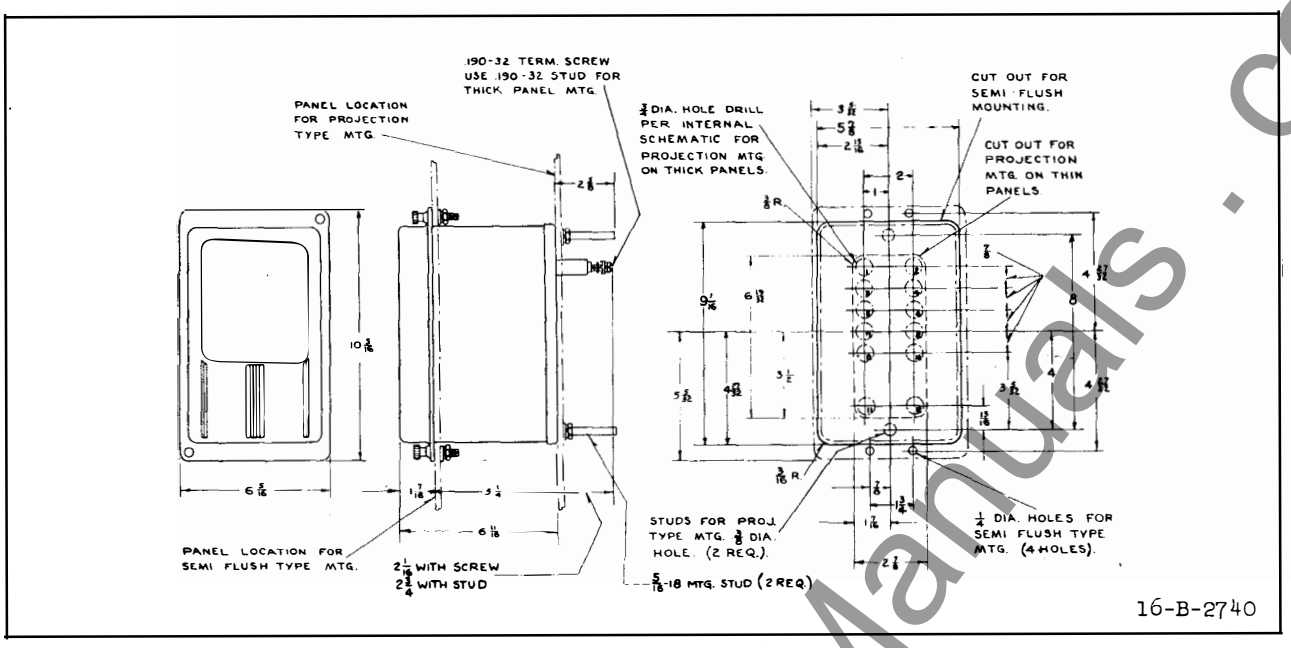


Fig. 10—Outline And Drilling Plan Of The Relays In The S-10 Semi-Flush Or Projection Type FT Flexitest Case. See The Internal Schematic For The Terminals Supplied. For Reference Only.

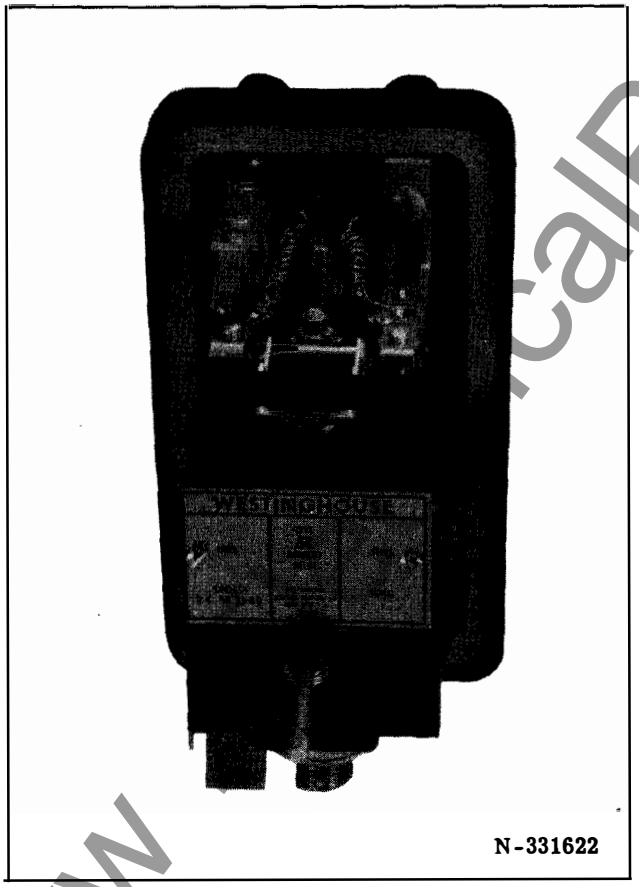


Fig. 11—View Of Type SC Relay Showing Correct Shaping Of Moving Contact Leads.

and the top of the core. This dimension should be 3/16" on the SV-1 relay for A-C. Both contacts should touch at the same time when the plunger is raised. When the plunger is moved upward against its stop, there should be a slight deflection of the stationary contact stop springs, but this should not exceed 1/32". When the stationary contacts are reversed so that they are closed when the relay is de-energized, they should be located so that they just touch the moving contacts when the latter are 1/32" above the de-energized position. On some relays it may be found that when the contacts are used in this position the relay may operate at values a few percent below the scale markings. The adjustments specified for the stationary contacts are important. Failure to observe them may cause improper relay operation, either directly or after a period of service. Contact position should not be used as a means of altering the ratio of dropout to pickup.

RENEWAL PARTS

Repair work can be done most satisfactorily at the factory. However, interchangeable parts can be furnished to the customers who are equipped for doing repair work. When ordering parts, always give the complete name-plate data.

CHARACTERISTICS OF TYPES SC AND SC-1 RELAYS

Type	Frequency	Range of Adjustment Amps.	Max. Amps. Continuous	Watts 5 Amps. 60 Cycles	V.A. at 5 Amps. 60 Cycles	Dropout Ratio-AC	Dropout Ratio-DC
SC	DC, 25 to 60 C.	.5-2	1.5	99	225	90-98%	65-80%
SC	DC, 25 to 60 C.	1-4	3	28	65	90-98%	65-80%
SC	DC, 25 to 60 C.	2-8	6	6.9	19	90-98%	65-80%
SC	DC, 25 to 60 C.	4-16	12	1.5	5	90-98%	65-80%
SC	DC, 25 to 60 C.	10-40	25	.24	.7	90-98%	65-80%
SC	DC, 25 to 60 C.	20-80	40	.07	.16	90-98%	65-80%
SC	DC, 25 to 60 C.	40-160	40	.03	.05	90-98%	65-80%
SC	DC, 25 to 60 C.	4-100*	10-15-20	1.7-0.6-0.18	5-1-0.2	90-98%	65-80%
SC-1	DC, 25 to 60 C.	.5-2	1.5	100	210	35-60%	25-40%
SC-1	DC, 25 to 60 C.	1-4	3	24	60	35-60%	25-40%
SC-1	DC, 25 to 60 C.	2-8	6	6	16	35-60%	25-40%
SC-1	DC, 25 to 60 C.	4-16	12	1.5	5	35-60%	25-40%
SC-1	DC, 25 to 60 C.	10-40	25	.25	.65	35-60%	25-40%
SC-1	DC, 25 to 60 C.	20-80	40	.07	.16	35-60%	25-40%
SC-1	DC, 25 to 60 C.	40-160	40	.03	.05	35-60%	25-40%
SC-1	DC, 25 to 60 C.	4-100*	10-15-20	1.7-0.6-0.18	5-1-0.2	35-60%	25-40%

* Coil has taps on which minimum pickups are 10 and 30 amperes.

CHARACTERISTICS OF SV AND SV-1 RELAYS

Type	Frequency (Cycles	Range of Adjustment Volts	Max. Volts Continuous	Watts at 115 V. AC (125 V. for DC	V.A. at 115 V.	Dropout Ratio
SV	60	70-160	160	3.4	7.3	90-98%
SV	50	70-160	180	2.8	6.1	90-98%
SV	25	70-160	200	1.5	2.5	90-98%
SV	DC	50-150	150	4.8		65-80%
SV-1	60	70-160	160	4.1	8.5	40-80%
SV-1	50	70-160	180	3.5	7.1	40-80%
SV-1	25	70-160	200	1.4	3.2	40-80%
SV-1	DC	50-150	150	4.8		25-40%

NOTES:--Standard current relays are calibrated on 60 cycles. This calibration is approximately correct for 25 cycle and DC applications, but there will be discrepancies of 10% to 15% at some points on the scale.

Values of watts and volt-amperes in the tables are average for various plunger and shunt position.

For the SC relay, volt-amperes for pickup at minimum setting are approximately 3.4 and 1.4 for 60 and 25 cycles. Watts at minimum setting are approximately 1.0, .65 and .57 for 60 cycles, 25 cycles and DC respectively. Multiply values by 16 for approximate burdens at maximum setting.

For the SC-1 relay, volt-amperes for pickup at minimum setting are approximately 3.5 and 1.3 for 60 and 25 cycles. Watts at minimum settings are 1.3, .7 and .57 for 60 cycles, 25 cycles and d-c, respectively. Multiply values by 16 for approximate burdens at maximum setting.

*The V.A. burdens of the SC and SC-1 relays at 3, 10 and 20 times minimum pickup current are approximately 31, 240 and 770 V.A. respectively.

Dropout ratio varies somewhat with pickup adjustment but will be approximately constant for any given pickup setting. Limits in tables include variables such as friction and other individual relay variations.

Maximum continuous volts given for the SV and SV-1 relays for A-C are for the relay set for minimum pickup. With the relay set for maximum pickup the continuous voltage can be increased 10 to 20%.

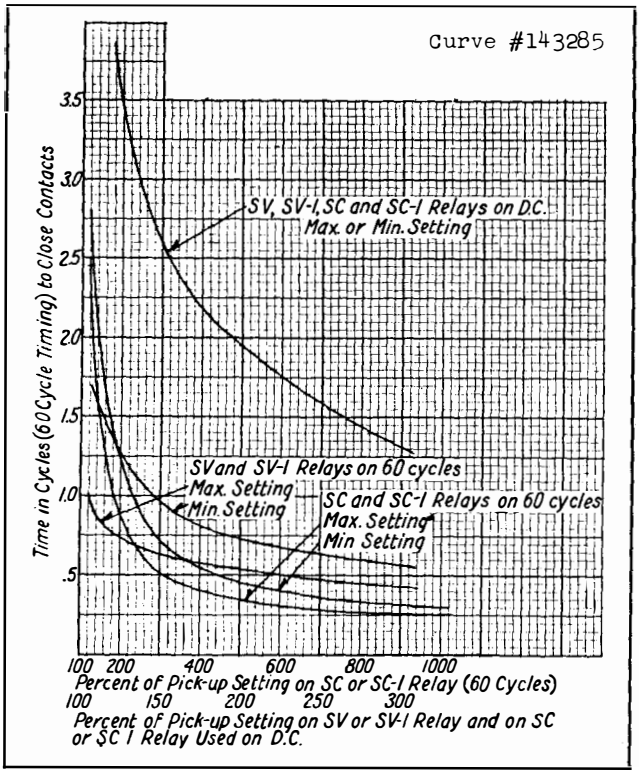


Fig. 7—Typical Time Curves For The Types SC And SV Relays (Using Flux Shunt For Pick-Up Adjustment).

plunger, but by removing the two mounting screws which fasten the indicator to the main frame, turning the indicator bracket around and at the same time swinging the indicator flag 180° about its shaft, the indicator can be set to indicate on the down stroke of the plunger. The rivet weight must be removed from the indicator flag and the latch screen turned around to complete the assembly.

