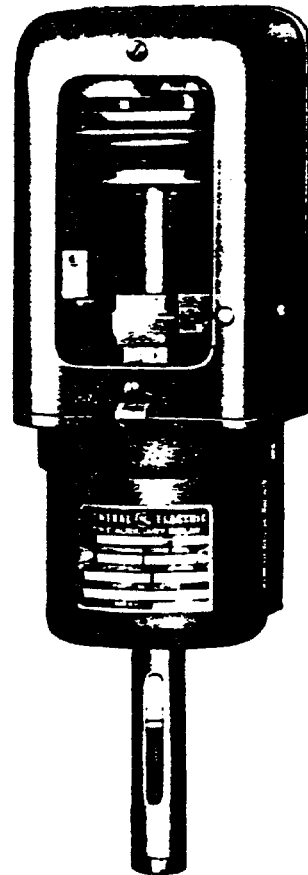




INSTRUCTIONS

GEH-954G
Supersedes GEH-954F

PLUNGER RELAYS



Types
PAA, PAC, PAV,
PBA, PBC, and PCV

POWER SYSTEMS MANAGEMENT DEPARTMENT

GENERAL  ELECTRIC

PHILADELPHIA, PA.

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DESCRIPTION

The Types PAA, PAC, PAV, PBA, PBC and PCV plunger relays are designed for protection against overcurrent and undervoltage and also for use as auxiliary devices. The operation of these relays depends upon the action of a magnet coil in attracting or releasing the plunger when predetermined values of voltage or current are present in the circuit to which the coil is connected. The contacts are made quick acting, on the upstroke of the plunger, by means of a snap-toggle mechanism. These contacts can be arranged in several ways which, with the use of a coil suitable for the particular purpose in view, adapt these relays to a large number of applications.

APPLICATION

Table I is composed to easily determine the differences between the types of relays covered by this instruction book. The table specifies the application, instantaneous or time delay operation, kind of contacts, frequency, hand or self-reset contacts, indicates if a target is present, and indicates the figure to refer to for the outline, panel drilling and internal connections.

These instructions do not purport to cover all details or variations in equipment nor to provide for every possible contingency to be met in connection with installation, operation or maintenance. Should further information be desired or should particular problems arise which are not covered sufficiently for the purchaser's purposes, the matter should be referred to the General Electric Company.

TABLE I

Type of Relay	Application	Time	*Contacts	Freq. in Cycles	Reset	Indicating Target	Outline		*** Panel Drilling Fig.	Int. Conn Fig.
							Ins. Fig.	Steel Fig.		
PAC11A	Over-current	Inst		40 to 60	Self or Hand	Yes	13A	13B	13E	15
PAC12A		Time		40 to 60		Yes	13A	13B	13E	15
PAC13A		Inst		40 to 60		Yes	13A	13B	13F	16
PAC14A		Time		40 to 60		Yes	13A	13B	13F	16
PAC11B		Inst		40 to 60		Yes	13A	13B	13E	14
PAC12B		Time		40 to 60		Yes	13A	13B	13E	14
PAC13B		Inst		40 to 60		Yes	13A	13B	13F	17
PAC14B		Time		40 to 60 **		Yes	13A	13B	13F	17
PBC11A	Sensitive Overcurrent	Inst		25 to 60	Hand	Yes	13A	13B	13E	18
PBC12A		Inst)		25 to 60	Hand	Yes	13A	13B	13F	16
PBC13A		Inst)		25 to 60	Hand and Electric	Yes	13A	13B	13H	20
PBC11B		Inst		25 to 60	Hand	Yes	13A	13B	13E	14
PBC12B		Inst)		25 to 60	Hand	Yes	13A	13B	13F	17
PBC13B		Inst)		25 to 60	Hand and Electric	Yes	13A	13B	13H	19
PAV11A	Undervoltage Protection For D-C Circuits	Inst		-----	Self	No	13A	13B	13E	15
PAV12A		Time		-----	Self	No	13A	13B	13E	15
PAV11B		Inst		-----	Self	No	13A	13B	13E	14
PAV12B		Time		-----	Self	No	13A	13B	13E	14
PAV13B		Inst		-----	Self	No	13A	13B	13F	17
PAV14B		Time		-----	Self	No	13A	13B	13F	16
PCV11A	Undervoltage Protection For A-C Circuits	Inst		25 to 60	Self	No	13C	13D	13E	15
PCV12A		Time		25 to 60	Self	No	13C	13D	13E	15
PCV13A		Inst		25 to 60	Self	No	13C	13D	13F	16
PCV14A		Time		25 to 60	Self	No	13C	13D	13F	16
PCV11B		Inst		25 to 60	Self	No	13C	13D	13E	14
PCV12B		Time		25 to 60	Self	No	13C	13D	13E	14
PCV13B		Inst		25 to 60	Self	No	13C	13D	13F	17
PCV14B		Time		25 to 60	Self	No	13C	13D	13F	17
PAA11A	Auxiliary	Inst		25 to 60	Self or Hand	Yes	13A	13B	13E	15
PAA12A		Time		25 to 60		Yes	13A	13B	13E	15
PAA13A		Inst		25 to 60		Yes	13A	13B	13F	16
PAA14A		Time		25 to 60		Yes	13A	13B	13F	16
PAA11B		Inst		25 to 60		Yes	13A	13B	13E	14
PAA12B		Time		25 to 60		Yes	13A	13B	13E	14
PAA13B		Inst		25 to 60		Yes	13A	13B	13F	17
PAA14B		Time		25 to 60		Yes	13A	13B	13F	17
PBA11A	Bell Alarm and Auxiliary	Inst		25 to 60	Hand	Yes	13A	13B	13E	18
PBA12A		Inst)		25 to 60	Hand	Yes	13A	13B	13F	16
PBA13A		Inst)		25 to 60	Hand and Electric	Yes	13A	13B	13H	20
PBA11B		Inst		25 to 60	Hand	Yes	13A	13B	13E	14
PBA12B		Inst		25 to 60	Hand	Yes	13A	13B	13F	17
PBA13B		Inst		25 to 60	Hand and Electric	Yes	13A	13B	13H	19

* Contacts may be changed from normally open to normally closed or vice versa by reversing position of the contact. Electrically separate contacts may be made common by replacing the movable contact bar. All contacts are shown in the de-energized position.

** Also available for 25 cycles. The 40 to 60 cycle ratings are also suitable for d-c.

*** For Type PAC relays rated over 40 amperes and Type PBC relays rated over 10 amperes, refer to instructions under LOCATION AND MOUNTING.

RATINGS AND BURDENS

The ratings and burdens of the PAA auxiliary relay is given in Table II.

TABLE II

RATINGS AND BURDENS OF TYPE PAA AUXILIARY RELAYS								
Ratings in Volts		Frequency Cycles	Pickup Volts	External Resistor Ohms	Resistance in Ohms (Total at 25C)	Impedance in Ohms	Watts	Volt-amperes
D-c Continuous	A-c One Minute							
12	-	-	8	None	11	-	13.1	-
24	-	-	18	None	40	-	14.4	-
48	-	-	36	None	270	-	8.5	-
125	-	-	80	430	780	-	20	-
250	-	-	170	1200	1550	-	40.3	-
600	-	-	450	3600	3950	-	91.1	-
-	115	25	70	None	95	148	58.2	89.6
		50	70	None	23.5	56	125	236
		60	70	None	23.5	67.3	104	197
-	230	25	140	None	373	600	57.4	88.4
		50	160	None	95	215	129	246
		60	160	None	95	258	107	205
-	460	25	250	1500	1875	1950	67.5	104
		50	300	None	373	860	129	246
		60	300	None	373	1032	107	205

The ratings and burdens of the PAC and PBC auxiliary relays are given in Table III.

TABLE III

RATINGS AND BURDENS OF TYPES PAC AND PBC OVERCURRENT RELAYS										
Relays	Continu-ous Rating in Amperes	Minimum Pickup in Amperes	Cali-bration Range in Amperes	#Burdens at Minimum Pickup			Burdens at 5 Amperes (Calculated from input at min. pickup)			
				Watts	*Vars	+Volt-Amperes	Power Factor	Watts	*Vars	Volts Amperes
60-CYCLE BURDENS										
	0.5	0.5	0.5-1.5	6.4	17.3	18.6	0.34	640	1730	1860
PAC11A	1	1	1-3	6.4	17.5	18.6	0.34	160	437	465
PAC11B	2	2	2-6	6.5	18.7	19.8	0.33	40.6	117	124
PAC12A	3	3	3-9	6.9	18.6	19.8	0.35	19.2	51.7	55
PAC12B	4	4	4-12	6.8	18.6	19.8	0.34	10.6	29.0	31
PAC13B	5	5	5-15	6.9	18.6	20.0	0.34	6.9	18.6	20
PAC14B	10	10	10-30	8.5#	19.3#	21.5#	0.39	2.1	4.8	5.4
	20	20	20-60	7.5#	19.8#	21.2#	0.36	0.47	1.24	1.3
	35	40	40-120	9.5#	17.6#	20.0#	0.47	0.15	0.28	0.31
PBC11A	1	0.5	0.5-1.5	1.6	4.9	5.2	0.39	128	317	330
PBC11B	2	1.0	1-3	1.5	5.1	5.3	0.32	36.3	108	114
PBC12B	5	2.5	2.5-7.5	1.7	5.2	5.5	0.32	0.7	20	21
	10	5.0	5-10	2.0	4.9	5.3	0.38	2.0	4.9	5.3

* The term "vars" has superseded the term "reactive volt-amperes."

