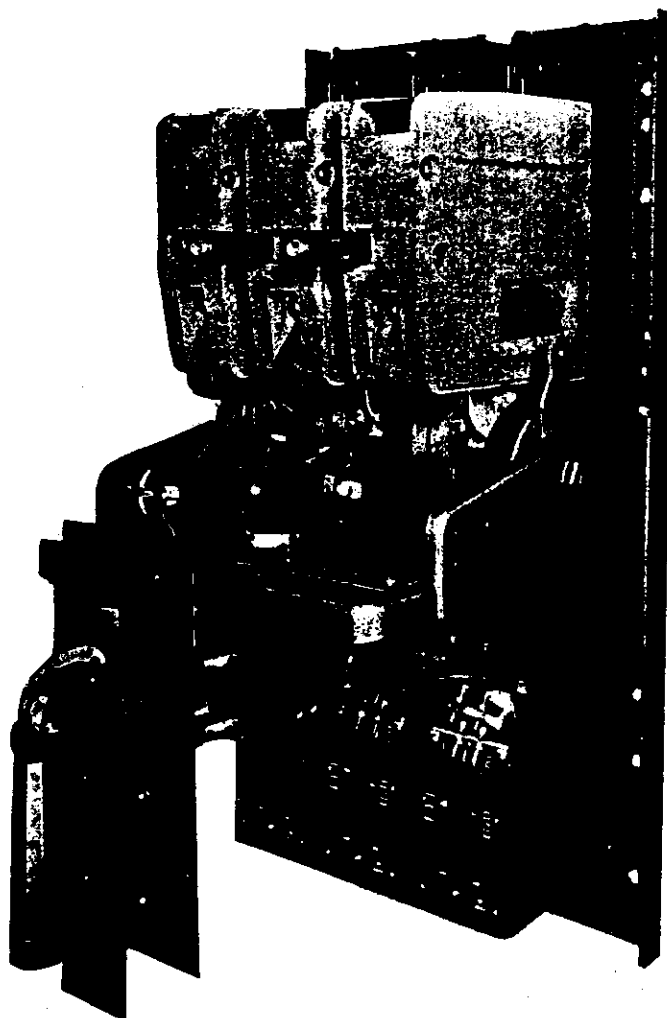


# LOW VOLTAGE SWITCHGEAR INSTRUCTIONS

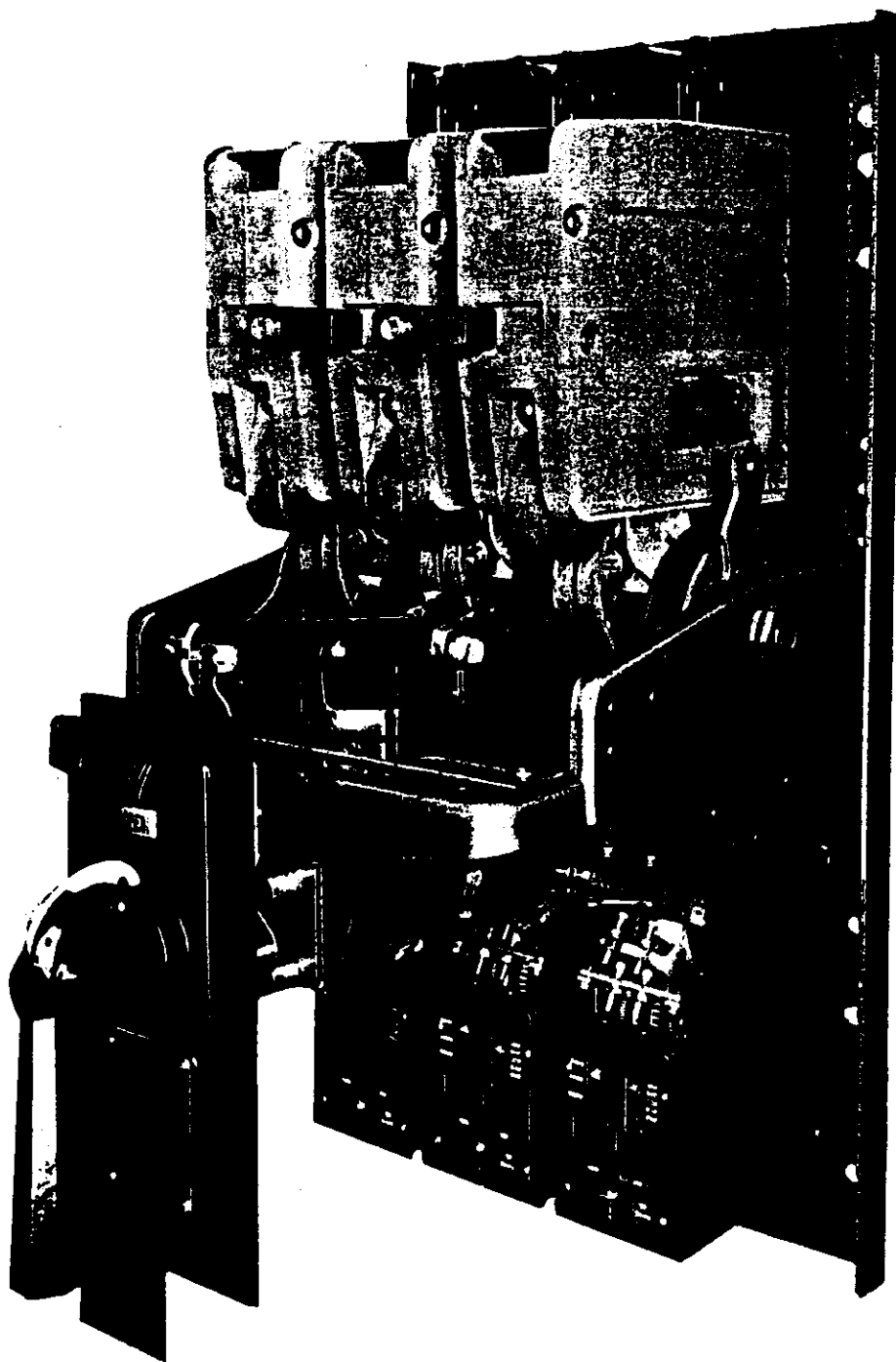


## TYPE KB CIRCUIT BREAKERS

(MODEL E)