In certain applications, an extremely wide range of current adjustment is desirable, and certain styles of SC and SC-1 relays have been provided with tapped coils to meet this requirement. The coil taps are brought out to a tap block mounted on the lower end of the relay frame or on the relay sub-base, depending on the type of case used. The connector plate on the tap block is marked with the minimum pick-up value of each tap, and the shunt is adjusted in the usual manner to obtain any pick-up setting between taps. The scale plate is not calibrated for the relays with tapped coils, as there is not sufficient space for marking a scale for each tap. However, the scale plate is supplied in order that a customer may mark on it the individual relay setting or settings if desired.

INSTALLATION

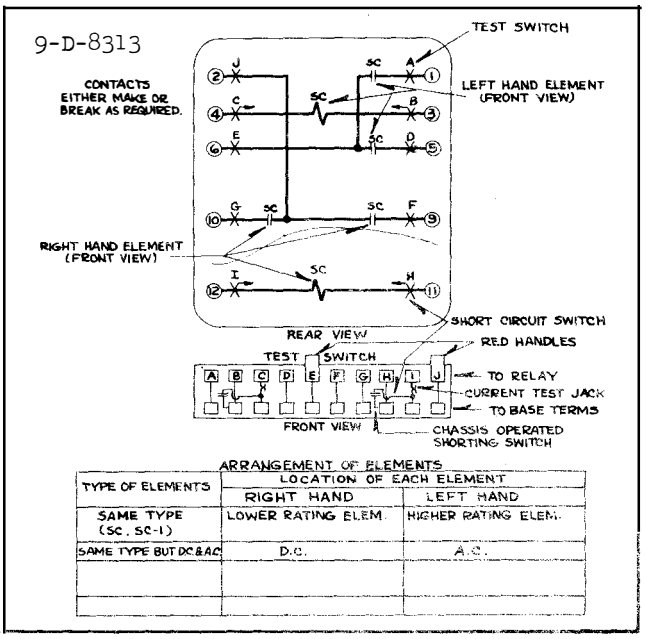
The relays should be mounted on switchboard panels or their equivalent in a location free from dirt, moisture, excessive vibration and heat. Mount the relay vertically by means of the two mounting studs for the standard cases and the type FT projection case or by means of the four mounting holes on the flange for the semi-flush type FT case. Either of the studs or the mounting screws may be utilized for grounding the relay. The electrical connections may be made direct to the terminals by means of screws for steel panel mounting or to terminal studs (furnished on request when ordering the relay) for ebony-asbestos or slate panel mounting. The terminal studs may be easily removed or inserted by locking two nuts on the studs and then turning the proper nut with a wrench.

ADJUSTMENTS AND MAINTENANCE

The proper adjustments to insure correct operation of this relay have been made at the factory and should not be disturbed after receipt by the customer. If the adjustments have been changed, the relay taken apart for repairs, or if it is desired to check the adjustments at regular maintenance periods, the instructions below should be followed.

All contacts should be periodically cleaned with a fine file. S#1002110 file is recommended for this purpose. The use of abrasive material for cleaning contacts is not recommended because of the danger of embedding small particles in the face of the soft silver and thus impairing the contact.

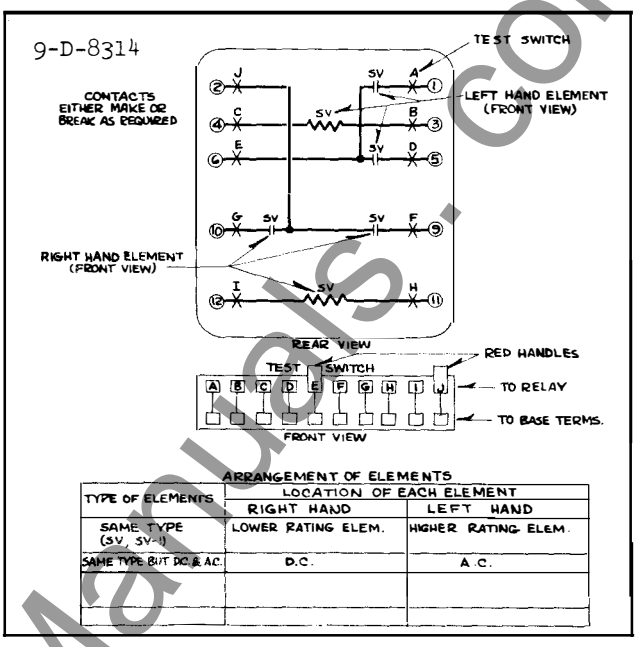
Several factors may affect the drop-out ratio of the relay. Whatever affects the ratio does so because either the drop-out or pick-up or both are affected. Obviously, incorrect assembly or interchange of parts, such as the use of the SC plunger with the SV core tube, will alter the electrical characteristics. However, the factor most likely to be



ARRANGEMENT OF ELEMENTS

TYPE OF ELEMENTS	LOCATION OF EACH ELEMENT	
	RIGHT HAND	LEFT HAND
SAME TYPE (SC, SC-1)	LOWER RATING ELEM.	HIGHER RATING ELEM.
SAME TYPE BUT DC & AC	D.C.	A.C.

Fig. 5—Internal Schematic of the Double Element Types SC and SC-1 Relays In The Type FT Case.



ARRANGEMENT OF ELEMENTS

TYPE OF ELEMENTS	LOCATION OF EACH ELEMENT	
	RIGHT HAND	LEFT HAND
SAME TYPE (SV, SV-1)	LOWER RATING ELEM.	HIGHER RATING ELEM.
SAME TYPE BUT DC & AC	D.C.	A.C.

Fig. 6—Internal Schematic of the Double Element Types SV and SV-1 Relays In The Type FT Case.

in some applications where the latch is not required. The plunger floats in its operated position just as in the SC and SV relays. The drop-out ratio varies somewhat for different shunt positions, but is constant for any one setting.

* The shunt is held in any desired position by pressure from a curved arm made of sheet spring steel, which is fastened to the bottom of the coil frame at the rear of the shunt. This spring arm is shaped to extend around the shunt to the front of the relay, and in its normal position it exerts sufficient pressure against the shunt to prevent any creeping of the shunt or undesired change of setting. The front end of the spring arm has a bent-over tab on which thumb-pressure may be applied to move the arm out of contact with the shunt while the position of the latter is being changed.

The stationary contacts are assembled on slotted brackets. These are held in position on the base by filister-head screws which are threaded into the terminal inserts. Lock-washers are assembled inside the moulded terminal bushings between the inserts and the base, as a safeguard against loosening of the screws. By rotating the bracket on its mounting screw and moving it along its slot, the contact assembly can be made either normally open or normally closed. The moving contacts are mounted on a Micarta insulation plate which is secured to the threaded end of the plunger shaft by a nut. The front edge of this insulation plate operates the indicator. The rear portion of the plate is slotted and a post screwed to the frame passes through this slot to prevent the plate from rotating. The moving contacts are double-faced so that they can be "make" or "break" and are connected to the base terminals by flexible leads. All contacts are pure silver. The contacts will carry 5 amperes continuously, and will interrupt 5 amperes at 115 volts A-C, or 1 ampere at 125 volts D-C.

The mechanical operation indicators used on these relays are shockproof, and can be used to indicate on the up stroke or down stroke of the plunger. The indicator is reset by pulling out the knurled stud which projects through the cover nut. The indicator should be reset after each relay operation because * otherwise there may be a one or two percent decrease in the operating value of the relay. The operation indicator is assembled at the factory to indicate on the up stroke of the

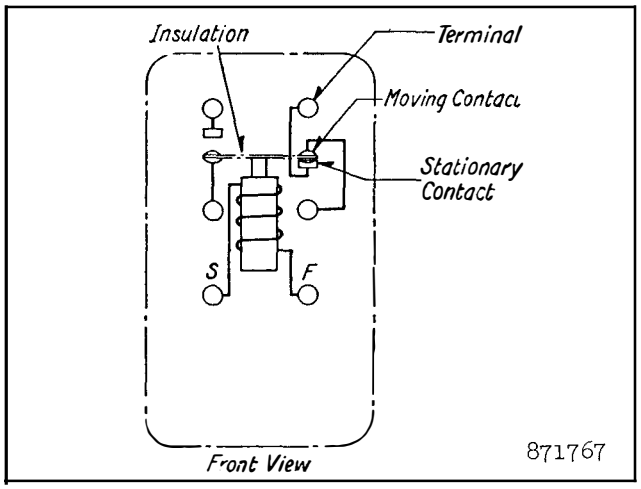


Fig. 1—Internal Wiring of the Relays In The Small Glass Case.

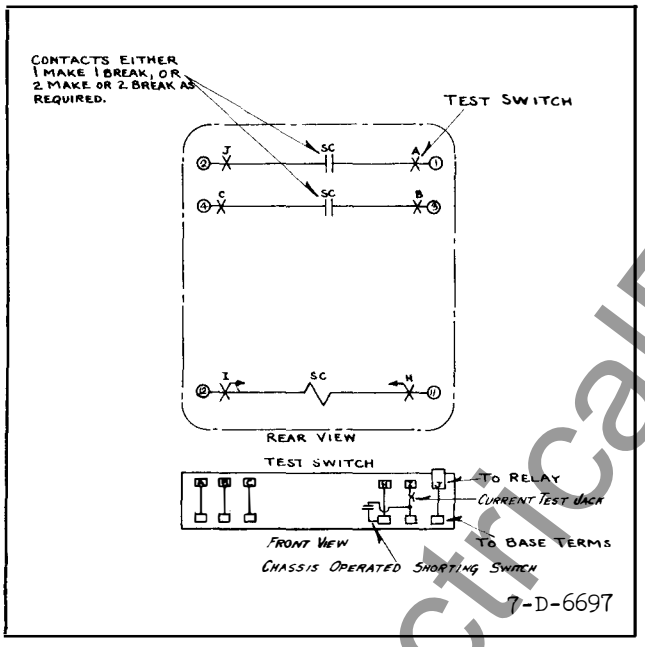


Fig. 3—Internal Schematic of the Single Element Types SC and SC-1 Relays In The Type FT Case.

without being held against a stop, even when energized much above the pick-up value. Consequently, there is negligible noise and the contacts are free from chatter, even on heavy overloads and in 25 cycle applications.

