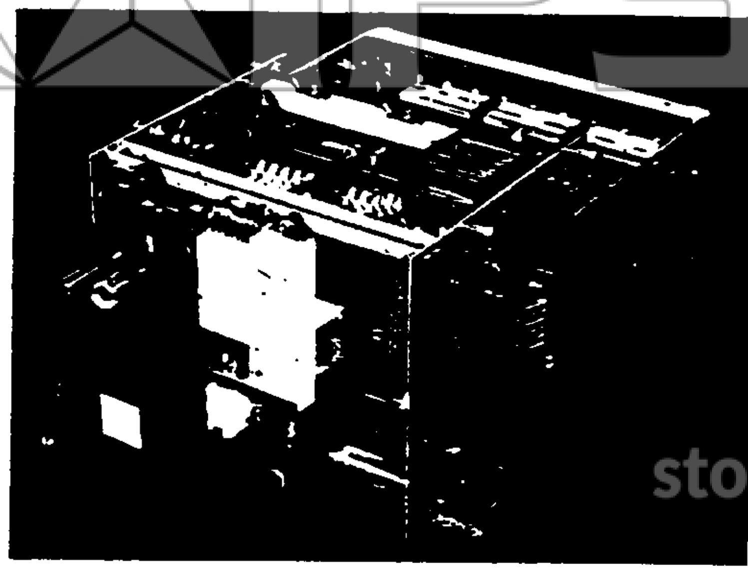
SSPB

POWER CIRCUIT BREAKER
INSTRUCTIONS



INSTALLATION
OPERATION
MAINTENANCE

800 - 2000 AMPS

THE BREAKER THAT LETS YOU CHANGE ITS MIND

NATIONAL INDUSTRI
an ELEKTRO UNION company

Electrical Equipment

CONTENTS

INSTALLATION - OPERATING - MAINTENANCE INSTRUCTIONS

SSPB BREAKERS

800 - 1600 - 2000 AMP FRAMES

The entire SSPB-X line encompasses frame sizes from 800 - 1600 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 remot operation. A stored energy principle of operatic is utilized for either type.

1. 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 epresentative.

CAUTION:

The drawout breaker elements are secured to their cradles installed in the switchg assembly. In order to withdraw the element, it i 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 With these bolts removed, the breaker may be cranked (counterclockwise) to its open position and then fully withdrawn. In the withdrawn position, the remaining four shipping bolts and orange plates should be removed and discarded.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Insert racking handle into cell being installed with breaker and turn counterclockwise until cradle is in withdrawn position.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 In this position, the two telescopic rails should be fully withdrawn to accept the breaker element.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 (8mm - 0.7 mm thread). Secure element to rails with lock washers and 8 mm metric nuts using a 13mm metric wrench or 1/2 inch open end wrench.

. Storage

Breakers and equipment not installed for immediate use must be stored in a ventilated room and protected from dust and water by means of non-absorbent covering.

4. Handling

Although SSPB-X circuit breakers include high precision components, they will only remain reliable if handled with care.

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

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

II. OPERATION

1. Manually Operated Breakers

With the manually operated SSPB-X 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, .igh-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 ındle used on manually operated breakers. The method of spring charging differs from the manually operated breaker in that the handle is rotated back and forth through approximately 25 degrees until there is no apparent spring resistance to tl operator. To fully charge the springs manually requires approximately 15 reversals or oscillatior of the handle.

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

buttons are furnished, one for initiating closing (main contacts (red) and one for opening (green). I addition, a spring indicator is included (yellow) f 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 butt is held depressed or a remote closing signal maintained, it will be necessary to interrupt this acti after tripping breaker, to effect a subsequent closing.

If tripping is a result of overload or short circu 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 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-X breaker can be equipped with a maximum of 24 secondary isolating contacts. Each contact is designed to accept two 1/4" quick disconnect lugs per terminal.

The secondary isolating blocks may contain up to twenty-four (24) terminals, twelver (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 breaker 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 to electrically connect the breaker in the cradle service position differently from that in the test position. This can be accomplished by removing the test or service terminal. After the fixed secondary isolating contact block has been removed, it is only necessary to remove the terminal by unscrewing 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 insertedor withdrawn, an enclosed 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 operated breakers. A built-in time differential of 15 milliseconds is available between contact group positions 1-8 and 9-16 for sequence logic. Contact positions 9-16 act simultaneously with main contacts.

7. Arrangement of Cubicle Door

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

8. Static Sensors

Static sensors consists of separate printed circuit for long time, short time, instantaneous, and ground fault tripping. Components are pre-aged and factory calibrated to insure utmost tripping accuracy. No field calibration is required. Since cards have been designed for plug-in field installation, it is possible to change systems by simply ordering cards from your nearest representative. When ordering ground fault, it is necessary to indicate whether the system is three or four wire. On a four wire system, a netural 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.

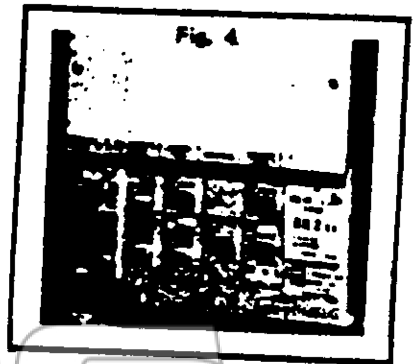
3. Select values of sensors desired.

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.

Fig. 4



10. Current Sensors

Multi-ratio window type current transformers mounted at the rear of the circuit breaker elemen provide signal source for the static trip sensors Since these sensors for initiating breaker trip d all necessary energy from the current monitored, external energy source is required. (any other accessory for breaker tripping must be provided with a separate power source.)

To change tripping range of breaker, transpose one wire on each of three current transformers. Termi nals are marked to indicate primary current settir When making this change on a four wire system with ground fault indication, it is necessary to change the current transformer located in the netural bus (rear of switchboard) accordingly.

11. Padlocking

SSPB-X breakers are provided with means for using a maximum of three padlocks (1/4" to 3/8" shackels) to lock the breaker in the opened or tripped position. To apply padlocks, it is necess to place the breaker in the tripped position by depressing the local trip button. While holding t trip button depressed, withdraw horizontal bar located adjacent to trip button and apply padlocks With this bar withdrawn, the trip button is held i the depressed postion, thereby preventing closing.