+ Some companies list their relay burdens only as the volt-ampere input to operate at minimum pickup and this column is included so that direct comparison can be made. The values listed should not be used in calculating volt-ampere burdens.

Burdens are measured at minimum pickup except where this exceeds 5 amperes they are measured at 5 amperes.

The ratings and burdens of the PAV and PCV relays are given in Table IV.

TABLE IV
RATINGS AND BURDENS OF TYPES PAV AND PCV UNDERVOLTAGE RELAYS

Type of Relay	Ratings in Volts		Frequency Cycles	Pickup and Dropout Voltages	External Resistor Ohms	Resistance in Ohms (Total at 25 C)	Impedance in Ohms	Watts	Volt-Amps
	D-c Continuous	A-c Continuous							
PAV	125	-	D-c	*	430	780	-	20.0	-
	250	-	D-c	*	1200	1550	-	40.3	-
	600	-	D-c	*	3600	3950	-	91.1	-
PCV	-	115	25	#	None	210	990	5.1	13.4
			50	#	None	55	492	10.7	27.0
			60	#	None	52	464	11.5	28.5
	-	230	25	#	None	820	3180	6.8	16.7
			50	#	None	292	1975	10.4	26.0
			60	#	None	210	2160	9.8	24.5
	-	460	25	#	None	4000	19080	5.3	10.7
			50	#	None	+	+	+	+
			60	#	None	820	7630	11.3	27.8

* The PAV relays will pick up at approximately 70% of rated voltage and will drop out at about 50%.

The PCV relays will pick up at approximately 50 to 80% of rated voltage and will drop out at about 20 to 40%.

+ For these values, refer to the nearest Sales Office of the Company.

The ratings and burdens of the PBA relay is given in Table V.

TABLE V
RATINGS AND BURDENS OF TYPE PBA AUXILIARY RELAYS

Ratings in Volts		Frequency Cycles	Pickup Volts	External Resistor Ohms	Resistance in Ohms (Total at 25C)	Impedance in Ohms	Watts	Volt Amperes
D-c Continuous	A-c One Minuet							
12	-	-	8	None	11	-	13.1	-
24	-	-	16	None	40	-	.4	-
48	-	-	38	None	270	-	8.5	-
125	-	-	50	500	850	-	18.3	-
250	-	-	125	1500	1850	-	33.8	-
650	-	-	250	4000	4350	-	97.1	-
-	115	25	30	None	42.5	114	53	116
		50	50	None	42.5	230	22	55
		60	50	None	42.5	306	13	43
-	230	25	110	300	343	364	140	145
		50	110	200	243	344	107	152
		60	110	200	243	412	91	128
-	460	25	200	500	543	560	374	379
		50	200	500	543	550	350	385
		60	200	500	543	659	284	317

CONTACT RATINGS

The interrupting ratings of any one contact for non-inductive circuits, are given in the following table.

TABLE VI

Volts	Snap Action*		Non-Snap Action**	
	A m p e r e s			
	A-C	D-C	A-C	D-C
12	--	6.0	--	3.0
24	--	4.0	--	2.0
48	--	2.5	--	1.25
125	10	1.0	2.5	0.5
250	7	0.4	1.0	0.2
600	3	0.1	0.0	0.0

* All instantaneous contacts, and the time contacts that open on the upstroke of the plunger have snap action.

** Time contacts that open on the downstroke of the plunger have non-snap action.

The current-closing rating of the contacts is 75 amperes for voltages not exceeding 600 volts. The contacts have a current-carrying rating of 5 amperes continuously or 75 amperes for one-half second. The interruption ratings are listed in Table VI.

Where the contacts are required to carry more than 75 amperes for one-half second, or 5 amperes continuously, they should be grouped in pairs and each pair should be connected in parallel. Two contacts in parallel will carry 150 amperes for one-half second. Multiple contacts increase the current-carrying rating but not the interrupting rating.

When these relays are used for a-c tripping from current-transformer secondaries, the contacts that normally short-circuit the trip coil of the circuit breaker may be used for all applications where the secondary current does not exceed 50 amperes.

CHARACTERISTICSTYPE PAC

The Type PAC relay can be obtained either instantaneous or with time delay, and with either self or hand-reset. When arranged for self-reset, the relay will reset its contacts when the current has been reduced to approximately 50% of pickup value. If the contacts have not operated, the relay will reset at a current value of approximately 70% of pickup.

The time delay may be adjusted for any time from 0.3 to 30 seconds at 150% of its calibration. The low point of calibration is approximately the same as the continuous capacity, while the highest calibration is three times the lowest calibration value.

The standard time-delay relay is assembled at the factory to give the delay on pickup with instantaneous dropout.

TYPE PBC

The Type PBC relay is built in the instantaneous form with either hand or hand-and-electrical reset only. It differs from the Type PAC relay in that the plunger is much lighter.

The low point of calibration is approximately 50% of the continuous capacity, while the high point of calibration is three times the lowest calibration value.

TYPE PAV

The Type PAV relay is similar to the Type PAC relay except that it is equipped with a potential coil to fit the device for use as a d-c undervoltage relay.

TYPE PCV

The Type PCV relay differs from the Type PAV construction in that it is particularly adapted for operation on a-c voltage and is quiet at rated voltage with the plunger up. It may be obtained either in the instantaneous form or with the time-delay feature. The latter is assembled at the factory to give instantaneous pickup with time-delay dropout unless otherwise specified. It has no provision for calibration but will pick up at approximately 80% of rated voltage and dropout at 30%.

TYPE PAA

The Type PAA relay is similar to the Type PAC relay except that it is equipped with an a-c or d-c potential coil. When used on a-c, this relay is suitable for momentary energization only.

TYPE PBA

The Type PBA relay is similar to the Type PBC relay except that it is equipped with an a-c or d-c potential coil. It is not suitable for continuous energization by alternating current. Current coils are also supplied when connected in series with other coils.

CONSTRUCTION

All of the relays included in this instruction are of the same type construction. The adjustable armature is mounted on the threaded portion of a plunger rod which carries the moving contacts upward as the armature is operated. The armature is drawn upward into the coil by the flux created in the rectangular magnet frame and a cylindrical pole piece inside the coil. Figures 1, 2, 3, 4, and 5, show the different kinds of relays.

RECEIVING, HANDLING AND STORAGE

These relays, when not included as a part of a control panel, will be shipped in cartons designed to protect them against damage. Immediately upon receipt of a relay, examine it for any damage sustained in transit. If injury or damage resulting from rough handling is evident, file a damage claim at once with the transportation company and promptly notify the nearest General Electric Apparatus Sales Office.

Reasonable care should be exercised in unpacking the relay in order that none of the parts are injured or the adjustments disturbed.

If the relays are not to be installed immediately, they should be stored in their original cartons in a place that is free from moisture, dust and metallic chips. Foreign matter collected on the outside of the case may find its way inside when the cover is removed and cause trouble in the operation of the relay.

ACCEPTANCE TESTS

Immediately upon receipt of the relay an INSPECTION & ACCEPTANCE TEST should be made to insure that no damage has been sustained in shipment and that the relay calibrations have not been disturbed. If the examination or test indicates that readjustment is necessary, refer to the section on SERVICING.

VISUAL INSPECTION

Check the nameplate stamping to insure that the model number and rating of the relay agree with the requisition.

Remove the relay from its case and check that there are no broken or cracked molded parts or other signs of physical damage, and that all screws are tight.

CONTACTS

The stationary contacts can be assembled to provide a circuit-opening or a circuit-closing contact as shown in Figure 1. The position of the contacts can be changed by loosening the screw at the bottom of the contact post, then removing the contact and replacing it in a forward or a backward position as desired.

The front and back contacts should make simultaneously when the plunger is manually moved thus operating the contact-bar toggle mechanism. If adjustment is required, the set screws should be loosened and the contact moved in the desired position. The contact spring should bear lightly against the front stop when the contact is open.

When the adjustment is made, be sure that the contacts still make simultaneously; and that each contact has wipe, indicated by the space between the contact bar and contact spring when the contact is closed.

SELF OR HAND RESET

In the construction of the Types PAA and PAC relays, the upper portion of the plunger rod is surrounded by two semi-cylindrical die castings which carry four projecting parts at the bottom spaced 90 degrees apart, located under the toggle arms; also two similar parts spaced 180 degrees apart, and located directly over the toggle arms. These projecting parts or knobs may be adjusted to two positions. When the two upper knobs lie across the toggle arms, the contacts are automatically reset by the fall of the plunger; whereas, when they are rotated through 90 degrees, they pass downward between the toggle arms and the contacts remain in the operated position until reset manually by means of the push rod projection through the front of the cover. This rotation is accomplished by removing the clamping spring at the top of the rod and rotating the semi-cylindrical castings carrying the knobs until the latter reaches the desired position. The spring must then be replaced in the recess provided for it.

