KIRK KEY INTERLOCK SYSTEM

APPLICATION INFORMATION

AND SCHEMES

GENERAL INFORMATION

An Interlock is a device applied to two, or more, movable parts, preventing or allowing a movement of one part, only when another part is locked in a predetermined position.

APPLICATION

An Interlock System is a series of these devices applied to associated equipment in such a manner as to prevent or allow operation of the equipment, in a prearranged sequence only.

Interlocks are applicable to practically any field wherein human life or property is endangered by an improper operation or improper sequence of operations. They are also used to protect valuable equipment, operating processes, and production.

Importance of Interlocking—Interlocks are SAFETY DEVICES. They are an important item in present-day management because of the general desire to provide safe working conditions. Increasing safety legislation and a reduction of insurance rates, when safety devices are used, are added incentives for the use of interlocks.

FUNDAMENTAL REQUIREMENTS FOR INTERLOCKS

There are four fundamental conditions to be met in a satisfactory interlock. It must be:—

1. Positive in Action—The interlock must normally make the controlled equipment absolutely inoperative at all times.
2. Cannot be Defeated—The Interlock must not be capable of being defeated. However, in an emergency it should be easily and quickly defeated, leaving a visual indication of the abnormal operation.
3. Simple—The Interlock must be a simple auxiliary device easily installed and easily and quickly operated.
4. Inexpensive—The Interlock must be relatively inexpensive in proportion to the equipment protected so that its use may be justified.

LOCKING VS. INTERLOCKING

A Key Lock differs essentially from a Key Interlock. In a Key Lock the key is removable in either the locked or unlocked position. In a Key Interlock the key is removable only in a predetermined position.

In a Locking System, where the keys are removable in either the locked or unlocked position, the operator must remember to leave the equipment locked.

In an Interlocking System, the locking operations are compulsory, since the keys can only be removed after the equipment has been locked.

Combined Locking and Interlocking—There may be cases where it is desirable to combine an interlocking system with a locking system where the locking system can be set up with adequate supervision to insure that any operative error is caught before the locking system and the interlocking system are made ineffective.

SUPERVISORY OPERATION

At any point in the sequence a supervisory key can be introduced into the system.

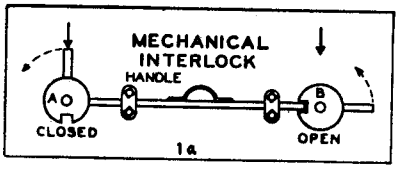
There may be operations that can and should be done by an operator, and other operations at which time it is felt a second man or supervisor should be present.

Classification

Interlocks are classified into three main divisions based on the type of interconnection between the associated devices.

Mechanical

(Fig. 1a) consists of a bar, chain, gear or other mechanical arrangement between the associated devices. A mechanical Interlock is reliable and if properly designed, difficult to defeat. It permits rapid operation due to the direct connection.

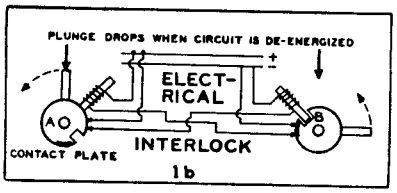


1a

Because of this direct connection, however, a Mechanical Interlock is of necessity limited to devices located close together. It is entirely unsuited for interlocking several devices or for sequence interlock operations.

Electrical

(Fig. 1b) consists chiefly of switches and solenoids arranged at the associated devices and connected by electrical conductors. This type of interlock is applicable to devices any distance apart, although it is sometimes difficult to arrange for the necessary conducting materials and supports.

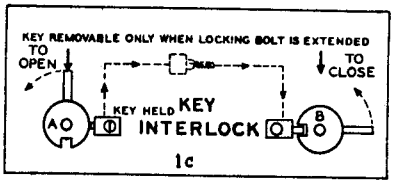


1b

The application of an Electrical Interlock is limited to devices adjacent to a satisfactory electrical power source and automatically becomes inoperative with failure of the electrical circuit.

Key Interchange

(Fig. 1c) consists of self-contained individual locking units located at the associated devices, which permit a desired operation only when conditions are correct for that operation. It is purely mechanical in operation, difficult to defeat, and is adaptable to devices regardless of their physical relation to each other.



1c

It is applicable to the simplest as well as the most complicated interlock operations. It is inexpensive, easy to install, and guarantees the safety of the operator and equipment.

GENERAL INFORMATION
KEY INTERLOCK APPLICATION

Interlocks are used to prevent the authorized operator from making an unauthorized operation.

The Kirk Interlock System is a simple and easy method of applying individual key interlock units and assemblies to any type of equipment so as to require operation in a predetermined sequence.

The Kirk Interlock System interlocks over any distance without complicated and expensive connecting rods or other mechanisms. The removal of a key makes the interlocked equipment non-operative mechanically and electrically.

The system normally can not be defeated. However, in an emergency it can easily and quickly be defeated leaving a visual indication of the abnormal operation.

It is applicable to any manufacturer's standard equipment as purchased instead of requiring the equipment to be designed and assembled around the interlocking devices. The system can be expanded or rearranged easily at any time.

Units may be mounted directly on the device to be locked or on an adapter located in any desired position where the interlock unit can control the movement of the device.

Interlock Units and Assemblies

Kirk interlock units consist of simple, rugged locking devices which operate on the principle that the key can only be removed when the locking bolt is in a predetermined position to lock the controlled equipment against motion, thus permitting the released key to unlock the other related equipment.

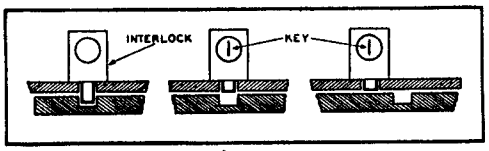


FIG. 1

The simplicity of mounting and interlocking is shown in Fig. 1 which briefly outlines the fundamentals. Figure 1a shows a Kirk interlock mounted on a device, consisting of two members, one of which moves relative to the other. The locking bolt extends through one member and engages a recess in the other member. In this position the key is removable from the lock, thus mechanically locking the device against operation. In Figure 1b the key has been inserted in the lock and turned to withdraw the locking bolt. The device is now operative. Figure 1c indicates that the device has been operated. the key can not now be removed from the lock as it is impossible to extend the locking bolt.

Special Assemblies

Typical of the many special assemblies which can be developed, is the latching bolt lock. The bolt on this type of lock is automatically extended when the receiving or movable member is moved into the lockable position.

This type of automatic locking action can be applied to any of the standard Kirk Interlocks, and is identified by the suffix letter "G". Example—BG or FG.

Referring to Fig. 1, assume that the "FG" type is shown the key can be removed when the bolt in the withdrawn position, as in Fig. 1c. When the movable member is returned to the lockable position as shown in 1b, the locking bolt will automatically extend itself into the locked position as shown in Fig. 1a.

It is now necessary to insert and operate the key to withdraw the locking bolt when it is desirable to operate the movable member.

Interlock Systems

The above shows the operation of an interlock unit on any particular device. Figure 2 illustrates two interlock units applied to two devices to form a simple Kirk Interlock System.

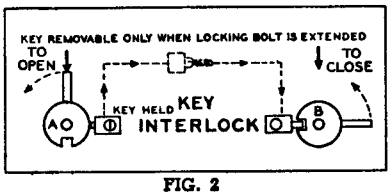


FIG. 2

Here the problem is to permit either device A or device B to be closed but not to permit them both being closed at the same time. In the position shown, device A is closed and device B is locked open. A is operative and can be opened. B is non-operative because it is locked. To close B the key from A must be obtained. This can only be done when A is open and locked open, releasing the key for the subsequent unlocking and the closing of B.

In the following illustration, Fig. 3, the problem is to permit either of two valves A or B to be open but not to permit both being open at the same time.

V is a vat for liquid. A is inlet valve for liquid. B is outlet valve to sewer used to slush out vat after cleaning. The liquid is prevented from flowing into vat if sewer valve is open. Valve B is locked closed. It can be opened only when valve A has been closed and locked closed allowing key to be taken to B to open it.

