

### PUMP & LEVEL CONTROLS

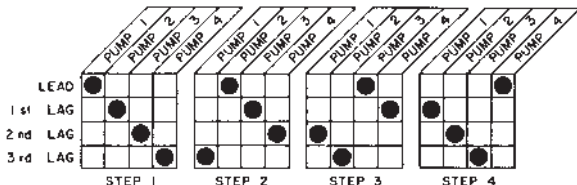
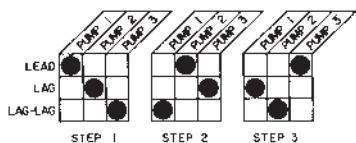
#### ALTERNATING RELAYS

The **Alternating Relay** is used in multiple load installations to assure equal run time on all loads. They also allow for the addition of more capacity in the event of excess load requirements. The Alternating Relay provides equal run time on two or more loads by alternating the sequence in which the loads are allowed to start up. In each case, the alternating action is initiated each time the control switch across designated terminal opens. The control switch may be a float, a thermostat, a pressure switch, or a timer contact.

ATC-Diversified Electronics offers a wide variety of models for various staging requirements. The different models available are: Duplexors, Triplexors, Quadraplexors, Special Function, and Expandable Alternating Relays.

#### FEATURE MATRIX

Model Number	NUMBER OF LOADS SEQUENCED			ENCLOSURE STYLE		EXPANDABLE	EXTERNAL CLOCKING	AUTOMATIC ALTERNATING	FIELD SELECTABLE SEQUENCING	UL/CANADIAN UL REC. OGNIZED	UL LISTED	CSA CERTIFIED
	2	3	4	A	E							
ARA-XXX-ABA	●			●				●		●		●
ARA-XXX-ACA	●			●				●		●		●
ARA-XXX-ADA	●			●				●		●		●
ARA-XXX-AEA	●			●				●		●		●
ARA-XXX-AFE		●			●		●	●			●	●
ARA-XXX-AGE			●		●		●	●			●	●
ARA-120-AHE		●			●		●	●				
ARA-120-AJE		●			●		●	●	●			
ARA-120-AME	●	●			●	●	●	●				
ARA-120-ANE		●	●		●	●	●	●				
ARB-XXX-ABA	●			●				●	●	●		●
ARB-XXX-ACA	●			●				●	●	●		●
ARB-XXX-ADA	●			●				●	●	●		●
ARB-XXX-AEA	●			●				●	●	●		●



#### ALTERNATING CONTROLLERS

The ARM Series, **Alternating Controllers**, are used in multiple load installations to assure equal run time on all loads. They also allow for the addition of more capacity in the event of excess load requirements. The Alternating Controllers provide equal run time on two or more loads by alternating the sequence in which the loads are allowed to start up.

All ARM models feature **intrinsically safe inputs** and logic that allows the outputs to operate even if one of the inputs fails to open or close. For example: if the off switch fails to close, the lead load will not energize until both the lead and the lag switches close. An inrush delay on all models reduces line sags by preventing multiple loads from energizing simultaneously.

ATC-Diversified Electronics offers a wide variety of models for various staging requirements. The different models available are: Duplexors, Triplexors, Quadraplexors, and Expandable Alternating Controllers.

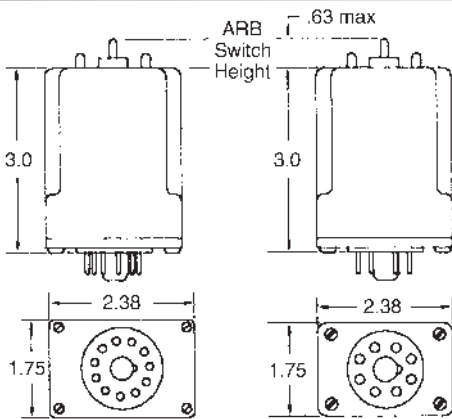
#### FEATURE MATRIX

Model Number	NUMBER OF LOADS SEQUENCED			STYLE SURFACE MOUNT	PANEL MOUNT	EXPANDABLE	AUTOMATIC ALTERNATING	SELECTABLE SEQUENCING	OUTPUT LOGIC (SOSO)	OUTPUT LOGIC (FOFO)	OMIT	LEAD SELECT	UL LISTED 913
	2	3	4										
ARM-XXX-AAE		●		●			●		●				●
ARM-XXX-AAEP		●		●	●		●		●				●
ARM-XXX-ABE		●		●			●			●			●
ARM-XXX-ABEP		●		●	●		●			●			●
ARM-XXX-ACE		●		●			●	●	●		●	●	●
ARM-XXX-ACEP		●		●	●		●	●	●		●	●	●
ARM-XXX-ADE		●		●			●	●		●	●	●	●
ARM-XXX-ADEP		●		●	●		●	●		●	●	●	●
ARM-XXX-AFE	●			●			●	●	●	●		●	●
ARM-XXX-AFEP	●			●	●		●	●	●	●		●	●
ARM-XXX-AGE			●	●			●		●				●
ARM-XXX-AGEP			●	●	●		●		●				●
ARM-XXX-AHE			●	●			●			●			●
ARM-XXX-AHEP			●	●	●		●			●			●



Duplexor

DIMENSIONS (INCHES)



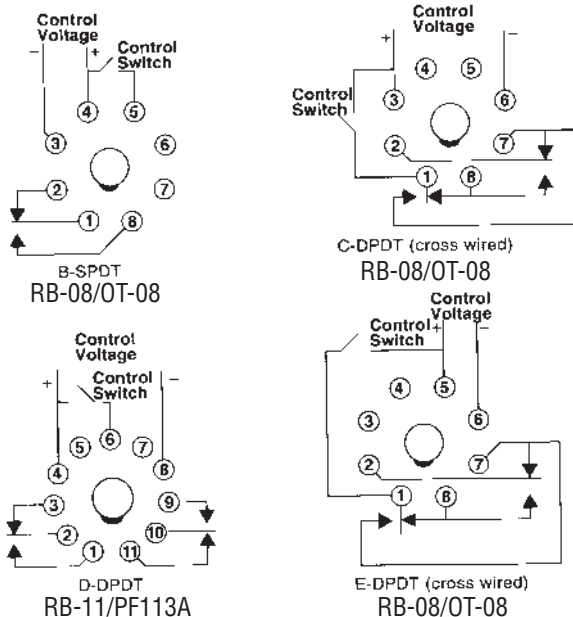
The **Duplexor** is used in control panels where **two loads** are required to alternate to provide equal run time on the loads. The alternating action is initiated by a control switch, which is common with one side of the control voltage. The output contacts will change states each time the control switch is opened, thus alternating the two loads. The LED indicators show the position of the output relay.

The ARA series is the standard Duplexor providing automatic alternating sequence. The ARB has the automatic sequencing feature plus the option of locking it into one sequence. A three position switch permits the field selection of normal duplexing action, locking in the A-B sequence, or B-A sequence.

SPECIFICATIONS

CONTROL VOLTAGE	24, 120 VAC/DC, 208, 240, 480 VAC, 50/60Hz, 48 VDC, ±10%	
CONTROL SWITCH CURRENT	1 mA	
POWER REQUIRED	3 VA (Approximately)	
DUTY CYCLE	Continuous	
LIFE EXPECTANCY	Mechanical	10,000,000 Operations (Minimum)
	Electrical	100,000 Operations @ Rated Load
INDICATORS	LED Shows Output Position	
TEMPERATURES RATING	Operate	-4° to 131°F (-20° to +55°C)
	Storage	-40° to 185°F (-40° to +85°C)
CONTACT RATING	10 Amps @ 240 VAC, Resistive 1/8 hp @ 120 VAC, 1/4 hp @ 240 VAC Inductive, 360 VA @ 240 VAC, Inductive	
ENCLOSURE	"A" Lexan® Dust Cover	
TERMINATIONS	Industrial Plug-in	
WEIGHT	4.5 oz.	
NOTE: For Analog signal inputs, ATC offers a duplexing pump control — the ATC-Digitec 3800 Panel Meter 480 VAC is not available in the D-DPDT 11-Pin configuration		

WIRING



MODEL NUMBER >>>>>>	AR				A
Type of Alternating Relay					
Standard Duplexor		A			
Special Function Duplexor		B			
Control Voltage					
24 VAC/DC		24			
48 VDC		48			
120 VAC/DC		120			
208 VAC		208			
240 VAC		240			
380-408 VAC (Consult Factory)		480			
Type of Voltage					
VAC or VAC/DC		A			
48 VDC only		D			
Contact Configuration					
		SPDT	B		
		DPDT (Cross Wired)	C		
		DPDT	D		
		DPDT (Cross Wired)	E		
					Enclosure Style A

Alternating Relays & Controllers // ARA, ARB Series

The Triplexor and Quadraplexor Alternating Relays are designed for use in **multiple load** installations that are required to alternate in sequence while assuring equal run time on all loads. They also allow for additional loads to run in the event of excess load requirements.

The Triplexor and Quadraplexor have the option of automatic alterations or external clocking alterations. When the factory installed jumper is in place the alternating action is initiated by a control switch, which is common with one side of the control voltage. When the jumper is removed the alternating action is initiated by an isolated normally open switch.

**ARA-XXX-AFE ALTERNATING ACTION**

**TRIPLEXOR:** For automatic alterations a factory-installed jumper is in place between terminals 3 and 4. The alternating action is accomplished when the control switch between terminals 2 and 4 opens.

For external clocking alterations, remove the factory-installed jumper between terminals 3 and 4 and place an isolated normally open switch between terminals 2 and 3. The alternating action will occur each time this isolated switch is closed and then re-opened.

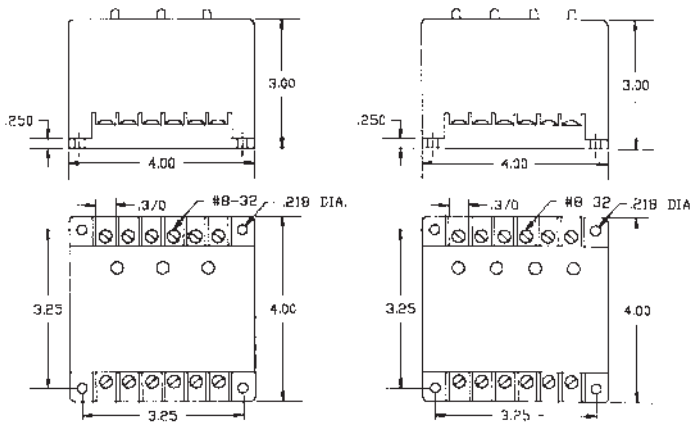
**ARA-XXX-AGE**

**QUADRAPLEXOR:** For automatic alterations, a factory installed jumper is in place between terminals 11 and 12. The alternating action is accomplished when the control switch between terminals 2 and 3 opens.

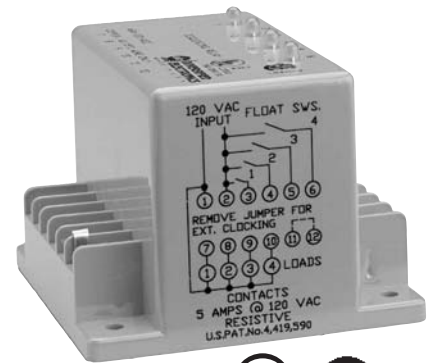
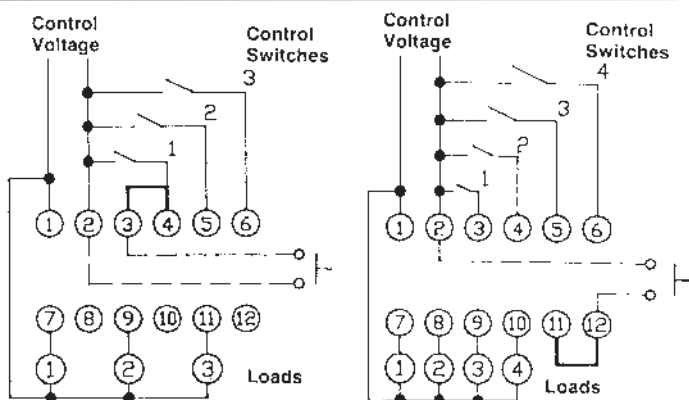
For external clocking alterations, remove the factory-installed jumper between terminals 11 and 12 and place an isolated normally open switch between terminals 2 and 12. The alternating action will occur each time this isolated switch is closed and then re-opened.

In the event of a power failure the Alternating Relays will return to their quiescent state and continue sequencing loads on one-at-a-time.

