

RECLOSING RELAY

INSTRUCTIONS

TYPE KSV MODEL A-1 & A-3



I-T-E CIRCUIT BREAKER COMPANY



INSTRUCTIONS FOR KSV RECLOSING RELAY MODEL A-1 & A-3

The KSV Relay is a reclosing relay that initiates either instantaneous or delayed breaker reclosing following tripping of the breaker by a protective relay. The KSV Relay is an electro-mechanical device having a timing motor, latching and unlatching relays, and cam operated switches to provide from one to three automatic reclosures in a timing cycle. Only one control voltage (the closing voltage of breaker) is required for operation. The relays are available with control voltages and timing cycles as shown in Table 1, Page 3. Unless otherwise specified, the relay is set at the factory to initiate reclosing at times of 1/4, 1/2 and 3/4 of the timing cycle. Contact ratings are shown in Table II, Page 3.

APPLICATION

The KSV Relay is suitable for use with all circuit breakers equipped as follows:

1. Operating Mechanism must be equipped with a latch-checking switch.
2. The closing circuit must incorporate a non-repetitive reclosing scheme.
3. The protective relay used to trip the breaker must open fast enough to prevent retripping of the breaker after an instantaneous reclosure.

For any reclosing application, it is imperative that the latest ASA standards be consulted to determine the operating factors for breaker interrupting ability when establishing a reclosing cycle.

RECEIVING

The KSV Relay is completely assembled and tested at the factory. Each relay is carefully inspected and packed by personnel experienced in the proper handling and packaging of electrical equipment.

When shipped separately, the relay should be examined to determine if any damage or loss was sustained during transit. Check the parts received against the packing list to make certain that no parts are missing. If the relay is damaged or a shortage is discovered, file a damage claim at once with the transportation company. Promptly notify the local representative of the I-T-E Circuit Breaker Company the nature and extent of loss. Include the purchase order number, the name of the transportation company and the bill of lading number. The I-T-E Circuit Breaker Company, though not responsible for damage to goods

after delivery to the carrier, will lend assistance to help secure adjustment if notified of such claims.

MOUNTING AND CONSTRUCTION

The KSV Relay is designed for surface, semi-flush, or spacer mounting. Dimensions and terminal arrangement are shown on Page 10. The operating parts of the relay are assembled on a phenolic plate which can be removed as a unit from the case. It includes the timing motor, latching and unlatching relays and calibrated dial with its associated cams and switches.

A window in the front cover gives visual observation of the calibrated dial with its adjustable components, mounted on the front of the plate as shown in Figure 1. The latch relay, unlatch relay, and motor are mounted on the rear of the plate as shown in Figure 2. The operating parts of the relay can be removed from the case as follows:

1. Remove the glass front cover and unscrew the four long hexagonal nuts in the corners of the plate.
2. Grasp the cam rotor firmly and pull straight out. The multi-pole plug inside the relay disconnects all the electrical connections located at the rear of the relay.

OPERATIONAL MODEL A-3

In Figure 1, three cams, "a", "b" and "c" operate switch C₁. They are adjustable, and provide for one, two or three automatic reclosures. Switch C₃ is operated by an adjustable cam "d" and energizes the unlatch relay. Another switch, C₂ is operated by a fixed cam "e". One contact of this switch stops the motor in the "START" position after completion of a complete timing cycle, which is one revolution of the dial. Another contact on this switch prevents energizing the latch relay (which starts the reclosing relay) until the relay has reset (returned to the "START" position).

Figure's 3 and 4 are schematic diagrams showing the operation of the KSV Model A-3 relay in reclosing schemes for spring operated and pneumatic mechanisms respectfully. The circuit elements inside the dotted area comprise the KSV Relay. "C" contacts are cam contacts and the "L" and "U" contacts are latch and unlatch relay contacts respectfully. The contacts are shown with the breaker "open", the unlatch relay armature closed, and the latch relay armature open, this being the "START" position for the KSV Relay.



The latch relay "L" and the unlatch relay "U" are mechanically interlocked. When either is energized, its armature is locked in the closed position by the armature of the other and remains closed even after it has been de-energized.

When the breaker is closed by the control switch, the CS/SC contact closes when the control switch handle returns to normal. Auxiliary switch "b", in series with the latch coil, is open. The KSV Relay is now in the "START" position and ready to start a reclosing cycle following tripping of the breaker by a protective relay. On a manual trip the control switch contact CS/SC prevents the latch relay "L" from being energized. When the breaker is tripped with the control switch, the control switch contact CS/O prevents the latch relay "L" from being energized.

When the breaker is tripped by a protective relay, the "b" auxiliary switch closes and energizes the latch relay "L" through contact C₂/2. The armature of the unlatch relay "U" is opened mechanically and the armature of the latch relay "L" is mechanically locked in the closed position. The latch relay "L" remains closed even if it is de-energized. The timing motor "M" is energized through contact L₂ to start a reclosing cycle. As soon as the motor starts and the dial rotates, cam "e" disengages switch C₂ and contact C₂/1 closes and C₂/2 opens. They remain in their respective positions until the KSV Relay resets (returns to the "START" position). Switch C₁, Figure 2, is momentarily closed by cam "a". Since contact L₁ is closed, the closing circuit of the breaker is energized and the breaker closes. For an instantaneous close, cam "a" would have to be set so that switch C₁ is closed when the KSV Relay is in the "START" position. The closing circuit of the breaker would then be energized as soon as the latch relay "L" is energized and contact L₁ closes. Cams "a", "b" and "c" operate switch C₁ to provide for 1 to 3 reclosures of the breaker. Once the motor has started it continues to run whether the reclosing attempts are successful or unsuccessful. Cam "d" operates switch C₃ and is set to close switch C₃ after the last reclosing attempt and before the KSV Relay returns to the "START" position. When switch C₃ closes, it energizes the unlatch relay "U" through contact L₂. Contact U₁ is a seal-in contact. Energizing the unlatch relay "U" mechanically unlatches the latch relay "L" and opens contact L₂.

