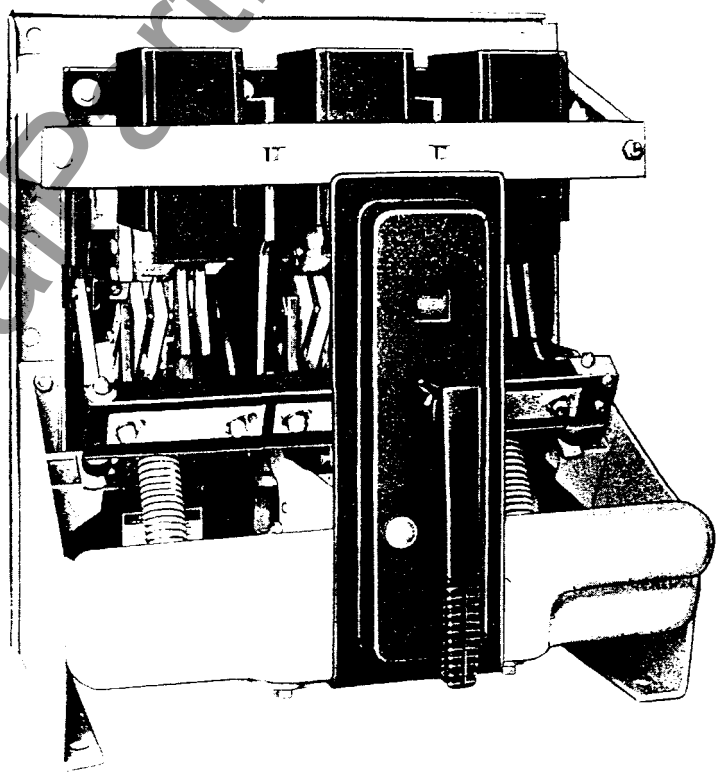
GEH-1799

INSTRUCTIONS

Switchgear

AIR CIRCUIT BREAKERS



Type AK-1-50-1
Manually Operated

GENERAL ELECTRIC

CONTENTS

These instructions do not purport to cover all details or variations in equipment nor to provide for every possible contingency to be met in connection with installation, operation or maintenance. Should further information be desired or should particular problems arise which are not covered sufficiently for the purchaser's purposes, the matter should be referred to the General Electric Company.

AIR CIRCUIT BREAKER
TYPE AK-1-50-1, MANUALLY OPERATED

INTRODUCTION

Before unpacking, installing, or attempting to operate the Type AK-1-50-1 Air Circuit Breaker described herein, these instructions should be thoroughly and carefully read.

The ratings for the AK-1-50-1 are as follows:

Continuous Current Rating	Interrupting Rating	Voltage	
RMS Amperes	RMS Amperes	AC	DC
15* to 1600	50,000	600	250

*The interrupting rating is limited on the lower rated coils.

These circuit breakers are generally used for protection and control of apparatus and branch circuits, including equipment in buildings, industries, power stations and for marine applications within the ratings designated.

The AK-1-50-1 breaker for D.C. applications differs from the breaker used for A.C. applications. The difference in D.C. breaker is an extra arcing contact per pole with a corresponding difference in the upper stud and interrupter.

These instructions apply to breakers used for both D.C. and A.C. applications.

RECEIVING, HANDLING AND STORAGE

Immediately upon receipt of the circuit breaker, an examination should be made for any damage or loss sustained in transit. If injury or rough handling is evident, a damage claim should be filed at once with the transportation company and the nearest General Electric Sales Office should be promptly notified.

The circuit breaker should be unpacked as soon as possible after being received as difficulty may be experienced in making claim for damage, not evident upon receipt, if delayed. Care should be used in unpacking to avoid damaging any of the breaker parts. Be sure that no loose parts are missing or left in the packing material. Blow out any dirt or particles of packing material that may have accumulated on the breaker parts.

If the circuit breaker is not installed at once, it should be stored in a clean dry place and preferably placed in a vertical position. It should be supported to prevent bending of studs or damage to the breaker parts. It is advisable not to cover the breaker with any packing or other material that absorbs moisture which may cause corrosion of breaker parts. A covering of paper will prevent dust from settling on the breaker parts.

INSTALLATION

LOCATION

The Air Circuit Breaker should be installed in a clean dry place where it is readily accessible for operation, inspection and proper maintenance. Special enclosures are available for the installation of circuit breakers which may be subjected to dust and moisture or other unfavorable locations.

MOUNTING

Dead front circuit breakers are designed for mounting in a switchboard or an enclosing case. The mounting of dead front breakers consists of placing the breakers within the enclosed structure and connecting the power buses or cables and making the necessary control connections. The standard mounting depth from the back surface of the breaker base to the back side of the front panel is 16". The front cover of dead front breakers consists either of a hinged door with cut-out or a plate bolted to the panel.

The structural surface to which the breaker is bolted must be flat throughout and the supporting structure must be of sufficient strength to hold the breaker firmly in place. Minimum cutout dimensions must be maintained in order to have proper electrical clearance.

CONNECTIONS

The connections to the circuit breaker studs should be firmly clamped or bolted in place to prevent excessive heating. The connecting cables or bus bars should have a current-carrying capacity specified to limit their temperature rise to that specified for the breakers. If these connecting

cables or bus bars are not of sufficient size, heat will be conducted from them to the breaker so that the breaker cannot carry normal current without exceeding the specified temperature rise.

Connecting cables or bus bars should be supported so that the breaker studs will not be subjected to unnecessary strains.

OPERATION

The circuit breaker is closed manually by an operating handle. To close the breaker the operating mechanism must be reset, this is accomplished by rotating the operating handle 165° counter clockwise. The breaker is then closed by rotating the operating handle 165° clockwise. The breaker may be tripped manually by pushing a trip button located in the front escutcheon, or automatically by any tripping device with which the breaker is equipped. After the breaker is tripped it cannot be closed again until the operating mechanism is reset.

MAINTENANCE

INSPECTION

BEFORE INSPECTION OR ANY MAINTENANCE WORK IS DONE, BE SURE THAT THE BREAKER IS IN THE OPEN POSITION. ALL ELECTRICAL POWER, BOTH PRIMARY AND CONTROL SOURCES, SHOULD ALSO BE DISCONNECTED.

Periodic inspection of the circuit breaker is recommended at least once a year. More frequent inspections are recommended, if severe load conditions, dust, moisture or other unfavorable conditions exist. A complete inspection of the breaker, including contacts and arc quenchers, should always be made after the breaker has opened a severe short circuit.

After the breaker has been installed, as well as at the regular inspection periods, slowly operate it manually several times as described above and observe whether the contacts line up properly and make sure that all parts move freely without binding or excessive friction.

If the breaker remains open or closed for a period of six months or more it is recommended that arrangements be made to open and close it several times in succession, preferably under load.

If overheating, not caused by overcurrent, is observed, a complete inspection of the breaker should be made including connections, contacts and flexible connectors.

At all times it is important not to allow pencil lines, paint, oil or other foreign materials on the insulating surfaces of the breaker as they may cause low resistance between points of different potential and result in eventual electrical breakdown.

The contacts should be inspected at the regular inspection periods and always after a known severe short circuit has been opened, to ascertain whether the contacts are badly worn or pitted, in which case they should be dressed or replaced. It is necessary to remove the arc quenchers in order to properly inspect the contacts.

LUBRICATION

In general, the circuit breaker requires little lubrication. Bearing points and sliding surfaces should be lubricated at the regular inspection periods with a thin film of G.E. Lubricant D50H15. Hardened grease and dirt should be removed from latch and bearing surfaces by using kerosene. ALL EXCESS LUBRICANT SHOULD BE REMOVED WITH A CLEAN CLOTH IN ORDER TO AVOID ANY ACCUMULATION OF DIRT OR DUST.

The use of cotton waste to wipe bearing surfaces should be avoided, as the cotton ravelings might become entangled under the bearing surfaces and destroy the surface of the bearing.

REPAIR AND REPLACEMENT

In order to replace contacts, operating mechanism or series overcurrent tripping devices, the front frame must be separated from the back frame. To separate the two frames proceed as follows:

1. The breaker must be open.
2. Remove the two opening springs from the outside pole units.
3. Remove the clevis pin, (14) Fig. 2.
4. Remove the four bolts from the back frame by using a socket wrench with an extension. The two frames can now be separated.

NOTE: It is recommended that the breaker be fastened to a suitable mounting base with a sling or hook to hold the front frame as the bolts are being removed.