TIME DELAY

Time delay is obtained by means of a bellows and air valve located at the top of the plunger rod. The bellows is composed of a rubber compound and must not be lubricated. This compound is not appreciably affected, either in its action or in its durability, by high or low temperature. The rate at which the air is expelled by the upward stroke of the plunger and returned by the downward stroke is governed by a calibrated disk at the right-hand side of the bellows controlling the air valve, the latter being located directly in front of the Textolite drum upon which the disk rotates. This disk is arbitrarily marked from one to ten and the valve mechanism is so arranged that when the numeral one lies over the valve opening, the time delay of the relay is at its minimum value. As the disk is rotated so that higher numerals lie vertically over the valve aperture, the time delay increases and reaches the maximum time setting of the relay at the numeral ten. (See Figure 10). The time delay corresponding to a given number on the disk will vary slightly from relay to relay.

The setting of the left-hand disk, which is not calibrated, determines whether the delay brought about by the bellows will occur on the upward stroke of the plunger, on its downward stroke, or on both. By raising the clip which holds this disk in place, and removing the latter, two valves are displayed; one of which contains a removable poppet, while the other does not. The action of the poppet is as follows.

When the poppet is placed in the left-hand valve opening, with the dowel pin on the cover seated in the recess at the back of the molded part, the time delay takes place on the upward stroke of the plunger and there is no appreciable time delay on the downward stroke.

When the poppet is placed on the right-hand valve opening, with the dowel pin still seated in the recess at the back of the molded part, the action is reversed, the time delay now occurring on the downward stroke, while the upward stroke is practically instantaneous.

With the poppet still in the right-hand valve opening, but with the disk replaced so that the dowel now rests directly on top of the poppet, instead of in the recess previously described, the time-delay action of the relay occurs on both the upward and downward strokes.

In making any of the above adjustments care should be taken to see that the leather washer under the disk is properly seated when the latter is replaced.

A test diagram for checking the operating time of a relay is shown in Figure 8. Figures 9, 11, and 12 show the characteristic time-current curves of the Types PAC, PAV and PCV relays.

OVERCURRENT SETTING

The current at which the plunger operates is predetermined by the height at which it rests in the calibrating tube at the bottom of the relay. The groove at the lower end of the plunger should be set opposite to the value in amperes at which it is desired that the relay shall operate. This setting is accomplished by turning the knurled nut until the plunger groove rests opposite the desired tripping current.

Note: On 25 cycle relays before the plunger setting can be changed, it is first necessary to loosen the locknut below the plunger. This is accomplished by loosening the setscrew which clamps the round nut to the plunger.

The overcurrent relays, Types PAC and PBC, are equipped with current coils. The others are provided with potential coils, except certain forms in the Type PBA relay which are intended for operation in series with a circuit breaker trip coil; these relays are provided with coils suitable for this purpose.

All relays, except the undervoltage Types PAV and PCV, are provided with targets. These targets are plainly visible, orange-colored semaphores which come into view when the plunger rises to operate the relay. They are reset manually by means of a push rod extending through the front of the cover.

INSTALLATION

The relay should be mounted on a vertical surface in a location reasonably free from excessive heat, moisture and vibration. It should also be well lighted to facilitate maintenance.

It may be more convenient to adjust the contacts before mounting the relay than afterwards. Refer to the section under ACCEPTANCE TESTS.

MOUNTING

The outline and panel drilling diagrams for the different types of relays are listed in Table I. The panel drilling diagram for the Type PAC relay, rated 20 to 40 amperes, is shown in Figure 22. Diagrams are available upon request at the nearest General Electric Sales Office for the Type PAC relay rated greater than 40 amperes and for the Type PBC relay rated higher than 10 amperes.

CONNECTIONS

The internal connections are given in Table I. Typical external connections are shown in Figures 6 and 7.

PERIODIC CHECKS AND ROUTINE MAINTENANCE

In view of the vital role of protective relays in the operation of a power system it is important that a periodic test program be followed. It is recognized that the interval between periodic checks will vary depending upon environment, type of relay and the user's experience with periodic testing. Until the user has accumulated enough experience to select the test interval best suited to his individual requirements it is suggested that the points listed under INSTALLATION PROCEDURE be checked at an interval of from one to two years.

CONTACT CLEANING

For cleaning relay contacts, a flexible burnishing tool should be used. This consists of a flexible strip of metal with an etched roughened surface resembling in effect a superfine file. The polishing action is so delicate that no scratches are left, yet it will clean off any corrosion thoroughly and rapidly. Its flexibility insures the cleaning of the actual points of contact. Do not use knives, files, abrasive paper or cloth of any kind to clean relay contacts.

SERVICING

If it is found during the installation on periodic testing that any of the units are out of limits, the following tests may be helpful before recalibration.

CONTACTS

Each contact spring should barely touch the top of its contact support and there should be approximately 1/32" between the spring and the bottom of the support when that particular contact is open.

Each contact should be held firmly in this position by advancing pointed screw, thus clamping contact support against contact block insert.

The contact bar should strike all contacts on each side at approximately the same time and each contact should move from 1/64" to 3/64" from top of contact support when that particular contact is closed.

TOGGLE MECHANISM

The center of toggle roller should be about 1/32" but not more than 1/16" below the center line. See that the operating rod does not rub against the sides of the toggle links. See that the target resets smoothly without any tendency to lock.

On time delay non-hand reset relays, see that the moving parts rest on the toggle, not on the bellows.

See that the moving parts have at least 1/32" travel after the toggle trips.

MAGNET SHELL

See that the magnet shell is held firmly in place but may be released manually by raising it and turning it to the left.

BY-PASS VALVE

See that the silver poppet is assembled with marked side up. See that the cap sits firmly on the gasket without rocking.

RENEWAL PARTS

It is recommended that sufficient quantities of renewal parts be carried in stock to enable the prompt replacement of any that are worn, broken, or damaged.

When ordering renewal parts, address the nearest Sales Office of the General Electric Company, specify quantity required, name of part wanted, and the complete model number of the relay for which the part is required.

