



INSTRUCTIONS

GEK-7302B
Supersedes GEH-2021D

Electrical System

LOW-VOLTAGE POWER CIRCUIT BREAKERS INSTALLATION AND OPERATION MANUAL

TYPES

AK-2/3/2A/3A-15

AK-2/3/2A/3A-25

AK-2/3/4/5/2A/3A/4A/5A-50/50S

AK-2/3/2A/3A-75/75S

AK-2/3/2A/3A-100/100S

AKT-2/3/50/50S

AKU-2/3/2A/3A-25

AKU-2/3/4/5/2A/3A/4A/5A-50/50S

AKF-2/2A-25

AKF-2C/2D/2E

GENERAL  ELECTRIC

AUXILIARY DEVICES SPECIFICATIONS

TYPE LOAD OR P. F.	VOLTAGE		INTERRUPTING RATING (AMPS)		
	Nominal	Range	Auxiliary Switch	Bell Alarm Switch	EC-1 Switchette
Resistance	48 DC	41-56	25.00	-	-
	125 DC	106-140	11.00	2.5	0.30
	250 DC	210-280	2.00	0.9	0.15
	600 DC	508-672	0.45	0.3	-
Electro- Magnet	48 DC	41-56	15.00	-	-
	125 DC	106-140	6.25	2.5	0.30
	250 DC	210-280	1.75	0.9	0.15
	600 DC	508-672	0.35	0.3	-
75 - 85% Lagging	120 AC	104-127	75.0	30.0	-
	240 AC	208-254	50.0	15.0	10.0
	480 AC	416-508	25.0	7.0	10.0
	600 AC	520-635	12.0	5.0	-
30 - 35% Lagging	120 AC	104-127	50.0	30.0	-
	240 AC	208-254	25.0	15.0	10.0
	480 AC	416-508	12.0	7.0	10.0
	600 AC	520-635	8.0	5.0	-
Continuous Rating (Amps)			*20.0	*10.0	*10.0
Closing Rating (Amps) 30-35% P F or resistive			50.0	30.0	**

* Limited to 5.0 A continuous rating of #16 GA. wire on Drawout Breakers.

** Adequate for use with AK Breaker Shunt Trip Coils of the voltage ratings listed in above table. (Maximum current of 12.3A for the 120 V. AC coil)

INSTALLATION AND OPERATION OF TYPE AK POWER CIRCUIT BREAKER

RECEIVING, HANDLING AND STORAGE

Before installing, or operating these circuit breakers, make a careful reading of the sections of these instructions which are pertinent to the anticipated work.

Upon receipt of a circuit breaker, immediately make an examination for any damage or loss sustained in shipment. If injury, loss or rough handling is evident, file a damage claim at once with the trans-

portation company and notify the nearest General Electric Sales Office.

Unpack the circuit breaker as soon as possible after it has been received. Exercise care in the unpacking to avoid damage to the breaker parts. Be sure that no loose parts are missing or left in the packaging material. Blow out any dirt or loose particles of packaging material remaining on or in the breaker.

If the circuit breaker is not to be placed in service at once, store it in a clean, dry location in an upright position. Support it to prevent bending of the studs or damage to any of the breaker parts. Do not cover the breaker with any packing or other material which absorbs moisture, that may cause corrosion of breaker parts. A covering of kraft or other non-absorbent paper will prevent dust from settling on the breaker.

INSTALLATION

LOCATION

In choosing a location for the installation of an AK Circuit Breaker, there are two factors to be considered. The first of these is the effect of the location on the breaker itself. Much better performance and longer life may be expected if the area is clean, dry, dust-free, and well ventilated, than if the opposites to these conditions exist. The second consideration is convenience for operation and maintenance. The breaker should be easily accessible to the operator, and there should be sufficient space allowed for maintenance work to be done if this becomes necessary.

MOUNTING

AK Circuit Breakers are designed to be mounted in any one of three ways. These are dead front mounting, individual mounting with the enclosure being provided, and drawout mounting in which the breaker is designed for insertion into a cubicle in drawout equipment such as a substation or control board.

DEAD FRONT BREAKERS

These breakers are designed for mounting in a switchboard or enclosing case of the customer's design and construction. Mounting in this instance consists of bolting the breaker frame to a supporting structure within the switchboard or enclosure, connecting the power buses or cables, and making any necessary control connections. The front cover of the breaker enclosure may be a hinged door or a plate bolted to the panel. In either case, it should have a section cut out, through which the front escutcheon of the breaker may protrude. Outline drawing numbers giving the dimensions needed for preparing a suitable enclosure or cubicle for the various types of AK breakers are given below. These are for standard 2 or 3 pole breakers.

Breaker

Typical Outline Drawing No.