TROUBLE SHOOTING

TROUBLE	PROBABLE CAUSE	REMEDY
Overheating	Contacts not aligned.	Adjust contacts.
	Contacts dirty, greasy or coated with dark film.	Clean contacts.
	Contacts badly burned or pitted.	Replace contacts.
	Current carrying surfaces dirty.	Clean surfaces of current carrying parts.
	Bolts and nuts of points at terminal connection not tight.	Tighten, but do not exceed elastic limit of bolts or fittings.
	Current in excess of breaker rating.	Decrease load, rearrange circuit or install larger breaker.
	Excessive ambient temperature.	Provide adequate ventilation.
Failure to Trip	Travel of tripping device does not permit positive release of tripping latch.	Re-adjust or replace device.
	Worn or damaged trip unit parts.	Replace Trip Unit.
False Tripping	Binds in overload device.	Replace overload device.
Failure to close and latch.	Binding in attachments preventing resetting of latch.	Re-align and adjust attachments.
	Chipped or worn latch.	Replace latch.
	Latch out of adjustment.	Adjust latch.
	Latch return spring too weak or broken	Replace spring.
	Hardened or gummy lubricant	Clean bearing and latch surfaces.

BASIC BREAKER COMPONENTS

ARC QUENCHER

The arc quenchers should be inspected at the regular inspection period and if the barriers are cracked or eroded, they should be replaced.

REPLACEMENT

1. Remove the channel shaped retaining bar by removing two screws.
2. Lift the quencher clear of the movable arcing contacts.
3. During replacement be careful not to overtighten the screws which secure the channel shaped retaining bar. Overtightening the screws will bow the bar and leave the center arc quencher loose.

INSPECTING INNER, SLIDE, AND POCKET BARRIERS, FIG. 1.

1. Remove arc quenchers (see above).
2. Remove screws holding spacer block (8).
3. Remove spacer block, steel backplate (7) and compound support (6).
4. Slide muffler (5) from slot and remove. The inner barriers (4) can now be removed for inspection.
5. Remove nut and withdraw stud from cap (1).
6. Remove cap (1). The side (2) and pocket (3) barriers can now be removed.
7. Re-assemble and replace the arc quenchers in the reverse order. Tighten all fastenings after replacement.

POLE UNIT ASSEMBLY

Each pole unit assembly consists of a set of arcing contacts, a set of main contacts, the operating linkage and the mounting base. See Fig. 2.

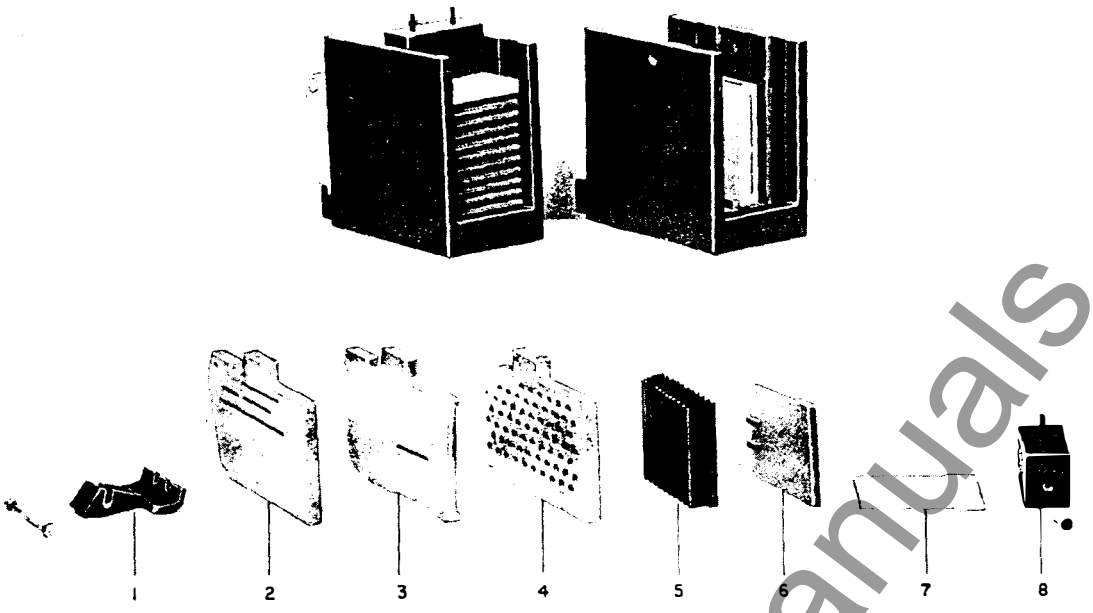


Fig. 1 8014B30

1. Cap
2. Side Barrier
3. Pocket Barrier
4. Inner Barrier
5. Muffler
6. Compound Support
7. Steel Back Plate
8. Spacer Block

Fig. 1 Dis-Assembly of Arc Quencher to Inspect, Inner, Side and Pocket Barriers

The stationary arcing contact consists of a set of parallel contact fingers (2), pin (3), and compression springs (22), which provide continuous contact pressure for the full travel of the contacts. Flexible braid leads shunt the pivot pin to prevent possible pitting at the pivot point when interrupting high currents.

The movable arcing contact assembly consists of parallel contact arms (4) carried on two movable pivot pins (8) and (19). The arcing contacts interleaf the main contacts and pivot with them about pin (19). This relative motion is obtained by linkages from the upper pin (7) to the breaker mechanism.

The stationary main contact assembly includes main contacts and intermediate contacts. The intermediate contact surface extends beyond the main contacts and will, therefore, make before the main contacts and break after the main contacts. The number of contacts for each rating is given in Table I.

The movable main contacts pivot around a stationary pin (18), which holds them to the lower block, motion is obtained from a second pin (7), connected by an insulated link (12) to the breaker mechanism. Steel springs (17) force the contacts against the pin to prevent pitting at the pivot point. The movable main contact assembly also contains main and intermediate contacts.

TABLE I

Breaker Type	Main Contacts			Intermediate Contacts			Arcing Contacts		
	No. of Contacts	Pressure lbs.	Wipe in Inches	No. of Contacts	Pressure lbs.	Wipe in Inches	No. of Contacts	Pressure lbs.	Wipe in Inches
AK-1-50-1 For D.C.	3	55-65	1/16-3/32	1	55-65	*	3	25-35	5/16-7/16
AK-1-50-1 For A.C.	3	55-65	1/16-3/32	1	55-65	*	2	25-35	5/16-7/16

* The intermediate contact wipe should be at least 1/16" more than the main contact wipe.

