Westinghouse

TYPE CV VOLTAGE RELAY

INSTRUCTIONS

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 type CV relay is a single-phase induction-disc type relay operating either on under or over voltage or both. This relay operates on under or over voltage and is applied as a voltage fault detector operating in conjunction with other protective relays. The relay is also used as a timing device for various automatic operations. Either geared or non-geared type relays are available. The non-geared relay gives short time operation with quick reset. The geared relay gives longer time of operation with longer reset. The contacts may be single or double to operate on either over or under voltage or may be single-pole, double-throw operating on both over and under voltages.

CONSTRUCTION AND OPERATION

The type CV relay consists of an induction-disc type voltage element, contactor switch and an operation indicator.

Voltage Element

The induction disc of this element is a thin four-inch diameter aluminum disc mounted on a vertical shaft. The shaft is supported on the lower end by a steel ball bearing riding between concave sapphire jewel surfaces, and on the upper end by a stainless steel pin.

The moving contact is a small silver hemi-sphere fastened on the end of a rigid arm. The other end of this arm is clamped to an insulated section of the disc shaft in the non-geared type relays, or to an auxiliary shaft geared to the disc shaft in the geared type relays. The electrical connection is made from the moving contact thru the arm and spiral spring. One end of the spring fastens to the arm, and the other to a slotted spring adjuster disc which in turn fastens to the element frame.

The stationary contact assembly consists of a silver contact attached to the free end of a leaf spring. This spring is fastened to a Micarta block and mounted on the element frame. A small set screw permits the adjustment of contact follow. When double trip is required another leaf spring is mounted on the Micarta block and a double contact is mounted on the rigid moving arm. Then the stationary contact set screws permit adjustment so that both circuits will be made simultaneously.

Torque is produced to rotate the disc by an electromagnet in the rear of the relay. A permanent damping magnet is mounted in the front. In the non-geared relay the disc rotates only a fraction of a revolution and has graduated perforations in the disc which gives the relay a constant pick-up value regardless of the time lever setting. The lower pole of the electromagnet is energized by voltage. In order to produce torque the upper pole circuit is energized with the voltage induced across a few secondary turns wound on the lower pole. This circuit is connected to a slide-wire resistor mounted on top of the electromagnet end through the upper pole windings. Changing the resistance of this circuit varies the pick-up of the relay, as shown by the calibration marks on the scale above the resistance wire. When the slider is clamped under the calibration marks, the pick-up is as indicated.

Contactor Switch and Operation Indicator

The contactor switch element is a small solenoid type switch, the coil of which is normally connected in the trip circuit. A small cylindrical plunger with a silver disc supported on its lower end rides up and down on a vertical guide rod in the center of the solenoid coil. The guide rod is fastened to the stationary core which, in turn, screws into the element frame. When the coil is energized and the plunger pulled up, the silver disc moves up, bridging three stationary contacts.

The operation indicator is a small solenoid coil connected in the trip circuit which operates to release the white target when energized.

CHARACTERISTICS

The relay is available in 3 ranges which refer to the range of voltage at which the relay will operate.

115	volt	relay	adjustable	from 50 to 140	volts
230	"	"	"	" 100 to 280	"
460	"	"	"	" 200 to 560	"

Typical operating curves of these relays are shown in figures 8 through 11

These instructions also apply in general to the older design relays with an external resistor and ranges as follows:

110 volt relay adjustable from 50 to 120 volts

220 Volt relay adjustable from 120 to 240 volts
440 " " " " 250 to 500 "

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. Either of these studs may be utilized for grounding the metal base. The electrical connections may be made direct to the terminals by means of screws for steel panel mounting or to terminal studs furnished with 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.

Voltage Element Connections

Connect the relay coil (between terminals 9 and 10 on the standard square-case relays) directly to the potential transformer. For phase-to-phase operation, either delta or star voltages may be used as desired. For phase-to-ground operation, the broken delta secondary of a ground star connected primary will provide the required residual voltage.

The external resistor on the older design relay is connected in series with the voltage coil.

Trip Circuit Connections

The relays are shipped with the contactor switch and operation indicator in parallel. This circuit is suitable for all trip currents above 2.25 amperes d-c. and up to 30 amperes at 250 volts d-c. The resistance of both coils in parallel is approximately 0.25 ohms. If the trip current is less than 2.25 amperes, there is no need for the contactor switch and it should be disconnected. This is done by removing the lower lead on the front stationary contact of the switch and dead-ending it. A small fillister-head screw located in the Micarta base of the switch is available for this purpose. The resistance of the operation indicator coil is 2.8 ohms. An auxiliary switch on the circuit breaker must be provided so that when the circuit breaker is tripped, the tripping circuit will be opened by this switch, thus relieving the relay contacts of that duty. The contacts should not be required to open more than 1 ampere at 125 volts d-c.

