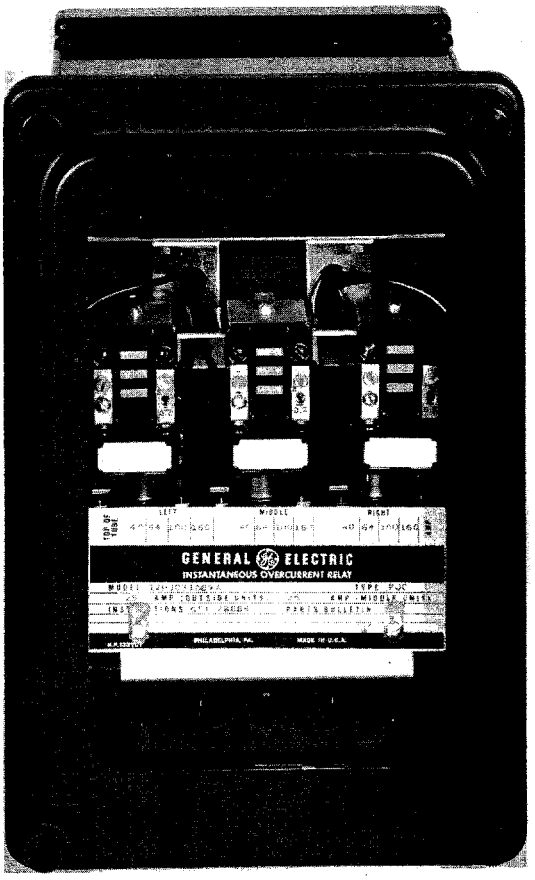
INSTRUCTIONS

GEI-83903A

INSTANTANEOUS OVERCURRENT RELAYS

TYPES

PJC31B,C,D,E,F,G,H, and J



POWER SYSTEMS MANAGEMENT DEPARTMENT

GENERAL ELECTRIC

PHILADELPHIA, PA.

Contents

COVER PHOTO (8029544)

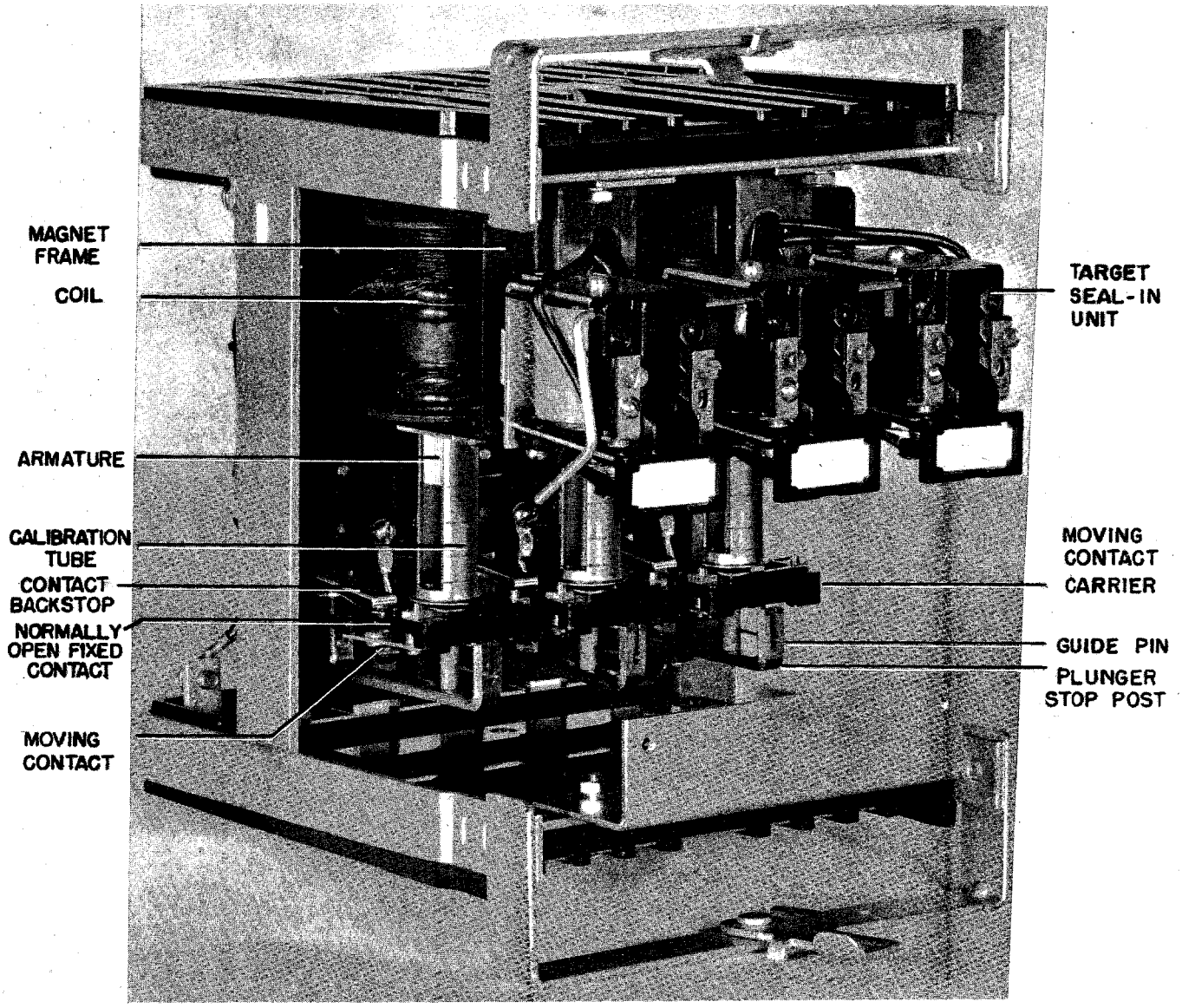


FIG. I (8029546) Relay Type PJC31D Removed From Case, 3/4 Front View

INSTANTANEOUS OVERCURRENT RELAYS

TYPE PJC31

TABLE A

RELAY TYPE	CONTACTS PER UNIT	TARGET SEAL-IN UNIT		CASE SIZE	INTERNAL CONNEC-TIONS	CONTACT CIRCUITS
		TARGET	SEAL-IN			
PJC31B	One N.O. One N.C.	Yes	Yes	S2	Fig. 5	Separate N.O. & N.C. on each unit with SI contacts across each N.O.
PJC31C	Two N.O.	Yes	Yes	S2	Fig. 6	SI contacts across each N.O. contact Provision for changing one N.O. to N.C. on each unit.
PJC31D	One N.O. One N.C.	Yes	Yes	S2	Fig. 7	Separate N.O. & N.C. on each unit with SI contacts across each N.O. Provision for changing to all N.O.
PJC31E	One N.O. One N.C.	Yes	No	S2	Fig. 8	Separate N.O. & N.C. on each unit. Targets in series with N.O. contacts. (No shorting bars on N.C. contacts).
PJC31F	Two N.O.	Yes	Yes	S2	Fig. 9	Separate contacts with SI contact. across one N.O. on each unit.
PJC31G	Two N.O.	No	No	S1	Fig. 10	All 3 L.H. contacts in parallel. All 3 R.H. contacts in parallel.
PJC31H	Two N.O.	Yes	Yes	S1	Fig. 11	Contact circuits of all units connected in parallel. Separate TSI for each contact circuit.
PJC31J	Two N.O.	Yes	No	S2	Fig. 12	Separate contacts on each unit. Target in series with one contact on each unit.

DESCRIPTION

The PJC31 relay consists of three PJC units mounted in a single unit drawout case. The various models are distinguished by different combinations of normally open and normally closed contacts, target and seal-in units, and contact circuit wiring, as shown in Table A.

APPLICATION

The PJC31 is commonly used for instantaneous overcurrent protection of feeder circuits and for motors in conjunction with other time delay relays. They are also used for fault detectors in conjunction with distance relays, pilot relays and the like. They are suitable for all applications which do not require continous operation in the picked-up condition. They can be used with definite time d-c relays to obtain time overcurrent protection.

RATINGS

OPERATING COILS

These relays are available with various combinations of unit current ratings as shown in Table B for

frequencies of 25 to 60 cycles, or DC.

TABLE B OVERCURRENT RATINGS

CONTIN. AMPS	ONE SEC. AMPS	CALIBRATIONS			
1.5	75	.5	.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 PJC contacts will make and carry 5 amperes continously, or 30 amperes for two seconds. In cases where the PJC contacts operate a target seal-in unit the contact circuit rating is determined by the tap setting of the seal-in coil as shown in Table C.