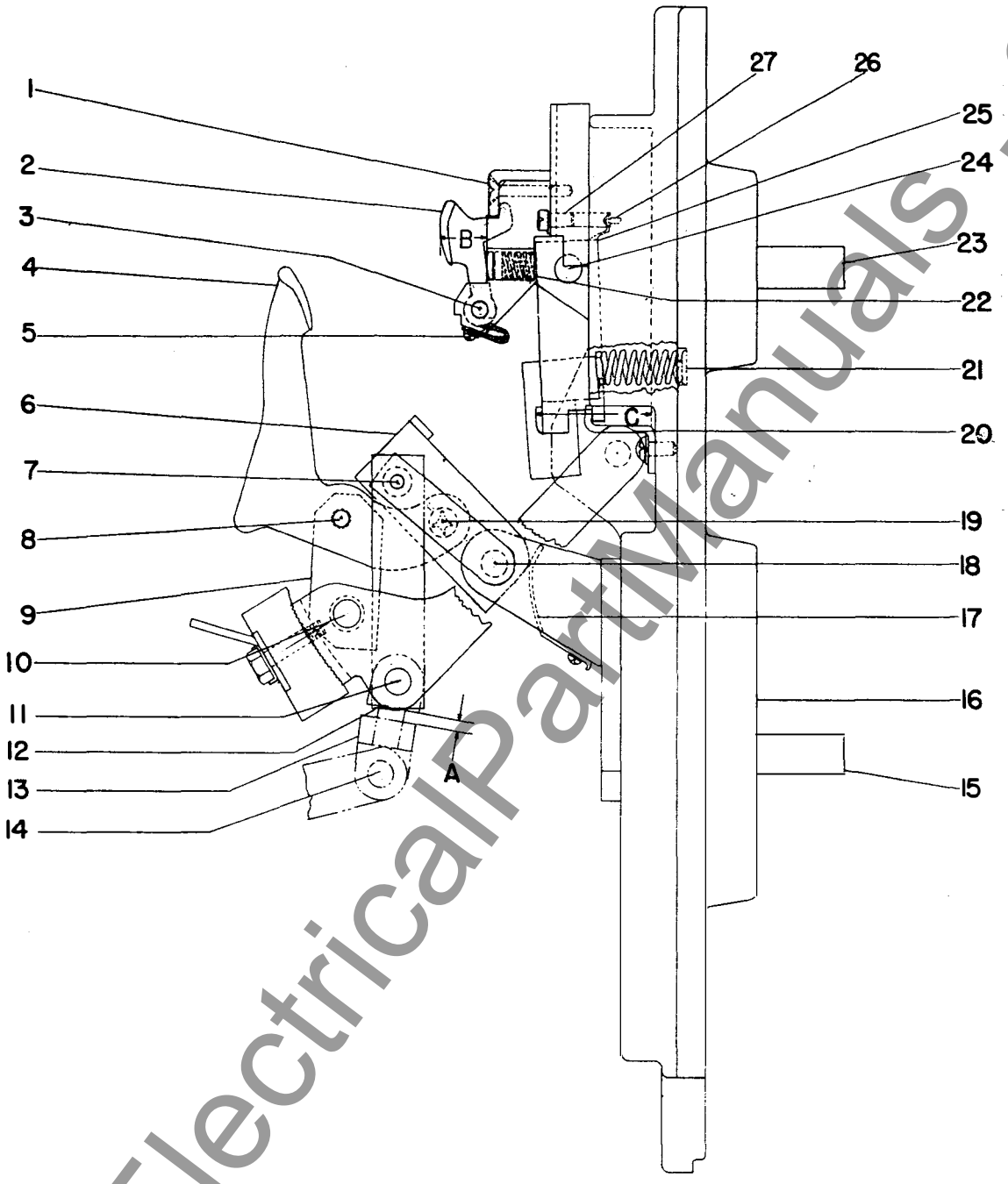


Fig. 2 2150150

1. Screw
2. Sta. Arcing Contact
3. Pin (Sta. Arcing Cont.)
4. Movable Arcing Contact
5. Braid
6. Movable Main Contact
7. Shouldered Pin
8. Pin (Arcing Cont. Link)
9. Insulating Link
10. Pin (Insulating Link)
11. Pin (Side Link)
12. Link
13. Clevis
14. Clevis Pin
15. Lower Stud
16. Pole Unit Base
17. Spring (Main Movable Cont.)
18. Pin (Movable Main Cont.)
19. Pin (Movable Arcing Cont.)
20. Side Link
21. Spring (Sta. Main Cont.)
22. Spring (Sta. Arcing Cont.)
23. Upper Stud
24. Pin (Sta. Main Cont.)
25. Stationary Main Contact
26. Screw
27. Screw

Fig. 2 Pole Unit Assembly

In order to function properly, a definite amount of contact pressure and contact wipe must exist between the movable and stationary contacts. Table I gives the figures for contact wipe and contact pressure. Both wipe and pressure should be checked during the regular inspection period.

MEASURING CONTACT PRESSURE, FIG. 2

1. Remove arc quenchers, (see replacements under "Arc Quenchers").
2. With the breaker open, measure the "B" dimension of the stationary arcing contact with the spring (22) full compressed.
3. Place a push-type scale against the stationary arcing contact and push the contact backward until the "B" dimension is 1/16" more than the measurement taken in item 2. The scale should then be read.

MEASURING CONTACT WIPE, FIG. 2

1. Remove the arc quencher.
2. With the breaker open, measure the horizontal distance from the edge of the contact to the surface behind it. ("B" and "C" dimensions).
3. Close the breaker and repeat item 2. The difference between the readings in item "2 and 3" determines the wipe of the contacts. For safety reasons be extremely careful not to trip the breaker.

ADJUSTING CONTACT WIPE AND PRESSURE, FIG. 2

1. With the breaker open, measure dimension "A".
2. Remove the clevis pin (14) and increase dimension "A" to increase the wipe, and decrease dimension "A" to decrease the wipe by turning the clevis (13).

NOTE: If the proper contact pressure does not exist when the contact wipe is within its limits, the stationary contact springs should be replaced.

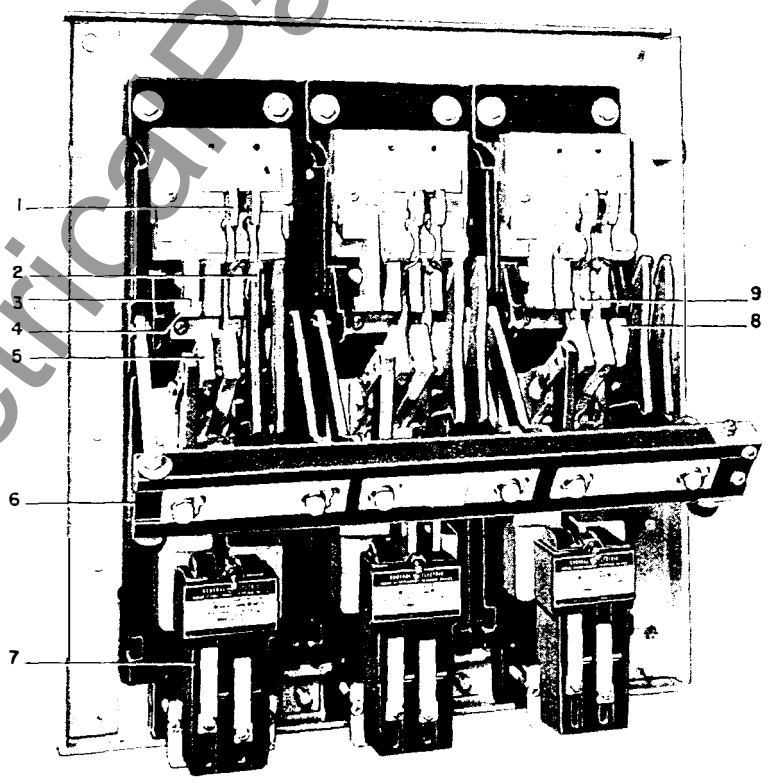
REPLACEMENT, FIG. 2

1. Remove the upper plate by removing two screws (1).
2. Remove screw from braid (5).
3. Remove pin (3) allowing the stationary contacts and spring (22) to fall free.
4. Install new springs and stationary arcing contacts in reverse order.
5. Adjust contact wipe and pressure (see "Adjusting Contact Wipe and Pressure").

MOVABLE ARCING CONTACTS (4)

The movable arcing contacts should be replaced when the stationary arcing contacts are replaced.

1. Separate the front frame from the pole unit frame (see "Repair and Replacement").



1. Stationary Arcing Contact
2. Movable Arcing Contact
3. Stationary Main Contact
4. Contact Stop
5. Movable Main Contact
6. Cross Bar
7. Series Overcurrent Device
8. Movable Intermediate Contact
9. Stationary Intermediate Contact

Fig. 3 Front View of Back Frame Assembly

Fig. 3 (8014678)

2. Remove pins (8) and (19) and withdraw the contacts.
3. Re-assemble parts in the reverse order.

STATIONARY INTERMEDIATE CONTACTS (9), FIG. 3

1. Remove screws (27) and remove bracket which holds pin (24) in place. See Fig. 2.
2. Remove clamp which holds lower part of stationary contact.
3. Remove pin (24) and screws (26).
4. Lift out the intermediate contacts.
5. Replace the contacts remembering to match the intermediate contacts on each pole.
6. Re-assemble in the reverse order.

MOVABLE INTERMEDIATE CONTACTS (8), FIG. 3.

1. Remove the movable arcing contacts as described above.
2. Loosen spring (17). See Fig. 2.
3. Slide link (12) to the side and off of pin (7).
4. Slide pins (18) and (7) far enough to the side to allow the movable intermediate contact to be replaced.
5. Reassemble parts in reverse order.

Always check the contact wipe and pressure following contact replacement.

OPERATING MECHANISM

The operating mechanism is supported in a "U" shaped steel frame in front of the center pole unit. It consists of a cam (5), linkage (6), prop (7), roller latch (10), trip latch and shaft (11). Refer to Fig. 4.

The breaker is closed by rotating the operating handle 165° counter-clockwise which allows cam reset spring (17) to pull the cam (5) into the reset position. The handle is then turned 165° clockwise thereby causing roller (4) to engage cam (5) thus causing the linkage to straighten, which moves the cross bar (6) Fig. 3, and movable contacts to the closed position.

