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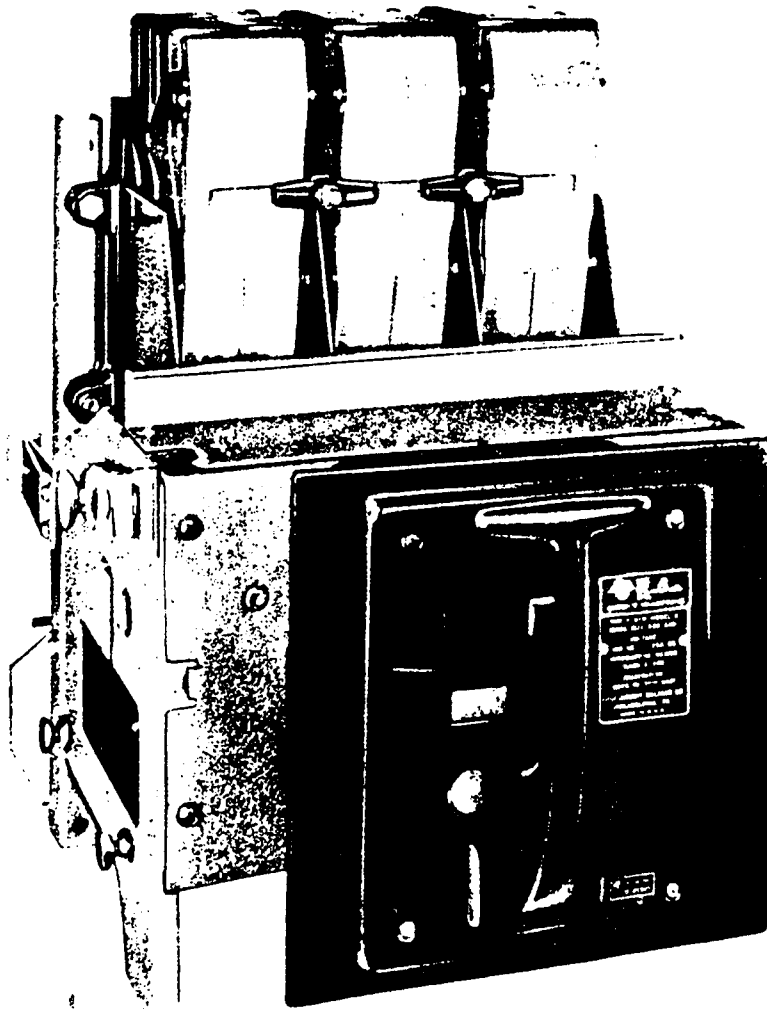
IB-5721

LOW VOLTAGE POWER SWITCHGEAR

## INSTRUCTIONS

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TYPE K-225, K-600 AND K-1600  
CIRCUIT BREAKERS  
DRAWOUT MOUNTED, MODEL A



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

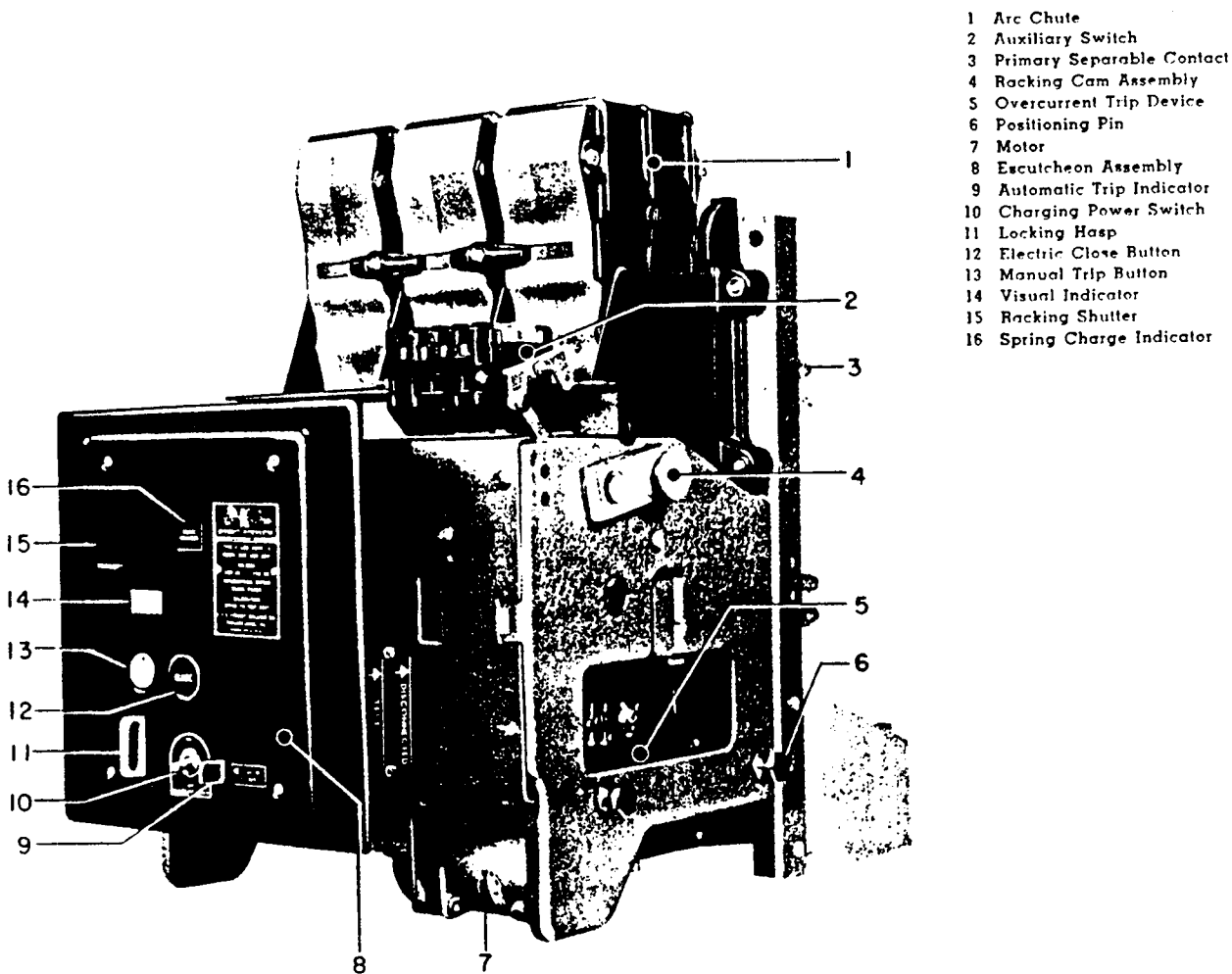
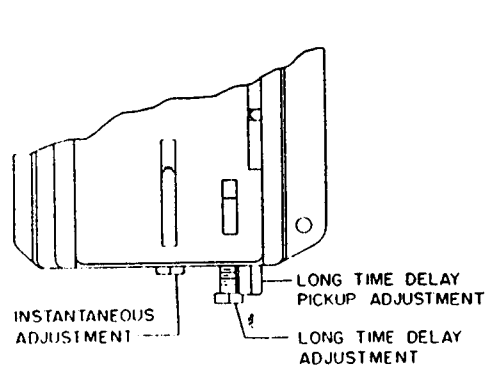


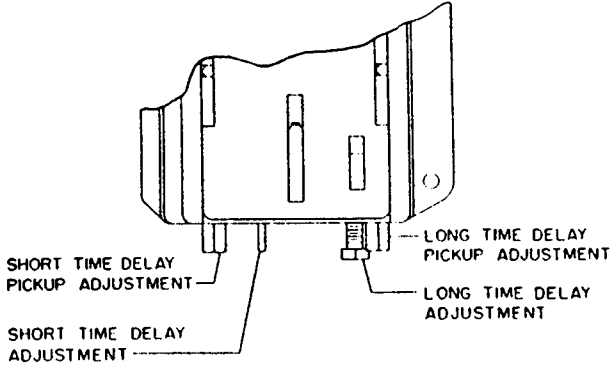
Photo. 28323-A

Fig. 1—Type K-600 Electrically Operated Circuit Breaker



Dwg. S-14388

Fig. 2—Type OD-3 Overcurrent Trip Device, Partial View Showing Adjustable Features



Dwg. S-14389

Fig. 3—Type OD-4 Overcurrent Trip Device, Partial View Showing Adjustable Features



## INSTRUCTIONS FOR TYPE K-225, K-600 AND K-1600 CIRCUIT BREAKERS DRAWOUT MOUNTED, MODEL A

### TRANSPORTATION DAMAGE

If damage or loss is evident, file a claim at once with the carrier and promptly notify the I-T-E Circuit Breaker Company.

### GENERAL INFORMATION

The following sections are pertinent to the basic operation of the circuit breaker.

### STORAGE

The circuit breaker may be stored and locked in the "DISCONNECTED" position in its compartment with the door closed. Both the primary and control separable contacts are disconnected in this position.

### RACKING MECHANISM

The racking mechanism may be used to move the circuit breaker to any one of its three positions ("CONNECTED," "TEST" or "DISCONNECTED"). All of these positions are attainable with the cubicle door closed. The racking shutter (15, Fig. 1), which must be lifted to gain access to the racking mechanism, is interlocked with the circuit breaker so that the circuit breaker contacts must be open before the shutter may be lifted to rack the circuit breaker to another position. The circuit breaker can not be closed when the shutter is open. The circuit breaker may be padlocked open by means of the locking hasp. This automatically locks the racking mechanism. With the "TRIP" button (13, Fig. 1) depressed, the locking hasp (11, Fig. 1) may be pulled outward, accommodating from one to three padlocks, when the shutter is closed and the circuit breaker is tripped. The shutter can not be lifted and the breaker contacts can not be closed when the locking hasp is restrained by one or more padlocks.

### AUTOMATIC TRIP INDICATOR (Alarm and Lockout)

The automatic trip indicator (9, Fig. 1) extends through the escutcheon and provides a positive indication when overcurrent or undervoltage tripping has occurred. The indicator should be manually reset after each indication by pushing the indicator to its normal position. The alarm contacts and/or lockout attachment, if provided, are manually reset by this indicator. Reset is mandatory if these features are provided.

### OVERCURRENT TRIP DEVICES

#### Type OD-3 Dual Overcurrent Trip Device

The type OD-3 overcurrent trip device, for general purpose applications, provides long-time delay tripping on moderate overcurrents which are above the long-time pickup setting, and instantaneous tripping on fault currents above the instantaneous trip settings. This device must be properly set to provide adequate protection for an electrical system. Three adjustment screws (See Fig. 2) on the bottom of the device provide independent control of the long-time pickup, instantaneous pickup, and amount of time delay. The nameplate of this device shows the settings of these adjustments and the range of settings which are available. For information on the time-current characteristic of this device, request a copy of TD-5523.

#### Type OD-4 Dual Selective Overcurrent Trip Device

The type OD-4 overcurrent trip device provides long-time delay and short-time delay tripping. Independent adjustment of both pickup and time delay is provided for both types of tripping (see Fig. 3). The pickup settings and ranges of adjustment are indicated on the device nameplate. For information on the time current characteristic of this device, request a copy of TD-5524.

### INSTALLATION

**CAUTION: FOR INITIAL INSTALLATION, DE-ENERGIZE THE PRIMARY AND CONTROL CIRCUITS BEFORE INSERTING THE CIRCUIT BREAKER INTO THE COMPARTMENT.**

### INSERTING CIRCUIT BREAKER

To insert the circuit breaker into its compartment, proceed as described below:

1. The circuit breaker must be in the "OPEN" position, the racking crank turned in the counter-clockwise direction fully against its stop, and the charging power switch (10, Fig. 1) (electrically operated circuit breakers only) in the "OFF" position.
2. Open the compartment door and pull out the right-hand and left-hand tracks (4, Fig. 4) to the fully extended and latched position.
3. Using the lifting yoke, lower the circuit breaker so that the positioning pins (5, Fig. 4) (two each side of circuit breaker) rest in the cut-out sections of each track (4, Fig. 4).

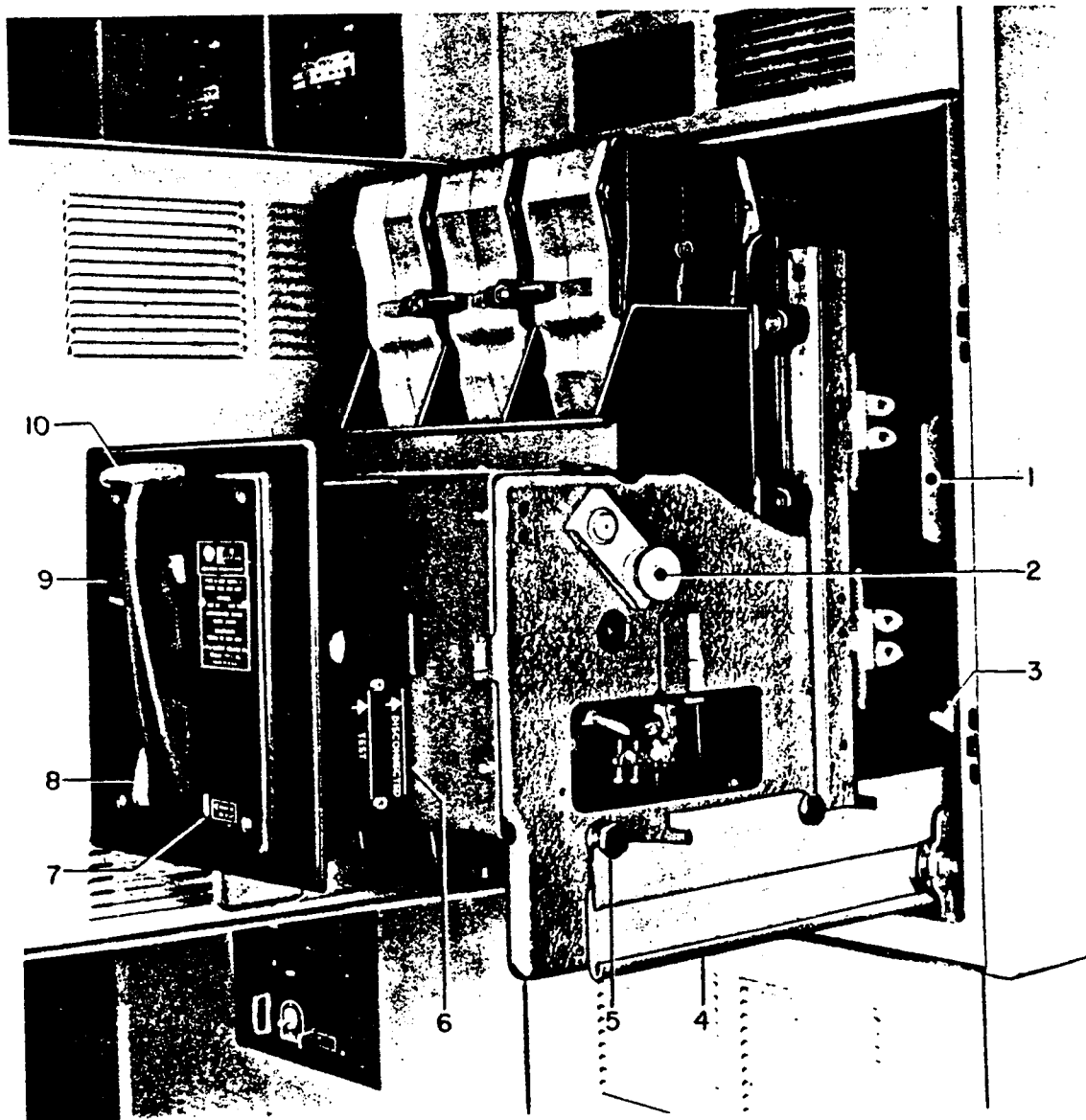


Photo. 28293-RA

- |                        |                            |
|------------------------|----------------------------|
| 1 Cradle Assembly      | 6 Position Indicator       |
| 2 Racking Cam Assembly | 7 Automatic Trip Indicator |
| 3 Latch                | 8 Locking Hasp             |
| 4 Track                | 9 Racking Shutter          |
| 5 Positioning Pin      | 10 Operating Handle        |

Fig. 4—Type K-600 Circuit Breaker on Tracks Ready to be Placed in Compartment



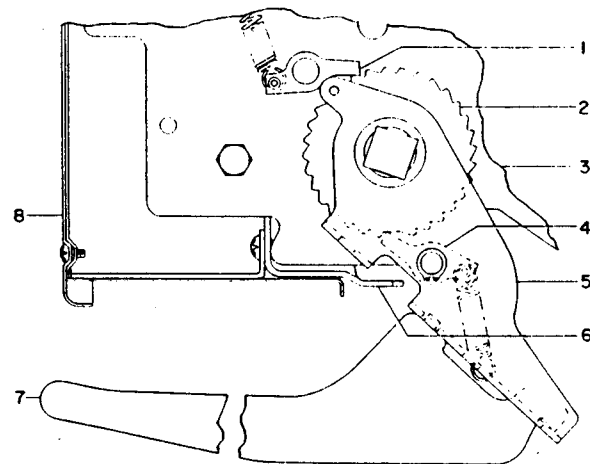
4. Remove the lifting yoke and push the circuit breaker toward the compartment. The circuit breaker will slide in the cut-out sections of the tracks until the positioning pins reach the end of the cutouts. An additional positive push will automatically release the two latches (3, Fig. 4). This allows the circuit breaker to move toward the compartment until the racking cams (2, Fig. 4) stop against their guides on the cradle (1, Fig. 4).
5. Lift shutter (9, Fig. 4) covering the racking opening, insert racking crank, and turn crank clockwise, pass through the "DISCONNECTED" position, until the position indicator on the cradle shows "TEST" position.
6. Perform all steps in TABLE I, A or B.

TABLE I — Pre-Operational Inspection

| A—Electrically Operated Breakers   |
|--|
| a. Manually reset automatic trip indicator (7, Fig. 4), if required.   |
| b. Charge closing power springs by means of removable maintenance handle (7, Fig. 5). Close circuit breaker by operating lever on closing relay. Trip by pushing manual "TRIP" button on escutcheon. |
| c. Refer to instruction card on type OD over-current trip device.  |
| d. Megger out all circuits.  |
| e. Energize the control circuit, turn charging power switch (10, Fig. 1) to "ON", and electrically close and manually trip the circuit breaker from the push buttons on the escutcheon.              |
| f. Close and trip the circuit breaker from the remote mounted control switch, and check each auxiliary device, such as undervoltage trip, for proper operation.                                      |

| B—Manually Operated Breakers   |
|--|
| a. Manually reset automatic trip indicator (7, Fig. 4), if required.   |
| b. Close circuit breaker by means of manual handle (10, Fig. 4). Trip by pushing manual "TRIP" button on escutcheon.   |
| c. Refer to instruction card on type OD over-current trip device.  |
| d. Megger out all circuits.  |
| e. If the circuit breaker has a shunt trip device, energize the control circuit and manually close, and electrically trip the circuit breaker from the remote mounted "TRIP" switch. |

7. With the circuit breaker in the "OPEN" position and the charging power switch (10, Fig. 1) in the "OFF" position, insert the racking crank and turn clockwise until the position



Dwg. S-14390

- |                        |                         |
|------------------------|-------------------------|
| 1 Pawl (Holding)       | 5 Carrier               |
| 2 Ratchet              | 6 Mechanism Front Plate |
| 3 Mechanism Side Plate | 7 Maintenance Handle    |
| 4 Pawl (Drive)         | 8 Escutcheon            |

Fig. 5—Partial View of Mechanism Showing Location of Maintenance Handle

indicator on the cradle shows "CONNECTED" position.

8. Remove racking crank, place charging power switch (electrically operated circuit breakers only) in the "ON" position, energize the primary circuit, and the circuit breaker is ready for service.

### REMOVING THE CIRCUIT BREAKER

To move the circuit breaker to the "TEST" position or to remove it from the compartment proceed as follows:

1. With the compartment door closed, trip the circuit breaker by means of the remote mounted control switch or manual "TRIP" button (13, Fig. 1) on the escutcheon.
2. Lift racking shutter (9, Fig. 4), insert racking crank and turn counter-clockwise until position indicator (6, Fig. 4) on the right-hand side of the escutcheon shows "TEST" position. (NOTE: The circuit breaker may be tested in this position -- primary contacts are disconnected and the control contacts are connected.)
3. Continue turning the racking crank counter-clockwise until the position indicator (6, Fig. 4) on the right-hand side of the escutcheon shows "DISCONNECTED" position.
4. Open compartment door and discharge closing springs (electrically operated breakers only) by lifting the emergency close lever on the relay and then pushing the manual trip button on the escutcheon. Place charging power switch (10, Fig. 1) in the "OFF" position.



5. Insert racking handle and crank clockwise as far as the stops will allow.
6. Pull circuit breaker forward until tracks (4, Fig. 4) are in the fully extended and latched position.
7. Using the lifting yoke, just pick up the circuit breaker weight.
8. With a positive pull, release positioning pins from cut-out sections of the tracks.
9. Remove circuit breaker from tracks by means of lifting yoke.
10. Release latch (3, Fig. 4) on each track, push tracks into the compartment, and close compartment door.

**OPERATION**

The circuit breakers are designed for manual and electrical operation. Electrically operated circuit breakers may be closed manually for maintenance purposes.

The circuit breakers are mechanically and electrically trip free. That is, the circuit breaker mechanism will be tripped in any part of its closing stroke by operation of any tripping device with which it is equipped. As soon as the contacts touch under short circuit or sever overload conditions, the circuit breaker will immediately trip to the "OPEN" position.

Refer to TABLE II for the possible means of charging, closing, and tripping the circuit breaker in the various compartment positions.

**MAINTENANCE**

It is recommended that a maintenance program be established for inspecting the circuit breaker at least once every six months and, as soon as possible, after a short circuit or severe overload interruption.

**WARNING: KEEP HANDS CLEAR OF ALL OPERATING PARTS. THE CLOSING SPRINGS ON ELECTRICALLY OPERATED CIRCUIT BREAKERS ARE CHARGED WHEN THE CIRCUIT BREAKER IS IN THE "OPEN" POSITION.** Refer to section Discharging Closing Springs under MAINTENANCE OPERATION for procedure to discharge the closing springs.

For maintenance instructions, request copies of IB-5724 from the nearest Sales Office of the I-T-E Circuit Breaker Company.

**MAINTENANCE OPERATION**

Refer to TABLE II for possible means of charging, closing, and tripping the circuit breaker. The circuit breaker should be in either the "TEST" or "DISCONNECTED" position, or withdrawn from the compartment.

**Discharging Closing Springs**

The closing springs of manually operated circuit breakers are discharged by each closing operation.

**TABLE II — Methods of Operation**

| Electrically Operated Breakers |      |              |   | Manually Operated Breakers |      |              |   |
|--------------------------------|------|--------------|---|----------------------------|------|--------------|---|
| Position                       |      |              | Operation and Method  | Position                   |      |              | Operation and Method  |
| Connected                      | Test | Disconnected |   | Connected                  | Test | Disconnected |   |
| x                              | x    |              | <b>CHARGING:</b><br>1. Electrical— <sup>ⓐ</sup> Motor<br>2. Manual— <sup>ⓑ</sup> Removable maintenance handle<br><br><b>CLOSING:</b><br>1. Electrical—<br>a. Remote "Close" Switch<br>b. Local "CLOSE" button<br>2. Manual— <sup>ⓒ</sup> Lever on closing relay<br><br><b>TRIPPING:</b><br>1. Electrical—Remote "TRIP" switch<br>2. Manual—Manual "TRIP" button | x                          | x    | x            | <b>CHARGING AND CLOSING:</b><br>1. Manual Closing Handle<br><br><b>TRIPPING:</b><br>1. Electrical (If shunt trip or under-voltage trip is provided)—Remote "TRIP" switch.<br>2. Manual—Manual "TRIP" button |
| ⓧ                              | x    | x            |   | x                          | x    |              |   |
| x                              | x    |              |   | x                          | x    | x            |   |
| ⓧ                              | x    | x            |   |                            |      |              |   |
| x                              | x    |              |   |                            |      |              |   |
| x                              | x    | x            |   |                            |      |              |   |

- ⓧ Operation requires compartment door to be open and therefore is not recommended when the circuit breaker is energized.
- ⓐ The charging power switch (10, Fig. 1) must be in the "ON" position.
- ⓑ Place maintenance handle as shown in Fig. 5, and operate with a ratchet type motion.
- ⓒ Lift lever at front-right of control relay to manually release latch and close circuit breaker.





The closing springs of electrically operated circuit breakers are charged whenever the contacts are open, the charging power switch is "ON", and control power is available. Two methods of discharging the closing springs are necessary; one, for the circuit breaker when it is in the "TEST" position; and the second, when it is in the "DISCONNECTED" position or withdrawn from the compartment.

With the circuit breaker in the "TEST" position, discharge the closing springs as follows:

1. Close the circuit breaker with the local "CLOSE" button (12, Fig. 1).
2. Place charging power switch (10, Fig. 1) in the "OFF" position.
3. Open the circuit breaker by means of the manual "TRIP" button (13, Fig. 1).
4. Closing springs are now discharged.

If the circuit breaker is in the "DISCONNECTED" position or withdrawn from the compartment, discharge the closing springs as follows:

1. Lift lever at front-right of control relay to manually release latch and close the circuit breaker.
2. Open the circuit breaker by means of the manual "TRIP" button (13, Fig. 1).
3. Closing springs are now discharged.
4. Place charging power switch (10, Fig. 1) in the "OFF" position.

#### RENEWAL PARTS

To order renewal parts, address the nearest Sales Office of the I-T-E Circuit Breaker Company. Specify the complete nameplate data, description of part, 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.*

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*Consult Our Sales Offices*

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The I-T-E Circuit Breaker Company is represented in all principal cities of the United States and Canada. These representatives are experienced and are competent to make correct applications, as well as give complete information and prices. We suggest you consult the representative nearest you.



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**General Offices and Factory:**

**PHILADELPHIA**

*19th and Hamilton Streets, Phila. 30, Pa.*

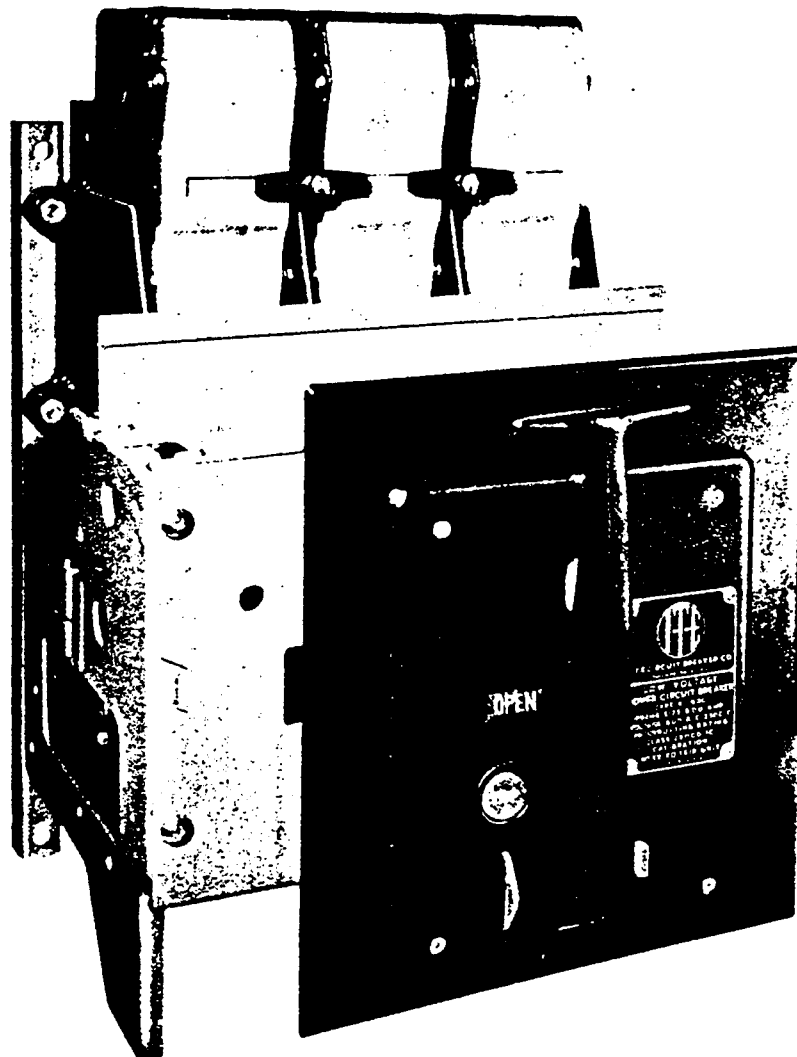




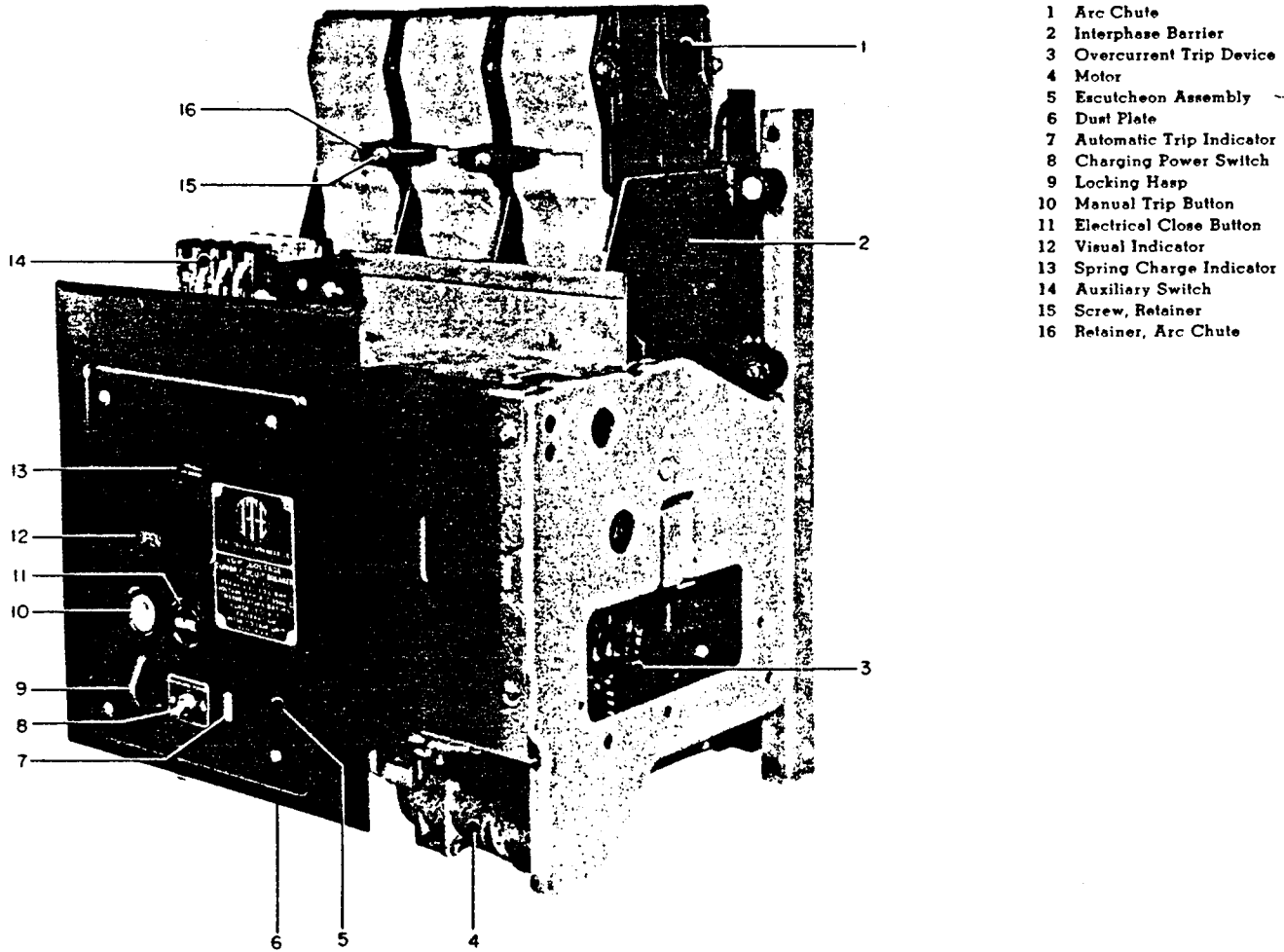
**IB-5724**

# LOW VOLTAGE POWER SWITCHGEAR **INSTRUCTIONS**

## MAINTENANCE OF TYPE K-225, K-600 AND K-1600 CIRCUIT BREAKERS

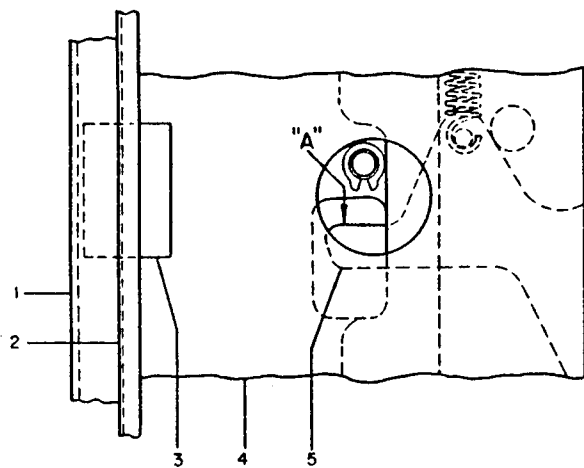


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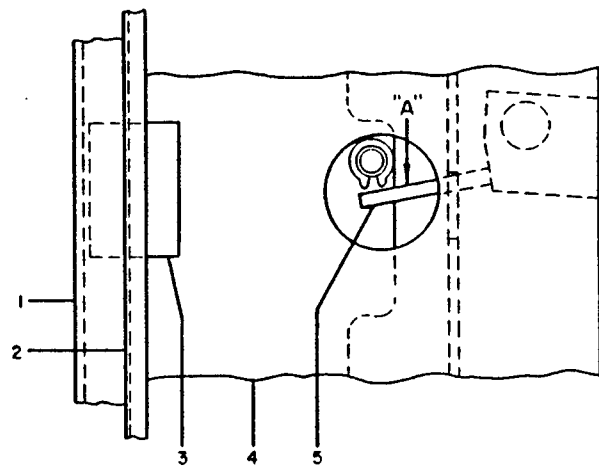
- 1 Arc Chute
- 2 Interphase Barrier
- 3 Overcurrent Trip Device
- 4 Motor
- 5 Escutcheon Assembly
- 6 Dust Plate
- 7 Automatic Trip Indicator
- 8 Charging Power Switch
- 9 Locking Hasp
- 10 Manual Trip Button
- 11 Electrical Close Button
- 12 Visual Indicator
- 13 Spring Charge Indicator
- 14 Auxiliary Switch
- 15 Screw, Retainer
- 16 Retainer, Arc Chute

Fig. 1—Typical "K-Line" Electrically Operated Circuit Breaker, Type K-600 Shown



- 1 Escutcheon
- 2 Dust Plate
- 3 Spring, Dust Plate
- 4 Box, Escutcheon (Right-Hand Side)
- 5 Hold-Up Latch

Fig. 2—Partial View of Escutcheon Assembly (Right-Hand Side) Showing Slow Close Lever for Manually Operated Circuit Breakers



- 1 Escutcheon
- 2 Dust Plate
- 3 Spring, Dust Plate
- 4 Box, Escutcheon (Right-Hand Side)
- 5 Pin, Close Block Lever

Fig. 3—Partial View of Escutcheon Assembly (Right-Hand Side) Showing Slow Close Lever for Electrically Operated Circuit Breakers

Photo 29366.RB  
Cover Photo 29214-R

Dwg. S-14785  
Dwg. S-14784



## MAINTENANCE OF TYPE K-225, K-600, AND K-1600 CIRCUIT BREAKERS

### GENERAL INFORMATION

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 as follows:

- a. At least once each year.
- b. After each short circuit or severe overload interruption.

Circuit breakers subjected to abnormal conditions, such as acid fumes, salt deposits, or cement dust, require more frequent maintenance if flashovers resulting from accumulated substances are to be avoided.

**WARNING: TRIP THE CIRCUIT BREAKER BY MEANS OF THE MANUAL TRIP BUTTON ONLY. KEEP HANDS CLEAR OF ALL OPERATING PARTS. THE CLOSING SPRINGS, ON ELECTRICALLY OPERATED CIRCUIT BREAKERS, ARE CHARGED WHEN THE CIRCUIT BREAKER IS IN THE OPEN POSITION.**

### DISCHARGING CLOSING SPRINGS

Discharge the closing springs, of electrically operated circuit breakers, if the circuit breaker is to be removed from its mounting or enclosure for maintenance purposes, or if it is to be placed in storage. Refer to the applicable circuit breaker instruction bulletin for the procedures to install and remove the circuit breakers. To discharge the closing springs, proceed as follows:

1. De-energize the primary and control circuits ("DISCONNECTED" position for drawout mounted circuit breakers).
2. Lift the emergency close lever (3, Fig. 9) on the control device to manually release the secondary close latch (7, Fig. 9) and close the circuit breaker.
3. Open the circuit breaker by means of the manual "TRIP" button (10, Fig. 1).
4. The closing springs are now discharged.
5. Place the charging power switch (8, Fig. 1) in the "OFF" position.

### MAINTENANCE INSPECTION

**CAUTION: DE-ENERGIZE THE PRIMARY AND CONTROL CIRCUITS BEFORE MAKING ANY INSPECTIONS. RACK DRAWOUT MOUNTED CIRCUIT BREAKERS TO THE "DISCONNECTED" POSITION.**

### ARC CHUTE (Refer to Fig. 1)

#### Removal

1. Loosen the retaining screw (15) and remove the screw and retainer (16).
2. Pull the arc chute forward slightly then lift to remove.

#### Examination

1. Discoloration or slight eroding is not harmful.
2. Arc runners or cooling plates that are burned, or moldings that are cracked or broken require replacement of the arc chute.

#### Replacement

1. Properly position the arc chute in the upper molding.
2. Position retainer (16) and insert and tighten screw (15).

### CONTACTS

1. Wipe with a clean cloth saturated with carbon tetrachloride or its equivalent.
2. Pitting or discoloration is not detrimental unless it interferes with proper contact adjustment.
3. Small burrs on the arcing contacts to be removed by filing along contour of the contact. Do not let filings fall into the mechanism.
4. Replace badly burned and pitted contacts that do not meet correct adjustment requirements.

**NOTE:** Several operations at two week intervals will remove the effects of oxidation.

### INSULATING PARTS

1. Wipe all insulating parts with a clean cloth saturated with carbon tetrachloride or its equivalent.

### ADJUSTMENTS

**NOTE:** The operating mechanism must be operated slowly, as described in section SLOW CLOSE PROCEDURE, when performing any adjustment requiring contact movement.

### SLOW CLOSE PROCEDURE

#### Manually Operated Circuit Breakers

Refer to Fig. 2 and,

1. Insert a screwdriver or rod through the hole in the escutcheon box (4) and mechanism housing assembly (right-hand side when facing the front of the circuit breaker).



2. Using the top of the hole as the fulcrum and the screwdriver or rod as the lever, depress the hold-up latch (5) at "A" and, at the same time, pull the operating handle downward to slowly close the circuit breaker contacts.

### Electrically Operated Circuit Breakers

**WARNING: THE CHARGING CRANKS MUST BE RESET (SEE STEPS 8, 9, AND 10 BELOW) AFTER THE LAST SLOW CLOSE OPERATION OR FUTURE ELECTRICAL OPERATION WILL BE IMPOSSIBLE.**

Refer to Fig. 3 unless otherwise noted.

1. The closing springs must be charged; see spring charge indicator (13, Fig. 1).

2. Insert a screwdriver or rod through the hole in the escutcheon box (4) (right-hand side when facing the front of the circuit breaker) and depress the close block lever pin (5) at "A".

3. With the close block lever pin (5) held in the down position, lift the emergency close lever (4, Fig. 9). The close block lever pin (5) will remain in the down position.

4. Insert the maintenance handle in the ratchet carrier and operate the handle to slowly close the contacts.

To repeat the slow close operation, continue with the following steps:

5. Insert the maintenance handle and continue the charging operation until the indicator (13, Fig. 1) shows "SPRINGS CHARGED".

6. Push manual "TRIP" button (10, Fig. 1) to open the contacts.

7. Repeat steps 2, 3, and 4 above for the slow close operation.

To reset the charging cranks for normal electrical operation, proceed as follows:

8. Repeat steps 5 and 6 above.

9. Lift emergency close lever (4, Fig. 9) to close the contacts.

10. Push the manual "TRIP" button (10, Fig. 1) to open the contacts.

The circuit breaker is now ready for normal service operation with the charging cranks reset and the closing springs discharged.

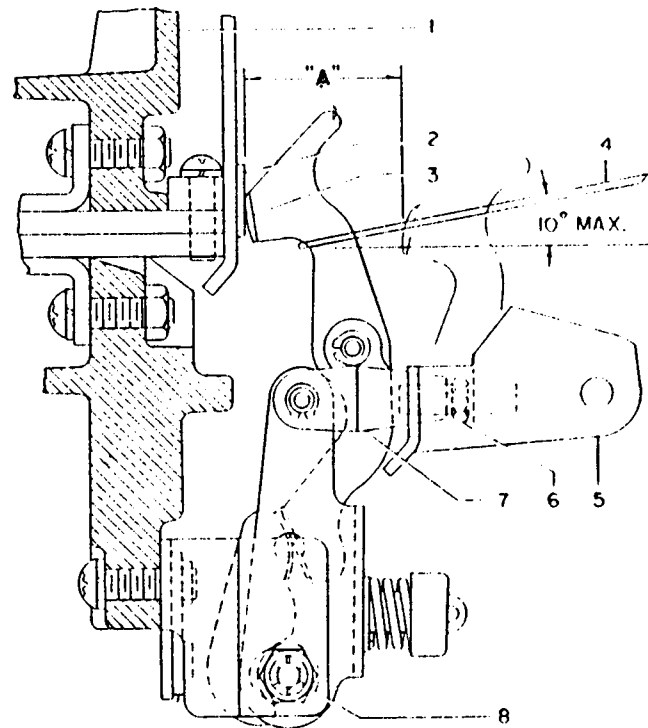
### CONTACTS

#### Type K-225 Circuit Breakers (Refer to Fig. 4)

1. The hex portion of the adjusting stud (6) must be centered, within 1/16 inch, between the yoke (7) and the insulator (5).

(NOTE: On some circuit breakers, the hex portion of the adjusting stud (6) must be centered between the lock nut on the adjusting stud and the insulator.)

2. Contact pressure should be between 40 and 50 pounds measured by a spring scale (4) positioned as shown. A low voltage bell and battery



|                      |                      |
|----------------------|----------------------|
| 1 Upper Molding      | 5 Insulator          |
| 2 Stationary Contact | 6 Adjusting Stud     |
| 3 Movable Contact    | 7 Yoke               |
| 4 Spring Scale       | 8 Nut (Self-Locking) |

**Fig. 4—Contact Adjustment for Type K-225 Circuit Breakers**

circuit, connected across the upper and lower current studs of each pole, can be used to indicate the instant the contacts "break".

NOTE: In the following steps, 3 and 4, if adjustment is required, always turn the adjusting stud (6) in the direction to increase the contact pressure (counter-clockwise when viewed from the insulator).

3. The movable contacts (3), of all poles, must touch the stationary contacts (2) at the same instant, within 0.015 inch.

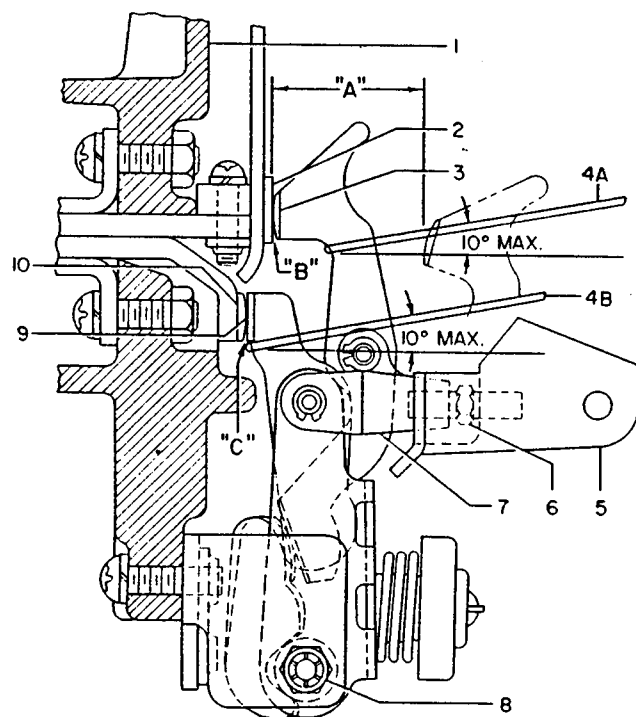
4. The open air gap measured at "A" should be 1-3/4 inch minimum.

5. Self-locking nut (8), producing the contact side pressure at the hinge, to be tightened to 30 foot pounds.

#### Type K-600 Circuit Breakers (Refer to Fig. 5)

This adjustment is the same as for the type K-225 circuit breaker except omit step 2 and use the following:

2. Contact pressure should be checked with a spring scale. A low voltage bell and battery circuit, connected across the upper and lower current studs of each pole, can be used to indicate the instant the contacts "break". Contact pressures should be as follows:



- |                             |                            |
|-----------------------------|----------------------------|
| 1 Upper Molding             | 6 Adjusting Stud           |
| 2 Stationary Arcing Contact | 7 Yoke                     |
| 3 Movable Arcing Contact    | 8 Nut (Self-Locking)       |
| 4 Spring Scale              | 9 Movable Main Contact     |
| 5 Insulator                 | 10 Stationary Main Contact |

**Fig. 5—Contact Adjustment for Type K-600 and K-1600 Circuit Breakers**

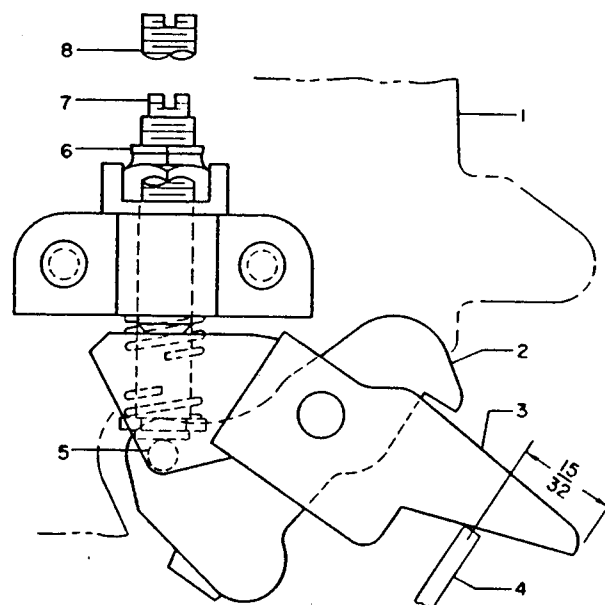
- The arcing contact pressure should be between 40 and 50 pounds measured by a spring scale positioned at "4A" and the main contacts separated by a thin sheet of insulation at "C".
- The main contact (pair) pressure should be between 60 and 68 pounds (both contacts pulled simultaneously) measured by a spring scale positioned at "4B" and the arcing contacts separated by a thin sheet of insulation at "B".

#### Type K-1600 Circuit Breakers (Refer to Fig. 5)

This adjustment is the same as for the type K-225 circuit breaker except omit step 2 and use the following:

2. Contact pressure should be checked with a spring scale. A low voltage bell and battery circuit, connected across the upper and lower current stud of each pole, can be used to indicate the instant the contacts "break". Contact pressures should be as follows:

- The arcing contact pressure should be between 40 and 50 pounds measured by a spring scale positioned at "4A" and the main contacts separated by a thin sheet of insulation at "C".



- |                                       |                                 |
|---------------------------------------|---------------------------------|
| 1 Mechanism Housing (Right-Hand Side) | 5 Trip Extension (On Latch Bar) |
| 2 Latch Bar                           | 6 Nut (Self-Locking)            |
| 3 Tripper Bar                         | 7 Adjusting Screw               |
| 4 Spring Scale                        | 8 Adjusting Screw               |

**Fig. 6—Latch Engagement and Tripper Bar Latch Engagement Adjustment**

- The center main contact (pair) pressure should be between 60 and 68 pounds (both contacts pulled simultaneously) measured by a spring scale positioned at "4B". The outer main contacts and arcing contacts must be separated by a thin sheet of insulation at "C" and "B" respectively.
- The outer main contact pressure should be between 45 and 50 pounds, each, measured by a spring scale positioned at "4B". The center main contacts, opposite outer main contact, and the arcing contacts must be separated by a thin sheet of insulation at "C" for the main contacts and at "B" for the arcing contacts.

#### MECHANISM

The various mechanism adjustments described in the following sections apply to the type K-225, K-600, and K-1600 circuit breakers.

#### Latch Engagement (Bite) (Refer to Fig. 6)

The latch engagement adjusting screw (7) is located to the right of the right-hand mechanism housing (1). It can be reached easily from the top of the circuit breaker.

To adjust the latch engagement, proceed as follows:

- Back off adjusting screw (7) to assure excessive latch engagement.
- Close the circuit breaker.





3. Turn adjusting screw (7) down slowly until the latch just releases, tripping the circuit breaker.
4. Back off the adjusting screw (7) 1-1/2 turns.

#### Tripper Bar Latch Engagement (Refer to Fig. 6)

The tripper bar latch engagement adjusting screw (8) is located adjacent to the latch engagement adjusting screw (7).

To adjust the tripper bar latch engagement, proceed as follows:

1. Back off adjusting screw (8) to assure excessive tripper bar travel.
2. Close the circuit breaker.
3. Turn adjusting screw (8) down slowly until the latch just releases, tripping the circuit breaker.
4. Back off the adjusting screw (8) 3-1/2 turns.

#### Tripper Bar Load (Refer to Fig. 6)

The tripper bar load is measured by use of a spring scale (4) positioned as shown.

1. With the circuit breaker in the "OPEN" position, the initial push required to move the tripper bar is 24 ounces maximum.
2. With the circuit breaker in the "CLOSED" position, the push required to trip the circuit breaker must be between 16 and 24 ounces.

### OVERCURRENT TRIP DEVICE

The type OD overcurrent trip devices are calibrated and adjusted before leaving the factory.

#### Armature Trip Travel (Refer to Fig. 7)

**CAUTION: KEEP HANDS CLEAR OF ALL MOVING PARTS. THE CIRCUIT BREAKER WILL TRIP TO THE "OPEN" POSITION WHILE CHECKING OR ADJUSTING THE ARMATURE TRIP TRAVEL.**

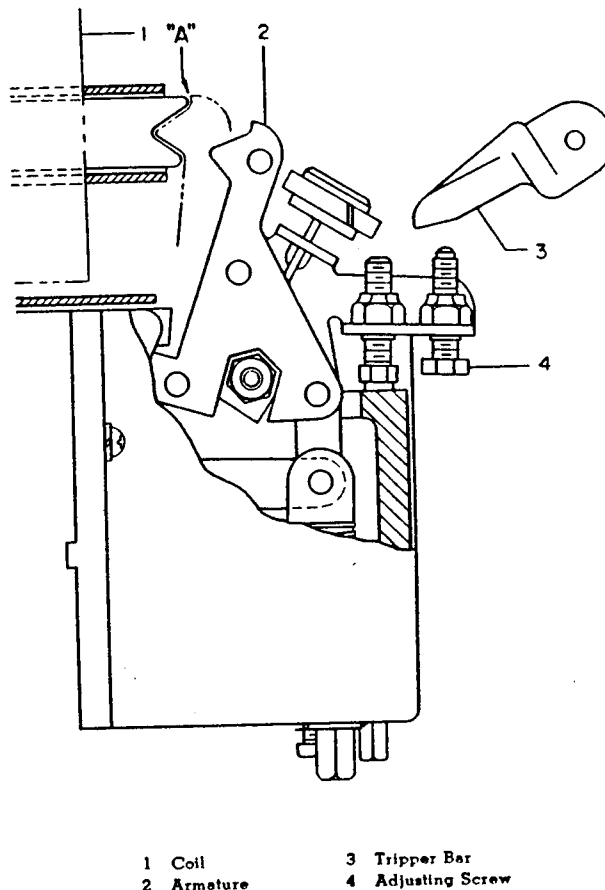
When checking the armature trip travel adjustment or making final armature trip travel adjustment, insert the feeler gauge at point "A" parallel to the magnet face. The circuit breaker should trip, when the armatures are operated by hand, with a 0.020 inch gauge inserted at "A". It should not trip when a 0.030 inch gauge is inserted.