**DIMENSIONS (INCHES)**



**WIRING**



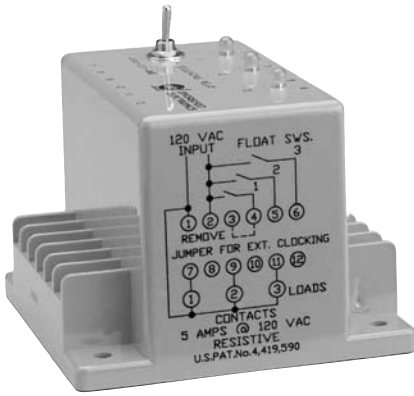
Triplexor

**SPECIFICATIONS**

CONTROL VOLTAGE	24, 120 VAC ±10%, 50/60 Hz	
CONTROL SWITCH CURRENT	2 mA	
POWER REQUIRED	3 VA (Approximately)	
DUTY CYCLE	Continuous	
OUTPUT RATING	Triplexor	(3) 5 Amp Resistive, 1/6 hp, 211 VA @ 120 VAC, Inductive Externally Switched to terminal #2
	Quadraplexor	(4) 5 Amp Resistive, 1/6 hp, 211 VA @ 120 VAC, Inductive Externally Switched to terminal #2
LIFE EXPECTANCY	Mechanical	10,000,000 Operations (Minimum)
	Electrical	100,000 Operations @ Rated Load
INDICATORS	LED's Show Condition of Outputs	
TEMPERATURE RATING	Operate	-4° to 131°F (-20° to +55°C)
	Storage	-40° to 185°F (-40° to +85°C)
ENCLOSURE	Style "E" Lexan® Surface Mounted	
TERMINATIONS	(12) #8-32 Screw Terminals	
WEIGHT	12 to 14 oz.	

NOTE: For Analog signal inputs, ATC offers a duplexing pump control — the ATC-Digitec 3800 Panel Meter

MODEL NUMBER >>>>>	ARA	A	E
Control Voltage			
24 V Triplexor	24		
120 V Triplexor	120		
120 V Quadraplexor	120		
Triplexor			F
Quadraplexor (120 V only)			G



Expandable Alternating Relays

The Expandable Alternating Relays are designed for use in multiple load installations that are required to alternate in sequence and have the ability to accept an additional load installation in the future.

**ARA-120-AME:** The ARA-120-AME is a **Duplexor/Triplexor Alternating Relay**. With the selector switch in position A, this alternating relay will duplex the loads on terminals 7 and 9. With the switch in position B, the Alternating Relay will triplex the three loads on terminals 7, 9 and 11.

For automatic alterations, a factory-installed jumper is in place between terminals 3 and 4. The alternating action is accomplished when the control switch between terminals 2 and 4 opens.

For external clocking alterations, remove the factory installed jumper between terminals 3 and 4 and place an isolated normally open switch between terminals 2 and 3. The alternating action will occur each time this isolated switch is closed and then re-opened.

**ARA-120-ANE:** The ARA-120-ANE is a **Triplexor/Quadruplexor Alternating Relay**. With the selector switch in position A, the Alternating Relay will triplex between the loads on terminals 7, 8 and 9. With the switch in position B, the Alternating relay will quadruplex the loads on terminals 7, 8, 9 and 10.

For automatic alterations, a factory installed jumper is in place between terminals 11 and 12. The alternating action is accomplished when the control switch between terminals 2 and 3 opens.

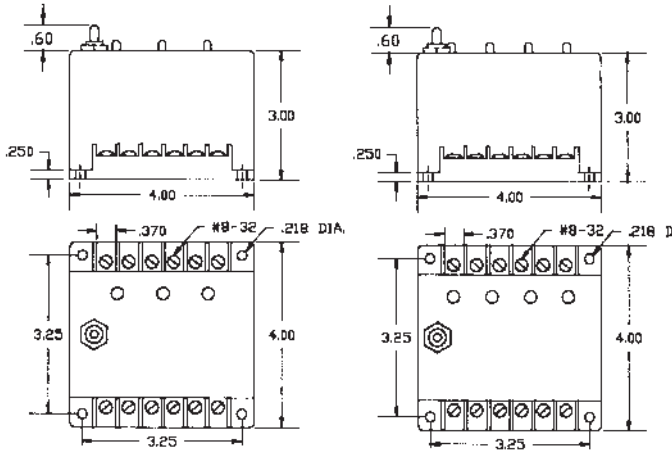
For external clocking alterations, remove the factory installed jumper between terminals 11 and 12 and place an isolated normally open switch between terminals 2 and 12. The alternating action will occur each time this isolated switch is closed and then re-opened.

In the event of a power failure the Alternating Relays will return to their quiescent state and continue sequencing loads on one-at-a-time.

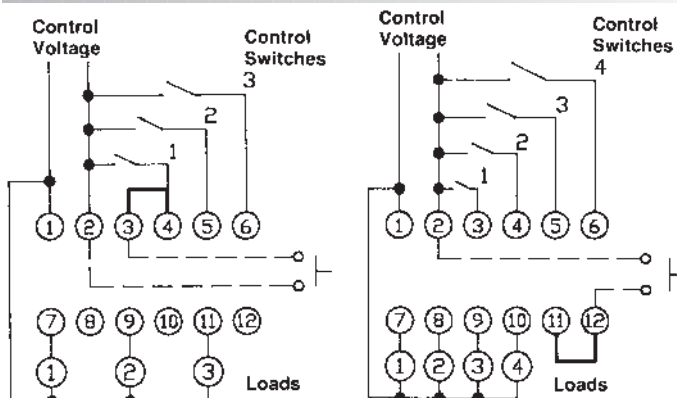
ORDERING INFORMATION

MODEL NUMBER	DESCRIPTION
ARA-120-AME	Duplexor/Triplexor
ARA-120-ANE	Triplexor/Quadruplexor

DIMENSIONS (INCHES)



WIRING



SPECIFICATIONS

CONTROL VOLTAGE	120 VAC ±10%, 50/60 Hz	
CONTROL SWITCH CURRENT	2 mA	
POWER REQUIRED	3 VA (Approximately)	
DUTY CYCLE	Continuous	
OUTPUT RATING	Triplexor	(3) 5 Amp Resistive, 1/6 hp, 211 VA @ 120 VAC, Inductive Externally Switched to terminal #2
	Quadruplexor	(4) 5 Amp Resistive, 1/6 hp, 211 VA @ 120 VAC, Inductive Externally Switched to terminal #2
LIFE EXPECTANCY	Mechanical	10,000,000 Operations (Minimum)
	Electrical	100,000 Operations @ Rated Load
INDICATORS	LED's Show Condition of Outputs	
TEMPERATURE RATINGS	Operate	-4° to 131°F (-20° to +55°C)
	Storage	-40° to 185°F (-40° to +85°C)
ENCLOSURE	Style "E" Lexan® Surface Mounted	
TERMINATIONS	(12) #8-32 Screw Terminals	
WEIGHT	12.5 to 14 oz.	

**OPERATION**

The ARA-120-AHE is a special function **Triplexor** designed for three load installations. This model has a field selection switch that is used to omit one of the three loads for general or emergency maintenance while duplexing the remaining two loads. The ARA-120-AHE has the option of alternating on each load cycle or by external clocking. This alternating relay also allows for additional loads to run in the event of excess load requirements.

The alternating action is initiated by the control switch between terminals 2 and 4 when the factory installed jumper is in place between terminals 3 and 4.

The alternating action may be initiated externally by removing the factory installed jumper between terminals 3 and 4 and placing an isolated normally open switch between terminals 2 and 3. An alternating action will occur each time this isolated switch is closed and then re-opened.

The selection switch has the following positions:

- Normal — Normal operation as Triplexor
- Omit 1 — Omit load #1 Duplex loads 2 and 3
- Omit 2 — Omit load #2 Duplex loads 1 and 3
- Omit 3 — Omit load #3 Duplex loads 1 and 2

In the event of a power failure, the Alternating Relay will return to its quiescent state and continue sequencing loads on one-at-a-time.

NOTE: When the "omit load" option is selected, full potential will appear on the output terminal of the omitted load when the lag switch between terminals 2 and 5 closes. It is recommended that the H-O-A switch be placed in the "off" position for the omitted load.

**SPECIFICATIONS**

CONTROL VOLTAGE	120 VAC ±10%, 50/60 Hz	
CONTROL SWITCH CURRENT	2 mA	
POWER REQUIRED	3 VA (Approximately)	
DUTY CYCLE	Continuous	
OUTPUT RATING	Triplexor	(3) 5 Amp Resistive, 1/6 hp, 211 VA @ 120 VAC, Inductive Externally Switched to terminal #2
	Mechanical	10,000,000 Operations (Minimum)
LIFE EXPECTANCY	Electrical	100,000 Operations @ Rated Load
	INDICATORS LED's Show Condition of Outputs	
TEMPERATURE RATINGS	Operate	-4° to 131°F (-20° to +55°C)
	Storage	-40° to 185°F (-40° to +85°C)
ENCLOSURE	Style "E" Lexan® Surface Mounted	
TERMINATIONS	(12) #8-32 Screw Terminals	
WEIGHT	16 oz.	



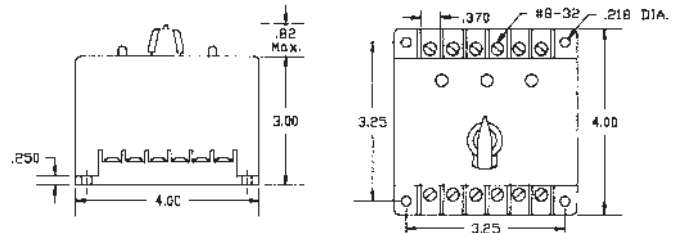
INCLUDES "LOAD OMIT" SWITCH

Special Function Alternating Relay

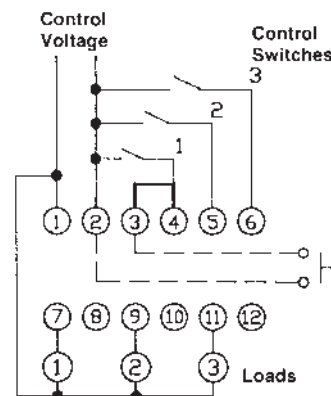
**ORDERING INFORMATION**

MODEL NUMBER	DESCRIPTION
ARA-120-AHE	Special Function Alternating Relay

**DIMENSIONS (INCHES)**



**WIRING**





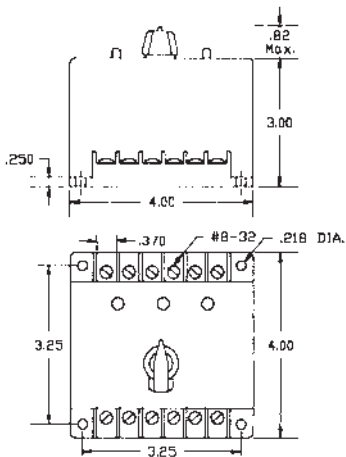
INCLUDES SEQUENCE LOCKING SWITCH

## Triplexor Alternating Relay

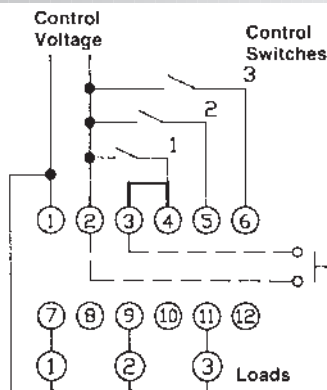
### ORDERING INFORMATION

MODEL NUMBER	DESCRIPTION
ARA-120-AJE	Alternating Relay

### DIMENSIONS (INCHES)



### WIRING



### OPERATION

The ARA-120-AJE is a special function **Triplexor** designed for three load installations. This model has a field selection switch that is used to lock the Alternating Relay into a desired sequence. The ARA-120-AJE has the option of automatically alternating on each load cycle or by external clocking. This Alternating Relay also allows for additional loads to run in the event of excess load requirements.

The alternating action is initiated by the control switch between terminals 2 and 4 when the factory installed jumper is in place between terminals 3 and 4. The alternating action may be initiated externally by removing the factory installed jumper between terminals 3 and 4 and placing an isolated normally open switch between terminals 2 and 3. The alternating action will occur each time this isolated switch is closed and then re-opened.

A four position **rotary switch** has been incorporated to permit field selection of the sequence that is to be maintained. The selection switch has the following positions:

- Normal — Normal operation as a Triplexor
- Lock 1 — Locks in sequence 1-2-3; No alternation will occur while in this position.
- Lock 2 — Locks in sequence 2-3-1; No alternation will occur while in this position.
- Lock 3 — Locks in sequence 3-1-2; No alternation will occur while in this position.

In the event of a power failure, the alternating relay will return to its quiescent state and continue sequencing loads on one-at-a-time.

### SPECIFICATIONS

CONTROL VOLTAGE	120 VAC ±10%, 50/60 Hz	
CONTROL SWITCH CURRENT	2 mA	
POWER REQUIRED	3 VA (Approximately)	
DUTY CYCLE	Continuous	
OUTPUT RATING	Triplexor	(3) 5 Amp Resistive, 1/6 hp, 211 VA @ 120 VAC, Inductive Externally Switched to terminal #2
LIFE EXPECTANCY	Mechanical	10,000,000 Operations (Minimum)
	Electrical	100,000 Operations @ Rated Load
INDICATORS	LED's Show Condition of Outputs	
TEMPERATURE RATING	Operate	-4° to 131°F (-20° to +55°C)
	Storage	-40° to 185°F (-40° to +85°C)
ENCLOSURE	Style "E" Lexan® Surface Mounted	
TERMINATIONS	(12) #8-32 Screw Terminals	
WEIGHT	17 oz.	