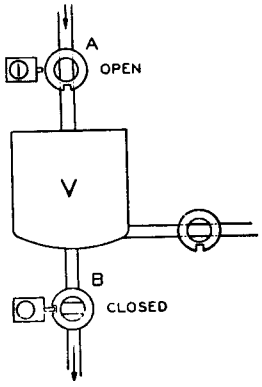


FIG. 3

Other Interlocking Applications

Are shown in following pages. The safety engineer, having familiarized himself with the fundamentals of interlocking devices and system interlocking can readily make his own interlocking system layout and specify the interlocks and related equipment from the catalog to carry out the purpose desired.

TYPES OF KEY INTERLOCKS

The Interlock Line

Consists of interlocks, interlock assemblies, combinations and related devices. The more common types are shown in accompanying figures.

Interlock

The simple form of interlock consists of lock, key and operating bolt in a housing. It is made in two types for two mounting methods.

Base Mounting
Type B

The type F is narrower than the base of the type B and can be mounted in a more limited space.

Flat Mounting
Type F (FN)

Interlock Assembly for Doors and Guards

Is a form of interlock made in two cooperating parts. The lock part is mounted on the movable door or guard and the bolt socket on the jamb or stationary part. The possession of the key indicates that the door to cubicle, room or enclosed area is locked closed.

Detachable Latch
Type D

Transfer Lock

Is two or more locks assembled in a single housing. They are designed to retain certain keys until other keys from the interlocking system are brought to it and inserted. When all keys are in their respective locks and the operating key turned, all keys are simultaneously turned which then makes the previously retained keys removable and retains those previously inserted.

Usually the need of a transfer lock can be eliminated by the use of multi-unit interlocks mounted on their respective

Transfer Lock
Type T

devices, making it unnecessary to go through an additional transfer lock operation. A transfer lock is actually not an interlock. The operating member or bolt is not extended through the base for locking any movable device or part.

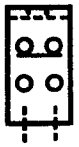
Padlocks

Are occasionally used to lock parts of mechanisms or doors or detachable parts. A padlock is not a true interlock, as the possession of the key does not indicate that the device with which it is to be used is in any locked or unlocked position.

Padlock
Type P

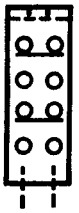
Auxiliary Switch

An auxiliary switch can be supplied with any of the interlocks, interlock assemblies, and transfer locks listed above to form a combination. The switch is mounted on the upper end of an interlock housing and is actuated by the operating bolt, which in turn is actuated by the operating key. The auxiliary switches are for indication and control purposes.



Type S

Either type can be obtained in combination with B, F, D, and T types of interlocks, and with their multi-lock arrangements.



Type SS

Single Lock and Multi-Lock Arrangements

The simple one-lock interlock is designated by type letters. Interlocks and assemblies are also made for two or more locks in one mounting assembly, for B, F, D and T types, and they are designated as multi-lock interlocks. The designation is a prefix M. Example—a two lock of the type F is M2F.

In a 2-lock M2 assembly, the locks are combined with the operating bolt. Two keys, one from each of the complementary locks, must be inserted in their respective locks before the operating bolt can be extended or withdrawn. The M2 can also be made that one key is retained until the other key is inserted and the bolt operated. The previously retained key is now made available and the key last inserted is retained.

With multi-locks having M3 or M4 as a prefix many more sequence schemes can be set up. Multi-locks for greater number of locks can be made to meet special requirements.

Other Combination Interlock Units

Many other combination interlock units can be built tc meet specific purposes as:

Combined interlock and solenoid permitting or preventing the operation of the interlock when the circuit is energized.

Combined interlock and indicating lamps indicating the position of the interlock bolt.

Time-Delay Units

One important feature is the control of the "time factor" or the minimum time required between any two steps in an operating sequence. The "time factor" control feature is made possible through the use of the Time Delay Key Release Unit. This unit enables a Kirk Interlock sequence to be set up so as to include a positive or fixed control of the minimum time lapse between any two steps in the sequence.

It is believed that the Time Delay Key Release Unit has many possible applications where it can be combined with the basic standard Kirk Interlocks to protect life, property or product

TYPES, (Continued)

Construction of Interlocks and Assemblies

The interlock housings are made of heavy bronze. The locking bolt is 5/8" diameter Everdur rod. The mounting is designed for use of 3/8" bolts.

The lock is a special 7-pin tumbler lock, simple and rugged in construction. The lock housing is 1 23/64" diameter. It extends 1 1/16" beyond the interlock body. The key has an ample finger grip of distinctive pattern. The lock number is stamped on the face of the lock and also on the key. It is a serial number applying to the lock combination, and is used as a record for possible replacements and extension of systems.

Each interlock is supplied with a key in each lock. This provides more keys than are actually necessary for the interlocking system setup. These extra keys however are needed in the installation of interlocks on equipment. **When once installed the extra keys should be removed from the system and destroyed or retained as extra keys by a responsible person.**

If the interchange number is specified it will be stamped on the lock and key only if requested. This number is a designation number used in the interlock sequence and aids in the operation of the system.

Master Locks

A Master Lock, also called an apartment lock, is a lock which is capable of being operated by either of two or more keys, which are not in themselves interchangeable. Examples of their use are shown later in Scheme 10. The dimensions of master locks are the same as standard locks.

Master Keys

Master Keys are not recommended. If an emergency occurs calling for an unusual operation of an interlocked device, a master key might be used in the wrong interlock and cause trouble.

Recommendation is made for the use of the regularly supplied extra keys under controlled conditions. Refer to previous paragraph. Master keys can not be used in standard locks. When master keys are desired, all the locks of the master key series become special and are priced accordingly.

OPTIONAL EXTRAS

Additional items to standard line not included with interlock.

Mounting Bolts

Bolts for interlock mountings are of one size, 3/8"-16 made of Everdur. The heads are provided with a through hole in which a sealing wire can be placed. Standard styles are: hex head-3/4" and 1 1/8" long, and fillister head machine screw-1 3/4", 2", 2 1/4" and 2 1/2" long.

Covers

Covers are recommended for interlocks used on outdoor service and for indoor service where dust is prevalent. Where there is no moisture or dirt, covers are not needed.

Adapters

In some cases mounting adapters, or spacers, might be used to advantage for mounting the Type D interlock.

Also, a mounting adapter is available for application to type FN interlock if desired.

Purchaser should provide adapters he needs to meet his special requirements. Other mounting adapters can be furnished where conditions are known.

Duplicate Keys

If additional keys are required because of loss or damage they can be supplied. They can be obtained only on purchaser's authorized order.

Seals - Sealing Irons

Seals may be used for sealing of interlock mountings to deter unauthorized removal. All exposed bolt heads are provided with drilling for meter type seals. This includes mounting bolts and screws for attaching switch covers.

OPERATION

Locking Bolt Position

The B and F interlocks are built in different assemblies to suit different requirements of locking bolt position and bolt projection.

Any key is removable from its lock in one position only, that is, either with the locking bolt extended or with the locking bolt withdrawn. All keys, however, must be in their respective locks in order to operate the locking bolt. The following designations indicate the positions in which the key will be released:

E—Bolt Extended, Key Removable.
(also—Bolt withdrawn, Key Held)

W—Bolt Withdrawn, Key Removable.
(also—Bolt extended, Key Held).

The interlock shown in Figure 1a is designated as "E" as the key is removable when the locking bolt is extended to lock the apparatus. As interlocking sequences usually require the associated devices to be locked in one position in successive order, it seldom occurs that a single unit "W" interlock is necessary

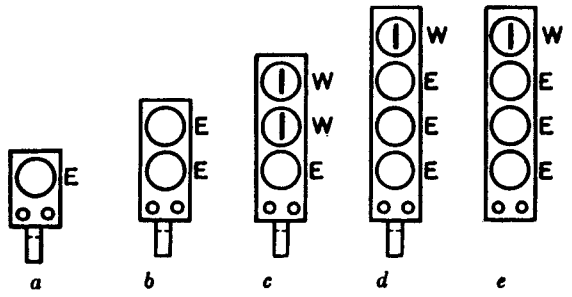


FIG. 1

as the key is removable when the interlock bolt is withdrawn. In the more common application this would leave the device unlocked. In the multiple lock interlocks "M", however, keys may be required to be removable in either the locked or unlocked position for each lock.

