ABB Power T&D Company Inc.
Relay Division
Coral Springs, FL
Allentown, PA

July, 1991
Supersedes DB 41-765, pages 1-8,
dated May, 1987
Mailed to: E, D, C/41-200A

Device Number: 27 or 59

Types SV, SV-1, SVF, SVF-1 Instantaneous Adjustable Voltage Relays

Application

The Types SV, SV-1 voltage relays are suitable for any application where an instantaneous plunger relay of high accuracy is required. These relays are utilized for protective service, and for auxiliary service where some of their features are desired.

The Type SV line of relays is adjustable over a wide range of voltage. Each relay is provided with a mechanical operation indicator and a calibrated scale to indicate the pick-up setting.

The high drop-out to pick-up ratio (85-98%) of the Type SV relay make it particularly suitable for use as fault detectors to supervise main protective relays. A typical application involves an SV voltage operated relay in a generator back-up protection scheme. The SV is used to supervise an overcurrent unit, when the overcurrent unit is to operate on less than full load current if the voltage drops below a predetermined level.

The Type SV-1 has a lower ratio of drop-out to pick-up. This lower ratio makes possible a plunger pull characteristic which permits operation of a latching device.

These relays must not be used in critical applications where they may be picked-up for prolonged periods of time.

Additional Applications
Instantaneous motor protection: To prevent low voltage damage, where time-delay relays would not operate fast enough.
High-speed non-directional tripping: Where economically justified on the end of outlying feeder lines.
Ground protection: Types SV and SV-1 are supplied for either dc or 50-60 Hz service.

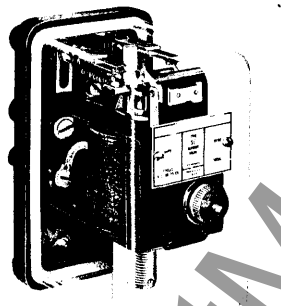
The SVF and SVF-1 type relays are recommended for applications where drop-out is independent of frequency. Drop-out is adjustable over the range of 30-45 and 24-36 volts for the SVF and SVF-1 respectively, with a maximum drop-out variation of ±5% between 20 and 60 Hertz.

Where the relay is required to operate only during balanced 3-phase conditions, the single-phase SVF or SVF-1 is suitable. Where balanced conditions may not exist when relay operation is required, the 3-phase relay design is recommended.

For supervising initiation of bus transfer, where the undervoltage relay is measuring the residual voltage of the motor load, the 3-phase SVF or SVF-1 is recommended, since one or more phase voltages may be reduced by a fault on the supply circuit prior to transfer.

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

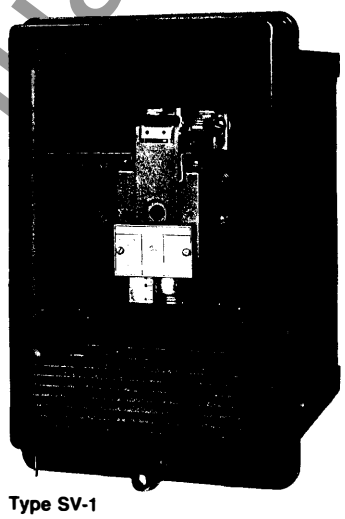
Small Glass Projection Case



Type SV

In Rear-Connected Small Glass Case

Flexitest① Case



Type SV-1

Device Numbers

	SV, SV-1	SVF, SVF-1
Undervoltage	27	27
Overvoltage	59	..

Construction

These relays consist of a wound operating coil, a magnetic shunt for adjustable pick-up or drop-out (determined by relay type), a stationary core, and a moving plunger.

Types Available

Relay	Operation	Service		Reset	
		Pick-up	Dropout	Self	Hand
SV	Voltage	X	X	X	..
SV-1	Voltage	X	X	X	①
SVF	Undervoltage	..	X	X	..
SVF-1	Undervoltage	..	X	X	..