TABLE C TARGET AND SEAL-IN UNIT

	2 AMP TAP	0.2 AMP TAP
DC Resistance	0.13 Ohms	7 Ohms
Minimum Operating	2.0 Amp.	0.2 Amps
Carry Continuously	3.5 Amps	0.35 Amps
Carry 30 amps for	4 Secs	--
Carry 10 amps for	30 Secs	0.2 Secs
60-Cycle Impedance	0.53 Ohms	52 Ohms

Table D shows the inductive and non-inductive interrupting ratings for a single PJC unit contact.

TABLE D PJC UNIT CONTACT

INTERRUPTING RATINGS

AC VOLTS	AMPS	
	INDUCTIVE	NON-INDUCTIVE
115	2	5
230	1	2
460	0.5	1

DC VOLTS	AMPS	
	INDUCTIVE	NON-INDUCTIVE
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 4:1 current range as shown in Table B 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 contacts 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 adjustable independently of pickup.

* Reset is defined as the de-energized plunger position.

OPERATING TIMES

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

BURDEN

The DC resistance and 60 Hertz burdens imposed on a current transformer by each overcurrent unit are tabulated in Table E and Fig. 3.

TABLE E

TYPE PJC31 BURDEN DATA

CONTINUOUS AMPS	PICKUP RANGE	COIL DC OHMS	60 CYCLE BURDEN *		
			RESISTANCE	REACTANCE	IMPEDANCE
1.5	0.5-2	1.40	3.8	6.3	7.6
3	1-4	0.35	0.83	1.7	1.9
6	2-8	0.091	0.22	0.43	0.49
12	4-16	0.023	0.055	0.11	0.13
25	10-40	0.005	0.011	0.018	0.021
25	20-80	0.0019	0.0032	0.0045	0.0055
25	40-160	0.0009	0.0016	0.0013	0.0020

* Minimum pickup calibration with pickup current applied and armature picked up.

CONSTRUCTION

Each of the three overcurrent units is of the same plunger type construction. (Refer to Fig. 1.) 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 frames, stationary contacts and plunger stop posts for each unit are separately mounted on the common compound mounting plate. The normally closed fixed contacts are similar to the normally open fixed contacts except they are mounted below the moving contact instead of above it, and the backstop arm is omitted.

The target seal-in unit is a small hinged armature type relay consisting of a "U" shaped magnet frame, fixed pole piece, armature, and a tapped coil. The armature carries a "T" shaped moving contact which bridges the two stationary contacts, and also operates a hand reset target. The target unit is similar to the target and seal-in unit, except the contacts are omitted. These three target and seal-in or target units, when present, are mounted on a strap which is in turn fastened across the front of the overcurrent unit magnet frames.

All components of each relay are mounted on a cradle assembly which can be easily removed from the relay case. The cradle is locked in the case by means of latches at the top and bottom. The electrical connections between the case blocks and cradle blocks are completed through removable connection plugs. Separate testing plugs can be inserted in place of the connection plugs to permit testing the relay in

its case. The cover attaches to the case from the front and includes the target reset mechanism and an interlock arm to prevent the cover from being replaced until the connection plug has been inserted.

All PJC31 relays covered by this instruction book except the PJC31G and PJC31H are mounted in S2 size cases. The outline and panel drilling dimension are shown in Fig.14 for the PJC31G and PJC31H which are mounted in S1 size cases. Both the cases are suitable for either semiflush or surface mounting on panels up to two inches thick. Hardware is available for all panel thickness up to two inches, but panel thickness must be specified on the order to insure that the proper hardware will be provided.

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 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. 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 test 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 by visual inspection 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 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 be reset to insure that all units are free from friction or binds. 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 contact brush at the tip should be approximately 1/16 inch with the armature reset.

3. Check the location of the contact brushes on the cradle and case blocks against the internal connection diagram for the relay. Be sure that the shorting bars are in the proper locations on the case block and that the long and short brushes on the cradle block agree with the internal connection diagram. Figure 4 shows a sectional view of the case and cradle blocks with connection plug in place. Note that there is an auxiliary brush in each position on the case block. This brush should be formed high enough so that when the connection plug is inserted it engages the auxiliary brush before striking the main brush. This is especially important in current circuits and other circuits with shorting bars since an improper adjustment of the auxiliary brush could result in a CT secondary circuit being momentarily open circuited.

4. The target or target and seal-in units, when present, should be checked as follows. The armature and seal-in contacts should move freely when operated by hand. There should be a screw in only one of the tap positions on the right stationary contact strip. Operate the armature by hand and be sure the target latches in its exposed position before the contacts close. There should be at least 1/32" wipe on the seal-in contacts. With the cover fastened securely in place, check that the target resets positively when the reset button at the bottom of the cover is operated.

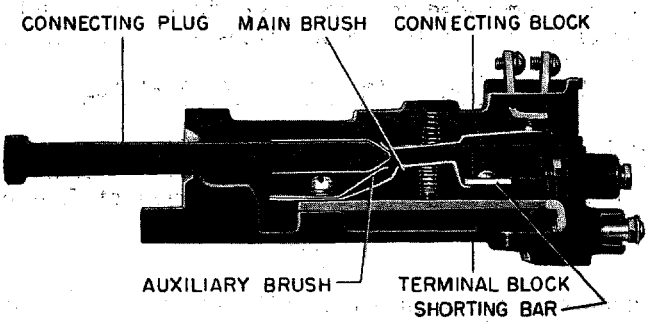


FIG. 4 (8025039) CROSS SECTION OF DRAWOUT CASE SHOWING POSITION OF AUXILIARY BRUSH

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.

1. 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 testing. 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 AC or between 70 and 95 percent on DC.

2. Target and Seal-in Unit - The following tests should be made on those relays having target or target seal-in units. With the target in the "down" or unexposed position, check pickup on both the 0.2 and 2.0 ampere tap with the associated main contact held closed by hand. Refer to the appropriate internal connection diagram and arrange a test circuit to apply gradually increasing DC current through the target seal-in circuit. Pickup current should be tap rating or less. On units having seal-in contacts, also open the main unit contacts with pickup current still flowing and check that the target seal-in unit remains picked up. Refer to the section on target seal-in unit settings under INSTALLATION PROCEDURE for the recommended steps to change the tap setting.

INSTALLATION PROCEDURE

If after the performance of the ACCEPTANCE TESTS the relay is held in storage before shipment to the job site, it is recommended that the visual and mechanical inspection described in the section on ACCEPTANCE TESTS be repeated before installation.

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

1. Pickup - The desired pickup on each overcurrent unit may be set as follows, using 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 raise it in the calibration tube; if the pickup is too low turn the armature to slightly lower it in the calibration tube; recheck pickup and readjust the armature if necessary until the desired calibration is obtained. Check to see that the unit resets between 85 and 95 percent of pickup on AC, or between 70 and 95 percent of pickup on DC.

2. Target Seal-In Unit - As shipped from the factory the tap screw of the target seal-in unit will be in the 2.0 ampere tap. To change the tap setting remove the spare tap screw from the left stationary contact member and insert it in the vacant tap on the right stationary contact member. Then remove the original screw from the right contact member and place it in the spare position on the left con-

tact member. This procedure is recommended to avoid disturbing the adjustment of the right stationary contact. Screws ahould never be left in both tap positions on the right stationary contact member.

PERIODIC CHECKS AND ROUTINE MAINTENANCE

In view of the vital roll 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 friction or 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 back stops on the normally open contacts are approximately 1/16 inch above the stationary contact tips.

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

Operate each target seal-in unit by hand and check the target latches before the contacts make, and that the contacts have at least 1/32 inch wipe. Check target units when present, to make sure that the target latches before the armature closes against the pole piece. With the cover replaced check that all targets reset when the reset button is operated.

ELECTRICAL CHECKS

Refer to the appropriate internal wiring diagram and with the use of a relay test plug, check the pick-up on each overcurrent unit. This pickup should be within 3 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 AC or 70 to 95 percent on DC.

It is not recommended that the relay be readjusted when minor pickup variations from the previous test are rated, as long as the relay is still within limits. Such deviation can be introduced by differences in test equipment or by human error.

SERVICING

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

1. Friction - If there is any tendency to bind or excessive friction is present, check to see that the moving contact guide pin is centered and moves freely in the U-shaped guide plate slot, and that no foreign matter is present between the armature and calibrating tube.

2. 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, and the bare lead should project either up or down to the terminal screw.