Since an interlock can be mounted in an upright or inverted or side position the term upper or lower to designate the lock cylinders should not be used. Reference to the lock cylinders should be made in a sequential order, beginning with the operating bolt end.

Figure 1 shows some multiple lock interlocks with key designations. Figure 1b shows an M2 interlock which has both keys lettered "E" indicating that both keys are removable when bolt is extended and are held when bolt is withdrawn. Figure 1c shows an "M3" interlock designated as an M3-EWW, indicating the key at the lower or operating bolt end, or the mounting bolt end, is removable when locking bolt is extended. When the locking bolt is withdrawn the other two "W" keys are removable.

Figure 1d shows an "M4-EEEW" indicating that the three keys at mounting bolt end are removable and the other key is held when the locking bolt is extended.

Figure 1e shows a transfer lock in which there is no extended operating bolt. The designations as above are referred to the relative position of locks from mounting bolt end. M4-EEEW.

Locking Bolt Throw

The travel of the locking bolt from the withdrawn to the extended position is ¾″.

Special Locking Bolt Position

Occasionally there is a requirement for more than one locking function from the same interlock. To solve such a problem, a combination of locking bolt extensions have been arranged on the same assembly. (Standard bolt travel ¾″, plus one half normal travel ⅜″.)

Locking Bolt Projection

The standard length for the projection of the interlock bolt when in the withdrawn position is 1″. Other lengths are 0″, ⅜″, 1″, 2″, and 3″. Unless otherwise called for, 1″ projection will be supplied. If other lengths are desired the specified length should be suffixed to the letters designating the type. Thus figure 1a with a 3″ bolt projection is specified type M2F-3-EE.

Lock Designations

When interlocks are used, locks will have keys that are to interchange with other locks. It is a help to purchaser in making studies, that a designation be assigned to indicate which locks have keys that are the same as other locks and keys. Designations such as A-1, A-2, B-1 B-2, etc., can be used. This designation is called a key interchange number.

Lock numbers are assigned on receipt of interlock orders. Where two or more locks with the same interchange numbers are used, two or more locks with the same lock number will be used.

The lock numbers are marked on the face of the lock above the word KIRK. If purchaser desires, the locks will be marked with interchange numbers. These numbers are marked on both sides of the lock face so that the interchange number can be read in any mounting position of the interlock that the purchaser may decide to use.

FIG. 2

The key is also marked with lock number and interchange number. The lock number appears on the same side as KIRK. The interchange number is marked on the reverse side, if the interchange number is also desired.

GENERAL APPLICATION

GENERAL TYPES OF INTERLOCK APPLICATIONS

Kirk Key Interlocks can be applied to all kinds of moving members, whether operated electrically, mechanically or otherwise. All interlocking applications fall into one of three general types; sliding, latching and detachable.

Sliding-

Members slide past one another.

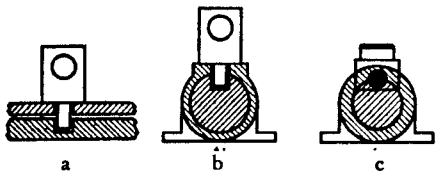


FIG. 1

Interlocking Sliding Members

The interlock unit is mounted on the stationary or movable member. The other member is provided with a recess to allow the interlocking bolt to be extended for locking at the proper position. In the unlocked position the bolt can not be extended. The key is held.

This sliding principle can be applied to a rectilinear movement of a bar or an angular movement of a disc as in Figure 1a. It can be applied to a rotational movement of a shaft as in Figure 1b. It can also be applied to a mounting with a bolt extending into a recess, partly in the stationary and partly in the movable member as in Figure 1c.

Latching-

Movement of the member is accomplished by a latch.

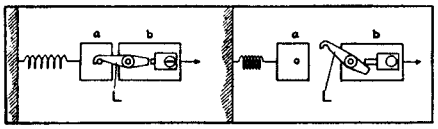


FIG. 2

Interlocking Latching Members

a and b, Figure 2 are two associated members. Member a is attached to member b by a latch L. A motion of b in direction of arrow carries a with it.

An interlock is attached to b with bolt withdrawn. The key is held. The key is removable by the extension of the bolt which holds latch L in the disengaged position. b can not now impart its motion to a.

Detachable-

Members are detachable.

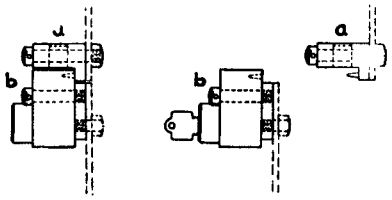


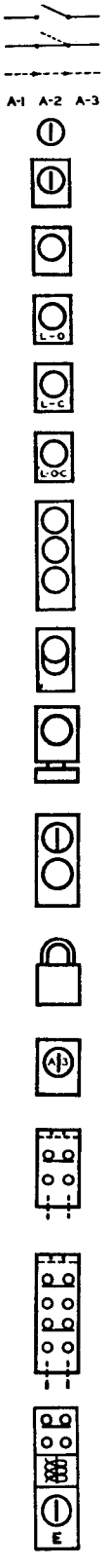
FIG. 3

Interlocking Detachable Members

a and b, Figure 3, are two members, one of which is detach able from the other. A detachable Type D interlock is mounted at b and a socket adapter is mounted at a. Members a and b are locked together in position at left and detached at right.

A control key inserted in the interlock and turned, withdraws the bolt, permitting member a to be detached from b. The control key is retained in the lock. The control key is available for interlocking only when members a and b have been brought back to their original position, the key then turned extending the locking bolt into the socket.

DIAGRAM SYMBOLS



.....*Device normally open.*

.....*Device normally closed.*

.....*Direction of key transfer.*

.....*Key interchange Number.*

.....*Key*

.....*Interlock with key held. Device in position as shown.*

.....*Interlock with key removed. Device in position as shown.*

.....*Interlock used to lock device open.*

.....*Interlock used to lock device closed.*

.....*Interlock used to lock device open and closed.*

.....*Multi-Lock interlock.*

.....*Interlock with master lock. (also called apartment lock).*

.....*Interlock, Delachable-Latch D. For doors—guards.*

.....*Interlock Transfer—T*

.....*Padlock—P.*

.....*Key interchange number (Showing key held).*

.....*Auxiliary Switch—S 1-Make 1-Break.*

.....*Auxiliary Switch—SS 2-Make 2-Break.*

.....*Solenoid Key Release Unit. Key released when Solenoid is energized (or D, de-energized).*

TYPICAL APPLICATIONS TO OPERATING DEVICES

The applications shown on this page are only suggestions, since there are many ways to adapt an interlock to the hundreds of operations where interlocking is desired.

Switch Operating Mechanisms

Figs. 1 and 2—Two sketches are shown indicating that interlocks can be applied to operating handles of the reciprocating (pump handle) or the torsional type for the operation of air switches or other apparatus.

The interlock is mounted on a stationary part of the operating device, or on a plate attached to the stationary part of the device.

The movable member, or a plate attached to a movable member, is provided with a recess into which the operating bolt of the interlock may be extended.

Thus, the air switches or other apparatus may be interlocked, open or closed, with anything which requires a sequence operation for protection.

Switch Gear Cubicle

Fig. 3—Here are shown several types of interlocks as applied to a switchgear cubicle. In the lower section an interrupter unit is enclosed, with the operating handle exposed. Here a type B interlock is installed, which interlocks with the upper section. The interlock on the upper door is a type D. The upper door can be opened only when the operating handle below is locked open.