12. Key Interlocks

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

Withdraw breaker element to fully disconnect 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% 130 % of rated voltage. An auxiliary contac series with the coil opens and removes sup voltage when breaker is open.

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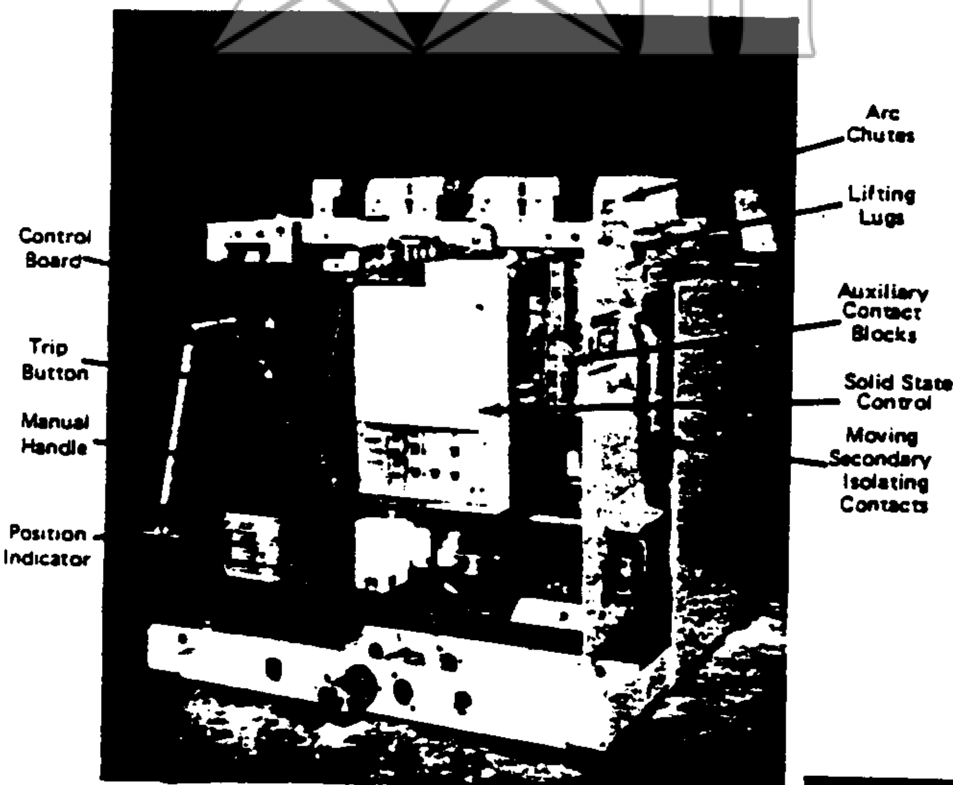
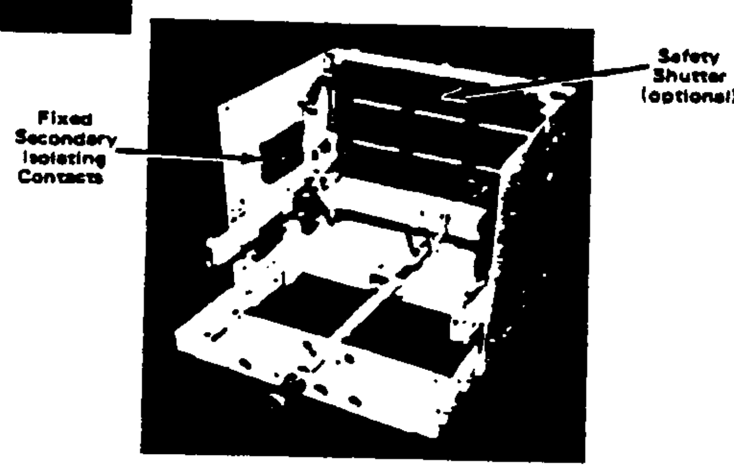
Undervoltage Trip (U.V.) When the voltage sou drops below 30% of rated voltage, the breake tripped. In the region of 30% to 60% of ra voltage, tripping may or may not occur. No t ping action will occur when the supply voltag 60% to 100% of rated voltage.





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. 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 loosening two retaining screws. Lift arc chute upwards clearing arcing horns.

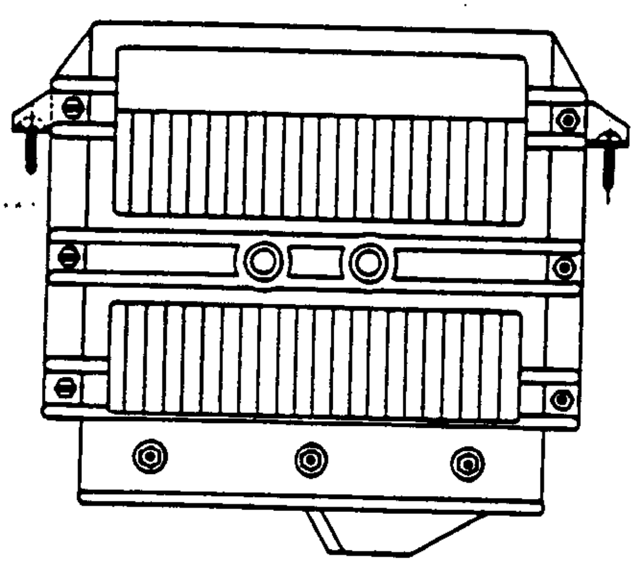


Fig. 5

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 1500 make-break operations at rated current, or 10 times at rated current, or 3 times at rated short circuit, it is recommended that the ar chutes be replaced. Caution: Arc chutes are not symmetrical position with front marking facing operator.

