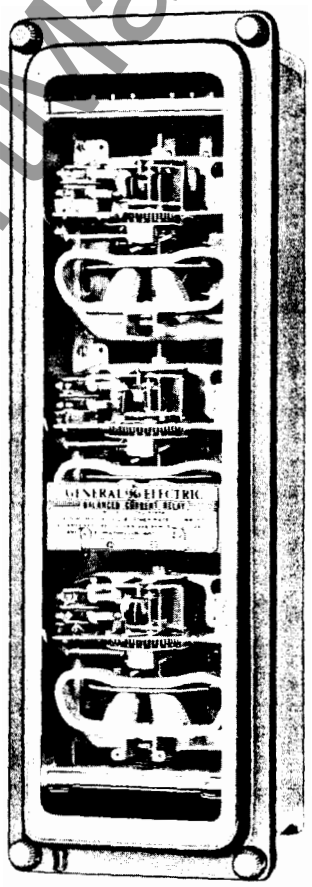
INSTRUCTIONS

GEH-1789B

SUPERSEDES GEH-1789A

BALANCED-CURRENT RELAYS



Types

IJC51B
IJC51C
IJC53A

GENERAL ELECTRIC

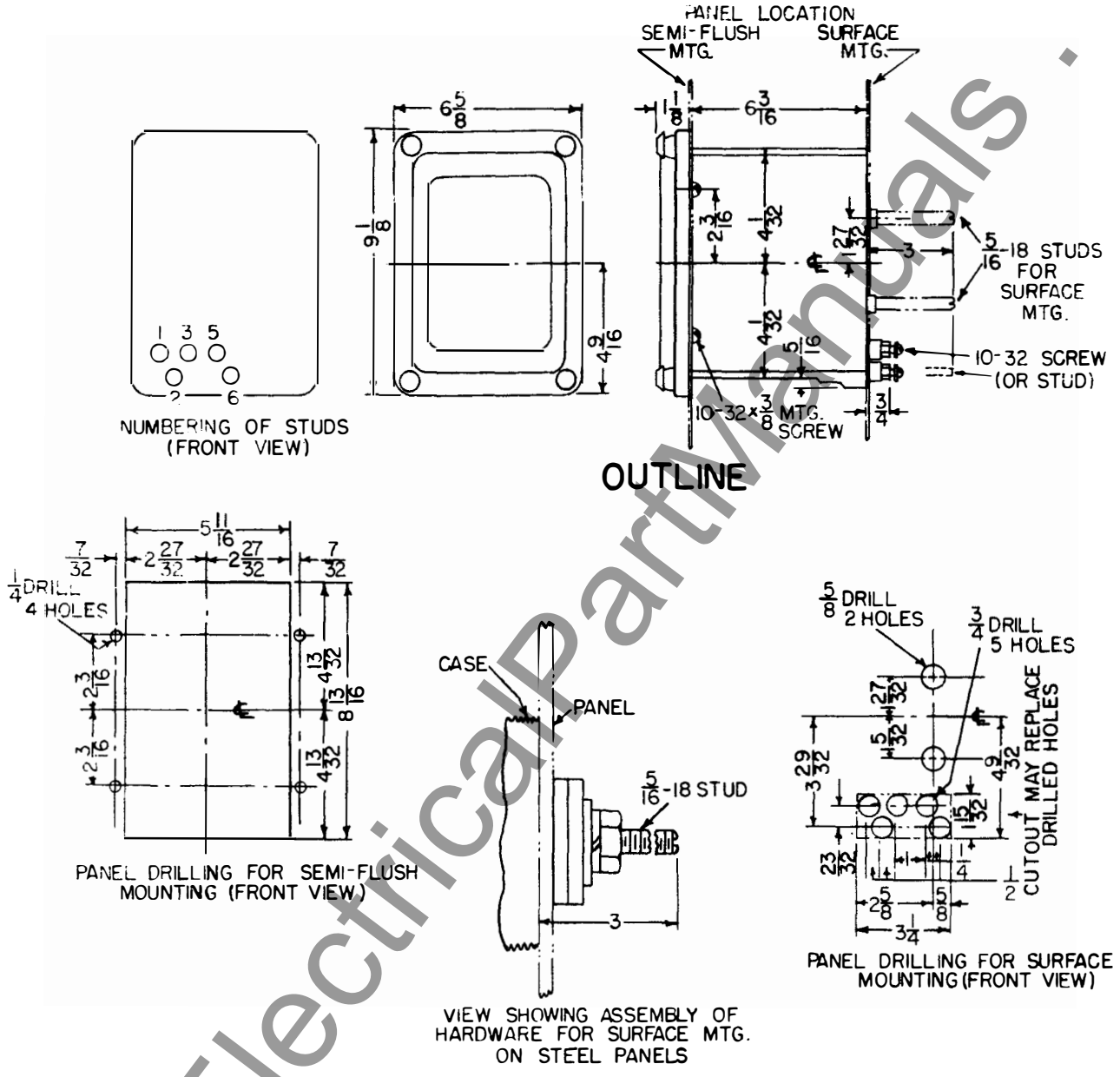


Fig. 11 (6209270-2) Outline and Panel Drilling Dimensions for the Type IJC51C Relay

