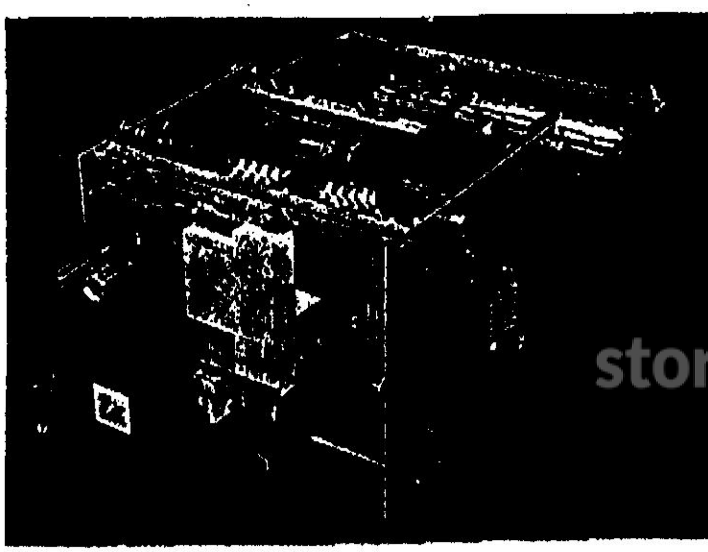
SSPB

POWER CIRCUIT BREAKER
INSTRUCTIONS



INSTALLATION
OPERATION
MAINTENANCE

800 - 2000 AMPS

THE BREAKER THAT LETS YOU CHANGE ITS MIND

GTE SYLVANIA

CONTENTS

INSTALLATION – OPERATING – MAINTENANCE INSTRUCTIONS

SSPB BREAKERS

800 – 1600 – 2000 AMP FRAMES

The complete SSPB line encompasses frame sizes from 800 to 4000 amperes, up to 600 volts A.C. Basic sub-assemblies include the operating mechanism, contact structures, arc chutes, and static trip device.

The operating mechanism offers a choice of either manual for local control, or electrical for remote operation. A stored energy principle of operation is utilized for either type.

I. DELIVERY OF EQUIPMENT

1. Receiving

Each shipping section of switchgear has been palletized to facilitate moving. The shipping section is covered with a transparent plastic cloth to inhibit entrance of foreign particles and permit carrier awareness of shipping contents.

Immediately upon receipt of equipment, examine components making note of any damages incurred in transit. If necessary, immediately file a claim with the delivering carrier and notify your Sylvania representative.

CAUTION:

The drawout breaker elements are secured to their cradles installed in the switchgear assembly. In order to withdraw the element, it is first necessary to remove the two bottom shipping bolts holding the orange shipping plates to the stationary cradle. With these bolts removed, the breaker may be cranked (counterclockwise) to its open position and then fully withdrawn. In the withdrawn position, the remaining four shipping bolts and orange plates should be removed and discarded.

2. Installation of Separately Shipped Breakers

Insert racking handle into cell being installed with breaker and turn counterclockwise until cradle is in withdrawn position. White lines surrounding collar of withdrawing device indicate cradle position. Three white lines visible ahead of cell frame or front of closed door indicates cradle is in isolated position. In this position, the two telescopic rails should be fully withdrawn to accept the breaker element.

Remove breaker element from shipping carton in the manner outlined under "Handling". After a visual inspection for damage, mount element on rails locating holes in the breaker support over the four mounting metric bolts (8 mm - 0.7 mm thread). Secure element to rails with lock washers and 8 mm metric nuts using a 13 mm metric wrench or ½ inch open end wrench.

3. Storage

[illegible] not installed for imme-diate use must be stored in a ventilated room anc protected from dust and water by means of non absorbent covering.

4. Handling

Although the SSPB circuit breakers include higl precision components, they will only remai reliable if handled with care.

Never rest the element on the contact jaws. Th breaker element must always be laid on a clear flat surface either upright or on its side. Th breaker can be easily and safely transported on lift truck. For transporting in this manner, a palli must be used.

Toward the top of the side plates of the breaki element, lugs (two on each side) are provided fi lifting. *Never* lift element by its contact jaws i its static trip sensor box.

II. OPERATION

1. Manually Operated Breakers

With the manually operated SSPB breaker, a simple rotary motion of the operating handle in the counterclockwise direction for approximately 90 degrees charges the springs for a close-open operation. Rotation clockwise back to its normal vertical position initiates the spring release for closing. The closing speed is completely independent of the operator. A position indicator located on the front escutcheon indicates the position of the main contacts: red for "on" or "closed", green for "off" or "open.

The breaker may be tripped manually by depressing the manual trip button. Through linkages, this action causes the mechanism trip latch to be displaced collapsing the operating springs and thereby opening the breaker contacts.

If breaker is equipped with a lock-out device or undervoltage release, refer to paragraph 4 operating instructions.

2. Electrically Operated Breakers

For electrical operation, a fractional horsepower, high-torque gearmotor provides energy for charging the springs. Charging requires approximately 5 seconds. Recharging takes place automatically after the breaker is closed. A limit switch removes the gearmotor supply voltage at the end of travel. The supply voltage at the motor terminals may be between 90 to 110% of the rated voltage.

After the springs are charged, the closing springs are held by an electromagnetically operated latch. When the breaker is closed by depressing the manual close button located on the front escutcheon the closing latch is displaced, thereby collapsing the springs and closing the main contacts. This action is initiated with remote closing by energizing the electromagnet.

The breaker may be manually tripped locally or electrically tripped from remote locations.

In the event of power loss, it is possible to manually charge the springs of an electrically operated breaker for close-open operation. The emergency operating handle is identical in appearance to the handle used on manually operated breakers. The method of spring charging differs from the manual-[illegible] breaker in that the handle is rotated until there is no apparent spring resistance to the operator. To fully charge the springs manually requires approximately 15 reversals or oscillations of the handle.

The control panel or front escutheon differs from the manually operated breaker in that two push

buttons are furnished, one for initiating closing of main contacts (red) and one for opening (green). In addition, a spring indicator is included (yellow) for charged, and (black) for discharged condition.

3. Safety Tripping

If the breaker is inserted or withdrawn with its main contacts in the closed position, a mechanical linkage automatically trips the breaker before separation of the main contacts during withdrawal or before closing of the main contacts during insertion. The same device prevents the closing of the breaker between positions'test'and'service'.

4. Anti-Pumping and Control Characteristics

Anti-pumping its assured in both the local and remote control operations. If the local close button is held depressed or a remote closing signal maintained, it will be necessary to interrupt this action, after tripping breaker, to effect a subsequent closing.

If tripping is a result of overload or short circuit current and the breaker is equipped with a local reset lockout device, it is necessary to completely depress the trip button in order to effect a subsequent closing.

By padlocking the local trip button in a depressed position, it is impossible to close the breaker [illegible] remotely, since the latch holding the charged closing springs cannot be released.

Maintaining a remote tripping signal nullifies any remote or local closing action. It is possible to depress the local close button causing the closing spring to release; however, the main contacts will not close until the remote tripping signal is removed. Should it be desired to prevent accidental closing when the local trip button is released, an undervoltage release device with lockout must be used for remote tripping.

Where electrically operated breakers equipped with an undervoltage release are closed by a constant signal, there are two possible methods of operating, depending upon whether the closing electromagnet and undervoltage release are energized by the same source or separate sources.

Common Source: Voltage drops - breaker trips
Voltage restores - breaker automatically closes

Separate Source: Voltage drops - breaker trips
Voltage restores - breaker remains open

The closing signal must be momentarily removed in order to reclose the breaker. If a closing signal is maintained even when the closing spring is discharged, the breaker will automatically close at the completion of spring charging. This would occur where voltage is applied simultaneously to the charging motor and closing electromagnet. The latch keeping the closing spring charged cannot be released if the breaker is in the closed position.

5. Auxiliary Circuits (Cradle/Element)

The SSPB breaker can be equipped with a maximum of 24 secondary isolating contacts. Each contact is designed to accept two ¼" quick disconnect lugs per terminal.

The secondary isolating blocks may contain up to twenty-four (24) terminals, twelve (12) on each side, which may be used for breaker operation and alarm circuits. Internal wiring of breakers is numbered in conformity with standard wiring diagrams. The terminals of the secondary or stationary isolating contacts on the cradle are arranged and connected in a manner to permit interchangeability of similar elements.

Six terminals of the secondary isolating block are required to operate electrically operated breakers. Two of these terminals are made continuous through the test-service position in order to provide power for the spring charging motor. The remaining four are for closing and tripping.

In some applications, it may be necessary tc electrically connect the breaker in the cradle service position differently from that in the tes position. This can be accomplished by removing the test or service terminal. After the fixed second ary isolating contact block has been removed, i is only necessary to remove the terminal by un screwing the fixing screw and breaking the bridge between the test and service contacts at the neck provided for this purpose.

To protect the auxiliary wires from physically coming in contact with moving parts when the breaker is being inserted or withdrawn, an enclosec passage, located at the point of exit from the stationary isolating terminal block, is provided.

6. Auxiliary Circuits (Devices)

Auxiliary contacts may be added as an accessory either on electrically or manually operatec breakers. A built-in time differential of 15 milli seconds is available between contact group posi tions 1-8 and 9-16 for sequence logic. Contac positions 9-16 act simultaneously with mai contacts.

7. Arrangement of Cubicle Door

The cubicle door for drawout air circuit breake elements is provided with an opening permittin entry of the control board or front escutcheon plate. A retracting collar surrounding the escutch eon plate permits the operator to rack the breake element from the service position to the test o fully open position without opening the cubicl door. It is, therefore, possible to store breaker without fear of unauthorized personnel havin access to them.