**I-T-E CIRCUIT BREAKER COMPANY • PHILADELPHIA 30, PENNSYLVANIA**



MODEL E

Fig. 1—Type KB Manually Operated Circuit Breaker  
with Type OD-1 Dual Overcurrent Trip Devices

Photo 25192



## INSTRUCTIONS FOR TYPE KB CIRCUIT BREAKERS MODEL E

### INTRODUCTION

These instructions apply to the Type KB circuit breakers having serial numbers with the prefix E (Model E).

Read these instructions thoroughly and carefully before installing or attempting to operate the Type KB circuit breaker. By following these instructions, the operator can prolong the life and usefulness of the equipment.

After the circuit breaker is installed and operating properly, file these instructions in a convenient place with any other drawings or switchgear data pertaining to the installation.

### APPLICATION AND RATINGS

The Type KB circuit breakers were designed for the protection of feeder circuits and as main circuit breakers on systems rated 600 volts a-c or 250 volts d-c, and where the interrupting requirements do not exceed 25,000 amperes. The Type KB circuit breakers are particularly adaptable to general industrial and switchgear applications where severe service, requiring frequent opening and closing operations, is encountered in general power and lighting circuits.

### RECEIVING, HANDLING, AND STORAGE

Each circuit breaker, before leaving the I-T-E Circuit Breaker Company, is carefully inspected and tested for proper operation and then crated by workmen who are experienced in the proper handling and packing of electrical equipment.

Immediately upon receipt of the circuit breaker, examine the crates to determine if any damage or loss was sustained during transit. If injury or rough handling is evident, file a damage claim at once with the carrier and promptly notify the I-T-E Circuit Breaker Company. The I-T-E Circuit Breaker Company is not responsible for damage of goods after delivery to the carrier. However, the company will lend assistance in securing any adjustment if notified of such claims.

### HANDLING

Unpack the circuit breaker as soon as possible after receipt. If unpacking is delayed, difficulty may be experienced in making a claim for damages not evident upon receipt.

Use care in unpacking in order to avoid bending, breaking, or damaging any of the circuit breaker parts. Check the contents of each package against the packing list before discarding any packing material. If any shortage of material is discovered, promptly notify the nearest representative of the I-T-E Circuit Breaker Company. Information specifying the purchase number, crate number, and part number of the damaged or missing parts should accompany the claim.

### STORAGE

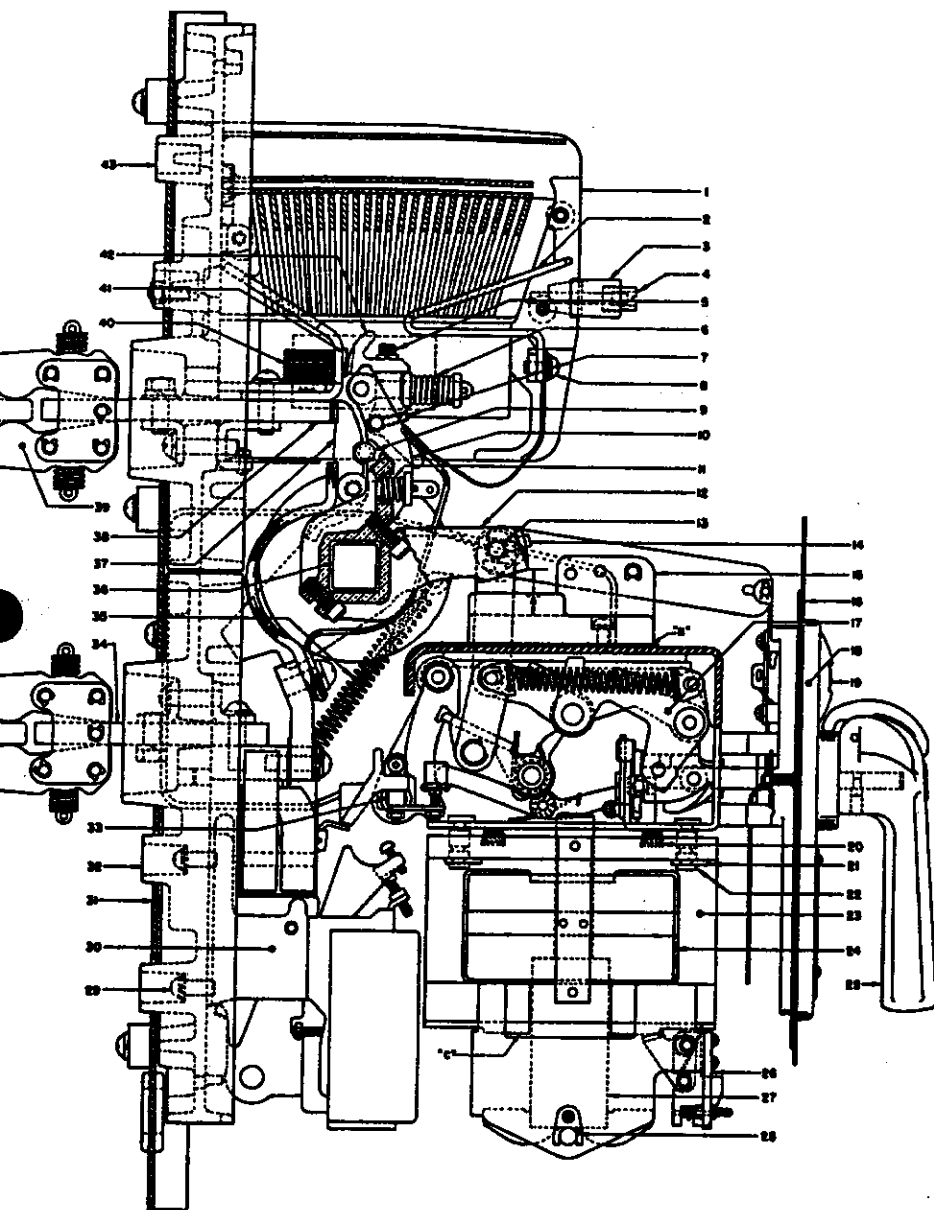
It is recommended that the circuit breakers be installed in their permanent location even though they may not be placed in service for some time. When set up in buildings under construction, they should be protected from damage, dirt, dust, and moisture.