If any of the reclosing attempts are successful and the breaker remains closed, the motor is energized through auxiliary switch "a" and contact C₂/1. The motor continues to run until the KSV Relay resets (returns to the "START" position), where cam "e" opens contact C₂/1 and stops the motor.

If the final reclosing attempt is unsuccessful and the breaker remains open, the motor stops since auxiliary

switch "a" in series with contact C₂/1 is open. The relay will then be in a "waiting" position. When the breaker is manually closed and stays closed, the timing motor is energized through the auxiliary switch "a". The dial rotates until the relay resets (returns to the "START" position). However, if the manual closing is not successful, the breaker is only closed for a few cycles. The motor will only run while the breaker is closed. Several closing attempts are possible depending on the setting of cam "d" with respect to cam "e". The relay will rotate on each attempt, inching towards the "START" position. This feature has been purposely built into the KSV relay. On unsuccessful manual closing attempts, it prevents the relay from resetting and starting a new automatic reclosing cycle. However, after the line has been cleared of the fault, and the breaker stays closed, the relay will reset (return to the "START" position). Contact L₃ is provided for cases when it is desirable to cut out the instantaneous trip elements of the over-current relays after the first opening of the breaker. The alarm circuit is made through contact U₂ to indicate if the breaker is open after the last reclosing attempt. Contact L₄ is an additional contact available for customer use.

OPERATIONAL MODEL A-1

The KSV Model A-1 Relay has been superseded by the KSV Model A-3. The KSV Model A-1 differs from the KSV Model A-3 in that the cam contact C₂/2 and the seal-in contact U₁ are not included in the Model A-1.

The KSV Model A-1 Relay requires for its operation an "f" auxiliary switch (auxiliary switch that makes momentarily only on opening stroke of the breaker). This switch is closed for about 0.05 second and is open when the breaker is open. Figures 5 and 6 are schematic diagrams showing the operation of the KSV Model A-1 Relay in reclosing schemes for spring operated and pneumatic mechanisms respectfully.

When the KSV Model A-1 Relay is connected as shown in Figures 5 and 6 with "a" auxiliary switch connected to terminal 9, it performs exactly the same as the KSV Model A-3. However, when the "a" auxiliary switch is omitted and a jumper connected between terminals 8 and 9, the motor, once started, will continue to run until the relay resets (reaches the "START" position) even when the last reclosing attempt is unsuccessful and the breaker is open.

The KSV Model A-3 will perform in exactly the same manner as the KSV Model A-1 providing an auxiliary switch "f" is used to replace the auxiliary switch "b" contact and the control switch CS/O contact.

Any KSV Model A-1 Relay can be converted to a Model A-3 by changing the internal wiring to put



contact C₂/2 in series with the latch relay coil as shown in Figures 2 and 3. This cam contact is part of the cam switch C₂. Seal-in contact U₁ will also have to be connected in parallel with contact C₃.

ADJUSTMENT

Cam "e" which actuates switch C₂, is not adjustable. It opens contact C₂/1 and closes contact C₂/2 when the relay is in the "START" position. The dial is calibrated in seconds, 360 angular degrees being 60, 120 or 240 seconds as determined by the timing motor's gear ratio. The motor has an accuracy of 5% and is equipped with a one way friction coupling. A resistor is used in the motor circuit for 125 and 250 VDC and 230 VAC. It is possible to turn the cam rotor, by hand, in a clockwise direction only. The cams are in the starting position when the arrow on the dial is lined up with the "START" arrow in the relay front plate. In this position the roller of switch C₂ is sitting on the fixed cam "e". To adjust any cam, except cam "e", loosen the three screws in the time dial and turn the cams to the desired positions. The reclosing switch C₁, which is actuated by three

independently adjustable cams "a", "b" and "c", can be set for instantaneous reclosing. This can be done by setting the roller of switch C₁ on one of these cam projections when the relay is in the "START" position. Delayed reclosing can be obtained by positioning these cams on the desired number of seconds counterclockwise from the "START" marking, on the calibrated dial. Cam "d" should always be set to actuate switch C₃ after the last reclosure but before the end of the timing cycle. When the cams are set, tighten the screws in the time dial and turn the dial clockwise to the "START" position. Energize the relay and allow it to run through its complete cycle until it resets and stops. Check carefully to see that the cams have returned to their correct positions. The KSV Relay is then ready to start its reclosing cycle.

MAINTENANCE

The KSV Relay requires little or no maintenance. If the operating parts are removed from the case for inspection or adjustment, clean the contacts with a cloth. Remove any dust from inside the case and clean the window in the front cover.