The core, shunt and plunger construction also provides the high ratio of drop-out to pick-up in the SC and SV relays. This ratio is above 90% for any pick-up setting. In the latch type relays it is necessary for the

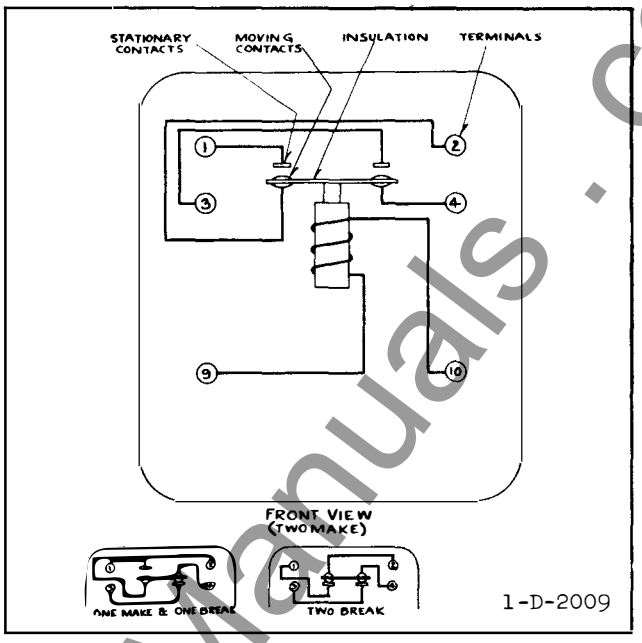


Fig. 2—Internal Wiring of the Relays In The Standard Case.

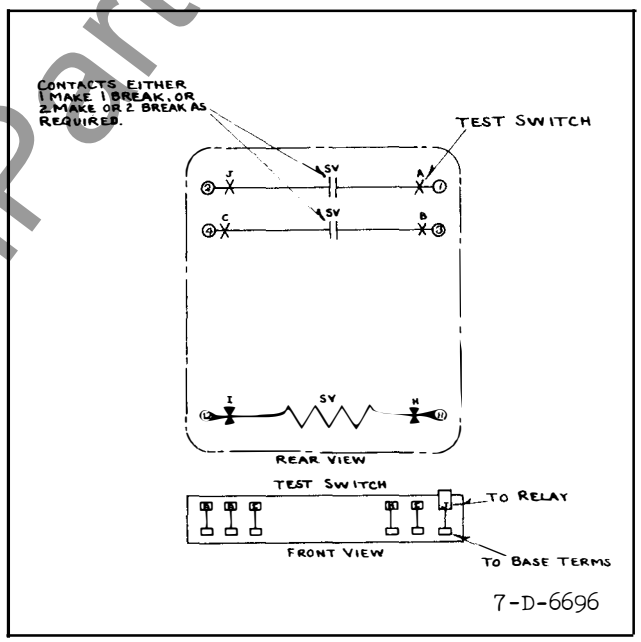


Fig. 4—Internal Schematic of the Single Element Types SV and SV-1 Relays In The Type FT Case.

plunger to rise with sufficient force to operate the latch positively and to deflect the stationary contacts sufficiently to prevent their opening, when the relay is de-energized, due to play in the latch. It is necessary to have a lower ratio of drop-out to pick-up in order to obtain this characteristic, and this lower ratio may be desirable

INSTALLATION • OPERATION • MAINTENANCE

INSTRUCTIONS

TYPES SC, SC-1, SV AND SV-1 RELAYS

CAUTION Before putting protective relays into service, remove all blocking which may have been inserted for the purpose of securing the parts during shipment, make sure that all moving parts operate freely, inspect the contacts to see that they are clean and close properly, and operate the relay to check the settings and electrical connections.

APPLICATION

The types SC and SC-1 current relays and the types SV and SV-1 voltage relays are applicable where an instantaneous plunger relay of high accuracy is required. These relays are suitable for protective service, and for auxiliary service where some of their special features are desired. They are adjustable over a wide range of voltage or current, are provided with mechanical operation indicators, and have a calibrated scale which indicates the pick-up setting. Both contacts can readily be changed from "make" to "break". The volt-ampere burden is low.

The type SC and SV relays have a high ratio of drop-out to pick-up (90 to 98%) and are particularly suitable for fault detector relays. The type SC-1 and SV-1 relays have a lower ratio of drop-out to pick-up. This lower ratio may be desirable in some applications, and it makes possible a plunger pull characteristic which permits the operation of a latching device. The latch is combined with the mechanical operation indicator, and prevents further motion of the moving contacts after the relay has operated.

CONSTRUCTION

The types SC, SC-1, SV and SV-1 relays operate on the solenoid principle. A U-shaped iron frame, mounted on the moulded base, supports the coil and serves as the external magnetic path for the coil. The coil surrounds a core and flux shunt. The upper end of the core is threaded and projects through the upper side of the frame, to which it is fastened by a nut. A tube threaded on the outside at its lower end is assembled in the core, and the threaded end extends below the core. * A graphite bushing, which is the lower bearing for the plunger shaft, is assembled in the lower end of this threaded tube. It is held in place by two split spring sleeves, one above and one below the bearing. The split sleeves must be compressed to insert them in the tube and they will remain at any position in which they are placed. The bearing for the upper end of the plunger shaft is a graphite bushing which is pressed in the upper end of the core. This bearing is visible when the plunger is in the energized position. The plunger itself does not touch the walls of the tube in which it moves.

A flux shunt which surrounds the core is screwed on the tube, and its lower end projects below the relay frame. The position of this shunt determines the pick-up setting of the relay. The lower end of the shunt is beveled and knurled, so that it can be grasped by the fingers and turned to change the setting. A calibrated scale plate is mounted adjacent to the shunt. A groove just above the knurl in the lower end of the shunt serves as an index mark, and the relay pick-up setting is indicated by the calibration scale marking which is adjacent to the groove.

The construction of the plunger, core and flux shunt (which differ in details in the various types of these relays) causes the plunger to float in its energized position,

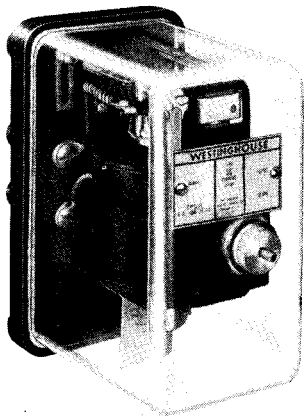
general purpose relays
with mechanical operation indicator

current operated • types SC and SC-1
voltage operated • types SV and SV-1

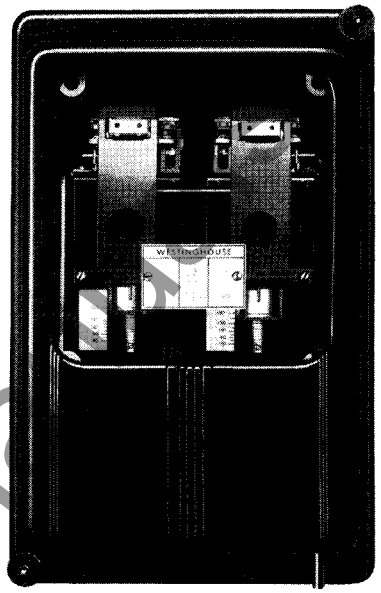
renewal parts data

41-766A1

page 1



single unit type SC in small projection glass case



double unit type SV in Flexitest case

relay type	rating amperes	rating volts	frequency	style number of relay — single unit: small glass projection case	single unit: Flexitest△ projection	single unit: Flexitest△ semi-flush	double unit: Flexitest△ projection	double unit: Flexitest△ semi-flush	style number of operating coil★
self reset relays									
SC	0.5-2	.....	a-c or d-c	1096 937	1273 987	1271 987	1274 347	1272 347	**1003 396**
SC	1-4	.....	a-c or d-c	1096 938	1273 989	1271 989	1274 349	1272 349	**1003 397**
SC	2-8	.....	a-c or d-c	1096 939	1273 991	1271 991	1274 351	1272 351	**1003 398**
SC	4-16	.....	a-c or d-c	1096 940	1273 993	1271 993	1274 353	1272 353	**1003 399**
SC	10-40	.....	a-c or d-c	1096 941	1273 995	1271 995	1274 355	1272 355	**1003 400**
SC	20-80	.....	a-c or d-c	1096 942	1273 997	1271 997	1274 357	1272 357	**1003 401**
SC	40-160	.....	a-c or d-c	1100 866	1273 999	1271 999	1274 359	1272 359	**1100 865**
SC	4-100	.....	a-c or d-c	1094 830	1274 029	1272 029	1274 389	1272 389	**1099 587**
SC-1	0.5-2	.....	a-c or d-c	1096 943	1274 001	1272 001	1274 361	1272 361	**1003 396**
SC-1	1-4	.....	a-c or d-c	1096 944	1274 003	1272 003	1274 363	1272 363	**1003 397**
SC-1	2-8	.....	a-c or d-c	1096 945	1274 005	1272 005	1274 365	1272 365	**1003 398**
SC-1	4-16	.....	a-c or d-c	1096 946	1274 007	1272 007	1274 367	1272 367	**1003 399**
SC-1	10-40	.....	a-c or d-c	1096 947	1274 009	1272 009	1274 369	1272 369	**1003 400**
SC-1	20-80	.....	a-c or d-c	1096 948	1274 011	1272 011	1274 371	1272 371	**1003 401**
SC-1	40-160	.....	a-c or d-c	1100 867	1274 013	1272 013	1274 373	1272 373	**1100 865**
SC-1	4-100	.....	a-c or d-c	1100 864	1274 031	1272 031	1274 391	1272 391	**1099 587**
SV	.....	70-160	60 cycle	1096 955	1274 085	1272 085	1274 399	1272 399	**1003 403**
SV	.....	70-160	50 cycle	1096 956	....	....	....	....	**1003 404**
SV	.....	70-160	25 cycle	1096 957	....	....	....	....	**1003 405**
SV	.....	140-320	60 cycle	1724 993	1955 044	....	....	....	**1163 631**
SV	.....	280-640	60 cycle	1876 916	....	....	....	....	**1878 863**
SV	.....	50-150	d-c	1096 958	1274 079	1272 079	1274 393	1272 393	**1003 406**
SV	.....	100-300	d-c	1731 455	....	....	....	....	**1333 916**
SV-1	.....	70-160	60 cycle	1096 959	1274 093	1272 093	1274 407	1272 407	**1003 403**
SV-1	.....	70-160	50 cycle	1096 960	....	....	....	....	**1003 404**
SV-1	.....	70-160	25 cycle	1096 961	....	....	....	....	**1003 405**
SV-1	.....	50-150	d-c	1096 962	1274 087	1272 087	1274 401	1272 401	**1003 406**
SV-1	.....	100-300	d-c	1731 456	....	....	....	....	**1333 916**
hand reset relays									
SC-1	0.5-2	.....	a-c or d-c	1096 949	1274 015	1272 015	1274 375	1272 375	**1003 396**
SC-1	1-4	.....	a-c or d-c	1096 950	1274 017	1272 017	1274 377	1272 377	**1003 397**
SC-1	2-8	.....	a-c or d-c	1096 951	1274 019	1272 019	1274 379	1272 379	**1003 398**
SC-1	4-16	.....	a-c or d-c	1096 952	1274 021	1272 021	1274 381	1272 381	**1003 399**
SC-1	10-40	.....	a-c or d-c	1096 953	1274 023	1272 023	1274 383	1272 383	**1003 400**
SC-1	20-80	.....	a-c or d-c	1096 954	1274 025	1272 025	1274 385	1272 385	**1003 401**
SC-1	40-160	.....	a-c or d-c	1100 868	1274 027	1272 027	1274 387	1272 387	**1100 865**
SC-1	4-100	.....	a-c or d-c	1731 458	....	....	....	....	**1099 587**
SV-1	.....	70-160	60 cycle	1096 963	1274 101	1272 101	1274 415	1272 415	**1003 403**
SV-1	.....	70-160	50 cycle	1096 964	....	....	....	....	**1003 404**
SV-1	.....	70-160	25 cycle	1096 965	....	....	....	....	**1003 405**
SV-1	.....	50-150	d-c	1096 966	1274 095	1272 095	1274 409	1272 409	**1003 406**
SV-1	.....	100-300	d-c	1731 457	....	....	....	....	**1333 916**