① 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.

Adjustment

Types SV, SV-1
These types may be set for a specific value of pick-up by adjusting the magnetic shunt to the desired value indicated on the calibrated scale. The relay may be set by test for desired drop-out values.

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

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

Both types designed for a nominal 120-volt system.

Types SV, 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.

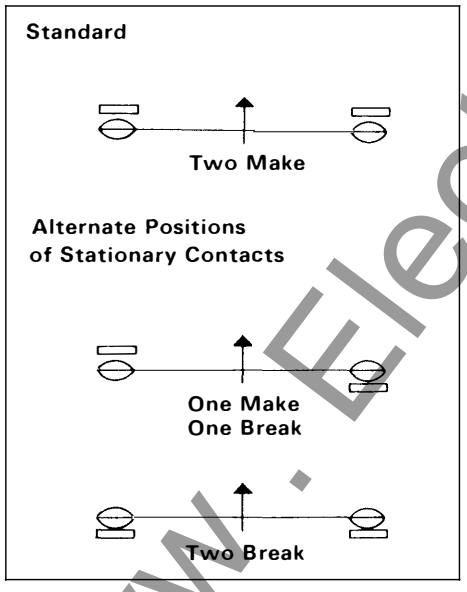
Construction and Operation
Single-Phase: Single-phase types consist of an SV or SV-1 voltage unit, a reactor, series resistor, and a full-wave rectifier. Insensitivity to frequency is obtained by operating the voltage unit on full-wave, rectified ac voltage. The reactor in the ac circuit is used to compensate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

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

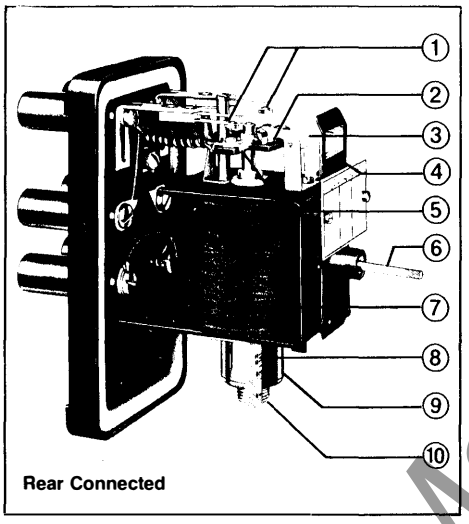
Three-Phase: Three-phase types consist of an SV or SV-1 voltage unit, a series resistor, and a three-phase bridge rectifier.

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

Contact Arrangement

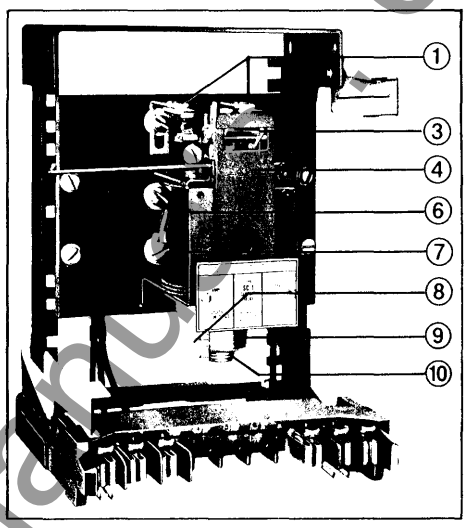


Small Glass Projection Case



Rear Connected

Flexitest Universal Case



① **Two independent, reversible, stationary contacts**

② **Moving contact arm with two contacts**

③ **Operation indicator, reversible to indicate up or down strokes**

④ **Target latch**

⑤ **Plunger**

⑥ **Target reset**

⑦ **Coil**

⑧ **Calibrated scale**

⑨ **Adjustable magnetic shunt**

⑩ **Core Screw**

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.