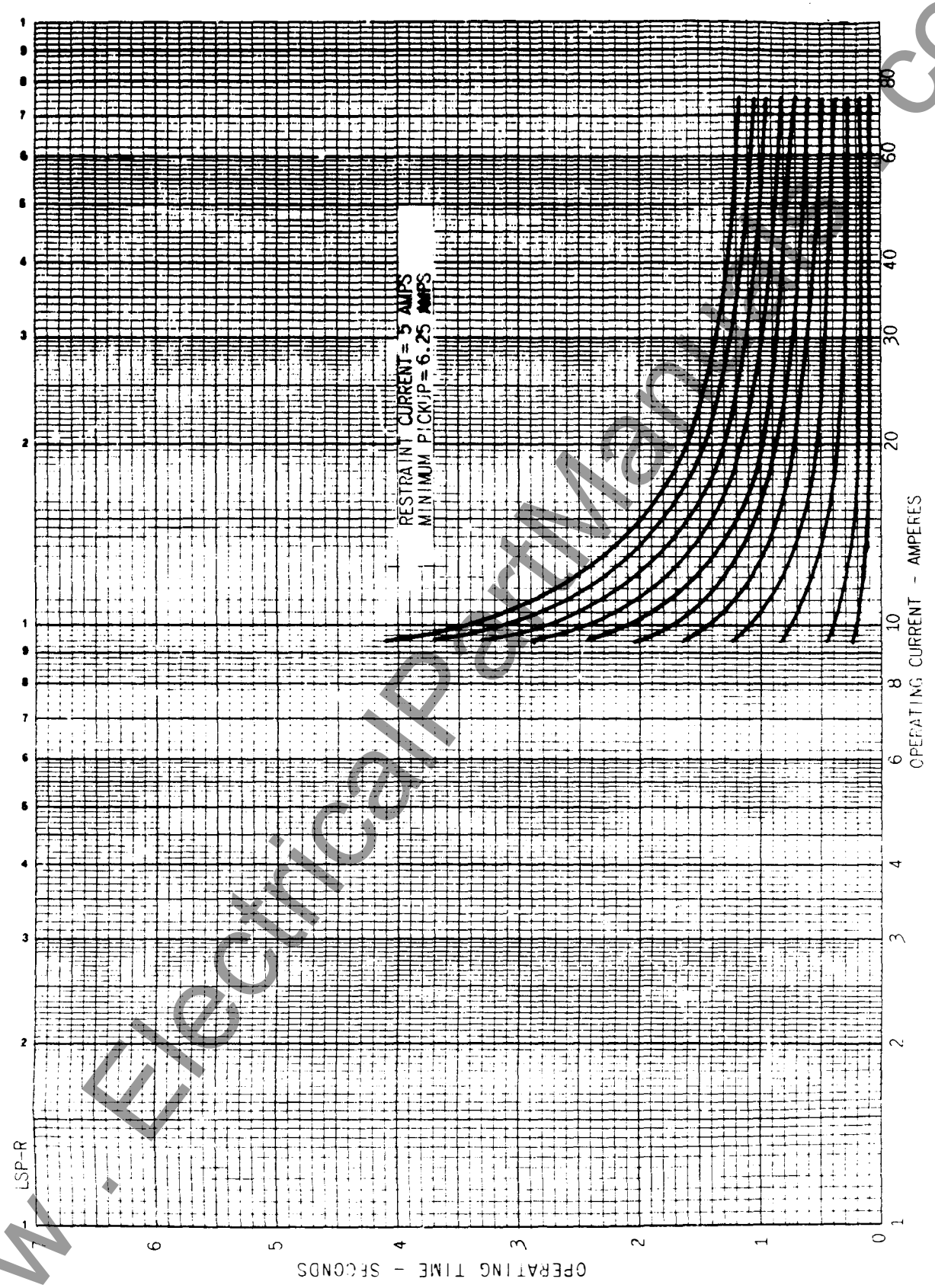


Fig. 10 (0376A0973-2) Typical Time Current Curve Restraint Current = 5 Amps

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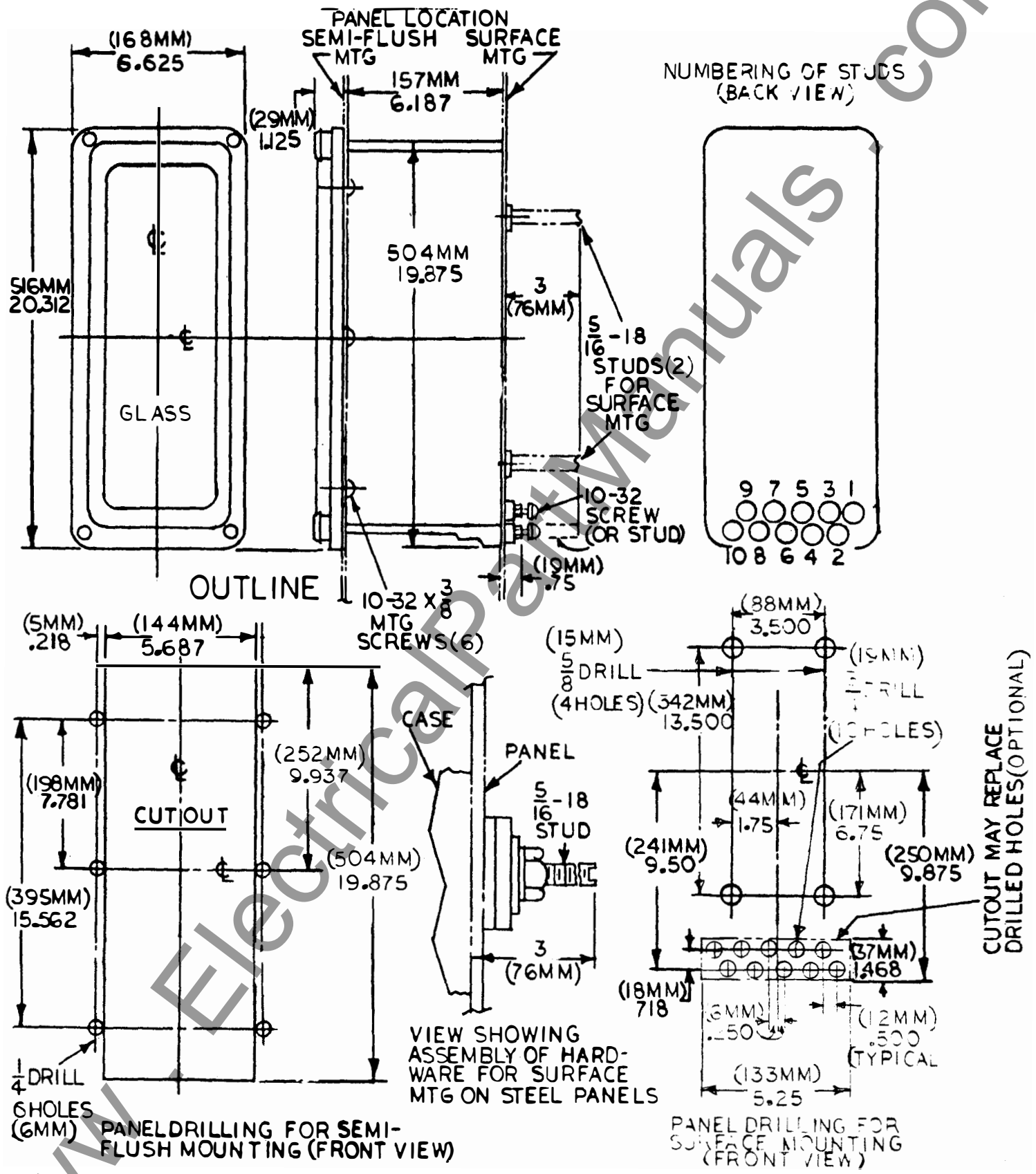