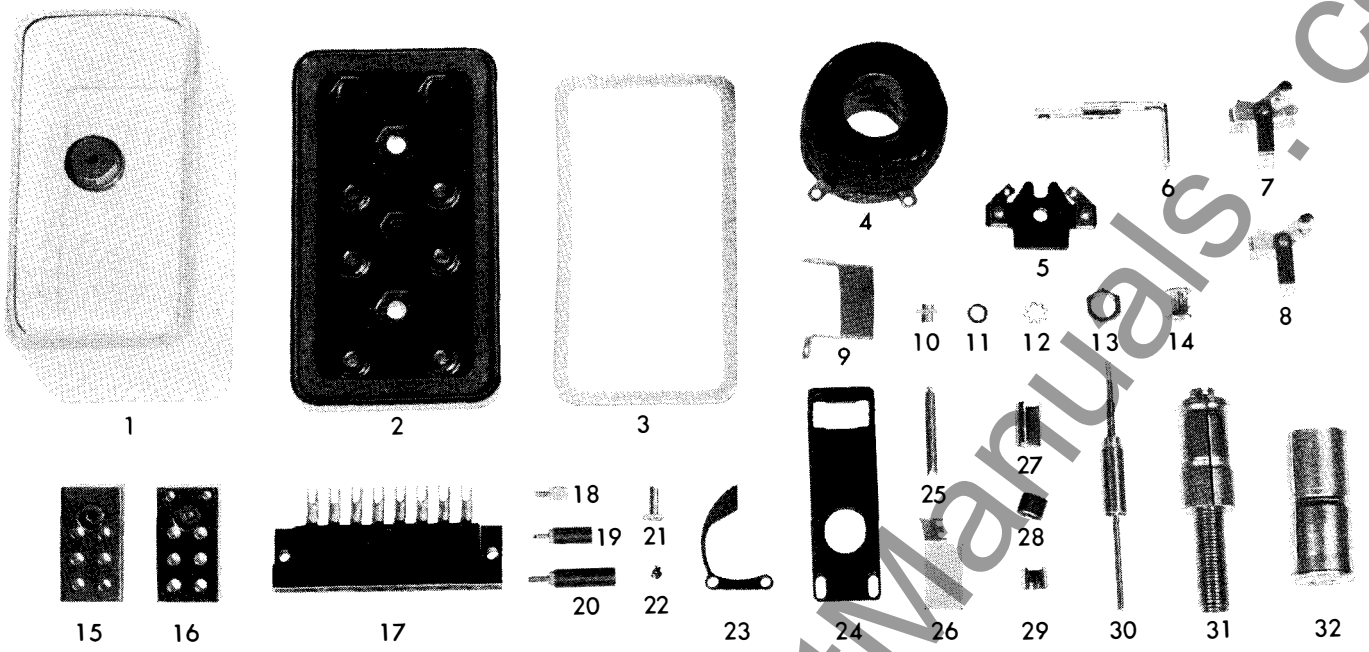
△ for Flexitest case parts refer to rpd 41-070A

★ recommended for stock

November, 1957

supersedes RPD 41-766A1 dated August, 1955

mailed to: E/685; D65-6A; C/601



reference number	description of part	style number of part
1	cover with nut for small glass case relays	629 939
2	base for small glass case relays	1097 217
3	gasket for the above case and base	1201 042
★4	operating coil	see pg 1
★5	moving contact assembly—self reset relays (one required per unit)	1730 181
★5	moving contact assembly—hand reset relays (one required per unit)	1730 182
★6	stationary contact assembly (two required per unit)	1097 234
7	operation indicator—hand reset relays	1341 061
8	operation indicator—self reset relays	1341 060
9	barrier	1156 014
10	nut for top of plunger	1269 640
11	washer on shaft in tube	1098 014
12	spring washer on shaft	321 406
13	nut to hold plunger assembly in frame	837 934
14	collar	1207 540
15	connector block	837 805
16	connector block	1337 887
17	tap block assembly	1003 644
18	tap screw	717 064
19	tap screw—insulated	1155 319
20	tap screw—insulated	1001 850
21	terminal for connector blocks	818 840
22	shoulder screw to mount locking spring	1731 904
23	locking spring	1726 080
24	spring for operation indicator	1002 163
25	guide post	1095 773
26	scale—blank	1725 937
27	upper retainer for lower bearing	1725 939
28	lower bearing	1725 940
29	lower retainer for lower bearing	1725 938
30	shaft and plunger assembly—a-c only	1207 231
30	shaft and plunger assembly—a-c or d-c or d-c only	1207 232
31	core and guide tube assembly with top bearing	
	for type SC a-c or d-c relays	1276 947
	for type SC-1 a-c or d-c relays	1276 946
	for type SV a-c relays	1276 948
	for type SV d-c relays	1276 947
	for type SV-1 a-c relays	1276 763
	for type SV-1 d-c relays	1276 946
32	shunt assembly	
	for types SV and SV-1 a-c relays	1097 231
	for all other relays	1097 230

★ recommended for stock

ordering information

- Name the part and give its style number.
- Give the complete nameplate reading.
- State method of shipment desired.
- Send all orders or correspondence to nearest sales office of the company.

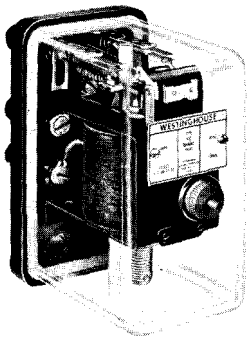
Westinghouse Electric Corporation
relay dept: meter division • Newark plant • Newark, N. J.
printed in U.S.A.

general purpose relays
instantaneous • adjustable

current: types SC, SC-1, SCT
voltage: types SV, SV-1, SVF, SVF-1

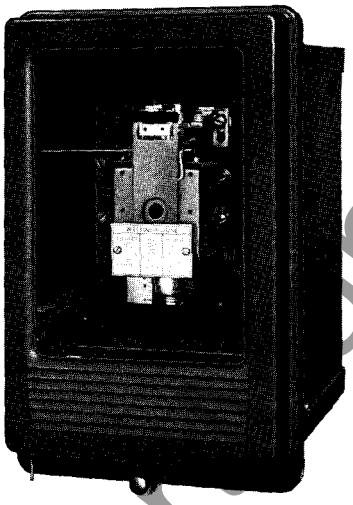
small glass projection case | **Flexitest case**

type SC
in rear-connected
small glass case

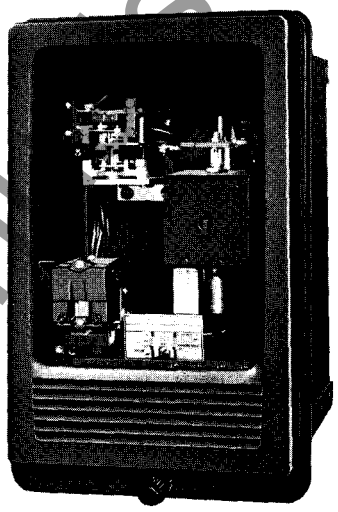


front-connected small glass case also available; see figure 3

type SC-1



type SCT



application

SC, SC-1, SV, SV-1

for fast operating protective or auxiliary service

(a-c relay trips in one cycle or less on 60 cycles, at 200% pick-up setting)

instantaneous protection of motors: To prevent damage from high current or low voltage under abnormal conditions, where time-delay relays would not operate fast enough.

fault detectors in system relaying: SC and SV relays can be used as fault detectors to supervise main protective relays. Typical application utilizes an SV voltage operated relay in generator back-up protection to supervise an overcurrent unit where it is desired to have the overcurrent unit set to operate on less than full load current when voltage falls below a predetermined value.

high-speed non-directional tripping: Where economically justified on the end of outlying feeder lines.

ground protection: Where fast operation is required. Types SC and SC-1 can be used on d-c to 60 cycle service without coil changeover. SV and SV-1 are supplied for either d-c, or 50-60 cycle a-c service.

SCT

For overcurrent protection where a definite time delay of 0-2 seconds is required.

SVF, SVF-1

Types SVF and SVF-1 relays are instantaneous voltage-operated relays calibrated to dropout or close their contacts when voltage drops to a predetermined value as determined by the relay setting. Both types have a maximum variation in dropout of ±5% of voltage setting and are independent of frequency over a range of 20 to 60 cycles.

typical application: Use as a supervising or interposing relay during initiation of bus transfer, where the SVF or SVF-1 responds to the residual voltage of the connected motor.

device numbers

	SC, SC-1	SCT	SV, SV-1	SVF, SVF-1
undercurrent	37	..	..	..
a-c overcurrent	50	50	..	..
d-c overcurrent	76	..	..	..
undervoltage	..	..	27	27
overvoltage	..	..	59	..

September, 1961
supersedes descriptive bulletin 41-765 dated October, 1959; and supplement, pages .01-.02, dated February, 1960
mailed to: E/326/DB; D/821/DB; C/377/DB

construction

Relays consist of a wound operating coil, magnetic shunt for adjustable pick-up or dropout (as determined by type of relay), stationary core, and moving plunger. The plunger floats in its energized position (centered in graphite bearings) without being held against a stop, or touching the walls of the tube. Consequently, noise is negligible on heavy overloads or 25-cycle operation.

types available

relay	operation	service		reset	
		pick-up	dropout	self	hand
SC	current	X	X	X	..
SC-1	current	X	X	X	X♦
SCT	current	X	..	X	..
SV	voltage	X	X	X	..
SV-1	voltage	X	X	X	X♦
SVF	undervoltage	..	X	X	..
SVF-1	undervoltage	..	X	X	..

♦ On these types, the plunger rises with enough force to latch itself in place and deflect the contacts sufficiently to prevent contact re-opening when the relay is de-energized.

SC and SC-1 relays can be used on d-c to 60 cycle service without coil changeover.

SCT relays are supplied for either 50 or 60 cycle a-c service.