TABLE I
TIMING CYCLES &
OPERATING VOLTAGES AVAILABLE

Motor & Coil Voltage Available	All Voltages	
	Motor RPM	Seconds Per Rev.
48 VDC	1/4 1/2 1	240
125 VDC		240
250 VDC		120
115 VAC		60
230 VAC		

TABLE II
RATINGS: L, U & C₁ CONTACTS

Operating Volts	Current Rating Amps	Interrupting Rating - L & U Contacts - Amps.		Interrupting Rating - C ₁ Contacts - Amps.	
		Res. Load	L/R=0.026	Res. Load	L/R=0.026
48 DC	10	10	8	9	9
125 DC	10	2	0.5	7	6
250 DC	10	1	0.2	3	0.25
115 AC	10	10	10	10	10
230 AC	10	10	10	10	10

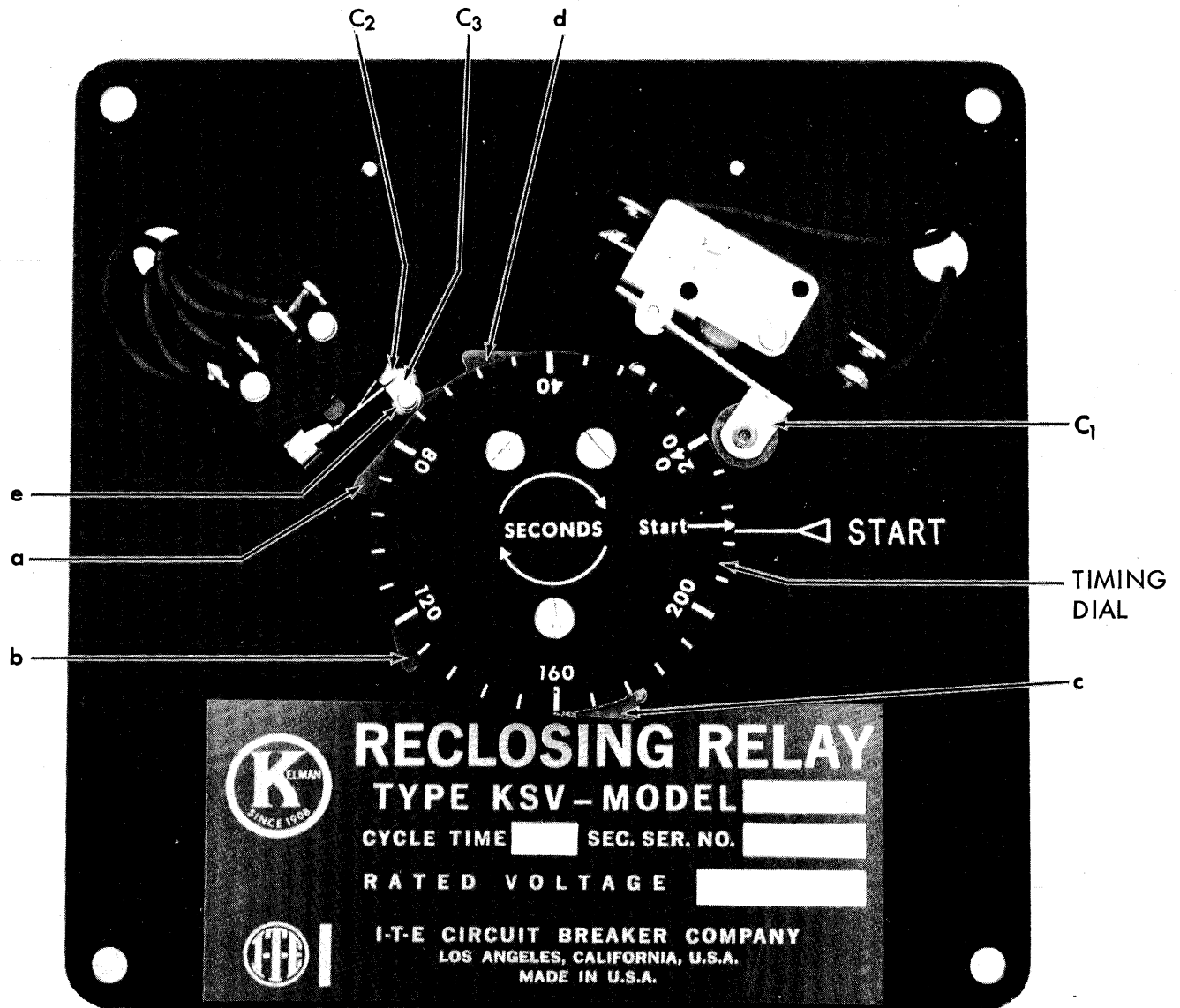


FIGURE 1
MOUNTING PLATE, FRONT VIEW

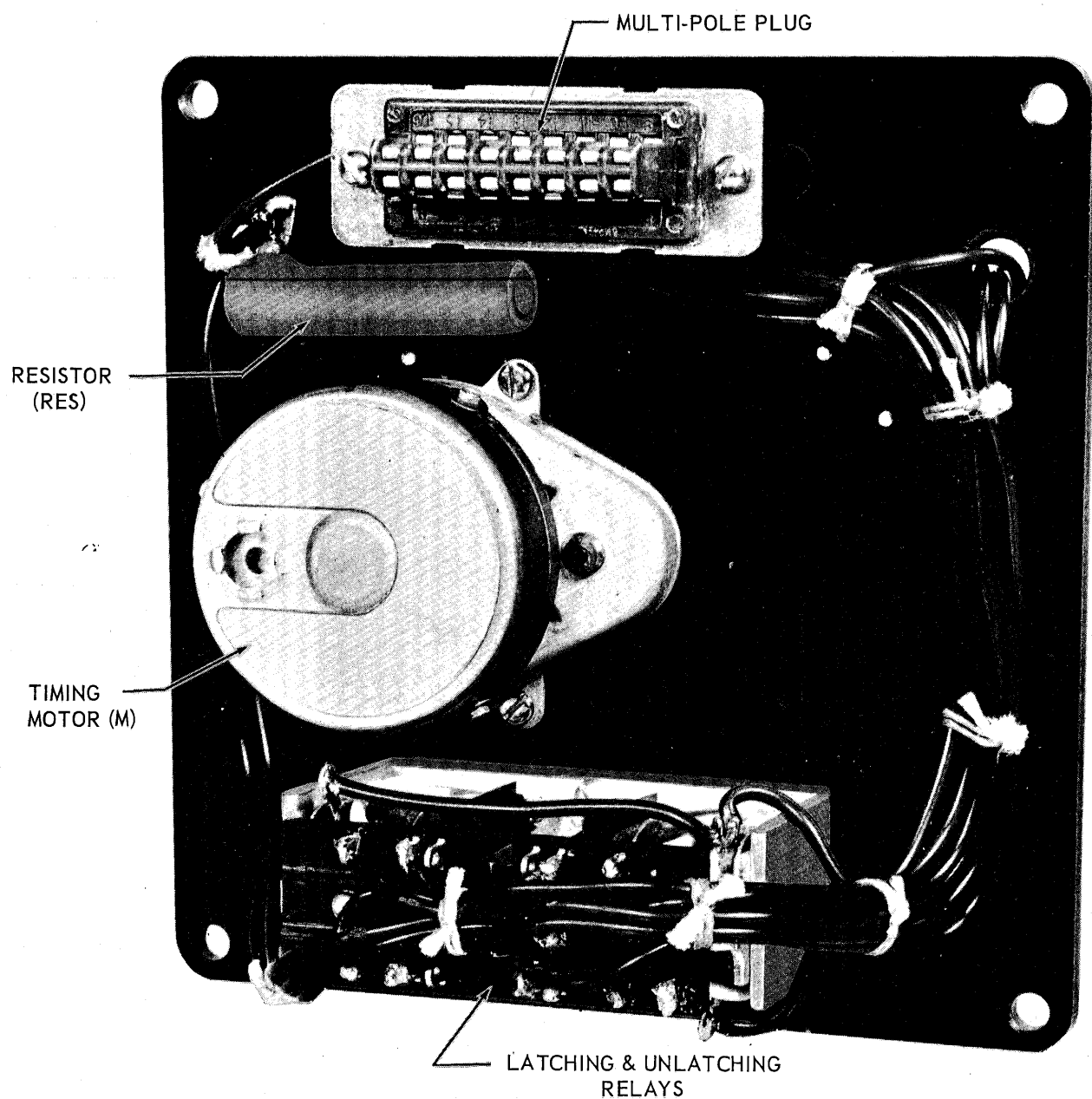
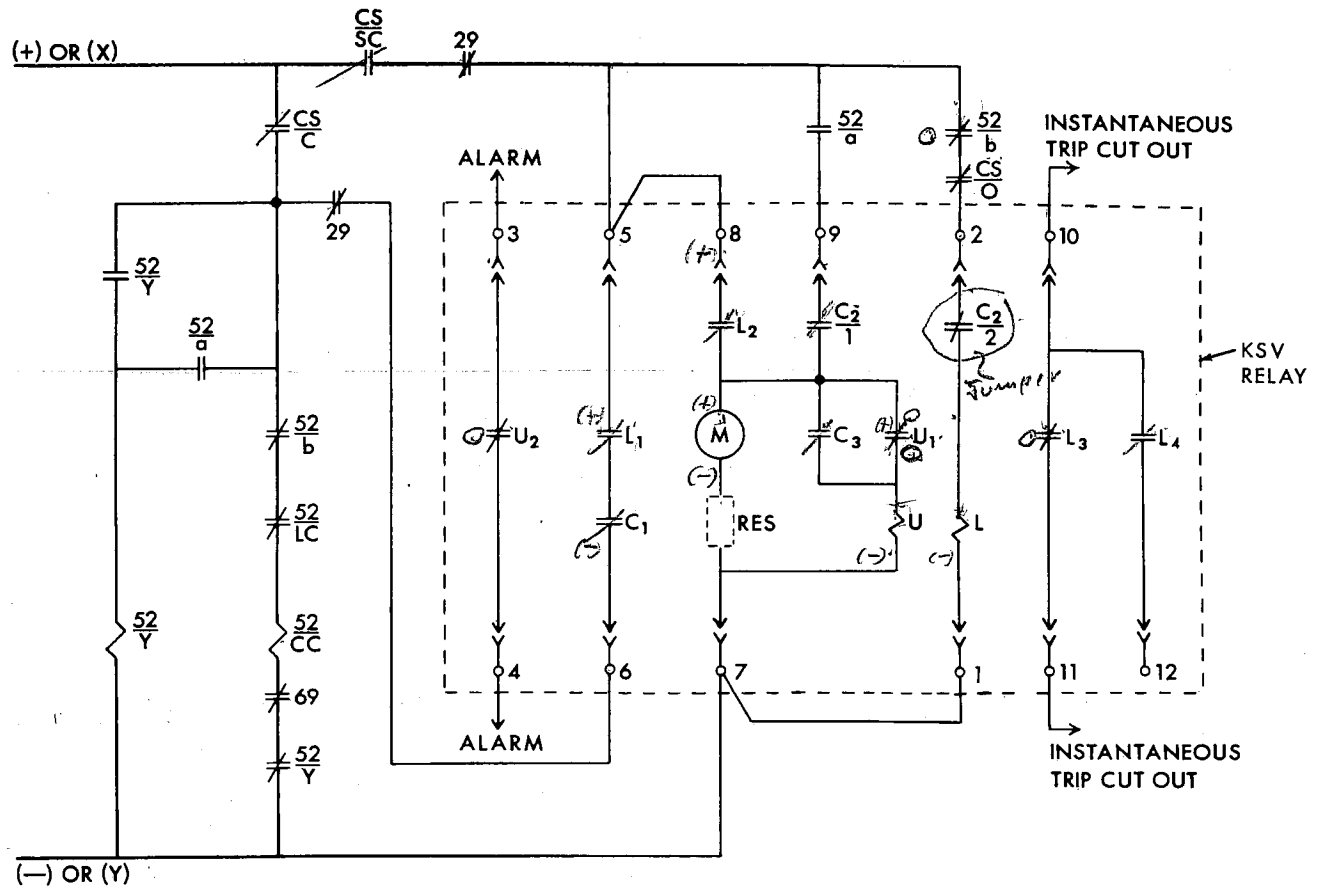


