

## TYPE SG AUXILIARY RELAYS

Closed and Open Types for A-C. or D-C. Use;

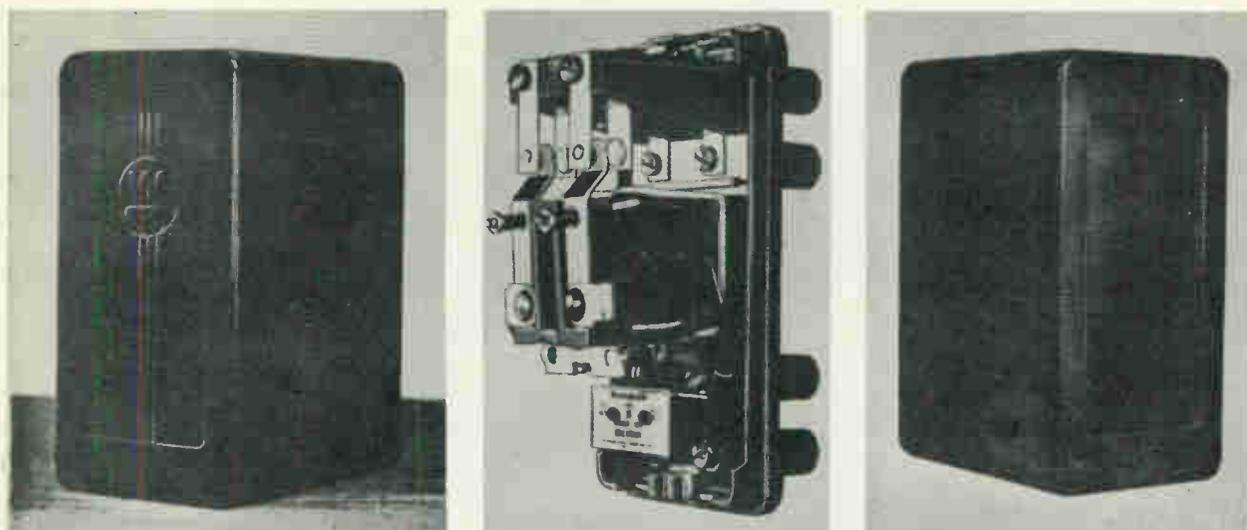


FIG. 1—CLOSED TYPE SG RELAY SHOWING SOLID MOLDED COVER, RELAY WITH COVER OFF, AND MOLDED COVER WITH GLASS WINDOW. THIS RELAY HAS TWO-MAKE AND TWO-BREAK CONTACTS.

### Application

The SG relay is made small and sturdy for auxiliary service. It is obtainable in two types; closed type with molded cover or molded cover with glass front, and front connected open type without cover. The open type is used widely for mounting in individual sheet metal cabinets or in larger cabinets with other apparatus.

The standard closed type relay is supplied with two-make and two-break contacts with each moving contact being common to its corresponding front and back stationary contacts. The standard open type relay is supplied with two independent contact circuits, and the contacts can readily be adjusted to provide either two-make, two-break, or one-make and one-break. The open relay also can be supplied with two-make and two-break contacts similar to the standard closed type SG.

Designed for continuous duty at rated voltage, the SG relay is obtainable for circuits up to 575 volts a-c. or 600 d-c. Ranges up to 250 volts can be used for intermittent duty up to approximately three times their continuous value.

Fig. 7 gives the method of connection when the SG relay is used to control circuits where the circuits required cannot be incorporated in the primary relay.

### Distinctive Features

1. Design is simple, construction is sturdy, and price is low.
2. The complete relay can be dismantled in a few minutes.
3. The stationary contacts of the open-type relay are reversible to provide for either two-make, one-make and one-break, or two-break contact service.
4. Relay is adapted for any thickness of panel material from  $\frac{1}{8}$ " (steel) to 2" (slate). The molded terminals are

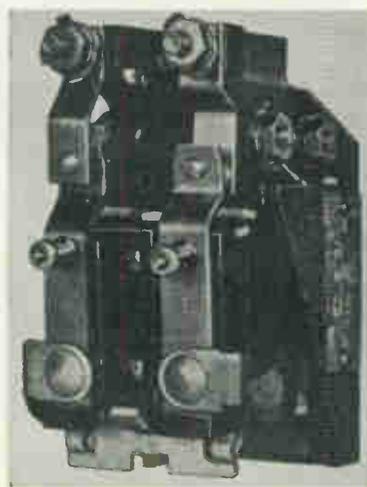


FIG. 2—OPEN TYPE SG AUXILIARY RELAY WITH ONE-MAKE AND ONE-BREAK CONTACT. THIS RELAY CAN BE SUPPLIED WITH TWO-MAKE AND TWO-BREAK CONTACTS.

$1\frac{1}{8}$ " long, being ample for steel-panel mounting. For thicker panels, extension terminal studs are furnished.

5. Molded cover is held securely by a bracket and a spring clip, yet can be easily removed. A glass window is optional.

### Construction

The SG relay, closed type, is shown in Fig. 1. The magnetic circuit is fastened to the molded base by two screws, while the coil and core are held securely in place by one screw. The armature is held in the de-energized position by gravity and a spring.

The moving contact fingers have a contact surface on both sides, and is so mounted on the armature block that motion in either direction compresses a spring. This permits sufficient contact follow to be obtained for both the make and the break contacts.

The standard relay is supplied with a molded cover which can be equipped with a glass front if desired.

The SG open type, shown in Fig. 2, has the same operating characteristics as the closed type. The coil, magnetic circuit, contacts and connecting screws are mounted on a molded base. The entire assembly is arranged so it can be mounted on any flat surface by means of 3 screws or bolts.

**Contact Rating for Each Contact**

**Non-Inductive**

Each contact will carry 12 amperes continuous and 30 amperes for one minute.

Volts	Interrupting Rating Amperes D.C.		Interrupting Rating Amperes A.C.
	1 Gap	2 Gaps in Series	1 Gap
24	15	50	60
48	8	35	45
115	2.4	20	30
230	.75	2.5	20
550	.25	.5	10

The SG relay operating time is approximately 1 to 2 cycles (60 cycle basis) and for most applications this

characteristic is required. However, in certain relay applications it is desirable to have a D-C. relay which provides a short time lag between the opening of the circuit to the relay coil and the dropping out of the relay armature. A time delay of approximately 0.1 second can be obtained with the SG relay by providing it with a heavy copper ring on the core. Because of the consequent reduction of coil space, this relay can be used only for intermittent service.

A longer time delay can be obtained by using a condenser, with or without a series resistor, connected across the relay coil. In this case the copper ring is omitted and the coil can be energized continuously. A maximum time delay of approximately 0.5 second can be obtained by using a condenser of approximately 30 mfd. capacity. A similar ar-

range ment, with the resistor in series with the coil, will delay the pick-up time to approximately .07 second.

**Operation**

The armature to which the moving contacts are fastened closes the make contacts when the coil is energized at the proper voltage or current which should not be less than 80% of the maximum rating marked on the name-plate. The armature will open at 30% or less (on d-c.) and 60% or less (on a-c.) of the relay rating. The relay can be supplied for voltage circuits up to 575 a-c. or 600 d-c.

**Volt-Ampere Burden**

The volt-ampere burden at rated voltage (60 cycles) is 10, power factor, 50%. The watt consumption at rated d-c. voltage is 3.5.

**Application Table No. 1**

**Relay Coils**

Volts	Amperes	Coil Style No.	D-C. RESISTANCE		Impedance Closed Gap*	EXTERNAL RESISTANCE WHEN USED		
			25°C. Ohms.			Style No.	Resistance Ohms.	
<b>Direct-Current Coil Ratings</b>								
...	1.0	1 059 282	2.5	.....	.....	None	None	
...	3.0	1 059 284	0.33	.....	.....	None	None	
...	5.0	1 059 286	0.1	.....	.....	None	None	
24	0.130	1 008 517	185	.....	.....	None	None	
48	0.066	1 008 520	725	.....	.....	None	None	
125	0.028	1 008 524	4430	.....	.....	None	None	
250	0.028	1 008 524	4430	.....	.....	1 009 014†	5000	
<b>50 to 60 Cycle Coil Ratings</b>								
115	0.087	1 008 517	185	1320	.....	None	None	
230	0.044	1 008 520	725	5300	.....	None	None	
460	0.022	1 008 523	2770	21000	.....	None	None	
<b>25 Cycle Coil Ratings</b>								
15	0.057	1 008 519	460	2000	.....	None	None	
30	0.029	1 008 522	1780	8020	.....	None	None	
60	0.019	1 008 524	4430	19800	.....	1 009 014†	5000	

\* Impedance open gap approximately 1/2 closed gap value. Impedance given includes external resistor if used.

† External resistor Style No. 1009014 is a 3 3/4-inch tube type with screw terminals and is supplied with an insulated mounting stud.

Order by Style Number

### Application Table No. 2 Operation Indicators

Use this table to determine if an additional resistor is required with an SG relay in order to draw enough current to operate a 0.2 ampere indicator. The resistor is not supplied with the relay and should be ordered separately.

Control Volts D-C.	Indicator Rating Amperes	SG Relay Coil Resistance and Resistor if Required	Rating	Current in Indicator at Normal Voltage
24	0.2	Relay Coil 185 ohms plus 150 ohm resistor (3.8 watts) style # 879976 in parallel with relay coil.....	Continuous	0.29
48	0.2	Relay Coil 725 ohms plus 200 ohm resistor (12 watts) style # 879977 in parallel with relay coil.....	Continuous	0.31
125	0.2	Relay Coil 4430 ohms plus 400 ohm resistor (39 watts) style # 281407 in parallel with relay coil.....	Continuous	0.34
250	0.2	Relay Coil 4430 ohms with 5000 ohm resistor (furnished with relay) in series with relay coil plus 970 ohm resistor (64 watts) style # 286266 in parallel with relay coil and series resistor.....	Continuous	0.28

NOTE—The 400 ohm and 970 ohm resistors are 8" tube type with screw terminals and require mounting detail style # 454921. The other resistors are 2" tube type with flexible leads and require mounting detail style # 877339.

### LIST PRICES

Volts	Amperes	Cycles*	Ohms. Resistance Relay Coil	Amperes	Coil Style No.	RELAY	
						Style No.	List Price Discount Symbol FC
<b>CLOSED TYPE</b>							
<b>2 make—2 break contacts, moving contact common</b>							
...	1	D-C.	2.5	.....	1 059 282	1 157 848	\$7 50
...	3	D-C.	0.33	.....	1 059 284	1 157 849	7 50
...	5	D-C.	0.1	.....	1 059 286	1 157 850	7 50
24	...	D-C.	185	0.130	1 008 517	1 155 687	7 50
48	...	D-C.	725	0.066	1 008 520	1 155 688	7 50
125	...	D-C.	4430	0.028	1 008 524	1 155 689	7 50
250	...	D-C.	4430	0.028	1 008 524	1 155 690	7 50
115	...	50 & 60	185	0.087	1 008 517	1 155 693	7 50
230	...	50 & 60	725	0.044	1 008 520	1 155 694	7 50
460	...	50 & 60	2770	0.022	1 008 523	1 155 695	7 50

### OPEN TYPE †

#### 2 contact with stationary reversible contacts

...	1	D-C.	2.5	.....	1 059 282	1 157 852	5 00
...	3	D-C.	0.33	.....	1 059 284	1 157 853	5 00
...	5	D-C.	0.1	.....	1 059 286	1 157 854	5 00
24	...	D-C.	185	0.130	1 008 517	1 059 231	5 00
48	...	D-C.	725	0.066	1 008 520	1 008 534	5 00
125	...	D-C.	4430	0.028	1 008 524	1 008 535	5 00
250	...	D-C.	4430	0.028	1 008 524	1 008 536	5 00
115	...	50 & 60	185	0.087	1 008 517	1 008 539	5 00
230	...	50 & 60	725	0.044	1 008 520	1 008 540	5 00
460	...	50 & 60	2770	0.022	1 008 523	1 008 541	5 00

\* 25 cycle relays can be supplied. Specify, "similar to style number ..... (give 60 cycle style) except 25 cycle." Add 10% to price of 60 cycle relay SG relays can be supplied for other A-C. voltages up to 575 A-C. or 600 D-C. and with D-C. current coils not over 5 amperes. Refer to nearest Westinghouse Sales Office for prices.

† For SG relays having glass front add \$0.25 to the list price of the standard style. When ordering, give "similar to style number ..... except with molded cover having glass front." The nameplate furnished with this relay will have the standard style number.

† Open type relays can be obtained at no additional price with 2 make and 2 break contacts having moving contact common. When ordering, give "similar to style number ..... except with 2 make, 2 break contacts."

SG RELAYS CAN BE FURNISHED FOR VOLTAGES OTHER THAN THOSE LISTED ABOVE AT AN ADDITIONAL PRICE.

### SHEET METAL CABINETS

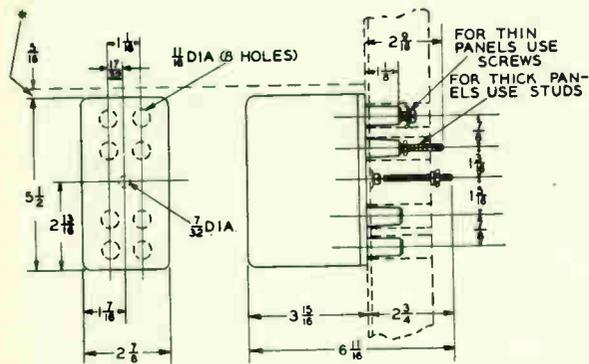
Two sizes of sheet metal cabinets for mounting the open-type SG relays can be supplied for industrial applications, etc. where it is desired to enclose one or two relays for conduit wiring or where it is desired to mount the relays near the machine. Both cabinets have knockouts for conduit connections.

### LIST PRICES

No. of Relays to be Mounted in One Cabinet	DIMENSIONS IN INCHES			Style No.	List Price Discount Symbol FC
	Width	Height	Depth		
1	4 1/4	5 3/4	4 1/4	1 095 780	\$0 90
2	8 1/4	5 3/4	4 1/4	1 095 759	1 35

Order by Style Number

OUTLINE DIMENSIONS IN INCHES



\* If relay is mounted under another device extending approximately same distance from panel, allow 3/16" minimum spacing to permit removal of cover.

FIG. 3—OUTLINE AND DRILLING PLAN FOR THE CLOSED TYPE SG AUXILIARY RELAY.

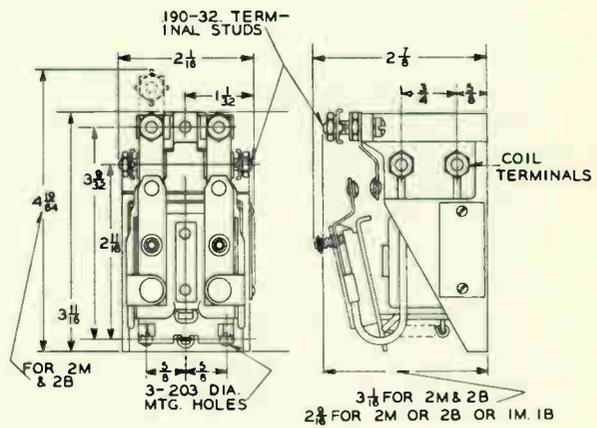


FIG. 4—OUTLINE AND DRILLING PLAN FOR THE OPEN TYPE SG AUXILIARY RELAY.

WIRING DIAGRAMS

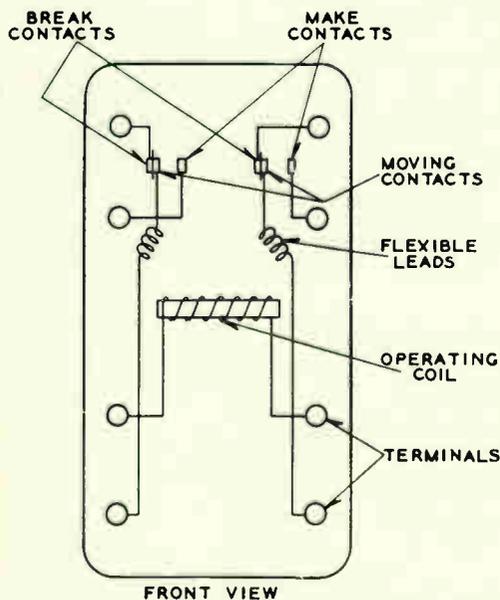


FIG. 5—INTERNAL CONNECTIONS FOR CLOSED TYPE SG RELAY.

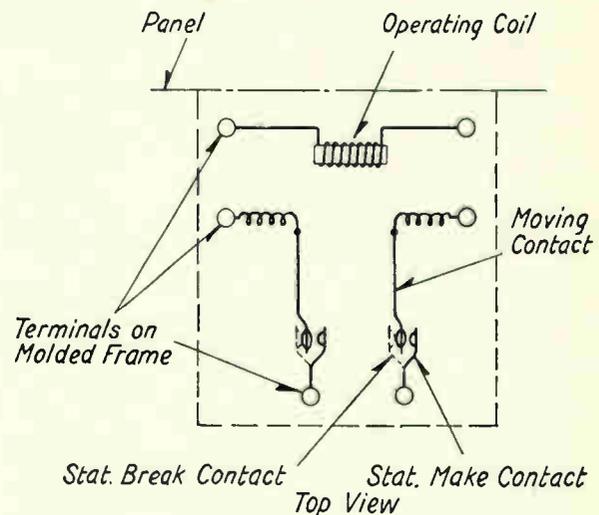


FIG. 6—INTERNAL CONNECTIONS FOR OPEN TYPE SG RELAY

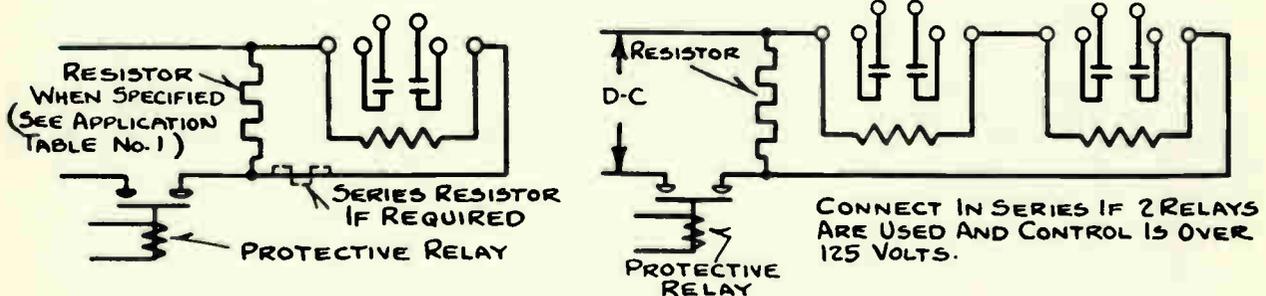


FIG. 7—EXTERNAL CONNECTIONS FOR THE OPEN TYPE SG RELAYS. THE CONNECTIONS WOULD BE SIMILAR FOR THE CLOSED TYPE RELAY EXCEPT THAT FOUR EXTERNAL CIRCUITS CAN BE CONTROLLED.

## TYPE SG AUXILIARY RELAYS

### Non-Reversible Contact Relays

Volts	Cycles	Switchboard Mounting			Panel Mounting		
		2 Make Contact Relay	1 Make 1 Break Contact Relay	2 Break Contact Relay	2 Make Contact Relay	1 Make 1 Break Contact Relay	2 Break Contact Relay
		Style Number	Style Number	Style Number	Style Number	Style Number	Style Number
48	DC	837 257	877 717	930 432	837 264	877 724	930 439
125	DC	837 255	877 715	930 430	837 262	877 722	930 437
250	DC	877 034	930 444	930 446	837 035	930 445	930 447
115	25	837 256	877 716	930 431	837 263	877 723	930 438
230	25	837 259	877 719	930 434	837 266	877 726	930 441
115	50 & 60	837 258	877 718	930 433	837 265	877 725	930 440
230	50 & 60	837 261	877 721	930 436	837 268	877 728	930 443
460	50 & 60	837 260	877 720	930 435	837 267	877 727	930 442

NOTE: Switchboard mounting relays may be supplied with or without glass cover. If glass cover is desired it should be clearly specified on the order. Otherwise all new relays will be supplied with solid moulded covers.

When desired, the 2-make contact switchboard type can be changed to 1 make-1 break. The set of parts for the 1-break contact, switchboard type only, is covered by S#930448.

When desired, the 2-make contact panel type can be changed to 1 make-1 break. The set of parts for the 1-break contact, panel type only is covered by S#930449.

When desired, the panel type only can be changed to single pole, double throw or double pole, double throw contacts. The set of parts for single pole, double throw combination of contacts, panel type only, is covered by S#930450.

### Reversible Contact Relays

Volts	Cycles	Switchboard Mounting	Panel Mounting
		Style Number	Style Number
48	DC	1 008 526	1 008 534
125	DC	1 008 527	1 008 535
250	DC	1 008 528	1 008 536
115	25	1 008 529	1 008 537
230	25	1 008 530	1 008 538
115	50 & 60	1 008 531	1 008 539
230	50 & 60	1 008 532	1 008 540
460	50 & 60	1 008 533	1 008 541

NOTE: Switchboard mounting relays may be supplied with or without glass cover. If glass cover is desired, it should be clearly specified on the order. Otherwise all new relays will be supplied with solid moulded covers.

For Prices refer to Price List 120

**Westinghouse Electric & Manufacturing Company**

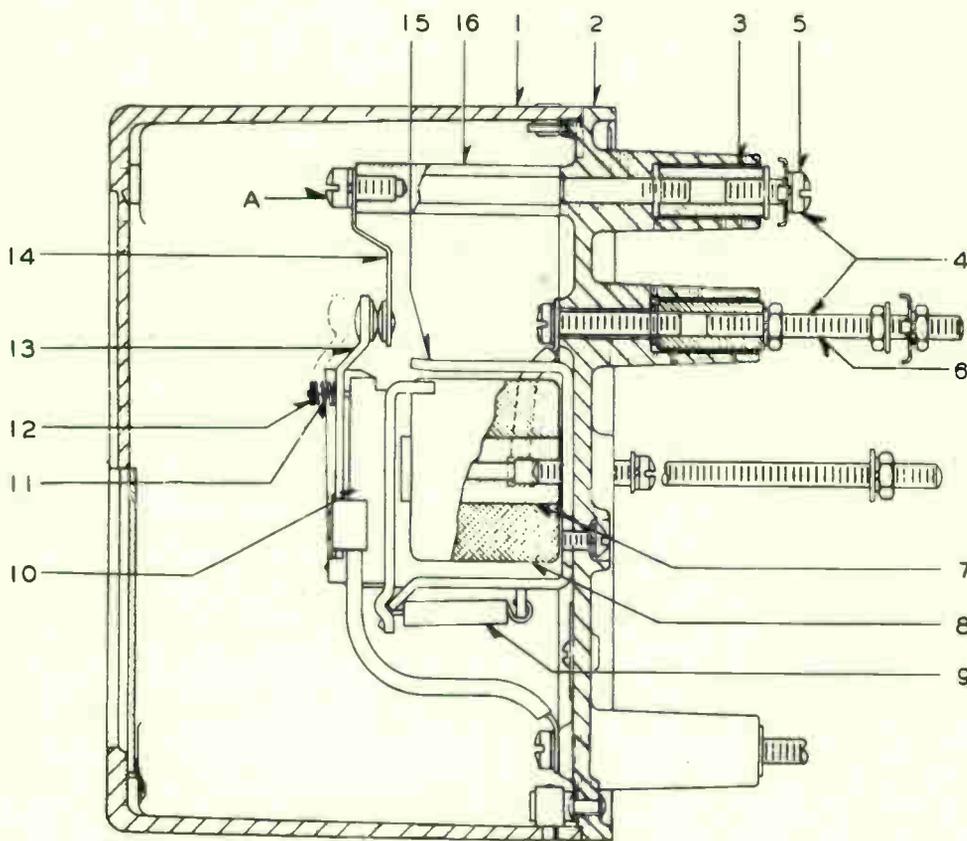
Newark Works, Newark, N. J.

Printed in U.S.A.

