INSTRUCTIONS

GEI-38974A
Supersedes GEI-38974

INSTANTANEOUS CURRENT RELAY

TYPE PJC20A

GENERAL ELECTRIC

CONTENTS

INSTANTANEOUS CURRENT RELAY

TYPE PJC20A

DESCRIPTION

The Type PJC20A relay consists of one unit mounted in a molded case with a glass window. It is a plunger type unit, and has an adjustable pickup current range. The moving contacts are fastened to a Textolite® contact barrier, which is molded to the plunger rod. The armature assembly is positioned by a calibrating tube, which is assembled to a magnet frame. These parts, including a coil, pole piece, stationary contacts and a target, are assembled on a molded Textolite base. There is an additional coil mounted on the magnet frame which is part of a hinged-armature element. The coil performs an electrical reset function.

When operating on an overcurrent condition, the plunger rod is lifted, tripping a visible target, and releasing a latch which holds the plunger rod assembly securely in position. The relay must then be reset by energizing the reset coil to trip the latch, or by tripping the latch manually. When the relay is in the latched-up position, the normally closed contacts will be open, but the normally open contacts may or may not be closed.

APPLICATION

The Type PJC20A relay is a plunger type relay designed for general service. This type relay is applicable for continuous operation in the reset position only. The Type PJC20A is non-directional, instantaneous in operation, and has contacts which must be manually or electrically reset after operation.

This relay is used for overcurrent protection of feeder circuits directly, or in conjunction with thermal or time-overcurrent relays, to protect equipment against very high currents which must be cleared before other devices operate.

To assure that the plunger latches up on overcurrent conditions, the normally closed contact of the PJC relay must not be used to open the operating coil directly or indirectly. A typical external connection which will accomplish this is given in Figure 1. The normally closed contacts of the PJC will not de-energize the LC coil upon operation, since the LC auxiliary contacts seal-in the normally closed contacts. The normally open contacts of the Type PJC relay must close, energize the X relay, which in turn will de-energize the LC coil and remove the overcurrent condition. Since the plunger of the relay will be latched in the picked-up position as the normally open contact closes, the Type PJC relay will have to be reset to energize the line contactor. Refer to Figure 3.

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RATINGS

OPERATING COILS

The Type PJC20A relay is designed for use on direct or alternating current, with frequencies of 25 to 60 cycles. The relays are available with operating coils of standard calibration ranges of 0.5-2.0 amperes to 40-160 amperes, as shown in Table 1. In combination with any standard operating coil, the relay is equipped with either a 115 volt 60 cycle, or 125 volt DC reset coil. The reset coils are intermittently rated for one minute at their respective voltages.

TABLE 1

OVERCURRENT RATINGS

CONTINUOUS AMPS	ONE SECOND AMPS	CALIBRATIONS			
1.5	75	0.5	0.8	1.25	2
3	150	1	1.6	2.5	4
6	275	2	3.2	5	8
12	275	4	6.4	10	16
25	275	10	16	25	40
25	275	20	32	50	80
25	275	40	64	100	160

CONTACTS

The current closing rating of the contacts is 30 amperes. The current carrying rating is five amperes continuously, or 30 amperes for two seconds. Interrupting ratings are listed in Table 2.

TABLE 2

PJC UNIT CONTACT INTERRRUPTING RATING

	AMPS	
AC VOLTS	INDUCTIVE	NON-INDUCTIVE
115	2	5
230	1	2
460	0.5	1
DC VOLTS		
24	1.0	5
48	0.5	2
125	0.3	1
250	0.15	0.3

CHARACTERISTICS

OPERATING PRINCIPLES

These plunger type relays operate on the principle of electromagnetic attraction. The contacts are opened or closed by an armature, which is drawn up vertically into a solenoid.

PICKUP AND RESET

The overcurrent unit pickup is continuously adjustable over approximately a four-to-one current range as shown in Table 1 for the various coil ratings. Pickup is set by adjusting the vertical position of the armature on its threaded shaft. The four factory pickup calibrations shown for each rating appear on the top of the relay nameplate, and correspond to the marks on the calibrating tubes of each unit.

The armature will reset at approximately 85 to 95 percent of pickup on alternating current, and 70 to 95 percent of pickup on direct current, at any point within the calibration range. Reset is not independently adjustable of pickup.