3. Poles *(Fig. 6 & 6A)*

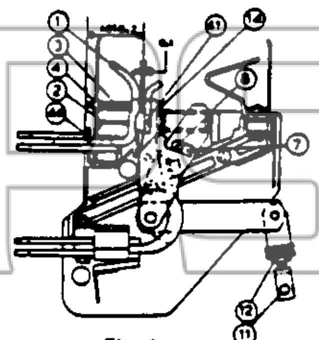


Fig. 6
800A

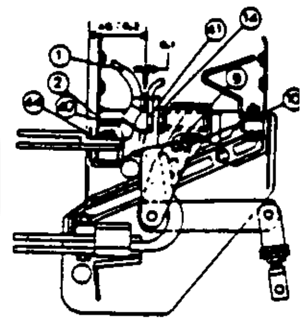


Fig. 6A
1600A

Inspect thickness of contact pads on staionary and movable contacts. If contact surfaces appear worn or eroded to a thickness less than 1 mm (0.039 inches) replace in accordance with procedure outlined under Chapter IV. Contacts not requiring replacement should be clean with #80 snadpaper and loose particles removed by wiping with clean cloth.

Main contacts may have spots on them without affecting the breaker. These contacts can be cleaned with a very fine sand paper and thoroughly wiped ro remove any particles.

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

4. Breaker Element Pole Assembly (Fig. 7)

The pole assemblies are maintained under 0.4 m-Kg (2.9 lb.-ft) pressure by each of six bolts (three per side) located on the outside surface of the breaker element. They may be identified as being painted red. Torque each bolt for correct tightness.

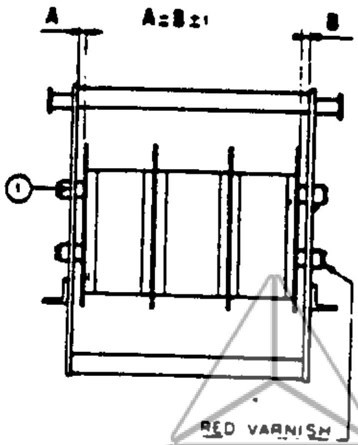


Fig. 7

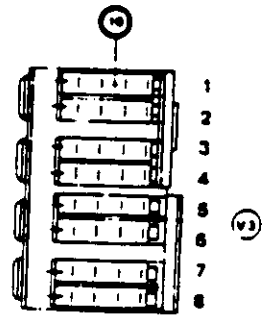


Fig. 8

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.

5. **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 lubrciated and operating in a dust-free and non-corrosive atmosphere regularly over a period of two years can undergo its normal cycle mechanical endurance without any lubricating. As such ideal service conditions are hardly encountered, it is advisable to check periodically the lubricating, particularly when unusual ceasing or friction is observed during inspection.

All rubbing surfaces (metal to metal) are to be lubricated with a thin film of high-temperature, high-pressure lubricant equal to SSPB-01. Hardened grease and dirt should be removed by use of trichlorethylene solvent. The main shaft, trip rod, intermediate manual control shfat, free-return charging spring and gear train for electrical operation do not require lubrication since they are provided with sealed bearings. Do not lubricate any shunt trip, under voltage trip 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 (800–1600 ampere 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.

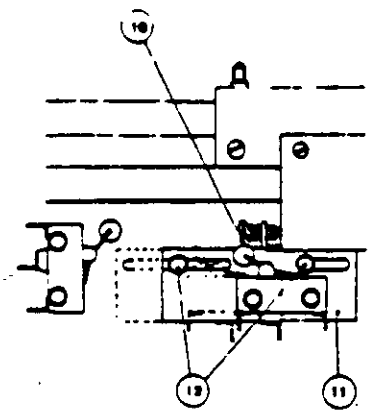


Fig. 9

   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 red, torquing to 0.4 m-kg (2.9 lb.-ft.).

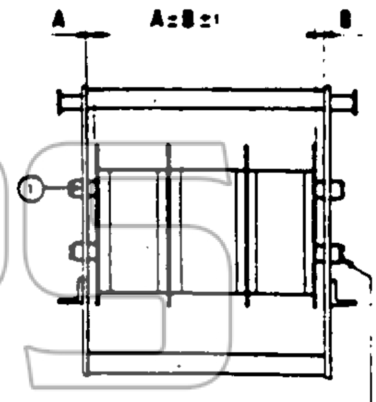


Fig. 10

2. *Pole Contacts and Contact Arm (Figs. 11 & 1*
   a. With breaker in open position measure thickness of silver contact pad on fixed

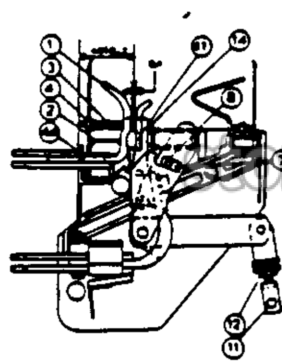


Fig. 11

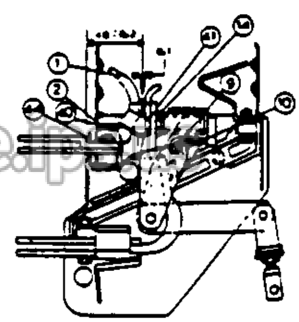


Fig. 11A

   and movable contact arms. If the thickness is greater than 1mm (.039 inch) clean contacts with fine grade sand paper and wipe clean. Where the contacts measure 1mm (.039 inch) or less remove and replace. (See chapter V Replacement Procedure).

   b. *Close Breaker*
   1. 800 Ampere Frame (Fig. 11)
   Measure distance between square shaft (7) and cage stop (8). When properly adjusted this distance should be within 1.2 + .3-0mm (.047 + .014) tolerance with a limit

of wear equal to 0.1mm (.0039 inch).

2. 1600 Ampere Frame (Fig. 11A)
Measure distance between roller shaft (10) and stop of cage (9). When properly adjusted this distance should be within 1.2+.3-0mm (.047 + .014) tolerance with a limit of wear equal to 0.1mm (.0039 inch).

NOTE: If limit of wear exceeds 0.1 i.e. less than 1.1mm adjustments should be made as described in chapter V.

c. Inspect contacts with breaker closed to see that bottom of contact pads touch. When properly adjusted, tops of contact pads will have gap of 0.1mm (.0039 inch). For any required adjustment follow procedure outlined in Chapter V.

d. Torquing requirements
Flexible leaf connections
800 amp — 0.9 m-kg
(5.8 lbs.-ft.)
1600 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).

