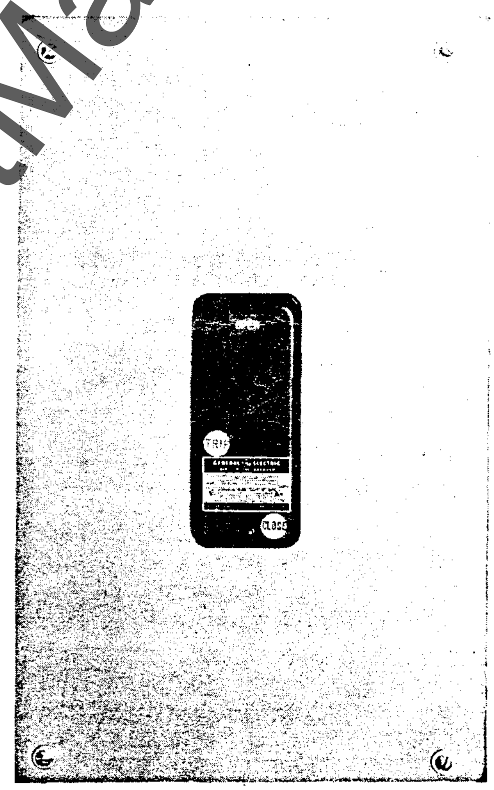
INSTRUCTIONS
MAINTENANCE

GEI-74603

SUPERSEDES GEH-1807B

POWER CIRCUIT BREAKERS



Types
AK-1-15 and AK-1-25
Electrically Operated

LOW VOLTAGE SWITCHGEAR DEPARTMENT

GENERAL ELECTRIC

PHILADELPHIA, PA.

CONTENTS

AIR CIRCUIT BREAKERS ELECTRICALLY OPERATED TYPES AK-1-15-3 THROUGH AK-1-15-10 AND AK-1-25-3 THROUGH AK-1-25-10

INTRODUCTION

The instructions contained herein provide information for performing maintenance procedures and for replacing AK-1-15/25 breaker components and accessories. For information regarding the receiving, handling, storage and installation of these breakers, refer to GEH-2021A, furnished with all AK breakers.

The AK-1-15 and AK-1-25 breakers differ, in that, the AK-1-25 has an extra contact per pole with corresponding differences in the upper stud and interrupter.

As various design improvements and new features were added, the suffix digit of the breaker type number was progressively increased. All of these models are essentially the same breaker, as changes were largely of a minor nature. These are tabulated as follows:

AK-1-15/25-3	Basic model.
AK-1-15/25-4	Improved "Y" relay in solenoid control system.
AK-1-15/25-6	Stationary primary disconnect and cable clamp redesigned. (Only enclosed breakers affected.)
AK-1-15/25-7	New type of front escutcheon and closing handle. Trip button relocated on escutcheon and reset lever of bell alarm and lockout breakers changed.
AK-1-15/25-8	EC-2 overload trip device used instead of the EC-1 device except on units requiring the short time delay feature.
AK-1-15/25-9	New drawout frame introduced.
AK-1-15/25-10	Improved "Y" relay in solenoid control system.

OPERATION

MANUAL

An electrical breaker may be equipped with a manual operating handle, thus providing both manual and electrical closing features. Breakers which are equipped with manual handles may be closed by rotating the handle 90° in the clockwise direction. Electrical breakers which do not have a manual operating handle may be closed by means of the manual maintenance handle furnished with the breaker. The closing mechanism automatically resets when the breaker trips, regardless of the type of breaker closing.

If the front escutcheon (9) Fig. 2 has been removed from the breaker, the maintenance handle can no longer be used. However, the breaker may still be closed manually by inserting a screw driver in the cam support as shown in Fig. 9, and then rotating its handle upwards and toward the top rear of the breaker.

The breaker may be tripped manually by means of the manual trip button in the front escutcheon (older model breakers in the manual operating handle), or automatically by any of the tripping devices with which it is equipped.

ELECTRICAL

The breaker is closed electrically by means of a push button, located on the front of the breaker, or by a remote switch. When the closing contact is made the x contactor becomes energized, thereby closing the x contacts and energizing the breaker closing solenoid, which causes the breaker to close. When the breaker closes, the prop switch causes the breaker closing solenoid to be de-energized.

The breaker may be tripped manually by pushing the manual trip button, which is located on the front escutcheon or automatically by any of the trip devices with which the breaker is equipped. The breaker mechanism will automatically reset when the breaker is tripped. The breaker is "trip free" from the closing mechanism, which assures that it cannot be closed as long as any trip device is functioning.

ELECTRICAL CONTROL CIRCUIT - Fig. 1

Figure 1 shows a typical elementary and connection diagram for the AK-1-15 and 25 breakers, with the breaker in the open position.

When normal voltage is supplied to the control curcuit, either by closing a remote switch or relay, or by the push button PB, the closing contactor coil X (9-10) will become energized through contacts BB (1-2) and Y (4-3). The X contacts will then close, sealing in the X coil through contact X (1-2) and energizing the breaker closing coil CC (1-2) through contacts X (3-4), X (6-5), and X (7-8). This causes the armature to move downward and the breaker to close, thereby opening the BB (1-2) contact and closing the BB (3-4) contact of the prop switch. Prop switch contact BB (1-2) opens the circuit to the X contactor coil (9-10), thus de-energizing the breaker closing coil CC (1-2) by opening contacts X (3-4), X (6-5), and X (7-8). Prop switch contact AA (3-4) will also energize the permissive relay Y (6-5), providing contact is maintained at the closing switch. The Y relay will in turn open its contact Y (4-3), thus holding open the X contactor coil circuit and providing the circuits anti-pump feature, as long as contact is maintained at the closing switch.

The breaker may be tripped electrically by a remote switch or relay which will energize the shunt trip coil TC (1-2) and trip the breaker. The trip impulse is interrupted by an "A" auxiliary switch contact (1-1C) which is connected in the shunt trip circuit.

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.

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

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

Always inspect the breaker after a short circuit current has been interrupted.

At the time of periodic inspection, the following checks should be made after the breaker has been de-energized.

1. Manually operate the breaker several times, check for obstructions or excessive friction.
2. Electrically operate the breaker several times to ascertain whether the electrical attachments are functioning properly.
3. Arc quencher (See Section on "Arc Quencher").
4. Contact condition, wipe, and pressure (See Section on "Pole Unit Assembly").
5. Latch engagement (See Adjustments under "Operating Mechanism").
6. Overcurrent device tripping (See Adjustments under "Series Overcurrent Tripping Device").

TOOLS

The tools listed below will adequately equip an operator for any maintenance operation on AK-1-15 and AK-1-25 breakers.

#1 Phillips Screw Driver
#2 Phillips Screw Driver with 8" shaft
#3 Phillips Screw Driver
K101-1/2 Crescent (Short) Screw Driver
K505-1/2 Crescent (Long Thin) Screw Driver
K306 Crescent (Standard) Screw Driver

H-28 8" Gas Pliers
654 Pointed Nose Side Cutting 6" Pliers
#2 Waldes Truarc Pliers Straight
#2 Waldes Truarc Pliers 90° Angle

Ratchet Socket Wrench 1/2" Drive
7/16" - 1/2" Drive Socket
9/16" - 1/2" Drive Socket
5/8" - 1/2" Drive Socket
3/4" - 1/2" Drive Socket
13/16" - 1/2" Drive Socket
15/16" - 1/2" Drive Socket
10" Extension Bar 1/2" Drive
6" Extension Bar 1/2" Drive

8" Adjustable End Wrench
1/4" - 5/16" (Blue Point) Open End Wrench
1/2" - 9/16" Open End Wrench

5/8" - 3/4" Open End Wrench
3/8" - 7/16" Open End Wrench
11/32" - 5/16" Open End Wrench

1/16" Allen Head Wrench for #6 Screw
5/64" Allen Head Wrench for #8 Screw
3/32" Allen Head Wrench for #10 Screw
1/8" Allen Head Wrench for 1/4" Screw
5/16" Straight Shank Allen Head Wrench for 3/8" screw, with adapter for 1/2" drive ratchet

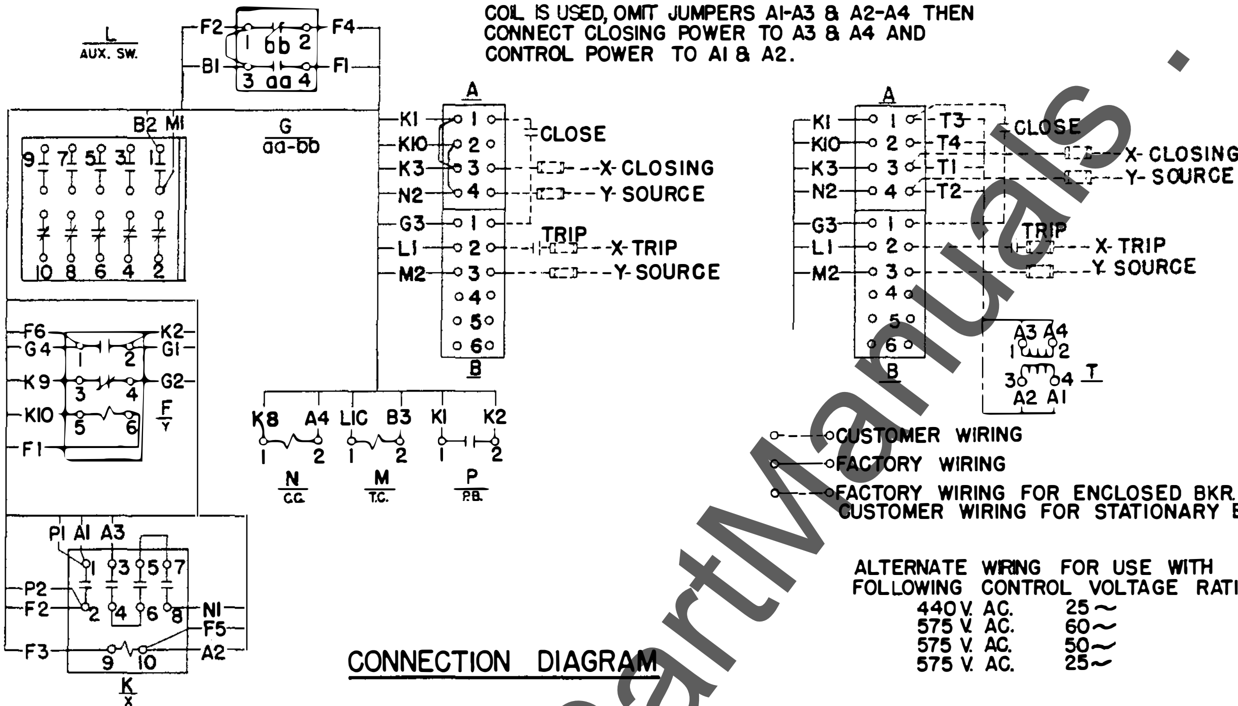
8 oz. Ball peen hammer

5/8" 6 point open box wrench

3/8" Spintite

NOTE: Obtain from local hardware, do not order on General Electric Company.