Voltage Relays: SV and SV-1

Type	Frequency Hz	Range of Adjustment Volts	Maximum Volts Continuous③	Watts at 115 V Ac② (125 V for Dc)	Volt-Amperes at 115 V	Dropout Ratio
SV	60	7-16	16	—	—	85-98%
	60	70-160	160	3.4	7.3	85-98%
	60	140-320	320	—	—	85-98%
	60	280-640	640	—	—	85-98%
	50	70-160	180	2.8	6.1	85-98%
	25	70-160	200	1.5	2.5	85-98%
	Dc	50-150	150	4.8	—	65-80%
	Dc	100-300	300	—	—	65-80%
SV-1	60	7-16	16	—	—	40-80%
	60	70-160	160	4.1	8.5	40-80%
	60	140-320	320	—	—	40-80%
	60	280-640	640	—	—	40-80%
	50	70-160	180	3.5	7.1	40-80%
	25	70-160	200	1.4	3.2	40-80%
	Dc	50-150	150	4.8	—	25-40%
	Dc	100-300	300	—	—	25-40%

② Values of watts and volt-amperes in the tables are average for various plunger and shunt positions.

③ Maximum continuous volts given for the Ac SV and SV-1 are for the relays set at minimum pick-up. At maximum pick-up the continuous voltage can be increased 10% to 20%.

Voltage Relays: SVF and SVF-1

Single Phase

Relays Energized With 120 Volts

Relay Type	Frequency in Hertz	Volt-Amperes Burden①
SVF	60	17
	25	18.5
SVF-1	60	17
	25	18.5

① Values of volt-amperes listed are average values for various plunger and shunt positions.

Three Phase

Relays Energized with 120 Volts, Balanced Three-Phase Voltage

Relay Type	Frequency in Hertz	Volt-Amperes Burden①		
		Phase A	Phase B	Phase C
SVF	60	9.6	9.6	9.6
	25	9.6	9.6	9.6
SVF-1	60	98.6	9.6	9.6
	25	9.6	9.6	9.6

Time Curves

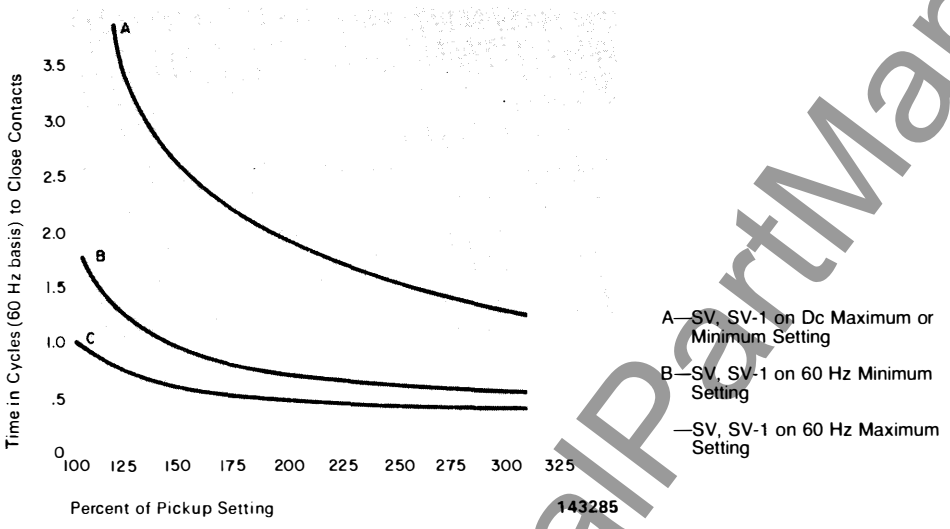


Fig. 1

Contact Rating: Amps

SV, SV-1, SVF, SVF-1

Control Circuit	Hertz	Contacts Will:		
Volts		Close	Open	Carry
120	60	30	5	5
125	Dc	30	1	5

