

# KIRK® Key Interlocks Application Schemes

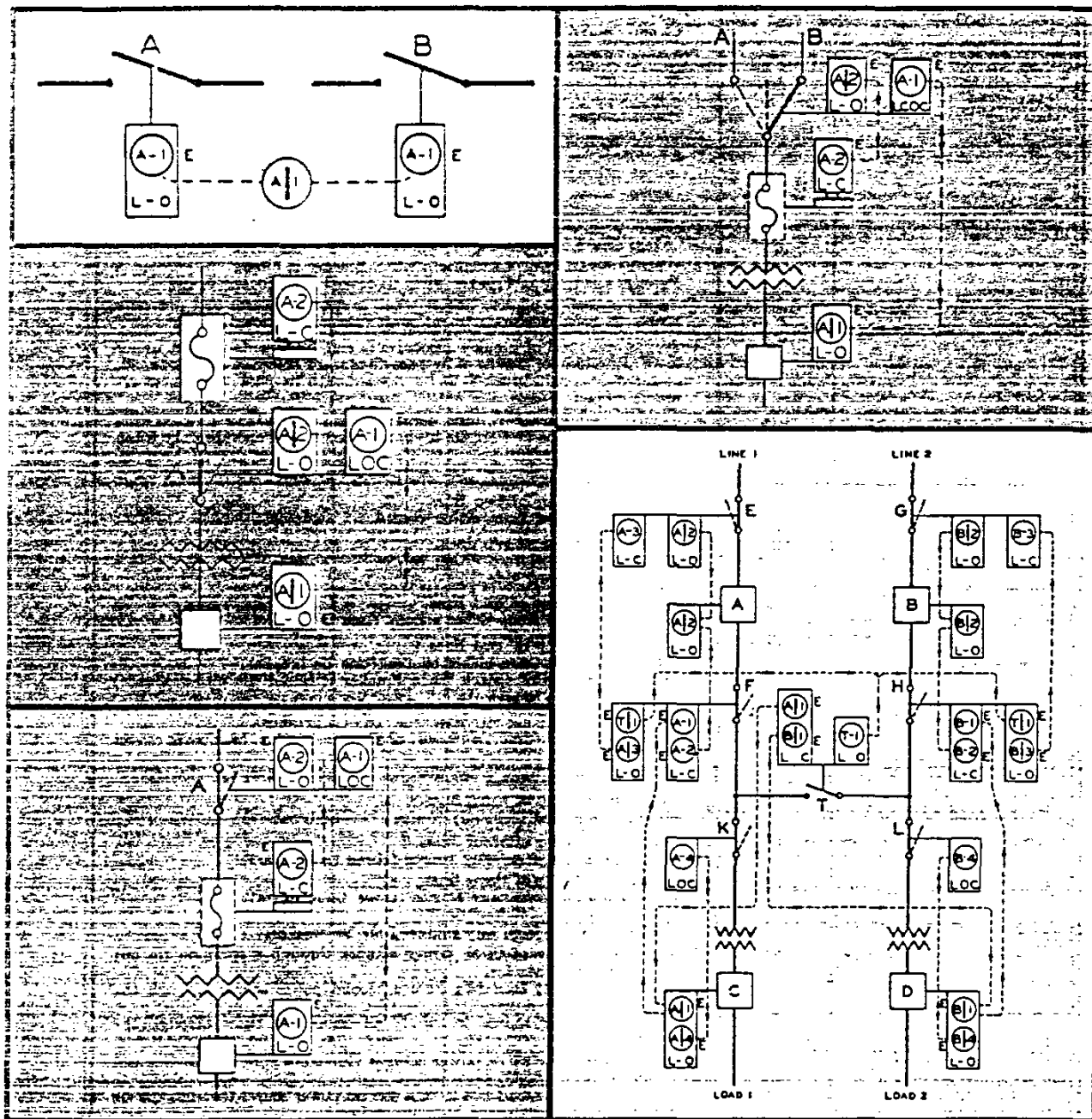


ABB Power Distribution, Inc.  
Circuit Breaker Division

**ABB**  
ASEA BROWN BOVERI

# TABLE OF CONTENTS

| Purpose of Interlocking   | Scheme No. | Function   |
|---|------------|--|
| SWITCH AND BREAKER  | 1          | Prevents opening of switch when breaker is closed.   |
|   | 2          | Prevents operation of switch when breaker is closed. Permits reclosing of breaker for servicing when switch is locked open.  |
|   | 3          | Prevents operation of switch when breaker is closed. Circuit cannot be cleared until proper supervisory key is obtained.   |
| GROUNDING SWITCH WITH MAIN SWITCH                               | 4          | Prevents closing of grounding switch when main switch is closed, and vice versa.   |
| ISOLATING SWITCHES AND BREAKER                                  | 5          | Prevents operation of disconnects when breaker is closed.  |
|   | 6          | Prevents opening fuse compartment door when disconnects are closed. Prevents operation of disconnect when any or all of a group of breakers are closed. Operates through transfer interlock, no sequence required for breaker closing.   |
|   | 7          | Prevents operation of disconnect when any or all of a group of breakers are closed. Breakers closed in prearranged sequence.   |
|   | 8          | Prevents operation of disconnects when breaker is closed. Permits servicing of breaker when disconnects are locked open.   |
|   | 9          | Prevents operation of disconnects when breaker is closed, and prevents access to breaker compartment with disconnects closed.  |
| ISOLATING SWITCHES AND BREAKER OR REGULATOR WITH BY-PASS SWITCH | 10         | Prevents operation of breaker disconnects and by-pass disconnect under load. Provides for closing of by-pass disconnect before circuit is opened, or permits circuit breaker to be opened with by-pass disconnect remaining open.  |
|   | 10A        | Prevents operation of voltage regulator disconnects and by-pass disconnect under load. Permits by-pass disconnect to operate only when regulator is in neutral position. Permits isolating regulator for servicing.  |
| PREVENT PARALLELING OF LINES                                    | 11         | Prevents paralleling of two lines. —single load, fed from either source.   |
|   | 12         | Prevents paralleling of two lines. —single load, fed from either source. —breaker on load side.  |
|   | 13         | Prevents paralleling of two lines. —two loads, fed from either source. (one tie breaker)   |
|   | 14         | Prevents paralleling of two lines. —two loads, fed from either source. (one tie breaker) Prevents operation of switch when breaker is closed (on either source)  |
|   | 15         | Prevents paralleling of two lines —two loads fed from either source (one tie breaker). Prevents operation (open or closed) of disconnect when breaker is closed (on either source). Prevents access to fuses when disconnects and breakers are closed.   |
|   | 16         | Prevents paralleling of three lines. —three loads, fed from any source (two tie-breakers)  |
|   | 17         | Prevents paralleling of four lines. —four loads fed from any source (three tie-breakers)   |
|   | 18         | Prevents paralleling of three lines. —three loads fed from any source (three tie-breakers)   |
|   | 19         | Prevents paralleling of four lines. —four loads fed from any source (four tie-breakers)  |
|   | 20         | Prevents paralleling of three power sources through a common tie bus not normally in service. Permits feeding any load bus from a second power source through the tie bus. Permits one power source to supply all three load buses through the tie bus.  |
|   | 21         | Prevents paralleling three power sources through a common tie bus not normally in service. Permits feeding any load bus from a second power source through the tie bus only when authorized by a supervisor. Permits one power source to supply all three load buses through the tie bus only when authorized by a supervisor. |

## TABLE OF CONTENTS

| Purpose of Interlocking                       | Scheme No. | Function  |
|---|------------|---|
| PREVENT<br>PARALLELING<br>OF LINES            | 22         | Prevents paralleling two incoming primary sources through primary tie bus disconnect.<br>Prevents operation (open or closed) of the disconnects under load.<br>Permits one power source to supply both loads through tie bus.   |
|   | 23         | Prevents paralleling two incoming primary sources through the primary tie bus disconnect or secondary tie bus breaker.<br>Prevents operation (open or closed) of disconnects under load.<br>Permits one power source to supply both loads through either the primary or secondary tie bus.  |
|   | 24         | Prevents paralleling of two incoming primary sources.<br>Prevents operation (open or closed) of disconnects under load.<br>Permits the isolating of breakers for servicing.<br>Permits one power source to supply both loads through tie bus.   |
| INTERRUPTER<br>SWITCH<br>SCHEMES              | 25         | Prevents opening fuse compartment door when the interrupter switch is closed.<br>Prevents closing interrupter switch until fuse compartment door is locked closed.  |
|   | 26         | Prevents operation (open or closed) of interrupter switch when breaker is closed.<br>Permits the breaker to be serviced and operated while the interrupter switch is locked open.   |
|   | 27         | Prevents operation (open or closed) of interrupter switch when breaker is closed.<br>Prevents opening fuse compartment door when the interrupter switch is closed.<br>Prevents closing interrupter switch until fuse compartment door is locked closed.<br>Permits the breaker to be serviced and operated while the interrupter switch is locked open.   |
|   | 28         | Prevents dropping load—when shifting from one source to the other.<br>Prevents opening both interrupter switches at the same time—(Permits both interrupter switches to be closed at the same time.)  |
|   | 29         | Prevents paralleling two lines—requires dropping load when shifting from one source to the other.<br>Prevents closing both interrupter switches at the same time—(Permits both interrupter switches to be opened at the same time.)   |
|   | 30         | Prevents paralleling two lines—requires dropping load when shifting from one source to the other.<br>Prevents closing both interrupter switches at the same time—permits both interrupter switches to be open at the same time.<br>Prevents operation (open or closed) of either interrupter switch when breaker is closed.<br>Permits the breaker to be serviced and operated while both interrupter switches are locked open. |
|   | 31         | Prevents operation (closed, open or closed) of a three position interrupter switch when the breaker is closed.<br>Permits the breaker to be serviced and operated while the interrupter switch is locked open.  |
|   | 32         | Prevents operation (closed, open or closed) of a three position interrupter switch when the breaker is closed.<br>Prevents opening fuse compartment door when the interrupter switch is closed.<br>Prevents closing interrupter switch until fuse compartment door is locked closed.<br>Permits the breaker to be serviced and operated while the interrupter switch is locked open.  |
| POWER SWITCH<br>AND<br>DOOR OR GUARD          | 33         | Prevents opening of guard when motor circuit is closed. (Guard may be a door to centrifuge cubical, electrostatic dust collector, etc.). Scheme includes time delay element—not necessary for this function.  |
| TIME DELAY<br>AND SOLENOID<br>RELEASE SCHEMES | 33         | Prevents opening of guard, or door for a predetermined time after removal of power. (From motor, centrifuge, condensers, etc.)  |
|   | 34         | Prevents laboratory personnel from gaining access to high-voltage equipment area while testing is going on.   |

## INTERLOCKING - TWO OR MORE DEVICES

With the fundamental applications as developed above it is quite simple to extend the application to the interlocking of two or more devices in a desired sequence.