OPERATING TIMES

Time current curves for the units are shown in Figure 2. The operating current is plotted in multiples of pickup and the operating times are plotted in cycles on a 60 cycle basis. The upper curve shows the closing time of a normally open contact, and the lower curve shows the opening time of a normally closed contact.

BURDENS

The burden of the operating coil for the armature in the full reset position is given in Table 3.

The burden of the reset coil with the armature open and rated voltage applied is given in Table 4.

TABLE 3

OPERATING COIL BURDEN

Rated Amps	Calibration Range	VA at 5 amps 60 cycles	W at 5 amps 60 cycles	W at 5 amps DC
1.5	0.5 - 2	165	55	24
3	1 - 4	41	12.7	6
6	2 - 8	11.5	3.56	1.6
12	4 - 16	2.65	0.8	0.43
25	10 - 40	0.4	0.125	0.08
25	20 - 80	0.1	0.03	0.056
25	40 - 160	0.025	0.008	0.025

Values are for minimum pickup settings.

VA and W in the dropout position, with pickup current applied on the minimum pickup setting at 60 cycles, are approximately 1.7 and 0.6, respectively.

TABLE 4

RESET COIL BURDEN

Voltage Rating of Reset Coil	Frequency	Amps	Watts
115	60	0.24	16.5
125	DC	0.096	12

CONSTRUCTION

The overcurrent unit is of the plunger type construction (refer to Figure 1 for typical 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. Guides for the plunger rod are provided at the top by a hole in the pole piece, and at the bottom by the fit of the molded contact carrier inside the calibration tube. Openings in the sides of the calibration tube allow access to the armature to adjust pickup. The magnet frame, stationary contacts and plunger stop post are mounted on the molded base. Normally closed stationary contacts are mounted below the moving contact and bear against a contact rester arm when the relay is picked up. Normally open stationary contacts are mounted above the moving contact and bear against a contact rester arm when the relay is reset. Normally open stationary contacts are restrained against bouncing from the moving contact at high operating levels by a contact backstop. This is not necessary on normally closed contacts since the resetting force cannot exceed the weight of the plunger assembly.

The electric reset unit is of the hinged armature construction. This unit is mounted on the bottom of the rectangular magnet frame behind the calibrating tube. The armature of the reset unit is pivoted at the bottom of the molded base and is attracted to the pole piece by the flux created by energizing the reset coil.

RECEIVING, HANDLING AND STORAGE

These relays, when not included as 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 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 when unpacking the relay in order that none of the parts are damaged 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 and acceptance tests should be made to insure that no damage has been sustained in shipment and that the relay calibrations have not been disturbed.

VISUAL INSPECTION

Check the nameplate stamping to insure that the model number, rating and calibration range of the relay received 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. Also check to see that the flexible moving contact leads extend straight back from the contacts and that they have not been deformed.

MECHANICAL INSPECTION

It is recommended that the following mechanical adjustments be checked:

1. Operate the plunger on each unit by hand and allow it to reset to insure that all units are free from friction and binding. If two normally open contacts are present, observe that with one contact just making, there is less than 1/64 inch gap on the other contact.

2. The wipe on a normally open or normally closed contact should be approximately 3/64 inch. The normally open contact gap with the armature fully reset should be approximately 3/32 inch for either contact arrangement. Backstops should be present above all normally open contacts only. The gap between the backstop and stationary contact at the tip should be approximately 1/16 inch with the armature reset. See Figure 2.

3. With the plunger in the latched position, operate the reset armature manually to insure that the latch resets and the plunger returns to its rest position at the bottom of the relay.

ELECTRICAL TESTS

It is recommended that the following electrical checks be made immediately upon receipt of the relay. Note that all tests should be made with the relay in its case and in a level position.

Pickup and Reset

The units are normally supplied from the factory with the bottom of the armature aligned with the top mark on the calibration tube. This corresponds to the minimum pickup setting on the nameplate. It should be sufficient to check the pickup of each unit at this setting. With gradually increasing test current in the operating coil, the unit should pick up, closing its normally open contacts with one continuous motion at the calibrated current level. The test current should then be gradually decreased until the contacts reset. The reset value should be between 85 and 95 percent of pickup on alternating current or between 70 and 95 percent of pickup on direct current

Electric Reset

With the plunger in the latched position, gradually increase the voltage on the reset coil until the armature picks up, allowing the plunger to drop to the bottom of the relay. Reset should occur at 80 percent or less of reset voltage rating.