8. Static Sensors

Static sensors consists of separate printed circuit for long time, short time, instantaneous, an ground fault tripping. Components are pre-age and factory calibrated to insure utmost trippin accuracy. No field calibration is required. Sinc cards have been designed for plug-in field installa tion, it is possible to change systems by simpl ordering cards from your nearest Sylvania office. When ordering ground fault, it is necessary to indicate whether the system is three or four wire. On a four wire system, a neutral CT will be furnished with the logic card. This CT must be installed in the neutral bus and wired to the

Fig. 3

breaker in accordance with included instructions. The ground fault logic card includes a retractable target that indicates tripping under ground fault conditions.

9. Setting of Static Trip Sensors

In order to prevent damage to static sensor pins, the following procedure should be followed when selecting or changing sensor settings.

1. Loosen two bottom screws holding transparent plastic shield.
2. Raise shield to clear bolt heads and lift out.
3. Select values of sensors desired.
4. Place thumb and forefinger on shorting bar and pull bar forward until shorting pins are cleared.
5. Raise or lower shorting bar to pre-selected sensor value.
6. Return shorting bar to pins until fully reseated.
7. Replace protective shield and tighten screws.

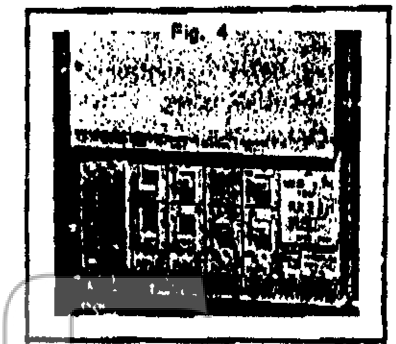


Fig. 4

10. Current Sensors

Multi-ratio window type current transforme mounted at the rear of the circuit breaker eleme provide signal source for the static trip sensor Since these sensors for initiating breaker trip deri all necessary energy from the current monitored, n external energy source is required. (Any oth accessory for breaker tripping must be provid with a separate power source.)

To change tripping range of breaker, transpose or wire on each of three current transformers. Term nals are marked to indicate primary current settin When making this change on a four wire syste with ground fault indication, it is necessary change the current transformer located in th neutral bus (rear of switchboard) accordingly.

11. Padlocking

All SSPB breakers are provided with means fc using a maximum of three padlocks (1/4" to 3/8 shackels) to lock the breaker in the opened c tripped position. To apply padlocks, it is necessar to place the breaker in the tripped position b depressing the local trip buton. While holding th trip button depressed, withdraw horizontal ba located adjacent to trip button and apply padlock With this bar withdrawn, the trip button is held i the depressed position, thereby preventing closing.

12. Key Interlocks

If the cradle is provided with a key interlock, th following procedure should be followed for lockin the breaker out:

Withdraw breaker element to fully disconnec position by turning crank counterclockwise t stop. (This operation may be performed wit cell door opened or closed.) Turn key i cylinder to remove. If key will not rotate in cylinder, turn cradle crank approximately 15 degrees to permit alignment. When stops are aligned, key will rotate for removal.

With this interlocking system, it is possible to remove the element from the cradle for either maintenance or replacement without permitting element insertion until the key has been returned to the key cylinder block.

13. Optional Devices

Shunt Trip (S.T.) This device will trip the breaker when energized by a voltage source of 65% to 130 % of rated voltage. An auxiliary contact in series with the coil opens and removes supply voltage when breaker is open.

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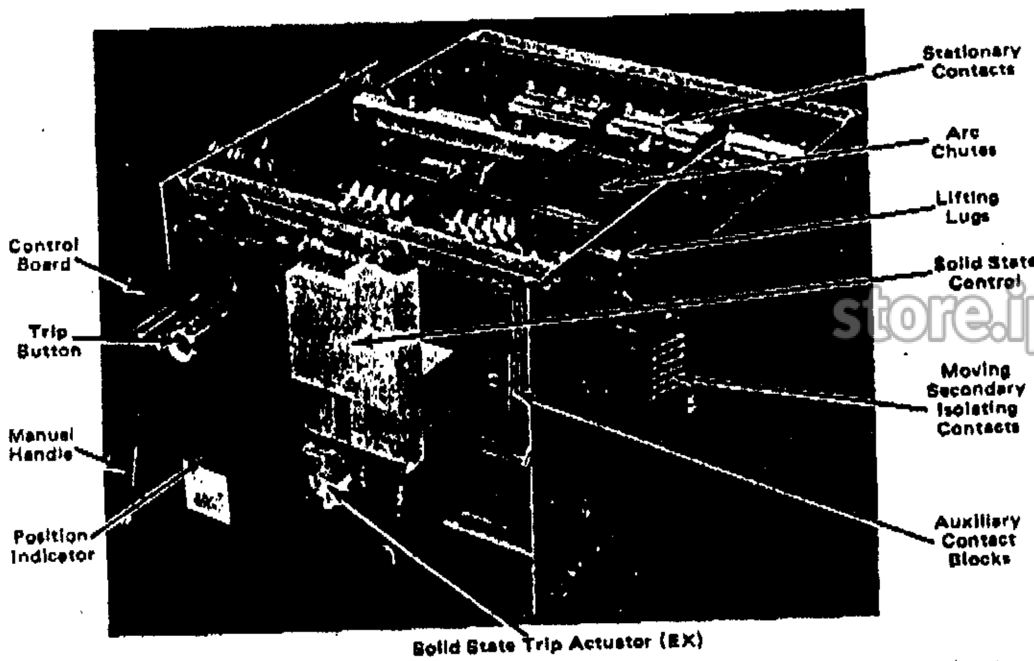
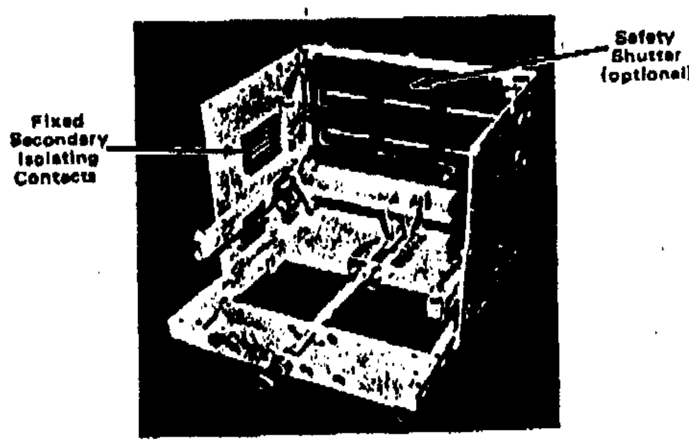
Undervoltage Trip (U.V.) When the voltage source drops below 30% of rated voltage, the breaker is tripped. In the region of 30% to 60% of rated voltage, tripping may or may not occur. No tripping action will occur when the supply voltage is 60% to 100% of rated voltage.





III. MAINTENANCE

1. Frequency

The frequency of maintenance depends essentially on the conditions of service of the breaker, frequency of operation, fault tripping, relative humidity, or presence of dust.

The mechanical endurance of the breaker is 20,000 operations with the main contacts being guaranteed for the life of the breaker. Arc chutes and the arcing contacts are guaranteed a minimum of 1500 make-break operations at the nominal current and voltage (0.2 to unity power factor), 10 make-break operations at 10 times rated current, or 3 make-break operations at rated short circuit.

To insure performance, it is recommended that breakers be inspected every six months if exposed to dust, every 3000 operations or every six months if left idle. In general, breakers should be inspected at least once a year.

2. Arc chutes *(Fig. 5)*

Remove arc chute by depressing or raising back part of retaining lever 61 and rotating clockwise 90 degrees. Lift arc chute upwards clearing arcing horns.

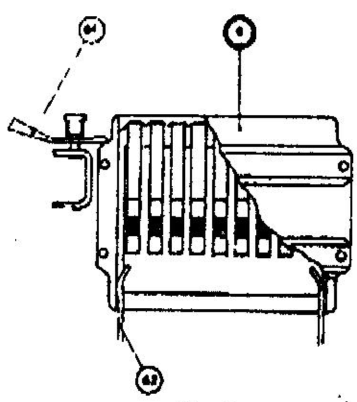


Fig. 5

Wipe the insulating surfaces clean with a dry piece of cloth. The two insulating barriers covering the inside of the arc chute walls may be blackened. In that case, they can be wiped clean of carbon deposits to restore them to their original quality. At the end of 3000 make-break operations at rated current, or 10 times at rated current, or 3 times at rated short circuit, it is recommended that the

the arc. This operation enables doubling the of the arc chutes. After two cycles, it is necess to replace the arc chutes.

3. Poles *(Fig. 6)*

Insulating barriers are located on each side of arcing area for each pole. With a piece of clean, cloth, wipe barriers to remove any deposits.

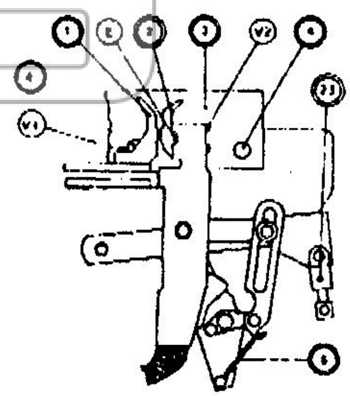


Fig. 6

Close breaker and check gap setting of arci horns. If gap exceeds 1.5mm (0.059 inches), adju contacts by loosening bolt # VI (Fig. 6) setting g to 0.9mm ± 0.1mm (0.035 ± 0.004 inches) a tightening bolt by torquing to 0.8mm-kg. (5.8 ft.). Remove both fixed and movable arci horns along with insulating barriers when thickn of arcing pads erodes to approximately 0.5m (0.020 inches).