FIGURE 2
MOUNTING PLATE, REAR VIEW



All contacts shown with breaker "OPEN" and the KSV Relay in the "START" position.

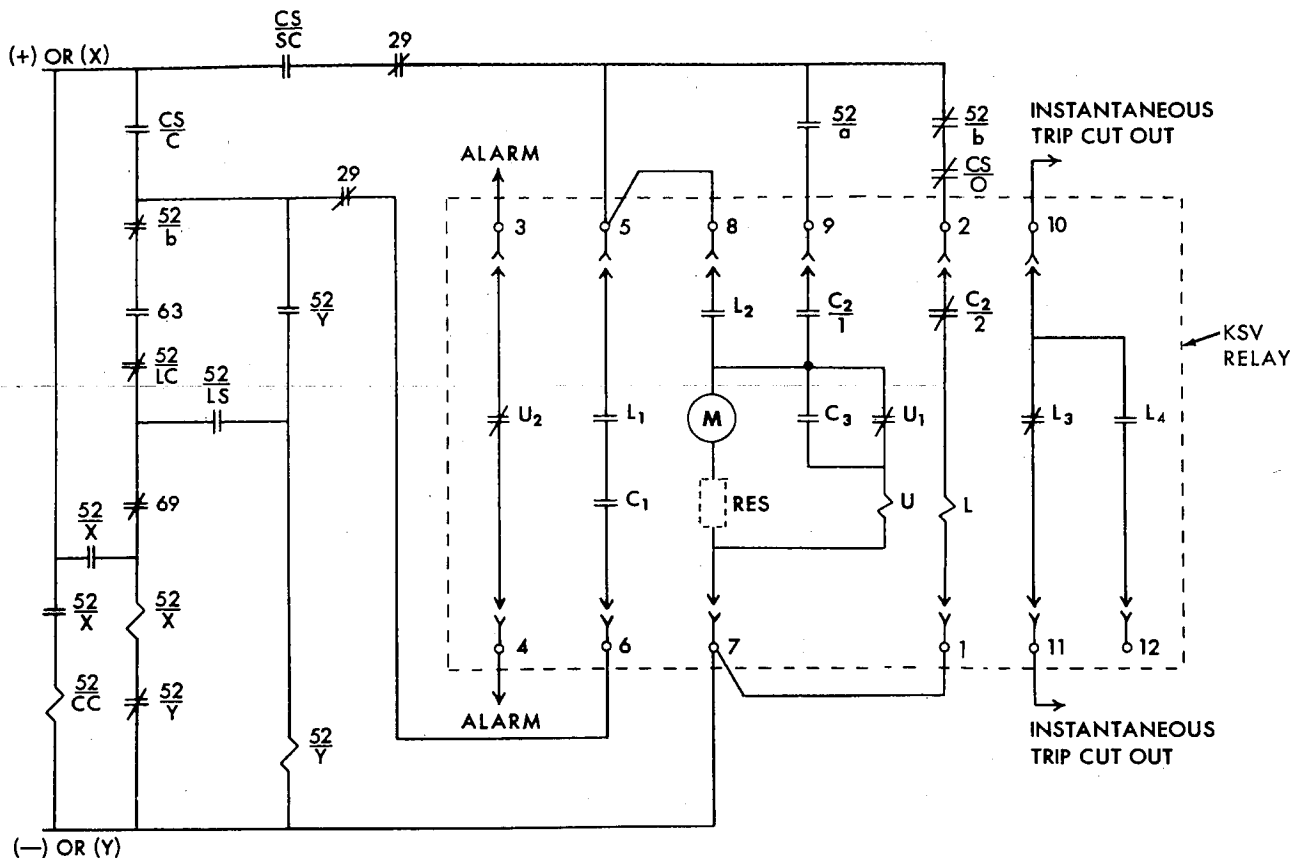
- 29 Reclosing Relay Manual Blocking Switch
- 69 Manual Lockout Switch (open after manual trip)
- CS Control Switch Close
- SC Control Switch Slip Contact (open after trip)
(close after close)
- 52/a Auxiliary Switch (open when breaker is open)
- CS/O Control Switch Contact (closed after trip and after close)