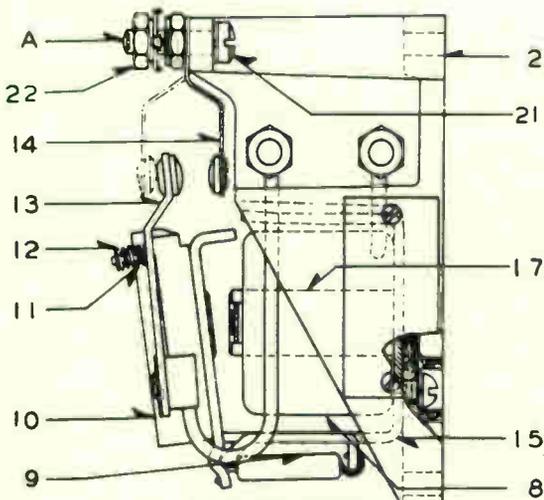
EVERY HOUSE NEEDS WESTINGHOUSE

### TYPE SG AUXILIARY RELAYS

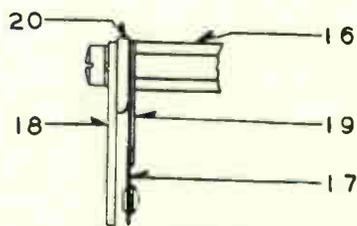
#### Non-Reversible Contact Relays



SWITCHBOARD TYPE



PANEL TYPE



VIEW-A

TWO BREAK CONTACTS

## TYPE SG AUXILIARY RELAYS

## Non-Reversible Contact Relays

Ref No.	DESCRIPTION OF PART	Style Number	No. Req	Ref No.	DESCRIPTION OF PART	Style Number	No. Req
1	Cover, moulded solid, switchboard . . . . .	876 718	1	14	Stationary contact support and contact, 1 make, 1 break . . . . .	836 175	1
1	Cover, moulded with glass front, switchboard. . . . .	876 270	1	15	Yoke . . . . .	668 593	1
2	Base, moulded, switchboard type . . . . .	878 637	1	*	Washer under yoke, a-c. only . . . . .	935 765	1
2	Base, moulded, panel type . . . . .	821 999	1	16	Post, switchboard type, 2 make . . . . .	836 176	2
3	Terminal nut, switchboard type . . . . .	821 998	6	16	Post, switchboard type, 1 make, 1 break . . . . .	836 176	1
4	Mounting details, switchboard type . . . . .	839 114	1	16	Post, switchboard type, 1 make, 1 break . . . . .	837 991	1
5	Terminal stud. . . . .	797 078	6	16	Post, switchboard type, 2 break . . . . .	837 991	2
6	Mounting stud. . . . .	837 330	2	17	Stationary contact spring and contact, 1 make, 1 break . . . . .	930 303	1
7	Core complete, a-c. only. . . . .	762 981	1	17	Stationary contact spring and contact, 2 break. . . . .	930 303	2
7	Core complete, d-c. only. . . . .	838 286	1	18	Stop, 1 make 1 break. . . . .	837 989	1
8	Coil, 48 volt, d-c., 115 volt, 25 cycle. . . . .	837 270	1	18	Stop, 2 break . . . . .	837 989	2
8	Coil, 125 and 250 volts, d-c., 460 volts, 50 and 60 cycle . . . . .	837 269	1	19	Stationary contact support, 1 make, 1 break . . . . .	838 632	1
8	Coil, 230 volts, 25 cycle . . . . .	837 273	1	19	Stationary contact support, 2 break . . . . .	838 632	2
8	Coil, 115 volt, 50 and 60 cycle. . . . .	837 272	1	20	Back plate, 1 make, 1 break . . . . .	837 990	1
8	Coil, 230 volt, 50 and 60 cycle. . . . .	837 275	1	20	Back plate, 2 break . . . . .	837 990	2
9	Spring for armature, 2 make. . . . .	837 967	1	21†	Fillister head brass machine screw, ".190-32 x 7/8", for mounting stationary contact, panel type only . . . . .	Std Hdw	2
9	Spring for armature, 1 make, 1 break, 2 break. . . . .	876 778	1	22†	Hexagon brass machine screw nut for above screw . . . . .	Std Hdw	2
10	Armature block complete . . . . .	837 931	1	*	External resistor, 250 volt, d-c. only . . . . .	879 978	1
11	Spring for contact finger . . . . .	837 968	2	*	Resistor mounting details, 250 volt, d-c. only . . . . .	877 339	1
12	Spring cap . . . . .	975 418	1				
13	Contact finger and lead, left hand. . . . .	838 253	1				
13	Contact finger and lead, right hand . . . . .	838 255	1				
14	Stationary contact support and contact, 2 make . . . . .	836 175	2				

\* Not Illustrated

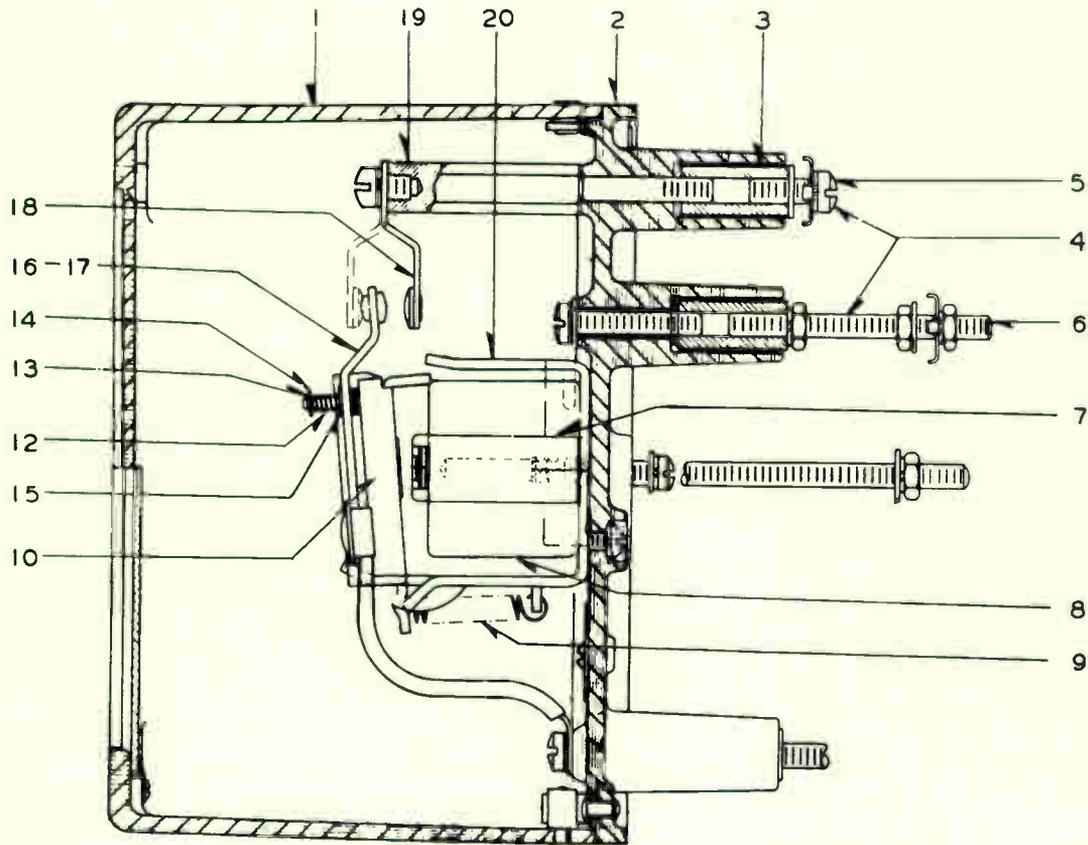
Order Parts by Style Number and Description

† When ordering, specify "Plus nickel finish"

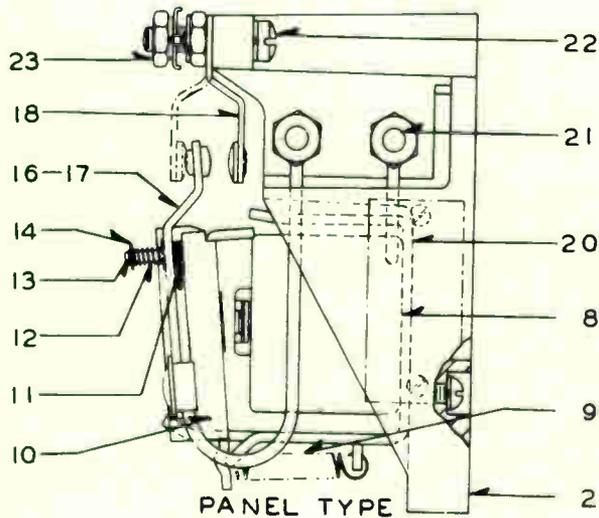
Parts indented are included in the Part under which they are indented

### TYPE SG AUXILIARY RELAYS

#### Reversible Contact Relays



SWITCHBOARD TYPE



PANEL TYPE

## TYPE SG AUXILIARY RELAYS

## Reversible Contact Relays

Ref No.	DESCRIPTION OF PART	Style Number	No. Req	Ref No.	DESCRIPTION OF PART	Style Number	No. Req
1	Cover, moulded solid, switchboard . . . . .	876 718	1	10	Armature block complete. . .	1 008 712	1
1	Cover, moulded with glass front, switchboard. . .	876 270	1	11	Lower contact spring. . . . .	1 001 025	2
2	Base, moulded, switchboard type . . . . .	878 637	1	12	Upper contact spring. . . . .	1 000 826	2
2	Base, moulded, panel type . . . . .	821 999	1	13	Washer for upper contact spring. . . . .	1 001 009	2
3	Nut, for terminal screw, switchboard type . . . . .	821 998	6	14	Cup washer for upper contact spring. . . . .	1 000 824	2
4	Mounting details, panel type . . . . .	1 008 226	1	15	Bushing under upper contact spring. . . . .	1 008 223	2
4	Mounting details, switchboard type . . . . .	839 114	1	16	Lead and contact, left hand . . . . .	1 008 709	1
5	Terminal stud. . . . .	797 078	6	17	Lead and contact, right hand . . . . .	1 008 710	1
6	Mounting stud. . . . .	837 330	2	18	Stationary contact complete	1 008 711	2
7	Core, d-c. . . . .	1 008 224	1	19	Post for mounting stationary contact, switchboard type . . . . .	836 176	2
7	Core, a-c. . . . .	1 008 225	1	20	Yoke . . . . .	668 593	1
*	Washer, under core, a-c. only. . . . .	935 765	1	21	Terminal screw, panel type.	837 321	4
8	Coil, 48 volts, d-c., 230 volts, 50 and 60 cycles . . .	1 008 520	1	22†	Fillister head brass machine screw, ".190-32 x 7/8" for mounting stationary contact, panel type only . . . . .	Std Hdw	2
8	Coil, 125 and 250 volts d-c. . . . .	1 008 524	1	23†	Hexagon brass machine screw nut for above screw . . . . .	Std Hdw	2
8	Coil, 115 volt, 25 cycle. . . . .	1 008 519	1	*	External resistor, 250 volts, d-c. only. . . . .	1 008 714	1
8	Coil, 230 volt, 25 cycle. . . . .	1 008 522	1	*	Resistor mounting details, 250 volt, d-c. only . . . . .	877 339	1
8	Coil, 115 volt, 50 and 60 cycle. . . . .	1 008 517	1				
8	Coil, 460 volt, 50 and 60 cycle. . . . .	1 008 523	1				
9	Spring for armature . . . . .	1 000 998	1				

\* Not Illustrated

Order Parts by Style Number and Description

† When ordering, specify "Plus nickel finish"

Parts indented are included in the Part under which they are indented

# WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY

Headquarters—306 4th Ave., Pittsburgh, Pa. P.O. Box 1017

- \*AKRON, OHIO, 106 South Main St.
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- †ATLANTA, GA., 426 Marietta St., N. W.
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- \*AUGUSTA, MAINE, 9 Bowman St.
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- †BALTIMORE, MD., 501 East Preston St.
- xBALTIMORE, MD., 2519 Wilkens Ave.
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- \*BIRMINGHAM, ALA., 1407 Comer Bldg.
- \*BLUEFIELD, W. VA., 208 Bluefield Avenue
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- \*BUTTE, MONTANA, Iron & Wyoming Sts.
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- \*CHARLOTTE, N. C., 210 East Sixth St.
- \*CHARLESTON, W. VA., 1415 Oakmont Rd., P. O. Box 865
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- †CHICAGO, ILL., 2211 W. Pershing Road, P.O. Box 1103
- \*†CINCINNATI, OHIO, 207 West Third St.
- \*†CLEVELAND, OHIO, 1216 W. Fifty-Eighth St.
- \*COLUMBUS, OHIO, 85 E. Gay St.
- \*DALLAS, TEXAS, 209 Browder St.
- \*DALLAS, TEXAS, 1712 Laws St.
- \*DAVENPORT, IOWA, 206 E. Second St., P.O. Box 55
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- †DENVER, COLORADO, 1700 Sixteenth St.
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- †EAST PEORIA, ILL., 900 W. Washington St.
- x†EAST PITTSBURGH, PA.
- \*EL PASO, TEXAS, Oregon and Mills Sts.
- †EL PASO, TEXAS, 450 Canal St.
- \*EMERYVILLE, CALIF., 5915 Green St.
- †EMERYVILLE, CALIF., 1466 Powell St.
- xEMERYVILLE, CALIF., 6121 Green St.
- \*ERIE, PA., 1003 State St.
- \*EVANSVILLE, IND., 201 N. W. First St.
- \*FAIRMONT, W. VA., 10th and Beldine Sts.
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- \*HOUSTON, TEXAS, 1314 Texas Ave.
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- †HOUSTON, TEXAS, 2315 Commerce Ave.
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- \*INDIANAPOLIS, IND., 551 West Merrill St.
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- \*JOHNSTOWN, PA., 107 Station St.
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- \*OKLAHOMA CITY, OKLA., Third & Alie Sts.
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- \*PHOENIX, ARIZONA, 11 West Jefferson St.
- †PHOENIX, ARIZONA, 425 Jackson St.
- xPITTSBURGH, PA., Nuttall Works, 200 Mc-Candless Ave.
- zPITTSBURGH, PA., 306 4th Ave., Box 1017
- †PITTSBURGH, PA., 543 N. Lang Ave.
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- †PORTLAND, OREGON, 2138 N. Interstate Ave.
- †PORTLAND, OREGON, 720 N. Thompson St.
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- \*RALEIGH, N. C., 803 North Person St., P.O. Box 2146
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- †SAN FRANCISCO, CALIF., 1355 Market St.
- \*SAN FRANCISCO, CALIF., 1 Montgomery St.
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- †SEATTLE, WASH., 3451 East Marginal Way
- †SEATTLE, WASH., 1041 First Ave., South
- xSHARON, PA., 469 Sharpshoot Ave.
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- \*SPRINGFIELD, MASS., 395 Liberty St.
- xSPRINGFIELD, MASS., 653 Page Boulevard
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- \*TACOMA, WASH., 1023 "A" St.
- \*TAMPA, FLA., 417 Ellamae Ave., Box 230
- \*TOLEDO, OHIO, 245 Summit St.
- xTRAFFORD CITY, PA.
- \*TULSA, OKLA., 303 East Brady St.
- †UTICA, N. Y., 113 N. Genesee St.
- \*WASHINGTON, D. C., 1434 New York Ave., N. W.
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- \*WILKES BARRE, PA., 267 N. Pennsylvania Ave.
- ① \*WORCESTER, MASS., 507 Main St.
- \*YORK, PA., 143 So. George St.
- \*YOUNGSTOWN, OHIO, 25 E. Boardman St.

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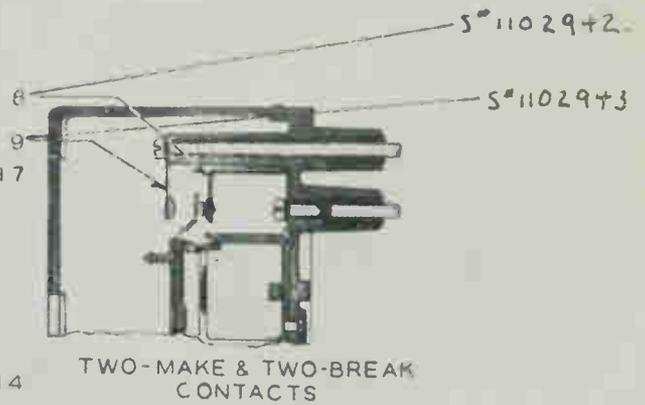
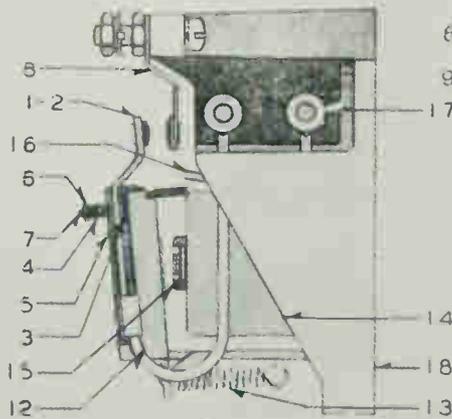
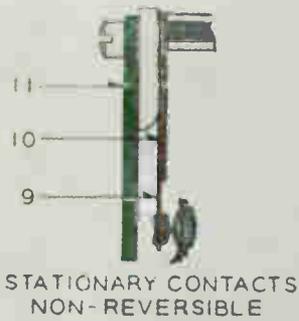
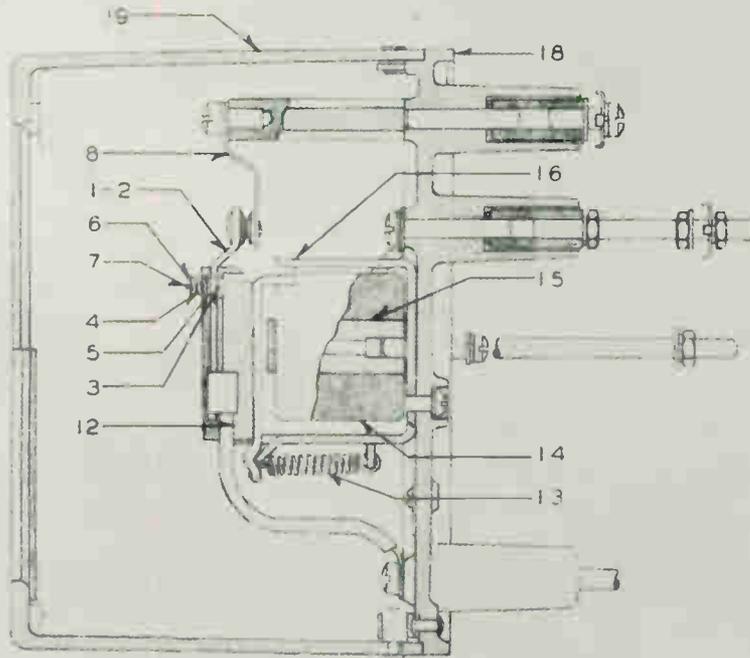
① Changed or added since previous issue.

HP DOP. SEP BA Spl.

October, 1940

## TYPE SG AUXILIARY RELAY

Closed or Open



Westinghouse Electric & Manufacturing Company  
 East Pittsburgh, Pa.

Westinghouse Press  
 Printed in U.S.A.

EVERY HOUSE NEEDS WESTINGHOUSE



**NEW**

# TYPE DnW "DE-ION" MOTOR WATCHMAN

Manual Motor Starter for A-C. Motors

1 and 3 Phase

1/6 to 7 1/2 Hp.

110 to 600 Volts



FIG. 1—TYPE DnW "DE-ION" MOTOR WATCHMAN IN STANDARD SURFACE ENCLOSURE

← Indicating Handle

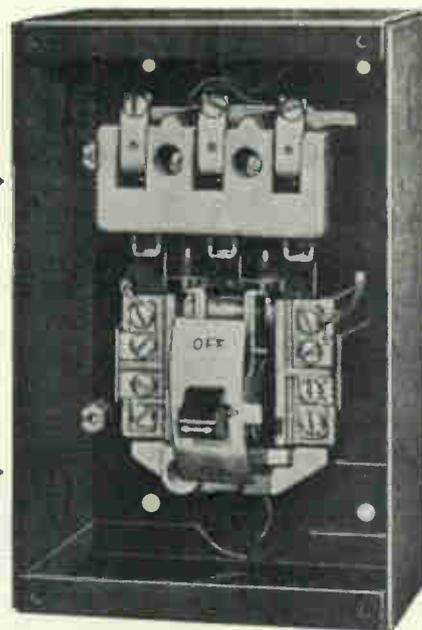


FIG. 2—SIZE 1 TYPE DnW "DE-ION" MOTOR WATCHMAN IN FLUSH ENCLOSURE WITH COVER REMOVED

"De-Ion" Arc Quenchers →

Bi-metallic Disc Overload →

## DISTINCTIVE FEATURES

- "DE-ION" ARC QUENCHERS most effectively open circuit and save contacts from burning.
- QUICK-MAKE AND QUICK-BREAK TRIP-FREE toggle operating mechanism.
- POSITIVE INDICATION of all switch positions (On, Off, Tripped).
- BI-METALLIC DISC TYPE overload relay provides inverse time limit motor protection.
- NON-CARBONIZING, NON-WARPING, moisture-proof arc boxes and relays.
- SAFETY INTERLOCK prevents contact with live parts.
- DOUBLE BREAK silver to silver contacts eliminate necessity for flexible shunts.
- STRAIGHT THROUGH WIRING and easily accessible terminals.



OFF



ON



TRIPPED

FIG. 3—THE HANDLE INDICATES

**Westinghouse Electric & Manufacturing Company**  
East Pittsburgh, Pa.

Org. A, B, D, Y. Agent-Jobbers and Cust. A, X, Y, b, s, X, C.

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TYPE DnW "DE-ION" MOTOR WATCHMAN—Continued

DISTINCTIVE FEATURES

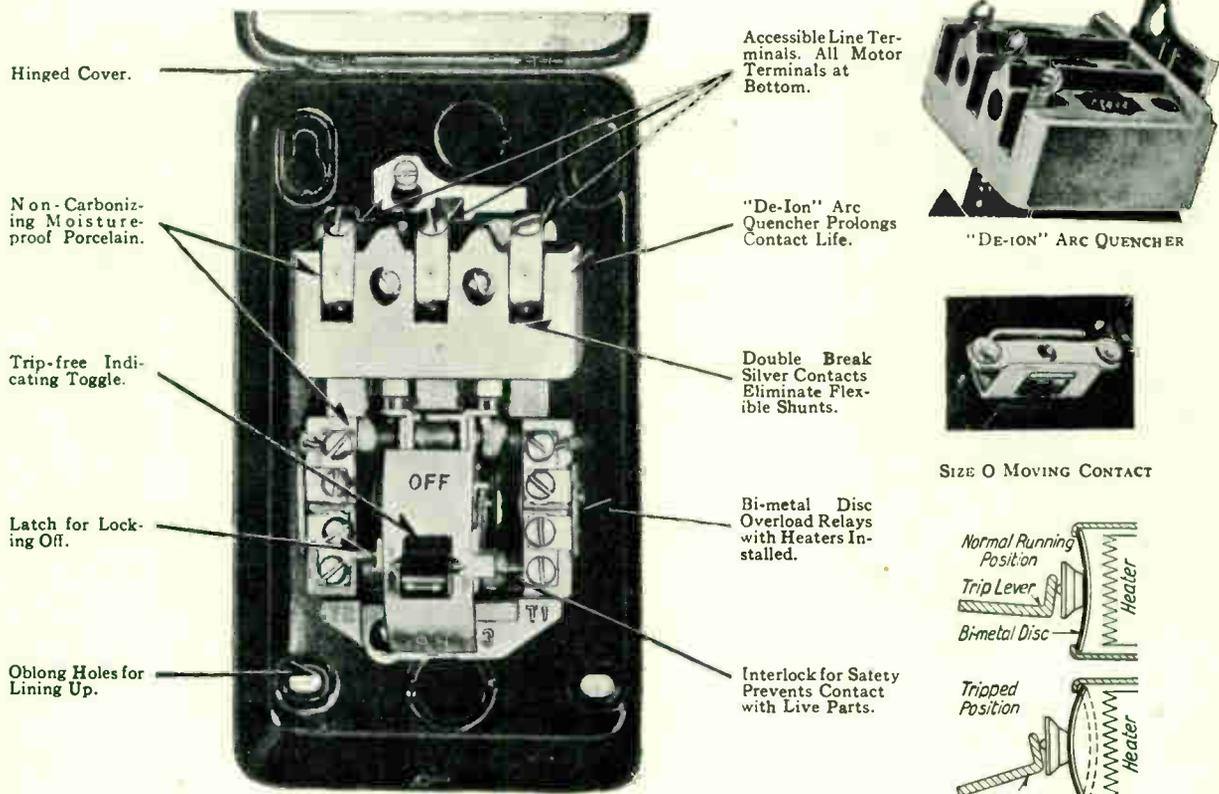


FIG. 4—"DE-ION" MOTOR WATCHMAN CLASS 10-100-SOA WITH HEATERS IN PLACE; SHOWING GENEROUS WIRING SPACE

APPLICATION

The "De-ion" Motor Watchman is a manually operated motor starter, designed for starting, stopping and protecting small single phase and polyphase A-C. motors driving looms, fans, pumps, machine tools, food machinery and many other industrial applications. It may also be used for small D-C. motors which may be started directly across the line.

110 to 600 Volts

Ratings and Nomenclature.

25 to 60 Cycles

MAXIMUM HORSEPOWER					CLASS NUMBER				
3 PHASE			1 PHASE		Standard Sheet Steel Enclosure NEMA Type I	Flush Type Steel Enclosure NEMA Type Ib	Water-Tight Dust-Tight Cast Iron Enclosure NEMA Types III, IV, V	For Hazardous Locations Class I Group D, Class II Group G NEMA Types VIII, IX	Switch Unit Without Enclosure
110 Volts	208-220 Volts	440-600 Volts	110 Volts	208-220 Volts					
1½	2	2	1	1½	10-100-SO	10-100-PO	10-100-WO	10-100-UO	10-100.O
1½	2	2	1	1½	*10-100-SOA	.....	.....	.....	.....
3	5	7½	1½	3	10-100-S1	10-100-P1	10-100-W1	10-100-U1	10-100.1

\* Especially designed for loom motor service, a Size O switch in a Size 1 box.

TYPE D<sub>n</sub>W "DE-ION" MOTOR WATCHMAN—Continued

FIG. 5—SIZES 0 AND 1 "DE-ION" MOTOR WATCHMAN STARTERS IN STANDARD SURFACE ENCLOSURES

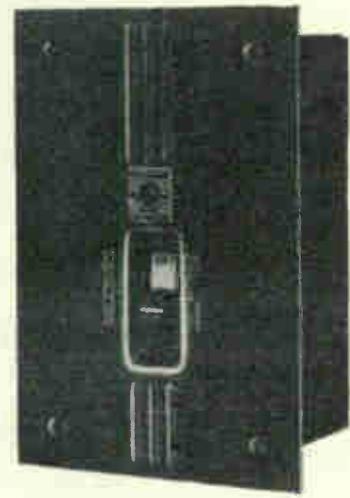


FIG. 6—FLUSH TYPE ENCLOSURE

## ● OPERATION

These starters are operated by means of a positive toggle mechanism that is:

1. Quick-make and quick-break.
2. Trip free on overload.
3. Indicating of all switch positions (on, off, tripped).
4. Capable of rapid and accurate inching operation.

## ● CONSTRUCTION

The switch unit is assembled on a rigid steel base. The toggle mechanism operates the moving contact assembly vertically, and is so easy yet positive in operation that rapid inching and accurate control of the machine is possible. The stationary contacts and the "De-ion" grids of the arc quencher are mount-

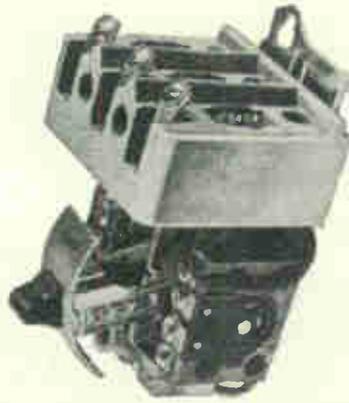


FIG. 7—SWITCH UNIT REMOVED FROM ENCLOSURE; HEATER IN PLACE

concave to convex form and trips a latch on the toggle mechanism, opening the switch.

The discs reset themselves when cooled, but the switch mechanism must be "reset" by moving the handle to the extreme "off" position, before the switch may be closed again. The handle cannot be held closed on overload.

The heaters are the same as those used on Size 0 and Size 1 magnetic LINESTARTERS; a great convenience when stocking or changing heaters.

Arc boxes and relays are moulded of grey porcelain which will neither absorb moisture, warp nor carbonize. All metal parts are cadmium plated or tinned to resist corrosion.

The switch unit mounts in any enclosure by only one screw at the top of the base. The lower end of the base is hooked into place over a projection in the back of the cabinet.



FIG. 8—"DE-ION" MOTOR WATCHMAN ON PEDESTAL

ed in porcelain arc boxes. All contacts are steel-backed silver buttons. Double break silver contacts—plus the "De-ion" arc quenchers—assure minimum contact burning, and eliminate the necessity for flexible shunts. Size 0 and Size 1 starters are similar except that the moving contact assembly of Size 1 starters has a magnetic loop (like Class 11-200-S1 LINESTARTERS) to accelerate the movement of the arc into the "De-ion" grids. This also requires a different arc box.

Overload protection is provided by two pre-formed bi-metallic disc relays, which operate independently with inverse time limit characteristics. These relays allow ample time in starting and for short peak loads, yet accurately protect the motor. The discs are heated by heaters in the motor circuit. When an overload causes the disc to reach tripping temperature, it snaps from



FIG. 9—"DE-ION" MOTOR WATCHMAN MOUNTED ON LOOM MOTOR

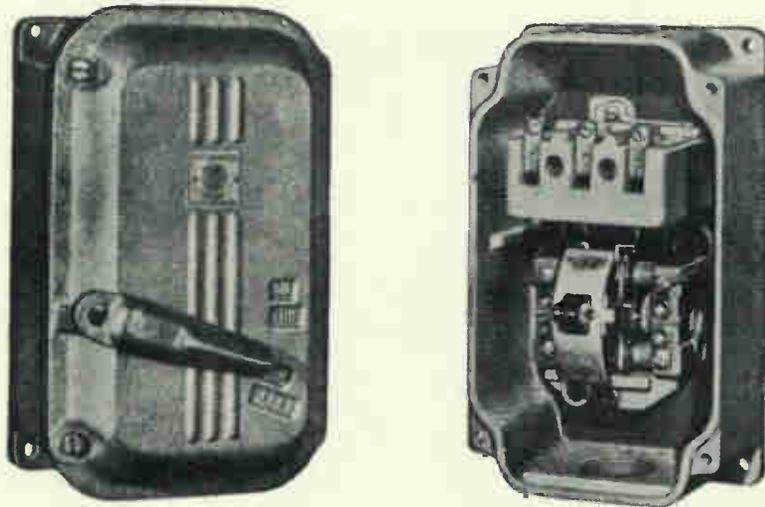
TYPE D<sub>n</sub>W "DE-ION" MOTOR WATCHMAN—Continued

FIG. 10—WATER-TIGHT "DE-ION" MOTOR WATCHMAN

## ● ENCLOSURES

**Standard steel enclosures** (Type S, Fig. 5) have deep drawn covers, hinged at the top. The operating handle is recessed in the front of the cover, eliminating projecting pieces, and permitting close mounting in group installations. Keyhole mounting holes at the top and oblong holes at bottom of cabinet make mounting and lining up easy. Ample knockouts for conduit are provided in top, bottom and both sides; and in addition the Size OA and Size 1 switches have two knockouts in the back.