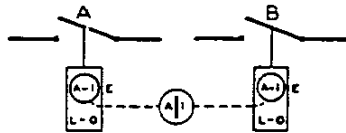


FIG. 1

Two devices are shown in Fig. 1. In operation they are not closed at the same time. With the interlocks arranged as shown only one key is required in the interlocking system. Both devices are shown open, therefore, the key is free. To close any one device the key is inserted and turned in that particular lock to withdraw the interlock bolt. The key is held in this lock until the device is again locked open. This simple interlocking sequence lends itself to a multitude of applications. The procedure is the same for two devices, neither of which is to be opened at the same time.

## SWITCH AND BREAKER SCHEME 1

To prevent opening of Switch A when Breaker B is closed.

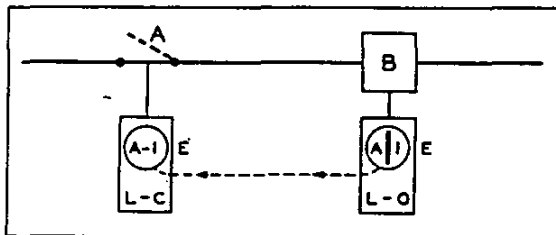


FIG. 2

Switch A and Breaker B are in closed position. Key A-1 is held in Breaker B interlock.

- 1—Open breaker.
  - 2—Turn key A-1 in L-O interlock on breaker B to lock open. Key A-1 is now free.
  - 3—Insert Key A-1 in L-C interlock on switch A and turn to unlock.
  - 4—Open switch A. Key A-1 is now held.
- Reverse sequence to restore service.

## SCHEME 2

To prevent operation of Switch A when Breaker B is closed. Permits reclosing of Breaker for servicing when Switch is locked open.

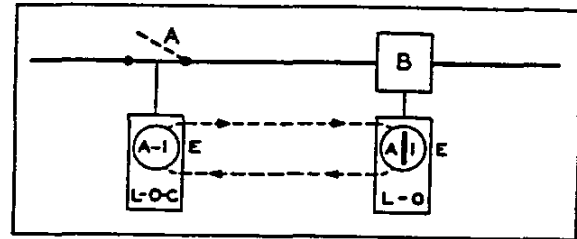


FIG. 3

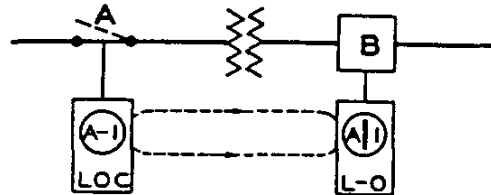


FIG. 4

Switch A and Breaker B are in closed position. Key A-1 is held in Breaker interlock.

- 1—Open breaker.
- 2—Turn key A-1 in L-O interlock on breaker B to lock open. Key A-1 is now free.
- 3—Insert Key A-1 in L-O-C interlock on switch A and turn to unlock.
- 4—Open switch A.
- 5—Turn key A-1 in L-O-C interlock on switch A to lock open. Key A-1 is now free.
- 6—Return Key A-1 to breaker interlock and unlock for operation during servicing period.

Reverse sequence to restore service.

### SCHEME 3

To prevent operation of switch A when Breaker B is closed. Circuit cannot be cleared until proper supervisory key is obtained.

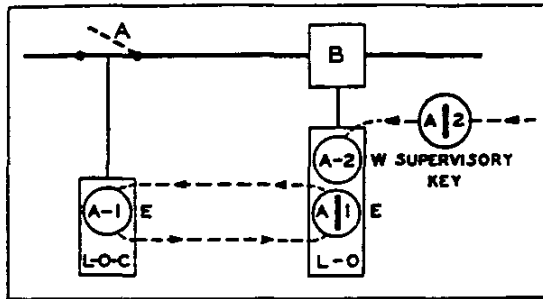


FIG. 1

Breaker B and switch A shown closed. Key A-1 held in Breaker interlock. Key A-2 retained by supervisor.

- 1—Obtain key A-2 from supervisor.
- 2—Open breaker.
- 3—Insert key A-2 in L-O interlock on Breaker B and turn key A-1 to lock open. Key A-2 is now held and key A-1 is free.
- 4—Insert Key A-1 in L-O-C interlock on switch A and turn to unlock.
- 5—Open switch A.
- 6—Turn key A-1 in L-O-C interlock on switch A to lock open. Key A-1 is now free.
- 7—Return Key A-1 to breaker interlock and unlock for operation during servicing period.

Reverse sequence to restore service.

### GROUNDING SWITCH WITH MAIN SWITCH SCHEME 4

To prevent closing of Grounding Switch B when main Switch A is closed, and vice versa.

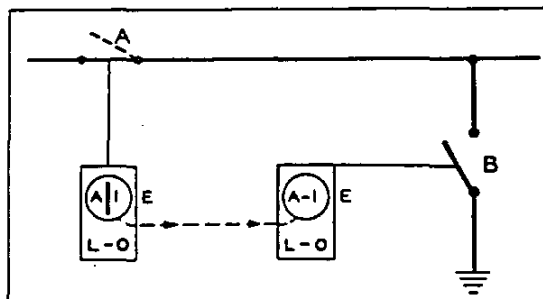


FIG. 2

Main Switch A shown closed and Grounding Switch B shown open. Key A-1 is held in Main Switch interlock.

- 1—Open main switch A.
- 2—Turn key A-1 in L-O interlock on main switch to lock open. Key A-1 is now free.
- 3—Insert key A-1 in L-O interlock on grounding switch B and turn to unlock. Key A-1 is now held.
- 4—Close grounding switch B.

Reverse sequence to restore service.

### ISOLATING SWITCHES AND BREAKER SCHEME 5

To prevent operation of disconnect switch A when breaker B is closed.

To prevent opening fuse compartment door when the disconnect switch A is closed.

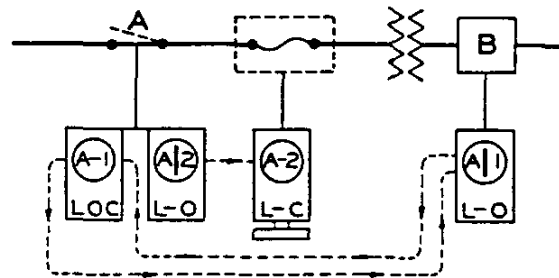


FIG. 3

Breaker, fuse compartment door and disconnect switch are shown in closed positions. Key A-1 is held in breaker interlock and key A-2 is held in disconnect interlock.

To service breaker:

- 1—Open breaker.
- 2—Turn key A-1 in L-O interlock on breaker to lock breaker open. Key A-1 is now free.
- 3—Insert key A-1 in L-O-C interlock on disconnecting switch and turn to unlock. Key A-1 is now held.
- 4—Open disconnect.
- 5—Turn key A-1 in L-O-C interlock on disconnect switch to lock open. Key A-1 is now free.
- 6—Return key A-1 to breaker interlock and unlock for operation of breaker during servicing.

Reverse sequence to restore service.

To open fuse compartment door:

- 1—Proceed from normal position with operations as in 1 through 4 above.
- 2—Turn key A-2 in L-O interlock on disconnect switch to lock open. Key A-2 is now free.
- 3—Insert key A-2 in L-C interlock on fuse compartment door and turn to unlock. Key A-2 is now held.
- 4—Open fuse compartment door.

Reverse sequence to restore service.

## ISOLATING SWITCHES AND BREAKER SCHEME 8

To prevent operation of disconnect switch A when breakers B, C, D and E are closed. Breakers may be opened in any sequence.

(Electrical circuit is equivalent of Scheme 7)

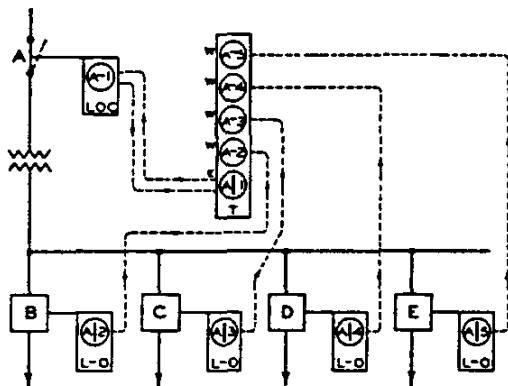


FIG. 1

Disconnect A and Breakers B, C, D and E are shown in closed position. Key A-1 is held in Transfer interlock. Keys A-2, A-3, A-4 and A-5 are held in interlocks on breaker B, C, D and E.

- 1—Open breakers B, C, D and E.
- 2—Turn key in L-O interlock on each breaker B, C, D and E to lock breakers open. Keys A-2, A-3, A-4 and A-5 are now free.
- 3—Insert keys A-2, A-3, A-4 and A-5 in transfer interlock.
- 4—Turn key A-1 in Transfer interlock. Key A-1 is now free. Keys A-2, A-3, A-4 and A-5 are now held.
- 5—Insert key A-1 in L-O-C interlock on disconnect A and turn to unlock. Key A-1 is now held.
- 6—Open disconnect A.
- 7—Turn key A-1 in L-O-C interlock on disconnect A to lock open. Key A-1 is now free.
- 8—Insert key A-1 in Transfer interlock and turn. Key A-1 is now held. Keys A-2, A-3, A-4 and A-5 are now free.
- 9—Return keys A-2, A-3, A-4 and A-5, as desired, to breaker interlocks and unlock for operation during servicing.

Reverse sequence to restore service.

## SCHEME 7

To prevent operation of disconnect switch A when breakers B, C, D and E are closed.

Breakers must be opened in prearranged sequence.

(Electrical circuit is equivalent of Scheme 6.)

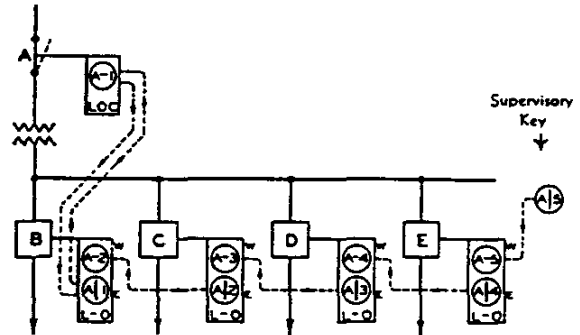


FIG. 2

Disconnect A and Breakers B, C, D and E are shown in closed positions. Key A-1 is held in breaker B interlock. Key A-2 is held in breaker C interlock, key A-3 is held in breaker D interlock and key A-4 is held in breaker E interlock. Key A-5 is held free in breaker E interlock or is retained by supervisor.

