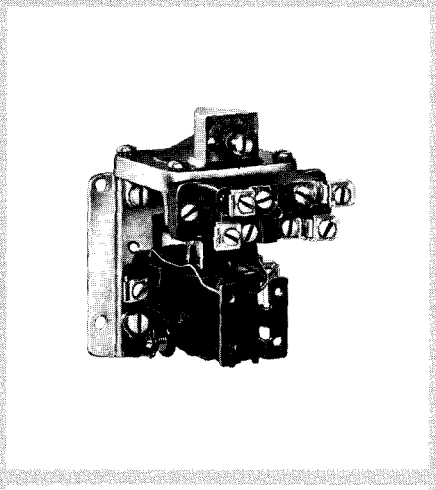
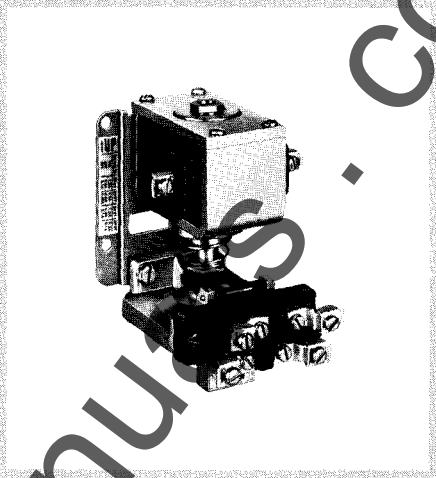
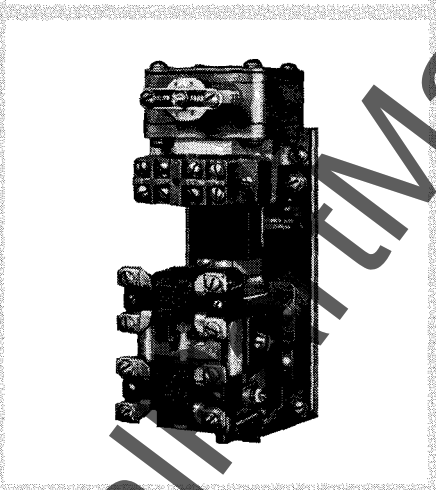
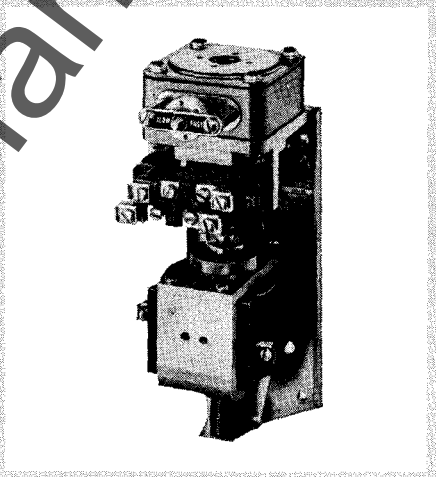








Pneumatic Timing Relays

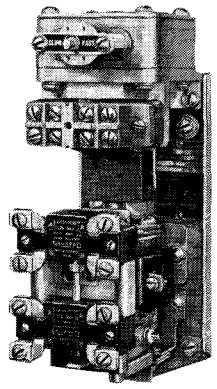
CONTENTS

SQUARE D COMPANY

PNEUMATIC TIMING RELAYS
TYPES B AND C

Type B ac timing relays and Type C dc timing relays feature:

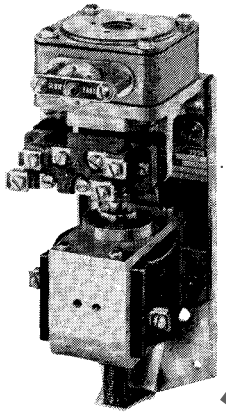
- 3 Minute timing
- ± 10% Repeat Accuracy
- ON and OFF Delay, Convertible
- SPDT or DPDT Timed Contacts
- 1 or 2 SPDT Instantaneous Contacts
- Optional Micrometer Dial