SETTINGS

The Type CV relay has two adjustments: The voltage slider setting and the time lever setting. The calibration marks on the voltage slide wire indicate the minimum operating voltage. If front and back contacts are used, the front contact closes on the value indicated on the slide wire calibration and the back contact will close when the voltage is somewhat lower. The time delay between these two operations depends upon the time lever setting.

The effect of the time lever adjustment is shown on the curves of figures 9 to 11. The accuracy of the type CV relay is approximately ± 5%.

ADJUSTMENTS AND MAINTENANCE

The relays should be inspected periodically and the time of operation should be checked at least once every six months. For this purpose a cycle counter should be employed, because of its convenience and accuracy. Phantom loads should not be used in testing induction-type relays because of the resulting distorted current wave form which produces an error in timing.

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.

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 or the relay taken apart for repairs, the following instructions should be followed in reassembling and setting it.

Voltage Element

Adjust the back stop on the time lever so that the moving contact just touches the stationary contact when the time lever is in the zero position. The small adjustment screw on the stationary contact should not be screwed in far enough to limit the follow of the stationary contact. For double-trip relays adjust these screws so that both circuits make at the same instant.

The spiral spring should have approximately 1-1/4 turns initial tension with the moving contact in the #10 time lever position. The convolutions of the spring should not touch each other for all conditions of the moving contacts. Adjust the tension of the sprial spring so that the contacts will operate on the voltage indicated on the calibration resistance and follow the time curve as shown. This may necessitate shifting the position of the damping magnets, as their position affects the time characteristics.

The reset time from the #10 lever setting is 83 seconds for the geared over-voltage relay and 73 seconds for the geared undervoltage relay.

Contactor Switch

Adjust the stationary core of the switch for clearance between the stationary core and the moving core of 1/64" when the switches are picked up. This can be done by turning the relay up-side-down and screwing up the core screw approximately 1/2 turn and lock in place.

This prevents the moving core from striking and sticking to the stationary core because of residual magnetism. Adjust the contact clearance for 3/32" by means of the two small nuts on either side of the Micarta disc. The switch should pick up at 2.0 amperes d-c. Test for sticking after 30 amperes d-c. is passed.

Operation Indicator

Adjust the indicator to operate at 0.2 ampere d-c. gradually applied. Test for sticking after 30 amperes d-c. is passed.

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 nameplate data.

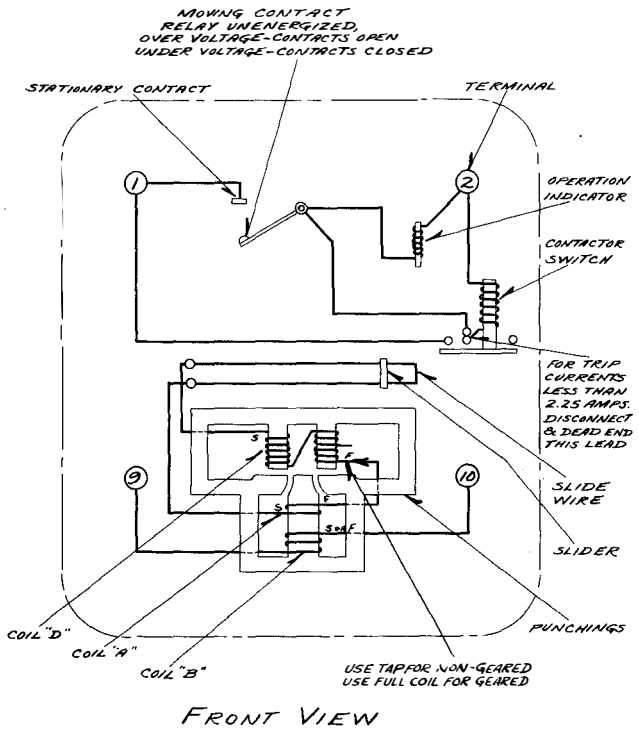

Figure 1
Internal Connections of the Single-Trip Geared Overvoltage or Ungeared Under-voltage relay in the Standard Case.