NOTE: WHEN SEPARATE POWER SOURCE FOR CLOSING COIL IS USED, OMIT JUMPERS A1-A3 & A2-A4 THEN CONNECT CLOSING POWER TO A3 & A4 AND CONTROL POWER TO A1 & A2.



CUSTOMER WIRING

FACTORY WIRING

FACTORY WIRING FOR ENCLOSED BKR. CUSTOMER WIRING FOR STATIONARY BKR.

ALTERNATE WIRING FOR USE WITH FOLLOWING CONTROL VOLTAGE RATING

440 V. AC.	25 ~
575 V. AC.	60 ~
575 V. AC.	50 ~
575 V. AC.	25 ~

CONNECTION DIAGRAM

LIST OF ABBREVIATIONS

A- TERMINAL BOARD LOCATED TOP RIGHT, FRONT VIEW.

B- TERMINAL BOARD-LOCATED UNDER-A.

F- ANTI-PUMP, PERMISSIVE RELAY.

G-(aa-bb)- MECHANISM SWITCH.

K-(X)- CLOSING CONTACTOR-3 SETS OF CONTACTS IN SERIES (MAIN) & 1 SET FOR SEAL-IN.

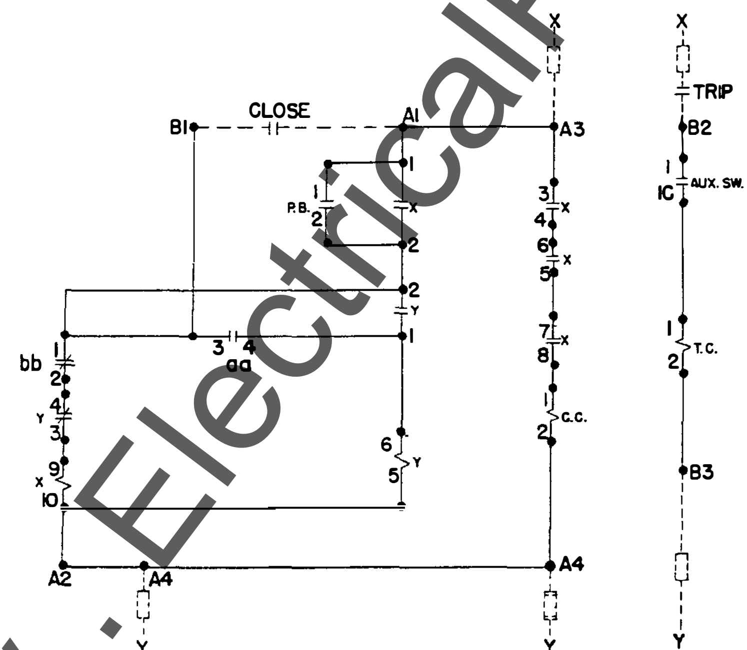
L-(AUX. SW.)- AUX. SW.-2"a" & 2"b" CONTACTS (STD.) OR 5"a" & 5"b" (SPECIAL).

M-(T.C.)-SHUNT TRIP DEVICE.

N-(C.C.)-SOLENOID CLOSING COIL.

P-(P.B.)-CLOSING SWITCH ON BREAKER.

T-TRANSFORMER.



ELEMENTARY DIAGRAM

Fig. 1 (215D185)

Fig. 1

LUBRICATION

In general, the circuit breaker requires moderate lubrication. Bearing points and latch surfaces should be lubricated at the regular inspection periods with a thin film of extreme temperature, high-pressure, light grease similar to G.E. Spec. No. 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.

At each inspection period, all silver to silver friction points, such as primary disconnects should be cleaned and given a fresh coat of G.E. Spec. No. D50H47 lubricant.

TROUBLE SHOOTING

The following table lists several typical symptoms of breaker malfunctions together with their causes and remedies. If, at any time, these symptoms are observed, their cause should be determined and the necessary corrective action should be taken.

TROUBLE SHOOTING

TROUBLE	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 at terminal connections 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 provide positive release of tripping latch.	Re-adjust or replace trip unit.
	Worn or damaged trip unit parts	Replace trip unit.
	Binds in overcurrent device.	Replace overcurrent device.
False Tripping	Overcurrent pick-up too low.	Change adjustment or replace with higher rated device.
	Overcurrent time-setting too short.	Change adjustment or replace with higher rated device.
	Bind in overcurrent device.	Replace 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 lubrication on bearing and latch surfaces.	Clean bearing and latch surfaces.
	Closing solenoid burned out.	Replace solenoid coil.
	Solenoid control device not functioning properly.	Re-adjust or replace device.

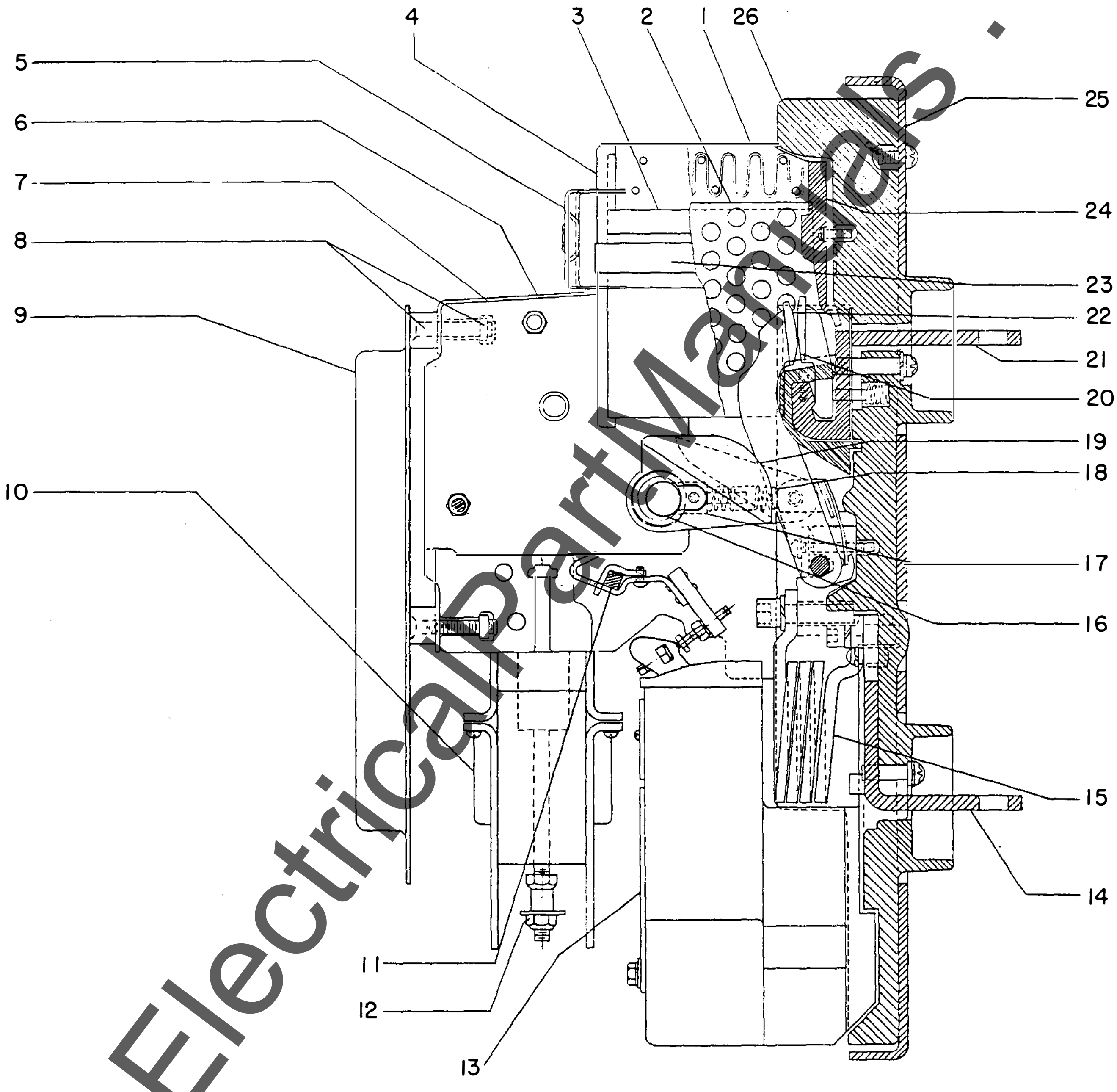
BASIC BREAKER COMPONENTS

ARC QUENCHER - FIG. 2

Each arc quencher has several compound inside barriers (2) containing a large number of perforations and two outside barriers (3) without perforations, as well as a front cap (4) and a rear support (24) held in place by a fiber strap (23). A clamp (5) is attached to the breaker base by two bolts. Clamp (5) holds all the arc quencher assemblies to their respective pole unit. A muffler (1) is located on top of the compound barriers. The compound barriers and the muffler, together with the slots between the barriers and the muffler, together with the slots between the barriers, serve to extinguish the arc.

The arc quenchers should be inspected at the regular inspection period. If the barriers are cracked or eroded to one-half their original thickness, they should be replaced.

Fig. 2 (215D170)



1. Muffler
2. Inside Barrier
3. Outside Barrier
4. Front Cap
5. Clamp
6. Strap
7. Operating Mechanism
8. Mounting Screw & Nut
9. Front Escutcheon
10. Hub
11. Trip Shaft
12. Stop Nut
13. Overcurrent Trip Device
14. Lower Stud
15. Series Coil
16. Main Shaft
17. Cap
18. Opening Spring
19. Insulating Link
20. Stationary Contact
21. Upper Stud
22. Movable Contact
23. Fiber Strap
24. Rear Support
25. Steel Base
26. Pole Unit Base

Fig. 2 Right Side View of Breaker

REPLACEMENT, FIG. 2

1. Remove clamp (5) by removing two bolts.
2. Unclasp fiber strap (23).
3. Remove front cap (4), muffler (1), outside barriers (3), inside barriers (2) and rear support (24).
4. Install new or disassembled parts in reverse order.

NOTE: In re-assembling the rear support (24) to the breaker, be sure and push the rear support toward the top of the pole unit so that the clearance in the rear support will accommodate the screwhead of the back plate.

POLE UNIT ASSEMBLY - FIG. 6

The contact assembly of each pole unit consists of a stationary and a movable contact subassembly.

The stationary contact assembly consists of parallel contact fingers (3) with silver alloy tips, the upper stud (20) and pins (4) with compression springs (19) which provide continuous contact pressure between the contact fingers and the upper stud (20). A shunt (21) is used to prevent pitting at the pivot point of the stationary fingers when carrying high momentary currents. The stationary contact fingers are held in place by the upper stud cap (6).

The movable contact assembly consists of parallel contact arms (5) with silver alloy tips, a contact carrier (18) with a spring (17) which provides continuous contact between the contact arms and pin (15). A clamp (14) secures pin (15) to the contact support (16). A flexible connection (12) is provided to prevent pitting at the pivot point of the movable contact arms when carrying high momentary currents.

The movable contact assembly is connected to the main shaft (16), Fig. 2, by an insulating link (7) which causes the contacts to move when the breaker is operated. Each movable contact assembly must exert a definite amount of contact pressure (see "Measuring Contact Pressure") against the stationary contacts when the breaker closes. During a closing operation, a definite amount of contact wipe must result, the distance which the stationary contacts are forced to the rear by the movable contact. (See "Measuring Contact Wipe"). At regular inspection periods both contact pressure and contact wipe should be checked.

