DESCRIPTION • INSTALLATION • MAINTENANCE

INSTRUCTIONS

INERTEEN AND OIL INSULATED FEEDER SWITCHES

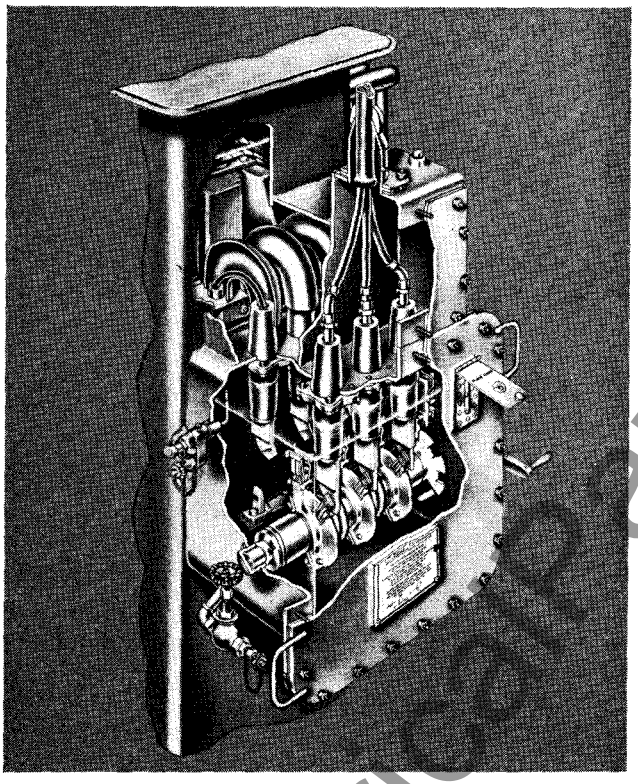

FIG. 1. Cutaway View of Typical Switch.

THE INERTEEN AND OIL INSULATED FEEDER SWITCH provides complete switching facilities in a minimum space. The switch, immersed in oil or Inerteen, is mounted on and becomes an integral part of the transformer. It will not interrupt load current but may be adapted to interrupt the transformer exciting current. The switch can be built for any current range from 200 to 2400 amperes and for any voltage up to the 34 kv class.

In the "ground" position the switch will withstand a short circuit current of 15,000 amperes for two seconds without any appreciable movement of the contacts. The switch is adaptable to many types of feeder distribution systems and uses such as: the radial feeder system in which a two-position switch is required (open and transformer); the double radial feeder where it is desired to select one of two feeders; the loop feeder system where it is desired to select either or both of two feeders; a three-position switch (open-transformer-ground) to ground the feeder for repair; to tie feeders together with the transformer disconnected.

DESCRIPTION

The switch is the rotary type and consists of a porcelain insulating tube keyed to the operating shaft. On this porcelain tube there is a segment of a disk and a wedge-type contact for each phase.

The disk segment slides in a wedge contact mounted on the outlet or line bushing and makes contact through the entire range of travel of the drum. See Figs. 1 and 2.

The wedge-type contact mounted on the rotating drum makes contact with the transformer bushing and the ground bushing which are arranged on the arc of a circle. This type of switch is designed to

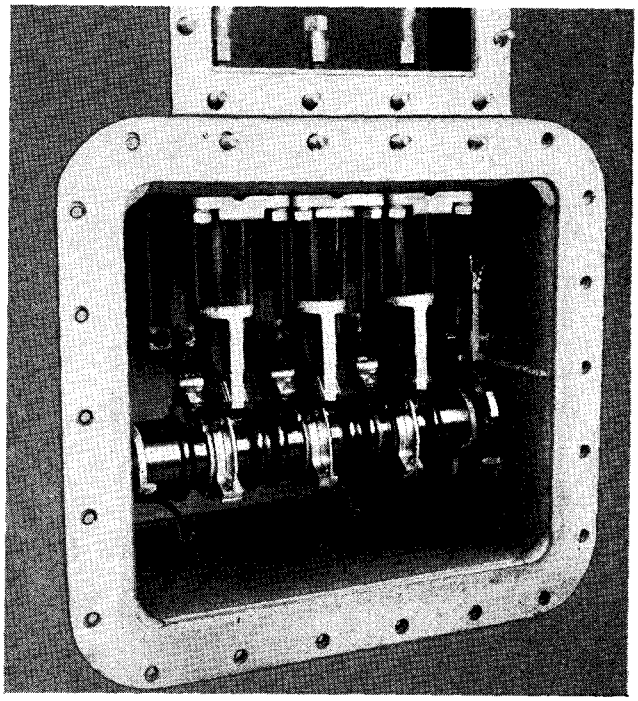

FIG. 2. Rotary Switch in Transformer Position.

have the "transformer" position between the "open" and "ground" positions.