3. Contact Reversal - The right hand contact of each unit on the PJC31C and PJC31D is arranged so that it can be changed from normally open to normally closed or vice versa. The PJC31C is supplied with two normally open contacts on all units, with a seal-in contact in parallel with each main contact. If for example the right-hand contact of the left unit is to be reversed, it should be wired between terminals 13 and 14 by disconnecting the lead from the junction stud and reconnecting it to terminal 14. The seal-in contact should then be disconnected from terminal 13 and connected to the junction stud so that the two seal-in contacts are in parallel across the left contact. If the right-hand fixed contact is now reassembled below the moving contact, the desired normally closed contact will be available and will have a shorting bar. The right hand contacts of the middle and right units can be rearranged in a similar manner. If all the units are similarly changed the internal wiring becomes the same as a PJC31D. Similar changes from normally closed to normally open right hand contact

can be made on the units of the PJC31D.

4. Fixed Contact Tension - After changing a contact from normally open to normally closed, or replacing a contact, each stationary contact should be adjusted as follows: Units having one normally open and one normally closed contact should have approximately 15 grams initial tension on each contact brush; Units having two normally open contacts should have approximately 5 grams initial tension on each contact brush. Initial tension is the force applied to the contact tip which is necessary to part the contact brushes from its stop arm. Whenever these contacts are readjusted, the wipe and gap as well as the pick-up adjustment should also be rechecked as outlined in the previous sections.

5. Target and Seal-in Unit: - If the wipe on the target and seal-in unit contact is found to be less than the 1/32 inch specified, it can be increased by lowering the position of the stationary contact members. When correctly adjusted both contacts should make at approximately the same time when the armature is operated by hand, and the target should latch in the exposed position slightly before the contacts close.

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.