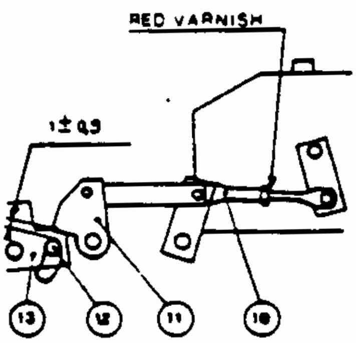


Fig. 12

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.

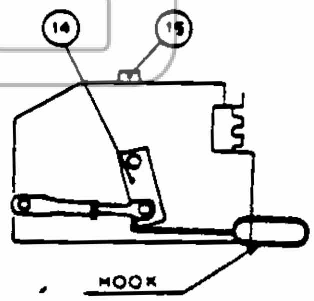


Fig. 13

NOTE: Restraining release crank (14) while performing this test results in the blocking of resetting which occurs when breaker opens or trips. Therefore, using hook, restore release crank to its reset and latched position.

b. Resetting

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

a) Adjustment. When breakers are equipped with this accessory, it is necessary to place breaker in open position and adjust screw (16) to effect latching the release. A very distinct click indicates latching. To insure a margin of safety, unscrew ¾ of a turn.

b) Place breaker in open position and check to see that 1.5 mm (0.059 inch) clearance is available.

LIMIT OF WEAR: Non-latching.

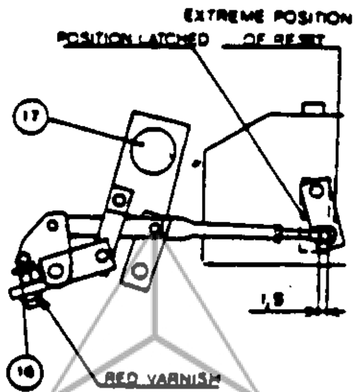


Fig. 14

2) Breaker equipped with signal indication on overload and short circuit tripping with local resetting (Fig's 15 and 16).

a) Adjustment. Insert wire hook as shown in Fig. 13 and hold release crank (14) while applying momentary signal of 9 - 18 volts DC to the tripping actuator EX. When release unlatches, slowly allow release crank to withdraw to tripped position shown in Fig. 15. With the release in the 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.

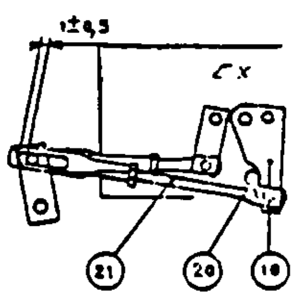


Fig. 15

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 the latch (13).

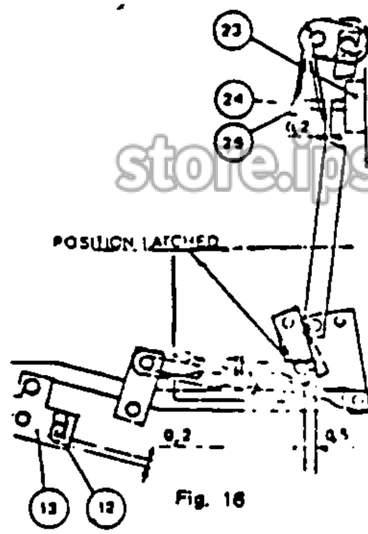


Fig. 16

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

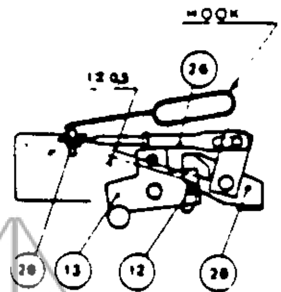


Fig. 17

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

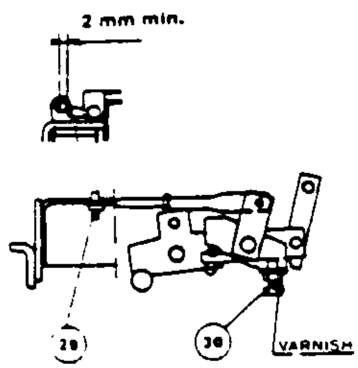


Fig. 18

5. *Auxiliary Contact Block Support Adjustment (Fig. 19).*
With contact blocks removed, adjust nut (32) until distance shown in Fig. 19 is 44.5 ± 0.5 mm (1.753 ± 0.020 inch).
LIMIT OF WEAR: Overall travel of auxiliary contact should not exceed 0.1 mm (0.004 inch).

6. *Limit switch on Trip Rod (Accessory).*
Limit switch for signal indication of triping on overload and short circuit.

A. Adjustment (Fig. 20). Place breaker in closed position with overcurrent and short circuit release bar latched. De-

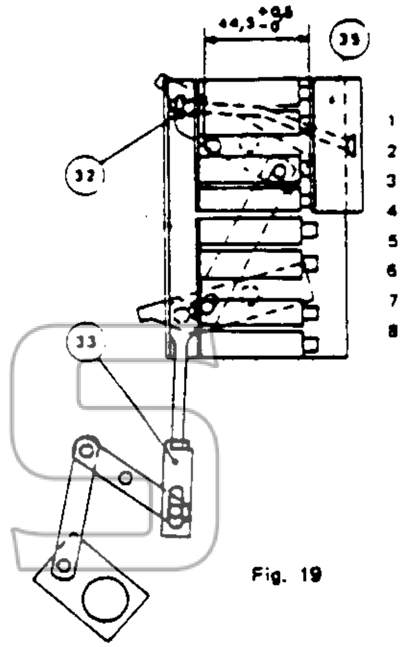


Fig. 19

form strip (36 to obtain clearanc between strip (36) and spring pin (37)

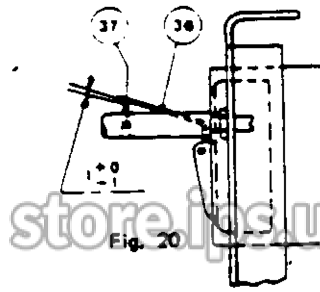


Fig. 20

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 switche: One will indicate when the undervoltag release bar is latched and the other wi 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 close 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. Followir adjustment, operate voltage relea: device permitting release bar to u latch. Inspect limit switch to see th contacts open.