MEASURING CONTACT PRESSURE - Fig. 6

1. Remove arc quencher (see "Replacement" under arc quencher).

2. With the breaker closed, place a push-type scale against the upper front end of the stationary contact tip (3).

3. Exert pressure against the push-type scale until the contacts just part. When the contacts first part the scale should read between 4 to 6 pounds. If the proper pressure is not indicated, (see "Adjusting Contact Wipe and Pressure").

4. Re-assemble parts in reverse order.

MEASURING CONTACT WIPE, FIG. 6

1. Remove arc quencher (see "Replacement" under Arc Quencher).
2. Measure the dimension between the inside surface of the pole base and top edge of the stationary contact tip (3), (a) with the breaker open, (b) with the breaker closed.
3. The difference between these two measurements should be within the limits of 3/32" and 1/4". If not within this range, the contact wipe must be adjusted.
4. With the breaker closed, the stationary contacts should have a minimum of 1/16" overtravel, measured at the contact tips, before reaching the limit of their movement in the direction of closing.
5. Replace arc quencher.

ADJUSTING CONTACT WIPE AND CONTACT PRESSURE" FIG. 6

1. Remove arc quenchers (see "Replacements" under Arc Quencher).
2. Remove tru-arc retaining ring from main shaft (16), Fig. 2, nearest the insulating link and contact assembly to be adjusted.
3. Loosen clamp (9) which secures eccentric bushing (8).
4. Turn the eccentric bushing in the insulating link (7) thereby moving the insulating link closer or farther away from the stationary contacts, as required to obtain proper wipe.
5. Reassemble parts in the reverse order after making adjustments.

NOTE: To adjust the insulating link in the center pole unit, first, push the main shaft through the right hand insulating link (7) and into the center insulating link as described in item 2 and 3 above. Opening spring (18), Fig. 2 and cap (17) Fig. 2, will drop out. Adjust center insulating link as described in step 4 above. Re-assemble parts in reverse order being careful to replace the opening spring and cap to their proper position.

If any of the contacts are badly corroded or pitted, thereby making it impossible to adjust for proper contact pressure or wipe, such stationary contacts or movable contact assemblies should be replaced. A commonly used "rule of thumb" is that contact replacement is indicated if less than one-half the original thickness (approx. 1/8 of an inch) of the contact tip material remains. See "Replacements" below.

If the proper contact pressure does not exist when the wipe is within its limits, the stationary contact springs (19) must be replaced.

REPLACEMENTS

Movable Contact Assembly, Fig. 6

1. Remove arc quenchers (see "Replacement" under "Arc Quencher").
2. Remove main shaft from breaker by removing tru-arc retainer from one end and pushing shaft through insulating links (7). (See Figs. 3 and 4.) As shaft clears the mechanism side frames, the opening springs and caps, (18) and (17) Fig. 2, will probably drop out of their recesses in the side frames. If the breaker is of the drawout type, handle socket, interlock lever, bushing and nut must be removed on the side from which the main shaft is to be removed.
3. Remove the upper mechanism mounting screws (Refer to Fig. 3).
4. Loosen lower mechanism mounting screws by using screw driver in slot provided on threaded end of screw which projects through back frame of breaker. (See Fig. 5.)
5. Mechanism and attached components may now be lifted clear of the breaker. If breaker is of the drawout type, movement of the mechanism will be somewhat restricted by control wires. There will be enough freedom, however, to allow the mechanism to be lifted to the top of the drawout frame, or on later model breakers, to the top of the pole base, where it should be secured by tying.
6. Remove insulating link (7) by removing tru-arc and drifting out pin (11).
7. Remove clamps (14) by removing fastening hardware.
8. Remove series coil terminals bolts. Movable contact unit is now free and may be removed.
9. Breaker may now be reassembled with new contact assembly by reversing the above described procedure. In remounting mechanism, be sure that dowels in mechanism side frames are well seated in dowel holes in the pole unit base. (See Fig. 7.) It will also be necessary to compress the opening spring and cap in the recess in the mechanism side frame in order to obtain clearance for replacement of the main shaft.
10. Check contact wipe and pressure and adjust if necessary.

Stationary Contact (3) Fig. 6

1. Remove arc quencher (see Replacements" under Arc Quencher).
2. Remove upper stud cap (6) by removing two holding screws threaded through the top of the cap.
3. Pry the stationary contacts (3) from upper stud (20) with a screw driver as shown in Fig. 7. Stationary contacts of the outer poles are readily accessible. On the center pole, it is recommended that the mech-

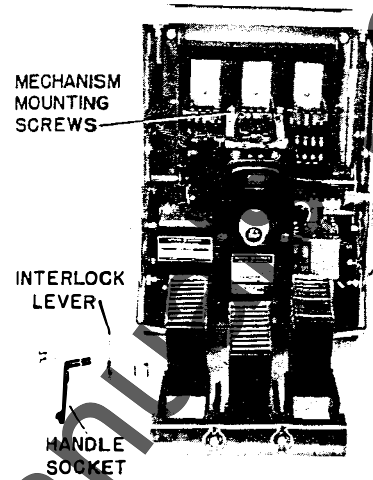


Fig. 3 Arc Quenchers and Handle Socket Removed from Drawout Breaker

Fig. 3 (8)18918

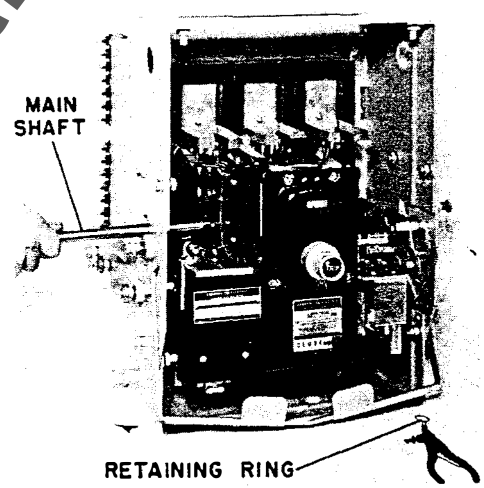


Fig. 4 Removal of Main Shaft from Drawout Breaker

Fig. 4 (8018937)

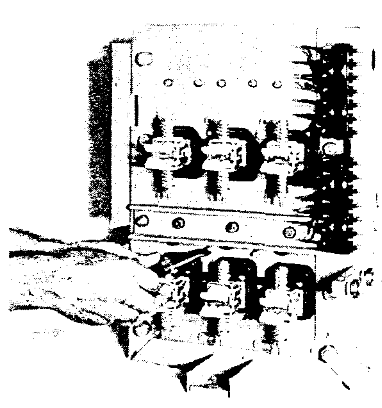


Fig. 5 Loosening Lower Mechanism Mounting Bolts

Fig. 5 (8018941)

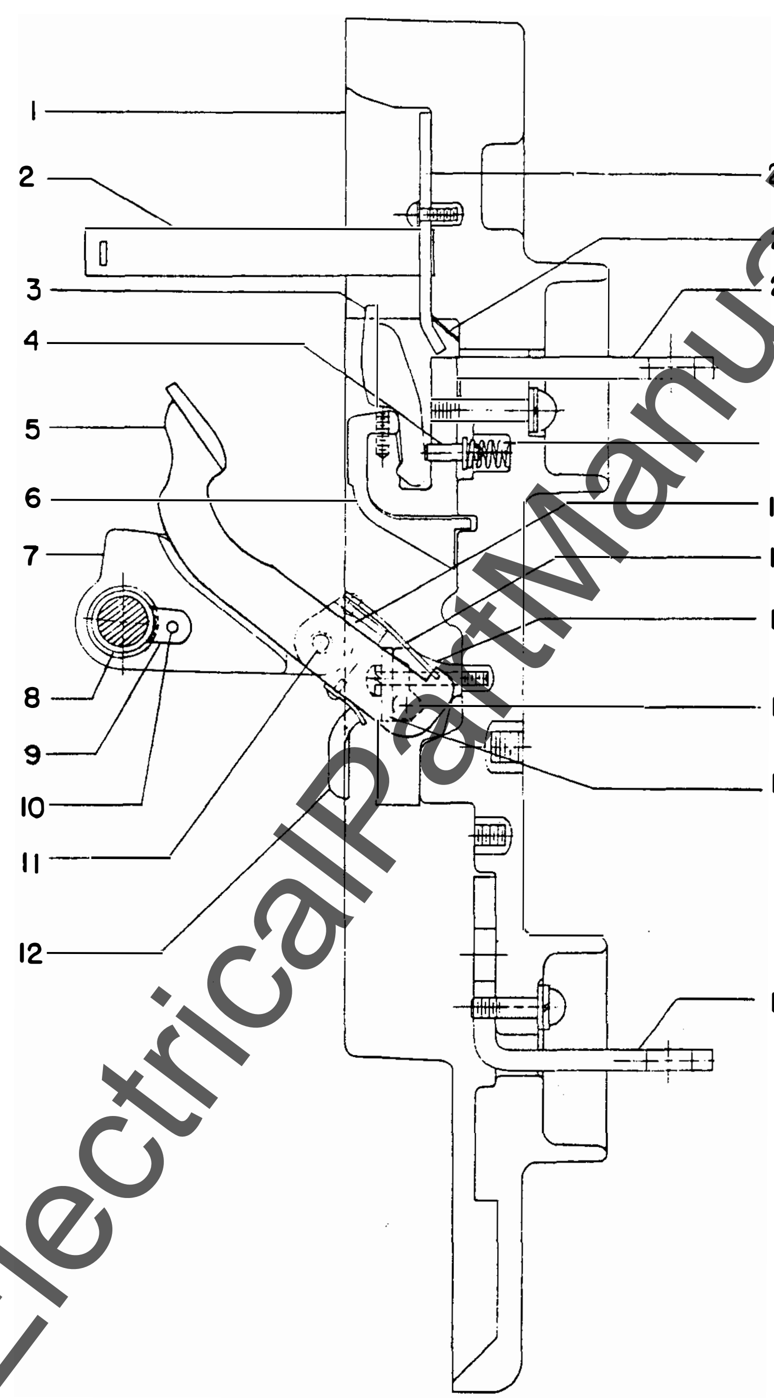


Fig. 6 (P-6423664)

1. Pole Unit Base
2. Fiber Strap
3. Stationary Contact
4. Contact Pin
5. Movable Contact Arm
6. Upper Stud Cap
7. Insulating Link
8. Eccentric Bushing
9. Clamp
10. Screw
11. Pin
12. Flexible Connection and Terminal
13. Lower Stud
14. Clamp
15. Pin
16 Contact Support
17. Spring
18. Contact Carrier
19. Spring
20. Upper Stud
21. Shunt
22. Steel Plate

Fig. 6 Pole Unit Assembly

anism be removed to facilitate removal of the stationary contacts. Refer to steps 1 to 5 of the procedure for "Replacing Movable Contacts."

4. Replace the new stationary contact in reverse order. (It may be necessary to tap the new stationary contact into place by using a rawhide mallet).
5. Adjust contact wipe and contact pressure (see above).