- 1—Obtain Key A-5 from supervisor.
- 2—Open breaker E.
- 3—Insert key A-5 in L-O interlock on Breaker E and turn Key A-4 to lock open. Key A-5 is now held. Key A-4 is now free.
- 4—Open breaker D.
- 5—Insert key A-4 in L-O interlock on breaker D and turn key A-3 to lock breaker open. Key A-4 is now held. Key A-3 is now free.
- 6—Open breaker C.
- 7—Insert key A-3 in L-O interlock on breaker C and turn key A-2 to lock breaker open. Key A-3 is now held. Key A-2 is now free.
- 8—Open breaker B.
- 9—Insert key A-2 in L-O interlock on breaker B and turn key A-1 to lock breaker open. Key A-2 is now held. Key A-1 is now free.
- 10—Insert key A-1 in L-O-C interlock on disconnect A and turn to unlock. Key A-1 is now held.
- 11—Open disconnect.
- 12—Turn key A-1 in L-O-C interlock on disconnect A to lock open. Key A-1 is now free.
- 13—Insert key A-1 in L-O interlock on breaker B and turn to unlock. Key A-1 is now held and key A-2 is free.
- 14—Breaker A may now be operated for servicing.
- 15—Insert key A-2 in L-O interlock on breaker C and turn to unlock. Key A-2 is now held, and key A-3 is free.
- 16—Breaker C may now be operated for servicing.
- 17—Insert key A-3 in L-O interlock on breaker D and turn to unlock. Key A-3 is now held and key A-4 is free.
- 18—Breaker D may now be operated for servicing.
- 19—Insert key A-4 in L-O interlock on breaker E and turn to unlock. Key A-4 is now held and supervisor's key A-5 is free.
- 20—Breaker E may now be operated for servicing.

Reverse sequence to restore service.

## SCHEME 8

To prevent operation of Disconnects A and B when Breaker C is closed, to permit servicing of Breaker when disconnects are locked open.

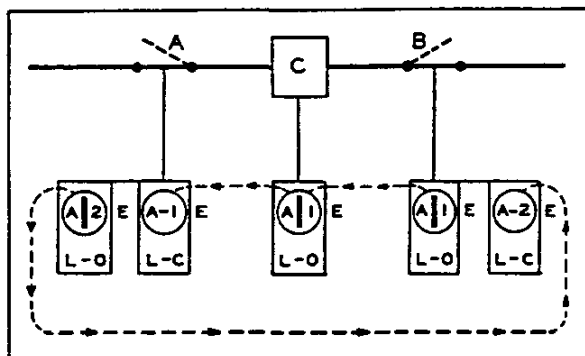


FIG. 1

Breaker C and disconnects A and B shown closed. One key A-1 is held in breaker L-O interlock and other key A-1 held in L-O interlock on disconnect B. Key A-2 is held in L-O interlock on disconnect A.

- 1—Open breaker.
- 2—Turn key A-1 in L-O interlock on breaker to lock open. Key A-1 is now free.
- 3—Insert key A-1 in L-C interlock on disconnect A and turn to unlock. Key A-1 is now held.
- 4—Open disconnect A.
- 5—Turn key A-2 in L-O interlock on disconnect A to lock open. Key A-2 is now free.
- 6—Insert key A-2 in L-C interlock on disconnect B and turn to unlock. Key A-2 is now held.
- 7—Open disconnect B.
- 8—Turn key A-1 in L-O interlock on disconnect B to lock open. Key A-1 is now free.
- 9—Insert key A-1 in breaker L-O interlock and turn to unlock for operation during servicing.

Reverse sequence to restore service.

## SCHEME 9

To prevent operation of Disconnects A and B with Breaker C closed, and to prevent access to Breaker compartment with Disconnects closed.

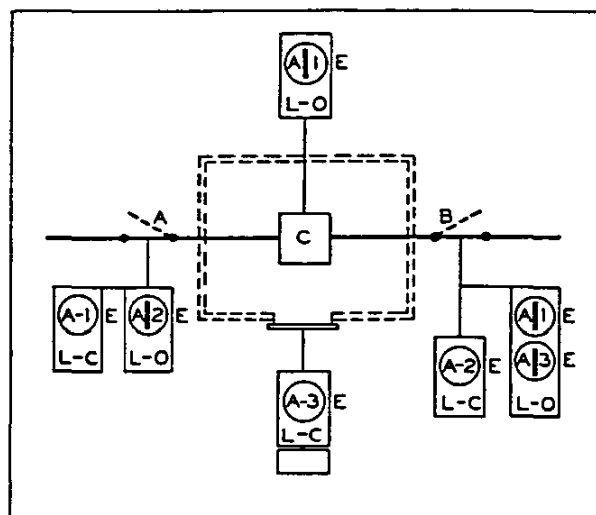


FIG. 2

Disconnects A and B, breaker C, and door are normally closed. Keys A-1 are held in L-O interlock, or Breaker C and L-O interlock on disconnect B. Key A-2 is held in L-O interlock on disconnect A. Key A-3 is held in L-O interlock on disconnect B.

- 1—Open breaker.
- 2—Turn key A-1 in L-O interlock on breaker to lock open. Key A-1 is now free.
- 3—Insert key A-1 in L-C interlock on disconnect A and turn to unlock. Key A-1 is now held.
- 4—Open disconnect A.
- 5—Turn key A-2 in L-O interlock on disconnect A to lock open. Key A-2 is now free.
- 6—Insert key A-2 in L-C interlock on disconnect B and turn to unlock. Key A-2 is now held.
- 7—Open disconnect B.
- 8—Turn keys A-1 and A-3 in L-O interlock on disconnect B to lock open. Keys A-1 and A-3 are now free.
- 9—Insert key A-1 in breaker L-O interlock and turn to unlock for operation during servicing.
- 10—Insert key A-3 in L-C interlock (Type D) on compartment door and turn to unlock. Key A-3 is now held.
- 11—Open compartment door to service breaker.

Reverse sequence to restore service.

## ISOLATING SWITCHES AND BREAKER OR REGULATOR WITH BY-PASS SWITCH SCHEME 10

To prevent operation of disconnects A and B and by-pass disconnect C under load. Provides for closing of by-pass disconnect C before breaker circuit is opened, or permits breaker circuit to be opened with by-pass disconnect C remaining open.

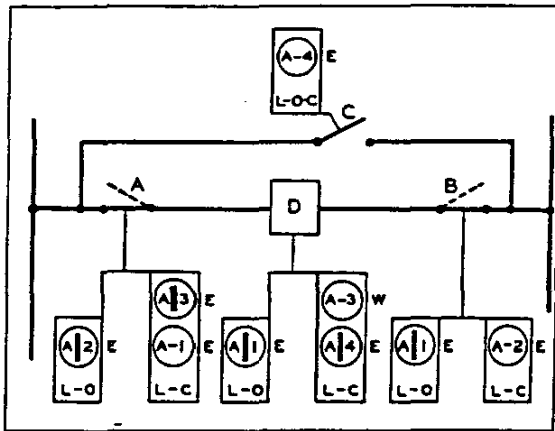


FIG. 1

Disconnects A and B and breaker D normally closed. By-pass disconnect C normally open. Keys A-1, A-2, and A-4 normally held in locks as indicated. Key A-3 is normally free.

To transfer load from breaker and disconnects to by-pass switch

- 1—Obtain key A-3 which is free and insures that both disconnects A and B are locked closed.
- 2—Insert key A-3 in L-C interlock on breaker D and turn to lock closed. Key A-3 is held and key A-4 is now free.
- 3—Insert key A-4 in L-O-C interlock on by-pass disconnect C and turn to unlock. Key A-4 is now held.
- 4—Close by-pass disconnect C.
- 5—Turn key A-4 in L-O-C interlock on by-pass disconnect C to lock closed. Key A-4 is now free.
- 6—Insert key A-4 in L-C interlock on breaker D and turn to unlock. Key A-4 is held and key A-3 is now free.
- 7—Open breaker D.
- 8—Turn key A-1 in L-O interlock on breaker D to lock open. Key A-1 is now free.
- 9—Insert keys A-1 and A-3 in L-C interlock on disconnect A and turn to unlock. Keys A-1 and A-3 are now held.
- 10—Open disconnect A.
- 11—Turn key A-2 in L-O interlock on disconnect A to lock open. Key A-2 is now free.
- 12—Insert key A-2 in L-C interlock on disconnect B and turn to unlock. Key A-2 is now held.
- 13—Open disconnect B.
- 14—Turn key A-1 in L-O interlock on disconnect B to lock open. Key A-1 is now free.
- 15—Insert key A-1 in L-O interlock on breaker D and turn to unlock to permit operation during servicing.

To open disconnects A and B and breaker D, leaving by-pass disconnect C open.

- 1—Proceed from normal position with operations as in 7 to 15 above.

## SCHEME 10A

To prevent operation of disconnect A and B and by-pass disconnect C under load.

Permits by-pass disconnect C to operate only when regulator is in neutral position.

Permits isolating regulator for servicing.

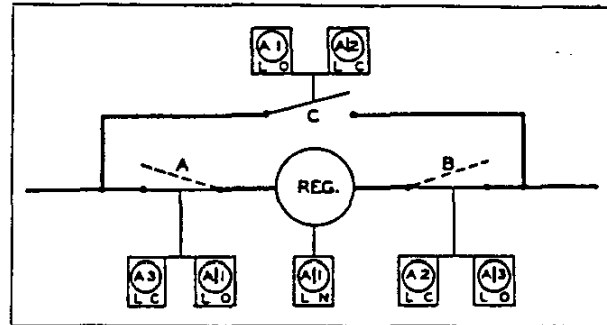


FIG. 2

Disconnects A and B are normally closed. Regulator is normally in operation. By-pass disconnect C is normally open.

One key A-1 is held in regulator L-N (Locked Neutral) interlock and the second key A-1 is held in L-O interlock on disconnect A. Key A-2 is held in L-C interlock on disconnect C. Key A-3 is held in L-O interlock on disconnect B.

- 1—Operate regulator to neutral position.
  - 2—Turn key A-1 in L-N interlock on regulator to lock in neutral position. Key A-1 is now free.
  - 3—Insert key A-1 in L-O interlock on by-pass disconnect C and turn to unlock. Key A-1 is now held.
  - 4—Close by-pass disconnect C.
  - 5—Turn key A-2 in L-C interlock on by-pass disconnect C to lock closed. Key A-2 is now free.
  - 6—Insert key A-2 in L-C interlock on disconnect B and turn to unlock. Key A-2 is now held.
  - 7—Open disconnect B.
  - 8—Turn key A-3 in L-O interlock on disconnect B to lock open. Key A-3 is now free.
  - 9—Insert key A-3 in L-C interlock on disconnect A and turn to unlock. Key A-3 is now held.
  - 10—Open disconnect A.
  - 11—Turn key A-1 in L-O interlock on disconnect A to lock open. Key A-1 is now free.
  - 12—Insert key A-1 in regulator L-N interlock and turn to unlock. This permits regulator to be operated during inspection and servicing.
- Reverse sequence to restore service.



## PREVENT PARALLELING OF LINES SCHEME 11

To prevent paralleling of lines A and B.  
—Single load, fed from either source.

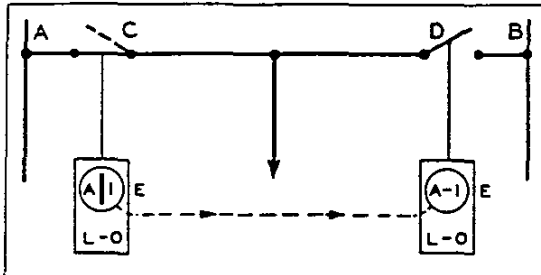


FIG. 1

Disconnect C shown closed and disconnect D shown open.  
Key A-1 held in disconnect C interlock.