If adjustments are not as stated above, turn the trip adjusting screw (4) in or out as may be required. Always recheck the trip travel adjustment after making any changes in the trip screw position.

Initial trip travel adjustment can be made as follows:

Refer to Fig. 7 and,

1. Back-out adjusting screw (4) so that it will not strike the tripper bar (3) when the armature (2) is operated by hand.



1 Coil  
2 Armature  
3 Tripper Bar  
4 Adjusting Screw

Fig. 7—Type OD Overcurrent Trip Device Adjustment

2. Close the circuit breaker.
3. Push up and hold the armature (2) in its tripping position (against the magnet face).
4. Slowly turn in the adjusting screw (4) until the circuit breaker trips.
5. Turn the adjusting screw (4) in (same direction as in step 4) one additional full turn.

**NOTE:** Final adjustment must be made by using the feeler gauges as described in the preceding paragraphs for checking the adjustment.

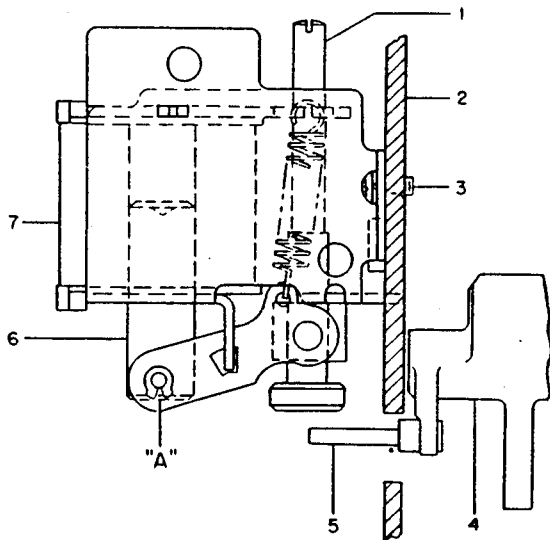
### SHUNT TRIP DEVICE (Refer to Fig. 8)

#### Excess Trip Travel

1. Back off trip rod (1) until it will not trip the circuit breaker with the armature (6) pushed up as far as the travel will allow.
2. Close the circuit breaker.
3. Push up on the armature (6) at "A" as far as the armature travel will allow.
4. Hold the armature as positioned in step 3 and turn trip rod (1) down until the circuit breaker just trips.
5. Turn trip rod (1) down an additional 3 turns.

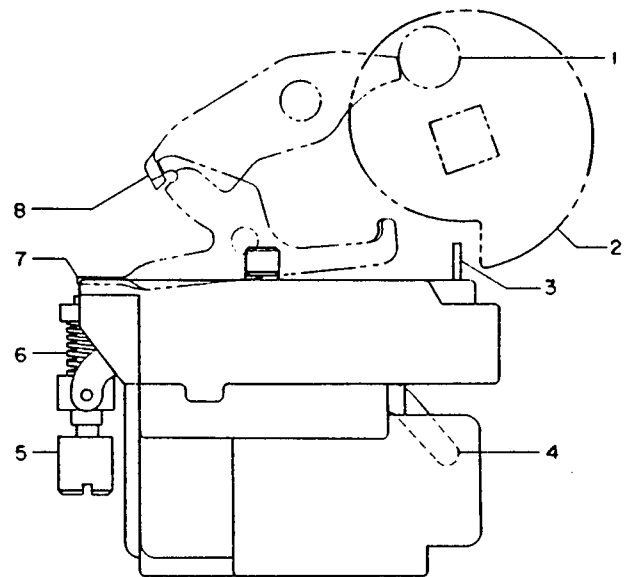


Dwg. S-14781  
Dwg. S-14786



- |   |                  |
|---|------------------|
| 1 Trip Rod                              | 4 Latch Bar      |
| 2 Mechanism Housing<br>(Left-Hand Side) | 5 Trip Extension |
| 3 Mounting Screw                        | 6 Armature       |
|   | 7 Coil           |

Fig. 8—Shunt Trip Device Adjustment



- |                          |                         |
|--------------------------|-------------------------|
| 1 Roller, Close Latch    | 5 Trip Rod              |
| 2 Charging Cam           | 6 Spring, Trip Rod      |
| 3 Actuator, Limit Switch | 7 Secondary Close Latch |
| 4 Emergency Close Lever  | 8 Primary Close Latch   |

Fig. 9—Control Device Adjustment

### CONTROL DEVICE (Refer to Fig. 9)

The control device is adjusted before leaving the factory. It is recommended that no attempt be made to adjust the internal relays and contacts of this device in the field. If replacement of the control device is required, the trip rod (5) overtravel may be adjusted as described below.

#### Trip Rod Overtravel

1. Back off on the trip rod (5) until it will not strike the secondary close latch (7) when the emergency close lever (4) is lifted as far as its travel will allow.
2. With the closing springs charged, and the emergency close lever (4) lifted as far as its travel

will allow, turn trip rod (5) in until the circuit breaker just closes.

3. Turn trip rod (5) one additional turn in the same direction required to just close the circuit breaker in step 2 above.

### RENEWAL PARTS

To order renewal parts, address the nearest Sales Office of the I-T-E Circuit Breaker Company. Specify the complete nameplate data, description of parts, and quantity required.

To facilitate the ordering of renewal parts, a copy of RP-5801 will be furnished on request.

*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.*

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**Consult Our Sales Offices**

The I-T-E Circuit Breaker Company is represented in all principal cities of the United States and Canada. These representatives are experienced and are competent to make correct applications, as well as give complete information and prices. We suggest you consult the representative nearest you.



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**General Offices and Factory:**  
**PHILADELPHIA**



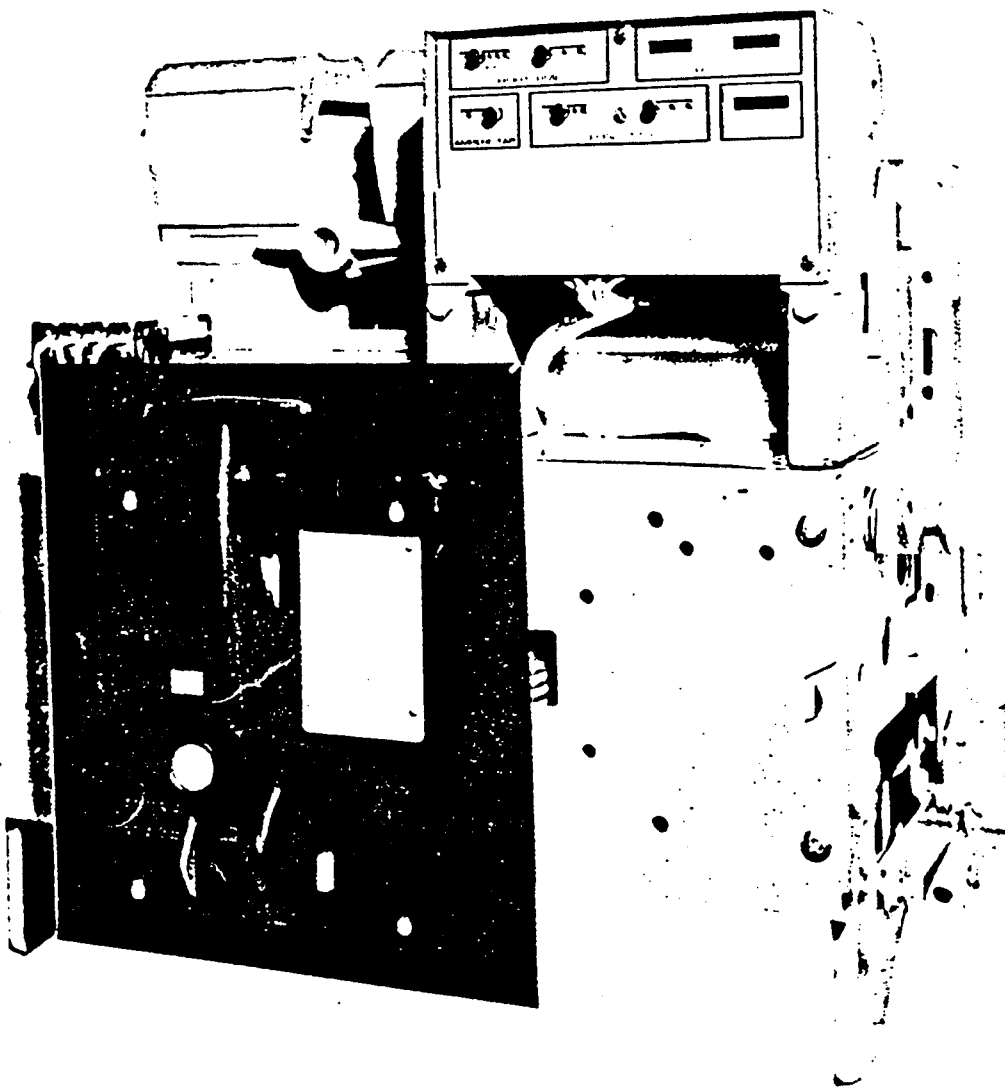
# LOW-VOLTAGE POWER CIRCUIT BREAKERS

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## INSTRUCTIONS

TYPE K-225, K-600, K-1600, K-2000,  
K-600S, K-1600S, K-2000S CIRCUIT BREAKERS

Stationary Switchboard Mounted and Drawout Mounted



**ITE Imperial Corporation**



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## INSTRUCTIONS FOR TYPE K-225, K-600, K-1600, K-2000, K-600S, K-1600S, K-2000S CIRCUIT BREAKERS

Stationary Switchboard Mounted and Drawout Mounted

### INTRODUCTION

These instructions apply to the type K-225 through K-2000 and K-600S through K-2000S circuit breakers; 225, 600, 1600 and 2000 ampere ac continuous current rating respectively. The type K-225 through K-2000 are equipped with electro-mechanical overcurrent trip devices, whereas the type K-600S through K-2000S incorporate the solid state overcurrent trip devices. A K-1600S circuit breaker is shown on the front cover of this bulletin.

The K-225 through K-2000 circuit breakers can be furnished with two or three poles for dc or ac operation. K-600S through K-2000S circuit breakers are only furnished for three pole, ac operation.

All circuit breakers can be furnished as drawout or stationary mounted and are available as manually or electrically operated and with electrical control devices available in various ac and dc voltage combinations. The manually and electrically operated mechanisms are interchangeable on circuit breakers having the same current rating. Many optional features are also available.

An electrically operated, drawout type circuit breaker is shown in Figure 1, with a typical schematic diagram shown in Figure 2.

These instructions should be read thoroughly before handling, installing and/or operating the circuit breaker.

### RECEIVING AND STORAGE

Immediately upon receipt of the circuit breakers, examine the cartons 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 Imperial Corporation. The I-T-E Imperial Corporation is not responsible for damage of goods after delivery to the carrier. However, the I-T-E Imperial Corporation will lend assistance if notified of claims.

Unpack the circuit breakers 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 damaging any of the circuit breaker parts. Check the contents of each carton 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 Imperial Corporation. Information specifying the purchase order number, carton number and part numbers of the damaged or missing parts should accompany the claim.

Circuit breakers should be installed in their permanent location as soon as possible. (See Basic Handling below.) If possible, a drawout circuit breaker should be stored and locked in the "DISCONNECTED" position in its compartment, with the door closed. Both the primary and control separable contacts are disconnected in this position. If the breaker cannot be installed in its compartment, it should be kept in its original carton and the carton should be sealed to prevent infiltration of dirt. Where conditions of high humidity prevail, the use of heaters is recommended, regardless of the method of storage selected.

### BASIC HANDLING INSTRUCTIONS

Once the circuit breaker has been removed from its shipping carton, it should be turned to the upright position and placed on a flat surface to avoid damage to breaker parts. For safety, all handling in this position should utilize the lifting yoke (20, Fig. 1).

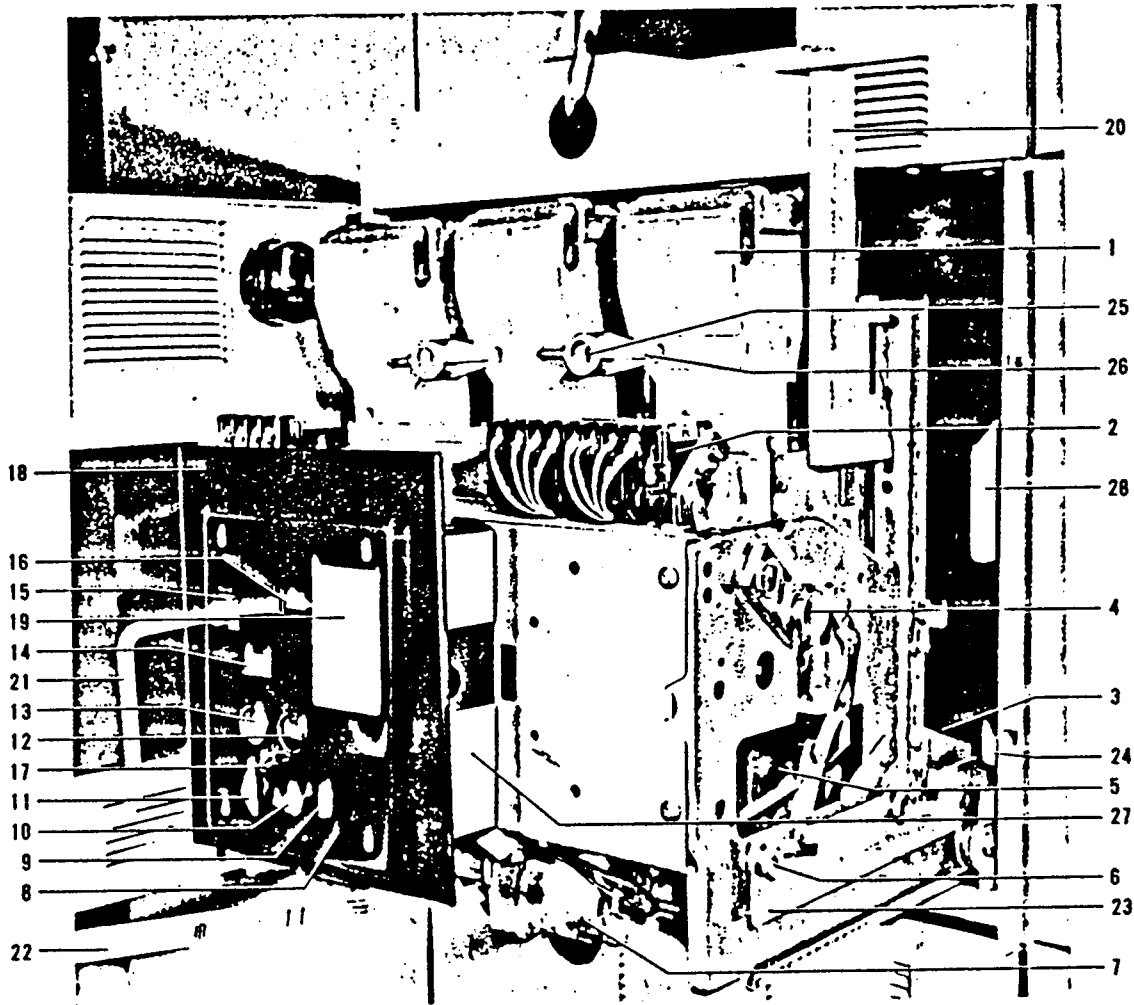
### CIRCUIT BREAKER OPERATION

#### CIRCUIT BREAKER RATING

The continuous current rating is established by the frame size of the circuit breaker and is the number listed in the type designation; i.e., K-600 means the circuit breaker can carry 600 amperes continuously. Exceeding these ratings may raise the temperature of the circuit breakers beyond their design limit and thereby affect the life of the circuit breaker. Thus, any long-time pickup setting exceeding 100% of the frame size is to be used only for coordination, not for carrying increased continuous current.

#### CLOSING SPRING OPERATION (Electrically Operated)

The two closing springs supply the power that closes the circuit breaker and also charge the two opening springs during the closing operation. The closing springs are charged by a motor. The spring energy is available to close the circuit breaker, thus referred to as "stored energy." Closing springs are normally charged when the circuit breaker is opened. If charged after closing, the circuit breaker may be opened and then reclosed without recharging the springs. In earlier model drawout circuit breakers, the closing springs are automatically discharged when the circuit breaker is pulled to the fully withdrawn position (shown in Figure 1). This prevents accidental discharge. In later models, the springs are automatically discharged when racking the circuit breaker from the disconnected to the withdrawn position.



- |                                  |                                     |                                  |
|----------------------------------|-------------------------------------|----------------------------------|
| 1. Arc Chute                     | 11. Locking Hasp                    | 21. Racking Crank                |
| 2. Auxiliary Switch              | 12. Electrical Close Push Button    | 22. Removable Maintenance Handle |
| 3. Secondary Separable Contacts  | 13. Manual Trip Button              | 23. Track                        |
| 4. Racking Cam Assembly          | 14. "OPEN" or "CLOSED" Indicator    | 24. Latch                        |
| 5. Overcurrent Trip Device       | 15. Racking Shutter                 | 25. Retaining Screw              |
| 6. Positioning Pins              | 16. Closing Spring Charge Indicator | 26. Retainer                     |
| 7. Closing Spring Charging Motor | 17. Manual Close Lever              | 27. Position Indicator           |
| 8. Escutcheon Assembly           | 18. Self Aligning Dust Plate        | 28. Cradle                       |
| 9. Automatic Trip Indicator      | 19. Nameplate                       |                                  |
| 10. Motor Disconnect Switch      | 20. Lifting Yoke                    |                                  |

Fig. 1 — Typical Electrically Operated, Drawout Type K-1600 Circuit Breaker





### CLOSING SPRING OPERATION (Manually Operated)

In one continuous downward pull of the handle the two closing springs are charged, and near the end of the stroke are discharged to fast close the circuit breaker. During closing, the two opening springs are charged.

### ESCUTCHEON OPERATING FEATURES

Manually and electrically operated circuit breakers are provided with an extendible escutcheon face plate. This escutcheon provides a central area for the controls which are mounted directly on the circuit breaker.

The controls for the electrically operated circuit breaker (Figure 1) included in the escutcheon face plate are: (19) nameplate giving the various ratings assigned to the particular type of circuit breaker, (13) manual trip button, (17) manual close lever, (12) electrical close push button switch, (10) motor disconnect switch, (14) "OPEN" and "CLOSED" position indicator, (9) automatic trip indicator with optional facilities for alarm indication and for lockout, (11) means for padlocking the circuit breaker in the "CONNECTED", "TEST" or "DISCONNECTED" position and (16) closing spring charge indicator. Handle (22) is normally removed and is used for emergency closing spring charging or maintenance work.

The manually operated circuit breaker includes a manual closing handle but does not include the electrical close push button switch, motor disconnect switch, manual close lever, spring charge indicator or maintenance handle.

All drawout circuit breakers have the racking shutter (15) that must be raised to allow inserting of the racking crank (21).

A self-aligning dust plate (18) immediately behind the escutcheon face plate is used to exclude dust from the circuit breaker compartment. On drawout type circuit breakers, the escutcheon face will protrude through the front door of the compartment when the circuit breaker is in the "TEST" and "DISCONNECTED" positions. In these positions, the dust plate still functions to exclude dust.

### Circuit Breaker Nameplate (Figure 1, Item 19)

The circuit breaker nameplate contains information regarding (1) the manufacturer's name and address, (2) type of circuit breaker design, (3) serial number of circuit breaker, (4) continuous current rating of frame size, (5) short circuit current rating at rated voltages, (6) frequency, (7) short time current.

### Manual Charging Handle (Manually Operated)

The manual charging handle is a T-shaped lever used on manually operated circuit breakers to charge the closing springs and close the circuit breaker in one continuous downward stroke.

### Manual Trip Button (Figure 1, Item 13)

The manual trip button, when pushed, trips the circuit breaker to "OPEN."

### Circuit Breaker "OPEN" or "CLOSED" Indicator (Figure 1, Item 14)

This indicator shows the physical position of the circuit breaker contacts.

### Automatic Trip Indicator (Figure 1, Item 9) (Not including undervoltage, alarm switch or lockout)

The automatic trip indicator is provided as standard equipment on the K-line® circuit breakers and is used to indicate the operation of the overcurrent trip device. This device is an indicator only and does not prevent the circuit breaker reclosing.

Upon an overcurrent trip operation, the indicator protrudes from the front plate approximately 1/2 inch.

The automatic trip indicator should be reset after each trip indication by pushing back into its normal latch position. The operator should investigate the cause of tripping before resetting the automatic trip indicator and subsequent reclosing the circuit breaker after an outage which results in an operation of the indicator.

### Automatic Trip Alarm Contacts (Hand Reset) (Figure 1, Item 9)

An alarm switch for remote electrical indication, which is optional, shows when automatic tripping has occurred. This is accomplished by adding a precision snap switch to the automatic trip indicator assembly. The automatic trip indicator actuates the roller on the alarm switch which in turn causes a normally open contact to close and a normally closed contact to open an overcurrent trip. The alarm contact is manually reset by pushing the trip indicator (9) back into its normal position.

### Automatic Trip Lockout (Hand Reset) (Figure 1, Item 9)

An additional device (which is also optional) may be added to the automatic trip indicator assembly device which serves to mechanically prevent reclosing the circuit breaker after an automatic trip operation. When the trip indicator is pushed in, the circuit breaker mechanism can then be operated to close the circuit breaker contacts.

### Padlocking Device (Figure 1, Item 11)

All K-line circuit breakers are equipped with means of padlocking the circuit breaker mechanism in a trip-free position. This is accomplished by the use of a locking plate to maintain the manual trip button in a tripping direction when the locking plate is held forward by one or more padlocks. To obtain the condition for padlocking the circuit breaker in the open position, the manual trip button is pushed inward. Then the padlock plate is pulled out and the padlock inserted into the vertical slot. In this position, the mechanism is maintained trip free and the contact arm cannot be moved to the closed position.

On circuit breakers equipped with drawout mechanism, the padlocking device is associated with the drawout interlocking mechanism so that the circuit breaker cannot be moved from any of its three basic drawout positions of "CONNECTED", "TEST" or "DISCONNECTED" with the padlocking in effect.



#### Closing Spring Charge Indicator (Electrically Operated) (Figure 1, Item 16)

Under normal operating conditions, the closing springs are automatically charged after each tripping operation. However, there are occasions when the springs will be in a discharged state. Therefore, it is desirable that means be available to indicate the charged or uncharged condition of the closing springs. This is accomplished by a visual indicator seen through an aperture in the escutcheon plate. The indicator is marked "SPRINGS CHARGED" and "SPRINGS UNCHARGED."

#### Motor Disconnect Switch (Electrically Operated) (Figure 1, Item 10)

The motor disconnect switch is a double pole, single-throw toggle type switch connected in series with the charging motor circuit and is used to disconnect the motor from the voltage source. This cut-off switch is used (1), when it is desirable to prevent automatic recharging of the closing springs just prior to taking the circuit breaker out of service for maintenance and (2), for control wiring dielectric test. The motor must be disconnected for the control wiring dielectric test and subsequently tested at 540 V ac or 760 V dc.

#### Electrical Close Push Button (Electrically Operated) (Figure 1, Item 12)

The electrical close push button is used to electrically close the circuit from the escutcheon. This contact is connected in series with the latch release coil (52X). Energizing the latch release coil allows the charged springs to close the circuit breaker.

#### Manual Close Lever (Electrically Operated) (Figure 1, Item 17)

The manual close lever is provided on electrically operated circuit breakers to provide a means of closing the breaker without control power.

#### Racking Mechanism (Drawout Breaker)

The racking mechanism may be used to move the circuit breaker to any one of its three positions ("CONNECTED", "TEST" or "DISCONNECTED"). All of these positions are attainable with the cubicle door closed. The racking shutter (15, Fig. 1), which must be lifted to gain access to the racking mechanism, is interlocked with the circuit breaker so that the circuit breaker contacts must be open before the shutter may be lifted to rack the circuit breaker to another position. The circuit breaker can not be closed when the shutter is open. The circuit breaker may be padlocked open by means of the locking hasp. This automatically locks the racking mechanism. With the "TRIP" button (13, Fig. 1) depressed, the locking hasp (11, Fig. 1) may be pulled outward, accommodating from one to three padlocks, when the shutter is closed and the circuit breaker is tripped. The shutter can not be lifted and the breaker contacts can not be closed when the locking hasp is restrained by one or more padlocks.

There are two sets of arrows and indicating lines to show the circuit breaker position. One set is utilized with the compartment door closed and one set with the door open.

## OPERATION OF DEVICES

### Electro-Mechanical Overcurrent Trip Devices Type K-225 thru K-2000 Circuit Breakers (Figures 14 thru 18)

(A) Type OD-3 General Purpose Overcurrent Trip Device. The type OD-3 overcurrent trip device, for general purpose applications, provides long-time delay tripping on moderate overcurrents which are above the long-time pickup setting; and instantaneous tripping on fault currents above the instantaneous trip setting. This device must be properly set to provide adequate protection for an electrical system. Three adjustment screws on the bottom of the device provide independent control of the long-time pickup, instantaneous pickup and amount of time delay. The nameplate of this device shows the setting of these adjustments and the range of settings which are available. For information on the time-current characteristics of this device, request a copy of TD-6693.

(B) Type OD-4 Selective Overcurrent Trip Device. The type OD-4 overcurrent trip device, for selective tripping applications, provides long-time delay and short-time delay tripping. Independent adjustment of both pickup and time delay is provided for both types of tripping. The nameplate of this device shows the settings which are available. For information on the time-current characteristics of this device, request a copy of TD-6694.

(C) Type OD-5 Triple-Selective Overcurrent Trip Device. This overcurrent trip device is similar to the OD-4 except that an instantaneous trip characteristic is added to the long-time delay and the short-time delay functions provided on the OD-4. For information on the time-current characteristics of this device, request a copy of TD-6695.

(D) See Table 1 on facing page for complete list of Electro-Mechanical standard overcurrent trip devices available. See Maintenance Section for adjustments.

### Power Shield™ Solid State Overcurrent Trip Devices Type K-600S thru K-2000S Circuit Breakers (See Figure 19)

This device includes the power supply sensors, overcurrent sensors, Power Shield solid state logic assembly, magnetic latch and the interconnecting wiring. Each phase of the circuit breaker has a power supply sensor and overcurrent sensor. The trip elements that are available are: long-time delay, instantaneous, short-time delay and ground fault. On a 3-phase 4-wire system, an additional remote sensor, mounted in the neutral bus, is required for complete ground fault protection.

The logic assembly is mounted near the front of the circuit breaker and with the cubicle door open the overcurrent control panel is readily accessible. This device must be properly set, as required by individual circuit conditions, to provide adequate protection for an electrical system. The movable plugs on the control panel provide independent control of the long-time, short-time, instantaneous and ground fault pickup and amount of time delay. The overcurrent device, with the exception of ground fault, will trip at the value of the AMPERE TAP setting times the plug setting of the various



pickup elements. The ground fault trip value will be the plug setting value times 100, as indicated on the nameplate.

(A) Type SS-3. This trip device is for general purpose application. It provides long-time delay tripping on moderate overcurrents, which are above the long-time pickup settings, and instantaneous tripping on fault currents above the instantaneous trip setting. For information on the time-current characteristics of this device, request a copy of TD-6966.

(B) Type SS-4 Selective Overcurrent Trip Device. This trip device, for selective tripping application, provides long-time delay and short-time delay tripping. For information on the time-current characteristics of this device, request a copy of TD-6967.

(C) Type SS-5 Triple-Selective Overcurrent Trip Device. This device includes the trip elements found in both the SS-3 and SS-4; i.e., long-time delay, short-time delay, and instantaneous tripping. For information on the time-current characteristics of this device, request a copy of TD-6967.

(D) The above three solid state overcurrent trip devices are available with ground fault protection and are designated by the types SS-3G, SS-4G and SS-5G. For information on the time current characteristics of this feature, request a copy of TD-6968.

(E) See Table 1A for a complete list of standard Solid State overcurrent trip devices.

TABLE 1  
STANDARD ELECTRO-MECHANICAL OVERCURRENT TRIP DEVICES

| Overcurrent Device Type | Trip Element |            |               | Time-Current Characteristic Curve |
|-------------------------|--------------|------------|---------------|-----------------------------------|
|                         | Long-Time    | Short-Time | Instantaneous |                                   |
| OD-3                    | X            |            | X             | TD-6693                           |
| OD-4                    | X            | X          |               | TD-6694                           |
| OD-5                    | X            | X          | X             | TD-6695                           |
| OD-6                    | X            |            | X             | TD-6695                           |
| OD-7                    |              |            | X             | None                              |
| OD-8                    |              |            | X             | None                              |
| OD-9                    |              | X          | X             | TD-6699                           |
| OD-10                   |              | X          |               | TD-6699                           |

NOTE: OD-3 long-time delay element has one time delay band only. All other long-time & short-time delay elements have three time delay bands.

TABLE 1A  
STANDARD SOLID STATE OVERCURRENT TRIP DEVICES

| Overcurrent Device Type | Trip Element |            |               |        | Time-Current Characteristic Curve |
|-------------------------|--------------|------------|---------------|--------|-----------------------------------|
|                         | Long-Time    | Short-Time | Instantaneous | Ground |                                   |
| SS-3                    | X            |            | X             |        | TD-6966                           |
| SS-3G                   | X            |            | X             | X      | TD-6966<br>TD-6968                |
| SS-4                    | X            | X          |               |        | TD-6967                           |
| SS-4G                   | X            | X          |               | X      | TD-6967<br>TD-6968                |
| SS-5                    | X            | X          | X             |        | TD-6967                           |
| SS-5G                   | X            | X          | X             | X      | TD-6967<br>TD-6968                |

NOTE: Time-current characteristic curves are not included in this book because separate coordination curves are normally provided with each order. When field calibration is performed, necessary instruction books (refer to page 18) will be provided and will include all pertinent timing information.



**Control Device (Electrically Operated)**

The control device (Fig. 12) is furnished on electrically operated circuit breakers. The device is mounted below and to the left of the mechanism. The control device contains three electrical components, the limit switch (LS), the lockout relay (52Y), and the latch release relay (52X). The schematic diagram of the control circuit (Fig. 2) illustrates the function of this device. In addition to its electrical functions, the base of the device provides a terminal block for the circuit breaker wiring.

The purpose of the lockout relay (52Y) is to require that, if the remote or local close contacts are closed, resulting in the charging springs discharging, the close contacts must first be released (opened) before the breaker can be reclosed. This prevents closing the circuit breaker more than one time unless the close contacts are first released.

**Auxiliary Switches (Figure 1, Item 2)**

The auxiliary switches contain the "a" and "b" contacts (Fig. 2) and are furnished in 4 or 8 contact ar-

rangements. They are mechanically interconnected with the main circuit breaker contacts such that, with the circuit breaker closed, the "a" contacts are closed. With the circuit breaker open, the "b" contacts are closed.

**Undervoltage Trip Device**

The electrically reset undervoltage trip device is a single-phase device which automatically trips the circuit breaker when the line voltage decreases to 30 to 60 percent of the rated voltage. This device may be furnished either for instantaneous trip operation or with adjustable time delay tripping of 0-15 seconds. The undervoltage trip device is an integral unit which may be added to the circuit breaker either at the factory or in the field.

The undervoltage device may be connected so that the automatic trip indicator (Figure 1, Item 9) will protrude from the front plate when the breaker is tripped by the undervoltage device.

See Table 4, page 20, for electrical characteristics.

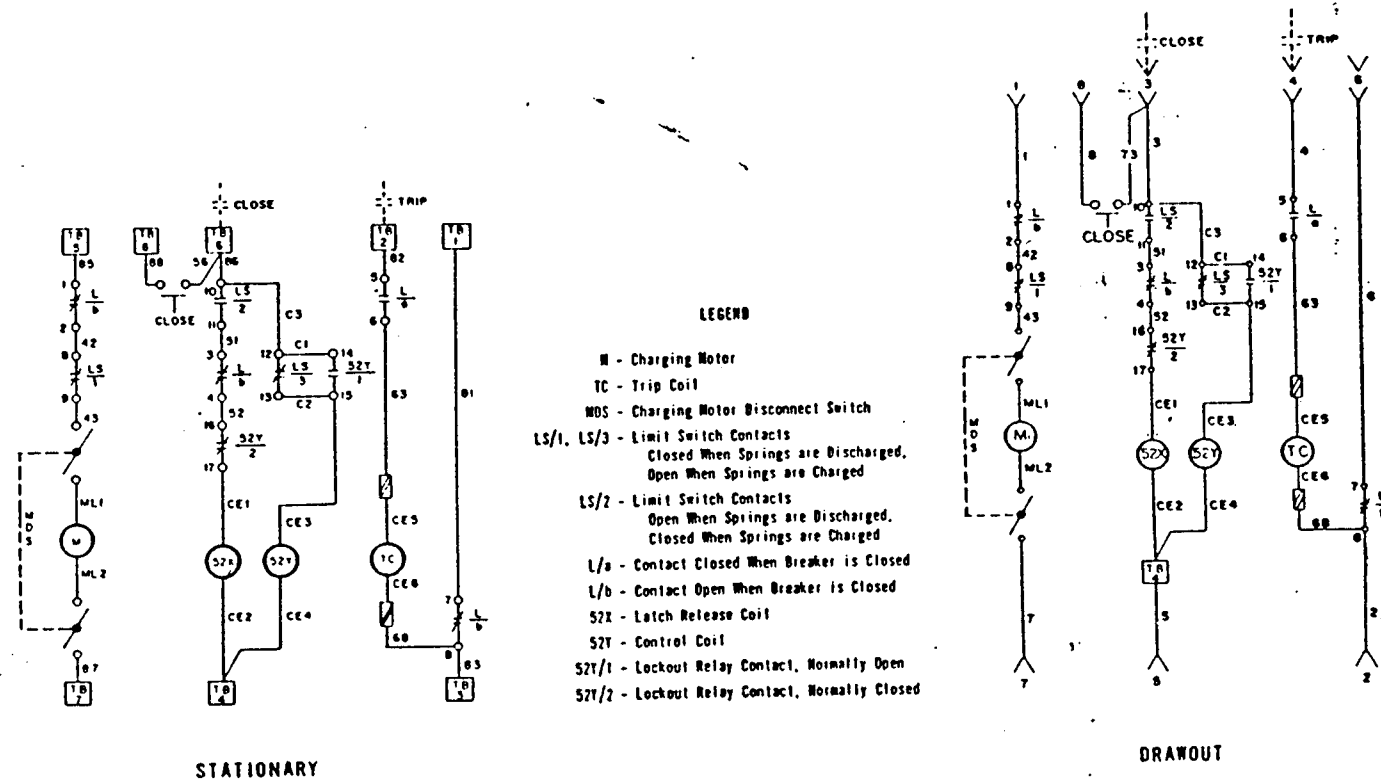


Fig. 2 — Typical Schematic Diagram of Control Circuit





### INSTALLATION, INITIAL TESTING AND REMOVAL (Drawout & Stationary)

**FOR SAFETY:** When installing or removing stationary breakers, the supply for primary and control circuits must be de-energized at all times. Testing of stationary circuit breakers to be done with the primary supply circuit de-energized.

• For initial installation of drawout breakers in the "CONNECTED" position, the supply for the primary circuit should be de-energized. Testing of the drawout breaker to be done in the test position.

**NOTE:** (K-225 thru K-2000 Circuit Breakers) Prior to inserting the circuit breaker into the switchboard and with the breaker in the upright position, exercise the three long time armatures ( $\frac{3}{8}$ " wide armatures) several times until resistance to motion has increased, indicating that the oil dashpot is functioning properly. Improper operation can result because the circuit breaker is shipped or stored on its back. This causes the oil in the dashpot to be displaced and an air bubble can be trapped under the piston. The exercise removes the air to permit proper operation.

#### INSTALLATION (Stationary Type)

Lifting yoke (20, Fig. 1) should be used to move the breaker to the switchboard; however, other handling means will be required to move the breaker into position inside the switchboard.

#### INSTALLATION (Drawout Type)

To insert the circuit breaker into its compartment, proceed as described below:

(Refer to Fig. 1)

1. The circuit breaker must be in the "OPEN" position, the racking crank turned in the counterclockwise direction fully against its stop, and the motor disconnect switch (10) (electrically operated circuit breakers only) in the "OFF" position.

2. Open the compartment door and pull out the right-hand and left-hand tracks (23) to the fully extended and latched position.

3. Using a lifting yoke, lower the circuit breaker so that the positioning pins (6) (two each side of circuit breaker) rest in the cut-out sections of each track (23).

4. Remove the lifting yoke and push the circuit breaker toward the compartment. The circuit breaker will slide in the cut-out sections of the tracks until the positioning pins reach the end of the cutouts. An additional positive push will automatically release the two latches (24). This allows the circuit breaker to move toward the compartment until the racking cams (4) stop against their guides on the cradle (28).

5. Lift shutter (15) covering the racking opening, insert racking crank, and turn crank clockwise, pass through the "DISCONNECTED" position, until the position indicator on the cradle (left side) shows "TEST" position. Remove racking crank.

### CHECKING CIRCUIT BREAKER OPERATION IN "TEST" POSITION (Electrically Operated, Drawout Type)

(Refer to Fig. 1)

1. Manually reset automatic trip indicator (9) if it protrudes approximately  $\frac{1}{2}$ ". Push in to reset.

2. Turn motor disconnect switch (10) to "ON" position and closing springs will automatically charge.

3. Close circuit breaker by local close button and trip by local trip button.

**NOTE:** All breakers have a manual trip button. The local close button for electrical breakers is standard. The local trip button for electrical breakers is optional.

4. Close and trip circuit breaker by means of remote control switch.

5. Check each auxiliary device for proper operation.

6. Close the circuit breaker and check that the shutter (15) cannot be lifted to allow insertion of the racking crank. This demonstrates that the circuit breaker could not be racked out while closed in the connected position.

### CHECKING CIRCUIT BREAKER OPERATION IN "TEST" POSITION (Manually Operated, Drawout Type)

(Refer to Fig. 1 and Cover Photo)

1. Manually reset automatic trip indicator (9) if it protrudes approximately  $\frac{1}{2}$ ". Push in to reset.

2. Close the circuit breaker by pulling down on the "T" handle.

3. Trip by manual "TRIP" button (13).

4. Check each auxiliary device for proper operation.

5. Close the circuit breaker and check that the shutter (15) cannot be lifted to allow insertion of the racking crank. This demonstrates that the circuit breaker could not be racked out while closed in the connected position.

### CHECKING CIRCUIT BREAKER OPERATION IN "CONNECTED" POSITION (Drawout Type)

(Refer to Fig. 1)

With the circuit breaker in the "OPEN" position and the motor disconnect switch (10) in the "OFF" position, insert the racking crank and turn clockwise until the position indicator on the cradle shows "CONNECTED" position.

### CHECKING CIRCUIT BREAKER OPERATION (Stationary Type)

Follow the same procedure as for the drawout circuit breaker, except the circuit breaker will be in the "CONNECTED" position. Primary supply circuit must be de-energized.



### EMERGENCY OPERATION (Electrically Operated)

Electrically operated circuit breakers may be charged manually by a removable maintenance handle (4, Fig. 3) for emergency operation.

The removable maintenance handle (4) is first positioned in two slots in the pawl carrier (2). The handle is then raised and lowered in a pumping motion until the pawl carrier (2) no longer rotates the ratchet wheel (1). The breaker closing springs now fully charged are ready for a closing operation which is done by raising the manual close lever (17, Fig. 1) on the escutcheon.

NOTE: The motor crank arm (3, Fig. 3) will stop occasionally in such a position as to prevent charging the springs with the handle. Should this happen, the motor crank arm must be rotated manually by using a screwdriver or similar tool to rotate the crank arm a sufficient amount so that the springs may be charged with the handle as described above.

### CIRCUIT BREAKER REMOVAL (Drawout Type)

To move the circuit breaker to the "TEST" position or to remove it from the compartment, proceed as follows:

(Refer to Fig. 1)

1. With the compartment door closed, trip the circuit breaker by means of the remote mounted control switch or manual "TRIP" button (13) on the escutcheon.

2. Lift racking shutter (15); insert racking crank and turn counterclockwise until position indicator (27) on the right-hand side of the escutcheon shows "TEST" position. (NOTE: The circuit breaker may be tested in this position—primary contacts are disconnected and the control contacts are connected.)

3. Continue turning the racking crank counterclockwise until the position indicator (27) on the right-hand side of the escutcheon shows "DISCONNECTED" position.

4. Open compartment door and discharge closing springs (electrically operated breakers only) by lifting the manual close lever (17) on the escutcheon and then pushing the manual trip button on the escutcheon. Place motor disconnect switch (10) in the "OFF" position.

5. Insert racking handle and crank counterclockwise as far as the stops will allow.

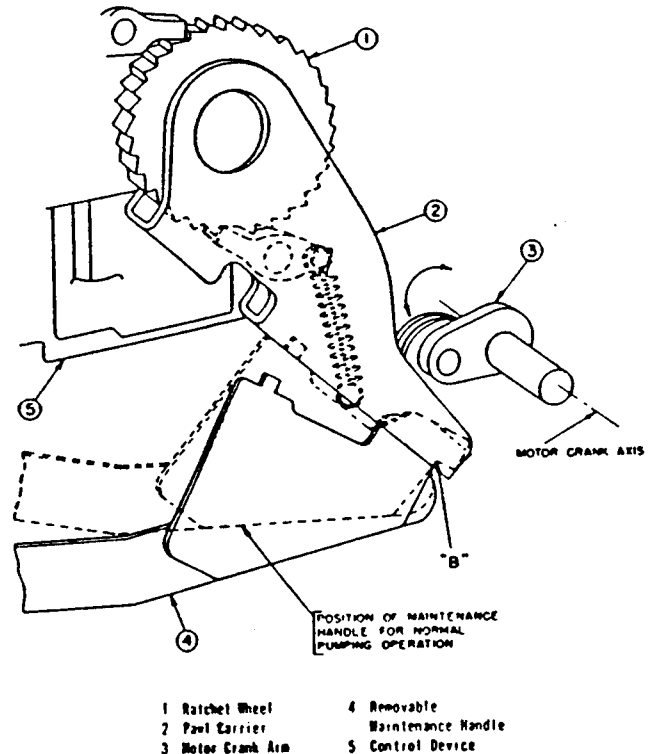


Fig. 3 — Method of Applying Maintenance Handle for Charging Closing Springs

6. Pull circuit breaker forward until tracks (23) are in the fully extended and latched position.

7. Using a lifting yoke, just pick up the circuit breaker weight.

8. With a positive pull, release positioning pins from cut-out sections of the tracks.

9. Remove circuit breaker from tracks by means of lifting yoke.

10. Release latch (24) on each track, push tracks into the compartment, and close compartment door.

NOTE: For safety, if the closing springs are charged, they will be automatically discharged when inserting or withdrawing the circuit breaker in the switchboard compartment.



## MAINTENANCE

### SAFETY NOTES

De-energize both primary and control circuits before making any inspections, adjustments or replacements of parts. Make certain breaker is open by observing indicator (14, Fig. 1), and closing springs are not charged by observing indicator (16, Fig. 1).

When it is necessary that the closing springs be charged, or the circuit breaker be closed, make sure to stay clear of operating parts.

Stationary breakers should be checked for operation with the control circuit energized and the primary power de-energized. Drawout breakers should be withdrawn to "TEST" position for checking the breaker operation. For further inspection, adjustments, cleaning or replacement of parts, the drawout circuit breaker should be withdrawn and moved to a suitable area.

Stationary breakers should likewise be removed, but, if removal is not possible, then the primary and control circuit sources **MUST BE DE-ENERGIZED**.

### PERIODIC MAINTENANCE INSPECTION

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 a periodic inspection of the circuit breaker as follows:

- K-225 — After 2,500 operations
- K-600, K-600S — After 1,750 operations
- K-1600, K-1600S — After 500 operations
- K-2000, K-2000S — After 500 operations

The above inspection periods apply for no load or load current switching. If the listed number of operations are not completed in the first year of service, the circuit breakers should be inspected regardless. The circuit breaker should also be inspected after a short circuit or severe overload interruption, regardless of time period or number of operations.

Where unusual service conditions, as covered by AN Standard C37.13, exist, it must be assumed that these conditions were considered at the time of order; that the equipment supplied was designed for the special application; and that an appropriate supplemental maintenance program has been developed. These maintenance instructions only cover circuit breakers used under the standard usual service conditions.

The inspection should include opening and closing the circuit breaker electrically and manually. The unit

should be visually inspected for loose or damaged parts. Arc chutes, contacts and insulation structure should be inspected as described below.

### ARC CHUTE (Refer to Fig. 1)

#### Removal

1. If the circuit breaker has a solid state overcurrent trip device, it is necessary to remove two 1/4" diameter screws fastening the solid state control assembly. Move the assembly for access to the arc chute retaining screws.

2. Loosen the retaining screw (25) and remove the screw and retainer (26).

3. Pull the arc chute forward slightly then lift to remove.

#### Examination

1. Discoloration or slight eroding is not harmful.

2. Arc runners or cooling plates that are burned, or moldings that are cracked or broken require replacement of the arc chute.

#### Replacement

1. Properly position the arc chute in the upper molding.

2. Position retainer (26) and insert and tighten screw (25).

3. Replace the solid state control assembly.

### CONTACTS

1. Remove dirt or grease on contacts with a clean lintless cloth.

2. Pitting or discoloration is not detrimental unless it interferes with proper contact adjustment.

3. Small burrs on the arcing contacts to be removed by filing along contour of the contact. Do not let filings fall into the mechanism.

4. Replace badly burned and pitted contacts that do not meet correct adjustment requirements.

5. If contacts are replaced or filed, then it is necessary to check the contact adjustment.

NOTE: Several operations at two week intervals will remove the effects of oxidation.

### INSULATION STRUCTURE

Insulated parts should be checked for damage. Dust and dirt should be removed by air or wiped with a clean lintless cloth. Do not use any oil base solvents.

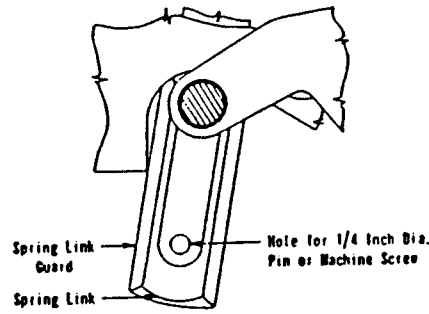
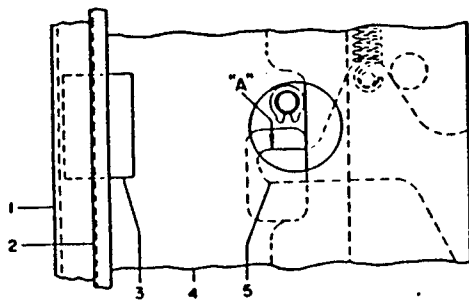
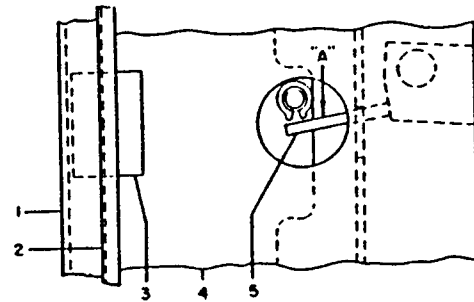


Fig. 4A



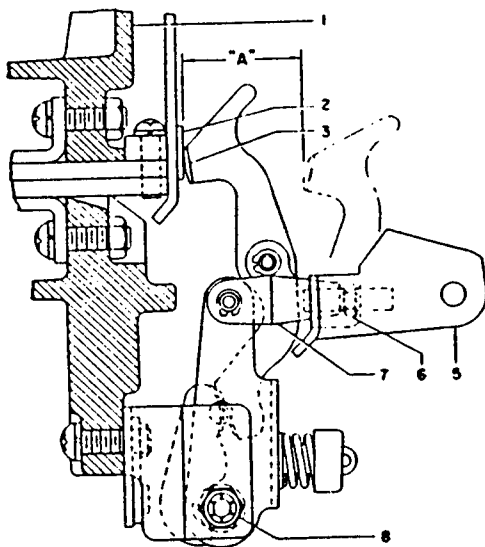
- |                      |                                     |
|----------------------|-------------------------------------|
| 1 Escutcheon         | 4 Box, Escutcheon (Right-Hand Side) |
| 2 Dust Plate         | 5 Hold-Up Latch                     |
| 3 Spring, Dust Plate |                                     |

Fig. 4 — Partial View of Escutcheon Assembly (Right-Hand Side) Showing Slow Close Lever for Manually Operated Circuit Breakers



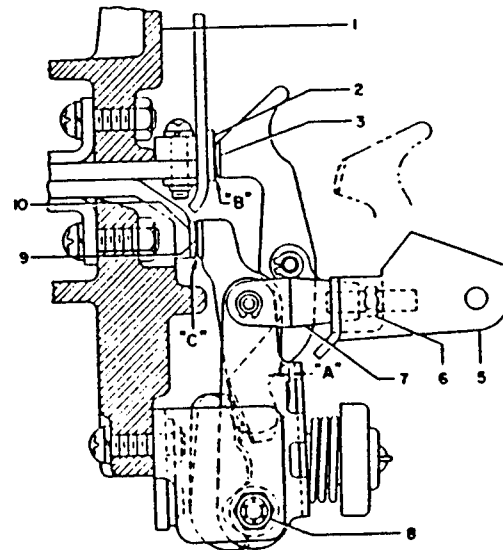
- |                      |                                     |
|----------------------|-------------------------------------|
| 1 Escutcheon         | 4 Box, Escutcheon (Right-Hand Side) |
| 2 Dust Plate         | 5 Pin, Close Block Lever            |
| 3 Spring, Dust Plate |                                     |

Fig. 5 — Partial View of Escutcheon Assembly (Right-Hand Side) Showing Slow Close Lever for Electrically Operated Circuit Breakers



- |                      |                      |
|----------------------|----------------------|
| 1 Upper Molding      | 6 Adjusting Stud     |
| 2 Stationary Contact | 7 Yoke               |
| 3 Movable Contact    | 8 Nut                |
| 5 Insulator          | 9 Nut (Self-Locking) |

Fig. 6 — Contact Adjustment for Type K-225 Circuit Breakers



- |                             |                            |
|-----------------------------|----------------------------|
| 1 Upper Molding             | 7 Yoke                     |
| 2 Stationary Arcing Contact | 8 Nut (Self-Locking)       |
| 3 Movable Arcing Contact    | 9 Movable Main Contact     |
| 5 Insulator                 | 10 Stationary Main Contact |
| 6 Adjusting Stud            |                            |

Fig. 7 — Contact Adjustment for Type K-600 and K-600S Circuit Breakers





## ADJUSTMENTS

**FOR SAFETY:** See SAFETY NOTES in MAINTENANCE section.

**NOTE:** The operating mechanism must be operated slowly, as described in section SLOW CLOSE PROCEDURE, when performing any adjustment requiring contact movement.

In order to close the circuit breaker, the racking mechanism in drawout circuit breakers must be turned to a position such that the racking shutter (15, Fig. 1) is closed when the racking crank (21, Fig. 1) is removed.

### SLOW CLOSE PROCEDURE

**NOTE:** The circuit breaker should be clamped down during the slow close procedure to keep it from tilting or moving.

#### Manually Operated Circuit Breakers

Refer to Fig. 4 unless otherwise noted.

1. On K-1600, K-1600S, K-2000 and K-2000S circuit breakers, at each of the two spring guards, loosely install  $\frac{1}{4}$  inch diameter pins or machine screws. (See Fig. 4A)

2. Insert a screwdriver or rod through the hole in the escutcheon box (4) and mechanism housing assembly (right-hand side when facing the front of the circuit breaker).

3. Using the top of the hole as the fulcrum and the screwdriver or rod as the lever, depress the hold-up latch (5) at "A" and, at the same time, pull the operating handle downward to slowly close the circuit breaker contacts.

4. On K-1600, K-1600S, K-2000 and K-2000S circuit breakers, remove the two  $\frac{1}{4}$  inch diameter pins or machine screws installed in step 1, after the slow close operation is complete.

#### Electrically Operated Circuit Breakers

**NOTE:** The charging cranks must be reset (see steps 8, 9, and 10 below) after the last slow close operation, or future electrical operation will be impossible.

Refer to Fig. 5 unless otherwise noted.