SV and SV-1 relays are supplied for either d-c, or 50 or 60 cycle a-c service.

contact arrangement

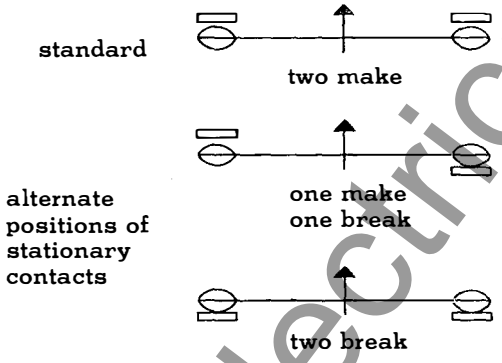


fig. 1

small glass projection case

rear-connected

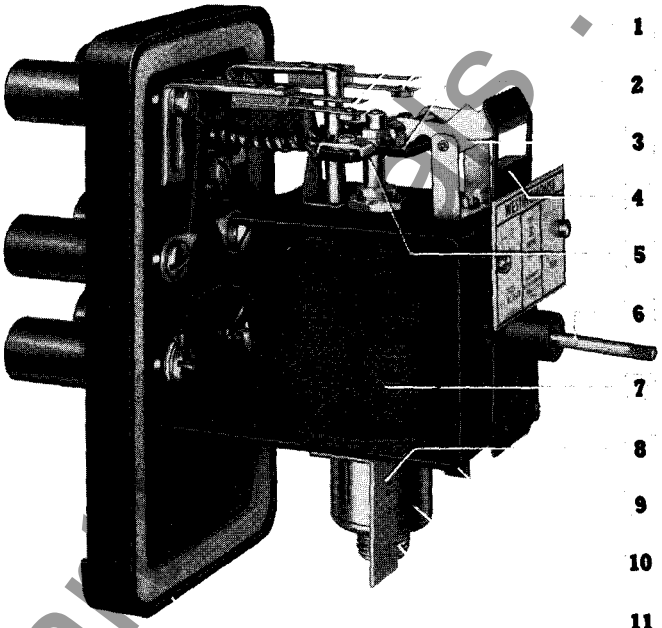


fig. 2

front-connected

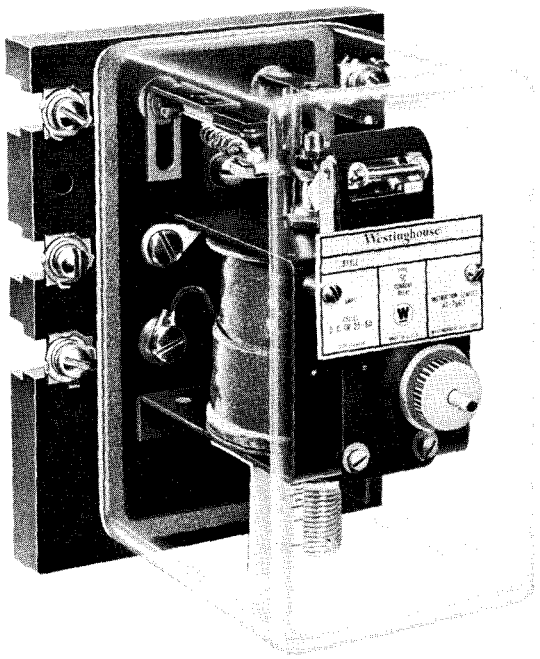


fig. 3

Flexitest universal case

type SC-1

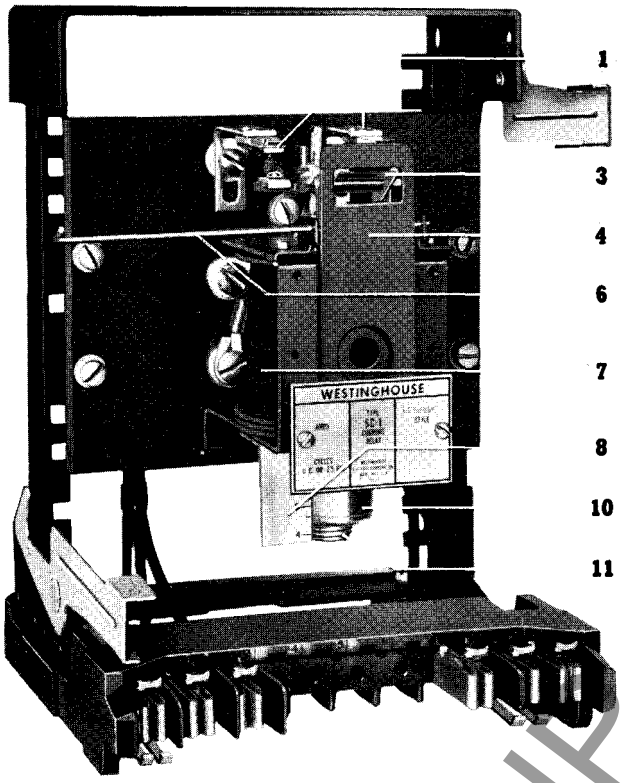


fig. 4

type SCT

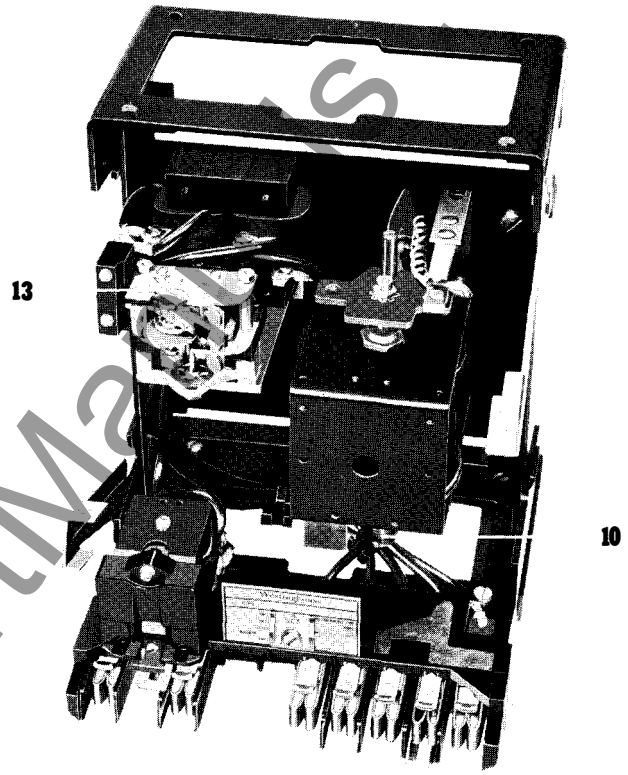


fig. 5

1 two independent reversible, silver stationary contacts

2 insulating moving contact arm with two silver contacts

3 operation indicator target, reversible to indicate up or down strokes (on hand-reset SC-1, SV-1 relays, target has extended lower lip to hold contacts closed until reset)

4 target latch

5 plunger

6 target reset

7 coil

8 calibrated scale

9 shunt locking device

10 adjustable magnetic shunt

11 core screw

12 one-piece molded base

13 moving contact arm pointer

adjustment

SC, SC-1, SV, SV-1: These types may be set for a specific value of **pick-up** by adjusting the magnetic shunt (item 10, fig. 2) to the desired value indicated on the calibrated scale. The relay may be set by test for desired dropout values.

SC and SC-1 relays have a normal current adjustment range of 4 to 1.

For use on extremely wide current ranges, SC and SC-1 relays with 4–100 amps range of adjustment are supplied with tapped coils. Taps are brought out to a tap block which has a connector plate marked with the minimum pick-up value of each tap. The relay shunt is adjustable over pick-up setting ranges listed below. On these relays, the adjustable scale plate is supplied blank so that the user can mark the individual relay settings desired.

SVF, SVF-1: On these types, the adjustable scale is calibrated in voltage dropout values.

pick-up adjustment range for 4–100 amp SC and SC-1 relays

tap setting	pick-up range
4 amps	4-16 amps
10 amps	10-40 amps
30 amps	30-100 amps

construction continued

specific SCT data

SCT relays are available in 10-40 ampere range, with 0-120 cycle (60 cycle base) time delay.

construction and operation

A type SC current unit is combined with a synchronous motor timing unit, which is actuated by a small saturating transformer.

The motor drives a moving contact arm (through a gear train) over a semi-circular arc. A pointer on the arm indicates the time delay on a calibrated scale at the top of the timer unit.

The synchronous motor has a floating rotor which is in mesh with the gear train only when energized. The rotor falls out of mesh instantly upon de-energization, permitting a spring to reset the moving contact arm.

adjustment

The SC instantaneous current unit is adjusted by setting the magnetic shunt (item 10, figure 5) to the desired value. The unit may also be set by test for a desired dropout value.

Time delay is adjusted by setting the moving contact arm pointer to the desired value on the calibrated scale (item 13, figure 5).

As the timing motor is controlled by the instantaneous unit contact, the trip circuit will not be energized until the timing unit has completed its timing cycle.

case

SCT relays are supplied in the FT-21 Flexitest universal case.

specific SVF, SVF-1 data

SVF and SVF-1 relays are available in single- or three-phase designs.

The single-phase design is used on balanced, three-phase applications whereas the three-phase type is recommended for applications where one or more of the phase voltages may be unbalanced by a fault on the system.

construction and operation

single-phase: Single-phase types consist of an SV or SV-1 voltage unit, a reactor, series resistor, and a full-wave rectifier. Insensitivity to frequency is obtained by operating the voltage unit on full-wave, rectified a-c voltage. The reactor in the a-c circuit is used to compensate for the tendency of the voltage unit to respond to the instantaneous voltage values and, as a result, drop out at higher r. m. s. values. The reactor causes the rectified current in the voltage unit to increase slightly as the frequency decreases, thereby maintaining a dropout value of approximately the same r. m. s. voltage over a 20 to 60 cycle frequency range.

The series resistor in the operating coil circuit minimizes the effect of relay coil temperature variation.

three-phase: Three-phase types consist of an SV or SV-1 voltage unit, a series resistor, and a three-phase bridge rectifier.

adjustment

The scale on both single- and three-phase types is calibrated in voltage drop-out values; 24 to 36 volts for type SVF, and 30 to 45 volts for the SVF-1.

A typical value of pick-up voltage for the SVF relay is 95 volts for a 45-volt dropout setting. A similar value for the SVF-1 is 100 volts for a 36-volt dropout setting.

Both types are designed for a nominal 120-volt system.

case

SVF and SVF-1 relays are available in the FT-21 Flexitest universal case only.

motor transfer schemes

On motor transfer schemes, the three-phase SVF or SVF-1 relay senses the magnitude of residual voltage in a motor, and allows transfer of the motor to an alternate supply source when the residual voltage has decreased to a value determined by the selected dropout voltage setting of the relay.

drop-out to pick-up ratio

Relays can be set for specific values of either pick-up or drop-out. For example, if a relay is adjusted for any pick-up value, the corresponding drop-out ratio will fall well within the limits given in the table below. This ratio will vary with different types of relays, as shown, or may change somewhat at different settings, but remains substantially constant at any one setting. Drop-out to pick-up ratio is closely repetitive at the same setting independent of the number of operations or temperature increase.

current relays: SC and SC-1

types	cycles:■	drop-out to pick-up ratios		range of pickup adjustment	max amp continuous	one-second rating in amperes	burden◆ 5 amp at 60 cycles	
		a-c	d-c	amps			watts	volt-amps
SC	d-c or 25 to 60	90-98%	65-80%	.5-2	1.5	70	99	225
				1-4	3	140	28	65
				2-8	6	280	6.9	19
				4-16	12	460	1.5	5
				10-40	25	460	.24	.7
				20-80	40🌡	460	.07	.16
				40-160	40🌡	460	.03	.05
				4-100✣	10-15-20	460	1.7-.6-.18	5-1-.2
SC-1	d-c or 25 to 60	35-60%	25-40%	.5-2	1.5	70	100	210
				1-4	3	140	24	60
				2-8	6	280	6	16
				4-16	12	460	1.5	5
				10-40	25	460	.25	.65
				20-80	40🌡	460	.07	.16
				40-160	40🌡	460	.03	.05
				4-100✣	10-15-20	460	1.7-.6-.18	5-1-.2

voltage relays: SV and SV-1

types	cycles	drop-out to pick-up ratios		range of adjustment	max volts continuous‡	burden◆ 120v, a-c or 125v, d-c	
		a-c	d-c	volts		watts	volt-amps
SV	60	90-98%	....	7-16	16	...	2.8+
	60	90-98%	....	70-160	160	3.4	7.3
	50	90-98%	....	70-160	180	2.8	6.1
	d-c	....	65-80%	50-150	150	4.8	...
	d-c	....	65-80%	100-300	300	1.11	...
SV-1	60	40-80%	....	70-160	160	4.1	8.5
	50	40-80%	....	70-160	180	3.5	7.1
	d-c	....	25-40%	50-150	150	4.8	...
	d-c	....	25-40%	100-300	300	1.11	...