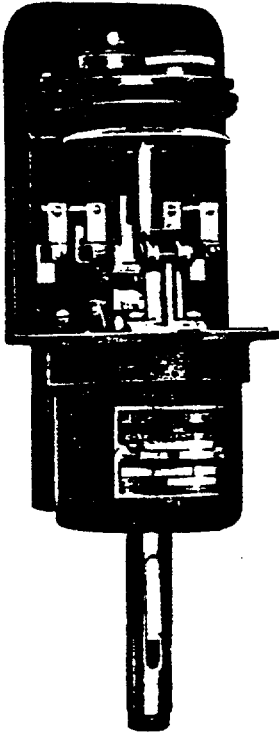


Fig. 1 (854777) Type PAC12B Time Overcurrent Relay

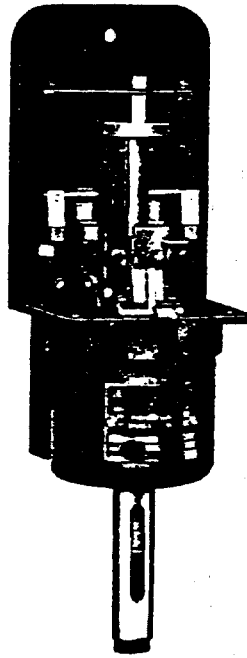


Fig. 2 (8013756) Type PAC11A Instantaneous Overcurrent Relay

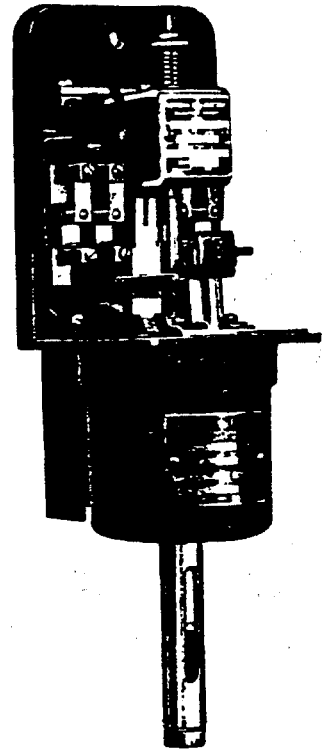


Fig. 3 (854770) Type PBA13A Instantaneous Auxiliary Relay

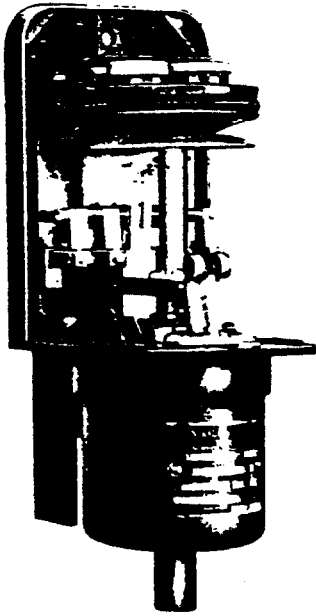


Fig. 4 (854773) Type PCV12B Time Undervoltage Relay

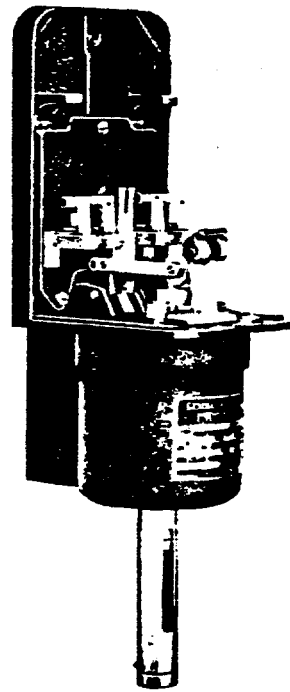


Fig. 5 (854771) Type PBA11A Instantaneous Auxiliary Relay

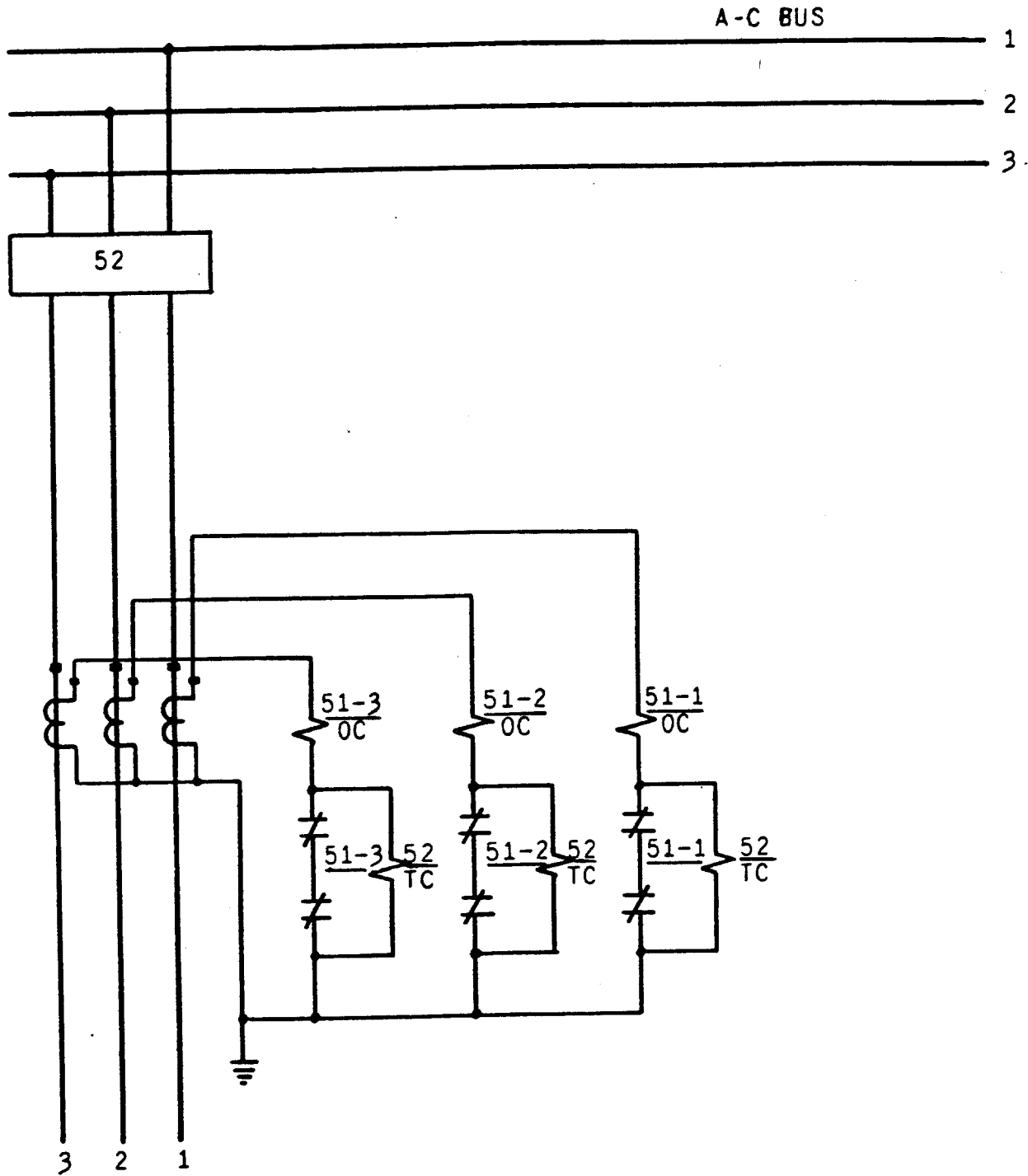


Fig. 6 (0362A0653-1) External Connections for Overcurrent Protection With Three Type PAC or PBC Relays Using Circuit Opening Contacts for Transformer Tripping

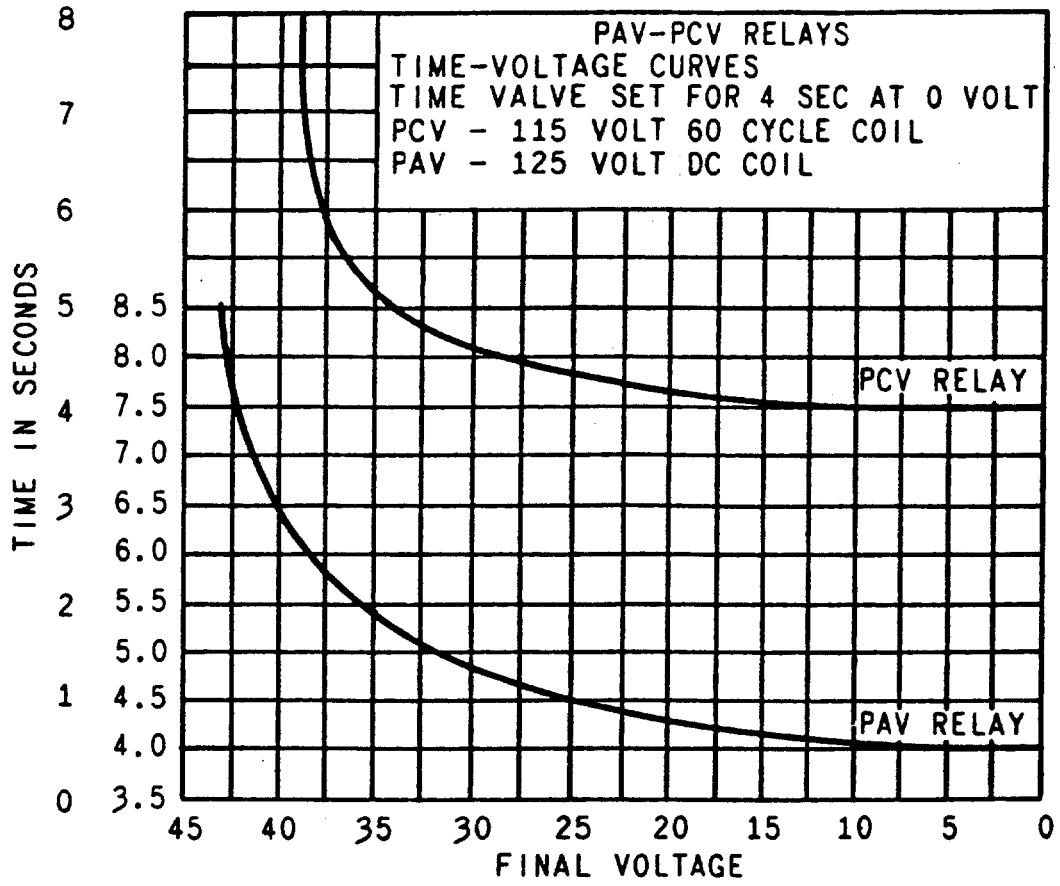


Fig. 7 (0362A0654-1) External Connections For Overcurrent Protection With Three Type PAC or PBC Relays Using Circuit Closing Contacts for D-C Tripping