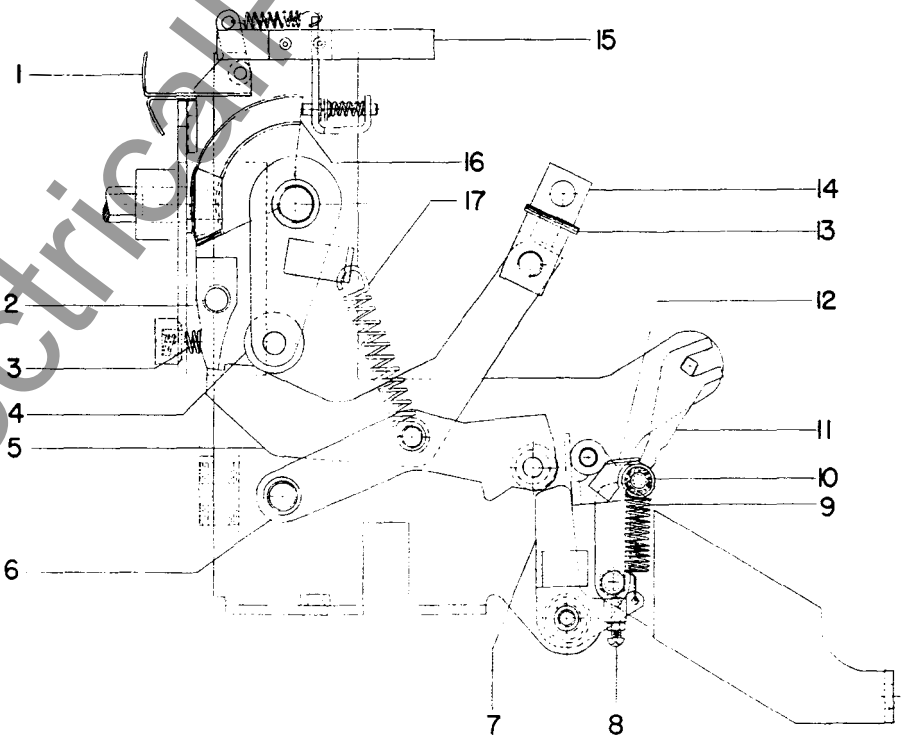
The breaker mechanism is tripped by rotating the trip shaft and releasing trip latch (11) which causes the linkage to collapse, allowing the opening springs to pull the cross bar and movable contacts to the open position. The mechanism does not reset until the operating handle is rotated 165° counter-clockwise. Latch stop (12) limits the rotation of the trip shaft and thus determines the amount of latch engagement.

ADJUSTMENTS, FIG. 4

With the breaker open the latch adjustments are as follows:

Latch clearance -

1. Reset the mechanism by turning the operating handle 165° counter-clockwise.



1. Position Indicator
2. Prop
3. Spring
4. Closing Roller
5. Closing Cam
6. Link
7. Prop
8. Prop Adjusting Screw
9. Reset Spring
10. Roller Latch
11. Trip Latch
12. Stop
13. Spacers
14. Clevis
15. Extension
16. Gear
17. Spring

Fig. 4 (215D148)

Fig. 4 Operating Mechanism

2. The vertical clearance between the trip latch (11) and roller (10) should be 1/64" to 1/32".
3. To obtain this clearance the adjusting screw (8) is turned. Be certain the nut is tightened on the adjusting screw (8) after obtaining proper clearance.

Latch engagement -

1. Mechanism in reset position.
2. Form stop (12) until center line of trip latch (11) passes through the center of roller (10).

REPLACEMENTS, FIG. 4

Prop reset spring (9) - unhook and replace.
Cam reset spring (17) - unhook and replace.

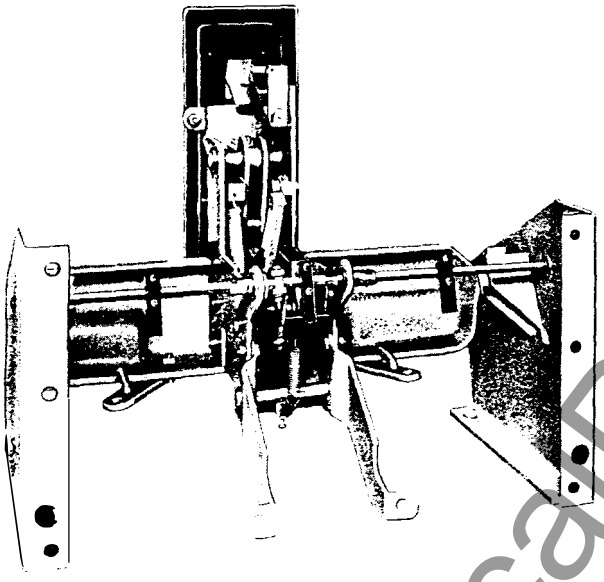


Fig. 5 Rear View of Front Frame Assembly

AUXILIARY SWITCH

The auxiliary switch is used to make and break various control circuits as the circuit breaker is opened and closed.

The auxiliary switch, refer to Fig. 6, is mounted on the left side of the front frame. As

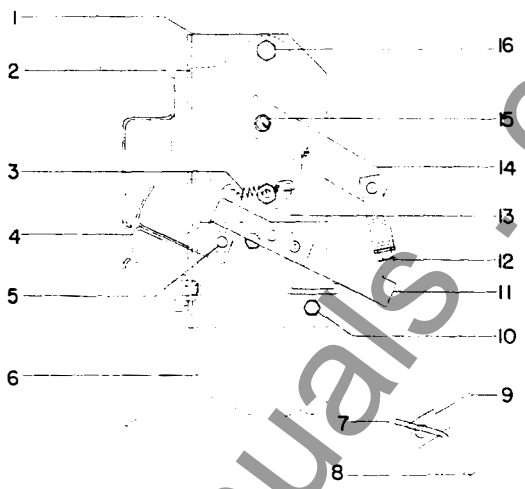


Fig. 5 (8014677)

1. Plate
2. Auxiliary Switch
3. Spring
4. Indicator
5. Pivot Pin
6. Frame
7. Indicator Actuator
8. Adjusting Plate
9. Cross Bar
10. Bolt
11. Extension
12. Operating Rod
13. Bracket
14. Link
15. Operating Shaft
16. Bolt

Fig. 6 242C885

Fig. 6 Auxiliary Switch Linkage

the cross bar (9) moves, with the contacts, to the open or closed position it operates a rectangular link (14) through an operating rod (12). The rectangular link rotates the operating shaft (15) of the auxiliary switch, which, through cams located on this shaft opens and closes the auxiliary switch contacts. The top terminals of the switch are "a" contacts (open when the breaker is open) and the bottom terminals are "b" contacts (closed when the breaker is open).

REPLACEMENT, FIG. 6

1. Disconnect all leads to auxiliary switch.
2. Remove two mounting bolts (16).
3. Disengage auxiliary switch shaft (15) from the rectangular link (14).
4. Set arrow on new auxiliary switch shaft as shown in Fig. 6.
5. Push auxiliary switch shaft (15) into square hole in link (breaker open).
6. Replace mounting hardware and wiring.

PROTECTIVE DEVICES

TIME DELAY UNDERVOLTAGE TRIPPING DEVICE

This device is mounted to a bracket on the left side of the operating mechanism (looking from the front). The purpose of this device is to trip the breaker for undervoltage. For rated voltage, the armature (3) is attracted by magnet (14). If the voltage falls below the rated value the magnet (14) releases the armature (3). Spring (4) then pulls armature (3) upward against the restraining force of the oil in cylinder (10); this action causes a time delay. When the spring overcomes the restraining

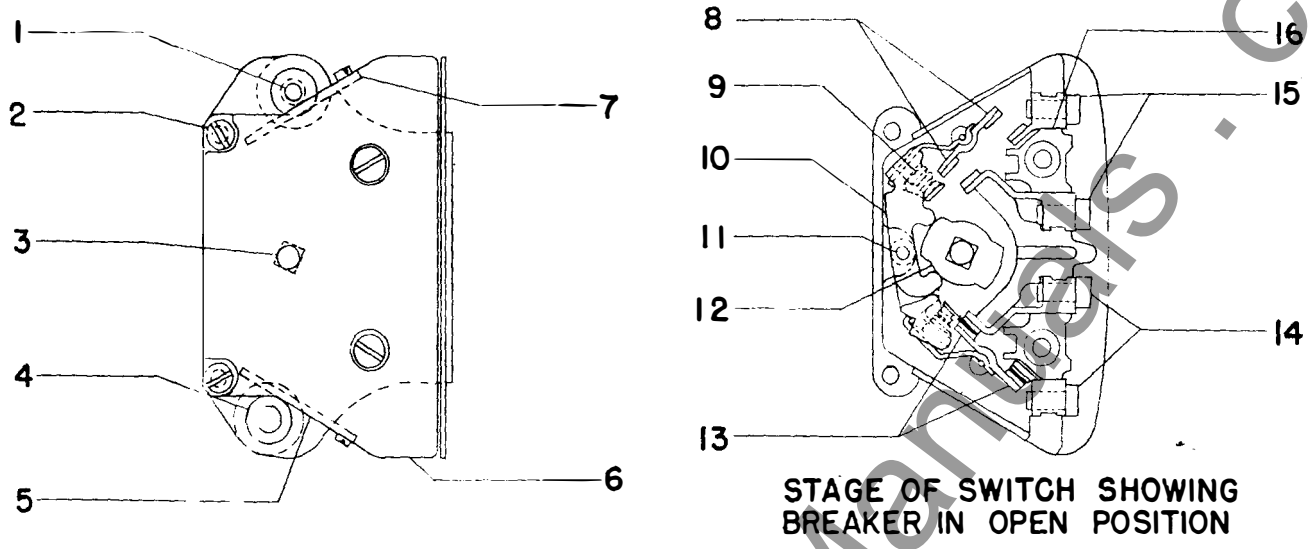


Fig. 7 (2426B66)