The ARM Series Alternating Relay is a **microprocessor-based** controller designed for use in dual load installations to assure equal run time on each load. LED indicators show the status of the unit's five intrinsically safe control switch inputs, one alarm, and two load outputs. H-O-A switches, a lead select switch, and a test/clear button are provided for manual control. The ARM Series reduces the number of components required for this application by combining many functions into one unit.

**TWO PUMP SEQUENCING:** Evenly distributes run time by automatically alternating lead and lag load designations when the off control switch input opens.

**UL913 INTRINSICALLY SAFE:** Control switch inputs are low voltage/low current and are electronically isolated from the control voltage and load-alarm contacts.

**H-O-A Switches:** Hand-of-automatic switches allow for manual operation.

**LEAD SELECT SWITCH:** Disables the automatic sequencing function and allows loads to be locked into the 2-1 or 1-2 sequence.

**CONTROL SWITCH FAULT DETECTION:** Unit detects open and shorted control switch failures.

**TEST/CLEAR SWITCH:** Verifies function and resets the control switch fault detection algorithm.

**ALARM OUTPUT:** Alarm contacts close when a control switch fails or the system's capacity is exceeded.

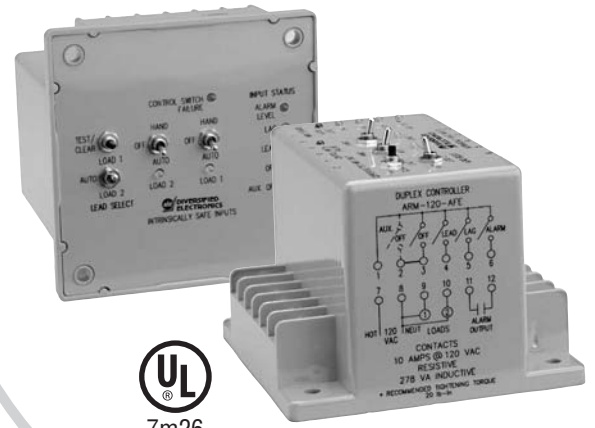
**INRUSH CURRENT DELAY:** Reduces line sags by preventing both loads from energizing simultaneously.

**VERSATILE MOUNTING:** Two (2) mounting configurations are available. The standard surface mount has top access to controls and indicators and is intended for back panel mounting. The panel mount option is intended for front panel or door cutout access to controls and indicators.

**SPECIAL CONTROLS:** ARM-2003 and ARM-2010—Standard operation without the HOA switches  
ARM-2011—Standard operation without the Control Switch Failure feature.

ORDERING INFORMATION			
MODEL NUMBER	CONTROL VOLTAGE	MOUNTING	COMMENTS
ARM-XXX-AFE*	24 or 120 VAC	Surface	Standard
ARM-XXX-AFEP*	24 or 120 VAC	Panel	Standard
ARM-2003	120 VAC	Surface	Special: w/o HOA switches
ARM-2010	120 VAC	Panel	Special: w/o HOA switches
ARM-2011	120 VAC	Surface	Special: w/o Control switch failure feature

\*Replace XXX with desire control voltage (24, 120)



UL  
7m26  
UL913

INCLUDES  
INTRINSICALLY SAFE  
INPUTS

Integrated Duplex Controller

SPECIFICATIONS

CONTROL VOLTAGE	24 or 120 VAC ±10%, 50/60 Hz			
CONTROL SWITCH	Open Circuit Voltage	5 VDC		
	Short Circuit Current	0.1mA		
POWER REQUIRED	4 VA Maximum			
DUTY CYCLE	Continuous			
RESPONSE DELAYS	Power Up	3 SEC. ±5%		
	Inrush Current	5 SEC. ±5%		
CONTACT RATING	(3) SPST-N.O. 10 Amp Resistive, 1/4 hp, 278 VA Inductive @ 120 VAC			
LED INDICATORS	Designation	Color	State	Condition
	Level/Alarm	Red	ON	cs5 Closed
	Lag	Green	ON	cs4 Closed
	Lead	Green	ON	cs3 Closed
	Off	Green	ON	cs2 Closed
	Aux. Off	Green	ON	cs1 Aux./cs2 Closed
	Load 1	Green	ON	Load ON
	Load 2	Green	ON	Load ON
	Ctrl. Switch	Red	ON	Failure Open/Closed
LIFE EXPECTANCY	Mechanical	20 Million Operations		
	Electrical	75,000 @ Rated Load		
TEMPERATURE RATING	Operate	-4° to 131°F (-20° to +55°C)		
	Storage	-40° to 185°F (-40° to +85°C)		
TERMINATIONS	(12) #8-32 Screw Terminals			
WEIGHT	16 oz.			

Alternating Relays & Controllers // ARM Series

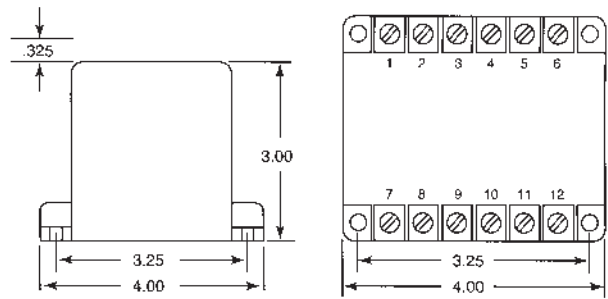
OPERATION

**FOUR CONTROL SWITCHING:** Do not remove factory-installed jumper between terminals 2 and 3. The control switches connected to terminals 3 through 6 are labeled OFF (cs2), LEAD (cs3), LAG (cs4) and ALARM (cs5). Under normal operation the lead load energizes when the off and lead control switches close in order. The lag load energizes when the lag closes and the alarm load energizes when the alarm switch closes. When all four switches reopen in the proper order all outputs are de-energized and the lead/lag output designations reverse.

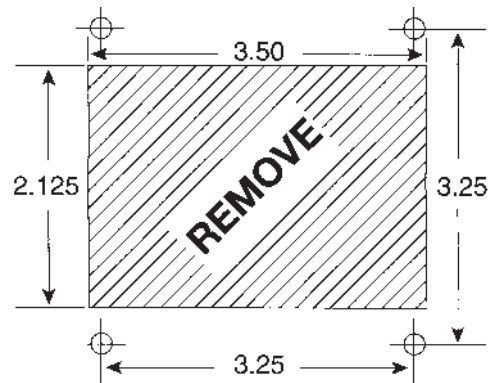
**FIVE CONTROL SWITCHING:** Remove factory installed jumper between terminals 2 and 3. After the jumper has been removed, the additional control switch is connected to terminal 2. The extra switch functions as an AUXILIARY OFF (cs1) switch. It is used to prevent loads from running continuously if the primary OFF (cs2) switch fails to open properly.

**FAULT DETECTION ALGORITHM:** If any of the control switches open or close out of order, the alarm output energizes and a fault detection algorithm is used to identify the faulty switch. The faulty switch is then ignored and the OFF, LEAD, and LAG control switch designations are altered to maintain safe operation.

DIMENSIONS (INCHES)



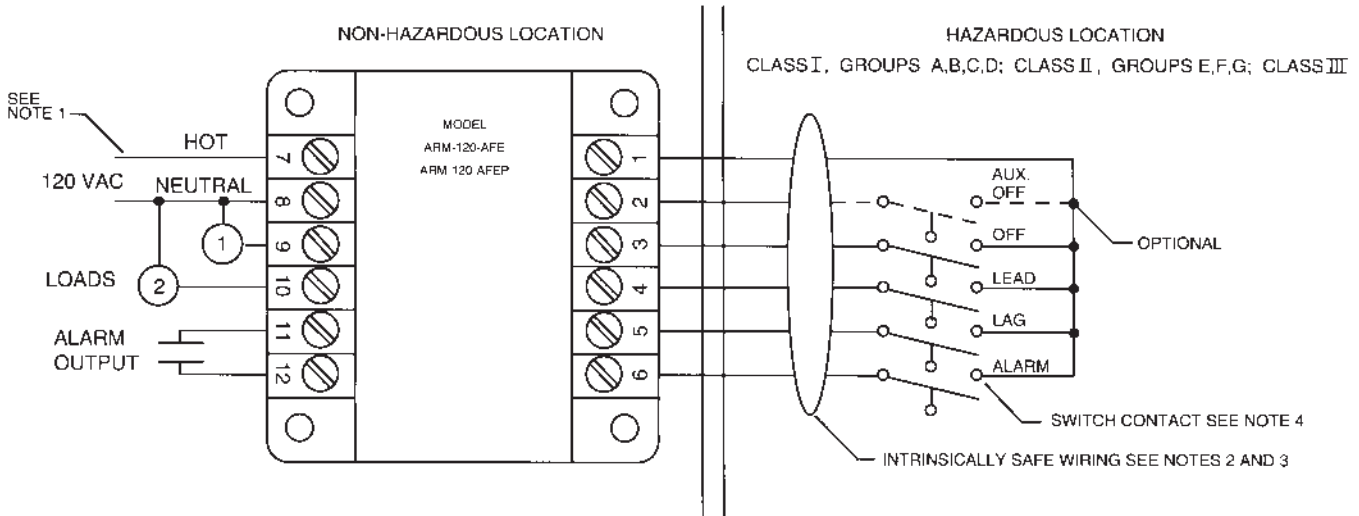
\*Panel Mount Cutout



\*greenlee punch #60071 or equivalent

WIRING

CONTROL DRAWING 190

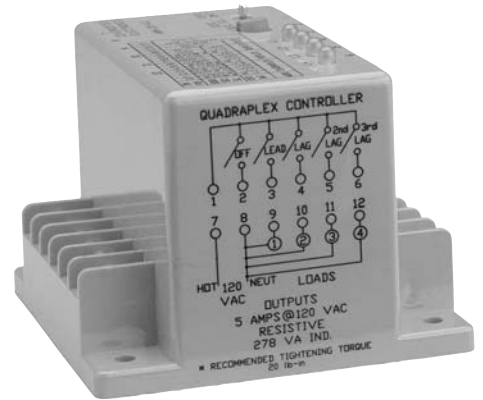


1. To maintain intrinsic safety, connect the Controller's Earth Ground Terminal 8 to the earth ground of the AC Power Supply feeder. The resistance between the Controller's Earth Ground Terminal and Earth Ground shall be less than 1 ohm.
2. Maximum distance between Controller and switch contact is 1000 feet.

3. All intrinsically safe wiring shall be separated from non-intrinsically safe wiring. Refer to article 504 of the National Electrical Code ANSI/NFPA 70 on procedures for intrinsically safe wiring.
4. Switch contact shall be any non-energy storing or generating mechanical switch type device containing no capacitance or inductance.

These **Triplex** and **Quadraplex** Controllers are available with *either* Sequence-On-Simultaneous-Off (SOSO) or First-On-First-Off (FOFO) output logic. The special function models are differentiated by a rotary switch that allows any output to be locked as the lead load or any one load to be omitted while sequencing only the remaining loads. In addition to load omission and lead selection, the expandable model can be set for 2, 3, or 4 load operation with either SOSO or FOFO logic.

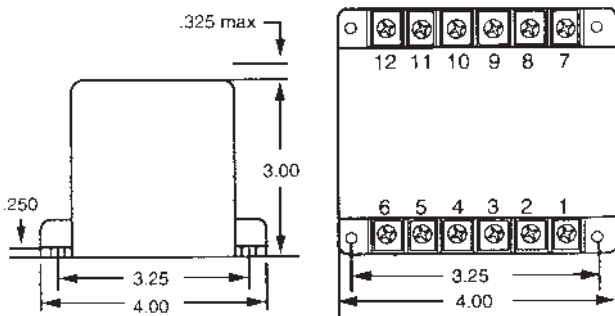
All models feature **intrinsically safe inputs** and logic that allows the outputs to operate properly even if one of the inputs fails to open or close. For example: if the off switch fails to close, the lead load will not energize until both the lead and the lag switches close. An inrush delay on all models reduces line sags by preventing multiple loads from energizing simultaneously.