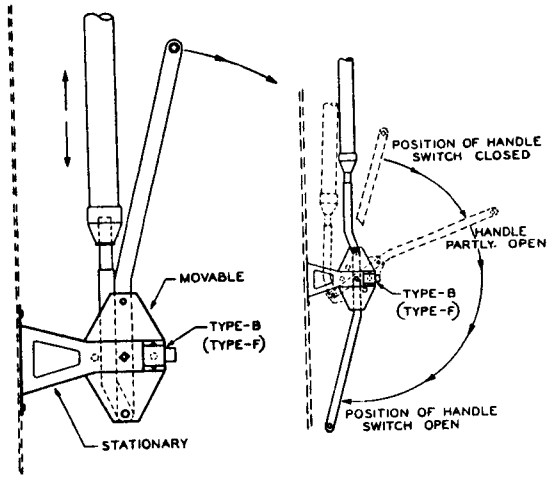


FIG. 1

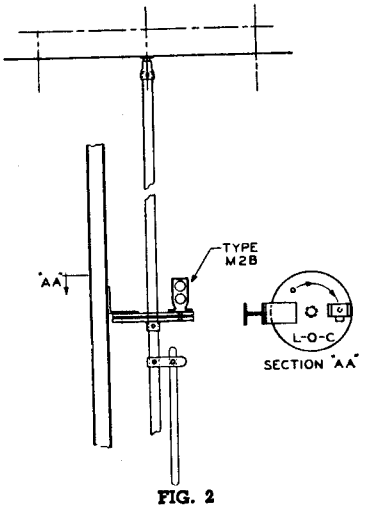


FIG. 2

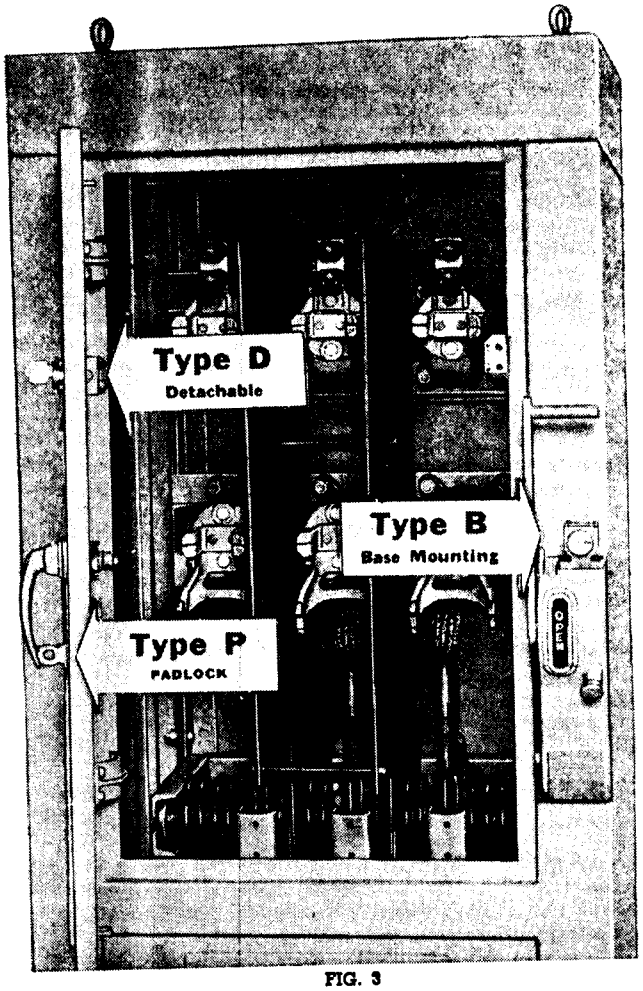


FIG. 3

GENERAL APPLICATION

See Page 8 for Diagram Symbols

LOCKING POSITION - DESIGNATIONS

As the Kirk Interlocks are single bolt type, they are designated with respect to the operating position of the device on which they are mounted. The following designations indicate the locked position of the device when the key may be removed.

L-O—Locked Open. This symbol indicates that the key is removable when the device,—a switch, valve, door, etc., is locked in the open position.

L-C—Locked Closed. This symbol indicates that the key is removable when the device is locked in the closed position.

L-O-C—Locked Open or Closed. This symbol indicates that the key is removable when the device is locked in the open or in the closed position.

Interlocking - Single Device

One unit—One position application. If it is desired to lock a device in the open position an interlock is used as in Figure 1. The possession of the key indicates that the device is in the open

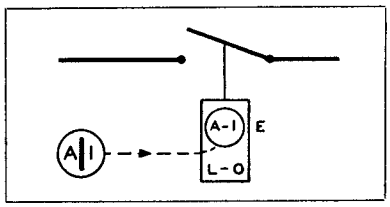


FIG. 1

position and is locked by the extension of the interlock bolt. When the key is inserted in the lock and turned to withdraw the

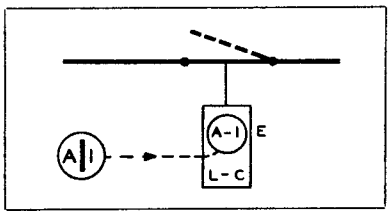


FIG. 2

interlock bolt, the device is free to operate to the closed position and the key is held in the lock.

When a device is to be locked only in the closed position an interlock is used as shown in Figure 2. The possession of the key indicates that the device is locked in the closed position, as the interlock bolt has been extended to remove the key. When the key is inserted in the lock and turned to withdraw the interlock bolt, the device is free to operate to the open position and the key is held in the lock.

One Unit - Two Position - Application

Two methods are used in locking a device in both the open and closed positions. The first method requires only one interlock as shown in Figure 3. The interlock bolt is extended in either the open or closed positions. This is accomplished with two recesses in the operating device, each coinciding with the locking bolt in one position.

The possession of the key indicates that the locking bolt is extended and that the device is locked in either the open or closed

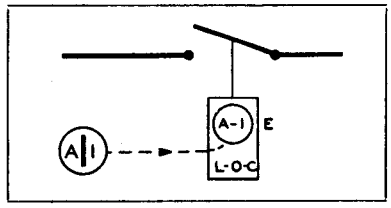


FIG. 3

position. Furthermore, the device can not be operated until the key is inserted and turned in the lock to withdraw the locking bolt. The key can not be removed from the lock in an intermediate position, but in the fully open or closed positions only. In this application, possession of the key however gives no indication as to whether the device is locked closed or open.

Two Units - Two Position Application

The other method for locking in both the open and closed positions requires two interlocks as shown in Figure 4. Possession of Key A-1 indicates that the device is locked open; possession of key A-2 indicates that the device is locked closed. The device is shown normally open, therefore, key A-1 is free and the L-O interlock bolt is extended into its recess provided in the movable member, while key A-2 is held and the L-C interlock bolt is withdrawn. To close the device, insert key A-1 in lock, turn to withdraw bolt of L-O interlock which permits the device to be oper-

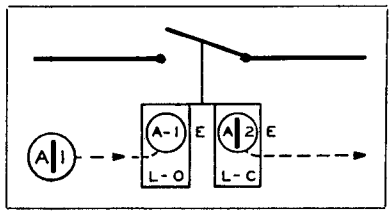


FIG. 4

ated. Now the device can be moved to the closed position, and key A-2 can be turned to extend the bolt of the L-C interlock into its recess, locking the device closed. This releases key A-2 from the L-C interlock. Meanwhile key A-1 is held in the L-O interlock, as the withdrawn bolt cannot be extended.

This method is used more often than the single interlock, two-position shown in Figure 3, due to its adaptability to sequence operations.

Sequence Interlocking

In the application of Kirk Interlocks, it is first necessary to decide upon a sequence of operation. When this has been done it is a simple matter to allocate the proper interlocks. Following are a number of applications with the development progressing from the simplest to the more complicated interlocking sequences.

The majority of applications are shown applied to electrical switches, only because this is the simplest manner in which to show them, and not because they are the only applications. For the switches there may be substituted **pipe valves, control rods, doors, safety guards, manhole covers,** etc., which are locked open or closed, corresponding to the locking indicated for the switches.

APPLICATION SCHEMES — 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. Prevents opening fuse compartment door when disconnects are closed.
	6	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.