Type BO-23D

TYPE B — AC OPERATED

Mode of Operation	Dial	Time Delay Contacts N.O.	Time Delay Contacts N.C.	Instantaneous Contacts N.O.	Instantaneous Contacts N.C.	Open Type	Price	Watertight and Dusttight Enclosure NEMA Type 4	Price	For Hazardous Locations Class I, Groups C, D Class II Groups E, F, G NEMA Types 7 & 9	Price	Flush Mounting Without Pull Box	Price
ON Delay Convertible	Standard Dial	1	1	0	0	BO-1E	$200.	BW-1E	$360.	BR-1E	$704.	BF-1E	$232.
		1	1	1	1	BO-2E	220.	BW-2E	380.	BR-2E	726.	BF-2E	252.
		1	1	2	2	BO-3E	240.	BW-3E	400.	BR-3E	748.	BF-3E	272.
		2	2	0	0	BO-21E	260.	BW-21E	420.	BR-21E	770.	BF-21E	292.
		2	2	1	1	BO-22E	280.	BW-22E	440.	BR-22E	792.	BF-22E	312.
		2	2	2	2	BO-23E	300.	BW-23E	460.	BR-23E	814.	BF-23E	332.
	Micrometer Dial	1	1	0	0	BO-4E	220.	BW-4E	380.	BR-4E	726.	BF-4E	252.
		1	1	1	1	BO-5E	240.	BW-5E	400.	BR-5E	748.	BF-5E	272.
		1	1	2	2	BD-6E	260.	BW-6E	420.	BR-6E	770.	BF-6E	292.
		2	2	0	0	BO-24E	280.	BW-24E	440.	BR-24E	792.	BF-24E	312.
		2	2	1	1	BO-25E	300.	BW-25E	460.	BR-25E	814.	BF-25E	332.
		2	2	2	2	BO-26E	320.	BW-26E	480.	BR-26E	836.	BF-26E	352.
OFF Delay Convertible	Standard Dial	1	1	0	0	BO-1D	200.	BW-1D	360.	BR-1D	704.	BF-1D	232.
		1	1	1	1	BO-2D	220.	BW-2D	380.	BR-2D	726.	BF-2D	252.
		1	1	2	2	BO-3D	240.	BW-3D	400.	BR-3D	748.	BF-3D	272.
		2	2	0	0	BO-21D	260.	BW-21D	420.	BR-21D	770.	BF-21D	292.
		2	2	1	1	BO-22D	280.	BW-22D	440.	BR-22D	792.	BF-22D	312.
		2	2	2	2	BO-23D	300.	BW-23D	460.	BR-23D	814.	BF-23D	332.
	Micrometer Dial	1	1	0	0	BO-4D	220.	BW-4D	380.	BR-4D	726.	BF-4D	252.
		1	1	1	1	BO-5D	240.	BW-5D	400.	BR-5D	748.	BF-5D	272.
		1	1	2	2	BO-6D	260.	BW-6D	420.	BR-6D	770.	BF-6D	292.
		2	2	0	0	BO-24D	280.	BW-24D	440.	BR-24D	792.	BF-24D	312.
		2	2	1	1	BO-25D	300.	BW-25D	460.	BR-25D	814.	BF-25D	332.
		2	2	2	2	BO-26D	320.	BW-26D	480.	BR-26D	836.	BF-26D	352.