7M26  
UL913

Alternating Controllers

**DIMENSIONS (INCHES)**



- 3 and 4 Load Output Models
- Intrinsically Safe Inputs
- 2-4 Load Expandable Model

MODEL NUMBER >>>>>>	ARM	E
Control Voltage		
24 VAC	24	
120 VAC	120	
Number of Loads	Output Logic	Special Functions
3	SOSO	none
3	FOFO	none
3	SOSO	Omit/Lead Select
3	FOFO	Omit/Lead Select
4	SOSO	none
4	FOFO	none
Enclosure		
E		
Mount		
No Suffix Surface Mount		
P Suffix Panel Mount		
P		

**SPECIFICATIONS**

CONTROL VOLTAGE	24 or 120 VAC ±10%, 50/60 Hz	
SWITCH VOLTAGE	5.1 Volts open circuit	
SWITCH CURRENT	10 μAmps short circuit	
POWER REQUIRED	2.5 VA	
SENSITIVITY	100 k ohm	
ISOLATION	2500V Input to Output	
DUTY CYCLE	Continuous	
RESPONSE TIMES	Power Up	< 1 SEC
	Operate	< 25 mSEC (switch closure)
	Inrush	5 SEC
	Release	< 150 mSEC
CONTACT RATING	All channels, SPST-N.O., 5 Amps per channel @ 24 or 120 VAC, Resistive; 278 VA, Inductive	
LED INDICATORS	ON when corresponding output is ON	
LIFE EXPECTANCY	Mechanical	20 Million Operations
	Electrical	50,000 Operations
TEMPERATURE RATING	Operate	-4° to 131°F (-20° to +55°C)
	Storage	-40° to 185°F (-40° to +85°C)
TERMINATIONS	(12) #8-32 Screw terminals with pressure clamps	
ENCLOSURE	Style "E" Surface mount	
WEIGHT	16 oz.	

OPERATION—TRIPLEX CONTROLLERS

Intrinsically safe equipment and wiring is equipment and wiring which is incapable of releasing sufficient electrical or thermal energy under normal or abnormal conditions to cause ignition of a specific hazardous atmospheric mixture in its most ignitable concentration. Intrinsically safe terminations and wiring may be brought into any hazardous location of any group classification for which it is accepted without requiring explosion-proof housing or other means of protection.

Hazardous locations are classified by the National Electrical Code according to the level of hazard that may exist in the area. A hazardous location is designated by its class, group and division. The class and group specify the specific hazardous substances that may exist in the classified location.

- Class I, Groups A through D – Flammable gasses
- Class II, Groups E through G – Combustible dusts
- Class III, Easily ignitable fibers or flyings

The division indicates the conditions under which the hazardous substance may be present.

- Division I—Hazardous substances exist continuously or intermittently under normal operating conditions.
- Division II – Hazardous substances exist within closed containers or systems from which they can escape only in case of accidental rupture or breakdown.

The **ARM-120-AAE** and **ARM-120-ABE** Triplex Controllers have four switch inputs and three load outputs. The inputs are designated off, lead, lag and 2nd lag. If the off switch fails to close, the lead load will not energize until both the lead and lag switches close. De-energization of the loads depends on the output logic of the selected controller.

**ARM-120-AAE (SOSO):** The **ARM-120-AAE** has sequence-on-simultaneous-off output logic. As the 2nd lag, lag and lead switches open, the loads remain energized. When the off switch opens, all three loads de-energize simultaneously. If any switch fails to open, the loads still de-energize when the off switch opens. The lead advances one position each time the loads de-energize.

**ARM-120-ABE (FOFO):** The **ARM-120-ABE** has first-on-first-off output logic. When the 2nd lag switch opens, all three loads remain energized. The lag switch opens next, and the lead load de-energizes. When the lead switch opens, the lag load de-energizes. Finally, the off switch opens, and the second lag load de-energizes. At the end of each cycle the lead advances one position for each load energized during the cycle. For example: if loads one and two cycle on and off, the lead will advance two positions. Load three will be the lead load for the next cycle.

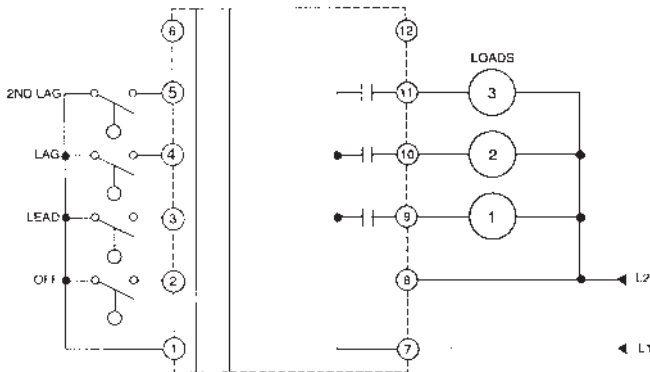
The **ARM-120-ACE (SOSO)** and **ARM-120-ADE (FOFO)** Special Function Triplex Controllers have the same features and operations as the ARM-120-AAE and ARM-120-ABE respectively with the addition of an eight-position field selection switch. The switch allows any one load to be omitted from the sequence or locked in the lead position. An automatic test mode is also provided for system verification and troubleshooting.

**LOAD OMIT MODE:** One load may be omitted from the sequence for general or emergency maintenance while alternating the remaining loads.

**LEAD SELECT MODE:** The controller may be locked into a desired sequence to equalize motor run time.

**AUTOMATIC TEST MODE:** The controller energizes the loads one at a time for five second intervals.

WIRING



FIELD SELECTION SWITCH

POS.	FUNCTION
0	NORMAL
1	1 2 3
2	2 3 1
3	3 1 2
4	OMIT L1
5	OMIT L2
6	OMIT L3
7	TEST

OPERATION—QUADRAPLEX CONTROLLERS

The **ARM-120-AGE** and **ARM-120-AHE** Quadraplex Controllers have five switch inputs and four load outputs. The inputs are designated off, lead, lag, 2nd lag, and 3rd lag. With the off switch closed, the loads energize in sequence upon closure of the lead, lag, 2nd lag, and 3rd lag inputs. If the off switch fails to close, the lead load will not energize until both the lead and lag switches close. De-energization of the loads depends on the output logic of the selected controller.

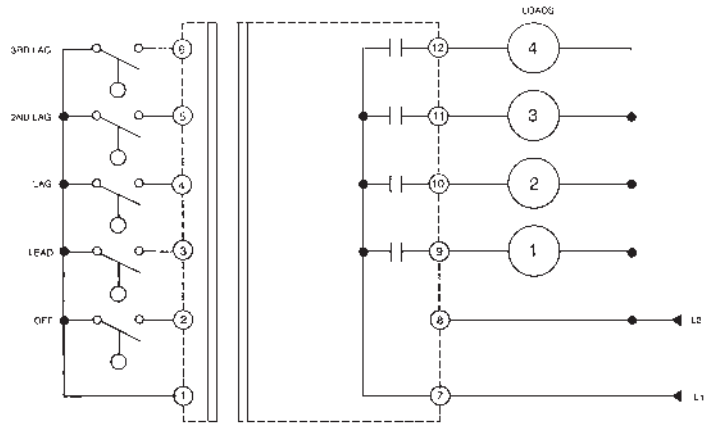
**ARM-120-AGE (SOSO):** The ARM-120-AGE has sequence-on-simultaneous-off output logic. As the 3rd lag, 2nd lag, lag and lead switches open, the loads remain energized. When the off switch opens, all four loads de-energize simultaneously. If any switch fails to open, the loads still de-energize when the off switch opens. The lead advances one position each time the loads de-energize.

**ARM-120-AHE (FOFO):** The ARM-120-AHE has first-on-first-off output logic. When the 3rd lag switch opens, all four loads remain energized. The 2nd lag switch opens next, and the lead load de-energizes. When the lag switch opens, the lag load de-energizes. Next, the lead switch opens, and the 2nd lag load de-energizes. Finally, the off switch opens, and the 3rd lag load de-energizes. At the end of each cycle the lead advances one position for each load energized during the cycle. For example: if loads one and two cycle on and off, the lead will advance two positions. Load three will be the lead load for the next cycle.

The **ARM-120-AJE** Expandable Controller combines five inputs, four load outputs, and two field selection switches making this our most versatile alternating controller. A toggle switch selects either SOSO or FOFO output logic. A rotary switch enables alternation between two, three or four loads. Combined settings of both switches are used to omit a load or lock the controller into a desired sequence. A manual test mode is provided for system verification and troubleshooting.

**MANUAL TEST MODE:** The rotary selector switch has two test positions, off and lead. When the lead position is chosen, the lead load energizes. Moving the switch to the off position de-energizes the load and advances the lead one position. Turning the rotary switch between the off and lead positions cycles the controller through all four outputs. Regardless of the number of loads connected, all four outputs are exercised by the test modes.

WIRING

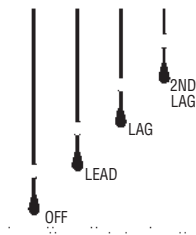


FIELD SELECTION SWITCHES (ARM-120-AJE)

ROTARY SW POS.	Toggle		MODE
	SOSO SEQ SEL	FOFO OMIT	
0	NORMAL		Quadraplex
1	1234	L1	
2	2341	L2	
3	3412	L3	
4	4123	L4	
5	NORMAL		Triplex
6	123	L1	
7	231	L2	
8	321	L3	
9	NORMAL		Duplex
A	12	L1	
B	21	L2	
C	OFF		Test
D	LEAD		
E	UNUSED		
F	OFF		

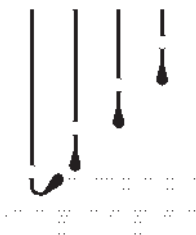
**SOSO OPERATION**

**STEP 1**



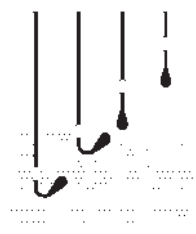
This example illustrates the normal operation of the Triplex Controller in a pump down application with four normally-open-dry float switches. The switches are designated off, lead, lag, and 2nd lag. The example begins with all switches open and all loads de-energized.

**STEP 2**



As the fluid level rises, the OFF switch closes, no loads are energized.

**STEP 3**



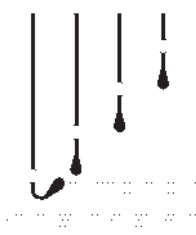
If the fluid level continues to rise, the lead switch closes and load 1 energizes.

**STEP 4**



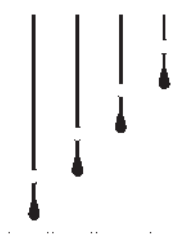
As the fluid level continues to rise each successive float switch closure sequentially energizes a corresponding load.

**STEP 5**



When the fluid level falls and each float switch opens, the loads remain energized so long as the OFF switch remains closed. No external auxiliary contacts are required to accomplish this latch feature.

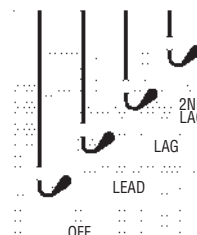
**STEP 6**



When the fluid level falls below the OFF switch, all loads simultaneously de-energize, and the alternating logic advances one position. The next rise and fall in fluid level and successive operation of load switches will result in the SOSO load operation as follows: 2-3-1, 3-1-2, and back to 1-2-3 as in Step 1.

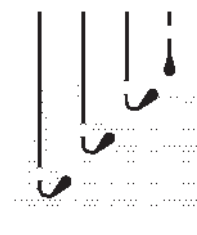
**FOFO OPERATION**

**STEP 1**



This example continues from SOSO operation step four. With all float switches closed, all loads are energized.

**STEP 2**



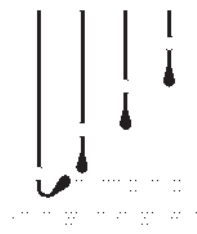
As the fluid level falls, the 2nd lag switch opens. All loads remain energized. Each float switch in descending order acts as the OFF switch for the preceding float.

**STEP 3**



When the lag switch opens, load 1 de-energizes. Loads 2 and 3 remain energized.

**STEP 4**



When the lead switch opens, load 2 de-energizes. Load 3 is held on by the OFF switch.

**STEP 5**















When the OFF switch opens, load 3 de-energizes and the lead advances three positions. At the end of each cycle the lead advances one position for each load energized during the cycle. This particular example reverts back to SOSO OPERATION 1-4 wherein load 1 would again be the lead load.

## ISOLATED SWITCHES

### INTRINSICALLY SAFE SINGLE & MULTIPLE CHANNEL INPUTS

Hazardous locations are classified by the National Electrical Code according to the level of hazard that may exist in the area. A hazardous location is designated by its class, group and division.

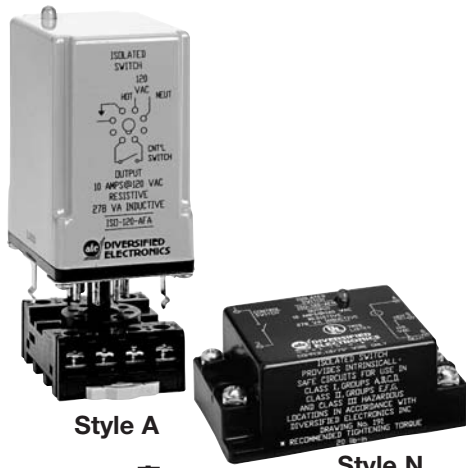
Class and group specify the type of hazardous substance that may exist in the classified location. The division indicates the conditions under which the hazardous substance may be present.