Main contacts may have spots on them witho affecting the breaker. These contacts can cleaned with a very fine emory cloth and thoroug ly wiped to remove any particles. Do not repla main contacts as they are guaranteed for the life the breaker.

With drawout breakers, clean the main isolati contacts of the breaker and the correspondi cradle contacts with a piece of clean cloth soake in trichlorethylene. Apply a light coat of Sylvani SSPB-01 grease to the cleaned surfaces.

4. Breaker Element Pole Assembly *(Fig. 7)*

The pole assemblies are maintained under 0. m-Kg. (2.9 lb.-ft.) pressure by each of six bolt (three per side) located on the outside surface o the breaker element. They may be identified a

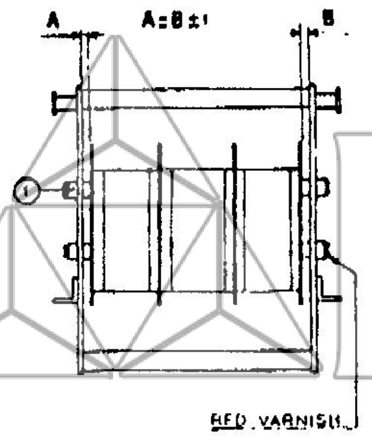


Fig. 7

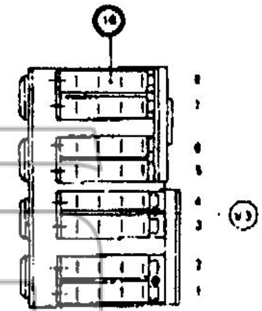


Fig. 8

5. Auxiliary Contacts *(Fig. 8)*

The auxiliary contacts located on the front right hand side of the element should not be cleaned or adjusted. A faulty relay should be replaced by placing the breaker contacts in the closed position and removing hold-down screws V3. Auxiliary contacts are only found on electrically operated breakers as a standard item since one of the contacts are required for isolating the shunt trip coil when the breaker is open.

6. Devices

Under voltage, shunt trip, and solid-state trip devices do not require maintenance. In case of failure, replace the complete device.

7. Lubrication

A breaker normally lubricated and operating in dust-free and non-corrosive atmosphere regular over a period of two years can undergo its norm cycle mechanical endurance without any lub cating. As such ideal service conditions are hard encountered, it is advisable to check periodical the lubricating, particularly when unusual ceasi or friction is observed during inspection.

All rubbing surfaces (metal to metal) are to l lubricated with a thin film of high-temperatu high-pressure lubricant equal to Sylvania SSPB-0 Hardened grease and dirt should be removed l use of trichlorethylene solvent. The main sha trip rod, intermediate manual control shaft, fre return charging spring and gear train for electric operation do not require lubrication since they a provided with sealed bearings. Do not lubricate a releases or grounding terminal.

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IV. ADJUSTMENTS AND INSPECTIONS

The following adjustments and inspections were performed at the factory following installation of various accessories. These procedures may be followed for field adjustment and inspections, realizing that tolerances are based upon the life of normal mechanical endurance for breakers. For normal service, the limits of admissible wear has been included. When these limits are reached, it is necessary to either readjust the components to the dimensions shown, or to replace components if these dimensions cannot be met.

A. CRADLE ACCESSORY

1. *Limit switch for position indication (1600A and 2000A frames only)*
   a. Service position *(Fig. 9)*.
   Adjust screw (10) to insure operation of the limit switch 3 mm ± 0.5 (0.118 ± 0.020 inches) before the service position stop. (Eliminate play by pulling on telescopic rails while making adjustments.

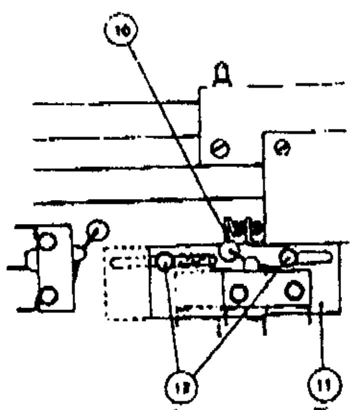


Fig. 9

   b. Test position
   Adjust the support (11) and the two screws (12) to insure the operation of the limit switch 3 mm (0.118 inches) before the test position in the direction of withdrawal. (Eliminate play by pushing on rail while making adjustment).
   c. Isolated position
   Adjust the support (11) and the two screws (12) to insure operation of the limit switch 2 mm (0.079 inches) before the stop of the isolated position. (Eliminate play by pushing on rail when making adjustments).

B. CIRCUIT BREAKER

1. *Breaker Assembly (Fig. 10)*
   a. Tightening of pole assembly
   Tighten six screws (1) painted torquing to 0.4 m-kg (2.9 lb.-ft.).

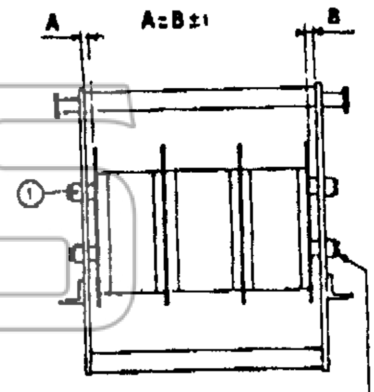


Fig. 10 RED VARNISH

2. *Pole (Fig. 11)*
   a. Adjustment of arcing contacts
   With breaker in closed position, l bolt (3) and gap arcing contacts

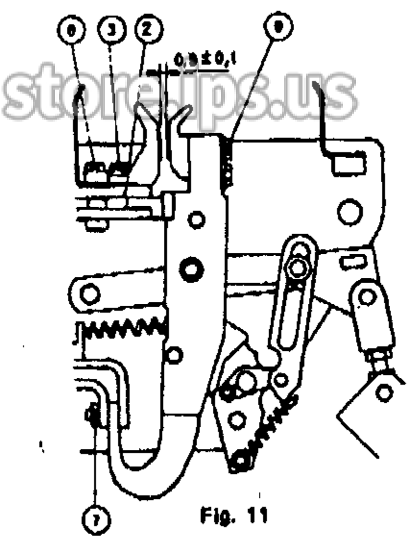


Fig. 11

   ± 0.1 mm (0.035 ± 0.004 ir Tighten bolts torquing to 0.9 (5.8 lb.-ft.).
   NOTE: All arcing contacts of th pole must be within 0.1 mm inches) of each other.
   LIMIT OF WEAR: 1.5 mm inch).
   b. Torquing requirements
      1) Flexible braid (7)
      800 amp – 0.8 m-kg (5.8 lbs.-ft.)
      1600-2000 amp – 1.3 m-kg (9.4 lbs.-ft.)

3. *Overload and short circuit release*

a. Tripping (Fig. 12)

1) Adjustment. With breaker in closed position and release reset, back off red nut until nearly all threads are exposed. Tighten same nut until distance between tripping striker (11) and lug (12) of the latch (13) shown in the normal position is 1 ± 0.5 mm (0.039 ± 0.020 inches).

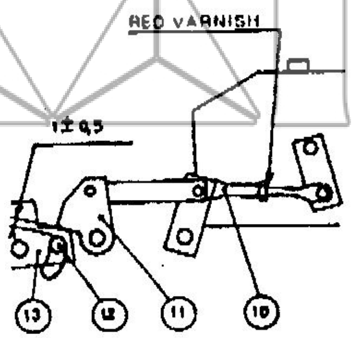


Fig. 12

2) Inspection. Place breaker in closed position and check to see that there is a minimum clearance of 0.5 mm (0.020 inches) between the tripping striker (11) and lug (12) of the latch (13) shown in the normal position.

LIMIT OF WEAR: 0.1 mm (0.004 inches).

To test tripping of breaker by the release crank, place a wire hook as shown in Fig. 13 and hold while applying a momentary signal of 12-18 volts D.C. to the tripping actuator EX. When release unlatches, slowly allow release crank to withdraw until breaker trips open.

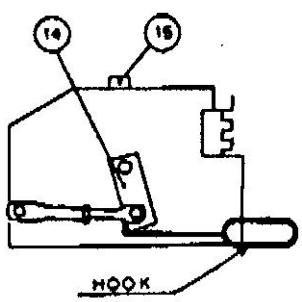


Fig. 13

NOTE: Restraining release crank (14) while performing this test results in the blocking of resetting or trips. Therefore, using ho restore release crank to its reset latched position.

b. Resetting

1) Breaker equipped with signal dication with memory for overl and short circuit release (with without indication.) (Fig. 14).

a) Adjustment. When breakers equipped with this accessory is necessary to place breake open position and adjust sc (16) to effect latching the lease. A very distinct c indicates latching. To insur margin of safety, unscrew ¾ a turn.

b) Place breaker in open posit and check to see that 1.5 (0.059 inch) clearance is av able.

LIMIT OF WEAR: Non-lat ing.