B. Limitswitch for Voltage Indicati
This limitswitch has no adjustme

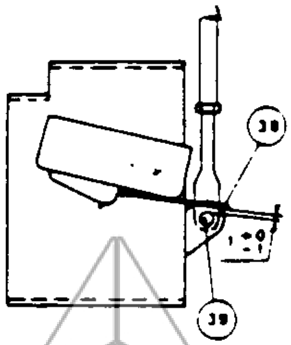


Fig. 21

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 1.0 ± 0.5 mm (0.04 ± 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.

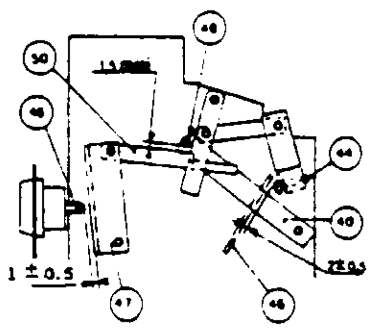


Fig. 22

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 following adjustments should be made:

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)

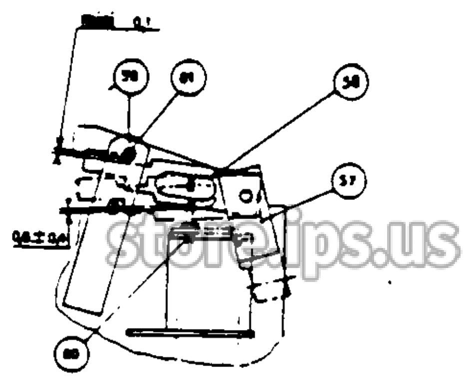


Fig. 23

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).

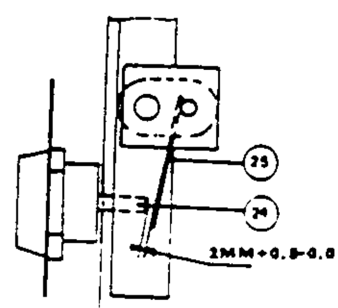


Fig. 24

V. REPLACEMENT PROCEDURE

A. Arc Chute (Fig. 25).

Remove arc chute by loosening two retaining screws. Lift arc chute upwards clearing arcing horns.

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 1500 make-break operations at rated current, or 10 times at rated current, or 3 times at rated short circuit, it is recommended that the arc chutes be replaced. Caution: Arc chutes are not symmetrical position with front marking facing operator.

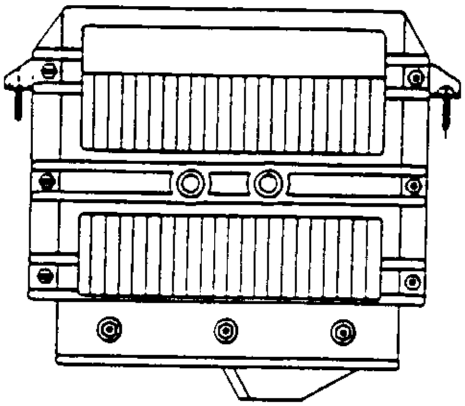


Fig. 25

B. Fixed and Moving Contacts Fig. 26 & 26A

1. *Fixed Contacts (1)*

   With breaker in open position loosen and remove retaining bolt (2), using a #10 hex wrench. Remove old contact by sliding forward. Replace with new contact and replace "U" clamp, lock washer and bolt. Position surface of contact pad 48 ± 0.2mm (1.872 ± .3744 inches) from shoulder of pole contact bar (44) and tighten retaining bolt (2) applying a torque of 1 meter Kg (7.25 lb-ft). Repeat p cedure for each stationary contact.

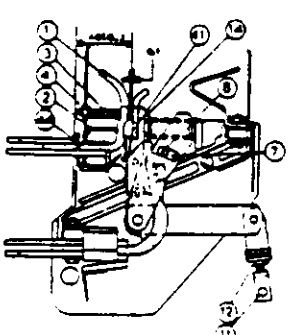


Fig. 26
800 Amp

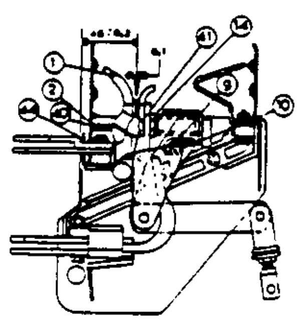


Fig. 26A
1600 Amp

2. *Moving contacts*

   While holding nut supporting spring (using a #4 open end metric wrench screw the allen screw (41) with a #6 h wrench. Remove old contact pads a replace. Replace set screw (41) and tigh applying a torque of 1.2 meter Kg (l lb-ft).

3. With new contact pads installed clo breaker and measure gap between tops contact pads. The gap may be adjusted varying the contact pressure. Referring Fig. 26 turn the pole closing/insulati connecting rod (11) clockwise to redu pressure and counter clockwise to increa: After obtaining the required 0.1mm spa ing in the axis of the pads lock t connecting rod (11) with the blocking n (12).

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

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

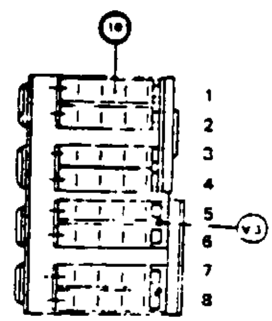


Fig. 27

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.