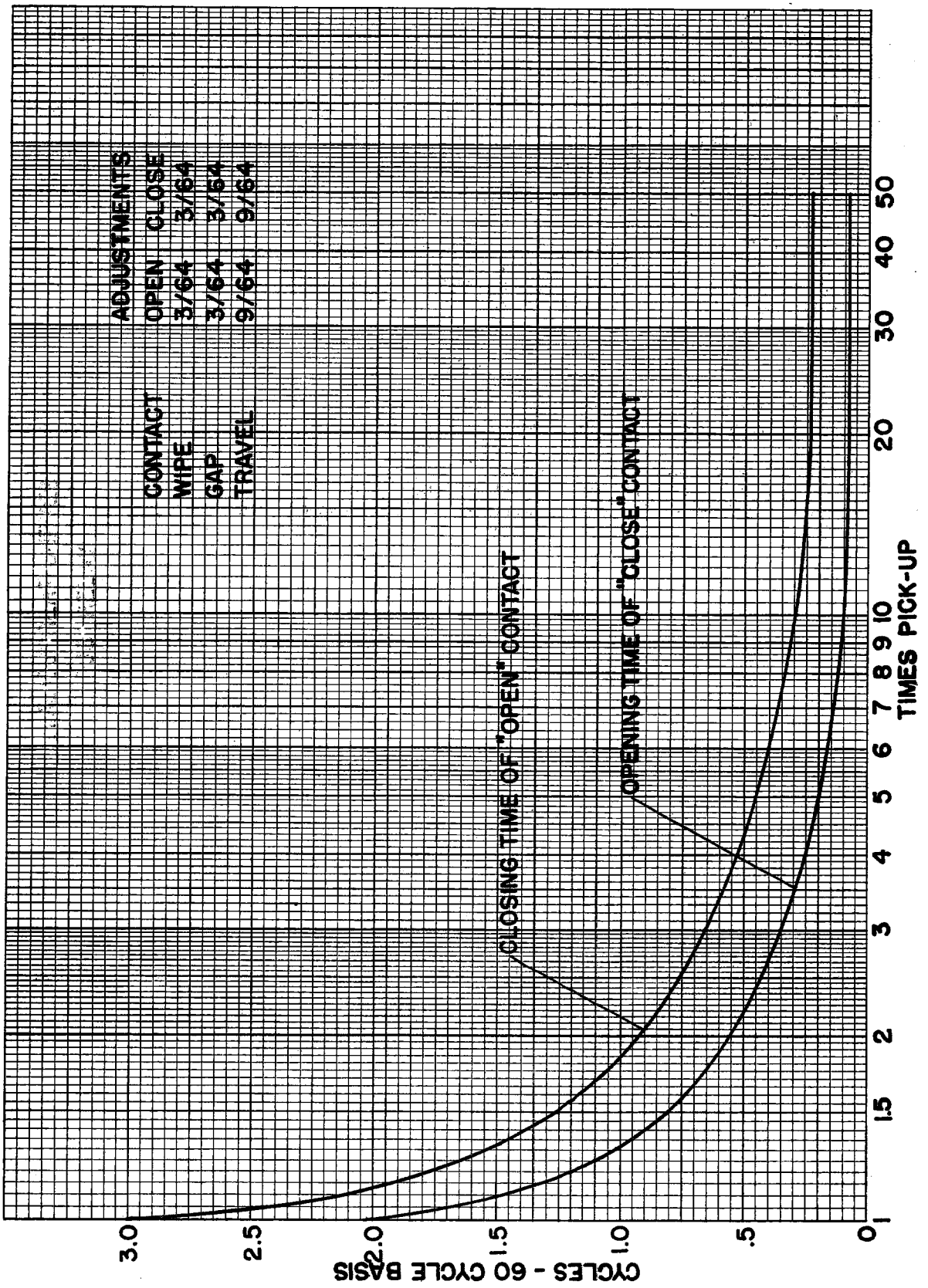


FIG. 2 (418A711-1) Time-Current Curves For The PJC31 Relays

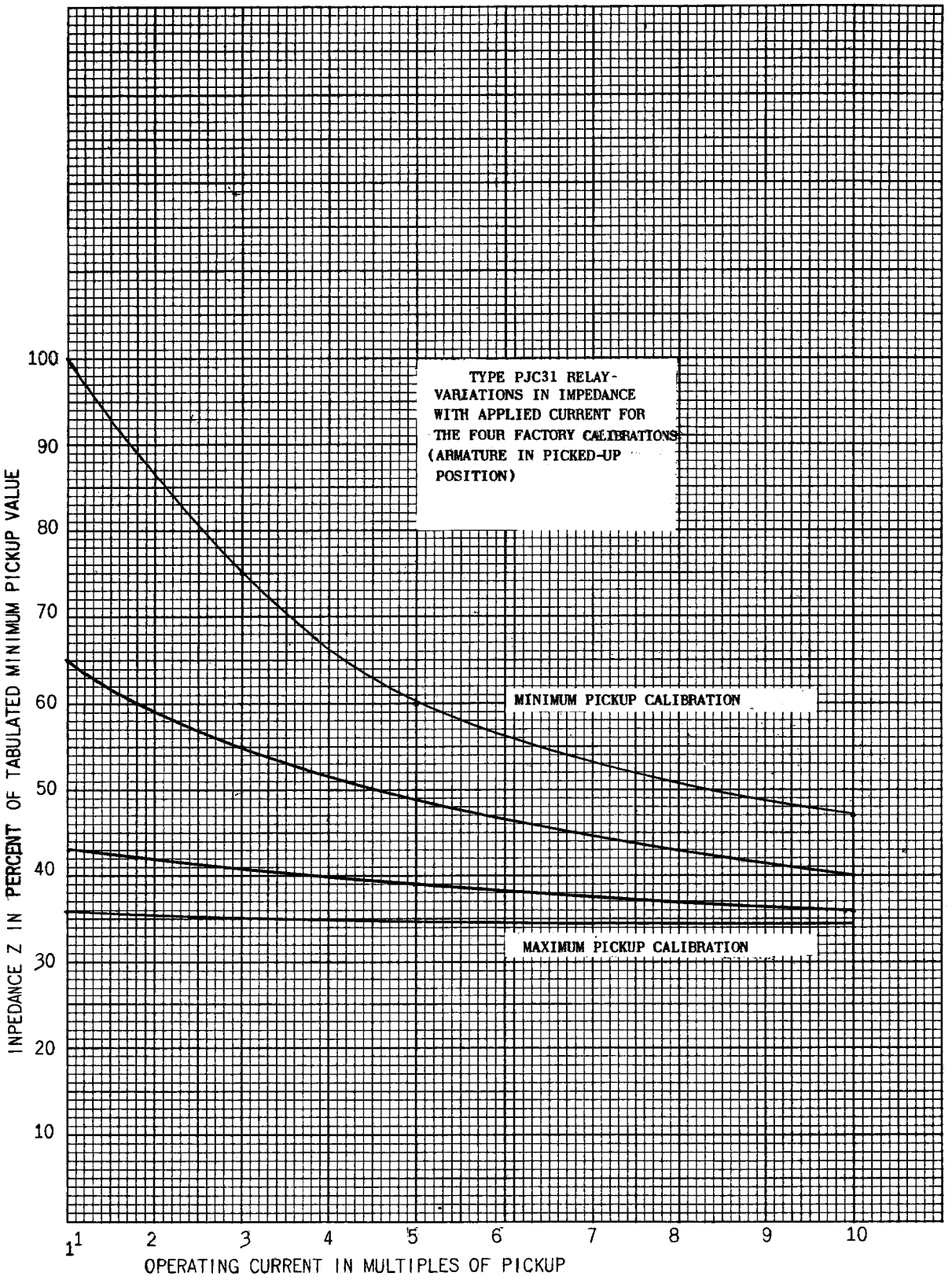


FIG. 3 (0148A3992-0) Saturation Curves For Type PJC31 Relays

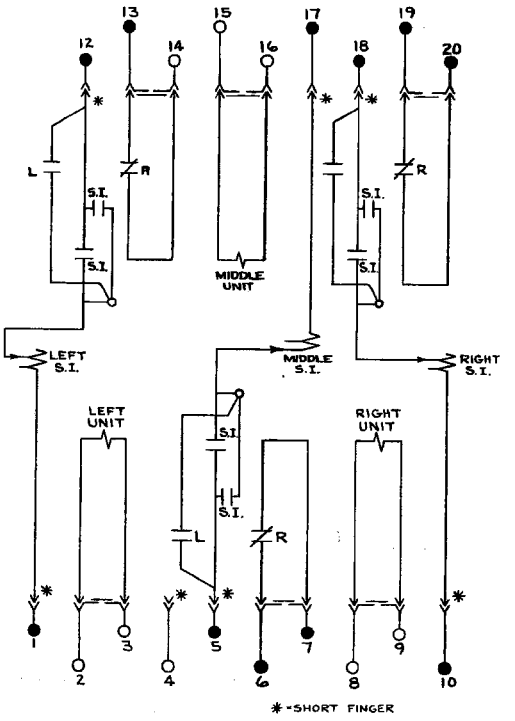


FIG. 5 (K-6400745-4) Internal Connections Diagram For The PJC31B Relay (Front View)

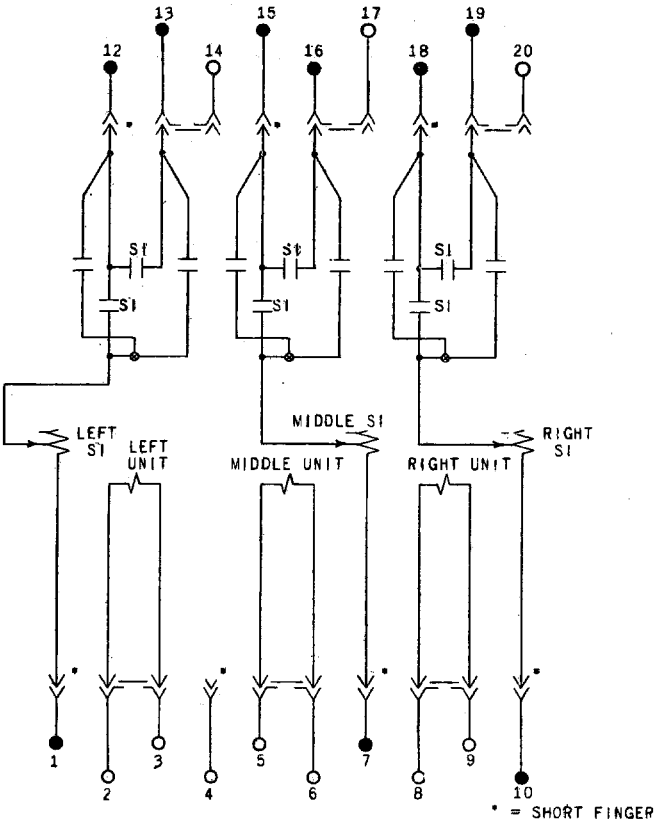


FIG. 6 (K-6375726-5) Internal Connections Diagram For The PJC31C Relay (Front View)

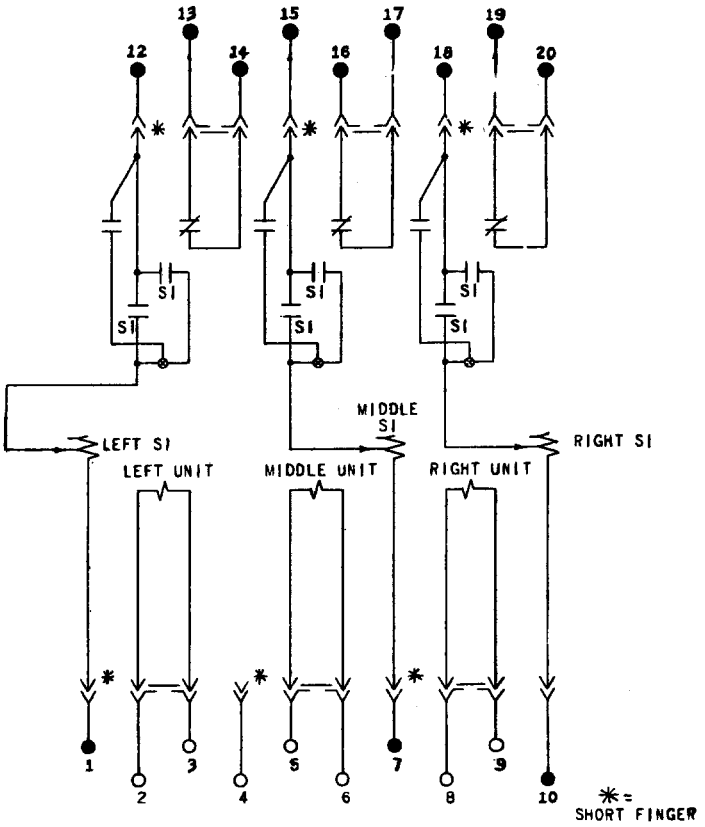


FIG. 7 (K-6375727-3) Internal Connections Diagram For The PJC31D Relay (Front View)

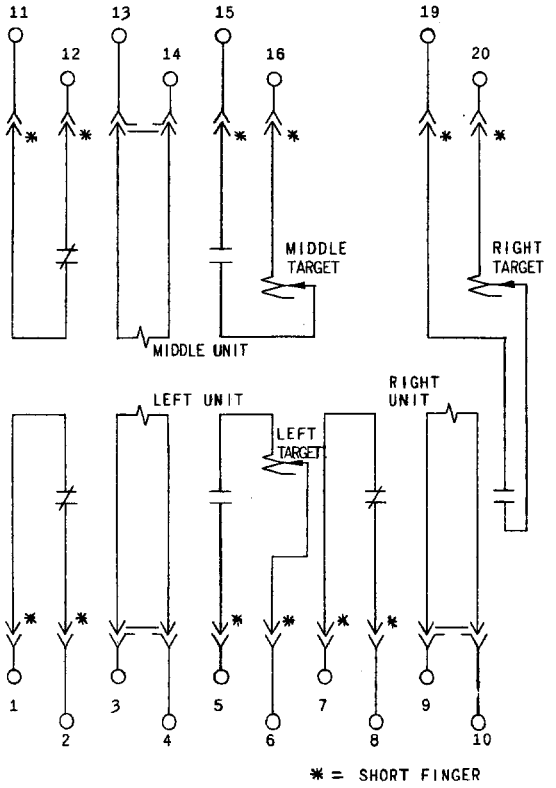


FIG. 8 (402A946-2) Internal Connections Diagram For The PJC31E Relay (Front View)

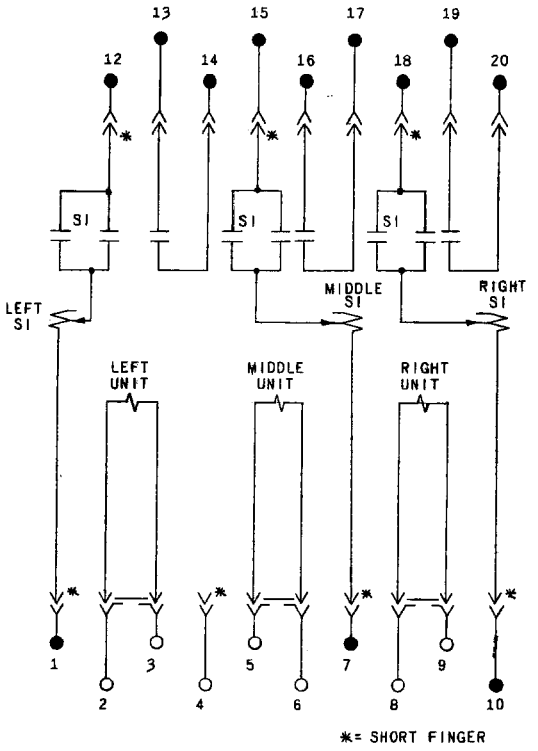


FIG. 9 (402A940-2) Internal Connections Diagram For The PJC31F Relay (Front View)