AK-2-15 and 25	695C116
AK-3-15 and 25	121C7570
AK-2-50 Man. Oper.	845C281
AK-2-50 Elec. Oper.	238C123
AK-3-50 Man. Oper.	121C7553
AK-3-50 Elec. Oper.	121C7555
AKT-2-50 Man. Oper.	102C3650
AKT-2-50 Elec. Oper.	102C3651
AKT-3-50 Man. Oper.	121C7589
AKT-3-50 Elec. Oper.	121C7590
AK-2-75 Man. Oper.	845C284
AK-2-75 Elec. Oper.	269C225
AK-3-75 Man. Oper.	121C7583
AK-3-75 Elec. Oper.	121C7557
AK-2-100 Man. Oper.	845C290
AK-2-100 Elec. Oper.	269C227
AK-3-100 Man. Oper.	121C7585
AK-3-100 Elec. Oper.	121C7559
AK-4-50 Man. Oper.	134C2800
AK-4-50 Elec. Oper.	134C2801
AK-5-50 Man. Oper.	134C2610
AK-5-50 Elec. Oper.	134C2611

The surface on which the breaker is mounted must be flat throughout in order not to impose any internal distortion on the breaker unit. The supporting structure must be rigid enough to avoid any possibility of the breaker studs supporting the weight of the breaker. Minimum cutout dimensions, as given by the appropriate outline drawing, must be maintained to provide adequate electrical clearance.

INDIVIDUALLY ENCLOSED BREAKERS

Individually enclosed breakers are supplied with several types of enclosures, most common is the general purpose type or the weather resistant type. The former is used for favorable indoor locations and the latter for outdoor locations or indoor locations that may be subject to unfavorable conditions. All of the enclosures are provided with suitable means for mounting on walls or supporting framework. Removable cover plates are supplied with the enclosures which may be drilled or machined to accommodate the entrance of bus ducts,

conduits or cables. Steps in the procedure for installing enclosed breakers follow:

1. If the breaker is an AK-15, AK-25 or an AK-50, remove it from the enclosure. With AK-50 breakers, a handle and cam arrangement is used for that part of the breaker movement that involves the disengagement or engagement of the primary disconnect. AK-75 and AK-100 breakers are bolted solidly to the enclosure frame and need not be removed from the enclosure.

2. Remove cover plates of enclosure and prepare them to accommodate whatever power entrance means is used.

3. Mount enclosing case to supporting structure.

4. Replace cover plate and make power connections to stationary terminals in enclosure.

5. If the breaker is a type AK-15, AK-25 or AK-50 and has been removed from the enclosure, it may now be replaced. Control power connections to the terminal board should be made as required. (See CONNECTIONS).

6. Before energizing the power circuit, operate the breaker several times to be sure that it is functioning properly. (See OPERATION).

AK-4/5-50 breakers which are individually enclosed will have enclosures of the AKD5 drawout type. These breakers will be straight drawout breakers, types AK-4A-50 and AK-5A-50. (See instructions in this book under the heading, "Drawout Breakers AKD5 Equipment")

DRAWOUT BREAKERS AKD EQUIPMENT

Mounting drawout breakers consists of simply placing the breaker in the proper position with respect to its enclosure, sliding or rolling it to a stop position, and, by means of a racking handle and mechanism, racking it through the last part of its movement during which the stationary and movable halves of the disconnects engage.

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.

Large drawout breakers are fastened to a telescoping tray which extends out from the enclosure to receive the breaker. Small breakers have guides on their side plates which slide in channels in the enclosures. Both large and small breakers have a test position in which the secondary disconnects are engaged, but the primary disconnects are not. In this position, the breaker may be operated electrically without energizing the load cable or bus.

Use D50H47 lubricant on the disconnect terminals to reduce the force required to insert the breaker.

Inserting Breaker AK-15 and 25

1. Trip the breaker.
2. Raise the breaker until the guides on the sides of the breaker are level with their mating supporting channels in the enclosure, and slide the breaker part way into its enclosure. (Note - The breaker will be obstructed by a position stop at the bottom of the enclosure after the breaker has traveled only a short distance into the cubicle. Lift the position stop handle, located at the bottom right of the enclosure, which will release the position stop and allow the breaker to travel further into the cubicle.)
3. Raise the rackout handle forward and up as far as its travel will permit and push the breaker into the enclosure until the rackout pins on the handle assembly bear against the housing rackout cams on the side of the enclosing case.
4. Push downward on the rackout handle forcing the pins on the handle up into the slot in the stationary cam plate. This action forces the breaker through a final short portion of its movement into the enclosure and allows the operator to provide the force necessary to make the primary disconnects engage the stationary studs in the enclosure. In performing this operation, make sure that the handle is rotated downwards as far as its free travel will permit and then pull the racking handle down to be sure the trip interlock is released. (Note - When the racking handle is in any position other than completely down, the breaker cannot be operated and is held trip-free by the trip interlock. This applies to the "fully in" and "test" positions.)

Withdrawing Breaker AK-15 and 25

1. Trip the breaker open. If the breaker is not open, the interlock lever of the drawout mechanism will not permit operation of the rackout handle.
2. Pull the racking handle up and forward as far as it will travel, disengaging the primary disconnects.
3. Slide the breaker out until the position stop engages in the front slot in the bottom of the breaker carriage. The breaker is now in the "test" position, where its primary disconnects are safely disconnected from the line and load terminals of the enclosure. (Note - Refer to section describing "Test Position" in these instructions.)
4. To remove the breaker from its enclosure, lift the position stop handle and slide the breaker forward until the position stop engages the rear slot in the bottom of

the breaker carriage. This is the safety position stop where both the primary and secondary contacts are disengaged. Again lift the position stop handle. Slide the breaker slightly forward to remove it from the enclosure.

