

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 *		✓						6
PLP	Plug-in *	✓	✓						6
PAP	Plug-in *	✓	✓		✓ (adj.)		50ms fixed		8
PMP	Plug-in *	✓	✓	✓ (adj.)	✓ (adj.)	✓ (fixed)	0.1 - 20 sec.		10
PMP-FA	Plug-in *	✓	✓	✓ (fixed)	✓ (fixed)	✓ (fixed)	4 seconds fixed		12
PMD	Surface	✓	✓	✓ (adj.)	✓ (adj.)	✓ (fixed)	0.1 - 20 sec.		14

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

PROTECTION

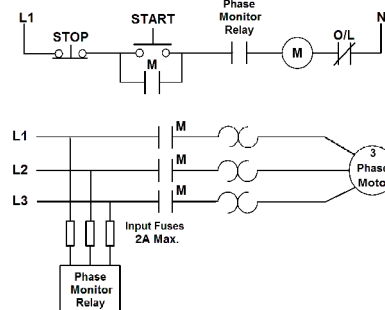
Depending on the unit selected, it will protect three phase equipment against:

- ◆ **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

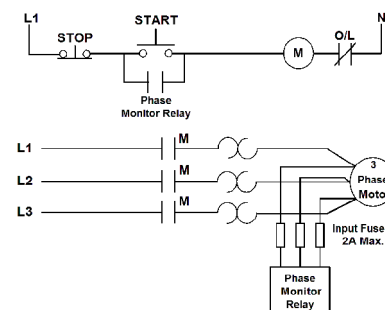
Line Side Monitoring

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

PAP SERIES PHASE LOSS, PHASE REVERSAL & UNDERVOLTAGE PLUG-IN



- ◆ Protects against phase loss, phase reversal & 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
- ◆ **cUL** **US** **UL** **LISTED**
(with appropriate socket)

The PAP Series Phase Monitor Relays provide protection against phase loss, phase reversal & undervoltage in a compact plug-in design. These devices 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 relay is energized and the LED on when all three phase are present in the correct sequence at a voltage level above the undervoltage setting. The undervoltage drop-out can be set at 75-95% 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.

PROTECTS AGAINST	NOMINAL VOLTAGE ▲ 50/60 Hz	UNDER-VOLTAGE RANGE	PRODUCT NUMBER	WIRING/ SOCKET ■
Phase Loss, Phase Reversal, & Undervoltage	120V	90-115V	PAP120	8 Pin Octal 70169-D DIAGRAM 23
	208V	156-198V	PAP208	
	240V	180-230V	PAP240	
	400V	300-380V	PAP400 *	
	480V	360-460V	PAP480 *	

▲ 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 & UNDERVOLTAGE

PAP 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 sequence of the three phases is anything other than A-B-C.

Undervoltage:

Adjustable over a range per product selection table. Unit trips when the average of all three lines is less than the adjusted set point.

Output Contacts:

10A Resistive SPDT @ 240V AC, 1/3HP @ 120/240V AC (N.O.), 1/6HP @ 120/240V AC (N.C.)

Life:

Full Load: 100,000 operations

Response Times:

Operate: 50ms

Release: 50ms

Load (Burden):

3VA

Temperature:

-28° to 65°C (-18° to 149°F)

Transient Protection:

10,000 volts for 20 microseconds

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:

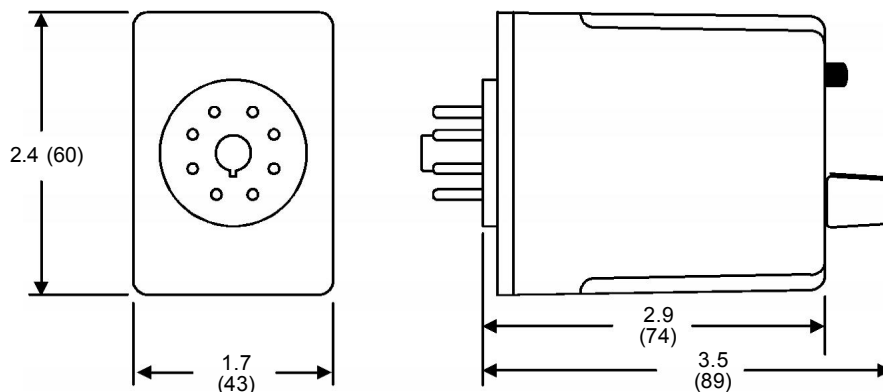
Red LED on when all conditions are normal, and off when a fault condition has occurred.

Reset:

Automatic upon correction of fault

Approvals:

DIMENSIONS



All Dimensions in
Inches (Millimeters)

SOCKETS & ACCESSORIES

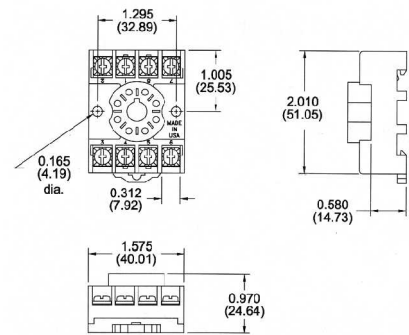
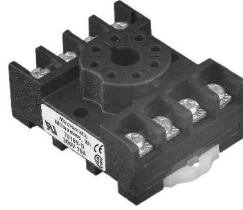
8 Pin Octal Socket-- Surface or DIN Rail-Mounted