■ Standard current relays are calibrated on 60 cycles. This calibration is correct for 25 cycle and d-c applications, within 10% to 15%.

◆ Values of watts and volt-amperes in the tables are average for various plunger and shunt positions.

‡ Maximum continuous volts for the a-c SV and SV-1 relays at **minimum** pick-up. At **maximum** pick-up the continuous voltage can be increased 10% to 20%.

🌡 Relays in Flexitest case have a maximum continuous current rating of 30 amperes.

✣ See page 3 for scale marking and adjustment ranges.

\+ At minimum pickup.

voltage relays: SVF, SVF-1

single phase

relays energized with 120 volts

relay type	frequency in cycles	volt-amperes burden‡
SVF	60	17
	25	18.5
SVF-1	60	17
	25	18.5

three phase

relays energized with 120 volts, balanced three-phase voltage

relay type	frequency in cycles	volt-amperes burden		
		phase A	phase B	phase C
SVF	60	9.6	9.6	9.6
	25	9.6	9.6	9.6
SVF-1	60	9.6	9.6	9.6
	25	9.6	9.6	9.6

‡ Values of volt-amperes listed are average values for various plunger and shunt positions.

additional burden data: SC, SC-1

relay	burden	at minimum pick-up			at multiples of minimum pick-up (60 cycles)			at maximum pick-up
		cycles		d-c				
		60	25		3	10	20	
SC	watts	1.0	0.65	0.57	..	...	...	multiply minimum values by 16
	volt-amps	3.4	1.4	....	31	240	770	
SC-1	watts	1.3	0.7	0.57	..	...	...	
	volt-amps	3.5	1.3	....	31	240	770	

contact rating: amps

SC, SC-1, SV, SV-1
SVF, SVF-1

control circuit		contacts will:		
volts	cycles	close	open	carry
120	60	30	5	5
125	d-c	30	1	5

time curves

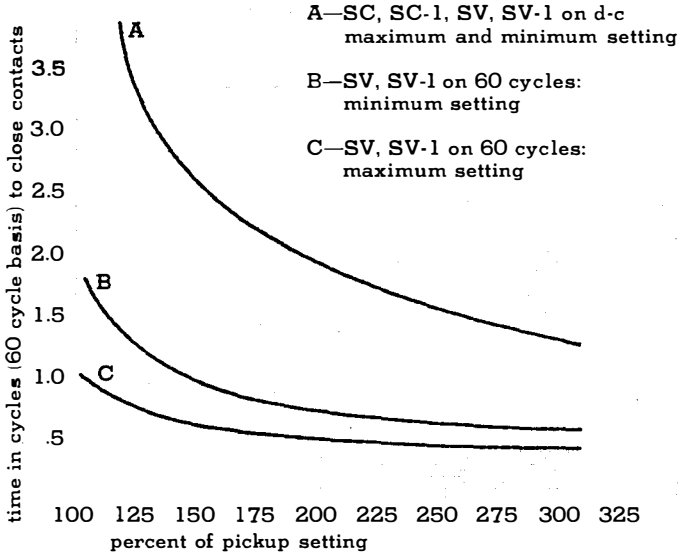


fig. 6

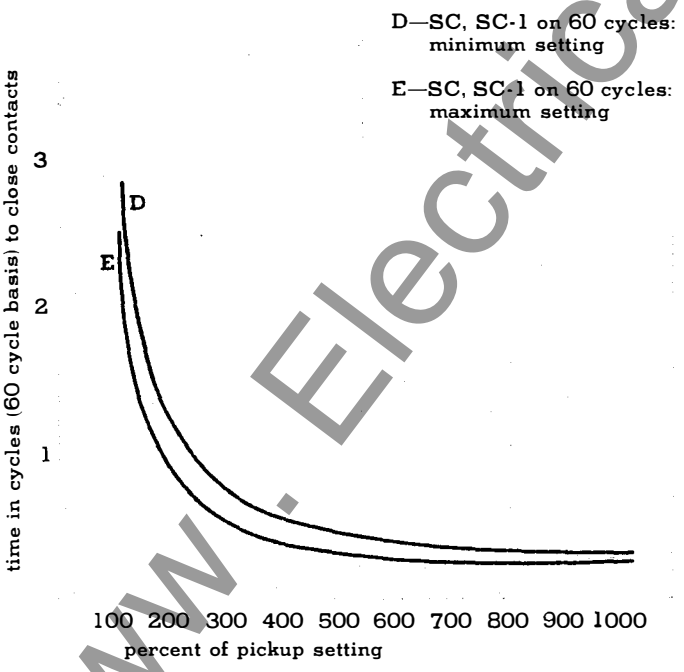


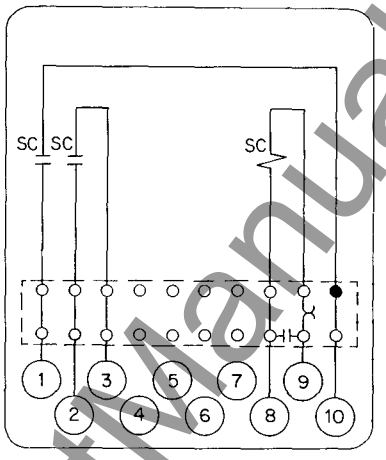
fig. 7

internal wiring front view

Flexitest case types

SC, SC-1 • current operated

single unit in FT-21 case



unit tapped for 4 to 100 amp range

Flexitest switch

current test jack

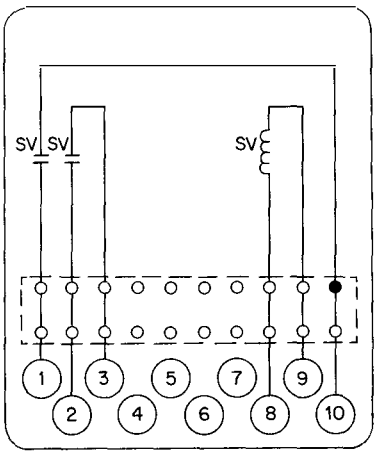
shorting switch

case terminals

fig. 8

SV, SV-1 • voltage operated

single unit in FT-21 case

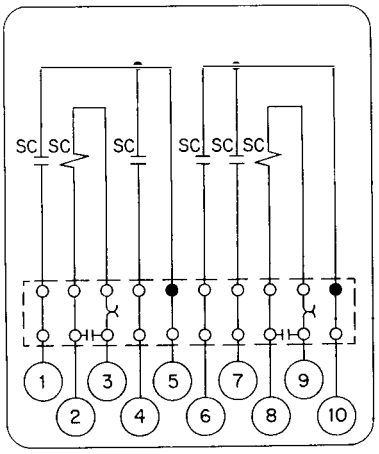


Flexitest switch

case terminals

fig. 11

two unit in FT-21 case



left unit

right unit

Flexitest switch

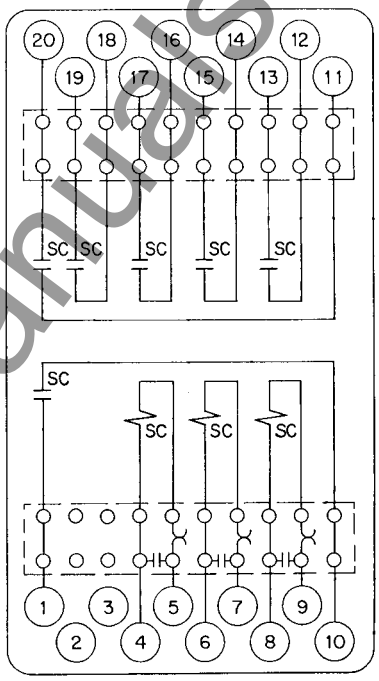
current test jack

shorting switch

case terminals

fig. 9

three unit in FT-32 case



top left unit

bottom unit

top right unit

current test jack

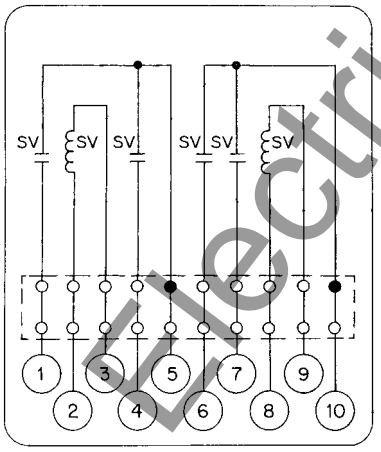
Flexitest switch

shorting switch

case terminals

fig. 10

two unit in FT-21 case



left unit

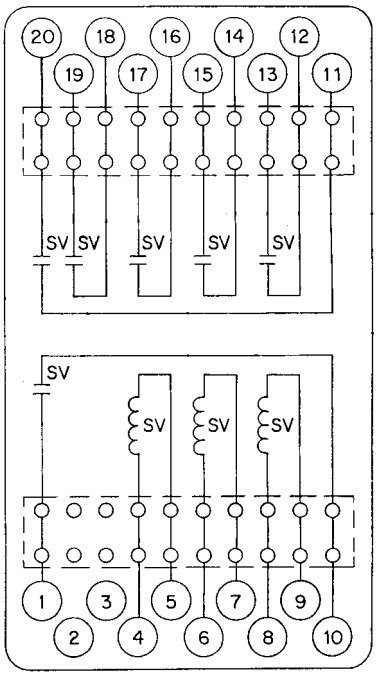
right unit

Flexitest switch

case terminals

fig. 12

three unit in FT-32 case



top left unit

bottom unit

top right unit

Flexitest switch

case terminals

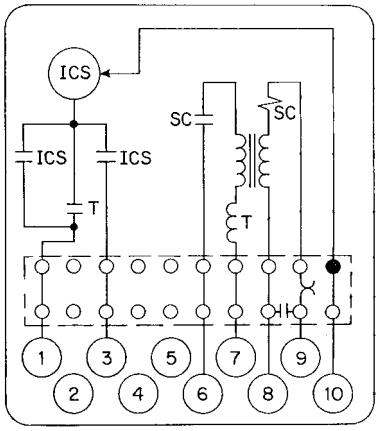
fig. 13

internal wiring front view

Flexitest case types, continued

SCT • current operated

adjustable definite time delay in FT-21 case

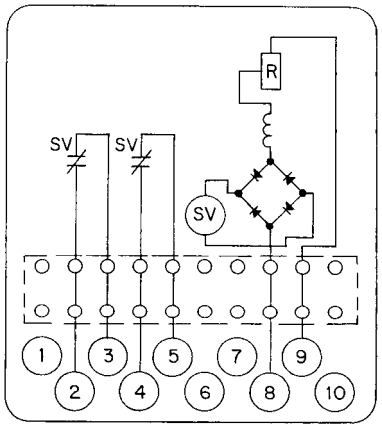


Indicating Contactor Switch
overcurrent unit
saturating transformer
timer unit
Flexitest switch
current test jack
shorting switch
case terminals