Inserting Breaker AK-50, 75 and 100

1. Lift the breaker to a position approximately six inches above the height of the compartment tray.
2. Pull the drawout tray out under the breaker as far as the tray will travel. NOTE - When installing an individual skeleton housing for a drawout AK-50 or 75, locate a bolt head over the two front bottom mounting holes of the housing to provide a limit stop for the drawout tray.
3. Lower the breaker about 1/2" above the dowel pins on the tray and push the breaker back into its compartment so that the rear bottom angle of the breaker is against the guides on the tray directly back of the dowel pins.
4. Slowly lower the breaker onto the tray and at the same time guide it so that the holes in the rear angle of the breaker fit over the two dowel pins on the tray. If the breaker is correctly positioned on the dowels, its rear and side bottom frame angles will all sit firmly on the tray.
5. Insert two 3/8 inch hex. head screws through the holes in the front of the side angles on the breaker and thread them part way into the tapped holes in the tray. Do not tighten screws firmly. This provides better alignment of the primary stationary studs and the primary disconnects for the subsequent racking operation.
6. Push the breaker into the compartment until the "test" position stop engages to prevent further travel. (Note - Refer to section describing "Test Position" in these instructions.)
7. Release the test position stop by depressing its lever and push the breaker back into the compartment until the racking pins on the housing butt against the outer surface of the racking cam. In this position, the racking pin has lifted the locking arm on the cam which allows the racking handle to be lifted enough to allow the pawl to engage the first notch on the cam.
8. When the pawl engages the first notch on the cam, push the handle down again to its normal position. This causes the cam to rotate about the racking pin. Repeat this operation five times to rack the breaker into its final operating position. Interlocks hold the breaker trip free until it is racked into the fully contacted position. The fifth stroke of the handle is only a partial stroke and does not result in any further movement of the breaker. It does serve three useful purposes: it positions the cam so that it cannot rotate and allow the breaker to back out under short circuit stresses; the partial stroke signals that the racking operation is complete, and it releases the trip interlock which was engaged by the racking pin during the previous four pumps of the racking arm. NOTE: Once a racking operation has been started, it must be completed, as the breaker cannot be reversed until the racking operation is completed.
9. After completing the fifth racking stroke, lift the handle as high as it will go and allow it to drop to its normal position. NOTE: Any strokes beyond this point will

cause the breaker to be trip free. Tighten the 3/8 inch hex head screws inserted in the front holes of the drawout tray during step 5 of this operation. The breaker is now in the operating position.

Withdrawing Breaker AK-50, 75 and 100

1. Trip the breaker to release the positive racking interlock.
2. Lift the racking handle as far as it will go.
This operation will re-engage the trip interlock to hold the breaker trip-free for the remainder of the racking operation. Note that here the cam is rotated by lifting the handle, whereas in racking the breaker in, the operation is performed as a result of pushing the handle down.
3. Reset the handle to its lowered position and lift it again. This operation must be performed 5 times to completely disengage the cams from their racking pins. After the fifth lifting stroke let the handle drop to its normal position.
4. Pull the breaker out of its compartment until the test position stop engages to hold the breaker in the "test" position.
5. Depress the test position stop handle and pull the breaker out of its compartment as far as the drawout tray will travel.
6. Remove the two 3/8 hex. head screws which hold the breaker on the tray.
7. Attach a lifting device to the top frame of the breaker.
8. Lift the breaker approximately 1/2 inch off the dowel pins on the tray and then pull the breaker forward until its primary contacts clear the compartment.
9. Push the tray all the way back into its compartment. The breaker is now free from its compartment.

TEST POSITION

The "Test Position", as referred to in the previous instructions, is that breaker position where the primary power disconnect contacts are safely disengaged but the secondary control disconnects are engaged. In this position, the breaker may be tested or operated, manually or electrically without energizing the primary power circuit, provided the racking handle has been moved to the completely down position, thus releasing the trip interlock.

For a more complete description of drawout mechanisms and enclosures see AKD DRAWOUT EQUIPMENT INSTRUCTIONS, GEH-1830 and AKD5 Drawout Equipment Instructions GEI-90890.

DRAWOUT BREAKERS AKD5 EQUIPMENT

NOTE: AKD5 breakers are identified by letter "A" appearing after breaker number - example, "AK-2A-15".

Drawout Mechanism Operation - There are four positions of the drawout mechanism:

1. The Connected Position - the breaker in the operating position, both primary and secondary contacts made and the door may be closed.
2. The Test Position - the primary (power) contacts not made but the secondary (control) contacts are made. Any breaker test not involving power may be made in this position. The door may be closed in this position.
3. Disconnect Position - neither the primary nor the secondary contacts made. The door may be closed.
4. Fully Withdrawn Position - the breaker completely out of its compartment ready for removal from the inner housing. The door must be open in this position.