Type CO-1E

TYPE C — DC OPERATED*

Mode of Operation	Dial	Time Delay Contacts N.O.	Time Delay Contacts N.C.	Instantaneous Contacts N.O.	Instantaneous Contacts N.C.	Open Type	Price	Watertight and Dusttight Enclosure NEMA Type 4	Price	For Hazardous Locations Class I, Groups C, D Class II Groups E, F, G NEMA Types 7 & 9	Price	Flush Mounting Without Pull Box	Price
ON Delay Convertible	Standard Dial	1	1	0	0	CO-1E	$220.	CW-1E	$380.	CR-1E	$726.	CF-1E	$252.
		1	1	1	1	CO-2E	240.	CW-2E	400.	CR-2E	748.	CF-2E	272.
		1	1	2	2	CO-5E	260.	CW-5E	420.	CR-5E	770.	CF-5E	292.
		2	2	0	0	CO-21E	280.	CW-21E	440.	CR-21E	792.	CF-21E	312.
		2	2	1	1	CO-22E	300.	CW-22E	460.	CR-22E	814.	CF-22E	332.
		2	2	2	2	CO-25E	320.	CW-25E	480.	CR-25E	836.	CF-25E	352.
	Micrometer Dial	1	1	0	0	CO-3E	240.	CW-3E	400.	CR-3E	748.	CF-3E	272.
		1	1	1	1	CO-4E	260.	CW-4E	420.	CR-4E	770.	CF-4E	292.
		1	1	2	2	CO-6E	280.	CW-6E	440.	CR-6E	792.	CF-6E	312.
		2	2	0	0	CO-23E	300.	CW-23E	460.	CR-23E	814.	CF-23E	332.
		2	2	1	1	CD-24E	320.	CW-24E	480.	CR-24E	836.	CF-24E	352.
		2	2	2	2	CO-26E	340.	CW-26E	500.	CR-26E	858.	CF-26E	372.
OFF Delay Convertible	Standard Dial	1	1	0	0	CO-1D	220.	CW-1D	380.	CR-1D	726.	CF-1D	252.
		1	1	1	1	CO-2D	240.	CW-2D	400.	CR-2D	748.	CF-2D	272.
		1	1	2	2	CO-5D	260.	CW-5D	420.	CR-5D	770.	CF-5D	292.
		2	2	0	0	CO-21D	280.	CW-21D	440.	CR-21D	792.	CF-21D	312.
		2	2	1	1	CO-22D	300.	CW-22D	460.	CR-22D	814.	CF-22D	332.
		2	2	2	2	CO-25D	320.	CW-25D	480.	CR-25D	836.	CF-25D	352.
	Micrometer Dial	1	1	0	0	CO-3D	240.	CW-3D	400.	CR-3D	748.	CF-3D	272.
		1	1	1	1	CO-4D	260.	CW-4D	420.	CR-4D	770.	CF-4D	292.
		1	1	2	2	CO-6D	280.	CW-6D	440.	CR-6D	792.	CF-6D	312.
		2	2	0	0	CO-23D	300.	CW-23D	460.	CR-23D	814.	CF-23D	332.
		2	2	1	1	CD-24D	320.	CW-24D	480.	CR-24D	836.	CF-24D	352.
		2	2	2	2	CO-26D	340.	CW-26D	500.	CR-26D	858.	CF-26D	372.

* Field convertible from On Delay to Off Delay (or vice versa) with Class 9999 Types K-5 and K-6 modification kits listed below.

MODIFICATION KITS FOR TIMING RELAYS

Class	Type	For Timing Relay	Description	Price
9991	BCG	Type B Type C	Separate NEMA Type 1 General Purpose Enclosure for use with all Type B and C timers	$40.
9991	LW-1	Type B Type C	Separate NEMA Type 4 Watertight and Dusttight Stainless Steel Enclosure for use with all Type B, C timers	144.
9999	R-4	Type B	A total of 2 instantaneous Type BO snap switch interlocks may be mounted on a Class 9050 Type B or C timing relay. Each interlock kit has 1 N.O.-1 N.C. contact.	20.
9999	R-5	Type C		20.
9999	K-5	Type C — D	Parts required to change Type C, dc timing relay from OFF Delay to ON Delay	6.
9999	K-6	Type C — E	Parts required to change Type C, dc timing relay from ON Delay to OFF Delay	4.

PNEUMATIC TIMING RELAYS
TYPES B AND C

CLASS 9050

APPLICATION DATA

Timing Range: 0.05 second to 3 minutes for timers without micrometer dial. For timers with a micrometer dial the timing range is 0.2 seconds to 3 minutes. Note: most Types B and C timing relays without micrometer dial can be adjusted to 20 minutes. Due to manufacturing tolerances not every timer can be guaranteed adjustable from 3 to 20 minutes.

Repeat Accuracy:
± 10% to 3 minutes max.
± 12% to 5 minutes max.
± 40% to 20 minutes max.

Reset Time: 34 ms average

Ambient Temperature Range: Relatively unaffected by ambient temperature in range 20°C to 40°C.

Modes of Operation: ON delay and OFF delay, convertible. ON delay types can be wired for Interval-Momentary or Maintained Start and Repeat Cycle (sequencing, using two devices).

Input Voltage:
Type B AC Timing Relay:
6 through 600 volts, +10%, −15% of nominal.
Type C DC Timing Relay:
6 through 250 volts, +10%, −20% of nominal.