	<b>CLASS I</b> Locations in which flammable gases or vapors may be present in the air in quantities sufficient to produce explosive or ignitable mixtures.		<b>CLASS II</b> Locations which are hazardous because of the presence of combustible dust.
	<b>GROUP A</b> Atmospheres containing acetylene.		<b>GROUP E</b> Atmospheres containing metal dust including aluminum, magnesium and their commercial alloys and other metals of similarly hazardous characteristics.
	<b>GROUP B</b> Atmospheres containing hydrogen, gases or vapors of equivalent hazard, such as manufactured gas.		<b>GROUP F</b> Atmospheres containing carbon black, coal or coke dust.
	<b>GROUP C</b> Atmospheres containing ethyl-ether vapors, ethylene or cyclopropane.		<b>GROUP G</b> Atmospheres containing flour, starch or grain dusts.
	<b>GROUP D</b> Atmospheres containing gasoline, hexane, naphtha, benzine, butane, propane, alcohol, acetone, benzol, lacquer solvent vapors or natural gas.		<b>CLASS III</b> Locations which are hazardous because of the presence of easily ignitable fibers or flyings, but in which such fibers or flyings are not likely to be in suspension in air in quantities sufficient to produce ignitable mixtures.
	<b>DIVISION I</b> Locations in which hazardous concentrations in the air exist continuously, intermittently or periodically under normal operating conditions.		<b>DIVISION II</b> Locations in which hazardous concentrations are handled, processed or used but are normally confined within closed containers or closed systems from which they can escape only in case of accidental rupture or breakdown.



The ATC Diversified Electronics series of Isolated Switches have been tested and approved for listing under Underwriters Laboratories (UL) UL913 Intrinsically Safe Apparatus and Associated Apparatus. The input(s) to these switches have been approved for use in all classes, groups and divisions of hazardous locations.

Sold by AA Electric 1-800-237-8274 Lakeland, FL • Lawrenceville, GA • Greensboro, NC • East Rutherford, NJ  
 Web : [www.A-Aelectric.com](http://www.A-Aelectric.com) Email : [njsales@a-aelectric.com](mailto:njsales@a-aelectric.com)

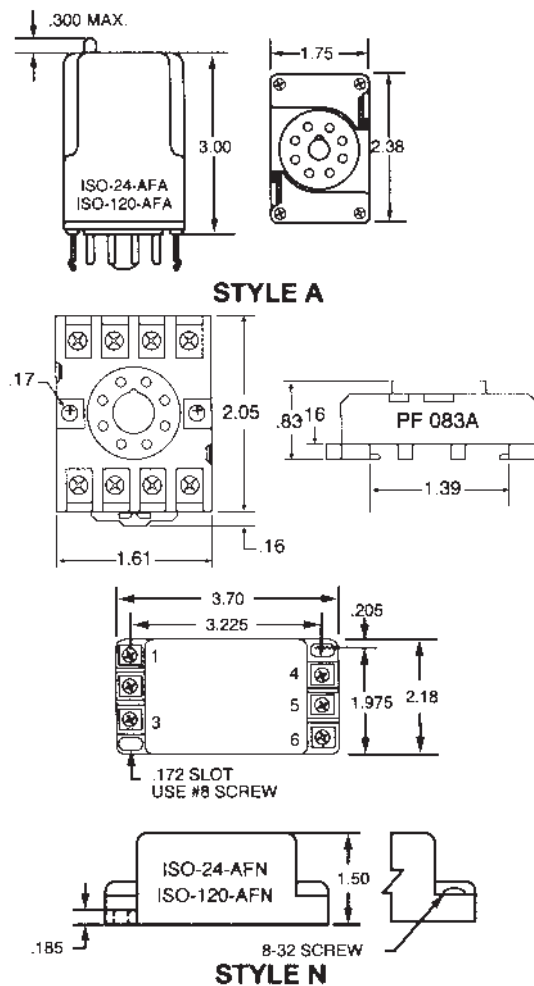


Single Channel Isolated Switch

OPERATION

The ISO Series **single channel** devices are used to provide a safe and reliable means of controlling loads from hazardous locations without releasing sufficient energy, under normal or abnormal conditions, to cause ignition of a flammable or combustible atmospheric mixture while in its most easily ignited concentration. An isolated output turns on when the control switch input from the hazardous location is closed. When the control switch input opens, the isolated output turns off. The Style A single channel plug-in devices come equipped with integral spring mating clips which secure the device to the base make this unit the only **UL913** Intrinsically Safe plug-in associated apparatus available on the market today. The Style N, surface mounted enclosure is sealed with a high quality epoxy resin material and has five (5) #8-32 screw terminals.

DIMENSIONS (INCHES)



SPECIFICATIONS

CONTROL VOLTAGE	24 or 120 VAC, ±10%, 50/60 Hz	
CONTROL SWITCH	Open Circuit Voltage	16 VDC
	Short Circuit Current	200 µAmps
RESPONSE TIMES	Operate	6 mSEC (Approx.)
	Release	2.5 mSEC (Approx.)
POWER REQUIRED	1.5 VA	
DUTY CYCLE	Continuous	
CONTACT RATING	SPST-N.O., 10 amps @ 24 or 120 VAC, Resistive; 278 VA, Inductive	
ISOLATION	2500 Volts, Input to Output	
LIFE EXPECTANCY	Mechanical	20 Million Operations
	Electrical	50,000 Operations @ Rated Load
INDICATORS	On When Output is On	
TEMPERATURE RATING	Operate	-4° to 131°F (-20° to +55°C)
	Storage	-40° to 185°F (-40° to +85°C)
ENCLOSURE	Style "E" Lexan® Surface Mounted	
TERMINATIONS	(12) #8-32 Screw Terminals	
WEIGHT	20 oz.	

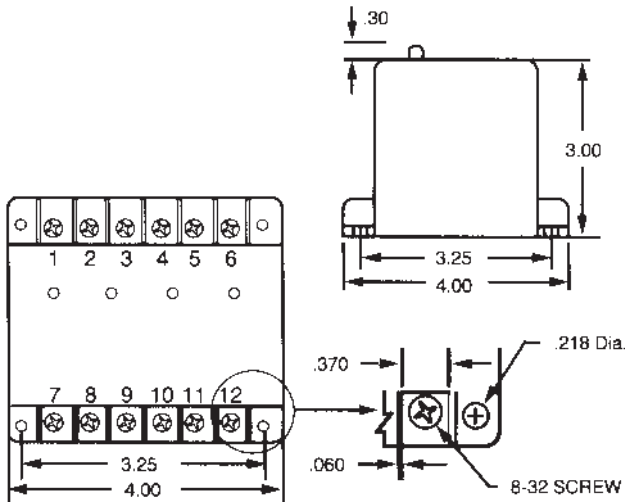
ORDERING INFORMATION

MODEL NUMBER	CONTROL VOLTAGE	ENCLOSURE STYLE
<b>ISO-24-AFA</b>	24 VAC	A
<b>ISO-120-AFA</b>	120 VAC	A
<b>ISO-24-AFN</b>	24 VAC	N
<b>ISO-120-AFN</b>	120 VAC	N

**OPERATION**

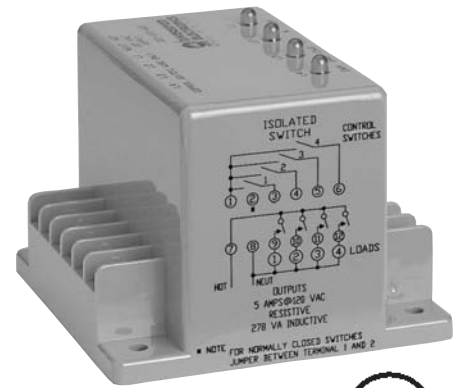
The ISO/ISL Series **multiple channel** devices are used to provide a safe and reliable means of controlling loads from hazardous locations without releasing sufficient energy under normal or abnormal conditions to cause ignition of a flammable or combustible atmospheric mixture while in its most easily ignited concentration. An isolated output turns on when the corresponding control switch input from the hazardous location is activated. When using normally closed control switch inputs, a jumper should be installed between terminals 1 and 2. Normally open control switch inputs do not require the optional jumper. When the **non-latching ISO** Series control switch input is activated, its corresponding output turns on. When the control switch input is deactivated, its output turns off. When the **latching ISL** Series control switch input 2, 3 or 4 is activated, its corresponding output turns on. When control switch 2, 3 or 4 is deactivated, its corresponding output remains latched on as long as control switch input 1 is activated; otherwise it turns off immediately. Control switch input 1 also controls output 1 just as in the non-latching ISO Series.

**DIMENSIONS (INCHES)**



**ORDERING INFORMATION**

MODEL NUMBER	CONTROL VOLTAGE	CHANNELS
<b>ISL-24-AAE</b>	24 VAC	2
<b>ISL-24-ABE</b>	24 VAC	3
<b>ISL-24-ACE</b>	24 VAC	4
<b>ISL-120-AAE</b>	120 VAC	2
<b>ISL-120-ABE</b>	120 VAC	3
<b>ISL-120-ACE</b>	120 VAC	4
<b>ISO-24-AAE</b>	24 VAC	2
<b>ISO-24-ABE</b>	24 VAC	3
<b>ISO-24-ACE</b>	24 VAC	4
<b>ISO-120-AAE</b>	120 VAC	2
<b>ISO-120-ABE</b>	120 VAC	3
<b>ISO-120-ACE</b>	120 VAC	4



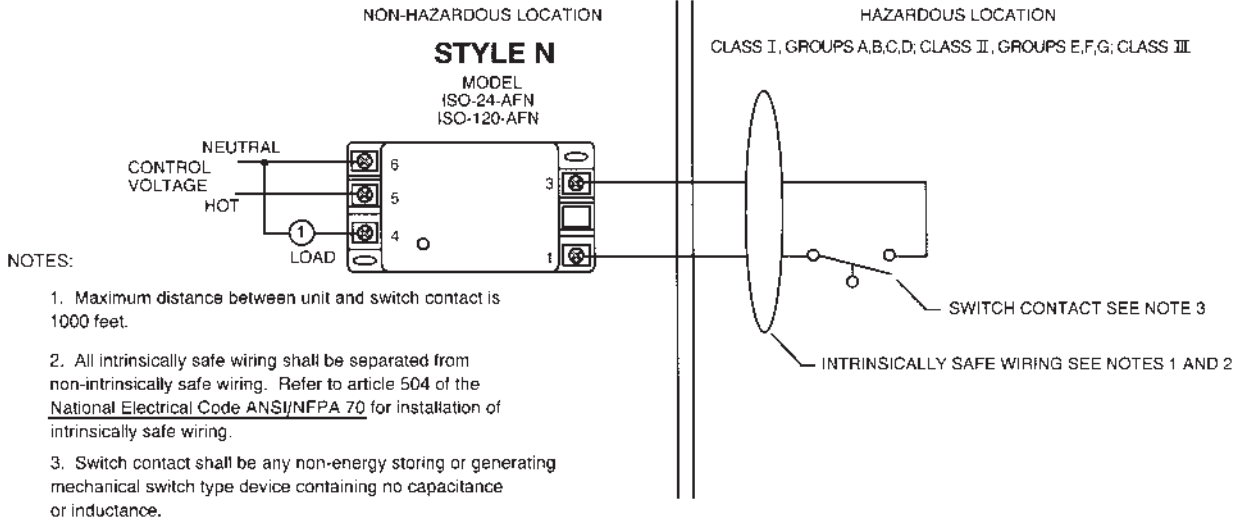
Multiple Channel Isolated Switch

**SPECIFICATIONS**

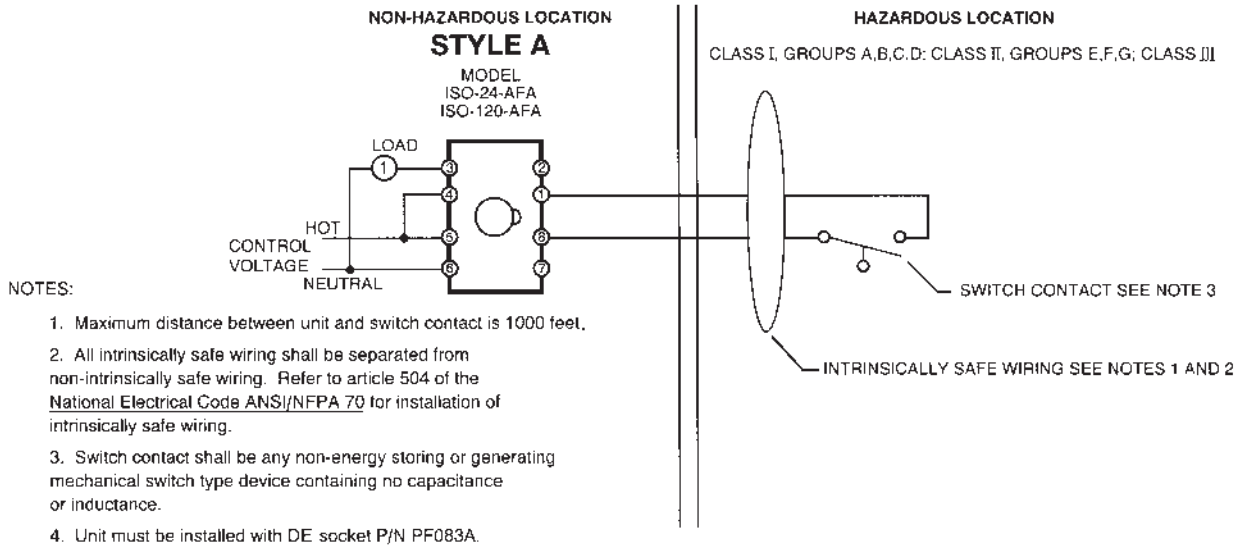
CONTROL VOLTAGE	24 or 120 VAC, ±10%, 50/60 Hz	
CONTROL SWITCH	Open Circuit Voltage	6.2 VDC
	Short Circuit Current	10 μAmps
RESPONSE TIMES	Operate	6 mSEC (Approx.)
	Release	2.5 mSEC (Approx.)
POWER REQUIRED	2.5 VA	
DUTY CYCLE	Continuous	
CONTACT RATING	SPST-N.O., 5 amps per channel @ 24 or 120 VAC, Resistive; 278 VA, Inductive	
ISOLATION	2500 Volts, Input to Output	
LIFE EXPECTANCY	Mechanical	20 Million Operations
	Electrical	50,000 Operations @ Rated Load
INDICATORS	On When Corresponding Output is On	
TEMPERATURE RATING	Operate	-4° to 131°F (-20° to +55°C)
	Storage	-40° to 185°F (-40° to +85°C)
ENCLOSURE	Style "E" Lexan® Surface Mounted	
TERMINATIONS	(12) #8-32 Screw Terminals	
WEIGHT	8 oz.	