Breaker Insertion AK-2A/3A - With the inner housing in the connected position proceed as follows:

1. Insert handle on jackscrew shaft located on left hand side of compartment right above indicator.
2. Rotate handle counter clockwise until jackscrew is stopped. (Indicator should read DISC).
3. Remove handle and open compartment door.
4. Rotate the two track lock links and pull the right track to the limit of its travel.
5. Using a lifting device, raise the breaker until the breakers mounting pins are approximately one inch above the tracks.
6. Pull the remaining track out to the limit of its travel and lower breaker so the breaker mounting pins drop into the slots in the track. Remove the lifting device.

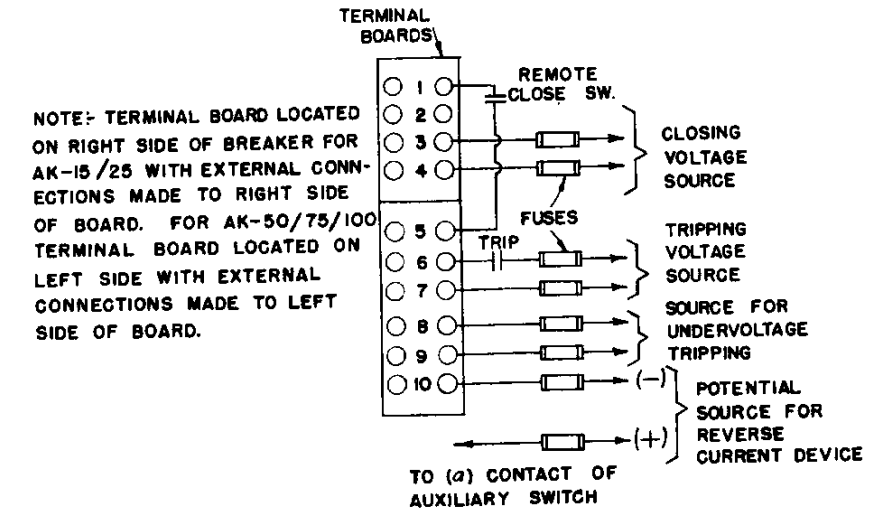


Fig. 1 (Front View)

7. Push the breaker in against the track stops. Rotate the two track lock links to lock the breaker in place. Close the compartment door.
8. Insert handle on jackscrew shaft and rotate clockwise to move breaker into the compartment. Breaker is in connected position when jackscrew can no longer be rotated. (Indicator should read CONN).

NOTE: When moving a breaker from one position to another, be sure breaker is tripped open.

Breaker Insertion AK-4A/5A - With the inner housing in the connected position, proceed as follows:

1. Open door and remove wooden wedge in the lower guide slot of the inner housing.
2. Pull inner housing forward as far as possible.