INSTALLATION PROCEDURE

LOCATION

The location should be clean and dry, free from dust and excessive vibration, and well lighted to faciltate inspection and testing.

MOUNTING

The relays should be mounted on a vertical surface. The outline and panel drilling diagram is shown in Figure 4.

CONNECTIONS

The internal connection diagram is shown in Figure 4.

INSTALLATION TESTS

After acceptance tests are performed, if the relay is to be held in storage before shipment to the job site, the visual and mechanical inspections described in the **ACCEPTANCE TEST** section should be repeated before installation.

The following electrical adjustments should be made with the relay in its case, preferably mounted in its permanent location.

Pickup

The desired pickup on each overcurrent unit may be set as follows, using the test current of the expected service frequency:

Turn the bottom of the knurled armature to the approximate position in the calibration tube corresponding to the desired pickup setting; gradually apply increasing test current to the operating coil by use of a relay test plug. If the pickup is too high, turn the armature to slightly lower it in the calibration tube; recheck pickup and readjust the armature, if necessary, until the desired pickup

calibration is obtained. Check to see that the unit resets between 85 and 95 percent of pickup on alternating current or between 70 and 95 percent of pickup on direct current.

Reset

Check to see that the plunger resets fully when 80 percent of rated voltage is applied to the reset coil.

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. Unless otherwise dictated by unusual environmental conditions, it is recommended that the following points be checked at an interval of from one to two years.

MECHANICAL CHECKS

Manually operate each overcurrent unit armature and allow it to reset to make sure that there is no excessive friction nor tendency to bind.

Check to see that the contacts have approximately 3/64 inch wipe and that the normally open contact gap is approximately 3/32 inch with the armature reset. Check to see that the backstops on the normally open contact are approximately 1/16 inch above the stationary contact tips.

Examine the contact surfaces for signs of tarnishing or corrosion. The fine silver contacts should be cleaned with a burnishing tool, which is a flexible strip of metal with an etched-roughened surface. Burninshing tools designed especially for cleaning relay contacts can be obtained from the factory. Do not use knives, files, abrasive paper or cloth of any kind to clean relay contacts.

ELECTRICAL CHECKS

Refer to the internal wiring diagram and check the pickup on each overcurrent unit. This pickup should be within three percent of the corresponding reading recorded during installation. The reset current should also be checked to be sure that it is within 85 to 95 percent of pickup on alternating current or between 70 to 95 percent on direct current Check that the electrical reset operates at 80 percent of rated voltage.

Instead of readusting the relay when minor pickup variations from a previous test are noted, no adjustments should be made as long as the relay is still within limits. Note the deviation on the relay test record. After sufficient test data has been accumulated, it will become apparent whether the measured deviations in the setting are due to random variations in test conditons, or by human error.

SERVICING

If any of the mechanical or electrical check points described in the previous section are found to be out of limits, the following points should be observed in restoring them.

Friction

If there is any tendency to bind, or excessive friction is present, check to see that the molded contact carrier has adequate clearance from the "T" shaped armature guide bracket. There should be no tendency for the armature to rotate and bind against the guide bracket as the relay operates. Also check that no foreign matter is present between the armature and calibrating tube.

Moving Contact Leads

The flexible moving contact leads should be formed to keep the moving contact assembly centrally located. If these moving contact leads have been deformed, they should be reshaped as follows:

- The insulated portion of the lead should extend straight back to the slot in the compound mounting plate
- There should be a 90 degree bend in the lead at a point just beyond the end of the insulating sleeve
- The bare lead should project either up or down to the terminal screw.

Stationary Contact Tension

Initial tension is the force applied to the contact tip to cause the moving contact to move to a position where the contact brush just starts to move away from its backstop. This initial tension should be approximately five grams on each contact, unless the relay has one normally open and one normally closed contact (Code 11). For Code 11, the initial tension on each contact brush should be approximately 15 grams. Whenever the contacts are readjusted, the wipe and gap, as well as the pickup adjustment, should also be rechecked as outlined in the previous section.