Two-position switches are also manufactured and may have the "open" and "transformer" positions, or have "transformer" and "ground" positions.

The three-position switch is designed to have the following sequence: "open", "transformer", "ground". The operating mechanism compels a pause in the "transformer" position to allow the electrical interlock to "pick-up", or lock the switch in the "transformer" position in case the feeder is energized. This action prevents grounding a live feeder.

The operating mechanism on both two- and three-position switches includes a latching device which holds the switch in any normal operating position unless released by the operator and also provides a means by which the customer may padlock it to prevent unauthorized operation.

The switch is assembled in the switch chamber which is either bolted or welded to the transformer tank. The incoming cables are brought into a terminal chamber which is an integral part of the switch chamber.

INSTALLATION

Before the transformer is installed, carefully examine the switch chamber for leaks. All switch chambers are tested at the factory at 7½ pounds per square inch pressure to check all welds and gasket seals. It is advisable to make a test at installation to make sure that no joints have opened. Check the packing gland seal on the operating mechanism end of the shaft carefully for leakage at this point. If oil leaks are discovered, tighten the two clamping nuts, which will compress the packing, until the leak stops.

Operate the switch a few times to make sure that all parts move freely. The switch chamber is shipped filled with liquid unless otherwise requested and the cover is sealed in place. It is not necessary to open the switch chamber since all cables are terminated in the terminal chamber.

Terminal Chamber. The terminal chamber cover gasket and wiping sleeve gasket are cemented to the chamber. Vaseline is used on the other side of these gaskets to facilitate removal of the cover and wiping sleeve.

The terminal chamber is shipped dry and must be filled with insulating compound or oil after making cable connections and replacing cover. Refer to Fig. 3, selecting the one that applies.

Cable Installation.

1. Remove the wiping nipple(s) and cut off end at A until inside diameter is slightly larger than the diameter of the lead cable. Slip flange and wiping nipple back over lead cable.

2. Remove the lead covering from cable(s) for a distance of approximately 8 inches and bell end away from conductor approximately ½ inch. This forming of the lead sheath is important and care should be taken that all sharp edges are removed.

3. Remove insulation from conductor(s) for a distance of approximately 1 inch. Slip the cable(s) into the terminal. Tighten union connection(s). Tape from 1 inch above the connection to the porcelain bushing with treated tape (supplied by customer) to a minimum thickness of ⅛ inch.

4. Replace the wiping nipple(s) after inspecting gasket(s), and tighten the bushing flange. Wipe lead cable(s) to nipple(s) at point B. Warm the metal parts of terminal chamber to drive off all moisture and wipe the porcelain bushings dry before replacing cover.

5. Replace the filling plug with standpipe and remove air vent plug. Fill terminal chamber with bushing compound #571 until compound comes out at air vent plug. Insulating compound #571 should be heated to a temperature of 105° to 115° C for a period of one hour and then poured into terminal chamber while hot.

6. Disconnect standpipe, replace plugs.

Note: If it is desired to fill the terminal chamber with oil instead of compound, substitute a short length of pipe and a container, with sufficient capacity to allow for oil expansion, for the filling plug. This container should be filled three-quarters full of oil. This expansion chamber will then provide a means of keeping the terminal filled with oil. A container with a flush-type gauge, a filling plug, and provision for connection to the terminal chamber can be obtained from the Westinghouse Electric Corporation, Sharon, Pa.