Burden:

Type B — AC			Type C — DC	
	Coil VA*			
Hz	Inrush	Sealed	Volts	Coil Res. (ohms)
60	165	27	115	1055
50	155	27	230	4240

*6 to 24 VAC coils have VA ratings 120% of values shown.

Timed Output Contacts: SPDT or DPDT snap switch. Contacts of each pole must be used on same polarity.

Instantaneous Output Contacts: 1 or 2 SPDT snap switches. Contacts of each pole must be used on same polarity.

Overlapping Contacts: ON delay timers with instantaneous contacts provide overlap between the instantaneous contact and the timed contact on the reset (non-timing) stroke. For example, the N.C. instantaneous contact will close before the N.O. timed contact opens on the reset stroke.

STANDARD COILS

Frequency	Voltage
60 Hz	6, 12, 24, 48, 120, 240, 277, 480, 600
50 Hz	6, 12, 24, 48, 110, 220, 440, 550
DC	6, 12, 24, 48, 115, 230/250

MODIFICATIONS

Description	Form	Price Addition
Hardened Magnet Parts For increased magnet life in high cycle AC rate applications.....	HA	$24.

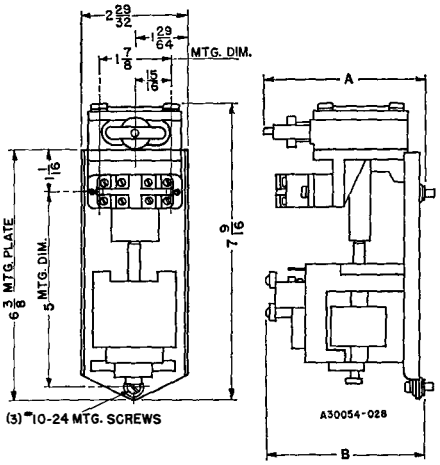
ELECTRICAL CONTACT RATINGS

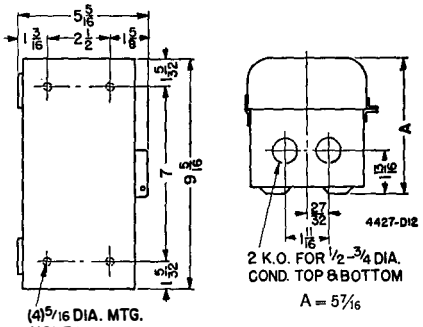
Type	AC Volts	AC Inductive 35% PF Make Amps.	AC Inductive 35% PF Make VA	AC Inductive 35% PF Break Amps.	AC Inductive 35% PF Break VA	AC Inductive 35% PF Continuous Carrying Amperes	AC Resistive 75% PF Make, Break and Continuous Carrying Amperes	DC Volts	DC Inductive and Resistive Make and Break Amperes Single Throw Ind.	DC Single Throw Res.	DC Double Throw Ind.	DC Double Throw Res.	DC Continuous Carrying Amperes
Type B SPDT Timed Contacts	120	40	....	15	....	15	15	115	0.5	0.5	0.25	0.25	15
	240	20	....	10	....	15	15	230	0.25	0.25	0.1	0.1	15
	480	10	....	6	....	15	15	600	0.05	0.05	....	....	15
	600	8	....	5	....	15	15						
Type C SPDT Timed Contacts	120	40	....	15	....	15	15	115	2.0	2.0	0.5	0.5	15
	240	20	....	10	....	15	15	230	0.5	0.5	0.2	0.2	15
	480	10	....	6	....	15	15	600	0.1	0.1	0.02	0.02	15
	600	8	....	5	....	15	15						
Types B and C DPDT Timed Contacts	120	30	3600	3	360	10	10	115	1.0	1.0	0.2	0.2	10
	240	15	3600	1.5	360	10	10	230	0.3	0.3	0.1	0.1	10
	480	7.5	3600	0.75	360	10	10	600	0.1	0.1	....	....	10
	600	6	3600	0.6	360	10	10						
Type B (AC only) and Type C Instantaneous Contacts	120	60	7200	6	720	10	10	115	1.1	1.1	0.2	0.2	10
	240	30	7200	3	720	10	10	230	0.25	0.55	0.1	0.1	10
	480	15	7200	1.5	720	10	10	600	0.05	0.2	....	....	10
	600	12	7200	1.2	720	10	10						

APPROXIMATE DIMENSIONS AND SHIPPING WEIGHTS

Type	A	B
BO1, 2, 3, 21, 22, 23 D & E	4¼	4
BO4, 5, 6, 24, 25, 26 D & E	4⅞	4
CO1, 2, 5, 21, 22, 25 D & E	4 3/16	4¼
CO3, 4, 6, 23, 24, 26 D & E	4⅞	4¼

Types BO and CO
Weight — 5 Lbs.