- 52/b Auxiliary Switch (closed when breaker is open)
- 52/LC Latch Checking Switch
- 52/CC Closing Coil
- 52/Y Anti-pump Relay

- C₁ u switch (close)
 - C₂ " " }
 - C₃ " " }
- causes

FIGURE 3

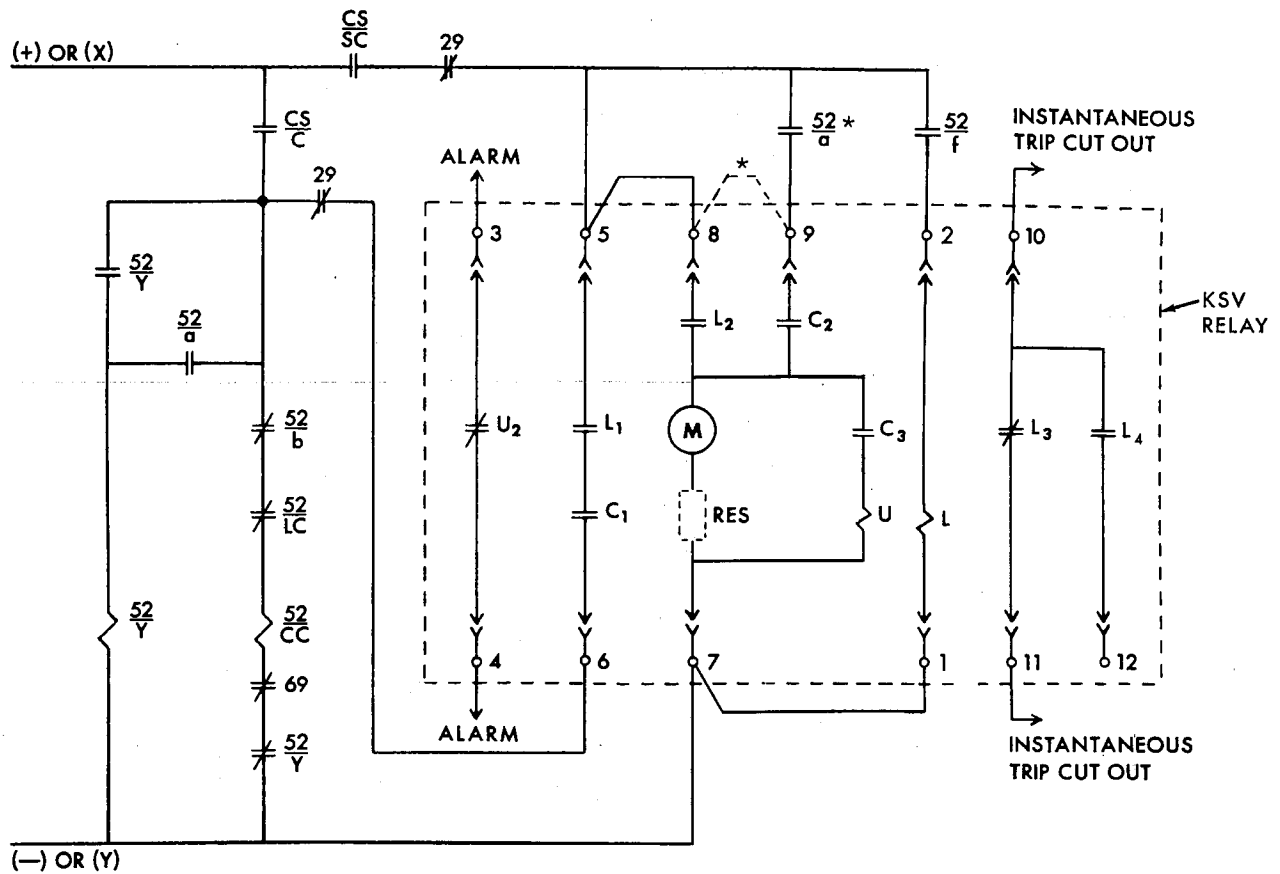
SCHEMATIC DIAGRAM OF TYPE KSV MODEL A-3 RELAY WITH SPRING OPERATED MECHANISM



All contacts shown with breaker "OPEN" and the KSV Relay in the "START" position.

29	Reclosing Relay Manual Blocking Switch	52	Latch Checking Switch
63	Lockout Pressure Switch (open on low pressure)	52	LC
69	Manual Lockout Switch (open after manual trip)	52	LS
CS	Control Switch Close	52	CC
CS	Control Switch Slip Contact (open after trip)	52	X
SC	(closed after close)	52	Y
52	Auxiliary Switch (open when breaker is open)		
52	Auxiliary Switch (closed when breaker is open)		
CS	Control Switch Contact (closed after trip and after close)		
O			

FIGURE 4
SCHEMATIC DIAGRAM OF TYPE KSV MODEL A-3 RELAY WITH PNEUMATIC OPERATING MECHANISM



All contacts shown with breaker "OPEN" and KSV Relay in the "START" position.