OPERATING MECHANISM

WITHOUT CLOSING HANDLE - Fig. 9

The operating mechanism is supported between two molded side frames in front of the center pole unit. It consists of a toggle linkage (19), crank (5), latch (15), trip shaft (12), roller (6), closing links (1), and armature (14).

When the coil (8) is energized it pulls armature (14) downward, which through closing links (1), causes the toggle linkage (19) to straighten. This motion causes the main shaft (18) and movable contacts to move to the closed position. As soon as the toggle linkage is straightened the prop (23) moves on top of prop pin (20) and roller (6) moves on latch (15) thereby holding the mechanism in the closed position. The motion of the prop (23) causes switch (25) to operate, thus de-energizing the closing coil.

The breaker mechanism is tripped by rotating the trip shaft (12), and releasing latch (15) which causes the toggle linkage to collapse, thereby allowing the opening springs (17) to push the main shaft and movable contacts forward to the open position. Trip latch (15) is automatically reset during the opening operating providing none of the trip devices are actuated. Latch adjusting screw (9) limits the rotation of the trip shaft (12) and thus determines the amount of latch engagement.

To operate the breaker manually see section titled "Manual" under "Operation".

Adjustments, Fig. 9

Latch (15) is adjusted to provide approximately 5/64" engagement between latch and roller (6). To adjust for proper latch engagement, follow the procedure described below:

1. Loosen locknut on adjusting screw (9).
2. Hold breaker contacts in a position in which the movable contacts are just touching the stationary contacts. This may be done by any of the provided means of manual closing.
3. Turn down adjusting screw (9) until breaker trips open. Normally the force required to rotate the trip shaft is small enough so that the spring on the buffer paddle (10) is not noticeably deflected. If any deflection is observed while turning down the screw, back off screw until spring returns, then turn down screw again. If deflection persists, check trip shaft for binds.
4. Mark position of adjusting screw head.
5. Repeat steps 2 and 3 and check position of adjusting screw in relation to marked position.

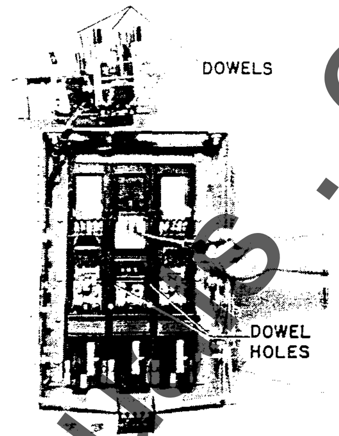


Fig. 7 Removal of Stationary Contacts

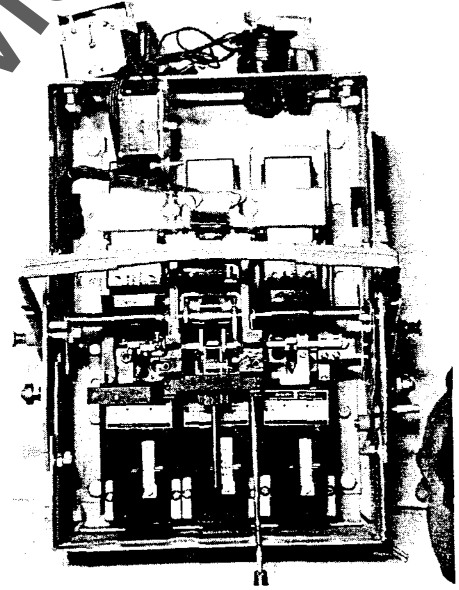


Fig. 8 Dismounting Upper Section of Magnet

6. If adjusting screw is in the same position as it was in the first tripping, back off the screw 3 full turns and tighten locknut. If it is not, repeat steps 2 and 3 until a constant tripping position is determined before backing off the three turns and locking. This check is necessary to avoid a false setting due to accidental tripping.
7. Operate the breaker electrically several times to make sure that the mechanism functions correctly.

With the breaker open, the stop nut (13) should be adjusted so that there is approximately 1/16" clearance between the bottom of the magnet and the upper stop nut. This will restrict linkage movement in tripping but allow enough movement for the mechanism to reset.

Fig. 7 (8018942)

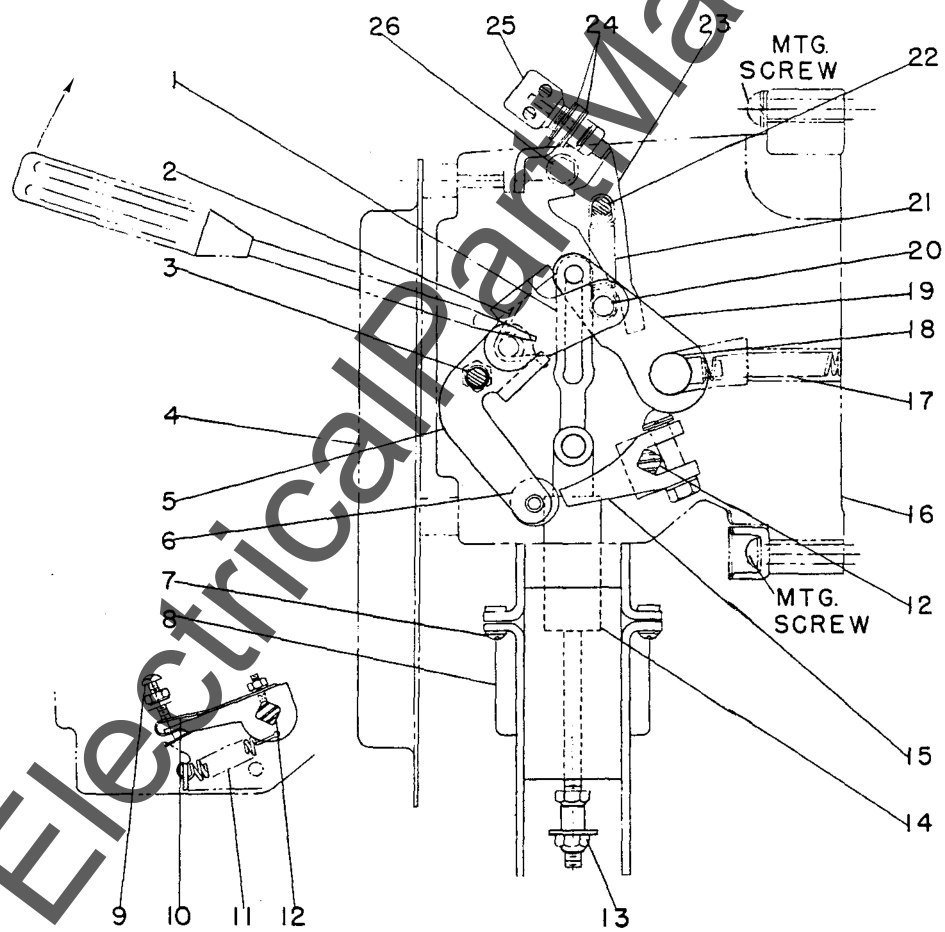
Fig. 8 (8018924)

Replacements, Fig. 9

Mechanism

NOTE: If a reasonable amount of care is exercised when replacing the mechanism, wiring lead connections will not be overstressed and need not be disconnected during the disassembly procedure. The electrical accessories may be tied up out of the way of the operator. If leads are disconnected, they should be marked to avoid incorrect connection.

1. Remove arc quenchers (see "Replacement" under "Arc Quencher").
2. Remove escutcheon (4).
3. If breaker is supplied with a terminal block, dismount block by removing two screws in back which fasten it to the supporting bracket.
4. Remove shunt trip supporting bracket by taking out the two screws which fasten it to the mechanism side frame. The nuts for these screws are loosely held in the recess on the inner side of the frame. If breaker is supplied with an undervoltage device, this also will be dismounted since it is held by the same supporting bracket.
5. If breaker is supplied with a closing switch, dismount switch base by removing two screws (10), Fig. 13.
6. Remove solenoid control device cover.
7. Remove X contactor and Y relay together, first removing two screws securing Y relay to arm which projects from magnet, then loosening the three screws which fasten the X contactor to the supporting arms. Both devices can then be removed by lifting slightly and moving towards front of breaker.



1. Closing Link	8. Coil (Solenoid)	13. Stop Nut	20. Pin
2. Cam Return Spring	9. Trip Shaft Adj. Screw	14. Armature	21. Reset Spring
3. Hold in Post	10. Buffer Paddle	15. Latch	22. Prop Pin
4. Escutcheon	11. Trip Shaft Ret. Spring	16. Mech. Frame	23. Prop
5. Crank	12. Trip Shaft	17. Opening Spring	24. Locknuts
6. Roller		18. Main Shaft	25. Switch (Prop)
7. Screw		19. Toggle Link	26. Screw

Fig. 9 Operating Mechanism Without Operating Handle

Fig. 9 (242C607)

the X contactor from operating. This feature makes it impossible to operate the closing solenoid when the breaker is already closed. It also provides for cut-off of the closing solenoid and anti-pump operation.

ADJUSTMENTS - FIG. 9

The only adjustment required for this system is on the prop switch (25). To make this adjustment proceed as follows:

1. Press the trip button in the front of the breaker.
2. Maintain pressure on the trip button and at the same time close the breaker with the maintenance operating handle.
3. The prop switch (25) should operate just before the armature (14) reaches the end of its stroke. To obtain this adjustment move the prop switch toward or away from the prop (23). Moving the switch too close to the prop can result in damage to the switch if its operating button is forced to travel beyond the limit of its movement. It is also possible, in this case, for the switch not to toggle when the breaker closes. (When the breaker closes, the prop moves away from the switch and the button is extended). This would leave the bb contacts closed with the breaker closed, and burn out the contactor and closing solenoid coils. If, on the other hand, the switch is too far away from the prop, it is possible for the bb contacts to remain open when the breaker is open. This would make it impossible to close the breaker electrically. This condition could also result in false tripping even though the switch may operate, since the thrust of the switch button is depended upon to move the prop into position and hold it in place on breaker closing operations.

REPLACEMENTS - FIG. 14

Y Relay and Coil - Fig. 14

1. Remove relay cover by removing two cover screws.

2. Disconnect wiring from front of relay (8) by loosening terminal screws.

3. Remove two screws (1) which fasten relay frame (2) to upper extension of magnet frame.

4. The relay and its frame are now free of the breaker.

5. With the relay (8) removed, the coil may now be removed by removing two small cotter keys at rear of relay frame.

6. Remove small spring at rear-center of relay frame.

7. Remove coil mounting screw (9) from center of coil. The coil may now be removed.

8. Install new coil or relay in reverse order.

X Contactor - Fig. 14

1. Perform steps 1 and 2 of "Replacing Y Relay and Coil".

2. Remove three mounting screws (3) which fasten the X contactor to magnet frame extensions.

3. The X contactor is now free from the breaker. Install new X contactor in reverse order.

X Contactor Coil

1. The X contactor coil may be removed without removing the X contactor by first disconnecting wiring from X contactor terminal screws (5).

2. Remove two hex. shaped posts (4). The coil is now free of its mounting.

3. Remove screw (7) which fastens the armature to the movable contacts. The coil is now completely removed.

4. Install new coil in reverse order.

Prop Switch (25), Fig. 9

1. Remove wiring.
2. Remove locknuts (24) from switch.
3. Replace switch in reverse order.

CLOSING SOLENOID, FIG. 9

The closing solenoid is located directly below the operating mechanism. It consists of a coil (8), a magnet, an armature (14), and four closing links (1).