The cover is interlocked for safety so that it cannot be opened unless the switch is in the "off" position. A spring

latch holds the cover closed, and only one padlock is needed to lock both the switch off and the cover closed. A small latch on the switch unit may be swung into position and then the cover locked shut. Finish is baked black enamel.

**Flush enclosures** (Type P, Fig. 6) for mounting in a plastered wall, or in a recess in a machine casting, consist of a wide flanged flush plate and a folded steel box with an adjustable mounting plate for accurately lining up the switch unit. The box has knockouts in all four sides and is finished baked black enamel. The flush cover is finished in gray lacquer.

**Water-tight and dust-tight** (Type W, Fig. 10) enclosures are cast iron with tapped conduit holes and with a rubber gasket between cover and box. The

switch is operated by a handle on the front which is arranged for padlocking in the "off" position. Finish is weather-resisting aluminum paint and all hardware is corrosion resisting copper-alloy.

**Explosion-protecting** (Type U, Fig. 13) enclosures are cast-iron designed in accordance with the specifications of the Underwriters' Laboratories for Class I, Group D; Class II, Group G; or Class III or IV Hazardous Locations. Finish is weather-resisting aluminum paint, and all hardware is corrosion-resisting copper alloy.

For Textile Loom service special mountings are available either on the side or top of the special loom motor (Fig. 9) or on pedestals (Fig. 8) which are designed for floor mounting over a junction box.

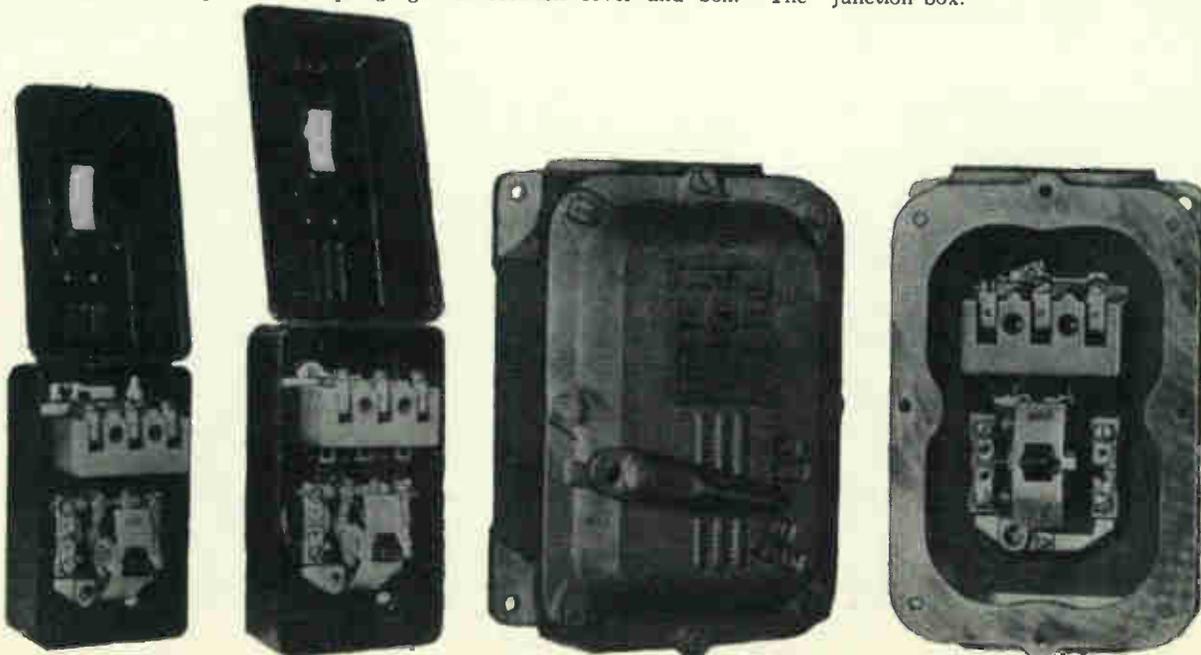


FIG. 11—SIZE O "DE-ION" MOTOR WATCHMAN

FIG. 12—SIZE 1 "DE-ION" MOTOR WATCHMAN

FIG. 13—"DE-ION" WATCHMAN FOR CLASS I GROUP D AND CLASS II GROUP G HAZARDOUS LOCATIONS

**TYPE MW MOTOR WATCHMAN THERMAL OVERLOAD RELAY**  
**INSTRUCTIONS**

**Application**

The type MW Thermal Overload Relay employs an electrically heated bi-metallic disc to open a pair of contacts in the coil circuit of a contactor for the disconnection of power on the occurrence of an overload. Heating of the disc is accomplished by a heating element connected directly in the circuit to be protected. With a proper choice of heaters, the relay may be used on a-c. or d-c. circuits of from .49 to 40 amperes at not more than 600 volts. The contacts will carry and break coil currents up to 1 ampere in an a-c. circuit and 50 volt-amperes at a maximum of 1 ampere in a d-c. circuit.

The relay will provide protection against abnormal load conditions to current values exceeding locked rotor current. In accordance with the National Electric Code the relay should be protected against short circuits by fuses rated at not more than four times the rated motor current, by a time limit circuit breaker set at not more than four times the rated motor current or by an instantaneous trip circuit breaker.

**Construction and Operation**

The thermostatic element is a bi-metallic disc which suddenly reverses its convexity when it is heated to a given temperature. This acts to separate the double-break silver-plated contacts, and initiates the movement of a reset rod which latches the relay contacts in this position until manually reset. After the disc has cooled sufficiently to resume its normal convexity, resetting may be accomplished by depressing the reset rod.

Under normal operating conditions the reset rod may be used as a spring-returned stop button, separating the relay contacts when fully depressed.

In case automatic resetting of the relay is desired it is necessary only to remove the reset rod. This is accomplished by deflecting the contact spring until clearance is provided for withdrawing the rod.

The time required for the relay to trip depends upon the size of the overload, the greater the overload the shorter being the time to trip. This is indicated in the Time Characteristic Curve, Fig. 3, of a relay operating in a 40°C. ambient temperature. The curve applies in general when the relay is operated in any ambient temperature as long as the currents are expressed in percentages of the heater rating at that ambient temperature.

The performance of the relay is such that it will allow motor starting currents to flow during the starting period, but will trip when subjected to smaller but long-continued overloads. A short time must elapse before the relay can be reset.

**Installation and Maintenance**

The Heater, with its mounting screws, is supplied separately, and is to be mounted as indicated in Fig. 1. Con-

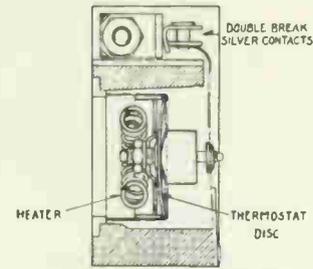


FIG. 2—SECTIONAL VIEW TYPE MW OVERLOAD RELAY WITH RESET ROD REMOVED

tact surfaces must be clean and all connections tight. Periodic inspection is recommended.

No oiling of relay parts is required. **Heaters**

Each heater is identified by a code marking stamped on one terminal near the mounting hole. The Heater Application Table indicates the range of full load motor current to which a given heater may be applied. This range is so selected that the current to produce ultimate tripping of the relay will be approximately 115% to 125% of the rated motor current.

The current rating of the relay (see Table No. 1) is based on an ambient temperature of 40°C. Standard motor ratings are also based on an ambient temperature of 40°C. For protection of the motor when it and the relay are operated in a common ambient temperature, heaters should be applied according to Heater Table No. 1 for average applications.

Confining the relay in a small space, such as a starter cabinet, with other apparatus which dissipates heat will raise its ambient temperature, affecting thereby its tripping value. Heater Table No. 2 is for use when the temperature of the air within the cabinet and immediately surrounding the relay is 15°C. above the ambient temperature in which the motor is applied. Heater Table No. 3 is to be used when this temperature difference is 30°C.

**Renewal Parts**

- Type MW Overload Relay Complete S # 972879
- Reset push rod..... S # 899862
- Push rod coil spring..... S # 899855

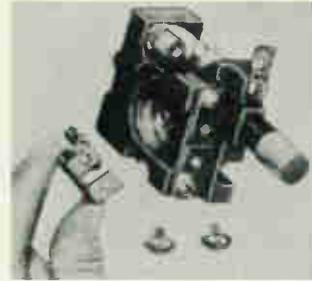


FIG. 1—THERMAL OVERLOAD RELAY SHOWING HOW HEATER IS INSTALLED

**HEATER APPLICATION TABLE**

Heater* Style Number	Heater Code Marking	FULL LOAD CURRENT OF MOTOR		
		Table No. 1 Relay Ambient Same as Motor Ambient	Table No. 2 Relay Ambient 15° C. Above Motor Ambient	Table No. 3 Relay Ambient 30° C. Above Motor Ambient
1 129 372	X .49	0.50 to 0.54	0.44 to 0.49	0.39 to 0.43
1 129 373	Y .55	0.55 to 0.62	0.50 to 0.54	0.44 to 0.49
1 129 374	Z .63	0.63 to 0.71	0.55 to 0.62	0.50 to 0.54
966 465-B	AA .71	0.72 to 0.79	0.63 to 0.71	0.55 to 0.62
966 466-B	AB .82	0.80 to 0.89	0.72 to 0.79	0.63 to 0.71
966 467-B	AC .93	0.90 to 0.99	0.80 to 0.89	0.72 to 0.79
966 468-B	AD 1.0	1.00 to 1.04	0.90 to 0.99	0.80 to 0.89
966 469-B	AE 1.1	1.05 to 1.18	1.00 to 1.04	0.90 to 0.99
966 470-B	AF 1.2	1.19 to 1.32	1.05 to 1.18	1.00 to 1.04
966 471-B	AG 1.4	1.33 to 1.49	1.19 to 1.32	1.05 to 1.18
966 472-B	AH 1.5	1.50 to 1.71	1.33 to 1.49	1.19 to 1.32
966 473-B	AI 1.7	1.72 to 1.89	1.50 to 1.71	1.33 to 1.49
966 474-B	AK 1.9	1.90 to 2.09	1.72 to 1.89	1.50 to 1.71
966 475-B	AL 2.1	2.10 to 2.35	1.90 to 2.09	1.72 to 1.89
966 476-B	AM 2.5	2.36 to 2.65	2.10 to 2.35	1.90 to 2.09
966 477-B	AN 2.7	2.66 to 2.98	2.36 to 2.65	2.10 to 2.35
966 478-C	AO 3.0	2.99 to 3.35	2.66 to 2.98	2.36 to 2.65
966 479-C	AP 3.4	3.36 to 3.75	2.99 to 3.35	2.66 to 2.98
966 480-C	AR 3.8	3.76 to 4.21	3.36 to 3.75	2.99 to 3.35
966 481-B	AS 4.3	4.22 to 4.71	3.76 to 4.21	3.36 to 3.75
966 482-C	AT 4.8	4.72 to 5.33	4.22 to 4.71	3.76 to 4.21
966 483-C	AU 5.4	5.34 to 5.94	4.72 to 5.33	4.22 to 4.71
966 484-C	AW 6.1	5.95 to 6.63	5.34 to 5.94	4.72 to 5.33
966 485-C	AX 6.8	6.64 to 7.52	5.95 to 6.63	5.34 to 5.94
966 486-C	AY 7.7	7.53 to 8.51	6.64 to 7.52	5.95 to 6.63
966 487-B	AZ 8.5	8.52 to 9.31	7.53 to 8.51	6.64 to 7.52
966 488-C	BA 9.6	9.32 to 10.5	8.52 to 9.31	7.53 to 8.51
966 489-B	BB 11.5	10.6 to 11.5	9.32 to 10.5	8.52 to 9.31
966 490-B	BC 12.	11.6 to 12.4	10.6 to 11.5	9.32 to 10.5
966 491-B	BD 13.	12.5 to 13.4	11.6 to 12.4	10.6 to 11.5
966 492-C	BE 14.	13.5 to 14.9	12.5 to 13.4	11.6 to 12.4
966 493-D	BF 16.	15.0 to 17.5	13.5 to 14.9	12.5 to 13.4
966 494-C	BG 18.	17.6 to 18.2	15.0 to 17.5	13.5 to 14.9
966 495-C	BH 19.	18.3 to 19.0	17.6 to 18.2	15.0 to 17.5
966 496-C	BI 21.	19.1 to 20.5	18.3 to 19.0	17.6 to 18.2
966 497-D	BK 23.	20.6 to 22.6	19.1 to 20.5	18.3 to 19.0
966 498-D	BL 25.	22.7 to 24.9	20.6 to 22.6	19.1 to 20.5
966 499-C	BM 27.	25.0 to 28.4	22.7 to 24.9	20.6 to 22.6
1 040 588	BN 29.	28.5 to 32.2	25.0 to 28.4	22.7 to 24.9
974 084-A	BO 31.	32.3 to 35.0	28.5 to 32.2	25.0 to 28.4
1 040 589	BR 36.	.....	32.3 to 35.0	28.5 to 32.2
1 040 590	BS 40.	.....	.....	32.3 to 35.0

\* For totally enclosed, splash-proof, drip-proof and all other continuous rated 50° and 55° motors, use one size smaller Heaters.

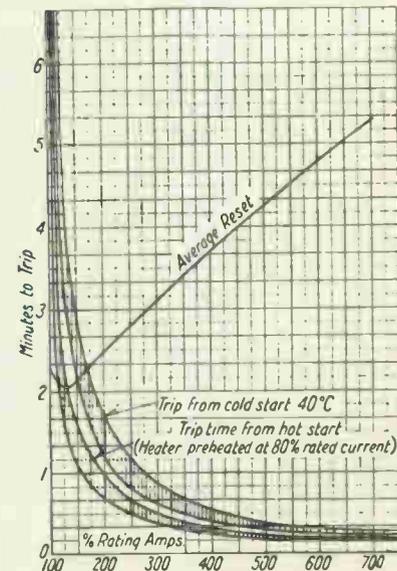


FIG. 3—AVERAGE TIME CURRENT CURVE



## TYPE TK UNIVERSAL TIMING RELAY AND D-C. TO A-C. INVERTER

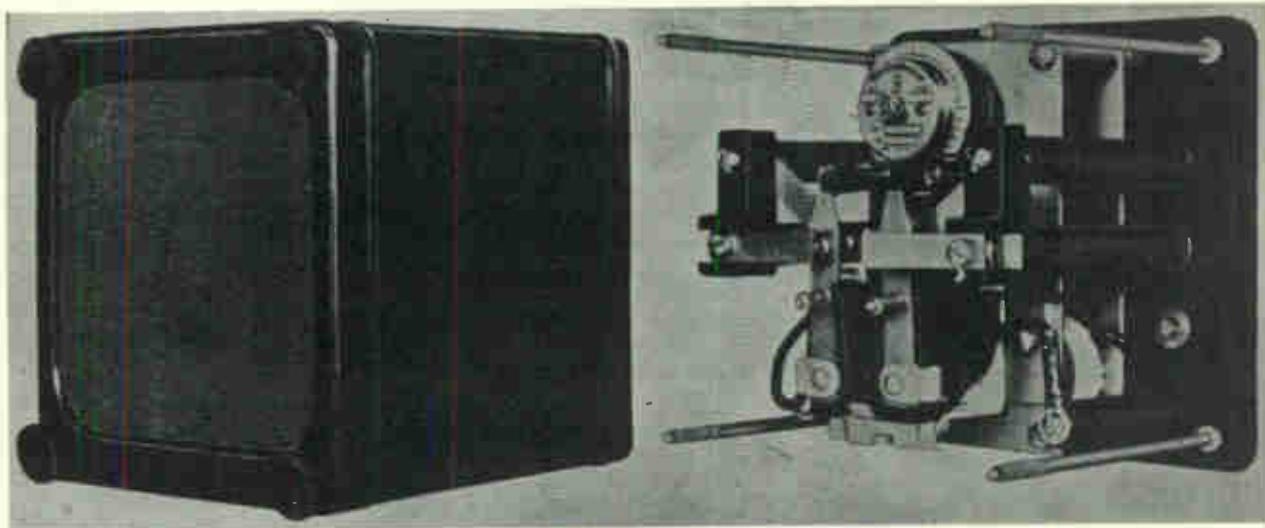


FIG. 1—TYPE TK RELAY WITH COVER REMOVED

### Application

The TK relay can be used on a-c. circuits which require a definite time delay between the closing of an a-c. circuit and the closing or opening of other circuits (either a-c. or d-c.) through the relay contacts. Accurate time settings from a few seconds to fifty minutes can be obtained in a single relay. The relay will reset practically instantaneously even with the longest time setting. Two sets of main contacts, one single pole double throw and the other single pole single throw are provided, and these contacts can be adjusted to operate either simultaneously or sequentially.

An unusually wide variation of applications can be handled with the TK relay. The wide time range, quick reset and number of contacts provided will allow a single relay to be applied without modification. Some typical applications are found in automatic control circuits for generators and motors, in connection with the operation of large rectifiers and other thermionic tubes, as a part of the control for voltage regulators, tap-changing transformers, and various forms of industrial control.

### Distinctive Features

1. Synchronous motor that will stay "in step" over a very wide fluctuation of voltage. (20% plus or minus motor rating).
2. Quick reset (less than 1 second at the maximum time setting).

3. Large silver contacts capable of carrying 12 amperes continuously. They will open 20 amperes 115 volts a-c. or 15 amperes at 230 volts a-c. non inductive or a circuit carrying 3 amperes at 125 volts d-c.
4. The motor is energized only during the timing interval and since the bearing has sealed-in lubrication, no attention is required and wear is negligible.
5. A new design relay consisting of standard well-known design parts.
6. Time settings from approximately 2 seconds to 50 minutes.

### Construction and Operation

The TK relay consists essentially of (1) a synchronous motor (2) a gear train which provides three different ratios (3) a clutch to permit quick resetting when the relay is de-energized (4) tripping mechanism adjustable for time delay and (5) a contactor which carries the main contacts and operates the clutch.

The motor and gear train are mounted between two plates supported by four posts which are in turn fastened to the relay base.

(1) The motor is the same standard design used in some of our other products (relays, meters, etc). It runs at a speed of 600 rpm. and its coil has a low temperature rise. Sleeve bearings, in which a permanent supply of lubrication is placed, are used. The motor pinion is permanently in mesh with the gear train.

(2) The gear train is mounted between the upper portion of the two plates which act as supports for the motor and gear train. The plates are drilled and reamed for the polished gear shafts. These shafts run at low speeds and require no lubrication. The location of a sliding gear assembly on its shaft can be varied to allow it to mesh with different gears or pinions to obtain any one of three speeds. This sliding gear assembly consists of two gears and hub which are free to slide on a shaft but can be locked in any desired position by a set screw. To assist in determining which speed is to be obtained, arrows are placed on the index plate. The sliding gear assembly can be moved to the position where its larger gear is opposite the index plate arrow corresponding to the desired time scale.

The 30 second scale is graduated in sub-divisions to 1 second, and the smallest sub-division on the 5 minute and 50 minute scales is .1 and 1 minute respectively.

(3) The clutch consists of two aluminum discs with serrated faces (resembling crown gears) which are normally separated. The clutch is mounted on the same shaft as the sliding gear assembly. The rear aluminum disc is mounted on this shaft; the front disc has a loose fit on the shaft and has fastened to it the pinion that drives the tripping mechanism. When the relay is energized, the two discs are pressed together by a spring, the serrations on

## TYPE TK UNIVERSAL TIMING RELAY—Continued

their faces mesh, and power is transmitted from the motor through the gear train to the tripping mechanism.

(4) The tripping mechanism is fastened to the front plate of the gear train assembly. The armature and clutch spring move in (that is toward the rear of the relay) when energized, but the two moving contacts that the armature carries are prevented from moving by the micarta latch arms. Therefore, the back contact on the left hand side (from the front of the relay) will remain closed until the arms are tripped and the moving fingers released. This same statement also applies to the side of the motor circuit which uses the back contact on the right-hand side of the relay. The tripping is accomplished by a pin on each of the tripping discs pushing down the latch arm levers.

Each of the tripping discs has an index mark on its edge. These marks are located so as to coincide with the zero on the scale plate when the trip pins have reached a point where they will just trip the micarta latch arms and release the contact fingers. Before setting for a predetermined tripping time the gear on the sliding gear

assembly should be shifted to the ratio desired. The tripping discs can be rotated so the index is on the desired scale marking by loosening the thumb nut. If sequential operation of the contact fingers is required the left hand contact must trip first as the motor is in series with the back contacts on the right-hand side. When the latter contact is tripped the motor supply becomes open circuited. The minimum setting obtainable without partially raising the latch arm is approximately one small division on the 30 second scale. When the relay is de-energized the clutch is released at once and therefore the tripping mechanism does not have to operate through the gear train. The tripping discs will reset from the maximum travel position in less than one second.

(5) The contactor is of the clapper type. The spring arm, which presses against the front half of the clutch and pushes it into mesh, is fastened to the top of the armature. The sealing-in contact, when used, is operated by an insulating button attached to the same spring arm. The motor and contactor coil are connected together so that as

soon as the clutch is operated the motor is also energized. The armature carries the two moving contacts. The moving and stationary contacts are made of chemically pure silver which will carry 12 amperes continuously and 20 amperes for 1 minute. The contacts will interrupt a non-inductive a-c. circuit carrying 20 amperes at 115 volts or 15 amperes at 230 volts. On 230 volts or higher voltages (60 cycles) the contactor coil has a tap brought out at the proper place to act as an auto-transformer to supply 115 volts to the motor.

The TK Relay can be provided with a sealing-in contact which closes when the relay is energized. By properly connecting this contact the relay can be energized and kept energized by momentary closure of an external contact or switch, such as a push button. The supply circuit must then be opened through some other contact or switch in order to de-energize the relay.

**Burden at 125 Volts, 60 Cycles**

Contactor Burden = 18 Volt-amperes  
Motor Burden = 2.6 Volt-amperes

**TK RELAY LIST PRICES**

Volts	Frequency	Style No. of Relay Without Sealing Contact	List Price Discount Symbol FC	Style No. of Relay With Sealing Contact	List Price Discount Symbol FC
115	25	1 008 930	\$40 00	1 008 933	\$40 00
230	25	1 008 931	40 00	1 008 934	40 00
460	25	1 008 932	40 00	1 008 935	40 00
115	50	1 008 924	40 00	1 008 927	40 00
230	50	1 008 925	40 00	1 008 928	40 00
460	50	1 008 926	40 00	1 008 929	40 00
115	60	938 926	40 00	1 008 552	40 00
230	60	1 008 550	40 00	1 008 553	40 00
460	60	1 008 551	40 00	1 008 554	40 00

Order by Style Number

TYPE TK UNIVERSAL TIMING RELAY—Continued

WIRING DIAGRAMS

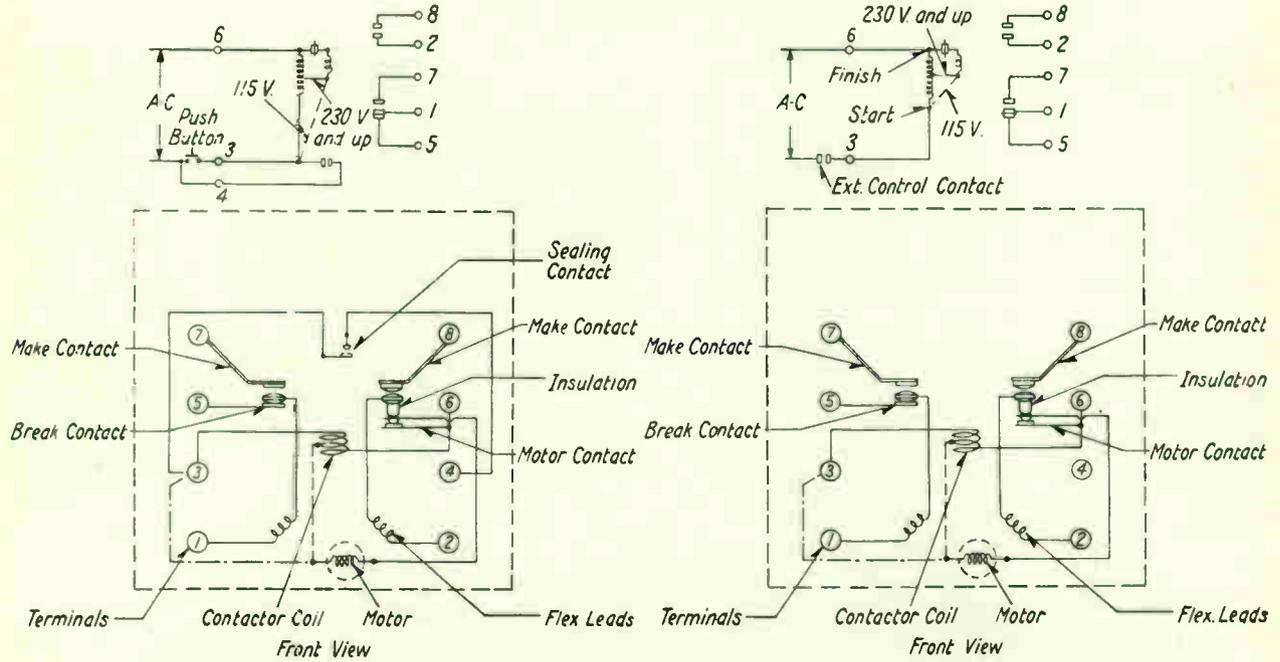
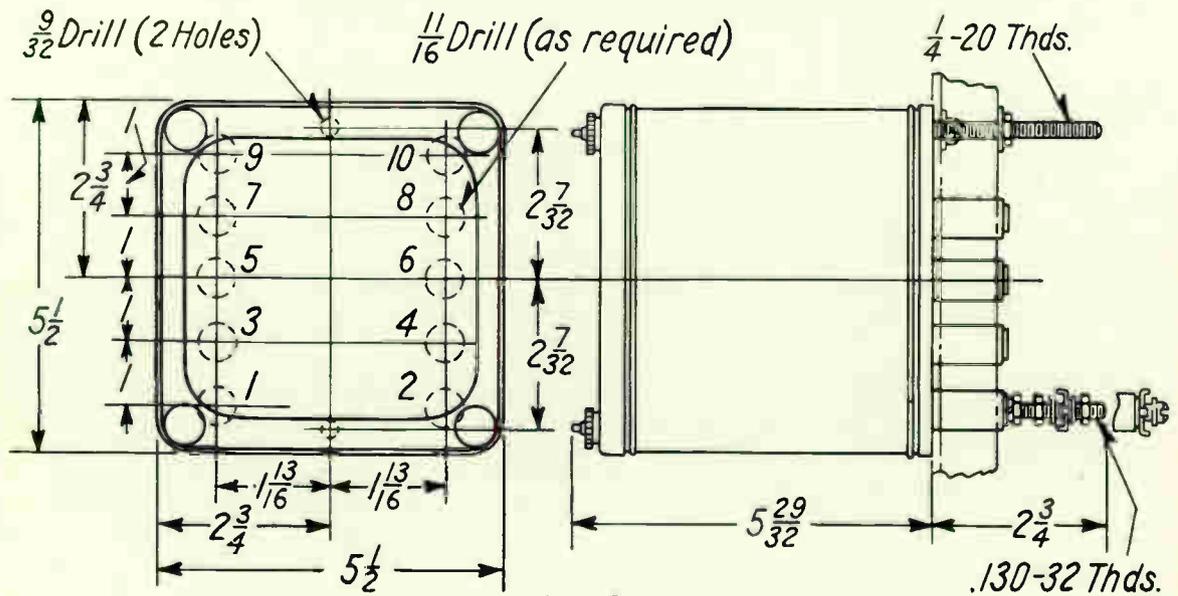


FIG. 2—TK RELAY WITH SEALING CONTACT

FIG. 3—TK RELAY WITHOUT SEALING CONTACT

OUTLINE DIMENSIONS IN INCHES

Dimensions are for reference only. For official dimensions refer to nearest Westinghouse Sales Office



No. of Terms	Drill Holes
8 or less	1 to 8
9	1 to 9
10	1 to 10

Note—For  $\frac{1}{8}$  or  $\frac{3}{16}$  metal swbds. use screws for mtg. relay and for terminal conns.  
 For  $\frac{1}{4}$  to  $1\frac{1}{2}$  inch swbds. use studs for mtg. relay and screws for terminal connections  
 For all other swbds. use studs for both purposes.