Fig. 12 (6209275-3) Outline and Panel Drilling Dimensions for Relay Types IJC51B and IJC53A

CONTENTS

(8007881) Cover

NOTE: THIS INSTRUCTION BOOK HAS HAD A MAJOR REVISION. PLEASE CHECK YOUR PREVIOUS EDITION TO COMPARE MATERIAL.

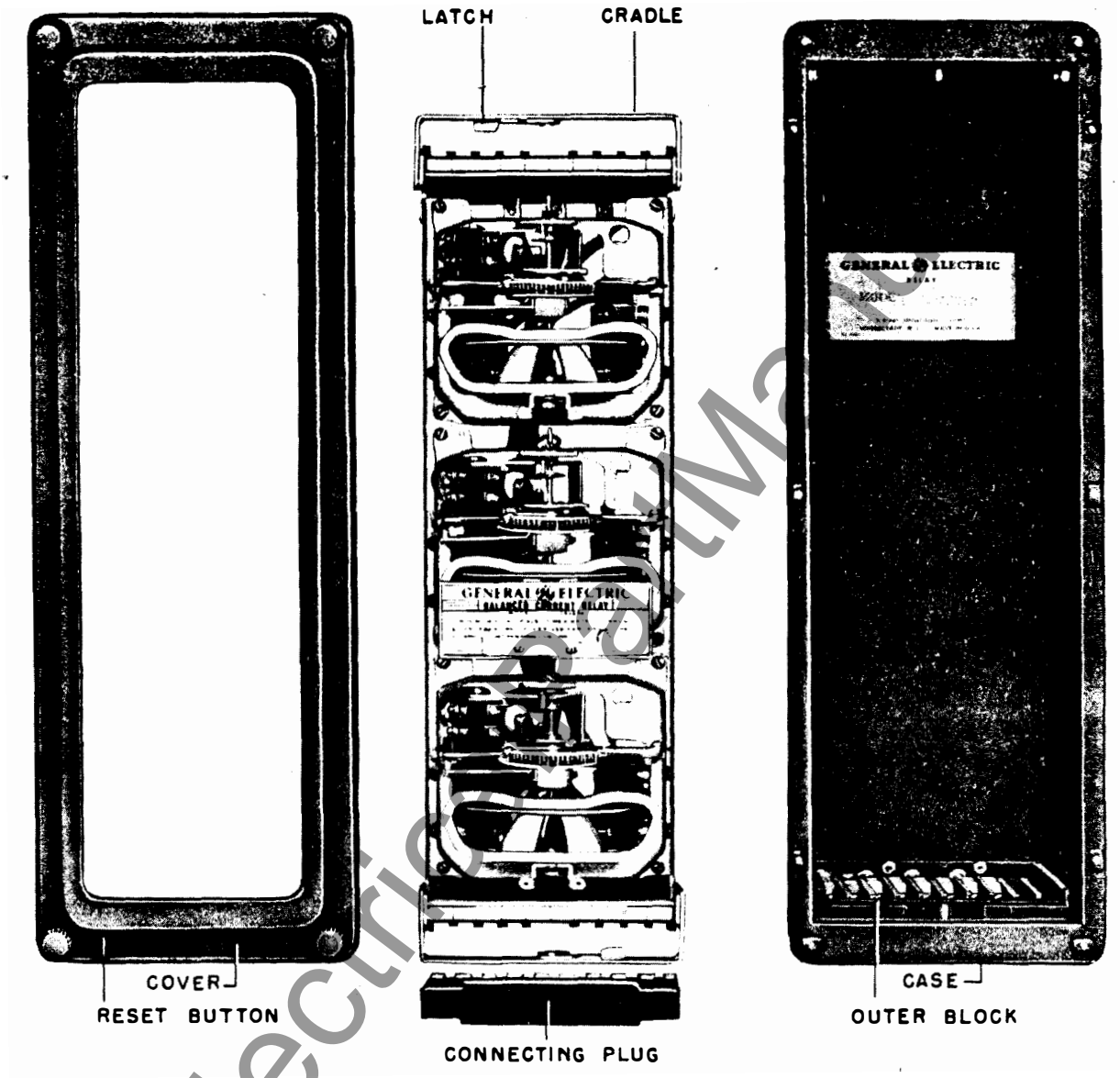

Fig. 1 Type IJC51B Relay-Disassembled (Front View)

BALANCED-CURRENT RELAYS
TYPES IJC51B, IJC51C, AND IJC53A

INTRODUCTION

APPLICATION

The relays covered by these instructions comprise a group of relays recommended for protection of three-phase lines and machines against damage due to phase unbalancing and single phase operation. These relays may be used in applications where the currents in the three phases of the circuit are normally balanced. Any unbalancing in such circuits is an indication of fault currents in one or more of the phases or of an open circuit in one of the phases.

Fig. 3 illustrates a typical application of these relays. The relays compare the currents in each phase with that in each of the other phases. Any increase of current in the circuit, irrespective of the magnitude, will not cause the relays to operate so long as the unbalance is not 25 per cent or more.