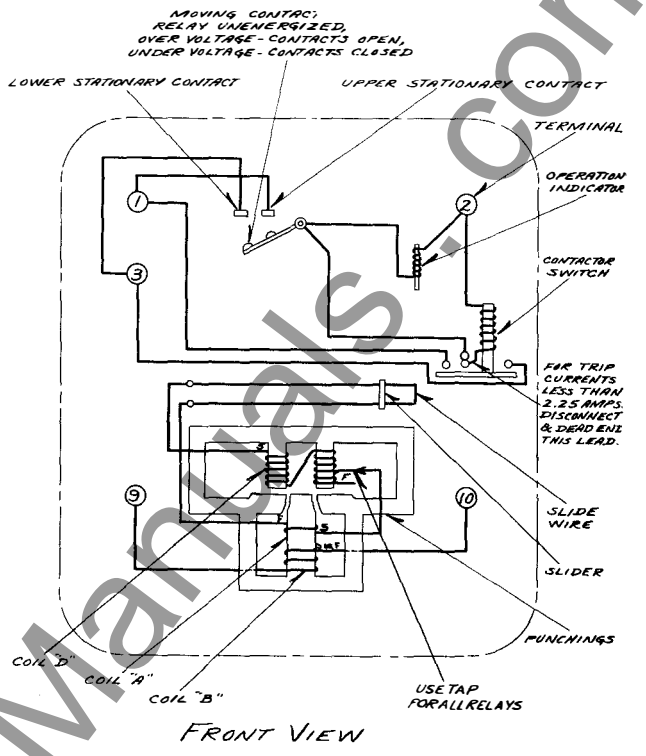

Figure 2
Internal Connections of the Double-Trip Ungeared Over-voltage or Geared Under-voltage Relay in the Standard Case.

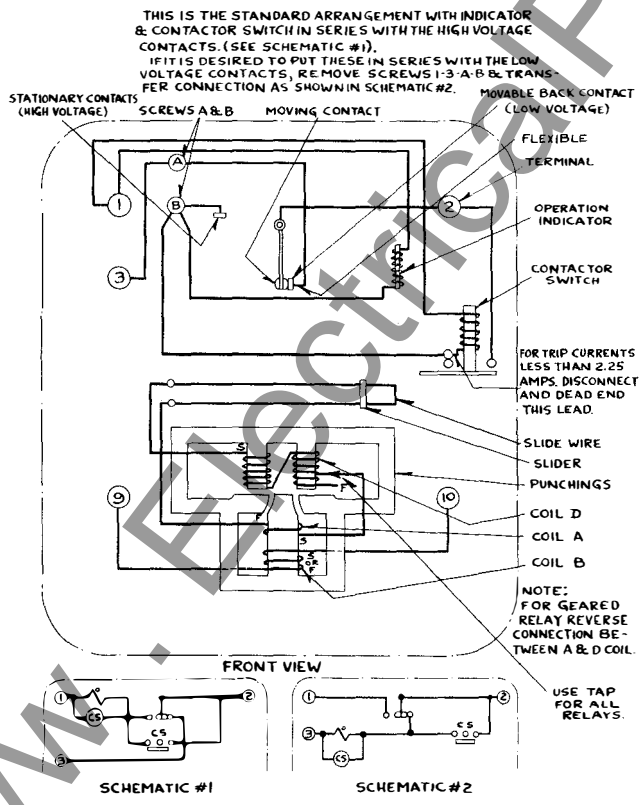

Figure 3
Internal Connections of the Single-Pole, Double-Throw Relay in the Standard Case.

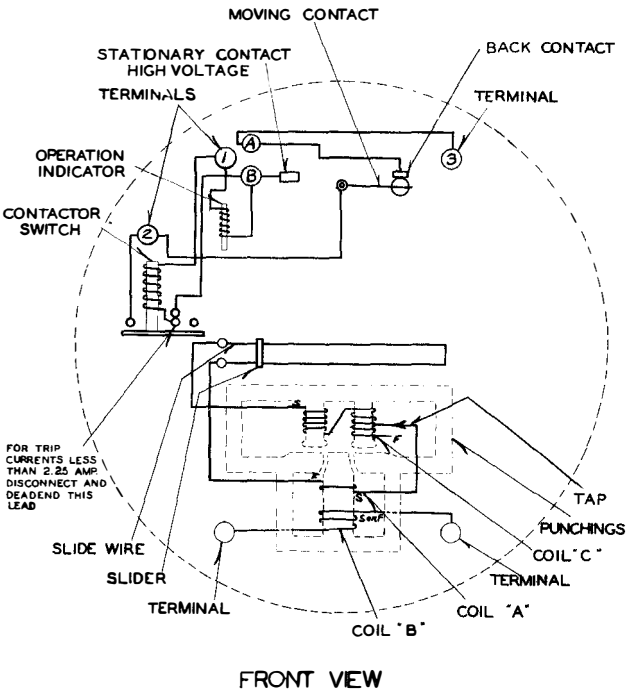

Figure 4
Internal Connections of the Single-Pole, Double-Throw Relay in the Round Case.