Electric Reset

If adjustment is required, the pole piece should be set while in the operated position, so that approximately 1/32 inch gap is between its end and the surface of the armature. The slotted end of the pole piece is accessible through a hole in the top of the magnet frame. The locknut provided should be tightened after the proper setting has been obtained. The holding unit should operate at 80 percent of its rating. If a target is provided, it should operate and be in full view when the holding coil is energized.

RENEWAL PARTS

Sufficient quantities of renewal parts should be kept in stock for 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 the name of the part wanted, quantity required, and complete nameplate data, including the serial number, of the relay.

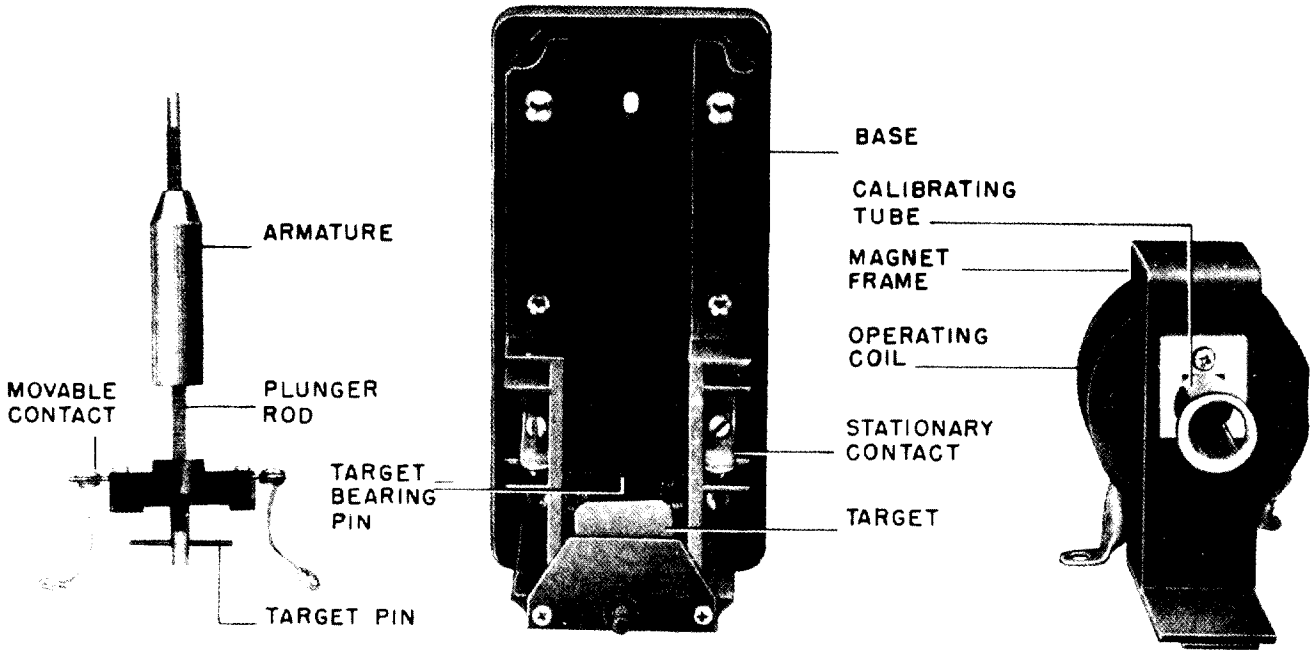


Figure 1 (8014170) Type PJC20A Relay Disassembled
(cover not shown)

Figure 1A (Later) Type PJC20A Relay, Without Cover
(Front View)