If the circuit breaker can not be installed in its permanent location immediately, and it is necessary to store the equipment, it should be kept in a clean, dry place. It must not be exposed to dirt, to the action of corrosive gases such as chlorine, or to possible mechanical injury. Special care should be taken to prevent injury to the apparatus through shocks or jars due to rough handling.

### DESCRIPTION

The Type KB circuit breakers can be furnished as a two-pole, three-pole, or four-pole circuit breaker having either a manually or electrically operated mechanism, depending upon the application. A three-pole manually operated circuit breaker is shown in Fig. 1. A two-pole circuit breaker omits the center pole; while an additional pole is added for a four-pole circuit breaker.

Each pole is mounted on individual insulating moldings. These moldings isolate the main current carrying structure from the metal supporting base of the circuit breaker.



- 1 Arc Chute
- 2 Front Arc Runner
- 3 Support Clamp
- 4 Mounting Stud Assembly
- 5 Screw
- 6 Movable Arcing Contact Spring
- 7 Spring Clip
- 8 Screw
- 9 Pivot Pin
- 10 Contact Arm
- 11 Movable Main Contact Spring
- 12 Contact Arm Cap
- 13 Eccentric Cam
- 14 Set Screw
- 15 Buffer and Support Block
- 16 Formed Door or Front Sheet
- 17 Operating Mechanism
- 18 Escutcheon Assembly
- 19 Visual Indicator
- 20 Shock Spring
- 21 Retainer
- 22 Mounting Pin
- 23 Solenoid Assembly
- 24 Closing Coil
- 25 Operating Handle
- 26 Solenoid Switch (bb)
- 27 Plunger Assembly
- 28 Stop Pin
- 29 Mounting Screw
- 30 Type OD-1 Dual Overcurrent Device
- 31 Metal Base
- 32 Lower Base Molding
- 33 Tripper Bar
- 34 Lower Current Stud
- 35 Opening Spring
- 36 Contact Arm Bar
- 37 Main Contact and Conductor Assembly
- 38 Upper Current Stud and Stationary Main Contact
- 39 Main Separable Contact Assembly
- 40 Blowout Iron
- 41 Stationary Arcing Contact and Rear Arc Runner
- 42 Movable Arcing Contact
- 43 Upper Base Molding

KB - E

Fig. 2—Type KB Electrically Operated Circuit Breaker  
with A-C Solenoid Assembly



## CONTACTS

Each pole consists of movable and stationary main contacts with their protective arcing contacts. The movable contact structure for each pole is mounted on an insulated, square, steel connector bar which assures that all poles open and close simultaneously.

The correct contact closing sequence is as follows: (1) the arcing contacts close, and (2) the main contacts close. The contacts open in the reverse order when the circuit breaker is opened.

### Main Contacts

The movable main contact and conductor assembly (37, Fig. 2), for each pole, consists of two contact levers having silver-alloy inserts for the actual contact surface. A laminated flexible conductor joins the two contact levers and connects them to the lower terminal.

The contact levers pivot about a bearing pin which is held in position against the contact arm by the pressure from a compression spring. One spring and its spring link are associated with each pair of contact levers.

When the circuit breaker is open, the lower end of the contact lever bears against the contact arm, limiting the free open-travel position. When the circuit breaker is closed, the contacts carried by their contact levers are pressed against the stationary main contacts. This operation includes a wiping action for maximum contact efficiency.

The stationary main contact (38, Fig. 2) for each pole is a silver alloy insert brazed to the upper current stud and is positioned so as to engage the movable main contact as the breaker is closed.

### Arcing Contacts

Each pole of the circuit breaker has two movable arcing contacts. The movable arcing contacts (42, Fig. 2) are faced with a silver-alloy insert and fastened to their contact levers by socket head screws. These contact levers pivot about a yoke pin which is held in place by the contact arm and a "U" shaped spring clip. A compression spring bears against the contact levers in such a manner that the spring pressure is divided between the two levers.

The stationary arcing contact (41, Fig. 2) is a silver-alloy insert which is brazed to the face of the arc runner and is supported by the upper current stud and blowout coil.

## ARC CHUTES

The arc chutes (1, Fig. 2) surround the main and arcing contacts of each pole. The arc chutes are properly positioned by a projection of the upper base molding which fits into a notch in the arc chute moldings. Two mounting stud assemblies and two supporting clamps hold the arc chute in place. The arc chutes are easily removed for inspection and maintenance of the contacts.

The arc chutes consist of two insulating molding assemblies, front arc runner, arc-plate extinguishers and perforated center and top baffles. Blowout irons which are a part of the molded side assemblies are magnetized as the circuit breaker opens. The magnetic field thus set up forces the arc into the extinguishing chamber of the arc chute where the arc is cooled and extinguished. The front arc runner in each arc chute is electrically connected to the lower terminal by a laminated conductor.

## OPERATING MECHANISM

The operating mechanism (17, Fig. 2) consists of a closing cam, trip-free toggle, latches, and tripper bar supported between the sides of the one-piece mechanism housing. The mechanism housing is securely fastened to the shelf by six mounting screws.