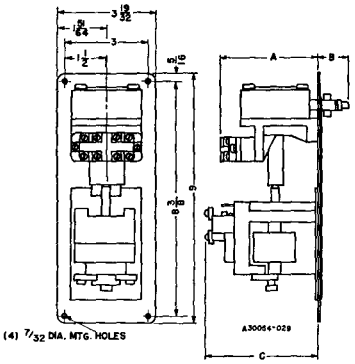
Class 9991 Type BCG
General Purpose Enclosure
Weight — 8½ Lbs.

PNEUMATIC TIMING RELAYS

TYPES B AND C

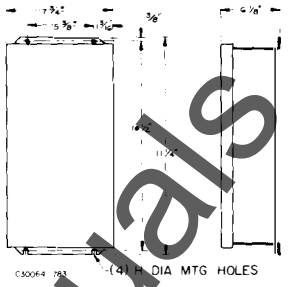
APPLICATION DATA (Cont.)

APPROXIMATE DIMENSIONS AND SHIPPING WEIGHTS



Type	A	B	C
BF1, 2, 3 D & E	4	1 1/32	4
BF4, 5, 6 D & E	4	1 5/8	4
CF1, 2 D & E	3 31/32	1 1/32	4 1/16
CF 3, 4 D & E	4 7/32	1 17/32	4 1/16
BF 21, 22, 23 D & E	3 21/32	1 1/32	4
BF 24, 25, 26 D & E	3 21/32	1 5/8	4
CF 21, 22 D & E	3 15/32	1 1/32	4 1/16
CF 23, 24 D & E	3 29/32	1 17/32	4 1/16

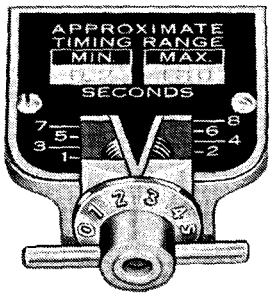
Types BF and CF
Weight — 8 Lbs.

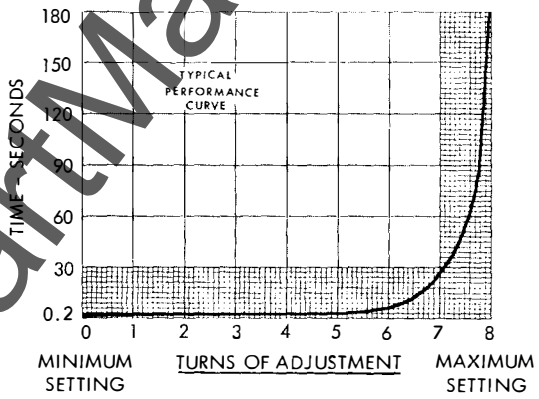


H Dimension 5/16"
Class 9991 Type LW-1
Weight — 15 Lbs.

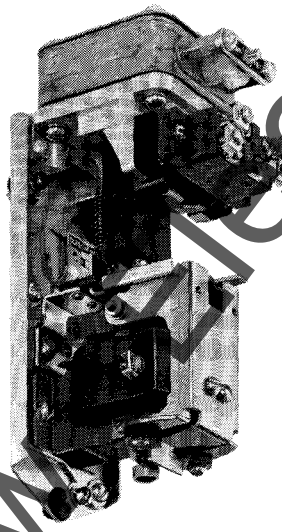
OPTIONAL MICROMETER DIAL

The optional micrometer dial provides an accurate reference setting of the timer to the nearest 1/10 turn of the knob. Eight complete turns, each divided into tenths, provide 80 numbered settings of the dial. Once a time delay has been set up, the dial number can be recorded and the timer returned to that setting for any future machine operation. A typical performance curve is shown at right. Calibrated curves are not furnished for individual timers.