1. The closing springs must be charged; see spring charge indicator (16, Fig. 1).

2. Insert a screwdriver or rod through the hole in the escutcheon box (4) (right-hand side when facing the front of the circuit breaker) and depress the close block lever pin (5) at "A".

3. With the close block lever pin (5) held in the down position, lift the manual close lever (17, Fig. 1). The close block lever pin (5) will remain in the down position.

4. Insert the maintenance handle in the ratchet carrier and operate the handle to slowly close the contacts. (See Fig. 3 and "Emergency Operation".)

To repeat the slow close operation, continue with the following steps:

5. Insert the maintenance handle and continue the charging operation until the indicator (16, Fig. 1) shows "SPRINGS CHARGED".

6. Push manual "TRIP" button (13, Fig. 1) to open the contacts.

7. Repeat steps 2, 3, and 4 above for the slow close operation.

To reset the charging cranks for normal electrical operation, proceed as follows:

8. Repeat steps 5 and 6 above.

9. Lift manual close lever (17, Fig. 1) to close the contacts.

10. Push the manual "TRIP" button (13, Fig. 1) to open the contacts.

The circuit breaker is now ready for normal service operation with the charging cranks reset and the closing springs discharged.

### CONTACTS

#### Type K-225 Circuit Breakers (Refer to Fig. 6)

1. The hex. portion of the adjusting stud (6) must be centered, within  $\frac{1}{16}$  inch, between the yoke (7) and the insulator (5).

**NOTE:** On some circuit breakers, the hex. portion of the adjusting stud (6) must be centered between the locknut on the adjusting stud and the insulator.

**NOTE:** In the following steps 2 and 3, if adjustment is required, always turn the adjusting stud (6) in the direction to increase the contact pressure (counterclockwise when viewed from the insulator).

2. Contact pressure is set by adjusting stud (6) for  $1\frac{3}{4}$  inches, plus or minus  $\frac{1}{32}$  inch open air gap measured at "A". Any adjustment of contact pressure must be followed by step 3.

3. Following the slow close procedure, slowly close the circuit breaker until the first contacts (2 and 3) just touch. The other two poles should be within .032 inch of touching. If not within .032 inch, then adjust stud (6) of these two poles in the direction to increase pressure until all three poles touch within .032 inch.

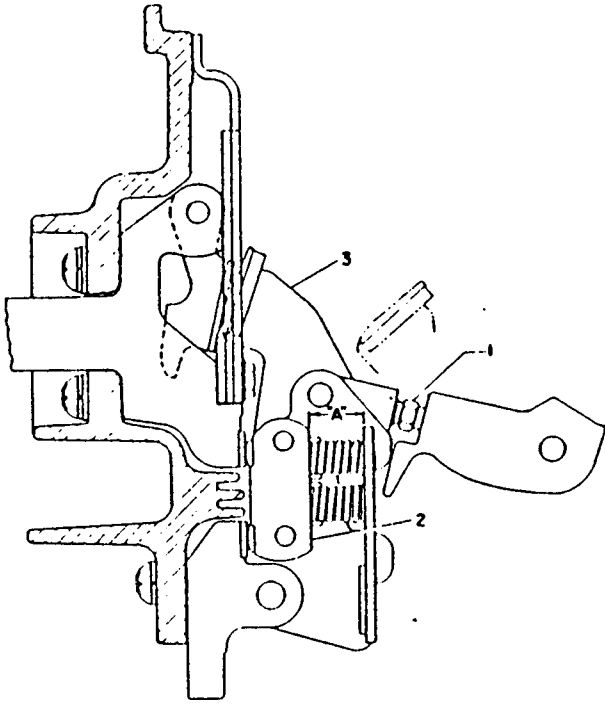
4. Self-locking nut (8), producing the contact side pressure at the hinge, to be tightened to 21 foot pounds.

#### Type K-600, K-600S Circuit Breakers (Refer to Fig. 7)

1. The hex. portion of the adjusting stud (6) must be centered, within  $\frac{1}{16}$  inch, between the yoke (7) and the insulator (5).

**NOTE:** On some circuit breakers, the hex. portion of the adjusting stud (6) must be centered between the locknut on the adjusting stud and the insulator.

2. Contact pressure is set by adjusting stud (6) so that there is a  $\frac{5}{64}$  to  $\frac{3}{32}$  inch gap, at "A", with the circuit breaker closed. This can be checked with  $\frac{5}{64}$  and  $\frac{3}{32}$  dia. wires (go and no-go) bent at 90 degrees. The  $\frac{5}{64}$  to  $\frac{3}{32}$  dimension is equivalent to .025 to .032 wiper, vertical movement of the main contacts during main contact engagement of the slow close



- 1 Adjusting Stud
- 2 Moving Main Contacts
- 3 Arcing Contacts

Fig. 8 — Contact Adjustment for Type K-1600, K-2000, K-1600S and K-2000S Circuit Breakers

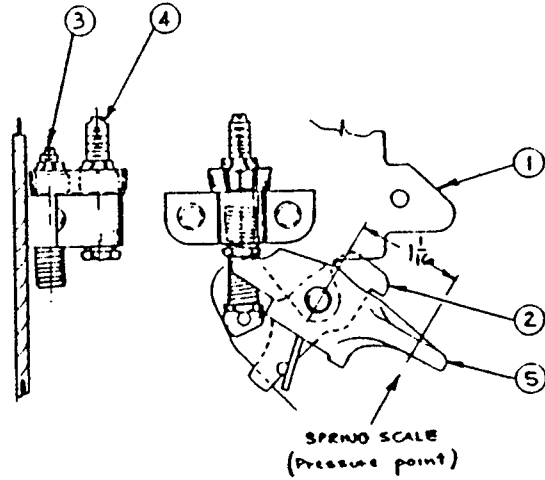
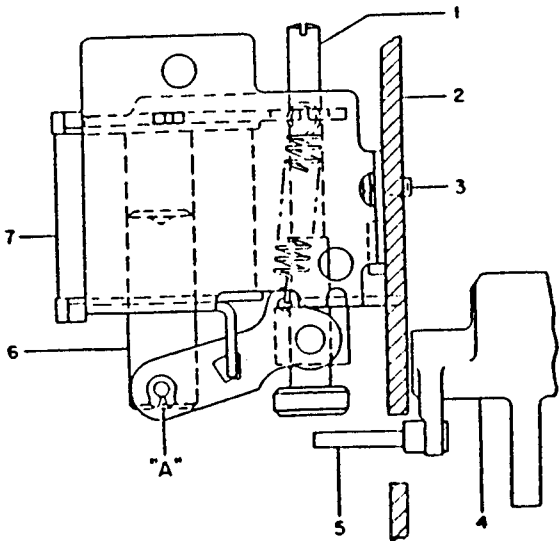


Fig. 9 — Latch Engagement and Tripper Bar Latch Engagement Adjustment



- |                                      |                  |
|--------------------------------------|------------------|
| 1 Trip Rod                           | 4 Latch Bar      |
| 2 Mechanism Housing (Left-Hand Side) | 5 Trip Extension |
| 3 Mounting Screw                     | 6 Armature       |
|                                      | 7 Coil           |

Fig. 10 — Shunt Trip Device Adjustment Type K-225 thru K-2000, K-1600S and K-2000S Circuit Breakers

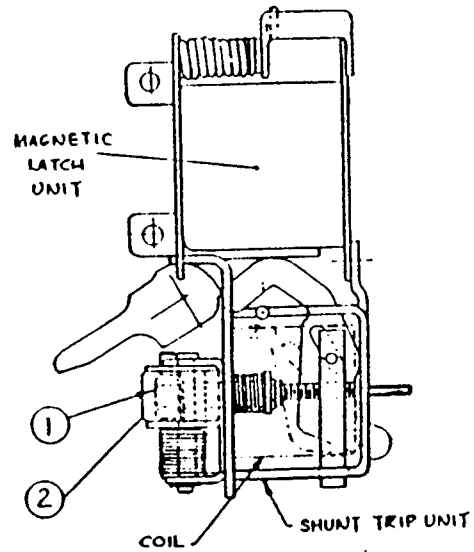


Fig. 11 — Shunt Trip Device Adjustment Type K-600S Circuit Breakers



operation. After adjusting, reclose the circuit breaker and recheck. Readjust if necessary. Any adjustment of contact pressure must be followed by step 3. Note that, after operation 3 is completed, contact pressure may exceed the 3/32 inch dimension on two poles. This is acceptable.

3. Following the slow close procedure, slowly close the circuit breaker until the first contacts (2 and 3) just touch. The other two poles should be within .032 inch of touching. If not within .032 inch, then adjust stud (6) of these two poles in the direction to increase pressure until all three poles touch within .032 inch.

4. Self-locking nut (8), producing the contact side pressure at the hinge, to be tightened to 21 foot pounds.

#### Type K-1600, K-1600S, K-2000, K-2000S Circuit Breakers (Refer to Fig. 8)

The main contact adjustment is to be made with the breaker in the latched closed position. The self-locking adjusting stud (1) is to be turned to provide contact pressure such that a 0.750 inch shim will just fit the space (A) at the rear of the moving main contacts (2).

After making this adjustment in contact pressure, open the circuit breaker, then reclose the circuit breaker normally and recheck the (A) gap. Readjust if necessary.

Open the circuit breaker and slow close the contacts until the arcing contact (3) of one pole just touches. The remaining poles should then be advanced by turning adjusting stud (1) so that these poles just touch or are within 0.032 inch of each other.

The contacts should now be in correct adjustment and the breaker may be put in service.

### MECHANISM

The various mechanism adjustments described in the following sections apply to all circuit breakers covered by this Instruction Bulletin.

#### Latch Engagement (Bite) (Refer to Fig. 9)

The latch engagement adjusting screw (3) is located to the right of the right-hand mechanism housing (1). It can be reached easily from the top of the circuit breaker.

To adjust the latch (2) engagement, proceed as follows:

1. Back off adjusting screw (3) to assure excessive latch engagement.
2. Close the circuit breaker.
3. Turn adjusting screw (3) down slowly until the latch just releases, tripping the circuit breaker.
4. Back off the adjusting screw (3) 2 turns.

#### Tripper Bar Latch Engagement (Refer to Fig. 9)

The tripper bar latch engagement adjusting screw (4) is located adjacent to the latch engagement adjusting screw (3).

To adjust the tripper bar latch engagement, proceed as follows:

1. Back off adjusting screw (4) to assure excessive tripper bar travel.
2. Close the circuit breaker.
3. Turn adjusting screw (4) down slowly until the latch just releases, tripping the circuit breaker.
4. Back off the adjusting screw (4) 3 1/2 turns.

#### Tripper Bar Load (Refer to Fig. 9)

The tripper bar load is measured by use of a spring scale positioned as shown.

With the circuit breaker in the "CLOSED" position, the push required to trip the circuit breaker must be between 16 and 29 ounces.

### SHUNT TRIP DEVICE

#### Trip Adjustment

##### Type K-225 thru K-2000, K-1600S, K-2000S

(Refer to Fig. 10)

1. Back off trip rod (1) until it will not trip the circuit breaker with the armature (6) pushed up as far as the travel will allow.
2. Close the circuit breaker.
3. Push up on the armature (6) at "A" as far as the armature travel will allow.
4. Hold the armature as positioned in step 3 and turn trip rod (1) down until the circuit breaker just trips.
5. Turn trip rod (1) down an additional 3 turns.

#### Trip Adjustment

##### Type K-600S

(Refer to Fig. 11)

1. Turn hex. head adjustment screw (1) counter-clockwise (viewing from head end) until the circuit breaker will not trip when the armature (2) is pushed in as far as travel will allow.
2. Close the circuit breaker.
3. Push in on armature (2) as far as the armature travel will allow.
4. Hold the armature as positioned in step 3 and turn the hex. head adjustment screw (1) clockwise until the circuit breaker just trips.
5. Turn the hex. head adjustment screw (1) an additional 1 turn.



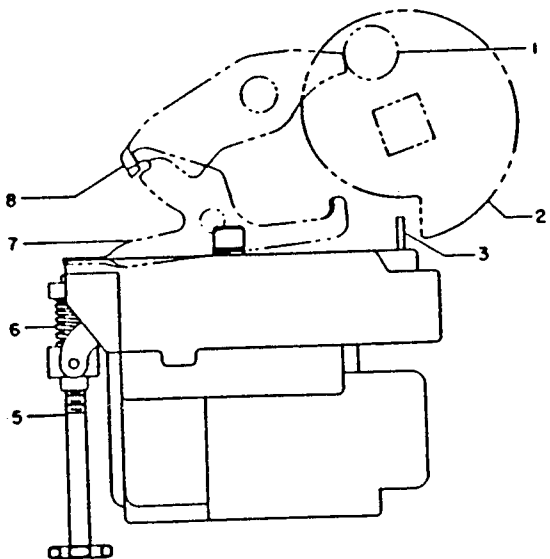
**CONTROL DEVICE (Refer to Fig. 12)**

The control device is adjusted before leaving the factory. It is recommended that no attempt be made to adjust the internal relays and contacts of this device in the field. If replacement of the control device is required, the trip rod (5) overtravel may be adjusted as described below.

**Trip Rod Overtravel**

1. Back off on trip rod (5) and check that the circuit breaker will not close by attempting to close it electrically or manually pushing up on trip rod (5) to the full extent of its travel.

2. Charge the closing springs. Push up on trip rod (5) to the full extent of its travel. While holding the trip rod in this position, turn up on trip rod (5) until the circuit breaker just trips. Turn trip rod (5) up an additional 1 1/2 turns.



- |                          |                         |
|--------------------------|-------------------------|
| 1 Roller, Close Latch    | 5 Trip Rod              |
| 2 Charging Cam           | 6 Spring, Trip Rod      |
| 3 Actuator, Limit Switch | 7 Secondary Close Latch |
|                          | 8 Primary Close Latch   |

Fig. 12 — Control Device Adjustment

**MAGNETIC LATCH DEVICE (Type K-1600S, K-2000S)  
Trip Adjustment (Refer to Fig. 13)**

1. Turn adjusting screw (1) out as far as possible so that the circuit breaker will not trip when the magnetic latch trips.

2. Remove the terminal block cover on the solid state assembly by removing two lower screws (Fig. 19). Disconnect two wires at terminals 15 and 16.

3. Close the circuit breaker.

4. While lightly holding down at point "A" so that the lever (2) does not move through its full stroke and trip the circuit breaker, momentarily apply the voltage (3V) from two dry cell batteries, size "D", to the two wires (+ to wire 16, - to wire 15) that were disconnected in operation 2. The magnetic latch should trip.

5. Gradually release the hold on lever (2).

6. While holding the lever (2) in the tripped position, turn in on screw (1) until the circuit breaker just trips, then turn in one additional turn.

7. Replace wires 15 and 16 and the terminal block cover.

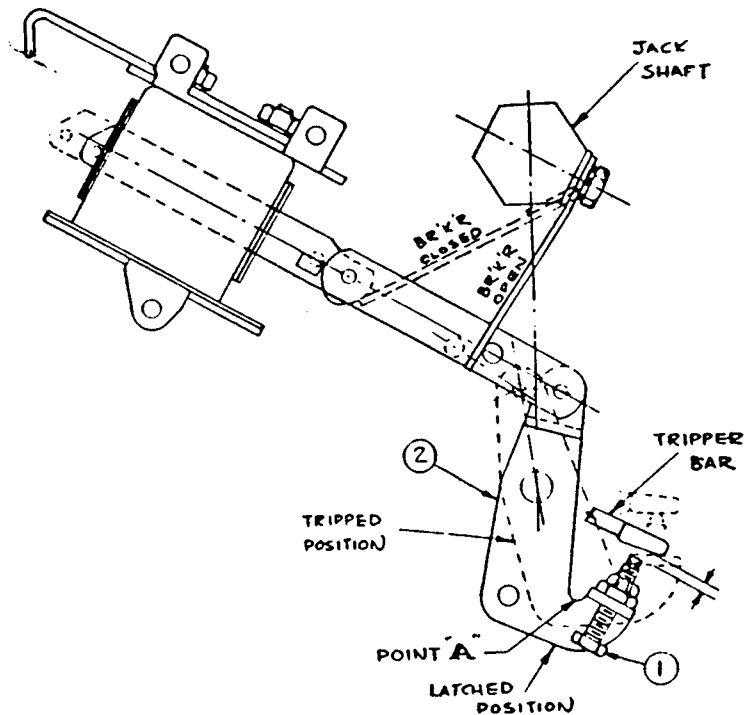


Fig. 13 — Magnetic Latch Trip Adjustment  
Type K-1600S and K-2000S Circuit Breakers



**ELECTRO-MECHANICAL  
OVERCURRENT TRIP DEVICE ADJUSTMENTS**

**Long-Time Delay Band Adjustment**  
OD Types 4, 6, 20, 61 (See Fig. 15)  
OD Type 5 (See Fig. 16)

Turn the adjustment until the top of the long-time delay indicator is in line with the desired delay line (Fig. 14). Push the armature toward the magnet, allowing time for the oil in the dashpot to be displaced. Release the armature, allowing the armature to reset. Check to see that the long-time indicator and line are in line. Readjust if required, and recheck by pushing the armature and allowing it to reset.

NOTE: OD-3 has only one long-time delay setting; which is factory set and therefore adjustment is not required.

**Pick-Up Setting Adjustments (See Fig. 14)**

Pick-up settings may be changed by turning the appropriate adjusting screw until the moving indicator lines up with the desired pick-up point line.

NOTE: The top line corresponds to the top pick-up point, the second line from the top corresponds to the second pick-up point from the top, etc.

**Short-Time Delay Adjustment**  
OD Types 4, 5, 9, 10 (See Fig. 17)

Move the lever toward the left of the circuit breaker so that the short-time step pin can be moved to the desired short-time delay pin hole. Make certain the step pin drops into the pin hole.

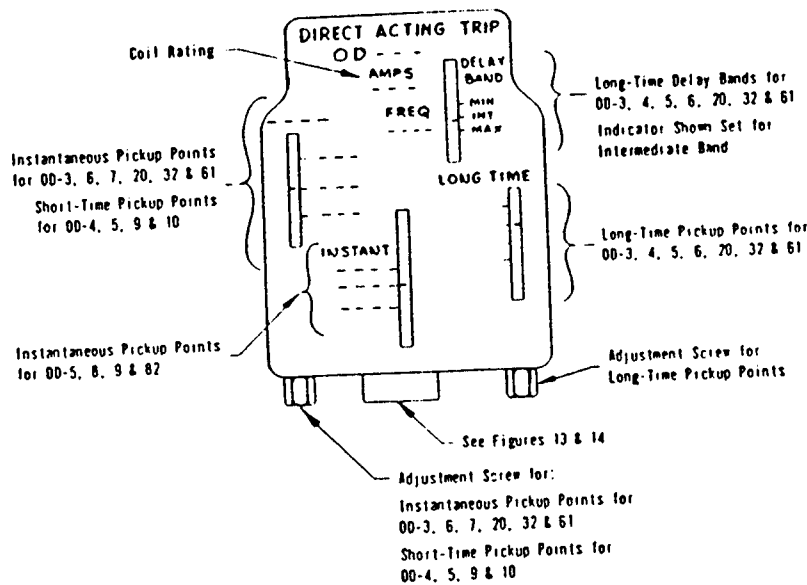


Fig. 14

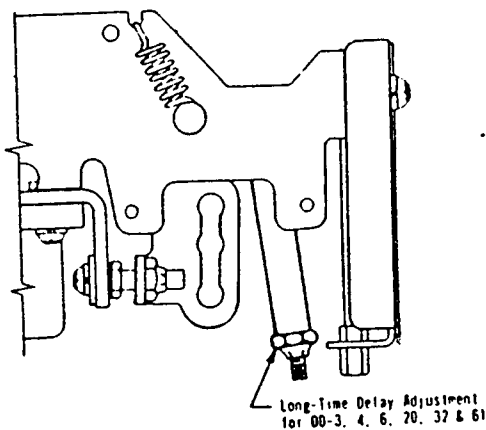


Fig. 15

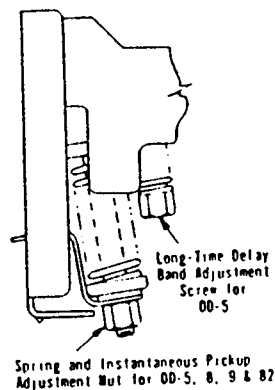


Fig. 16

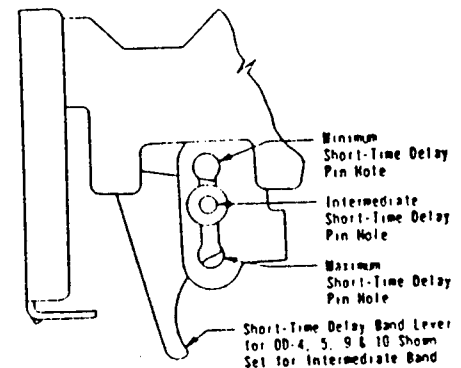


Fig. 17



**Armature Trip Travel Adjustment**

**FOR SAFETY:** Keep hands clear of all moving parts. The circuit breaker will trip to the "OPEN" position while checking or adjusting the armature trip travel.

The overcurrent trip device trip travel is set at the factory; however, if trip travel readjustment is required due to replacement of overcurrent trip devices or other parts, then readjust as follows:

1. (See Fig. 18). Back out on the two trip adjusting screws (1) until the screws are engaging the nut by approximately two turns.
2. Charge springs and close circuit breaker.
3. Using a one-foot long (approximate) stick, push up on the long-time armature, thick armature, at point "A", and hold it tight against the magnet. (When pushing, allow time for the oil dashpot to displace the oil.) While holding the armature in this position by pushing at point "B", turn up on screw (1) until the circuit breaker just trips. Continue to turn the screw an additional one turn. **NOTE:** During this adjustment operation, hold the armature firmly against the magnet, but do not exert excessive force that will result in incorrect adjustment due to distortion.
4. Charge springs and close circuit breaker. Push up on the thin armature and adjust screw (1) using the same procedure as in step 3 above.

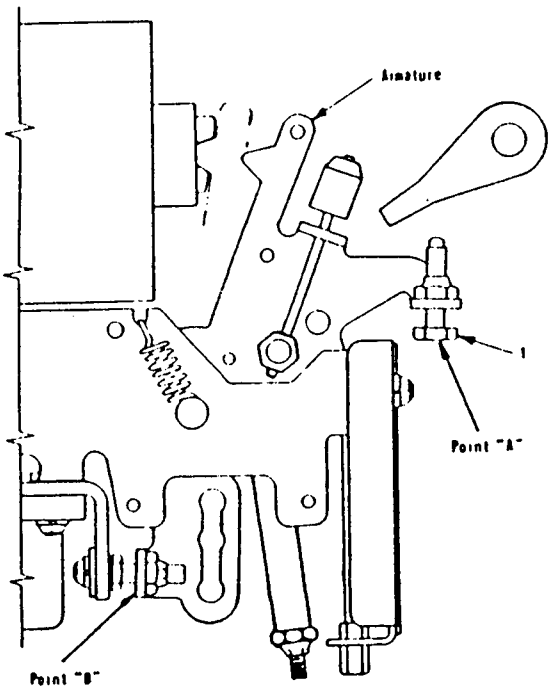


Fig. 18 — Armature Trip Travel Adjustment

5. Readjust the trip travel at the other two poles using the same procedure (steps 1 through 4).

**Field Testing of Electro-Mechanical Overcurrent Trip Devices**

Refer to I-T-E IB-9.1.7-5 for complete testing of devices using high current test sets.

Refer to I-T-E IB-9.1.7-7 for testing of long-time delay elements using the I-T-E "LTD Test Device".

**SOLID STATE OVERCURRENT TRIP DEVICE SETTINGS (See Fig. 19)**

No adjustments are necessary in selecting trip settings on this trip device. The selector plugs (solid circle) allow flexibility in settings and may be moved from one plug tap to another, consistent, however, with the pickup and time band settings necessary for proper circuit protection. Make certain that the selector plugs are pushed in completely for proper operation. If a plug is left out or not secure, the affected element will trip at the minimum setting shown, for safety, but coordination will be affected.

**Field Testing of Solid State Overcurrent Trip Devices**

Refer to I-T-E IB-9.1.7-21 for complete testing of these devices.

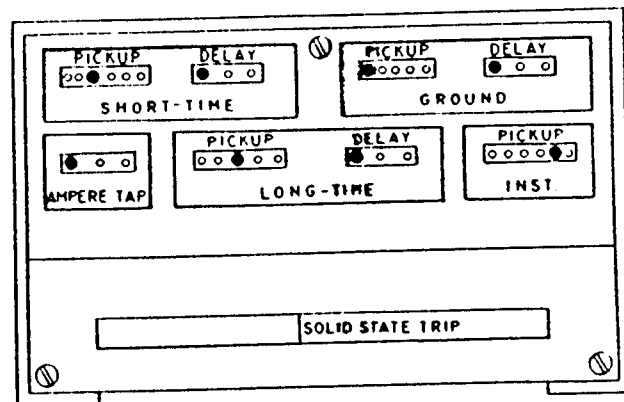


Fig. 19 — Solid State Overcurrent Trip Device Type SS-5G Shown



**LUBRICATION**

The K-line circuit breakers are lubricated during factory assembly as follows:

1. All mating surfaces of moving current-carrying joints have been lubricated with NO-OX-ID special Grade "A" grease manufactured by Dearborn Chemical Company.

2. All other mechanism parts, bearings, pins, etc. have been lubricated with NEBULA EP 5F manufactured by the Humble Oil and Refining Company.

The circuit breaker requires no lubrication during its normal service life. However, if the grease should become contaminated or if parts are replaced, any relubrication should be done with NO-OX-ID or NEBULA grease as applicable.

**NOTES:**

1. Do not use NO-OX-ID grease on any main and arcing contact surfaces.
2. It is recommended that the primary disconnects be maintained by renewing the NO-OX-ID grease during maintenance periods.
3. Do not use light oil to lubricate any mechanism parts.
4. Do not allow grease to be deposited on any latch roller surface during relubrication.
5. The charging motor is sealed and no lubrication is required.
6. DO NOT LUBRICATE OVERCURRENT TRIP DEVICES.

**DIELECTRIC TEST**

If the insulation has become contaminated, or routine tests are required, the test voltages to be applied for one minute to test the ability of the insulation to withstand overvoltages are as shown in Table 2, below.

It is not recommended that the motor be dielectric tested, but if desired, then test at 540 V ac or 760 V dc.

On K-600S through K-2000S circuit breakers, connect

all sixteen terminals of the power shield solid state logic box together and to ground when conducting tests listed in Table 2. These terminals are located under the lower front cover of the logic box.

An additional dielectric test should be performed on K-600S through K-2000S circuit breakers as follows: Connect all sixteen terminals of the power shield solid state logic box together and apply 500 V ac between the sixteen terminals and metal parts normally grounded.

**ELECTRICAL CHARACTERISTICS OF CONTROL DEVICES**

For closing and tripping currents, voltages and ranges, refer to Table 3, page 20.

For undervoltage trip devices, standard voltages and operating data, refer to Table 4, page 20.

Current values are average steady state values. Momentary inrush currents for all charging motors and ac coils are approximately 6-8 times these values.

**RENEWAL PARTS**

I-T-E recommends only those renewal parts be stocked that will be required to insure proper and timely maintenance for normal operation of the circuit breakers.

Refer to Renewal Parts Bulletin RP-9.1.8-1 for complete ordering information and Parts List. A copy of this bulletin will be furnished on request.

The minimum quantity of assemblies and items recommended in this bulletin is predicated on infrequent replacement of parts based on accumulated tests and operating experience. Total assemblies are recommended for fast replacement, when necessary, to return the breaker to service as quickly as possible. Then certain replaced assemblies, such as the stationary upper terminals, can be returned to the factory for nominal reconditioning. The bulletin contains specific part ordering instructions; and if desired, specific instructions regarding replacement of those part assemblies recommended, that are not obvious, are also available if ordered.

**TABLE 2**  
**TEST VOLTAGES TO BE APPLIED FOR ONE MINUTE**  
**TO TEST THE ABILITY OF THE INSULATION TO WITHSTAND OVERVOLTAGES**

|   | Breaker Open  | Breaker Closed  | Breaker Open or Closed  |
|---|---|---|---|
| Breaker in Service<br>or<br>After Storage | 1650 V ac -- 2300 V dc<br>a. Between line and load terminals and metal parts normally grounded.<br>b. Between line and load terminals | 1650 V ac -- 2300 V dc<br>a. Between terminals and metal parts normally grounded.<br>b. Between phases. | 1125 V ac -- 1600 V dc<br>a. Between control circuit and metal parts normally grounded.<br>NOTE: Motor must be disconnected from control circuit for this test. |
| After Short Circuit                       | 1320 V ac -- 1860 V dc<br>a and b as above  | 1320 V ac -- 1860 V dc<br>a and b as above  | 900 V ac -- 1260 V dc<br>a as above   |



TABLE 3  
ELECTRICAL CHARACTERISTICS OF CONTROL DEVICES  
CLOSING AND TRIPPING CURRENTS, VOLTAGES AND RANGES

| Type Breaker                              | Nominal Control Voltage | Average Closing Motor Current Amperes | Shunt Trip Current Amperes | Closing Relay Current Amperes |         | Closing Circuit Voltage Range | Shunt Trip Circuit Voltage Range | Recommended Control Fuse Size |
|---|-------------------------|---------------------------------------|----------------------------|-------------------------------|---------|-------------------------------|----------------------------------|-------------------------------|
|   |                         |                                       |                            | Anti-Pump                     | Release |                               |                                  |                               |
| K-225 thru K-2000 and K-600S thru K-2000S | 115 V ac 60 cycle       | 10.                                   | 6.5                        | .4                            | 1.5     | 95-125                        | 50-125                           | 10 A                          |
|   | 230 V ac 60 cycle       | 5.                                    | 1.15                       | .2                            | .75     | 190-250                       | 190-250                          | 10 A                          |
|   | 48 V dc                 | 25.                                   | 3.14                       | .15                           | 1.33    | 35-40                         | 28-60                            | 15 A                          |
|   | 125 V dc                | 10.                                   | 1.3                        | .06                           | .7      | 90-130                        | 70-140                           | 10 A                          |
|   | 250 V dc                | 5.                                    | .65                        | .03                           | .3      | 180-260                       | 140-280                          | 10 A                          |

TABLE 4  
UNDervOLTAGE TRIP DEVICE  
STANDARD VOLTAGES AND OPERATING DATA

| Service Voltage   | Current at Rated Volts | Maximum Pickup Voltage | Dropout Voltage Range |
|-------------------|------------------------|------------------------|-----------------------|
| 115 V ac 60 cycle | 0.5                    | 92                     | 35-69                 |
| 230 V ac 60 cycle | 0.2                    | 184                    | 69-138                |
| 480 V ac 60 cycle | 0.1                    | 384                    | 144-288               |
| 48 V dc           | 0.32                   | 38                     | 14-29                 |
| 125 V dc          | 0.2                    | 100                    | 38-75                 |
| 250 V dc          | 0.1                    | 200                    | 75-150                |





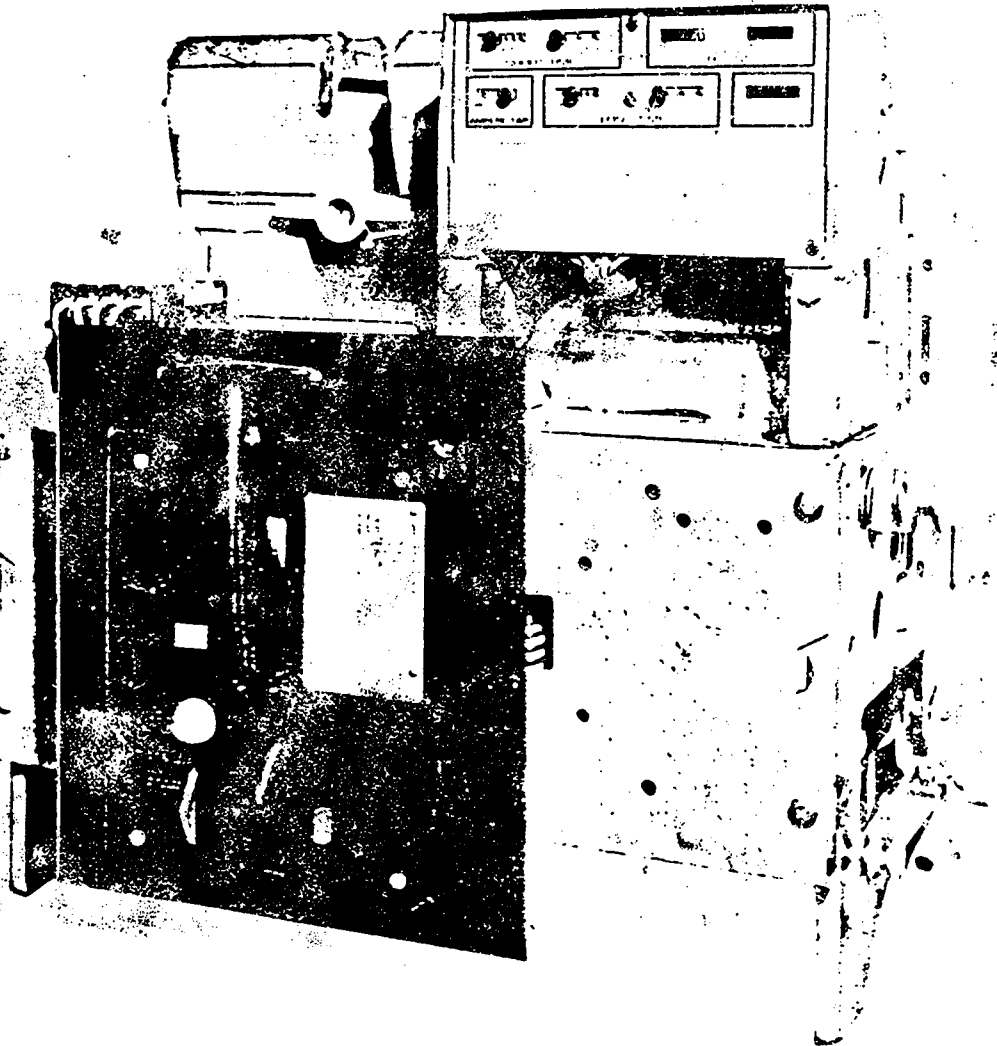


# Installation/Maintenance Instructions

## I-T-E Low Voltage Power Circuit Breakers

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Type K-225 thru 2000 and K-600S thru 2000S  
Stationary Mounted and Drawout Mounted



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## INTRODUCTION

These instructions apply to the type K-225 through K-2000 and K-600S through K-2000S circuit breakers; 225, 600, 800, 1600 and 2000 ampere ac continuous current rating respectively. The type K-225 through K-2000 are equipped with electro-mechanical overcurrent trip devices, whereas the type K-600S through K-2000S incorporate the solid state overcurrent trip devices. A K-1600S circuit breaker is shown on the front cover of this bulletin.

The K-225 through K-2000 circuit breakers can be furnished with two or three poles for dc or ac operation. K-600S through K-2000S circuit breakers are only furnished for three pole, ac operation.

All circuit breakers can be furnished as drawout or stationary mounted and are available as manually or electrically operated and with electrical control devices available in various ac and dc voltage combinations. The manually and electrically operated mechanisms are interchangeable on circuit breakers having the same current rating. Many optional features are also available.

An electrically operated, drawout type circuit breaker is shown in Figure 1, with a typical schematic diagram shown in Figure 2.

These instructions should be read thoroughly before handling, installing and/or operating the circuit breaker.

## RECEIVING AND STORAGE

Immediately upon receipt of the circuit breakers, examine the cartons 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 nearest District Office. Brown Boveri is not responsible for damage of goods after delivery to the carrier. However, we will lend assistance if notified of claims.

Unpack circuit breakers 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 damaging any circuit breaker parts. Check the contents of each carton against the packing list before discarding any packing material. If any discrepancy is discovered, promptly notify the nearest District Office. Information specifying the purchase order number, carton number and part numbers of damaged or missing parts should accompany the claim.

Circuit breakers should be installed in their permanent location as soon as possible. (See Basic Handling below.) If possible, a drawout circuit breaker should be stored and

locked in the "DISCONNECTED" position in its compartment, with the door closed. Both the primary and control separable contacts are disconnected in this position. If the breaker cannot be installed in its compartment, it should be kept in its original carton and the carton should be sealed to prevent infiltration of dirt. Where conditions of high humidity prevail, the use of heaters is recommended, regardless of the method of storage selected.

## BASIC HANDLING INSTRUCTIONS

Once the circuit breaker has been removed from its shipping carton, it should be turned to the upright position and placed on a flat surface to avoid damage to breaker parts. For safety, all handling in this position should utilize the lifting yoke (20, Fig. 1).

## CIRCUIT BREAKER OPERATION

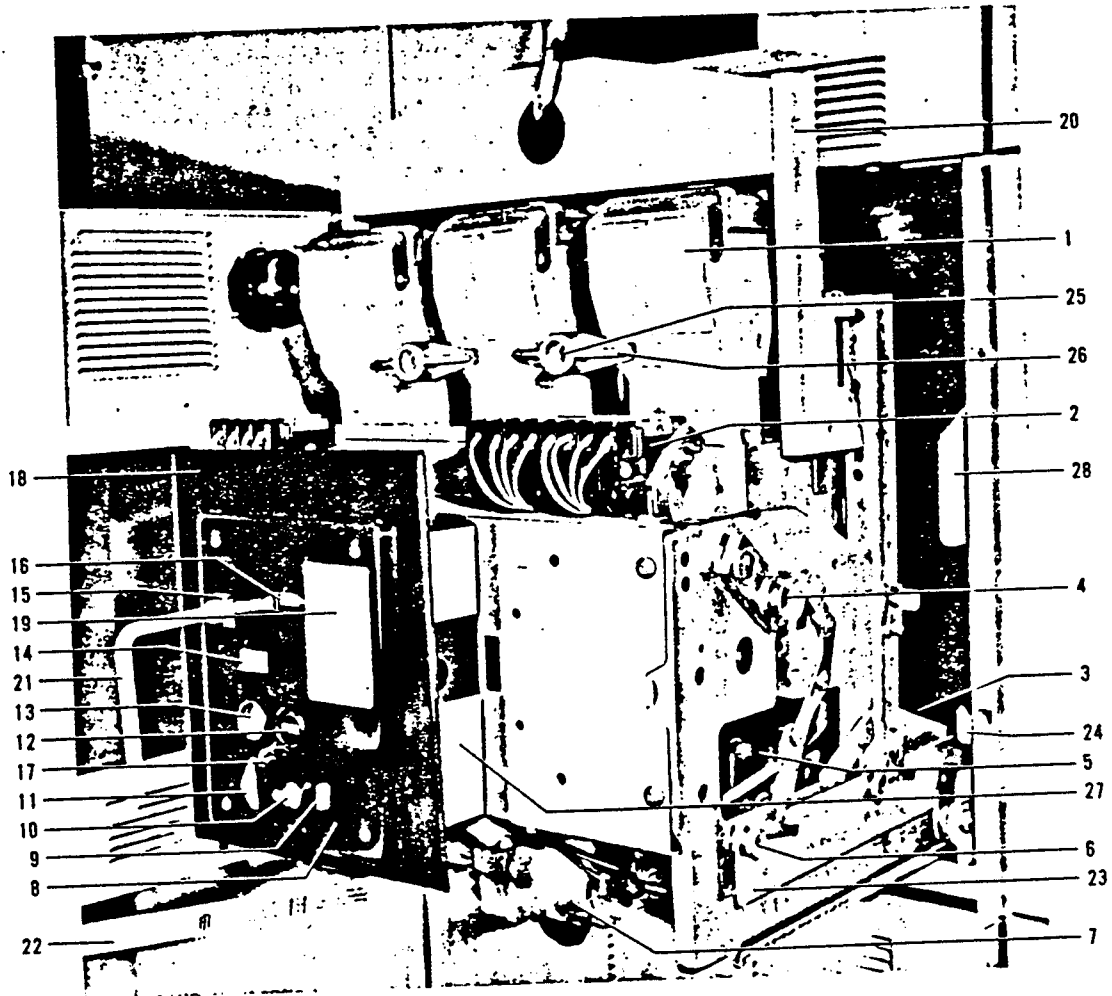
### CIRCUIT BREAKER RATING

The continuous current rating is established by the frame size of the circuit breaker and is the number listed in the type designation; i.e., K-600 means the circuit breaker can carry 600 amperes continuously. Exceeding these ratings may raise the temperature of the circuit breakers beyond their design limit and thereby affect the life of the circuit breaker. Thus, any long-time pickup setting exceeding 100% of the frame size is to be used only for coordination, not for carrying increased continuous current.

### CLOSING SPRING OPERATION (Electrically Operated)

The two closing springs supply the power that closes the circuit breaker and also charge the two opening springs during the closing operation. The closing springs are charged by a motor. The spring energy is available to close the circuit breaker, thus referred to as "stored energy." Closing springs are normally charged when the circuit breaker is opened. If charged after closing, the circuit breaker can be opened and then reclosed without recharging the springs. In earlier model drawout circuit breakers, the closing springs are automatically discharged when the circuit breaker is pulled to the fully withdrawn position (shown in Figure 1). This prevents accidental discharge. In later models, the springs are automatically discharged when racking the circuit breaker from the disconnected to the withdrawn position.

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 nearest District Office.



- |                                  |                                     |                                  |
|----------------------------------|-------------------------------------|----------------------------------|
| 1. Arc Chute                     | 11. Locking Hasp                    | 21. Racking Crank                |
| 2. Auxiliary Switch              | 12. Electrical Close Push Button    | 22. Removable Maintenance Handle |
| 3. Secondary Separable Contacts  | 13. Manual Trip Button              | 23. Track                        |
| 4. Racking Cam Assembly          | 14. "OPEN" or "CLOSED" Indicator    | 24. Latch                        |
| 5. Overcurrent Trip Device       | 15. Racking Shutter                 | 25. Retaining Screw              |
| 6. Positioning Pins              | 16. Closing Spring Charge Indicator | 26. Retainer                     |
| 7. Closing Spring Charging Motor | 17. Manual Close Lever              | 27. Position Indicator           |
| 8. Escutcheon Assembly           | 18. Self Aligning Dust Plate        | 28. Cradle                       |
| 9. Automatic Trip Indicator      | 19. Nameplate                       |                                  |
| 10. Motor Disconnect Switch      | 20. Lifting Yoke                    |                                  |

Fig. 1 — Typical Electrically Operated, Drawout Type  
K-1600 Circuit Breaker

### CLOSING SPRING OPERATION (Manually Operated)

In one continuous downward pull of the handle the two closing springs are charged, and near the end of the stroke are discharged to fast close the circuit breaker. During closing, the two opening springs are charged.

### ESCUTCHEON OPERATING FEATURES

Manually and electrically operated circuit breakers are provided with an extendible escutcheon face plate. This escutcheon provides a central area for the controls which are mounted directly on the circuit breaker.

The controls for the electrically operated circuit breaker (Figure 1) included in the escutcheon face plate are: (19) nameplate giving the various ratings assigned to the particular type of circuit breaker, (13) manual trip button, (17) manual close lever, (12) electrical close push button switch, (10) motor disconnect switch, (14) "OPEN" and "CLOSED" position indicator, (9) automatic trip indicator with optional facilities for alarm indication and for lockout, (11) means for padlocking the circuit breaker in the "CONNECTED", "TEST" or "DISCONNECTED" position and (16) closing spring charge indicator. Handle (22) is normally removed and is used for emergency closing spring charging or maintenance work.

The manually operated circuit breaker includes a manual closing handle but does not include the electrical close push button switch, motor disconnect switch, manual close lever, spring charge indicator or maintenance handle.

All drawout circuit breakers have the racking shutter (15) that must be raised to allow inserting of the racking crank (21).

A self-aligning dust plate (18) immediately behind the escutcheon face plate is used to exclude dust from the circuit breaker compartment. On drawout type circuit breakers, the escutcheon face will protrude through the front door of the compartment when the circuit breaker is in the "TEST" and "DISCONNECTED" positions. In these positions, the dust plate still functions to exclude dust.

#### Circuit Breaker Nameplate (Figure 1, Item 19)

The circuit breaker nameplate contains information regarding (1) the manufacturer's name and address, (2) type of circuit breaker design, (3) serial number of circuit breaker, (4) continuous current rating of frame size, (5) short circuit current rating at rated voltages, (6) frequency, (7) short time current.

#### Manual Charging Handle (Manually Operated)

The manual charging handle is a T-shaped lever used on manually operated circuit breakers to charge the closing springs and close the circuit breaker in one continuous downward stroke.

#### Manual Trip Button (Figure 1, Item 13)

The manual trip button, when pushed, trips the circuit breaker to "OPEN."

#### Circuit Breaker "OPEN" or "CLOSED" Indicator (Figure 1, Item 14)

This indicator shows the physical position of the circuit breaker contacts.

#### Automatic Trip Indicator (Figure 1, Item 9) (Not including undervoltage, alarm switch or lockout)

The automatic trip indicator is provided as standard equipment on the K-line<sup>®</sup> circuit breakers and is used to indicate the operation of the overcurrent trip device. This device is an indicator only and does not prevent the circuit breaker reclosing.

Upon an overcurrent trip operation, the indicator protrudes from the front plate approximately 1/2 inch.

The automatic trip indicator should be reset after each trip indication by pushing back into its normal latch position. The operator should investigate the cause of tripping before resetting the automatic trip indicator and subsequent reclosing the circuit breaker after an outage which results in an operation of the indicator.

#### Automatic Trip Alarm Contacts (Hand Reset) (Figure 1, Item 9)

An alarm switch for remote electrical indication, which is optional, shows when automatic tripping has occurred. This is accomplished by adding a precision snap switch to the automatic trip indicator assembly. The automatic trip indicator actuates the roller on the alarm switch which in turn causes a normally open contact to close and a normally closed contact to open an overcurrent trip. The alarm contact is manually reset by pushing the trip indicator (9) back into its normal position.

#### Automatic Trip Lockout (Hand Reset) (Figure 1, Item 9)

An additional device (which is also optional) may be added to the automatic trip indicator assembly device which serves to mechanically prevent reclosing the circuit breaker after an automatic trip operation. When the trip indicator is pushed in, the circuit breaker mechanism can then be operated to close the circuit breaker contacts.

#### Padlocking Device (Figure 1, Item 11)

All K-line circuit breakers are equipped with means of padlocking the circuit breaker mechanism in a trip-free position. This is accomplished by the use of a locking plate to maintain the manual trip button in a tripping direction when the locking plate is held forward by one or more padlocks. To obtain the condition for padlocking the circuit breaker in the open position, the manual trip button is pushed inward. Then the padlock plate is pulled out and the padlock inserted into the vertical slot. In this position, the mechanism is maintained trip free and the contact arm cannot be moved to the closed position.

On circuit breakers equipped with drawout mechanism, the padlocking device is associated with the drawout interlocking mechanism so that the circuit breaker cannot be moved from any of its three basic drawout positions of "CONNECTED", "TEST" or "DISCONNECTED" with the padlocking in effect.

### Closing Spring Charge Indicator (Electrically Operated) (Figure 1, Item 16)

Under normal operating conditions, the closing springs are automatically charged after each tripping operation. However, there are occasions when the springs will be in a discharged state. Therefore, it is desirable that means be available to indicate the charged or uncharged condition of the closing springs. This is accomplished by a visual indicator seen through an aperture in the escutcheon plate. The indicator is marked "SPRINGS CHARGED" and "SPRINGS UNCHARGED."

### Motor Disconnect Switch (Electrically Operated) (Figure 1, Item 10)

The motor disconnect switch is a double pole, single-throw toggle type switch connected in series with the charging motor circuit and is used to disconnect the motor from the voltage source. This cut-off switch is used (1), when it is desirable to prevent automatic recharging of the closing springs just prior to taking the circuit breaker out of service for maintenance and (2), for control wiring dielectric test. The motor must be disconnected for the control wiring dielectric test and subsequently tested at 540 V ac or 760 V dc.

### Electrical Close Push Button (Electrically Operated) (Figure 1, Item 12)

The electrical close push button is used to electrically close the circuit from the escutcheon. This contact is connected in series with the latch release coil (52X). Energizing the latch release coil allows the charged springs to close the circuit breaker.

### Manual Close Lever (Electrically Operated) (Figure 1, Item 17)

The manual close lever is provided on electrically operated circuit breakers to provide a means of closing the breaker without control power.

### Racking Mechanism (Drawout Breaker)

The racking mechanism may be used to move the circuit breaker to any one of its three positions ("CONNECTED", "TEST" or "DISCONNECTED"). All of these positions are attainable with the cubicle door closed. The racking shutter (15, Fig. 1), which must be lifted to gain access to the racking mechanism, is interlocked with the circuit breaker so that the circuit breaker contacts must be open before the shutter may be lifted to rack the circuit breaker to another position. The circuit breaker can not be closed when the shutter is open. The circuit breaker may be padlocked open by means of the locking hasp. This automatically locks the racking mechanism. With the "TRIP" button (13, Fig. 1) depressed, the locking hasp (11, Fig. 1) may be pulled outward, accommodating from one to three padlocks, when the shutter is closed and the circuit breaker is tripped. The shutter can not be lifted and the breaker contacts can not be closed when the locking hasp is restrained by one or more padlocks.

There are two sets of arrows and indicating lines to show the circuit breaker position. One set is utilized with the compartment door closed and one set with the door open.

## OPERATION OF DEVICES

### Electro-Mechanical Overcurrent Trip Devices Type K-225 thru K-2000 Circuit Breakers (Figures 14 thru 18)

(A) Type OD-3 General Purpose Overcurrent Trip Device. The type OD-3 overcurrent trip device, for general purpose applications, provides long-time delay tripping on moderate overcurrents which are above the long-time pickup setting; and instantaneous tripping on fault currents above the instantaneous trip setting. This device must be properly set to provide adequate protection for an electrical system. Three adjustment screws on the bottom of the device provide independent control of the long-time pickup, instantaneous pickup and amount of time delay. The nameplate of this device shows the setting of these adjustments and the range of settings which are available. For information on the time-current characteristics of this device, request a copy of TD-6693.

(B) Type OD-4 Selective Overcurrent Trip Device. The type OD-4 overcurrent trip device, for selective tripping applications, provides long-time delay and short-time delay tripping. Independent adjustment of both pickup and time delay is provided for both types of tripping. The nameplate of this device shows the settings which are available. For information on the time-current characteristics of this device, request a copy of TD-6694.

(C) Type OD-5 Triple-Selective Overcurrent Trip Device. This overcurrent trip device is similar to the OD-4 except that an instantaneous trip characteristic is added to the long-time delay and the short-time delay functions provided on the OD-4. For information on the time-current characteristics of this device, request a copy of TD-6695.

(D) See Table 1 on facing page for complete list of Electro-Mechanical standard overcurrent trip devices available. See Maintenance Section for adjustments.

### Power Shield™ Solid State Overcurrent Trip Devices Type K-600S thru K-2000S Circuit Breakers (See Figure 19)

This device includes the power supply sensors, overcurrent sensors, Power Shield solid state logic assembly, magnetic latch and the interconnecting wiring. Each phase of the circuit breaker has a power supply sensor and overcurrent sensor. The trip elements that are available are: long-time delay, instantaneous, short-time delay and ground fault. On a 3-phase 4-wire system, an additional remote sensor, mounted in the neutral bus, is required for complete ground fault protection.

The logic assembly is mounted near the front of the circuit breaker and with the cubicle door open the overcurrent control panel is readily accessible. This device must be properly set, as required by individual circuit conditions, to provide adequate protection for an electrical system. The movable plugs on the control panel provide independent control of the long-time, short-time, instantaneous and ground fault pickup and amount of time delay. The overcurrent device, with the exception of ground fault, will trip at the value of the AMPERE TAP setting times the plug setting of the vari-

pickup elements. The ground fault trip value will be the plug setting value times 100, as indicated on the nameplate.

(A) Type SS-3. This trip device is for general purpose application. It provides long-time delay tripping on moderate overcurrents, which are above the long-time pickup settings, and instantaneous tripping on fault currents above the instantaneous trip setting. For information on the time-current characteristics of this device, request a copy of TD-6966 (TD-9001\*).

(B) Type SS-4 Selective Overcurrent Trip Device. This trip device, for selective tripping application, provides long-time delay and short-time delay tripping. For information on the time-current characteristics of this device, request a copy of TD-6967 (TD-9002\*).