The shelf which supports the operating mechanism also forms a top cover for the mechanism as well as a mounting support for the shunt trip device, undervoltage trip device, and auxiliary switch when used.

A manual operating handle is connected directly to the operating mechanism by a shaft, which passes through an escutcheon assembly. The closing force of the operating mechanism is transmitted through a short insulating link pivoted to the contact arm cap which is fastened to the center of the contact arm bar.

For electrically operated circuit breakers, a solenoid closing mechanism is mounted directly under the operating mechanism. The a-c solenoid (23, Fig. 2) is secured to the operating mechanism by four mounting pins. The solenoid consists of a laminated magnet frame, plunger housing, plunger assembly, and closing coil. The d-c solenoid (see Fig. 4) is also fastened to the operating mechanism by four mounting pins. It consists of a top plate, cylindrical side, bottom plate, plunger assembly, and closing coil.

When the closing coil is energized, the upward motion of the plunger is applied to the operating mechanism toggle system which in turn transmits the force to close the contacts. The shock of the plunger closing stroke is absorbed by four springs



mounted between the solenoid and operating mechanism. "Pumping" or repetition of the closing stroke is prevented by a "non-repeat" feature on the control relay. The solenoid coil, which is designed for intermittent service only, is energized by this control relay.

### INSTALLATION

The Type KB circuit breakers are adjusted, tested, and inspected before leaving the factory. However, it is possible that unusually rough handling during transit, or severe operating conditions after installation may loosen bolted parts or change some of the circuit breaker adjustments. Refer to the MAINTENANCE and ADJUSTMENT sections for adjustments and procedures that may be required.

**CAUTION: DE-ENERGIZE THE PRIMARY AND CONTROL CIRCUITS BEFORE INSTALLING THE CIRCUIT BREAKER OR ANY RENEWAL PARTS.**

### LOCATION

Indoor circuit breakers should be installed in a clean, dry place which is free from the destructive action of acids, alkalis, or gases, and where good ventilation can be secured. Open-type circuit breakers should be mounted high enough to prevent injury to the operator due to arcing or by the sudden movement of parts during an automatic opening of the breaker. Sufficient electrical clearance must be provided for the circuit breaker, and it should be so located that it will be readily accessible for cleaning and inspection. Ample space must be provided above the circuit breaker to insure proper operation and to prevent damage to other equipment from arc condition when opening under fault.

### MOUNTING

#### Individual Steel Enclosures

Type KB circuit breakers which are individually enclosed in a steel housing (Urelite) may be installed in any convenient location. The enclosure serves as a pull box and is provided with knock-outs in the top and bottom for standard wiring conduit. The cables may be pulled in and connected to the solderless connectors before the circuit breaker is pushed into place. A shallow front cover with a standard escutcheon cutout is bolted to the flanges of the pull box.

A second arrangement, the panel mounted Urelite, permits the circuit breaker to be mounted on a framework or steel panel. In this arrangement, the connection studs are exposed at the rear of the circuit breaker.

#### Dead Front Mounting

The Type KB circuit breaker is designed primarily for mounting behind a protective steel bar-

rier. Exclusive of Urelite, a dead-front mounting usually consists of a metal enclosed, dead-front switchboard. Each circuit breaker is enclosed in an individual compartment having a flat front sheet or formed door for a front cover. Only the operating handle and an escutcheon containing the position indicator project through the front cover.

### ELECTRICAL CONNECTIONS

Before making any electrical connections, every precaution must be taken to see that all leads which are to be connected to the circuit breaker are de-energized.

All leads must be fastened securely to the terminals and tightly clamped to the connection studs. All joints must be clean, bright, and free from dents and burrs. All nuts on the current carrying studs must be securely bolted against the terminal connection to obtain good contact. The nuts should turn freely on the studs and not be forced. If the joints are not made correctly, dangerous heating of the circuit breaker may result.

Cables and connections should be properly supported so that the circuit breaker is not subjected to unnecessary strains.

To avoid overheating of the circuit breaker, the connecting leads must have a current-carrying capacity at least equal to that of the current-carrying parts of the circuit breaker, which in turn must be adequate for the maximum continuous current of the load.

Shunt for ammeters, resistors, or similar devices which operate at relatively high temperatures must be mounted far enough away from the circuit breaker so that they will not conduct heat to the breaker.

### Control Wiring

The control circuit wiring should be in accordance with the diagram accompanying the circuit breaker. A typical connection diagram for a-c or d-c applications is shown in Fig. 3. Diagrams for a specific application may be obtained from the I-T-E Circuit Breaker Company.

### FINAL INSPECTION

After a circuit breaker is installed and all the mechanical and electrical connections complete, the following inspections and tests should be made:

1. See that the circuit breaker is properly set up and leveled on its supporting structure (panels, pipes, structural iron or steel frame, etc.).
2. Close the circuit breaker slowly by hand, with primary and control circuits de-energized, noting whether the contacts are properly adjusted for correct alignment, and that good contact is made with the circuit breaker closed.
3. Inspect all insulated wiring to see that no



damage to the insulation has resulted during the process of installing the circuit breaker.

4. Test the wiring for possible grounds or shorts.

5. See that all joints, whether bolted joints of copper bars or soldered (or clamped) joints made with wire or cables, are made correctly.

6. Circuit breakers furnished with Type OD overcurrent trip devices should have the long-time delay armature on each pole operated manually a few times until the armature is restrained during the closing stroke. This is done to make sure that all of the fluid is in the lower (pressure) side of the time delay cup.

### OPERATION

The manual and electrical closing operations are independent of each other. Therefore, the interruption of control power does not render the circuit breaker inoperable. The circuit breaker may be kept in service as a manually operated device.

### TRIP FREE OPERATION

The Type KB circuit breakers are mechanically and electrically trip free so that the circuit breaker mechanism may be tripped in any part of the closing stroke by the operation of any tripping device with which it may be equipped. As soon as the contacts touch under fault conditions, the trip device will operate the tripping mechanism, release the tripping toggle, and allow the opening springs to return the contacts to the fully open position.