These relays can be classed as relays which protect against discontinuity of balanced system phase conditions, rather than as fault protective relays. When used for protection against single phase operation of a machine, they must have a time setting of such length that they will not trip off the machine on an external single-phase fault. Such a time delay will permit selective tripping by the relays protecting the faulty circuit.

OPERATING CHARACTERISTICS

The Type IJC51B relay consists of three mechanically separate but electrically interconnected induction disk units mounted in a three unit, single-end case. Each unit consists of a disk actuated by two U-magnet assemblies. The disk drives a shaft which in turn is geared to the moving contact. The disk shaft is restrained by a spiral spring on the moving contact shaft, the purpose of which is to hold the contacts open when the relay is de-energized.

Each of the three units of the Type IJC51B relay has two U-magnets. The right-hand U-magnet coil (front view) is called the operating coil as current through it produces torque tending to close the contacts. The left-hand U-magnet coil is called the restraint coil as current through it produces torque tending to hold the contact open. The relay is connected so that each unit receives its operating current from one phase and its restraint current from another phase in such combinations that each phase current is compared with each of the other phase currents (Fig. 3). Any increase of current in the circuit, irrespective of magnitude, will not cause the relay to operate as long as the currents in the phases are not unbalanced by 25 per cent or more. Thus a three-phase short circuit which is of such a nature that the phases will carry equal currents, will not cause the relay to operate. However, upon the occurrence of a fault which will cause the current in one of the phases to exceed that in the others by 25 per cent or more, the torque exerted by the operating coil receiving the high current will be greater than that of the restraining coil and that unit will close its contacts. The contacts of the three units are in parallel, hence if either unit operates tripping will occur.

The percentage ratio of the current in the operating circuit to that in the restraint circuit for pickup is referred to as percentage slope and appears on the relay nameplate.

The pick-up characteristics of the 125 per cent slope relay is shown in Fig. 2. The relay has a minimum pick-up setting of one ampere which is the operating current required to close the relay contacts when no restraint current flows.

Each unit closes its contacts after a time delay which is dependent both on the ratio and the magnitudes of the currents and also on the time lever setting. The time decreases with an increase of both currents or an increase of the ratio operating to restraint current. The time lever controls the contact travel. A lower time lever setting decreases the contact travel and the time. See Figs. 8, 9, and 10 for time curves.

The Type IJC51C relay is a single unit relay. This unit is the same as the unit described for the Type IJC51B relay.

The Type IJC53A relay is similar to the Type IJC51B relay except that some of the parts have been altered to reduce the variation in operating characteristics with variation in frequency. This change gives better performance in cases where the frequency changes under normal conditions, such as it does in propulsion-unit applications aboard ships.

RATINGS

Present available ratings are 5 amperes normal current, 25-60 cycles, 1 ampere minimum pickup, with 125 per cent slope and either a 1.0 or 0.2 ampere target and holding coil.

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.

To the extent required the products described herein meet applicable ANSI, IEEE and NEMA standards; but no such assurance is given with respect to local codes and ordinances because they vary greatly.

CONTACTS

The current-closing rating of the contacts is 30 amperes for voltages not exceeding 250 volts. The current-carrying rating is limited by the two forms of target and holding coils. Relays with 1.0-ampere target and holding coils have a rating of 30 amperes for tripping duty and hence will trip any circuit breaker with trip-coil current within this rating. After tripping occurs, the tripping circuit must be opened by an auxiliary switch on the circuit breaker or by other automatic means as the relay contacts are sealed closed when tripping current is flowing.

TARGET AND HOLDING COILS

There are two ratings of these coils available. The choice between them depends on the current taken by the tripping circuit.

The 0.2-ampere coil is for use with trip coils that operate on currents ranging from 0.2 to 1.0 ampere at the minimum control voltage. If this coil is used with trip coils that take 1.0 ampere, or more there is a possibility that the 7-ohm resistance will reduce the tripping current to so low a value that the breakers will not be tripped.

The 1.0-ampere coil should be used with trip coils that take 1.0 ampere or more at the minimum control voltage provid3d the tripping current does not exceed 30 amperes at the maximum control voltage. If the tripping current exceeds 30 amperes an auxiliary relay must be used to control the trip coil circuit, the connections being such that the tripping current does not pass through the contacts of the target and holding coil of the Type IJC relays.

When it is desirable to adopt one type of relay as standard to be used anywhere on a system, relays with the 1.0-ampere target and holding coil should be chosen. These relays should also be used where it is impossible to obtain trip-coil data, but attention is called to the fact that the target may not operate if used in connection with trip coils taking less than 1.0 ampere.

The ratings of the two forms of target and holding coils are as follows:

Function	Amperes, a-c or d-c	
	1 Amp. (0.25 Ohm) Coil	0.2 Amp. (7 Ohm) Coil
Carry for Tripping Duty	30	5
Carry Continuously	4	0.8

BURDENS

The burdens imposed on the current transformers by each operating and restraining coil at 5 amperes, 60 cycles are as follows:

Circuit	Impedance Ohms	Power Factor	Volt Amperes
Operating	0.30	0.38	6.7
Restraints	0.40	0.34	10.0

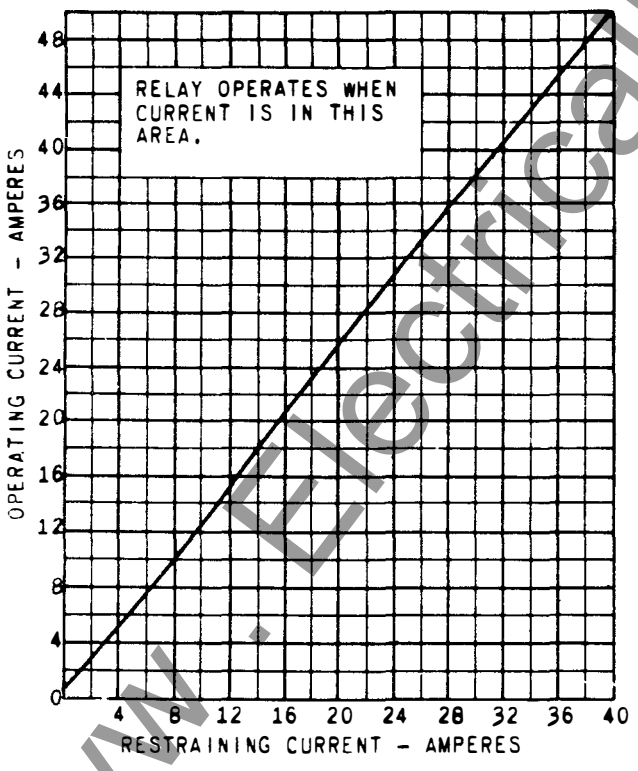

Fig. 2 (6174244) Pick-up Characteristic Curves for Type IJC Relays-One Ampere Minimum Pickup and 125 Percent Slope.