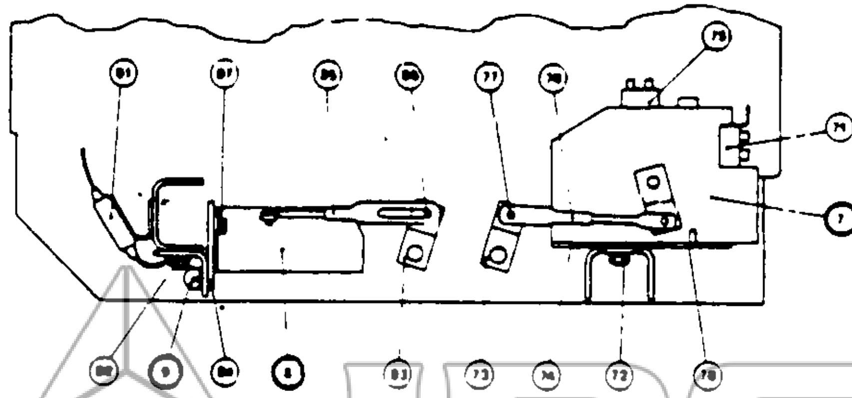


Fig. 28

Test sets are available as an accessory for checking the calibration of SSP8 breakers.

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, adjust as described in Chapter IV under Voltage Tripping Devices Page 10 4. A.

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

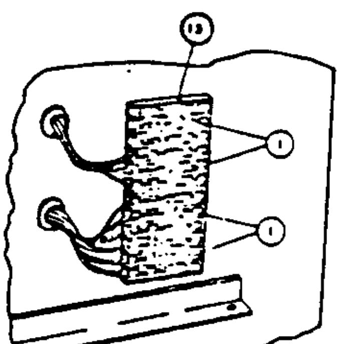


Fig. 29

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 properly aligned.

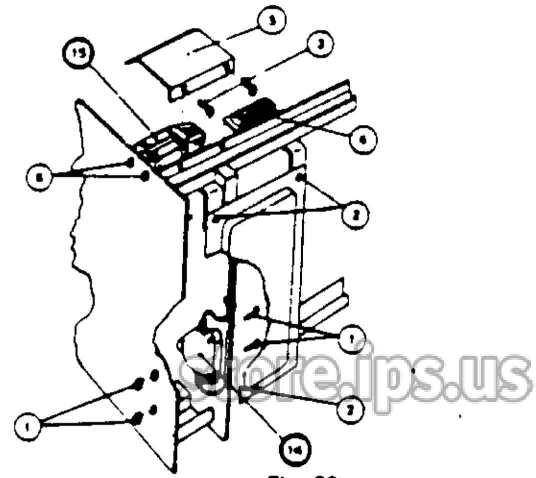


Fig. 30

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,

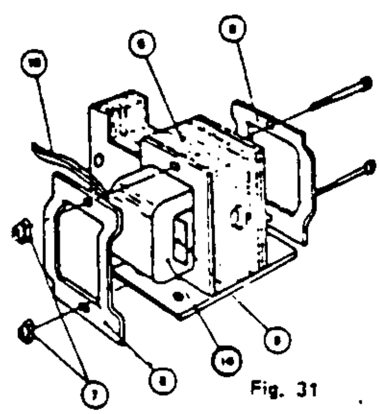


Fig. 31

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.

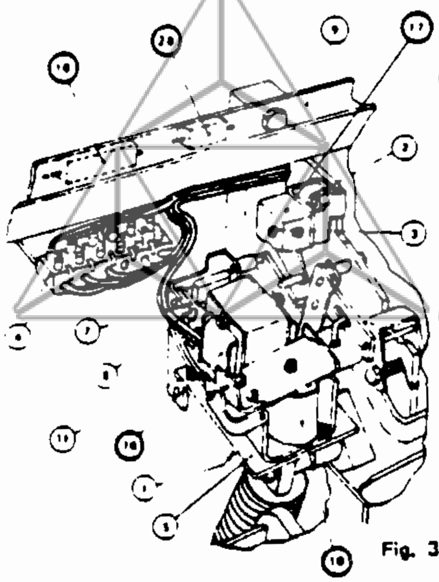


Fig. 32

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.

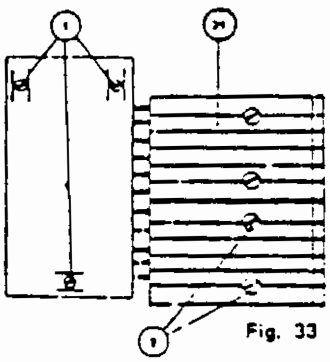


Fig. 33

K. Limitswitch for Fault Indication (Fig. 34). The limitswitch for fault indication located on the underside of the element may be removed by breaking connections and removing screws as shown.

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

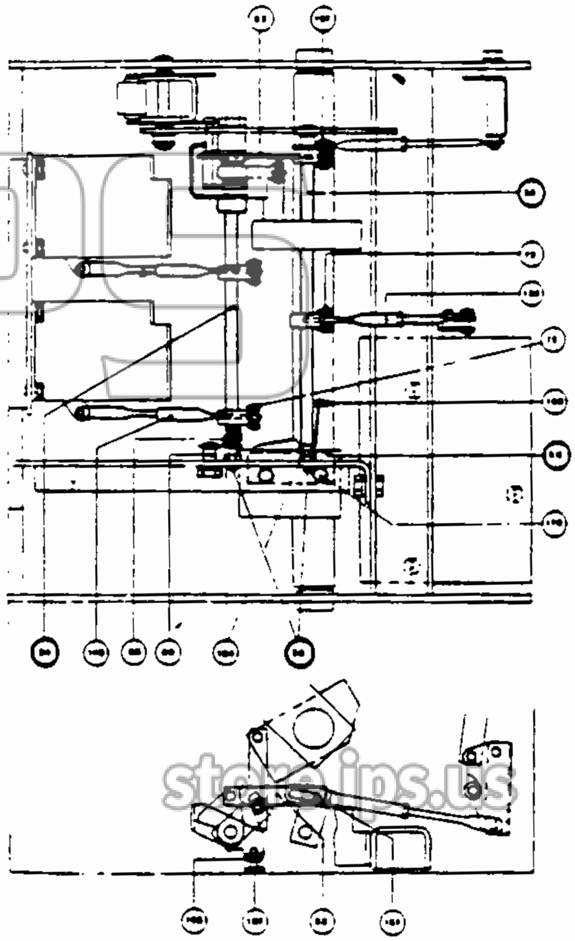
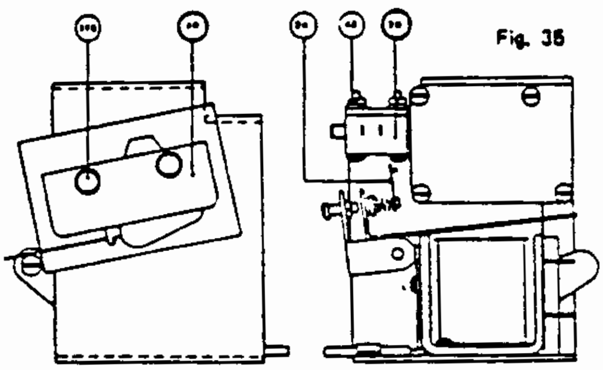