Circuit breakers equipped with undervoltage or reverse current trip devices are also trip free under undervoltage or reverse current conditions respectively.

### MANUAL OPERATION

The direction in which to turn the manual operating handle, to "CLOSE" or "TRIP" the circuit breaker, is indicated on the escutcheon under the operating handle.

To close the circuit breaker, turn the manual operating handle clockwise until the operating mechanism latch remains closed and the visual indicator shows "CLOSED." The operating handle, when released, will return automatically to a vertical position.

To trip the circuit breaker, turn the manual operating handle counter-clockwise until the operating mechanism latch is released and the visual indicator shows "OPEN." The operating handle, when released, will return automatically to a vertical position.

To lock the circuit breaker in the "OPEN" position, turn the operating handle counter-clockwise, raise the locking hasp, and insert the padlock. The locking hasp will accommodate from one to three padlocks.

Refer to the schematic diagram Fig. 3 when following the electrical operation procedure described in the following section.

### ELECTRICAL OPERATION

The Type KB circuit breaker is electrically closed, by the operation of a control switch located at some remote point, as follows:

Turn the control switch (CS) to the "CLOSED" position. This energizes simultaneously pick-up coil (PC) and holding coil (HC). The stronger of the two coils, the pick-up coil, attracts the relay armature and closes the CR14/2 and CR14/3 contacts. (Note: Contact CR14/4 is closed when the CR-14 relay is de-energized and remains closed while the armature is attracted to the pick-up coil magnet). This energizes the solenoid closing coil (CC) and the solenoid plunger moves toward its closed position. At the end of the plunger travel, a projection on the lower part of the solenoid plunger opens the "bb" switch and de-energizes the pick-up coil. The relay armature is then attracted by the magnet of the weaker or holding coil (HC) and opens all the CR14 contacts. The opening of the CR14/2 and CR14/3 contacts de-energizes the solenoid closing coil and completes the closing cycle.

If the control switch has a maintaining contact in the "CLOSE" circuit or if a momentary contact is being held closed, the circuit breaker will not attempt to reclose if it failed on the first attempt due to some fault. The reason for this failure to reclose, even though the control switch is in the "CLOSE" position, is that the relay armature remains attracted to the magnet of the holding coil, thus preventing the CR14 contacts from closing. Therefore, a second attempt to close the circuit breaker can not be made until the control switch is turned to the "OFF" position or the momentary contact is released. This de-energizes the holding coil and closes the CR14/4 contact.

The control relay is now in its normal de-energized position and will function to close the circuit breaker when the control switch is again turned to the "CLOSE" position. This non-repeat feature of the control relay prevents cyclic reclosing of the circuit breaker and assures that the momentarily rated pick-up coil receives only intermittent service.

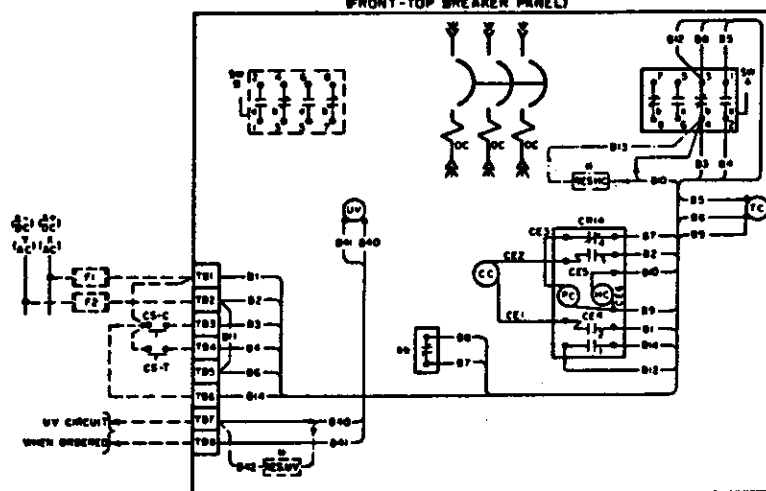
### MAINTENANCE

The safety and successful functioning of the connected apparatus depends upon the proper operation of the circuit breaker. Therefore, it is recommended that a maintenance program be established that will provide for an inspection of the circuit breaker at least once every six months and immediately after operating to interrupt a fault.

Circuit breakers subjected to abnormal conditions, such as acid fumes, salt deposits, or cement



PHYSICAL DIAGRAM  
(FRONT-TOP BREAKER PANEL)



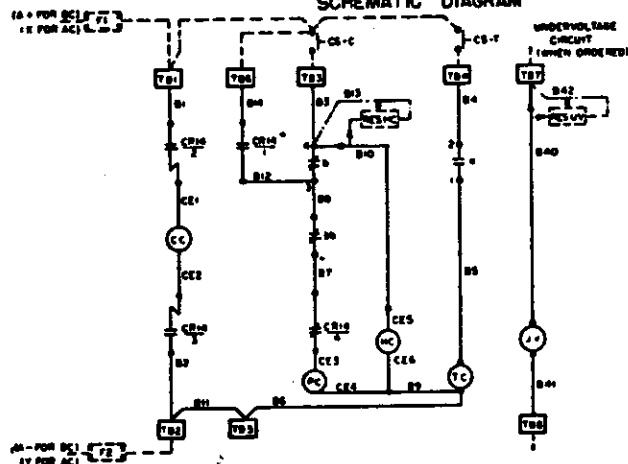
#### LEGEND

- a — Contact Closed When Circuit Breaker Is Closed.
- b — Contact Closed When Circuit Breaker Is Open.
- bb — Contact Closed When Closing Solenoid Is in Non-operative Position.
- CC — Closing Coil.
- CE — Coil End.
- CR14 — Closing Control Relay (Trip Free).
- CR14/1 } Contacts Close When Pickup Coil Is Energized.
- CR14/2 }
- CR14/3 }
- CR14/4 — Contact Open Only when Pickup Coil Is De-energized and Holding Coil Is Energized.
- CS — Control Switch.
- CS-C — Control Switch Close Contact— Maintained or Momentary.
- CS-T — Control Switch Trip Contact.
- HC — Holding Coil of Closing Control Relay.
- OC — Overcurrent Trip Coil (Omit for Non-automatic Breakers).
- PC — Pickup Coil of Closing Control Relay.
- TB — Terminal Block.
- TC — Shunt Trip Coil.
- UV — Undervoltage Trip Coil.