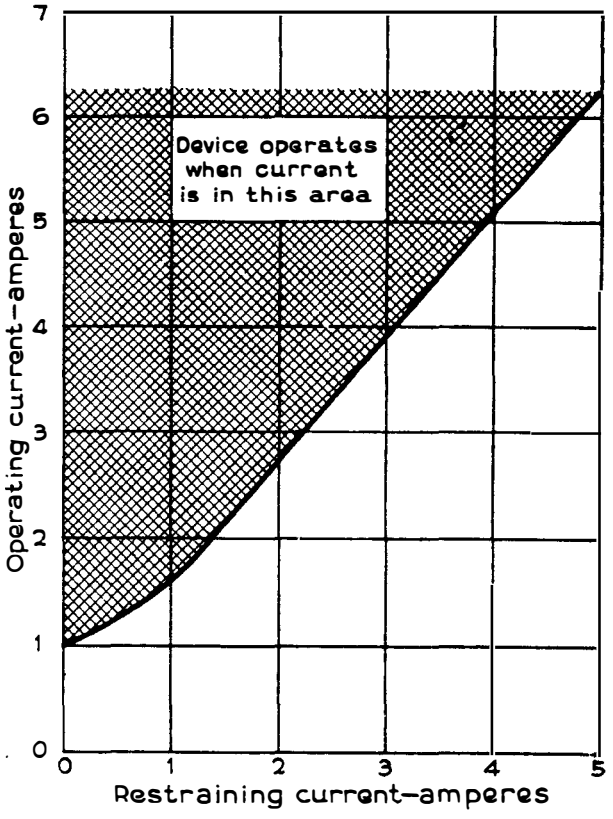

Fig. 2A (6174243) Expanded Curve for the Low Current Portion of Fig. 2.

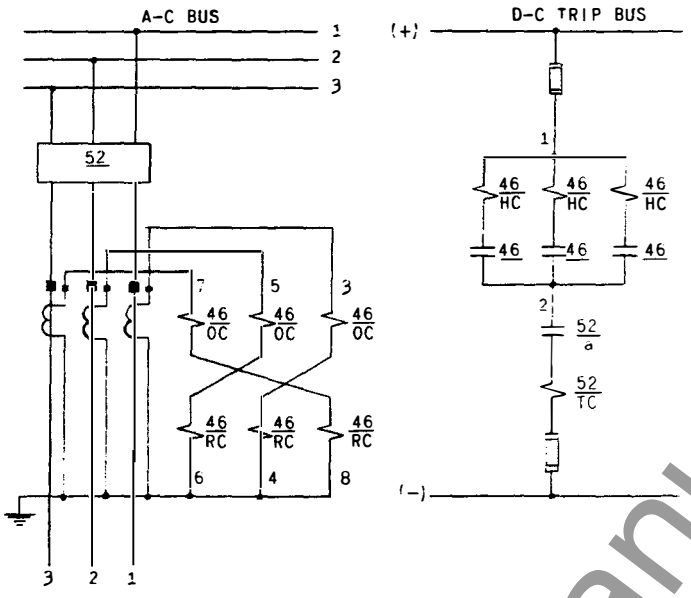

Fig. 3 (6154177) External Connections for Type IJC51B and Type IJC53A Relays

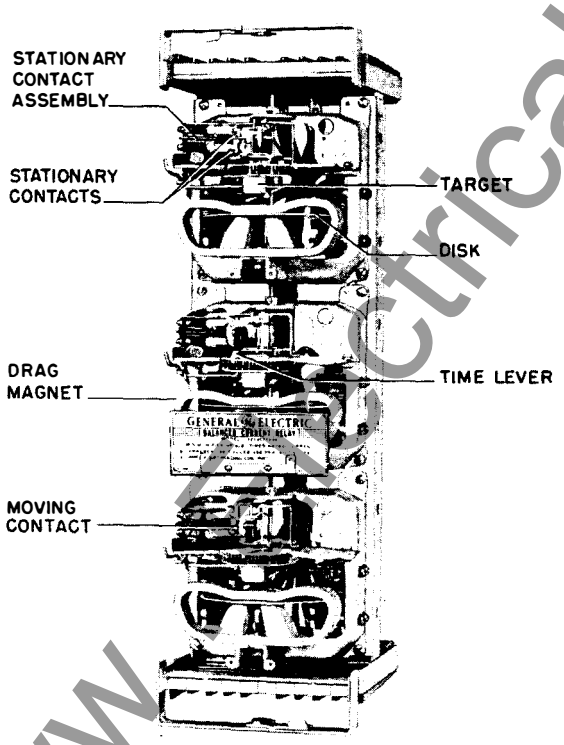

Fig. 4 (8007880) Type IJC51B Relay-Unit in Cradle (Front View)

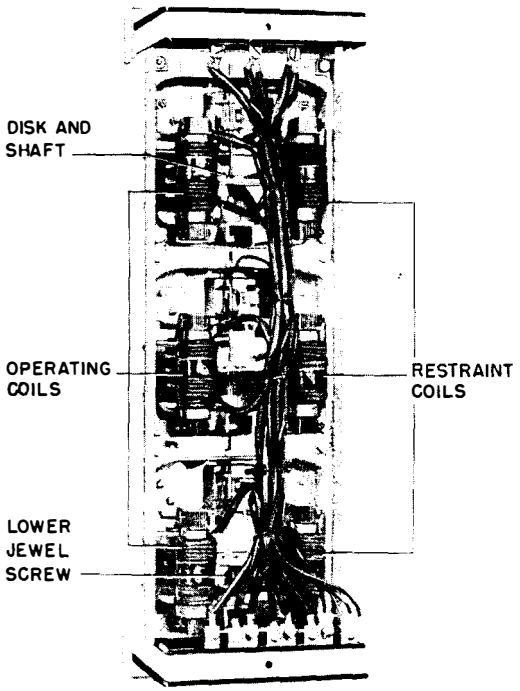

Fig. 5 (8007883) Type IJC51B Relay-Unit in Cradle (Rear View)

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.