APPLICATION SCHEMES — TABLE OF CONTENTS

Purpose of Interlocking	Scheme No.	Function
PREVENT PARALLELING OF LINES	22	Prevents paralleling two incoming primary sources through primary tie bus disconnect. Prevents operation (open or closed) of the disconnects under load. 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. Prevents operation (open or closed) of disconnects under load. Permits one power source to supply both loads through either the primary or secondary tie bus.
	24	Prevents paralleling of two incoming primary sources. Prevents operation (open or closed) of disconnects under load. Permits the isolating of breakers for servicing. Permits one power source to supply both loads through tie bus.
INTERRUPTER SWITCH SCHEMES	50	Prevents opening fuse compartment door when the interrupter switch is closed. Prevents closing interrupter switch until fuse compartment door is locked closed.
	51	Prevents operation (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.
	52	Prevents operation (open or closed) of interrupter switch when breaker is closed. Prevents opening fuse compartment door when the interrupter switch is closed. Prevents 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.
	53	Prevents dropping load—when shifting from one source to the other. Prevents opening both interrupter switches at the same time—(Permits both interrupter switches to be closed at the same time.)
	54	Prevents paralleling two lines—requires dropping load when shifting from one source to the other. Prevents closing both interrupter switches at the same time—(Permits both interrupter switches to be opened at the same time.)
	55	Prevents paralleling two lines—requires dropping load when shifting from one source to the other. Prevents closing both interrupter switches at the same time—permits both interrupter switches to be open at the same time. Prevents 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.
	56	Prevents operation (closed, open or closed) of a three position interrupter switch when the breaker is closed. Permits the breaker to be serviced and operated while the interrupter switch is locked open.
	57	Prevents operation (closed, open or closed) of a three position interrupter switch when the breaker is closed. Prevents opening fuse compartment door when the interrupter switch is closed. Prevents 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.
POWER SWITCH AND DOOR OR GUARD	70	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 AND SOLENOID RELEASE SCHEMES	70	Prevents opening of guard, or door for a predetermined time after removal of power. (From motor, centrifuge, condensers, etc.)
	71	Prevents laboratory personnel from gaining access to high-voltage equipment area while testing is going on.

APPLICATION SCHEMES

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.

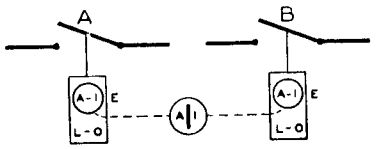


FIG. 1

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.

SCHEME 1.

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

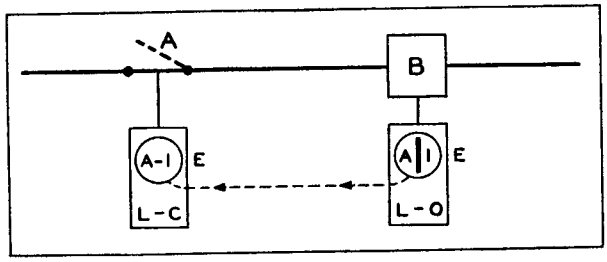


FIG. 2

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.

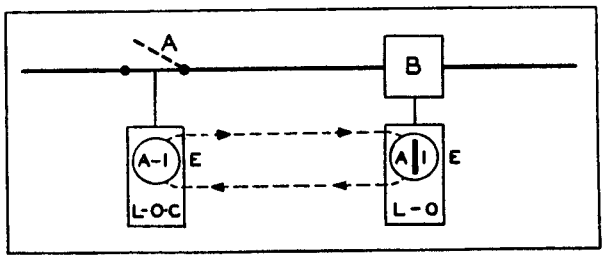


FIG. 3

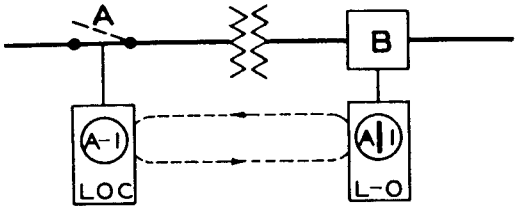


FIG. 4

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.

APPLICATION SCHEMES

SCHEME 3.

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

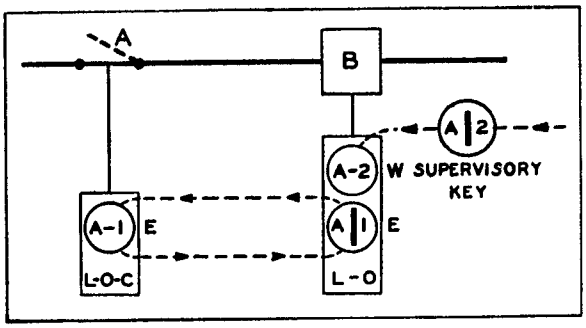


FIG. 1

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.

SCHEME 4.

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

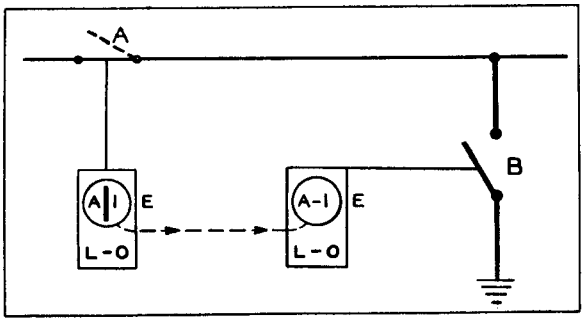


FIG. 2

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.

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.

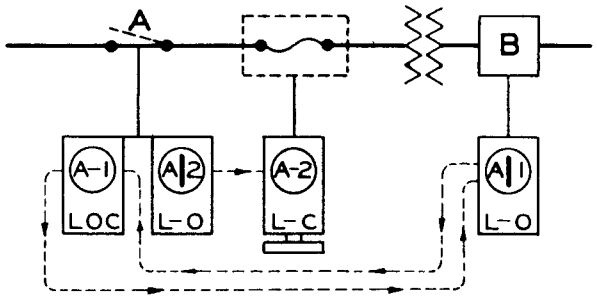


FIG. 3

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.

APPLICATION SCHEMES

SCHEME 6.

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)

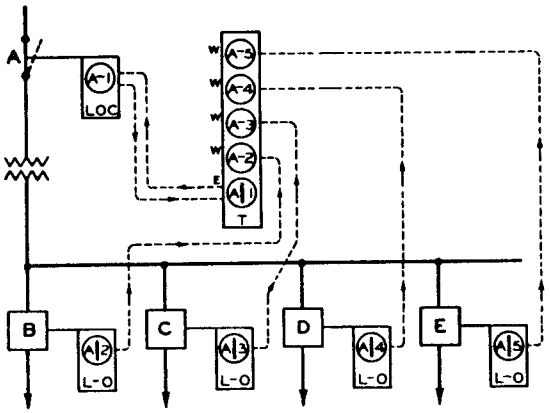


FIG. 1

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.)

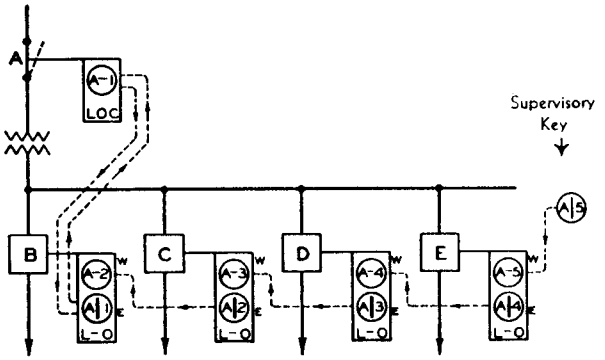


FIG. 2

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.

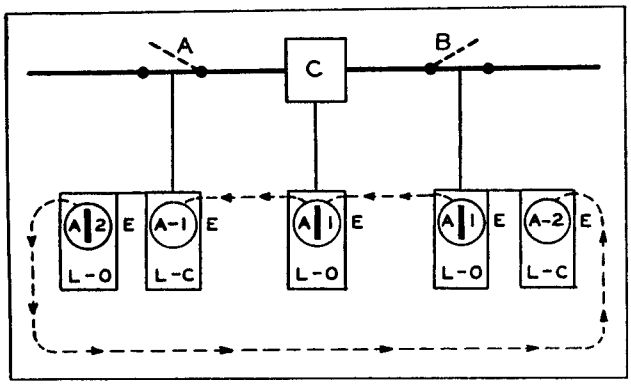


FIG. 1

Breaker C and diconnects 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.