#### NOTES

1. Use #16-7 Strand Wire on All Circuits, except #12-7 Strand on Closing Solenoid.
2. Pole Positions Reading Left to Right:  
One-pole Breakers Use #2 Pole Only.  
Two-pole Breakers Use #1 & #3 Poles.  
Three-pole Breakers Use #1, #2, & #3 Poles.  
Four-pole Breakers Use #1, #2, #3 Poles As Shown & #4 Pole in Addition.
3. Main Separable Contacts on Individually Enclosed Pullout Breakers and Switchgear.

SCHEMATIC DIAGRAM



KB-E

Dwg. 701373

Fig. 3—Typical Diagram of Connections for Type KB Circuit Breakers





dust, require more frequent maintenance if flashovers resulting from accumulated substances are to be avoided.

**CAUTION: DE-ENERGIZE THE PRIMARY AND CONTROL CIRCUITS BEFORE MAKING ANY INSPECTIONS, ADJUSTMENTS, OR REPLACEMENTS OF PARTS.** If the circuit breakers are drawout pantograph mounted, rack to the "TEST" position or completely withdraw the circuit breaker.

## CONTACTS

In general, any dirt or grease on the contacts should be removed by wiping them with a clean cloth saturated in carbon tetrachloride. A very slight pitting or discoloration of the contact surfaces is not harmful. Experience has shown that several operations of the circuit breaker at two week intervals will remove the effects of oxidation and materially prolong their effective life.

The arc chutes must be removed in order to inspect, maintain, or replace the contacts.

### Main Contacts

A slight amount of pitting is to be expected on the main contacts. If the contacts are badly pitted or eroded, the contacts should be replaced before other parts of the circuit breaker become damaged. Excessive pitting may be caused by badly burned arcing contacts, or the circuit breaker may be interrupting currents beyond its interrupting rating.

All flexible conductors should be inspected for broken or pinched laminations. Flexible conductors in such condition require replacement of the assembly of which they are a part.

### Arcing Contacts

A moderate amount of pitting is to be expected and will not interfere with the operation of the arcing contacts. Occasionally, it may be necessary to "dress-up" the contacts by removing small burrs with several light wipes of a fine file. Always follow the contour of the contacts and do not attempt to entirely eliminate the pitting. Prevent any filings from falling into the mechanism by covering it with a clean cloth. After filing the contacts, carefully remove the cloth and blow out any dust or particles that may have fallen into the mechanism with low-pressure, dry air.

If the arcing contacts are severely pitted or eroded, the contacts should be replaced.

## ARC CHUTES

Examine the arc chutes whenever they are removed for inspection or replacement of contact parts. Discoloration or slight eroding of the interior does no harm; but if the parts show signs of serious burning, or if the insulating side moldings

are cracked or broken, the arc chute should be replaced as a complete unit.

When replacing the arc chutes, be sure they are held firmly in place by the support clamps. Also, be sure to replace and tighten the screws fastening the flexible conductors to the front arc runner.

## MECHANISM AND SOLENOID

At all inspections, the circuit breaker should be operated manually to see that all parts move freely in the proper manner without binding or excessive friction. After a careful inspection shows all parts to be in proper working order, the circuit breaker may be operated electrically.

The solenoid does not require maintenance. Should it become necessary to remove the solenoid, spread the "U" shaped retainers (21, Fig. 2 or 3, Fig. 4) and remove them from the four mounting pins (22, Fig. 2 or 4, Fig. 4). Care must be taken to see that the "U" shaped retainers are replaced properly during re-assembly.

(NOTE: The retainers must be in the upper slot of the mounting pins (See Fig. 2) for a-c solenoids, and in the lower slot of the mounting pins (See Fig. 4) for d-c solenoids).

The solenoid plunger rod should be checked for proper stroke. If the plunger has too much travel (slamming), an excessive strain will be placed on the operating mechanism; and if it does not have enough travel, the circuit breaker will fail to latch closed. The closing stroke of the plunger rod should be checked and adjusted as described under ADJUSTMENTS.

## RESISTORS

All connections to resistors should be kept tight. Each resistor is designed for a specific duty and its longest life will be obtained if overloading is avoided. Resistors should be kept free of dirt and other foreign matter, and should be allowed adequate space for ventilation. The full value of each resistor is needed for its particular duty. Short-circuiting a broken-down resistor is a dangerous practice and should be avoided. In making replacements of broken-down or burned-out resistors, the I-T-E Circuit Breaker Company's specifications should be followed explicitly.

## ADJUSTMENTS

The Type KB circuit breakers are adjusted, inspected, and tested before leaving the factory. However, it is possible that rough handling during transit or abnormal usage after installation may cause a change in some of the adjustments. The circuit breaker should be checked and if adjustments are required, they should be made in accordance with the following sections.