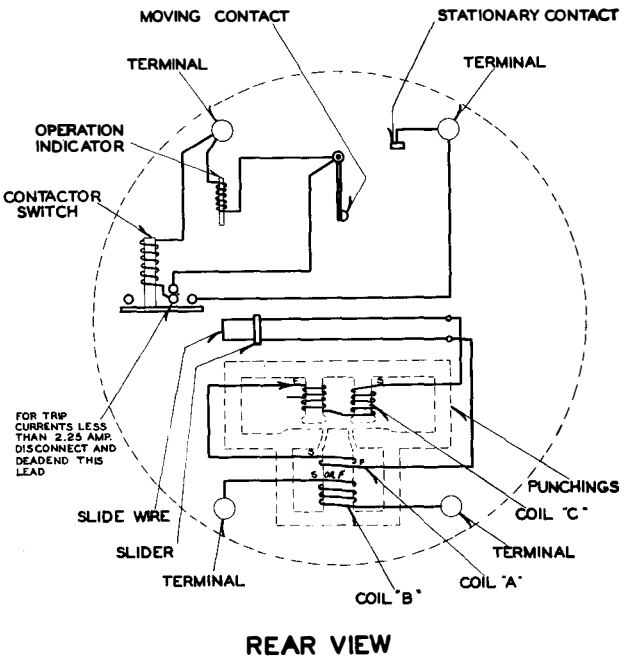

Figure 5
Internal Connections of the Single-Trip, Ungeared Over-voltage and Geared Under-voltage Relay in the Round Case.

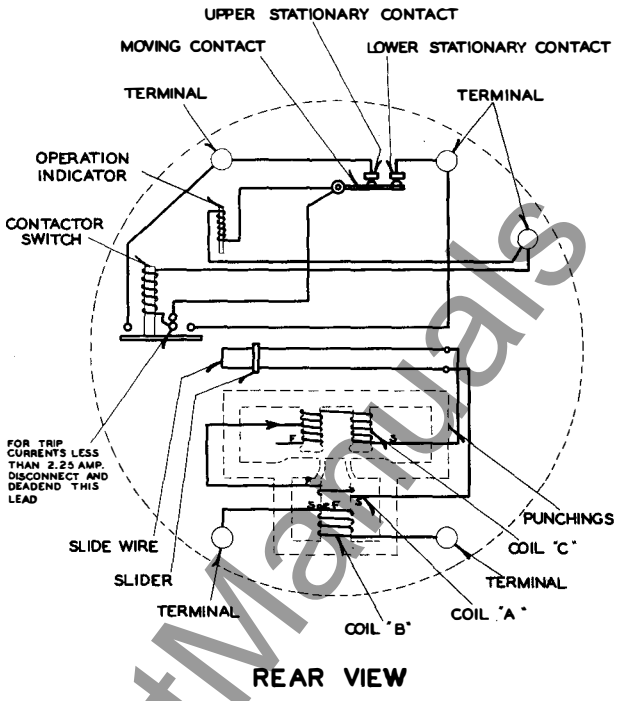

Figure 6
Internal Connections of the Double-Trip, Geared Over-voltage and the Ungeared Under-voltage relay in the Round Case.