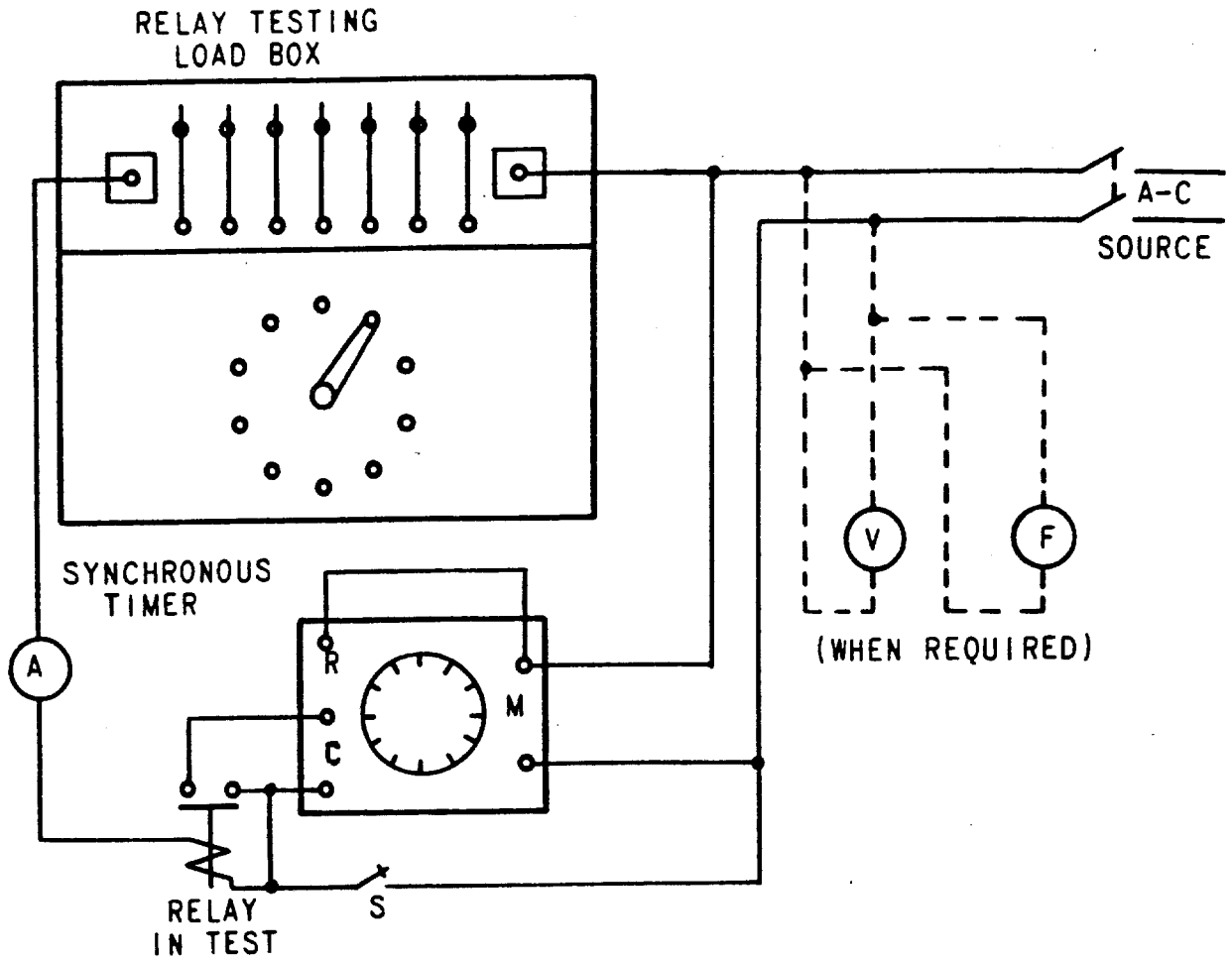


Fig. 8 (0362A0661-1) Connection For Testing a Circuit Closing Relay Operated From Same Supply As The Type MF-2 Timer

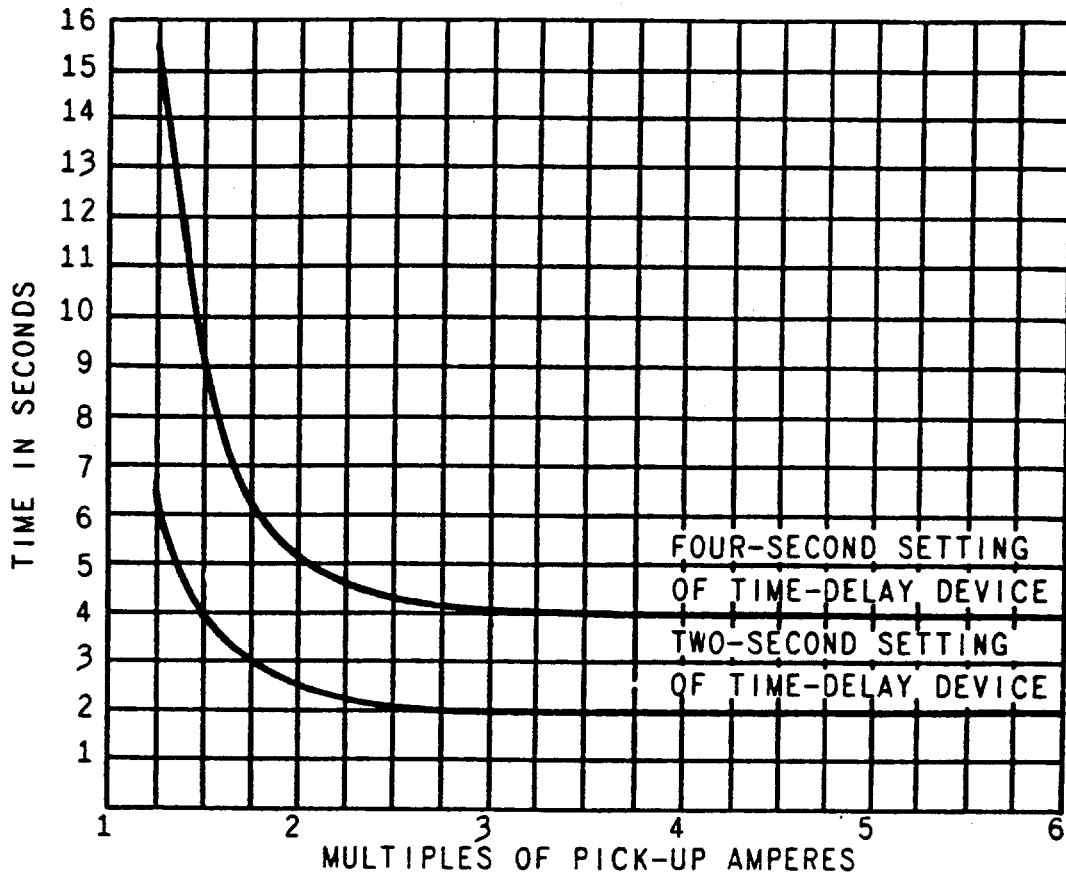


Fig. 9 (0362A0662-1) Time Current Characteristic Curves For The PAC Overcurrent Relay

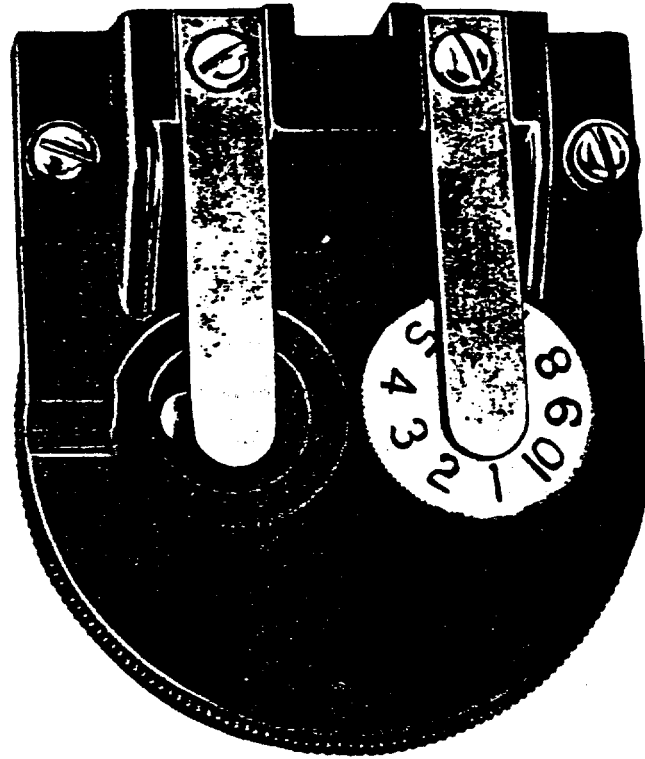


Fig. 10 (847859)