## CONTACTS

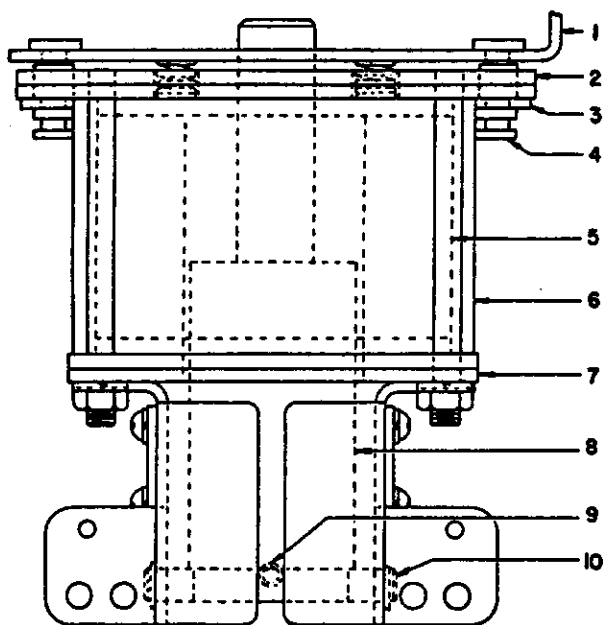
After replacing contacts, or during regular maintenance inspections, the contact pressure and wipe should be checked for proper adjustment as follows:

1. Slowly close the circuit breaker manually until the last engaging movable main contact just touches the stationary main contacts.

2. Measure the gap between the buffer block and contact arm cap at "A" Fig. 2.

3. Complete the closing motion until the circuit breaker is latched closed. Repeat the measurement at "A" which should indicate an additional 1/6 inch (minimum) travel of the contact arm cap.

If adjustment is required, open the circuit breaker, loosen the set screws for eccentric cam (13, Fig. 2), and turn the cam in the direction required to raise or lower the contact arm cap. Tighten the set screws and repeat the above procedure until the 1/16 inch (minimum) travel at "A" is obtained.



Dwg. S-14309

- |                     |                    |
|---------------------|--------------------|
| 1 Mechanism Housing | 6 Housing          |
| 2 Top Plate         | 7 Bottom Plate     |
| 3 Retainer          | 8 Plunger Assembly |
| 4 Mounting Pin      | 9 Pin              |
| 5 Closing Coil      | 10 Stop Pin        |

Fig. 4—D-C Solenoid Assembly for Type KB Circuit Breakers

## PLUNGER ROD STROKE

### A-C Solenoid

The solenoid plunger assembly (27, Fig. 2), is non-adjustable in the field. However, the assembly can be checked for proper adjustment as described in steps 1 to 3 under D-C solenoid. The

downward movement can be measured by placing a 0.025 to 0.050 inch gauge, between the solenoid magnet and plunger assembly, at "C," Fig. 2. If adjustment is required, contact our Service Department through your nearest I-T-E Sales Office.

### D-C Solenoid

The adjustment of the plunger rod stroke should not be changed if movement of the plunger is felt during the following:

1. Manually close the circuit breaker and hold the operating handle as far in the closed position as its stops will allow.

2. Raise the solenoid plunger (by hand) as far as possible and hold it in that position.

3. Slowly release the operating handle. As the handle approaches the normally closed position, a slight downward movement (0.025 to 0.050 of an inch) of the plunger should be felt by the hand supporting the plunger.

If the circuit breaker did not latch closed in step 1, or if no movement of the plunger is felt in step 3, it is necessary to adjust the length of the plunger rod as follows:

4. Remove the plunger stop pin (10, Fig. 4), and allow the plunger to drop out of the solenoid.

5. Turn plunger rod in or out of the plunger to increase or decrease the plunger rod travel as required.

Replace the plunger and stop pin and again check the plunger rod stroke as described above. Repeat the above procedures until the plunger rod stroke is correct.

### MECHANISM RESET

Failure of the mechanism to reset should not be confused with failure of the tripper bar latch to hold. Upon failure of the circuit breaker to successfully close, reset failure may be detected by pushing the contacts, by hand, a slight distance toward the closed position. If the mechanism resets during this operation, it is then necessary to place a shim of 0.015 inch maximum thickness under the buffer and support block at "B" Fig. 2.

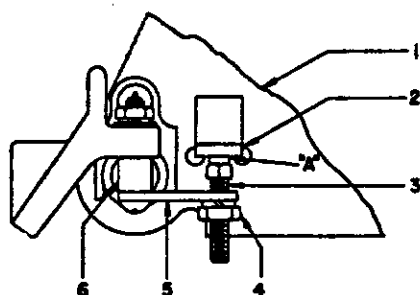
### LATCH BITE ADJUSTMENT

The circuit breaker latching and tripping mechanisms are adjusted at the factory. However, failure of the circuit breaker to remain closed (slipping latch) under normal operation or after replacement of parts may require re-adjustment of the latch bite.

Should adjustment be necessary, proceed as follows:

Refer to Fig. 5 and,

1. Check freedom of latch with the circuit breaker in the open position. The tripper bar spring should return the tripper bar stop screw (3) against stop (2).



Dwg. S-14328

- |                               |                       |
|-------------------------------|-----------------------|
| 1 Operating Mechanism Housing | 4 Stop Screw Lock Nut |
| 2 Stop                        | 5 Trip Bar Stop Plate |
| 3 Stop Screw                  | 6 Tripper Bar         |

**Fig. 5—Latch Bite Adjustment for Type KB  
Circuit Breakers**

2. Adjust stop screw (3) so that the circuit breaker will trip with a 0.060 inch feeler gauge and close with a 0.050 inch feeler gauge inserted at "A." Be sure and tighten the locknut on the stop screw and then recheck the adjustment.

### ACCESSORIES

The accessories that may be furnished with the Type KB circuit breaker should be connected in accordance with the connection diagram furnished. These devices have been adjusted, tested, and inspected before leaving the factory. However, operating tests under actual conditions are necessary and both the mechanical and electrical performance of each device should be noted. Where provision is made for adjustments, such adjustments should be within the limits recommended.

The instruction bulletin numbers for the accessories and tripping devices described in the following sections are listed in the bibliography at the back of this bulletin. Copies of these bulletins will be furnished on request.