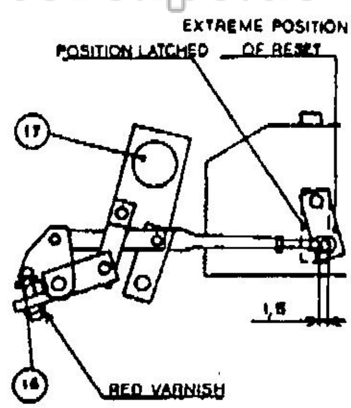


Fig. 14

2) Breaker equipped with signa dication on overload and shor cuit tripping with local res (Fig's 15 and 16).

a) Adjustment. Insert wire ho shown in Fig. 13 and hol lease crank (14) while app momentary signal of 9 - 18 DC to the tripping actuator When release unlatches, sl allow release crank to with to tripped position show tripped position and the crank (10) resting against stop (20), adjust link (21) to allow 1 ± 0.5 mm (0.039 ± 0.020 inch) clearance. Press the local tripping pushbutton (23) while adjusting screw (24) to effect resetting of the release. A distinct click will be heard when the release crank latches. Unscrew one turn to insure a margin of safety in resetting.

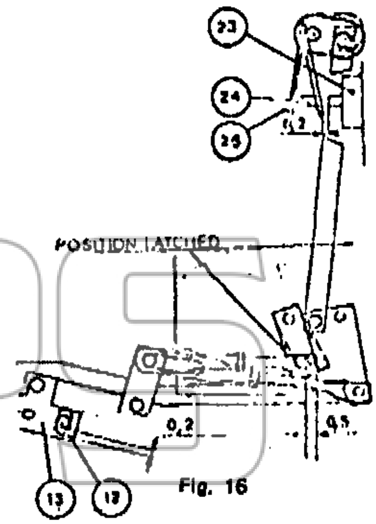


Fig. 16

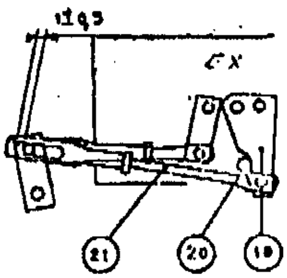


Fig. 15

b) Inspection. With the breaker in the open position, press the trip button (23) Fig. 16 and check travel of release bar. Distance between maximum position of reset and latch should be 0.5 mm (0.020 inch). Check play between lever (24) and adjustment screw (24) for a minimum of 0.2 mm (0.008 inch). Press the pushbutton fully to check for a minimum clearance of 0.2 mm (0.008 inch) between lug (12) of the latch (13) and the bottom of the slot.

4. *Voltage Tripping Devices (Accessory)*

A. Tripping (Fig. 17 and 18)

1) Adjustment. Place breaker in open position and unscrew adjusting reset screw (30). With release bar in latched on position resulting from breaker being in open position, adjust linkage (26) to provide 1 ± 0.5 mm (0.039 ± 0.020 inch) between lever (28) and lug (12) of

2) Inspection. Place breaker in the closed position and inspect to see that a minimum of 0.5 mm (0.020 inch) exists between lever (28 and lug (12) of the lever (13) shown in the normal position.

LIMIT OF WEAR: 0.1 mm (0.004 inch).

Holding the striking pin (29) as illustrated in Fig. 23, apply rated voltage to the holding coil, placing release bar in unlatched position. Remove voltage and allow release bar to slowly withdraw observing

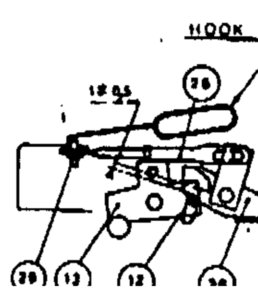


Fig. 17

breaker tripping.

NOTE: In order to prevent blocking of the release bar from being reset when breaker opens, it is necessary to return release bar to its latched position by means of the hook illustrated in Fig. 23.

B. Resetting

1) Adjustment. With the breaker in the open position and the release bar latched as illustrated in Fig. 14, adjust screw (30) lengthening linkage until stirrup is against stop (29), then back off ½ turn.

2) Inspection. Place breaker in latched position as illustrated in Fig. 18. Check for minimum clearance of 2 mm (0.079 inch).

LIMIT OF WEAR: Non-Latching

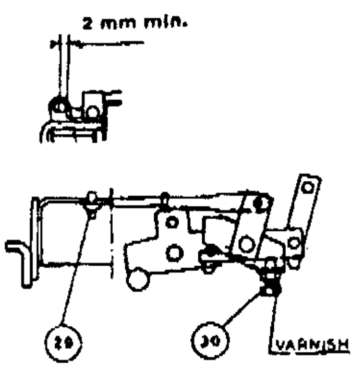


Fig. 18

5. *Auxiliary Contact Block Support Adjustment (Fig. 19).*

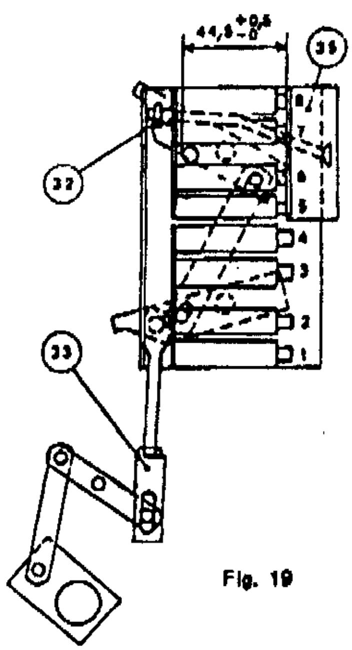


Fig. 19

With contact blocks removed, adjust nu (32) until distance shown in Fig. 19 i 44.5 ± 0.5 mm (1.753 ± 0.020 inch).

LIMIT OF WEAR: Overall travel of auxiliary contact should not exceed 0.1 mn (0.004 inch).

6. *Limit switch on Trip Rod (Accessory)*

Limit switch for signal indication of tripping on overload and short circuit.

A. Adjustment (Fig. 20). Place breaker i closed position with overcurrent an short circuit release bar latched. Deform strip (36 to obtain clearanc between strip (36) and spring pin (37)

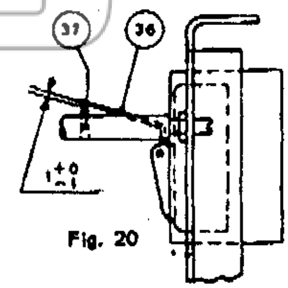


Fig. 20

B. Inspection. Check operation of micro switch by tripping breaker.

7. *Limit switch on voltage release (Accessory)*

The undervoltage release device can b equipped with two separate limit switches One will indicate when the undervoltag release bar is latched and the other wil indicate undervoltage coil being energized.

A. Limit switch for Latch Indication. Plac bar in latched position as shown i Fig. 17 and 18. In this position, th limit switch contacts will be closec Deform strip (38) Fig. 21 to provide maximum gap setting of 1 mm (0.03 inch) between strip (38) and lug (39) NOTE: This adjustment must be pe formed without applying voltage to th undervoltage holding coil. Followin adjustment, operate voltage releas device permitting release bar to ur latch. Inspect limit switch to see tha contacts open.

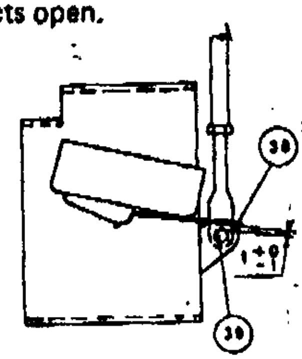


Fig. 21

B. Limitswitch for Voltage Indication. This limitswitch has no adjustments. Check position of contacts by applying and removing voltage to holding coil of solenoid.

8. *Closing Adjustment Electrically Operated Breakers*

A. Adjustment (Fig. 22). Place breaker in tripped position with closing springs fully charged. Adjust screw (44) to obtain 4 ± 0.5 mm (0.158 ± 0.020 inch) clearance between lever (45) and end of screw (44). Adjust screw (46) on trip button for 4 ± 0.5 mm (0.158 ± 0.020 inch) clearance between strip (47) and screw end (46).

NOTE: Breakers fitted with a D.C. electromagnetic for closing have a series resistance (economizer) which is placed in series with the coil, after pickup, thereby reducing current consumption to a minimum. To adjust, hold 1 mm (0.039 inch) gap setting of the electromagnet and deform limitswitch strip until contacts close.

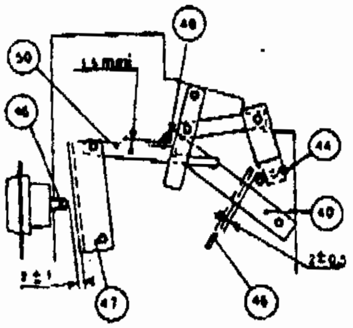


Fig. 22

B. Anti-Pumping Inspection. Mechanically operated breaker. Depress trip button and hold while charging and unlatch closing springs. Breaker contacts must remain open.

Electrically operated breaker. Close breaker by depressing local close button and allow gear motor to charge stored energy springs. While holding close button depressed, depress trip button. Breaker must trip and remain tripped until close button is released for next cycle of operation.

C. Undervoltage lockout (Fig. 23). When the undervoltage release is provided with lockout to prevent breaker reclosing upon voltage restoration, the

Applying voltage to the relay allows lever (58) to come into contact with adjusting stop (60). Adjust stop (60) for a clearance of 0.6 ± 0.4 mm (0.024 ± 0.016 inch).

Remove voltage, allowing lever (59) to rise, check for clearance of 0.1 mm (0.004 inch) between lever (59) and pin (61).