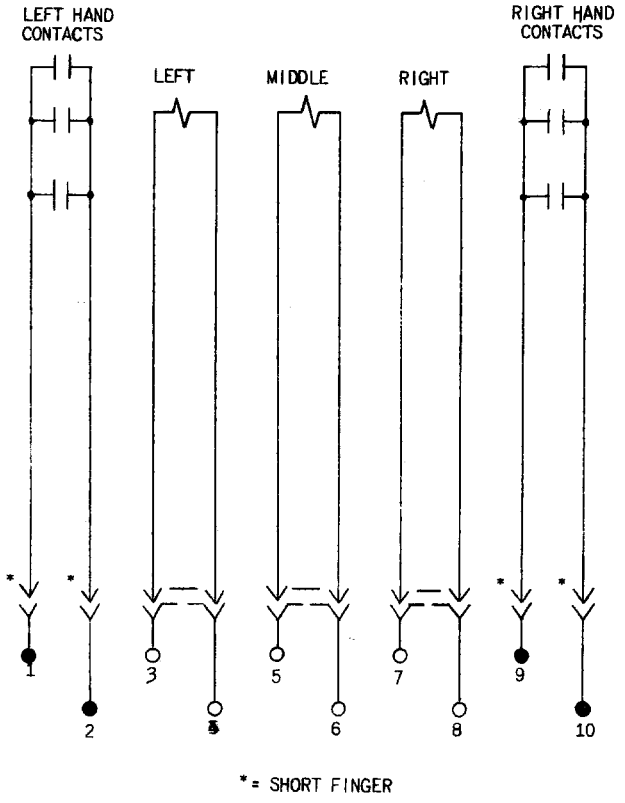


FIG. 10 (K-6154875-5) Internal Connections Diagram For The PJC31G Relay (Front View)

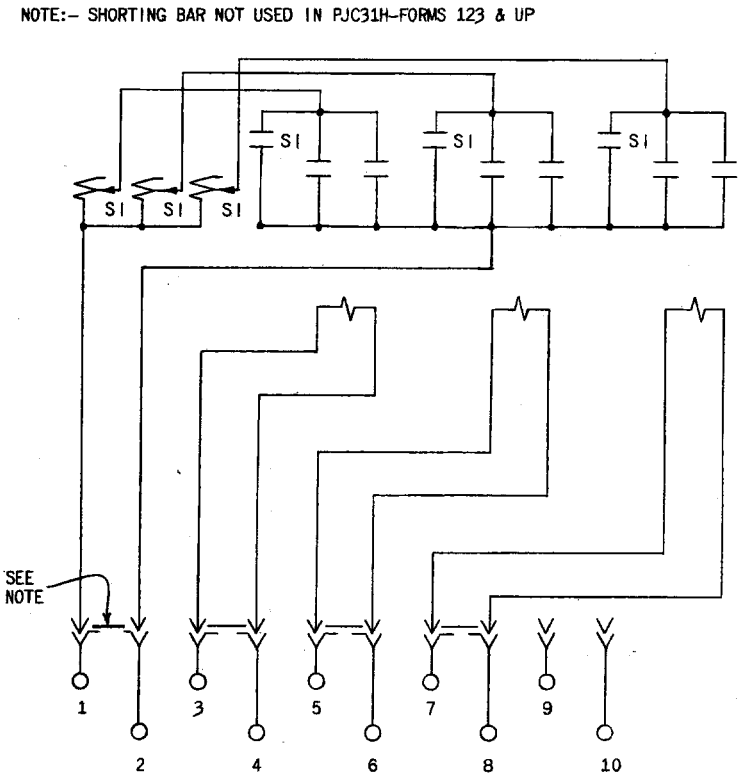


FIG. 11 (402A929-4) Internal Connections Diagram For The PJC31H Relay (Front View)

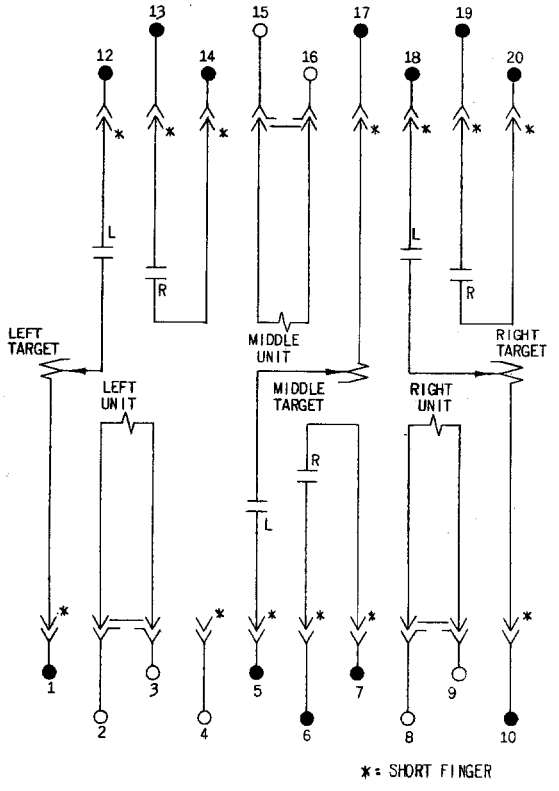


FIG. 12 (104A8955-1) Internal Connections Diagram For The PJC31J Relay (Front View)

