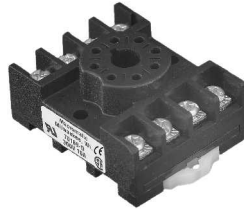
## 8 Pin Octal Socket-- Surface or DIN Rail-Mounted

10A @ 600V \*  
1 or 2 #12-22 AWG Wire  
Recommended Tightening Torque  
of 6-7 in-lbs. (12 in-lbs maximum)  
Pressure Wire Clamp Terminations



File #E169693 File #LR701114

### Product Number 70169-D



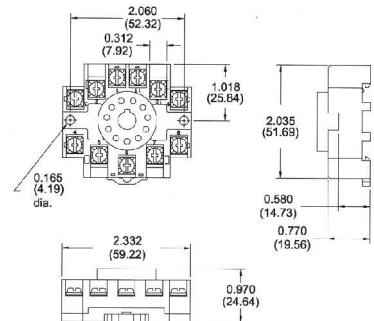
## 11 Pin Octal Socket-- Surface or DIN Rail-Mounted

10A @ 300V  
1 or 2 #12-22 AWG Wire  
Recommended Tightening Torque  
of 6-7 in-lbs. (12 in-lbs maximum)  
Pressure Wire Clamp Terminations



File #E169693 File #LR701114

### Product Number 70170-D



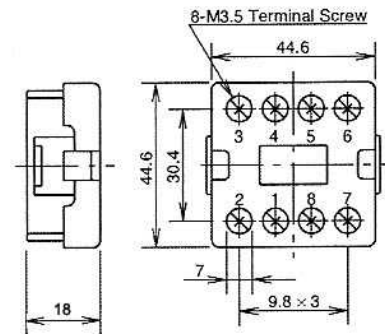
## 8 Pin Octal Socket-- Back-Mounted

10A @ 300V  
Pressure Wire Clamp Terminations



File #E62437

### Product Number SR6P-M08G



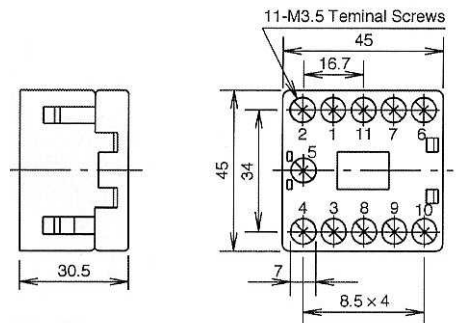
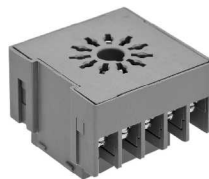
## 11 Pin Octal Socket-- Back-Mounted

10A @ 300V  
Pressure Wire Clamp Terminations



File #E62437

### Product Number SR6P-M11G



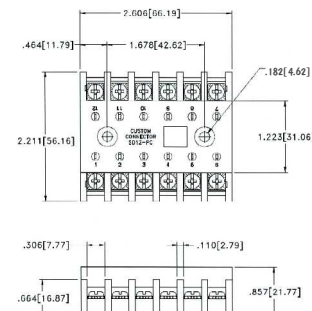
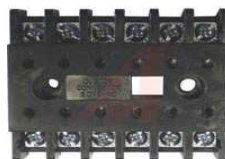
## 12 Pin Socket-- Surface-Mounted

10A @ 600V  
#12-20 AWG Wire  
Pressure Wire Clamp Terminations



File #E60008 File #LR29513

### Product Number SD12-PC



\* Plug-in Three-Phase Monitor Relays require a 600V-rated socket when used on system voltages greater than 300V.

# SOCKETS & ACCESSORIES

## Hold Down Spring Product Number 70166

Can be used for:

- ◆ Panel-Mounted Sockets
- ◆ Sockets Mounted to 35mm DIN Track \*

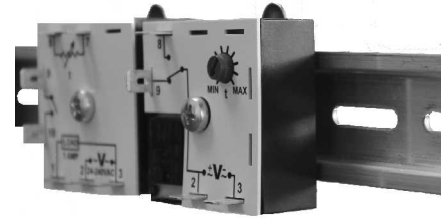
\* Requires two machine screws with washers & nuts-- contact Macromatic or [www.macromatic.com/70166](http://www.macromatic.com/70166) for more information.