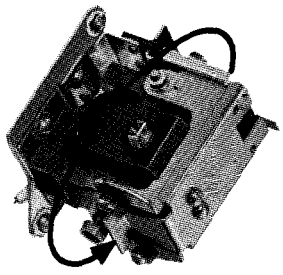




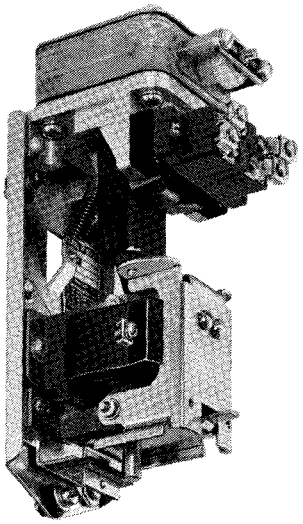
TIMING MODE CONVERSION



Type BO-1E
On-Delay



Conversion from on-delay to off-delay is easily accomplished by using only a screwdriver.

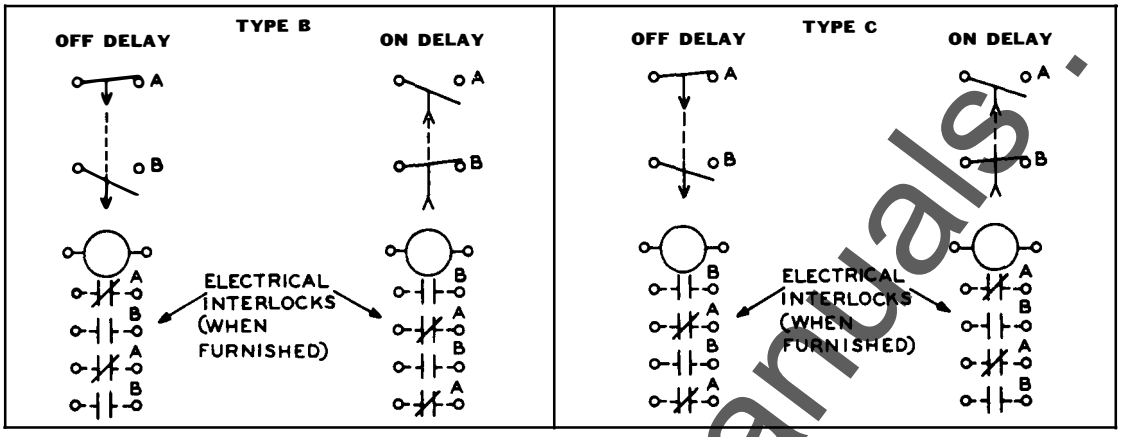


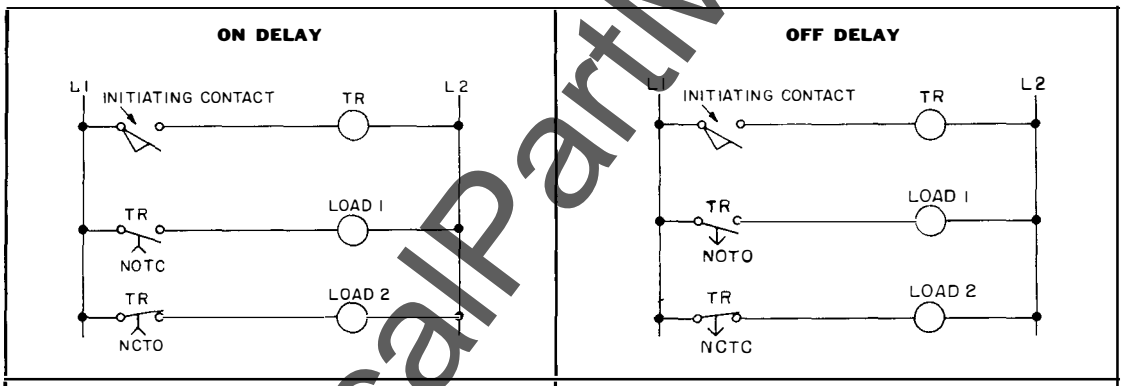
Type BO-1D
Off-Delay

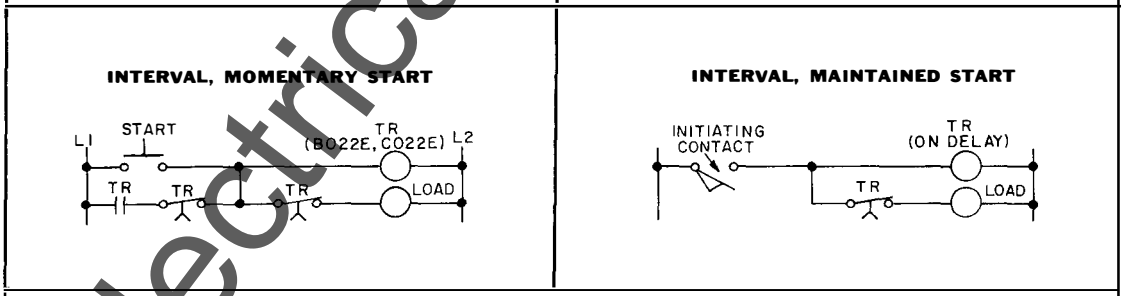
PNEUMATIC TIMING RELAYS
TYPES B AND C

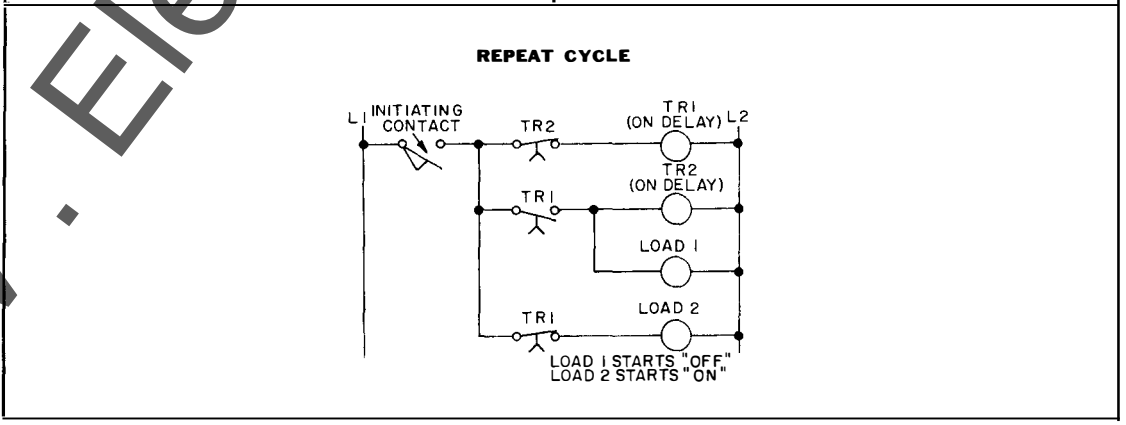
APPLICATION DATA (Cont.)

WIRING DIAGRAMS









CLASS 8991

PNEUMATIC TIMING RELAYS

AC RESISTANCE WELDER CONTROL

TYPE ATO

JANUARY, 1981

The Class 8991 Type ATO is an individual, flush mounting, pneumatic timing unit with a large adjusting dial calibrated in cycles. A range of from 3 to 120 cycles is standard for 60 cycle frequency except for Weld Interval timers which are calibrated from 8 to 360 cycles.

25-60 HERTZ			CLASS 8991				600 VOLTS MAX.
Description	Nameplate Marking	† Calibration in Cycles	Time Delay After:	✱Interlocks		Open Type	
				Provision For	Number Installed	Type	Price
Individual flush mounting timer units for installation in **Safront** timer panels	Squeeze Time	3-120	Energization	No	0	ATO-8	**$316.**
	Weld Time	3-120	Energization	No	0	ATO-9	**316.**
	Hold Time	3-120	Energization	No	0	ATO-10	**316.**
	Off Time	3-120	De-energization	No	0	ATO-11	**316.**
	Weld Interval	8-360	Energization	No	0	ATO-12	**316.**
	Heat Time	3-120	Energization	No	0	ATO-13	**316.**
	Cool Time	3-120	De-energization	No	0	ATO-14	**316.**
	Weld Time	3-120	Energization	Yes	1	✱ATO-15	**352.**
	.....	3-120	★Energization	Yes	0	ATO-16	**316.**
	.....	3-120	★De-energization	Yes	0	ATO-16-S1	**316.**
	.....	3-120	Energization	Yes	1	ATO-17	**352.**
	.....	8-360	De-energization	Yes	1	▲ATO-18	**352.**