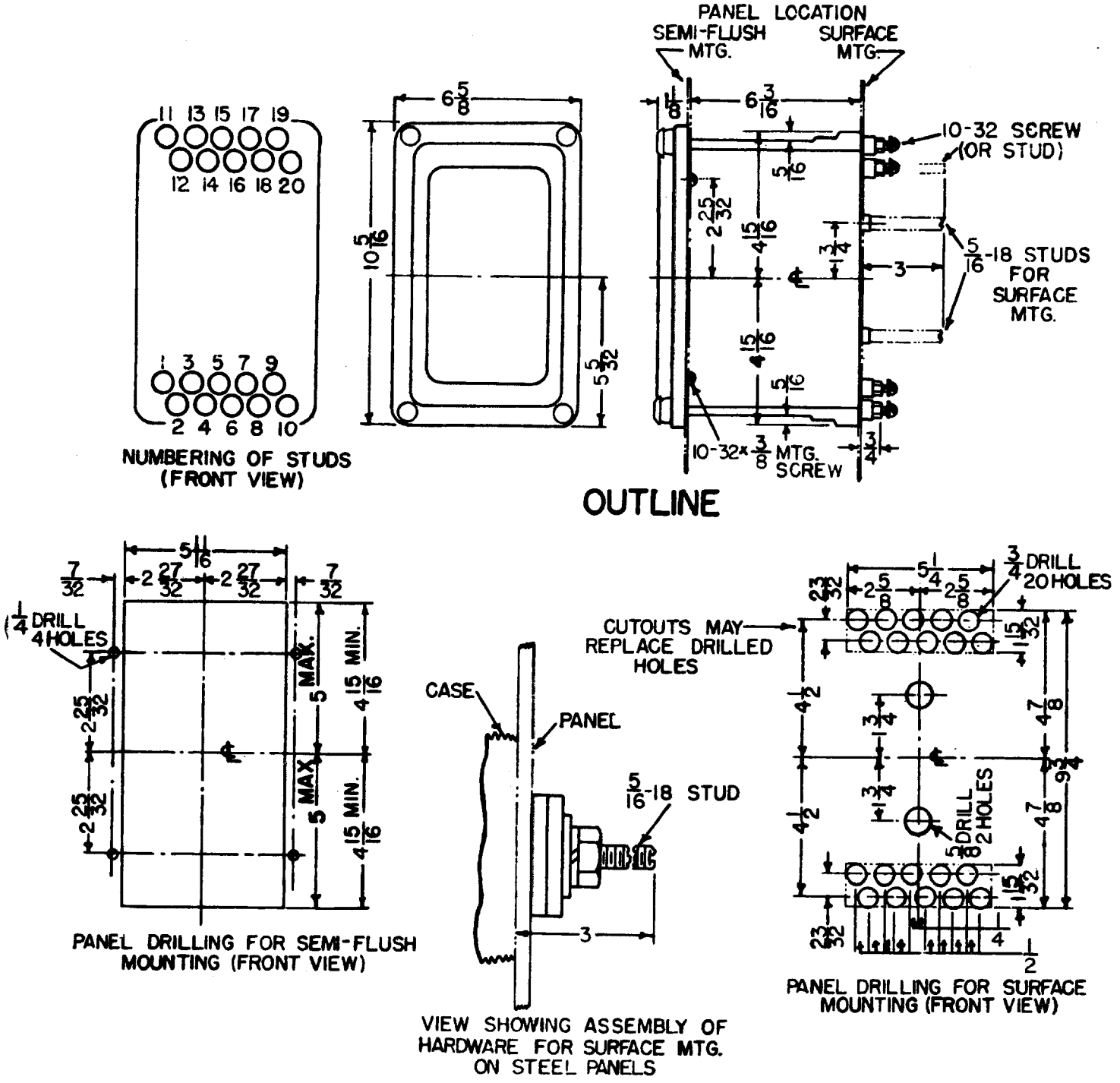


FIG. 13 (K-6209272-2) Outline And Panel Drilling Dimensions Diagram For The S2 Case

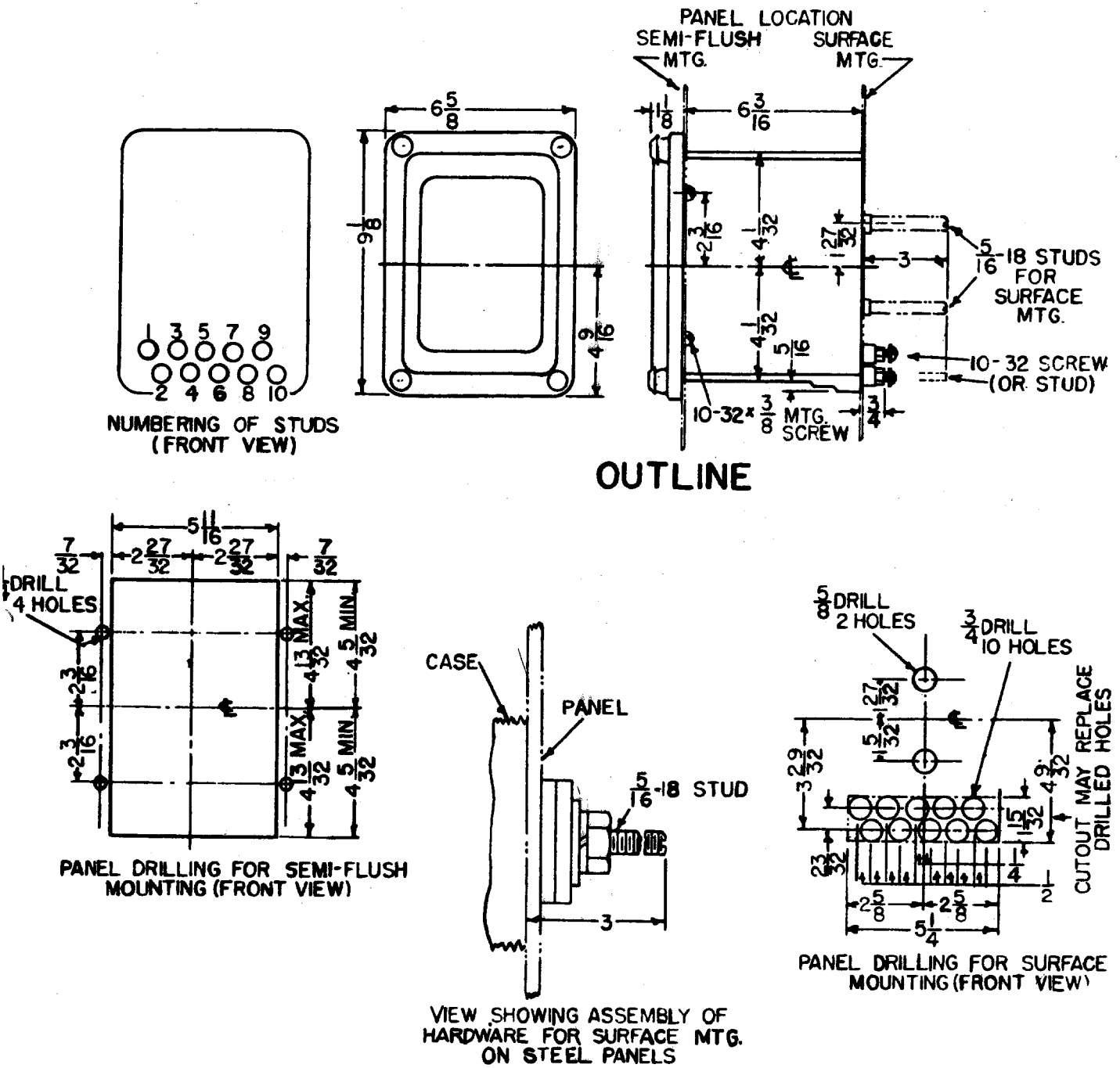


FIG. 14 (K-6209271-3) Outline And Panel Drilling Dimensions For The S1 Case

GENERAL ELECTRIC SALES OFFICES

READY TO ASSIST YOU ... When You Have Electrical Problems ... Need Further Information ... Require Ordering Instructions

KEY TO SALES OPERATIONS

A - Agency & Distributor
C - Components Sales
I - Industrial Sales
M - Marine & Defense Facilities Sales
S - Installation and Service Engineering
U - Electric Utility Sales

ALABAMA
A C I S U Birmingham 35205 . . 2151 Highland Ave.
I Huntsville 35801 . .3322 Memorial Pkwy S.
A I S Mobile 36606 . . . . .1111 S. Beltline Hwy.

ARIZONA
A C I S U Phoenix 84012 . . . .3550 N. Central Ave.
A I S U Tucson 85711 . . . . . 40 No. Swan Rd.

ARKANSAS
A C I S N. Little Rock 72119. . . . . 120 Main St.
U Pine Bluff 71602 . . . . . P.O. Box 1033

CALIFORNIA
A Burlingame 94010 . . . 770 Airport Blvd.
C Burlingame 94010 . . . 1575 Rollins Rd.
A I Emeryville 94608 . . .5000 Shellmound St.
A I Fresno 93728 . . . . . .1532 N. West Ave.
C Los Angeles 90015 .1543 W.Olympic Blvd.
A I M S U Los Angeles 90054 . . . 212 N. Vignes St.
A Oakland 94621 . . . . .8105 Edgewater Dr.
A Ontario 91764 . . . . . 214 West E St.
S Palo Alto 94303 . . . .960 San Antonio Rd.
A S U Sacramento 95808 . . . . . 2407 "J" St.
A M S U San Diego 92103 . . . . . 2560 First Ave.
A I M S U San Francisco 94108. 235 Montgomery St.
A Santa Clara 95050 . . .1400 Coleman Ave.

COLORADO
A C I S U Denver 80206 . . . . 201 University Blvd.

CONNECTICUT
I U Hamden 06518 . . . . . 2905 Dixwell Ave.
A Hartford 06105 . . . . . 764 Asylum Ave.
C I S U Meriden 06450 . . . . . 1 Prestige Dr.

DISTRICT OF COLUMBIA
I M U Washington 20005. . . 777-14th St., N. W.

FLORIDA
A I S U Jacksonville 32207 . . 4040 Woodcock Dr.
A S U Miami 33134 . . . . . 4100 W. Flagler St.
A Orlando 32803 . . 601 N. Fern Creek Ave.
U Pensacola 32502 . . . . . P.O. Box 1027
A C I S U Tampa 33609 . . . . . 2106 S. Lois Ave.

GEORGIA
A C I S U Atlanta 30309. . .1860 Peachtree Rd. N.W.
A Macon 31204 . . . . . 2720 Riverside Dr.
A I S U Savannah 31405 . . . . . 5002 Paulsen St.

IDAHO
A U Boise 83701 . . . . . .1524 Idaho St.

ILLINOIS
A I M S U Chicago 60680 . . . . . 840 S. Canal St.
C Oakbrook 60521 . . . . .1200 Harger Rd.
A I U Peoria 61603. . . . 2008 N.E. Perry Ave.
A I Rockford 61108 . . . . . .4223 E. State St.
U Springfield 62701 . . . . 607 E. Adams St.
A Springfield 62701 . . . 425 1/2 So. Fifth St.