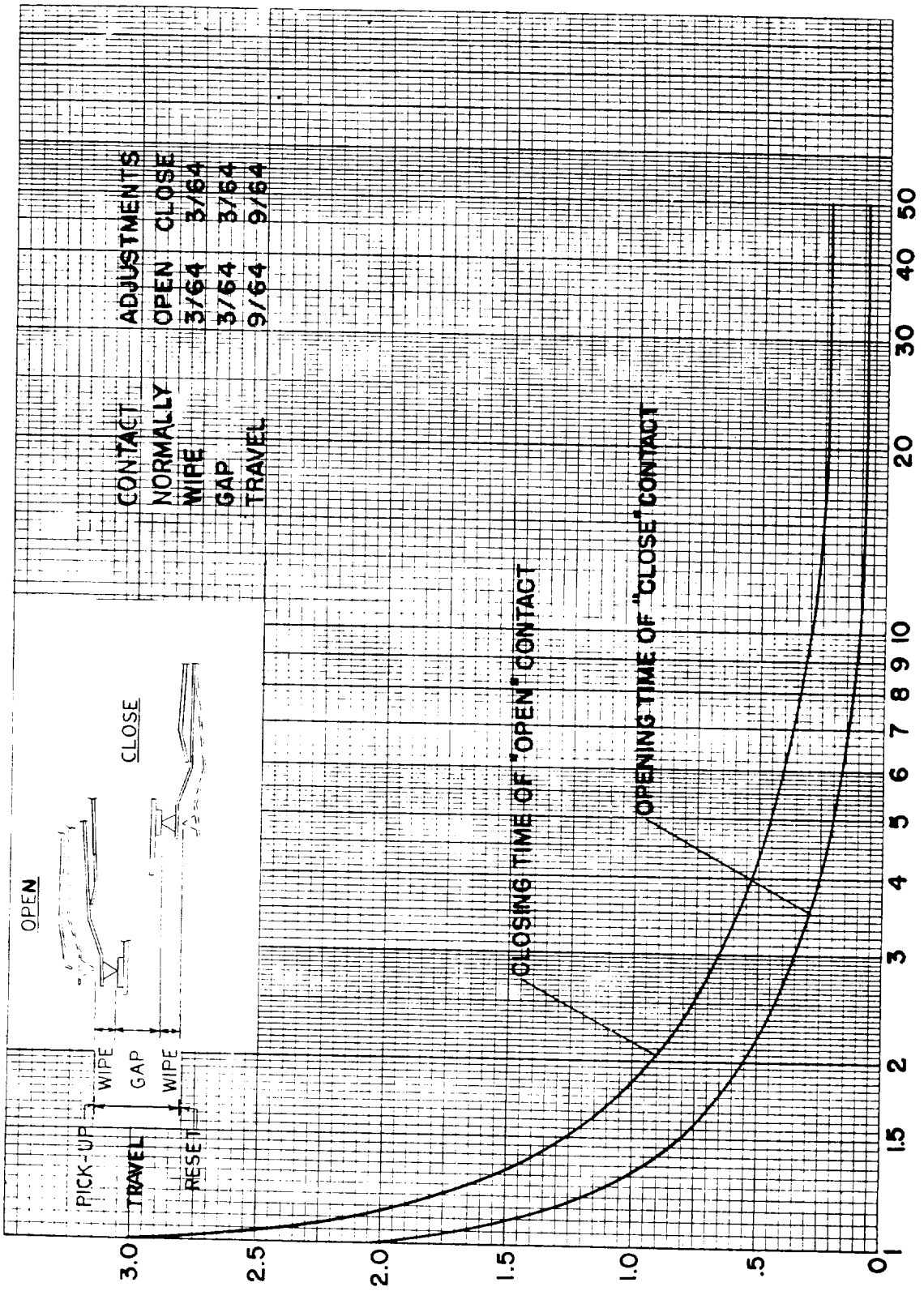
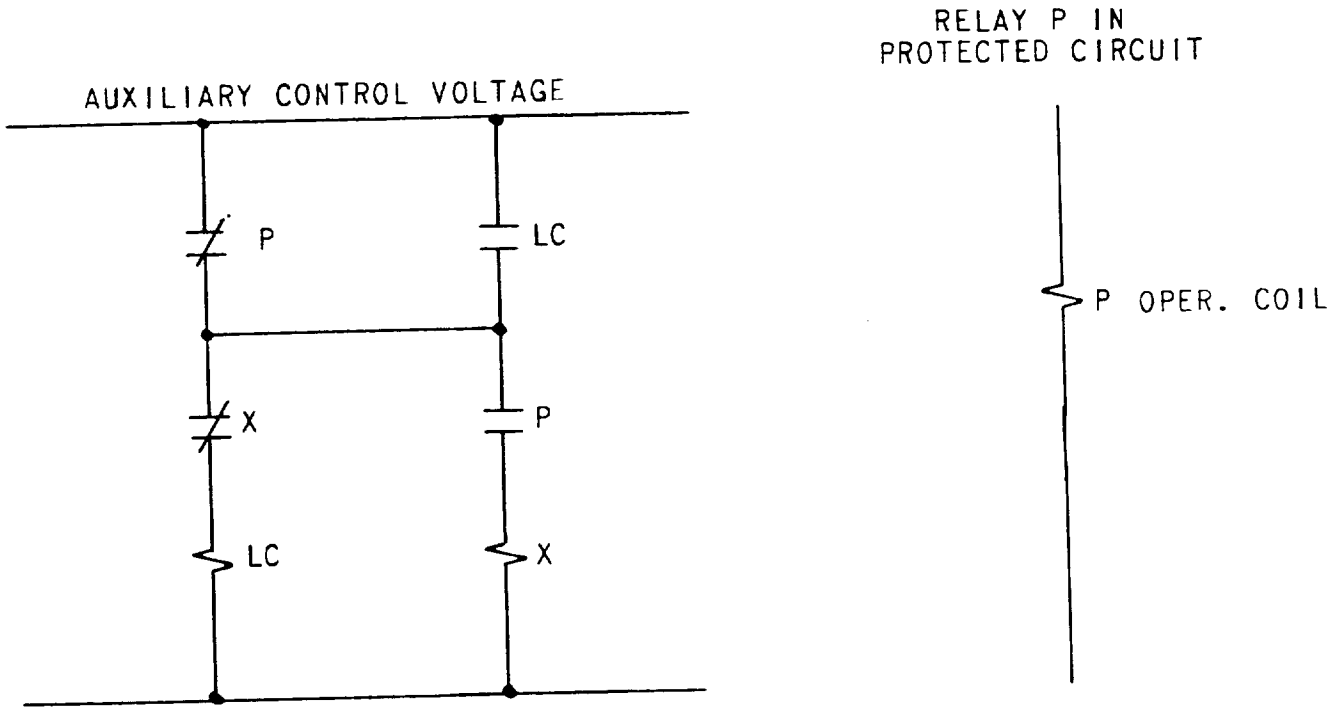