WIRING

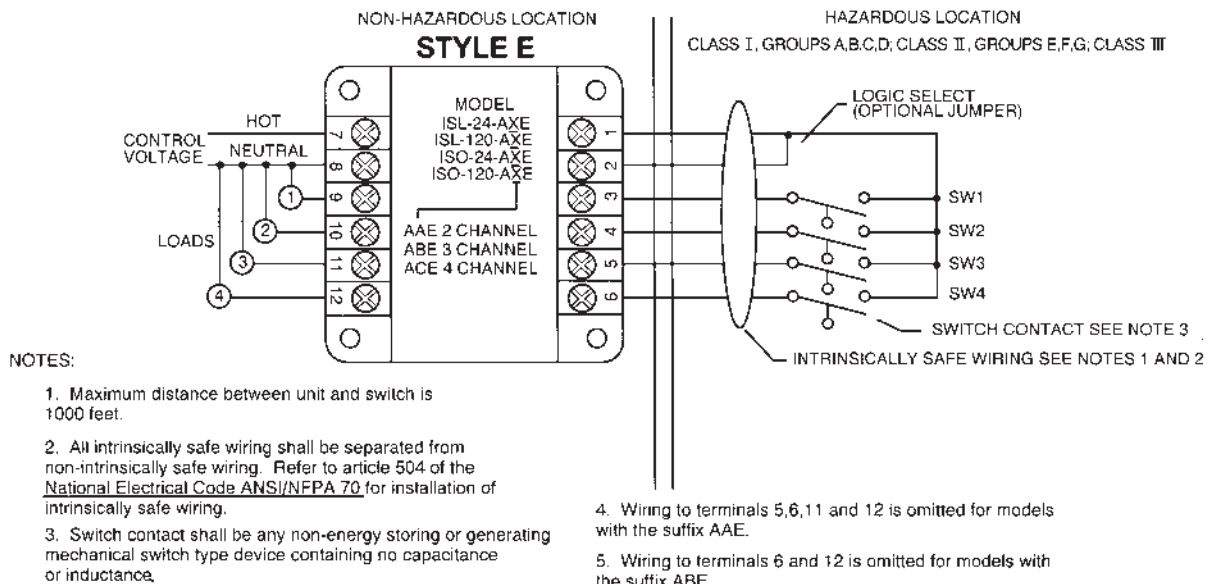
CONTROL DRAWING 191



CONTROL DRAWING 192



CONTROL DRAWING 193



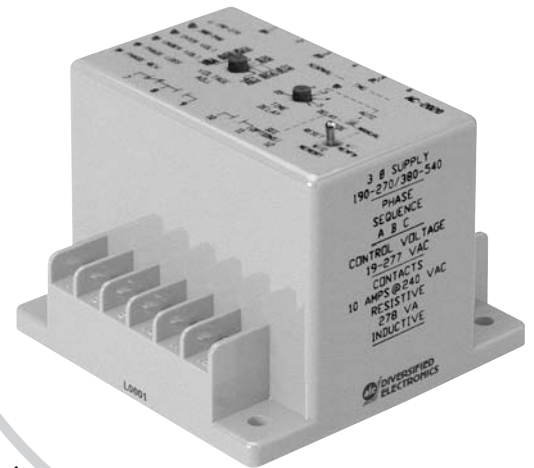
The **AC 2020 compressor protector** provides multimode **time delays**, **reset** selections and a **memory capability** which indicates using LED's, the last fault condition. This offers not only protection for the compressor in adverse electrical conditions but also a method to readily determine the type of fault occurrence.

### OPERATING VOLTAGE

Auto Ranges	
240 VAC	190-270 VAC, Adj., 50/60 Hz
480 VAC	380-540 VAC, Adj., 50/60 Hz

### SPECIFICATIONS

CONTROL VOLTAGE	24 or 120 VAC, $\pm 10\%$ , 50/60 Hz	
TRIP POINTS	Under Voltage	-10% of Setting
	Over Voltage	+10% of Setting
	Hysteresis	5% of Nominal Setting
RESPONSE TIMES	Pick-Up	Auto Mode: 0.05 to 5 Min. (Adj) Delay-On-Make Delay Mode: 3 Min. (Fixed) Delay-On-Break
	Drop-Out	Over/Under Voltage, Phase Loss: 2 SEC (Approximately)
POWER REQUIRED	<5 VA	
MAXIMUM VOLTAGE	550 VAC	
PHASE SEQUENCE	ABC (Will Not Operate On CBA Sequence)	
OUTPUT RATING	278 VA Inductive; 10 Amps Resistive @ 240 VAC	
CONFIGURATION	Control	SPST-N.O.
	Auxiliary	SPDT
MODE SELECTIONS	Automatic; Manual; Delay-On-Break	
RESET SWITCH	With Memory, Without Memory, Auto Reset, Manual Reset	
TRANSIENT WITHSTAND	1500 V @ 8X 20 Microseconds	
TEMPERATURE RATING	Operate	-4° to 131°F (-20° to +55°C)
	Storage	-40° to 185°F (-40° to +85°C)
ENCLOSURE	Style "E" Lexan® Surface Mounted	
TERMINATIONS	(12) #8-32 Screw Terminals	
WEIGHT	6 oz.	



3-Phase Compressor Protector

- Automatic Voltage Ranging
  - Universal Control Voltage
  - Condition/Fault Indicators
  - Automatic/Manual Reset
  - Last Fault Memory
  - Delay-On-Make
  - Delay-On-Break
  - Auxiliary Contacts
  - Easy Installation
- PROTECTS AGAINST:
- Phase Loss
  - Under Voltage
  - Over Voltage
  - Phase Reversal
  - Short Cycling

### ORDERING INFORMATION

MODEL NUMBER	DESCRIPTION
AC-2020	3-Phase Compressor Protector



This family of HVAC controls provides **short cycle protection** by locking out the compressor for a period of time after a voltage or thermostat interruption. Subsequent interruptions will not increase the delay period. Since the delay begins when the interruption occurs, the temperature control is not affected. Under normal operating conditions, the compressor off time is longer than five (5) minutes. In this case, the use of these timers will not lengthen this off cycle.

This field adjustable model will operate on control voltages of 19 VAC through 288 VAC. Unlike most universal voltage timers, the AC-503 is a two (2) terminal device that simply connects in series with the control voltage, thermostat and control relay making for easy installation. This timer is engineered to provide **true thermostat interruption protection** even when there is a continuous current flow through the thermostat's cooling anticipator.

NOTE: When used on 120/240 VAC control circuits, the external jumper should be cut. This disables the 24 VAC bypass circuit.

Delay-On-Break Timers

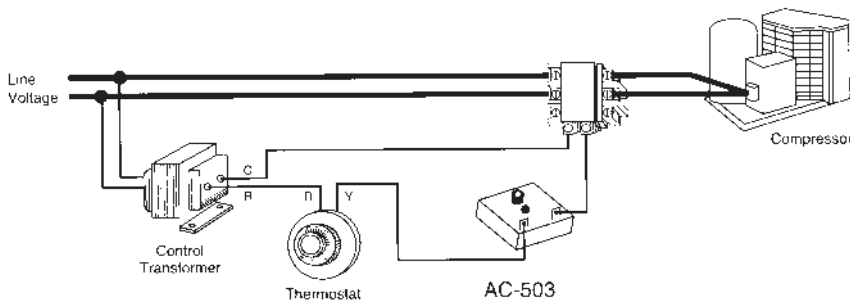
ORDERING INFORMATION

MODEL NUMBER	DESCRIPTION
AC-503	Delay-On-Break Timer

SPECIFICATIONS

CONTROL VOLTAGE	24/120 or 208/240 VAC
OUTPUT RATING	250 VA Inrush; 25 VA Run @ 24 VAC, or 1250 VA Inrush; 125 VA Run @ 120/240 VAC
TIME DELAY	0.1 to 5 min. Adjustable
DIMENSIONS	2.0" x 2.0" x .75" high
WEIGHT	2.5 oz.

WIRING



The AC-505-5 provides **short cycle protection** by locking out the compressor for a period of time after a voltage or thermostat interruption. Subsequent interruptions will not increase the delay period. Since the delay begins when the interruption occurs, the temperature control is not affected. Under normal operating conditions, the compressor off time is longer than five (5) minutes. In this case, the use of these timers will not lengthen this off cycle.

This is an easy to install, two (2) wire Short Cycle Timer that connects in series with the control voltage and control relay. The AC-505 is engineered to provide **true thermostat interruption protection** even when there is continuous current flow through the thermostat's cooling anticipator.

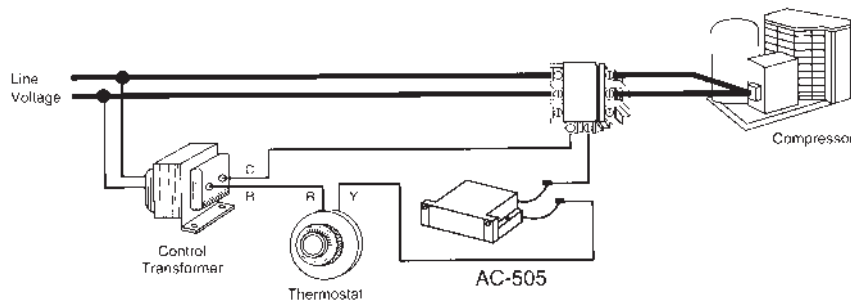


Delay-On-Break Timer

SPECIFICATIONS	
CONTROL VOLTAGE	24 VAC
OUTPUT RATING	250 VA Inrush; 25 VA Run @ 24 VAC @ 77°F
TIME DELAY	5 min. ±20%
DIMENSIONS	2.65" x 2.13" x .875" high.
WEIGHT	3 oz.

ORDERING INFORMATION	
MODEL NUMBER	DESCRIPTION
AC-505-5	Delay-On-Break Timer

WIRING





This family of controls provides short cycle protection by locking out the compressor for a period of time after a voltage or thermostat interruption. Subsequent interruptions will not increase the delay period. Since the delay begins when the interruption occurs, the temperature control is not affected. Under normal operating conditions, the compressor off time is longer than five (5) minutes. In this case, the use of these timers will not lengthen this off cycle.

These are easy to install two (2) terminal Short Cycle Timers that connect in series with the control voltage and control relay. The 24 VAC model employs a built-in bypass circuit for allowing continuous flow through the thermostat's cooling anticipator while the timer output is off.

Delay-On-Break Timer

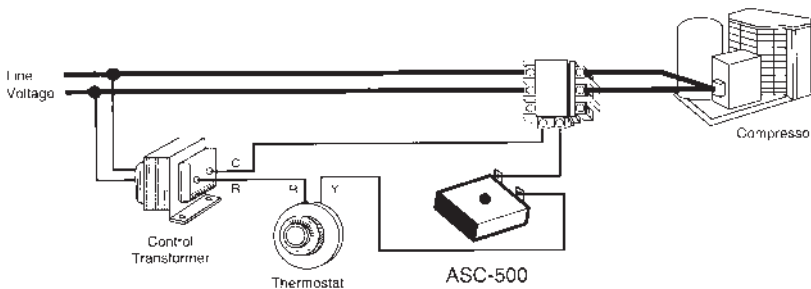
ORDERING INFORMATION

MODEL NUMBER	DESCRIPTION
ASC-500-5	Delay-On-Break Timer
ASC-501-5	Delay-On-Break Timer
ASC-502-5	Delay-On-Break Timer

SPECIFICATIONS

CONTROL VOLTAGE	ASC-500-5	24 VAC
	ASC-501-5	110/120 VAC
	ASC-502-5	208/240 VAC
OUTPUT RATING	ASC-500-5	250 VA Inrush; 25 VA Run @ 24 VAC
	ASC-501-5	1250 VA Inrush; 125 VA Run @ 120 VAC
	ASC-502-5	1250 VA Inrush; 125 VA Run @ 240 VAC
TIME DELAY	5 min. ±20%	
DIMENSIONS	2.0" x 2.0" x .75" high	
WEIGHT	3 oz.	