- 1—Open switch C.
- 2—Turn key A-1 in L-O interlock on switch C to lock open. Key A-1 is now free.
- 3—Insert key A-1 in L-O interlock on switch D and turn to unlock. Key A-1 is now held.
- 4—Close switch D.

Reverse sequence to restore service through switch C.

## SCHEME 12

To prevent paralleling of lines A and B.  
—Single load, fed from either source.

To prevent operation of disconnect switches A and B when breaker C is closed.

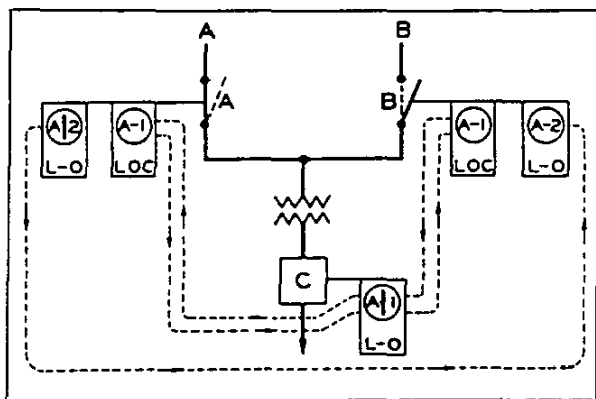


FIG. 2

Breaker C and disconnect A are shown in closed position. Disconnect B is shown in open position. Key A-1 is held in breaker C interlock. Key A-2 is held in disconnect A L-O interlock.

To service breaker:

- 1—Open breaker C.
- 2—Turn key A-1 in L-O interlock on breaker to lock open. Key A-1 is now free.
- 3—Insert key A-1 in L-O-C interlock on disconnect A and turn to unlock. Key A-1 is now held.

4—Open disconnect A.

5—Turn key A-1 in L-O-C interlock on disconnect A to lock open. Key A-1 is now free.

6—Return key A-1 to breaker interlock and unlock for operation of breaker during servicing.

To transfer load from line A to line B:

- 1—Open breaker C.
- 2—Turn key A-1 in L-O interlock on breaker to lock open. Key A-1 is now free.
- 3—Insert key A-1 in L-O-C interlock on disconnect A and turn to unlock. Key A-1 is now held.
- 4—Open disconnect A.
- 5—Turn key A-1 in L-O-C interlock and key A-2 in L-O interlock on disconnect A to lock open. Keys A-1 and A-2 are now free.
- 6—Insert key A-1 in L-O-C interlock on disconnect B and turn to unlock. Key A-1 is now held.
- 7—Insert key A-2 in L-O interlock on disconnect B and turn to unlock. Key A-2 is now held.
- 8—Close disconnect B.
- 9—Turn key A-1 in L-O-C interlock on disconnect B to lock closed. Key A-1 is now free.
- 10—Insert key A-1 in breaker interlock and turn to unlock. Key A-1 is now held.
- 11—Close breaker.

Reverse sequence to restore service through line A.

## SCHEME 13

To prevent paralleling of lines A and B.  
—Two loads, fed from either source.

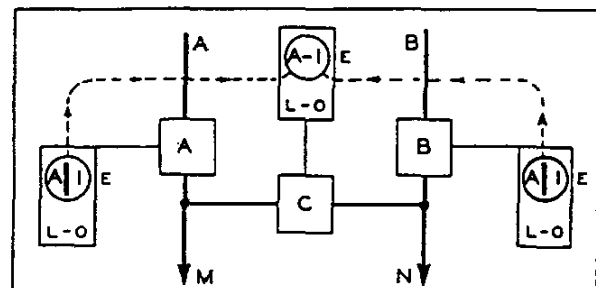


FIG. 3

Breaker A is closed to supply load M. Breaker B is closed to supply load N. Tie-Breaker C is open. Keys A-1 are held in interlocks on both breakers A and B. Tie-Breaker C cannot be closed unless either A or B is locked open.

To transfer load N to breaker A, proceed as follows:

- 1—Open breaker B.
- 2—Turn key A-1 in L-O interlock on breaker B to lock open. Key A-1 is now free.
- 3—Insert Key A-1 in L-O interlock on tie-breaker C and turn to unlock. Key A-1 is now held.
- 4—Close tie-breaker C.

Reverse sequence to restore service.

Load M can be supplied through breaker B in a similar manner.

## PREVENT PARALLELING OF LINES SCHEME 14

- To prevent paralleling of lines A and B.
- Two loads, fed from either source. (One tie-breaker).
- To prevent operation of disconnect switch D when breaker A is closed.
- To prevent operation of disconnect switch E when breaker B is closed.

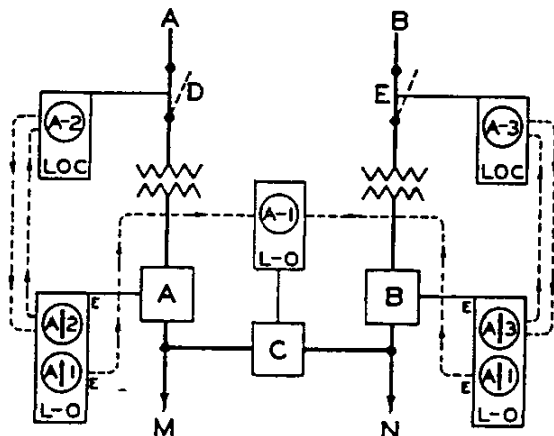


FIG. 1

Disconnect switches D and E and breakers A and B are closed. Breaker A closed to supply load M. Breaker B closed to supply load N. Tie-Breaker C is open. Keys A-1 and A-2 are held in interlock on breaker A. Keys A-1 and A-3 are held in interlock on breaker B. Tie-Breaker C cannot be closed until either breaker A or B is locked open.

To transfer load N to breaker A, proceed as follows:

- 1—Open breaker B.
  - 2—Turn key A-1 in L-O interlock on breaker B to lock open. Keys A-1 and A-3 are now free.
  - 3—Insert key A-1 in L-O interlock on tie-breaker C and turn to unlock. Key A-1 is now held.
  - 4—Close tie-breaker C.
- Reverse sequence to restore service through breaker B. Load M can be supplied through breaker B in a similar manner.

To service Breaker B, proceed as follows:

- 1—Open breaker B.
- 2—Turn key A-1 in L-O interlock on breaker B to lock open. Keys A-1 and A-3 are now free.
- 3—Insert key A-3 in L-O-C interlock on disconnect E and turn to unlock. Key A-3 is now held.
- 4—Open disconnect E.
- 5—Turn key A-3 in L-O-C interlock on disconnect E to lock open. Key A-3 is now free.
- 6—Return key A-3 to L-O interlock on breaker B and unlock for operation of breaker during servicing.

Reverse sequence to restore service.

Breaker A can be serviced in a similar manner.

## SCHEME 15

- To prevent paralleling of lines A and B.
- Two loads, fed from either source. (One tie-breaker).
- To prevent operation of disconnect switch D when breaker A is closed.
- To prevent operation of disconnect switch E when breaker B is closed.
- To prevent opening fuse compartment door when the associated disconnects D or E and breakers A and B are closed.

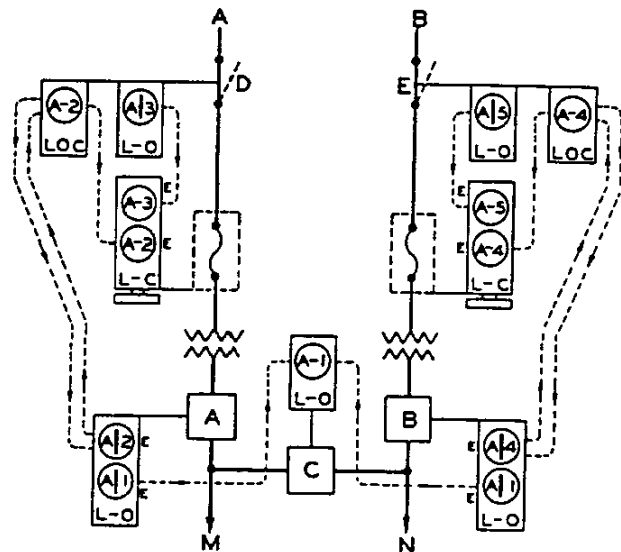


FIG. 1

Disconnect switch D, and Breaker A are closed to supply load M. Disconnect switch E and breaker B are closed to supply load N. Tie-breaker C is open. Keys A-1 and A-2 are held in interlock on breaker A. Key A-3 is held in L-O interlock on disconnect D. Keys A-1 and A-4 are held in interlock on breaker B. Key A-5 is held in L-O interlock on disconnect E. Tie-breaker C cannot be closed until either breaker A or B is locked open.

To transfer load N to breaker A, proceed as follows:

- 1—Open breaker B.
  - 2—Turn key A-1 in L-O interlock on breaker B to lock open. Keys A-1 and A-4 are now free.
  - 3—Insert key A-1 in L-O interlock on tie-breaker C and turn to unlock. Key A-1 is now held.
  - 4—Close tie breaker C.
- Reverse sequence to restore service through breaker B. Load M can be supplied through breaker B in a similar manner.

To service breaker B, proceed as follows:

- 1—Open breaker B.
- 2—Turn key A-1 in L-O interlock on breaker B to lock open. Keys A-1 and A-4 are now free.

- 3—Insert key A-4 in L-O-C interlock on disconnect E and turn to unlock. Key A-4 is now held.
- 4—Open disconnect E.
- 5—Turn key A-4 in L-O-C interlock on disconnect E to lock open. Key A-4 is now free.
- 6—Return key A-4 to L-O interlock on breaker B and unlock for operation of breaker during servicing.

Reverse sequence to restore service.

Breaker A can be serviced in a similar manner.

To enter fuse compartment on line B, proceed as follows:

- 1—Open breaker B.
- 2—Turn key A-1 in L-O interlock on breaker B to lock open. Keys A-1 and A-4 are now free.
- 3—Insert key A-4 in L-O-C interlock on disconnect E and turn to unlock. Key A-4 is now held.
- 4—Open disconnect E.
- 5—Turn key A-4 in L-O-C interlock on disconnect E to lock open. Key A-4 is now free.
- 6—Turn key A-5 in L-O interlock on disconnect E to lock open. Key A-5 is now free.
- 7—Insert keys A-4 and A-5 in L-C interlock on fuse compartment door and turn to unlock. Keys A-4 and A-5 are now held.
- 8—Open fuse compartment door.

Reverse sequence to restore service.

Fuse compartment on line A can be entered in a similar manner.

## SCHEME 16

To prevent paralleling of lines A, B, and C.

—Three loads, fed from any source. (Two tie-breakers).