fig. 14

SVF, SVF-1 • undervoltage operated

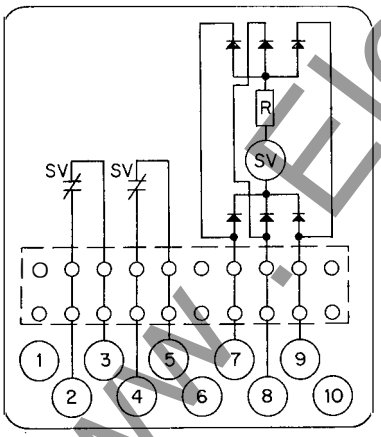
single phase in FT-21 case



resistor
reactor
Flexitest switch
case terminals

fig. 15

three phase in FT-21 case



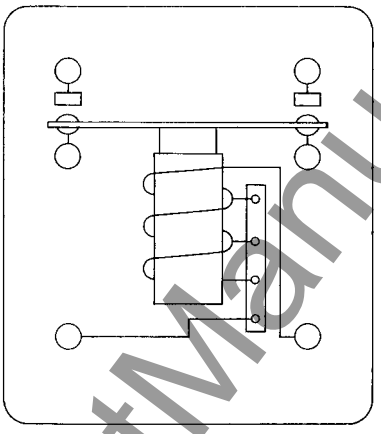
resistor
voltage unit
Flexitest switch
case terminals

fig. 16

small glass projection case types

SC, SC-1, SV, SV-1
current and voltage operated

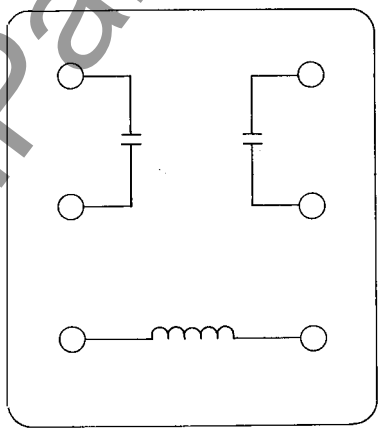
rear connected



terminals
stationary contacts
moving contacts
insulator support
tap block supplied only on 4—100 amp SC, SC-1 relays

fig. 17

front connected



terminals
contacts
coil

fig. 18

ordering information • list prices

see price list 41-020.

case dimensions

Flexitest case types: see descriptive bulletin 41-075.
Other case types: see descriptive bulletin 41-075A.

carton dimensions and weights

case type	no. of units	weight, lb net	weight, lb shipping	domestic shipping carton, in.
small glass	1	2	6	9½ x 10½ x 11
Flexitest: FT-21	1	10	13	9 x 12 x 13
	2	12	15	
FT-32	3	15	19	13 x 13 x 21
	4	18	22	

Westinghouse Electric Corporation
relay dept: meter division Newark plant Newark, N. J.
printed in U.S.A.

INSTALLATION • OPERATION • MAINTENANCE

INSTRUCTIONS

TYPES SC, SC-1, SV AND SV-1 RELAYS

CAUTION Before putting protective relays into service, remove all blocking which may have been inserted for the purpose of securing the parts during shipment, make sure that all moving parts operate freely, inspect the contacts to see that they are clean and close properly, and operate the relay to check the settings and electrical connections.

APPLICATION

The types SC and SC-1 current relays and the types SV and SV-1 voltage relays are applicable where an instantaneous plunger relay of high accuracy is required. These relays are suitable for protective service, and for auxiliary service where some of their special features are desired. They are adjustable over a wide range of voltage or current, are provided with mechanical operation indicators, and have a calibrated scale which indicates the pick-up setting. Both contacts can readily be changed from "make" to "break". The volt-ampere burden is low.

The type SC and SV relays have a high ratio of drop-out to pick-up (90 to 98%) and are particularly suitable for fault detector relays. The type SC-1 and SV-1 relays have a lower ratio of drop-out to pick-up. This lower ratio may be desirable in some applications, and it makes possible a plunger pull characteristic which permits the operation of a latching device. The latch is combined with the mechanical operation indicator, and prevents further motion of the moving contacts after the relay has operated.

CONSTRUCTION

The types SC, SC-1, SV and SV-1 relays operate on the solenoid principle. A U-shaped iron frame, mounted on the moulded base, supports the coil and serves as the external magnetic path for the coil. The coil surrounds a core and flux shunt. The upper end of the core is threaded and projects through the upper side of the frame, to which it is fastened by a nut. A tube threaded on the outside at its lower end is assembled in the core, and the threaded end extends below the core.* A graphite bushing, which is the lower bearing for the plunger shaft, is assembled in the lower end of this threaded tube. It is held in place by two split spring sleeves, one above and one below the bearing. The split sleeves must be compressed to insert them in the tube and they will remain at any position in which they are placed. The bearing for the upper end of the plunger shaft is a graphite bushing which is pressed in the upper end of the core. This bearing is visible when the plunger is in the energized position. The plunger itself does not touch the walls of the tube in which it moves.

A flux shunt which surrounds the core is screwed on the tube, and its lower end projects below the relay frame. The position of this shunt determines the pick-up setting of the relay. The lower end of the shunt is beveled and knurled, so that it can be grasped by the fingers and turned to change the setting. A calibrated scale plate is mounted adjacent to the shunt. A groove just above the knurl in the lower end of the shunt serves as an index mark, and the relay pick-up setting is indicated by the calibration scale marking which is adjacent to the groove.

The construction of the plunger, core and flux shunt (which differ in details in the various types of these relays) causes the plunger to float in its energized position,

EFFECTIVE AUGUST 1956

SUPERSEDES I. L. 41-380K
*Denotes change from previous issue.

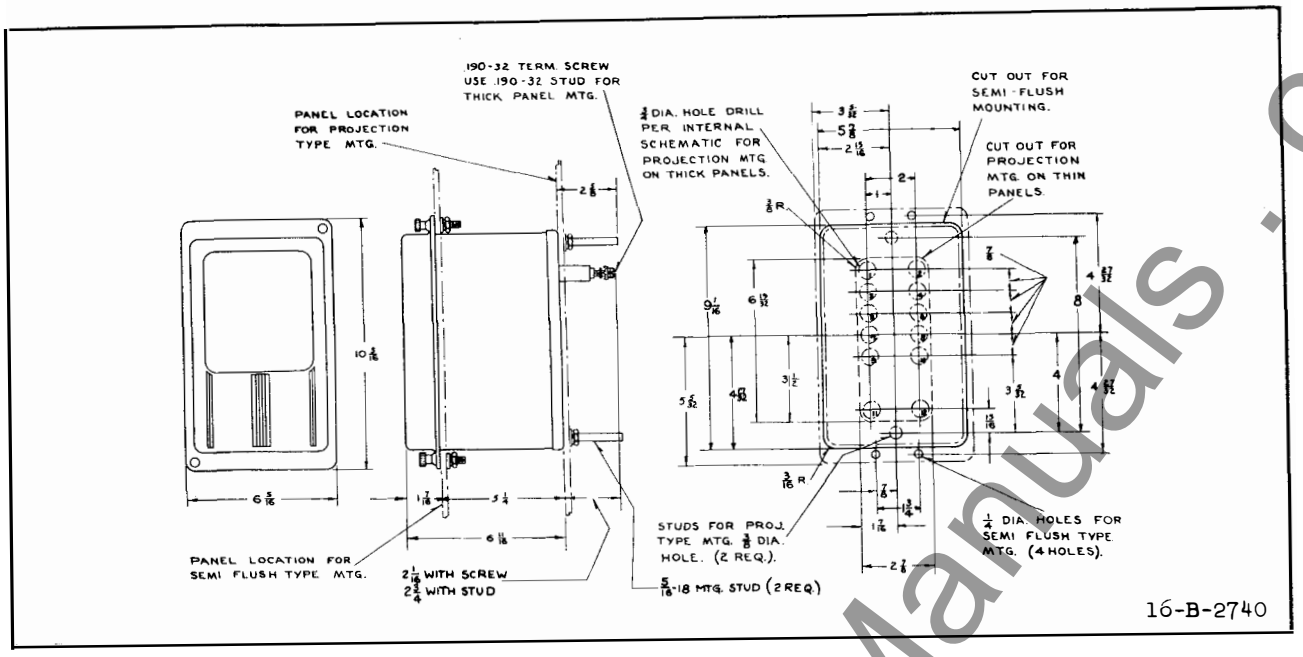


Fig. 10—Outline And Drilling Plan Of The Relays In The S-10 Semi-Flush Or Projection Type FT Flexitest Case. See The Internal Schematic For The Terminals Supplied. For Reference Only.

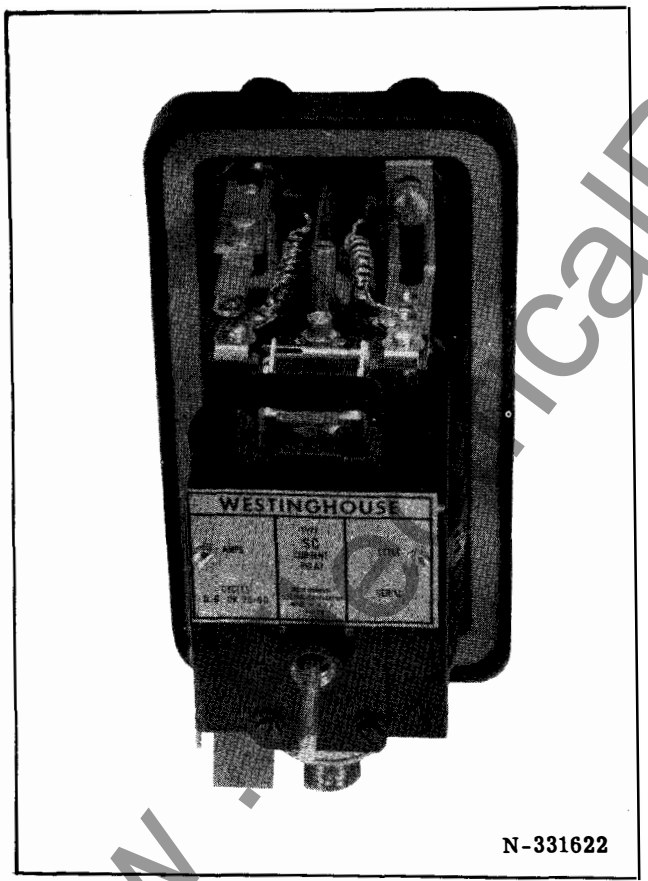


Fig. 11—View Of Type SC Relay Showing Correct Shaping Of Moving Contact Leads.

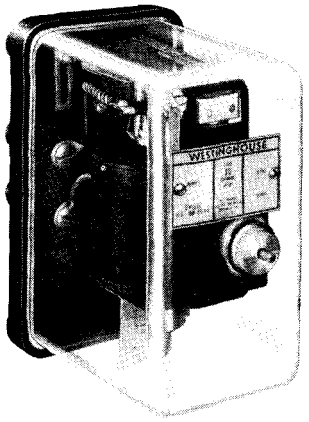
and the top of the core. This dimension should be 3/16" on the SV-1 relay for A-C. Both contacts should touch at the same time when the plunger is raised. When the plunger is moved upward against its stop, there should be a slight deflection of the stationary contact stop springs, but this should not exceed 1/32". When the stationary contacts are reversed so that they are closed when the relay is de-energized, they should be located so that they just touch the moving contacts when the latter are 1/32" above the de-energized position. On some relays it may be found that when the contacts are used in this position the relay may operate at values a few percent below the scale markings. The adjustments specified for the stationary contacts are important. Failure to observe them may cause improper relay operation, either directly or after a period of service. Contact position should not be used as a means of altering the ratio of dropout to pickup.