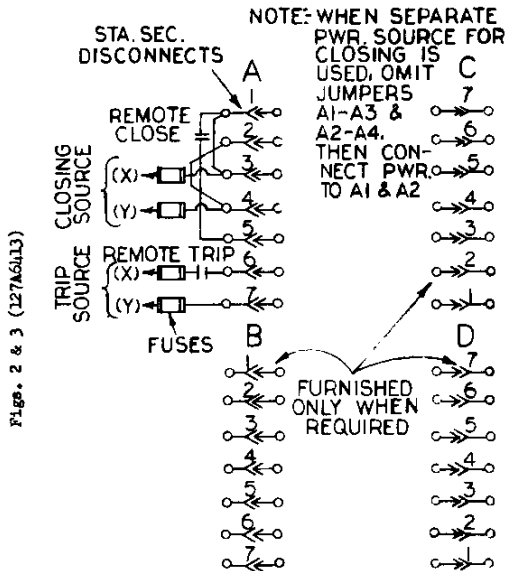


Fig. 2 Front View AK-15 and 25 Breaker Compartment

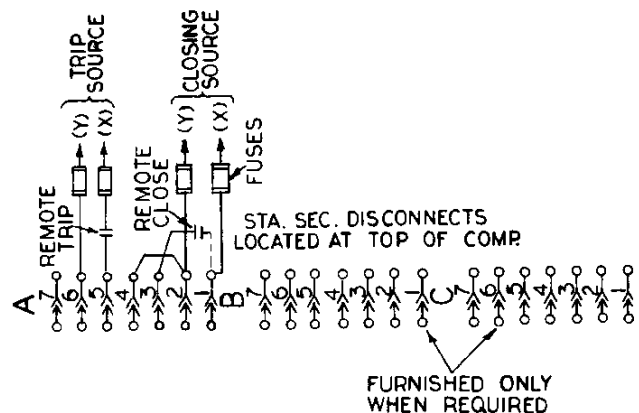


Fig. 3 Front View AK-50, 75, 100 Breaker Compartment

3. Rotate the two track lock links, and pull the right track all the way forward.
4. Using a lifting device and the spreader provided for these breakers, raise the breaker and position it so that the mounting pins on the side of the breaker line up with the slots in the track and are about 2 inches above the track.
5. Pull the left track out and lower the breaker so that the mounting pins engage the slots in the tracks.
6. Engage the racking handle. This is done by pushing the trip button in the breaker escutcheon, sliding the cover below it to the right, and inserting the handle on the jackshaft.
7. Turn the handle counterclockwise as far as it will go, (if it will move in that direction) and remove the handle.
8. Push the breaker in against the track stops, and lock the track links.
9. Close the compartment door. Again engage the handle as in step 6, and rotate the handle clockwise as far as it will go. Towards the end, a high force requirement will be felt as the disconnect fingers on the breaker engage the stationary studs. A couple of turns later, and the stop will be encountered. The position indicator will now show "CONN."

Breaker Removal AK-2A/3A

1. Trip the breaker.

2. Move the breaker and inner housing to the fully withdrawn position. (See Breaker Insertion, Steps 1, 2 and 3).
3. Rotate the two track lock links and pull the breaker out to the limit of the track travel. Attach lifting device and lift breaker up and away from compartment until primary disconnects clear the compartment.
4. Move the inner housing to the connected position by pushing the tracks back against the track stops and then follow Steps 7 and 8 under Breaker Insertion. The inner housing is now in the connected position and the breaker is free from its compartment.

Breaker Removal AK-4A/5A

1. Trip the breaker.
2. Engage the handle and rotate it counterclockwise. If the breaker closing spring is fully charged, it will be discharged automatically a couple of turns before the end of the action.
3. Open the door, unlock the track locks, and pull the breaker all the way forward. The breaker may now be lifted from the tracks.

NOTE: The installation of AK-2/3-50S/75S/100S/AKF2C/2D and breakers equipped with the quick-closing mechanism is the same as the other breakers described in this book. The only difference occurs with drawout breakers. The compartments that house the quick-close breakers will be equipped with an interlock that prevents the manual discharging of the closing springs while the

breaker is in the racked in (connected position). This interlock, when requested, will be provided with both AKD and AKD5 equipment that require quick close breakers

CONNECTIONS

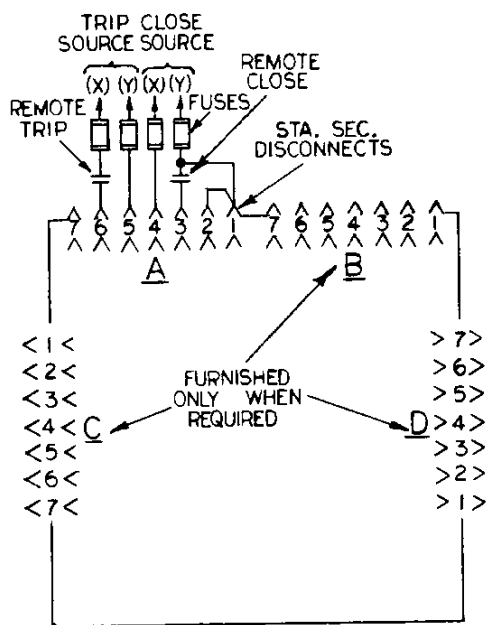
All electrical connections should be made to assure good conductivity. Mating surfaces should be parallel and firmly bolted or clamped together. Contact surfaces should be clean and have a smooth finish. The bus or cable connecting to the breaker should have adequate current-carrying capacity to prevent excessive heating. Control circuit connections should be made according to the wiring diagram which applies to each breaker specifically. Depending on the breaker type, those connections are made either to a terminal board on the breaker or to the stationary parts of the secondary disconnects.

INDIVIDUALLY ENCLOSED AND STATIONARY BREAKERS

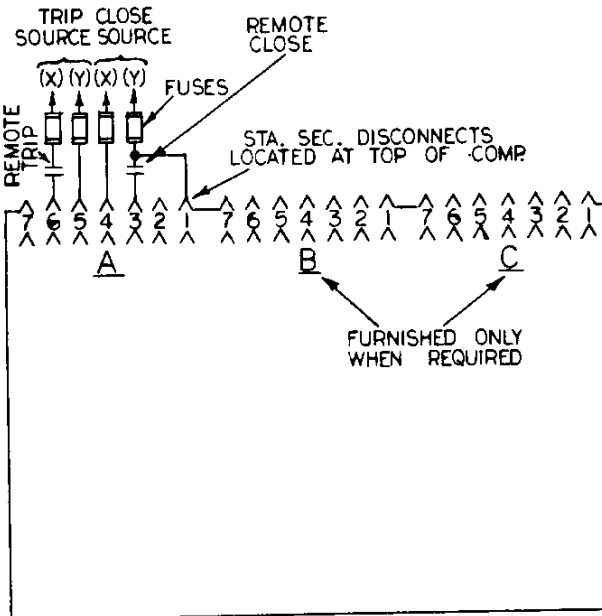
The customers external connections for operation of breaker control components and accessories are shown in Fig. 1.