FIG. 4—TK RELAY OUTLINE AND DRILLING PLAN

## TYPE TK UNIVERSAL TIMING RELAY—Continued

## D-C. TO A-C. INVERTER

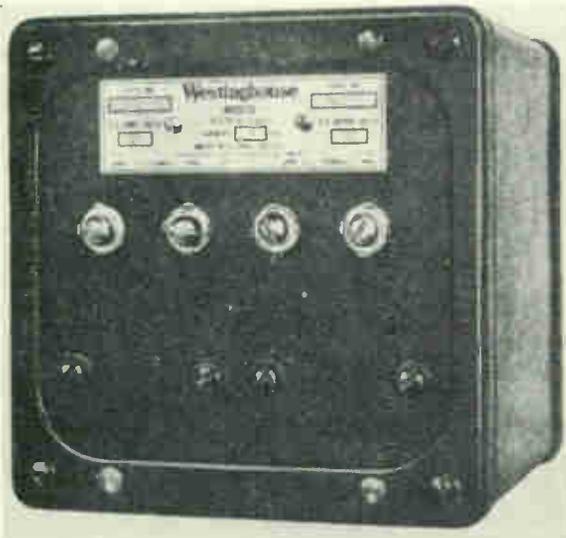


FIG. 5—D-C. TO A-C. INVERTER

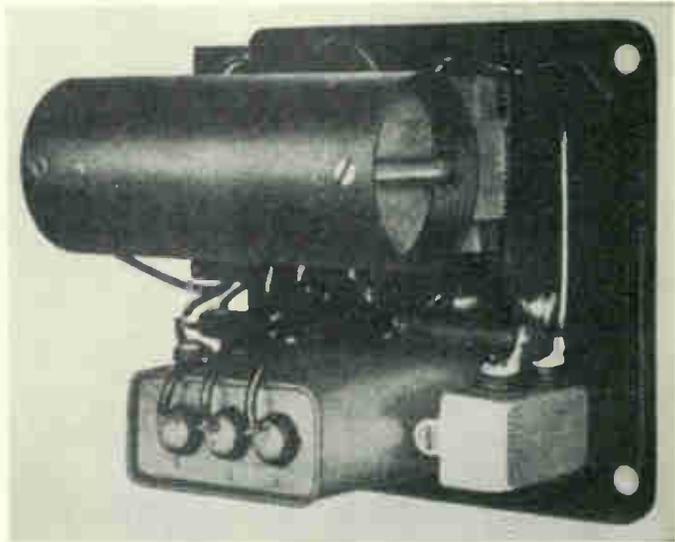


FIG. 6—D-C. TO A-C. INVERTER—COVER REMOVED

## D-C.—A-C. INVERTER

To provide a means of converting d-c. power to a-c. for operating 60 cycle devices of low power consumption the inverter was developed; and as there are a number of installations where it will be desirable to operate a TK relay from a d-c. source, the information on the inverter is included in this section.

## Application

It is well-known that very small d-c. motors generally are not as satisfactory or accurate as small a-c. motors. Consequently most motor-driven relays are a-c. operated to obtain the most reliable results.

In many installations it is essential to obtain the operating energy from an unfailing source of power. In these installations a battery is used.

The d-c. to a-c. inverter enables both of these advantages to be employed. It is an intermediate device used to convert battery power into 115 volts 60 cycles so that standard a-c. apparatus within its capacity can have a positive source of power at all times. It, therefore, is sometimes desirable to convert available d-c. to a-c. to operate timing relays such as the Westinghouse TK relay and other small synchronous motor-driven devices.

It will not convert a-c. to d-c.

## Distinctive Features

1. Simple and reliable.
2. Provides a reliable sinusoidal wave form.
3. No chemical action or thermionic tubes required.
4. Small burden (does not exceed 20 Watts).
5. Contained in 5½" square case for back of switchboard mounting.

## Construction and Operation

The d-c. to a-c. inverter includes a magnetically operated double contact vibrator that charges a tank circuit through a series reactor. When the contacts make on either side the tank circuit is given impulses which furnishes the power to keep it oscillating.

The vibrator mechanism is mounted in a sulphur free sponge rubber sleeve with end pads to absorb the contact noise, so that the operation of the d-c. to a-c. inverter is practically noiseless. The mounting serves as a resilient support as well as for sound absorption.

The vibrator has special silver-alloy contact material which has high conductivity, resists oxidation and will give long wear. There is a magnetic weight with a cross-wire on the end of the moving contact spring. The combined weight of these parts together with the spring strength determines the oscillating period of the vibrator.

The tank circuit is composed of a center tap reactor that has a center-

tapped capacitor connected to it. The oscillatory circuit is designed to maintain a sinusoidal wave form from no load to full load. The reactor is tapped to obtain the proper operating voltage.

The series reactor is the same size as the tank reactor and has the proper characteristics to reduce the instantaneous tank circuit charging current, reduce the contact duty and aid in obtaining the excellent wave form secured for a device of this kind.

There is a condenser and resistor combination used to absorb the voltage of the series reactor when the vibrator contacts open.

A second resistor and condenser is connected to the vibrator coil. This gives frequency stabilization with varying loads. It reduces the a-c. in the vibrator coil, which in turn reduces the amplitude of vibration, and by permitting the d-c. in the coil to be increased it permits low-starting voltage.

There is a resistor connected across the a-c. output terminals which should be disconnected if the device supplied from the inverter requires more than 3 VA. The maximum output of the inverter is 7.5 VA.

The inverter is intended for intermittent use only, which is the type of service ordinarily required of timing relays and apparatus of that nature.

## Burden

20 watts on the d-c. side.

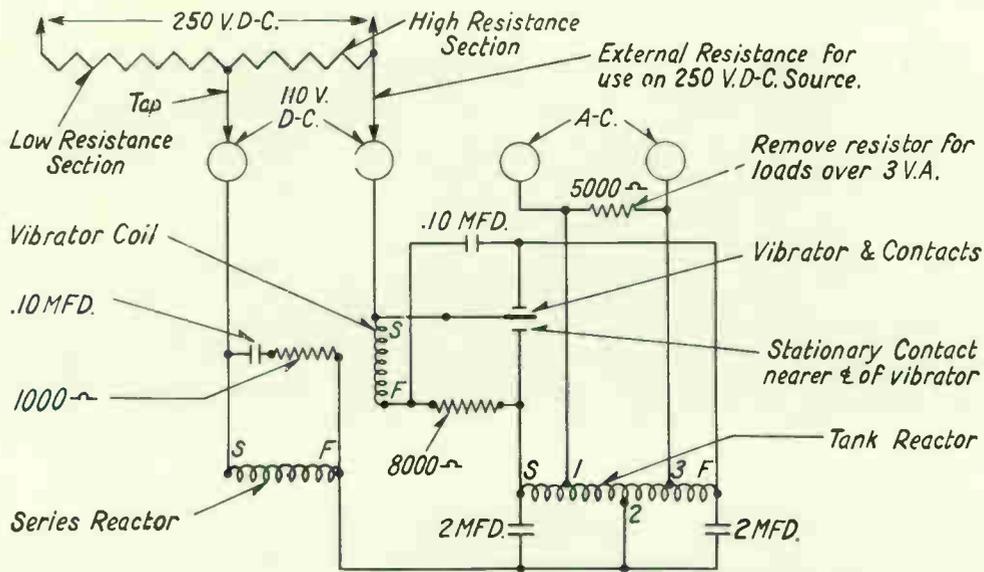
TYPE TK UNIVERSAL TIMING RELAY—Continued

D-C. TO A-C. INVERTER—Continued

INVERTER LIST PRICE

VOLTS		Style No.	List Price Discount Symbol PC
D-C. Input	A-C. 60 Cycle		
125	115	1 008 561	\$25 00

WIRING DIAGRAM



FRONT VIEW

FIG. 7—WIRING DIAGRAM FOR INVERTER STYLE No. 1008561

OUTLINE DIMENSIONS IN INCHES

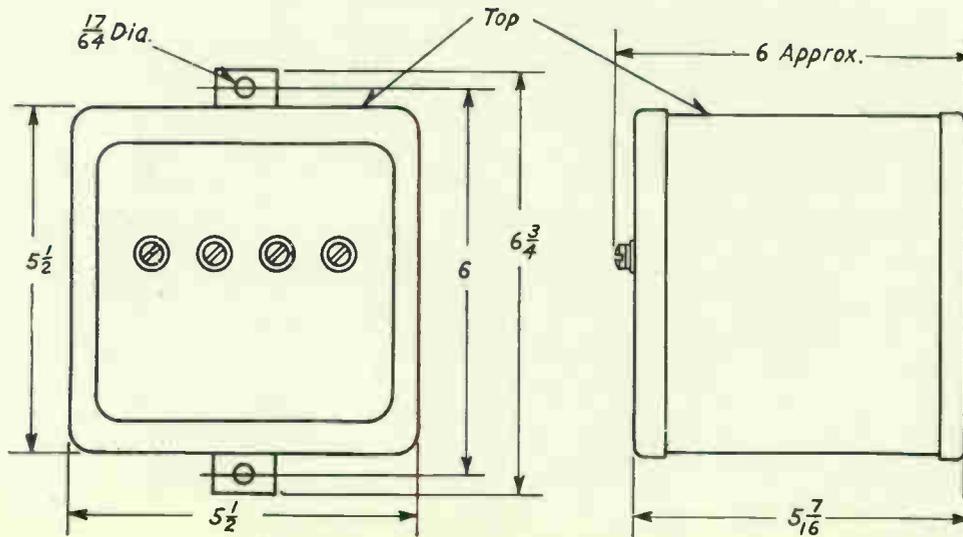
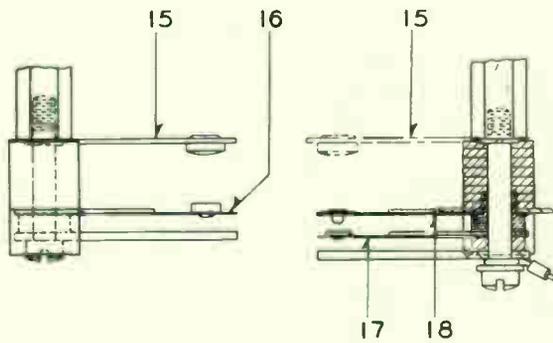
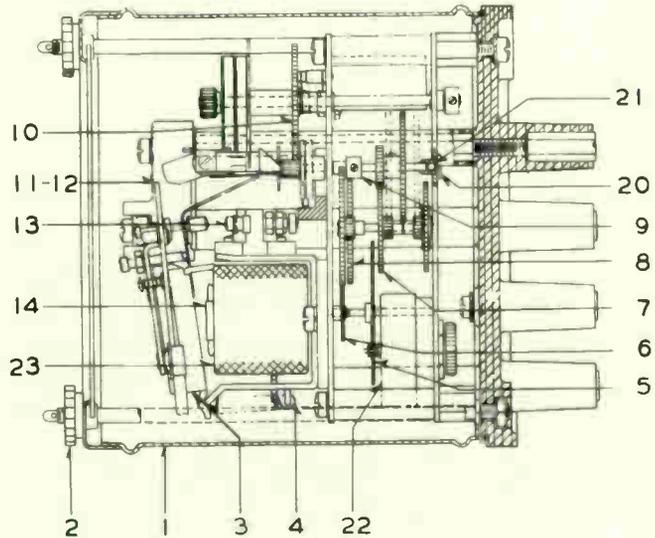
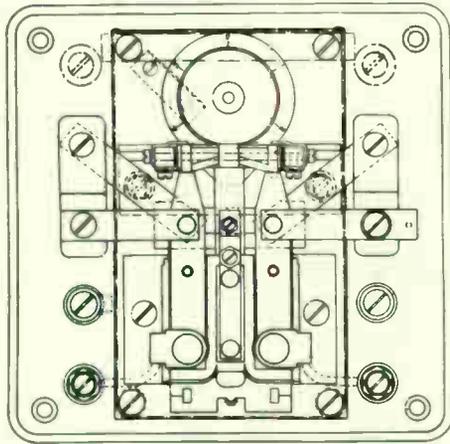


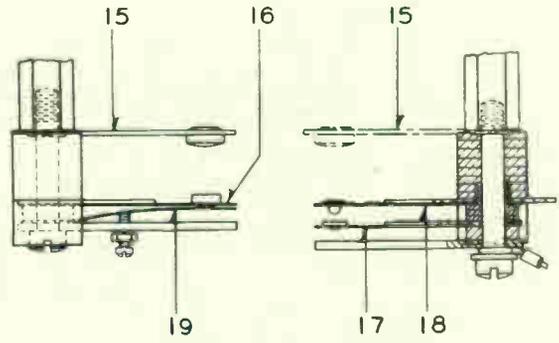
FIG. 8—OUTLINE DIMENSIONS FOR INVERTER STYLE No. 1008561



### TYPE TK UNIVERSAL TIMING RELAY



STATIONARY CONTACT ASSEMBLY OLD DESIGN



STATIONARY CONTACT ASSEMBLY IMPROVED DESIGN

**Westinghouse Electric & Manufacturing Company**  
Newark Works, Newark, N. J.

Printed in U.S.A.

EVERY HOUSE NEEDS WESTINGHOUSE

TYPE TK UNIVERSAL TIMING RELAY

5 1/2" Square Case

Relay Complete		Volts	Cycles	Ref. No. 5	Ref. No. 22	Ref. No. 23
Without Sealing Contact	With Sealing Contact			Shaft Assembly No.1	Synchronous Motor	Operating Coil
Style Number	Style Number			Style Number	Style Number	Style Number
936 926	1 008 552	115	60	1 009 266	1 009 265	937 021
1 008 550	1 008 553	230	60	1 009 266	1 009 265	1 008 563
1 008 551	1 008 554	460	60	1 009 266	1 009 265	1 008 564
1 008 924	1 008 927	115	50	1 059 221	1 059 219	1 002 324
1 008 925	1 008 928	230	50	1 059 221	1 059 219	1 002 325
1 008 926	1 008 929	460	50	1 059 221	1 059 219	1 002 326
1 008 930	1 008 933	115	25	1 059 222	1 059 220	1 002 462
1 008 931	1 008 934	230	25	1 059 222	1 059 220	1 002 463
1 008 932	1 008 935	460	25	1 059 222	1 059 220	1 002 464

Ref No.	DESCRIPTION OF PART	Style Number	No. Req
1	Case . . . . .	1 009 305	1
2	Cover Nut . . . . .	1 001 015	4
3	Armature Block Complete for relays with sealing contact . . . . .	1 099 578	1
3	Armature Block Complete for relays without sealing contact . . . . .	1 009 564	1
4	Armature Spring . . . . .	837 967	1
5	Shaft Assembly #1, meshes with motor . . . . .	Per Table	1
6	Shaft Assembly #2 . . . . .	1 009 267	1
7	Shaft Assembly #3 . . . . .	1 009 268	1
8	Shaft Assembly #4 . . . . .	1 009 269	1
9	Shaft Assembly #5 with clutch . . . . .	1 009 270	1
10	Shaft Assembly #6 with tripping discs, 50 and 60 cycles . . . . .	1 009 456	1
10	Shaft Assembly #6 with tripping discs, 25 cycle . . . . .	1 059 181	1
11	Lead and Contact Arm Complete, left hand . . . . .	1 099 580	1
12	Lead and Contact Arm Complete, right hand . . . . .	1 099 581	1
13	Sealing Contact, when used . . . . .	1 055 830	1
14	Core Complete . . . . .	1 096 714	1
15	Stationary Contact and Support, make contact . . . . .	1 096 860	2
16	Stationary Contact and Spring, break contact . . . . .	1 009 291	1
17	Stationary Contact and Spring, front break contact, motor circuit . . . . .	1 009 290	1
18	Stationary Contact and Spring, rear break contact, motor circuit . . . . .	1 009 289	1
19	Not Used . . . . .	. . . . .	. . . . .
20	Bearing Screw, for shaft #5 . . . . .	1 009 272	1
21	Steel Ball, 3/32" Dia. . . . .	. . . . .	1
22	Motor . . . . .	Per Table	1
23	Operating Coil . . . . .	Per Table	1
*	Mounting Details for relays with sealing contact . . . . .	839 131	1
*	Mounting Stud . . . . .	837 331	2
*	Terminal Stud . . . . .	839 582	8
*	Mounting Details for relays without sealing contact . . . . .	839 130	1
*	Mounting Stud . . . . .	837 331	2
*	Terminal Stud . . . . .	839 582	7

\* Not Illustrated  
 Order Parts by Style Number and Description  
 Parts indented are included in the Part under which they are indented

TYPE TK UNIVERSAL TIMING RELAY

5 1/2" Square Case—Improved Design

Relay Complete		Volts	Cycles	Ref. No. 5	Ref. No. 22	Ref. No. 23
Without Sealing Contact	With Sealing Contact			Shaft Assembly No. 1	Synchronous Motor	Operating Coil
Style Number	Style Number			Style Number	Style Number	Style Number
1 059 953	1 059 962	115	60	1 009 266	1 009 265	937 021
1 059 954	1 059 963	230	60	1 009 266	1 009 265	1 008 563
1 059 955	1 059 964	460	60	1 009 266	1 009 265	1 008 564
1 096 870	1 096 817	575	60	1 009 266	1 009 265	1 008 565
1 059 950	1 059 959	115	50	1 059 221	1 059 219	1 002 324
1 059 951	1 059 960	230	50	1 059 221	1 059 219	1 002 325
1 059 952	1 059 961	460	50	1 059 221	1 059 219	1 002 326
1 096 869	1 096 872	575	50	1 059 221	1 059 219	1 003 383
1 059 947	1 059 956	115	25	1 059 222	1 059 220	1 002 462
1 059 948	1 059 957	230	25	1 059 222	1 059 220	1 002 463
1 059 949	1 059 958	460	25	1 059 222	1 059 220	1 002 464
‡ 1 096 868	‡ 1 096 871	575	25	1 059 222	1 059 220	‡ 1 002 464

‡ For 575 Volt, 25 Cycles only, one external resistor S# 1009014 is required in series with 460 Volt, 25 Cycle Coil S# 1002464.

Ref No.	DESCRIPTION OF PART	Style Number	No. Req
1	Case . . . . .	1 009 305	1
2	Cover Nut . . . . .	1 001 015	4
3	Armature Block Complete for relays with sealing contact . . . . .	1 099 579	1
3	Armature Block Complete for relays without sealing contact . . . . .	1 096 713	1
4	Armature Spring . . . . .	1 000 998	1
5	Shaft Assembly #1, meshes with motor . . . . .	Per Table	1
6	Shaft Assembly #2 . . . . .	1 009 267	1
7	Shaft Assembly #3 . . . . .	1 009 268	1
8	Shaft Assembly #4 . . . . .	1 009 269	1
9	Shaft Assembly #5 with clutch . . . . .	1 096 695	1
10	Shaft Assembly #6 with tripping discs, 50 and 60 cycles . . . . .	1 009 456	1
10	Shaft Assembly #6 with tripping discs, 25 cycles . . . . .	1 059 181	1
11	Lead and Contact Arm Complete, left hand . . . . .	1 099 580	1
12	Lead and Contact Arm Complete, right hand . . . . .	1 099 581	1
13	Sealing Contact, when used . . . . .	1 099 582	1
14	Core Complete . . . . .	1 096 714	1
15	Stationary Contact and Support, make contact . . . . .	1 096 860	2
16	Stationary Contact and Spring, break contact . . . . .	1 096 710	1
17	Stationary Contact and Spring, front break contact, motor circuit . . . . .	1 096 709	1
18	Stationary Contact and Spring, rear break contact, motor circuit . . . . .	1 096 708	1
19	Spring . . . . .	1 094 807	1
20	Bearing Screw for Shaft #5 . . . . .	1 009 272	1
21	Steel Ball 3/32" Dia. . . . .	.....	1
22	Motor . . . . .	Per Table	1
23	Operating Coil . . . . .	Per Table	1
*	Mounting Details for relays with sealing contacts . . . . .	839 131	1
*	Mounting Stud . . . . .	837 331	2
*	Terminal Stud . . . . .	839 582	8
*	Mounting Details for relays without sealing contacts . . . . .	839 130	1
*	Mounting Stud . . . . .	837 331	2
*	Terminal Stud . . . . .	839 582	7

\* Not Illustrated  
 Order Parts by Style Number and Description  
 Parts indented are included in the Part under which they are indented

## TYPE TK UNIVERSAL TIMING RELAY

### Standard Rectangular Case—Improved Design

Relay Complete				Volts	Cycles	Ref. No. 5	Ref. No. 22	Ref. No. 23
Without Sealing Contacts		With Sealing Contacts				Shaft Assembly No.1	Synchronous Motor	Operating Coil
Projection Mounting	Flush Mounting	Projection Mounting	Flush Mounting			Style Number	Style Number	Style Number
1 056 824-A	1 056 924-A	1 056 833-A	1 056 933-A	115	60	1 009 266	1 009 265	937 021
1 056 825-A	1 056 925-A	1 056 834-A	1 056 934-A	230	60	1 009 266	1 009 265	1 008 563
1 056 826-A	1 056 926-A	1 056 835-A	1 056 935-A	460	60	1 009 266	1 009 265	1 008 564
1 096 875-A	1 096 881-A	1 096 878-A	1 096 884-A	575	60	1 009 266	1 009 265	1 008 565
1 056 821-A	1 056 921-A	1 056 830-A	1 056 930-A	115	50	1 059 221	1 059 219	1 002 324
1 056 822-A	1 056 922-A	1 056 831-A	1 056 931-A	230	50	1 059 221	1 059 219	1 002 325
1 056 823-A	1 056 923-A	1 056 832-A	1 056 932-A	460	50	1 059 221	1 059 219	1 002 326
1 096 874-A	1 096 880-A	1 096 877-A	1 096 883-A	575	50	1 059 221	1 059 219	1 003 383
1 056 818-A	1 056 918-A	1 056 827-A	1 056 927-A	115	25	1 059 222	1 059 220	1 002 462
1 056 819-A	1 056 919-A	1 056 828-A	1 056 928-A	230	25	1 059 222	1 059 220	1 002 463
1 056 820-A	1 056 920-A	1 056 829-A	1 056 929-A	460	25	1 059 222	1 059 220	1 002 464
φ 1 096 873-A	φ 1 096 879-A	φ 1 096 876-A	φ 1 096 882-A	575	25	1 059 222	1 059 220	φ 1 002 464

φ For 575 Volt, 25 Cycles only, one external resistor S# 1009014  
is required in series with 460 Volt, 25 Cycle Coil S# 1002464.

Ref No.	DESCRIPTION OF PART	Style Number	No. Req
*	Glass Cover, projection type	1 001 582	1
*	Glass Cover, flush type	1 001 581	1
*	Case, flush type	939 034	1
2	Cover Nut	704 110	2
3	Armature Block Complete for relays with sealing contact	1 099 579	1
3	Armature Block Complete for relays without sealing contact	1 096 713	1
4	Armature Spring	1 000 998	1
5	Shaft Assembly #1, meshes with motor	Per Table	1
6	Shaft Assembly #2	1 009 267	1
7	Shaft Assembly #3	1 009 268	1
8	Shaft Assembly #4	1 009 269	1
9	Shaft Assembly #5 with clutch	1 096 695	1
10	Shaft Assembly #6 with tripping discs, 50 and 60 cycles	1 009 456	1
10	Shaft Assembly #6 with tripping discs, 25 cycles	1 059 181	1
11	Lead and Contact Arm Complete, left hand	1 099 580	1
12	Lead and Contact Arm Complete, right hand	1 099 581	1
13	Sealing Contact, when used	1 099 582	1
14	Core Complete	1 096 714	1
15	Stationary Contact and Support, make contact	1 096 860	2
16	Stationary Contact and Spring, break contact	1 096 710	1
17	Stationary Contact and Spring, front break contact, motor circuit	1 096 709	1
18	Stationary Contact and Spring, rear break contact, motor circuit	1 096 708	1
19	Spring	1 094 807	1
20	Bearing Screw for shaft #5	1 009 272	1
21	Steel Ball, 3/32" Dia.	...	1
22	Motor	Per Table	1
23	Operating Coil	Per Table	1
*	Mounting Details for relays with sealing contacts	839 131	1
*	Mounting Stud.	837 331	2
*	Terminal Stud.	839 582	8
*	Mounting Details for relays without sealing contacts	839 130	1
*	Mounting Stud.	837 331	2
*	Terminal Stud.	839 582	7

\* Not Illustrated  
Order Parts by Style Number and Description  
Parts indented are included in the Part under which they are indented

# Westinghouse

## TYPE TK TIMING RELAY

### INSTRUCTIONS

#### APPLICATION

The type TK relay is an a-c. relay suitable for applications which require a definite time-delay between closing an a-c. circuit and closing or opening other a-c. or d-c. circuits, through contacts on the relay. Accurate time-settings from a few seconds to fifty minutes can be obtained in the same relay, with a maximum reset time of less than one second for any setting. Two sets of main contacts--one single-pole double-throw and one single-pole single-throw--are provided, and these contacts can be adjusted to operate either simultaneously or sequentially. A seal-in auxiliary contact can also be provided for applications where it is desired to start a timing operation by the momentary closure of an external switch.

#### INSTALLATION

Inspect relay for any damage that might have occurred in shipment. When removing the blocking from the contactor armature, make sure that the armature has not shifted off its bearings. Rotate the tripping disc mechanism counter-clockwise and allow to reset to make sure that it returns to zero positively. Remove the cover strip at the top of the gear case. This can be readily done by pulling aside one end of the strip which covers the sides and bottom. This strip is held against the top corner posts by a spring. When the bent-over end is clear of the top strip, the strip can be lifted off, exposing the sliding gear assembly and the gear position index plate. With the large gear on clutch shaft set opposite the 30-second mark on index plate, rotate this gear slowly in order to check for apparent friction in gear train.

The tripping disc mechanism is at the top of the relay and the synchronous motor at the bottom. The relay should be mounted in an approximately level position, as viewed from both front and side. Any appreciable variation from a level position will affect the operating characteristics of the relay.

Mounting studs and terminal details are contained in a small cloth bag packed with the relay.

#### CONSTRUCTION AND OPERATION

The type TK relay consists of a synchronous motor, a gear train to provide three different ratios, a clutch interposed in the gear train to permit quick resetting when the relay is de-energized, a contactor which carries the main contacts and operates the clutch, and a tripping mechanism adjustable for time-delay.

The motor for driving the gear train is located on the back plate of the gear train assembly in the lower right-hand corner. It runs at a synchronous speed of 600, 500 or 250 R.P.M. for 60, 50 or 25 cycle relays respectively, its bearing is self-sealed and self-lubricated and does not require special attention. On

relays rated at 230 volts or higher, the contactor coil has a tap brought out at the proper place to act as an auto-transformer to supply 115 volts for the motor.