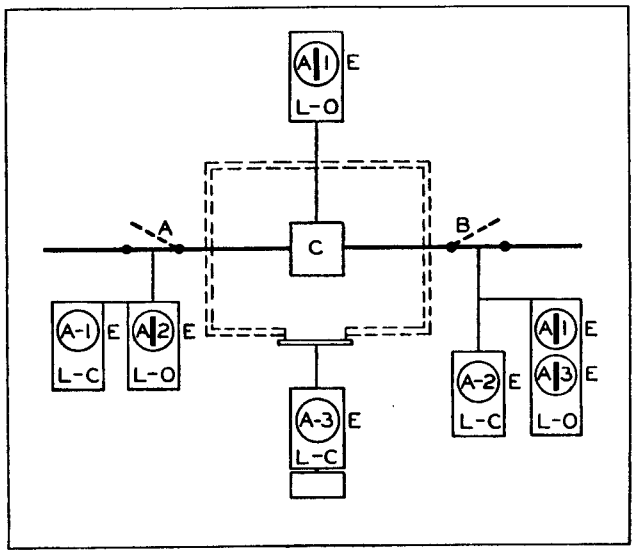


FIG. 2

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.

APPLICATION SCHEMES

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.

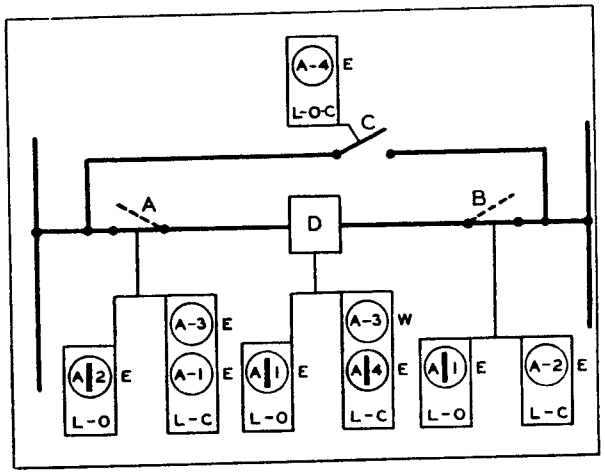


FIG. 1

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.

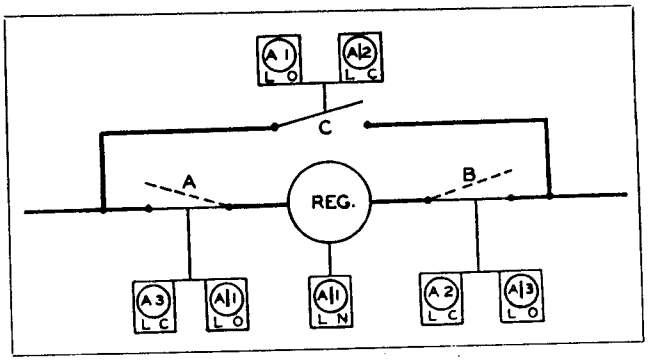


FIG. 2

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 Netural) 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.

APPLICATION SCHEMES

SCHEME 11.

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

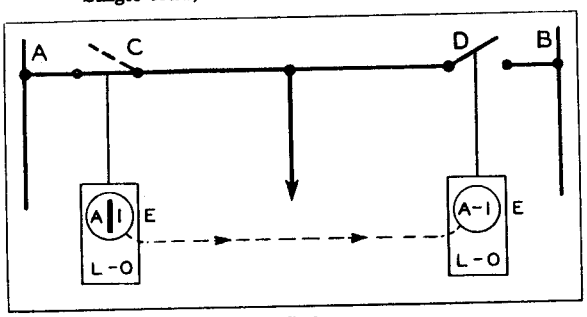


FIG. 1

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.

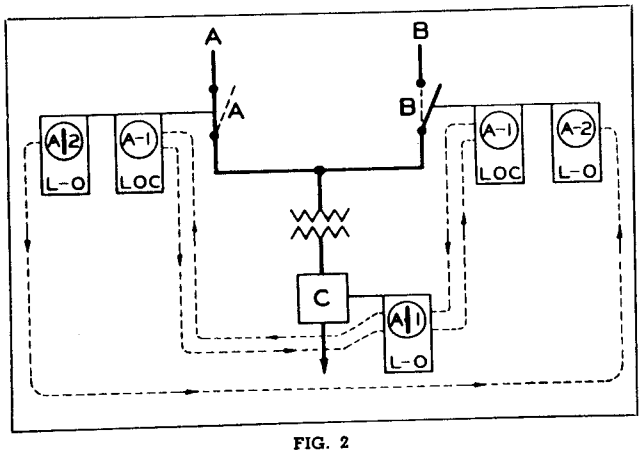


FIG. 2

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.

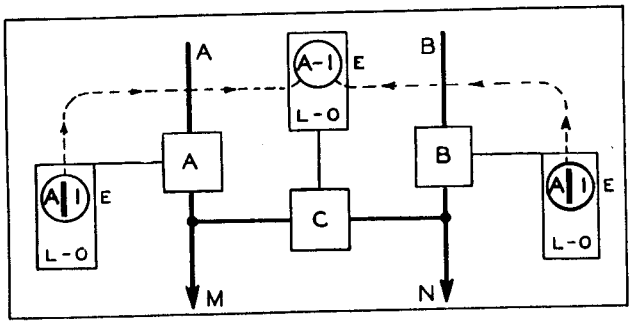


FIG. 3

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.

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.

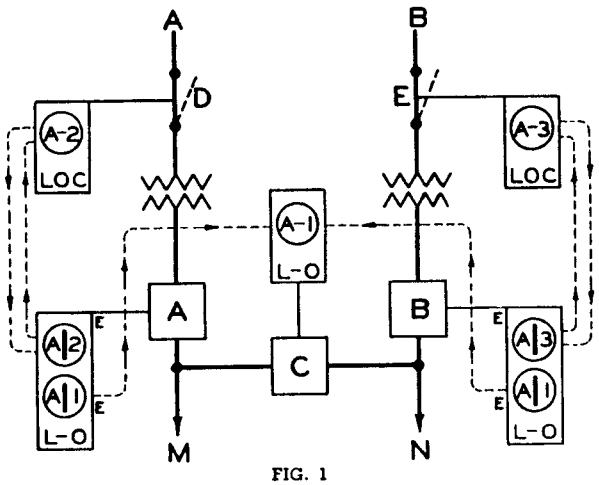


FIG. 1

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.

APPLICATION SCHEMES

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.

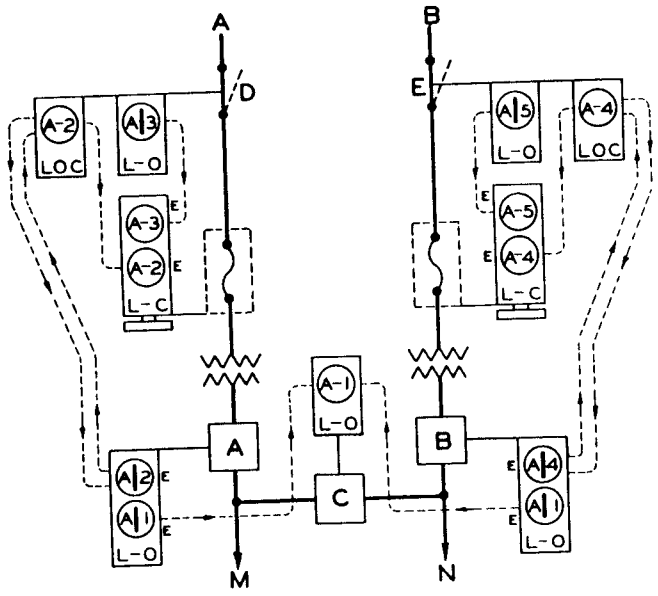


FIG. 1

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).

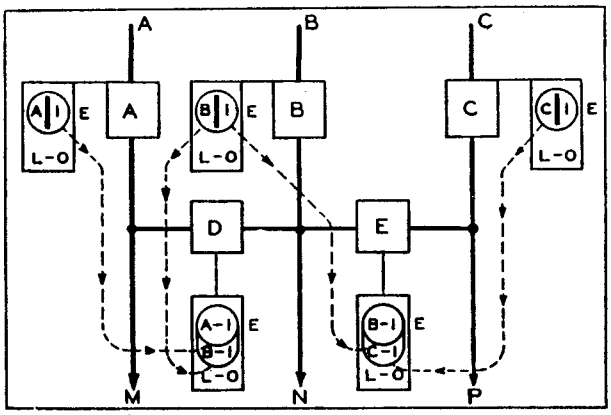


FIG. 1

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.