DRAWOUT BREAKERS

The customers external control connections to these breakers are made to the stationary secondary disconnect located in the breaker compartment as shown in Figs. 2 and 3, AKD Equipment and Figs. 4 and 5 AKD5 Equipment. (Note - If the breaker is used in a General Electric Company, Drawout Switchgear Equipment, all external connections must be made to terminal blocks located in the rear vertical wiring trough of the equipment.)



FRONT VIEW AK-1A-15, 25 & AK-2A-15, 25
BREAKER COMPARTMENT



FRONT VIEW AK-2A-50, 75, 100
BREAKER COMPARTMENT

TYPICAL WIRING DIAGRAMS

Figs. 4 & 5 (0156A2377)

MANUAL CLOSING

AK-15/25 manually operated breakers are closed by turning the handle 90 degrees counterclockwise and then clockwise 90 degrees back to the original position. The initial counterclockwise movement resets the closing mechanism. The clockwise movement closes the breaker.

The closing mechanism of the AK-2/3 50/75/100 manual breakers is a spring charged mechanism similar to the one used on AK-2/3-50/75/100 electrically operated breakers. AK-2/3-50/75/100 manual breakers are closed by rotating the closing handle counterclockwise through approximately 120 degrees, and then clockwise back through 120 degrees to the normal handle position. Four such complete movements of the handle are required to close the breaker. During the four counterclockwise movements and the first three clockwise movements of the handle, the springs are charged. After approximately 70 degrees travel of the fourth clockwise handle movement, the spring charged mechanism is driven over-center and the breaker closes. A charge-indicator, numbered 1 to 4, viewed through the breaker front escutcheon, moves with each complete handle movement and indicates the number of complete handle movements that have been performed.

AK-4/5-50 manual breakers are also closed by means of energy released through the discharge of a closing spring. The charging of the spring is done by a single stroke of the breaker handle. This involves raising the handle counterclockwise from the vertical position until a stop is encountered after about 140 degrees of rotation. The spring is then extended to its fully charged position as the handle is returned to its normal vertical position. Release of the spring, and resultant closing of the breaker, occurs when the "close" button in the escutcheon is pushed. (The breaker will close only if the racking mechanism is in the "CONN" or "TEST" position.)

ELECTRICAL CLOSING

(Figures 6 and 7)

STANDARD BREAKERS

AK-15 and AK-25 electrically operated

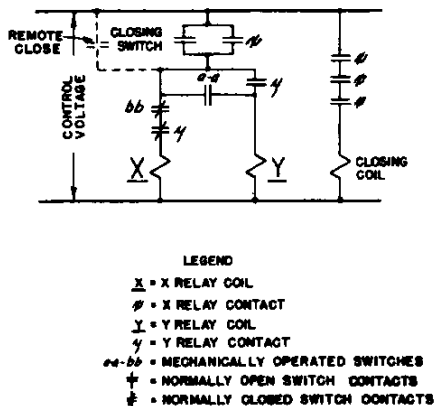


Fig. 6 Simplified Elementary Diagram Internal Wiring AK-15 and 25

OPERATION

breakers are closed by a solenoid coil. The armature of the solenoid is linked to the breaker mechanism and its movement, operating through the mechanism, closes the breaker. The closing solenoid circuit may be operated by a push button closing switch on the breaker or by a remote switch or relay, depending on the individual arrangements desired. When a closing signal is given, the X relay coil is energized and it in turn closes its contacts. One of these seals in the X coil circuit; the other three, which are arranged in series, energize the solenoid closing coil. As the breaker closes, a mechanically operated switch opens one pair of its contacts (bb) and closes another (aa). The contacts which open cut out the X relay coil. The contacts which close energize the Y relay coil, whose contacts now seal in the Y coil and hold open the X relay coil circuit. This prevents another closing operation if one of the protective devices operates to trip the breaker before contact at the closing switch is released.

Large AK breakers (AK-50/75/100) are closed by the discharge of a closing spring. This rotates a crankshaft which, by means of an attached roller, operates a closing cam, forcing the movable breaker contacts against the stationary contacts. The closing spring is charged through the operation of a motor and gear reduction unit.

The electrical control system is comprised of an X relay, two double contact mechanically operated switches (F and G), a push button closing switch and any means for remote closing which the user may incorporate into the system. When voltage is first applied to the breaker, (before any closing signal is given) the motor is energized through two of the X relay contacts and the two G switch contacts. The motor then compresses the closing springs to the "pre-charged" position at which point the mechanically operated F and G switches are operated. This opens the G contacts, stopping the motor, and closes the F contacts, which readies the system for the actual closing of the breaker. When the push button or remote switch signals for a closing operation, the X relay coil is

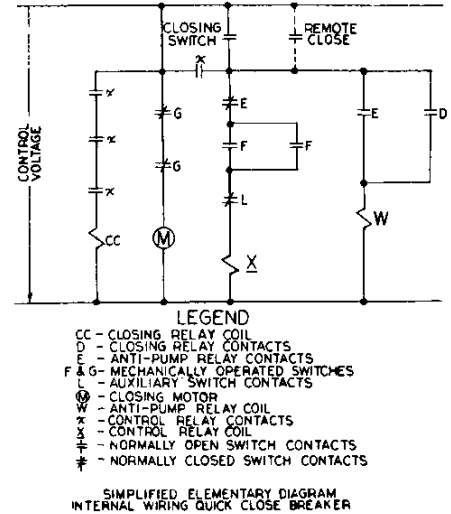


Fig. 8

energized, operating the X contacts. This seals in the X relay and energizes the motor once again and the closing operation takes place.