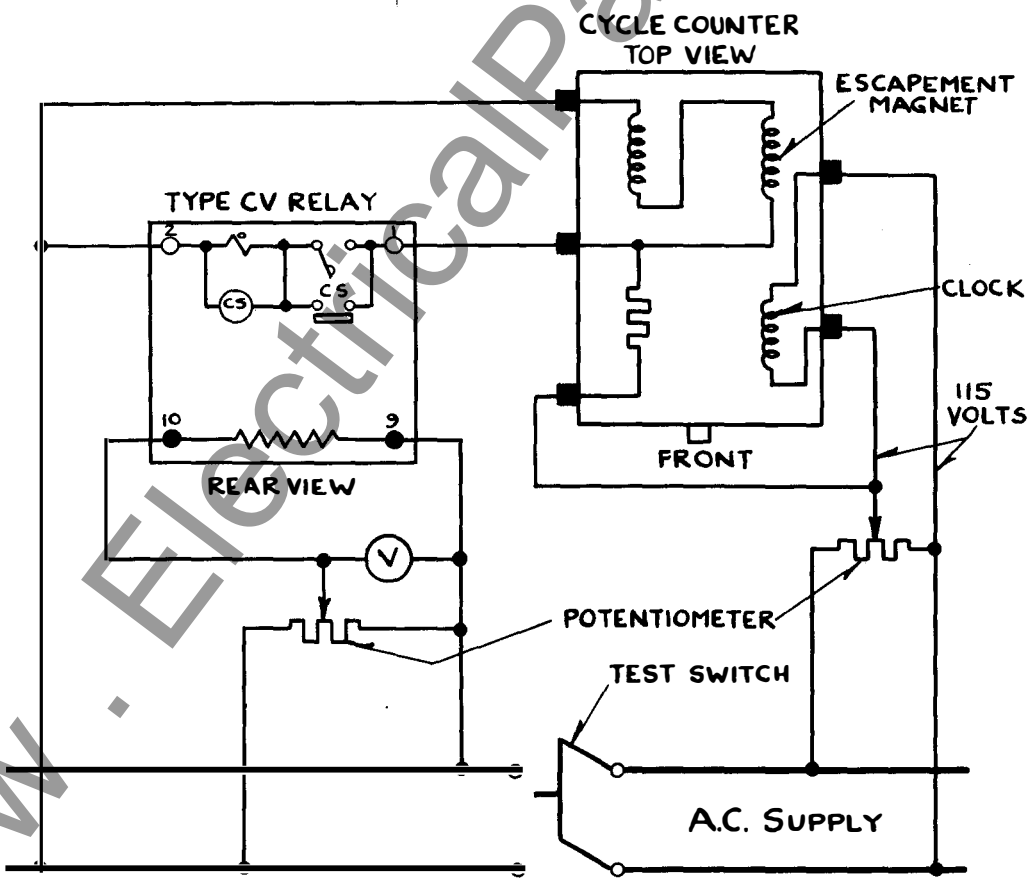

Figure 7
Diagram of Test Connections

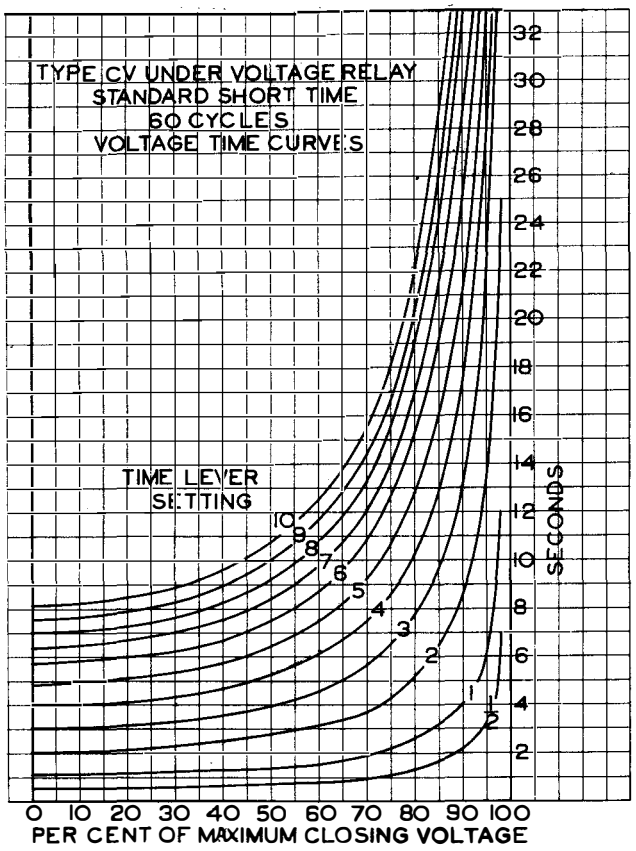

Figure 8
Typical Voltage Time Curves for the Ungeared Under-voltage Relay.

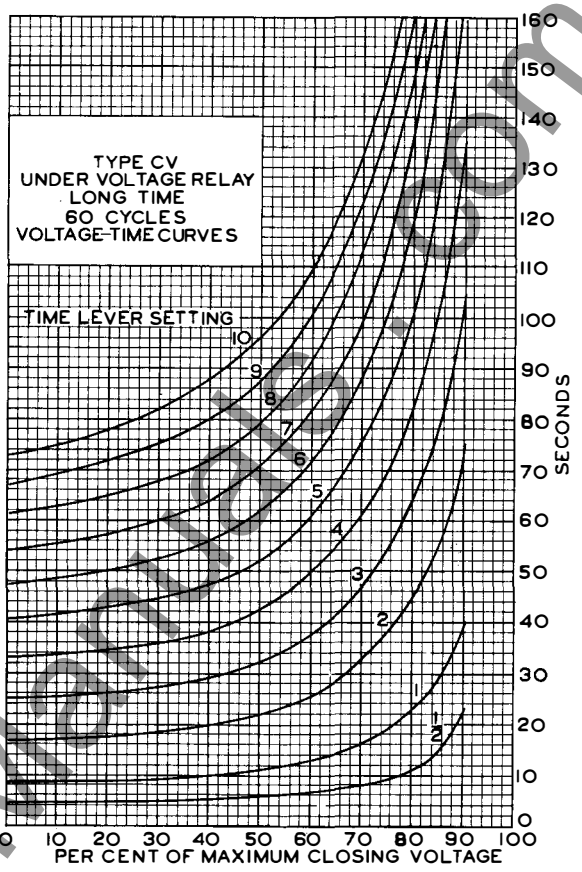

Figure 9
Typical Voltage Time Curves for the Geared Under-voltage Relay.