Disks For Adjusting Time Delay

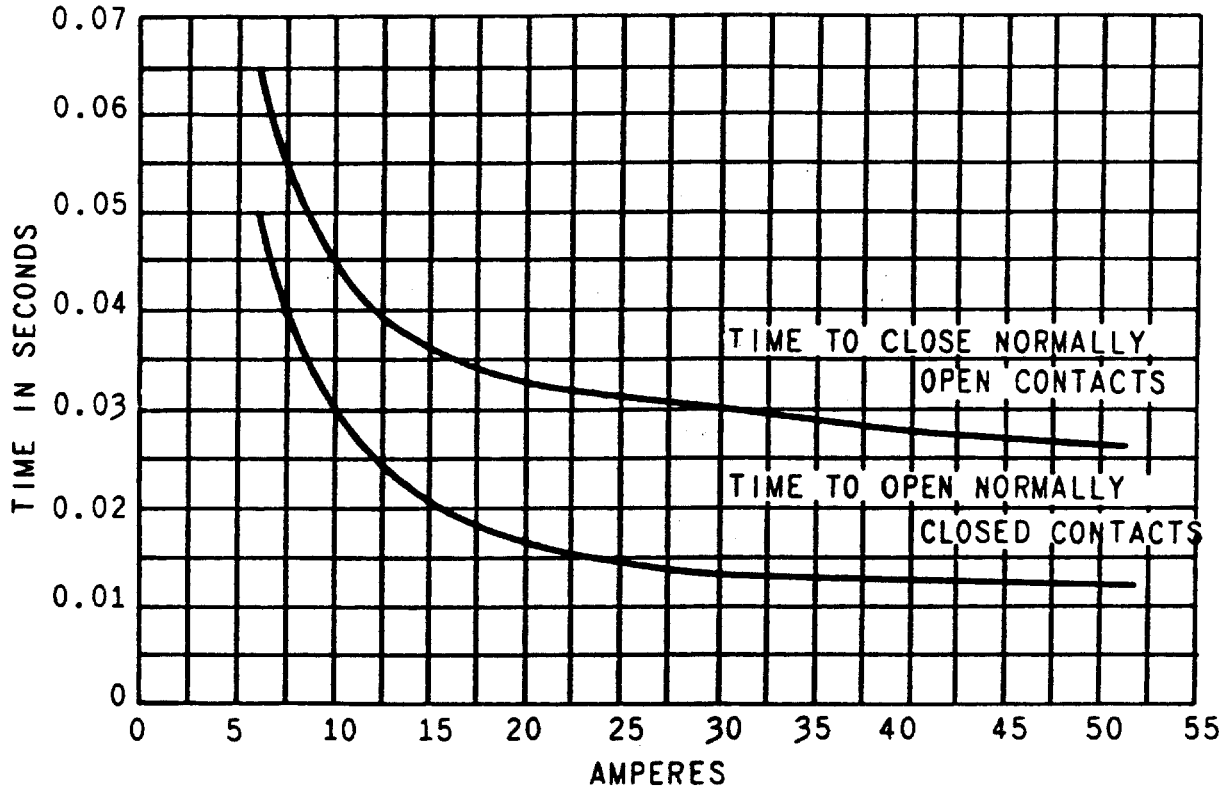


Fig. 11 (0362A0663-1) Typical Time Current On Pickup of PAC Instantaneous Overcurrent Relay With 5 Ampere Coil Plunger Set At 5 Amperes

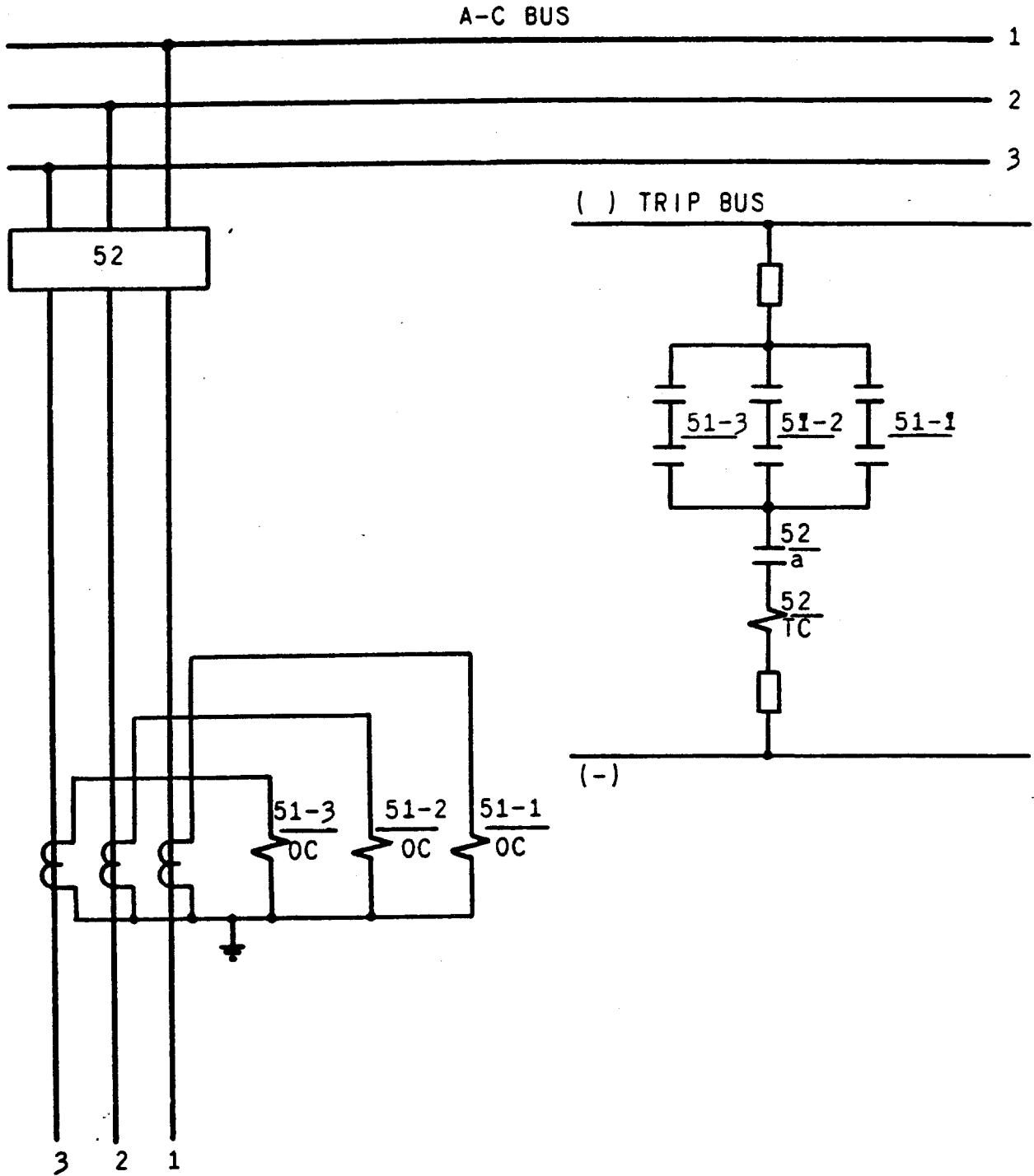


Fig. 12 (0362A0664-1) Typical Time Voltage Curves of PAV and PCV Undervoltage Relays