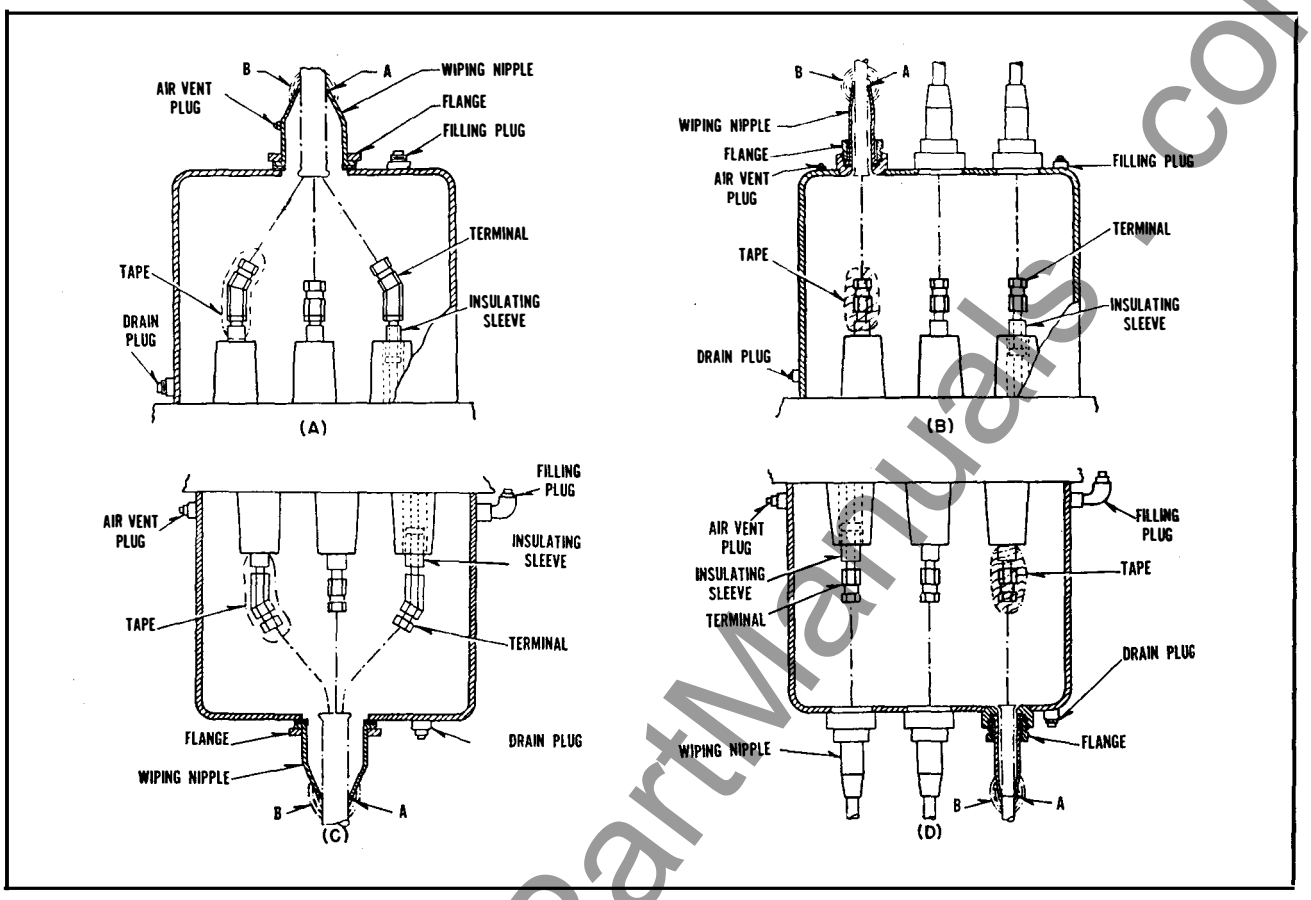

FIG. 3. Terminal Chamber Cable Connections.

SPECIAL ACCESSORIES

Switches when so ordered may be equipped with auxiliary devices, such as quick-break mechanism, phasing-out contacts, and switch-to-tap changer interlocks.

Quick-Break Mechanism. When quick-break contacts are supplied, an auxiliary switch is provided on the network protector or low voltage breaker. This switch is so arranged as to lock the interlock cam and thereby lock the switch when a load is on the transformer. A lead is usually brought from the interlock coil through the low voltage throat for connection to the auxiliary switch on the low voltage breaker and then to the network bus. Refer to the unit diagram. With the transformer energized from the high voltage feeder and with the load breaker open, the mechanism will permit movement of the switch between "transformer" and "open" positions. A mechanical stop prevents movement to "ground" position.