The opening and closing points of the non-geared relay are exactly the same; but for the geared relay are separated by more than 10%.

ENERGY REQUIREMENTS

The burdens of the various relays are as follows:

Rated[1] Volts	Frequency	Voltage Setting	Volt-Amps.	Watts	Vars	P.F.	R^{2-3} Ohms	X^2	Z^2
115 230 460	25	Highest	16.8	4.4	16.2	.26	206	760	788
		Rated	16.9	4.6	16.3	.27	213	753	783
		Lowest	17.4	10.0	14.2	.58	438	621	762
	50	Highest	7.5	2.0	7.2	.27	471	1700	1770
		Rated	7.6	2.1	7.3	.28	482	1680	1742
		Lowest	11.4	8.0	8.1	.70	815	826	1172
	60	Highest	6.1	1.3	5.9	.21	462	2120	2170
		Rated	6.2	1.5	6.0	.24	527	2086	2150
		Lowest	10.0	7.3	6.8	.73	965	900	1322

1. These relays will stand 110% of rated voltage continuously.
2. Values are for 115 volt relay. For the 230 and 460 volt relays, multiply values by 4 and 16, respectively.
3. Resistance is a-c value.

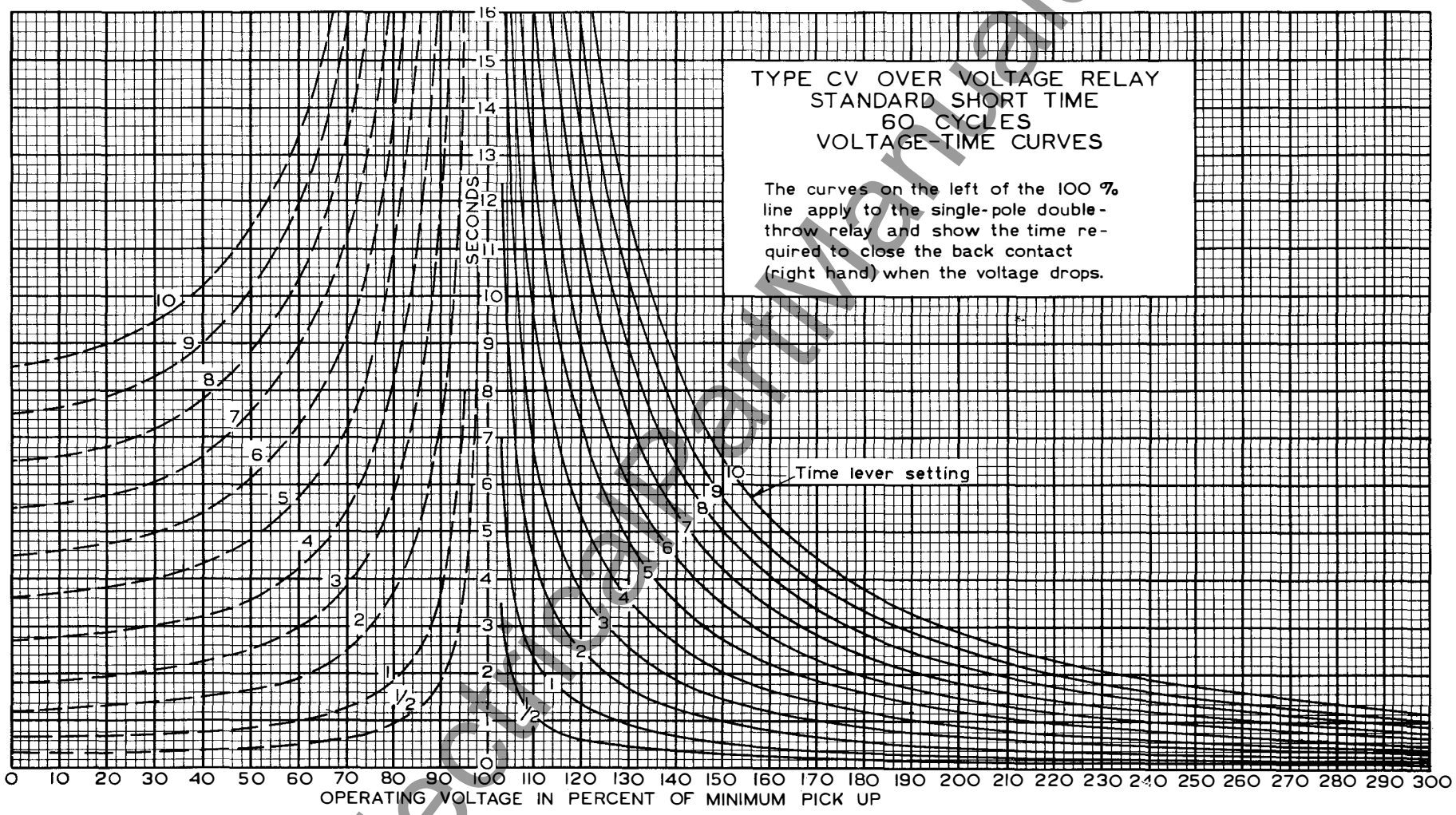

Figure 10
Typical Voltage Time Curves for the Ungeared Over-voltage Relay.

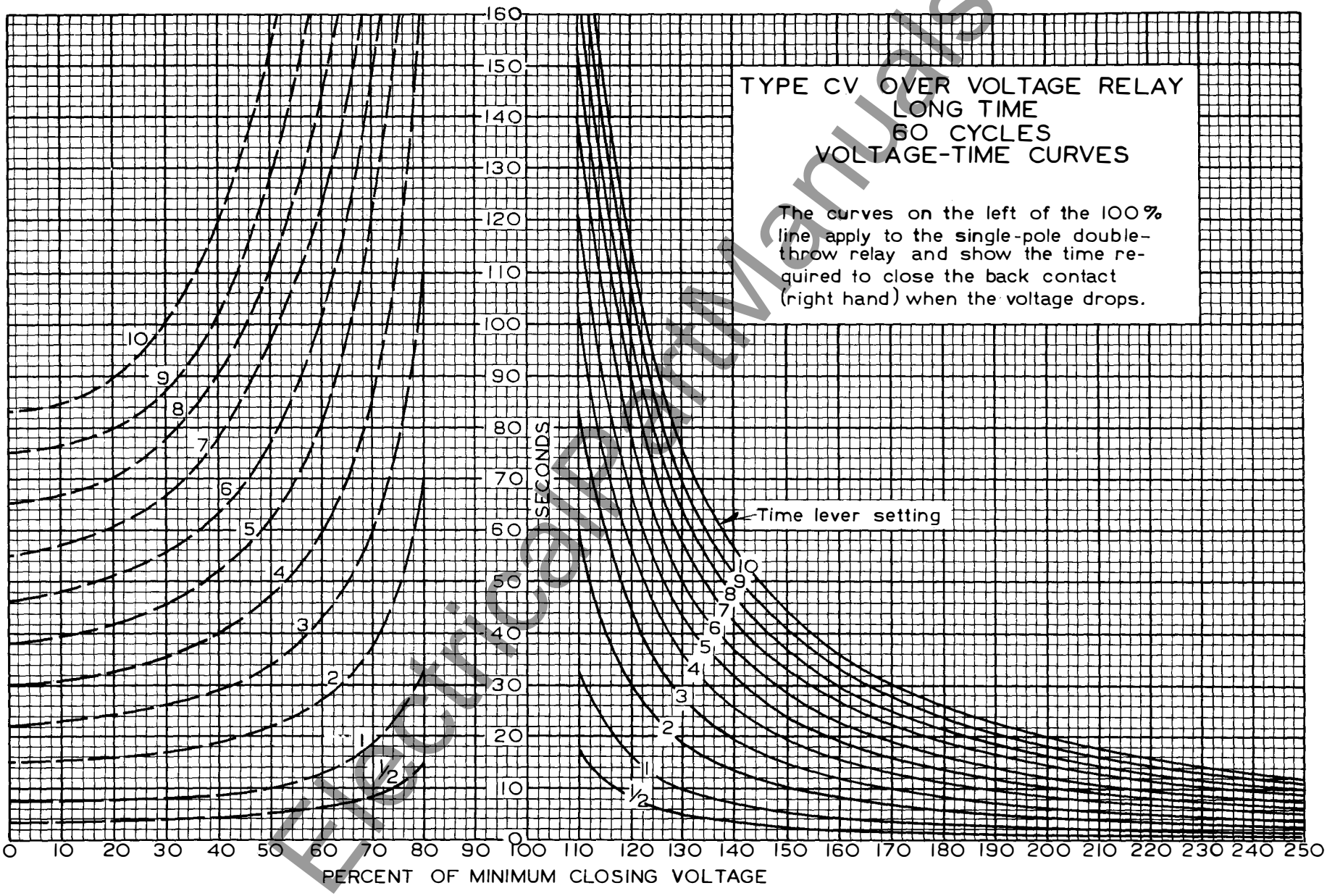

Figure 11
Typical Voltage Time Curves for the Geared Over-voltage Relay.