### TYPE R-14 CONTROL RELAY

The Type R-14 control relay is a trip-free closing relay furnished on electrically operated circuit breakers. The operation of a remote mounted control switch energizes the control relay. The operation of the control relay contacts controls the closing operation of the solenoid. A non-repeat feature of the control relay prevents cyclic reclosing of the circuit breaker and assures that the momentarily rated relay pick-up coil receives only intermittent service.

### AUXILIARY SWITCHES

The Type L2 auxiliary switch is a front-connected switch with double-break contacts. The four-contact switch, furnished as standard on elec-

trically operated circuit breakers, is mounted on the right-hand side of the mechanism shelf. If more than four-contacts are required, a switch having an additional two contacts can be furnished in the same location. On applications requiring 7 to 12 contacts, an additional two, four, or six contact switch can be mounted on the left-hand side of the mechanism shelf.

The auxiliary switch is used primarily to protect the coil of the shunt trip device by opening the trip coil circuit. The auxiliary switch may also be used to control indicating lamps and interlocking or alarm circuit.

On applications requiring alarm contacts, a Type ML latched-contact switch is mounted on the rear of the circuit breaker escutcheon plate.

### SHUNT TRIP DEVICE

The shunt trip device is mounted to the shelf at the right-hand side of the operating mechanism. The device is used to trip the circuit breaker electrically from some remote control point without regard to the load conditions of the circuit.

### UNDERVOLTAGE TRIP DEVICE

The undervoltage trip device is mounted to the shelf at the left-hand side of the operating mechanism. The device will trip the circuit breaker when the voltage drops to some predetermined value of the main circuit voltage. The dropout voltage is 30 to 60 per cent of the circuit voltage.

When it is required that the circuit breaker remain closed for a short interval following a voltage failure, an adhesion type time delay device is added. This device delays the operation of the undervoltage trip device for approximately 3 seconds at no voltage.

### INSTANTANEOUS OVERCURRENT TRIP DEVICE

The instantaneous overcurrent trip device is a direct acting device which operates to trip the circuit breaker instantaneously at all values of current above a predetermined calibrated value. The device is series connected so that all the current flowing through the circuit breaker flows through the trip coil. Normal calibration is 80 to 160 per cent of the circuit breaker rating.

### DUAL MAGNETIC OVERCURRENT TRIP DEVICE

The dual magnetic overcurrent trip device combines short period overcurrent protection with instantaneous short circuit protection. The device is mounted to the insulated base molding directly beneath the pole with which it is associated. Since all poles are rigidly connected in opening and closing, response of the tripping device of one pole to an overcurrent or short circuit will cause the opening of all poles. The time delay calibration range of the tripping adjustment is 80 to 160



per cent of the circuit breaker rating. The outside armature provides a fixed instantaneous trip which is set at approximately 8 times the continuous-current rating for d-c circuit breakers, and 12 times the continuous-current rating for a-c circuit breakers.

#### DUAL THERMAL MAGNETIC OVERCURRENT TRIP DEVICE

The dual thermal magnetic overcurrent trip device is designed for standard a-c circuit breakers when used on individual motor circuits. The device provides direct acting inverse time operation and is designed for tripping a circuit breaker during overcurrent, single-phase overcurrent, and short circuit conditions. It is mounted to the insulated base molding directly beneath the pole with which it is associated.

#### REVERSE CURRENT TRIP DEVICE

The reverse current trip device is a direct current device which operates to trip the circuit breaker upon a reversal of current flow in the circuit. Operation is through magnetic interaction of a series-connected coil and a shunt-connected coil.

The device will trip on any reverse current in excess of the calibration setting. The calibration range of tripping adjustment is 5-25 per cent of the continuous-current rating of the circuit breaker. Tripping action requires that voltage in excess of 70 per cent be maintained.

#### TYPE OD-1 AND OD-2 OVERCURRENT TRIP DEVICES

The Type OD-1 and Type OD-2 overcurrent trip devices each consist of two of the following basic elements in two combinations.

1. A long-time delay trip element using a fluid-displacement dashpot for time delays measured in seconds, minutes, and hours.

2. A short-time delay trip element using a mechanical timer for time delays measured in cycles.

3. An instantaneous trip element which operates with no intentional time delay.

The Type OD-1 dual overcurrent trip device is comprised of a long-time delay element and an instantaneous element.

The Type OD-2 dual selective overcurrent trip device is comprised of a long-time delay element and a short-time delay element.

The long-time delay trip element is calibrated and adjustable to minimum operating currents of 80 to 160 per cent of the continuous-current rating of the circuit breaker.

The short-time delay trip element is calibrated and adjustable to minimum operating currents of 500, 750, and 1000 per cent of the continuous-current rating of the circuit breaker.

The instantaneous trip element is calibrated and adjustable to minimum operating currents of 800, 1200, and 1500 per cent of the continuous-current rating of the circuit breaker.

#### RENEWAL PARTS

It is recommended that sufficient renewal parts be stocked to facilitate proper maintenance and replacement of parts. The quantity of parts and items stocked should be based on the number of circuit breakers in service and previous operating experience.

When ordering renewal parts, address the nearest Sales Office of the I-T-E Circuit Breaker Company. Specify the type and serial number of the circuit breaker, description of parts, and quantity required.

*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 I-T-E Circuit Breaker Company.*

**BIBLIOGRAPHY**

<i>Title</i>	<i>Bulletin No.</i>
Type L2 Auxiliary Switches .....	IB-5504
Type ML Latched-Contact Switch .....	IB-5500
Type R-14 Control Relay .....	IB-5412
Shunt Trip Device .....	IB-5405
Undervoltage Trip Device .....	IB-5406
Dual Magnetic Overcurrent Trip Device .....	IB-5408
Type OD-1 and OD-2 Overcurrent Trip Devices .....	IB-5413

The above listed instruction bulletins can be obtained by requesting copies from the nearest Sales Office of the I-T-E Circuit Breaker Company.