Fig. 34

L. Undervoltage and Shunt Trip Limitswitches (Fig. 35).

1. *Limitswitch for trip indication.* To remove the limitswitch (28) for indicating tripping by undervoltage or shunt tripping, break connections and remove screws (178). When replacing limitswitch, follow adjustment 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	
800	Frames 1600			Part No.	Figure
3	9	Fixed arcing-contact	536-800-9071	1	6
–	9	Fixed arcing-contact	536-1600-9071	1	6
3	9	Moving arcing-contact	536-1600-9072	2	6
3	–	Arc-chute	536-800-9060	6	5
	3	Arc-chute	536-1600-9060	6	5
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	Motor - 110V AC-DC	536-2000-0030	15	30
1	1	Motor - 125V AC-DC	536-2000-0034	15	30
1	1	Motor - 220V AC-DC	536-2000-0031	15	30
1	1	Motor - 240V AC-DC	536-2000-0035	15	30
1	1	Electromagnet 110V 60 Cy	536-2000-0040	16	31
1	1	Electromagnet 230V 60 Cy	536-2000-0041	16	31
1	1	Electromagnet 125V DC	536-2000-0044	16	31
1	1	Electromagnet 240 DC	536-2000-0045	16	31
1	1	Electromagnet 48 DC	536-2000-0043	16	31

Description	Replacement Part No.	Part No.	Fig.
Key Interlock for Draw-out ACB	536-0000-0500	Not Shown	
Printed Circuit Board - long time	536-0000-0002	3	3
Printed Circuit Board - short time	536-0000-0003	3	3
Printed Circuit Board - instantaneous	536-0000-0004	3	3
Printed Circuit Board - ground fault	536-0000-0005	3	3
Solid State Relay without Cards	536-0000-0001	4	3
Safety Shutter - 800 A	536-0803-0020	—	1
Safety Shutter - 1600 A	536-1603-0020	—	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

Quantity Required					
Frames 800	1600	Description	Replacement Part No.	Part No.	
4	4	Fixed Isolating Contacts	536-0000-0200	–	1
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	

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 1600	100,000	30,000 50,000	30,000 50,000
480	800 1600	100,000	30,000 50,000	30,000 50,000
600	800 1600	100,000	30,000 42,000	30,000 42,000

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
SSPB 800	250	.4		.6	3	3	.3
	300	.5		.7	5	5	.4
		.6	or	.8	8	8	.6
	600	.8		.9	10	10	.75
	800	1.0		1.0			
		1.25•		1.1			
SSPB 1600	500	.4		.6	3	3	.3
	600	.5		.7	5	5	.4
		.6	or	.8	8	8	.6
	1200	.8		.9	10	10	.75
	1600	1.0		1.0			
		1.25•		1.1			

• 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 temperature range of -20° to 55°C.

CONTACT RATINGS

Cradle Limitswitch Contact Rating

Load	Max. Voltage	Max. Current
Resistive	115 - 230 A.C.	8A
	110 D.C.	0.5A
	22u 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

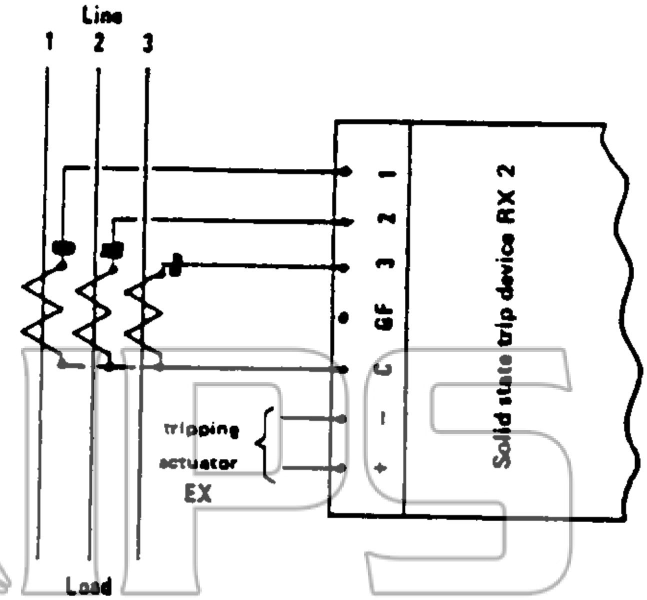
**Operates monentarily as circuit breaker trips*

Energized Undervoltage Relay Indication Limitswitch (C-4)

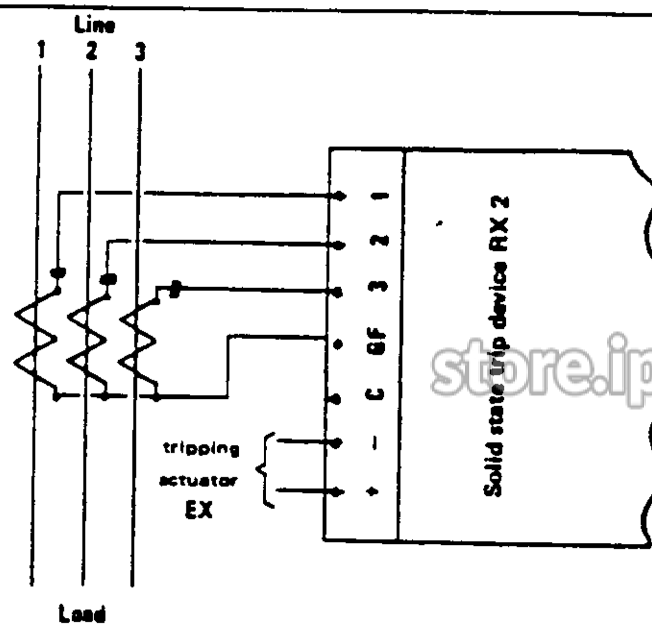
Load	Max. Voltage	Max. Current
Resistive	115 - 250V A.C.	6A
	125V D.C.	0.6A
	250V D.C.	0.4A