Internal Wiring Diagrams, Flexitest Case Types

SV, SV-1 Voltage Operated

Single Phase in FT-21 Case

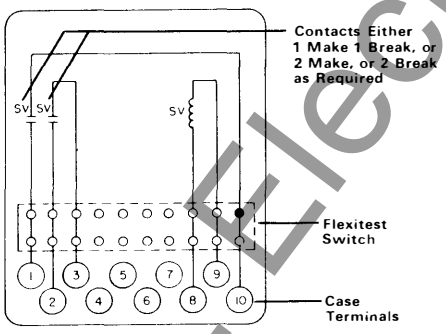


Fig. 2

Two Unit in FT-21 Case

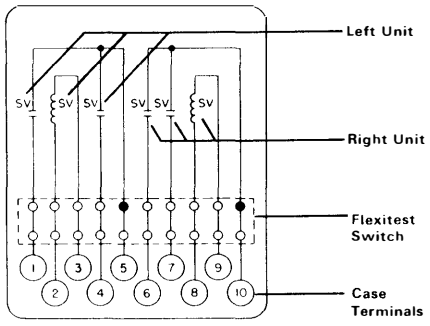


Fig. 3

Note: Contacts either make or break as required.

Three Phase in FT-21 Case

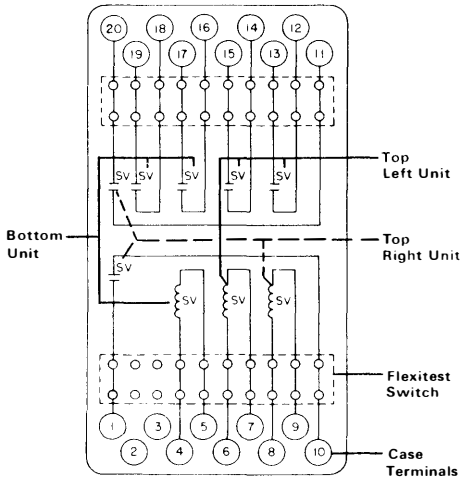


Fig. 4

Note: Contacts either make or break as required.

Internal Wiring Diagrams, Flexitest Case Types SVF, SVF-1 Under Voltage Operated

Single Phase in FT-21 Case

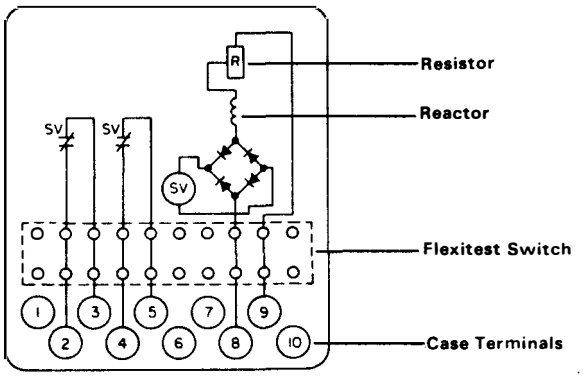


Fig. 5 184A193

Three Phase in FT-21 Case

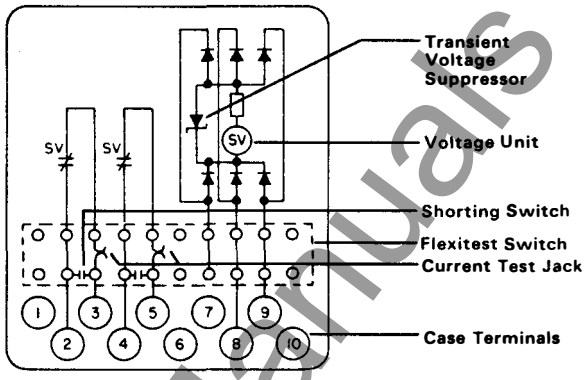


Fig. 6 629A138

Internal Wiring Diagrams, Small Glass Projection Case SVF, SVF-1 Under Voltage Operated