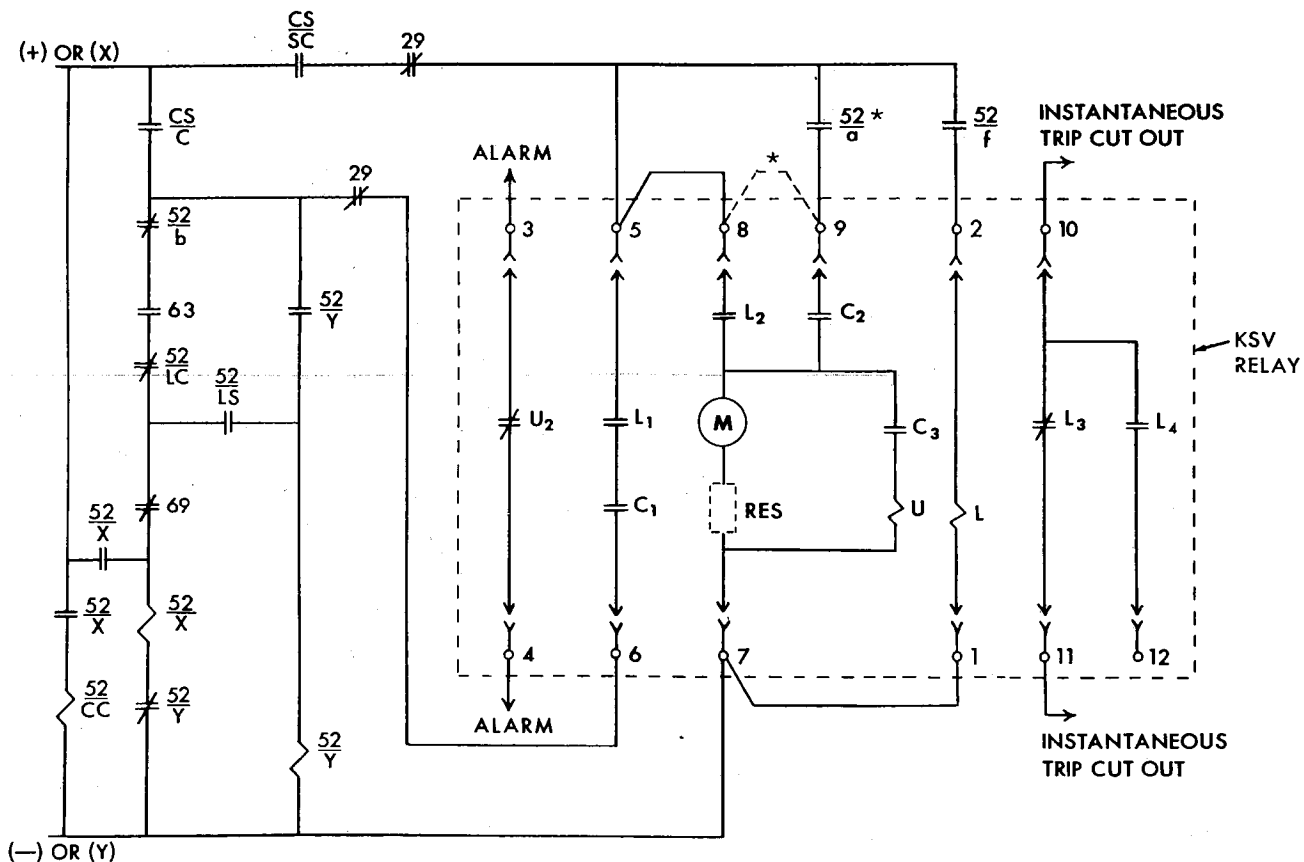
*With auxiliary switch "a" removed and a jumper placed between terminals 8 and 9 the closing relay, once started, will always reset whether the breaker stays closed or is locked open.

- 29 Reclosing Relay Manual Blocking Switch
- 69 Manual Lockout Switch (open after manual trip)
- $\frac{CS}{C}$ Control Switch Close
- $\frac{CS}{SC}$ Control Switch Slip Contact (open after trip)
(closed after close)
- $\frac{52}{a}$ Auxiliary Switch (open when breaker is open)
- $\frac{52}{b}$ Auxiliary Switch (closed when breaker is open)

- $\frac{52}{f}$ Auxiliary Switch that makes momentarily only
on opening stroke of breaker
- $\frac{52}{LC}$ Latch Checking Switch
- $\frac{52}{CC}$ Closing Coil
- $\frac{52}{Y}$ Anti-pump Relay

FIGURE 5

SCHEMATIC DIAGRAM OF TYPE KSV MODEL A-1 RELAY WITH SPRING OPERATED MECHANISM



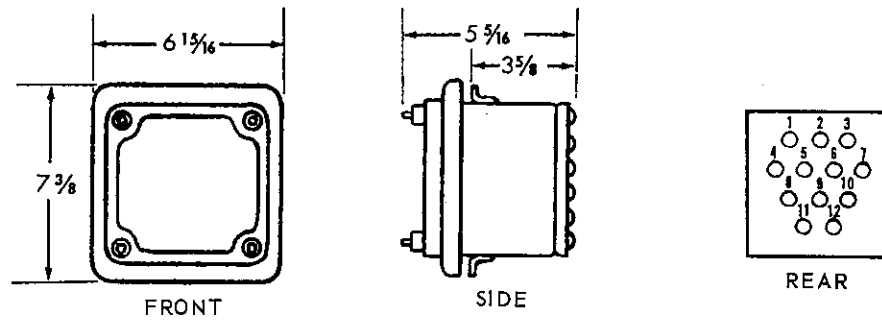
All contacts shown with breaker "OPEN" and KSV Relay in the "START" position.

*With auxiliary switch "a" removed and a jumper placed between terminals 8 and 9 the reclosing relay, once started, will always reset whether the breaker stays closed or is locked open.