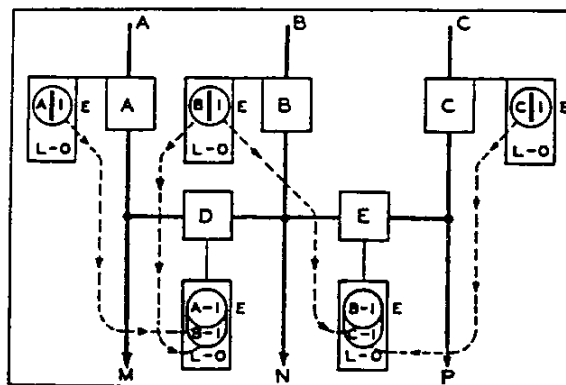


FIG. 1

Breaker A is closed to supply load M. Breaker B is closed to supply Load N. Breaker C is closed to supply load P. Keys A-1, B-1 and C-1 are held in L-O interlocks of breakers A, B, and C. Tie-breakers D and E are locked open.

Tie-breaker D interlock has a master or apartment lock and can be unlocked for operation with either keys A-1 or B-1. Tie-breaker E has a master or apartment lock, and can be unlocked for operation with either keys B-1 or C-1.

To transfer load M from breaker A to breaker B.

- 1—Open breaker A.
- 2—Turn key A-1 in L-O interlock on breaker A to lock open. Key A-1 is now free.
- 3—Insert key A-1 in L-O interlock on tie-breaker D and turn to unlock. Key A-1 is now held.
- 4—Close tie-breaker D.

Reverse sequence to restore service through breaker A.

To transfer load M and N from breakers A and B to breaker C.

- 1—Close tie-breaker D as above.
- 2—Turn key B-1 in L-O interlock on breaker B to lock open. Key B-1 is now free.
- 3—Insert key B-1 in L-O interlock on tie-breaker E and turn to unlock. Key B-1 held.
- 4—Close tie-breaker E.

Reverse sequence to restore service (M and N through breakers A and B).

Any of the loads M, N, P or R can be transferred from its own supply to any adjacent supply.

## PREVENT PARALLELING OF LINES SCHEME 17

To prevent paralleling lines A, B, C and D.  
—Four loads, fed from any source. (Three tie-breakers)

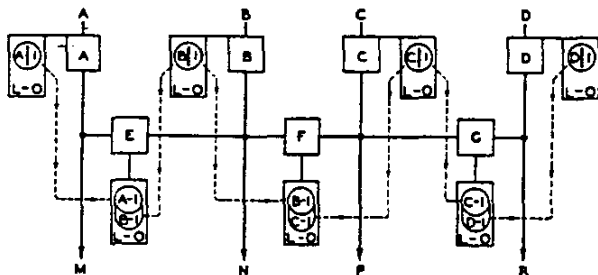


FIG. 2

Breaker A is closed to supply load M. Breaker B is closed to supply load N. Breaker C is closed to supply load P. Breaker D is closed to supply load R. Keys A-1, B-1, C-1 and D-1 are held in L-O interlocks of breakers A, B, C and D. Breakers E, F and G are locked open. Breaker E interlock has a master or apartment lock and can be unlocked for operation with either keys A-1 or B-1. Breaker F interlock has a master or apartment lock and can be unlocked for operation with either keys B-1 or C-1. Breaker G interlock has a master or apartment lock and can be unlocked for operation with either keys C-1 or D-1.

To transfer load M from breaker A to breaker B.

- 1—Open breaker A.
- 2—Turn key A-1 in L-O interlock on breaker A to lock open. Key A-1 is now free.
- 3—Insert key A-1 in L-O interlock on tie-breaker E and turn to unlock. Key A-1 is now held.
- 4—Close tie-breaker E.

Reverse sequence to restore service through breaker A.

To transfer load M and N from breaker A and B to breaker C.

- 1—Close tie-breaker E as above.
- 2—Open breaker B.
- 3—Turn key B-1 in L-O interlock on breaker B to lock open. Key B-1 is now free.
- 4—Insert key B-1 in L-O interlock on tie-breaker F and turn to unlock. Key B-1 is now held.
- 5—Close tie-breaker F.

Reverse sequence to restore service (M and N) through breakers A and B.

To transfer load R from breaker D to breaker C.

- 1—Open breaker D.
- 2—Turn key D-1 in L-O interlock on breaker D to lock open. Key D-1 is now free.
- 3—Insert key D-1 in L-O interlock on tie-breaker G and turn to unlock. Key D-1 is now held.
- 4—Close tie-breaker G.

Reverse sequence to restore service through breaker D.

## SCHEME 18

To prevent paralleling of lines A, B, and C.  
—Three loads, fed from any source (Three tie-breakers).

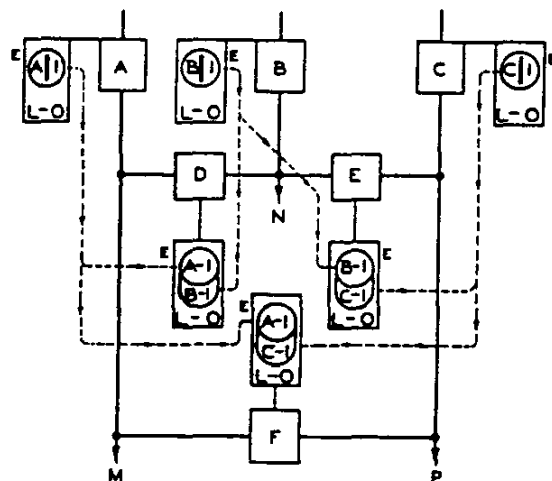


FIG. 1

Breaker A is closed to supply load M. Breaker B is closed to supply load N. Breaker C is closed to supply load P. Keys A-1, B-1, and C-1 are held in L-O interlocks of breakers A, B, and C. Tie-Breakers D, E, and F are locked open. Master or apartment lock interlocks are mounted on tie-breakers D, E, and F, and can be unlocked for operation with either keys A-1 or B-1, B-1 or C-1, and A-1 or C-1 respectively.

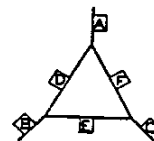


FIG. 2

To transfer load M from breaker A to breaker B.

- 1—Open breaker A.
- 2—Turn key A-1 in L-O interlock on breaker A to lock open. Key is now free.
- 3—Insert key A-1 in L-O interlock on tie-breaker D and turn to unlock. Key A-1 is now held.
- 4—Close tie-breaker D.

Reverse sequence to restore service through breaker A.

To transfer load M and N from breakers A and B to breaker C.

- 1—Close tie-breaker D as above.
- 2—Open breaker B.
- 3—Turn key B-1 in L-O interlock on breaker B to lock open. Key B-1 is now free.
- 4—Insert key B-1 in L-O interlock on breaker E and turn to unlock. Key B-1 held.
- 5—Close tie-breaker E.

Reverse sequence to restore service (loads M and N) through breakers A and B.

To transfer load P from breaker C to breaker A.

- 1—Open breaker C.
- 2—Turn key C-1 in L-O interlock on breaker C to lock open. Key C-1 is now free.
- 3—Insert key C-1 in L-O interlock on tie-breaker F and turn to unlock. Key C-1 is now held.
- 4—Close tie-breaker F.

Reverse sequence to restore service through breaker C.

## SCHEME 19

To prevent paralleling lines A, B, C, and D.

—Four loads fed from any source. (four tie-breakers).

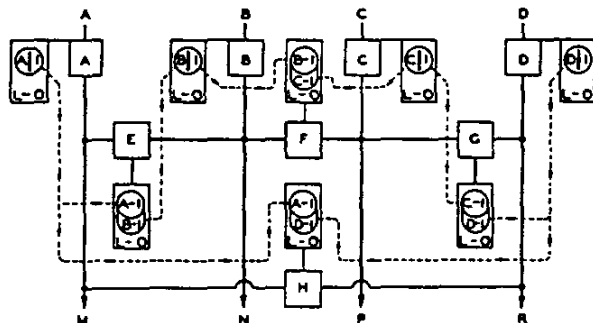


FIG. 1

Breaker A is closed to supply load M.  
Breaker B is closed to supply load N.  
Breaker C is closed to supply load P.  
Breaker D is closed to supply load R.

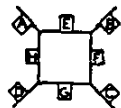


FIG. 2

Keys A-1, B-1, C-1 and D-1 are held in L-O interlocks of breakers A, B, C and D. Tie-breakers E, F, G and H are locked open. Breaker E interlock has a master or apartment lock and can be unlocked for operation with either keys A-1 or B-1. Breaker F interlock has a master or apartment lock and can be unlocked for operation with either keys B-1 or C-1. Breaker G interlock has a master or apartment lock and can be unlocked for operation with either keys C-1 or D-1. Breaker H interlock has a master or apartment lock and can be unlocked for operation with either keys A-1 or D-1.

To transfer load M from breaker A to breaker B.

- 1—Open breaker A.
- 2—Turn key A-1 in L-O interlock on breaker A to lock open. Key A-1 is now free.
- 3—Insert key A-1 in L-O interlock on tie-breaker E and turn to unlock. Key A-1 is now held.
- 4—Close tie-breaker E.

Reverse sequence to restore service through breaker A.

To transfer load M and N from breaker A and B to breaker C.

- 1—Close tie-breaker E as above.
- 2—Open breaker B.
- 3—Turn key B-1 in L-O interlock on breaker B to lock open. Key B-1 is now free.
- 4—Insert key B-1 in L-O interlock on tie-breaker F and turn to unlock. Key B-1 is now held.
- 5—Close tie-breaker F.

Reverse sequence to restore service (M and N) through breakers A and B.

To transfer load R from breaker D to breaker C.

- 1—Open breaker D.
- 2—Turn key D-1 in L-O interlock on breaker D to lock open. Key D-1 is now free.
- 3—Insert key D-1 in L-O interlock on tie-breaker G and turn to unlock. Key D-1 is now held.
- 4—Close tie-breaker G.

Reverse sequence to restore service through breaker D.

To transfer load M from breaker A to breaker D.

- 1—Open breaker A.
- 2—Turn key A-1 in L-O interlock on breaker A to lock open. Key A-1 is now free.
- 3—Insert key A-1 in L-O interlock on tie-breaker H and turn to unlock. Key A-1 is now held.
- 4—Close tie-breaker H.

Reverse sequence to restore service through breaker A.

Any of the loads M, N, P, or R can be transferred from its own supply to any adjacent supply.

## PREVENT PARALLELING OF LINES SCHEME 20

To prevent paralleling three power sources through a common tie bus not normally in service.

To permit feeding any load bus from a second power source through the tie bus.

To permit one power source to supply all three load busses through the tie bus.

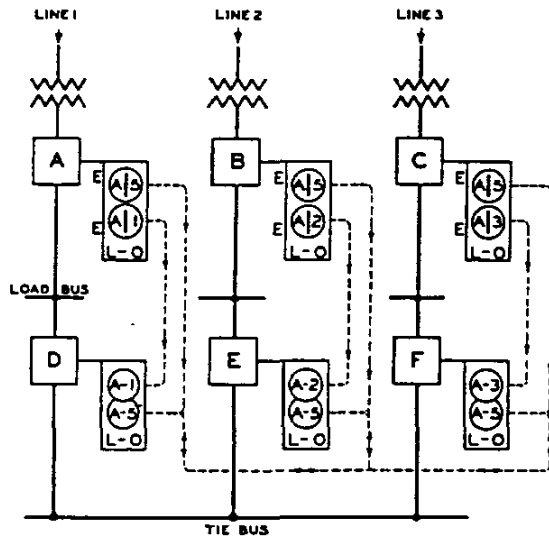


FIG. 1

Breakers A, B and C are normally closed. Breakers D, E, and F are normally open. Under normal conditions keys A-1 and A-5 are held in breaker A interlock, keys A-2 and A-5 are held in breaker B interlock and keys A-3 and A-5 are held in breaker C interlock.