(C) Type SS-5 Triple-Selective Overcurrent Trip Device. This device includes the trip elements found in both the SS-3 and SS-4; i.e., long-time delay, short-time delay, and instantaneous tripping. For information on the time-current characteristics of this device, request a copy of TD-6967 (TD-9002\*).

(D) The above three solid state overcurrent trip devices are available with ground fault protection and are designated by the types SS-3G, SS-4G and SS-5G. For information on the time current characteristics of this feature, request a copy of TD-6968 (TD-9005\*).

(E) See Table 1A for a complete list of standard Solid State overcurrent trip devices.

TABLE 1  
STANDARD ELECTRO-MECHANICAL OVERCURRENT TRIP DEVICES

| Overcurrent Device Type | Trip Element |            |               | Time-Current Characteristic Curve |
|-------------------------|--------------|------------|---------------|-----------------------------------|
|                         | Long-Time    | Short-Time | Instantaneous |                                   |
| OD-3                    | X            |            | X             | TD-6693                           |
| OD-4                    | X            | X          |               | TD-6694                           |
| OD-5                    | X            | X          | X             | TD-6695                           |
| OD-6                    | X            |            | X             | TD-6695                           |
| OD-7                    |              |            | X             | None                              |
| OD-8                    |              |            | X             | None                              |
| OD-9                    |              | X          | X             | TD-6699                           |
| OD-10                   |              | X          |               | TD-6699                           |

NOTE: OD-3 long-time delay element has one time delay band only. All other long-time & short-time delay elements have three time delay bands.

TABLE 1A  
STANDARD SOLID STATE OVERCURRENT TRIP DEVICES

| Overcurrent Device Type | Trip Element |            |               |        | Time-Current Characteristic Curve |                      |
|-------------------------|--------------|------------|---------------|--------|-----------------------------------|----------------------|
|                         | Long-Time    | Short-Time | Instantaneous | Ground | Device in RED CASE                | Device in GRAY CASE* |
| SS-3                    | X            |            | X             |        | TD-6966                           | TD-9001              |
| SS-3G                   | X            |            | X             | X      | TD-6966<br>TD-6968                | TD-9001<br>TD-9005   |
| SS-4                    | X            | X          |               |        | TD-6967                           | TD-9002              |
| SS-4G                   | X            | X          |               | X      | TD-6967<br>TD-6968                | TD-9002<br>TD-9005   |
| SS-5                    | X            | X          | X             |        | TD-6967                           | TD-9002              |
| SS-5G                   | X            | X          | X             | X      | TD-6967<br>TD-6968                | TD-9002<br>TD-9005   |

NOTE: Time-current characteristic curves are not included in this book because separate coordination curves are normally provided with each order. When field calibration is performed, necessary instruction books (refer to page 18) will be provided and will include all pertinent timing information.

\* Device in GRAY CASE (Current Manufacture)  
TD-6966, TD-6967 & TD-6968 apply to Device in RED CASE



**Control Device (Electrically Operated)**

The control device (Fig. 12) is furnished on electrically operated circuit breakers. The device is mounted below and to the left of the mechanism. The control device contains three electrical components, the limit switch (LS), the lockout relay (52Y), and the latch release relay (52X). The schematic diagram of the control circuit (Fig. 2) illustrates the function of this device. In addition to its electrical functions, the base of the device provides a terminal block for the circuit breaker wiring.

The purpose of the lockout relay (52Y) is to require that, if the remote or local close contacts are closed, resulting in the charging springs discharging, the close contacts must first be released (opened) before the breaker can be reclosed. This prevents closing the circuit breaker more than one time unless the close contacts are first released.

**Auxiliary Switches (Figure 1, Item 2)**

The auxiliary switches contain the "a" and "b" contacts (Fig. 2) and are furnished in 4 or 8 contact ar-

rangements. They are mechanically interconnected with the main circuit breaker contacts such that, with the circuit breaker closed, the "a" contacts are closed. With the circuit breaker open, the "b" contacts are closed.

**Undervoltage Trip Device**

The electrically reset undervoltage trip device is a single-phase device which automatically trips the circuit breaker when the line voltage decreases to 30 to 60 percent of the rated voltage. This device may be furnished either for instantaneous trip operation or with adjustable time delay tripping of 1.5 to 15 seconds. The undervoltage trip device is an integral unit which may be added to the circuit breaker either at the factory or in the field.

The undervoltage device may be connected so that the automatic trip indicator (Figure 1, Item 9) will protrude from the front plate when the breaker is tripped by the undervoltage device.

See Table 4, page 20, for electrical characteristics.

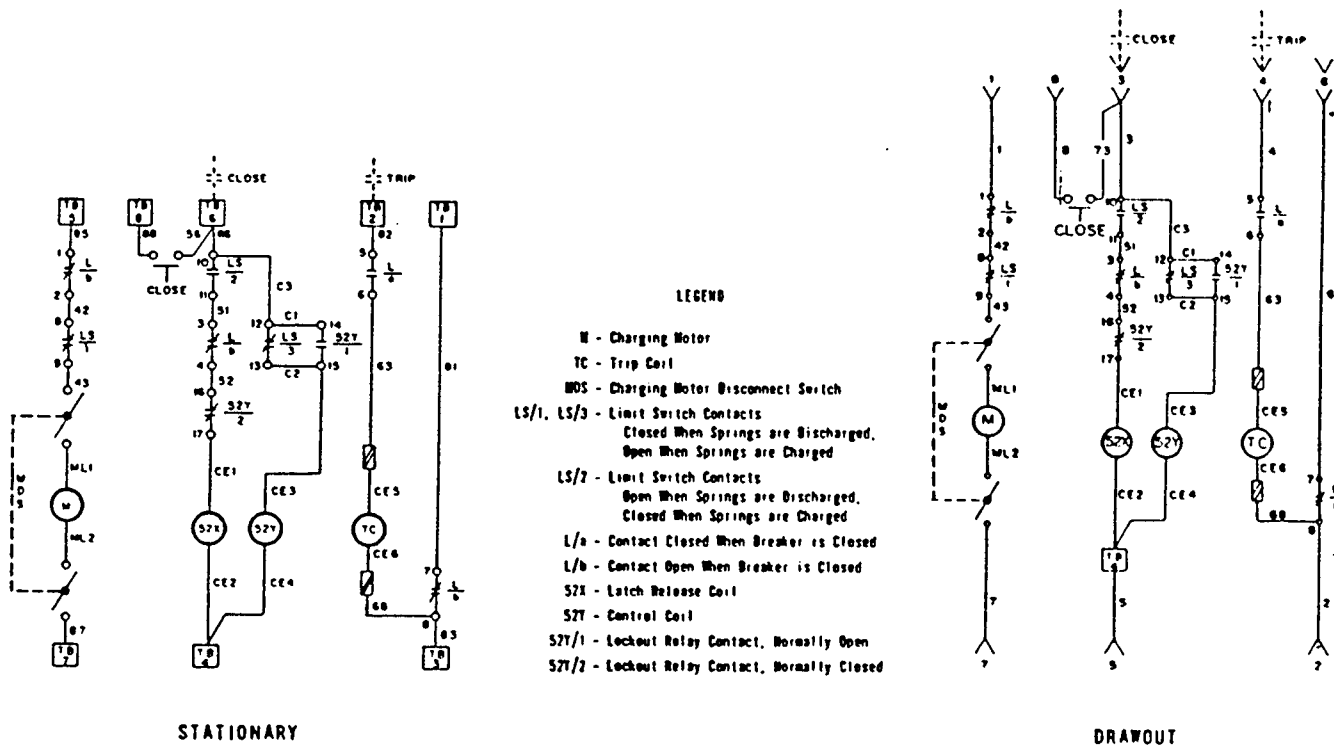


Fig. 2 — Typical Schematic Diagram of Control Circuit

### INSTALLATION, INITIAL TESTING AND REMOVAL (Drawout & Stationary)

**FOR SAFETY:** When installing or removing stationary breakers, the supply for primary and control circuits must be de-energized at all times. Testing of stationary circuit breakers to be done with the primary supply circuit de-energized.

For initial installation of drawout breakers in the "CONNECTED" position, the supply for the primary circuit should be de-energized. Testing of the drawout breaker to be done in the test position.

**NOTE:** (K-225 thru K-2000 Circuit Breakers) Prior to inserting the circuit breaker into the switchboard and with the breaker in the upright position, exercise the three long time armatures ( $\frac{1}{8}$ " wide armatures) several times until resistance to motion has increased, indicating that the oil dashpot is functioning properly. Improper operation can result because the circuit breaker is shipped or stored on its back. This causes the oil in the dashpot to be displaced and an air bubble can be trapped under the piston. The exercise removes the air to permit proper operation.

#### INSTALLATION (Stationary Type)

Lifting yoke (20, Fig. 1) should be used to move the breaker to the switchboard; however, other handling means will be required to move the breaker into position inside the switchboard.

#### INSTALLATION (Drawout Type)

To insert the circuit breaker into its compartment, proceed as described below:

(Refer to Fig. 1)

1. The circuit breaker must be in the "OPEN" position, the racking crank turned in the counterclockwise direction fully against its stop, and the motor disconnect switch (10) (electrically operated circuit breakers only) in the "OFF" position.

2. Open the compartment door and pull out the right-hand and left-hand tracks (23) to the fully extended and latched position.

3. Using a lifting yoke, lower the circuit breaker so that the positioning pins (6) (two each side of circuit breaker) rest in the cut-out sections of each track (23).

4. Remove the lifting yoke and push the circuit breaker toward the compartment. The circuit breaker will slide in the cut-out sections of the tracks until the positioning pins reach the end of the cutouts. An additional positive push will automatically release the two latches (24). This allows the circuit breaker to move toward the compartment until the racking cams (4) stop against their guides on the cradle (28).

5. Lift shutter (15) covering the racking opening, insert racking crank, and turn crank clockwise, pass through the "DISCONNECTED" position, until the position indicator on the cradle (left side) shows "TEST" position. Reverse racking crank.

### CHECKING CIRCUIT BREAKER OPERATION IN "TEST" POSITION (Electrically Operated, Drawout Type)

(Refer to Fig. 1)

1. Manually reset automatic trip indicator (9) if it protrudes approximately  $\frac{1}{2}$ ". Push in to reset.

2. Turn motor disconnect switch (10) to "ON" position and closing springs will automatically charge.

3. Close circuit breaker by local close button and trip by local trip button.

**NOTE:** All breakers have a manual trip button. The local close button for electrical breakers is standard. The local trip button for electrical breakers is optional.

4. Close and trip circuit breaker by means of remote control switch.

5. Check each auxiliary device for proper operation.

6. Close the circuit breaker and check that the shutter (15) cannot be lifted to allow insertion of the racking crank. This demonstrates that the circuit breaker could not be racked out while closed in the connected position.

### CHECKING CIRCUIT BREAKER OPERATION IN "TEST" POSITION (Manually Operated, Drawout Type)

(Refer to Fig. 1 and Cover Photo)

1. Manually reset automatic trip indicator (9) if it protrudes approximately  $\frac{1}{2}$ ". Push in to reset.

2. Close the circuit breaker by pulling down on the "T" handle.

3. Trip by manual "TRIP" button (13).

4. Check each auxiliary device for proper operation.

5. Close the circuit breaker and check that the shutter (15) cannot be lifted to allow insertion of the racking crank. This demonstrates that the circuit breaker could not be racked out while closed in the connected position.

### CHECKING CIRCUIT BREAKER OPERATION IN "CONNECTED" POSITION (Drawout Type)

(Refer to Fig. 1)

With the circuit breaker in the "OPEN" position and the motor disconnect switch (10) in the "OFF" position, insert the racking crank and turn clockwise until the position indicator on the cradle shows "CONNECTED" position.

### CHECKING CIRCUIT BREAKER OPERATION (Stationary Type)

Follow the same procedure as for the drawout circuit breaker, except the circuit breaker will be in the "CONNECTED" position. Primary supply circuit must be de-energized.

**EMERGENCY OPERATION (Electrically Operated)**

Electrically operated circuit breakers may be charged manually by a removable maintenance handle (4, Fig. 3) for emergency operation.

The removable maintenance handle (4) is first positioned in two slots in the pawl carrier (2). The handle is then raised and lowered in a pumping motion until the pawl carrier (2) no longer rotates the ratchet wheel (1). The breaker closing springs now fully charged are ready for a closing operation which is done by raising the manual close lever (17, Fig. 1) on the escutcheon.

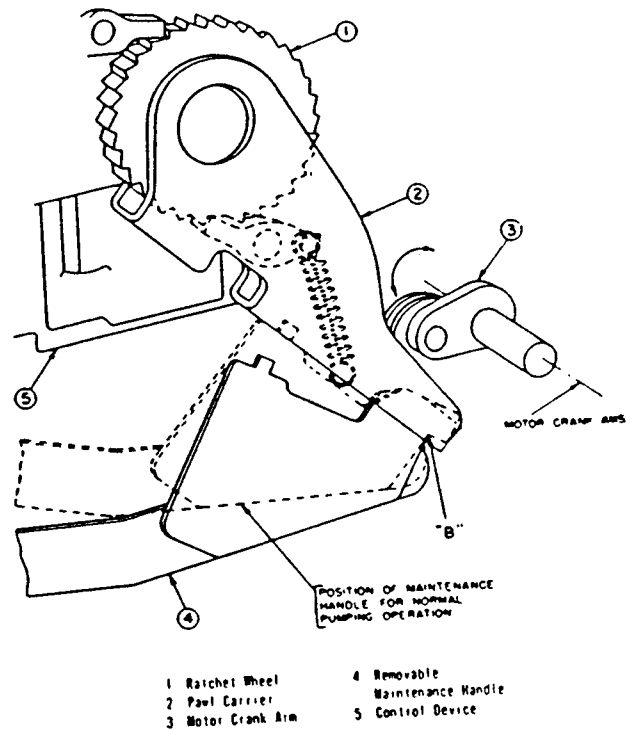
**NOTE:** The motor crank arm (3, Fig. 3) will stop occasionally in such a position as to prevent charging the springs with the handle. Should this happen, the motor crank arm must be rotated manually by using a screwdriver or similar tool to rotate the crank arm a sufficient amount so that the springs may be charged with the handle as described above.

**CIRCUIT BREAKER REMOVAL (Drawout Type)**

To move the circuit breaker to the "TEST" position or to remove it from the compartment, proceed as follows:

(Refer to Fig. 1)

1. With the compartment door closed, trip the circuit breaker by means of the remote mounted control switch or manual "TRIP" button (13) on the escutcheon.
2. Lift racking shutter (15), insert racking crank and turn counterclockwise until position indicator (27) on the right-hand side of the escutcheon shows "TEST" position. (NOTE: The circuit breaker may be tested in this position—primary contacts are disconnected and the control contacts are connected.)
3. Continue turning the racking crank counterclockwise until the position indicator (27) on the right-hand side of the escutcheon shows "DISCONNECTED" position.
4. Open compartment door and discharge closing springs (electrically operated breakers only) by lifting the manual close lever (17) on the escutcheon and then pushing the manual trip button on the escutcheon. Place motor disconnect switch (10) in the "OFF" position.
5. Insert racking handle and crank counterclockwise as far as the stops will allow.



**Fig. 3 — Method of Applying Maintenance Handle for Charging Closing Springs**

6. Pull circuit breaker forward until tracks (23) are in the fully extended and latched position.
7. Using a lifting yoke, just pick up the circuit breaker weight.
8. With a positive pull, release positioning pins from cut-out sections of the tracks.
9. Remove circuit breaker from tracks by means of lifting yoke.
10. Release latch (24) on each track, push tracks into the compartment, and close compartment door.

**NOTE:** For safety, if the closing springs are charged, they will be automatically discharged when inserting or withdrawing the circuit breaker in the switchboard compartment.

## MAINTENANCE

### SAFETY NOTES

De-energize both primary and control circuits before making any inspections, adjustments or replacements of parts. Make certain breaker is open by observing indicator (14, Fig. 1), and closing springs are not charged by observing indicator (16, Fig. 1).

When it is necessary that the closing springs be charged, or the circuit breaker be closed, make sure to stay clear of operating parts.

Stationary breakers should be checked for operation with the control circuit energized and the primary power de-energized. Drawout breakers should be withdrawn to "TEST" position for checking the breaker operation. For further inspection, adjustments, cleaning or replacement of parts, the drawout circuit breaker should be withdrawn and moved to a suitable area.

Stationary breakers should likewise be removed, but, if removal is not possible, then the primary and control circuit sources MUST BE DE-ENERGIZED.

### PERIODIC MAINTENANCE INSPECTION

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 a periodic inspection of the circuit breaker as follows:

- K-225 – After 2,500 operations
- K-600, K-600S – After 1,750 operations
- K-800, K-800S – After 1,750 operations
- K-1600, K-1600S – After 500 operations
- K-2000, K-2000S – After 500 operations

The above inspection periods apply for no load or load current switching. If the listed number of operations are not completed in the first year of service, the circuit breakers should be inspected regardless. The circuit breaker should also be inspected after a short circuit or severe overload interruption, regardless of time period or number of operations.

Where unusual service conditions, as covered by ANSI Standard C37.13, exist, it must be assumed that these conditions were considered at the time of order; that the equipment supplied was designed for the special application; and that an appropriate supplemental maintenance program has been developed. These maintenance instructions only cover circuit breakers used under the standard usual service conditions.

The inspection should include opening and closing the circuit breaker electrically and manually. The unit should be visually inspected for loose or damaged parts. Arc chutes, contacts and insulation structure should be inspected as described below.

### ARC CHUTE (Refer to Fig. 1)

#### Removal

1. If the circuit breaker has a solid state overcurrent trip device, it is necessary to remove two ¼" diameter screws fastening the solid state control assembly. Move the assembly for access to the arc chute retaining screws.
2. Loosen the retaining screw (25) and remove the screw and retainer (26).
3. Pull the arc chute forward slightly then lift to remove.

#### Examination

1. Discoloration or slight eroding is not harmful.
2. Arc runners or cooling plates that are burned, or moldings that are cracked or broken require replacement of the arc chute.

#### Replacement

1. Properly position the arc chute in the upper molding.
2. Position retainer (26) and insert and tighten screw (25).
3. Replace the solid state control assembly.

### CONTACTS

1. Remove dirt or grease on contacts with a clean lintless cloth.
2. Pitting or discoloration is not detrimental unless it interferes with proper contact adjustment.
3. Small burrs on the arcing contacts to be removed by filing along contour of the contact. Do not let filings fall into the mechanism.
4. Replace badly burned and pitted contacts that do not meet correct adjustment requirements.
5. If contacts are replaced or filed, then it is necessary to check the contact adjustment.

NOTE: Several operations at two week intervals will remove the effects of oxidation.

### INSULATION STRUCTURE

Insulated parts should be checked for damage. Dust and dirt should be removed by air or wiped with a clean lintless cloth. Do not use any oil base solvents. Spray solvents vary as to type and are questionable. However, externally at rear terminals is the only critical area, which is easily wiped or blown out with air, so other methods are not necessary. If contamination is so great, means are probably necessary to isolate the entire equipment.

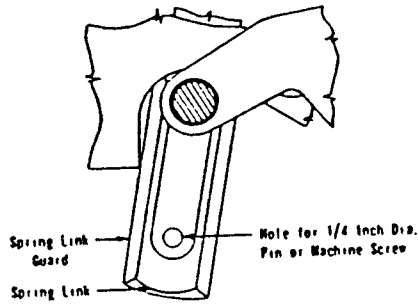
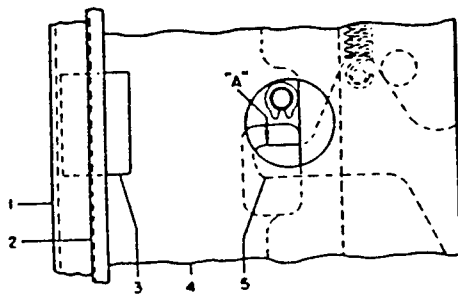
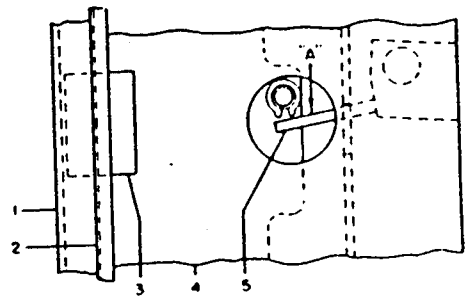


Fig. 4A



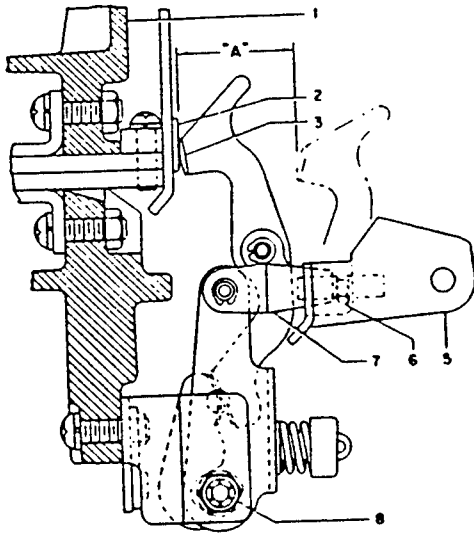
- |                      |                                     |
|----------------------|-------------------------------------|
| 1 Escutcheon         | 4 Box, Escutcheon (Right-Hand Side) |
| 2 Dust Plate         | 5 Hold-Up Latch                     |
| 3 Spring, Dust Plate |                                     |

Fig. 4 — Partial View of Escutcheon Assembly (Right-Hand Side) Showing Slow Close Lever for Manually Operated Circuit Breakers



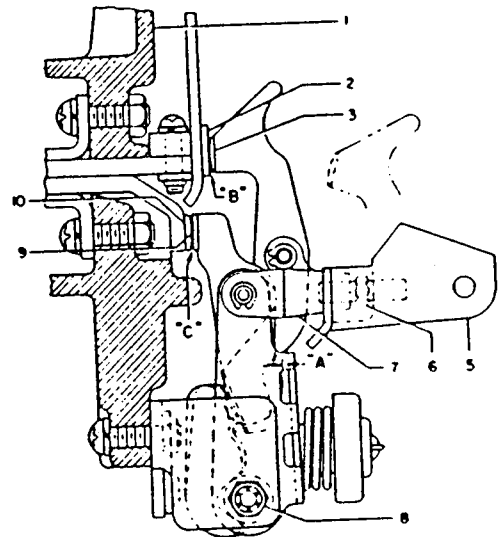
- |                      |                                     |
|----------------------|-------------------------------------|
| 1 Escutcheon         | 4 Box, Escutcheon (Right-Hand Side) |
| 2 Dust Plate         | 5 Pin, Close Block Lever            |
| 3 Spring, Dust Plate |                                     |

Fig. 5 — Partial View of Escutcheon Assembly (Right-Hand Side) Showing Slow Close Lever for Electrically Operated Circuit Breakers



- |                      |                      |
|----------------------|----------------------|
| 1 Upper Molding      | 6 Adjusting Stud     |
| 2 Stationary Contact | 7 Yoke               |
| 3 Movable Contact    | 8 Nut (Self-Locking) |
| 5 Insulator          |                      |

Fig. 6 — Contact Adjustment for Type K-225 Circuit Breakers



- |                             |                            |
|-----------------------------|----------------------------|
| 1 Upper Molding             | 7 Yoke                     |
| 2 Stationary Arcing Contact | 8 Nut (Self-Locking)       |
| 3 Movable Arcing Contact    | 9 Movable Main Contact     |
| 5 Insulator                 | 10 Stationary Main Contact |
| 6 Adjusting Stud            |                            |

Fig. 7 — Contact Adjustment for Type K-600, K-600S, K-800, K-800S Circuit Breakers

## ADJUSTMENTS

**FOR SAFETY:** See SAFETY NOTES in MAINTENANCE section.

**NOTE:** The operating mechanism must be operated slowly, as described in section SLOW CLOSE PROCEDURE, when performing any adjustment requiring contact movement.

In order to close the circuit breaker, the racking mechanism in drawout circuit breakers must be turned to a position such that the racking shutter (15, Fig. 1) is closed when the racking crank (21, Fig. 1) is removed.

### SLOW CLOSE PROCEDURE

**NOTE:** The circuit breaker should be clamped down during the slow close procedure to keep it from tilting or moving.

#### Manually Operated Circuit Breakers

Refer to Fig. 4 unless otherwise noted.

1. On K-1600, K-1600S, K-2000 and K-2000S circuit breakers, at each of the two spring guards, loosely install  $\frac{1}{4}$  inch diameter pins or machine screws. (See Fig. 4A)

2. Insert a screwdriver or rod through the hole in the escutcheon box (4) and mechanism housing assembly (right-hand side when facing the front of the circuit breaker).

3. Using the top of the hole as the fulcrum and the screwdriver or rod as the lever, depress the hold-up latch (5) at "A" and, at the same time, pull the operating handle downward to slowly close the circuit breaker contacts.

4. On K-1600, K-1600S, K-2000 and K-2000S circuit breakers, remove the two  $\frac{1}{4}$  inch diameter pins or machine screws installed in step 1, after the slow close operation is complete.

#### Electrically Operated Circuit Breakers

**NOTE:** The charging cranks must be reset (see steps 8, 9, and 10 below) after the last slow close operation, or future electrical operation will be impossible.

Refer to Fig. 5 unless otherwise noted.

1. The closing springs must be charged; see spring charge indicator (16, Fig. 1).

2. Insert a screwdriver or rod through the hole in the escutcheon box (4) (right-hand side when facing the front of the circuit breaker) and depress the close block lever pin (5) at "A".

3. With the close block lever pin (5) held in the down position, lift the manual close lever (17, Fig. 1). The close block lever pin (5) will remain in the down position.

4. Insert the maintenance handle in the ratchet carrier and operate the handle to slowly close the contacts. (See Fig. 3 and "Emergency Operation".)

To repeat the slow close operation, continue with the following steps:

5. Insert the maintenance handle and continue the charging operation until the indicator (16, Fig. 1) shows "SPRINGS CHARGED"

6. Push manual "TRIP" button (13, Fig. 1) to open the contacts.

7. Repeat steps 2, 3, and 4 above for the slow close operation.

To reset the charging cranks for normal electrical operation, proceed as follows:

8. Repeat steps 5 and 6 above.

9. Lift manual close lever (17, Fig. 1) to close the contacts.

10. Push the manual "TRIP" button (13, Fig. 1) to open the contacts.

The circuit breaker is now ready for normal service operation with the charging cranks reset and the closing springs discharged.

## CONTACTS

### Type K-225 Circuit Breakers (Refer to Fig. 6)

1. The hex. portion of the adjusting stud (6) must be centered, within  $\frac{1}{16}$  inch, between the yoke (7) and the insulator (5).

**NOTE:** On some circuit breakers, the hex. portion of the adjusting stud (6) must be centered between the locknut on the adjusting stud and the insulator.

**NOTE:** In the following steps 2 and 3, if adjustment is required, always turn the adjusting stud (6) in the direction to increase the contact pressure (counterclockwise when viewed from the insulator).

2. Contact pressure is set by adjusting stud (6) for  $1\frac{3}{4}$  inches, plus or minus  $\frac{1}{32}$  inch open air gap measured at "A". Any adjustment of contact pressure must be followed by step 3.

3. Following the slow close procedure, slowly close the circuit breaker until the first contacts (2 and 3) just touch. The other two poles should be within .032 inch of touching. If not within .032 inch, then adjust stud (6) of these two poles in the direction to increase pressure until all three poles touch within .032 inch.

"If for any reason the breaker is disassembled and the contact structure Figures 6 and 7 is replaced or disassembled, the torque of the nut ((8) Figures 6 and 7)) should be checked. This should be adjusted to be between 15 and 25 foot pounds. This will provide sufficient side pressure on the hinge joint so the joint will be capable of adequately carrying its current rating."

### Type K-600, K-600S, K-800, K-800S Circuit Breakers (Refer to Fig. 7)

1. The hex. portion of the adjusting stud (6) must be centered, within  $\frac{1}{16}$  inch, between the yoke (7) and the insulator (5).

**NOTE:** On some circuit breakers, the hex. portion of the adjusting stud (6) must be centered between the locknut on the adjusting stud and the insulator.

2. Contact pressure is set by adjusting stud (6) so

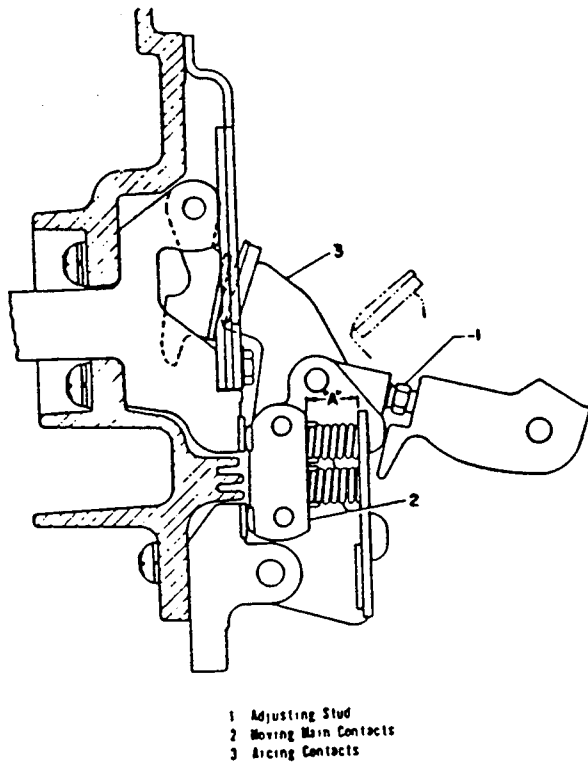


Fig. 8 — Contact Adjustment for Type K-1600, K-2000, K-1600S and K-2000S Circuit Breakers

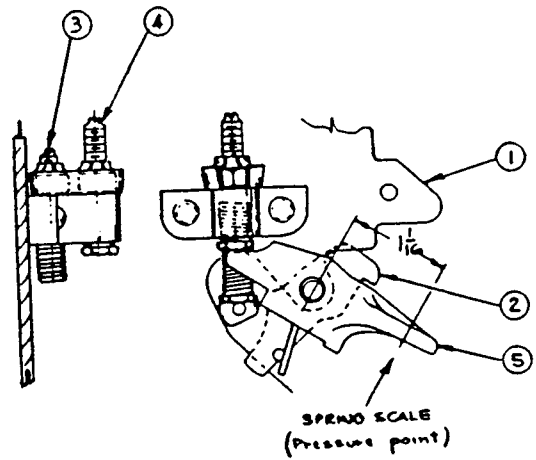


Fig. 9 — Latch Engagement and Tripper Bar Latch Engagement Adjustment

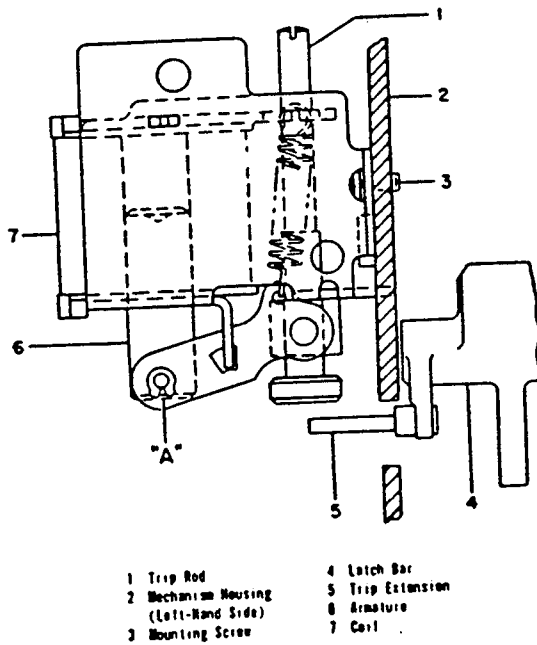


Fig. 10 — Shunt Trip Device Adjustment Type K-225 thru K-2000, K-1600S and K-2000S Circuit Breakers

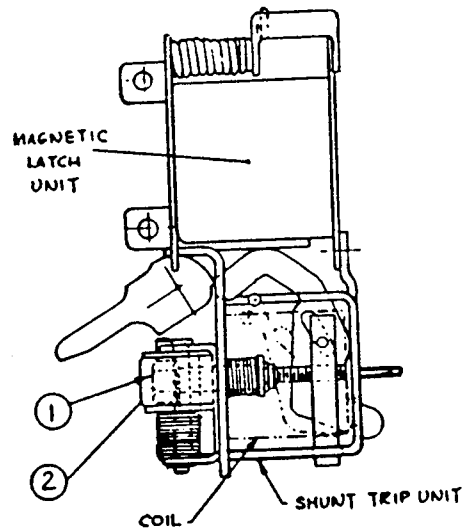


Fig. 11 — Shunt Trip Device Adjustment Type K-600S, K-800S Circuit Breakers

that there is a 5/64 to 3/32 inch gap, at "A", with the circuit breaker closed. This can be checked with 5/64 and 3/32 dia. wires (go and no-go) bent at 90 degrees. The 5/64 to 3/32 dimension is equivalent to .025 to .032 wiper, vertical movement of the main contacts during main contact engagement of the slow close operation. After adjusting, reclose the circuit breaker and recheck. Readjust if necessary. Any adjustment of contact pressure must be followed by step 3. Note that, after operation 3 is completed, contact pressure may exceed the 3/32 inch dimension on two poles. This is acceptable.

3. Following the slow close procedure, slowly close the circuit breaker until the first contacts (2 and 3) just touch. The other two poles should be within .032 inch of touching. If not within .032 inch, then adjust stud (6) of these two poles in the direction to increase pressure until all three poles touch within .032 inch.

"If for any reason the breaker is disassembled and the contact structure Figures 6 and 7 is replaced or disassembled, the torque of the nut ((8) Figures 6 and 7)) should be checked. This should be adjusted to be between 15 and 25 pounds. This will provide sufficient side pressure on the hinge joint so the joint will be capable of adequately carrying its current rating."

#### Type K-1600, K-1600S, K-2000, K-2000S Circuit Breakers (Refer to Fig. 8)

The main contact adjustment is to be made with the breaker in the latched closed position. The self-locking adjusting stud (1) is to be turned to provide contact pressure such that a 0.750 inch shim will just fit the space (A) at the rear of the moving main contacts (2).

After making this adjustment in contact pressure, open the circuit breaker, then reclose the circuit breaker normally and recheck the (A) gap. Readjust if necessary.

Open the circuit breaker and slow close the contacts until the arcing contact (3) of one pole just touches. The remaining poles should then be advanced by turning adjusting stud (1) so that these poles just touch or are within 0.032 inch of each other.

The contacts should now be in correct adjustment and the breaker may be put in service. Note that if an adjustment is necessary for "simultaneous" make, the contact pressure will increase on those adjusted poles. Thus, a dimension of less than 3/4 inch indicates more contact pressure, which is acceptable.

#### MECHANISM

The various mechanism adjustments described in the following sections apply to all circuit breakers covered by this Instruction Bulletin.

#### Latch Engagement (Bite) (Refer to Fig. 9)

The latch engagement adjusting screw (3) is located to the right of the right-hand mechanism housing (1). It can be reached easily from the top of the circuit breaker.

To adjust the latch (2) engagement, proceed as follows:

1. Back off adjusting screw (3) to assure excessive latch engagement.
2. Close the circuit breaker.
3. Turn adjusting screw (3) down slowly until the latch just releases, tripping the circuit breaker.
4. Back off the adjusting screw (3) 2 turns.

#### Tripper Bar Latch Engagement (Refer to Fig. 9)

The tripper bar latch engagement adjusting screw (4) is located adjacent to the latch engagement adjusting screw (3).

To adjust the tripper bar latch engagement, proceed as follows:

1. Back off adjusting screw (4) to assure excessive tripper bar travel.
2. Close the circuit breaker.
3. Turn adjusting screw (4) down slowly until the latch just releases, tripping the circuit breaker.
4. Back off the adjusting screw (4) 3 1/2 turns.

#### Tripper Bar Load (Refer to Fig. 9)

The tripper bar load is measured by use of a spring scale positioned as shown.

With the circuit breaker in the "CLOSED" position, the push required to trip the circuit breaker must be between 16 and 29 ounces.

#### SHUNT TRIP DEVICE

##### Trip Adjustment

#### Type K-225 thru K-2000, K-1600S, K-2000S

(Refer to Fig. 10)

1. Back off trip rod (1) until it will not trip the circuit breaker with the armature (6) pushed up as far as the travel will allow.
2. Close the circuit breaker.
3. Push up on the armature (6) at "A" as far as the armature travel will allow.
4. Hold the armature as positioned in step 3 and turn trip rod (1) down until the circuit breaker just trips.
5. Turn trip rod (1) down an additional 3 turns.

##### Trip Adjustment

#### Type K-600S, K-800S

(Refer to Fig. 11)

1. Turn hex. head adjustment screw (1) counter-clockwise (viewing from head end) until the circuit breaker will not trip when the armature (2) is pushed in as far as travel will allow.
2. Close the circuit breaker.
3. Push in on armature (2) as far as the armature travel will allow.
4. Hold the armature as positioned in step 3 and turn the hex. head adjustment screw (1) clockwise until the circuit breaker just trips.
5. Turn the hex. head adjustment screw (1) an additional 1 turn.

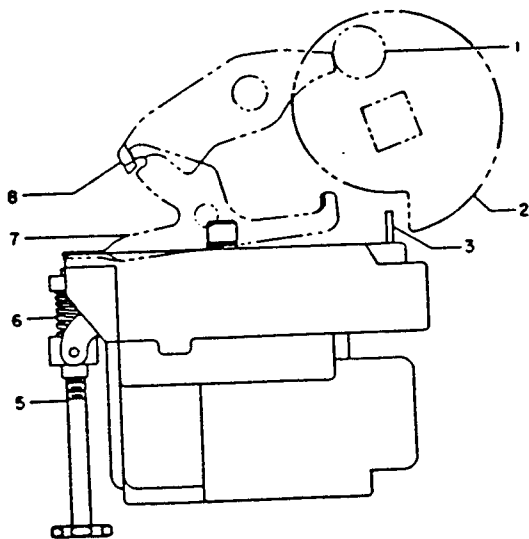


**CONTROL DEVICE (Refer to Fig. 12)**

The control device is adjusted before leaving the factory. It is recommended that no attempt be made to adjust the internal relays and contacts of this device in the field. If replacement of the control device is required, the close latch release rod (5) overtravel may be adjusted as described below.

**Close Latch Release Rod Overtravel**

1. Back off on close latch release rod (5) and check that the circuit breaker will not close by attempting to close it electrically or manually pushing up on close latch release rod (5) to the full extent of its travel.
2. Charge the closing springs. Push up on close latch release rod (5) to the full extent of its travel. While holding the close latch release rod in this position, turn up on close latch release rod (5) until the circuit breaker closes. Turn close latch release rod (5) up an additional 1 1/2 turns.

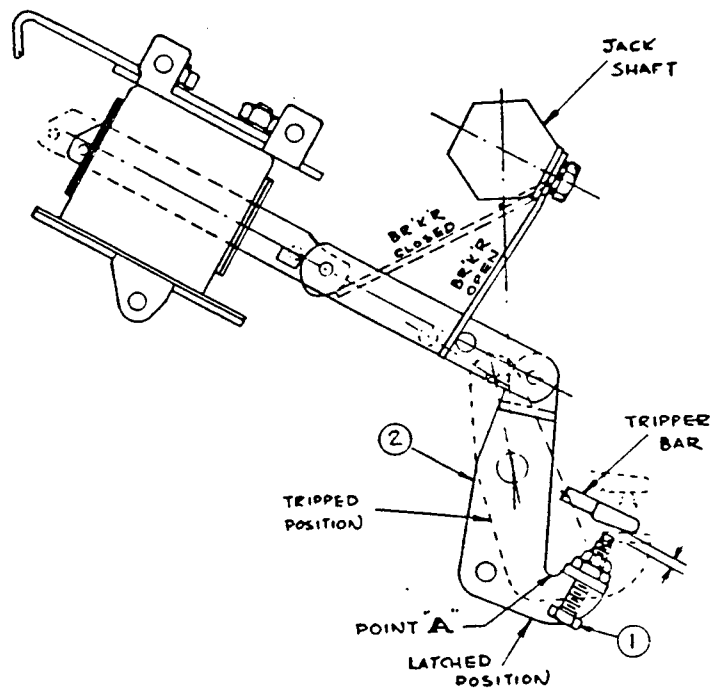


- |                          |                                   |
|--------------------------|-----------------------------------|
| 1 Roller, Close Latch    | 5 Close Latch Release Rod         |
| 2 Charging Cam           | 6 Spring, Close Latch Release Rod |
| 3 Actuator, Limit Switch | 7 Secondary Close Latch           |
|                          | 8 Primary Close Latch             |

**Fig. 12 — Control Device Adjustment**

**MAGNETIC LATCH DEVICE (Type K-1600S, K-2000S)  
Trip Adjustment (Refer to Fig. 13)**

1. Turn adjusting screw (1) out as far as possible so that the circuit breaker will not trip when the magnetic latch trips.
2. Remove the terminal block cover on the solid state assembly by removing two lower screws (Fig. 19). Disconnect two wires at terminals 15 and 16.
3. Close the circuit breaker.
4. While lightly holding down at point "A" so that the lever (2) does not move through its full stroke and trip the circuit breaker, momentarily apply the voltage (3V) from two dry cell batteries, size "D", to the two wires (+ to wire 16, - to wire 15) that were disconnected in operation 2. The magnetic latch should trip.
5. Gradually release the hold on lever (2).
6. While holding the lever (2) in the tripped position, turn in on screw (1) until the circuit breaker just trips, then turn in one additional turn.
7. Replace wires 15 and 16 and the terminal block cover.



**Fig. 13 — Magnetic Latch Trip Adjustment  
Type K-1600S and K-2000S Circuit Breakers**

**ELECTRO-MECHANICAL  
OVERCURRENT TRIP DEVICE ADJUSTMENTS**

**Long-Time Delay Band Adjustment**  
OD Types 4, 6, 20, 61 (See Fig. 15)  
OD Type 5 (See Fig. 16)

Turn the adjustment until the top of the long-time delay indicator is in line with the desired delay line (Fig. 14). Push the armature toward the magnet, allowing time for the oil in the dashpot to be displaced. Release the armature, allowing the armature to reset. Check to see that the long-time indicator and line are in line. Readjust if required, and recheck by pushing the armature and allowing it to reset.

**NOTE:** OD-3 has only one long-time delay setting; which is factory set and therefore adjustment is not required.

**Pick-Up Setting Adjustments (See Fig. 14)**

Pick-up settings may be changed by turning the appropriate adjusting screw until the moving indicator lines up with the desired pick-up point line.

**NOTE:** The top line corresponds to the top pick-up point, the second line from the top corresponds to the second pick-up point from the top, etc.

**Short-Time Delay Adjustment**  
OD Types 4, 5, 9, 10 (See Fig. 17)

Move the lever toward the left of the circuit breaker so that the short-time step pin can be moved to the desired short-time delay pin hole. Make certain the step pin drops into the pin hole.

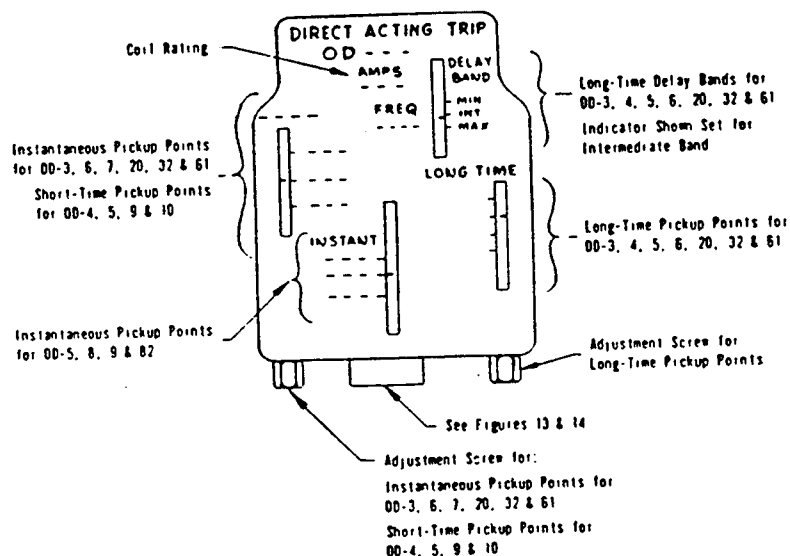


Fig. 14

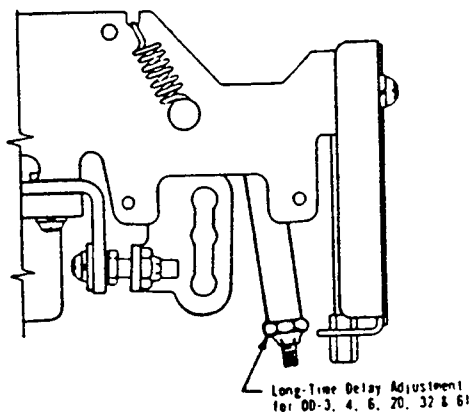


Fig. 15

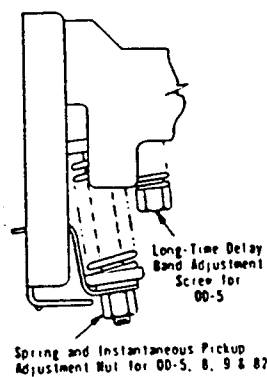


Fig. 16

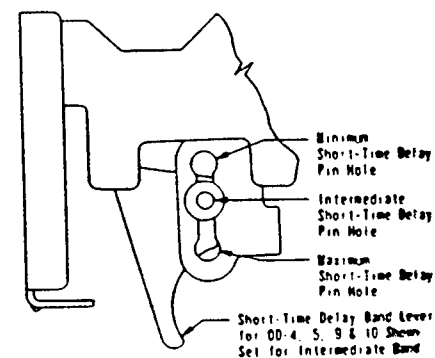


Fig. 17

**Armature Trip Travel Adjustment**

**FOR SAFETY:** Keep hands clear of all moving parts. The circuit breaker will trip to the "OPEN" position while checking or adjusting the armature trip travel.

The overcurrent trip device trip travel is set at the factory; however, if trip travel readjustment is required due to replacement of overcurrent trip devices or other parts, then readjust as follows:

1. (See Fig. 18). Back out on the two trip adjusting screws (1) until the screws are engaging the nut by approximately two turns.
2. Charge springs and close circuit breaker.
3. Using a one-foot long (approximate) stick, push up on the long-time armature, thick armature, at point "A", and hold it tight against the magnet. (When pushing, allow time for the oil dashpot to displace the oil.) While holding the armature in this position by pushing at point "B", turn up on screw (1) until the circuit breaker just trips. Continue to turn the screw an additional one turn. **NOTE:** During this adjustment operation, hold the armature firmly against the magnet, but do not exert excessive force that will result in incorrect adjustment due to distortion.
4. Charge springs and close circuit breaker. Push up on the thin armature and adjust screw (1) using the same procedure as in step 3 above.

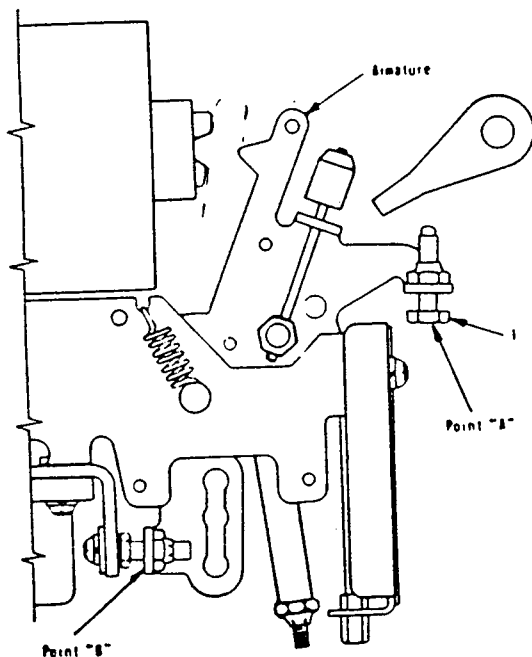


Fig. 18 — Armature Trip Travel Adjustment

5. Readjust the trip travel at the other two poles using the same procedure (steps 1 through 4).

**Field Testing of Electro-Mechanical Overcurrent Trip Devices**

Refer to IB-8203 for complete testing of devices, using high current test sets.

**SOLID STATE OVERCURRENT TRIP DEVICE SETTINGS (See Fig. 19)**

No adjustments are necessary in selecting trip settings on this trip device. The selector plugs (solid circles) allow flexibility in settings and may be moved from one plug tap to another, consistent, however, with the pickup and time band settings necessary for proper circuit protection. Make certain that the selector plugs are pushed in completely for proper operation. If a plug is left out or not secure, the affected element will trip at the minimum setting shown, for safety, but coordination will be affected.

**Field Testing of Solid State Overcurrent Trip Devices**

For complete testing of these devices, refer to the following Instruction Bulletins:

IB 6.1.2.7 - 4 (Device in GRAY CASE)

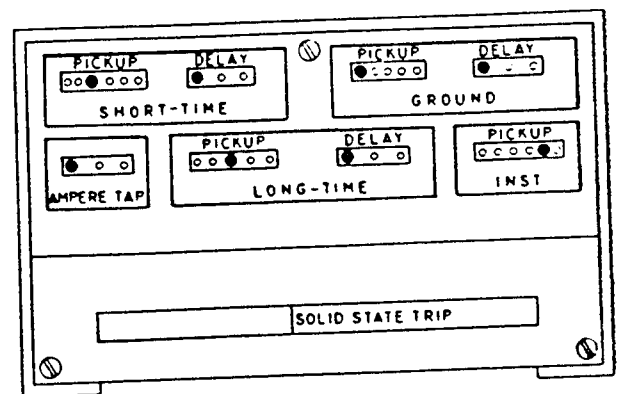


Fig. 19 — Solid State Overcurrent Trip Device Type SS-5G Shown

**LUBRICATION**

The K-line circuit breakers are lubricated during factory assembly as follows:

1. All mating surfaces of moving current-carrying joints have been lubricated with NO-OX-ID special Grade "A" grease manufactured by Dearborn Chemical Company.

2. All other mechanism parts, bearings, pins, etc. have been lubricated with ANDEROL L757 manufactured by Tenneco Chemical, Inc., Intermediate Division.

The circuit breaker requires no lubrication during its normal service life. However, if the grease should become contaminated or if parts are replaced, any relubrication should be done with NO-OX-ID or ANDEROL grease as applicable.

**NOTES:**

1. Do not use NO-OX-ID grease on any main and arcing contact surfaces.

2. It is recommended that the primary disconnects be maintained by renewing the NO-OX-ID grease during maintenance periods.

3. Do not use light oil to lubricate any mechanism parts.

4. Do not allow grease to be deposited on any latch roller surface during relubrication.

5. The charging motor is sealed and no lubrication is required.

6. DO NOT LUBRICATE OVERCURRENT TRIP DEVICES OR OTHERWISE CLEAN OR SPRAY WITH ANY SUBSTANCE OTHER THAN AIR.

**DIELECTRIC TEST**

If the insulation has become contaminated, or routine tests are required, the test voltages to be applied for one minute to test the ability of the insulation to withstand overvoltages are as shown in Table 2, below.

It is not recommended that the motor be dielectric tested, but if desired, then test at 540 V ac or 760 V dc.

On K-600S through K-2000S circuit breakers, connect all sixteen terminals of the power shield solid state logic box together and to ground when conducting tests listed in Table 2. These terminals are located under the lower front cover of the logic box.

An additional dielectric test should be performed on K-600S through K-2000S circuit breakers as follows: Connect all sixteen terminals of the power shield solid state logic box together and apply 500 V ac between the sixteen terminals and metal parts normally grounded.

**ELECTRICAL CHARACTERISTICS OF CONTROL DEVICES**

For closing and tripping currents, voltages and ranges, refer to Table 3, page 20.

For undervoltage trip devices, standard voltages and operating data, refer to Table 4, page 20.

Current values are average steady state values. Momentary inrush currents for all charging motors and ac coils are approximately 6-8 times these values.

**RENEWAL PARTS**

We recommend only those renewal parts be stocked that will be required to insure proper and timely maintenance for normal operation of the circuit breakers.

Refer to Renewal Parts Bulletin RP 6.1.2.8 - 1 for complete ordering information and Parts List. A copy of this bulletin will be furnished on request.