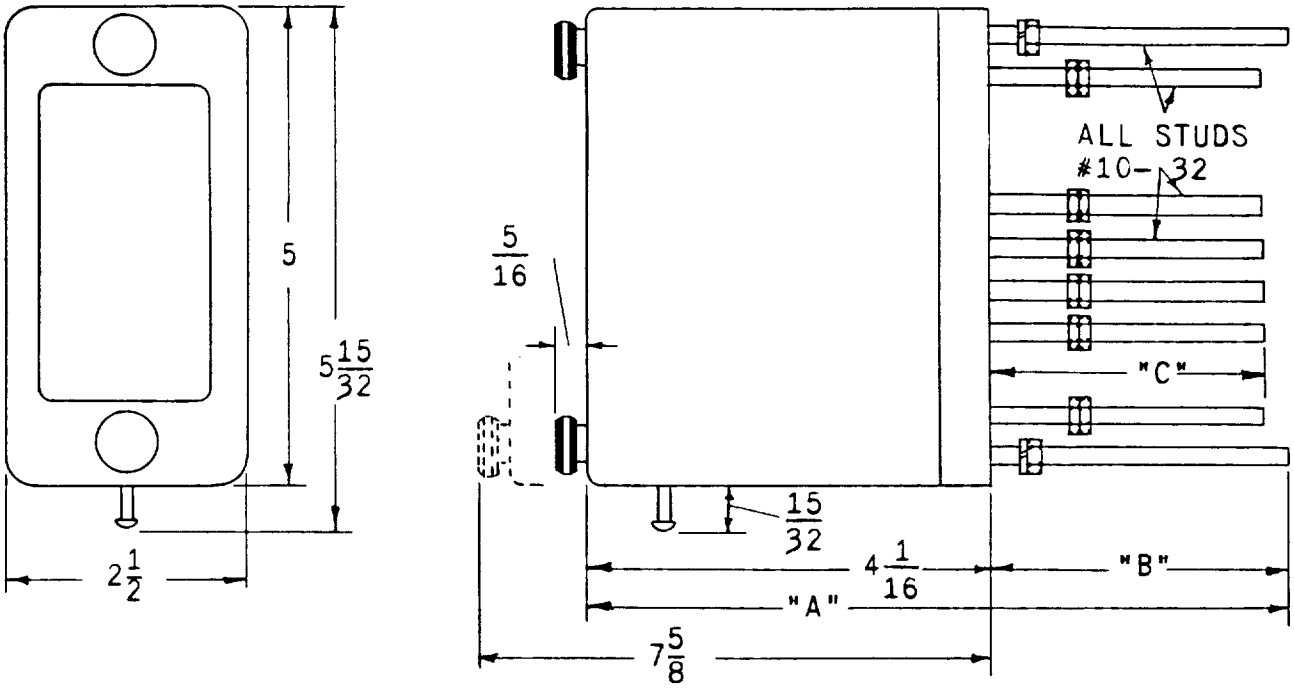