To transfer load from line No. 1 to line No. 2 or line No. 3 through tie bus, proceed as follows:

- 1—Open breaker A.
- 2—Turn key A-1 in L-O interlock on breaker A to lock breaker open. Keys A-1 and A-5 are now free.
- 3—Insert key A-1 in L-O interlock on breaker D and turn to unlock. Key A-1 is now held.
- 4—Close breaker D.
- 5—Insert key A-5 in L-O interlock on either breaker E or F and turn to unlock. Key A-5 is now held.
- 6—Close breaker E or F (whichever is selected).

Reverse sequence to restore load to line No. 1.

To transfer load from lines No. 1 and No. 2 to line No. 3 through tie bus, proceed as follows:

- 1—Close breaker D as per steps 1 to 4 above.
- 2—Open breaker B.
- 3—Turn key A-2 in L-O interlock on breaker B to lock breaker open. Keys A-2 and A-5 are now free.
- 4—Insert key A-2 in L-O interlock on breaker E and turn to unlock. Key A-2 is now held.
- 5—Close breaker E.
- 6—Insert one of the A-5 keys from either breaker A or B in L-O interlock on breaker F and turn to unlock. Key A-5 is now held.
- 7—Close breaker F.

Reverse sequence to restore load to lines No. 1 and No. 2.

## SCHEME 21

To prevent paralleling three power sources through a common tie bus not normally in service.

To permit feeding any load bus from a second power source through the tie bus only when authorized by supervisor.

To permit one power source to supply all three load busses through the tie bus only when authorized by supervisor.

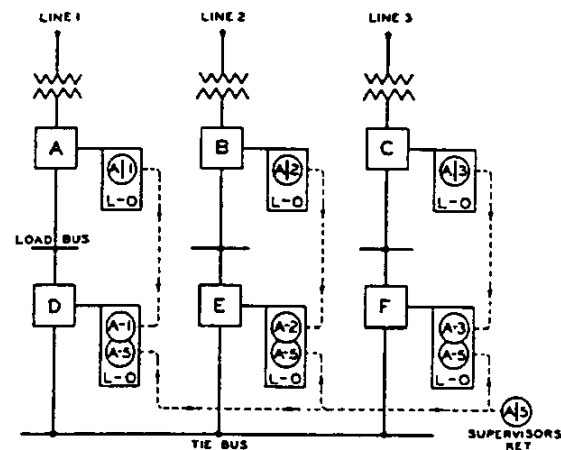


FIG. 2

Breakers A, B and C are normally closed. Breakers D, E and F are normally open. Under normal conditions Key A-1 is held in breaker A interlock, Key A-2 is held in breaker B interlock and Key A-3 is held in breaker C interlock. Key A-5 is retained by supervisor.

To transfer load from line No. 1 to line No. 2 or line No. 3 through tie bus, proceed as follows:

- 1—Open breaker A.
- 2—Turn key A-1 in L-O interlock on breaker A to lock breaker open. Key A-1 is now free.
- 3—Insert key A-1 in L-O interlock on breaker D and turn to unlock. Key A-1 is now held.
- 4—Close breaker D.
- 5—Insert Supervisor's key A-5 (only one A-5 is available) in L-O interlock on either breaker E or F and turn to unlock. Key A-5 is now held.
- 6—Close breaker E or F (whichever is selected).

Reverse sequence to restore load to line No. 1.

To transfer load from lines No. 1 and No. 2 to line No. 3 through tie bus, proceed as follows:

- 1—Close breaker D as per steps 1 to 4 above.
- 2—Open breaker B.
- 3—Turn key A-2 in L-O interlock on breaker B to lock breaker open. Key A-2 is now free.
- 4—Insert key A-2 in L-O interlock on breaker E and turn to unlock. Key A-2 is now held.
- 5—Close breaker E.
- 6—Insert Supervisor's key A-5 in L-O interlock on breaker F and turn key to unlock. Key A-5 is now held.
- 7—Close breaker F.

Reverse sequence to restore load to lines No. 1 and No. 2.

## SCHEME 22

To prevent paralleling incoming primary sources, lines 1 and 2, through primary tie bus disconnect.

To prevent operation (open or closed) of the disconnects under load.

Permits one power source to supply both loads through tie bus.

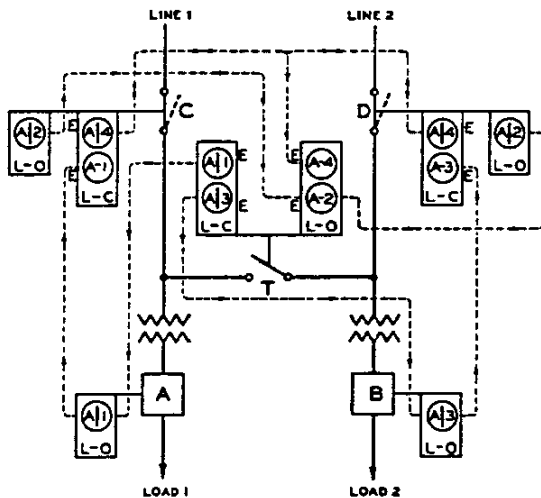


FIG. 1

Under normal conditions breakers A and B are closed, disconnects C and D are locked closed, and tie bus disconnect C is locked open. Keys A-1 are held in L-O interlock on breaker A and L-C interlock on tie bus disconnect T. Keys A-2 are held in L-O interlock on disconnects C and D. Keys A-3 are held in L-O interlock on breaker B and L-C interlock on tie bus disconnect T. Keys A-4 (free keys) are shown removably held in the L-C interlocks on disconnects C and D.

To transfer load No. 1 from line 1 to line 2 through bus tie disconnect T, proceed as follows:

- 1—Open breaker A.
- 2—Turn key A-1 in L-O interlock on breaker A to lock open. Key A-1 is now free.
- 3—Insert key A-1 in L-C interlock on disconnect C and turn to unlock. Keys A-1 and A-4 are now held.
- 4—Open disconnect C.
- 5—Turn key A-2 in L-O interlock on disconnect C to lock open. Key A-2 is now free.
- 6—Insert keys A-2 and free key A-4 (from L-C interlock on disconnect D) in L-O interlock on bus tie disconnect T and turn to unlock. Keys A-2 and A-4 are now held.
- 7—Close bus tie disconnect T.
- 8—Turn key A-3 in L-C interlock on disconnect T to lock closed. Keys A-1 and A-3 are now free.
- 9—Insert key A-1 in L-O interlock on breaker A and turn to unlock. Key A-1 is now held.
- 10—Close breaker A.

Reverse sequence to restore load No. 1 to line 1.

To transfer load No. 2 from line 2 to line 1 through bus tie disconnect T, proceed in a similar manner.

## PREVENT PARALLELING OF LINES SCHEME 23

To prevent paralleling incoming primary sources, lines 1 and 2, through the primary tie bus disconnect or the secondary tie bus breaker.

To prevent operation (open or closed) of the disconnects under load.

Permits one power source to supply both loads through either the primary or secondary tie bus.

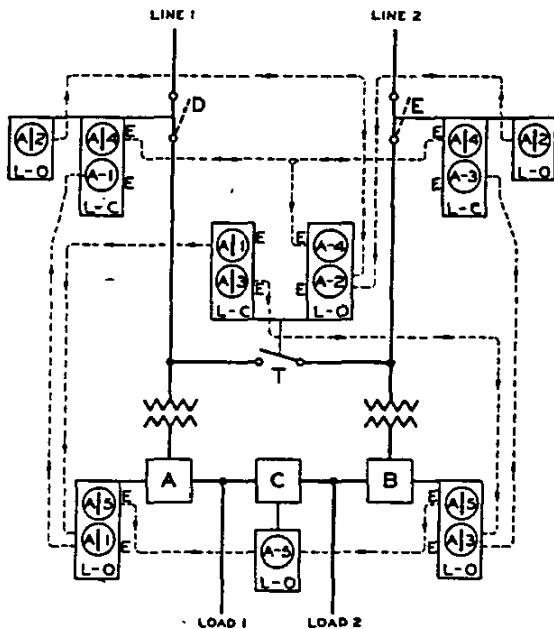


FIG. 1

Under normal conditions breakers A and B are closed, breaker C is locked open, disconnects D and E are locked closed and tie disconnect T is locked open. Keys A-1 are held in L-O interlock on breaker A and L-C interlock on primary tie bus disconnect T. Keys A-2 are held in L-O interlocks on disconnects D and E. Keys A-3 are held in L-O interlock on breaker B and L-C interlock on primary tie bus disconnect T. Keys A-4 (free keys) are shown removably held in the L-C interlocks on disconnects D and E. Keys A-5 are held in L-O interlocks on breakers A and B.

To transfer load No. 1 from line 1 to line 2 through primary bus tie disconnect T.

- 1—Open breaker A.
- 2—Turn key A-1 in L-O interlock on Breaker A to lock open. Keys A-1 and A-5 are now free.
- 3—Insert key A-1 and "free key A-4" in L-C interlock on disconnect D and turn to unlock. Keys A-1 and A-4 are now held.
- 4—Open Disconnect D.
- 5—Turn key A-2 in L-O interlock on disconnect D to lock open. Key A-2 is now free.
- 6—Insert key A-2 and free key A-4 (from L-C interlock on disconnect E) in L-O interlock on primary bus tie disconnect T and turn to unlock. Keys A-2 and A-4 are now held.
- 7—Close bus tie disconnect T.
- 8—Turn key A-3 in L-C interlock on bus tie disconnect T to lock closed. Keys A-1 and A-3 are now removable.
- 9—Insert key A-1 in L-O interlock on breaker A and turn to unlock. Key A-1 is now held.
- 10—Close breaker A.

Reverse procedure to restore service to line 1.

Load No. 2 can be supplied from No. 1 through the primary bus tie in a similar manner.

To transfer load No. 1 from line 1 to line 2 through secondary tie breaker C.

- 1—Open breaker A.
- 2—Turn key A-1 in L-O interlock on breaker A to lock open. Keys A-1 and A-5 are now removable.
- 3—Insert key A-5 in L-O interlock on tie breaker C and turn to unlock. Key A-5 is now held.
- 4—Close tie breaker C.

Reverse procedure to restore service on line 1.

Load No. 2 can be supplied from line No. 1 through the secondary tie breaker C in a similar manner.



## SCHEME 24

To prevent paralleling incoming primary sources, lines 1 and 2.

To prevent operation (open or closed) of the disconnects under load. (Permits transformer primary disconnects (K&L) to open and close the transformer magnetizing current.)\*

Permits isolating breakers for servicing.