The minimum quantity of assemblies and items recommended in this bulletin is predicated on infrequent replacement of parts based on accumulated tests and operating experience. Total assemblies are recommended for fast replacement, when necessary, to return the breaker to service as quickly as possible. Then certain replaced assemblies, such as the stationary upper terminals, can be returned to the factory for nominal reconditioning. The bulletin contains specific part ordering instructions; and if desired, specific instructions regarding replacement of those part assemblies recommended, that are not obvious, are also available if ordered.

**TABLE 2**  
**TEST VOLTAGES TO BE APPLIED FOR ONE MINUTE**  
**TO TEST THE ABILITY OF THE INSULATION TO WITHSTAND OVERVOLTAGES**

|                                     | Breaker Open  | Breaker Closed  | Breaker Open or Closed  |
|-------------------------------------|---|---|---|
| Breaker in Service or After Storage | 1650 V ac -- 2300 V dc<br>a. Between line and load terminals and metal parts normally grounded.<br>b. Between line and load terminals | 1650 V ac -- 2300 V dc<br>a. Between terminals and metal parts normally grounded.<br>b. Between phases. | 1125 V ac -- 1600 V dc<br>a. Between control circuit and metal parts normally grounded.<br>NOTE: Motor must be disconnected from control circuit for this test. |
| After Short Circuit                 | 1320 V ac -- 1860 V dc<br>a and b as above  | 1320 V ac -- 1860 V dc<br>a and b as above  | 900 V ac -- 1260 V dc<br>a as above   |

TABLE 3  
 ELECTRICAL CHARACTERISTICS OF CONTROL DEVICES  
 CLOSING AND TRIPPING CURRENTS, VOLTAGES AND RANGES

| Type Breaker                              | Nominal Control Voltage | Average Closing Motor Current Amperes | Shunt Trip Current Amperes | Closing Relay Current Amperes |         | Closing Circuit Voltage Range | Shunt Trip Circuit Voltage Range | Recommended Control Fuse Size |
|---|-------------------------|---------------------------------------|----------------------------|-------------------------------|---------|-------------------------------|----------------------------------|-------------------------------|
|   |                         |                                       |                            | Anti-Pump                     | Release |                               |                                  |                               |
| K-225 thru K-2000 and K-600S thru K-2000S | 120 V ac 60 cycle       | 10.                                   | 6.5                        | .15                           | 1.5     | 104-127                       | 50-127                           | 10 A                          |
|   | 240 V ac 60 cycle       | 5.                                    | 1.15                       | .075                          | .75     | 208-254                       | 208-254                          | 10 A                          |
|   | 48 V dc                 | 25.                                   | 3.14                       | .15                           | 1.33    | 38-56                         | 28-56                            | 15 A                          |
|   | 125 V dc                | 10.                                   | 1.3                        | .06                           | .7      | 100-140                       | 70-140                           | 10 A                          |
|   | 250 V dc                | 5.                                    | .65                        | .03                           | .3      | 200-280                       | 140-280                          | 10 A                          |

TABLE 4  
 UNDERVOLTAGE TRIP DEVICE  
 STANDARD VOLTAGES AND OPERATING DATA

| Service Voltage   | Current at Rated Volts | Maximum Pickup Voltage | Dropout Voltage Range |
|-------------------|------------------------|------------------------|-----------------------|
| 120 V ac 60 cycle | 0.5                    | 102                    | 36-72                 |
| 240 V ac 60 cycle | 0.2                    | 204                    | 72-144                |
| 480 V ac 60 cycle | 0.1                    | 408                    | 144-288               |
| 48 V dc           | 0.3                    | 41                     | 15-29                 |
| 125 V dc          | 0.2                    | 106                    | 38-75                 |
| 250 V dc          | 0.1                    | 212                    | 75-150                |



# Installation/Maintenance Instructions

## Low-Voltage Power Circuit Breakers

*Type K-225 thru 2000 and K- 600S thru 2000S*  
Stationary Mounted and Drawout Mounted

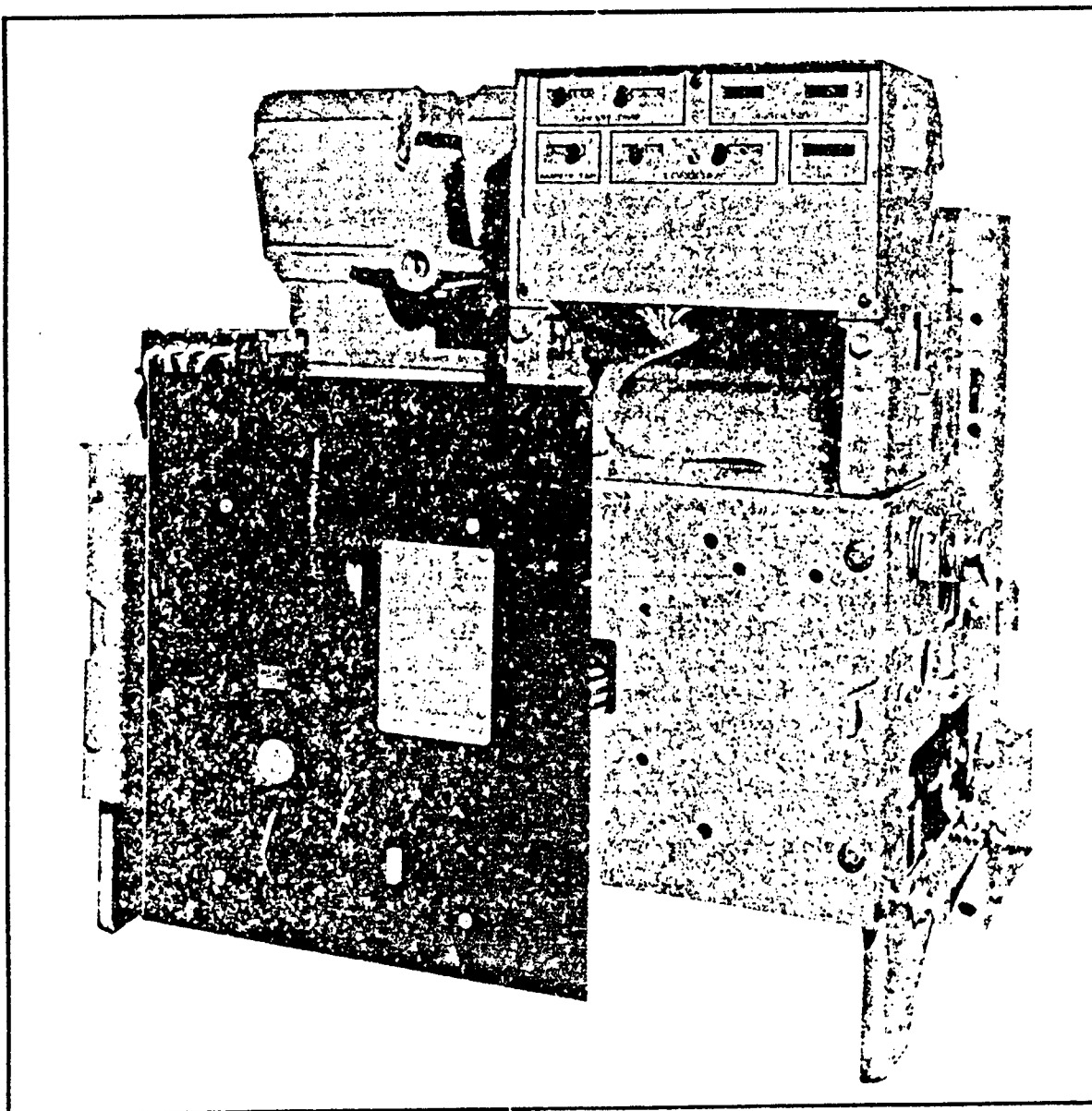


ABB Power Distribution, Inc.  
Circuit Breaker Division

**ABB**  
ASEA BROWN BOVERI

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## INTRODUCTION

These instructions apply to the type K-225 through K-2000 and K-600S through K-2000S circuit breakers; 225, 600, 800, 1600 and 2000 ampere ac continuous current rating respectively. The type K-225 through K-2000 are equipped with electro-mechanical overcurrent trip devices, whereas the type K-600S through K-2000S incorporate the solid state overcurrent trip devices. A K-1600S circuit breaker is shown on the front cover of this bulletin.

The K-225 through K-2000 circuit breakers can be furnished with two or three poles for dc or ac operation. K-600S through K-2000S circuit breakers are only furnished for three pole, ac operation.

All circuit breakers can be furnished as drawout or stationary mounted and are available as manually or electrically operated and with electrical control devices available in various ac and dc voltage combinations. The manually and electrically operated mechanisms are interchangeable on circuit breakers having the same current rating. Many optional features are also available.

An electrically operated, drawout type circuit breaker is shown in Figure 1, with a typical schematic diagram shown in Figure 2.

These instructions should be read thoroughly before handling, installing and/or operating the circuit breaker.

## RECEIVING AND STORAGE

Immediately upon receipt of the circuit breakers, examine the cartons 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 nearest District Office. Asea Brown Boveri is not responsible for damage of goods after delivery to the carrier. However, we will lend assistance if notified of claims.

Unpack circuit breakers 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 damaging any circuit breaker parts. Check the contents of each carton against the packing list before discarding any packing material. If any discrepancy is discovered, promptly notify the nearest District Office. Information specifying the purchase order number, carton number and part numbers of damaged or missing parts should accompany the claim.

Circuit breakers should be installed in their permanent

location as soon as possible. (See Basic Handling below.) If possible, a drawout circuit breaker should be stored and locked in the "DISCONNECTED" position in its compartment, with the door closed. Both the primary and control separable contacts are disconnected in this position. If the breaker cannot be installed in its compartment, it should be kept in its original carton and the carton should be sealed to prevent infiltration of dirt. Where conditions of high humidity prevail, the use of heaters is recommended, regardless of the method of storage selected.

## BASIC HANDLING INSTRUCTIONS

Once the circuit breaker has been removed from its shipping carton, it should be turned to the upright position and placed on a flat surface to avoid damage to breaker parts. For safety, all handling in this position should utilize the lifting yoke (Page 20, Fig. 1).

## CIRCUIT BREAKER OPERATION

### CIRCUIT BREAKER RATING

The continuous current rating is established by the frame size of the circuit breaker and is the number listed in the type designation; i.e., K-600 means the circuit breaker can carry 600 amperes continuously. Exceeding these ratings may raise the temperature of the circuit breakers beyond their design limit and thereby affect the life of the circuit breaker. Thus, any long-time pickup setting exceeding 100% of the frame size is to be used only for coordination, not for carrying increased continuous current.

### CLOSING SPRING OPERATION (Electrically Operated)

The two closing springs supply the power that closes the circuit breaker and also charge the two opening springs during the closing operation. The closing springs are charged by a motor. The spring energy is available to close the circuit breaker, thus referred to as "stored energy." Closing springs are normally charged when the circuit breaker is opened. If charged after closing, the circuit breaker can be opened and then reclosed without recharging the springs. In earlier model drawout circuit breakers, the closing springs are automatically discharged when the circuit breaker is pulled to the fully withdrawn position (shown in Figure 1). This prevents accidental discharge. In later models, the springs are automatically discharged when racking the circuit breaker from the disconnected to the withdrawn position.

### **CLOSING SPRING OPERATION (Manually Operated)**

In one continuous downward pull of the handle the two closing springs are charged, and near the end of the stroke, are discharged to fast close the circuit breaker. During closing, the two opening springs are charged.

### **ESCUTCHEON OPERATING FEATURES**

Manually and electrically operated circuit breakers are provided with an extendible escutcheon face plate. This escutcheon provides a central area for the controls which are mounted directly on the circuit breaker.

The controls for the electrically operated circuit breaker (Figure 1) included in the escutcheon face plate are: (19) nameplate giving the various ratings assigned to the particular type of circuit breaker, (13) manual trip button, (17) manual close lever, (12) electrical close push button switch (10) motor disconnect switch, (14) "OPEN" and "CLOSED" position indicator, (9) automatic trip indicator with optional facilities for alarm indication and for lockout, (11) means for padlocking the circuit breaker in the "CONNECTED", "TEST" or "DISCONNECTED" position and (16) closing spring charge indicator. Handle (22) is normally removed and is used for emergency closing spring charging or maintenance work.

The manually operated circuit breaker includes a manual closing handle but does not include the electrical close push button switch, motor disconnect switch, manual close lever, spring charge indicator or maintenance handle.

All drawout circuit breakers have the racking shutter (15) that must be raised to allow inserting of the racking crank (21).

A self-aligning dust plate (18) immediately behind the escutcheon face plate is used to exclude dust from the circuit breaker compartment. On drawout type circuit breakers, the escutcheon face will protrude through the front door of the compartment when the circuit breaker is in the "TEST" and "DISCONNECTED" positions. In these positions, the dust plate still functions to exclude dust.

#### **Circuit Breaker Nameplate (Figure 1, Item 19)**

The circuit breaker nameplate contains information regarding (1) the manufacturer's name and address, (2) type of circuit breaker design, (3) serial number of circuit breaker, (4) continuous current rating of frame size, (5) short circuit current rating at rated voltages, (6) frequency, (7) short time current.

#### **Manual Charging Handle (Manually Operated)**

The manual charging handle is a T-shaped lever used on manually operated circuit breakers to charge the closing

springs and close the circuit breaker in one continuous downward stroke.

**Manual Trip Button (Figure 1, Item 13)** The manual trip button, when pushed, trips the circuit breaker to "OPEN." Circuit Breaker "OPEN" or "CLOSED" Indicator (Figure 1, Item 14)

This indicator shows the physical position of the circuit breaker contacts.

**Automatic Trip Indicator (Figure 1, Item 9)** (Not including undervoltage, alarm switch or lockout)

The automatic trip indicator is provided as standard equipment on the K-line circuit breakers and is used to indicate the operation of the overcurrent trip device. This device is an indicator only and does not prevent the circuit breaker reclosing.

Upon an overcurrent trip operation, the indicator protrudes from the front plate approximately 1/2 inch.

The automatic trip indicator should be reset after each trip indication by pushing back into its normal latch position. The operator should investigate the cause of tripping before resetting the automatic trip indicator and subsequent reclosing the circuit breaker after an outage which results in an operation of the indicator.

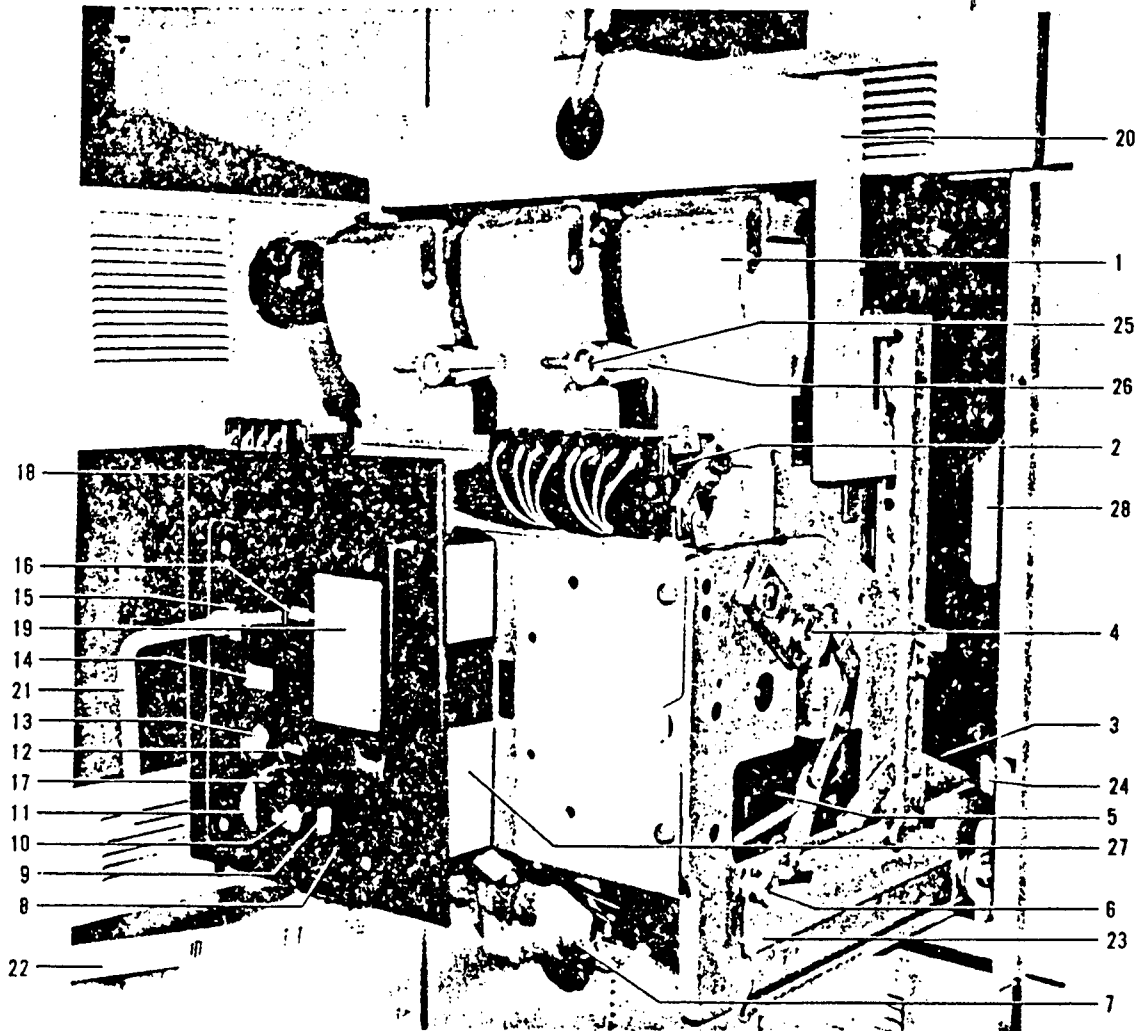
**Automatic Trip Alarm Contacts (Hand Reset) (Figure 1, Item 9)**

An alarm switch for remote electrical indication, which is optional, shows when automatic tripping has occurred. This is accomplished by adding a precision snap switch to the automatic trip indicator assembly. The automatic trip indicator actuates the roller on the alarm switch which in turn causes a normally open contact to close and a normally closed contact to open on overcurrent trip. The alarm contact is manually reset by pushing the trip indicator (9) back into its normal position.

**Automatic Trip Lockout (Hand Reset) (Figure 1, Item 9)**  
An additional device (which is also optional) may be added to the automatic trip indicator assembly device which serves to mechanically prevent reclosing the circuit breaker after an automatic trip operation. When the trip indicator is pushed in, the circuit breaker mechanism can then be operated to close the circuit breaker contacts.

**Padlocking Device (Figure 1, Item 11)**

All K-line circuit breakers are equipped with means of padlocking the circuit breaker mechanism in a tripfree position. This is accomplished by the use of a locking plate to maintain the manual trip button in a tripping direction when the locking plate is held forward by one or more padlocks. To obtain the condition for padlocking the circuit breaker in the open position, the manual trip button is pushed inward. Then the padlock plate is pulled out and the padlock inserted into the vertical slot. In this position, the mechanism is maintained trip free and the contact arm cannot be moved to the closed position.



- |                                  |                                     |                                  |
|----------------------------------|-------------------------------------|----------------------------------|
| 1. Arc Chute                     | 11. Locking Hasp                    | 21. Racking Crank                |
| 2. Auxiliary Switch              | 12. Electrical Close Push Button    | 22. Removable Maintenance Handle |
| 3. Secondary Separable Contacts  | 13. Manual Trip Button              | 23. Track                        |
| 4. Racking Cam Assembly          | 14. "OPEN" or "CLOSED" Indicator    | 24. Latch                        |
| 5. Overcurrent Trip Device       | 15. Racking Shutter                 | 25. Retaining Screw              |
| 6. Positioning Pins              | 16. Closing Spring Charge Indicator | 26. Retainer                     |
| 7. Closing Spring Charging Motor | 17. Manual Close Lever              | 27. Position Indicator           |
| 8. Escutcheon Assembly           | 18. Self Aligning Dust Plate        | 28. Cradle                       |
| 9. Automatic Trip Indicator      | 19. Nameplate                       |                                  |
| 10. Motor Disconnect Switch      | 20. Lifting Yoke                    |                                  |

Fig. 1 — Typical Electrically Operated, Drawout Type  
 K-1600 Circuit Breaker

On circuit breakers equipped with drawout mechanism, the padlocking device is associated with the drawout interlocking mechanism so that the circuit breaker cannot be moved from any of its three basic drawout positions of "CONNECTED", "TEST" or "DISCONNECTED" with the padlocking in effect.

**Closing Spring Charge Indicator (Electrically Operated)** (Figure 1, Item 16)

Under normal operating conditions, the closing springs are automatically charged after each tripping operation. However, there are occasions when the springs will be in a discharged state. Therefore, it is desirable that means be available to indicate the charged or uncharged condition of the closing springs. This is accomplished by a visual indicator seen through an aperture in the escutcheon plate. The indicator is marked "SPRINGS CHARGED" and "SPRINGS DISCHARGED."

**Motor Disconnect Switch (Electrically Operated)** (Figure 1, Item 10)

The motor disconnect switch is a double pole, single-throw toggle type switch connected in series with the charging motor circuit and is used to disconnect the motor from the voltage source. This cut-off switch is used (1), when it is desirable to prevent automatic recharging of the closing springs just prior to taking the circuit breaker out of service for maintenance and (2), for control wiring dielectric test. The motor must be disconnected for the control wiring dielectric test and subsequently tested at 540 V ac or 760 V dc.

**Electrical Close Push Button (Electrically Operated)** (Figure 1, Item 12)

The electrical close push button is used to electrically close the circuit from the escutcheon. This contact is connected in series with the latch release coil (52X). Energizing the latch release coil allows the charged springs to close the circuit breaker.

**Manual Close Lever (Electrically Operated)** (Figure 1, Item 17)

The manual close lever is provided on electrically operated circuit breakers to provide a means of closing the breaker without control power.

**Racking Mechanism (Drawout Breaker)**

The racking mechanism may be used to move the circuit breaker to any one of its three positions ("CONNECTED", "TEST" or "DISCONNECTED"). All of these positions are attainable with the cubicle door closed. The racking shutter (15, Fig.1), which must be lifted to gain access to the racking mechanism, is interlocked with the circuit breaker so that the circuit breaker contacts must be open before the shutter may be lifted to rack the circuit breaker to another position. The circuit breaker cannot be closed when the shutter is open. The circuit breaker may be padlocked open

by means of the locking hasp. This automatically locks the racking mechanism. With the "TRIP" button (13, Fig.1) depressed, the locking hasp (11, Fig.1) may be pulled outward, accommodating from one to three padlocks, when the shutter is closed and the circuit breaker is tripped. The shutter cannot be lifted and the breaker contacts can not be closed when the locking hasp is restrained by one or more padlocks.

There are two sets of arrows and indicating lines to show the circuit breaker position. One set is utilized with the compartment door closed and one set with the door open.

**OPERATION OF DEVICES**

**Electro-Mechanical Overcurrent Trip Devices Type K-225 thru K-2000 Circuit Breakers (Figures 14 thru 18)**

(A) Type OD-3 General Purpose Overcurrent Trip Device. The type OD-3 overcurrent trip device, for general purpose applications, provides long-time delay tripping on moderate overcurrents which are above the long-time pickup setting; and instantaneous tripping on fault currents above the instantaneous trip setting. This device must be properly set to provide adequate protection for an electrical system. Three adjustment screws on the bottom of the device provide independent control of the long-time pickup, instantaneous pickup and amount of time delay. The nameplate of this device shows the setting of these adjustments and the range of settings which are available. For information on the time-current characteristics of this device, request a copy of TD-6693.

(B) Type OD-4 Selective Overcurrent Trip Device. The type OD-4 overcurrent trip device, for selective tripping applications, provides long-time delay and short-time delay tripping. Independent adjustment of both pickup and time delay is provided for both types of tripping. The nameplate of this device shows the settings which are available. For information on the time-current characteristics of this device, request a copy of TD-6694.

(C) Type OD-5 Triple-Selective Overcurrent Trip Device. This overcurrent trip device is similar to the OD-4 except that an instantaneous trip characteristic is added to the long-time delay and the short-time delay functions provided on the OD-4. For information on the time-current characteristics of this device, request a copy of TD-6695.

(D) See Table 1 on facing page for complete list of Electro-Mechanical standard overcurrent trip devices available. See Maintenance Section for adjustments.

**Power Shield™ Solid State Overcurrent Trip Devices Type K-600S thru K-2000S Circuit Breakers ( See Figure 19)**

This device includes the power supply sensors, overcurrent sensors, Power Shield solid state logic assembly, magnetic latch and the interconnecting wiring. Each phase

of the circuit breaker has a power supply sensor and overcurrent sensor. The trip elements that are available are long-time delay, instantaneous, short-time delay and ground fault. On a 3-phase 4-wire system, an additional remote sensor, mounted in the neutral bus, is required for complete ground fault protection.

The logic assembly is mounted near the front of the circuit breaker and, with the cubicle door open, the overcurrent control panel is readily accessible. This device must be properly set, as required by individual circuit conditions, to provide adequate protection for an electrical system. The movable plugs on the control panel provide independent control of the long-time, short-time, instantaneous and ground fault pickup and amount of time delay. The overcurrent device, with the exception of ground fault, will trip at the value of the AMPERE TAP setting times the plug setting of the various pickup elements. The ground fault trip value will be the plug setting value times 100, as indicated on the nameplate.

(A) Type SS-3. This trip device is for general purpose application. It provides long-time delay tripping on moderate overcurrents, which are above the long-time pickup

settings, and instantaneous tripping on fault currents above the instantaneous trip setting. For information on the time-current characteristics of this device, request a copy of TD-6966 (TD-9001\*).

(B) Type SS-4 Selective Overcurrent Trip Device. This trip device, for selective tripping application, provides long-time delay and short-time delay tripping. For information on the time-current characteristics of this device, request a copy of TD-6967 (TD-9002\*).

(C) Type SS-5 Triple-Selective Overcurrent Trip Device. This device includes the trip elements found in both the SS-3 and SS-4; i.e., long-time delay, short-time delay, and instantaneous tripping. For information on the time-current characteristics of this device, request a copy of TD-6967 (TD-9002\*).

(D) The above three solid state overcurrent trip devices are available with ground fault protection and are designated by the types SS-3G, SS-4G and SS-5G. For information on the time current characteristics of this feature, request a copy of (TD-6968 (TD-9005\*).

(E) See Table IA for a complete list of standard Solid State overcurrent trip devices.

TABLE I  
STANDARD ELECTRO-MECHANICAL OVERCURRENT TRIP DEVICES

| Overcurrent Device Type | Trip Element |            |               | Time-Current Characteristic Curve |
|-------------------------|--------------|------------|---------------|-----------------------------------|
|                         | Long-Time    | Short-Time | Instantaneous |                                   |
| OD-3                    | X            |            | X             | TD-6693                           |
| OD-4                    | X            | X          |               | TD-6694                           |
| OD-5                    | X            | X          | X             | TD-6695                           |
| OD-6                    | X            |            | X             | TD-6695                           |
| OD-7                    |              |            | X             | None                              |
| OD-8                    |              |            | X             | None                              |
| OD-9                    |              | X          | X             | TD-6698                           |
| OD-10                   |              | X          |               | TD-6699                           |

NOTE: OD-3 long-time delay element has one time delay band only. All other long-time & short-time delay elements have three time delay bands.

TABLE IA  
STANDARD SOLID STATE OVERCURRENT TRIP DEVICES

| Overcurrent Device Type | Trip Element |            |               |        | Time-Current Characteristic Curve |                      |
|-------------------------|--------------|------------|---------------|--------|-----------------------------------|----------------------|
|                         | Long-Time    | Short-Time | Instantaneous | Ground | Device in RED CASE                | Device in GRAY CASE* |
| SS-3                    | X            |            | X             |        | TD-6966                           | TD-9001              |
| SS-3G                   | X            |            | X             | X      | TD-6966<br>TD-6968                | TD-9001<br>TD-9005   |
| SS-4                    | X            | X          |               |        | TD-6967                           | TD-9002              |
| SS-4G                   | X            | X          |               | X      | TD-6967<br>TD-6968                | TD-9002<br>TD-9005   |
| SS-5                    | X            | X          | X             |        | TD-6967                           | TD-9002              |
| SS-5G                   | X            | X          | X             | X      | TD-6967<br>TD-6968                | TD-9002<br>TD-9005   |

NOTE: Time-current characteristic curves are not included in this book because separate coordination curves are normally provided with each order. When field calibration is performed, necessary instruction books (refer to page 16) will be provided and will include all pertinent timing information.

\* Device in GRAY CASE (Current Manufacture)  
TD-6968, TD-6967 & TD-6968 apply to Device in RED CASE

**Control Device (Electrically Operated)**

The control device (Fig. 12) is furnished on electrically operated circuit breakers. The device is mounted below and to the left of the mechanism. The control device contains three electrical components, the limit switch (LS), the lockout relay (52Y), and the latch release relay (52X). The schematic diagram of the control circuit (Fig. 2) illustrates the function of this device. In addition to its electrical functions, the base of the device provides a terminal block for the circuit breaker wiring.

The purpose of the lockout relay (52Y) is to require that, if the remote or local close contacts are closed, resulting in the charging springs discharging, the close contacts must first be released (opened) before the breaker can be reclosed. This prevents closing the circuit breaker more than one time unless the close contacts are first released.

**Auxiliary Switches (Figure 1, Item 2)**

The auxiliary switches contain the "a" and "b" contacts (Fig. 2) and are furnished in 4 or 8 contact arrangements. They

are mechanically interconnected with the main circuit breaker contacts such that, with the circuit breaker closed, the "a" contacts are closed. With the circuit breaker open, the "b" contacts are closed.

**Undervoltage Trip Device**

The electrically reset undervoltage trip device is a single-phase device which automatically trips the circuit breaker when the line voltage decreases to 30 to 60 percent of the rated voltage. This device may be furnished either for instantaneous trip operation or with adjustable time delay tripping of 1.5 to 15 seconds. The undervoltage trip device is an integral unit which may be added to the circuit breaker either at the factory or in the field.

The undervoltage device may be connected so that the automatic trip indicator (Figure 1, Item 9) will protrude from the front plate when the breaker is tripped by the undervoltage device.

See Table 4, page 20, for electrical characteristics.

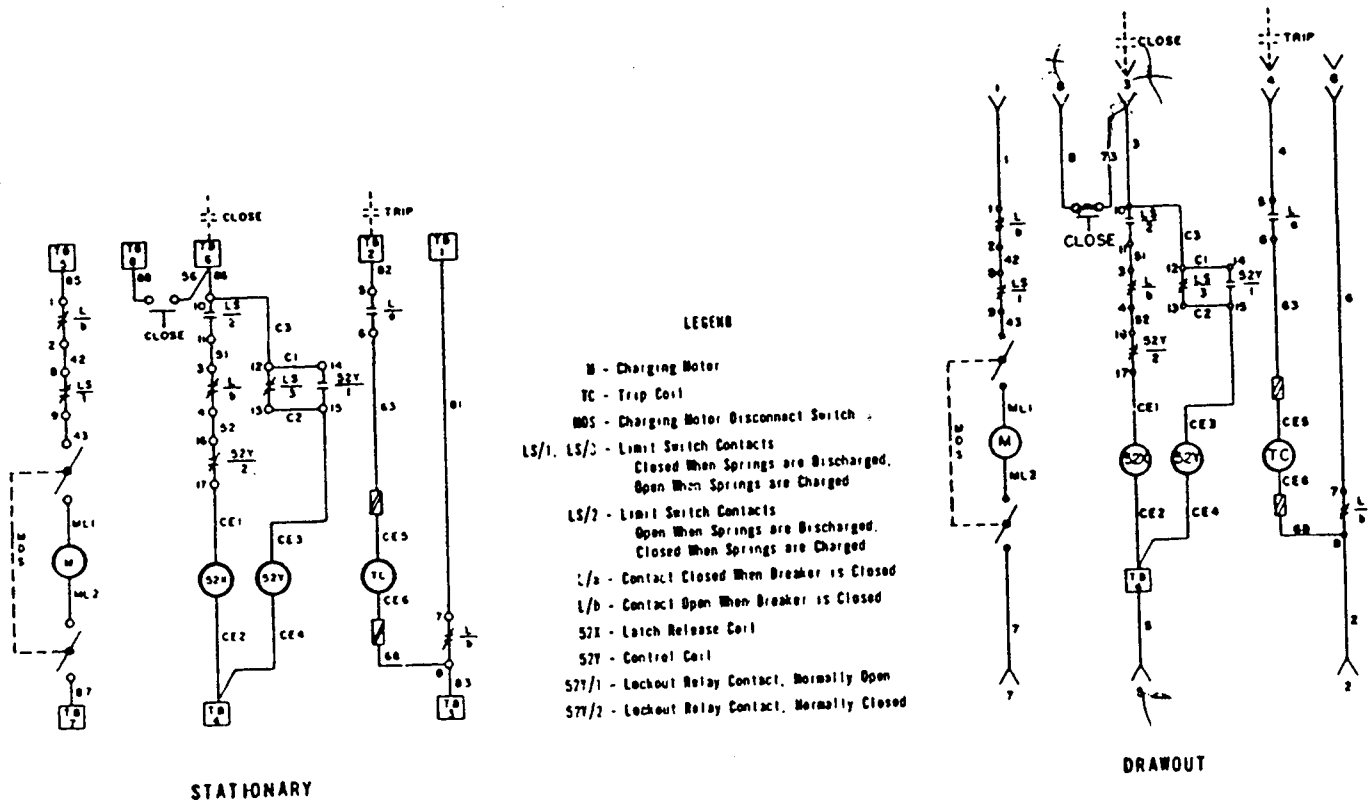


Fig. 2 — Typical Schematic Diagram of Control Circuit

**INSTALLATION, INITIAL TESTING AND REMOVAL  
(Drawout Stationary)**

**FOR SAFETY:** When installing or removing stationary breakers, the supply for primary and control circuits must be de-energized at all times. Testing of stationary circuit breakers to be done with the primary supply circuit de-energized.

For initial installation of drawout breakers in the "CONNECTED" position, the supply for the primary circuit should be de-energized. Testing of the drawout breaker to be done in the test position.

**NOTE:** (K 225 thru K-2000 Circuit Breakers) Prior to inserting the circuit breaker into the switchboard and with the breaker in the upright position, exercise the three long time armatures (5/8" wide armatures) several times until resistance to motion has increased, indicating that the oil dashpot is functioning properly. Improper operation can result because the circuit breaker is shipped or stored on its back. This causes the oil in the dashpot to be displaced and an air bubble can be trapped under the piston. The exercise removes the air to permit proper operation.

**INSTALLATION (Stationary Type)**

Lifting yoke (20, Fig. 1) should be used to move the breaker to the switchboard; however, other handling means will be required to move the breaker into position inside the switchboard.

**INSTALLATION (Drawout Type)**

To insert the circuit breaker into its compartment, proceed as described below:

(Refer to Fig. 1)

1. The circuit breaker must be in the "OPEN" position, the racking crank turned in the counterclockwise direction fully against its stop, and the motor disconnect switch (10) (electrically operated circuit breakers only) in the "OFF" position.
2. Open the compartment door and pull out the right-hand and left-hand tracks (123) to the fully extended and latched position.
3. Using a lifting yoke, lower the circuit breaker so that the positioning pins (6) (two each side of circuit breaker) rest in the cut-out sections of each track (23).
4. Remove the lifting yoke and push the circuit breaker toward the compartment. The circuit breaker will slide in the cut-out sections of the tracks until the positioning pins reach the end of the cutouts. An additional positive push will automatically release the two latches (24). This allows the circuit breaker to move toward the compartment until the racking cams (4) stop against their guides on the cradle (28).

5. Lift shutter (15) covering the racking opening, insert racking crank, and turn crank clockwise, pass through the "DISCONNECTED" position, until the position indicator on the cradle (left side) shows "TEST" position. Remove racking crank.

**CHECKING CIRCUIT BREAKER OPERATION IN "TEST"  
POSITION (Electrically Operated, Drawout Type)**  
(Refer to Fig.1)

1. Manually reset automatic trip indicator (9) if it protrudes approximately 1/2 ". Push in to reset.
  2. Turn motor disconnect switch (10) to "ON" position and closing springs will automatically charge.
  3. Close circuit breaker by local close button and trip by local trip button.
- NOTE:** All breakers have a manual trip button. The local close button for electrical breakers is standard. The local trip button for electrical breakers is optional.
4. Close and trip circuit breaker by means of remote control switch.
  5. Check each auxiliary device for proper operation.
  6. Close the circuit breaker and check that the shutter (15) cannot be lifted to allow insertion of the racking crank. This demonstrates that the circuit breaker could not be racked out while closed in the connected position.

**CHECKING CIRCUIT BREAKER OPERATION IN "TEST"  
POSITION (Manually Operated, Drawout Type)**  
(Refer to Fig. 1 and Cover Photo)

1. Manually reset automatic trip indicator (9) if it protrudes approximately 1/2". Push in to reset.
2. Close the circuit breaker by pulling down on the "T" handle.
3. Trip by manual "TRIP" button (13).
4. Check each auxiliary device for proper operation.
5. Close the circuit breaker and check that the shutter (15) cannot be lifted to allow insertion of the racking crank. This demonstrates that the circuit breaker could not be racked out while closed in the connected position.

**CHECKING CIRCUIT BREAKER OPERATION IN  
"CONNECTED" POSITION (Drawout Type)**  
(Refer to Fig. 1)

With the circuit breaker in the "OPEN" position and the motor disconnect switch (10) in the "OFF" position, insert the racking crank and turn clockwise until the position indicator on the cradle shows "CONNECTED" position.

### CHECKING CIRCUIT BREAKER OPERATION (Stationary Type)

Follow the same procedure as for the drawout circuit breaker, except the circuit breaker will be in the "CONNECTED" position. Primary supply circuit must be de-energized.

### EMERGENCY OPERATION (Electrically Operated)

Electrically operated circuit breakers may be charged manually by a removable maintenance handle (4, Fig. 3) for emergency operation.

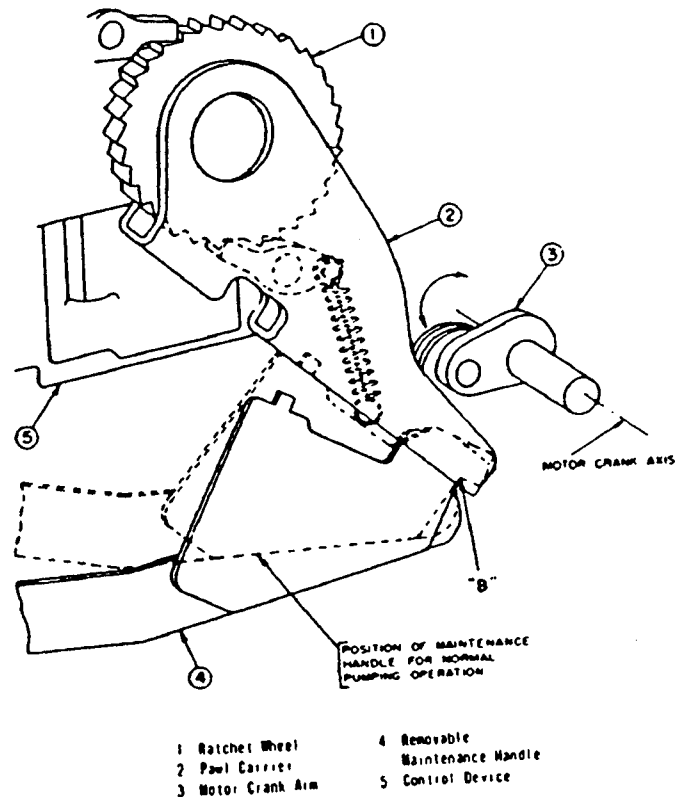
The removable maintenance handle (4) is first positioned in two slots in the pawl carrier (2). The handle is then raised and lowered in a pumping motion until the pawl carrier (2) no longer rotates the ratchet wheel (1). The breaker closing springs now fully charged are ready for a closing operation which is done by raising the manual close lever (17, Fig. 1) on the escutcheon.

**NOTE:** The motor crank arm (3, Fig. 3) will stop occasionally in such a position as to prevent charging the springs with the handle. Should this happen, the motor crank arm must be rotated manually by using a screwdriver or similar tool to rotate the crank arm a sufficient amount so that the springs may be charged with the handle as described above.

### CIRCUIT BREAKER REMOVAL (Drawout Type)

To move the circuit breaker to the "TEST" position or to remove it from the compartment, proceed as follows:  
(Refer to Fig. 1)

1. With the compartment door closed, trip the circuit breaker by means of the remote mounted control switch or manual "TRIP" button (13) on the escutcheon.
2. Lift racking shutter (15), insert racking crank and turn counterclockwise until position indicator (27) on the right-hand side of the escutcheon shows "TEST" position. (NOTE: The circuit breaker may be tested in this position—primary contacts are disconnected and the control contacts are connected.)
3. Continue turning the racking crank counterclockwise until the position indicator (27) on the right-hand side of the escutcheon shows "DISCONNECTED" position.
4. Open compartment door and discharge closing springs (electrically operated breakers only) by lifting the manual close lever (17) on the escutcheon and then pushing the manual trip button on the escutcheon. Place motor dis-



**Fig. 3 — Method of Applying Maintenance Handle for Charging Closing Springs**

- nect switch (10) in the "OFF" position.
  5. Insert racking handle and crank counterclockwise as far as the stabs will allow.
  6. Pull circuit breaker forward until tracks (23) are in the fully extended and latched position.
  7. Using a lifting yoke, just pick up the circuit breaker weight.
  8. With a positive pull, release positioning pins from cut-out sections of the tracks.
  9. Remove circuit breaker from tracks by means of lifting yoke.
  10. Release latch (24) on each track, push tracks into the compartment, and close compartment door.
- NOTE:** For safety, if the closing springs are charged, they will be automatically discharged when inserting or withdrawing the circuit breaker in the switchboard compartment.



## MAINTENANCE SAFETY NOTES

De-energize both primary and control circuits before making any inspections, adjustments or replacements of parts. Make certain breaker is open by observing indicator (14, Fig. 1), and closing springs are not charged by observing indicator (16, Fig. 1).

When it is necessary that the closing springs be charged, or the circuit breaker be closed, make sure to stay clear of operating parts.

Stationary breakers should be checked for operation with the control circuit energized and the primary power de-energized. Drawout breakers should be withdrawn to "TEST" position for checking the breaker operation. For further inspection, adjustments, cleaning or replacement of parts, the drawout circuit breaker should be withdrawn and moved to a suitable area.

Stationary breakers should likewise be removed, but, if removal is not possible, then the primary and control circuit sources **MUST BE DE-ENERGIZED**.

It is **HAZARDOUS** to work on any circuit breaker when it is located on extended cradle rails.

## PERIODIC MAINTENANCE INSPECTION

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 a periodic inspection of the circuit breaker as follows:

K-225 - After 2,500 operations

K-600, K-600S - After 1,750 operations

K-800, K-800S - After 1,750 operations

K-1600, K-1600S - After 500 operations

K-2000, K-2000S After 500 operations

The above inspection periods apply for no load or load current switching. If the listed number of operations are not completed in the first year of service, the circuit breakers should be inspected regardless. The circuit breaker should also be inspected after a short circuit or severe overload interruption, regardless of time period or number of operations.

Where unusual service conditions, as covered by ANSI Standard C37.13, exist, it must be assumed that these conditions were considered at the time of order; that the equipment supplied was designed for the special application; and that an appropriate supplemental maintenance program has been developed. These maintenance instructions only cover circuit breakers used under the standard usual service conditions.

The inspection should include opening and closing the circuit breaker electrically and manually. The unit should be

visually inspected for loose or damaged parts. Arc chutes, contacts and insulation structure should be inspected as described below.

### ARC CHUTE (Refer to Fig. 1) Removal

1. If the circuit breaker has a solid state overcurrent trip device, it is necessary to remove two 1/4" diameter screws fastening the solid state control assembly. Move the assembly for access to the arc chute retaining screws.
2. Loosen the retaining screw (25) and remove the screw and retainer (26).
3. Pull the arc chute forward slightly then lift to remove.

### Examination

1. Discoloration or slight eroding is not harmful.
2. Arc runners or cooling plates that are burned, or moldings that are severely cracked or broken require replacement of the arc chute.

### Replacement

1. Properly position the arc chute in the upper molding.
2. Position retainer (26) and insert and tighten screw (25).
3. Replace the solid state control assembly.

## CONTACTS

1. Remove dirt or grease on contacts with a clean lintless cloth.
2. Pitting or discoloration is not detrimental unless it interferes with proper contact adjustment.
3. Small burrs on the arcing contacts to be removed by filing along contour of the contact. Do not let filings fall into the mechanism.
4. Replace badly burned and pitted contacts that do not meet correct adjustment requirements.
5. If contacts are replaced or filed, then it is necessary to check the contact adjustment.

**NOTE:** Several operations at two week intervals will remove the effects of oxidation.

## INSULATION STRUCTURE

Insulated parts should be checked for damage. Dust and dirt should be removed by air or wiped with a clean lintless cloth. Do not use any oil base solvents. Spray solvents vary as to type and are questionable. However, externally at rear terminals is the only critical area, which is easily wiped or blown out with air, so other methods are not necessary. If contamination is so great, means are probably necessary to isolate the entire equipment.

## ADJUSTMENTS

**FOR SAFETY:** See SAFETY NOTES in MAINTENANCE section.

**NOTE:** The operating mechanism must be operated slowly, as described in section SLOW CLOSE PROCEDURE,

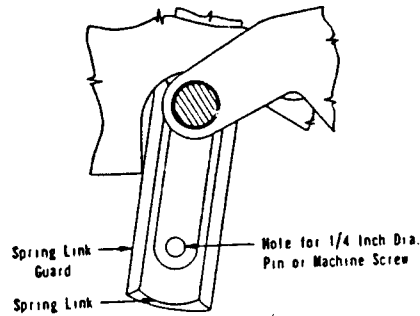


Fig. 4A

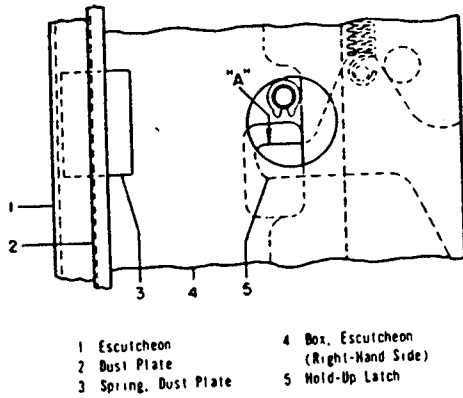


Fig. 4 — Partial View of Escutcheon Assembly (Right-Hand Side) Showing Slow Close Lever for Manually Operated Circuit Breakers

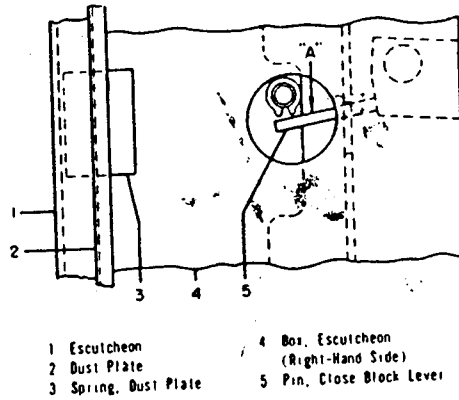


Fig. 5 — Partial View of Escutcheon Assembly (Right-Hand Side) Showing Slow Close Lever for Electrically Operated Circuit Breakers

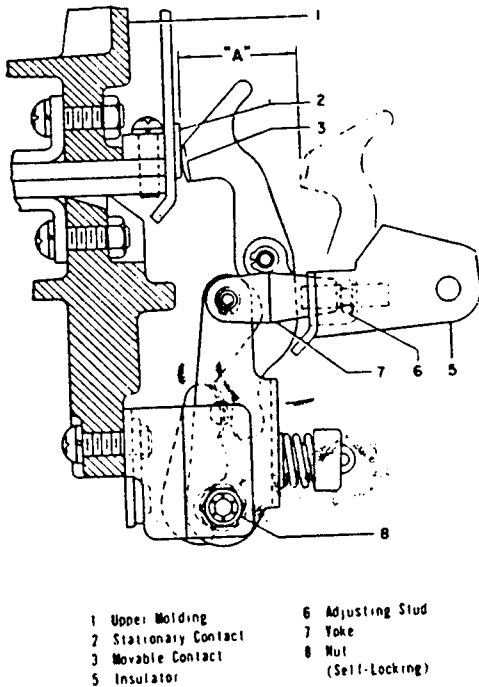


Fig. 6 — Contact Adjustment for Type K-225 Circuit Breakers

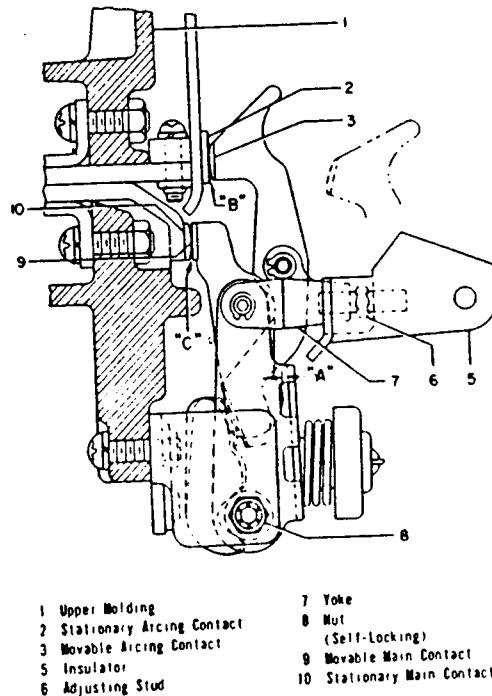


Fig. 7 — Contact Adjustment for Type K-600, K-600S, K-800, K-800S Circuit Breakers

when performing any adjustment requiring contact movement.

In order to close the circuit breaker, the racking mechanism in drawout circuit breakers must be turned to a position such that the racking shutter (15, Fig. 1) is closed when the racking crank (21, Fig. 1) is removed.

### **SLOW CLOSE PROCEDURE**

**NOTE:** The circuit breaker should be clamped down during the slow close procedure to keep it from tilting or moving. Manually Operated Circuit Breakers Refer to Fig. 4 unless otherwise noted.

1. On K-1600, K-1600S, K-2000 and K-2000S circuit breakers, at each of the two spring guards, loosely install 1/4 inch diameter pins or machine screws. (See Fig. 4A)
2. Insert a screwdriver or rod through the hole in the escutcheon box (4) and mechanism housing assembly (right-hand side when facing the front of the circuit breaker).
3. Using the top of the hole as the fulcrum and the screwdriver or rod as the lever, depress the hold-up latch (5) at "A" and, at the same time, pull the operating handle downward to slowly close the circuit breaker contacts.
4. On K-1600, K-1600S, K-2000 and K-2000S circuit breakers, remove the two 1/4 inch diameter pins or machine screws installed in step 1, after the slow close operation is complete.

### **Electrically Operated Circuit Breakers**

**NOTE:** The charging cranks must be reset (see steps 8, 9, and 10 below) after the last slow close operation, or future electrical operation will be impossible.

Refer to Fig. 5 unless otherwise noted.

1. The closing springs must be charged; see spring charge indicator (16, Fig. 1).
2. Insert a screwdriver or rod through the hole in the escutcheon box (4) (right-hand side when facing the front of the circuit breaker) and depress the close block lever pin (5) at "A".
3. With the close block lever pin (5) held in the down position, lift the manual close lever (17, Fig. 1). The close block lever pin (5) will remain in the down position.
4. Insert the maintenance handle in the ratchet carrier and operate the handle to slowly close the contacts. (See Fig. 3 and "Emergency Operation".)

To repeat the slow close operation, continue with the following steps:

5. Insert the maintenance handle and continue the charging operation until the indicator (16, Fig. 1) shows "SPRINGS CHARGED"
6. Push manual "TRIP" button (13, Fig. 1) to open the contacts.

7. Repeat steps 2, 3, and 4 above for the slow close operation.

To reset the charging cranks for normal electrical operation, proceed as follows

8. Repeat steps 5 and 6 above.
9. Lift manual close lever (17, Fig. 1) to close the contacts.
10. Push the manual "TRIP" button (13, Fig. 1) to open the contacts

The circuit breaker is now ready for normal service operation with the charging cranks reset and the closing springs discharged.

### **CONTACTS**

#### **Type K-225 Circuit Breakers (Refer to Fig. 6)**

1. The hex. portion of the adjusting stud (6) must be centered, within 1/16 inch, between the yoke (7) and the insulator (5).