LIMIT OF WEAR: 0.1 mm (0.004 inch)

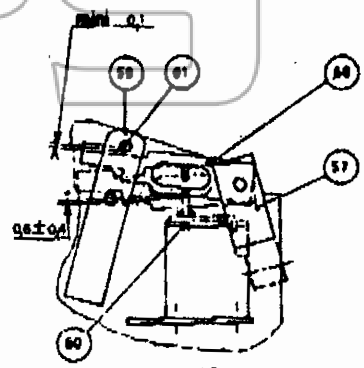


Fig. 23

9. *Tripping - By Local Mechanical Pushbutton.*

If the breaker is fitted with a signal system for overload and short circuit tripping with local reset, adjustments should be carried out as previously outlined. In other cases, adjust screw (24) *(Fig. 24)* for obtaining clearance of 2 + 0.5 - 0.0 mm (0.079 + 0.158 inch) between strip (25) and the end of the screw (24).

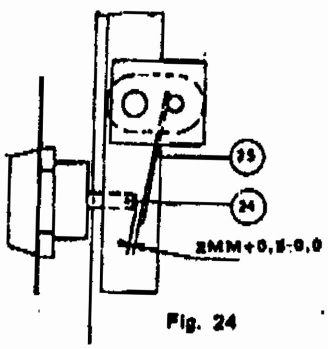


Fig. 24

V. REPLACEMENT PROCEDURE

A. Arc Chute (Fig. 25). To remove arc chute, raise retaining lever (61), rotate lever 90 degrees to clear path, and remove arc chute by lifting upwards. The reverse procedure is followed for repositioning arc chutes, making sure the respective arc chutes fit over arcing horns (62).

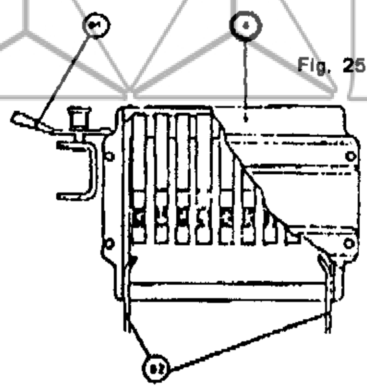


Fig. 25

B. Arcing Contacts and Insulating Strips (Fig. 26).

1. *Arcing contacts.* With breaker in open position, loosen retaining bolts VI and remove contact by sliding forward. Replace with new contact leaving retaining bolt VI loose. Close breaker and loosen bolt V2 (two per contact) approximately 1.5 mm (0.059 inch) or until contact clears locating boss E, then remove by lifting upwards. Replace with new contact, checking to see that contact seats in locating boss before tightening bolt V2. With 0.9 mm (0.035 inch) feeler gauge, position contact (1) and tighten bolt VI.

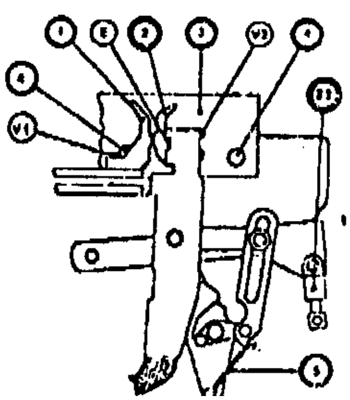


Fig. 26

2. *Insulating strips.* When replacing contacts, it is recommended that the insulating strips be replaced also. Using a screwdriver, remove two fasteners (4) retaining insulating strip (3). Replace strips using new fasteners.

C. Auxiliary Contact Block (Fig. 27). When removing contact blocks (1-4), place breaker in closed position before loosening contact cradle bolt V3. Slide cradle free of V3 and remove contact assemblies. To replace contact blocks, reverse procedure making sure wires are returned to their original positions.

The same procedure is followed for removing or replacing contact blocks 5-8, except the breaker is placed in the open position.

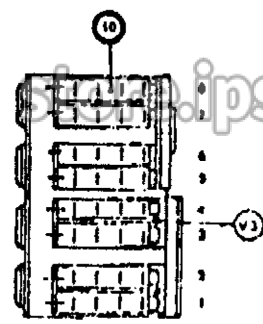


Fig. 27

D. Overload and/or Short Circuit Release. Remove wires from plus (+) and minus (—) terminals on solid-state control panel located on front of breaker element. Place breaker in closed position and apply an 18 volt DC 9 millisecond pulse to plus and minus wires going to EX trip actuator.

With voltage applied, breaker should trip. Repeat procedure, reducing voltage in increments until 12 volts DC is reached. At this level, breaker should not trip. Do not attempt to adjust actuator.

Test sets are available as an accessory for checking the calibration of SSPB breakers.

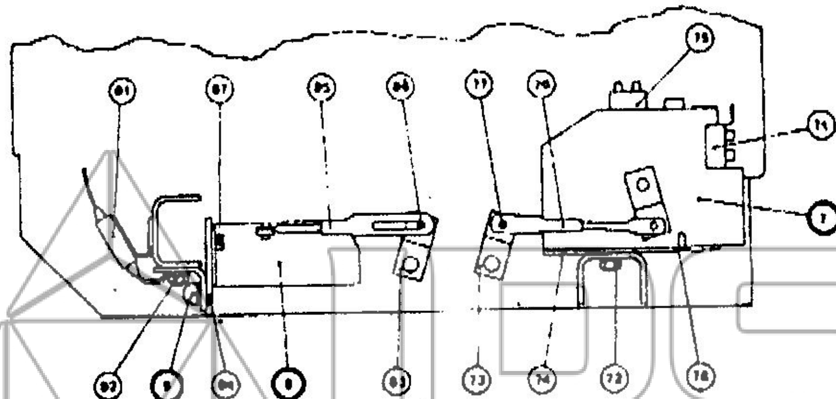


Fig. 28

E. Undervoltage and Shunt Trip Release (Fig. 28). To remove trip device (8), place breaker in open position and remove coil wires from terminal block (81) located on rear of breaker. By removing pin (86) and mounting nuts (82), the device may be removed. When replacing trip device, lubricate and adjust as described in Chapter IV under Voltage Tripping Devices.

F. Secondary Isolating Contact Block (Fig. 29). Removal of contact block is accomplished by removing wiring and mounting screws illustrated in Fig. 29.

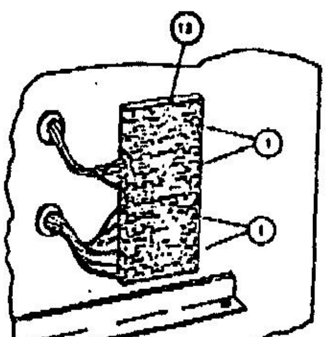


Fig. 29

G. Motor (Fig. 30). To gain access to motor, remove protective cover (5) held by two bolts (3). After removing wires from terminal block (4) and mounting nuts (6), lift motor from gear train. When replacing motor, check to see that clearance exists between pinion and gear. No further adjustment is required after motor is

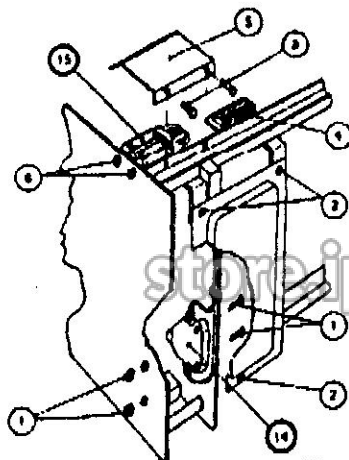


Fig. 30

H. Closing Solenoid (Fig. 31, 32). Slide coil and housing from plunger (Fig. 31) after removing coil wires from terminal block (4) and four mounting bolts (11). (Fig. 32) If breaker is equipped with closing preventer which would be mounted adjacent to the closing solenoid, the coil and housing cannot slide sideways. It is,

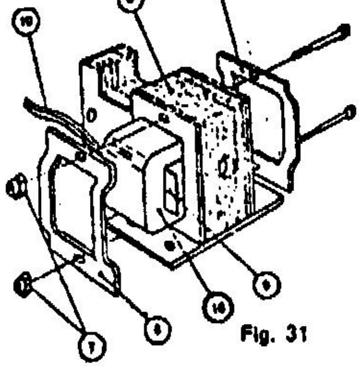


Fig. 31

therefore, necessary to remove horseshoe retaining washer (8) and linkage pin from plunger so complete assembly may be lifted out. Coil may be removed from housing as illustrated in Fig. 31. When replacing, make adjustments as described in Chapter IV, Voltage Tripping Devices.

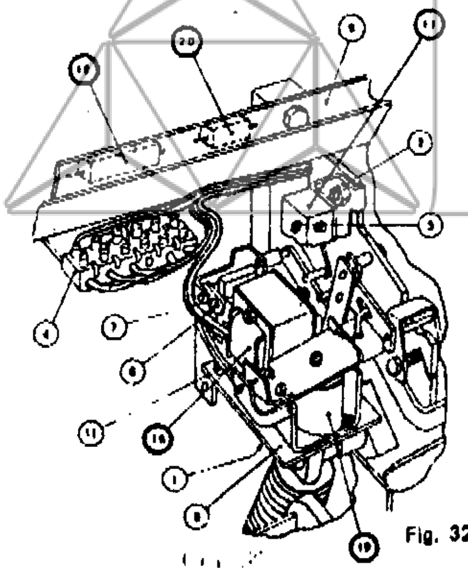


Fig. 32

I. **Closing Preventer (Fig. 32).** The closing preventer (19) located directly behind the closing solenoid, may be removed by removing coil wires and two holddown bolts from base (5). When replacing closing preventer, make adjustments as described in Chapter IV, Undervoltage Lockout.

J. **Fixed Secondary Isolating Contact Blocks (Fig. 33).** Removal of blocks may be simplified by removing three screws (1) in wire guard and removing holddown screws (2) as illustrated.