SCHEME 17.

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

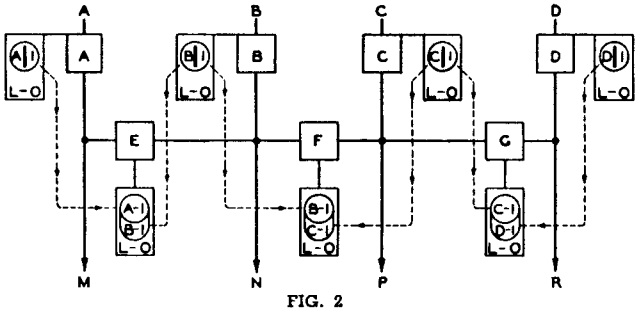


FIG. 2

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 t 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).

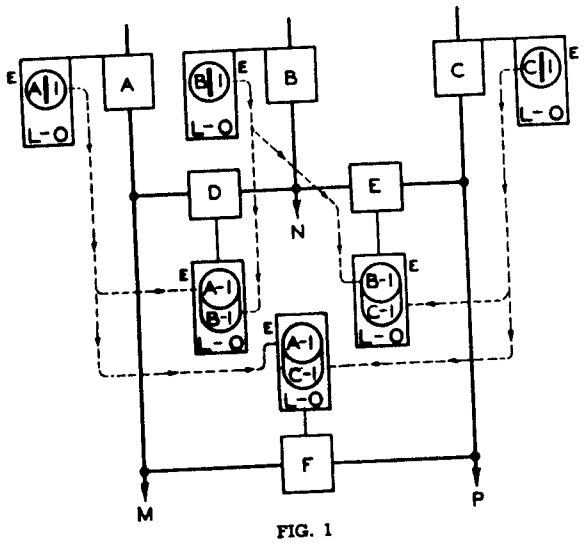


FIG. 1

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.

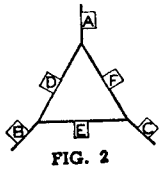


FIG. 2

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).

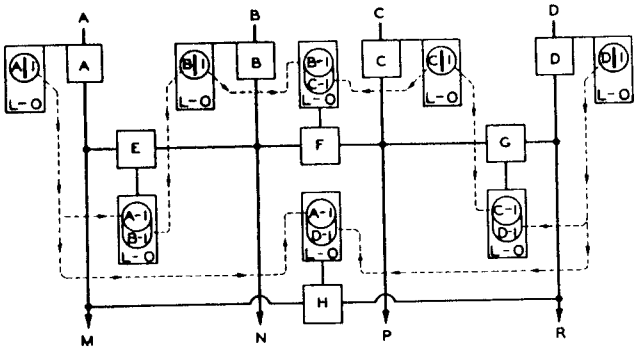


FIG. 1

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.

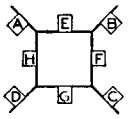


FIG. 2

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.

APPLICATION SCHEMES

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.

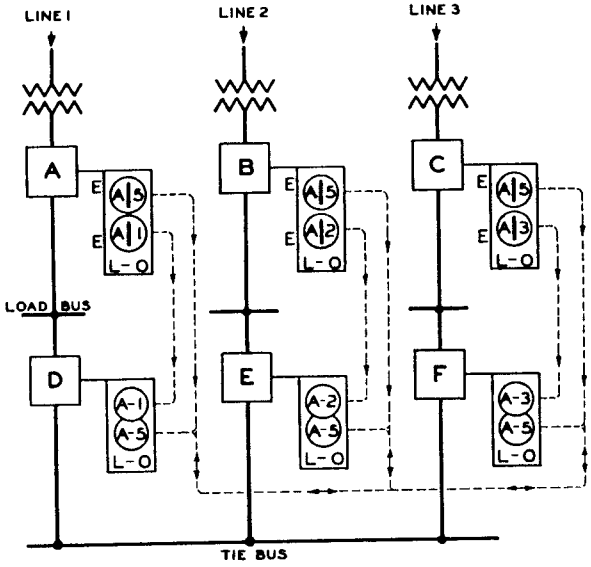


FIG. 1

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.

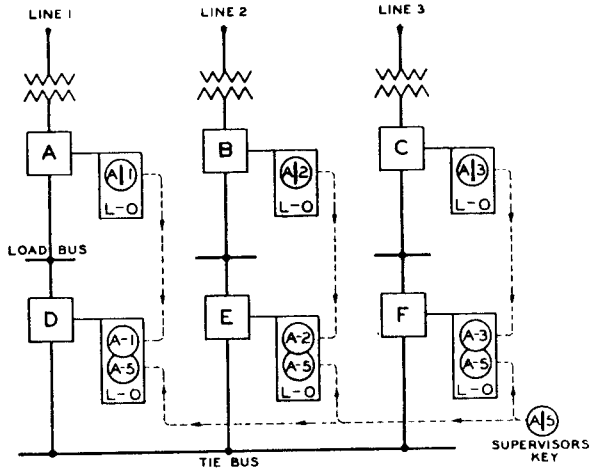


FIG. 2

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.

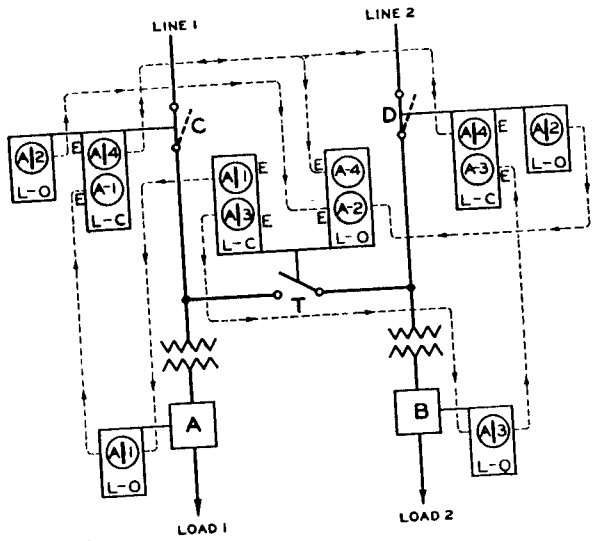


FIG. 1

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.

APPLICATION SCHEMES

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.

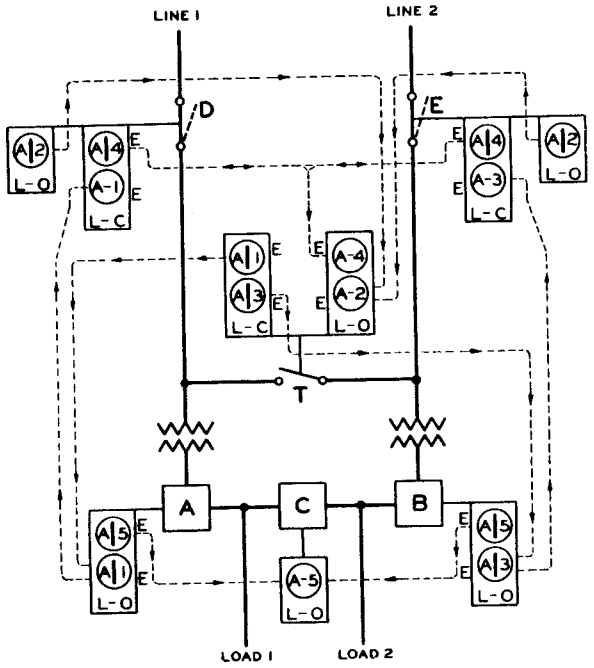


FIG. 1

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 LO- 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.