Rear Connected

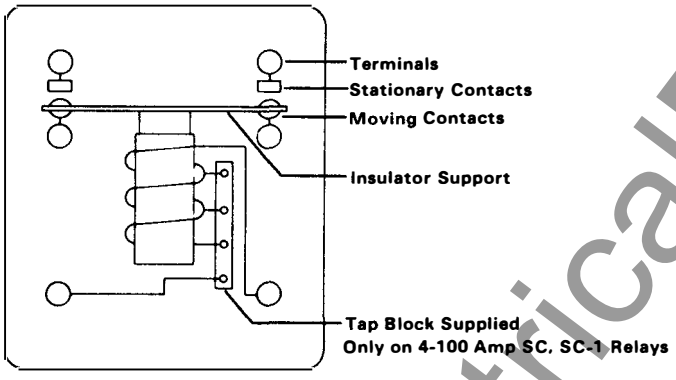


Fig. 7 871766

Front Connected

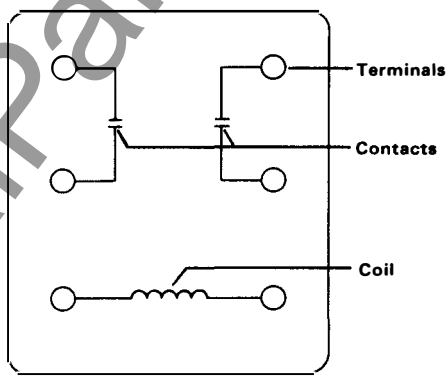


Fig. 8 184A942

Case Dimensions

Flexitest case types: See Descriptive Bulletin 41-076.
Other case types: see Descriptive Bulletin 41-080.

Further Information
List Prices: PL 41-020
Technical Data: TD 41-025
Instructions: SV, SV-1: IL 41-766.1;
SVF, SVF-1: IL 41-766.4
Other Protective Relays:
Application Selector Guide, TD 41-016

Carton Dimensions and Weights

Case Type	No. of Units	Weight, LB		Domestic Shipping Carton, in.
		Net	Shipping	
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	

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Supersedes TD 41-020, Types SV, SV-1, SVF, SVF-1 on pages 140-142, dated November, 1987
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Types SV, SV-1, SVF, SVF-1 Instantaneous Adjustable Voltage Relays

Instantaneous, Voltage Operated Mechanical Operation Indicator, Two Normally Open Contacts (Device Number: 59)
(Not to be used for continuously energized applications on Ac undervoltage.)

Flexitest Case Type

Type	Frequency Hertz	Adjustable Range: Volts	Dropout Ratio		Relay Data		
					Self-Reset		
			Ac	Dc	Internal Schematic	Style Number	Case Size
One Unit Per Case							
SV①	60	7-16	85-98%		182A856	1956 708	**FT-21**
		70-160				1876 094@	
		140-320				1876 095	
		280-640				1876 096	
	Dc	50-150		65-80%		1876 097	
		100-300				1876 098	
Two Units Per Case②							
SV①	60	70-160	85-98%		182A857	1876 099	**FT-21**
		140-320				1876 100	
		280-640				1876 101	
	Dc	50-150		65-80%		1876 102	
		100-300				1876 103	
Three Units Per Case②							
SV①	60	70-160	85-98%		183A192	1878 417	**FT-32**
		140-320				1878 418	
		280-640				1878 419	
	Dc	50-150		65-80%		1878 420	
		100-300				1878 421	

Small Glass Projection Type

Type	Frequency, Hertz	Adjustable Range: Volts	Dropout Ratio		Small Glass Projection Case	
					Internal Schematic	Self-Reset Style Number
			Ac	Dc		
Rear Connected (One Unit Per Case)						
SV①	60	7-16	85-98%		871766	1956 709
		70-160				1096 955
		140-320				1724 993
		280-640				1876 916
	Dc	50-150		65-80%		1096 958
		100-300				1731 455
Front Connected (One Unit Per Case)						
SV①	60	7-16	85-98%		184A942	292B402A09
		70-160				292B402A10@
		140-320				292B402A11@
		280-640				292B402A12
	Dc	50-150		65-80%		292B402A13
		100-300				292B402A14

@ Denotes item is "Qwik Ship" style. Qwik Ship is being phased in during 1990/1991. Check for availability.