The closing solenoid is connected in series with the main contacts on the X contactor and is energized or de-energized when these contacts are closed or opened, respectively. When the closing solenoid is energized, its armature (14) is drawn downward into the coil (8) pulling the four closing links (1) in the same direction. This action straightens the toggle linkage (19), of the operating mechanism, thereby closing the breaker. As the operating mechanism moves into the closed position, the prop switch (25) operates, causing the X contactor coil and breaker closing coil (8) to be de-energized.

ADJUSTMENT - FIG. 9

The stop nut (13) should be set so that there is approximately 1/16" clearance between the nut and the magnet when the breaker is in the open position. This adjustment is required in order to allow the mechanism linkage to reset.

REPLACEMENTS, FIG. 9

Closing Solenoid

1. Remove the X contactor and Y relay (see "Replacements" under Solenoid Control System).
2. Remove stop nut (13).
3. Remove four screws (7) which attach lower part of magnet to upper part of magnet.
4. Remove two screws (see Fig. 8) which attach upper part of magnet to the two side frames of the operating mechanism.

5. Install new closing solenoid in reverse order.

Coil (8) - Fig. 9

1. Remove lower member of magnet as described in steps 1 to 3 of "Closing Solenoid Replacement".

2. Remove wiring to coil (8) by disconnecting one lead at the X contactor and cutting the other lead three to four inches from coil.

3. Remove brass coil guides and the coil may now be removed.

4. Install new coil in reverse order.

PROTECTIVE DEVICES

An AK-1-15 or AK-1-25 breaker may be equipped with any combination of the following protective devices:

1. Overcurrent trip
2. Reverse Current trip
3. Undervoltage trip

TIME DELAY UNDERVOLTAGE TRIPPING DEVICE - FIG 15

This device is mounted to a bracket on the right 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 a predetermined 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 minimum time delay of 3 seconds. When the spring overcomes the restraining force of the oil the armature engages screw (20) thus rotating the trip shaft and opening the breaker.

ADJUSTMENTS - Fig. 15

1. An adjusting screw (20) in the trip paddle (22) is used to adjust for "positive tripping". The overtravel of the trip paddle from the point of tripping the breaker should be 1/32 to 1/16 inch, which may be visually observed when making this adjustment.

2. The armature pick-up is a function of the open air gap of the armature. The air gap is factory set by means of adjusting screw (2) so that the

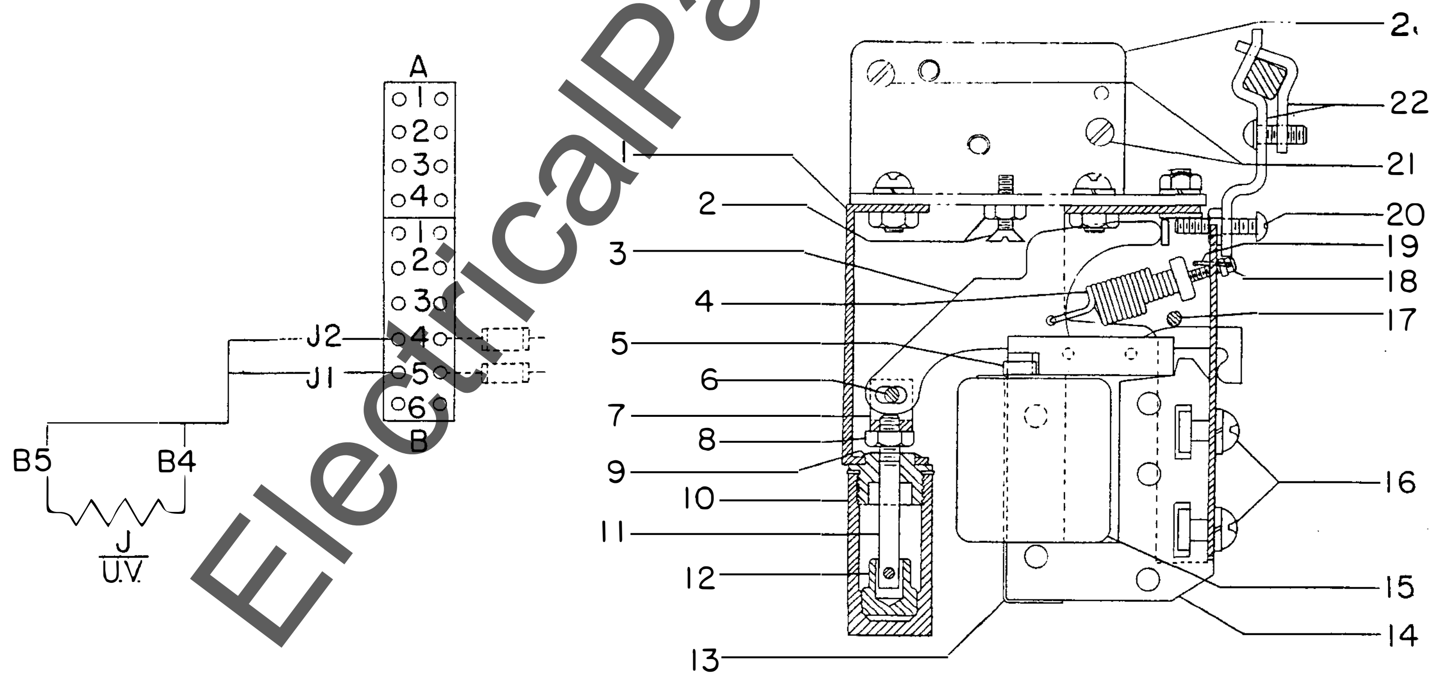


Fig. 15 (215D177)

1. Bracket
2. Adjusting Screw and Nut
3. Armature
4. Spring
5. Shading Ring
6. Pin
7. Clevis
8. Locking 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
23. Supporting Bracket

Fig. 15 Time Delay Undervoltage Tripping Device

armature will pick-up at 80% of rated voltage. In order to make this adjustment in the field a variable voltage source is required. The air gap should be increased if pick-up occurs at less than 80% of rated voltage and decreased if pick-up occurs at more than 80%.

3. A calibration spring (4) attached to adjusting screw (18) extablishes the drop-out value of voltage which results in breaker tripping. This is largely a factory adjustment, the drop-out value being 30 to 60% of rated voltage.

4. The time-delay of the device may be varied somewhat by changing the relative positions of the connecting rod (11) and clevis (7). This is accomplished by loosening the locking nut (8) then raising or lowering the plunger (12) by turning the connecting rod (11) which is threaded into the clevis (7). When any time-delay of 3 to 10 seconds exists from loss of voltage, the device is considered satisfactorily adjusted.

5. From 1/4 to 3/8 inch of oil should be maintained in the cylinder (10) at all times. In order to make an inspection of the oil, the cylinder may be unscrewed from the cap (9). Use a silicone oil, such as, G.E. 9981LT40NV or similar, in the cylinder.

REPLACEMENTS, FIG. 15

Coil

The only part of the undervoltage device that is likely to require replacement during the life of the breaker is the coil (15). The replacement procedure follows:

(Note:- It is advisable to replace the magnet and coil assembly as nearly as possible in its exact original position in relation to the device frame. Doing this will result in having the same open air gap between armature and magnet and will insure the device's picking up at the same voltage value).

1. Disconect coil leads.
2. Remove two screws (16), freeing magnet (14) and coil (15) from device. (It may be more convenient to remove the entire device from its supporting bracket (23) before removing the magnet and coil. If the device is of the time-delay type, bracket (1) will also have to be removed from bracket (23).
3. Straighten laminations which were bent to hold shading ring (5) in place.
4. Removing shading ring (5).
5. Straighten end of coil clamp (13).
6. Remove coil, install new coil, and reassemble device by reversing disassembly procedure.

Device

If the entire device is replaced, simply remove the hardware fastening the frame of the device to supporting bracket (23). If a time-delay device, bracket (1) must also be removed from bracket (23).

INSTANTANEOUS UNDERVOLTAGE TRIPPING DEVICE

This 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 locking nut (8), as shown in Fig. 15 are omitted.

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

OVERCURRENT TRIPPING DEVICES

The typical overcurrent trip device consists of a magnetic structure, a series current coil, and a pivoted armature. Depending on the type of individual device, the movement of the armature may be delayed by a timing device, of either the oil dashpot or escapement gear and pallet type.

An AK-1-15/25 breaker may be equipped with either the EC-2 or EC-1 overcurrent trip device. The majority of applications will require the use of the EC-2 device. The EC-1 device is normally used when the short-time delay feature is required, or when the trip device is used to operate a special overcurrent alarm switch.

Most circuit breakers are equipped with series overcurrent trip devices either of the dual magnetic type (instantaneous and time delay tripping) or instantaneous alone. Breakers are designed to carry up to 100% of the continuous current rating of their trip devices. Any attempt to carry higher currents for a prolonged period will cause overheating and possible damage.

EC-2 DEVICE

The EC-2 overcurrent tripping device is available in three forms:

1. Dual overcurrent trip, with long-time delay and high-set instantaneous tripping.
2. Low-set instantaneous tripping.
3. High-set instantaneous tripping.

The dual trip has adjustable long-time and instantaneous pick-up setting and adjustable time settings. Both forms of instantaneous trips have adjustable pick-up settings.

DUAL OVERCURRENT TRIP, WITH LONG-TIME DELAY AND HIGH-SET INSTANTANEOUS TRIPPING.

By means of the adjustment knob (5), Fig. 16, which can be manipulated by hand, the current pickup point may be varied from 80 to 160 percent of the series coil rating. The indicator and a calibration plate (4), Fig. 16, on the front of the case provide a means of indicating the pick-up point setting in terms of percentage of coil rating. The calibration plate is indexed at percentage settings of 80, 100, 120, 140 and 160.

The long-time delay tripping feature can be supplied with any one of three time-current characteristics which correspond to the NEMA standards maximum, intermediate and minimum long-time delay operating bands. These are identified as 1A, 1B and 1C characteristics, respectively. Approximate tripping time for each of these, in the same order are 30, 15 and 5 seconds at 600% of the pickup value of current. (See time-current characteristic curves 286B201A, B and C).

TIME ADJUSTMENT - Fig. 17

The tripping time may be varied within the limits shown on the characteristic curves (Fig. 19) by turning the time adjustment screw (5). Turning in a clockwise direction increases the tripping time; counterclockwise decreases it. The dashpot arm (7) is indexed at four points, max. - 2/3 - 1/3 - min. from left to right, as viewed in Figs. 17 and 18. When the index mark on the connecting link (8) lines up with the indicated mark on the dashpot arm, the approximate time as shown by the characteristic curve is indicated. Fig. 19 shows typical time-current curves for the EC-2 and EC-1 tripping devices. The 1A and 1B characteristic devices are usually shipped with the time setting at the 2/3 mark and the 1C characteristic at the 1/3 mark. The standard characteristic curves are plotted at the same setting.