Permits one power source to supply both loads through tie bus.

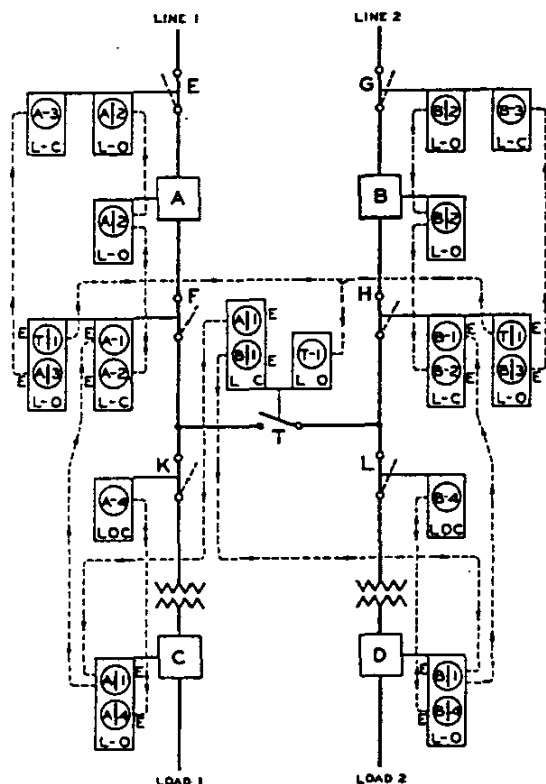


FIG. 1

Under normal conditions, breakers A, B, C and D are closed, disconnects E, F, G, H, K and L are locked closed and bus tie disconnect T is locked open. Keys A-1 are held in L-O interlock on breaker C and L-C interlock on bus tie disconnect T. Keys A-2 are held in L-O interlocks on breaker A and disconnect E. Key A-3 is held in L-O interlock on disconnect F. Key A-4 is held in L-O interlock on breaker D and L-C interlock on bus tie disconnect T. Keys B-2 are held in L-O interlocks on breaker B and disconnect G. Key B-3 is held in L-O interlock on disconnect H. Key B-4 is held in L-O interlock on breaker D. Keys T-1 are held in L-O interlocks on disconnects F and H.

To transfer load No. 1 from line 1 to line 2 through bus tie disconnect T:

- 1—Open breaker A.
- 2—Turn key A-2 in L-O interlock on breaker A to lock breaker open. Key A-2 is now free.
- 3—Open breaker C.
- 4—Turn key A-4 in L-O interlock breaker C to lock breaker open. Keys A-1 and A-4 are now free.
- 5—Insert key A-2 from L-O interlock on breaker A and key A-1 from L-O interlock on breaker C, in L-C interlock on disconnect F and turn to unlock. Keys A-1 and A-2 are now held.
- 6—Open disconnect F.
- 7—Turn key A-3 in L-O interlock on disconnect F to lock open. Keys A-3 and T-1 are now free.
- 8—Insert key T-1 in L-O interlock on bus tie disconnect T and turn to unlock. Key T-1 is now held.
- 9—Close bus tie disconnect T.
- 10—Turn key B-1 in L-C interlock on bus tie disconnect T to lock closed. Keys A-1 and B-1 are now free.
- 11—Insert key A-1 in L-O interlock on breaker C and turn to unlock. Keys A-1 and A-4 are now held.
- 12—Close breaker C.

Reverse sequence to restore load No. 1 to line 1.

To transfer load No. 2 from line 2 to line 1, proceed in a similar manner.

To isolate breaker A for servicing:

- 1—Proceed from normal position with operations as in 1 through 7 above.
- 2—Insert key A-3 in L-C interlock on disconnect E and turn to unlock. Key A-3 is now held.
- 3—Open disconnect E.
- 4—Turn key A-2 in L-O interlock on disconnect E to lock open. Key A-2 is now free.
- 5—Return key A-2 to breaker A and unlock for operation during servicing.

Reverse sequence to restore service.

To isolate breaker B for servicing, proceed in a similar manner.

To isolate breaker C for servicing, proceed as follows:

- 1—Open breaker C.
- 2—Turn key A-4 in L-O interlock on breaker C to lock breaker open. Keys A-1 and A-4 are now free.
- 3—Insert key A-4 in L-O-C interlock on disconnect K and turn to unlock. Key A-4 is now held.
- 4—Open disconnect K.
- 5—Turn key A-4 in L-O-C interlock on disconnect K to lock disconnect open. Key A-4 is now free.
- 6—Return key A-4 to breaker C and unlock for operation during servicing.

Reverse sequence to restore service.

To isolate breaker D for servicing, proceed in a similar manner.

\*To prevent primary disconnects (K&L) from opening magnetizing current only, additional interlocks should be provided for disconnects K&L.

## INTERRUPTER SWITCHES SCHEME 25

To prevent opening fuse compartment door when the interrupter switch A is closed.

To prevent closing interrupter switch until fuse compartment door is locked closed.

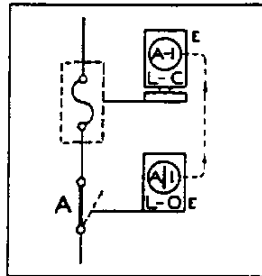


FIG. 1

Fuse compartment door and Interrupter are shown in closed position. Key A-1 is held in interrupter interlock.

- 1—Open interrupter.
- 2—Turn key A-1 in L-O interlock on interrupter switch to lock open. Key A-1 is now free.
- 3—Insert Key A-1 in L-C interlock on fuse compartment door and turn to unlock. Key A-1 is now held.
- 4—Open fuse compartment door.

Reverse sequence to restore service.

## SCHEME 26

To prevent operation (open or closed) of interrupter switch A when breaker is closed.

Permits the breaker to be serviced and operated while the interrupter switch is locked open.

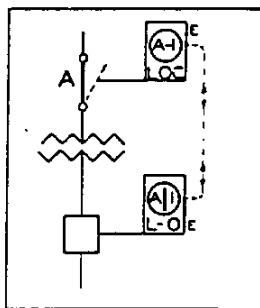


FIG. 2

Interrupter and Breaker are shown in closed position. Key A-1 is held in breaker interlock.

- 1—Open breaker.
- 2—Turn key A-1 in L-O interlock on breaker to lock breaker open. Key A-1 is now free.
- 3—Insert key A-1 in L-O-C interlock on interrupter and turn to unlock. Key A-1 is now held.
- 4—Open interrupter.
- 5—Turn key A-1 in L-O-C interlock on interrupter to lock open. Key A-1 is now free.
- 6—Return key A-1 to breaker interlock and unlock for operation of breaker during servicing.

Reverse sequence to restore service.

## SCHEME 27

To prevent operation (open or closed) of interrupter switch A when breaker is closed.

To prevent opening fuse compartment door when the interrupter switch A is closed.

To prevent closing interrupter switch until fuse compartment door is locked closed.

Permits the breaker to be serviced and operated while the interrupter is locked open.

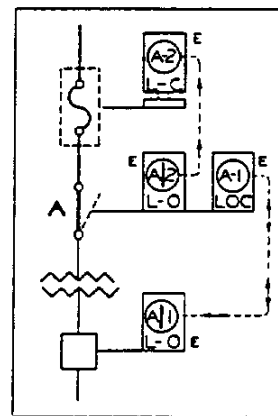


FIG. 3

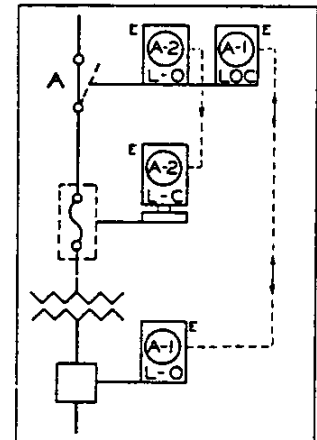


FIG. 4

Breaker, Fuse compartment door and Interrupter are shown in closed position. Key A-1 is held in breaker interlock and key A-2 is held in interrupter interlock.

To service breaker:

- 1—Open breaker.
- 2—Turn key A-1 in L-O interlock on breaker to open. Key A-1 is now free.
- 3—Insert key A-1 in L-O-C interlock on interrupter and turn to unlock. Key A-1 is now held.
- 4—Open interrupter.
- 5—Turn key A-1 in L-O-C interlock on interrupter to lock open. Key A-1 is now free.
- 6—Return key A-1 to breaker interlock and unlock for operation of breaker during servicing.

Reverse sequence to restore service.

To open fuse compartment door:

- 1—Proceed from normal position with operations as in 1 through 4 above.
- 2—Turn key A-2 in L-O interlock on interrupter switch to lock open. Key A-2 is now free.
- 3—Insert key A-2 in L-C interlock on fuse compartment door and turn to unlock. Key A-2 is now held.
- 4—Open fuse compartment door.

Reverse sequence to restore service.

## SCHEME 28

To prevent dropping load—when shifting from one source to the other.

To prevent opening both interrupter switches A and B at the same time—(Permits both interrupter switches to be closed at the same time).

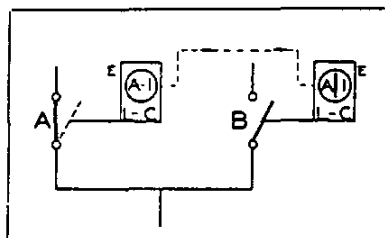


FIG. 1

Interrupter A is shown closed and interrupter B is shown open. Key A-1 is held in interrupter B interlock.

- 1—Close interrupter B.
- 2—Turn key A-1 in L-C interlock on interrupter B to lock closed. Key A-1 is now free.
- 3—Insert key A-1 in L-C interlock on interrupter A and turn to unlock. Key A-1 is now held.
- 4—Open interrupter A.

Reverse sequence to restore service through interrupter B.

## SCHEME 29

To prevent paralleling lines A and B—requires dropping load when shifting from one source to the other.

To prevent closing both interrupter switch A and B at the same time—(Permits both interrupter switches to be opened at the same time).

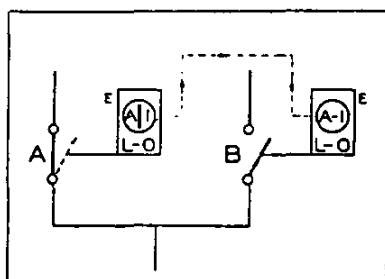


FIG. 2

Interrupter A is shown closed and interrupter B is shown open. Key A-1 is held in interrupter A interlock.

- 1—Open interrupter A.
- 2—Turn key A-1 in L-O interlock on interrupter A to lock. Key A-1 is now free.
- 3—Insert key A-1 in L-O interlock on interrupter B and turn to unlock. Key A-1 is now held.
- 4—Close interrupter B.

Reverse sequence to restore service through interrupter A.

## SCHEME 30

To prevent paralleling lines A and B—requires dropping load when shifting from one source to the other.

To prevent closing both interrupter switch A and B at the same time—(Permits both interrupter switches to be opened at the same time).

To prevent operation (open or closed) of either interrupter switch when breaker is closed.

Permits the breaker to be serviced and operated while both interrupter switches are locked open.