**NOTE:** On some circuit breakers, the hex. portion of the adjusting stud (6) must be centered between the locknut on the adjusting stud and the insulator.

**NOTE:** In the following steps 2 and 3, if adjustment is required, always turn the adjusting stud (6) in the direction to increase the contact pressure (counter-clockwise when viewed from the insulator).

2. Contact pressure is set by adjusting stud (6) for 1 3/4 inches, plus or minus 1/32 inch open air gap measured at "A". Any adjustment of contact pressure must be followed by step 3.
3. Following the slow close procedure, slowly close the circuit breaker until the first contacts (2 and 3) just touch. The other two poles should be within .032 inch of touching. If not within .032 inch, then adjust stud (6) of these two poles in the direction to increase pressure until all three poles touch within .032 inch.

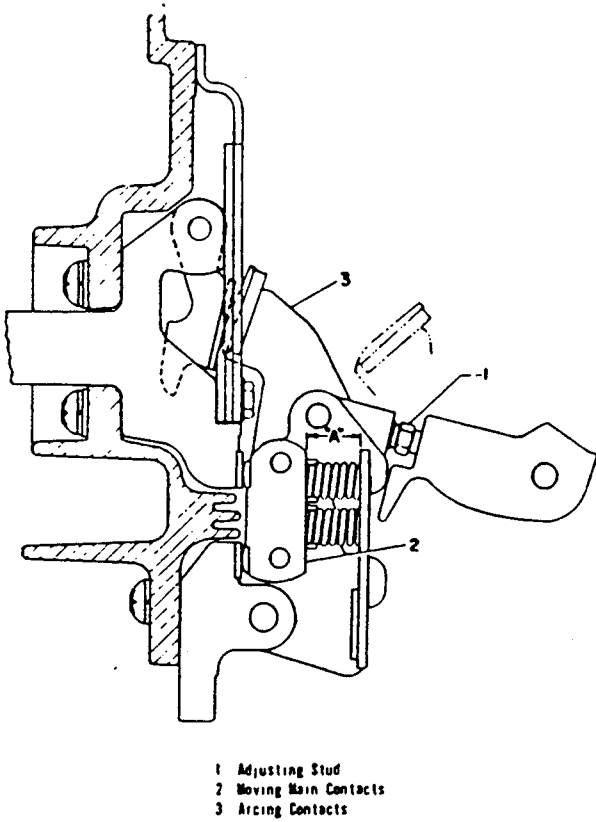
If for any reason the breaker is disassembled and the contact structure Figures 6 and 7 is replaced or disassembled, the torque of the nut ((8) Figures 6 and 7) should be checked. This should be adjusted to be between 15 and 25 foot pounds. This will provide sufficient side pressure on the hinge joint so the joint will be capable of adequately carrying its current rating.

#### **Type K-600, K-600S, K-800, K-800S Circuit Breakers (Refer to Fig. 7)**

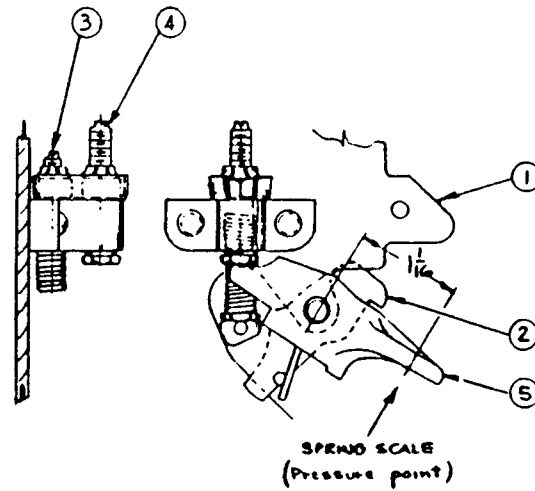
1. The hex. portion of the adjusting stud (6) must be centered, within 1/16 inch, between the yoke (7) and the insulator (5).

**NOTE:** On some circuit breakers, the hex. portion of the adjusting stud (6) must be centered between the locknut on the adjusting stud and the insulator

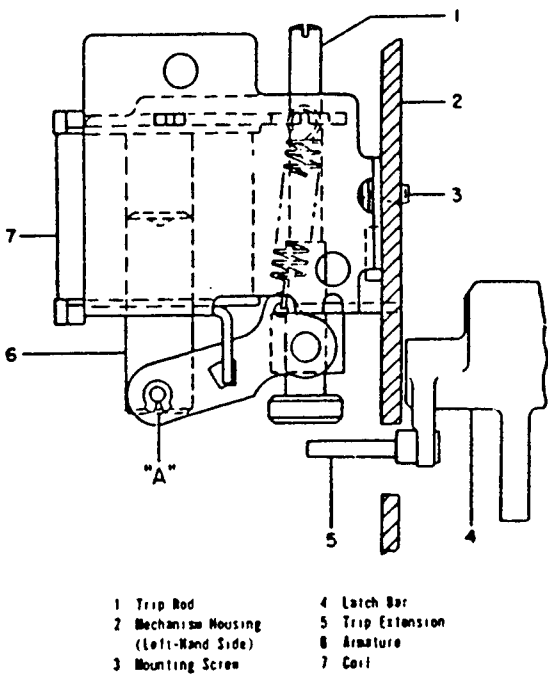
2. Contact pressure is set by adjusting stud (6) so that there is a 5/64 to 3/32 inch gap, at "A", with the circuit breaker



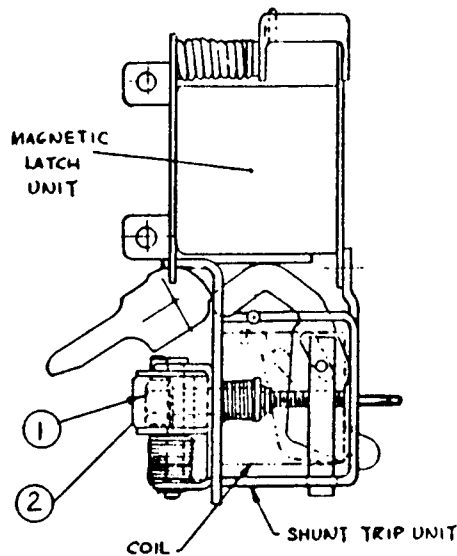
**Fig. 8 — Contact Adjustment for Type K-1600, K-2000, K-1600S and K-2000S Circuit Breakers**



**Fig. 9 — Latch Engagement and Tripper Bar Latch Engagement Adjustment**



**Fig. 10 — Shunt Trip Device Adjustment Type K-225 thru K-2000, K-1600S and K-2000S Circuit Breakers**



**Fig. 11 — Shunt Trip Device Adjustment Type K-600S, K-800S Circuit Breakers**

closed. This can be checked with 5/64 and 3/32 dia. wires (go and no-go) bent at 90 degrees. The 5/64 to 3/32 dimension is equivalent to .025 to .032 wiper, vertical movement of the main contacts during main contact engagement of the slow close operation. After adjusting, reclose the circuit breaker and recheck, Readjust if necessary. Any adjustment of contact pressure must be followed by step 3. Note that, after operation 3 is completed, contact pressure may exceed the 3/32 inch dimension on two poles. This is acceptable.

3. Following the slow close procedure, slowly close the circuit breaker until the first contacts (2 and 3) just touch. The other two poles should be within .032 inch of touching. If not within .032 inch, then adjust stud (6) of these two poles in the direction to increase pressure until all three poles touch within .032 inch.

If for any reason the breaker is disassembled and the contact structure Figures 6 and 7 is replaced or disassembled the torque of the nut ((8) Figures 6 and 7)) should be checked. This should be adjusted to be between 15 and 25 pounds. This will provide sufficient side pressure on the hinge joint so the joint will be capable of adequately carrying its current rating.

#### **Type K-1600, K-1600S, K-2000, K-2000S Circuit Breakers (Refer to Fig. 8)**

The main contact adjustment is to be made with the breaker in the latched closed position. The self-locking adjusting stud (1) is to be turned to provide contact pressure such that a 0.750 inch shim will just fit the space (A) at the rear of the moving main contacts (2).

After making this adjustment in contact pressure, open the circuit breaker, then reclose the circuit breaker normally and recheck the (A) gap, Readjust if necessary.

Open the circuit breaker and slow close the contacts until the arcing contact (3) of one pole just touches. The remaining poles should then be advanced by turning adjusting stud (1) so that these poles just touch or are within 0.032 inch of each other.

The contacts should now be in correct adjustment and the breaker may be put in service. Note that if an adjustment is necessary for "simultaneous" make, the contact pressure will increase on those adjusted poles. Thus a dimension of less than 3/4 inch indicates more contact pressure, which is acceptable.

#### **MECHANISM**

The various mechanism adjustments described in the following sections apply to all circuit breakers covered by this Instruction Bulletin.

#### **Latch Engagement (Bite) (Refer to Fig. 9)**

The latch engagement adjusting screw (3) is located to the

right of the right-hand mechanism housing (1). It can be reached easily from the top of the circuit breaker.

To adjust the latch (2) engagement, proceed as follows:

1. Back off adjusting screw (3) to assure excessive latch engagement.

2. Close the circuit breaker.

3. Turn adjusting screw (3) down slowly until the latch just releases, tripping the circuit breaker.

4. Back off the adjusting screw (3) 2 turns.

#### **Tripper Bar Latch Engagement ( Refer to Fig. 9)**

The tripper bar latch engagement adjusting screw (4) is located adjacent to the latch engagement adjusting screw (3).

To adjust the tripper bar latch engagement, proceed as follows:

1. Back off adjusting screw (4) to assure excessive tripper bar travel.

2. Close the circuit breaker.

3. Turn adjusting screw (4) down slowly until the latch just releases, tripping the circuit breaker.

4. Back off the adjusting screw (4) 3 1/2 turns.

#### **Tripper Bar Load (Refer to Fig. 9)**

The tripper bar load is measured by the use of a spring scale positioned as shown. On electro-mechanical trip devices, the tripper bar load should be no greater than 29 ounces. On circuit breakers with solid state trip systems, the tripper bar load should be no greater than 50 ounces.

#### **SHUNT TRIP DEVICE**

#### **Trip Adjustment Type K-225 thru K-2000, K-1600S, K-2000S (Refer to Fig. 10)**

1. Perform this procedure only on an open circuit breaker with its closing springs discharged.

2. Locate the shunt trip adjusting screw. See Figure 10 in IB6.1.2.7.-1.

3. Rotate the adjusting screw counterclockwise until it is not possible to turn it further, DO NOT FORCE.

4. Rotate the screw clockwise three (3) full turns then stop.

5. Remove all tools from the breaker. Test the operation of the shunt trip device after charging and closing the breaker.

Apply the required voltage to terminals 2 and 4 of the circuit breaker secondary disconnects.

6. This procedure should only be performed when the shunt trip has malfunctioned or been replaced.

#### **Trip Adjustment Type K-600S, K-800S ( Refer to Fig. 11)**

1. Perform this procedure only on an open circuit breaker with its closing springs discharged.

2. Locate the shunt trip adjusting screw.

3. Rotate the screw clockwise until it is not possible to turn it further, DO NOT FORCE.

4. Rotate the screw counterclockwise seven (7) complete turns.
5. Remove all tools from the breaker. Test the operation of the shunt trip device after charging the breaker. Apply the required volts to terminals 2 and 4 of the circuit breaker.
6. This procedure should only be performed when the shunt trip has malfunctioned or has been replaced.

**CONTROL DEVICE ( Refer to Fig. 12 )**

The control device is adjusted before leaving the factory. It is recommended that no attempt be made to adjust the internal relays and contacts of this device in the field. If replacement of the control device is required, the close latch release rod (5) overtravel may be adjusted as described below.

**Close Latch Release Rod Overtravel**

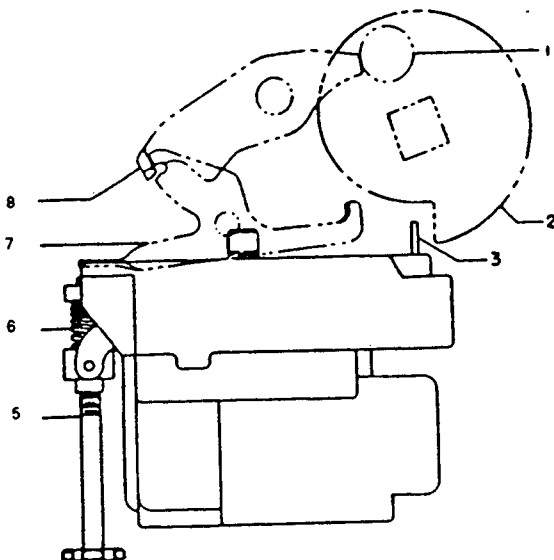
1. Back off on close latch release rod (5) and check that the circuit breaker will not close by attempting to close it electrically or manually pushing up on close latch release rod (5) to the full extent of its travel.
2. Charge the closing springs. Push up on close latch release rod (5) to the full extent of its travel. While holding

the close latch release rod in this position, turn up on close latch release rod (5) until the circuit breaker closes. Turn close latch release rod (5) up an additional 1 1/2 turns.

**MAGNETIC LATCH DEVICE (Type K-1600S, K-2000S)  
Trip Adjustment (Refer to Fig. 13)**

This procedure must be performed with the main contacts of the circuit breaker closed. Extreme care should be exercised to keep fingers and tools away from the jackshaft, closing, and opening springs of the breaker.

1. Locate the magnetic latch trip lever and the tripper bar. (See Fig. 1)
2. After closing the circuit breaker, gently push up on the tripper bar until resistance is encountered. Stop pushing immediately.
3. With the tripper bar pushed up, measure the distance between the adjusting screw and tripper bar. The pretravel gap should be 1/4 to 5/16 inches.
4. Adjust the adjusting screw, if necessary, to re-establish the tripper pretravel.



- |                          |                                   |
|--------------------------|-----------------------------------|
| 1 Noller, Close Latch    | 5 Close Latch Release Rod         |
| 2 Charging Cam           | 6 Spring, Close Latch Release Rod |
| 3 Actuator, Limit Switch | 7 Secondary Close Latch           |
|                          | 8 Primary Close Latch             |

Fig. 12 — Control Device Adjustment

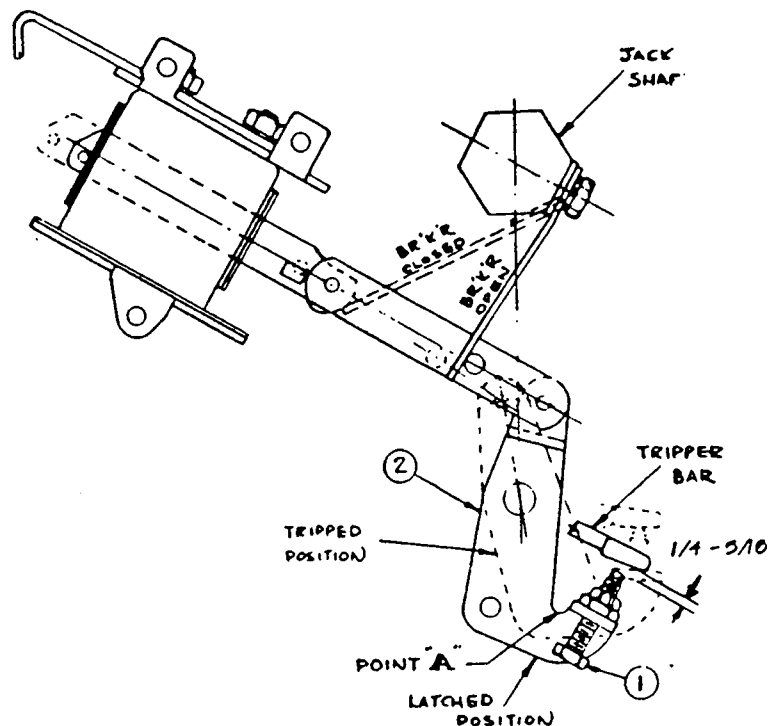


Fig. 13 — Magnetic Latch Trip Adjustment  
Type K-1600S and K-2000S Circuit Breakers

**ELECTRO-MECHANICAL OVERCURRENT TRIP DEVICE ADJUSTMENTS**

**Long-time Delay Band Adjustments**

OD Types 4, 6, 20, 61 (See fig. 15)

OD Type 5 (See Fig. 16)

Turn the adjustment until the top of the long-time delay indicator is in line with the desired delay line (Fig. 14). Push the armature toward the magnet, allowing time for the oil in the dashpot to be displaced. Release the armature, allowing the armature to reset. Check to see that the long-time indicator and line are in line. Readjust if required, and recheck by pushing the armature and allowing to reset.

NOTE: OD-3 has only one long-time delay setting; which is factory set and therefore adjustment is not required.

**Pick-Up Setting Adjustments (See Fig. 14)**

Pick-up settings may be changed by turning the appropriate adjusting screw until the moving indicator lines up with the desired pick-up point line.

NOTE: The top line corresponds to the top pick-up point, the second line from the top corresponds to the second pick-up point from the top, etc.

**Short-Time Delay Adjustment**

OD Types 4, 5, 9, 10 ( See Fig. 17 )

Move the lever toward the left of the circuit breaker so that the short-time step pin can be moved to the desired short-time delay pin hole. Make certain the step pin drops into the pin hole.

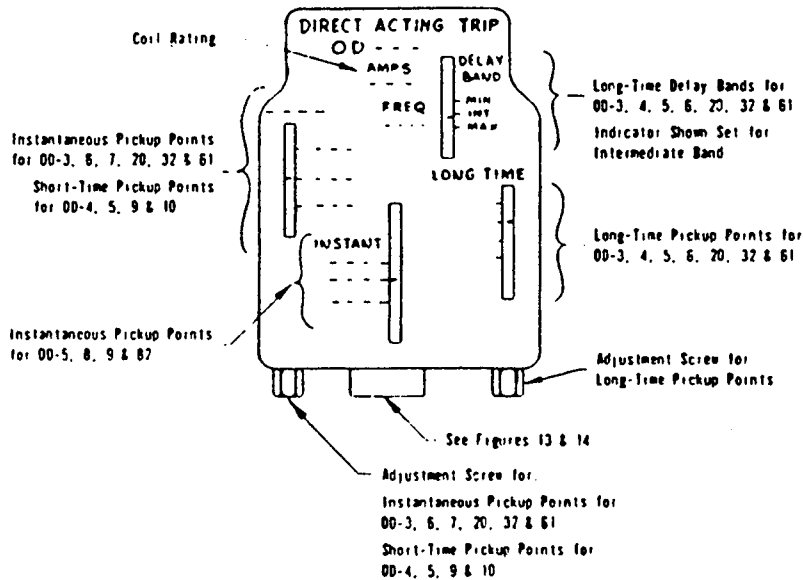


Fig. 14

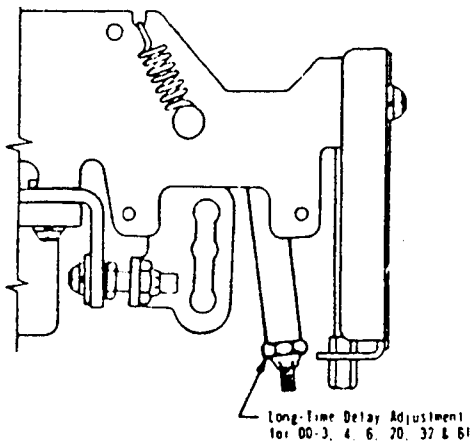


Fig. 15

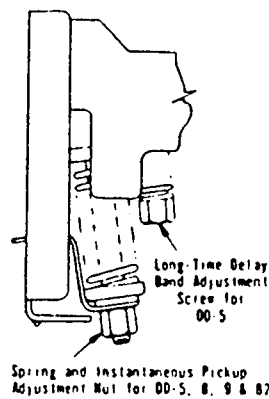


Fig. 16

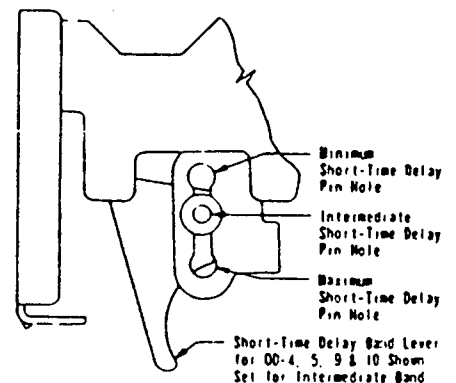


Fig. 17

### Armature Trip Travel Adjustment

**FOR SAFETY:** Keep hands clear of all moving parts. The circuit breaker will trip to the "OPEN" position while checking or adjusting the armature trip travel.

The overcurrent trip device trip travel is set at the factory; however, if trip travel readjustment is required due to replacement of overcurrent trip devices or other parts, then readjust as follows:

1. (See Fig. 18). Back out on the two trip adjusting screws (1) until the screws are engaging the nut by approximately two turns.
2. Charge springs and close circuit breaker.
3. Using a one-foot long (approximate) stick, push up on the long-time armature (thick armature) at point "A", and hold it tight against the magnet. (When pushing, allow time for the oil dashpot to displace the oil.) While holding the armature in this position by pushing at point "B", turn up on screw (1) until the circuit breaker just trips. Continue to turn the screw an additional one turn.

**NOTE:** During this adjustment operation, hold the armature firmly against the magnet, but do not exert excessive force that will result in incorrect adjustment due to distortion.

4. Charge springs and close circuit breaker. Push up on the thin armature and adjust screw (1) using the same procedure as in step 3 above.
5. Readjust the trip travel at the other two poles using the same procedure (steps 1 through 4).

### Field Testing of Electro-Mechanical Overcurrent Trip Devices

Refer to IB-8203 for complete testing of devices, using high current test sets (IB-8203 is available from the factory.)

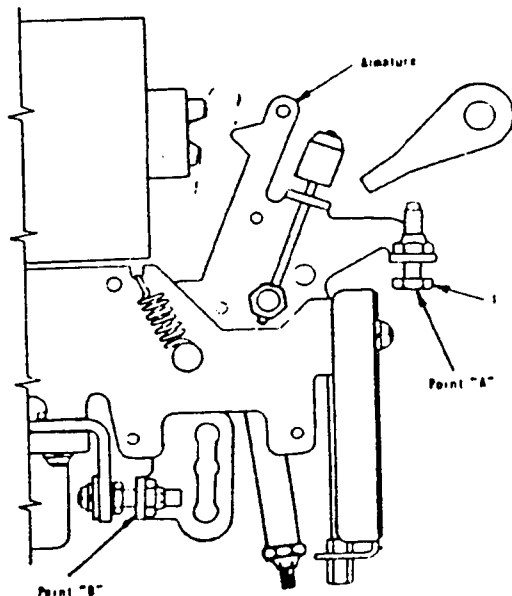


Fig. 18 — Armature Trip Travel Adjustment

### SOLID STATE OVERCURRENT TRIP DEVICE SETTINGS ( See Fig. 19 )

No adjustments are necessary in selecting trip settings on this trip device. The selector plugs (solid circle) allow flexibility in settings and may be moved from one plug tap to another, consistent, however, with the pickup and time band settings necessary for proper circuit protection. Make certain that the selector plugs are pushed in completely for proper operation. If a plug is left out or not secure, the affected element will trip at the minimum setting shown, for safety, but coordination will be affected.

### Field Testing of Solid State Overcurrent Trip Devices

For complete testing of these devices, refer to the following Instruction Bulletins

IB 6.1.2.7 - 4 (Device in GRAY CASE)

### LUBRICATION

Only two lubricants are approved for use in the K-Line circuit breaker. Lubricated during final assembly, the K-Line circuit breaker should not require additional lubrication during its service life when applied in accordance with ANSI C37.13. If however, the breaker is applied in unusual situations defined by ANSI C37.13, has lubricant contaminated with dirt and debris, or has parts replaced, relubrication should be performed as follows.

When mechanism cleaning and relubrication is required, do not spray solvents down through the mechanism to remove old lubricants, dust, and debris.

Do not use dichlorodifluoromethane on any part of the circuit breaker. These solvents tend to wash debris into the

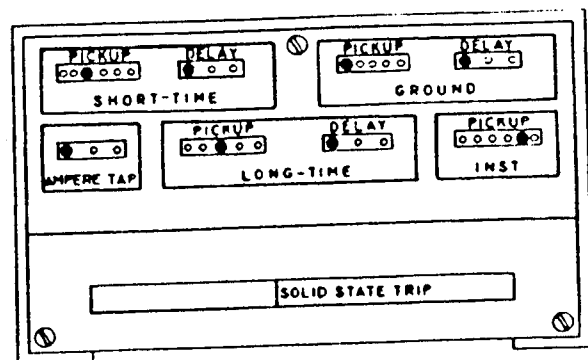


Fig. 19 — Solid State Overcurrent Trip Device Type SS-5G Shown



bearing areas of the breaker, while at the same time removing any existing lubricant. Breaker performance will be compromised when these cleaning techniques are employed.

Proper relubrication requires disassembly, thorough cleaning by wiping, then reassembly using a brush or other means for reapplying the lubricants listed.

1. Apply NO-OX-ID special grade "A" grease from Dearborn Chemical Company to all mating surfaces of moving current carrying joints. Do not apply NO-OX-ID grease on any main or arcing contact surface. Primary disconnects should be maintained by reapplying NO-OX-ID during maintenance periods. NO-OX-ID is available from Asea Brown Boveri in one pint cans, number 713222-A.

2. Apply Anderol 757 synthetic grease manufactured by HULS AMERICA, INC. to mechanism parts, bearings and pins. DO NOT APPLY GREASE TO LATCH OR ROLLER SURFACES. Anderol 757 is available from Asea Brown Boveri in four ounce tubes, part number 712994-A.

3. Anderol synthetic lubricant is also available as a spray, Anderol 732. Anderol 732 is useful as a solvent for removing old lubricant, dirt, and debris in the mechanism. It cannot be used as a substitute for Anderol 757.

Please observe the following warnings:

1. DO NOT apply light machine oil, or thin spray lubricants to lubricate any mechanism part.

2. DO NOT attempt to relubricate the spring charging motor gearbox. It is sealed and should not require repacking.

3. DO NOT lubricate magnetic latch device or otherwise clean or spray with any substance.

4. Use only the recommended lubricants. Use of other than approved lubricants can cause breaker misoperation at temperature extremes.

#### DIELECTRIC TEST

If the insulation has become contaminated, or routine tests are required, the test voltages to be applied for one minute to test the ability of the insulation to withstand overvoltages are as shown in Table 2, below.

It is not recommended that the motor be dielectric tested, but if desired, then test at 540 V ac or 760 V dc.

An additional dielectric test should be performed on K-600S through K-2000S circuit breakers as follows: Connect all sixteen terminals of the Power Shield solid state logic box together and apply 500 V ac between the sixteen terminals and metal parts normally grounded.

#### ELECTRICAL CHARACTERISTICS OF CONTROL DEVICES

For closing and tripping currents, voltages and ranges, refer to Table 3, page 20.

For undervoltage trip devices, standard voltages and operating data, refer to Table 4, page 20.

Current values are average steady state values. Momentary inrush currents for all charging motors and ac coils are approximately 6-8 times these values.

#### RENEWAL PARTS

We recommend only those renewal parts be stocked that will be required to insure proper and timely maintenance for normal operation of the circuit breakers.

Refer to Renewal Parts Bulletin RP 6.1.2.8-1 for complete ordering information and Parts List. A copy of this bulletin will be furnished on request.

The minimum quantity of assemblies and items recommended in this bulletin is predicated on infrequent replacement of parts based on accumulated tests and operating experience. Total assemblies are recommended for fast replacement, when necessary, to return the breaker to service as quickly as possible. Then certain replaced assemblies, such as the stationary upper terminals, can be returned to the factory for nominal reconditioning. The bulletin contains specific part ordering instructions; and if desired, specific instructions regarding replacement of those part assemblies recommended, that are not obvious, are also available if ordered.

TABLE 2  
TEST VOLTAGES TO BE APPLIED FOR ONE MINUTE  
TO TEST THE ABILITY OF THE INSULATION TO WITHSTAND OVERVOLTAGES

|   | Breaker Open  | Breaker Closed  | Breaker Open or Closed  |
|---|---|---|---|
| Breaker in Service<br>or<br>After Storage | 1650 V ac -- 2300 V dc<br>a. Between line and load terminals and metal parts normally grounded.<br>b. Between line and load terminals | 1650 V ac -- 2300 V dc<br>a. Between terminals and metal parts normally grounded.<br>b. Between phases. | 1125 V ac -- 1600 V dc<br>a. Between control circuit and metal parts normally grounded.<br>NOTE: Motor must be disconnected from control circuit for this test. |
| After Short Circuit                       | 1320 V ac -- 1860 V dc<br>a and b as above  | 1320 V ac -- 1860 V dc<br>a and b as above  | 900 V ac -- 1260 V dc<br>a as above   |

**TABLE 3**  
**ELECTRICAL CHARACTERISTICS OF CONTROL DEVICES**  
**CLOSING AND TRIPPING CURRENTS, VOLTAGES AND RANGES**

| Type Breaker                              | Nominal Control Voltage | Average Closing Motor Current Amperes | Shunt Trip Current Amperes | Closing Relay Current Amperes |         | Closing Circuit Voltage Range | Shunt Trip Circuit Voltage Range | Recommended Control Fuse Size |
|---|-------------------------|---------------------------------------|----------------------------|-------------------------------|---------|-------------------------------|----------------------------------|-------------------------------|
|   |                         |                                       |                            | Anti-Pump                     | Release |                               |                                  |                               |
| K-225 thru K-2000 and K-600S thru K-2000S | 120 V ac 60 cycle       | 10.                                   | 6.5                        | .15                           | 1.5     | 104-127                       | 50-127                           | 10 A                          |
|   | 240 V ac 60 cycle       | 5.                                    | 1.15                       | .075                          | .75     | 208-254                       | 208-254                          | 10 A                          |
|   | 48 V dc                 | 25.                                   | 3.14                       | .15                           | 1.33    | 38-56                         | 28-56                            | 15 A                          |
|   | 125 V dc                | 10.                                   | 1.3                        | .06                           | .7      | 100-140                       | 70-140                           | 10 A                          |
|   | 250 V dc                | 5.                                    | .65                        | .03                           | .3      | 200-280                       | 140-280                          | 10 A                          |

**TABLE 4**  
**UNDervOLTAGE TRIP DEVICE**  
**STANDARD VOLTAGES AND OPERATING DATA**

| Service Voltage   | Current at Rated Volts | Maximum Pickup Voltage | Dropout Voltage Range |
|-------------------|------------------------|------------------------|-----------------------|
| 120 V ac 60 cycle | 0.5                    | 102                    | 36-72                 |
| 240 V ac 60 cycle | 0.2                    | 204                    | 72-144                |
| 480 V ac 60 cycle | 0.1                    | 408                    | 144-288               |
| 48 V dc           | 0.3                    | 41                     | 15-29                 |
| 125 V dc          | 0.2                    | 106                    | 38-75                 |
| 250 V dc          | 0.1                    | 212                    | 75-150                |



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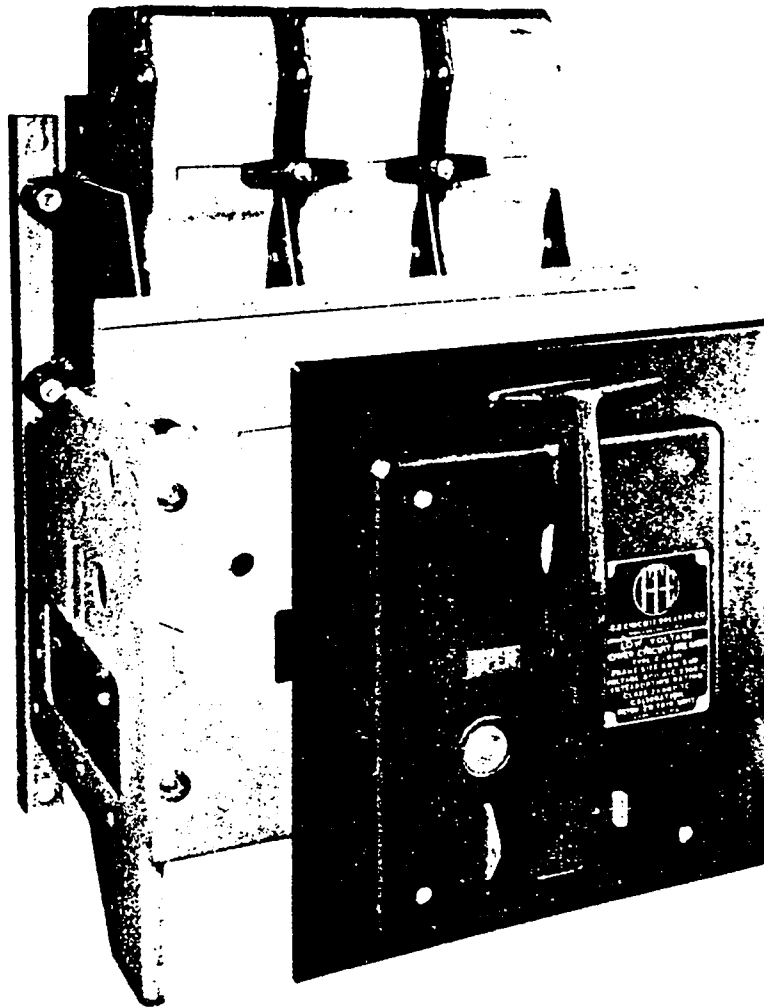




RP-5801

LOW VOLTAGE POWER SWITCHGEAR  
**RENEWAL PARTS**

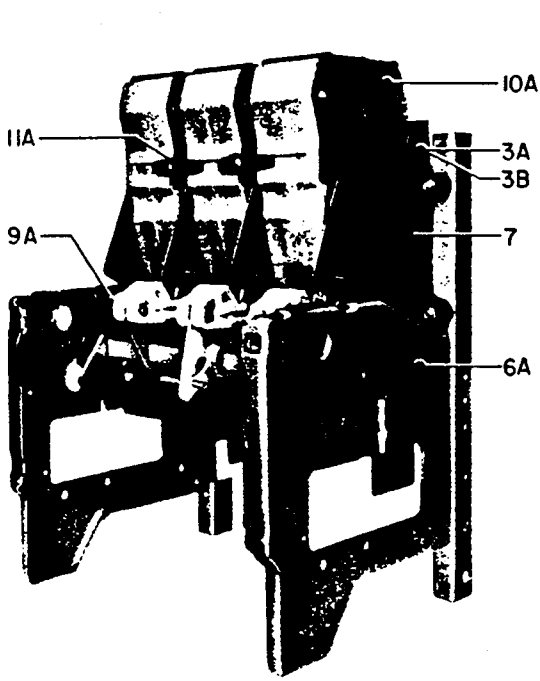
TYPE K-225, K-600, AND K-1600  
CIRCUIT BREAKERS



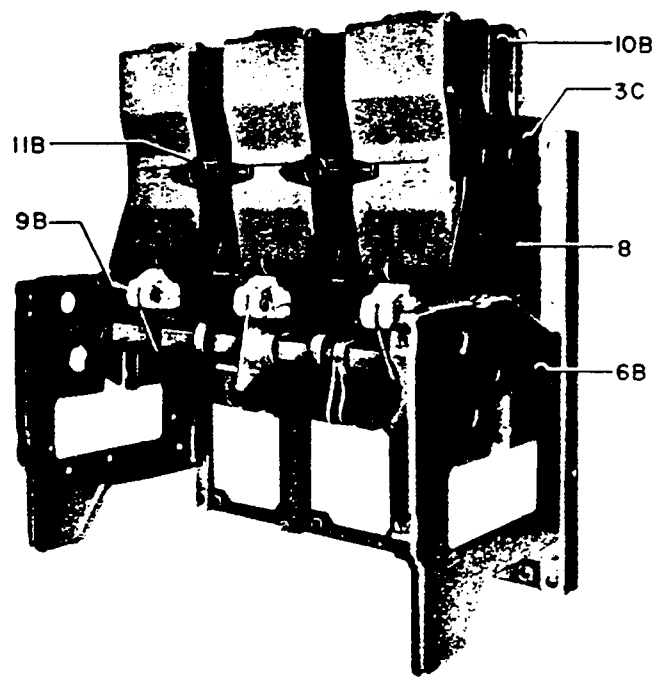
**I-T-E CIRCUIT BREAKER COMPANY**



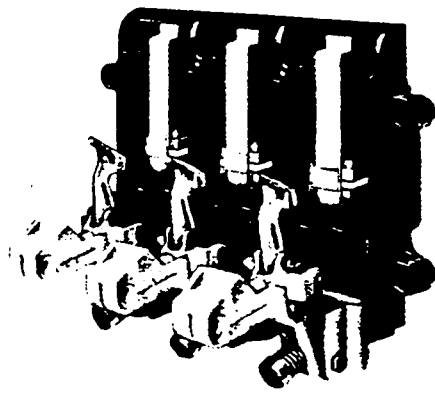
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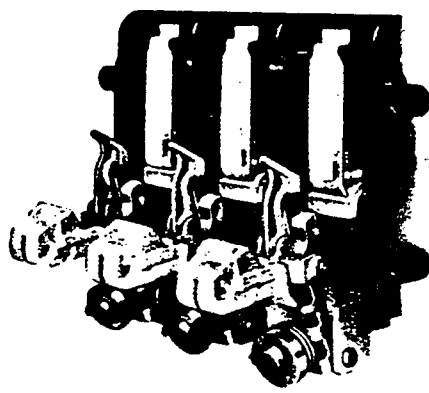
2A or 2B



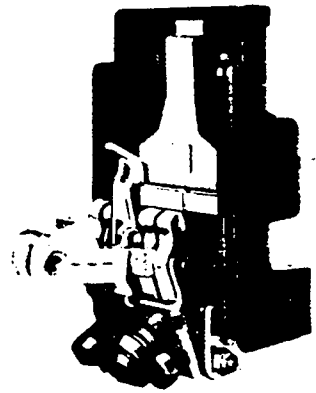
2C



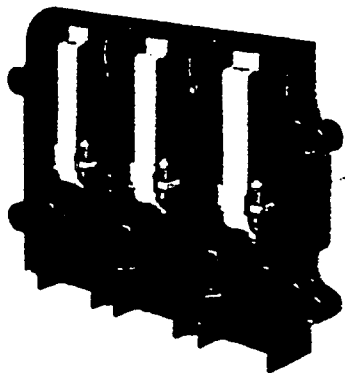
3A



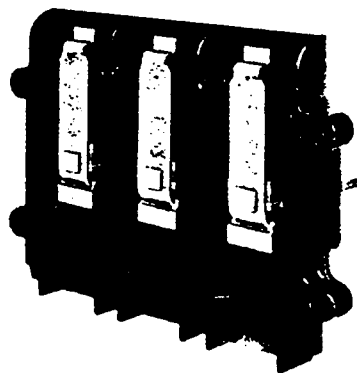
3B



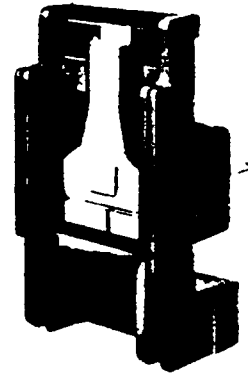
3C



4A



4B

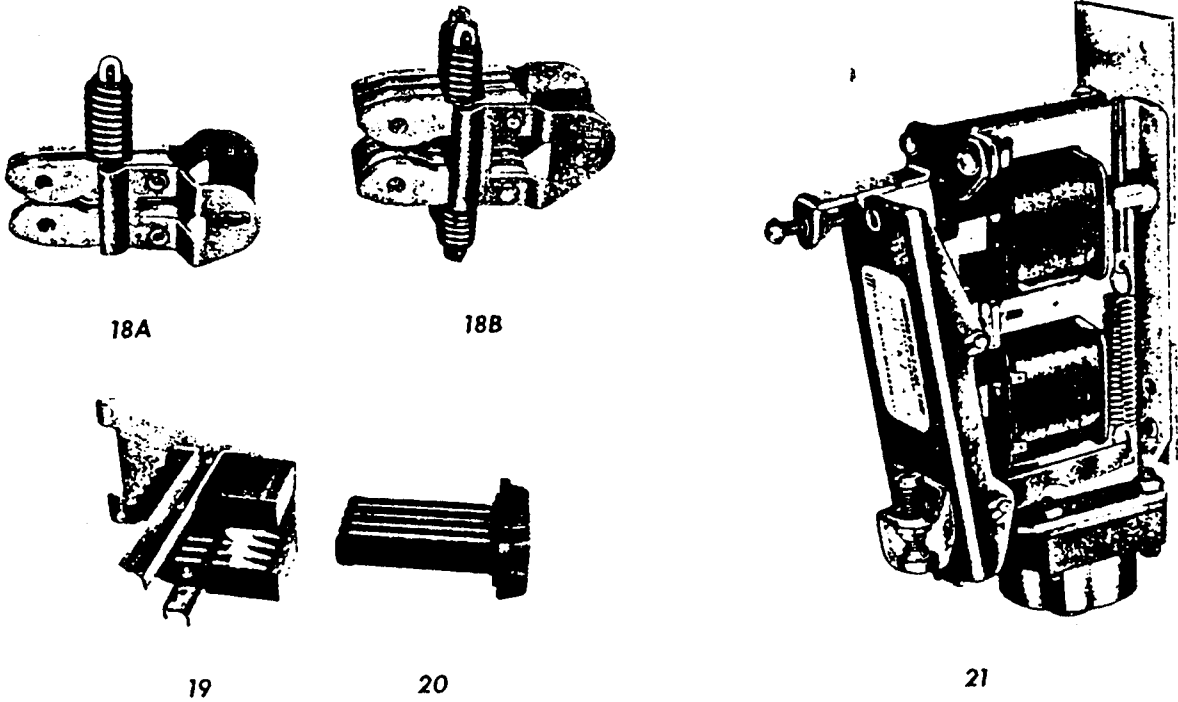


4C



| FIG. REF. | QUANTITY PER 3 POLE BREAKER |       |        | DESCRIPTION OF ASSEMBLY OR PART<br>(Components Indented) | ORDERING NUMBER<br>(Components Indented) | RECOMMENDED SPARES FOR NUMBER OF BREAKERS INSTALLED |      |       |       | Ø         |           |
|-----------|-----------------------------|-------|--------|--|--|---|------|-------|-------|-----------|-----------|
|           | K-225                       | K-600 | K-1600 |  |  | 1-5   | 6-10 | 11-15 | 16-25 |           |           |
| 1         |                             |       |        | Circuit Breaker Assembly, Complete                       | ⊙  | 0   | 0    | 0     | 1     | RP-702290 |           |
| 2A        | 1                           |       |        | Basic Breaker Assembly                                   | 702290-K3                                | 0   | 0    | 0     | 0     |           |           |
| 2B        |                             | 1     |        | Basic Breaker Assembly                                   | 702290-K9                                |   |      |       |       |           |           |
| 2C        |                             |       | 1      | Basic Breaker Assembly                                   | 702290-K15                               |   |      |       |       |           |           |
| 3A        | 1                           |       |        | Upper Molding and Contact Assembly                       | 702293-K3                                | 0   | 1    | 1     | 0     |           |           |
| 3B        |                             | 1     |        | Upper Molding and Contact Assembly                       | 702293-K9                                | 0   | 1    | 1     | 0     |           |           |
| 3C        |                             |       | 3      | Upper Molding and Contact Assembly                       | 702293-K13                               | 0   | 3    | 3     | 0     |           |           |
| 4A        | 1                           |       |        | Upper Molding and Stationary Contact Assembly            | 702291-K3                                | 1   | 1    | 1     | 1     |           |           |
| 4B        |                             | 1     |        | Upper Molding and Stationary Contact Assembly            | 702291-K9                                | 1   | 1    | 1     | 1     |           |           |
| 4C        |                             |       | 3      | Upper Molding and Stationary Contact Assembly            | 702291-K13                               | 3   | 3    | 3     | 3     |           |           |
| 5A        | 3                           |       |        | Movable Contact Assembly                                 | 702292-K1                                | 3   | 3    | 3     | 3     |           |           |
| 5B        |                             | 3     |        | Movable Contact Assembly                                 | 702292-K7                                |   |      |       |       |           |           |
| 5C        |                             |       | 3      | Movable Contact Assembly                                 | 702292-K13                               |   |      |       |       |           |           |
| 6A        | 1                           | 1     |        | Frame Assembly   | 703140-K1                                | 0   | 0    | 0     | 0     |           |           |
| 6B        |                             |       | 1      | Frame Assembly   | 703140-K9                                | 0   | 0    | 0     | 0     |           |           |
| 7         | 4                           | 4     |        | Interphase Vertical Barrier                              | 701531-A                                 | 2   | 4    | 6     | 0     |           |           |
| 8         |                             |       | 3      | Interphase Cover   | 701520-A                                 | 1   | 2    | 3     | 3     |           |           |
| 9A        | 2                           | 2     |        | Opening Spring   | 650220-A6                                | 2   | 4    | 6     | 6     |           |           |
| 9B        |                             |       | 2      | Opening Spring   | 650220-A7                                | 2   | 4    | 6     | 6     |           |           |
| 10A       | 3                           | 3     |        | Arc Chute Assembly                                       | 702289-K1                                | 1   | 2    | 3     | 3     |           |           |
| 10B       |                             |       | 3      | Arc Chute Assembly                                       | 702289-K9                                | 1   | 2    | 3     | 3     |           |           |
| 11A       | 2                           | 2     |        | Retainer Molding-For Arc Chute                           | 701496-A                                 | 1   | 2    | 3     | 3     |           |           |
| 11B       |                             |       | 2      | Retainer Molding-For Arc Chute                           | 701543-A                                 | 1   | 2    | 3     | 3     |           |           |
| 12A       | 1                           | 1     |        | Operating Mechanism Assembly                             | 702296-K1                                | 0   | 0    | 0     | 1     | RP-702296 |           |
|           |                             |       |        |  | 702296-K3                                |   |      |       |       |           |           |
|           |                             |       |        |  | 702296-K5                                |   |      |       |       |           |           |
|           |                             |       |        |  | 702296-K7                                |   |      |       |       |           |           |
| 12B       |                             |       | 1      | Operating Mechanism Assembly                             | 702296-K9                                | 0   | 0    | 0     | 1     |           |           |
|           |                             |       |        |  | 702296-K11                               |   |      |       |       |           |           |
|           |                             |       |        |  | 702296-K13                               |   |      |       |       |           |           |
|           |                             |       |        |  | 702296-K15                               |   |      |       |       |           |           |
| 13A       | 1                           |       |        | Lower Molding Assembly                                   | 703213-K11                               | 0   | 0    | 0     | 1     |           |           |
|           |                             |       |        |  | 703213-K12                               |   |      |       |       |           |           |
|           |                             |       |        |  | 703213-K13                               |   |      |       |       |           |           |
|           |                             |       |        |  | 703213-K14                               |   |      |       |       |           |           |
|           |                             |       |        |  | 703213-K15                               |   |      |       |       |           |           |
| 13B       |                             | 1     |        | Lower Molding Assembly                                   | 703223-K9                                | 0   | 0    | 0     | 1     |           | △         |
|           |                             |       |        |  | 703223-K10                               |   |      |       |       |           |           |
|           |                             |       |        |  | 703223-K11                               |   |      |       |       |           |           |
|           |                             |       |        |  | 703223-K12                               |   |      |       |       |           |           |
|           |                             |       |        |  | 703223-K13                               |   |      |       |       |           |           |
| 13C       |                             |       | 3      | Lower Molding Assembly                                   | 703233-K1                                | 0   | 0    | 0     | 3     |           |           |
|           |                             |       |        |  | 703233-K2                                |   |      |       |       |           |           |
|           |                             |       |        |  | 703233-K3                                |   |      |       |       |           |           |
|           |                             |       |        |  | 703233-K4                                |   |      |       |       |           |           |
| 14A       | 1                           | 1     |        | Auxiliary Switch Assembly with Mounting                  | 703142-K1                                | 0   | 1    | 1     | 2     | RP-703142 |           |
|           |                             |       |        |  | RH-4 4 Total                             |   |      |       |       |           |           |
|           |                             |       |        |  | RH-8 8 Total                             |   |      |       |       |           |           |
|           |                             |       |        |  | LH-4 4 Total                             |   |      |       |       |           |           |
|           |                             |       |        |  | LH-4 RH-4 8 Total                        |   |      |       |       |           |           |
| 14B       |                             |       | 1      | Auxiliary Switch Assembly with Mounting                  | 703142-K4                                | 0   | 1    | 1     | 2     |           |           |
|           |                             |       |        |  | RH-4 4 Total                             |   |      |       |       |           |           |
|           |                             |       |        |  | RH-8 8 Total                             |   |      |       |       |           |           |
|           |                             |       |        |  | LH-4 4 Total                             |   |      |       |       |           |           |
|           |                             |       |        |  | LH-4 RH-4 8 Total                        |   |      |       |       |           |           |
| 15        | 1                           | 1     | 1      | Shunt Trip Assembly                                      | 703142-K5                                | 0   | 1    | 1     | 2     |           |           |
|           |                             |       |        |  | 110-120 Volts, 60 Cycle                  |   |      |       |       |           |           |
|           |                             |       |        |  | 208-240 Volts, 60 Cycle                  |   |      |       |       |           |           |
|           |                             |       |        |  | 360-480 Volts, 60 Cycle                  |   |      |       |       |           |           |
|           |                             |       |        |  | 500-600 Volts, 60 Cycle                  |   |      |       |       |           |           |
|           |                             |       |        |  | 125 Volts, DC                            |   |      |       |       |           |           |
| 16        | 1                           | 1     | 1      | Motor Assembly with Mounting                             | 703145-K9                                | 0   | 0    | 0     | 1     |           | RP-703145 |
|           |                             |       |        |  | 250 Volts, DC                            |   |      |       |       |           |           |
| 17        | 1                           | 1     | 1      | Control Device Assembly                                  | 703144-K1                                | 0   | 1    | 1     | 2     |           |           |
|           |                             |       |        |  | 110-120 Volts AC or 125 Volts DC         |   |      |       |       |           |           |
|           |                             |       |        |  | 208-240 Volts AC or 250 Volts DC         |   |      |       |       |           |           |
|           |                             |       |        |  | 703144-K2                                |   |      |       |       |           |           |
|           |                             |       |        |  | 703143-K4                                |   |      |       |       |           |           |
|           |                             |       |        | 703143-K5  |  |   |      |       |       |           |           |
|           |                             |       |        | 703143-K6  |  |   |      |       |       |           |           |
|           |                             |       |        | 703143-K7  |  |   |      |       |       |           |           |

Ø-For the ordering number of all parts of assemblies, request bulletins listed.  
 ⊙-Specify catalog number of circuit breaker as originally ordered, Customer's original purchase order, and I-T-E shop order number.  
 △-Components not available, sold only as assemblies.



| FIG. REF. | QUANTITY PER 3 POLE BREAKER |       |        | DESCRIPTION OF ASSEMBLY                           | ORDERING NUMBER            | RECOMMENDED SPARES FOR NUMBER OF BREAKERS INSTALLED |      |       |       | Ø           |
|-----------|-----------------------------|-------|--------|---|----------------------------|---|------|-------|-------|-------------|
|           | K-225                       | K-600 | K-1600 |   |                            | 1-5   | 6-10 | 11-15 | 16-25 |             |
| 18A       | 6                           |       |        | Primary Disconnect Contact Assembly               | 702299-K1                  | 0   | 1    | 2     | 6     | Δ           |
| 18B       |                             | 6     | 12     | Primary Disconnect Contact Assembly               | 702299-K2                  | 0   | 1    | 2     | 6     |             |
| 19        | •                           | •     | •      | Secondary Disconnect Contact Assembly, Movable    | 703153-K1                  | 1   | 1    | 2     | 4     |             |
| 20        | •                           | •     | •      | Secondary Disconnect Contact Assembly, Stationary | 703152-K2                  | 1   | 1    | 1     | 2     |             |
| 21        | 1                           | 1     | 1      | Undervoltage Trip Assembly Complete               | #<br>#<br>#<br>#<br>#<br># | 0   | 1    | 1     | 2     | RP-703811-↑ |

Ø—For the ordering number of all parts of assemblies, request bulletins listed.  
 Δ—Components not available, sold only as assemblies.  
 •—Quantity varies—8 movable and 4 stationary contact assemblies (maximum) per breaker.  
 #—Specify the ordering number from the following table that agrees with the service number on the label of your undervoltage trip device.

| ORDERING NUMBER                                |   |  |   |
|--|---|--|---|
| INSTANTANEOUS TRIP DEVICES                     |   | TIME-DELAY TRIP DEVICES                        |   |
| STANDARD DEVICE<br>Operates<br>Reset Indicator | SPECIAL DEVICE<br>Does Not Operate<br>Reset Indicator | STANDARD DEVICE<br>Operates<br>Reset Indicator | SPECIAL DEVICE<br>Does Not Operate<br>Reset Indicator |
| 703811-K3                                      | 703811-K11  | 703812-K3                                      | 703812-K11  |
| 703811-K4                                      | 703811-K12  | 703812-K4                                      | 703812-K12  |
| 703811-K5                                      | 703811-K13  | 703812-K5                                      | 703812-K13  |
| 703811-K6                                      | 703811-K14  | 703812-K6                                      | 703812-K14  |
| 703811-K7                                      | 703811-K15  | 703812-K7                                      | 703812-K15  |
| 703811-K1                                      | 703811-K9   | 703812-K1                                      | 703812-K9   |
| 703811-K2                                      | 703811-K10  | 703812-K2                                      | 703812-K10  |

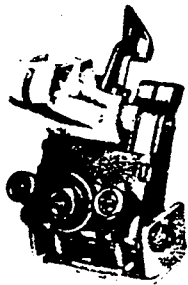
FOR PRICES AND TECHNICAL INFORMATION,  
 REFER TO THE NEAREST OFFICE OF I-T-E CIRCUIT BREAKER COMPANY.