Time values are inversely proportional to the effective length of the dashpot arm. Therefore, the linkage setting that give the shortest time value is the one at which dimension "A", Fig. 17, is greatest. The time adjustment screw (5), may be turned by inserting a Phillips head screwdriver through the hole in the front of the case, but if it is desired to relate the linkage setting to the index marks on the linkage it will be necessary to remove the case. This may be done by removing the two mounting screws, one on each side of the case, which may be taken off without disturbing the trip unit itself.

NOTE: Forcing the adjusting screw to either extreme positon may cause binding of the device and should be avoided.

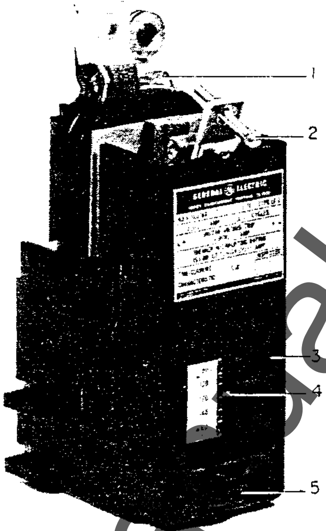
INSTANTANEOUS-LOW-SET TRIPPING - FIG. 16

The low-set instantaneous pick-up point may be varied by the adjustment knob (5). The calibration in this case usually ranges from 80% to 250% of the series coil rating, the calibration plate being indexed at values of 80%, 100%, 150%, 200% and 250% of the coil rating.

INSTANTANEOUS-HIGH-SET TRIPPING - FIG. 17

The high set instantaneous pick-up value may have one of the following three ranges: 4 to 9 times coil rating; 6 to 12 times coil rating or 9 to 15 times coil rating. The pick-up setting may be varied by turning the instantaneous trip adjusting screw (4).

Three standard calibration marks will appear on the operating arm at (9), and the value of these



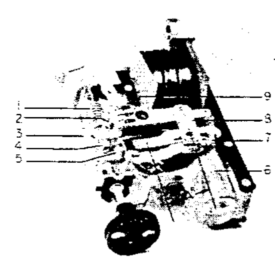
1. Series Coil
2. Trip Adjustment Screw
3. Opening for Time Adjustment
4. Pickup Indicator & Calibr Plate
5. Pickup Adjustment Knob

Fig. 16 EC-2 Overcurrent Trip

calibration marks will be indicated by stampings on the arm as follows:

4X		6X		9X
6.5X	or	9X	or	12X
9X		12X		15X

At the factory, the pick-up point has been set at the nameplate value of the instantaneous trip current. (Usually expressed in times the ampere rating of the trip coil.) The variations in pick-up setting is accomplished by varying the tensil force on the instantaneous spring (1). Turning the adjustment screw (4) change the position of the movable nut (2), on the screw. The spring



1. Instantaneous Calibration Spring
2. Movable Nut (Index Pointer)
3. Time-Delay Calibration Spring
4. Instantaneous Pickup Adjustment Screw
5. Time-Delay Adjustment Screw
6. Oil Dashpot
7. Dashpot Arm
8. Connecting Link
9. Instantaneous Pickup Calibration Marks

Fig. 17 EC-2 Overcurrent Trip with Cover Removed

Fig. 16 (6024842)

Fig. 17 (6024843)

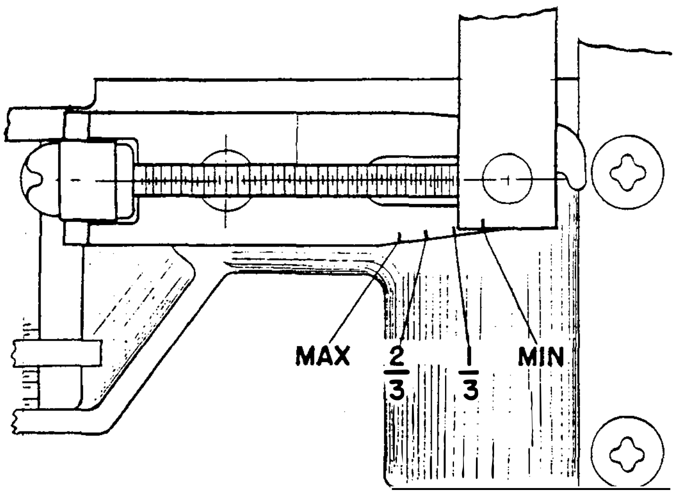


Fig. 18 Time-Adjustment Indexing

is anchored to this movable nut so that when the position of the nut is changed, there is a corresponding change in the spring load. As the spring is tightened, the pick-up point is increased. The top edge of the movable nut (2), serves as an index pointer and should be lined up with the center of the desired calibration mark, punched slots on operating arm, to obtain the proper instantaneous trip setting.

ADJUSTMENTS, EC-2 - FIG. 16

In addition to the pick-up settings and time-delay adjustments already described, overcurrent trip devices must be adjusted for positive tripping. This adjustment is made at the factory on new breakers, but must be made in the field when the breaker mechanism or the overcurrent trip devices have been replaced.

Positive tripping is achieved when adjustment screw (2), is in such a position that it will always carry the trip paddle on the trip shaft beyond the point of tripping the breaker when the device armature closes against the magnet.

In order to make the adjustment, first unscrew trip adjustment screw (2), until it will not trip the breaker even though the armature is pushed

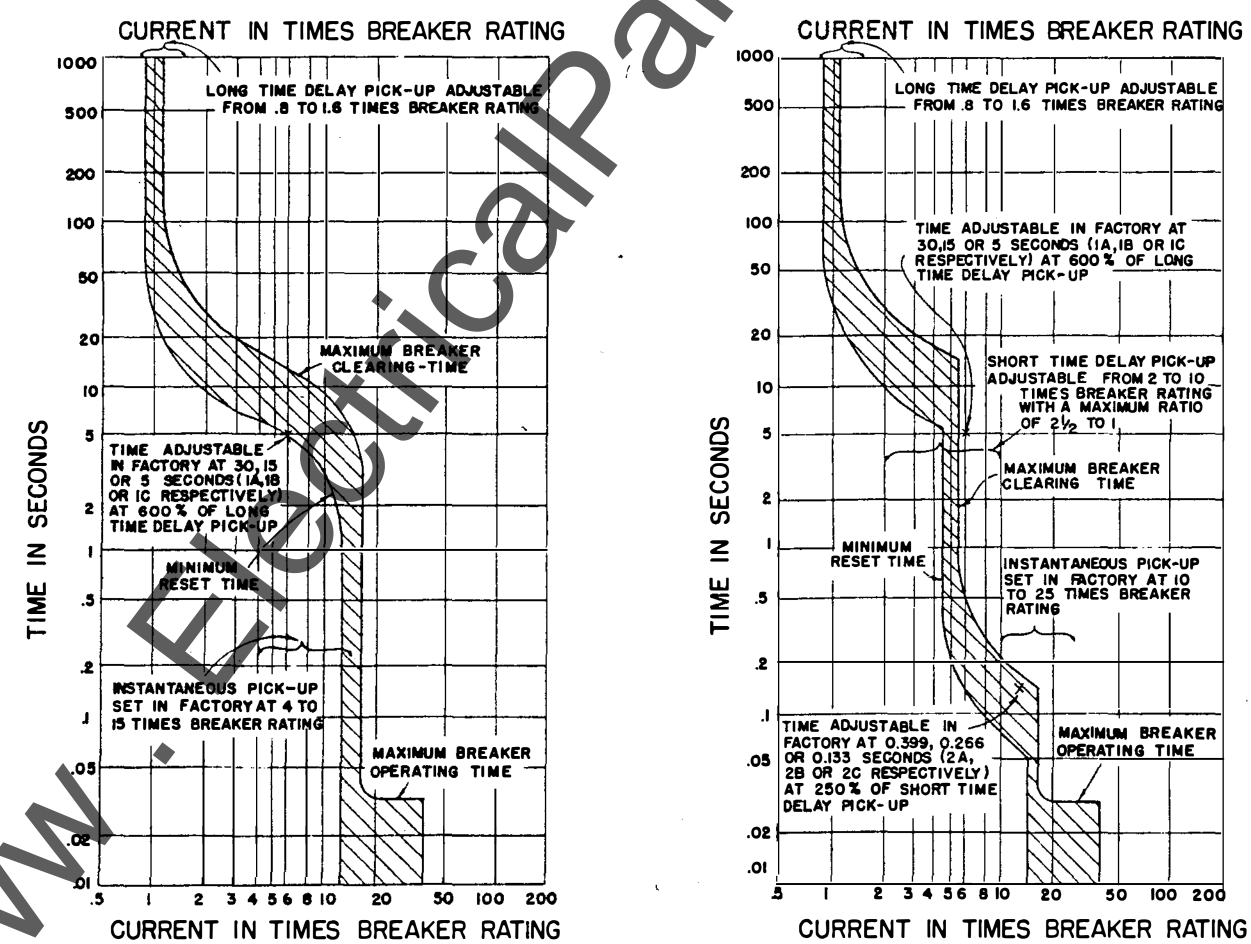


Fig. 19 Typical Time-Current Characteristic of Series Overcurrent Trip Device in 25° C Ambient

Fig. 18 (417A464)

Fig. 19 (215D182)

against the magnet. Then, holding the armature in the closed position, advance the screw until it just trips the breaker. After this point has been reached, advance the screw two additional full turns. This will give an overtravel of 1/16 of an inch and will make sure that activation of the device will always trip the breaker.

Adjustment screw (2), can best be manipulated by an extended 1/4 inch hex socket wrench.

In order to gain access to the adjustment screw of the center pole overcurrent device, it will be necessary to remove the operating mechanism and attached components as a complete unit. To remove the mechanism, follow the first five steps of "Replacement - Movable Contact Assembly" under Pole Unit Assembly".

REPLACEMENT, EC-2

Replacement of the EC-2 overcurrent trip device is accomplished by the following procedure:

1. Remove the mechanism as a complete unit as described in the first five steps of "Replacement - Movable Contact Assembly" under "Pole Unit Assembly".

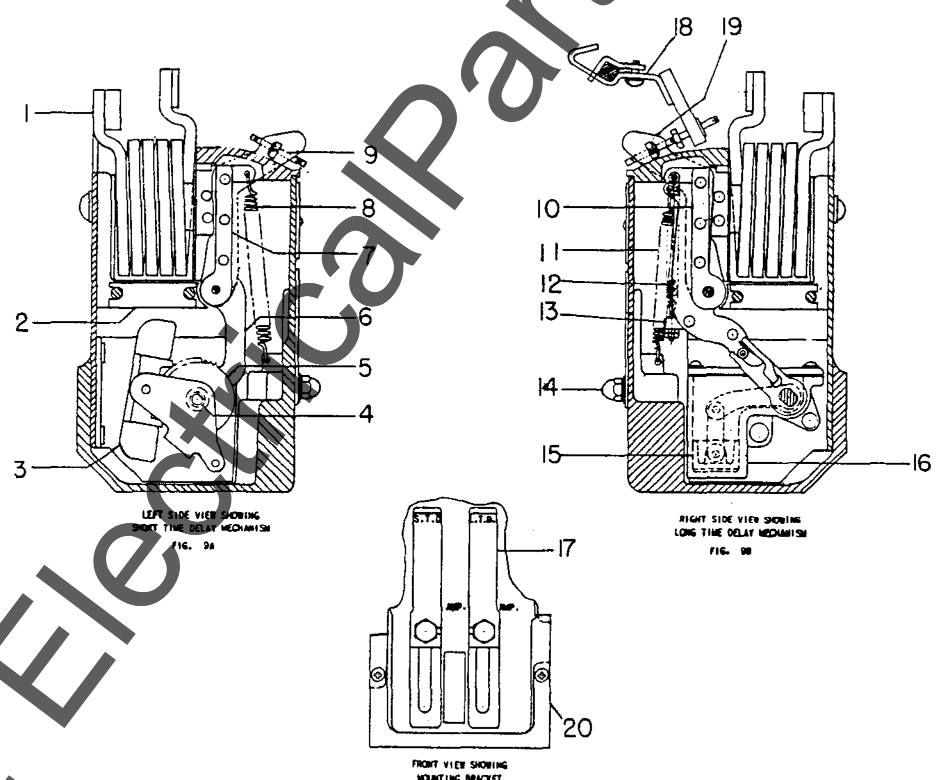
2. Remove the steel clamps which fasten the cover of the device to the back of the breaker. NOTE: Pickup settings on the cover of each device are calibrated for the specific device. When replacing covers, replace on associated device.