The gear train is assembled as a separate unit and consists of two brass bearing plates fastened together at the corners by brass posts. The gear shafts run at low speeds and require no lubrication. The three different speeds are obtained by changing the location of a sliding gear assembly. This assembly consists of two gears on a hub that is free to slide on the clutch shaft and can be locked in any desired position with a set screw. The hub is moved to the position where the larger gear is opposite the arrow on the index plate corresponding to the desired time scale. The mesh of the gear teeth should be inspected and the hub shifted slightly if necessary to secure a full mesh, and then the set-screw should be tightened securely.

In 50 and 60 cycle TK relays the maximum time settings available for the three gear positions are: 30 seconds, 5 minutes and 50 minutes. The smallest sub-division is 1 second on the 30 second scale, 0.1 minute on the 5 minute scale and 1 minute on the 50 minute scale. In 25 cycle TK relays the three time scales are 1, 10 and 100 minutes and the smallest sub-divisions are twice the time value for the 50 and 60 cycle relays.

The motor may require one or two seconds to reach synchronous speed after the relay is energized and its average speed during this accelerating period will be something less than synchronous speed. The time scales on the dial make no provision for the effect the accelerating period has upon the total operating time, as this is not noticeable on the intermediate or slow speed settings. When the gears are in the high speed position, it will be more accurate to use a scale setting approximately one second less than the desired time setting.

The clutch is two aluminum discs with serrated faces, arranged so that they are positively engaged and disengaged by a spring on the contactor armature when the latter is in its closed and open positions respectively. The rear disc is fastened on its shaft and the front disc is a running fit on the end of the same shaft. The latter disc has fastened to it the pinion which drives the tripping mechanism. When the relay is energized, the clutch discs engage and power is transmitted from the motor, through the gear train, to the tripping mechanism. When the relay is de-energized, the clutch discs are separated by the opening of the contactor armature, and the reset spring for the tripping mechanism is required to rotate only the trip discs and the front clutch disc. Because of the low inertia and low friction of these parts, the trip discs will reset from the position of maximum travel in much less than one second. The position of the sliding gear assembly has no effect upon the resetting time.

## TYPE TK TIMING RELAY

The contactor is of the clapper type. At the top of the armature is fastened a spring arm which presses against the front half of the clutch when the relay is energized, causing the clutch to mesh. The position of the clutch-operating spring can be controlled by an adjusting screw on a bracket fastened to the front of the armature. The seal-in contact is operated by an insulating button on the end of an adjusting screw on the upper end of the same bracket. The motor and contactor coil are connected together so that as soon as the clutch is operated the motor also is energized. The armature carries the two moving contacts, which, as well as the stationary contacts, are silver. The "make" contacts will carry 12 amperes continuously and 20 amperes for 1 minute. The "break" contact has somewhat less pressure and will carry about two-thirds of this rating. The contacts will interrupt a non-inductive a-c. circuit carrying 20 amperes at 115 volts or 15 amperes at 230 volts.

The trip mechanism is fastened to the front plate of the gear train assembly. Although the armature and clutch-operating spring move in when energized, the two moving contact fingers on the armature are prevented from operating by the two Micarta latch arms. Consequently, the back contact on the left-hand side, and the motor circuit which is the back contact on the right-hand side, will remain closed until the Micarta arms are tripped up and the moving fingers released. This is accomplished by the heads of the trip screws on the two discs, which push down the latch arm levers. Repeated tests have shown that the relay will make more than one million operations before the striking and rubbing action of the contact fingers on the ends of the latch arms wears them sufficiently to require replacement.

Each disc has a small bronze index pin projecting approximately  $1/32$ " from its edge. The relay is adjusted so that these pins are opposite the zero on the scale plate when the trip screws in the discs have reached a point where they will just trip the Micarta latch arms and release the contact fingers. To set for a predetermined trip time, first shift gears to the scale wanted. Then loosen the thumb nut locking the trip discs and rotate them so each index is on the desired scale marking, and tighten the thumb nut. The disc nearest the scale plate will trip the left finger only; the disc that is nearest the front will trip both contact fingers. To set the contact fingers for sequential operation the left finger must trip first, as the motor is in series with the back contacts on the right-hand side. When this finger is tripped, it opens the motor circuit.

In making these settings the trip disc should not be rotated so that the trip pins are holding the Micarta arms part way up. Under this condition it is possible for the moving contacts to bounce under these arms and close the front contacts instantaneously when the relay is energized. The minimum settings obtainable without partially raising the latch arm are approximately  $1-1/2$  division on the 30 second scale, and corresponding points on the other scales.

In some applications it may be desired to have the left-hand contact operate instantaneously, as soon as the relay is energized, and have the time-delay on the right-hand contact only. This can be done by setting the disc nearest the scale plate so that the left-hand

latch arm is raised above the end of the contact finger when the trip discs are reset. If any time-delay is desired, however, the minimum setting obtainable without the possibility of erratic operation is the point at which the trip disc begins to raise the latch arm.

Some styles of the TK relay are provided with a seal-in contact, which closes the moment the relay is energized. When connected according to the wiring diagram, this contact energizes the relay, and keeps it energized, when an external contact or switch (such as a push button) is momentarily closed. The relay can be de-energized then only by interrupting the supply circuit by means of some other contact or switch.

### ADJUSTMENTS AND MAINTENANCE

The adjustments described in the following paragraphs ordinarily need be made only when reassembling the relay after it has been dismantled for repairs. However, it will be advisable to check the adjustment at the regular maintenance periods and correct them, if necessary.

The die-cast bracket which supports the latch arm assembly is secured to the front gear plate by means of screws passing through slotted holes. To adjust the position of this bracket, loosen both the mounting screws and the screw which holds the stop bracket for the right hand latch arm. Move the sliding gear assembly out of mesh, so that the trip discs will not rotate, and energize the relay. The latch arms should be down so that the contact fingers are held out. Shift the die-cast bracket so that with the latch arms touching the aluminum trip discs (not the trip screws), the projection of the end of the latch arm above the top of its adjacent contact finger will be  $.075$ " for the left-hand finger and  $.070$ " for the right-hand finger. The dimensions given apply to relays in which the trip discs are  $1-1/8$ " in diameter. Earlier relays used discs with a diameter of  $1-3/16$ ", and on these the dimension should be  $.110$ " for the left-hand finger and  $.120$ " for the right-hand finger. A small strip of metal with the ends filed to these dimensions will be convenient to use as a gauge. It can be rested on the ends of the contact fingers and the bracket shifted until the upper front corners of the fingers are even with the ends of the gauge. The mounting screws for the bracket should then be tightened securely. The screw for the right-hand latch arm stop bracket should also be tightened, and the end of the bracket should be bent up or down until the latch arms just clear the small bronze index pins projecting from the trip discs.

Raise the right-hand latch with the fingers and move the armature in by hand until the tips of the contact fingers are opposite the lowest portions of the latch arms. When the left-hand latch arm is just touching its contact finger, there should be a gap of about  $.010$ " to  $.015$ " between the right-hand arm and its contact finger. (This relation between the latches and the contact fingers prevents any possibility of the left-hand finger tripping first when the trip discs are set for simultaneous tripping.)

Loosen the thumb nut locking the two trip discs and energize the relay with the gears still out of mesh. Hold the final gear firmly against its back stop, and rotate each trip disc by hand until it depresses its latch arm far

TYPE TK TIMING RELAY

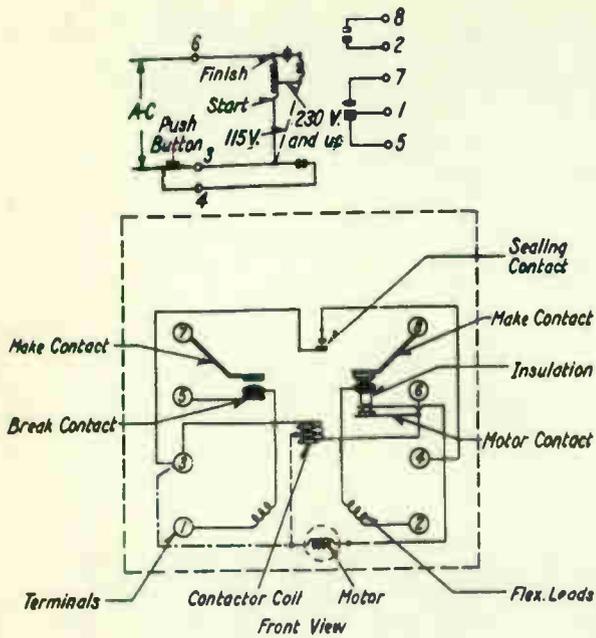


Figure 1  
Internal wiring diagram of the Type TK relay with Seal-in cont acts. (Outline & drilling see Fig. 5)

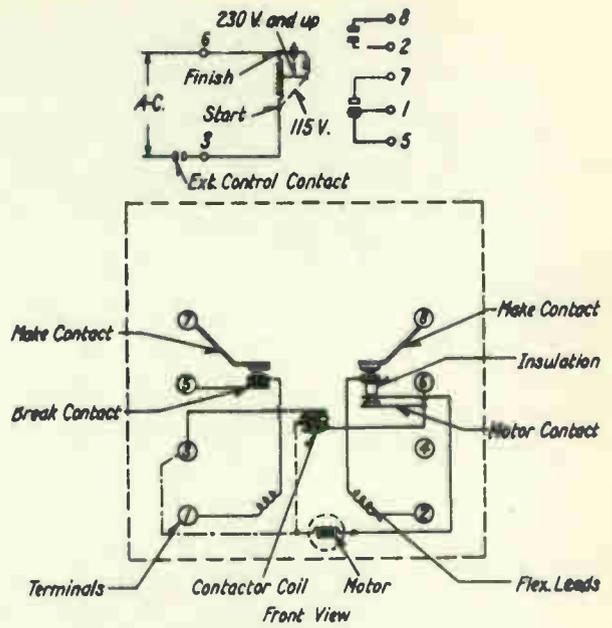
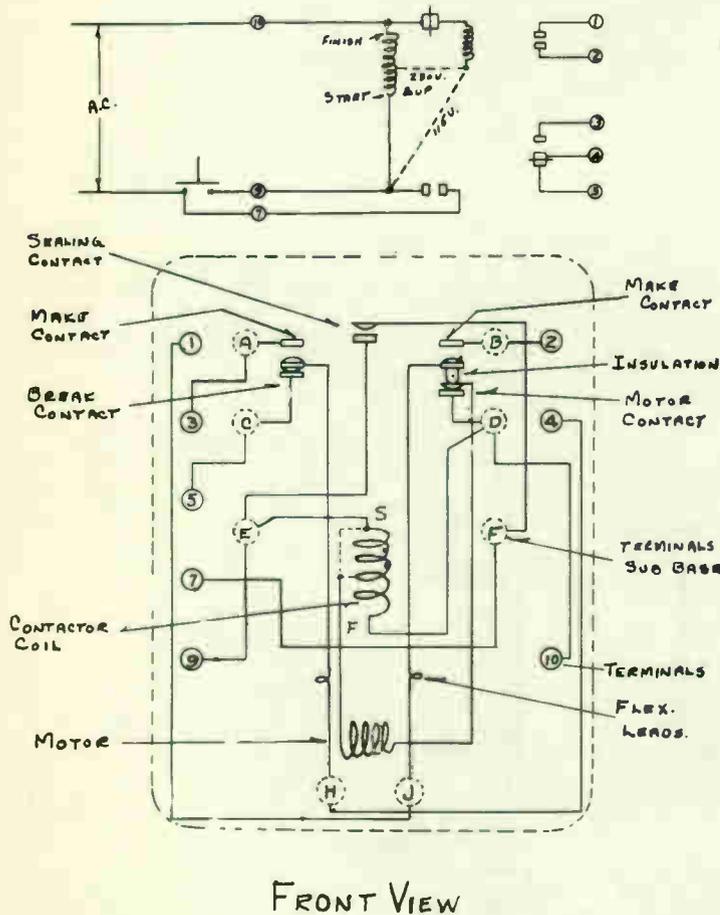
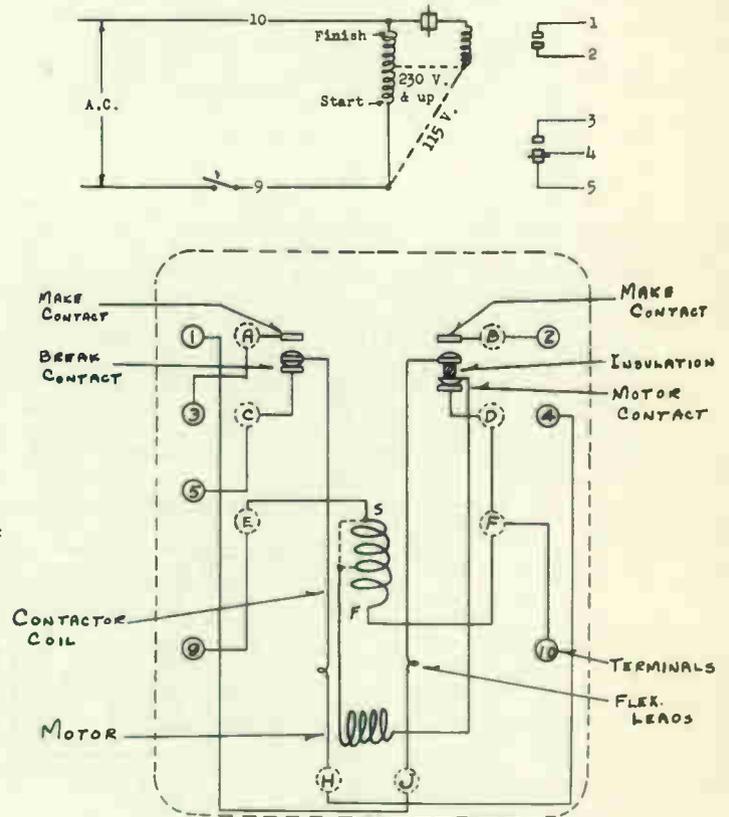


Figure 2  
Internal wiring diagram of the Type TK relay without seal-in cont acts. (Outline & drilling see Fig. 5)



FRONT VIEW

Figure 3  
Internal wiring diagrams of the Type TK relay with Seal-in cont acts. (Outline & drilling see Fig. 6 & 7)



FRONT VIEW

Figure 4  
Internal wiring diagram of the Type TK relay without Seal-in cont acts. (Outline & drilling see Fig. 6 & 7)

TYPE TK TIMING RELAY

enough to just trip the contact finger. The bronze pin projecting from each trip disc serves as its zero index, and should be opposite the zero on the dial when the contact finger trips. The trip screws are prevented from turning by a locking wire spring which passes through a slot in the inner end of the trip screw and is accessible from the rear of the trip disc. It should be moved out of the slot and the trip screw should be screwed in or out until the index pin is opposite the zero on the dial when the contact finger is released. Then the locking spring should be placed in the slot of its trip screw to prevent any accidental change in adjustment. The trip discs should release the contact fingers when the trip screws are one-scale division or more from the center or lowest position.

When the armature is held closed, the clutch teeth should have a full mesh and there should be approximately  $1/32''$  follow on the clutch spring. Any necessary adjustment should be made by means of the lower screw in the bracket at the front of the armature, and the lock nut should be securely tightened. One-quarter turn of the adjusting screw, after the clutch is closed and with the operating spring just touching the clutch pinion without deflection, will give about  $1/32''$  follow on the spring. When the armature is released, the clutch teeth should have sufficient separation to prevent any interference with resetting of the trip discs. Too much follow on the clutch spring will prevent the clutch from being held open positively when the relay is de-energized.

The stationary contacts should be adjusted by bending so that both moving contacts make simultaneously when they move in with the armature, with about  $1/16''$  follow. With the relay de-energized, adjust the position of the left hand back contact spring, by means of the adjusting screw, so that there will be a gap of  $1/64''$  or slightly more, between the ends of the latch arms and the contact fingers. Tighten the lock nut securely. The gaps between the contact fingers and the ends of the latch arms should be approximately equal. If the gaps are unequal, the contact fingers probably have been bent. When the relay is de-energized and the front clutch member is at the limit of its outward travel, there should be a slight clearance between the clutch spring and the washer at the front of the clutch pinion. There should also be clearance between the clutch spring and the dial plate.

The motor circuit contact should have  $1/16''$  to  $3/32''$  follow when the right-hand contact finger is against the latch arm. When the motor circuit is open, there should be no gap between the rear contact spring (in which the flat contact is assembled) and its stop plate.

On relays provided with a seal-in contact, adjust the upper screw in the bracket at the front of the armature so that there will be  $1/32''$  to  $3/64''$  follow on the seal-in contact after it has closed. Tighten the lock nut securely. When the relay is de-energized, the seal-in contact should have  $1/32''$  to  $3/64''$  gap.

The motor bearing is of the self-sealed, self-lubricated type and requires no special attention. Due to the close tolerances held in manufacture, no attempt should be made to repair the motor in case of damage. It should be returned to the factory for repair or a complete new motor ordered as a replacement.

If the relay operates very frequently, a small drop of special oil should be applied to the clutch pinion bearing at intervals of six months to one year. This oil is obtainable in small bottles under style #1101752. It will not congeal at low temperatures, and it contains an anti-oxident to retard the formation of gum at high temperatures. It can be applied by dipping a small wire into the oil and touching this to the clutch shaft between the two clutch discs. A very small amount of oil is sufficient. A drop of oil may be applied to the teeth of the clutch pinion at the same time.

The silver contacts are large enough to permit dressing with a fine file if they should become tarnished or pitted due to breaking heavy currents. Contact file S#1002110 is recommended for this purpose. Any other part that may be damaged can be replaced by advising the factory of the style number of the relay and giving a description of the part. However, if very extensive repairs are required, it is most satisfactory to return the complete relay to the factory unless the customer is well equipped for repair work of this nature and carries a stock of renewal parts on hand.

The burden of the TK relay at rated voltage, 60 cycles, is approximately 18 volt-amperes for the contactor and 2.6 volt-amperes for the motor.

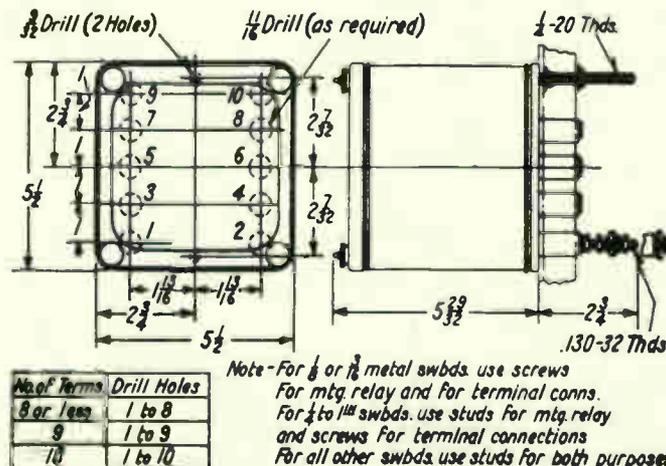
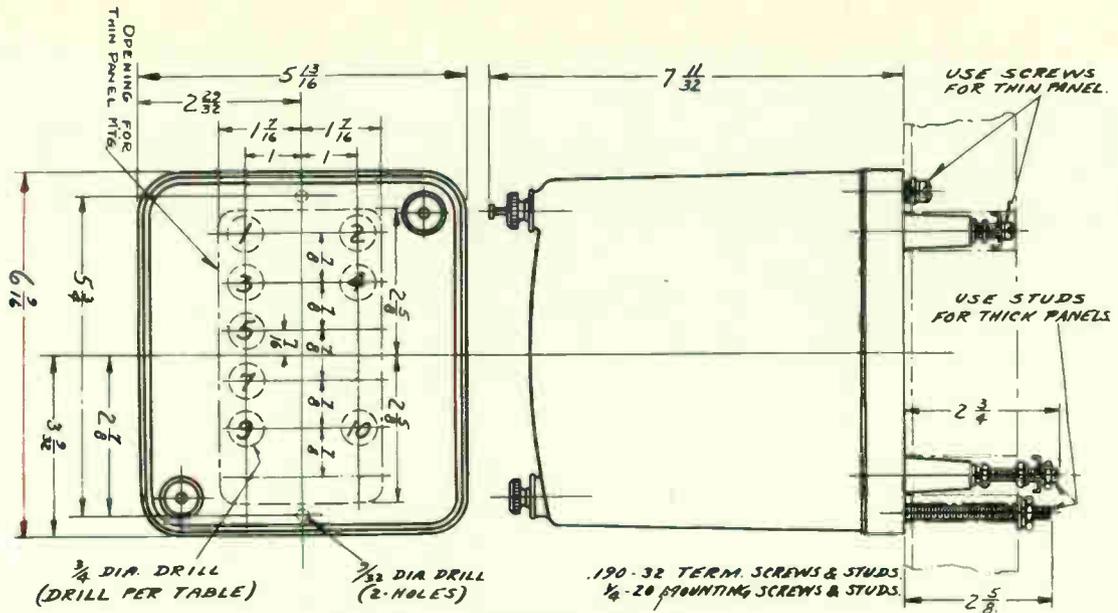


Figure 5  
Outline and drilling plan for the metal case with a glass front. (Figures 1 and 2)

TYPE TK TIMING RELAY



Omit Term. No. 7 for Fig. 4.

Figure 6  
Outline and drilling plan for the glass cover case -  
projection type mounting (Figures 3 and 4)

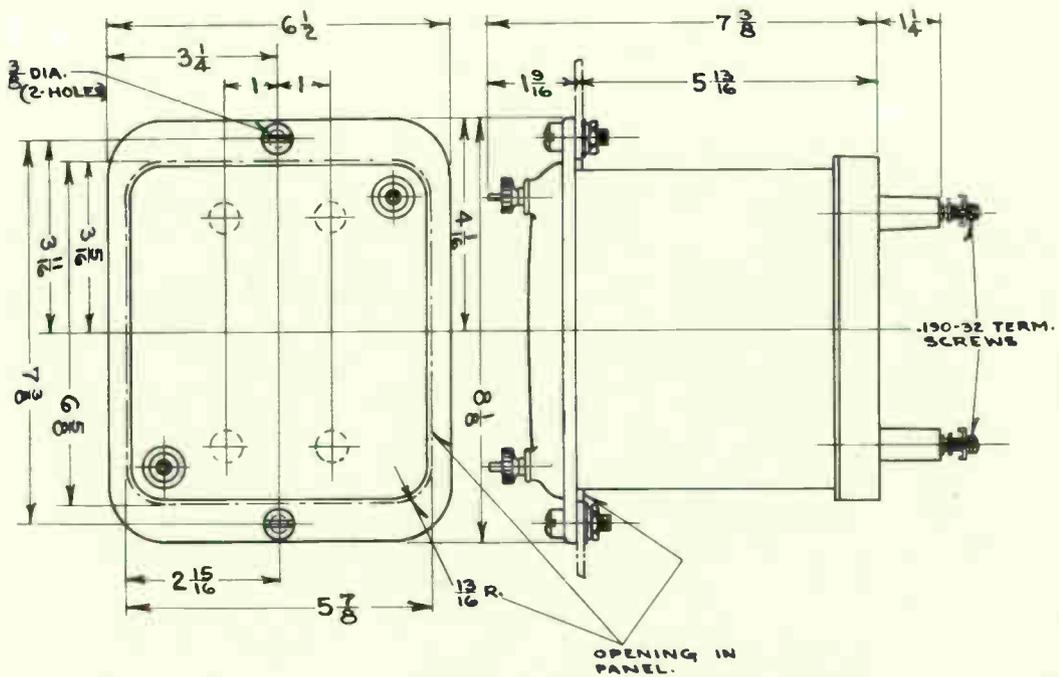
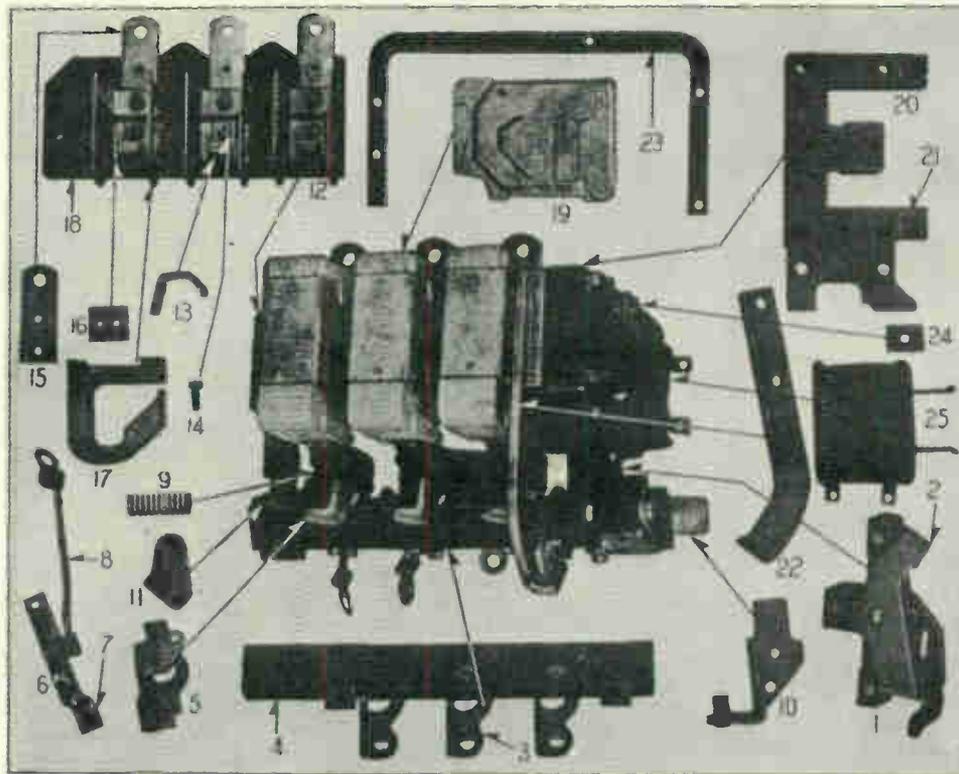


Figure 7  
Outline and drilling plan for the glass cover case -  
flush type mounting (Figures 3 and 4)



**TYPE Dn CONTACTORS**  
 Size 3, Frame No. 330 (3 Pole)—Size 4, Frame No. 430 (3 Pole)



Frame Size		330-P	430-P	No. Per Contactor	Contactors in Use	
Ampere Rating		100	150		1	5
Style Number of Contactor		1 039 891	1 039 892		Recommended for Stock	
Ref. No.	Description of Part	Style Number of Part				
1	Armature Iron with Mounting Bracket	884 580	884 581	1	0	0
2	Non-Magnetic Shim	884 574	884 574	1	0	1
3	Cross Bar with Moving Contact Bracket	1 039 878	1 039 878	1	0	0
4	Cross Bar	1 039 860	1 039 860	1	0	1
5	Moving Contact Bracket	884 594	884 594	3	0	0
6	Moving Contact with Shunt	884 567	884 568	3	0	1
7	Moving Contact	884 595	884 595	3	2	4
8	Shunt	884 613	884 614	3	2	4
9	Contact Spring	884 590	884 591	3	0	1
10	Bearing Bracket—Magnet End	884 575	884 575	1	0	0
11	Bearing Bracket—Left Hand End	884 576	884 576	1	0	0
12	Stationary Contact Base Complete	1 039 877	1 039 877	1	0	0
13	Stationary Contact	884 596	884 596	3	2	4
14	Stationary Contact Screw	186 529	186 529	3	2	4
15	Stationary Contact Connector	884 597	884 597	3	0	0
16	Stationary Contact Spacer	884 598	884 598	3	0	0
17	Blowout Coil	884 583	884 583	3	0	1
18	Base	1 039 859	1 039 859	1	0	0
19	Arc Quencher	884 589	884 589	3	1	2
†	Stationary Contact Stud	178 553	178 553	3	0	1
†	Shunt Stud	361 718	361 718	3	0	1
20	Stationary Core	884 560	884 562	1	0	0
21	Shading Coil	884 558	884 559	2	0	1
22	Stop	1 041 907	1 041 907	1	0	0
23	Frame	1 039 874	1 039 874	1	0	0
24	Coil Retaining Washer	882 191	882 191	2	0	0
25	Operating Coil	†	†	1	1	1

† Not illustrated.