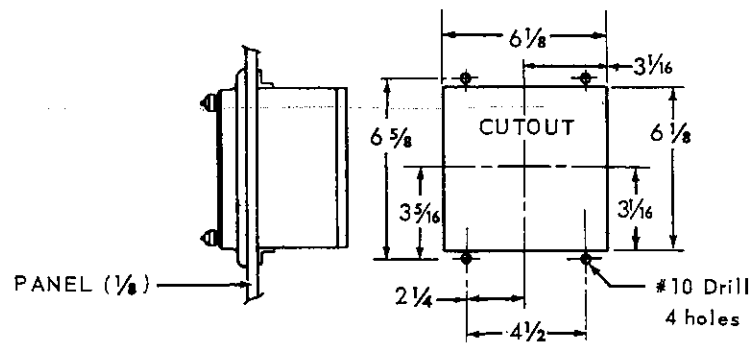
- | | |
|-----------------|--|
| 29 | Reclosing Relay Manual Blocking Switch |
| 63 | Lockout Pressure Switch (open on low pressure) |
| 69 | Manual Lockout Switch (open after manual trip) |
| \overline{CS} | Control Switch Close |
| \overline{CS} | Control Switch Slip Contact (open after trip) |
| \overline{SC} | (closed after close) |
| $\frac{52}{a}$ | Auxiliary Switch (open when breaker is open) |
| $\frac{52}{b}$ | Auxiliary Switch (closed when breaker is open) |

- | | |
|-----------------|---|
| $\frac{52}{f}$ | Auxiliary Switch that makes momentarily only on opening stroke of breaker |
| $\frac{52}{LC}$ | Latch Checking Switch |
| $\frac{52}{LS}$ | Limit Switch |
| $\frac{52}{CC}$ | Closing Coil |
| $\frac{52}{X}$ | Closing Relay |
| $\frac{52}{Y}$ | Anti-pump Relay |

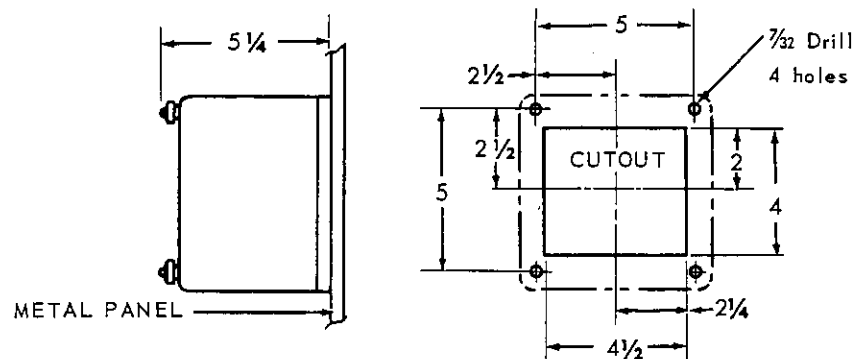
FIGURE 6
SCHEMATIC DIAGRAM OF TYPE KSV MODEL A-1 RELAY WITH PNEUMATIC OPERATING MECHANISM



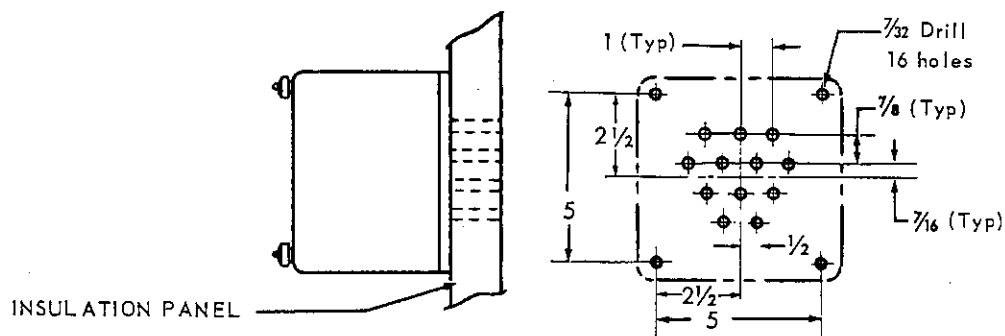
OVERALL DIMENSIONS



SEMI-FLUSH MOUNTED



SURFACE MOUNTED



INSULATED PANEL MOUNTED

When the relay is purchased as a separate unit, a kit is supplied for mounting the relay in any of the above positions. This kit can also be obtained separately by ordering Catalog No. 050L075-01.

FIGURE 7
DRILL PLANS

Consult Our Sales Offices

The I-T-E Circuit Breaker Company is represented in all principal cities of the United States and Canada. These representatives are experienced and are competent to make correct applications, as well as give complete information and prices. We suggest you consult the representative nearest you.

ORDERING PROCEDURE

The KSV Relay is available as a standard item in the voltages and timing cycles listed below. To order the KSV Relay, include the Motor and Coil Voltage, and the Timing Cycle, in addition to the Catalog Number.

KSV RELAY MODEL A-3		
Motor and Coil Voltage	Timing Cycle (Seconds)	Catalog Number
48 VDC	60	762A015-39
48 DC	240	762A015-42
125 VDC	60	762A015-40
125 VDC	120	762A015-38
125 VDC	240	762A015-37
115 VAC	60	762A015-41

For voltages and timing cycles not listed, consult your local I-T-E representative.

**I-T-E CIRCUIT BREAKER COMPANY**

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