Figure 2 (418A711-2) Time Current Curves for Type PJC Relays

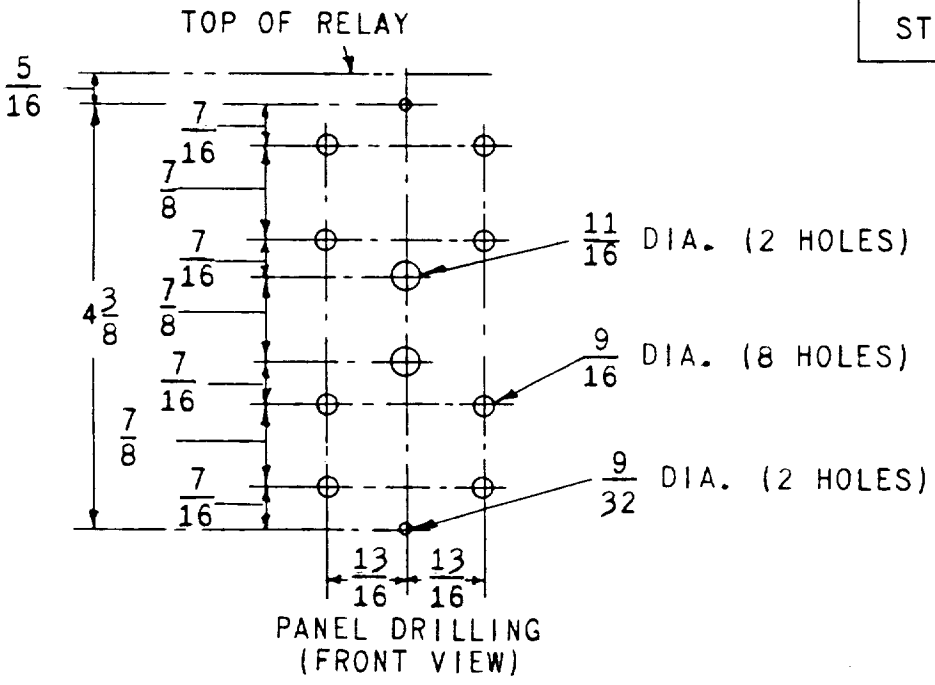


P – PJC
X – HGA14 OR HMA14, P.U. LESS THAN D.O. OF L.C.
L.C.– LINE CONTACTOR

Figure 3 (6375720) Typical External Connections Diagram for Type PJC20A Relay



TYPE OF PANEL	"A"	"B"	"C"
INSULATING	7 3/16	3 1/8	2 7/8
STEEL	5 11/16	1 5/8	1 3/8



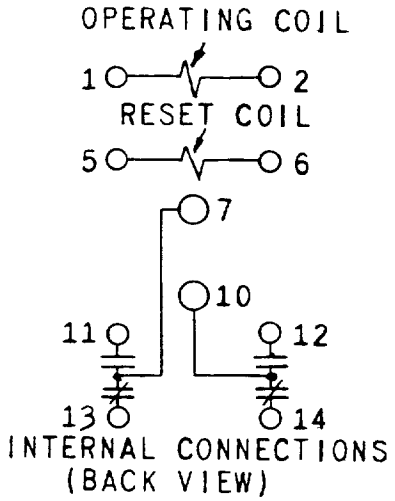


Figure 4 (6375721-0) Outline, Panel Drilling and Internal Connections Diagram for Type PJC20A Relay

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