3. Using a 5/16 inch Allen Head Wrench, remove the 3/8 inch bolts which fasten the coil of the overcurrent device to the breaker copper.

4. Remove the round head screw which fastens the frame of the overcurrent device to the breaker base.

5. After reassembling breaker with new overcurrent device, adjust for "positive trip" as described under "Adjustments" of this section.

NOTE: When replacing an EC-1 device with an EC-2, or vice versa, it will be necessary to replace the trip paddles on the trip shaft. These will be provided with the replacement trip units.



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 Paddle Adjusting Screw
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 Arm
20. Clamping Bracket

Fig. 20 Type EC-1 Series Overcurrent Tripping Device

Fig. 20 (256C884)

EC-1 DEVICE

The EC-1 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 only.

(a) Adjustable (Low set)
Or
Nonadjustable (High set)

SHORT TIME DELAY TRIPPING, FIG. 20

The armature (7) is retained by calibrating spring (8). After the magnetic force, produced by an 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 in the left side view of Fig. 20.

The pickup for this device can be field set between limits having a ratio of 2-1/2 to 1 in the range of 200 to 1000% of the coil rating.

LONG TIME DELAY TRIPPING, FIG. 20

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 a flow of silicone oil in a dashpot, which produces an inverse time delay characteristic. The mechanism is shown in the right side view of Fig. 20.

INSTANTANEOUS TRIPPING, FIG. 20

(a) Adjustable instantaneous tripping takes place after the magnetic force produced by an overcurrent condition, overcomes the restraining force of the adjustable calibration spring (11).

(b) Nonadjustable instantaneous tripping takes place after the magnetic force produced by an overcurrent condition overcomes the restraining force of a nonadjustable calibration spring (12).

SELECTIVE TRIPPING

Selective overcurrent tripping is the application of circuit breakers in series so that only the circuit breaker nearest the fault opens. Any one or combination of two or more of the preceding over-current devices may be used in a selective system. The breaker having the shorter time setting and lower pickup will trip before the breaker having the longer setting and higher pickup, provided the fault is on the part of the line protected by the breaker having the lower setting.

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

ADJUSTMENTS - EC-1 - Fig. 20

The EC-1 device may be adjusted for positive tripping by following the same procedure described above for the EC-2 device and using adjusting screw (9).

REPLACEMENT - EC-1

When replacing the EC-1 device, refer to the section entitled "Replacement" under EC-2 device.

REVERSE CURRENT TRIPPING DEVICE - FIG. 21

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

The reverse current tripping device consists of a series coil (1) with an iron core mounted between two pole pieces (7), also a potential coil (4) connected across a constant source of voltage and mounted around a rotary-type armature (6). Calibration spring (3) 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 (9) attached to a bearing plate on the right side of the device.

If the current through the series coil (1) is reversed, the armature (6) tends to move in the clockwise direction against the restraint of the calibration spring (3). When the current reversal exceeds the calibration setting, the armature revolves clockwise causing the trip rod (2) to move upward engaging the trip paddle adjusting screw (15) thereby tripping the breaker.

ADJUSTMENTS - Fig. 21

The only field adjustment that should be required on the reverse current device is that of "positive tripping", which is the amount of overtravel of the trip rod (2) beyond the point of tripping the breaker. Proper overtravel is provided, if the trip rod (2) advances the trip paddle (14) 1/32 to 3/64 inch beyond the point of tripping the breaker. To adjust for "positive tripping", proceed as follows:

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

1. Manually lift the trip rod (2) as high as possible and turn the adjusting screw (15) into the trip paddle (14) until it will not touch the trip rod and trip the breaker.

2. Back-out the adjusting screw (15) to a position where the breaker is just tripped when the trip rod is lifted as far as it will go.

3. Back-out the adjusting screw (15) an additional 1-1/2 turns from the position established in step 2 and the proper overtravel should be obtained.

4. Be sure to tighten the locking nut on the adjusting screw.

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. 21.

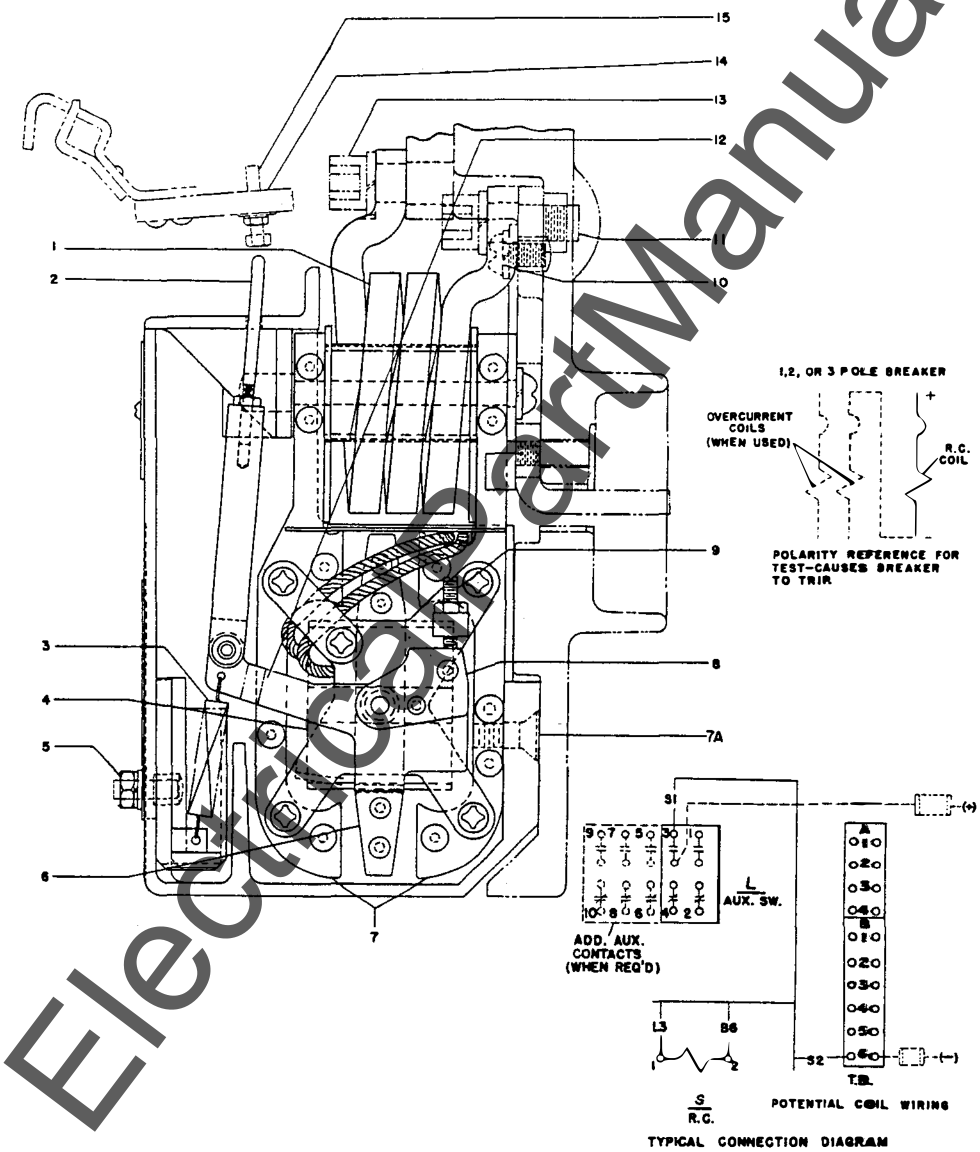


Fig. 21 (T-6490346)

1. Series Coil
2. Trip Rod
3. Spring (Calib.)
4. Potential Coil
5. Calibration Nut
6. Armature
7. Pole Pieces
7A. Screws
8. Counterweight
9. Stop Screw
10. Mounting Screw
11. Screw
12. Trip Crank
13. Screw
14. Trip Paddle
15. Adj. Screw

Fig. 21 Reverse Current Tripping Device

BREAKER ACCESSORIES

SHUNT TRIPPING DEVICE - FIG. 22

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

A remote switch or relay contact is used to close the circuit of the device causing the armature (9) to engage the trip paddle (11) thereby tripping the breaker. The spring (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.

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 formed 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.

If, for some reason, the entire device is to be replaced, this is accomplished by removing the fasteners between the shunt trip device frame (3) and supporting bracket (13).

After replacing either the coil or the entire shunt trip device, the overtravel adjustment should be checked.

BELL ALARM AND LOCKOUT DEVICES

BELL ALARM DEVICE - FIG. 23

A bell alarm device is available which operates when an overcurrent trips the breaker. It consists primarily of a lever (7) and hanger (11) riveted to auxiliary shaft (6), latch (12), catch (16), switch (1), reset lever (3), and mounting bracket (4).

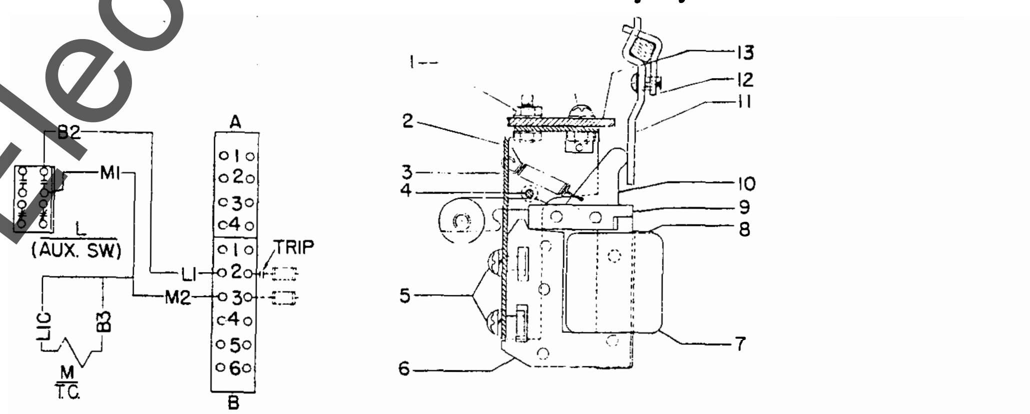
When the breaker is tripped by an overcurrent the overcurrent device trip arm (8) causes lever (7), hanger (11), and latch (12) to rotate counterclockwise as a single member about pin (9). This disengages the latch from the catch (16). When the breaker opens, link (17) also releases the catch, allowing its spring to rotate it counterclockwise about pin (15). This in turn permits plunger of switch (1) to move downward, closing the lower contact of the switch and thereby completing the alarm circuit.