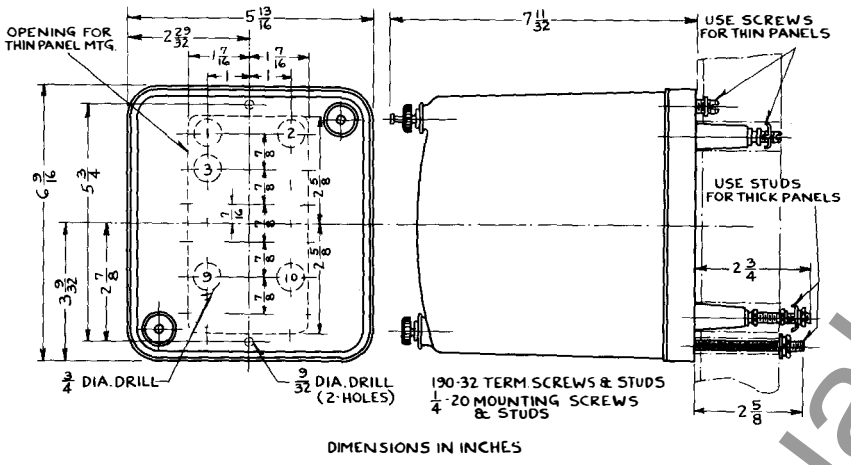

Figure 12
Outline and Drilling Plan for the Standard Projection Type Case. Omit Terminal 3 for the Single-Trip Relay.

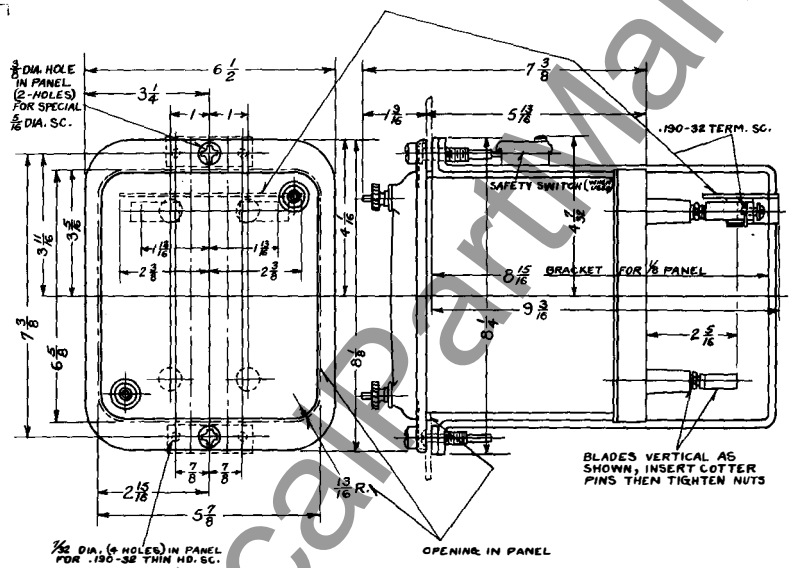

Figure 13
Outline and Drilling Plan for the Standard Flush Type Case.

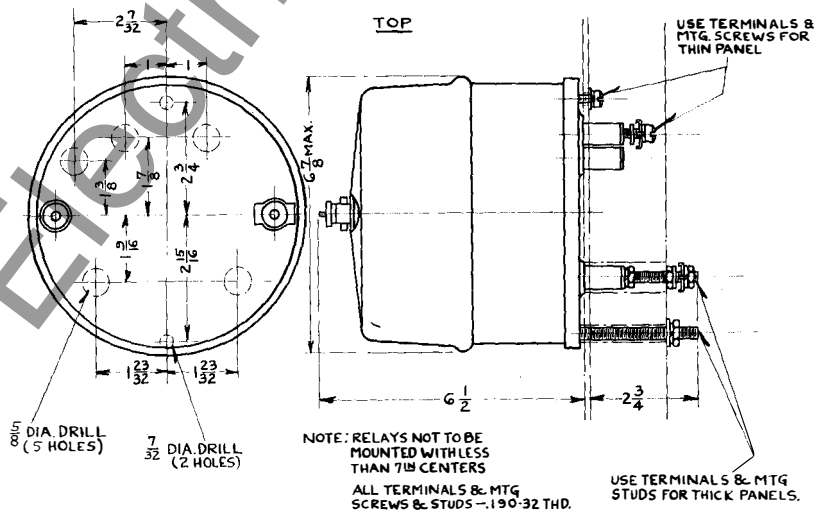

Figure 14
Outline and Drilling Plan for the Round Case. Omit the Unsymmetrical Left Terminal for Single-Trip Relay.