‡ When ordering, specify identification number shown on Coil. See Table for Style Number of commonly used Coils. Parts indented are included in the part under which they are indented.

This list of Renewal Parts is given only as a guide. When continuous operation is a primary consideration, additional insurance against shutdowns is desirable. Under such conditions more renewal parts should be carried, the amount depending upon the severity of the service and the time required to secure renewals.

**ORDERING INSTRUCTIONS**

Name the part and give its style number. Give the complete nameplate reading. State whether shipment is desired by express, freight or parcel post. Send all orders or correspondence to nearest Sales Office of the Company. Small orders should be combined so as to amount to a value of at least \$1.00 net. Where the total of the sale is less than this, the material will be invoiced at \$1.00.

**Westinghouse Electric & Manufacturing Company**

## TYPE Dn CONTACTORS

Size 3, Frame No. 330 (3 Pole)—Size 4, Frame No. 430 (3 Pole)

## Instructions

**Description**—Type Dn Contactors are alternating current contactors which can be supplied either with or without De-ion arc quenchers. The contactors are designed for mounting on steel plate or insulating panels up to 2 inches thick.

When a contactor is mounted on a steel plate, insulation of the shunts is provided by an insulating plate interposed between the contactor and steel plate.

**Ratings**—The 8 hour open ratings are 100 amperes for the Size 3 Dn Contactor and 150 amperes for the Size 4 Dn Contactor. Insulation is for a maximum of 600 volts.

**Unit Assembly**—Type Dn Contactors are of unit assembly, with the cross-bar pivoted in bearings integral with the frame, which supports the magnet and stationary contacts. This insures accurate and permanent alignment of parts before leaving the factory.

Interchangeability of parts among Sizes 3 Dn and 4 Dn Contactors is an advantageous feature enabling the user to carry a smaller stock of renewal parts.

Mounting of the contactor to a vertical panel is accomplished by means of three bolts inserted from the front of the frame. These may be held by nuts at the back of the panel or may be threaded into tapped spacers previously secured to the panel. The latter arrangement permits of removing the contactor from the panel for servicing or other attention without necessitating the operator's going to the rear of the panel.

**Magnet**—The magnet consists of an E-shaped stator and a T-shaped armature. In addition to other advantages, the T-shaped armature is of sufficiently low inertia to accelerate rapidly on opening, affording a quick break of the contacts and consequently less arcing. Movement of the armature is almost vertical, rendering less likely the chance of accidental closing due to shock or impact.

**Operating Coil**—The coil is designed for continuous duty at 100% of its rating. It will operate the contactor satisfactorily at from 85% to 110% of its rated voltage.

TABLE OF OPERATING COILS

Volts	Cycles	DN 330-P		DN 430-P	
		Style No.	Style No.	Style No.	Style No.
110	60	897 905	1 014 611		
208	60	944 740	1 040 139		
220	60	874 111	1 040 140		
440	60	919 996	966 752		
550	60	943 156	966 746		
110	50	966 738	1 040 141		
220	50	966 739	1 040 142		
440	50	966 740	1 040 143		
550	50	966 741	1 040 144		
110	25	874 111	1 040 140		
220	25	919 996	966 752		
440	25	966 742	1 040 145		
550	25	895 655	1 040 159		

**Contacts**—The contact tips are of heavy copper, designed for easy removal and replacement. Movement of the tips on opening and closing produces a slight wiping action which insures a

clean contact surface but which is not sufficient to produce undue wear. A "hammer blow" dealt the contacts at the moment of opening increases the speed of separation, thereby decreasing the arcing.

Following the moment at which the contacts meet, the armature and cross-bar have an unusually long overtravel before the magnet seals. This insures that ample contact pressures exist, even when the contacts are worn so far as to require replacement.

The contact springs are unusually long, insuring almost constant pressure as the contacts wear.

The current-carrying contact shunts of flexible copper cable give complete freedom to the cross-bar and have ample capacity to carry the maximum current for which the contactors are rated. The shunts are suspended about the center of rotation of the crossbar, minimizing their flexure and increasing their life to such an extent that their renewal is practically never required.

**De-ion Arc Quenchers**—The De-ion arc quenchers are of exclusive design functioning to confine, divide and extinguish the arc almost instantaneously, greatly prolonging the contact life. Confinement of the arc is a feature which admits of close spacing of the contactor poles, while at the same time the superior performance of the De-ion principle enables the contactor to maintain a high interrupting capacity.

The arc quenchers are easily removed for inspection of the contacts.

**Connections**—The contactors may be connected from the front or from the back. See the Renewal Parts List for studs for back-connecting.

**Provision for Interlock**—Provision is made in two places, on the cross-bar of the contactor for mounting moving contact assemblies of Type L-41 Electrical Interlocks. The stationary members of the interlocks are to be secured to the panel on which the contactor is mounted. For more complete information concerning the Type L-41 Electrical Interlock refer to Instruction Leaflet 2406.

## Maintenance

The contactor should be inspected frequently to see that no impairment of electrical or mechanical functioning occurs in service. Accumulations of dust may be removed with a dry cloth or a compressed air jet. Except only when cleaning the magnet sealing surfaces avoid oily cloths, as an oil film quickly attracts dust.

**Bearings**—Bearing pins are of wear-resistant nitrided alloy steel. They should not be lubricated as oil collects dust, hindering free operation of the contactor.

**Magnet**—Before shipment, the magnet sealing surfaces are covered with grease to prevent rusting. This should be removed before the contactor is placed in service. The surfaces should be cleaned occasionally with a cloth moistened with a light oil to remove deposits of dirt and prevent rusting.

The magnet armature and the bracket supporting it may be easily removed as a unit by removing the two screws securing the bracket to the cross-bar.

**Contacts**—The contact tips should not be lubricated, as the slight wear of dry contacts produces a self-cleaning action. Should excessive roughening or burning occur the tips may be dressed with a fine file. Do not use emery cloth, as abrasive granules left imbedded in the contact surfaces may raise the contact resistance and produce a tendency of the contacts to weld.

Chiefly for reasons of mechanical strength it is advisable to replace the contact tips before they have become worn to one-third their original thickness.

Correct contact pressures should be maintained as follows:

Contactor Size No.	Initial Pressure	Final Pressure
3	2.8 pounds	6 pounds
4	4 pounds	9 pounds

The contact gap, measured at the heels of the contacts in their fully-open position, is  $\frac{5}{8}$  inch for both the Size 3 Dn and Size 4 Dn contactors.

**Operating Coil**—To remove the coil, first remove the armature by taking out the two bolts securing its supporting bracket to the cross-bar. Then loosen the bolt which holds the coil to the magnet and separate the rectangular washers until it is possible to lower the coil entirely free of the magnet.

**De-ion Arc Quenchers**—To remove a De-ion arc quencher, grasp it at its lower end and swing it upward (it will pivot about point P, see Fig. 2), striking its lower corner upward with the palm of the hand to overcome any initial resistance to movement. The arc quencher is then free to be lifted entirely clear of the contactor.

To restore the De-ion arc quencher to its location on the contactor, slide it into the position indicated in Fig. 2, and by striking the upper corner in a direction indicated by the arrow force the arc quencher into the final location shown by the dotted lines.

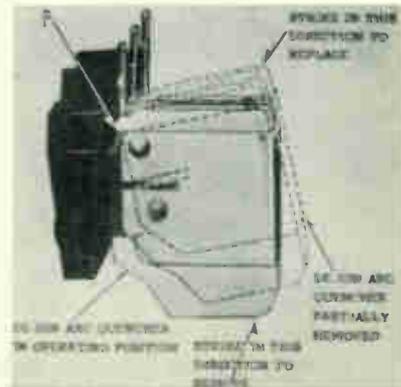
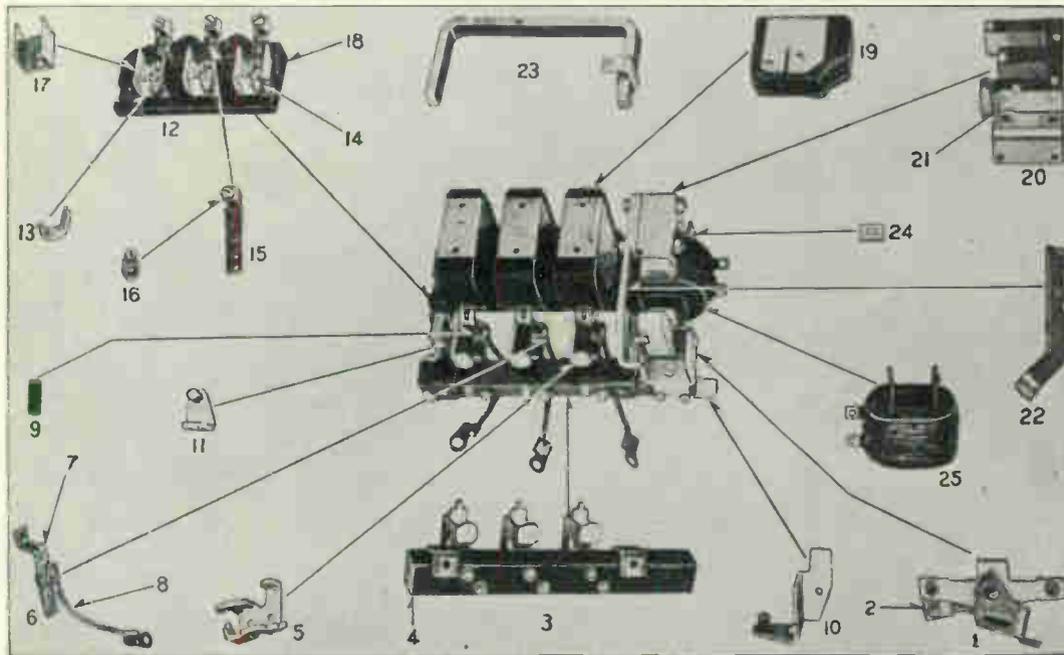


FIG. 2—DETAIL OF ARC QUENCHER AND ITS SUPPORTING BRACKET, SHOWING EASE OF REMOVAL AND REPLACEMENT.

TYPE Dn CONTACTOR—SIZE 2, Frame Numbers 220, 230, 230-P, 240



Frame Size		220	230	230-P	240	No. Per Contactor	Contactors in Use	
Style Number of Contactor		972 863 972 864	972 866 972 867	1 039 961	972 869 972 870			1
Ref. No.	Description of Part	Style Number of Part				No. Per Contactor	Recommended For Stock	
1	Armature Iron With Mounting Bracket	972 858	972 858	972 858	972 859		1	
2	Non-Magnetic Shim	972 734	972 734	972 734	972 734	1	0	1
3	Cross Bar With Moving Contact Bracket	972 779	972 855	1 039 953	972 856	1	0	0
4	Cross Bar	972 747	972 748	1 039 862	972 749	1	0	1
5	Moving Contact Bracket	972 738 (2)	972 738 (3)	972 738 (3)	972 738 (4)	( )	0	0
6	Moving Contact With Shunt	972 778 (2)	972 778 (3)	972 778 (3)	972 778 (4)	( )	0	1
7	Moving Contact	972 739 (2)	972 739 (3)	972 739 (3)	972 739 (4)	( )	0	4
8	Shunt	972 773 (2)	972 773 (3)	972 773 (3)	972 773 (4)	( )	2	4
9	Contact Spring	972 774 (2)	972 774 (3)	972 774 (3)	972 774 (4)	( )	2	1
10	Bearing Bracket—Magnet End	972 735	972 735	972 735	972 735	1	0	0
11	Bearing Bracket—Left Hand End	972 736	972 736	972 736	972 736	1	0	0
12°	Stationary Contact Base Complete	972 860	972 861	1 039 957	972 862	1	0	0
12x	Stationary Contact Base Complete	972 775	972 776	972 776	972 777	1	0	0
13	Stationary Contact	972 740 (2)	972 740 (3)	972 740 (3)	972 740 (4)	( )	0	4
14	Stationary Con. Screw. 190°-32 x 3/8" Fil. Hd. I. M. Sc.	Std. Hdw. (2)	Std. Hdw. (3)	Std. Hdw. (3)	Std. Hdw. (4)	( )	2	4
15	Stationary Contact Connector	972 743 (2)	972 743 (3)	1 039 956 (3)	972 743 (4)	( )	2	0
15	Connection Lug—Solderless	974 131 (2)	974 131 (3)	974 131 (3)	974 131 (4)	( )	Q	1
16	Stationary Contact Spacer	972 742 (2)	972 742 (3)	972 742 (3)	972 742 (4)	( )	0	0
17°	Arc Quencher Support	972 766 (2)	972 766 (3)	972 765 (3)	972 766 (4)	( )	0	0
18	Base	972 746	972 744	1 039 851	972 745	1	0	0
19	Arc Quencher	972 771 (2)	972 771 (3)	972 771 (3)	972 771 (4)	( )	0	2
†	Shunt Stud	559 187 (2)	559 187 (3)	559 187 (3)	559 187 (4)	( )	1	0
20	Stationary Core	972 658	972 658	972 658	972 660	1	0	0
21	Shading Coil	972 654	972 654	972 654	972 657	2	0	1
22	Stop	972 687	972 687	1 041 906	972 687	1	0	0
23	Frame	972 683	997 939	1 039 920	972 685	1	0	0
24	Coil Retaining Washer	972 754	972 754	972 754	972 754	2	0	0
25	Operating Coil	†	†	†	†	1	0	0

† Not illustrated. ° Used Only on Contactor With Arc Quencher. x Used Only on Contactor Without Arc Quencher.  
( ) Figures in Parentheses indicate the number per Contactor. † When ordering, specify identification number stamped on coil.  
See table for style number of commonly used coils. ‡ Parts indicated are included in the part under which they are indented.

This list of Renewal Parts is given only as a guide. When continuous operation is a primary consideration, additional insurance against shutdowns is desirable. Under such conditions more renewal parts should be carried, the amount depending upon the severity of the service and the time required to secure renewals.

ORDERING INSTRUCTIONS

Name the part and give its style number. Give the complete nameplate reading. State whether shipment is desired by express, freight or parcel post. Send all orders or correspondence to nearest Sales Office of the Company. Small orders should be combined so as to amount to a value of at least \$1.00 net. Where the total of the sale is less than this, the material will be invoiced at \$1.00.

Westinghouse Electric & Manufacturing Company

East Pittsburgh, Pa.

## TYPE Dn CONTACTORS

### Size 2—Frame Nos. 220 (2 poles), 230 and 230-P (3 poles), 240 (4 poles)

#### Instructions

**Description**—Type Dn Contactors are alternating current contactors which can be supplied either with or without De-ion arc quenchers. The contactors are designed for mounting on steel plate or insulating panels up to 2 inches thick.

When a contactor is mounted on a steel plate, insulation of the shunts is provided by an insulating plate interposed between the contactor and steel plate.

**Ratings**—The 8 hour open rating of the size 2 Dn contactors is 50 amperes. Insulation is for a maximum of 600 volts.

**Unit Assembly**—Type Dn Contactors are of unit assembly, with the cross-bar pivoted in bearings integral with the frame which supports the magnet and stationary contacts. This insures accurate and permanent alignment of parts before leaving the factory.

Mounting of the contactor to a vertical panel is accomplished by means of three bolts inserted from the front of the frame. These may be held by nuts at the back of the panel or may be threaded into tapped spacers previously secured to the panel. The latter arrangement permits of removing the contactor from the panel for servicing or other attention without necessitating the operator's going to the rear of the panel.

**Magnet**—The magnet consists of an E-shaped stator and a T-shaped armature. In addition to other advantages, the T-shaped armature is of sufficiently low inertia to accelerate rapidly on opening, affording a quick break of the contacts and consequently less arcing. Movement of the armature is almost vertical, rendering less likely the chance of accidental closing due to shock or impact.

**Operating Coil**—The coil is designed for continuous duty at 100% of its rating. It will operate the contactor satisfactorily at from 85% to 110% of its rated voltage.

"hammer blow" dealt the contacts at the moment of opening increases the speed of separation, thereby decreasing the arcing.

Following the movement at which the contacts meet, the armature and cross-bar have an unusually long overtravel before the magnet seals. This insures that ample contact pressures exist, even when the contacts are worn so far as to require replacement.

The contact springs are unusually long, insuring almost constant pressures as the contacts wear.

The current-carrying contact shunts of flexible copper cable give complete freedom to the cross-bar and have ample capacity to carry the maximum current for which the contactors are rated. The shunts are suspended about the center of rotation of the crossbar, minimizing their flexure and increasing their life to such an extent that their renewal is practically never required.

**De-ion Arc Quenchers**—The De-ion arc quenchers are of exclusive design functioning to confine, divide and extinguish the arc almost instantaneously, greatly prolonging the contact life. Confinement of the arc is a feature which admits of close spacing of the contactor poles, while at the same time the superior performance of the De-ion principle enables the contactor to maintain a high interrupting capacity.

The arc quenchers are easily removed for inspection of the contacts.

**Connections**—The contactors may be connected from the front or from the back. See the Renewal Parts List for studs for back-connecting.

**Provision for Interlock**—Provision is made in two places, on the cross-bar of the contactor for mounting moving contact assemblies of Type L-41 Electrical Interlocks. The stationary members of the interlocks are to be secured to the panel on which the contactor is mounted. For more complete information concerning the Type L-41 Electrical Interlock refer to Instruction Leaflet 2406.

#### Maintenance

The contactor should be inspected frequently to see that no impairment of electrical or mechanical functioning occurs in service. Accumulations of dust may be removed with a dry cloth or a compressed air jet. Except only when cleaning the magnet sealing surfaces avoid oily cloths, as an oil film quickly attracts dust.

**Bearings**—Bearing pins are of wear-resistant nitrided alloy steel. They should not be lubricated as oil collects dust, hindering free operation of the contactor.

**Magnet**—Before shipment, the magnet sealing surfaces are covered with grease to prevent rusting. This should be removed before the contactor is placed in service. The surfaces should be cleaned occasionally with a cloth

moistened with a light oil to remove deposits of dirt and prevent rusting.

The magnet armature and the bracket supporting it may be easily removed as a unit by removing the two screws securing the bracket to the cross-bar.

**Contacts**—The contact tips should not be lubricated, as the slight wear of dry contacts produces a self-cleaning action. Should excessive roughening or burning occur the tips may be dressed with a fine file. Do not use emery cloth, as abrasive granules left imbedded in the contact surfaces may raise the contact resistance and produce a tendency of the contacts to weld.

Chiefly for reasons of mechanical strength it is advisable to replace the contact tips before they have become worn to one-third their original thickness.

Correct contact pressures should be maintained as follows:

Initial pressure—1 lb. 2 oz.  
Final pressure—2 lb. 14 oz.

The contact gap, measured at the heels of the contacts in their fully-open position, is  $\frac{1}{16}$  inch.

**Operating Coil**—To remove the coil, first remove the armature by taking out the two bolts securing its supporting bracket to the cross-bar. Then loosen the bolt which holds the coil to the magnet and separate the rectangular washers until it is possible to lower the coil entirely free of the magnet.

**De-ion Arc Quenchers**—To remove a De-ion arc quencher, grasp it at its lower end and swing it upward (it will pivot about point P, see Fig. 1), striking its lower corner upward with the palm of the hand to overcome any initial resistance to movement. The arc quencher is then free to be lifted entirely clear of the contactor.

To restore the De-ion arc quencher to its location on the contactor, slide it into the position indicated by the dashed lines in Fig. 1, and by striking the upper corner in a direction indicated by the arrow force the arc quencher into its final location

TABLE OF OPERATING COILS

Volts	Cycles	Dn-220 Dn-230 Dn-230-P		Dn-240
		Style No.	Style No.	Style No.
110	60	974 133	1 014 618	
220	60	974 135	1 014 620	
440	60	974 136	1 014 621	
550	60	974 138	1 014 623	
110	50	974 140	1 014 625	
220	50	974 141	1 014 626	
440	50	974 142	1 014 627	
550	50	974 143	1 014 628	
110	25	974 135	1 014 620	
220	25	974 136	1 014 621	
440	25	974 144	1 014 629	
550	25	974 145	1 014 630	

**Contacts**—The contact tips are of heavy copper, designed for easy removal and replacement. Movement of the tips on opening and closing produces a slight wiping action which insures a clean contact surface but which is not sufficient to produce undue wear. A

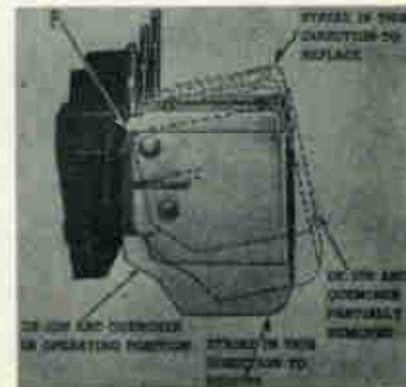


FIG. 1 — DETAIL OF ARC QUENCHER AND ITS SUPPORTING BRACKET, SHOWING EASE OF REMOVAL AND REPLACEMENT.

# TYPE L-41 ELECTRICAL INTERLOCK

## INSTRUCTIONS

### APPLICATION

The Type L-41 electrical interlock is an auxiliary contacting device to be mounted on Sizes 2, 3 and 4 Dn contactors.

### Rating

The interlock will carry 6 amperes continuously in control circuits up to 600 volts A-C.

### DESCRIPTION

#### Sizes

The Type L-41 electrical interlock is produced in two sizes: Size 2 for Size 2 Dn contactors, and Size 3 for Sizes 3 and 4 Dn contactors. The only difference between the two exists in the insulating base, which is slightly smaller in the Size 2 interlock.

#### "Make" and "Break"

The interlock is shipped for "make" or "break" service, as ordered. Any Type L-41 "make" interlock may readily be converted to a "break" interlock by substituting stationary break contacts 11 (Fig. 1) for the make contacts 10; and rotating the moving contact assembly 3 one-half turn about the mounting screw 21, loosening and re-tightening screw 21 to accomplish this. A "break" interlock may be converted to a "make" interlock in an inverse manner.

#### Contact Tips

Both the moving and stationary contacts of the Type L-41 interlock are equipped with silver buttons securely welded in place.

### INSTALLATION

#### Location

The Type L-41 electrical interlock may be mounted on a 2, 3 or 4 pole contactor in any or all of three locations, depending upon the limitations of space imposed by the presence of other equipment.

On a **LINESTARTER** one of these interlock locations is occupied by the overload relay, leaving but two locations available. These two locations are indicated by B and C in Fig. 1. Location C (mounting holes shown dotted in Fig. 1) is generally available in addition to B and C on panel mounting applications.

On a reversing **LINESTARTER**, the upper contactor affords only locations

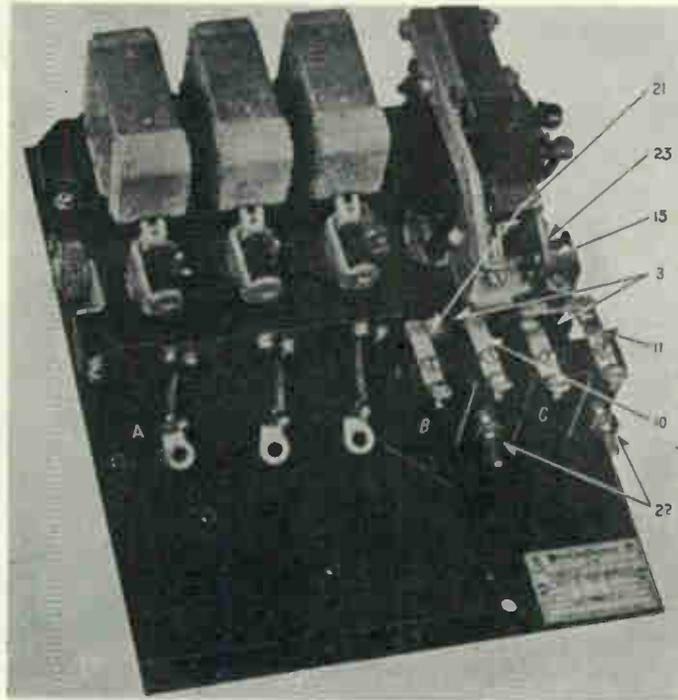


FIG. 1—SIZE 2 TYPE L-41 INTERLOCKS APPLIED TO A SIZE 2, 3 POLE **LINESTARTER** (OVERLOAD RELAY REMOVED, LEAVING CONTACTOR SHUNTS UNATTACHED)

A and B, location C being obstructed by the mechanical interlock. The lower contactor, being accompanied by the overload relay, has available for the interlock only positions B and C.

Since interlocks are more accessible in locations A and B, these locations are to be preferred to location C.

#### Mounting

In locations A and B, the moving contact assembly 3 of the interlock is held to a projecting surface of the insulation cross-bar of the contactor by the mounting screw 21 (a  $\frac{1}{4}$ -20 fillister head iron machine screw  $\frac{5}{8}$  of an inch long). In position C, an adaptor 15 is required, by means of which the moving contact assembly 3 is secured to the armature bracket 23 of the contactor. The adaptor used with the Size 2 interlock differs from that used with the Size 3 interlock. When ordering, see Renewal Parts List.

The interlock base is secured directly to the contactor panel or mounting plate, employing studs for insulation panel mounting or machine screws inserted from the rear for **LINESTARTER** on steel plate mounting. The threaded holes provided in the interlock base to receive the mounting screws or studs are completely insulated from current-

carrying parts. Mounting hardware is included in the interlock styles in the Renewal Parts List.

#### Contact Pressure

The contacts should have long life without much attention. They should be replaced, however, before the contact buttons have become reduced to one-third their original thickness.

The normal overtravel of the contact support after the contacts touch is approximately  $\frac{1}{32}$  of an inch.

#### Extra Terminals

For the convenience of the user, the interlock base is provided with holes to receive extra terminals (22, Fig. 1), insulated from current-carrying parts and from ground. These will be found especially useful when it is desired to operate the contactor coil from a separate master control circuit, or when unusual switch connections are to be made.

The Size 2 interlock contains one hole, and the Size 3 interlock contains two holes. The terminals are included in the styles for **LINESTARTER** or steel plate mounting. See Renewal Parts List.