If the breaker is opened by means other than the overcurrent device, the latch (12) remains in position and does not allow the catch (16) to rotate even though it is released by link (17).

Operation of the reset lever (3) returns the catch and switch contacts to their original position. At the same time, spring (5) resets latch (12).

LOCKOUT DEVICE - FIG. 23

The lockout device consists of the same mechanism as the bell alarm device except that a screw (18) secures the hanger (11) to latch (12). This causes these two parts to function as a unit. Whenever the breaker is opened due to an overcurrent, the trip paddle (10) will be held in the tripped position by the lever (7), thereby locking the breaker in the open position until the lockout mechanism is reset manually by means of the reset lever (3).



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

Fig. 22 Shunt Tripping Device

Fig. 22 (215D176)

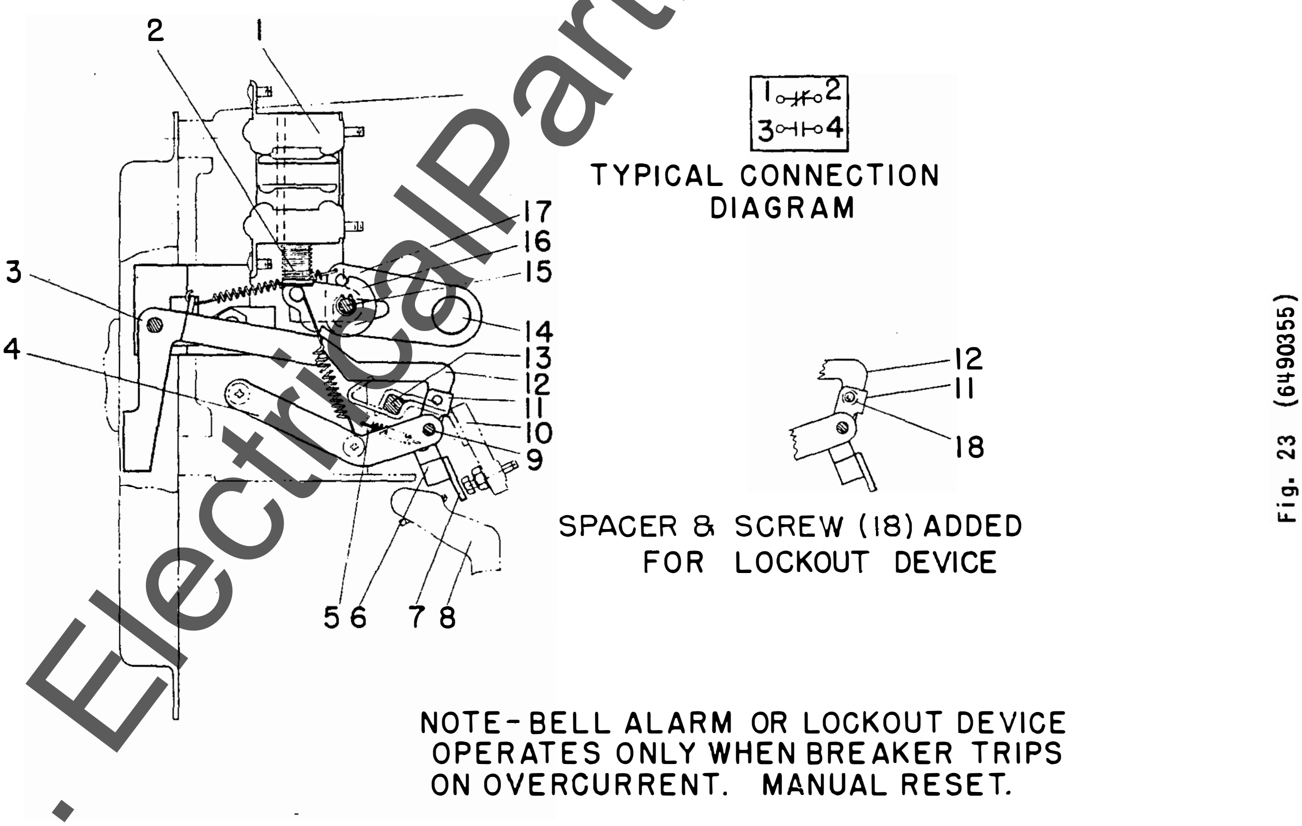
ADJUSTMENTS

In order for the bell alarm and lockout device to function properly the following conditions must exist:

1. The auxiliary trip shaft (6) must swing freely from its points of suspension and hang perfectly level with respect to the breaker parts.
2. The auxiliary shaft must be positioned so that each of its clearance cut-outs has such a position relative to its respective overcurrent device trip arm that the trip arm can operate without encountering interference from the shaft and contacts the shaft only at lever (7).
3. When the breaker is closed, lever (7) must hang in a position such that it touches neither the trip arm (8) or the adjusting screw in the trip paddle (10). The optimum condition is an equidistant position.
4. The latch (12) and the catch (16) must be so positioned relative to one another that when the breaker is closed and reset, the latch will clear the catch when the latch is rotated counterclockwise. The catch is mounted on the same supporting bracket as switch (1). This bracket may be shifted vertically by dismounting the switch and loosening the hardware which fastens the bracket to the mechanism side frame.

DRAWOUT BREAKER - FIG. 24

The drawout circuit breaker consists of a circuit breaker mounted in a drawout carriage which comprises the drawout mechanism. The drawout mechanism consists of guides (5), racking pins (3), racking handle (7), interlock lever (2) and an interlock arrangement which prevents the insertion and withdrawal of the breaker in the closed position. The drawout carriage is also equipped with a "test position" stop, where the secondary disconnects are engaged but the primary disconnects are safely parted. In this position the breaker may be operated for test purposes without energizing the primary circuit.



1. Switch
2. Plunger
3. Reset Lever
4. Mounting Bracket
5. Spring
6. Auxiliary Shaft
7. Lever
8. Trip Arm
9. Pin
10. Trip Paddle
11. Hanger
12. Latch
13. Trip
14. Main Shaft
15. Pin
16. Catch
17. Link
18. Screw

Fig. 23 Bell Alarm and Lockout Device

Older model breakers were equipped with rollers in place of guides on the breaker side frames, otherwise the drawout mechanisms are similar.

It is recommended that a fresh coat of G.E. lubricant D50H47 be applied to the primary disconnects at each inspection period.

For a complete description of the inserting and withdrawing the breaker from its enclosure, refer to GEH-2021A furnished with all AK breakers.

DISCONNECTS

PRIMARY DISCONNECTS

The primary disconnects are attached to the ends of the breaker studs on the rear side of the breaker base. Each disconnect assembly consists of two pair of opposed contact fingers. These are secured to the breaker stud by a bolt which passes through the assembly and the stud. When engaged with the stationary stud of the enclosure, the disconnect fingers exert a set amount of force against the stationary stud through the action of the compression springs. Retainers and spacers hold the contact fingers in correct alignment for engagement with the stud. The amount of force which the fingers exert against the stud is determined by degree to which the springs are compressed by the bolt and nut which hold the assembly together. If, for any reason, the disconnects must be taken apart, the position of the nut on the bolt should be carefully noted, so that in reassembling, the original amount of compression can be restored by replacing the nut at its former position on the bolt.

SECONDARY DISCONNECT, FIG. 25

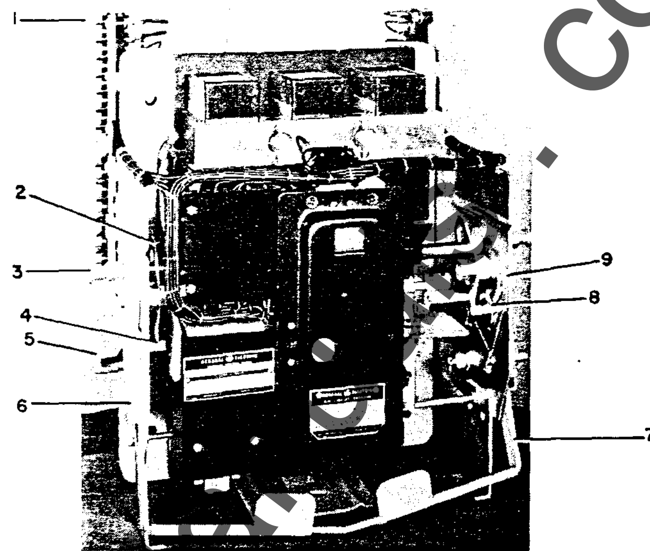
The secondary disconnects serve as connections between breaker control circuit elements and external control circuits. They are used only on drawout type breakers. A terminal board serves the same purpose on stationary mounted and general purpose enclosure mounted breakers. The secondary disconnects allow removal of the breaker without the necessity of having to detach external connections.

The movable part of the secondary disconnect consists of an insulating body which holds a conducting spring loaded plunger to which a flexible lead is attached. As the breaker moves into its enclosure, the plunger is depressed by sliding onto the stationary disconnects of the enclosure.

REPLACEMENT OF MOVABLE SECONDARY DISCONNECTS

1. Unfasten disconnect body from breaker back frame.
2. Open tabs which hold wires on inner side.
3. Pull contact tip loose from hollow tube.
4. Remove contact tip by cutting wire at its base.

Fig. 24 (8021019)



1. Secondary Disconnect
2. Interlock Lever
3. Rack-Out Pin
4. Locking Pin
5. Guide
6. Handle Socket
7. Rack-Out Handle
8. Cam Slot
9. Trip Cam

Fig. 24 AK-1-25 Drawout Breaker

Fig. 25 (8017973)

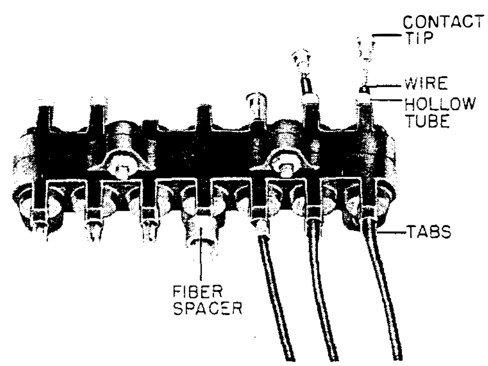


Fig. 25 Movable Secondary Disconnects

5. Push wire through hollow tube of new disconnect assembly.
6. Strip insulation off end of wire to about 1/4 of an inch from end.
7. Place new contact tip on end of wire and crimp.
8. Pull wire through hollow tube until contact tip fits snugly against end of hollow tube.
9. Crimp tab on other side of assembly to hold wire in place.
10. Any hollow tubes which are not used should be pushed into the disconnect body and held in that position by placing fibre spacers over inner ends of tubes and spreading tabs.
11. When all wires have been connected, refasten the body of the assembly to the breaker back frame.