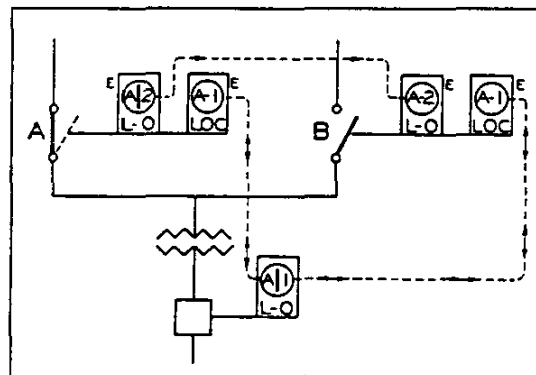


FIG. 3

Breaker and Interrupter A are shown in closed position. Interrupter B is shown in open position. Key A-1 is held in breaker interlock. Key A-2 is held in interrupter A interlock.

To service breaker:

- 1—Open breaker.
- 2—Turn key A-1 in L-O interlock on breaker to lock breaker open. Key A-1 is now free.
- 3—Insert key A-1 in L-O-C interlock on interrupter A and turn to unlock. Key A-1 is now held.
- 4—Open interrupter A.
- 5—Turn key A-1 in L-O-C interlock on interrupter A to lock open. Key A-1 is now free.
- 6—Return key A-1 to breaker interlock and unlock for operation of breaker during servicing.

Reverse sequence to restore service.

To transfer load from interrupter A to interrupter B.

- 1—Proceed from normal positions with operations as in 1 through 4 above.
- 2—Turn key A-1 in L-O-C interlock and key A-2 in L-O interlock on interrupter A to lock open. Keys A-1 and A-2 are now free.
- 3—Insert key A-1 in L-O-C interlock and key A-2 in L-O interlock on interrupter B and turn to unlock. Keys A-1 and A-2 are now held.
- 4—Close interrupter B.
- 5—Turn key A-1 in L-O-C interlock on interrupter B to lock closed. Key A-1 is free and key A-2 is held.
- 6—Insert key A-1 in L-O interlock on breaker and turn to unlock. Key A-1 is now held.
- 7—Close breaker.

Reverse sequence to restore service through interrupter A.

## INTERRUPTER SWITCHES SCHEME 31

To prevent operation (closed, open or closed) of interrupter switch when breaker is closed.

Permits the breaker to be serviced and operated while the interrupter switch is locked open.

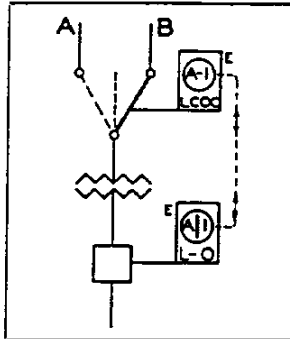


FIG. 1

Breaker and Interrupter are shown in closed position, connected to line B. Key A-1 is held in breaker interlock.

To service breaker:

- 1—Open breaker.
- 2—Turn key A-1 in L-O interlock on breaker to lock breaker open. Key A-1 is now free.
- 3—Insert key A-1 in L-C-O-C interlock on interrupter and turn to unlock. Key A-1 is now held.
- 4—Open interrupter.
- 5—Turn key A-1 in L-C-O-C interlock on interrupter to lock open. Key A-1 is now free.
- 6—Return key A-1 to breaker interlock and unlock for operation of breaker during servicing.

Reverse sequence to restore service through either line A or line B.

To transfer interrupter from line B to line A:

- 1—Proceed from normal position with operations as in steps 1, 2 and 3 above.
- 2—Open interrupter switch from line B and connect to line A.
- 3—Turn key A-1 in L-C-O-C interlock on interrupter to lock closed. Key A-1 is now free.
- 4—Insert key A-1 in L-O interlock on breaker and turn to unlock. Key A-1 is now held.
- 5—Close breaker.

Reverse sequence to restore service through either line A or line B.

## SCHEME 32

To prevent operation (closed, open or closed) of interrupter switch when breaker is closed.

To prevent opening fuse compartment door when the interrupter switch A is closed.

To prevent closing interrupter switch until fuse compartment door is locked closed.

Permits the breaker to be serviced and operated while the interrupter switch is locked open.

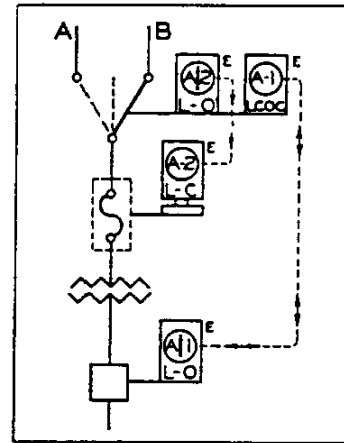


FIG. 2

Breaker, Fuse compartment door and Interrupter are shown in closed position, connected to line B. Key A-1 is held in breaker interlock and key A-2 is held in interrupter interlock.

To service breaker:

- 1—Open breaker.
- 2—Turn key A-1 in L-O interlock on breaker to lock breaker open. Key A-1 is now free.
- 3—Insert key A-1 in L-C-O-C interlock on interrupter and turn to unlock. Key A-1 is now held.
- 4—Open interrupter.
- 5—Turn key A-1 in L-C-O-C interlock on interrupter to open. Key A-1 is now free.
- 6—Return key A-1 to breaker interlock and unlock for operation of breaker during servicing.

Reverse sequence to restore service through either line A or line B.

To Open fuse compartment door.

- 1—Proceed from normal position with operations as in 1 through 4 above.
- 2—Turn key A-2 in L-O interlock on interrupter to lock open. Key A-2 is now free.
- 3—Insert key A-2 in L-C interlock on fuse compartment door and turn to unlock. Key A-2 is now held.
- 4—Open fuse compartment door.

Reverse sequence to restore service.

To transfer interrupter from line B to line A.

- 1—Proceed from normal position with operations as in steps 1, 2 and 3 above.
- 2—Open interrupter switch from line B and connect to line A.
- 3—Turn key A-1 in L-C-O-C interlock on interrupter to lock closed. Key A-1 is now free.
- 4—Insert key A-1 in L-O interlock on breaker and turn to unlock. Key A-1 is now held.
- 5—Close breaker.

Reverse sequence to restore service through line B.

# POWER SWITCH AND DOOR OR GUARD WITH TIME DELAY SCHEME 33

To prevent opening of guard B with motor circuit closed.

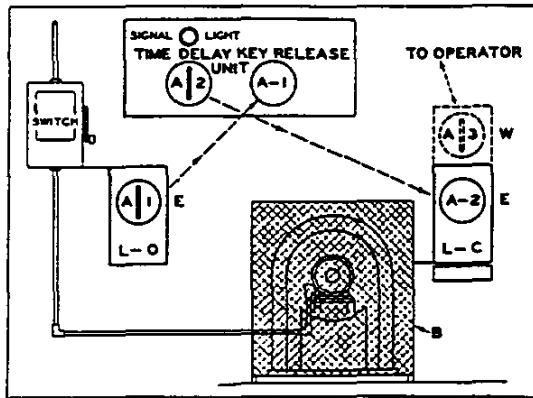


FIG. 1

Starting switch normally closed. Key A-1 held in starting switch interlock. Guard B (or door) is locked closed by means of type D—detachable interlock.

- 1—Open starting switch.
  - 2—Turn key A-1 in L-O interlock on switch to lock open. Key A-1 is now free.
  - 3—Insert key A-1 in Time Delay Key Release Unit and rotate to start time delay action.
  - 4—Signal light energized and key A-2 can be removed after the prescribed time period.
  - 5—Insert key A-2 in L-C interlock (type D) on guard B and turn to unlock. Key A-2 is now held.
  - 6—Open guard.
- Reverse sequence to restore service.

## TIME DELAY AND SOLENOID RELEASE SCHEME SCHEME 34

This application is used in a high-voltage testing laboratory. Personnel must be protected against hazards stemming from the use of a surge generator and high voltage, 60-cycle transformers. All doors to the testing area must be locked while tests are proceeding.

### Sequence of Operations in Surge Testing

To energize surge generator and insure that testing area is clear of personnel while it is energized:

To provide time delay before personnel can enter equipment testing area following tests.

- 1—Close main low voltage 60-cycle breaker.
- 2—Energize control panel of generator. Energizing of control panel initiates timer action in key release unit.
- 3—After one minute delay, lamp lights. Solenoid is now energized.
- 4—Key can now be turned in lock and withdrawn. While key is free, generator cannot be charged.
- 5—Key is used to lock all six doors of testing area. Extending bolt closes series switches. When all doors are locked closed, series switches are also closed.
- 6—Key is re-inserted in key release unit, and is turned in lock. Key is now held, and control circuit is completely energized.

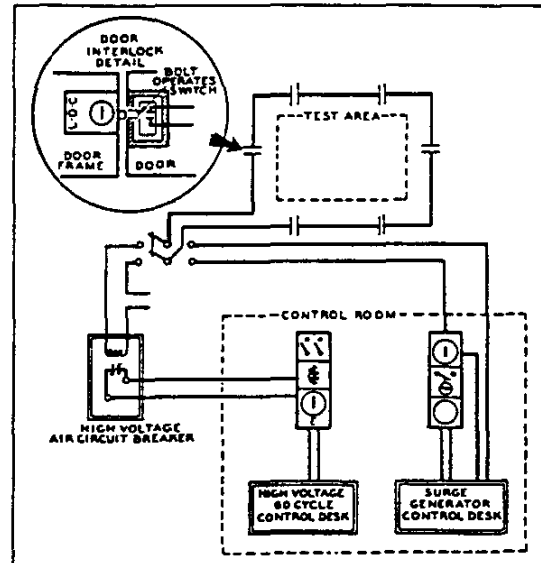


FIG. 2

- 7—Generator may be charged and testing proceeds. When testing is completed, and it is desired to gain access to the surge generator:
- 8—Discharge surge generator.
- 9—Discharge initiates timer.
- 10—After one minute delay, lamp lights. Solenoid is now energized.
- 11—Key can now be turned in lock, and withdrawn. While key is free, generator cannot be charged.
- 12—Key is used to unlock any of the six doors desired.
- 13—Key is re-inserted in time delay unit and turned. Key is now held.

### Sequence of Operations in High-voltage testing.

To energize transformer for high voltage tests, and to insure that testing area is clear of personnel while it is energized.

To insure that testing equipment is de-energized before personnel can enter area following tests.

- 1—Energize solenoid in key release unit.
- 2—Key may now be turned and withdrawn.
- 3—Use key to close and lock all doors in testing area. When all doors are locked closed, series switches are also closed.
- 4—Replace key in key release unit and turn. Breaker trip circuit is now open.
- 5—Energize breaker.

When testing is completed and it is desired to gain access to the testing area:

- 6—Trip breaker.
- 7—Turn key in key release unit and withdraw. If breaker has not previously been tripped, it is tripped when key is turned. Trip circuit is completed whenever key is removed from unit.
- 8—Use key to unlock doors as required.
- 9—Replace key in unit. Key is turned and held. Breaker trip circuit is open.