## TYPE L-41 ELECTRIC INTERLOCK RENEWAL PARTS DATA

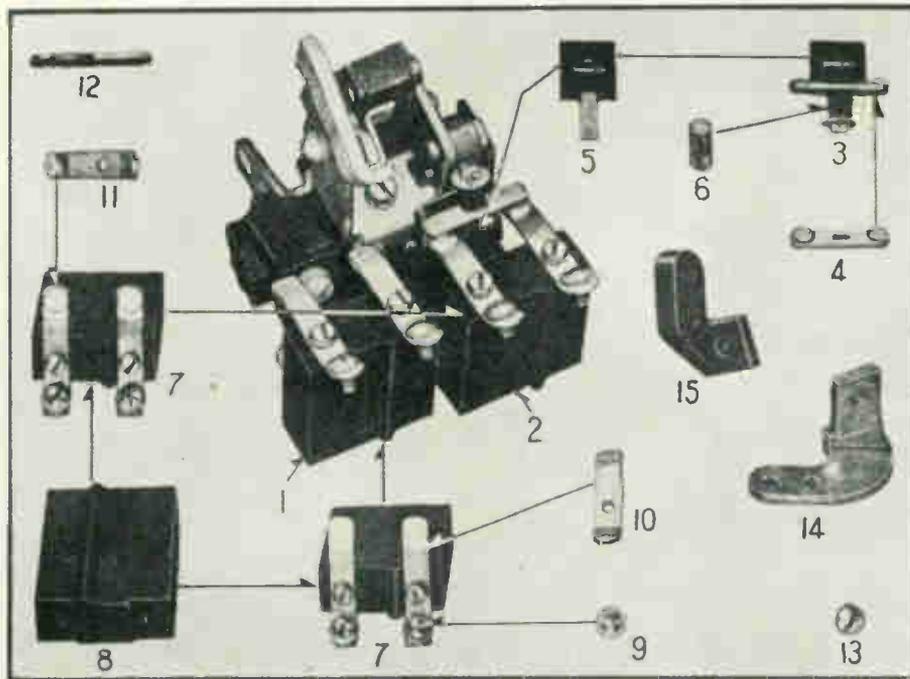


FIG. 2—RENEWAL PARTS FOR TYPE L-41 ELECTRICAL INTERLOCK

### RECOMMENDED STOCK OF RENEWAL PARTS

Type of Mounting	LINESTARTER or Steel Plate		Insulation Panel		No. Per Interlock	Interlocks in Use					
	Make	Break	Make	Break							
	Ref. No. 1	Ref. No. 2	Ref. No. 1	Ref. No. 2							
Contact Arrangement						1	5				
Size No. 3 Interlock Style No.	897 835 △897 839 △972 915	897 836 △897 840 △972 916	897 837 △897 841 972 913	897 838 △897 842 972 914							
Style No. 2 Interlock Style No.	974 326 △974 330 △974 337	974 327 △974 331 △974 338	974 328 △974 332 974 335	974 329 △974 323 974 336							
Ref. No.	Description of Part				Style Number of Part						
3	Moving Contact Complete				897 832	897 832	897 832	897 832	1	0	0
4	Moving Contact				884 643	884 643	884 643	884 643	1	1	2
5	Moving Contact Support				884 648	884 648	884 648	884 648	1	0	0
6	Moving Contact Spring				972 843	972 843	972 843	972 843	1	0	1
7	°Stationary Contact Complete				897 833	897 834	897 833	897 834	1	0	0
8	°Stationary Contact Base				884 647	884 647	884 647	884 647	1	0	0
9	°Washer Head Screw				540 190	540 190	540 190	540 190	2	0	0
10	°Stationary Contact				884 644	884 644	884 644	884 644	2	2	4
11	°Stationary Contact				884 645	884 645	884 645	884 645	2	2	4
7	xStationary Contact Complete				974 324	974 325	974 324	974 325	1	0	0
8	xStationary Contact Base				974 009	974 009	974 009	974 009	1	0	0
9	xWasher Head Screw				540 190	540 190	540 190	540 190	2	0	0
10	xStationary Contact				884 644	884 644	884 644	884 644	2	2	4
11	xStationary Contact				884 645	884 645	884 645	884 645	2	2	4
12	Stud				361 705	361 705	361 705	361 705	2	0	2
13	Mounting Screw				970 317	970 317	970 317	970 317	2	0	2
14	°Adaptor				884 640	884 640	884 640	884 640	1	0	0
15	xAdaptor				974 129	974 129	974 129	974 129	1	0	0
†	°Terminal				974 334	974 334	974 334	974 334	2	0	0
†	xTerminal				974 334	974 334	974 334	974 334	1	0	0

† Not Illustrated.  
 ° Used only on Interlock Size No. 3.  
 x Used only on Interlock Size No. 2.  
 △ Adaptor included in these Interlock Styles.  
 Parts indented are included in the part under which they are indented.

This is a list of the Renewal Parts and the quantities of each that we recommend should be stocked by the user of this apparatus to minimize interrupted operation caused by breakdowns. The parts recommended are those most subject to wear in normal operation or those subject to damage or breakage due to possible abnormal conditions.

This list of Renewal Parts is given only as a guide. The parts illustrated may not be identical in construction with the parts needed, but the views in Fig. 2 will assist ordering.

#### ORDERING INSTRUCTIONS

Name the part and give the complete name plate reading. State whether shipment is desired by express, freight or by parcel post. Send all orders or correspondence to nearest Sales Office of the Company. Small orders should be combined so as to amount to a value of at least \$1.00 net; where the total of the sale is less than this, the material will be invoiced at \$1.00.

**Westinghouse Electric & Manufacturing Company**

# ROTARY SWITCHES—TYPE W

## Instrument, Control and Auxiliary Types

### GENERAL

#### Application

The Westinghouse type W switches are of the rotary type. They are made in three classifications: namely, instrument, control and auxiliary switches for various applications. These switches are notable for their ruggedness, accessibility and smooth, reliable operation. They are recommended for use with all types of circuit breakers and other classes of apparatus which are electrically controlled. They are insulated for 600 volts and have a continuous current carrying capacity of 10 amperes which is very conservative as indicated by the curve below.

#### Recommended Interrupting Ratings

**Alternating Current**  
125 Volts—10.0 Amperes  
250 Volts—7.5 Amperes  
600 Volts—1.5 Amperes

**Direct Current**  
125 Volts—4.0 Amperes  
250 Volts—2.0 Amperes  
600 Volts—0.5 Amperes

The interrupting capacity depends upon the voltage, current and inductance of the circuit controlled. Control relays are to be used in conjunction with control switches on heavy current circuits.

#### Construction

From the front of the panel, the switch presents a pleasing appearance with its sturdy, convenient black-molded handle and light finished dial plate.

From the rear, the black polished sides and cadmium plated steel end plates make a neat looking switch.

An operating shaft, made from a

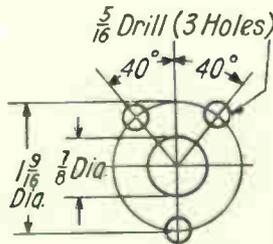


FIG. 3—DRILLING PLAN FOR TYPE W INSTRUMENT AND CONTROL SWITCHES

\*This dimension is 3 3/8-inches for switches Style No. 519110 and 519116.

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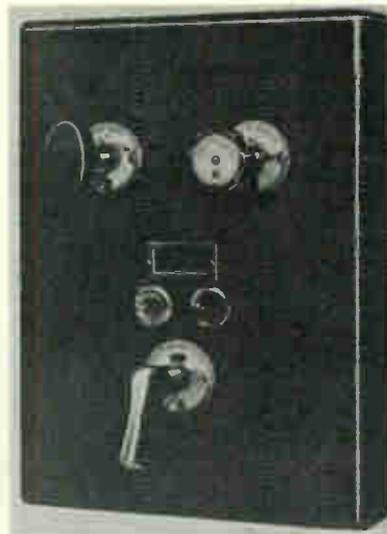


FIG. 1—ILLUSTRATION OF THE OVAL, NOTCHED AND PISTOL-GRIP HANDLES FOR THE TYPE W ROTARY SWITCHES

1/8-inch diameter cold rolled steel rod, rotates in bronze bearings which are riveted in steel end plates. The steel end plates provide ample support for

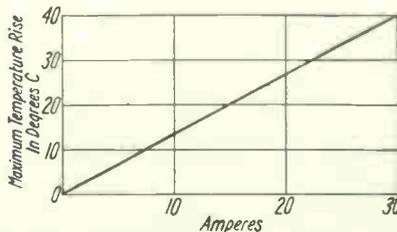


FIG. 2—CURVE SHOWING CAPACITIES OF TYPE W SWITCHES

the base and the enameled steel top which is channel-shaped to secure strength. This arrangement assures permanent alignment of the contacts.

The moving contacts are brass segments with a corrosion resisting finish. The segments are separated by spacers of molded moisture-proof composition.

All of the contacts are keyed to an insulated micarta tube which covers the steel operating shaft. These have numbered key notches to facilitate assembling. Spacers and contacts are securely clamped to the shaft.

The stationary contacts are of the self-aligning type and are made of a

suitable material selected for the highest wearing and arc resisting characteristics. Good contact pressure between the moving and stationary contacts is obtained by the use of compression springs which do not carry current. This combination of contact materials operates with a high pressure, wiping action, assuring clean low resistance contacts, with long life.

Multiple laminated copper shunts conduct the current from the contacts to the terminal studs. These studs are mounted on the base in such a manner that they positively will not turn or become loose.

The base is made of an excellent grade of black molded material which has both very high mechanical and dielectric strength, and is ribbed to give ample creepage distance between studs. Each stud hole is numbered for the purpose of identifying the connections on the wiring diagram.

Sheet Micarta side plates slide in grooves in the top and bottom of the switch, snapping snugly into the closed position. This arrangement provides immediate access for the inspection of contacts.

All switches are easily mounted on panels 1/8, 1/4, 1, 1 1/2 or 2 inches in thickness without changing any of the parts except the mounting screws—the length of which depends upon the thickness of the panel. Correct shaft length is obtained by simply sliding the handle

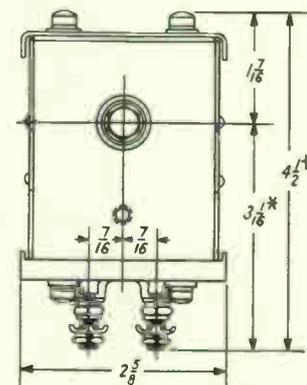


FIG. 4—REAR VIEW AND DIMENSIONS OF TYPE W INSTRUMENT AND CONTROL SWITCHES

†This dimension is 4 3/8-inches for switches Style No. 519110 and 519116.

## ROTARY SWITCHES—TYPE W—Continued

## GENERAL—Continued

over the shaft until the pointer screw fits into the proper tap-hole in the shaft.

Segments, contacts, studs, shunts, etc., are the same for the entire line of switches. This permits great flexibility of design so that type W switches can be easily supplied for special requirements other than those for which style numbers have been listed. The maximum number of circuits in the unit switch is 10 but multiple switches

operated from one handle can be obtained with up to 40 circuits.

## Style Numbers

Switch style numbers include mounting screws for a 2-inch panel. When required for other than 2-inch panels, add the style number of extra mounting screws.

The round notched handle is standard for instrument switches, and the pistol-grip handle is standard for control

switches. Either of the switches may be obtained with the round notched, or pistol grip handle or with an oval handle.

Special combinations of keys or handles can be obtained on request.

The style number for instrument switches with removable keys does not include keys. Such keys are listed under separate style numbers. Other switches are supplied with non-removable handles.

## INSTRUMENT SWITCHES

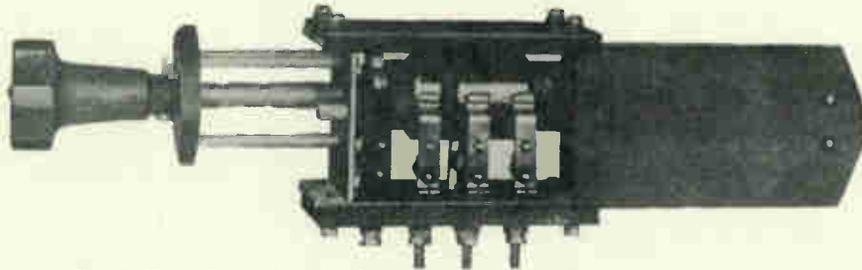


FIG. 5—THREE-PHASE AMMETER SWITCH ASSEMBLY WITH SIDE PANELS DRAWN BACK

## General

All type W instrument switches, with the exception of ammeter, regulator transfer and temperature indicator switches, have removable keys.

These keys, besides being labelled, are constructed so that they can be inserted only in the proper switch and can be withdrawn only when the switch is in the off position. This precludes the possibility of trouble when several independent circuits may be connected to the same instrument through similar switches. If only one key is used, only one switch can be operated at a time. A key from any dissimilar switch cannot be inserted.

Large notched handles insure easy operation. A suitable notching device assures permanent alignment of the contact segments with the dial marking, and holds the switch in the position to which it is turned. Length of key to suit different panel thicknesses is obtained in a similar manner to that for non-removable handles.

Type W instrument switches are made in standard styles for connecting any instrument or group of instruments selectively to various circuits as may be required for metering or synchronizing.

## Ammeter Switches

The ammeter switches are arranged to connect instruments to any phase without opening the secondary circuit of the current transformers. The three-circuit ammeter switch is used where other instruments are to be connected in the circuit beyond the ammeter switch.

are supplied for reading the voltage from one to six independent circuits.

## Frequency Meter Switch

This switch connects the frequency meter to one circuit only. In order to use one frequency meter on several circuits, a separate switch is required for each circuit.

## Wattmeter, Power Factor Meter and Reactive Factor Meter Switches

These switches connect the instrument transformers of any one polyphase circuit to the proper instrument by means of a suitable combination of voltage and current contacts. A separate switch is required for each polyphase circuit. Power factor meter switches can be used for reactive factor meters by using a suitably marked nameplate.

## Voltmeter Switches



FIG. 6—OPERATING KEY FOR TYPE W INSTRUMENT SWITCH

These switches are arranged to connect the voltmeter to the individual circuit of which the voltage is to be read. Switches

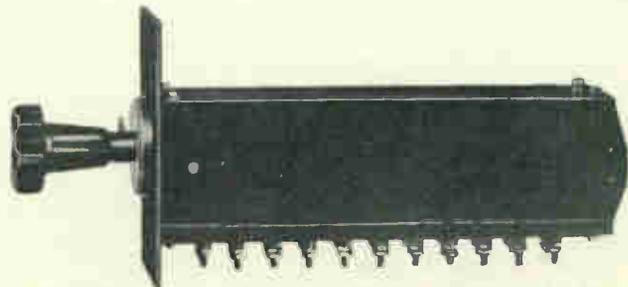


FIG. 7—TYPE W INSTRUMENT SWITCH WITH SIDE PLATES IN PLACE

ROTARY SWITCHES—TYPE W—Continued

INSTRUMENT SWITCHES—Continued

**Temperature Indicator Switches**

Each temperature switch is arranged to connect the temperature measuring instrument to any one of six exploring coils located in the apparatus, the temperature of which is to be read. Two forms of this switch can be supplied, single-pole and double-pole. Double-pole construction is for use with exploring coil leads of appreciably different lengths. For thermo-couple switch refer to headquarters.

**Synchroscope Switch for Synchronizing Between Machine and Bus**

The synchronizing switch connects the potential transformer of the circuit to be synchronized and the bus potential transformer to the synchroscope.

One switch is required for each machine when synchronizing to a single bus system and two are required when synchronizing to a double bus system. One form of this switch includes interlock contacts for connecting in the control circuit of the circuit breaker to prevent closing the breaker unless the synchronizing switch is in use.

**Synchroscope Switch for Synchronizing Between Machines**

This type of switch is double-throw and requires a different key for each throw. One switch is required for each machine.

The running key turns the switch so as to connect the voltage transformer of the running machine to the running side of the synchroscope.

The incoming key is used in the switch of the circuit which is to be synchronized, and connects its voltage transformer to the incoming side of the synchroscope. By this means any circuit may be treated either as an incoming or a bus circuit. One form of this switch includes interlock contacts for connecting in the control circuit of the circuit breaker to prevent closing the breaker unless the synchronizing switch is in use.

**Test Switches**

The standard type W ammeter, voltmeter or combination instrument switch can be used as a test switch for instruments, relays, etc. The type W switch can be used in any conventional testing system, using independent connection studs, test bus, etc. The key handle can be fixed or removable, with interlocking key.

**STYLE NUMBERS SWITCHES**

Description of Switches	Schematic Diagram Fig. No.	Drilling Plan Fig. No.	Dimension A, Inches*	Switch Style No.	Key Style No.
Ammeter, two-phase.....	8	3	5 $\frac{3}{8}$	519 108	†
Ammeter, three-phase.....	9	3	5 $\frac{3}{8}$	519 109	†
Ammeter, three independent circuits.....	10	3	11 $\frac{1}{8}$	519 110	†
Voltmeter, a-c or d-c, single-pole.....	11	3	4 $\frac{1}{2}$	519 111	519 128
Voltmeter, single-phase or d-c, two-pole.....	12	3	4 $\frac{1}{2}$	519 112	519 127
Voltmeter, two-phase or d-c, three-wire.....	13	3	6 $\frac{1}{2}$	519 113	519 128
Voltmeter, three-phase, four-wire.....	14	3	6 $\frac{1}{2}$	591 454	591 680
Voltmeter, three-phase, a-c, three-wire.....	15	3	6 $\frac{1}{2}$	519 114	519 129
Voltmeter, four-circuit a-c or d-c, two-wire.....	16	3	7 $\frac{1}{2}$	519 115	†
Voltmeter, six circuit a-c or d-c, two-wire.....	17	3	11 $\frac{1}{2}$	519 116	†
Frequency meter, two-pole.....	12	3	4 $\frac{1}{2}$	519 117	519 132
Wattmeter, polyphase.....	18	3	7 $\frac{1}{2}$	519 118	519 133
Power factor meter.....	19	3	7 $\frac{1}{8}$	591 626	519 134
Temperature indicator, single-pole, six circuits.....	20	3	7 $\frac{1}{2}$	940 082	†
Temperature indicator, two-pole, six circuits.....	24	3	11 $\frac{1}{8}$	895 355	.....
Synchroscope to bus without interlocks.....	21	3	5 $\frac{3}{8}$	519 122	519 136
Synchroscope to bus with interlocks.....	21	3	6 $\frac{1}{8}$	519 123	519 137
Synchroscope between machines, without interlocks.....	22	3	4 $\frac{1}{2}$	519 124	519 138†
Synchroscope between machines, with interlocks.....	22	3	5 $\frac{3}{8}$	519 125	519 139‡
Regulator transfer switch.....	23	3	7 $\frac{1}{2}$	591 571	519 140†
					519 141
					.....

**MOUNTING SCREWS FOR INSTRUMENT SWITCHES**

Description—Three per set	Style No.
Screws for $\frac{1}{4}$ -inch thick panel.....	555 659
Screws for $\frac{1}{2}$ -inch thick panel.....	555 658
Screws for 1-inch thick panel.....	555 657
Screws for 1 $\frac{1}{2}$ -inch thick panel.....	555 656

\*Dimension A is the distance from rear of panel to rear end of switch.  
 †Running key.  
 ‡Separate key not required.  
 §Incoming key.

Order by Style Number

ROTARY SWITCHES—TYPE W—Continued  
 INSTRUMENT SWITCHES—Continued  
 DIAGRAMS OF CONNECTIONS

NOTE—Instrument switches are shown for handle end at the top.

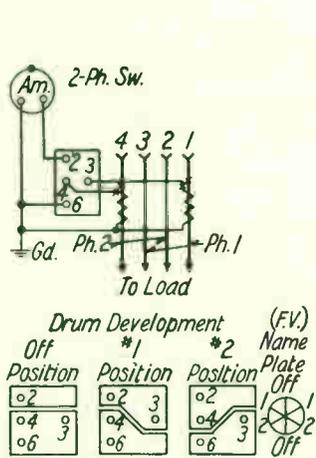


FIG. 8—TWO-PHASE AMMETER SWITCH, STYLE NO. 519108

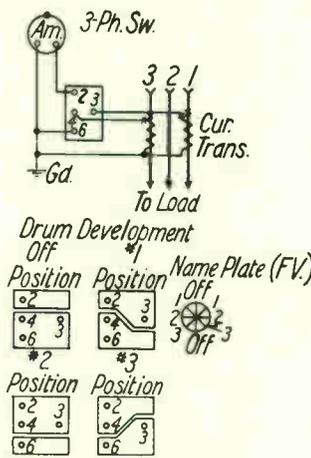


FIG. 9—THREE-PHASE AMMETER SWITCH, STYLE NO. 519109

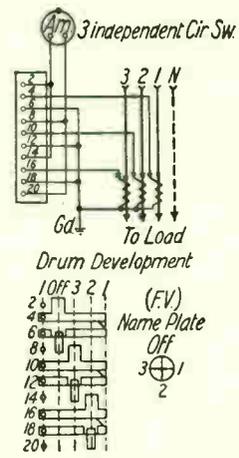


FIG. 10—AMMETER SWITCH 3 INDEPENDENT CIRCUITS, STYLE NO. 519110

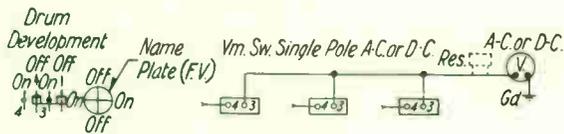


FIG. 11—SINGLE-POLE, VOLTMETER SWITCH A-C OR D-C, STYLE NO. 519111

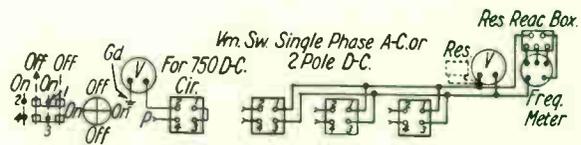


FIG. 12—SINGLE-PHASE A-C OR TWO-POLE D-C VOLTMETER SWITCH, STYLE NO. 519112  
 FREQUENCY METER SWITCH, STYLE NO. 519117

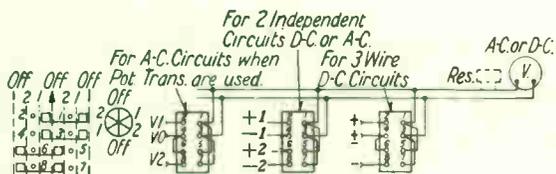


FIG. 13-A—FOR A-C CIRCUIT WHEN POTENTIAL TRANSFORMERS ARE USED, STYLE NO. 519113

FIG. 13-B—FOR TWO INDEPENDENT CIRCUITS D-C OR A-C, STYLE NO. 519113

FIG. 13-C—FOR THREE-WIRE D-C CIRCUITS, STYLE NO. 519113

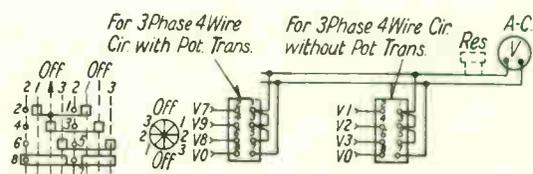


FIG. 14—VOLTMETER SWITCH, 3-PHASE, 4-WIRE CIRCUITS, STYLE NO. 591454

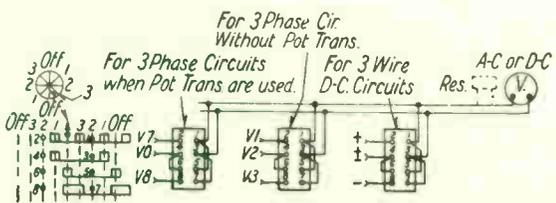


FIG. 15-A—THREE-PHASE CIRCUITS WHEN POTENTIAL TRANSFORMERS ARE USED, STYLE NO. 519114

FIG. 15-B—THREE-PHASE CIRCUIT WITHOUT POTENTIAL TRANSFORMERS, STYLE NO. 519114

FIG. 15-C—THREE-WIRE D-C CIRCUITS, STYLE NO. 519114

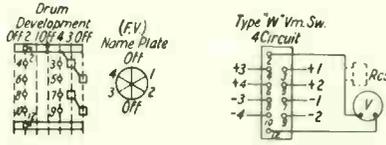


FIG. 16—FOUR-CIRCUIT, 2-POLE SWITCH, STYLE NO. 519115

ROTARY SWITCHES—TYPE W—Continued

INSTRUMENT SWITCHES—Continued

DIAGRAMS OF CONNECTIONS—Continued

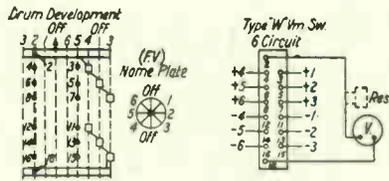


FIG. 17—SIX-CIRCUIT, 2-POLE SWITCH, STYLE No. 591116

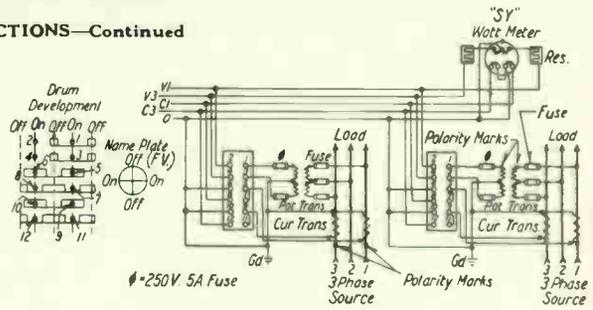


FIG. 18—WATTMETER SWITCH, STYLE No. 591118

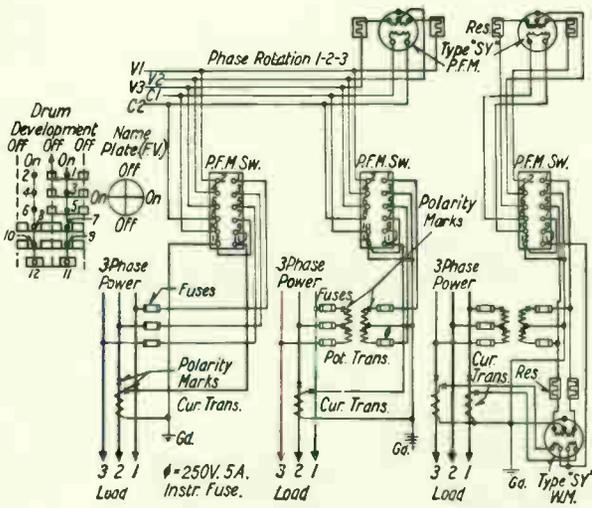


FIG. 19—POWER-FACTOR METER SWITCH, STYLE No. 591626

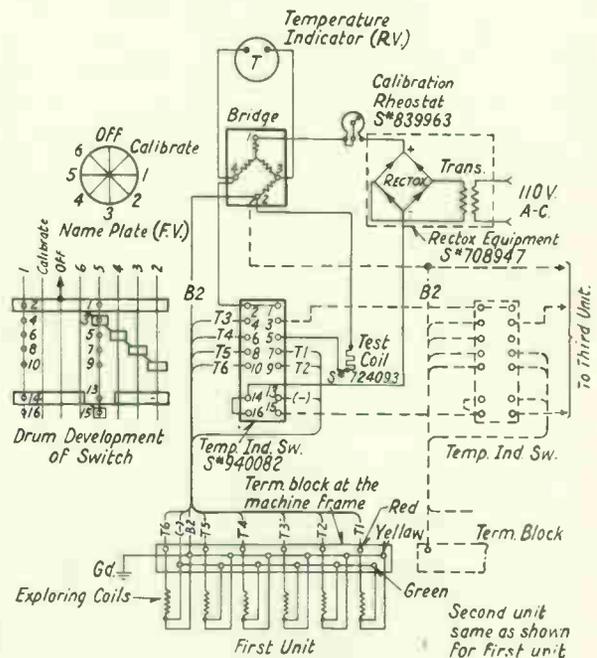


FIG. 20—TEMPERATURE INDICATOR SWITCH, STYLE No. 940087 SINGLE-POLE SIX-CIRCUIT FOR APPROXIMATE LEAD COMPENSATION

NOTE—For six exploring coils, wire as per solid lines. For more than six exploring coils, wire as per solid and dotted lines, using two or more switches as needed. For each generator, use six hot-test coils.