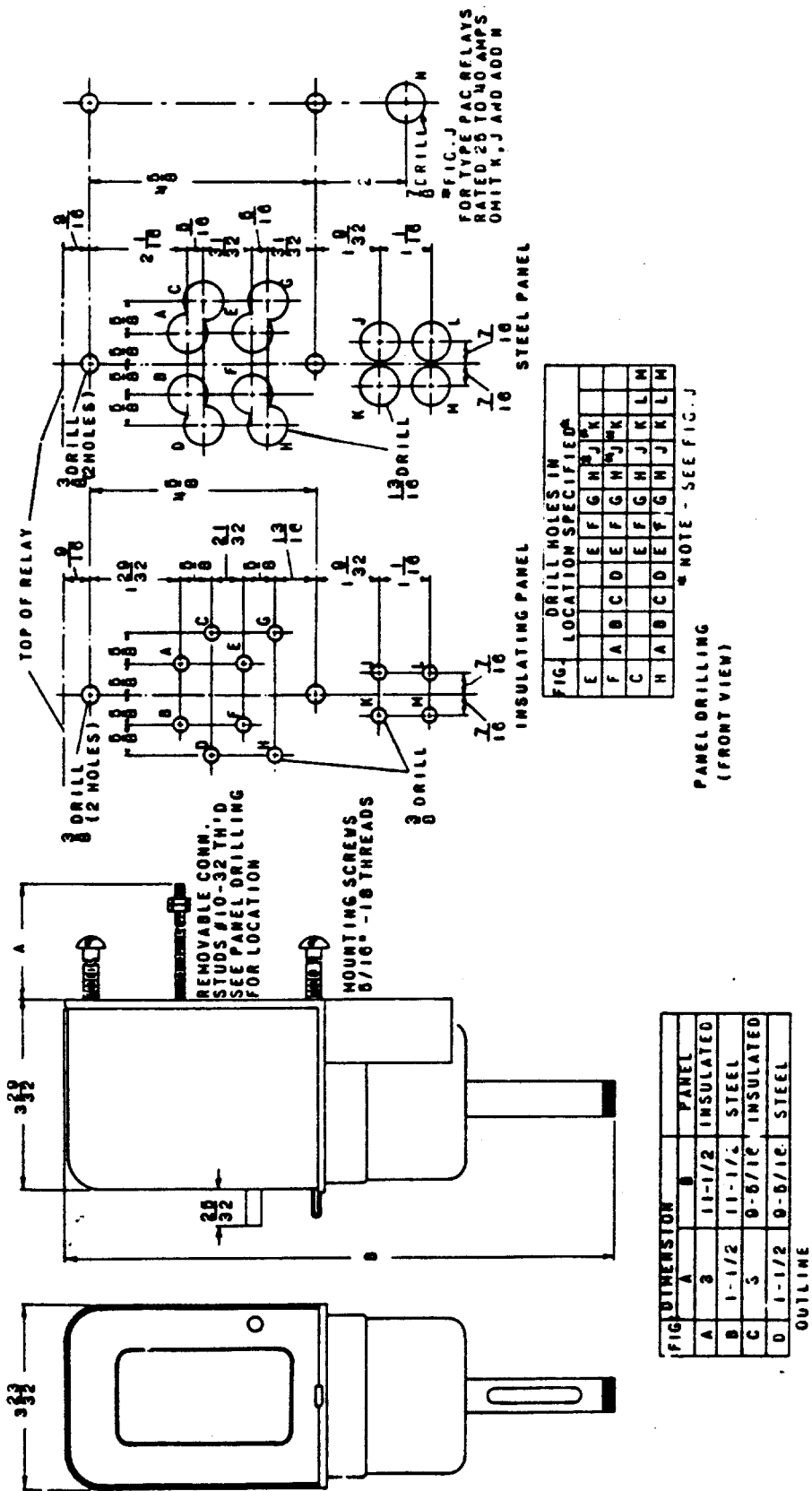


Fig. 13 (06216014-1) Outline & Panel Drilling Dimensions for Various Types of Plunger Relays

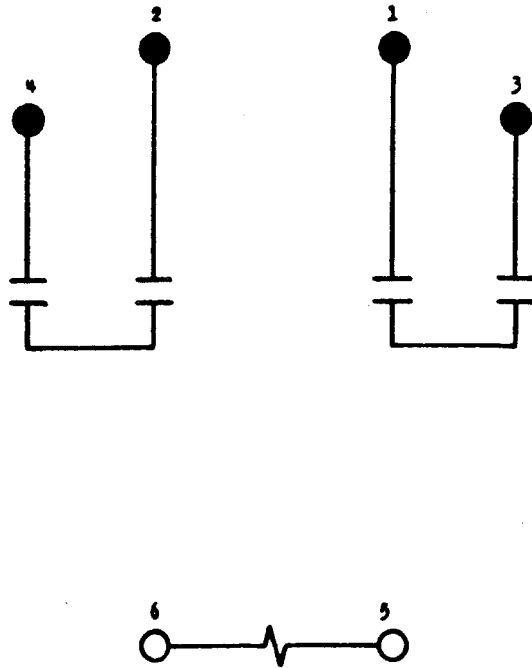


Fig. 14 (06507955-1 sh. 1) Internal Connections for Relays PCV12B, PAC11B, PAC12B, PAV11B, PAV12B, PCV11B, PBA11B, PAA11B, PAA12B & PAA12D

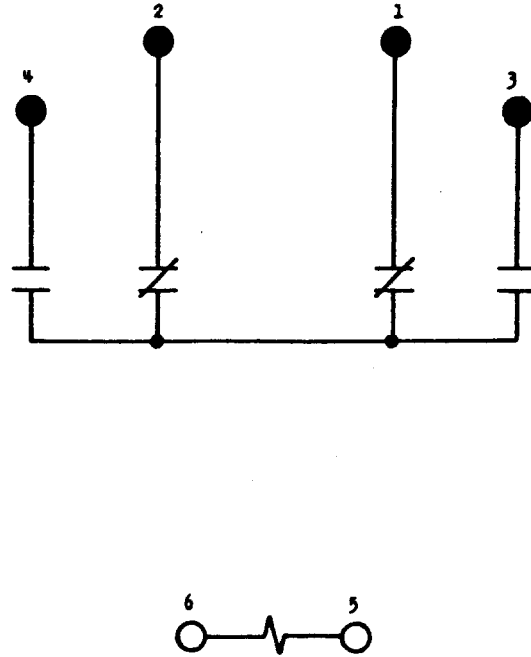


Fig. 15 (J605J7955-1 sh. 4) Internal Connections for Relays PAC11A, PAC12A, PAV11A, PAV12A, PAV12C, PCV11A, PCV12A, PCV12D, PAA11A, PAA12A, PAA12C, PAA12R & PAA16A

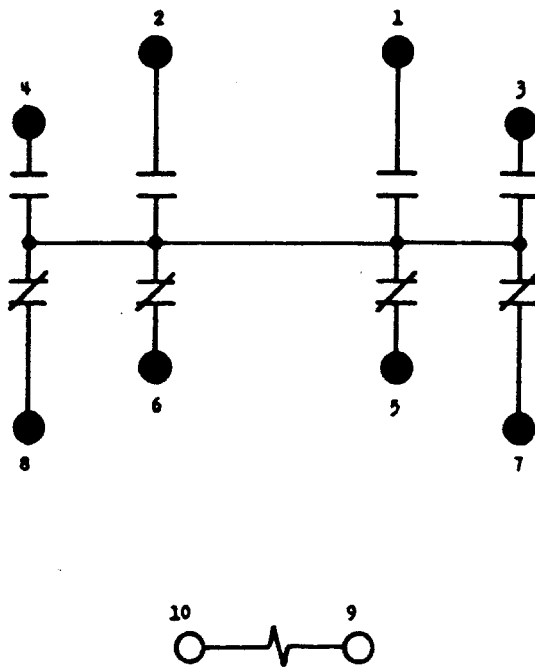


Fig. 16 (76050955-1 sh. 6) Internal Connections for Relays PAC13A, PAC14A, PBC14A, PAV14A, PCV13A, PCV14A, PAA13A, PAA14A, and PBA12A

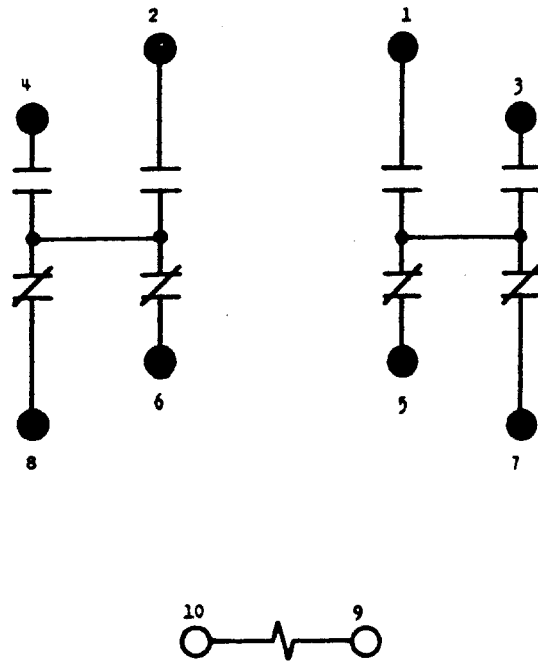


Fig. 17 (06050955-1 sh.5) Internal Connections for Relays PAC13B, PAC14B, PBC12B, PAV13B, PAV14B, PCV13B, PCV14B, PAA13B, PAA14B, PAA14C, PAA17A & PBA12B

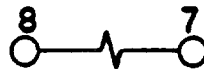
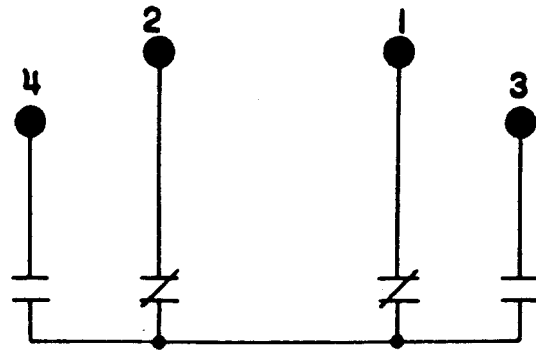


Fig. 18 (060507955-1 sh. 2)

Internal Connections for Relays PBC11C & PBA11A

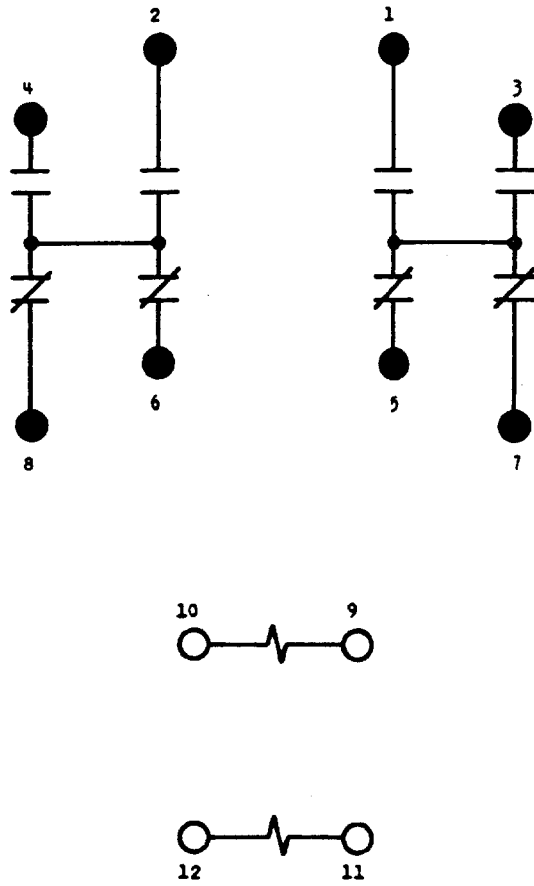


Fig. 19 (060507955-1 sh.7)