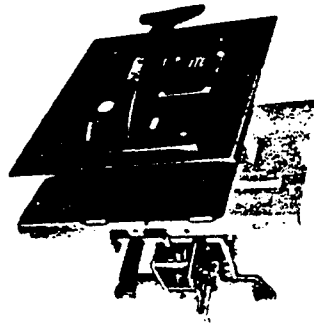
5A



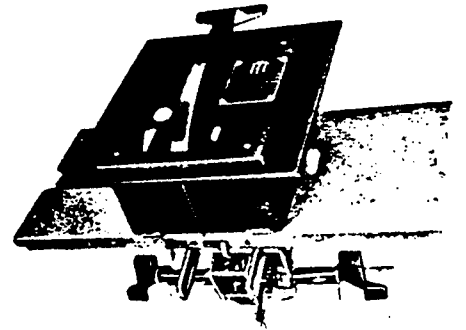
5B



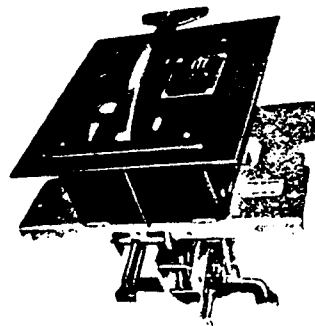
5C



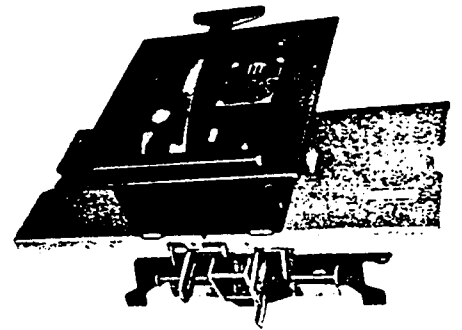
12A



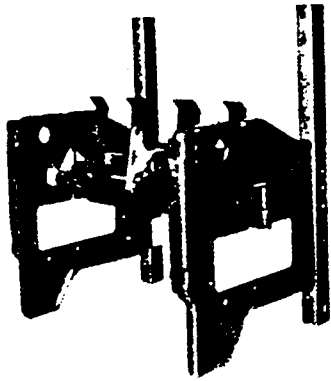
12B



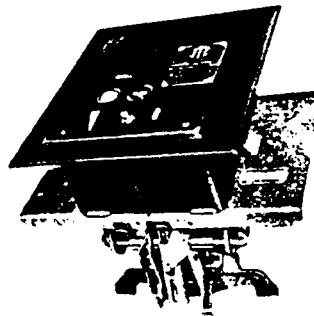
12A



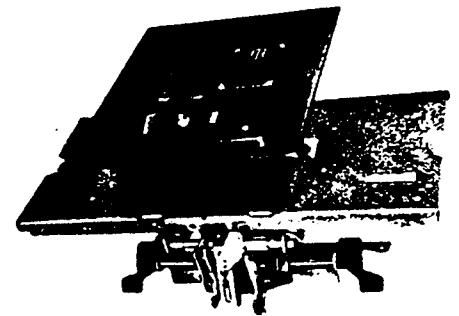
12B



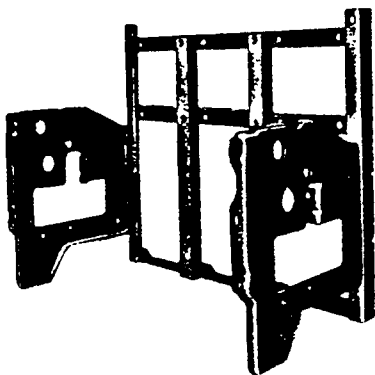
6A



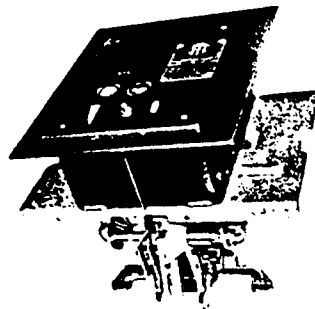
12A



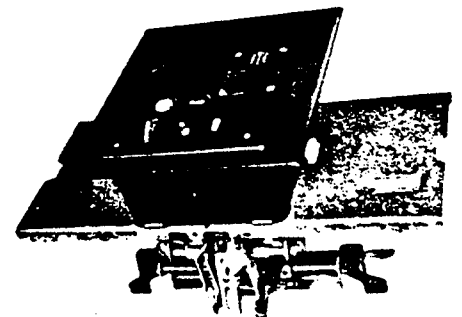
12B



6B

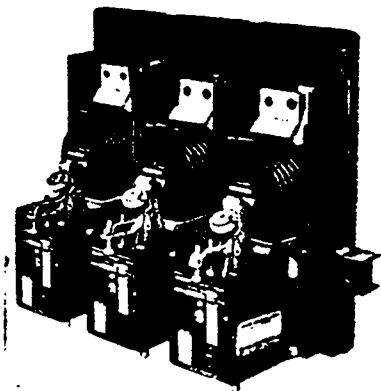


12A

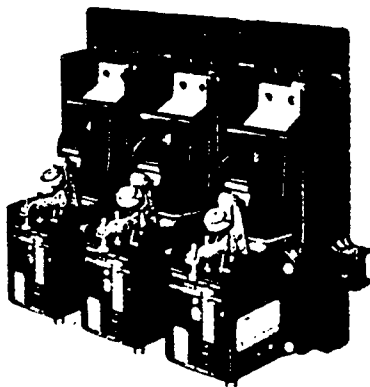


12B

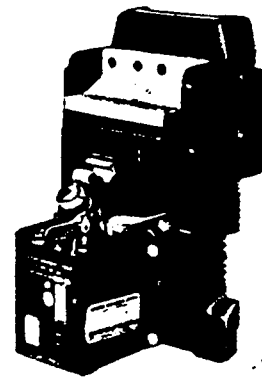




13A

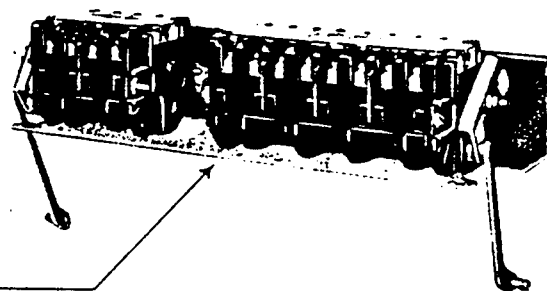
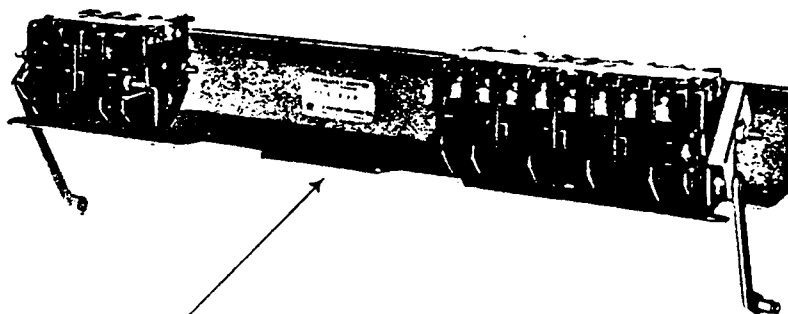


13B



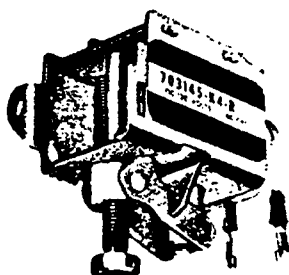
13C

| K-225<br>K-600 | K-1600 | SWITCH MOUNTING VARIATIONS<br>FRONT OF BOARD |
|----------------|--------|--|
| K1             | K9     |  |
| K2             | K10    |  |
| K3             | K11    |  |
| K4             | K12    |  |
| K5             | K13    |  |

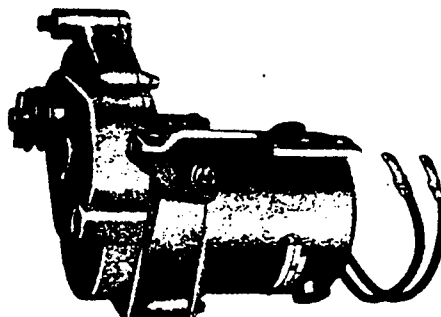


↑ 14A    ↑ 14B    ——— K13 Shown

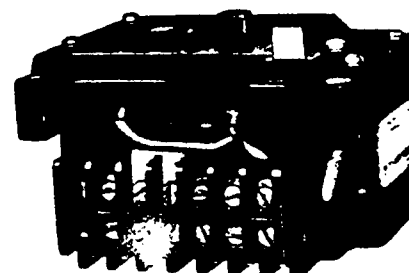
————— K5 Shown



15



16



17



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## ORDERING INSTRUCTIONS

When ordering, always state type of circuit breaker and service number from the label associated with the assembly requiring service.

State the quantity, description, and ordering number of each assembly or part required.

EXAMPLE: To order movable contact assemblies for a type K-600 circuit breaker, specify the following:

For a type K-600 circuit breaker  
Service Number 702290-K9-R5

Quantity 3    Movable Contact Assembly    702292-K7

The recommended spares in this bulletin apply only to circuit breakers having the features recommended.

EXAMPLE: If your circuit breaker is stationary mounted, you would disregard the primary and secondary disconnect contacts (Fig. Refs. 18A, 18B, 19, and 20).

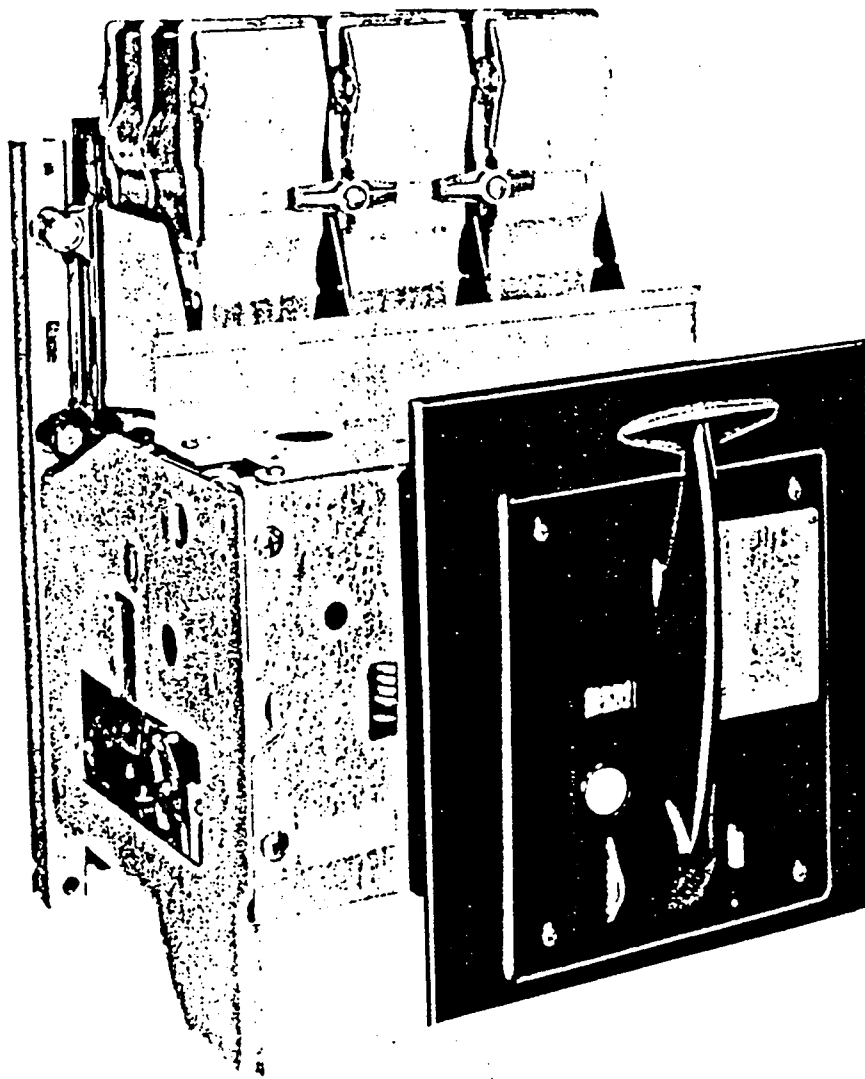
FOR PRICES AND TECHNICAL INFORMATION,  
REFER TO THE NEAREST OFFICE OF I-T-E CIRCUIT BREAKER COMPANY.



# LOW-VOLTAGE POWER CIRCUIT BREAKERS

## RENEWAL PARTS

TYPE K-225, K-600, K-1600, K-2000 CIRCUIT BREAKERS  
K-DON<sup>®</sup>-600, K-DON-1600 FUSED CIRCUIT BREAKERS  
KSP<sup>™</sup>-1200, KSP-1600, KSP-2000 POWER SERVICE PROTECTORS



**ITE IMPERIAL CORPORATION**



**RENEWAL PARTS FOR**  
**TYPE K-225, K-600, K-1600, K-2000 CIRCUIT BREAKERS**  
**K-DON-600, K-DON-1600 FUSED CIRCUIT BREAKERS**  
**KSP-1200, KSP-1600, KSP-2000 POWER SERVICE PROTECTORS**

**GENERAL NOTES**

1. Recommended quantities are as follows:  
 DOMESTIC - One (1) complete set for each ten (10) breakers or fraction thereof installed for each rating.  
 FOREIGN - One (1) complete set for each five (5) breakers or fraction thereof installed for each rating.  
 NOTE: Fig. Ref. parts marked with triangle (▲) are minimum that should be ordered for normal duty applications. For heavy duty applications, all applicable Fig. Ref. parts should be ordered.
2. The parts listed cover an indefinite period of time. With normal duty and maintenance, replacement will be infrequent.
3. Standard hardware (screws, nuts, lockwashers, etc.) is not included with the parts.
4. Where continuity of service is mandatory, a spare breaker is recommended.

**ORDERING INSTRUCTIONS**

When ordering, always state type of circuit breaker and serial number from breaker nameplate, original purchase order number and I-T-E sales order number in addition to part description and ordering number.

State the quantity, description, and ordering number of each assembly or part required, as applicable.

EXAMPLE: To order moving contact assemblies for a type K-600 circuit breaker, specify the following:

For a type K-600 circuit breaker  
 Serial # 39402-22-2-4A  
 P.O. # 35432 (Your Number)  
 I-T-E S.O. 33-39402

Quantity 3 Moving Contact Assembly 706783-T2

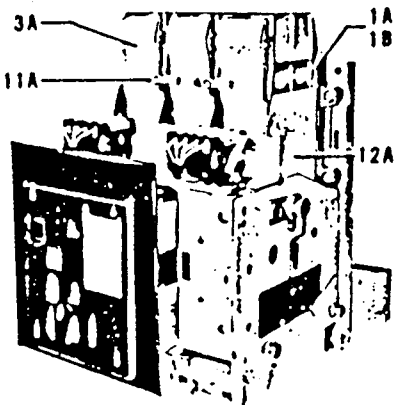
The recommended spares in this bulletin apply only to circuit breakers having the features listed. For example, if your circuit breaker is stationary mounted, you would disregard the primary and secondary disconnect assemblies (Fig. Refs. 13A, B, D, E, and 14A).

If your circuit breaker has some special feature not listed, provide complete description of feature, such as - Bell Alarm Switch - 120 Volts AC, (1) N.O. and (1) N.C. contact - - in addition to other information requested above.

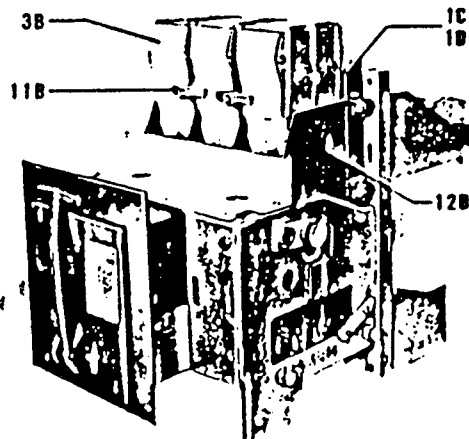
When ordering current-limiting fuses, always specify the continuous current rating in addition to ordering number.

**FOR PRICES AND TECHNICAL INFORMATION, REFER TO THE NEAREST OFFICE OF I-T-E IMPERIAL CORPORATION.**

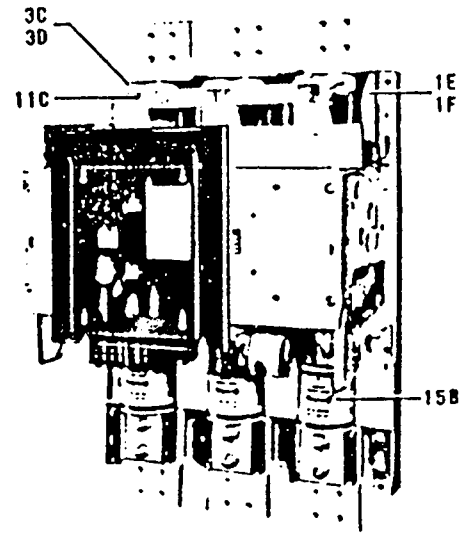
The photographs reproduced in this bulletin are furnished only to serve as a guide in the identification of assemblies and parts, and do not purport to cover all details or variations in equipment.



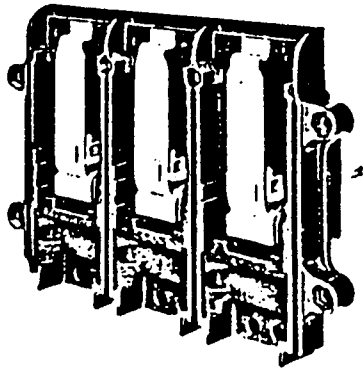
Typical K-600, E.O.



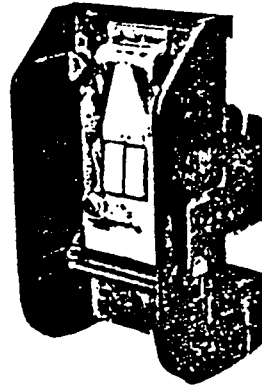
Typical K-Don-600, M.O.



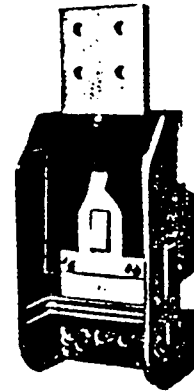
Typical KSP-2000, E.O.



1A or 1B



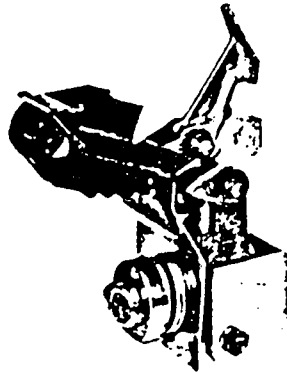
1C or 1D



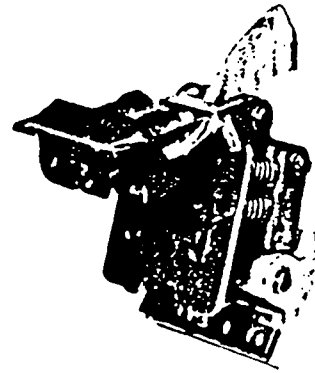
1E or 1F



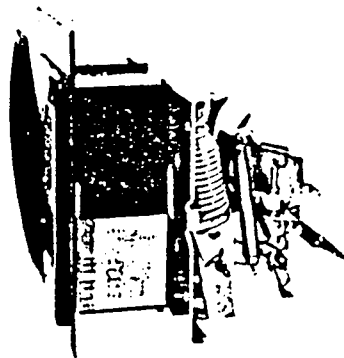
2A



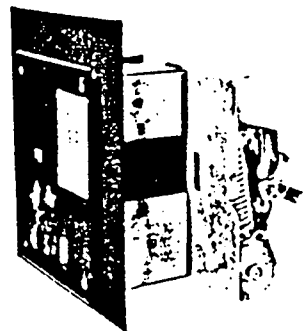
2B



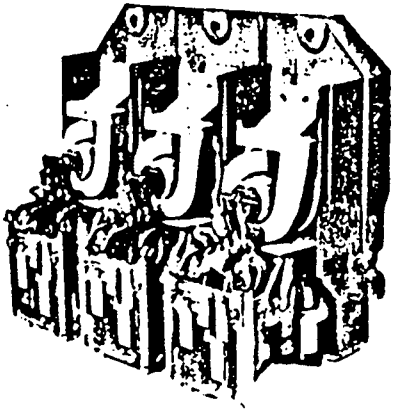
2C or 2D



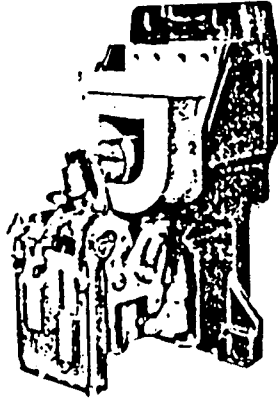
4A or 4B  
(M.O. Drawout Shown)



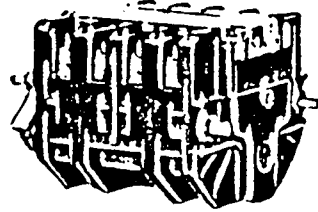
4A or 4B  
(E.O. Drawout Shown)



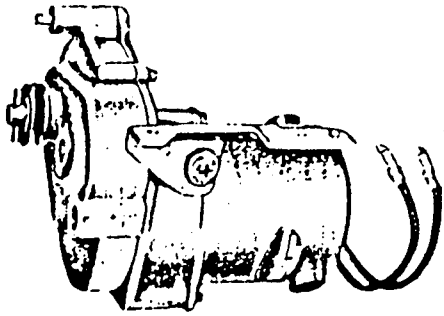
5A or 5B



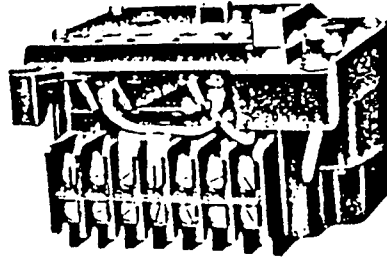
5C or 5D



6A or 6B



7A



8A



9A

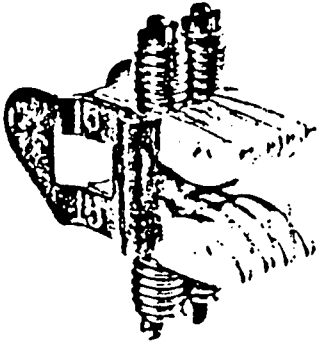


10A

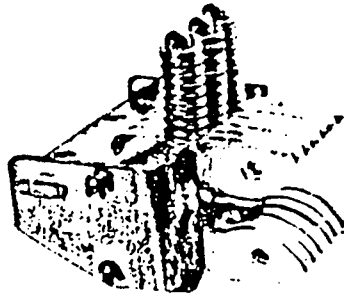


| Fig. Ref.                        | Quantity per 3-Pole |                       |        |                         |                      |          | Description of Assembly or Part  | Ordering Number   |  |
|----------------------------------|---------------------|-----------------------|--------|-------------------------|----------------------|----------|--|---|--|
|                                  | Circuit Breaker     |                       |        |                         | Service Protector    |          |  |   |  |
|                                  | K-225               | K-600<br>K-Don<br>600 | K-1600 | K-2000<br>K-Don<br>1600 | KSP-1200<br>KSP-1600 | KSP-2000 |  |   |  |
| 1A<br>1B<br>1C<br>1D<br>1E<br>1F | 1                   | 1                     | 3      | 3                       | 3                    | 3        | Stationary Contact and Base Molding Assembly<br>Stationary Contact and Base Molding Assembly<br>Stationary Contact and Base Molding Assembly<br>Stationary Contact and Base Molding Assembly<br>Stationary Contact and Base Molding Assembly<br>Stationary Contact and Base Molding Assembly | 706784-T1<br>706784-T3<br>706784-T5<br>706784-T6<br>706784-T7<br>706784-T8  |  |
| 2A<br>2B<br>2C<br>2D             | 3                   | 3                     | 3      | 3                       | 3                    | 3        | Moving Contact Assembly<br>Moving Contact Assembly<br>Moving Contact Assembly<br>Moving Contact Assembly   | 706783-T1<br>706783-T2<br>706783-T3<br>706783-T4  |  |
| 3A<br>3B<br>3C<br>3D             | 3                   | 3                     | 3      | 3                       | 3                    | 3        | Arc Chute Assembly<br>Arc Chute Assembly<br>Arc Chute Assembly - 240 Volts Only<br>Arc Chute Assembly - 480 & 600 Volts  | 706775-T5<br>706775-T1<br>706775-T7<br>706775-T8  |  |
| 4A<br>4B                         | 1                   | 1                     |        |                         |                      |          | Operating Mechanism Assembly<br>Operating Mechanism Assembly   | Manually Operated - Stationary<br>Manually Operated - Drawout<br>Electrically Operated - Stationary<br>Electrically Operated - Drawout<br>Manually Operated - Stationary<br>Manually Operated - Drawout<br>Electrically Operated - Stationary<br>Electrically Operated - Drawout  | 706774-T1<br>706774-T2<br>706774-T3<br>706774-T4<br>706774-T5<br>706774-T6<br>706774-T7<br>706774-T8   |
| 5A<br>5B<br>5C<br>5D             | 1                   | 1                     | 3      | 3                       |                      |          | Lower Molding Assembly<br>Standard Type OD-3<br>Overcurrent Device<br>Lower Molding Assembly<br>Standard Type OD-3<br>Overcurrent Device<br>Lower Molding Assembly<br>Standard Type OD-3<br>Overcurrent Device<br>Lower Molding Assembly<br>Standard Type OD-3<br>Overcurrent Device         | 225 to 120 Amps.<br>125 to 70 Amps.<br>70 to 40 Amps.<br>40 to 20 Amps.<br>20 to 12 Amps.<br>600 to 400 Amps.<br>400 to 250 Amps.<br>225 to 120 Amps.<br>125 to 70 Amps.<br>70 to 40 Amps.<br>40 to 20 Amps. (Except K-Don)<br>1600 to 800 Amps.<br>800 to 400 Amps.<br>400 to 250 Amps.<br>225 to 120 Amps.<br>2000 to 1200 Amps.<br>1600 to 800 Amps.<br>800 to 400 Amps.<br>400 to 250 Amps. | 708371-322<br>708371-312<br>708371-307<br>708371-304<br>708371-302<br>708372-360<br>708372-340<br>708372-322<br>708372-312<br>708372-307<br>708372-304<br>708373-316<br>708373-380<br>708373-340<br>708373-322<br>708374-370<br>708374-316<br>708374-380<br>708374-340 |
| 6A<br>6B                         | 1                   | 1                     | 1      | 1                       | 1                    | 1        | Auxiliary Switch - 4 Contact (When Used)<br>Auxiliary Switch - 8 Contact (When Used)   | 700034-K1<br>700038-K1  |  |
| 7A                               | 1                   | 1                     | 1      | 1                       | 1                    | 1        | Motor Assembly with Mounting (When Used)   | 110-120 Volts AC or 125 Volts DC<br>208-240 Volts AC or 250 Volts DC  | 708391-T1<br>708391-T2   |
| 8A                               | 1                   | 1                     | 1      | 1                       | 1                    | 1        | Control Device Assembly (When Used)  | 110-120 Volts, 60 Cycle<br>208-240 Volts, 60 Cycle<br>125 Volts, DC<br>250 Volts, DC  | 708392-T9<br>708392-T10<br>708392-T7<br>708392-T8  |
| 9A                               | 1                   | 1                     | 1      | 1                       | 1                    | 1        | Shunt Trip Assembly (When Used)  | 110-120 Volts, 60 Cycle<br>208-240 Volts, 60 Cycle<br>360-480 Volts, 60 Cycle<br>500-600 Volts, 60 Cycle<br>125 Volts, DC<br>250 Volts, DC  | 708393-T6<br>708393-T10<br>708393-T11<br>708393-T8<br>708393-T7<br>708393-T8   |
| 10A                              |                     | 1                     |        | 1                       | 1                    | 1        | Anti-Single-Phase Device (K-Don & KSP)   |   | 708934-T1  |
| 11A<br>11B<br>11C                | 2                   | 2                     | 2      | 2                       | 1                    | 1        | Arc Chute Retainer<br>Arc Chute Retainer<br>Arc Chute Retainer   | 701496-A<br>701543-A<br>705536-A  |  |
| 12A<br>12B<br>12C                | 4                   | 4                     | 3      | 3                       | 2                    | 2        | Interphase Barrier<br>Interphase Barrier<br>Interphase Barrier (600 Volts Only)  | 701531-A<br>707110-A<br>708504-A  |  |

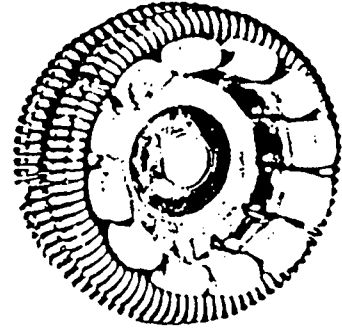




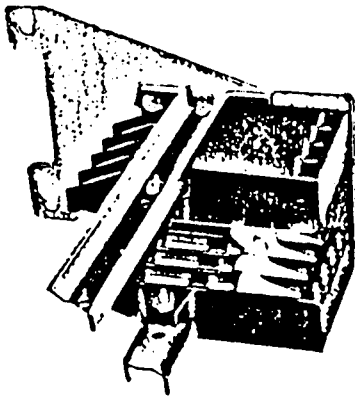
13A, 13B or 13C



13D



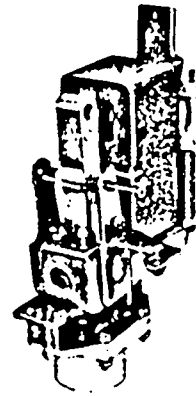
13E



14A



15A or 15B



16A



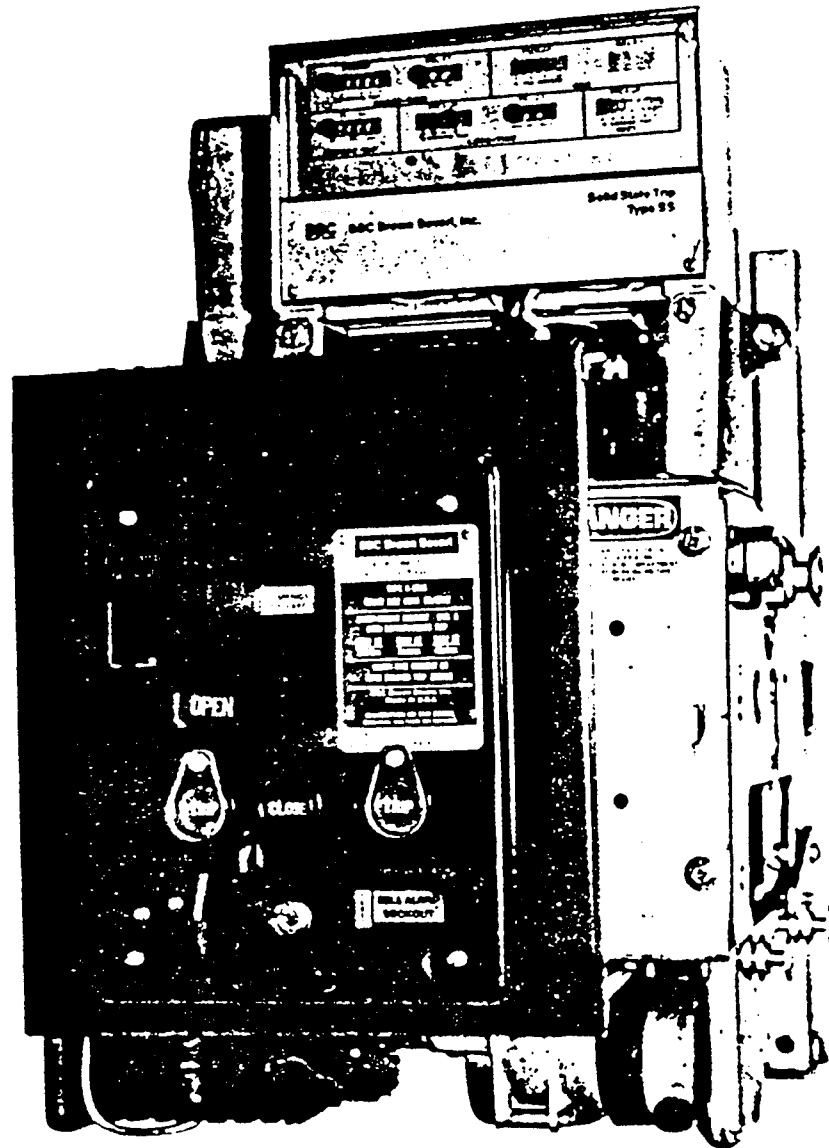
| Fig. Ref. | Quantity per 3-Pole |                       |        |                         |                      |          | Description of Assembly or Part           | Ordering Number |
|-----------|---------------------|-----------------------|--------|-------------------------|----------------------|----------|---|-----------------|
|           | Circuit Breaker     |                       |        |                         | Service Protector    |          |   |                 |
|           | K-225               | K-800<br>K-Don<br>600 | K-1600 | K-2000<br>K-Don<br>1600 | KSP-1200<br>KSP-1600 | KSP-2000 |   |                 |
| 13A       | 6                   |                       |        |                         |                      |          | Primary Disconnect Assembly               | 706777-T1       |
| 13B       |                     | 6 *3                  |        |                         |                      |          | Primary Disconnect Assembly (K-Don Lower) | 706777-T3       |
| 13C       |                     | *3                    |        |                         |                      |          | Primary Disconnect Assembly (K-Don Upper) | 706777-T5       |
| 13D       |                     |                       | 6      |                         |                      |          | Primary Disconnect Assembly               | 706777-T11      |
| 13E       |                     |                       |        | 6                       |                      |          | Primary Disconnect Assembly               | 706777-T15      |
| 14A       | 2                   | 2                     | 2      | 2                       |                      |          | Secondary Disconnect Assembly (When Used) | 703153-K1       |
| ▲15A      |                     | *3                    |        | *3                      |                      |          | Current-Limiting Fuse                     | 708235          |
| ▲15B      |                     |                       |        |                         | 3                    | 3        | Current-Limiting Fuse                     | 705070          |
| ▲16A      | 1                   | 1                     | 1      | 1                       | 1                    | 1        | Undervoltage Assembly (When Used)         |                 |
|           |                     |                       |        |                         |                      |          | Instantaneous                             |                 |
|           |                     |                       |        |                         |                      |          | 110-120 Volts, 60 Cycle                   | 708472-T1       |
|           |                     |                       |        |                         |                      |          | 220-240 Volts, 60 Cycle                   | 708472-T2       |
|           |                     |                       |        |                         |                      |          | 440-480 Volts, 60 Cycle                   | 708472-T4       |
|           |                     |                       |        |                         |                      |          | 550-600 Volts, 60 Cycle                   | 708472-T5       |
|           |                     |                       |        |                         |                      |          | 48 Volts, DC                              | 708472-T6       |
|           |                     |                       |        |                         |                      |          | 125 Volts, DC                             | 708472-T7       |
|           |                     |                       |        |                         |                      |          | 250 Volts, DC                             | 708472-T8       |
|           |                     |                       |        |                         |                      |          | Time-Delay                                |                 |
|           |                     |                       |        |                         |                      |          | 110-120 Volts, 60 Cycle                   | 708472-T9       |
|           |                     |                       |        |                         |                      |          | 220-240 Volts, 60 Cycle                   | 708472-T10      |
|           |                     |                       |        |                         |                      |          | 440-480 Volts, 60 Cycle                   | 708472-T12      |
|           |                     |                       |        |                         |                      |          | 550-600 Volts, 60 Cycle                   | 708472-T13      |
|           |                     |                       |        |                         |                      |          | 48 Volts, DC                              | 708472-T14      |
|           |                     |                       |        |                         |                      |          | 125 Volts, DC                             | 708472-T15      |
|           |                     |                       |        |                         |                      |          | 250 Volts, DC                             | 708472-T16      |

\*K-Don Only



**I-T-E Low-Voltage  
Power Circuit Breakers**

Type K-225 thru 2000 and K-600S thru 2000S  
Type K-Don® 600 thru 1600 and K-Don 600S thru 1600S



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**RENEWAL PARTS FOR  
TYPE K-225, 600, 800, 1600, 2000, 600S, 800S, 1600S, 2000S CIRCUIT BREAKERS  
K-DON-600, 800, 1600, 600S, 800S, 1600S FUSED CIRCUIT BREAKERS**

**General Notes**

**1. Recommended quantities are as follows:**

DOMESTIC - One (1) complete set for each ten (10) breakers or fraction thereof installed for each rating.

FOREIGN - One (1) complete set for each five (5) breakers or fraction thereof installed for each rating.

NOTE: Fig. Ref. parts marked with triangle ( ▲ ) are minimum that should be ordered for normal duty applications. For heavy duty applications, all applicable Fig. Ref. parts should be ordered.

**2. The parts listed cover an indefinite period of time. With**

normal duty and maintenance, replacement will be infrequent.

**3. Standard hardware (screws, nuts, lockwashers, etc.) is not included with the parts.**

**4. Where continuity of service is mandatory, a spare breaker is recommended.**

**Ordering Instructions**

When ordering, always state type of circuit breaker and serial number from breaker nameplate in addition to part description and ordering number.

State the quantity, description, and ordering number of each assembly or part required, as applicable.



# Allen-Bradley Centerline Medium-Voltage Air Break Contactor • 400 Amp Size

### SPECIFICATIONS

#### Maximum Voltage

- 5000
- 7200

#### Rated Current (Amps.)

- Open Type-400A
- Enclosed Type:
 

|        |                 |         |
|--------|-----------------|---------|
| Type 1 | Type 1 w/gasket | Type 12 |
|--------|-----------------|---------|

|                     |      |      |
|---------------------|------|------|
| High                | 360A | 360A |
| Total per Section - | 360A | 360A |
| High - Middle       | 300A | 200A |
| Bottom              | 340A | 300A |
| Total per Section - | 600A | 400A |
| High -              | 240A | 180A |
|                     | 240A | 180A |
|                     | 240A | 180A |
| Total per Section - | 720A | 540A |

#### Horsepower Ratings

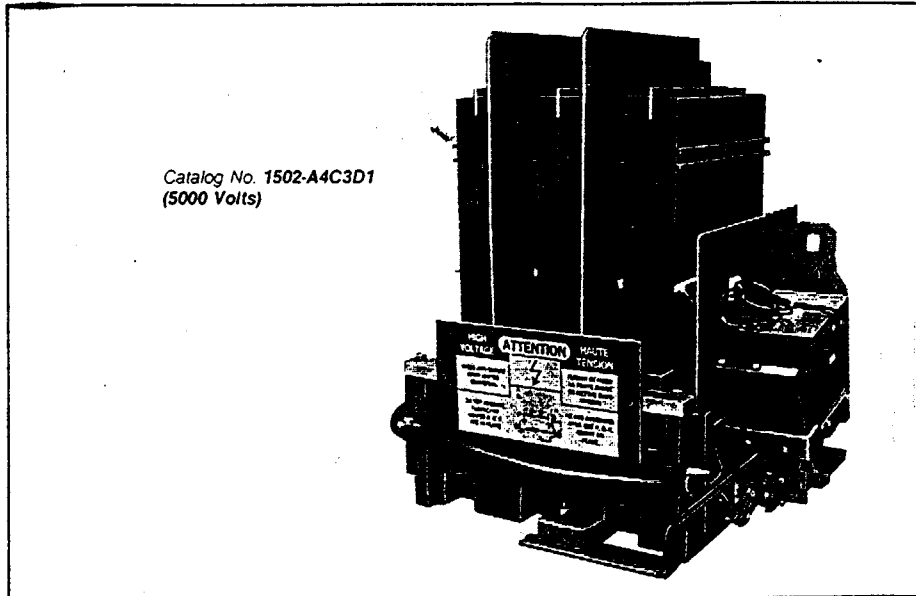
- 2400V
  - Induction Type 1500 HP
  - Synchronous Type (1.0PF) 1750 HP
  - (0.8PF) 1500 HP
- 4600V
  - Induction Type 2500 HP
  - Synchronous Type (1.0PF) 3000 HP
  - (0.8PF) 2500 HP
- 6600V
  - Induction Type 4000 HP
  - Synchronous Type (1.0PF) 5000 HP
  - (0.8PF) 4000 HP

#### Interrupting Ratings

- Fused, E2 200 MVA at 2400V
- 400 MVA at 4600V
- 570 MVA at 6600V

#### Basic Impulse Level

- 60 KV Crest



**INTRODUCTION** – The intent of this manual is to provide an outlined procedure for handling, installation and maintenance of CENTERLINE medium-voltage contactors.

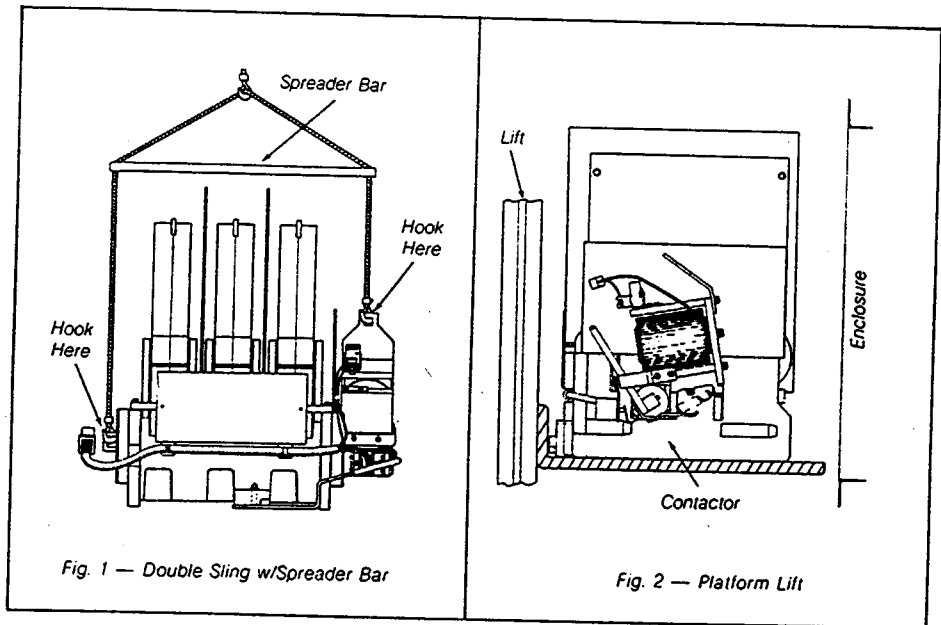
Should problems relating to installation or operation be encountered that are not covered in this manual, refer to ALLEN-BRADLEY.

**Note:** Keep these instructions for future reference.

**DESCRIPTION** – CENTERLINE medium-voltage contactor operating voltages are 120V AC for the control circuit and 104V DC for the contactor coil. The contactor weighs 230 lbs. (165 lbs. with arc-chutes and interphase barriers removed). It is 26" (66 cm) high 16-1/8" (41 cm) high with arc-chutes and interphase barriers removed), 17-3/4 (45 cm) long and 23-3/8" (59 cm) wide.

**RECEIVING:** Before leaving the factory, all CENTERLINE medium-voltage contactors have been tested both mechanically and electrically. Immediately upon receiving the controller, remove the packing and check for possible shipping damage. Report any damage immediately to the claims office of the common carrier.

**HANDLING:** Each contactor can be lifted with the aid of a double sling with spreader bar (see Fig. 1) or with a platform lift (see Fig. 2). The contactor is provided with two lifting brackets located to properly distribute the weight.



**Note:** Arc-chutes and interphase barriers may be removed for easier handling. Refer to "Service Instructions" in this manual. When moving the contactor by hand, use the "Handling Points" indicated in Fig. 6.

**WARNING:** DO NOT operate contactor UNLESS arc-chutes, interphase barriers, and arc-chute retaining bar are securely in place.

**EXAMPLE:** To order moving contact assemblies for a typical K-600 circuit breaker, provide the following:

For a-type K-600 circuit breaker  
 Serial No. 39402-22-2-4A (From breaker nameplate)  
 S.O. 33-39402  
 Quantity-2 (Fig. Ref. 4B, page 5) Moving Contact  
 Assemblies 706783-T2

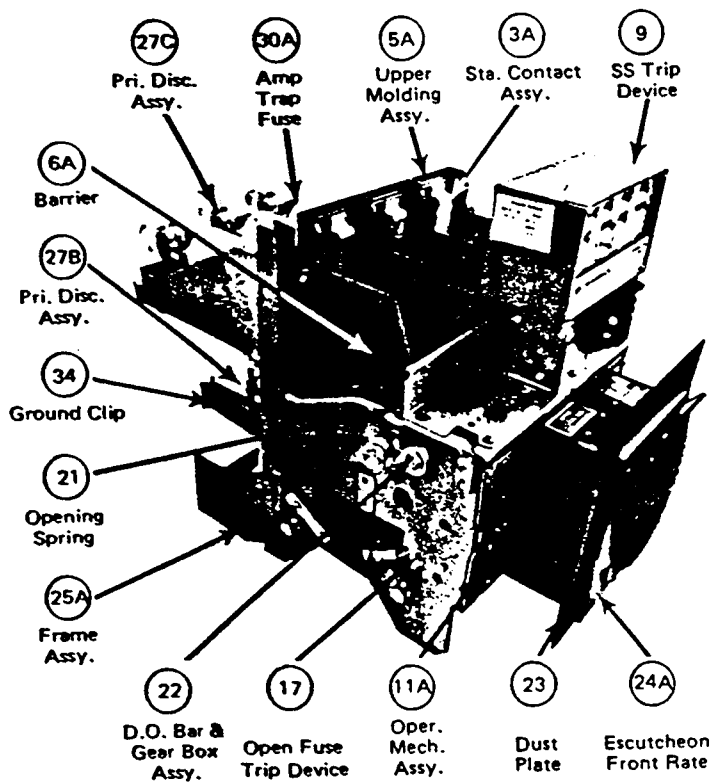
The recommended spares in this bulletin apply only to circuit breakers having the features listed. For example, if your circuit breaker is stationary mounted, you would disregard the primary and secondary disconnect assemblies (Fig. Refs, 27 A,B,C,D,E, and 28).

If your circuit breaker has some special feature not listed, provide complete description of feature, such as— Shunt Trip — 120 Volts AC, in addition to other information requested in example above.

When ordering current-limiting fuses, always specify the continuous current rating in addition to the ordering number.

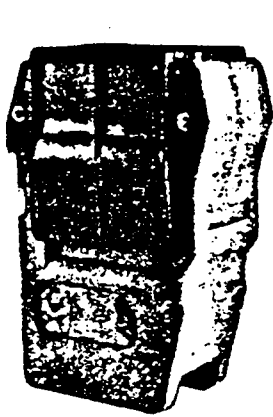
NOTE: Fig. Ref. parts marked with bullet (•) - On circuit breakers equipped with solid state overcurrent trip devices, as designated by the "S" at the end of the circuit breaker "Type", it is necessary to replace both the solid state logic assembly and the lower molding assembly when changing the circuit breaker to a new AMPERE TAP range.

**FOR PRICES SEE PS 6.1.2.8-1.  
 FOR TECHNICAL INFORMATION,  
 CONTACT OUR NEAREST DISTRICT OFFICE.**

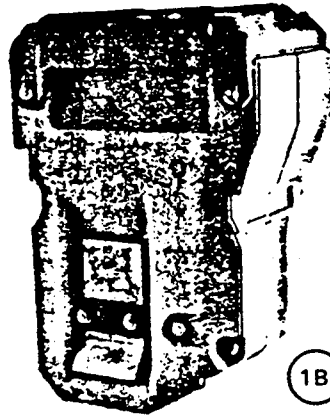


The photographs reproduced in this bulletin are furnished only to serve as a guide in the identification of assemblies and parts, and do not purport to cover all details or variations in equipment.