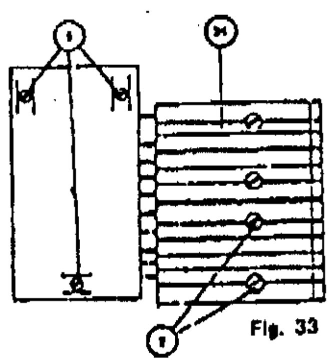


Fig. 33

K. **Limitswitch for Fault Indication (Fig. 34).** The limitswitch for fault indication located on the underside of the element may be removed by shown.

When replacing limitswitch, follow adjustment instructions outlined in Chapter IV, Limitswitch On Trip Rod.

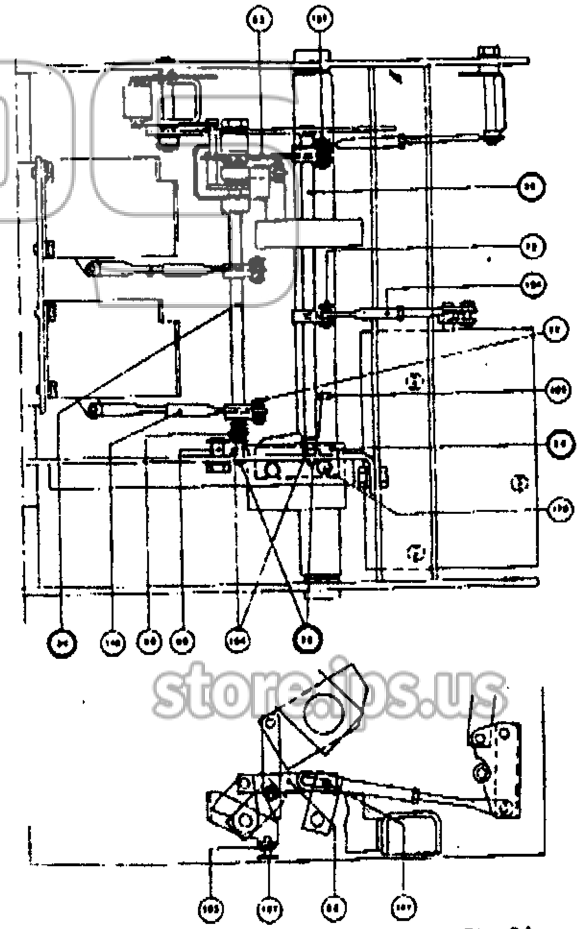
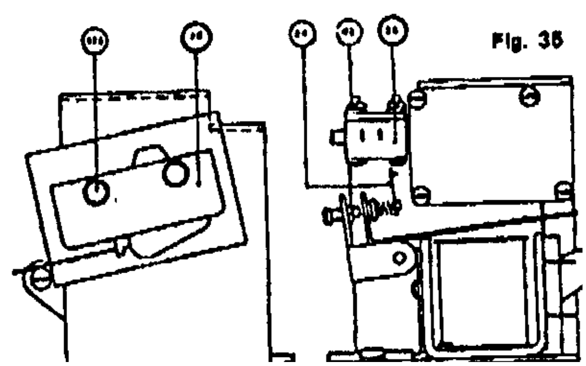


Fig. 34

L. **Undervoltage and Shunt Trip Limitswitch (Fig. 35).**

1. *Limitswitch for trip indication.* To remov the limitswitch (28) for indicating trippir by undervoltage or shunt tripping, brea connections and remove screws (178) When replacing limitswitch, follow adjus ment instructions outlined in Chapter IV Limitswitch On Voltage Release.

Fig. 35



2. *Limitswitch Operating on Undervoltage.* Limitswitch (29) used to indicate voltage being applied to holding coil of solenoid may be removed by breaking connections and removing screws (43).

When replacing limitswitch, move armature of solenoid to see that limitswitch does not prevent solenoid from closing. Adjustment may be made by bending limitswitch lever.

VI REPLACEMENT PARTS

Quantity Required			Description	Replacement Part No.	Identification	
Frames					Part No.	Figure
800	1600	2000				
9	12	12	Fixed arcing-contact	536-2000-0071	1	6
9	12	12	Moving arcing-contact	536-2000-0072	2	6
3	–	–	Arc-chute	536-0800-0060	6	5
	3	3	Arc-chute	536-2000-0060	6	5
1	1	1	Ex-Tripping Actuator	536-0000-0006		15
			2 NO + 2 NC Auxiliary Contacts	536-0000-0210	10	27
			Motor - 48V AC-DC	536-2000-0033	15	30
1	1	1	Motor - 110V AC-DC	536-2000-0030	15	30
1	1	1	Motor - 125V AC-DC	536-2000-0034	15	30
1	1	1	Motor - 220V AC-DC	536-2000-0031	15	30
1	1	1	Motor - 240V AC-DC	536-2000-0035	15	30
1	1	1	Electromagnet 110V 60 Cy	536-2000-0040	16	31
1	1	1	Electromagnet 230V 60 Cy	536-2000-0041	16	31
1	1	1	Electromagnet 125V DC	536-2000-0044	16	31
1	1	1	Electromagnet 240 DC	536-2000-0045	16	31
1	1	1	Electromagnet 48 DC	536-2000-0043	16	31

VI. REPLACEMENT PARTS — CONTINUED

Description	Replacement Part No.	Part No.	Fi
Key Interlock for Draw-out ACB	536-0000-0500	Not Shown	
Printed Circuit Board - long time	536-0000-0002	3	
Printed Circuit Board - short time	536-0000-0003	3	
Printed Circuit Board - instantaneous	536-0000-0004	3	
Printed Circuit Board - ground fault	536-0000-0005	3	
Solid State Relay without Cards	536-0000-0001	4	[illegible]
Safety Shutter - 800 A	536-0803-0020	—	1
Safety Shutter - 1600 A	536-1603-0020	—	1
Safety Shutter - 2000 A	536-2003-0020	—	1
Flexible Crank	536-2000-0091	Not Shown	
Standard Crank	536-2000-0090	Not Shown	
Shunt Trip Device - 110 VAC	536-0000-0100	8	28
Shunt Trip Device - 220 VAC	536-0000-0101	8	28
Shunt Trip Device - 460 VAC	536-0000-0102	8	28
Shunt Trip Device - 48 VDC	536-0000-0103	8	28
Shunt Trip Device - 125 VDC	536-0000-0104	8	28
Shunt Trip Device - 240 VDC	536-0000-0105	8	28
Undervoltage Trip Device - 110 VAC	536-0000-0110	8	28
Undervoltage Trip Device - 220 VAC	536-0000-0111	8	28
Undervoltage Trip Device - 460 VAC	536-0000-0112	8	28
Undervoltage Trip Device - 48 VDC	536-0000-0113	8	28
Undervoltage Trip Device - 125 VDC	536-0000-0114	8	28
Undervoltage Trip Device - 240 VDC	536-0000-0115	8	28
Undervoltage Time Delay Device - 110 VAC	536-0000-0120	8	28
Undervoltage Time Delay Device - 220 VAC	536-0000-0121	8	28
Undervoltage Time Delay Device - 460 VAC	536-0000-0122	8	28
Undervoltage Time Delay Device - 48 VDC	536-0000-0123	8	28
Undervoltage Time Delay Device - 125 VDC	536-0000-0124	8	28
Undervoltage Time Delay Device - 240 VDC	536-0000-0125	8	28

VI REPLACEMENT PARTS - continued

Quantity Required			Description	Replacement Part No.	Part No.	Fig.
Frames						
800	1600	2000				
1	1	1	195 Ω - 25W Resistor	536-0000-0401	9	28
1	1	1	340 Ω - 25W Resistor	536-0000-0402	9	28
1	1	1	900 Ω - 25W Resistor	536-0000-0403	9	28
1	1	1	1000 Ω - 25W Resistor	536-0000-0404	9	28
4	4	4	Fixed Isolating Contacts	536-0000-0200	—	1
4	4	4	Moving Isolating Contacts	536-0000-0201	—	1
3	—	—	Current Sensors - 250/300 Amp	536-0800-0010	Not Shown	
3	—	—	Current Sensors - 600/800 Amp	536-0800-0011	Not Shown	
—	3	—	Current Sensors - 500/600 Amp	536-1600-0010	Not Shown	
—	3	—	Current Sensors - 1200/1600 Amp	536-1600-0011	Not Shown	
—	—	3	Current Sensors - 600/800 Amp	536-2000-0010	Not Shown	
—	—	3	Current Sensors - 2000 Amp	536-2000-0011	Not Shown	

VII

TABLE 1

INTERRUPTING RATINGS

Volts	Frame Size	Symmetrical Interrupting Rating		Symmetrical Close & Latch & 30 cycle Short Time Rating
		Instantaneous Trip	Short Time Delay	
240	800	42,000	22,000	22,000
	1600	65,000	50,000	50,000
	2000	65,000	50,000	50,000
	3000	85,000	85,000	85,000
	4000	130,000	114,000	114,000
480	800	30,000	22,000	22,000
	1600	50,000	50,000	50,000
	2000	50,000	50,000	50,000
	3000	85,000	85,000	85,000
	4000	114,000	114,000	114,000
600	800	22,000	22,000	22,000
	1600	42,000	42,000	42,000
	2000	42,000	42,000	42,000
	3000	85,000	85,000	85,000
	4000	100,000	100,000	100,000

ACCESSORIES:

- Shunt trip
- Undervoltage trip
- Key interlock provision on Racking Mechanism
- Extra auxiliary contacts (up to 16)
- Ground fault protection
- Short time delay
- Mechanical interlock
- Portable test set
- Bell alarm

TABLE 2 .... STANDARD TYPES

TYPE	DESIGNATION	TRIP FUNCTIONS
RX2	General Purpose	Long Time + Instantaneous
RX2S	Dual Selective	Long Time + Short Time
RX2S1	Triple Selective	Long Time + Short Time + Instantaneous
	Instantaneous	
RX2G		Same As RX2 Except with Ground (3 or 4 wire)
RX2SG		Same As RX2S Except with Ground (3 or 4 wire)
RX2S1G		Same As RX2S1 Except with Ground (3 or 4 wire)

TABLE 3 ....TIME DELAY CHARACTERISTICS

Trip Function	Time Delay Band	Time Delay
Long Time	Maximum	30-45 Seconds +
	Intermediate	15-22 Seconds +
	Minimum	5-7 Seconds +
Short Time and Ground	Maximum	0.1 Seconds *
	Intermediate	0.2-0.3 Seconds*
	Minimum	0.4 Seconds *
Instantaneous	Maximum	No
	Intermediate	Intentional
	Minimum	Delay

\+ Measured at six (6) times ampere tap setting and at lower limit of maximum, intermediate, or minimum long time delay bands.