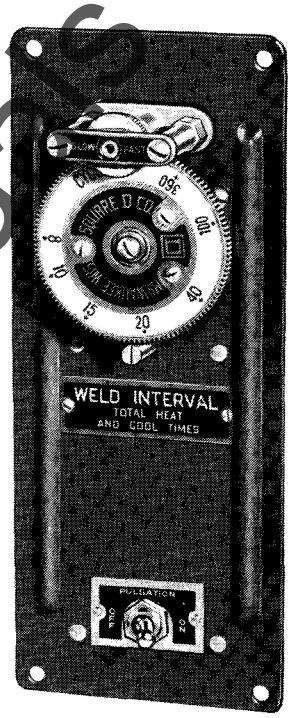
† Timers for 50 or 60 cycles are calibrated on 60 cycle basis. For 50 cycle devices, multiply dial reading by 5/6 to obtain actual time in cycles. Timers for 25 cycles are calibrated 2 to 50 cycles (or 4 to 150 cycles) on 25 cycle basis. For special calibrations to a maximum range of 360 cycles, add **$44.** list. For calibration beyond 360 cycles, consult Square D Field Office.

✱ A maximum of two 9007 BO-3 snap switch interlocks (S.P.D.T.) can be mounted on timers **which have provision for interlocks**. Order parts kit 9999-R4 for field installation of **each** interlock. On timers without provision for interlocks, provision can be made by changing the armature lever and armature lever guide. One interlock, factory installed, **$36.** Two interlocks, factory installed, **$58.**

★ Invertible magnet for time delay after energization or de-energization.

▲ Includes OFF-ON toggle switch.

NOTE: Timed Contacts are S.P.D.T. (9007 AO-102). For 2 P.D.T. (9007 CO-3) Timed Contacts, Factory Installed on Any ATO Timer, Add **$66.** Specify Form W63.



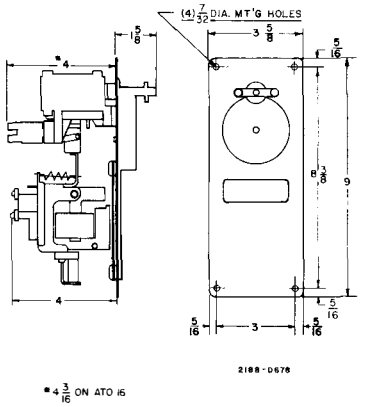
Class 8991 **TYPE ATO-18**

ELECTRICAL CONTACT RATINGS

TIME DELAY CONTACTS										INTERLOCK CONTACTS					
Types AO-102 (S.P.D.T.)✱					Types CO-3 (2 P.D.T.)★					Type BO-3 (S.P.D.T.)			Type BO-4 (S.P.D.T.)		
Volts	AC Pilot Duty Amperes†		DC Pilot Duty Amperes‡		Volts	AC Pilot Duty †		Volts	DC Pilot Duty Amps.‡		Volts	AC Pilot Duty Amperes†		Volts	DC Pilot Duty Amperes‡	
	Make	Break	Double Throw	Single Throw		Make	Break		Single Throw	Double Throw		Make	Break		Double Throw	Single Throw
120	40	15	0.25	0.5	0-115	30 Amps.	3 Amps.	115	1.0	0.2	120	60	6	115	0.25	1.1
240	20	10	0.1	0.25	115-600	3450 VA	345 VA	230	0.3	0.1	240	30	3	230	0.1	0.25
480	10	6	▲	....				600	0.1	▲	480	15	1.5	600	▲	0.05
600	8	5	▲	0.05							600	12	1.2			

✱ AC continuous ampere rating is 15 amperes based on a 75% power factor.
★ AC continuous ampere rating is 10 amperes based on a 75% power factor.
† AC pilot duty rating is based on a 35% power factor.
‡ DC pilot duty rating is based on inductive loads such as coils and solenoids.
▲ Double throw switches rated 250 volts dc maximum.

APPROXIMATE DIMENSIONS



✱ 4 3/16 ON ATO 16

ORDERING INFORMATION REQUIRED

1. Specify class and type number.
2. If special features are desired, order "Class 8991 similar to Type . . . except . . ." describing clearly the modification.
3. Give control circuit voltage and frequency.