## DIN Rail Adaptor Kit Product Number 70500

Quick & Economical Way to Install Any THx Series 2" x 2" Encapsulated Time Delay Relays on 35mm DIN Track

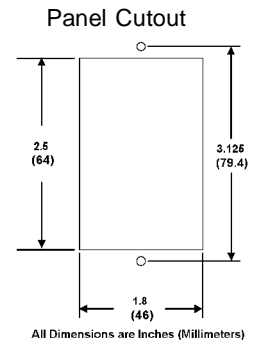
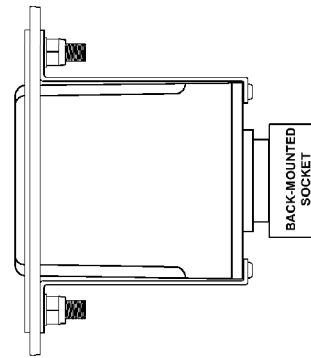
- ◆ Clip Comes with a Threaded Hole to Eliminate Need for a Washer & Nut
- ◆ All Mounting Hardware Included



## Panel Mount Assembly For Panel Mounting Standard Plug-in Products Product Number 70400

This assembly provides a simple & economical method to mount plug-in products to the deadfront of an enclosure/panel:

- ◆ Sturdy Aluminum Construction
- ◆ Stainless Steel Studs
- ◆ All Mounting Hardware Included
- ◆ White Textured Painted Finish
- ◆ 2 3/16" W x 3 7/16" H



(Relay Not Included with Assembly--  
Shown for Reference Only)

## INDEX BY PRODUCT NUMBER

Product *	Page	Product *	Page	Product *	Page	Product *	Page	Product *	Page	Product *	Page
70166	81	ARP024A6	32	ATP024A1R	36	CMKP10A68	18	COKP01A68	19	COP10A62	19
70169-D	80	ARP024A6R	32	ATP024A7R	36	CMP01A22	18	COKP05A22	19	COP10A68	19
70170-D	80	ARP120A2	32	ATP120A1	36	CMP01A28	18	COKP05A28	19	CUH05Ayyy ***	16
70400	81	ARP120A2R	32	ATP120A1R	36	CMP01A62	18	COKP05A62	19	CUH20Ayyy ***	16
70500	81	ARP120A3	34	ATP120A7R	36	CMP01A68	18	COKP05A68	19	CUH50Ayyy ***	16
ARP012A2	32	ARP120A3R	34	CAH05Ayyy	16	CMP05A22	18	COKP10A22	19	CUP01A22	20
ARP012A2R	32	ARP120A5	34	CAH20Ayyy	16	CMP05A28	18	COKP10A28	19	CUP01A28	20
ARP012A3	34	ARP120A5R	34	CAH50Ayyy	16	CMP05A62	18	COKP10A62	19	CUP01A62	20
ARP012A3R	34	ARP120A6	32	CMKP01A22	18	CMP05A68	18	COKP10A68	19	CUP01A68	20
ARP012A5	34	ARP120A6R	32	CMKP01A28	18	CMP10A22	18	COP01A22	19	CUP05A22	20
ARP012A5R	34	ARP240A2	32	CMKP01A62	18	CMP10A28	18	COP01A28	19	CUP05A28	20
ARP012A6	32	ARP240A2R	32	CMKP01A68	18	CMP10A62	18	COP01A62	19	CUP05A62	20
ARP012A6R	32	ARP240A3	34	CMKP05A22	18	CMP10A68	18	COP01A68	19	CUP05A68	20
ARP024A2	32	ARP240A3R	34	CMKP05A28	18	COH05Ayyy	16	COP05A22	19	CUP10A22	20
ARP024A2R	32	ARP240A5	34	CMKP05A62	18	COH20Ayyy	16	COP05A28	19	CUP10A28	20
ARP024A3	34	ARP240A5R	34	CMKP05A68	18	COH50Ayyy	16	COP05A62	19	CUP10A62	20
ARP024A3R	34	ARP240A6	32	CMKP10A22	18	COKP01A22	19	COP05A68	19	CUP10A68	20
ARP024A5	34	ARP240A6R	32	CMKP10A28	18	COKP01A28	19	COP10A22	19		
ARP024A5R	34	ATP024A1	36	CMKP10A62	18	COKP01A62	19	COP10A28	19		

\* The "-xx" suffix denotes the time range for time delay relays with adjustable time delay. Contact Macromatic for any product not listed.

\*\*\* The "-yyy" suffix denotes the input voltage, trip delay & sensing delay for CxH Series encapsulated current sensing relays.

Continued on  
Page 82