1. Mounting Bolt
2. Tie Bolt
3. Shaft
4. Screw
5. Bottom Cover
6. End Plate
7. Top Cover
8. 'a' Contacts
9. Contact Spring
10. Rocker Arm
11. Pin
12. Cam
13. 'b' Contacts
14. 'b' Terminals
15. 'a' Terminals
16. Barrier

Fig. 7 Rotary Auxiliary Switch

force of the oil, the armature engages screw (20) thus rotating the trip shaft and opening the breaker. (For parts reference refer to Fig. 8).

ADJUSTMENTS, FIG. 8

An adjusting screw (20) in the trip lever is used to allow from 1/32 to 1/16 inch overtravel after tripping the breaker.

Adjusting screw (2) is used to adjust the armature so that it will pick-up at 80% of normal voltage and drop out between 30% and 60% of normal voltage.

Adjusting nut (8) on connecting rod (11) is intended for a minimum amount of adjustment of the time delay setting.

From 1/4 to 3/8 inch of oil should be maintained in the cylinder at all times. In order to make an inspection of the oil, the cylinder may be unscrewed from the cap. G.E. silicone oil 9981LT4 NV or similar grade should be used in the cylinder.

REPLACEMENTS, - - Time Delay Undervoltage Device, Fig. 8

1. Disconnect coil leads
2. Remove two screws from bracket (1). (Bracket is omitted when instantaneous undervoltage device is used).
3. Remove four mounting screws (21) and remove device.
4. Install new device in reverse order.

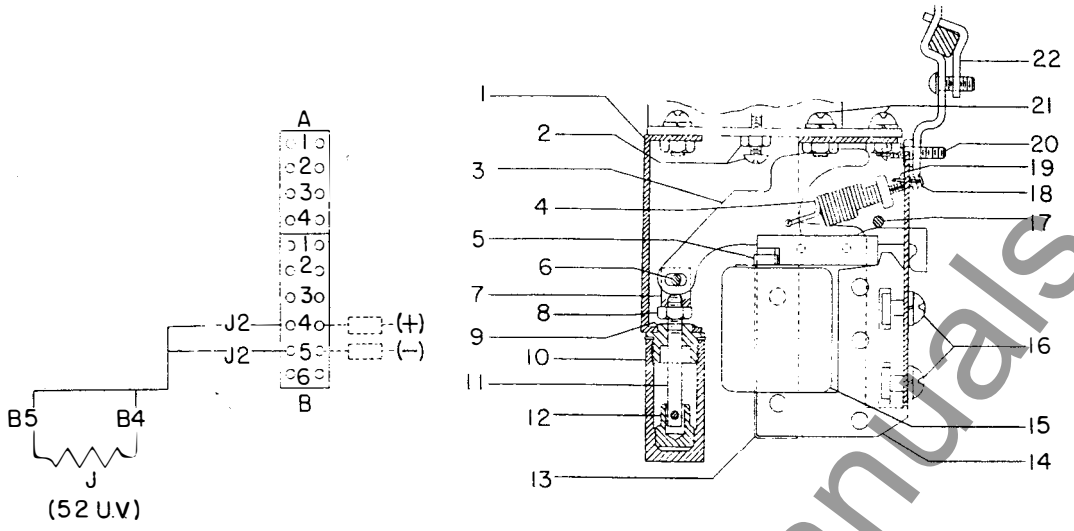
Coil (15)

1. Disconnect leads to coil.
2. Remove two screws (16).
3. Remove magnet and coil assembly.
4. Straighten laminations around shading ring (5).
5. Remove shading ring and straighten lower end of coil clamp (13).
6. Remove coil. Install new coil in reverse order.

INSTANTANEOUS UNDER VOLTAGE TRIPPING DEVICE

The undervoltage tripping device is constructed similarly to the time delay undervoltage tripping device with the exception that the cylinder (10), plunger (12), connecting rod (11), clevis (7), bracket (1) and adjusting nut (8), as shown in Fig. 8 are omitted.

The adjustments and replacement for this device are also the same as those for the time delay undervoltage tripping device.



1. Bracket
2. Adjusting Screw & Nut
3. Armature
4. Spring
5. Shading Ring
6. Pin
7. Clevis
8. Adjusting Nut
9. Cap
10. Cylinder
11. Connection Rod
12. Plunger
13. Clamp
14. Magnet
15. Coil
16. Screws
17. Pin
18. Adjusting Screw
19. Locking Wire
20. Adjusting Screws
21. Mounting Screws
22. Trip Paddle & Clamp

Fig. 8 Time Delay Undervoltage Tripping Device

SERIES OVERCURRENT TRIPPING DEVICE

Each series overcurrent tripping device is enclosed in a molded case and mounted by three screws and a bracket to the lower part of the pole unit base.

The device can be provided with the following tripping combinations:

1. Long time delay, short time delay and instantaneous tripping.
2. Long time and short time delay tripping only.
3. Long time delay and instantaneous tripping.
4. Short time delay and instantaneous tripping.
5. Short time delay tripping only.
6. Instantaneous tripping.
   (a) Adjustable
   (b) Nonadjustable

Short Time Delay Tripping, Fig. 9

The armature (7) is retained by calibrating spring (8). After the magnetic force, produced by and overcurrent condition, overcomes this restraining force, the armature movement is further retarded by an escapement mechanism which produces an inverse time delay characteristic. The mechanism is shown on Fig. 9a.

Long Time Delay Tripping, Fig. 9

The armature (10) is retained by the calibration spring (11). After the magnetic force, produced by an overcurrent condition, overcomes this restraining force, the armature movement is further retarded by the flow of silicone oil in a dashpot, which produces an inverse time delay characteristic. The mechanism is shown on Fig. 9b.

Instantaneous Tripping, Fig. 9

(a) Adjustable instantaneous tripping takes place after the magnetic force produced by an overcurrent condition, overcomes the restraining force of the calibration spring which can be adjusted by the calibration clamp nut (14).
(b) Nonadjustable instantaneous tripping takes place after the magnetic force produced by an overcurrent condition overcomes the restraining force of a nonadjustable spring.

Selective tripping is obtained when the breakers in the electrical distribution system are arranged on the basis of a progressive series of time and current pickup. This will allow the breaker having the shorter time setting and the lower pickup to trip before the breaker having the longer time setting and the higher current pickup, provided the fault is on the part of the line protected by the breaker having the lower setting. Hence, if a fault