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



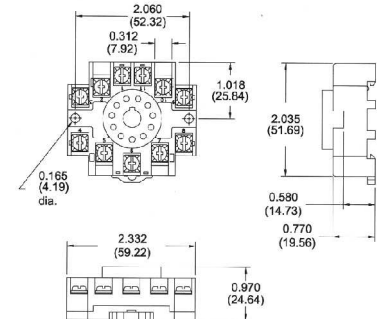
11 Pin Octal Socket-- Surface or DIN Rail-Mounted

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



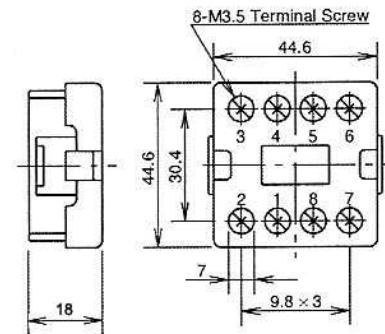
8 Pin Octal Socket-- Back-Mounted

10A @ 300V
Pressure Wire Clamp Terminations



File #E62437

Product Number SR6P-M08G



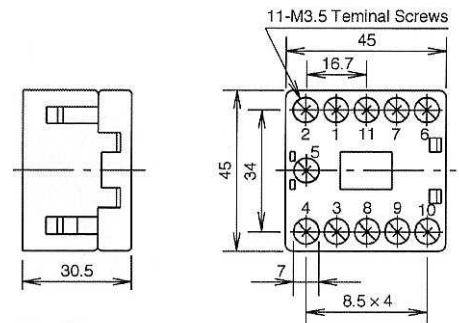
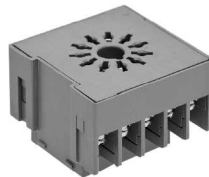
11 Pin Octal Socket-- Back-Mounted

10A @ 300V
Pressure Wire Clamp Terminations



File #E62437

Product Number SR6P-M11G



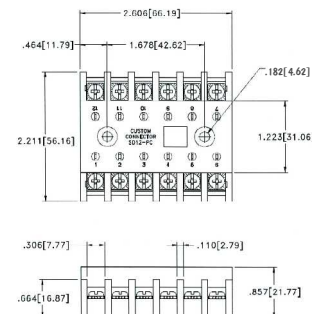
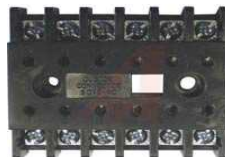
12 Pin Socket-- Surface-Mounted

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



File #E60008 File #LR29513

Product Number SD12-PC



NOTE: if a 12 Pin Socket is required for DIN-rail mounting, please contact Macromatic.

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

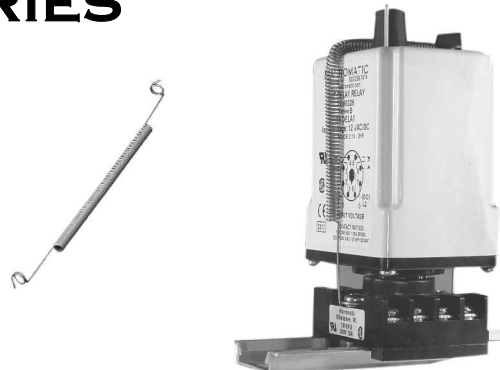
SOCKETS & ACCESSORIES

Hold Down Spring Product Number 70166

Can be used for:

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

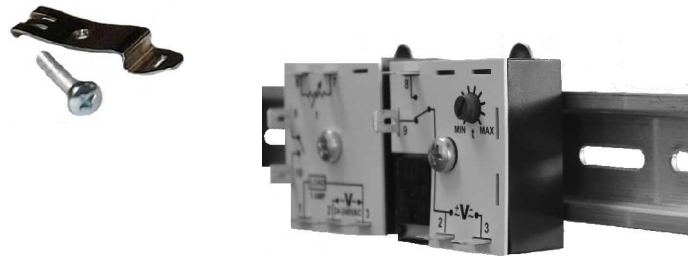
* Requires two machine screws with washers & nuts--
contact Macromatic or www.macromatic.com/70166
for more information.



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

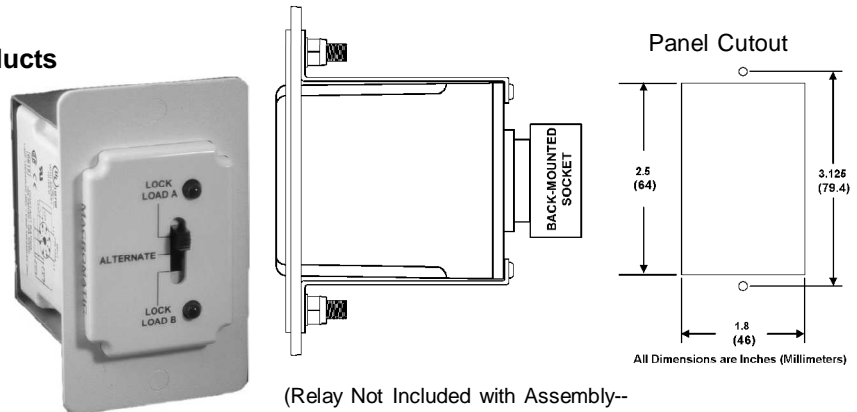
- ◆ Clip Comes with a Threaded Hole to Eliminate Need
for a Washer & Nut
- ◆ All Mounting Hardware Included



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
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70169-D	80	ARP024A6R	32	ATP024A7R	36	CMP01A22	18	COKP05A22	19	COP10A68	19
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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
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ARP024A3R	34	ARP240A6	32	CMKP10A22	18	COKP01A22	19	COP05A68	19	CUP10A68	20
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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.