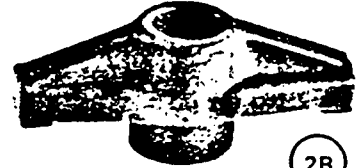
1A



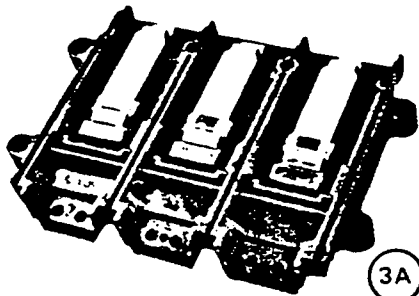
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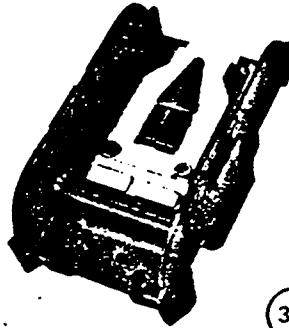
2A



2B



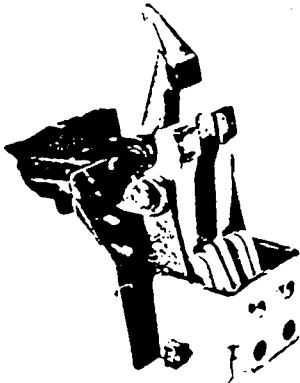
3A



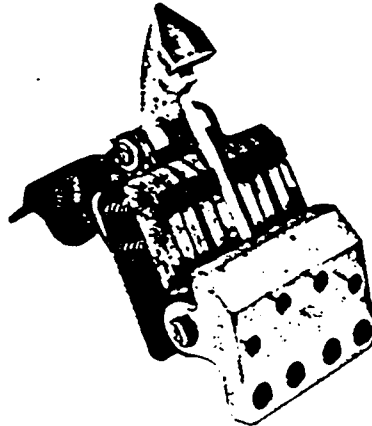
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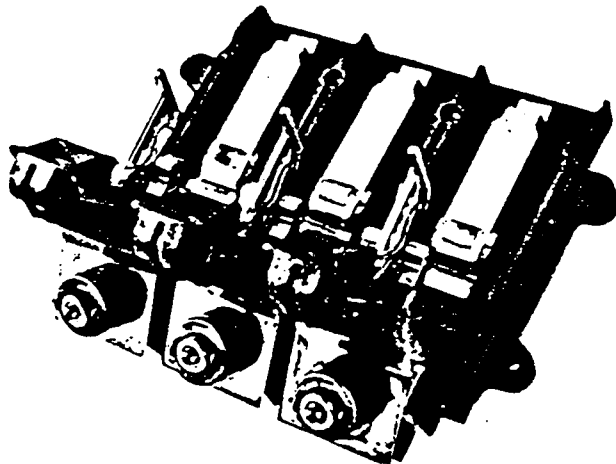
4A



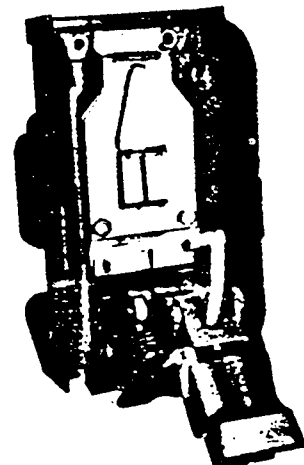
4B



4C

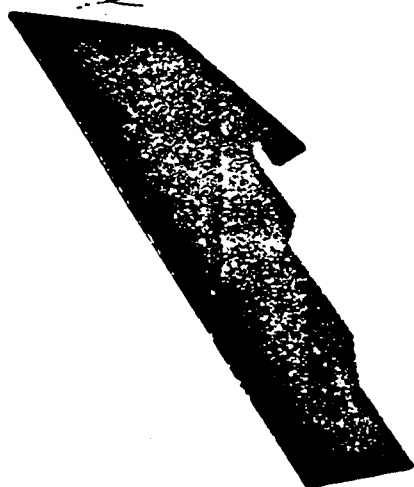


5A

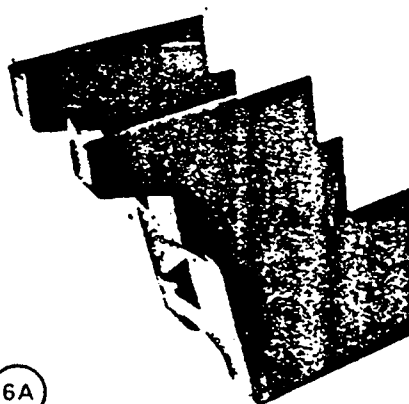


5B

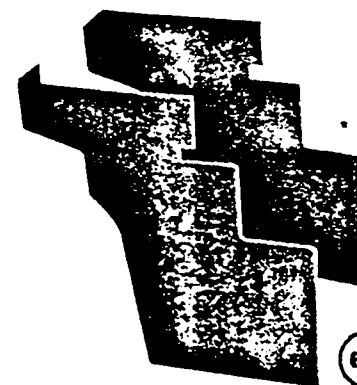
| Description Of Assembly Or Part                   | Fig. Ref. | Quantity Per 3-Pole Breaker |           |       |       |             |        |        |               |            |                 |             | Ordering Number |           |
|---|-----------|-----------------------------|-----------|-------|-------|-------------|--------|--------|---------------|------------|-----------------|-------------|-----------------|-----------|
|   |           | K225                        | K600-K800 | K1600 | K2000 | K600S-K800S | K1600S | K2000S | K-Don 600/800 | K-Don 1600 | K-Don 600S/800S | K-Don 1600S |                 |           |
| Arc Chute Assembly                                | 1A        | 3                           | 3         |       |       | 3           |        |        |               | 3          |                 |             |                 | 706775-T4 |
| Arc Chute Assembly                                | 1B        |                             |           | 3     | 3     |             | 3      | 3      |               |            | 3               |             |                 | 706775-T2 |
| Arc Chute Retainer                                | 2A        | 2                           | 2         |       |       | 2           |        |        |               | 2          |                 |             |                 | 701496-A  |
| Arc Chute Retainer                                | 2B        |                             |           | 2     | 2     |             | 2      | 2      |               |            | 2               |             |                 | 701543-A  |
| Upper Base Molding w/Stationary Contact Assembly  | 3A        | 1                           |           |       |       |             |        |        |               |            |                 |             |                 | 706784-T1 |
| Upper Base Molding w/Stationary Contact Assembly  | 3A        |                             | 1         |       |       | 1           |        |        |               | 1          |                 | 1           |                 | 706784-T3 |
| Upper Base Molding w/Stationary Contact Assembly  | 3B        |                             |           | 3     |       |             |        | 3      |               |            |                 |             |                 | 706784-T5 |
| Upper Base Molding w/Stationary Contact Assembly  | 3B        |                             |           |       | 3     |             |        |        | 3             |            | 3               |             | 3               | 706784-T6 |
| Moving Contact Assembly                           | 4A        | 3                           |           |       |       |             |        |        |               |            |                 |             |                 | 706783-T1 |
| Moving Contact Assembly                           | 4B        |                             | 3         |       |       | 3           |        |        |               | 3          |                 | 3           | 3               | 706783-T2 |
| Moving Contact Assembly                           | 4C        |                             |           | 3     |       |             | 3      |        |               |            |                 |             |                 | 706783-T3 |
| Moving Contact Assembly                           | 4C        |                             |           |       | 3     |             |        | 3      |               |            |                 |             |                 | 706783-T7 |
| Upper Base Molding w/Stationary & Moving Contacts | 5A        | 1                           |           |       |       |             |        |        |               |            |                 |             |                 | 706782-T1 |
| Upper Base Molding w/Stationary & Moving Contacts | 5A        |                             | 1         |       |       | 1           |        |        |               | 1          |                 | 1           |                 | 706782-T3 |
| Upper Base Molding w/Stationary & Moving Contacts | 5B        |                             |           | 3     |       |             |        | 3      |               |            |                 |             |                 | 706782-T5 |
| Upper Base Molding w/Stationary & Moving Contacts | 5B        |                             |           |       | 3     |             |        |        | 3             |            | 3               |             | 3               | 706782-T6 |
| Interphase Barrier                                | 6A        | 4                           | 4         |       |       | 4           |        |        |               | 4          |                 | 4           |                 | 701531-A  |
| Interphase Barrier                                | 6B        |                             |           | 3     | 3     |             |        |        |               |            | 3               |             | 3               | 707110-A  |
| Interphase Barrier                                | 6C        |                             |           |       |       |             | 3      | 3      |               |            |                 |             | 3               | 710524-A  |



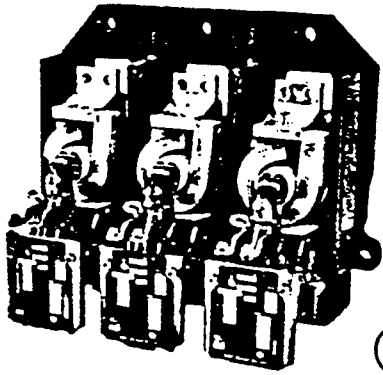
6A



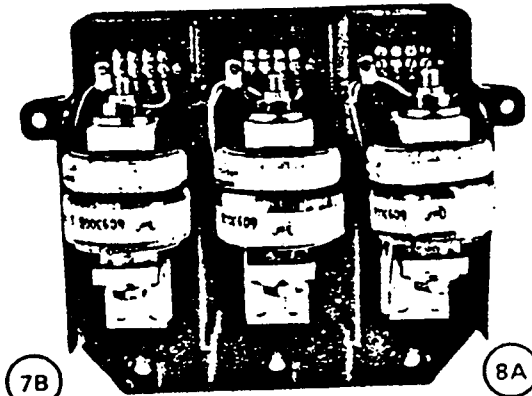
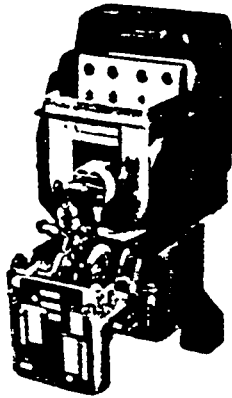
6B



6C

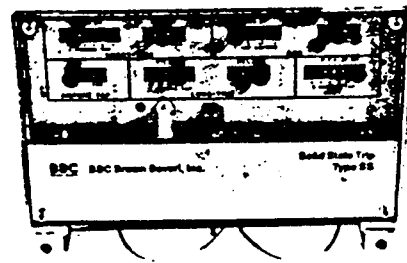
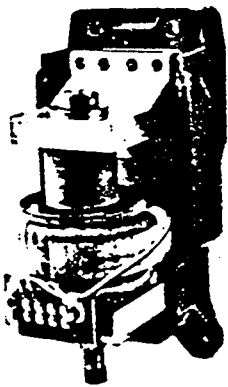


7A

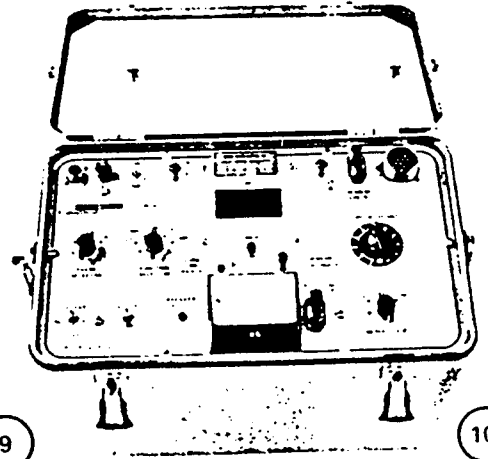


7B

8A

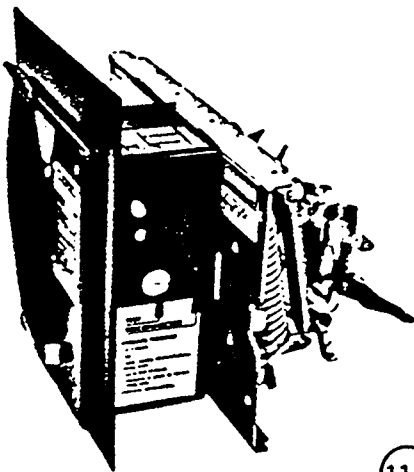


8B

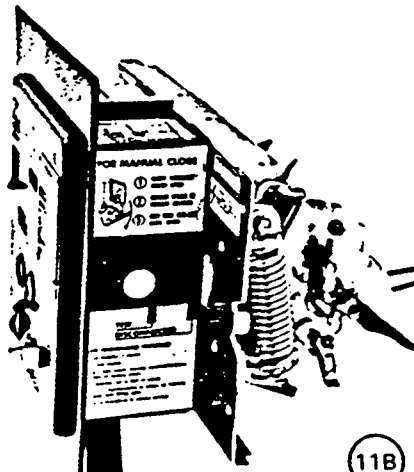


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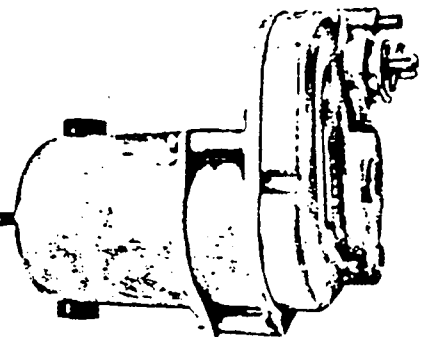
10



11A



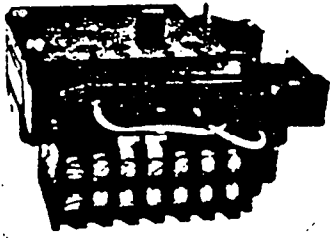
11B



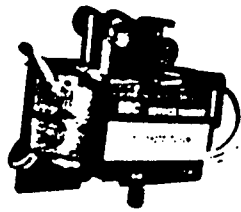
12

| Description Of Assembly Or Part  | Fig. Ref. | Quantity Per 3-Pole Breaker |           |       |       |             |        |        |               |            |                 | Ordering Number |             |           |
|--|-----------|-----------------------------|-----------|-------|-------|-------------|--------|--------|---------------|------------|-----------------|-----------------|-------------|-----------|
|  |           | K225                        | K600-K800 | K1600 | K2000 | K600S-K800S | K1600S | K2000S | K-Den 600/800 | K-Den 1600 | K-Den 600S/800S |                 | K-Den 1600S |           |
| Lower Base Molding w/Overcurrent Trip Device (Standard Type OD-3 Electro-Mechanical Trip Devices) (Specified Ampere Rating.) ① |           |                             |           |       |       |             |        |        |               |            |                 |                 |             |           |
| 12 to 20 Amp   | 7A        | 1                           |           |       |       |             |        |        |               |            |                 |                 |             | 708363-T1 |
| 20 to 40 Amp   | 7A        | 1                           |           |       |       |             |        |        |               |            |                 |                 |             | 708363-T1 |
| 40 to 70 Amp   | 7A        | 1                           |           |       |       |             |        |        |               |            |                 |                 |             | 708363-T1 |
| 70 to 125 Amp  | 7A        | 1                           |           |       |       |             |        |        |               |            |                 |                 |             | 708363-T1 |
| 120 to 225 Amp   | 7A        | 1                           |           |       |       |             |        |        |               |            |                 |                 |             | 708363-T1 |
| 40 to 70 Amp   | 7A        |                             | 1         |       |       |             |        |        |               | 1          |                 |                 |             | 708363-T3 |
| 70 to 125 Amp  | 7A        |                             | 1         |       |       |             |        |        |               | 1          |                 |                 |             | 708363-T3 |
| 120 to 225 Amp   | 7A        |                             | 1         |       |       |             |        |        |               | 1          |                 |                 |             | 708363-T3 |
| 250 to 400 Amp   | 7A        |                             | 1         |       |       |             |        |        |               | 1          |                 |                 |             | 708363-T3 |
| 400 to 600 Amp   | 7A        |                             | 1         |       |       |             |        |        |               | 1          |                 |                 |             | 708363-T3 |
| 400 to 800 Amp   | 7A        |                             | 1         |       |       |             |        |        |               | 1          |                 |                 |             | 708363-T3 |
| 120 to 225 Amp   | 7B        |                             |           | 3     |       |             |        |        |               |            | 3               |                 |             | 708363-T7 |
| 250 to 400 Amp   | 7B        |                             |           | 3     |       |             |        |        |               |            | 3               |                 |             | 708363-T5 |
| 400 to 800 Amp   | 7B        |                             |           | 3     |       |             |        |        |               |            | 3               |                 |             | 708363-T5 |
| 800 to 1600 Amp  | 7B        |                             |           | 3     |       |             |        |        |               |            | 3               |                 |             | 708363-T5 |
| 250 to 400 Amp   | 7B        |                             |           |       | 3     |             |        |        |               |            |                 |                 |             | 708363-T5 |
| 400 to 800 Amp   | 7B        |                             |           |       | 3     |             |        |        |               |            |                 |                 |             | 708363-T5 |
| 800 to 1600 Amp  | 7B        |                             |           |       | 3     |             |        |        |               |            |                 |                 |             | 708363-T5 |
| 1200 to 2000 Amp   | 7B        |                             |           |       | 3     |             |        |        |               |            |                 |                 |             | 708363-T5 |
| • Lower Base Molding w/Phase & Power Sensors   |           |                             |           |       |       |             |        |        |               |            |                 |                 |             |           |
| 50 to 225 Amp  | 8A        |                             |           |       |       | 1           |        |        |               |            | 1               |                 |             | 709733-T3 |
| 250 to 600 Amp   | 8A        |                             |           |       |       | 1           |        |        |               |            | 1               |                 |             | 709733-T4 |
| 300 to 800 Amp   | 8A        |                             |           |       |       | 1           |        |        |               |            | 1               |                 |             | 709733-T2 |
| 250 to 600 Amp   | 8B        |                             |           |       |       |             | 3      |        |               |            |                 |                 |             | 709734-T3 |
| 600 to 1600 Amp  | 8B        |                             |           |       |       |             | 3      |        |               |            |                 |                 |             | 709734-T2 |
| 250 to 600 Amp   | 8B        |                             |           |       |       |             |        | 3      |               |            |                 | 3               |             | 709734-T5 |
| 600 to 1600 Amp  | 8B        |                             |           |       |       |             |        | 3      |               |            |                 | 3               |             | 709734-T5 |
| 800 to 2000 Amp  | 8B        |                             |           |       |       |             |        | 3      |               |            |                 | 3               |             | 709734-T5 |
| • Power Shield (Standard Type SS-3) ②  |           |                             |           |       |       |             |        |        |               |            |                 |                 |             |           |
| 50 to 225 Amp  | 9         |                             |           |       |       | 1           |        |        |               |            |                 | 1               |             | 609901-T2 |
| 250 to 600 Amp   | 9         |                             |           |       |       | 1           |        | 1      |               |            |                 | 1               | 1           | 609901-T3 |
| 300 to 800 Amp   | 9         |                             |           |       |       | 1           |        |        |               |            |                 | 1               | 1           | 609901-T3 |
| 600 to 1600 Amp  | 9         |                             |           |       |       |             | 1      | 1      |               |            |                 |                 | 1           | 609901-T2 |
| 800 to 2000 Amp  | 9         |                             |           |       |       |             |        | 1      |               |            |                 |                 | 1           | 609901-T2 |
| SS Trip Device Test Set (Type 504)   | 10        |                             |           |       |       | 1           | 1      | 1      |               |            |                 | 1               | 1           | 608089-T1 |
| Operating Mechanism Assembly (M O -Stationary)   | 11A       | 1                           | 1         |       | 1     |             |        |        |               | 1          |                 |                 |             | 709774-T1 |
| Operating Mechanism Assembly (M O -Stationary)   | 11A       |                             |           | 1     | 1     |             |        |        |               |            | 1               |                 |             | 709774-T5 |
| Operating Mechanism Assembly (M O -Stationary)   | 11A       |                             |           |       |       | 1           |        | 1      |               |            |                 |                 | 1           | 709730-T1 |
| Operating Mechanism Assembly (M O -Stationary)   | 11A       |                             |           |       |       |             |        | 1      |               |            |                 |                 |             | 709730-T2 |
| Operating Mechanism Assembly (M O -Drawout)  | 11A       | 1                           | 1         |       | 1     |             |        |        |               | 1          |                 |                 |             | 709774-T2 |
| Operating Mechanism Assembly (M O -Drawout)  | 11A       |                             |           | 1     | 1     |             |        |        |               |            | 1               |                 |             | 709774-T5 |
| Operating Mechanism Assembly (M O -Drawout)  | 11A       |                             |           |       |       | 1           |        | 1      |               |            |                 |                 | 1           | 709730-T2 |
| Operating Mechanism Assembly (M O -Drawout)  | 11A       |                             |           |       |       |             | 1      | 1      |               |            |                 |                 |             | 709730-T6 |
| Operating Mechanism Assembly (E O -Stationary)   | 11B       | 1                           | 1         |       | 1     |             |        |        |               | 1          |                 |                 |             | 709774-T3 |
| Operating Mechanism Assembly (E O -Stationary)   | 11B       |                             |           | 1     | 1     |             |        |        |               |            | 1               |                 |             | 709774-T1 |
| Operating Mechanism Assembly (E O -Stationary)   | 11B       |                             |           |       |       | 1           |        | 1      |               |            |                 |                 | 1           | 709730-T3 |
| Operating Mechanism Assembly (E O -Stationary)   | 11B       |                             |           |       |       |             |        | 1      |               | 1          |                 |                 |             | 709730-T1 |
| Operating Mechanism Assembly (E O -Drawout)  | 11B       | 1                           | 1         |       | 1     |             |        |        |               | 1          |                 |                 |             | 709774-T4 |
| Operating Mechanism Assembly (E O -Drawout)  | 11B       |                             |           | 1     | 1     |             |        |        |               |            | 1               |                 |             | 709774-T5 |
| Operating Mechanism Assembly (E O -Drawout)  | 11B       |                             |           |       |       | 1           |        | 1      |               |            |                 | 1               |             | 709730-T6 |
| Operating Mechanism Assembly (E O -Drawout)  | 11B       |                             |           |       |       |             | 1      | 1      |               |            |                 |                 | 1           | 709730-T5 |
| ▲ Motor Assembly (When Used)   |           |                             |           |       |       |             |        |        |               |            |                 |                 |             |           |
| 48 Volts DC  | 12        | 1                           | 1         | 1     | 1     | 1           | 1      | 1      | 1             | 1          | 1               | 1               | 1           | 709795-T3 |
| 110/120V AC or 125V DC   | 12        | 1                           | 1         | 1     | 1     | 1           | 1      | 1      | 1             | 1          | 1               | 1               | 1           | 709795-T1 |
| 208/240V AC or 250V DC   | 12        | 1                           | 1         | 1     | 1     | 1           | 1      | 1      | 1             | 1          | 1               | 1               | 1           | 709795-T2 |

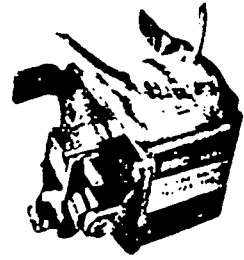
① Basic OD-3 Overcurrent listed, for OD-4, OD-5, OD-6, etc. refer to the Current Breaker Division.  
 ② Basic (Phase only) Power Shield, for SS-4, SS-5, SS-7, etc. and for target or alarm option adders, refer to the Circuit Breaker Division.



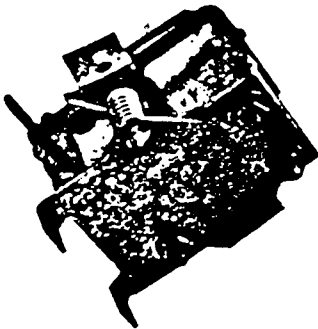
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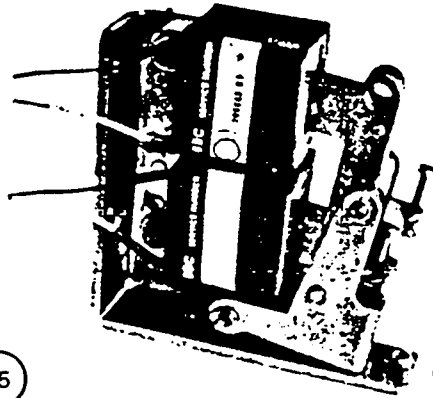
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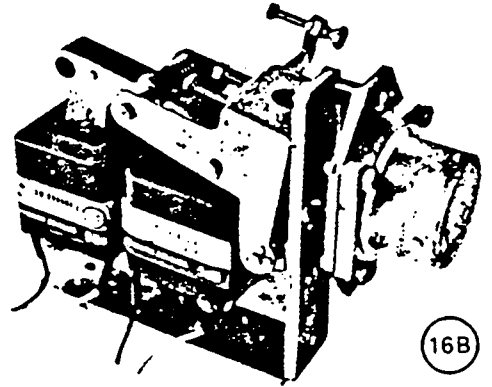
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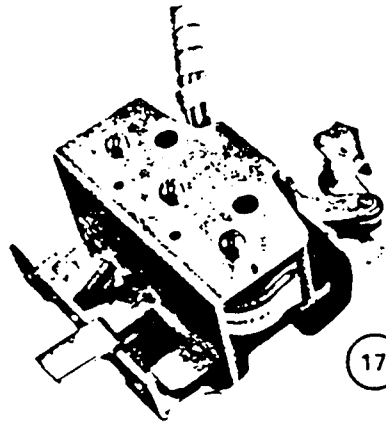
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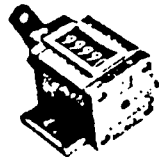
16A



16B



17



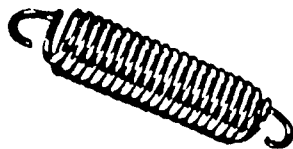
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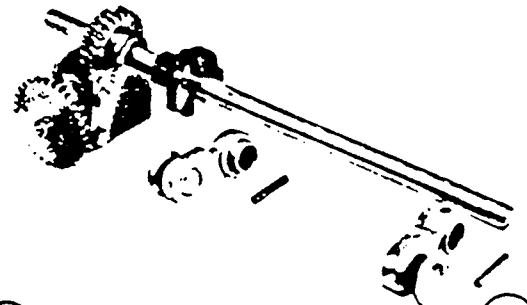
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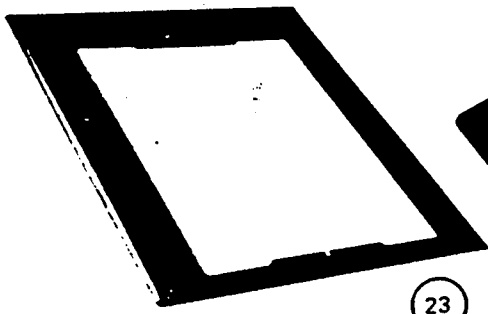


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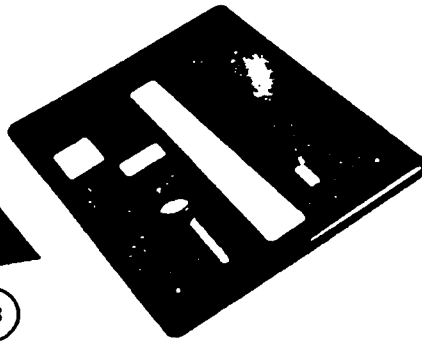


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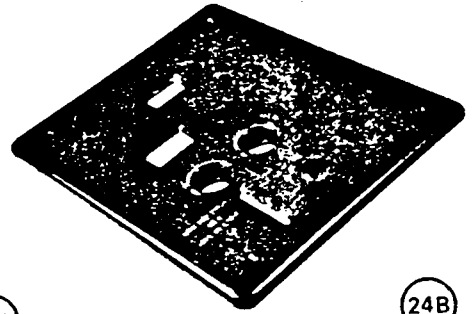
| Description Of Assembly Or Part                      | Fig. Ref. | Quantity Per 3-Pole Breaker |           |       |       |             |        |        |               |            |                 |             | Ordering Number |            |
|--|-----------|-----------------------------|-----------|-------|-------|-------------|--------|--------|---------------|------------|-----------------|-------------|-----------------|------------|
|  |           | K225                        | K600-K800 | K1600 | K2000 | K600S-K800S | K1600S | K2000S | K-Don 600/800 | K-Don 1600 | K-Don 600S/800S | K-Don 1600S |                 |            |
| ▲ Control Device Assembly (When Used)                |           |                             |           |       |       |             |        |        |               |            |                 |             |                 |            |
| 110/120V AC  | 13        | 1                           | 1         | 1     | 1     | 1           | 1      | 1      | 1             | 1          | 1               | 1           | 1               | 708392-T9  |
| 208/240V AC  | 13        | 1                           | 1         | 1     | 1     | 1           | 1      | 1      | 1             | 1          | 1               | 1           | 1               | 708392-T16 |
| 48V DC   | 13        | 1                           | 1         | 1     | 1     | 1           | 1      | 1      | 1             | 1          | 1               | 1           | 1               | 708392-T6  |
| 125V DC  | 13        | 1                           | 1         | 1     | 1     | 1           | 1      | 1      | 1             | 1          | 1               | 1           | 1               | 708392-T7  |
| 250V DC  | 13        | 1                           | 1         | 1     | 1     | 1           | 1      | 1      | 1             | 1          | 1               | 1           | 1               | 708392-T8  |
| ▲ Shunt Trip Assembly (When Used)                    |           |                             |           |       |       |             |        |        |               |            |                 |             |                 |            |
| 110/120V AC  | 14A       | 1                           | 1         | 1     | 1     |             | 1      | 1      | 1             | 1          |                 |             | 1               | 708393-T12 |
| 208/240V AC  | 14A       | 1                           | 1         | 1     | 1     |             | 1      | 1      | 1             | 1          |                 |             | 1               | 708393-T10 |
| 360/480V AC  | 14A       | 1                           | 1         | 1     | 1     |             | 1      | 1      | 1             | 1          |                 |             | 1               | 708393-T11 |
| 500/600V AC  | 14A       | 1                           | 1         | 1     | 1     |             | 1      | 1      | 1             | 1          |                 |             | 1               | 708393-T8  |
| 48V DC   | 14A       | 1                           | 1         | 1     | 1     |             | 1      | 1      | 1             | 1          |                 |             | 1               | 708393-T6  |
| 125V DC  | 14A       | 1                           | 1         | 1     | 1     |             | 1      | 1      | 1             | 1          |                 |             | 1               | 708393-T7  |
| 250V DC  | 14A       | 1                           | 1         | 1     | 1     |             | 1      | 1      | 1             | 1          |                 |             | 1               | 708393-T8  |
| ▲ Shunt Trip Assembly (When Used)                    |           |                             |           |       |       |             |        |        |               |            |                 |             |                 |            |
| 110/120V AC  | 14B       |                             |           |       |       |             | 1      |        |               |            |                 | 1           |                 | 709723-T12 |
| 208/240V AC  | 14B       |                             |           |       |       |             | 1      |        |               |            |                 | 1           |                 | 709723-T10 |
| 360/480V AC  | 14B       |                             |           |       |       |             | 1      |        |               |            |                 | 1           |                 | 709723-T11 |
| 500/600V AC  | 14B       |                             |           |       |       |             | 1      |        |               |            |                 | 1           |                 | 709723-T8  |
| 48V DC   | 14B       |                             |           |       |       |             | 1      |        |               |            |                 | 1           |                 | 709723-T6  |
| 125V DC  | 14B       |                             |           |       |       |             | 1      |        |               |            |                 | 1           |                 | 709723-T7  |
| 250V DC  | 14B       |                             |           |       |       |             | 1      |        |               |            |                 | 1           |                 | 709723-T8  |
| ▲ Magnetic Latch Assembly                            | 15        |                             |           |       |       |             | 1      | 1      | 1             |            |                 | 1           | 1               | 160862-T3  |
| ▲ Undervoltage Trip Device-Instantaneous (When Used) |           |                             |           |       |       |             |        |        |               |            |                 |             |                 |            |
| 110/120V AC  | 16A       | 1                           | 1         | 1     | 1     | 1           | 1      | 1      | 1             | 1          | 1               | 1           | 1               | 708472-T1  |
| 220/240V AC  | 16A       | 1                           | 1         | 1     | 1     | 1           | 1      | 1      | 1             | 1          | 1               | 1           | 1               | 708472-T2  |
| 440/480V AC  | 16A       | 1                           | 1         | 1     | 1     | 1           | 1      | 1      | 1             | 1          | 1               | 1           | 1               | 708472-T4  |
| 550/600V AC  | 16A       | 1                           | 1         | 1     | 1     | 1           | 1      | 1      | 1             | 1          | 1               | 1           | 1               | 708472-T5  |
| 48V DC   | 16A       | 1                           | 1         | 1     | 1     | 1           | 1      | 1      | 1             | 1          | 1               | 1           | 1               | 708472-T6  |
| 125V DC  | 16A       | 1                           | 1         | 1     | 1     | 1           | 1      | 1      | 1             | 1          | 1               | 1           | 1               | 708472-T7  |
| 250V DC  | 16A       | 1                           | 1         | 1     | 1     | 1           | 1      | 1      | 1             | 1          | 1               | 1           | 1               | 708472-T8  |
| ▲ Undervoltage Trip Device-Time Delay (When Used)    |           |                             |           |       |       |             |        |        |               |            |                 |             |                 |            |
| 110/120V AC  | 16B       | 1                           | 1         | 1     | 1     | 1           | 1      | 1      | 1             | 1          | 1               | 1           | 1               | 708472-T9  |
| 220/240V AC  | 16B       | 1                           | 1         | 1     | 1     | 1           | 1      | 1      | 1             | 1          | 1               | 1           | 1               | 708472-T10 |
| 440/480V AC  | 16B       | 1                           | 1         | 1     | 1     | 1           | 1      | 1      | 1             | 1          | 1               | 1           | 1               | 708472-T12 |
| 550/600V AC  | 16B       | 1                           | 1         | 1     | 1     | 1           | 1      | 1      | 1             | 1          | 1               | 1           | 1               | 708472-T13 |
| 48V DC   | 16B       | 1                           | 1         | 1     | 1     | 1           | 1      | 1      | 1             | 1          | 1               | 1           | 1               | 708472-T14 |
| 125V DC  | 16B       | 1                           | 1         | 1     | 1     | 1           | 1      | 1      | 1             | 1          | 1               | 1           | 1               | 708472-T15 |
| 250V DC  | 16B       | 1                           | 1         | 1     | 1     | 1           | 1      | 1      | 1             | 1          | 1               | 1           | 1               | 708472-T16 |
| Open Fuse Trip Device                                | 17        |                             |           |       |       |             |        |        | 1             | 1          | 1               | 1           | 1               | 709724-T1  |
| Operation Counter (When Used)                        | 18        | 1                           | 1         | 1     | 1     | 1           | 1      | 1      | 1             | 1          | 1               | 1           | 1               | 180522-C   |
| Motor Disconnect Switch (When Used)                  | 19        | 1                           | 1         | 1     | 1     | 1           | 1      | 1      | 1             | 1          | 1               | 1           | 1               | 703270-A   |
| Electrical Close Switch (When Used)                  | 20        | 1                           | 1         | 1     | 1     | 1           | 1      | 1      | 1             | 1          | 1               | 1           | 1               | 703271-A   |
| Opening Spring                                       | 21        | 2                           | 2         |       |       | 2           |        |        | 2             |            |                 | 2           |                 | 650220-A6  |
| Opening Spring                                       | 21        |                             |           | 2     | 2     |             | 2      | 2      |               | 2          |                 |             | 2               | 650220-A7  |
| Drawout Mechanism Assembly                           | 22        | 1                           | 1         |       |       | 1           |        |        | 1             |            | 1               |             |                 | 703230-T15 |
| Drawout Mechanism Assembly                           | 22        |                             |           | 1     | 1     |             | 1      | 1      |               |            |                 | 1           | 1               | 703230-T16 |



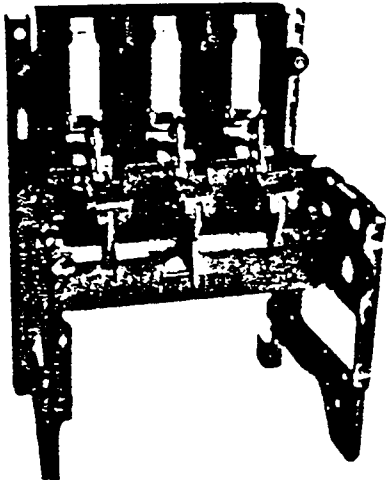
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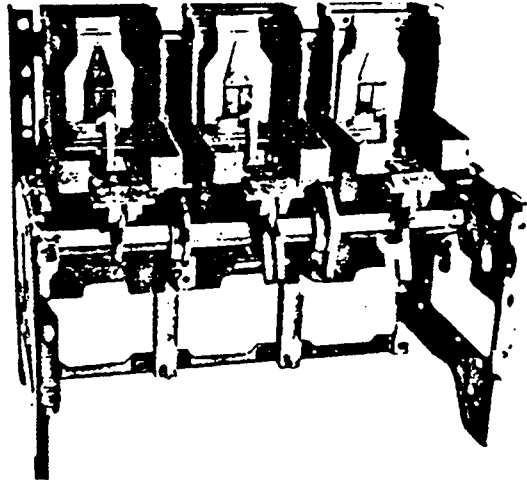
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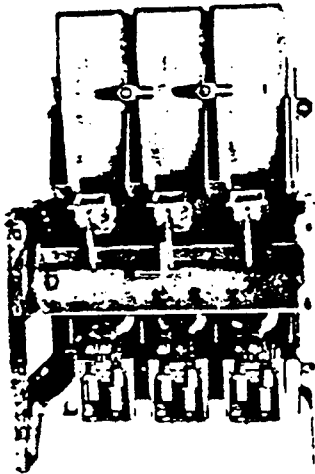
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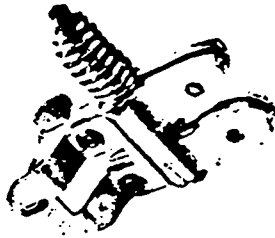
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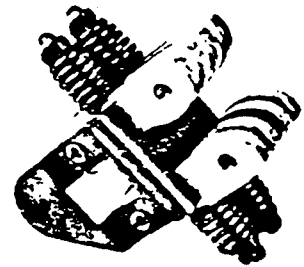
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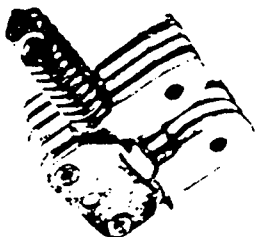
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27A



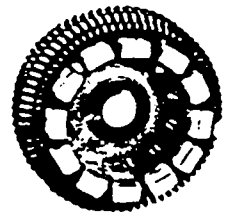
27B



27C

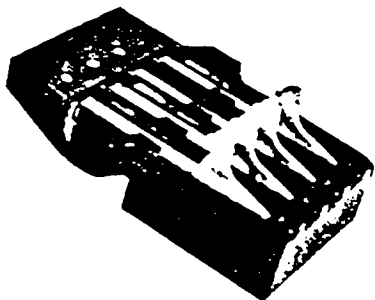


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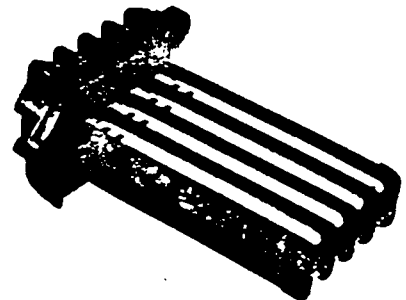


27E

| Description Of Assembly Or Part                      | Fig. Ref. | Quantity Per 3-Pole Breaker |           |       |       |             |        |        |               |            |                 |             | Ordering Number |
|--|-----------|-----------------------------|-----------|-------|-------|-------------|--------|--------|---------------|------------|-----------------|-------------|-----------------|
|  |           | K225                        | K600-K800 | K1600 | K2000 | K600S-K800S | K1600S | K2000S | K-Don 600/800 | K-Don 1600 | K-Don 600S/800S | K-Don 1600S |                 |
| Dust Plate   | 23        | 1                           | 1         | 1     | 1     | 1           | 1      | 1      | 1             | 1          | 1               | 1           | 702669-A        |
| Escutcheon Front Plate Assembly                      |           |                             |           |       |       |             |        |        |               |            |                 |             |                 |
| M.O.-Stationary                                      | 24A       | 1                           | 1         | 1     | 1     | 1           | 1      | 1      | 1             | 1          | 1               | 1           | 708118-K1       |
| M.O.-Drawout   | 24A       | 1                           | 1         | 1     | 1     | 1           | 1      | 1      | 1             | 1          | 1               | 1           | 708118-K2       |
| E.O.-Stationary                                      | 24B       | 1                           | 1         | 1     | 1     | 1           | 1      | 1      | 1             | 1          | 1               | 1           | 708119-K3       |
| E.O.-Drawout   | 24B       | 1                           | 1         | 1     | 1     | 1           | 1      | 1      | 1             | 1          | 1               | 1           | 708119-K4       |
| Basic Frame Assembly                                 | 25A       | 1                           | 1         |       |       | 1           |        |        | 1             |            | 1               |             | 708356-T1       |
| Basic Frame Assembly                                 | 25A       |                             |           |       |       |             |        |        | 1             |            |                 |             | 708356-T3       |
| Basic Frame Assembly                                 | 25B       |                             |           | 1     | 1     |             | 1      | 1      |               | 1          |                 | 1           | 708356-T5       |
| Basic Breaker Assembly                               | 26        | 1                           |           |       |       | 1           |        |        | 1             |            | 1               |             | 708355-T1       |
| Basic Breaker Assembly                               | 26        |                             | 1         |       |       |             |        |        |               |            |                 |             | 708355-T3       |
| Basic Breaker Assembly                               | 26        |                             |           | 1     |       |             | 1      |        |               | 1          |                 |             | 708355-T5       |
| Basic Breaker Assembly                               | 26        |                             |           |       | 1     |             |        | 1      |               |            |                 | 1           | 708355-T7       |
| Primary Disconnect Assembly (When Used)              | 27A       | 6                           |           |       |       |             |        |        |               |            |                 |             | 706777-T1       |
| Primary Disconnect Assembly (When Used)              | 27B       |                             | 6         |       |       |             |        |        | 3             |            | 3               |             | 706777-T3       |
| Primary Disconnect Assembly (When Used)              | 27C       |                             |           |       |       |             |        |        | 3             |            | 3               |             | 706777-T5       |
| Primary Disconnect Assembly (When Used)              | 27D       |                             |           | 6     |       |             | 6      |        |               |            |                 |             | 706777-T17      |
| Primary Disconnect Assembly (When Used)              | 27E       |                             |           |       | 6     |             |        | 6      |               | 6          |                 | 6           | 709957-T1       |
| Secondary Disconnect Assembly-Moving (When Used)     | 28        | 2                           | 2         | 2     | 2     | 2           | 2      | 2      | 2             | 2          | 2               | 2           | 703153-K1       |
| Secondary Disconnect Assembly-Stationary (When Used) | 29        | 2                           | 2         | 2     | 2     | 2           | 2      | 2      | 2             | 2          | 2               | 2           | 703152-K1       |

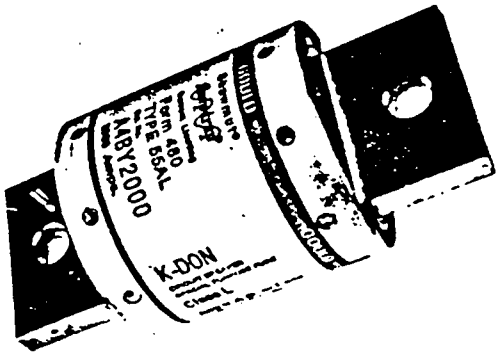


28



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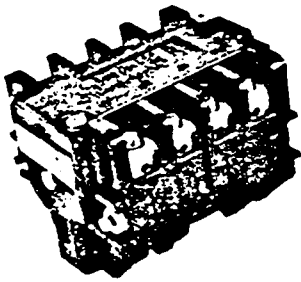




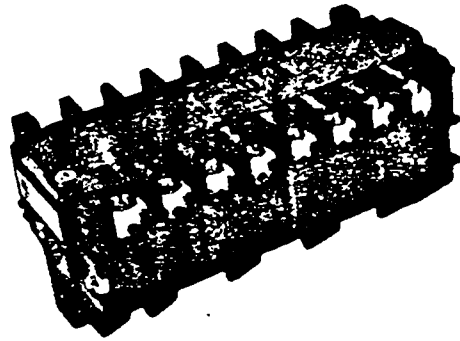
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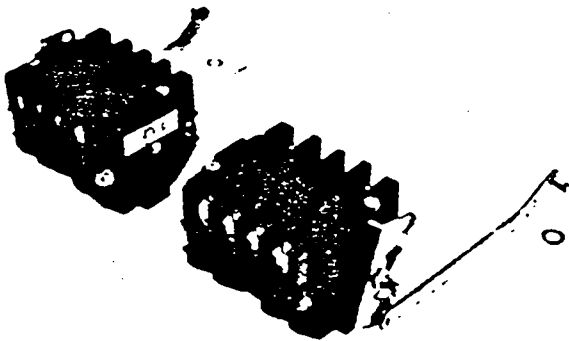
30B



31



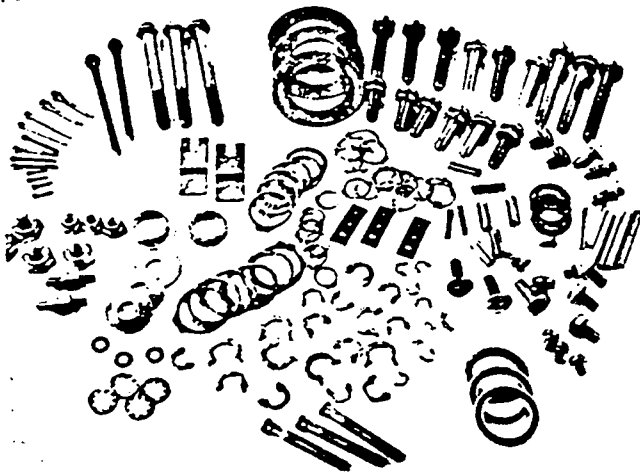
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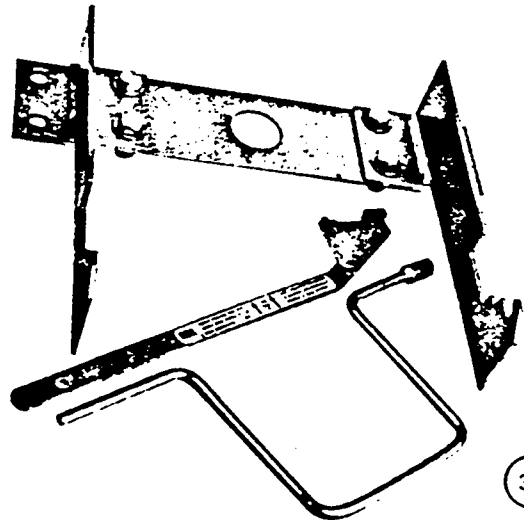
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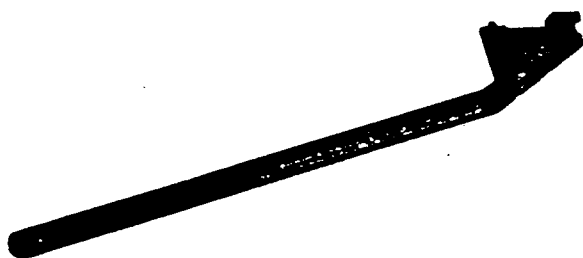


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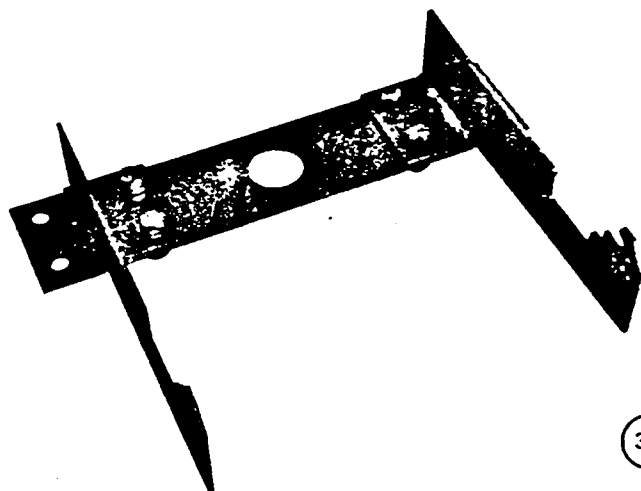


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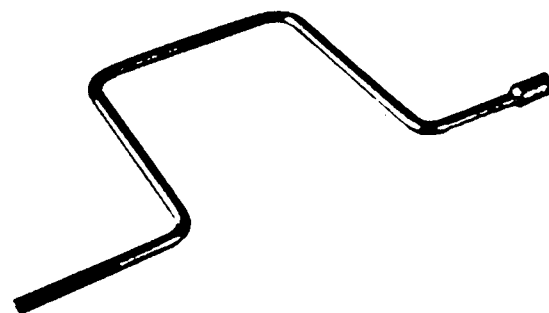
| Description Of Assembly Or Part      | Fig. Ref. | Quantity Per 3-Pole Breaker                  |           |       |       |             |        |        |               |            |                 | Ordering Number |             |            |  |  |  |  |  |  |  |  |  |           |
|--------------------------------------|-----------|--|-----------|-------|-------|-------------|--------|--------|---------------|------------|-----------------|-----------------|-------------|------------|--|--|--|--|--|--|--|--|--|-----------|
|                                      |           | K225   | K600-K800 | K1600 | K2000 | K600S-K800S | K1600S | K2000S | K-Don 600/800 | K-Don 1600 | K-Don 600S/800S |                 | K-Don 1600S |            |  |  |  |  |  |  |  |  |  |           |
| ▲ Current Limiting Fuse (When Used)  |           |  |           |       |       |             |        |        |               |            |                 |                 |             |            |  |  |  |  |  |  |  |  |  |           |
| 300 Amp (Non-UL)                     | 30A       |  |           |       |       |             |        |        | 3             | 3          | 3               |                 |             | 710316-A1  |  |  |  |  |  |  |  |  |  |           |
| 400 Amp (Non-UL)                     | 30A       |  |           |       |       |             |        |        | 3             | 3          | 3               |                 |             | 710316-A2  |  |  |  |  |  |  |  |  |  |           |
| 600 Amp (Non-UL)                     | 30A       |  |           |       |       |             |        |        | 3             | 3          | 3               | 3               |             | 710316-A3  |  |  |  |  |  |  |  |  |  |           |
| 800 Amp (UL)                         | 30A       |  |           |       |       |             |        |        | 3             | 3          | 3               | 3               |             | 710316-A4  |  |  |  |  |  |  |  |  |  |           |
| 1000 Amp (UL)                        | 30A       |  |           |       |       |             |        |        | 3             | 3          | 3               | 3               |             | 710316-A5  |  |  |  |  |  |  |  |  |  |           |
| 1200 Amp (UL)                        | 30A       |  |           |       |       |             |        |        | 3             | 3          | 3               | 3               |             | 710316-A6  |  |  |  |  |  |  |  |  |  |           |
| 1600 Amp (UL)                        | 30A       |  |           |       |       |             |        |        |               | 3          |                 | 3               |             | 710316-A7  |  |  |  |  |  |  |  |  |  |           |
| 2000 Amp (UL)                        | 30A       |  |           |       |       |             |        |        |               |            | 3               | 3               |             | 710316-A8  |  |  |  |  |  |  |  |  |  |           |
| 2500 Amp (UL)                        | 30B       |  |           |       |       |             |        |        |               | 3          |                 | 3               |             | 712652-A   |  |  |  |  |  |  |  |  |  |           |
| Auxiliary Switch - 4 Contact         | 31        | 1  | 1         | 1     | 1     | 1           | 1      | 1      | 1             | 1          | 1               | 1               | 1           | 700034-K1  |  |  |  |  |  |  |  |  |  |           |
| Auxiliary Switch - 8 Contact         | 32        | 1  | 1         | 1     | 1     | 1           | 1      | 1      | 1             | 1          | 1               | 1               | 1           | 700038-K1  |  |  |  |  |  |  |  |  |  |           |
| Auxiliary Switch w/mounting          |           |  |           |       |       |             |        |        |               |            |                 |                 |             |            |  |  |  |  |  |  |  |  |  |           |
| 4 Contact - RH                       | 33        | 1  | 1         |       |       | 1           |        |        | 1             |            | 1               |                 |             | 709653-T1  |  |  |  |  |  |  |  |  |  |           |
| 8 Contact - RH                       | 33        | 1  | 1         |       |       | 1           |        |        | 1             |            | 1               |                 |             | 709653-T2  |  |  |  |  |  |  |  |  |  |           |
| 4 Contact - LH                       | 33        | 1  | 1         |       |       | 1           |        |        | 1             |            | 1               |                 |             | 709653-T3  |  |  |  |  |  |  |  |  |  |           |
| 4 Cont. -LH & 4 Cont. -RH (As shown) | 33        | 1  | 1         |       |       | 1           |        |        | 1             |            | 1               |                 |             | 709653-T4  |  |  |  |  |  |  |  |  |  |           |
| 4 Cont. -LH & 8 Cont. -RH            | 33        | 1  | 1         |       |       | 1           |        |        | 1             |            | 1               |                 |             | 709653-T5  |  |  |  |  |  |  |  |  |  |           |
| 4 Contact - RH                       | 33        |  |           | 1     | 1     |             | 1      | 1      |               | 1          |                 | 1               |             | 709653-T6  |  |  |  |  |  |  |  |  |  |           |
| 8 Contact - RH                       | 33        |  |           | 1     | 1     |             | 1      | 1      |               | 1          |                 | 1               |             | 709653-T7  |  |  |  |  |  |  |  |  |  |           |
| 4 Contact - LH                       | 33        |  |           | 1     | 1     |             | 1      | 1      |               | 1          |                 | 1               |             | 709653-T8  |  |  |  |  |  |  |  |  |  |           |
| 4 Cont. -LH & 4 Cont. -RH            | 33        |  |           | 1     | 1     |             | 1      | 1      |               | 1          |                 | 1               |             | 709653-T9  |  |  |  |  |  |  |  |  |  |           |
| 4 Cont. -LH & 8 Cont. -RH            | 33        |  |           | 1     | 1     |             | 1      | 1      |               | 1          |                 | 1               |             | 709653-T10 |  |  |  |  |  |  |  |  |  |           |
| Ground Clip                          | 34        | 1  | 1         | 1     | 1     | 1           | 1      | 1      | 1             | 1          | 1               | 1               | 1           | 703230-T3  |  |  |  |  |  |  |  |  |  |           |
| Hardware & Retainer Kit              | 35        | 1  | 1         | 1     | 1     | 1           | 1      | 1      | 1             | 1          | 1               | 1               | 1           | 709654-T2  |  |  |  |  |  |  |  |  |  |           |
| Accessories                          |           | Order Accessories in quantities as required. |           |       |       |             |        |        |               |            |                 |                 |             |            |  |  |  |  |  |  |  |  |  |           |
| Accessory Kit                        | 36        |  |           |       |       |             |        |        |               |            |                 |                 |             |            |  |  |  |  |  |  |  |  |  | 709770-T1 |
| Maintenance Handle                   | 37        |  |           |       |       |             |        |        |               |            |                 |                 |             |            |  |  |  |  |  |  |  |  |  | 703848-K1 |
| Lifting Yoke                         | 38        |  |           |       |       |             |        |        |               |            |                 |                 |             |            |  |  |  |  |  |  |  |  |  | 709770-T5 |
| Racking Crank                        | 39        |  |           |       |       |             |        |        |               |            |                 |                 |             |            |  |  |  |  |  |  |  |  |  | 711706-K1 |



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Notes