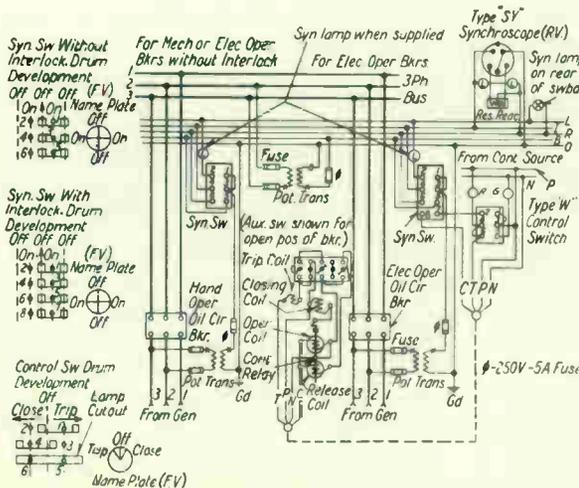


FIG. 21—SWITCH FOR SYNCHRONIZING BETWEEN BUS AND MACHINE WITHOUT INTERLOCKS, STYLE No. 519122 WITH INTERLOCKS, STYLE No. 519123

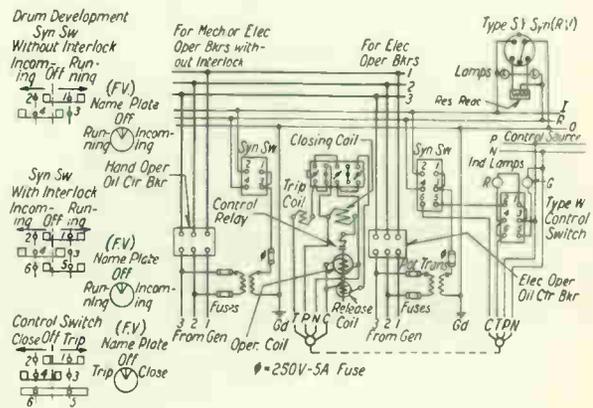


FIG. 22—SWITCH FOR SYNCHRONIZING BETWEEN MACHINES WITHOUT INTERLOCKS, STYLE No. 519124 WITH INTERLOCKS, STYLE No. 519125

ROTARY SWITCHES—TYPE W—Continued

INSTRUMENT SWITCHES—Continued

DIAGRAMS OF CONNECTIONS—Continued

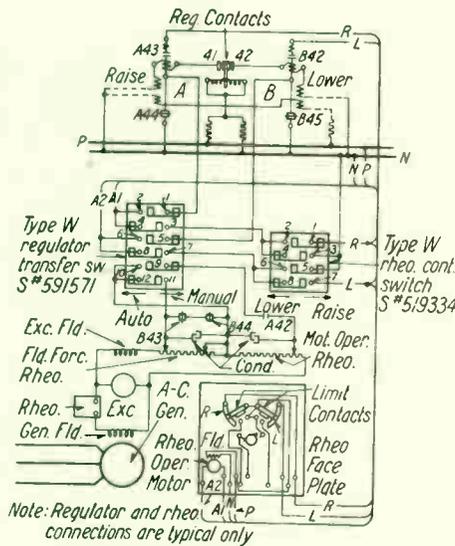


FIG. 23—REGULATOR TRANSFER SWITCH STYLE NO. 591571

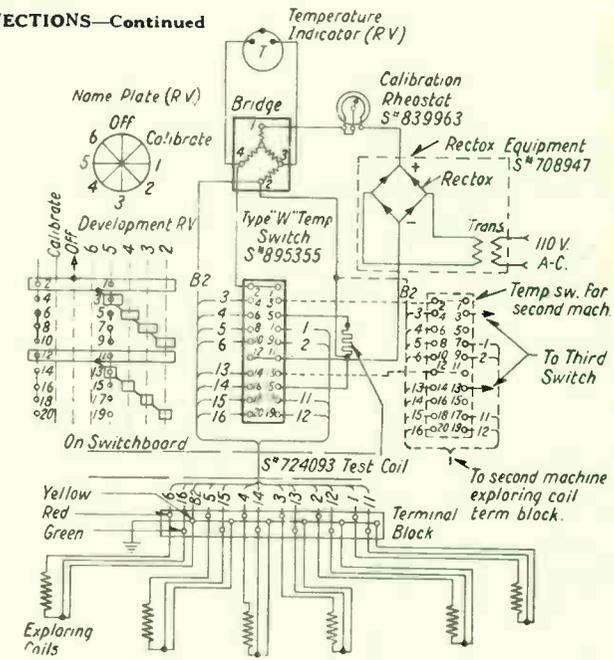


FIG. 24—TEMPERATURE INDICATOR SWITCH, STYLE NO. 895355, DOUBLE-POLE, SIX-CIRCUIT FOR COMPLETE LEAD COMPENSATION

CONTROL SWITCHES

Application

The type W control switch is for the control of electrically-operated switches and circuit breakers, rheostats, engine and turbine governors, feeder potential regulators, etc., both motor and solenoid-operated. In general control relays are operated directly from the control switches in order to handle such heavy capacity operating current as may be met with, particularly in the case of switches and circuit breakers.

These switches are essentially multi-circuit double-throw switches. One form of this switch is used for starting

induction or synchronous motors, one position being used to close the starting breakers, the other position being used to close the running breakers. A special

pull-out feature is provided in the usual "off" position to trip the breakers when desired. These control switches are also adapted for raising and lowering voltage, both in conjunction with feeder-voltage regulators of the induction type, and automatic generator-voltage regulators of any conventional type.

Operation

**Trip Position**—By turning the control switch to the trip position, the trip coil of the oil circuit breaker is energized. The control switch is latched in this position by pulling the handle forward which action also opens the signal lamp circuit.

**Spring Return Handle**—Control switches are provided with large pistol-grip handles to facilitate operation by

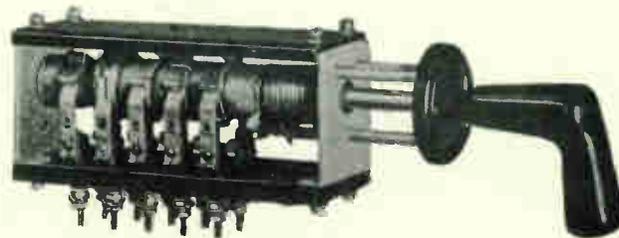


FIG. 25—CONTROL SWITCH FITTED TO STEEL PANEL WITH SIDE PLATES IN PLACE

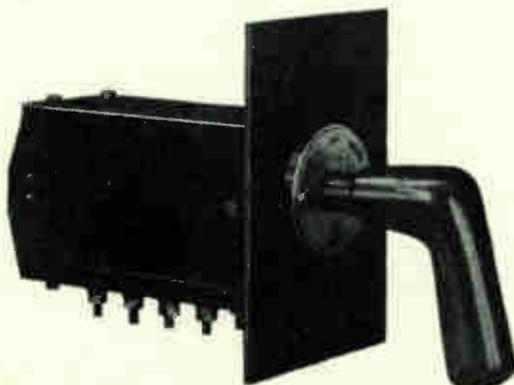


FIG. 26—CONTROL SWITCH ASSEMBLY WITH SIDE PANELS REMOVED

ROTARY SWITCHES—TYPE W—Continued

CONTROL SWITCHES—Continued

the switchboard attendant. These switches are provided with a spring return mechanism which causes the switch to return automatically to the "off" position, when released from the operating position.

**Mechanical Indicator**—All circuit breaker control switches are provided with a mechanical indicating device which shows a red or green marker to

indicate the last manual operation of the switch.

**Signal Lamp**—Signal lamp cutouts may be obtained with circuit breaker control switches. This lamp cutout is in circuit with one or all of the indicating lamps.

**Automatic Indicator Cutouts**—This arrangement is generally used for an alarm system, causing the sounding of

an alarm or the lighting of a lamp on the occurrence of an automatic operation. These contacts are also used for interlocking a common tripping circuit with several control switches.

**Indicating Lamps**—Suitable indicating lamps can be used in conjunction with control switches to obtain electrical indication of the position of circuit breakers or other devices.

STYLE NUMBERS

SWITCHES

Application	Description	Schematic Diagram Fig. No.	Dimension A, Inches *	Style No.
Oil circuit breaker control switches	S. P. D. T. switch with lamp cutouts.....	28	5 3/4	519 330
	S. P. D. T. switch with lamp and automatic indicator cutouts.....	29	6 1/2	519 331
	S. P. D. T. switch with lamp and two automatic indicator cutouts.....	30	...	780 374
	S. P. D. T. switch with overload relay contacts and lamp cutouts.....	31	7 1/8	519 332
	S. P. D. T. switch with overload relay contacts, lamp and automatic indicator cutouts.....	32	7 1/2	519 333
	S. P. D. T. switch with overload relay contacts, lamp and two automatic indicator cutouts.....	33	...	780 375
Voltage control switches, field rheostat and induction regulator	2-P. D. T. switch.....	34	6 1/2	519 334
	3-P. D. T. switch.....	34	7 1/2	519 335
	2-P. D. T. switch with regulator contacts.....	35	7 1/2	519 336
	2-P. D. T. switch (induction regulator, 5 position).....	36	5 3/8	592 128
Motor control switches	D. T. with two-circuit pull-out trip.....	37	7 1/2	519 337
	2-P. D. T.....	38	6 1/2	519 338

MOUNTING SCREWS FOR CONTROL SWITCHES

Description	Style No. Per Set
Screws for 1/2-inch thick panel, 3 per set.....	519 480
Screws for 3/4-inch thick panel, 3 per set.....	519 479
Screws for 1-inch thick panel, 3 per set.....	519 478
Screws for 1 1/2-inch thick panel, 3 per set.....	519 477

\*Dimension A is distance from rear end of the switch to the panel.

DIAGRAMS OF CONNECTIONS

NOTE:—Auxiliary switches are shown for the open position of the breaker. Control switches are shown as top view, with the handle end at the top of the diagram.

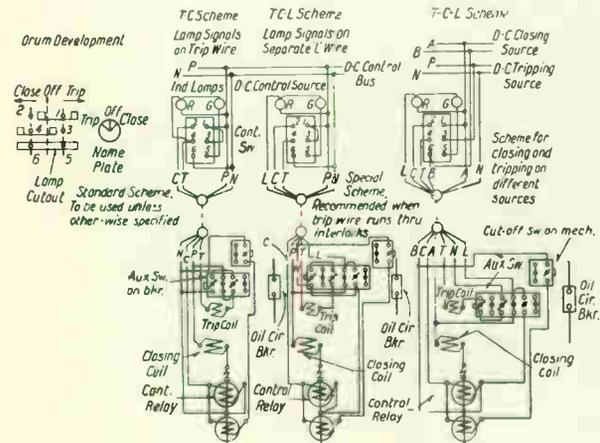


FIG. 28—CIRCUIT BREAKER CONTROL SWITCH, STYLE NO. 519330

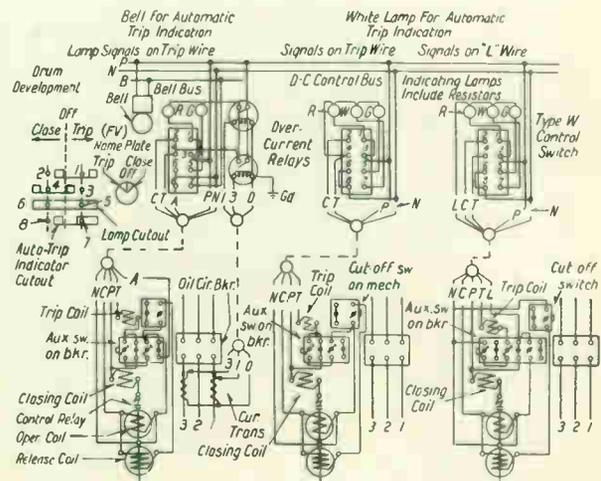


FIG. 29—CIRCUIT BREAKER CONTROL SWITCH, BELL AND WHITE LAMP FOR AUTOMATIC TRIP, STYLE NO. 519331

Order by Style Number

ROTARY SWITCHES—TYPE W—Continued

CONTROL SWITCHES—Continued

DIAGRAMS OF CONNECTIONS—Continued

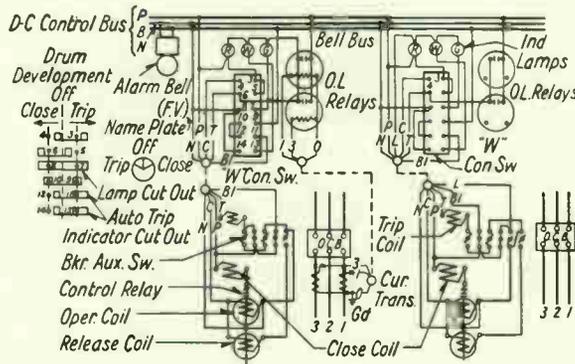


FIG. 30—CIRCUIT BREAKER CONTROL SWITCH BELL AND WHITE LAMP FOR AUTOMATIC TRIP INDICATION, STYLE No. 780374  
 A—LAMP SIGNALS ON TRIP WIRES  
 B—LAMP SIGNALS ON L WIRES

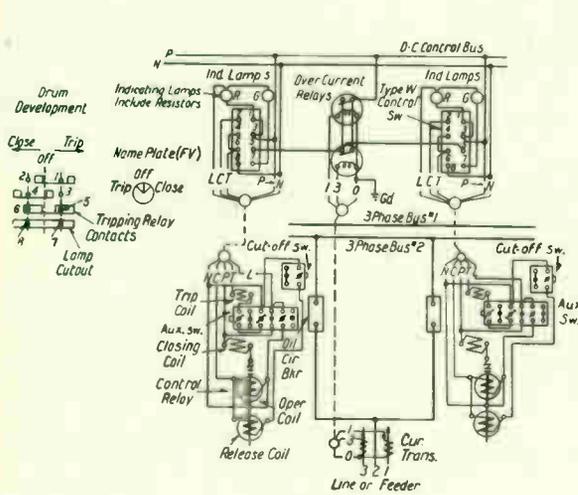


FIG. 31—STYLE No. 519332  
 CIRCUIT BREAKER CONTROL SWITCHES FOR DOUBLE-BUS SYSTEMS

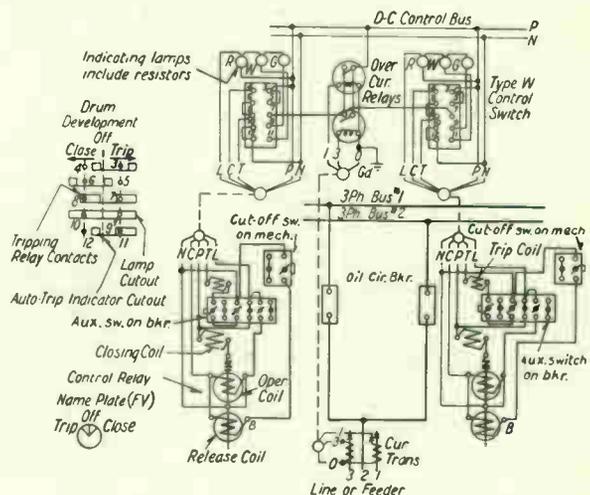


FIG. 32—STYLE No. 519333

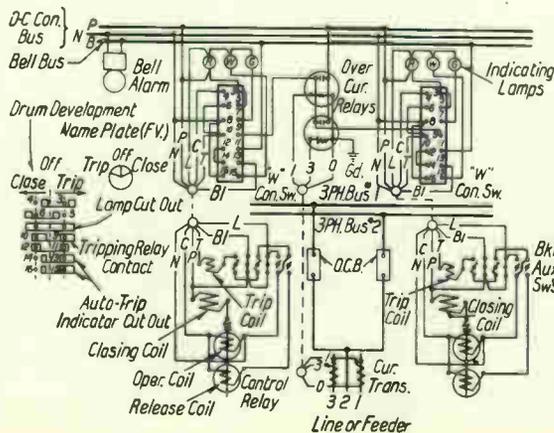


FIG. 33—CIRCUIT BREAKER CONTROL SWITCH FOR DOUBLE BUS SYSTEM, STYLE No. 780375

ROTARY SWITCHES—TYPE W—Continued

CONTROL SWITCHES—Continued

DIAGRAMS OF CONNECTIONS—Continued

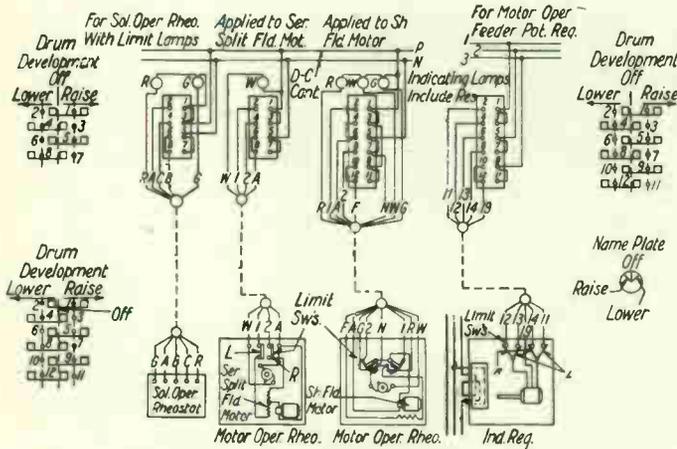


FIG. 34—SOLENOID, OR MOTOR-OPERATED RHEOSTAT AND INDUCTION REGULATOR CONTROL SWITCHES, STYLE NO. 519334, 519335

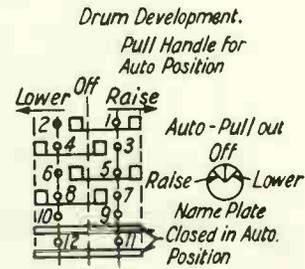


FIG. 35—RHEOSTAT CONTROL SWITCH WITH REGULATOR CUT-OUT CONTACTS, STYLE NO. 519336

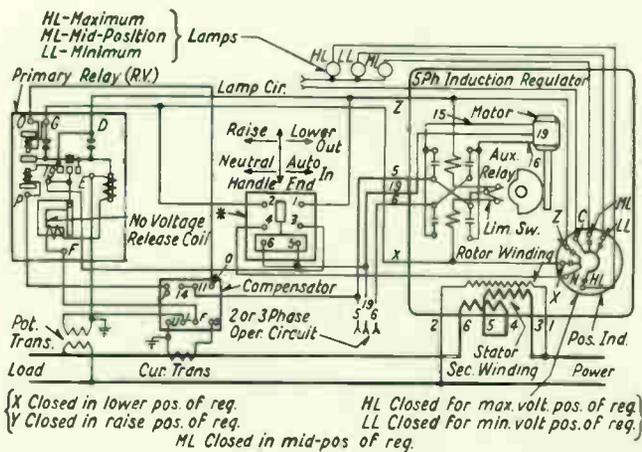


FIG. 36—INDUCTION REGULATOR CONTROL WITH INDUCTION REGULATOR CONTROL SWITCH STYLE NO. 592128

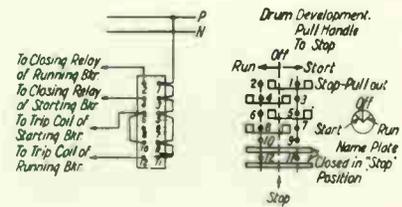


FIG. 37—SWITCH FOR MOTOR CONTROL, STYLE NO. 519337

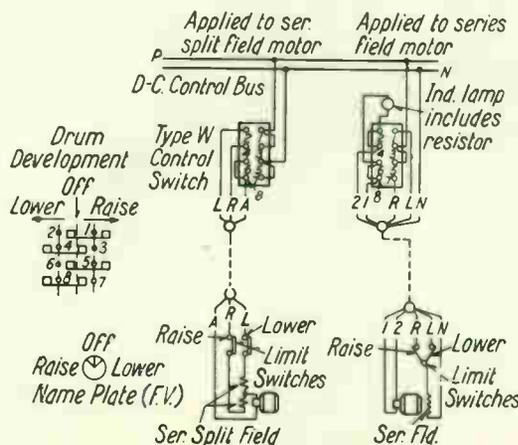


FIG. 38—GOVERNOR MOTOR-SPEED CONTROL SWITCH, STYLE NO. 519338

ROTARY SWITCHES—TYPE W—Continued

AUXILIARY SWITCHES

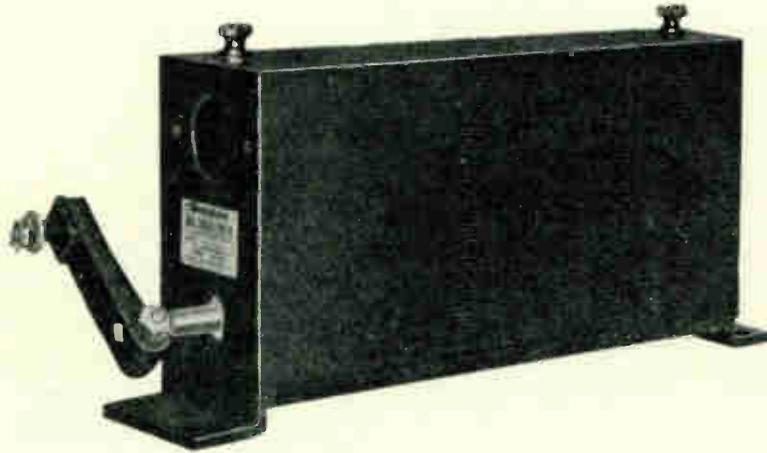


FIG. 39—AUXILIARY SWITCH COMPLETE WITH COVER

Application

The type W auxiliary switch is similar to the instrument and control switches having identical control fingers, rotor segments and molded base. They are applicable to circuit breakers, operating mechanisms, or other apparatus requiring auxiliary switches. These switches are made with 2, 4, 6 and 10 contact circuits. The rotor turns to two positions 90 degrees apart. The rotor segment makes contact with its pair of stationary fingers in one or the other 90-degree position. Any individual rotor segment can be rotated 90 degrees to change from a "make" contact to a "break" contact or vice versa. Special

segments can be supplied for special switching arrangements.

The switch is made in two forms with and without terminal covers. The switch which is equipped with a Micarta cover, as shown in Fig. 39, has provision for bringing leads out of either end of the switch through holes provided in the end brackets. A cover-plate is supplied for the hole not in use.

The switch without cover is used on applications where the apparatus is otherwise housed, as for example, with the operating mechanism on outdoor oil circuit breakers. This switch is shown in Fig. 40. The operating lever of both

types of switches clamp to the squared end of the rotor shaft. Provision is made for changing the length of the operating lever so as to adapt the

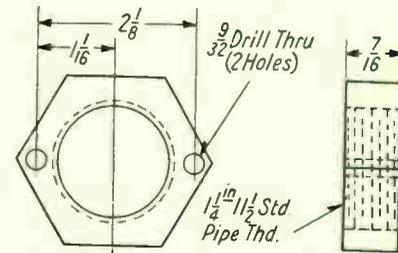


FIG. 41—PIPE FLANGE STYLE NO. 762198 FOR USE ON AUXILIARY SWITCHES

switch to an operating rod travel of from 1 to 3 inches. The angular travel of the rotor is always 90 degrees.

Where the wires are to be carried in conduit, the auxiliary switches are arranged to accommodate a special nut, Fig. 41, with 1 1/4-inch pipe threads which can be bolted to the switch bracket. The nut with mounting bolts Style No. 762198 is not included with the switch style number, but will be furnished, if desired, without additional charge.

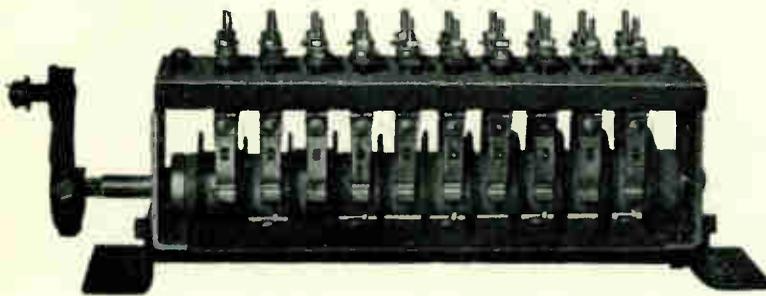


FIG. 40—AUXILIARY SWITCH ASSEMBLY

STYLE NUMBERS

Description	Over-All Length in Inches from Front of Base to Rear of Switch	STYLE No.	
		With Cover	Without Cover
2-pole, 1-"a"—1-"b"*	4 5/8	676 957	591 816
4-pole, 2-"a"—2-"b"*	6 3/8	676 960	591 819
6-pole, 3-"a"—3-"b"*	8	676 963	591 822
10-pole, 5-"a"—5-"b"*	11 3/8	676 966	591 825

\*The letter "a" and "b" designate "make" and "break" as shown in the N. E. M. A. hand book on switching equipment.

Order by Style Number

ROTARY SWITCHES—TYPE W—Continued

WEATHER-PROOF AUXILIARY SWITCHES

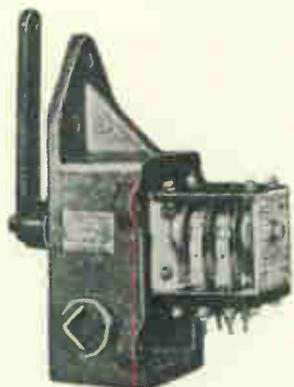


FIG. 42—2-POLE AUXILIARY SWITCH.  
COVER REMOVED



FIG. 43—2-POLE AUXILIARY SWITCH.  
COVER IN PLACE

The type W weatherproof auxiliary switches are completely housed for outdoor applications. See Fig. 43. They are used with remotely controlled, gang-operated, disconnecting switches, or for any other application where it is desired to give a signal or alarm as to the action of some mechanical device.

These switches can be furnished in

2, 4, 6 or 10-pole types and are manufactured from standard indoor switch parts mounted on a cast brass base to which the cover is bolted.

The base contains 3 holes for  $\frac{3}{8}$ -inch mounting bolts. Holes tapped for conduit connection are provided on two sides and the top, two of which are fitted with pipe plugs. These holes are for

1-inch conduit on the 2 and 4-pole switches,  $1\frac{1}{4}$ -inch conduit on the 6-pole switch and  $1\frac{1}{2}$ -inch on the 10-pole switch.

A substantial cover, with a cast alloy flange, is provided to cover the switch. This cover contains an inner lining of insulating material. All joints are fitted with gaskets to assure weatherproof construction.

STYLE NUMBERS

Description	Over-All Length in Inches from Front of Base to Rear End of Switch	Style No.
2-pole, 1-"a"—1-"b"*	7 $\frac{1}{8}$	599 938
4-pole, 2-"a"—2-"b"*	8 $\frac{3}{4}$	599 939
6-pole, 3-"a"—3-"b"*	10 $\frac{3}{4}$	599 940
10-pole, 5-"a"—5-"b"*	13 $\frac{3}{4}$	599 941

\*The letters "a" and "b" designate "make" and "break" as shown in the N.E.M.A. hand book on switching equipment.

Dimensions are for reference only. For official dimensions apply to the nearest district office.

OUTLINE DIMENSIONS IN INCHES

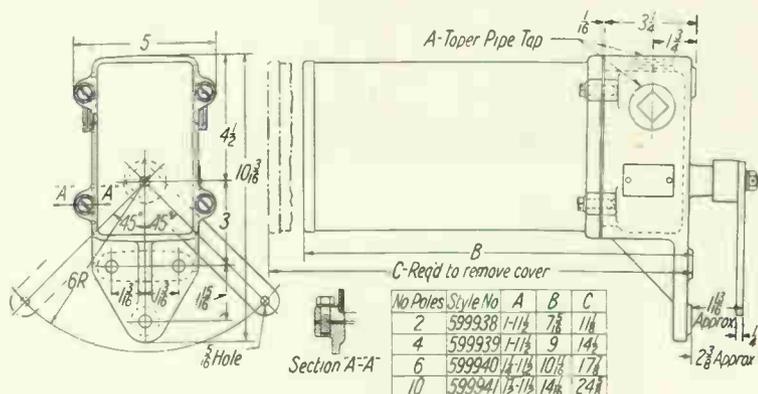


FIG. 44—2, 4, 6 AND 10-POLE, 10-AMPERE, 250-VOLT AUXILIARY SWITCH

Order by Style Number