WIRING



The ATC Diversified **STAR PERFORMER** provides **short cycle protection** of **compressors** by delaying restart after a voltage or control circuit interruption. When the interruption occurs, the control relay drops out. The delay period begins when power is restored, providing random restart.

This universal voltage Delay-on-Make Short Cycle Timer provides the ultimate protection against short cycling of a compressor. The Star Performer offers true thermostat interruption protection even in 24 VAC control circuits.

The general conception of thermostat operation is that when the mercury tilts open, all control circuit current stops. The fact is that the cooling anticipator located inside most 24 volt thermostats does allow a small amount of current to flow (trickle current). This trickle current fools most Delay-on-Make Short Cycle Timers, as they will not reset as a result of this continuous current.

The **STAR PERFORMER** is engineered to provide true thermostat interruption protection even when the trickle current is present. The adjustable delay is ideal for providing random starting in multiple equipment installations.

NOTE: When used on 120/240 VAC control circuits, the external jumper should be cut. This disables the 24 VAC bypass circuit.



"STAR PERFORMER"

Delay-On-Make Timers

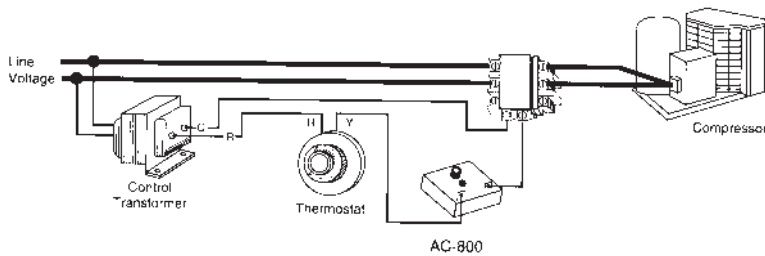
SPECIFICATIONS

CONTROL VOLTAGE	24/120, 208/240 VAC
OUTPUT RATING	250 VA Inrush; 25 VA Run @ 24 VAC, or 1250 VA Inrush; 125 VA Run @ 120/240 VAC
TIME DELAY	0.2 to 8 min. Adjustable
WEIGHT	2.5 oz. to 3 oz.

ORDERING INFORMATION

MODEL NUMBER	DESCRIPTION
AC-800	Delay-On-Make Timer

WIRING





File #E55826

The ASC-600 Series provides **short cycle protection of compressors** by delaying restart after a voltage or control circuit interruption. When the interruption occurs, the control relay drops out. The delay period begins when power is restored, providing random restart.

These are easy to install, two (2) terminal short cycle timers that connect in series with the control voltage and control relay. The 24 VAC models employ a built in bypass circuit for allowing continuous current flow through the thermostat's cooling anticipator while the timer output is off.

## Delay-On-Make Timer

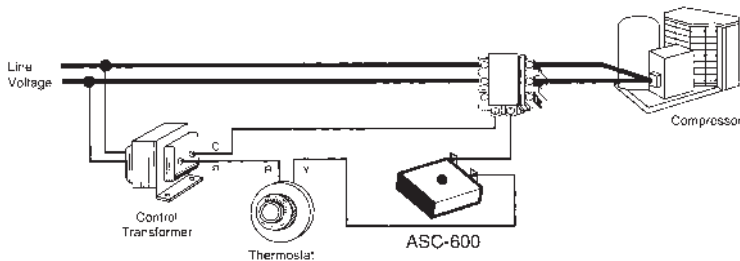
### ORDERING INFORMATION

MODEL NUMBER	DESCRIPTION
ASC-600-3	24 VAC Delay-On-Make Timer
ASC-601-3	120/240 VAC Delay-On-Make Timer

### SPECIFICATIONS

CONTROL VOLTAGE	ASC-600-3	24 VAC
	ASC-601-3	120/240 VAC
OUTPUT RATING	ASC-600-3	250 VA Inrush; 25 VA Run @ 24 VAC
	ASC-601-3	1250 VA Inrush; 125 VA Run @ 120/240 VAC
TIME DELAY	3 min. ±20%	
WEIGHT	3 oz.	

### WIRING



The AC-410 Series are plug in Phase Sequence and Loss Monitors that protect 3 phase *refrigeration equipment* from adverse line conditions such as:

**PHASE LOSS (SINGLE PHASING):** When any one phase drops to 83% or less of the adjustment setting.

**UNDER VOLTAGE (BROWN OUTS):** When all three phase voltages drop to 90% or less of the adjustment setting.

**PHASE REVERSAL (IMPROPER SEQUENCE):** When the wrong sequence is applied to the equipment.



STYLE A

Phase Sequence & Loss Monitor

OPERATION

When any of the mentioned occurs, the internal control relay drops out and a 3 minute delay-on-break time delay begins. This delay is used to lock out the compressor, allowing time for head pressure to equalize. When the delay has completed, the relay will re-energize provided all conditions are corrected and the external control voltage is present on terminals six (6) and seven (7). A green indicator glows when all line conditions are normal and a red indicator shows when the timer is in its delay.

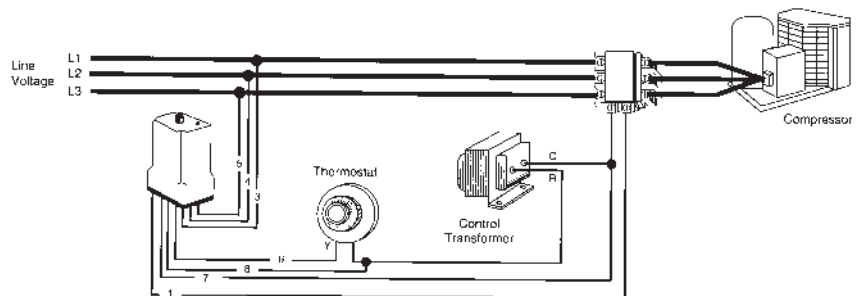
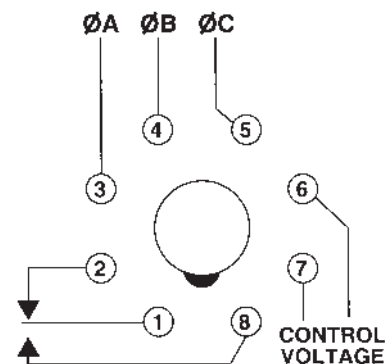
SPECIFICATIONS

DROP OUT	1 Ø Low	83% of Adjustment Setting
	3 Ø Low	90% of Adjustment Setting
PHASE SEQUENCE	ABC (Will Not Operate CBA)	
TIME DELAYS	Operate	3 Minutes ±20%
	Release	100 Milliseconds
OUTPUT RATING	AC-410	SPDT, 10 Amps @ 240 VAC, Resistive; 470 VA, Inductive.
	AC-411 & 412	SPDT, 10 Amps @ 240 VAC, Resistive; 180 VA, Inductive
TEMPERATURE RATING	Operate	-4° to 131°F (-20° to +55°C)
	Storage	-40° to 185°F (-40° to +85°C)
ENCLOSURE	Style "A"	
WEIGHT	7 oz.	

ORDERING INFORMATION

Consult Factory for available Models.

WIRING





CV-100RS  
1.5" X 2.65" X 3.75"H

CV-230-AFN

Single Phase Under/Over Voltage Monitor

The CV-100 and 200 Series are **Under/Over Voltage Monitors** combined with short cycle protectors used for **appliance control**. These units employ a user selectable voltage range Set Point switch.

OPERATION

This switch should be positioned to match the line voltage for proper operation. When the line voltage goes below (brown out) or above the preselected operating range, the internal relay drops out removing the plugged-in appliance from these adverse fault conditions. When the voltage returns to the normal operating range, a five (5) minute delay begins. Upon completion, the internal relay picks up allowing the plugged-in appliance to start. LED indicators give an immediate visual reference as to the status of the control. The GREEN LED indicates conditions are normal. When a fault condition occurs the GREEN LED will extinguish and the RED LED will glow. When a fault condition has been corrected, the RED LED will begin to flash. The RED LED will continue to flash until the five (5) minute delay period elapses. At the end of the delay period the RED LED will extinguish and the GREEN LED will glow. When both LED's are extinguished, a total loss of power is indicated.

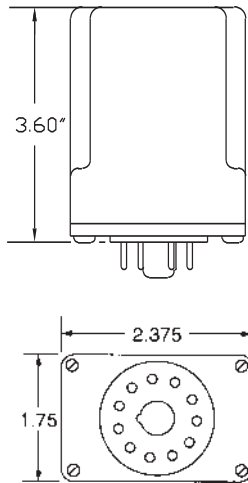
The CV-XXX-AFN Series monitors under voltage only and do not feature LED indicators. They also incorporate the five (5) minute short cycle delay. This style is epoxy encapsulated to protect against adverse environmental conditions.

MODEL NUMBER	SET POINT	VOLTAGE 50/60 HZ	UNDER VOLTAGE		OVER VOLTAGE		OUTPUT RATING		RECEPTACLE STYLE	WEIGHT
			DROP OUT	PICK UP	PICK UP	DROP OUT	RUN	LOCK ROTOR		
<b>CV-100RS</b>	110	110 VAC	87 VAC	95 VAC	120 VAC	128 VAC	15A	40A		8.5 oz.
	120	120 VAC	95 VAC	103 VAC	131 VAC	140 VAC	15A	40A		
<b>CV-200RS-15</b>	230	230 VAC	190 VAC	198 VAC	243 VAC	253 VAC	15A	52A		8.5 oz.
	240	240 VAC	202 VAC	210 VAC	258 VAC	268 VAC	15A	52A		
<b>CV-200RS-20</b>	230	230 VAC	190 VAC	198 VAC	243 VAC	253 VAC	20A	72A		8.5 oz.
	240	240 VAC	202 VAC	210 VAC	258 VAC	268 VAC	20A	72A		
<b>CV-120-AFN</b>	N/A	120 VAC	95 VAC	103 VAC	N/A	N/A	20A	52A	Not Applicable 1/4 inch quick disconnect terminals	8.5 oz.
<b>CV-230-AFN</b>	N/A	230 VAC	190 VAC	198 VAC	N/A	N/A	20A	52A		
<b>CV-240-AFN</b>	N/A	240 VAC	202 VAC	210 VAC	N/A	N/A	20A	52A		

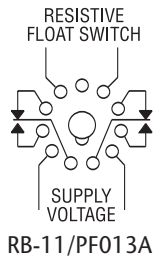
**OPERATION**

The ATC Diversified SPM Series Single channel seal failure module is a specialized control for monitoring the **shaft seal** of a **submersible pump motor**. A leak is detected by sensing the position of a resistive float switch installed in the seal cavity. When the resistance drops below the sensitivity rating, the output relay energizes and the LED illuminates. When the fault condition clears, the output relay resets automatically.

**DIMENSIONS (INCHES)**



**WIRING**



Single Channel Seal Failure Alarm

**SPECIFICATIONS**

CONTROL VOLTAGE	120 VAC, 50/60 Hz	
SWITCH VOLTAGE	9 VDC	
ISOLATION	2500 Volts	
POWER REQUIRED	2 VA	
DUTY CYCLE	Continuous	
SENSITIVITY	470 Ω ±10% Fixed	
	470 Ω to 10K Ω ±10% Adjustable	
	4.7K Ω to 100K Ω ±10% Adjustable	
CONTACT RATING	DPDT, 10 A @ 250 VAC Resistive, 360 VA Inductive	
RESPONSE TIMES	Operate	15 ms (approximately)
	Release	8 ms (approximately)
LIFE EXPECTANCY	Mechanical	10,000,000 Operations (Minimum)
	Electrical	50,000 Operations @ Rated Load
INDICATORS	Red LED illuminates when leak is detected	
TEMPERATURE RATING	Operate	-4° to 131°F (-20° to +55°C)
	Storage	-40° to 185°F (-40° to +85°C)
ENCLOSURE	11-Pin plug-in "A" style enclosure	
WEIGHT	8 oz.	