Current sensor connections:

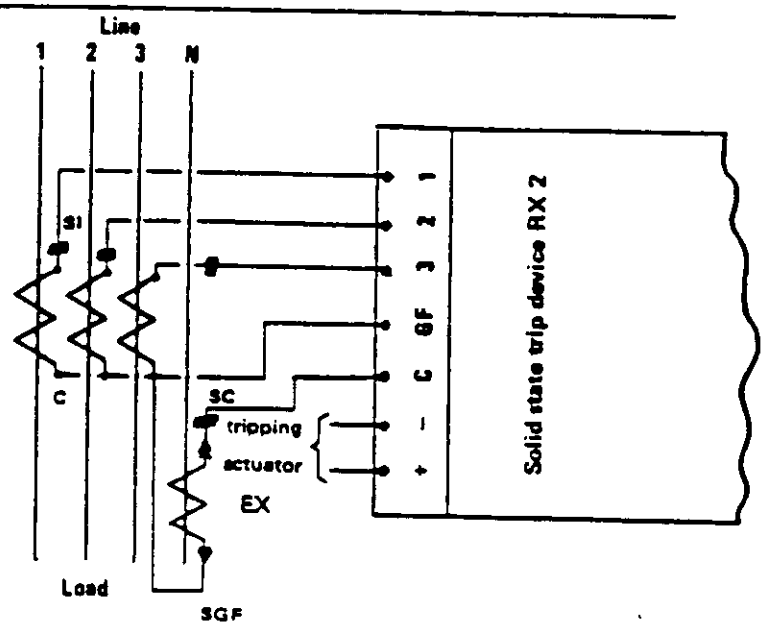
3 ϕ 3 W



3 ϕ 3 W with
ground fault protection



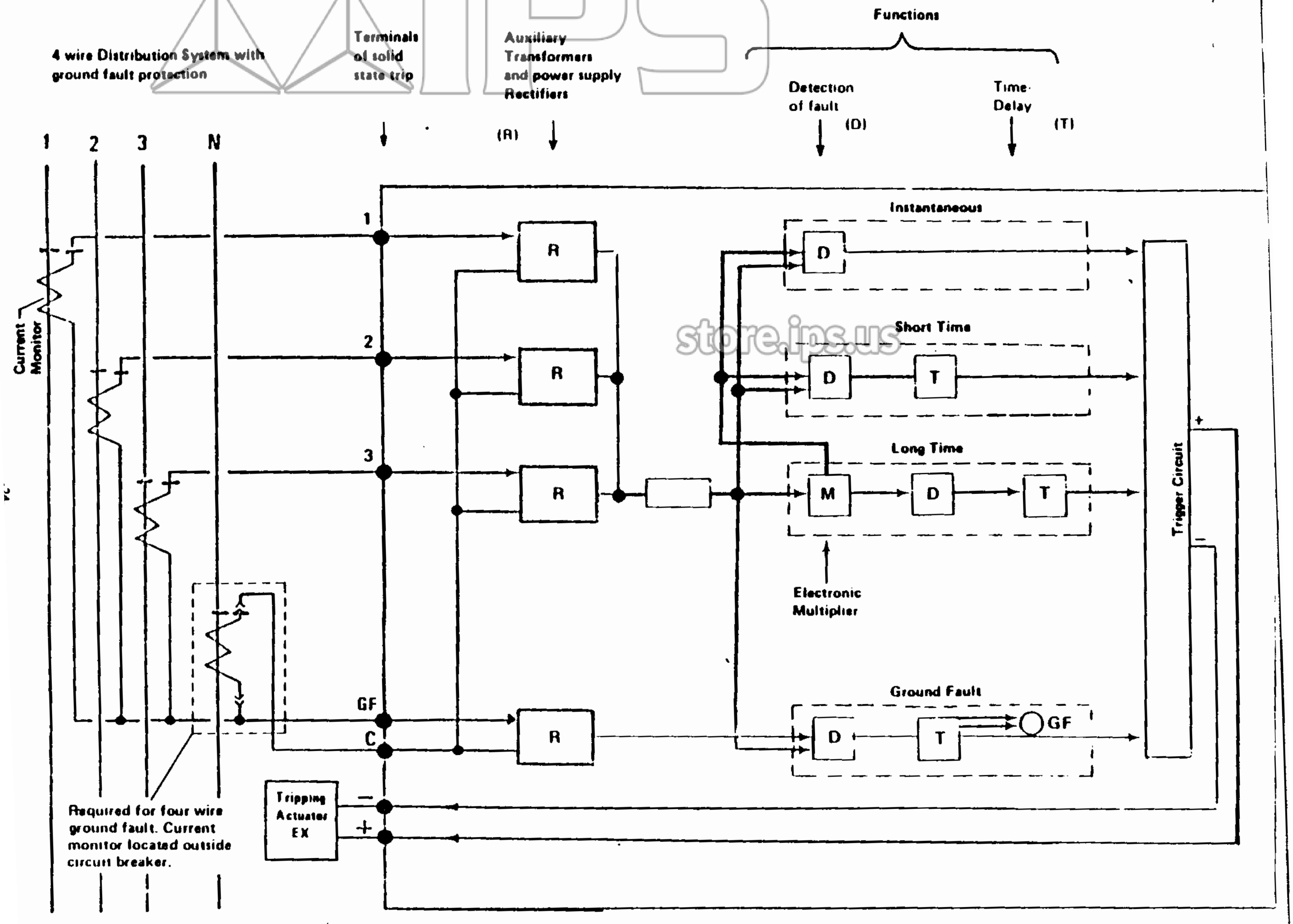
3 ϕ 4 W with
ground fault protection



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