QUICK CLOSE BREAKERS

(Figure 8)

Functionally, the quick close mechanism differs from the standard electrical mechanism in that the pre-charge operation is extended to completely charge the closing springs. At the end of the charging operation, which takes approximately 5 seconds, (2 seconds for AK-4/5-50 breakers) a latch plate engages the prop roller to prevent the closing springs from discharging.

With the closing springs fully charged the breaker is ready for a closing operation upon release of the prop roller. This may be accomplished either manually, by depressing the closing lever on the breaker, or electrically by closing the remote closing switch. Upon the release of the prop roller the closing springs discharge and close the breaker in the same manner as on the standard electrical breaker. AK-4/5-50 breakers are closed through a remote switch or the close button in the escutcheon, (if the breaker is equipped with a push button closing switch).

With control voltage applied, the motor is energized through the G switch contacts, and charges the closing springs. When the springs reach the fully charged position, the mechanically operated switches operate, reversing their contacts. Upon operation of these switches the motor is stopped by the opening of the G switch. The closing of the F switch prepares the breaker for a closing operation.

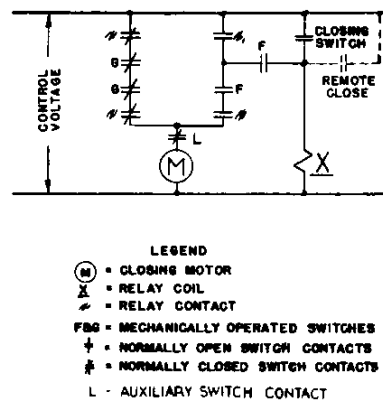


Fig. 7 Simplified Elementary Diagram Internal Wiring AK-50, 75 and 100

A closing signal now given energizes the control relay X whose contacts close and complete the circuit through the closing relay coil. With the closing relay coil energized the breaker closes as described above. At the same time the closing relay contact closes to energize the anti-pump relay causing its contacts to reverse providing the anti-pump feature.

When the breaker closes, the mechanical operated G switches close to energize the motor again and the F switches open and de-energize the control relay. The auxiliary switch contact opens preventing the control relay from being energized until the breaker is tripped open. With the G switches closed, the motor charges the closing springs ready for the next closing operation.

MANUAL OR MAINTENANCE CLOSING OF ELECTRICAL BREAKERS

All electrical breakers may be closed manually by means of the maintenance handle furnished with the breaker or switchgear.

To close AK-15/25 breakers:

1. Place the two small hooks of the handle into the two slots located in the lower portion of the front escutcheon.
2. Rotation of the long end of the handle downwards forces the shorter end of the handle upwards against the bottom of the solenoid armature, and closes the breaker's contacts.

To close AK-2/3-50/75/100 breakers:

1. Place the ratchet type maintenance handle on the shaft that protrudes from the gear reduction unit.
2. Operate handle until the spring charge indicator reads charged.
3. Continue to operate handle until the closing springs discharge and close the contacts.

To close AK-50S/75S/100S, AKF2C, 2D breakers and breakers equipped with the quick closing mechanism:

NOTE: All AKD, or AKD-5 drawout type breakers equipped with the quick closing mechanism cannot normally be closed manually when in the racked in (connected

position), due to mechanical designed interference between the enclosure and the spring discharge lever on the breaker. If manual closing is desired with the breaker racked in, the interference feature must be removed, otherwise the breaker can be manually closed in the test position or fully racked out position only.

1. With the ratchet type maintenance handle applied to the gear box shaft, operate the handle until the springs are fully charged. The fully charged position is indicated by the spring charge indicator and by solid resistance to any further handle operation.
2. Push down on the push to close lever to release the energy stored in the closing springs which closes the breaker's contacts.

To close AK-4/5-50 breakers:

NOTE: AK-4A and AK-5A drawout breakers will be "trip-free" if the racking mechanism is in any position other than the "TEST" or "CONN" position. If the breaker is on a workbench or on the extended rails, and it is to be closed with the maintenance handle, operate the drawout mechanism as far as it will go in a clockwise direction. This will put the mechanism in the "connected" position, and the breaker may be closed. If this is done, the mechanism will have to be reset to the "disconnected" position before it can be reinserted into the breaker compartment in the enclosure.

1. Place the maintenance handle on the end of the camshaft below the motor.
2. Operate the handle until the closing spring goes over center and the breaker closes. If the breaker is a "quick-close" breaker, type AK-4/5-50S, the spring will not release upon going over center, but will be held off by a blocking link. This can be released by pulling forward on the closing solenoid armature located beneath the mechanism. This can be done safely, since no moving parts are located in this space.