INDIANA
A C S U Evansville 47714 . .2709 Washington Ave.
C Fort Wayne 46804 . . . . .1635 Broadway
S Fort Wayne 46807. . . 3808 S. Calhoun St.
A U Fort Wayne 46806. . 6001 S. Anthony Bldg.
A I S U Indianapolis 46207 . .3750 N. Meridian St.
C Indianapolis 46240 . . . . 1010 E. 86th St.
A C South Bend 46601 . . . 430 N. Michigan St.

IOWA
U Cedar Rapids 52401 . 210 Second St., S. E.
C Davenport 52722 . . . . . P.O. Box 748
A I S Davenport
. . . . . (1039 State St., Bettendorf 52722)
A U Des Moines 50310 . . 3839 Merle Hay Rd.
U Sioux City 51101 . . . . . 520 Pierce St.

KANSAS
C Overland Park 66204. . . 7219 Metcalf St.
A Wichita 67211. . . 820 E. Indianapolis Ave.
U Wichita 67202. .104 S. Broadway Suite 1408

KENTUCKY
A U Lexington 40502. . . . 443 S. Ashland Ave.
A C I S U Louisville 40218. . . . . 2300 Meadow Dr.

LOUISIANA
A U Alexandria 71301 . . .2001 MacArthur Dr.
I S Baton Rouge 70806 . . .8312 Florida Blvd.
I Lake Charles 70604 . . . . 1424 Ryan St.
I S Monroe 71201 . . . . . 1028 N. Sixth St.
A I S New Orleans 70125 . . 4747 Earhart Blvd.
U New Orleans 70112. . . . 225 Baronne St.
M New Orleans 70130. 930 Inter. Trade Mart
A S U Shreveport 71104 . . 2620 Centenary Blvd.

MAINE
U Augusta 04330 . . . . . 152 State St.
I Bangor 04402 . . . . . .77 Central St.
A Portland 04102 . . . . . Thomapson's Point

MARYLAND
I S U Baltimore 21201. . . . . 1 N. Charles St.
A U Columbia 21403 . . 10221 Wincopin Circle
U Hagerstown 21740 . . . . . P.O. Box 477
A Salisbury 21801 . . . . . P.O. Box 424

MASSACHUSETTS
I U Boston 02117. . . . . 31 St. James Ave.
I Springfield 01103 . . . . . 120 Maple St.
A C I M S Wellesley 02181. . . . . 1 Washington St.

MICHIGAN
A C I S U Detroit 48202 . . . . . .700 Antoinette St.
I Flint 48502 . . . . . 801 S. Saginaw St.
A C I Grand Rapids 49508
. . . . . 2821 Madison Ave., S. E.
S U Jackson 49201 . . . . . 210 W. Franklin St.
S Kalamazoo 49003 . . . . . P.O. Box 2085
A I S Saginaw 48601 . . 1230 S. Washington Ave.

MINNESOTA
I S U Duluth 55802 . . . . . 300 W. Superior St.
U Fergus Falls 56537
. . . . . 201 1/2 Lincoln Ave., W.
C Minneapolis 55424 . . . 4018 W. 65th St.
A I S U Minneapolis 55416 . . . 1500 Lilac Dr., S.

MISSISSIPPI
U Gulfport 39502. . . . . P.O. Box 33
A S Jackson 39206 . . . . . 333 No. Mart Plaza
U Jackson 39201 . . Rm. 717 Electric Bldg.

MISSOURI
A Joplin 64802 . . . . . 310 Wall St.
A I S U Kansas City 64105 . . . . . 911 Main St.
A C I S U St. Louis 63101 . . . . . 1015 Locust St.

MONTANA
A Billings 59101
. . . . . 312 Transwestern Life Bldg.
A I S U Butte 59701. . . . . .103 N. Wyoming St.

NEBRASKA
A I S U Omaha 68102. . . . . 409 S. 17th St.

NEVADA
U Las Vegas 89106 . . . . . 1711 S. 8th St.

NEW HAMPSHIRE
U Manchester 03104 . . . . . 46 Bay St.

NEW JERSEY
C East Orange 07017 . 50 Melmore Gardens
A I S U Millburn 07041. . . . . 25 E. Willow St.

NEW MEXICO
A I M S U Albuquerque 87108
. . . . . 120 Madeira Dr., N.E.

NEW YORK
A I M S U Albany 12201. . . . .11 Computer Dr. West
U Binghamton 13902. . . . . 40 Front St.
A I S U Buffalo 14202. . . . . 625 Delaware Ave.
A Elmsford 10523 . . . . .44 N. Central Ave.
A Harrison 10528 . . . 600 Mamaroneck Ave.
C Mattydale 13211
. . . . . P.O. Box 5858 E. Molloy Rd.
I M S U New York 10022. . . . .641 Lexington Ave.
C Rochester 14618. . . . . 3380 Monroe Ave.
A I S U Rochester 14604. . . . . 339 East Ave.
A I S U Syracuse 13201 . . . . . 3532 James St.
A Yestal 13805 . . . . . P.O. Box 407

NORTH CAROLINA
A C I S U Charlotte 28207 . . . . 141 Providence Rd.
A I Greensboro 27405 . . . . 801 Summit Ave.
A U Raleigh 27603 . . . . 120 N. Boylan Ave.

NORTH DAKOTA
U Bismarck 58501. . . . . 418 Rosser Ave.
A Fargo 58102 . . . . . 112 University Dr.

OHIO
A I Akron 44320 . . . . . 341 White Pond Dr.
I U Canton 44703. . . . . 515 Third St., N.W.
A C I S U Cincinnati 45206. . . . 2621 Victory Pkwy.
C Cleveland 44116. 20950 Center Ridge Rd.
A I M S U Cleveland 44114. . . . 1000 Lakeside Ave.
C Columbus 43212. . . . . 937 Burrell Ave.
A I S U Columbus 43216. . . . . 1110 Morse Rd.
A C I U Dayton 45439. . . . . 3430 S. Dixie Hwy.
C Mansfield 44902. . . . . 166 Park Ave., W.
U North Canton 44720
. . . . . 7900 Whipple Ave. N.W.
U Toledo 43604. . . . . 420 Madison Ave.
A I S Youngstown 44507. . 272 E. Indianola Ave.

OKLAHOMA
A S U Oklahoma City 73106 . 2000 Classen Blvd.
A I Tulsa 74105 . . . . . 5138 S. Peoria Ave.
U Tulsa 74103 . . . . . 420 Main St.
S Tulsa 74105
. . . . . P.O. Box 7646, Southside Station
C Tulsa 74135 . . . . . 3315 E 47th Place

OREGON
A I S U Eugene 97409 . . . . . 1170 Pearl St.
A U Medford 97501. . . . . 107 E. Main St.
A C I S U Portland 97210. . . . 2929 N.W. 29th Ave.

PENNSYLVANIA
A I U Allentown 18102 . . . . .1444 Hamilton St.
A Camp Hill 17011. . . 1521 Cedar Cliff Dr.
A Erie 16501 . . . . . 3001 E. Lake Rd.
I Erie 16501 . . . . . 1001 State St.
I U Johnstown 15902 . . . . . 841 Oak St.
C Philadelphia 19114 . . . . .2417 Welsh Rd.
A I M S U Philadelphia 19102 . 3 Penn Center Plaza
C Pittsburgh 15234. . 300 Mt. Lebanon Blvd.
A I S U Pittsburgh 15222 . . . 300 6th Ave. Bldg.
A Williamsport 17701 . . . . 2209 Fink Ave.
C York 17403 . . . . . 1617 E. Market St.

RHODE ISLAND
A Providence 02904. . . 1006 Charles St., N.

SOUTH CAROLINA
A I U Columbia 29205 . . . . . .2728 Devine St.
S Columbia 29204 . Middleburgh Office Mall
A I Greenville 29606 . . . . 1403 Laurens Rd.

SOUTH DAKOTA
A Sioux Falls 57105. . . . . 513 Main Ave.