DESCRIPTION

CASE

The case is suitable for either surface or semiflush panel mounting and an assortment of hardware is provided for either mounting. The cover attaches to the case and also carries the reset mechanism when one is required. Each cover screw has provision for a sealing wire.

The case has studs or screw connections at both ends or at the bottom only for the external connections. The electrical connections between the relay units and the case studs are made through spring backed contact fingers mounted in stationary molded inner and outer blocks between which nests a removable connecting plug which completes the circuits. The outer blocks, attached to the case, have the studs for the external connections, and the inner blocks have the terminals for the internal connections.

The relay mechanism is mounted in a steel framework called the cradle and is a complete unit with all leads being terminated at the inner block. This cradle is held firmly in the case with a latch at the top and the bottom and by a guide pin at the back of the case. The cases and cradles are so constructed that the relay cannot be inserted in the case upside down. The connecting plug, besides making the electrical connections between the respective blocks of the cradle and case, also locks the latch in place. The cover, which is fastened to the case by thumbscrews, holds the connecting plug in place.

To draw out the relay unit the cover is first removed, and the plug drawn out. Shorting bars are provided in the case to short the current transformer circuits. The latches are then released, and the relay unit can be easily drawn out. To replace the relay unit, the reverse order is followed.

A separate testing plug can be inserted in place of the connecting plug to test the relay in place on the panel either from its own source of current and voltage, or from other sources. Or, the relay unit can be drawn out and replaced by another which has been tested in the laboratory.

INSTALLATION

LOCATION

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

MOUNTING

The relay should be mounted on a vertical surface. The outline and panel drilling dimensions are shown in Figs. 11 and 12.

CONNECTIONS

The internal connection diagrams are shown in Figs. 6 and 7. Typical external connections are shown in Fig. 3.

One of the mounting studs or screws should be permanently grounded by a conductor not less than No. 12 B&S gage copper wire or its equivalent.

ADJUSTMENTS

PICKUP

The pickup of the relay is adjusted before it leaves the factory. Pick-up current required to close the contacts with zero restraint, can be adjusted to some extent by turning the arm which holds the outer end of the control spring on the contact shaft. This adjustment will have very little effect on the slope characteristics whenever the restraint current exceeds 3 amperes.

TIME

For a given condition, time may be adjusted in

two ways. The time lever setting controls the contact travel hence the time. The drag magnet may be moved on its shelf away from the disk shaft for increased time and toward the disk shaft for decreased time. The time lever gives the greater range of adjustment and is more convenient.

To set the time of a particular unit it is necessary to impose the desired conditions on the unit and measure the time required to close the contacts with a standard timer. Adjust the time lever and drag magnet until the desired time is obtained.

OPERATION

Before leaving the factory, the relays were tested and adjusted for correct operation. The only adjustment which should be necessary is setting the time lever, and if necessary, adjusting the drag magnet, for the correct time.

It may be that the control spring on the gear sector shaft will not reset the contacts all the way back to the time lever. This condition will cause no difficulty; however, because as soon as the relay is energized with balanced currents of applicable magnitude the torque of the restraint U-magnet will reset the contacts. As noted before, the chief function of the spring is to open the contacts when the relay is de-energized.

MAINTENANCE

The relays were adjusted at the factory and it is advisable not to disturb these adjustments. If for any reason, they have been disturbed, the following points should be observed in restoring them:

DISK AND BEARINGS

The lower jewel may be tested for cracks by exploring its surface with the point of a fine needle. The jewel should be turned up until the disk is centered in the air gaps, after which it should be locked in this position by the set screw provided for this purpose. The upper bearing pin should next be adjusted until very little end play can be felt; about 0.015 inch is correct.

GEAR MESH

The gear and pinion should be meshed as deeply as possible without binding in any position when the disk is rotated. This adjustment is correct when a slight backlash can be felt in all disk positions. The two screws holding the contact mechanism assembly to the relay frame should be tightened securely after this adjustment is made.

CONTACT ADJUSTMENT

With the contacts just closed, there should be enough space between the contact-holding armature and the poles of the target magnet to permit the fixed contact tips to be deflected about 1/32 inch when the armature is finally pushed against its poles. The tips should lie in the same vertical plane. These adjustments are readily secured by moving each contact brush by means of the screws in the front of the brush block which pushes against it near its center.

When the time lever is moved to the position where it holds the contacts just closed, it should indicate zero on the time-lever scale. If it does not, and the brushes are correctly adjusted, shift the scale slightly after loosening the two small screws holding it to the under side of the contact plate.

CONTACT CLEANING

For cleaning fine silver 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 corroded material will be removed rapidly and thoroughly. The flexibility of the tool insures the cleaning of the actual points of contact. Sometimes an ordinary file cannot reach the actual points of contact because of some obstruction from some other part of the relay.

Fine silver contacts should not be cleaned with knives, files, or abrasive paper or cloth. Knives or files may leave scratches which increase arcing and deterioration of the contacts. Abrasive paper or cloth may leave minute particles of insulating abrasive material in the contacts and thus prevent closing.

The burnishing tool described is included in the standard relay tool kit obtainable from the factory.