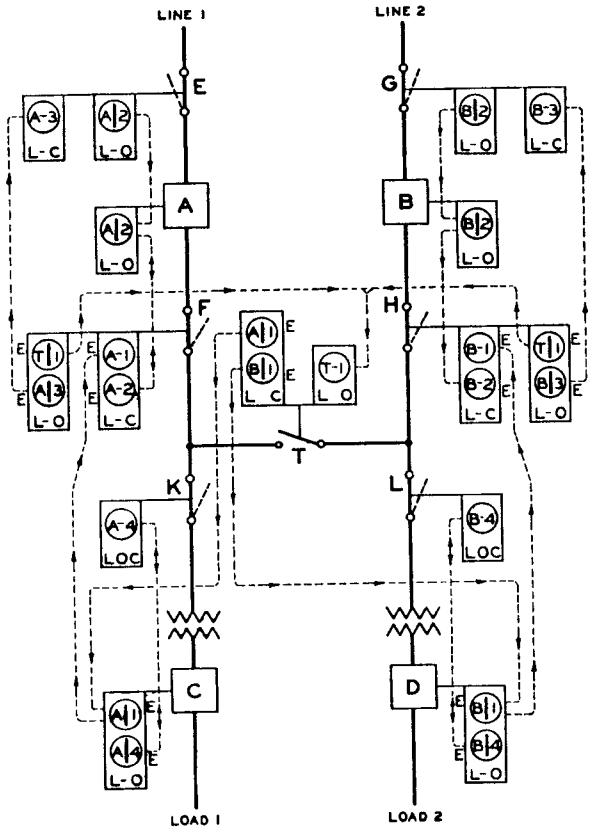


FIG. 1

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 C. Keys B-1 are 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 t. 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 lo 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.

APPLICATION SCHEMES

Interrupter Switches

SCHEME 50.

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.

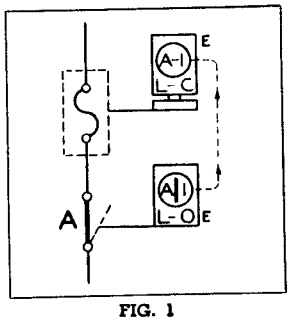


FIG. 1

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 51.

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.

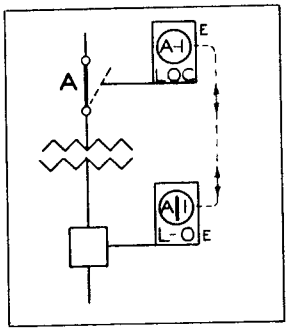


FIG. 2

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 52.

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.

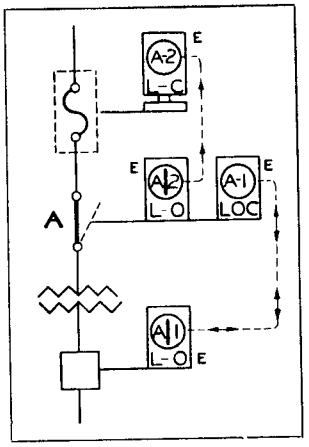


FIG. 3

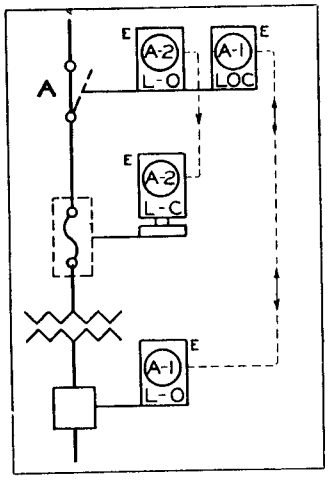


FIG. 4

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.

APPLICATION SCHEMES

Interrupter Switches

SCHEME 53.

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).

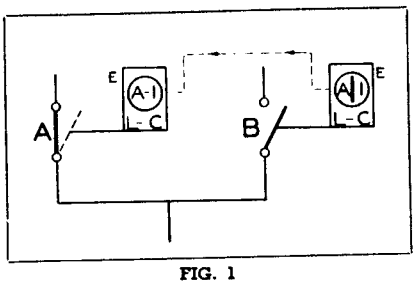


FIG. 1

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 54.

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).

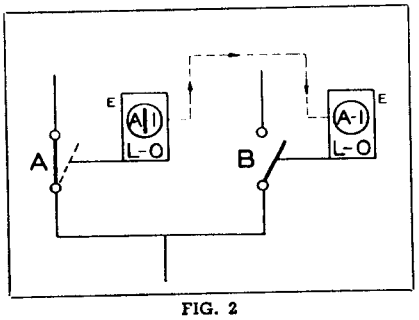


FIG. 2

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 55.

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.

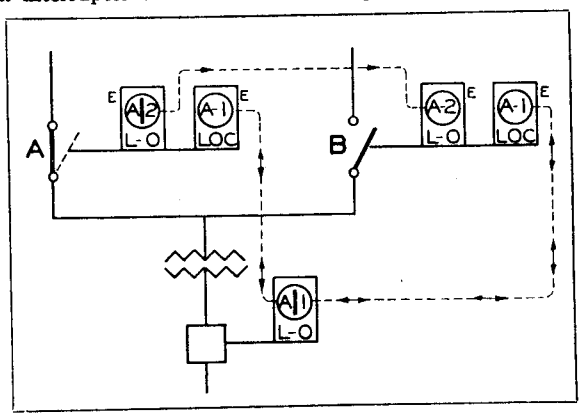


FIG. 3

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.

APPLICATION SCHEMES

Interrupter Switches

SCHEME 56.

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.

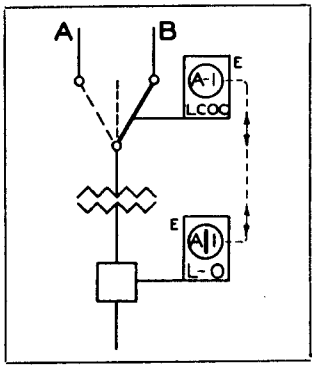


FIG. 1

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 57.

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.

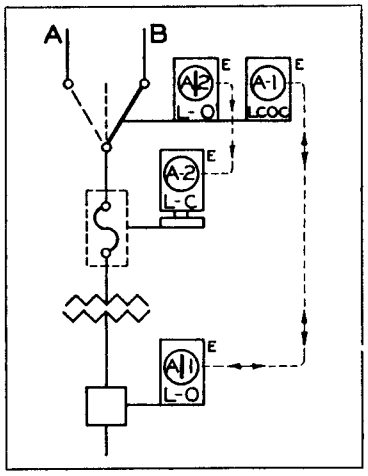


FIG. 2

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.

APPLICATION SCHEMES WITH TIME DELAY

SCHEME 70.

To prevent opening of guard B with motor circuit closed.

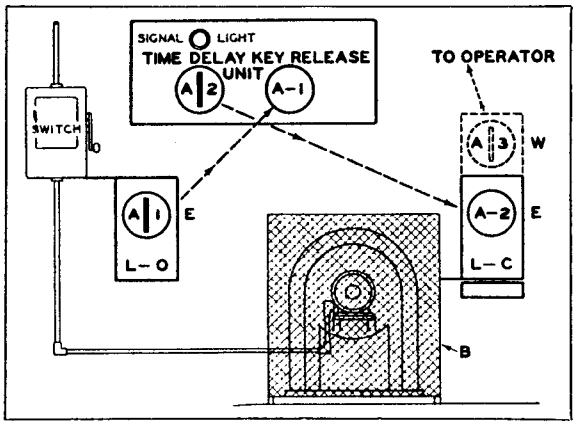


FIG. 1

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.

SCHEME 71.

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. Extend ing 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.

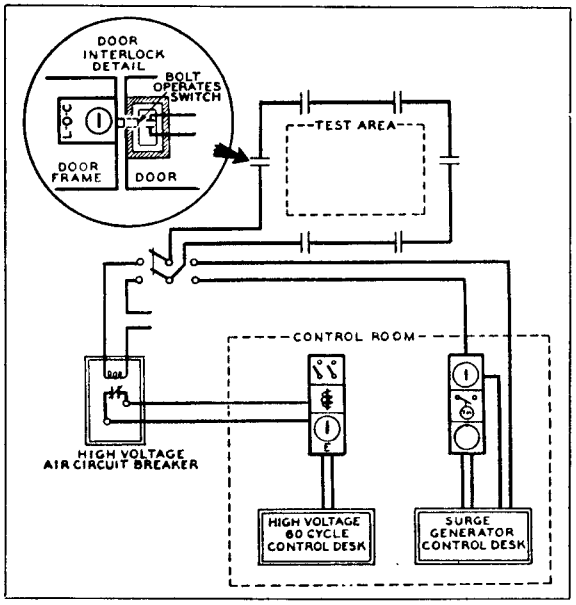


FIG. 2

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.

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