* Measured at lower limit of maximum, intermediate, or minimum short time and ground time delay bands at any point above pick-up.

TABLE 4 PHASE AMPERE TAP AND GROUND PICK-UP RANGES

Circuit Breaker Type	Sensor Rating	PICK-UP RANGE + Long Term (TIMES AMPERE TAP SETTING)	Short Term	Instantaneous	Ground Pick-up Setting
	250	.4	3	3	.3
	300	.5	5	5	.4
SSPB		.6	8	8	.6
800	600	.8	10	10	.75
	800	1.0			
		1.25*			
	500	.4	3	3	.3
	600	.5	5	5	.4
SSPB		.6	8	8	.6
1600	1200	.8	10	10	.75
	1600	1.0			
		1.25*			
	600	.4	3	3	.3
	800	.5	5	5	.4
SSPB		.6	8	8	.6
2000	2000	.8	10	10	.75
		1.0			
		1.25*			
	1000	.4	3	3	.3
	1200	.5	5	5	.4
SSPB		.6	8	8	.6
3000	3000	.8	10	10	.75
		1.0			
		1.25*			
	1600	.4	3	3	.3
	2000	.5	5	5	.4
SSPB		.6	8	8	.6
4000	4000	.8	10	10	.75
		1.0			
		1.25*			

* Setting above maximum ampere tap rating and breaker frame size is available for coordination, if needed, but is not thermal self-protecting.

\+ The tolerance on all calibrated pick-up settings for long-time, short-time, instantaneous, and ground functions is ± 10% through the

CONTACT RATINGS

Cradle Limitswitch Contact Rating

Load	Max. Voltage	Max. Current
Resistive	115 - 230 A.C.	8A
	110 D.C.	0.5A
	220 D.C.	0.2A
Reactive	125 - 250 A.C.	5A
Lighting	125 - 250 A.C.	3A

Auxiliary Contacts (Breaker Closing) 8 "A" and "B" Maximum

Load	Max. Voltage	Max. Current
Resistive	24 - 500V A.C.	6
	24 - 110V D.C.	3.5
	250V D.C.	1.2
Reactive	24 - 500V A.C.	6
	24 - 110V D.C.	2.5
	250V D.C.	0.8

Short Circuit Indication Limitswitch C-2

Load	Max. Voltage	Max. Current
Resistive	125V A.C.	5.0
	250V A.C.	2.5

Overload and Short Circuit Indication Limitswitch C-1

Load	Max. Voltage	Max. Current
Resistive	115 - 230V A.C.	8A
	110V D.C.	0.5
	220V D.C.	0.2
	115 - 230V A.C.	5
	115 - 230V	3

*Undervoltage, Time Delay, Undervoltage, and Shunt Trip Indication Limitswitch (C-3) (C-5)

Load	Max. Voltage	Max. Current
Resistive	115 - 250V A.C.	8A
	110V D.C.	0.5A
	220V D.C.	0.2A
Reactive	115 - 250V D.C.	5A
Lighting	115 - 250V A.C.	3A

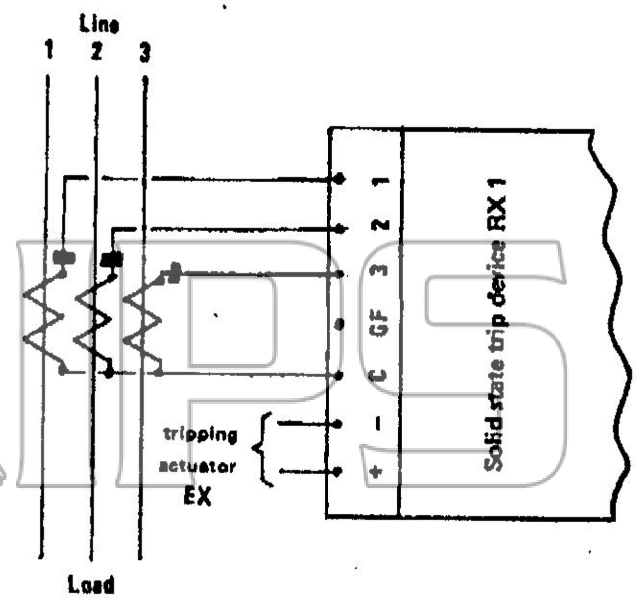
**Operates monentarily as circuit breaker trips*

Energized Undervoltage Relay Indication Limitswitch (C-4)

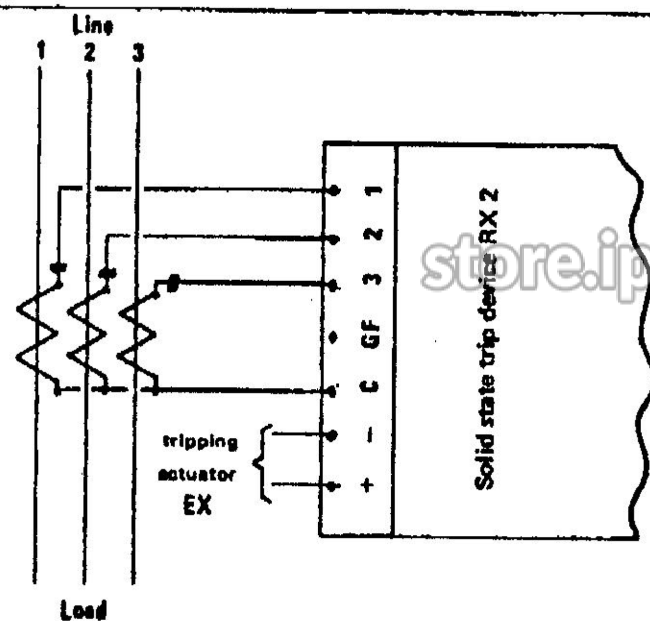
Load	Max. Voltage	Max. Current
Resistive	115 - 250V A.C.	6A
	125V D.C.	0.6A
	250V D.C.	0.4A

Current sensor connections:

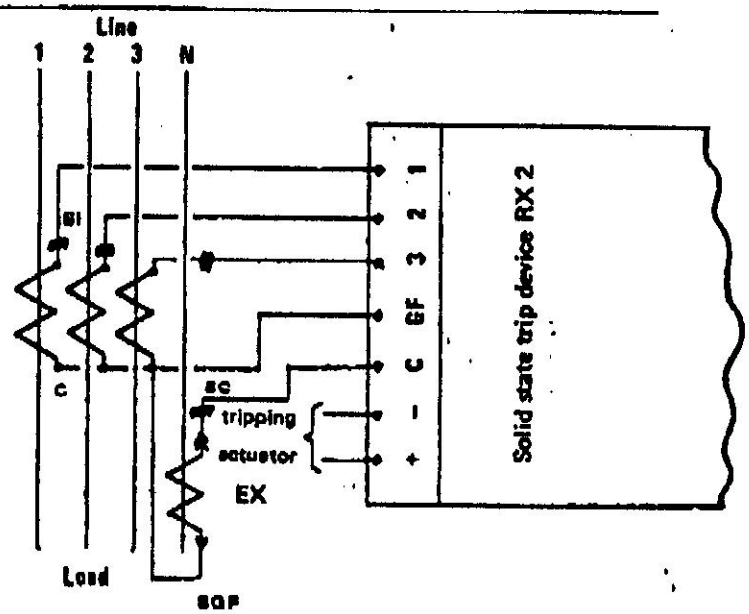
3 ϕ 3 W



3 ϕ 3 W with
ground fault protection



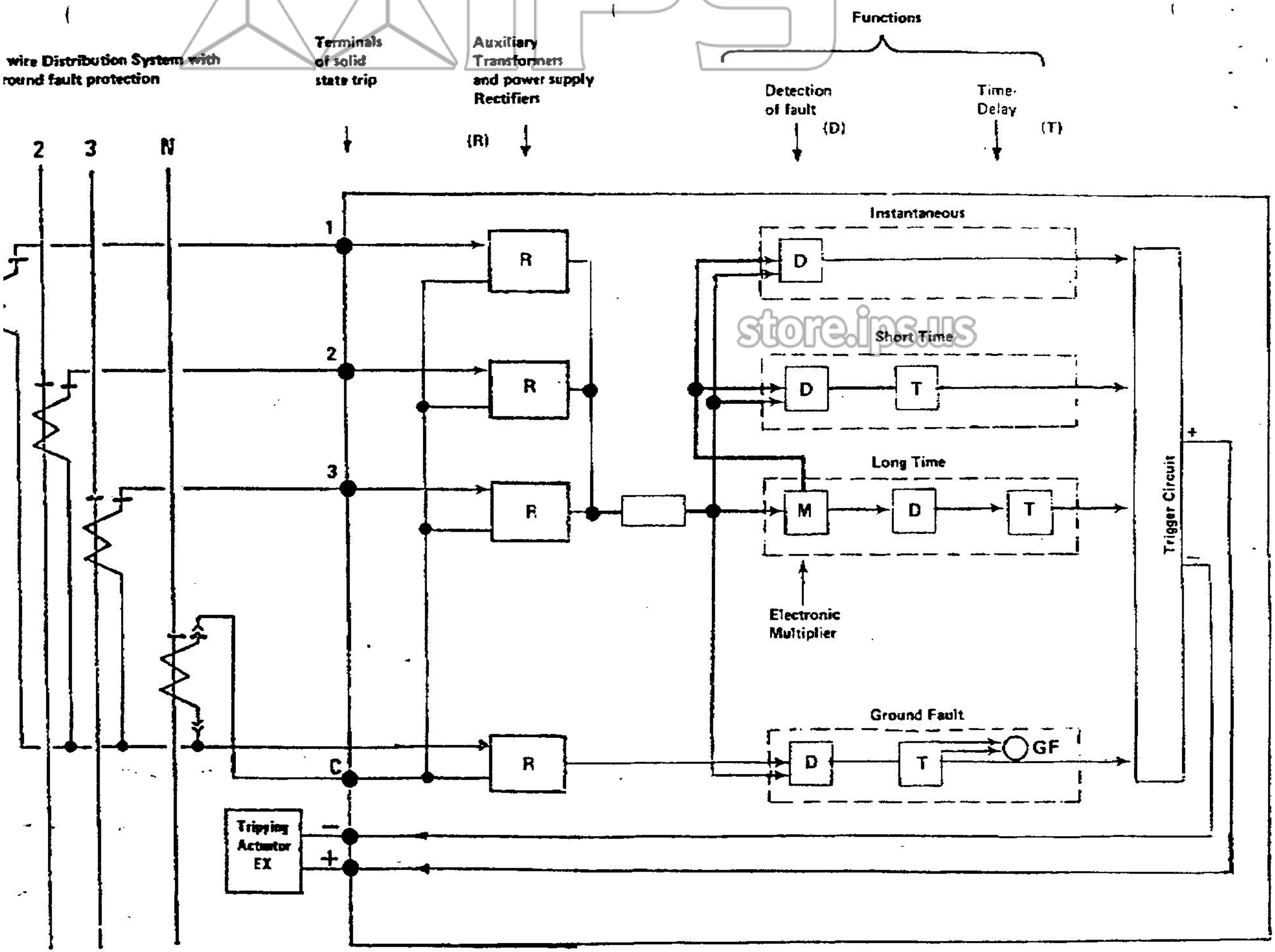
3 ϕ 4 W with
ground fault protection



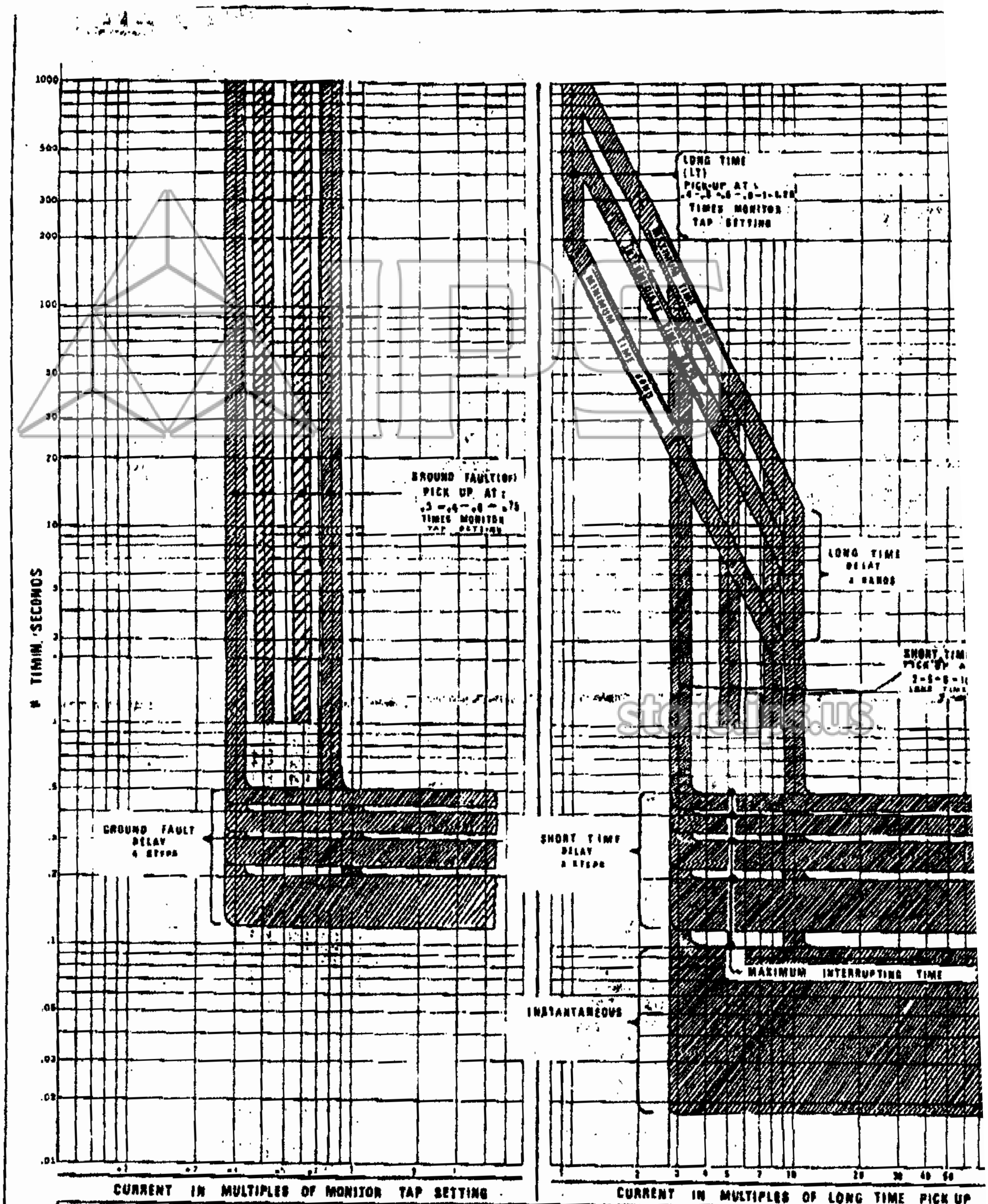
CAUTION

The current sensor on the neutral bus is identical to the sensors supplied in the phases.

The current sensor on the neutral bus must be carefully connected for proper polarity.



PRINCIPLE OF OPERATION



SSPB AIR CIRCUIT-BREAKERS

TIME-CURRENT CHARACTERISTIC CURVES

GTE SYLVANIA

No. TC-1000
Date Nov. 1, 1977

SALES OFFICES

ALABAMA
Mobile
Trussville (Birmingham)

ALASKA
Anchorage

ARIZONA
Phoenix

ARKANSAS
Little Rock

CALIFORNIA
Fresno
Los Angeles
Riverside
Sacramento
San Diego
San Francisco
San Leandro
Santa Clara
Santa Rosa

COLORADO
Denver

CONNECTICUT
Hartford
Waterbury

FLORIDA
Jacksonville
Longwood
Miami
Orlando
Pompano Beach
St. Petersburg
Tampa

GEORGIA
Atlanta

HAWAII
Honolulu

ILLINOIS
Chicago
Elk Grove Village
Schiller Park
Springfield

INDIANA
Cicero
Evansville
Fort Wayne
Gary
Indianapolis

IOWA
Bettendorf
Clive
Des Moines

KANSAS
Kansas City
Prairie Village

KENTUCKY
Louisville

LOUISIANA
New Orleans
Shreveport

MAINE
Farmington

MARYLAND
Annapolis
Baltimore
Columbia

MASSACHUSETTS
Randolph
Waltham

MICHIGAN
Columbiaville
Detroit
Grand Rapids

MINNESOTA
Fridley
Hastings
Minneapolis

MISSISSIPPI
Jackson

MISSOURI
St. Louis

MONTANA
Bigfork

NEBRASKA
Omaha

NEW JERSEY
Ho Ho Kus
Teterboro

NEW MEXICO
Albuquerque

NEW YORK
Albany
Bronxville
Buffalo
Farmingdale
Syracuse

NORTH CAROLINA
Charlotte
Greensboro
Monroe
Raleigh

OHIO
Cincinnati
Cleveland
Columbus
Poland

OKLAHOMA
Oklahoma City
Tulsa

OREGON
Portland

PENNSYLVANIA
Hershey
Pittsburgh
Wayne

SOUTH CAROLINA
Columbia
Garden City
Greenville

TENNESSEE
Knoxville
Memphis
Nashville

TEXAS
Dallas
Houston
Irving
Longview
Lubbock
San Antonio

UTAH
Salt Lake City
Sandy

VIRGINIA
Mechanicsville
Hampton
Richmond

WASHINGTON
Seattle
Vancouver

WEST VIRGINIA
Huntington

WISCONSIN
Green Bay
Milwaukee

PUERTO RICO
Rio Piedras

MANUFACTURING PLANTS

ALABAMA
Trussville

CALIFORNIA
Los Angeles
Sacramento

MISSISSIPPI
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