① 50-Hertz relays and auxiliaries can be supplied at same price. Order "Similar to Style Number ....., except 50 Hertz".

② Relays can be supplied with different ratings on each unit. Choose from standard ratings listed. Use standard price. Order similar to style number of relay with rating desired for first unit and then specify other rating.

Instantaneous, Voltage Operated Mechanical Operation Indicator, Two Normally Open Contacts (Device Number: 59)

(Not to be used for continuously energized applications on Ac undervoltage.)

Flexitest Case Type

Type	Frequency Hertz	Adjustable Range: Volts	Dropout Ratio		Relay Data					
					Self-Reset			Hand Reset		
			Ac	Dc	Internal Schematic	Style Number	Case Size	Internal Schematic	Style Number	Case Size
One Unit Per Case										
SV-1①	60	70-160	40-80%		182A856	1876 104	**FT-21**	182A856	1876 114	**FT-21**
		140-320				1876 105			1876 115	
		280-640				1876 106			1876 116	
	Dc	50-150		25-40%		1876 107			1876 117	
		100-300				1876 108			1876 118	
Two Units Per Case										
SV-1①	60	70-160	40-80%		182A857	1876 109	**FT-21**	182A857	1876 119	**FT-21**
		140-320				1876 110			1876 120	
		280-640				1876 111			1876 121	
	Dc	50-150		25-40%		1876 112			1876 122	
		100-300				1876 113			1876 123	
Three Units Per Case②										
SV-1①	60	70-160	40-80%		183A192	1878 422	**FT-32**	183A192	1878 475	**FT-32**
		140-320				1878 423			1878 476	
		280-640				1878 424			1878 477	
	Dc	50-150		25-40%		1878 425			1878 478	
		100-300				1878 426			1878 479	

Small Glass Projection Type

Type	Frequency Hertz	Adjustable Range: Volts	Dropout Ratio		Small Glass Projection Case		
			Ac	Dc	Internal Schematic	Self-Reset Style Number	Hand Reset Style Number
Rear Connected (One Unit Per Case)							
SV-1①	60	70-160	40-80%		871766	1096 959	1096 963
		140-320				1876 917	1876 919
		280-640				1876 918	1876 920
	Dc	50-150		25-40%		1096 962	1096 966
		100-300				1731 456	1731 457
Front Connected (One Unit Per Case)							
SV-1①	60	70-160	40-80%		184A942	292B401A09	292B401A21
		140-320				292B401A10	292B401A22
		280-640				292B401A11	292B401A23
	Dc	50-150		25-40%		292B401A12	292B401A24
		100-300				292B401A13	292B401A25

① 50-Hertz relays and auxiliaries can be supplied at same price. Order "Similar to Style Number ....., except 50 Hertz".

② Relays can be supplied with different ratings on each unit. Choose from standard ratings listed. Use standard price. Order similar to style number of relay with rating desired for first unit and then specify other rating.

Undervoltage, Self-Reset, Constant Dropout Over 20 to 60 Hertz, Ac (Device Number: 27)

Type	Contacts	Voltage Rating			Phase	Relay Data		
		Nominal	Maximum Pickup	Dropout (Adjustable Calibrated Scale)		Internal Schematic	Style Number	Case Size
SVF	2 co	120	95 (at 45 volt dropout)	30 to 45	Single	184A796	1961 843	**FT-21**
SVF-1	Electrically independent		100 (at 36 volt dropout)	24 to 36	Single	184A796	1961 845	

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