MODEL NUMBER >>>>>>	SPM	120	AAA		
				Sensitivity	
				470 Ω ±10% Fixed	470
				470 Ω to 10K Ω ±10% Adjustable	10K
				4.7K Ω to 100K Ω ±10% Adjustable	100K

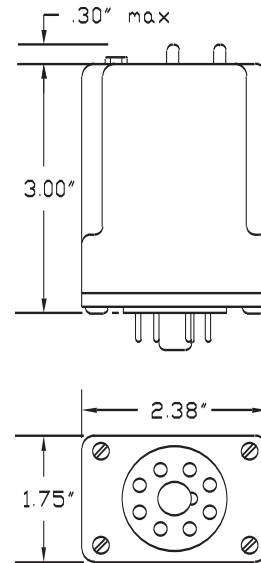


Dual Channel Seal Failure Alarm

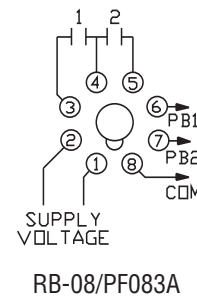
OPERATION

The ATC Diversified Electronics SPM Series **dual seal failure** module is a specialized control for monitoring the shaft seals of **two submersible pump motors**. Leaks are detected by sensing the conductivity of the contaminating fluid through probes installed in the seal cavity. When a seal begins to leak, the seal failure module energizes one of its SPST output relays indicating that the seal needs to be replaced before the motor is damaged. The sensitivity of the probe inputs is field adjustable. When the resistance between one of the probe inputs and the common connection drops below the sensitivity setting, the corresponding output relay and LED are activated.

DIMENSIONS (INCHES)



WIRING



SPECIFICATIONS

CONTROL VOLTAGE	120 VAC, 50/60 Hz	
PROBE VOLTAGE	9 VDC	
ISOLATION	2500 Volts	
POWER REQUIRED	2 VA	
DUTY CYCLE	Continuous	
SENSITIVITY	10K $\Omega$ to 25K $\Omega$ $\pm$ 10% Adjustable	
	4.7K $\Omega$ to 100K $\Omega$ $\pm$ 10% Adjustable	
CONTACT RATING	(2) SPST-N.O., 5 A @ 120 VAC Resistive, 345 VA Inductive	
LIFE EXPECTANCY	Mechanical	20 Million Operations
	Electrical	50,000 Operations @ Rated Load
INDICATORS	Red LED illuminates when leak is detected	
TEMPERATURE RATING	Operate	-4° to 131°F (-20° to +55°C)
	Storage	-40° to 185°F (-40° to +85°C)
ENCLOSURE	8-Pin plug-in "A" style enclosure	
WEIGHT	8 oz.	

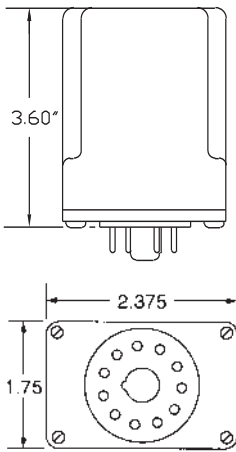
MODEL NUMBER >>>>>>	SPM	120	ABA	
		Sensitivity		
		10K $\Omega$ to 25K $\Omega$ $\pm$ 10% Adjustable		25K
		4.7K $\Omega$ to 100K $\Omega$ $\pm$ 10% Adjustable		100K

Special Controls // SPM Series

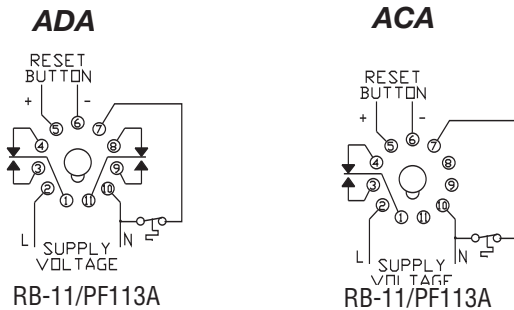
**OPERATION**

The non-volatile **latching temperature switch** relay monitors a normally-closed-low temperature switch. It incorporates a bistable relay that retains its state during power failures. LEDs indicate the status of the relay, and connections for an external reset button are provided for manual control. The reset inputs of multiple units may be connected to a single push button as long as proper polarity is observed when making the connections. Under normal conditions the temperature switch is closed and the relay is de-energized. When the temperature switch opens, the relay energizes and latches on until the temperature switch re-closes and the reset button is pressed. The unit will function properly with zero to 2k Ω of resistance in series with the temperature switch.

**DIMENSIONS (INCHES)**



**WIRING**



<b>MODEL NUMBER &gt;&gt;&gt;&gt;&gt;</b>	SPM	120	
	Contacts		
	SPDT Contacts		ACA
	DPDT Contacts		ADA



Temperature Switch Relay

**SPECIFICATIONS**

SUPPLY VOLTAGE	120 VAC, 50/60 Hz	
POWER REQUIRED	2 VA	
DUTY CYCLE	Continuous	
CONTACT RATING	SPM-120-ACA	SPDT, 10 A @ 250 VAC, Resistive, 360 VA Ind.
	SPM-120-ADA	DPDT, 10 A @ 250 VAC, Resistive, 360 VA Ind.
RESPONSE TIMES	Operate	10 ms (approximately)
	Release	1 SEC (approximately)
LIFE EXPECTANCY	Mechanical	30 Million Operations
	Electrical	50,000 Operations @ Rated Load
INDICATORS	SPM-120-ACA	Green LED illuminates under normal conditions Red LED illuminates under fault conditions
	SPM-120-ADA	None
TEMPERATURE SWITCH	Voltage	12 VDC
	Current	2 mA max.
TEMPERATURE RATING	Operate	-4° to 131°F (-20° to +55°C)
	Storage	-40° to 185°F (-40° to +85°C)
ENCLOSURE	11-Pin plug-in "A" style enclosure	
WEIGHT	8 oz.	



Submersible Pump Monitor

The ATC Diversified Submersible Pump Monitor is a specialized control for monitoring the **shaft seal** and stator **temperature** of a **submersible pump motor**. Seal leakage is detected by either a resistive float switch or a pair of conductive probes installed in the seal cavity. Over-temperature is detected by a normally-closed-low temperature switch mounted on the stator. The over-temperature function incorporates a bistable relay that retains its position during power failures.

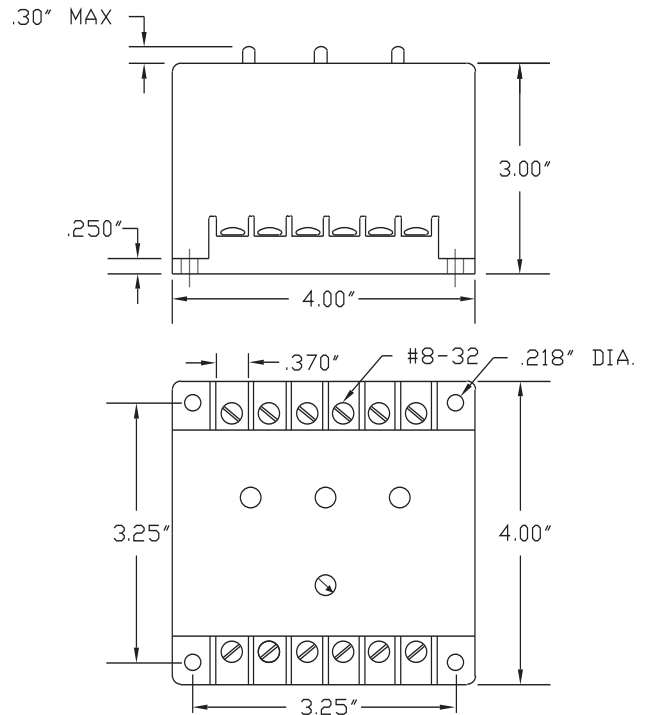
ORDERING INFORMATION

MODEL NUMBER	DESCRIPTION
SPM-120-AEE	Dual Function Alarm/Relay

SPECIFICATIONS

SUPPLY VOLTAGE	120 VAC, 50/60 Hz	
SENSOR VOLTAGE	12 VDC	
POWER REQUIRED	4 VA	
DUTY CYCLE	Continuous	
SENSITIVITY	Leakage	1k $\Omega$ to 35 k $\Omega$ adjustable
	Over-Temperature	Open Circuit
CONTACT RATING	(2) SPDT, 10 A @ 120 VAC Resistive	
LIFE EXPECTANCY	Mechanical	10 Million Operations
	Electrical	100,000 Operations @ Rated Load
INDICATORS	Green LED illuminates under normal conditions Red LED illuminates when leak is detected Red LED illuminates on over-temperature	
TEMPERATURE RATING	Operate	-4° to 131°F (-20° to +55°C)
	Storage	-40° to 185°F (-40° to +85°C)
RESPONSE TIMES	Leakage Trip	1 SEC
	Leakage Reset	1 SEC
	Temperature Trip	0.1 SEC
TERMINATIONS	(12) #8-32 Screw Terminals	
ENCLOSURE	Style "E" Lexan® Surface Mounted	
WEIGHT	17 oz.	

DIMENSIONS (INCHES)



**OPERATION**

Figure 1 shows the connections for use with a Flygt model FLS float switch. The leakage sensitivity must be adjusted to 1 k for float switch applications. If a pair of conductive probes is used to sense seal leakage, a 100 k resistor is required as shown in Figure 2, and the sensitivity should be set to the desired value.

The states of the unit's relay outputs are determined by the series combination resistance of the leakage and temperature sensors. Under normal conditions the resistance remains between the leakage and over-temperature sensitivities, and both output relays are de-energized. If the temperature switch opens, the over-temperature relay latches on until the remote reset button is pressed. Two conditions must be met for reset to occur: power must be applied and the temperature switch must be closed. If the leakage sensor resistance drops below the leakage sensitivity setting, the leakage relay energizes. When the leakage condition clears, the relay resets automatically.

**WIRING**

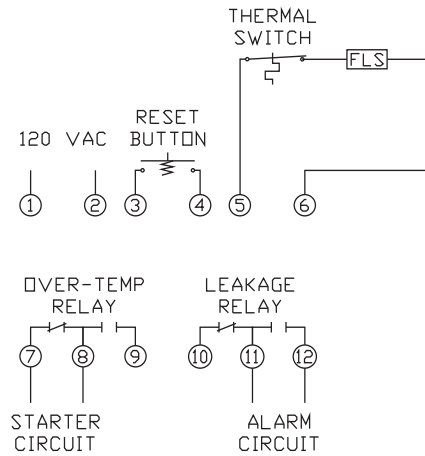


Fig. 1 FLS Connection

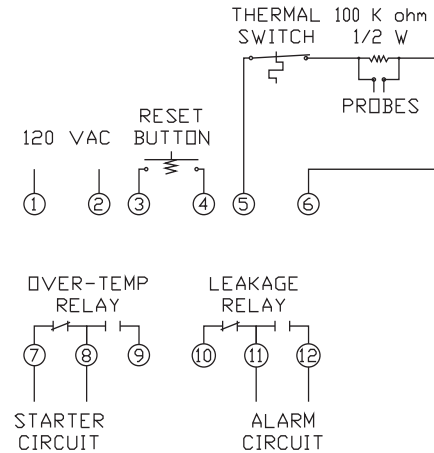


Fig. 2 Probe Connection



## Phase Rotation Tester

The PRT-100 is a hand-held tester that takes the guesswork out of connecting a 3-phase motor. The direction of rotation of a motor depends on phase sequence of the power line connections. If the sequence is reversed, the motor will run in the wrong direction, possibly damaging the equipment connected to the motor. The PRT-100 identifies the leads of a three-phase motor and detects the sequence of a three-phase power line. Once the motor and line leads are properly identified, the motor can be wired so that it turns in the desired direction on the first try. The unit also detects phase loss and no voltage conditions.

### OPERATION

To identify the leads of a three-phase line, connect the tester to the energized line and press the test button. Either the normal or reverse LED will glow. If the reverse LED glows, switch two leads and press the test button again. The normal LED should now glow. Label the three-phase line conductors according to the marking on the tester. If the loss LED glows, a phase loss or no voltage condition exists, and the normal and reverse LEDs are meaningless. Correct the loss condition and retest.

To identify the leads of a three-phase motor, connect the tester to the de-energized motor, turn the rotor in the desired direction, and press the test button. If the reverse LED glows, switch two leads and repeat. The normal LED should now glow. Label the motor leads according to the markings on the tester. **NOTE:** the loss LED will glow during motor testing. This is normal since the turning motor generates less than 20 volts.

De-energize the three-phase line and connect the line conductors to the matching motor leads. When the motor is energized, it will run in the desired direction.

### SPECIFICATIONS

SUPPLY VOLTAGE	20 to 600 VAC, 50/60/400 Hz	
ABSOLUTE MAXIMUM VOLTAGE	700 VAC, Phase-to-Phase	
BATTERY	9V, Included	
ISOLATION	3000 VAC, Leads to User	
ROTATION/SEQUENCE	Red	Phase Loss/No Voltage
	Yellow	Low Battery
OPERATOR CONTROL	Momentary Test Button	
INDICATORS	Green	Normal Rotation/Sequence
	Red	Reverse
TEMPERATURE RATING	Operate	32° to 113°F (0° to +45°C)
	Storage	-40° to 140°F (-40° to +60°C)
RESPONSE TIMES	100ms	
LEADS	18", color coded, battery clip type	
DIMENSIONS	3.75 x 2.625 x 1.5 inches	
WEIGHT	NET: 4.16 oz	

### ORDERING INFORMATION

MODEL NUMBER	DESCRIPTION
PRT-100	Phase Rotation Tester

### DIMENSIONS (INCHES)