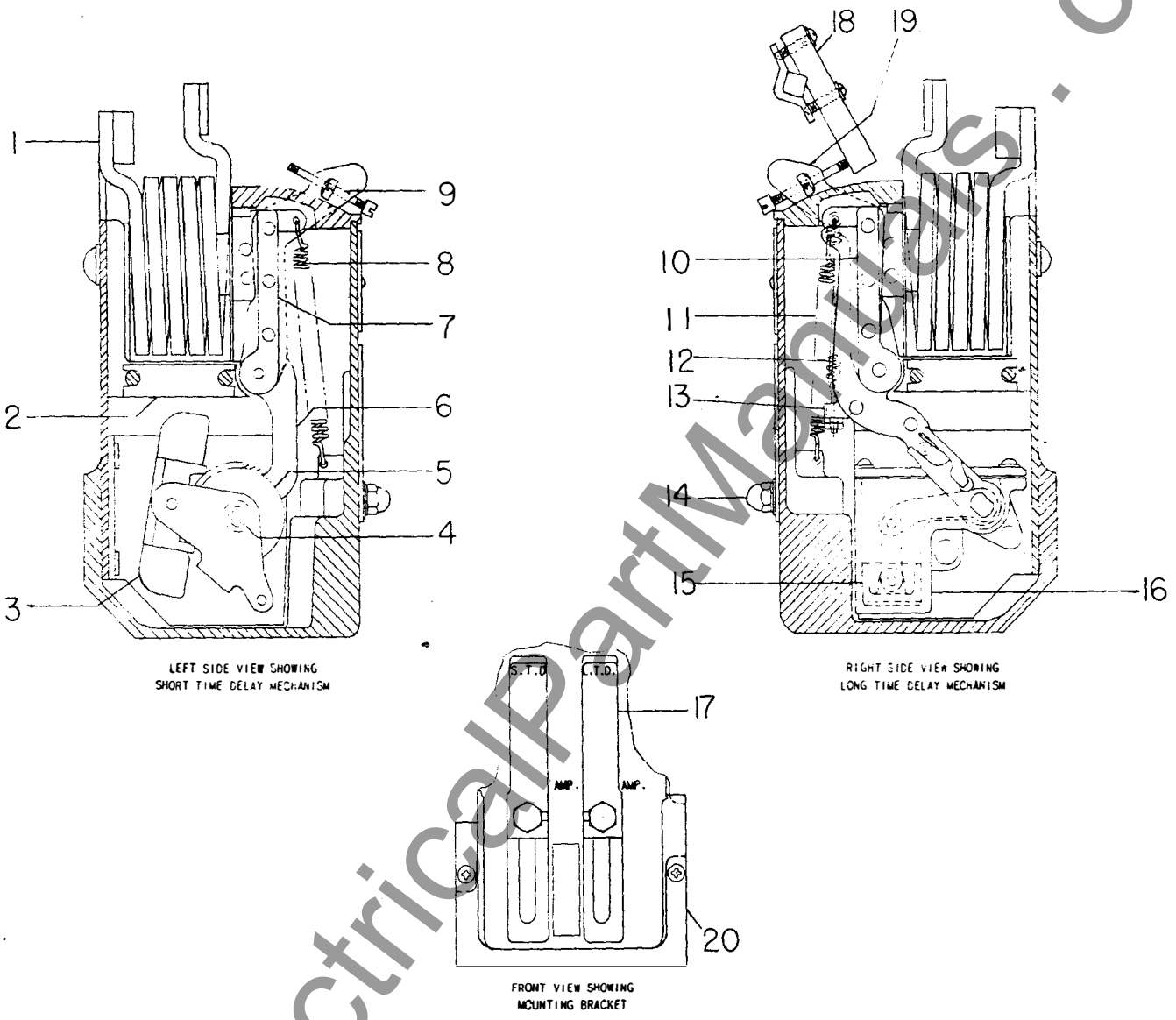


Fig. 9 (P-6423678)

1. Series Coil
2. Magnet
3. Pallet
4. Pinion
5. Escape Wheel
6. Driving Segment
7. S.T.D. Armature
8. S.T.D. Calibration Spring
9. Trip Arm
10. L.T.D. Armature
11. L.T.D. Calibration Spring
12. Instantaneous Trip Spring
13. Spring Holder
14. Calibration Clamp Nut
15. Plunger
16. Cylinder
17. Calibration Plate
18. Trip Paddle
19. Trip Paddle Adjusting Screw
20. Clamping Bracket

Fig. 9 Series Overcurrent Tripping Device

occurs in any part of the electrical system, only the breaker nearest the fault will trip.

In order to reduce the possibility of damaging the equipment and to provide maximum safety to the operator, the overload caused by a fault is removed in a minimum amount of time by selective tripping. Overloads producing current up to 5 or 10 times the breaker rating are removed in a matter of a few seconds while currents in excess of this value are removed in a fraction of a second.

For the exact characteristics and setting of each breaker in a selective system, reference should be made to the coordination chart furnished for the particular system.

ADJUSTMENTS, FIG. 9

Calibration clamping nuts (14) are used to set the desired pickup for the adjustable elements.

To adjust for approximately 1/32" overtravel of trip arm (9) after tripping:

1. Check trip latch engagement. See "Adjustments - Operating Mechanism".
2. Loosen the locknut and turn the adjusting screw (19) on the trip arm (9). The screw should not touch the trip paddle when the breaker is "open" and the latch is reset, but should have a clearance not exceeding 1/32".
3. Tighten the adjusting screw locknut on the trip arm.

REPLACEMENT

1. Remove front frame (See "Repair and Replacement").
2. Remove the bolts holding the coil to the lower stud
3. Remove bracket and mounting screws.
4. Before installing a new device, check the travel of the trip arm with a rod or wire and push the armature solidly against the magnet (see Fig. 10). The trip arm should move at least 5/32". If there appears to be insufficient movement of the trip arm, or if the armature appears to be binding, the device should not be used.
5. Replace new device in reverse order.
6. Adjust device as described above.

NOTE: No component parts of the overcurrent tripping device are replaced. It will be necessary to install a new device when parts are worn or damaged.

REVERSE CURRENT TRIPPING DEVICE

The device is enclosed in a molded case and is mounted on the right pole base similarly to the series overcurrent tripping device.

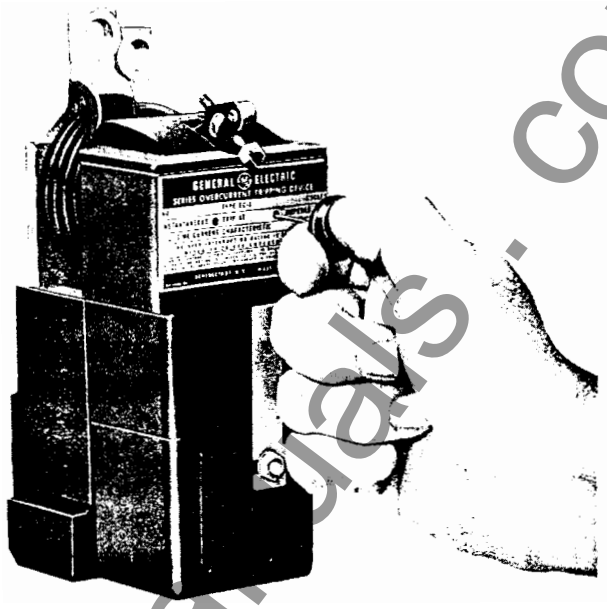


Fig. 10 (8016188)

Fig. 10 Checking Travel Distance Of Trip Arm On Overcurrent Trip Device

The reverse current tripping device consists of a series coil (2) with an iron core mounted between two pole pieces (9), also a potential coil (7) connected across a constant source of voltage and mounted around a rotary-type armature (10). Calibration spring (6) determines the armature pick-up when a reversal of current occurs.

As long as the flow of current through the breaker is in the normal direction, the magnetic flux of the series coil and the magnetic flux of the potential coil produce a torque which tends to rotate the armature counter-clockwise. The calibration spring also tends to rotate the armature in the same direction. This torque causes the armature to rest against the stop screw (12) attached to a bearing plate on the right side of the device.

If the current through the series coil (2) is reversed, the armature (10) tends to move in the clockwise direction against the restraint of the calibration spring (6). When the current reversal exceeds the calibration setting, the armature revolves clockwise causing the trip rod (3) to move upward engaging the trip paddle (1), thereby tripping the breaker.