PERIODIC TESTING

An operation test and inspection of the relay at least once every six months are recommended.

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 give complete nameplate data, including serial number. If possible, give the General Electric Company requisition number on which the relay was furnished.

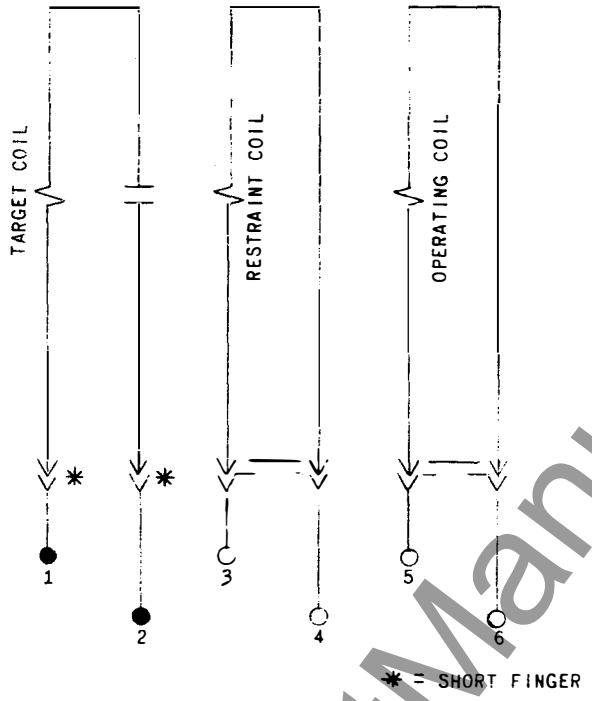

Fig. 6 (6375641-1) Internal Connections for the Type IJC51C Relay (Front View)

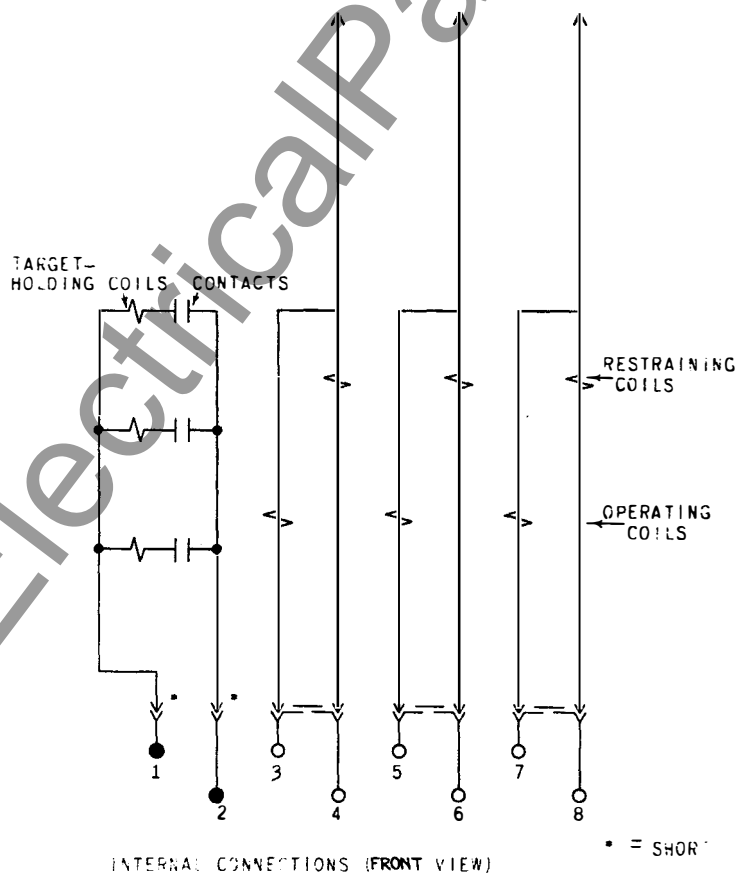

Fig. 7 (6306693-3) Internal Connections for Relay Types IJC51B and IJC53A (Front View)