TRIPPING

The breaker is tripped open by the displacement of a mechanism latch, which allows a toggle linkage supporting the movable contacts in the closed position to collapse. This trip latch is fastened rigidly to a trip shaft which runs horizontally from left to right through the

breaker. All of the means provided for tripping the breaker operate through striker arms which displace the mechanism trip latch by moving against trip paddles fastened on the trip shaft. Looking at the breaker from the right, counterclockwise rotation of the trip shaft causes the breaker to trip; clockwise movement resets the mechanism latch. The manual trip button, overload devices, shunt trip, undervoltage tripping device, and reverse current trip all operate in this fashion to trip the breaker. The movement of the striker arms of all of these, when activated, should move from 1/32 to 1/16 inch beyond the point at which tripping occurs. This is what is meant by the expression, "positive tripping".

NOTE: BEFORE MAKING ANY ADJUSTMENTS TO TRIP DEVICE SETTINGS, THE BREAKER SHOULD BE IN THE OPEN POSITION AND CONTROL POWER REMOVED.

Most AK-2 and AK-4 air 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.

All AK-3 and AK-5 type air circuit breakers will be equipped with Power Sensor* overcurrent trip devices. The time current band as well as the pickup settings of this device are adjustable. A single captive thumb screw adjusts all three phases for any particular characteristic or setting. Should a thumb screw be inadvertently left loose the Power Sensor* will revert to the "minimum" pickup settings or "maximum" time delay bands accordingly. If after installation, nuisance tripping occurs, check the Power Sensor* for proper settings as required for the specific application and tighten all the thumb screws on the Power Sensor*.

For a more detailed discussion of the construction, operation, and application of overcurrent trip devices refer to the following publications:

1. Maintenance manual for specific breaker involved (see "Maintenance").
2. "Selection and Application of Power Circuit Breakers" GET-1113.

TYPE AKU AND BREAKERS WITH FUSE-BREAKER COMBINATIONS

Open Fuse Lockout Device

This device may be furnished with any of the above type breakers. The open fuse lockout device consists of 3 separately operated devices (one per breaker pole) each wired in parallel to corresponding breaker fuses. These devices are mounted on the

left hand side of the breaker (looking from front). The purpose of this device is to trip the breaker upon the blowing of anyone of the breaker fuses. This energizes the coil of the device causing the armature to engage the trip paddle, thereby tripping the breaker. Once operated, the armature is

latched in the closed air gap position allowing the reset button to extend forward indicating which fuse has blown, and simultaneously holding the breaker in the trip-free position until the latch closed armature is released by the operating of the manual reset button.

* Trade-Mark of General Electric Company

MAINTENANCE INSTRUCTIONS

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.

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

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

1. Manually operate the breaker several times, checking for obstructions or excessive friction.

2. Electrically operate the breaker several times (if breaker has electrical control) to ascertain whether the electrical attachments are functioning properly.

3. Remove the arc quenchers by removing the channel shaped retaining bar.

4. Inspect arc quenchers and contacts for breakage or excessive burning.

Should arc quencher barriers or contacts be eroded to half their original thickness they should be replaced.

LUBRICATION

In general, the circuit breaker requires moderate lubrication. Bearing points and sliding surfaces should be lubricated at the regular inspection periods with a thin film of GE Lubricant D50H15. Before lubricating remove any hardened grease and dirt from latch and bearing surfaces with kerosene. ALL EXCESS LUBRICANT SHOULD BE REMOVED WITH A CLEAN CLOTH TO AVOID ANY ACCUMULATION OF DIRT OR DUST.

On drawout breakers, the contact surface of the disconnect studs should be cleaned and greased with GE Grease Specification D50H47.

These instructions have as their purpose the imparting of information of a general nature concerning the installation and operation of Type AK power circuit breakers. If more complete and specific information is required, such as might be needed for overhauling the breaker, trouble

shorting, or replacing parts of the breaker, refer to the complete instruction for the particular breaker type involved. These are:

Maintenance Manual	Breaker Type
GEI-50299	AK-2/2A/3/3A-15125, AK U-2/2A/3/3A-25
GEI-93863	AKF-2/2A-25
GEK-7303	AK-2/2A/3/3A-50/75/100, AKU-2/2A/3/3A-50
	AK-2/2A/3/3A-50S/75S/100S, AKF-2C/2D/2E
GEK-7301	Power Sensor Solid State Test Instructions
GEK-7310	AK/AKU-4/5-50/50S
GEK-7309	Test Instructions for Installation or service of Power Sensor Equipped AK breakers

Renewal parts bulletins for the various types of breakers are:

Bulletin	Breaker Type
GEF-4149	AK-2-15/25
GEF-4150	AK-2-50
GEF-4395	AK-2/2A/3/3A-75
GEF-4396	AK-2/2A/3/3A-100
GEF-4527	AK-4/5-50

GENERAL ELECTRIC COMPANY
CIRCUIT PROTECTIVE DEVICES DEPARTMENT
PLAINVILLE, CONNECTICUT 06062

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