TENNESSEE
U Chattanooga 37402 . . . 832 Georgia Ave.
A C I M S Chattanooga 37411
. . . . . 5800 Bldg. Eastgate Center
I Kingsport 37664. . . 1170 E. Eastman Rd.
A U Knoxville 37921 . 1301 Hannah Ave., N.W.
A I S U Memphis 38116 . . . . 3385 Airways Blvd.
A Murfreesboro 37130 . 117 N.W. Broad St.
A U Nashville 37203 . . . 1717 West End Bldg.
C Nashville 37204 . . . . . 2930 Sidco Drive
M Oak Ridge 37830 . . . 253 Main St., East

TEXAS
S U Abilene 79601 . . . . . 442 Cedar St.
S U Amarillo 79101 . . . . . 303 Polk St.
A I S U Beaumont 77704. . . . . .1385 Calder Ave.
S U Corpus Christi 78401
. . . . . .205 N. Chaparral St.
A C I S U Dallas 75247 . . .8101 Stemmons Freeway
I S U El Paso 79902 . . . . . 215 N. Stanton St.
A El Paso 79902 . . . . . 2800 N. Stanton St.
A Fort Worth 76107. . . . . 100 N. Univ. Dr.
S U Fort Worth 76102. . . . . 408 W. 7th St.
A C I S U Houston 77027 . . . . .4219 Richmond Ave.
A I Lubbock 79408 . . . . . 500 E. 50th St.
A S Midland 79704 . . . . . .122 N. "N" St.
A S U San Antonio 78204 . . . . 419 S. Main Ave.

UTAH
A I S U Salt Lake City 84110. . 431 S. Third E St.

VERMONT
U Rutland 05702 . . . . . .38 1/2 Center St.

VIRGINIA
A M S Newport News 23601. . . . . 311 Main St.
A I S U Richmond 23230. . 1508 Willow Lawn Dr.
A I S U Roanoke 24015. . .2018 Colonial Ave., SW

WASHINGTON
A I M S U Seattle 98188. . . . . 112 Andover Park, E.
A I S U Spokane 99220 . . . . . E. 1805 Trent Ave.

WEST VIRGINIA
A I S Charleston 25328
. . . . . 306 MacCorkle Ave., SE
I U Fairmont 26555 . . . . . 310 Jacobs Bldg.
A Huntington 25701 . Sixth Ave. & Ninth St.
I Wheeling 26002 . . . . . 40 14th St.

WISCONSIN
A I S U Appleton 54911. . . . 3003 W. College Ave.
U Madison 53704 . . 2038 Pennsylvania Ave.
C Milwaukee 53226
. . . . .Mayfair Plaza, 2421 N. Mayfair Rd.
A I S U Milwaukee 53202 . . . 615 E. Michigan St.

CANADA
Canadian General Electric Company, Ltd.
Toronto

GENERAL ELECTRIC SERVICE SHOPS

WHEN YOU NEED SERVICE... These GE service shops will repair, recondition, and rebuild your electric apparatus. The facilities are available day and night, seven days a week, for work in the shops or on your premises. Latest factory methods and genuine GE renewal parts are used to maintain performance of your equipment. For full information about these services, contact your nearest service shop or sales office.

ALABAMA
•*Birmingham 35211
. . . . . 1500 Mims Ave., S.W.
•Mobile 36609. . . . . 721 Lakeside Drive

ARIZONA
•(Phoenix) Glendale 85019
. . . . . 4911 W. Colter St.
•Phoenix 85019 . . 3840 W. Clarendon St.
•Tucson 85713. . 2942 So. Palo Verde Ave.

CALIFORNIA
•Los Angeles 90301 . . .6900 Stanford Ave.
•(Los Angeles) Anaheim 92805
. . . . . 3601 E. LaPalma Ave
•(Los Angeles) Inglewood 90301
. . . . . 228 W. Florence Ave.
•Sacramento 95814. . . . 99 North 17th St.
•*(San Francisco) Oakland 94608
. . . . . 1650 34th St.

COLORADO
•*Denver 80205 . . . . . 3353 Larimer St.

CONNECTICUT
•*(Southington) Plantsville 06479
. . . . . 370 Atwater St.

FLORIDA
•*Jacksonville 32203 . . .2020 W. Beaver St.
•(Miami) Hialeah 33010. .1062 East 28th St.
•*Tampa 33601. . . . . .19th & Grant Sts.

GEORGIA
•*(Atlanta) Chamblee 30341
. . . . . 5035 Peachtree Industrial Blvd.

ILLINOIS
•*Chicago 60638 . . 6045 S. Nottingham Ave.

INDIANA
•Ft. Wayne 46803 . . . . .1731 Edsall Ave.
•*Indianapolis 46222 . . 1740 W. Vermont St.

IOWA
•(Davenport) Bettendorf 52722
. . . . . 1025 State St.

KENTUCKY
•Louisville 40209. . 3900 Crittenden Drive

LOUISIANA
•Baton Rouge 70814 . .10955 North Dual St.
•*New Orleans 70114. . . 1115 DeArmas St.

MARYLAND
•*Baltimore 21230 . . . . . 920 E. Fort Ave.

MASSACHUSETTS
•*Δ(Boston) Medford 02155
. . . . . 3960 Mystic Valley Pkwy.

MICHIGAN
•*Δ(Detroit) Riverview. . .18075 Krause Ave.
•Flint 48505 . . . . . 1506 E. Carpenter Rd.

MINNESOTA
•Duluth 55807
. . . . . .50th Ave. W & St. Louis Bay
•*Minneapolis 55430 . . . 2025 49th Ave., N.

MISSOURI
•*Kansas City 64120 . . .3525 Gardner Ave.
•*St. Louis 63110 . . . . . 1125 East Road

NEW JERSEY
•New Brunswick 08902 . . . 3 Lawrence St.

NEW MEXICO
•Albuquerque 87109 . 4420 McLeod Rd., NE

NEW YORK
•Albany 12205. . . . . 1097 Central Avenue
•*(Buffalo) Tonawanda 14150
. . . . . 175 Milens Rd.
•(Long Island) Old Bethpage 11804
. . . . . 183 Bethpage-Sweet Hollow Rd.
•(New York City) North Bergen, N.J. 07012
. . . . . 6001 Tonnelle Ave.
•(New York City) Clifton, N. J. 07012
. . . . . 9 Brighton Rd.
•ΔSchenectady 12305 . . . . . 1 River Road
•Syracuse 13208 . . 1015 E. Hiawatha Blvd.

NORTH CAROLINA
•*Charlotte 28208 . . . . . 2328 Thrift Rd.

OHIO
•*Cincinnati 45202. . . . . 444 West 3rd St.
•*ΔCleveland 44125 . . . . . 4477 East 49th St.
•Columbus 43229 . . . . . 6660 Huntley Rd.
•*Toledo 43605. . . . . 405 Dearborn Ave.
•Youngstown 44507. . 272 E. Indianola Ave.

OKLAHOMA
•Tulsa 74145 . . . .5220 S. 100th East Ave.

OREGON
•Eugene 97402 . . . . . .570 Wilson St.
•*Portland 97210 . . . . .2727 NW 29th Ave.

PENNSYLVANIA
•*Allentown 18103. . . . .668 E. Highland St.
•*(Delaware Valley) Cherry Hill, N. J. 08034
. . . . . 1790 E. Marlton Pike
•Johnstown 15802. . . . . 841 Oak Street
•Philadelphia 19124 . .1040 East Erie Ave.
•*(Pittsburgh) West Mifflin 15122
. . . . . .4930 Buttermilk Hollow Rd.
•York 17403 . . . . . 54 N. Harrison St.

SOUTH CAROLINA
•(Charleston) No. Charleston 29401
. . . . . 2490 Debonair St.

TENNESSEE
•Knoxville 37914
. . . . . 2621 Governor John Sevier Hwy.
•Memphis 38107 . . . . .708 North Main St.

TEXAS
•Beaumont 77705. . . 1490 W. Cardinal Dr.
•Corpus Christi 78401 . . 115 Waco Street
•*Dallas 75235 . . . . . 3202 Manor Way
•Houston 77036 . . 5534 Harvey Wilson Dr.
•Houston 77036 . . 5539 Harvey Wilson Dr.
•Midland 79701 . . . . . 704 S. Johnston St.

UTAH
•*Salt Lake City 84110. . 301 S. 7th West St.

VIRGINIA
•*Richmond 23224 . . . . .1403 Ingram Ave.
•Roanoke 24013 . . . . .1004 River Ave., SE

WASHINGTON
•*Seattle 98134. . . . 3422 First Ave., South
•Spokane 99211 . . . . . E. 4323 Mission St.

WEST VIRGINIA
•*Charleston 25328
. . . . . 306 MacCorkle Ave., SE

WISCONSIN
•(Appleton) Menasha 54910
. . . . . 1725 Racine St.
•Milwaukee 53207 . 235 W. Oklahoma Ave.

•Electrical/Mechanical Service Shop •Instrumentation Shop ΔSpecial Manufacturing Shop

GENERAL ELECTRIC COMPANY, PHILADELPHIA, PA.

PRINTED IN U.S.A.