ADJUSTMENTS

No adjustments should be made in the field with the exception of checking for overtravel of the trip rod. Proper overtravel of the trip rod is provided, if the trip rod advances the trip paddle between 1/32" to 3/64" beyond the point where the breaker trips. To adjust for this amount of overtravel, lift the trip rod as high as possible after backing off the adjusting nut on the trip rod (3) so that it will not touch the trip paddle (1). Advance adjusting nut on the trip rod until you can just trip the breaker by lifting the trip rod (3) as far as it will go. Then advance this same adjusting nut an additional 1-1/2 turns, thereby assuring positive

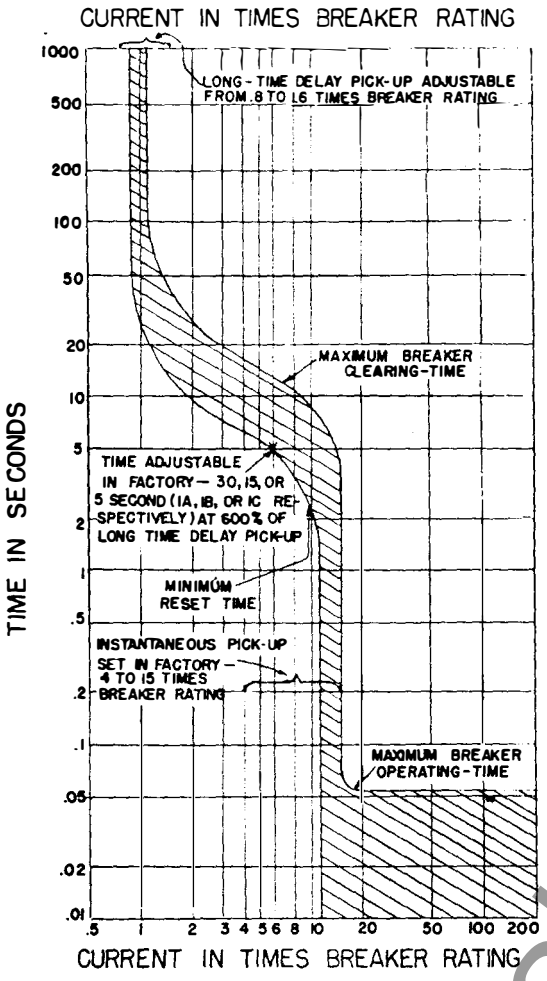


FIG. 11A
LONG-TIME AND INSTANTANEOUS
TRIPPING CHARACTERISTIC

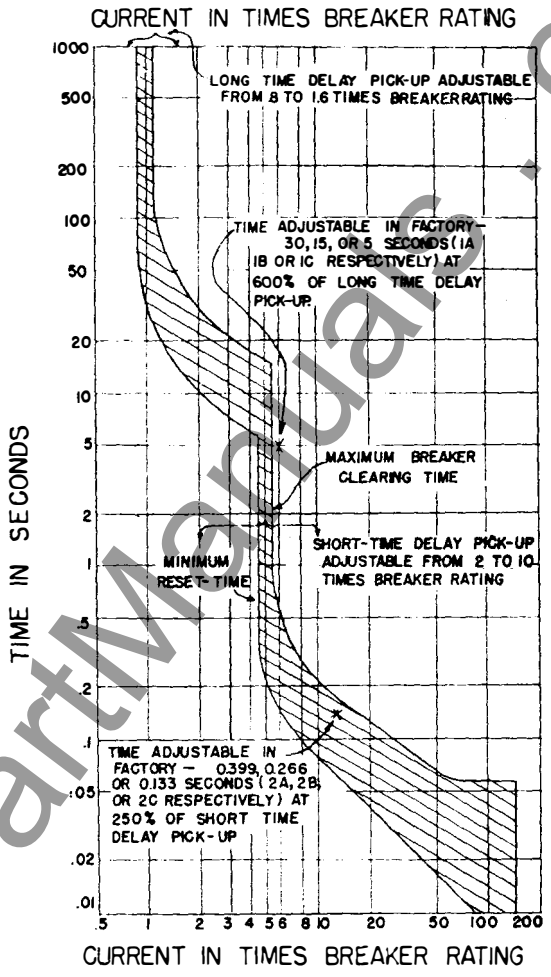


FIG. 11B
LONG-TIME AND SHORT-TIME
TRIPPING CHARACTERISTIC

Fig. 11 (215D180)

Fig. 11 Typical Time-Current Characteristic

tripping. Lock adjusting nut.

Be extremely cautious not to have hands near moving parts of the breaker when making this adjustment.

REPLACEMENT

After removing the wiring for the potential coil the reverse current device can be removed and replaced by following the procedure outlined for replacing the series overcurrent device. For wiring, see Fig. 12.

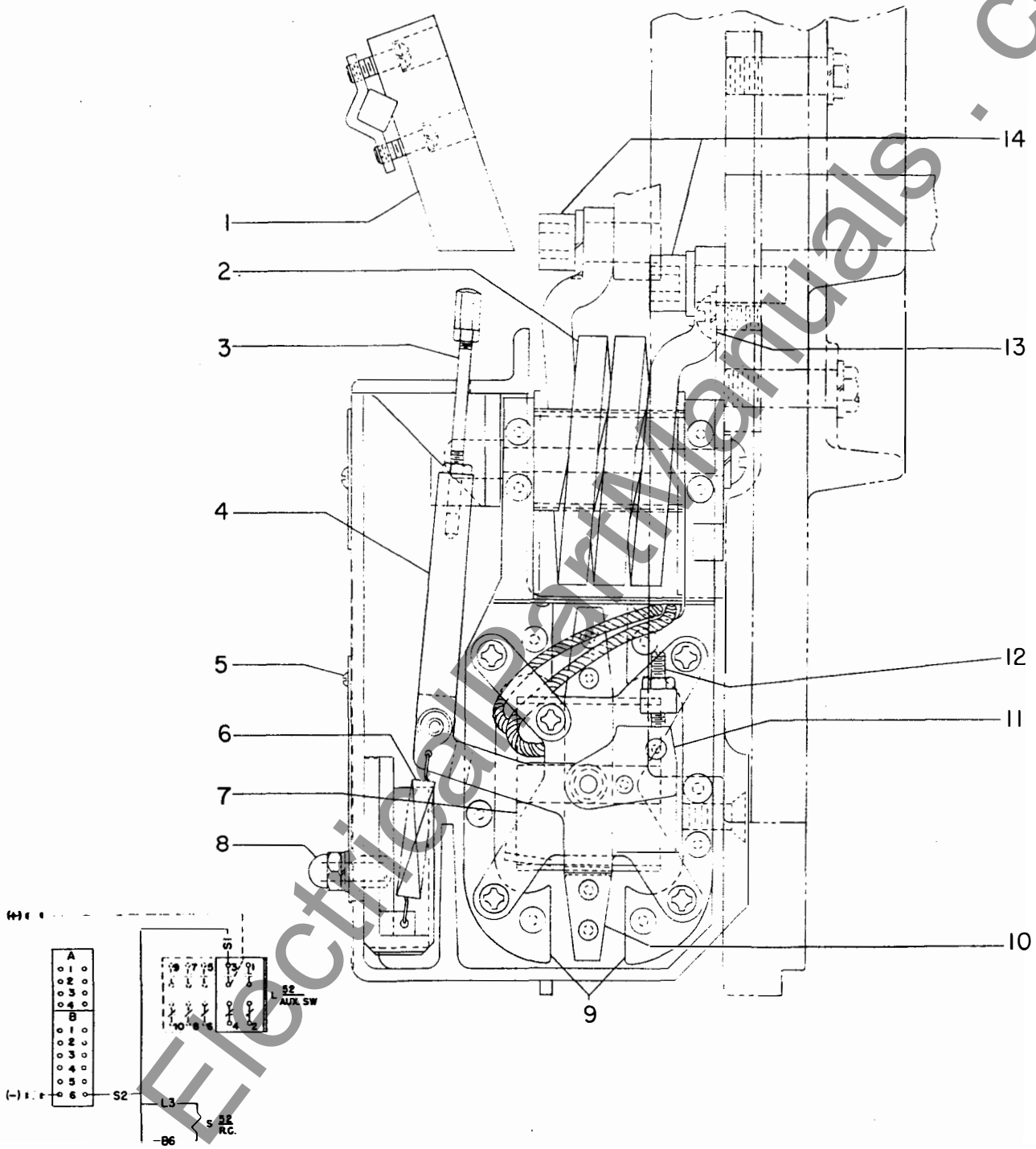
MISCELLANEOUS

SHUNT TRIPPING DEVICE

The shunt tripping device (refer to Fig. 13) is mounted on a bracket attached to the left side of the operating mechanism (looking from the front).

A remote switch or relay contacts are used to close the circuit of the device causing the armature (9) to engage the trip paddle (11), thereby tripping the breaker. The sprin (2) is used to return the armature to the neutral position after the breaker trips.

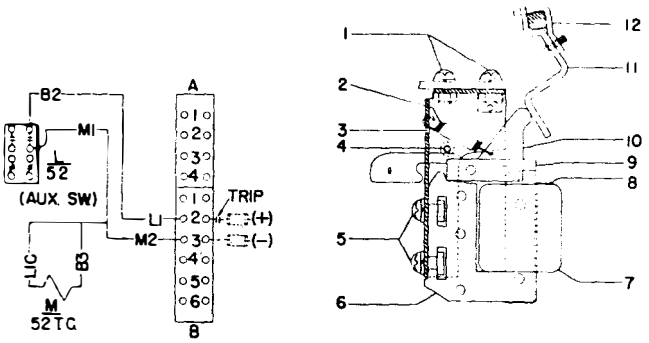
To prevent overheating, the coil (7) is cut off by contacts of the auxiliary switch which are open when the breaker is open.