Internal Connections for Relays PBC138 & PBA13B

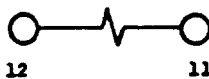
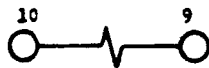
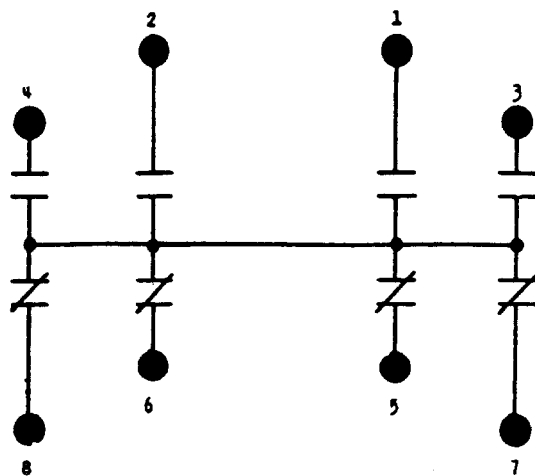


Fig. 20 (060507955-1 sh.8 Internal Connections for Relays PBC13A & PBA13A

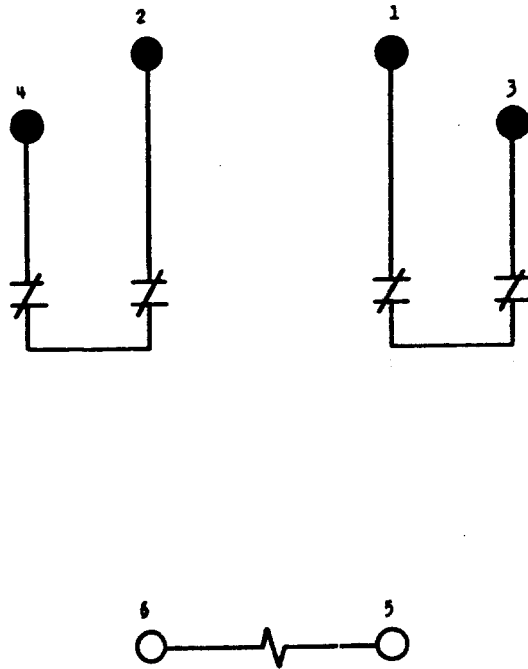


Fig. 21 (0362A0652-1) Internal Connections for Relays PAA12S & PCV12E

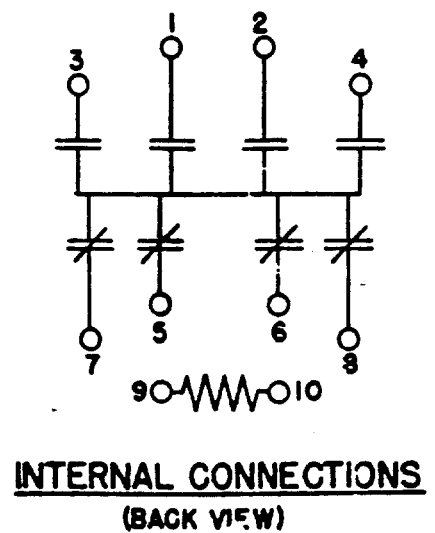
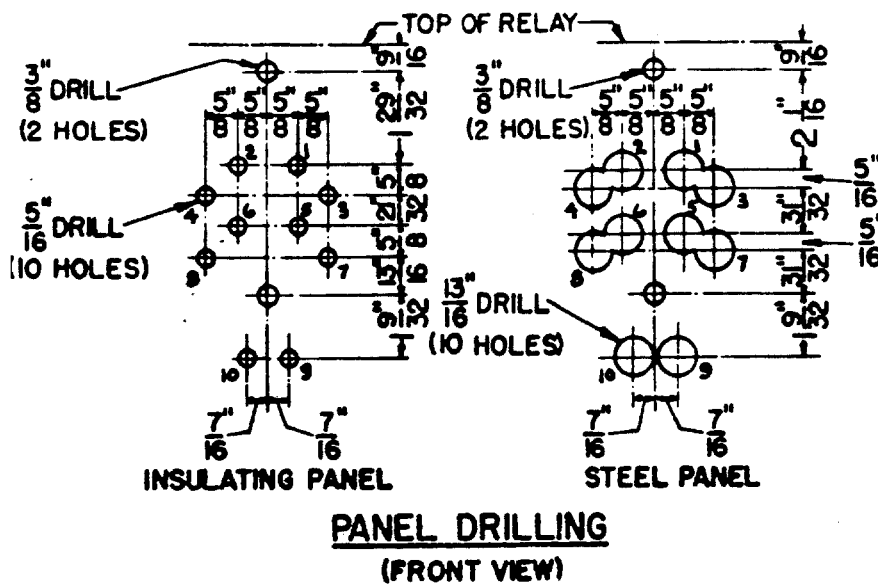
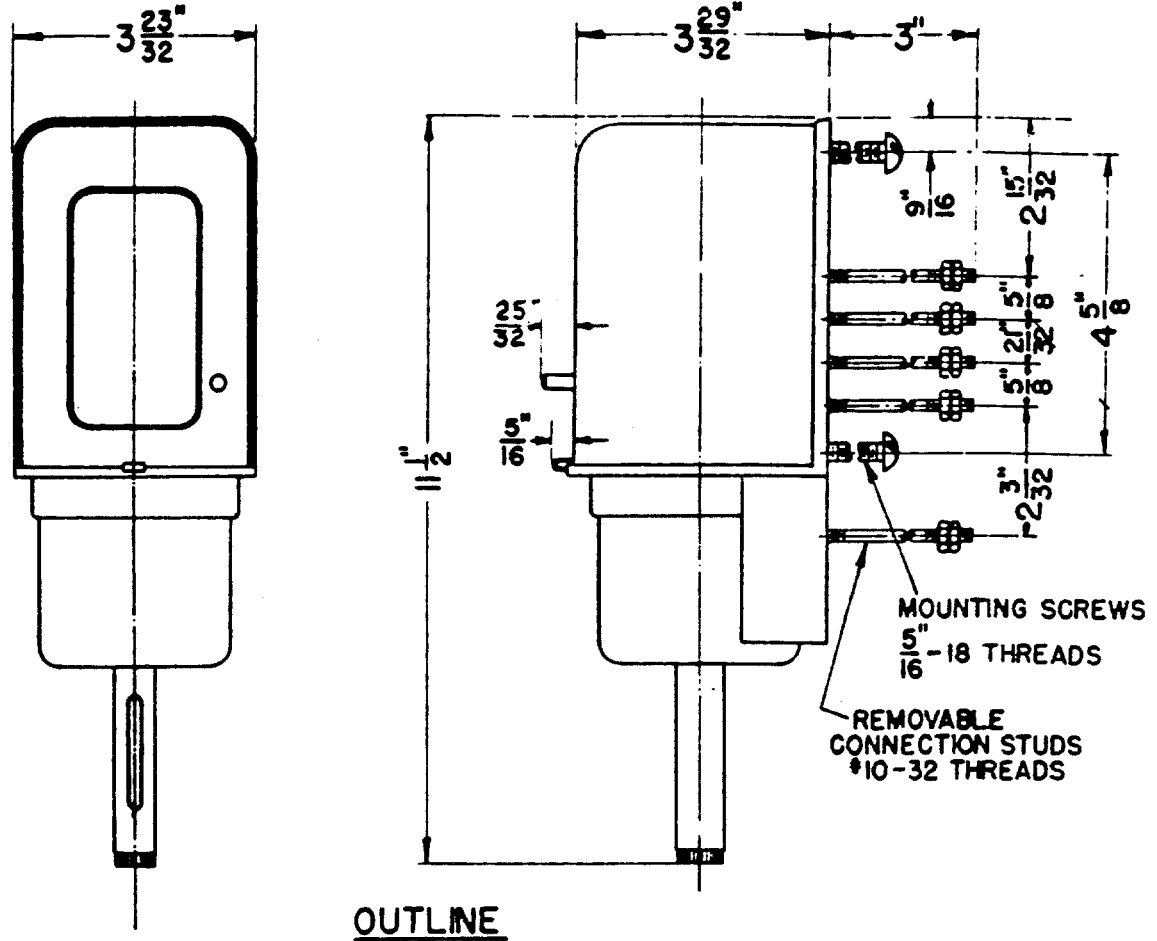


Fig. 22 (06008352-8) Outline & Panel Drilling Dimensions for Relay PAC Rated at 20 to 40 Amperes