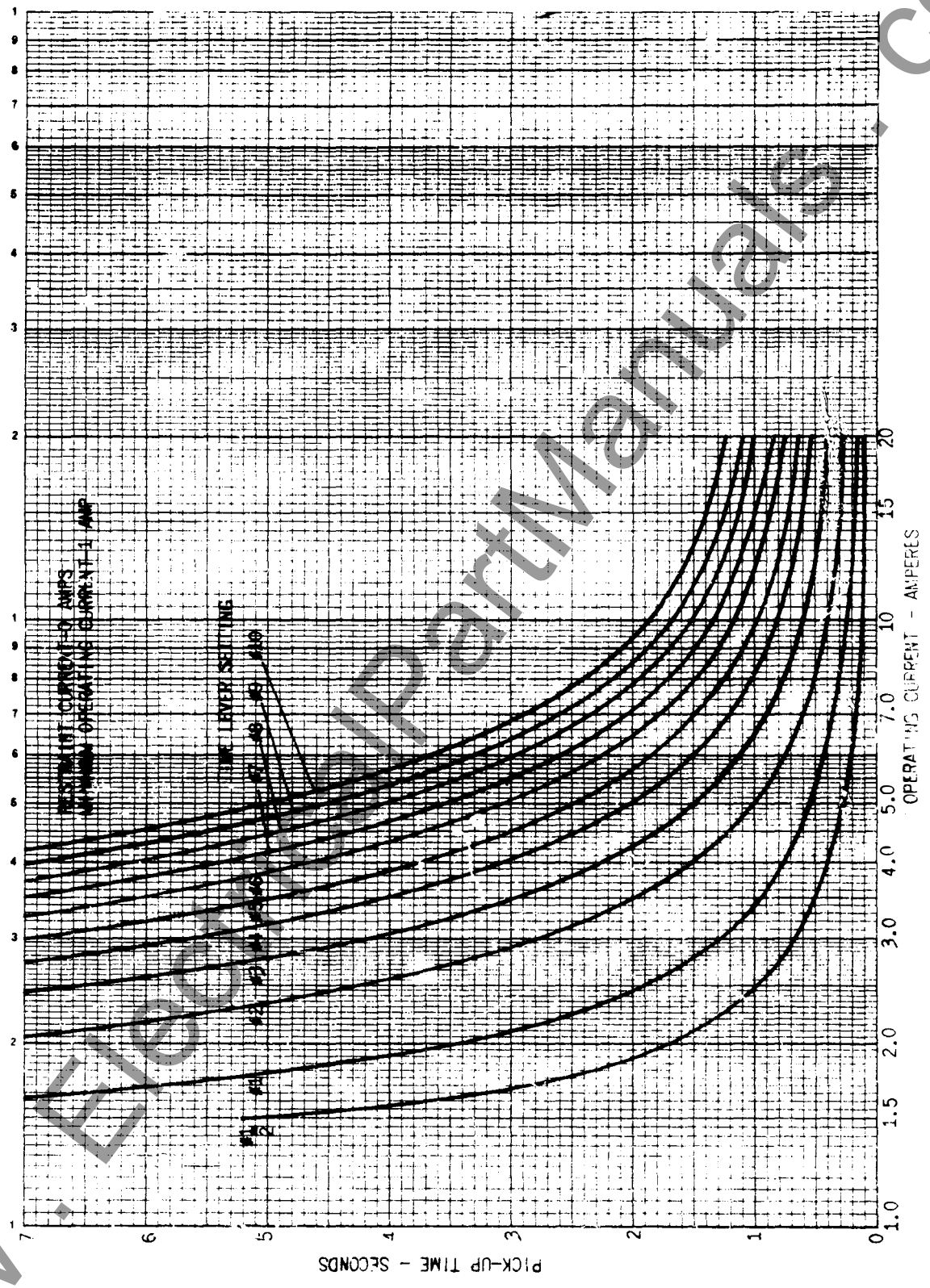

Fig. 8 (0376A0971-2) Typical Time Current Curve Relay Set for 2.5 sec. with 8 Amp Operating (#10 Tds) Restraint Current = Zero Amps

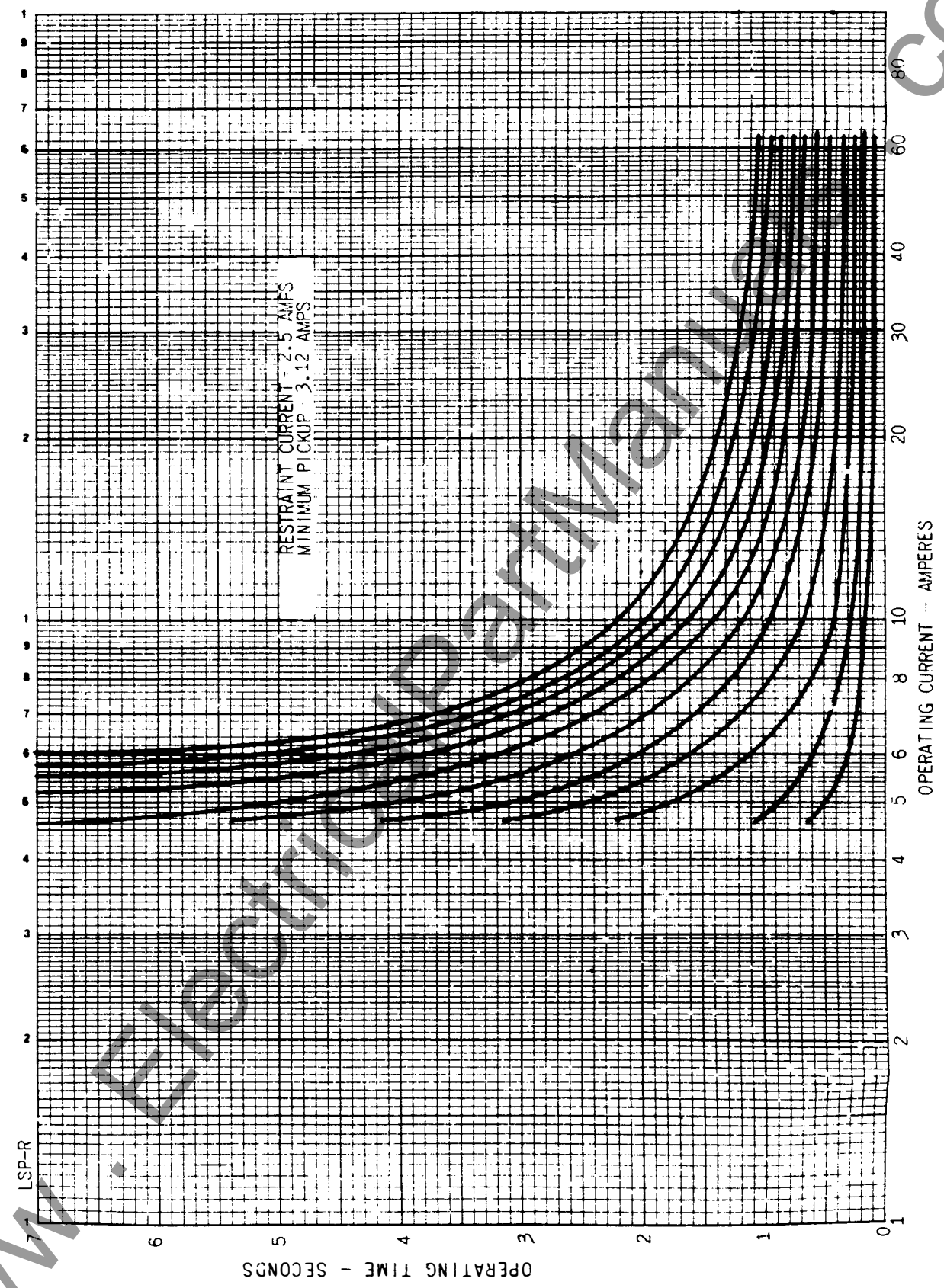

Fig. 9 (0376A0972-2) Typical Time Current Curve Restraint Current = 2.5 Amps