1. Trip Paddle
2. Series Coil
3. Trip Rod
4. Trip Crank
5. Setting Sealing Screw
6. Spring
7. Potential Coil
8. Calibration Nut
9. Pole Pieces
10. Armature
11. Counter Weight
12. Stop Screw
13. Mounting Screw
14. Screw

Fig. 12 Reverse Current Tripping Device

Fig. 12 (215D175) & (383A681)



1. Screws
2. Spring
3. Frame
4. Pin
5. Screws
6. Magnet
7. Coil
8. Clamp
9. Armature
10. Armature Arm
11. Trip Paddle
12. Clamp

Fig. 13 Shunt Tripping Device

Fig. 13 (215D176)

ADJUSTMENTS

From 1/32" to 1/16" overtravel of the armature is required when the breaker is tripped. If any adjustment is necessary to provide this amount of overtravel, the trip lever is bent in or out accordingly.

REPLACEMENT - COIL (7)

1. Disconnect leads to coil.
2. Remove magnet (6) and coil from frame (3).
3. Bend lower end of clamp (8) straight and remove.
4. Remove coil and install new coil in reverse order.

BELL ALARM AND LOCKOUT DEVICE

Refer to Fig. 14. When the breaker is tripped by an overload device, auxiliary shaft (9) rotates counter clockwise causing latch (8) to move off of latch arm (5). The breaker opens causing prop (3) to rotate clockwise allowing switch (2) to close. The switch then rotates latch arm (5) which, in turn, allows catch (11) to move downward thereby locking latch arm (5) in the rotated position. When in the rotated position the latch arm keeps the trip shaft and prop (3) in the trip-free position, thus keeping the breaker from being closed until the lockout mechanism is reset by means of reset button (1). When the switch is closed it sounds an alarm. If the breaker is tripped by any device other than an overload device, latch (8) keeps latch arm (5) from rotating and therefore stops the bell alarm and lockout device mechanism from operating.

ADJUSTMENTS

1. With the breaker mechanism and lockout mechanism in the reset position adjusting screw (13) should be set so that auxiliary shaft (9) just touches the overload paddles on the trip shaft.
2. With the front frame assembled to the back frame the adjusting screws in the series overcurrent tripping devices should be adjusted so that there is approximately 1/16 inch to 3/32 inch clearance between screw and auxiliary shaft (9).

DISCONNECTS

The disconnects are attached to the circuit breaker studs at the rear of the breaker.

Each disconnect consists of eight contact fingers (5), four retainers (7), two spacers (4), two screws (1), one retaining ring (6), four washers (2) and four springs (3). The parts are assembled as shown in Fig. 16.

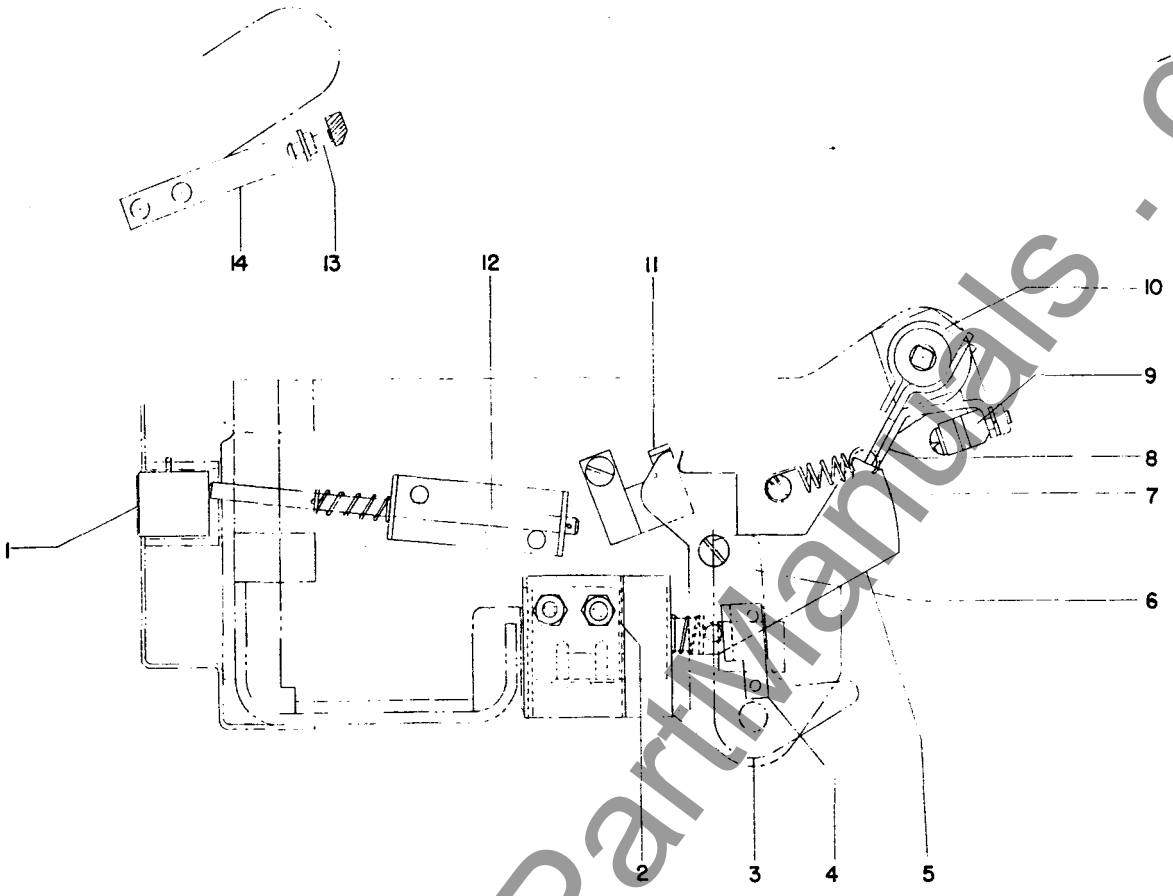
ADJUSTMENTS, FIG. 16

Tighten the nuts on screw (1) compressing springs (3) so that the spring length from retainer to washer does not exceed 1-1/32 inches. GREASE CONTACT FINGERS (5) WITH GREASE G.E. SPECIFICATION D50H28.

RENEWAL PARTS

When ordering renewal parts, address the nearest Sales Office of the General Electric Company, specifying the quantity required. The parts should be described and the complete nameplate data of the breaker should be given.

Renewal parts, which are furnished, may not be identical with the original parts since improvements are made from time to time. Parts which are furnished will be interchangeable.



1. Reset Button
2. Switch
3. Prop
4. Paddle
5. Latch Arm
6. Pin
7. Pin
8. Latch
9. Auxiliary Shaft
10. Clamp
11. Catch
12. Reset Rod
13. Adjusting Screw
14. Bracket

Fig. 14 Bell Alarm And Lockout Device

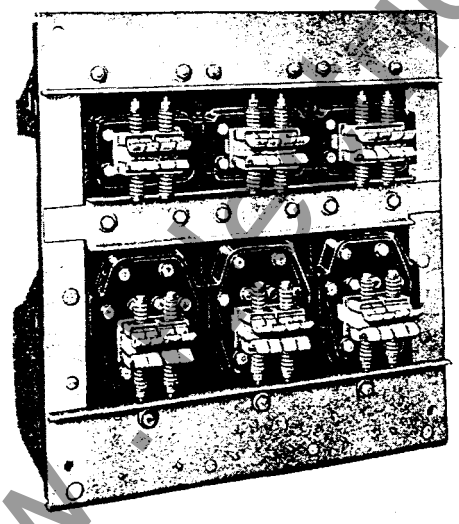
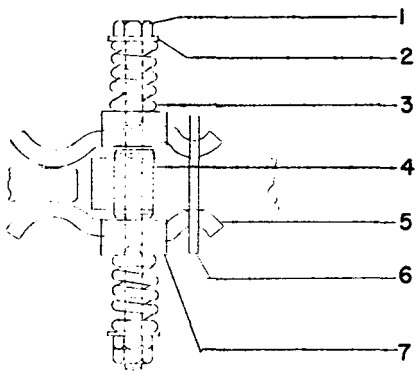


Fig. 15 Rear View Of Breaker, Showing Secondary Disconnects



1. Screw
2. Washer
3. Spring
4. Spacer
5. Contact Finger
6. Retaining Ring
7. Retainer

Fig. 16 Secondary Disconnect

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