RENEWAL PARTS

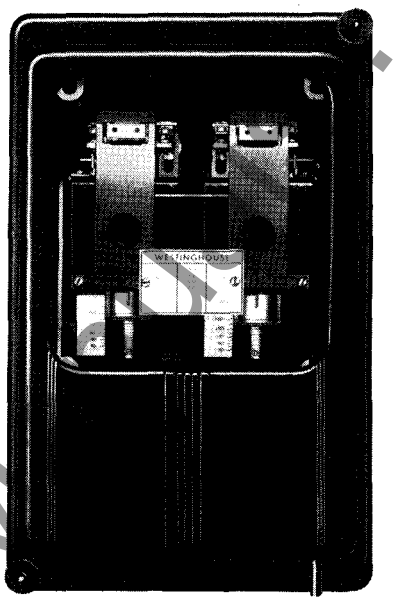
Repair work can be done most satisfactorily at the factory. However, interchangeable parts can be furnished to the customers who are equipped for doing repair work. When ordering parts, always give the complete name-plate data.

general purpose relays
with mechanical operation indicator

current operated • types SC and SC-1
voltage operated • types SV and SV-1



single unit type SC in small projection glass case



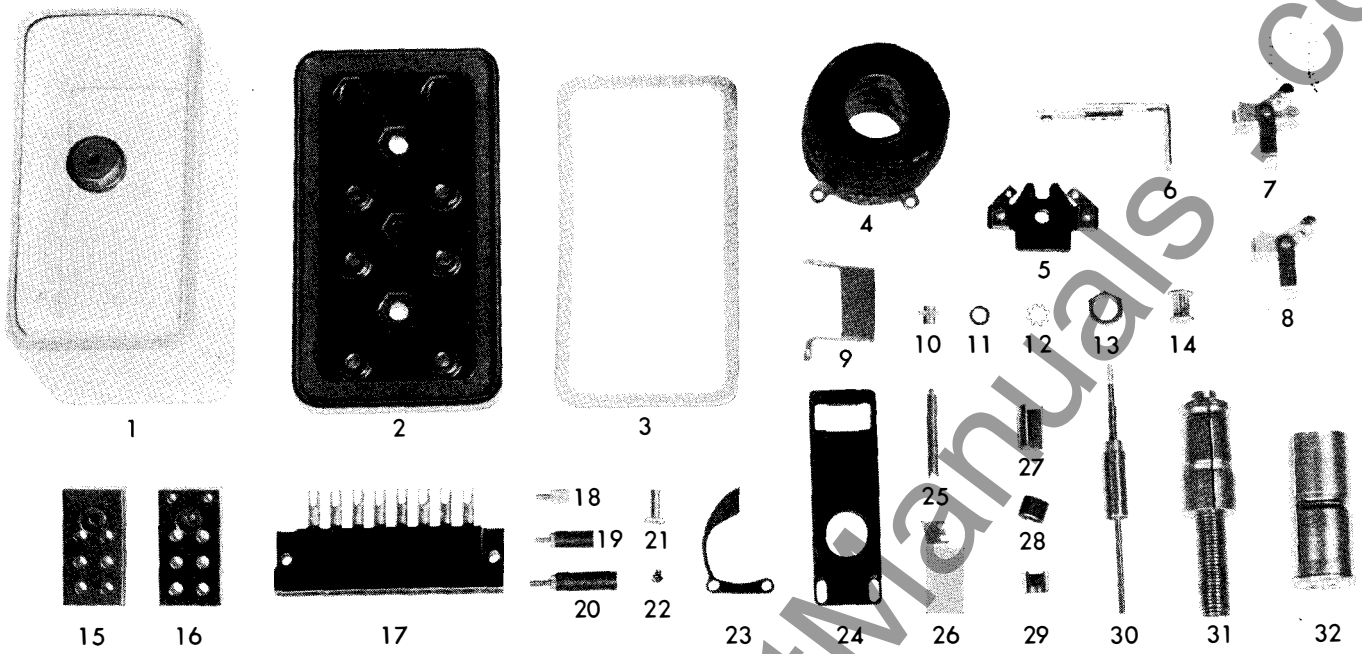
double unit type SV in Flexitest case

relay type	rating amperes	rating volts	frequency	style number of relay — single unit: small glass projection case	single unit: Flexitest△ projection	single unit: Flexitest△ semi-flush	double unit: Flexitest△ projection	double unit: Flexitest△ semi-flush	style number of operating coil ★
self reset relays									
SC	0.5-2	.....	a-c or d-c	1096 937	1273 987	1271 987	1274 347	1272 347	**1003 396**
SC	1-4	.....	a-c or d-c	1096 938	1273 989	1271 989	1274 349	1272 349	**1003 397**
SC	2-8	.....	a-c or d-c	1096 939	1273 991	1271 991	1274 351	1272 351	**1003 398**
SC	4-16	.....	a-c or d-c	1096 940	1273 993	1271 993	1274 353	1272 353	**1003 399**
SC	10-40	.....	a-c or d-c	1096 941	1273 995	1271 995	1274 355	1272 355	**1003 400**
SC	20-80	.....	a-c or d-c	1096 942	1273 997	1271 997	1274 357	1272 357	**1003 401**
SC	40-160	.....	a-c or d-c	1100 866	1273 999	1271 999	1274 359	1272 359	**1100 865**
SC	4-100	.....	a-c or d-c	1094 830	1274 029	1272 029	1274 389	1272 389	**1099 587**
SC-1	0.5-2	.....	a-c or d-c	1096 943	1274 001	1272 001	1274 361	1272 361	**1003 396**
SC-1	1-4	.....	a-c or d-c	1096 944	1274 003	1272 003	1274 363	1272 363	**1003 397**
SC-1	2-8	.....	a-c or d-c	1096 945	1274 005	1272 005	1274 365	1272 365	**1003 398**
SC-1	4-16	.....	a-c or d-c	1096 946	1274 007	1272 007	1274 367	1272 367	**1003 399**
SC-1	10-40	.....	a-c or d-c	1096 947	1274 009	1272 009	1274 369	1272 369	**1003 400**
SC-1	20-80	.....	a-c or d-c	1096 948	1274 011	1272 011	1274 371	1272 371	**1003 401**
SC-1	40-160	.....	a-c or d-c	1100 867	1274 013	1272 013	1274 373	1272 373	**1100 865**
SC-1	4-100	.....	a-c or d-c	1100 864	1274 031	1272 031	1274 391	1272 391	**1099 587**
SV	.....	70-160	60 cycle	1096 955	1274 085	1272 085	1274 399	1272 399	**1003 403**
SV	.....	70-160	50 cycle	1096 955	....	....	....	....	**1003 404**
SV	.....	70-160	25 cycle	1096 957	....	....	....	....	**1003 405**
SV	.....	140-320	60 cycle	1724 993	1955 044	....	....	....	**1163 631**
SV	.....	280-640	60 cycle	1876 916	....	....	....	....	**1878 863**
SV	.....	50-150	d-c	1096 958	1274 079	1272 079	1274 393	1272 393	**1003 408**
SV	.....	100-300	d-c	1731 455	....	....	....	....	**1333 916**
SV-1	.....	70-160	60 cycle	1096 959	1274 093	1272 093	1274 407	1272 407	**1003 403**
SV-1	.....	70-160	50 cycle	1096 960	....	....	....	....	**1003 404**
SV-1	.....	70-160	25 cycle	1096 961	....	....	....	....	**1003 405**
SV-1	.....	50-150	d-c	1096 962	1274 087	1272 087	1274 401	1272 401	**1003 406**
SV-1	.....	100-300	d-c	1731 456	....	....	....	....	**1333 916**
hand reset relays									
SC-1	0.5-2	.....	a-c or d-c	1096 949	1274 015	1272 015	1274 375	1272 375	**1003 396**
SC-1	1-4	.....	a-c or d-c	1096 950	1274 017	1272 017	1274 377	1272 377	**1003 397**
SC-1	2-8	.....	a-c or d-c	1096 951	1274 019	1272 019	1274 379	1272 379	**1003 398**
SC-1	4-16	.....	a-c or d-c	1096 952	1274 021	1272 021	1274 381	1272 381	**1003 399**
SC-1	10-40	.....	a-c or d-c	1096 953	1274 023	1272 023	1274 383	1272 383	**1003 400**
SC-1	20-80	.....	a-c or d-c	1096 954	1274 025	1272 025	1274 385	1272 385	**1003 401**
SC-1	40-160	.....	a-c or d-c	1100 868	1274 027	1272 027	1274 387	1272 387	**1100 865**
SC-1	4-100	.....	a-c or d-c	1731 458	....	....	....	....	**1099 587**
SV-1	.....	70-160	60 cycle	1096 963	1274 101	1272 101	1274 415	1272 415	**1003 403**
SV-1	.....	70-160	50 cycle	1096 964	....	....	....	....	**1003 404**
SV-1	.....	70-160	25 cycle	1096 965	....	....	....	....	**1003 405**
SV-1	.....	50-150	d-c	1096 966	1274 095	1272 095	1274 409	1272 409	**1003 406**
SV-1	.....	100-300	d-c	1731 457	....	....	....	....	**1333 916**

△ for Flexitest case parts refer to rpd 41-070A

★ recommended for stock

November, 1957
supersedes RPD 41-766A1 dated August, 1955
mailed to: E/685; D65-6A; C/601



reference number	description of part	style number of part
1	cover with nut for small glass case relays	629 939
2	base for small glass case relays	1097 217
3	gasket for the above case and base	1201 042
★4	operating coil	see pg 1
★5	moving contact assembly—self reset relays (one required per unit)	1730 181
★5	moving contact assembly—hand reset relays (one required per unit)	1730 182
★6	stationary contact assembly (two required per unit)	1097 234
7	operation indicator—hand reset relays	1341 061
8	operation indicator—self reset relays	1341 060
9	barrier	1156 014
10	nut for top of plunger	1269 640
11	washer on shaft in tube	1098 014
12	spring washer on shaft	321 406
13	nut to hold plunger assembly in frame	837 934
14	collar	1207 540
15	connector block	837 805
16	connector block	1337 887
17	tap block assembly	1003 644
18	tap screw	717 064
19	tap screw—insulated	1155 319
20	tap screw—insulated	1001 850
21	terminal for connector blocks	818 840
22	shoulder screw to mount locking spring	1731 904
23	locking spring	1726 080
24	spring for operation indicator	1002 163
25	guide post	1095 773
26	scale—blank	1725 937
27	upper retainer for lower bearing	1725 939
28	lower bearing	1725 940
29	lower retainer for lower bearing	1725 938
30	shaft and plunger assembly—a-c only	1207 231
30	shaft and plunger assembly—a-c or d-c or d-c only	1207 232
31	core and guide tube assembly with top bearing	
	for type SC a-c or d-c relays	1276 947
	for type SC-1 a-c or d-c relays	1276 946
	for type SV a-c relays	1276 948
	for type SV d-c relays	1276 947
	for type SV-1 a-c relays	1276 763
	for type SV-1 d-c relays	1276 946
32	shunt assembly	
	for types SV and SV-1 a-c relays	1097 231
	for all other relays	1097 230

★ recommended for stock

ordering information

- Name the part and give its style number.
- Give the complete nameplate reading.
- State method of shipment desired.
- Send all orders or correspondence to nearest sales office of the company.

Westinghouse Electric Corporation
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