On switches equipped with both quick-break mechanisms and grounding contacts, a second electrical interlock coil connected to the low voltage winding of the transformer prevents movement between "transformer" and "ground" positions unless the transformer and feeder are de-energized. This eliminates the possibility of grounding the feeder while it is energized. For connection diagram of interlock circuit refer to the diagram instruction plate on the transformer.

Important: Care must be exercised when installing a unit with quick-break mechanism. Some load interlocks are arranged to lock when energized while others are locked when de-energized. The load switch must be arranged for the proper connection.

Tap Changer Mechanical Interlock. This manually operated interlock is designed to prevent operation of the tap changer unless the switch is in "open" or "ground" position. It also prevents operation of the switch from "open" or "ground" position unless the tap changer is on one of its various positions. The interlock will normally be in position to lock the tap changer. To operate the tap changer, move the switch to "open"

and it is advisable to order the complete bushing assembly if new parts are required.

To replace a bushing, remove flange and cushion washer and break the porcelain loose from the gasket. Remove the gasket and replace with a new one as directed above. Set the new porcelain assembly in place and replace cushion washer and flange. Draw down on all of the flange bolts with even pressure. After all bushings are in place, close up the chamber, using a new cover gasket, and pressure test at 15 pounds per square inch. Check carefully for any leaks. If leaks are discovered, the gasket must be replaced as above and the test repeated.

Mechanical Interlock. The mechanical interlock may be connected with flexible metal tubing enclosing a solid rod or by a linkage mechanism. Since the mechanism is exposed, it is possible that it may become inoperative due to corrosion of the parts. To prevent this, it is advisable to clean the mechanism once a year. Working parts should have a light coating of vaseline applied to them. The interlock rod should be removed from the housing tube and have a light coating of graphite applied to its entire length. In assembling this type of mechanism, the ends of the housing must be clamped firmly to prevent any motion at these points.

Electrical Interlock. The electrical interlock is the counterweighted type. The moving part is equipped with an adjustable counterweight to adjust the pick-up and drop-out voltages of the interlock. This assembly is adjusted at the factory according to the following table:

INTERLOCK VOLTAGE RANGE

INTERLOCK COIL	MAXIMUM PICK-UP VOLTS TO LOCK SWITCH	MINIMUM DROP-OUT VOLTS TO RELEASE SWITCH
125V-60 cycle	85V	20V
266V-60 cycle	190V	35V
460V-60 cycle	240V	45V
125V-D-C	65V	5V
250V-D-C	125V	5V

Do not disturb this adjustment unless the interlock is dismantled. The adjustment is made with a screw driver through a 1-inch pipe plug in the side of the interlock pocket. The counterweight can be moved in a horizontal direction, and after setting the screw should be drawn down tight to prevent movement of the counterweight.

Dielectric Tests. For oil-filled switches, sample and test oil as per Instruction Book 44-820-1. For Inerteen-filled switches, sample and test Inerteen as per Instruction Book 5802.

Insulation Test. Place switch in "open" position and test to ground for one minute at the following voltages based on the voltage rating of the transformer:

Rated Voltage of Transformer	Test Voltage
5000 to 15000	40,000 volts, a-c
15001 to 34000	70,000 volts, a-c

Renewal Parts. Order renewal parts from the nearest Westinghouse Sales Office, giving description of parts wanted, as well as all data on the nameplate of the transformer.

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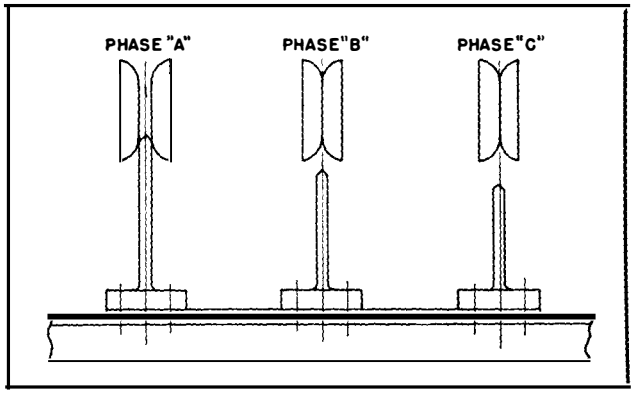

FIG. 4. Phasing Sequence A-B-C or H1-H2-H3.

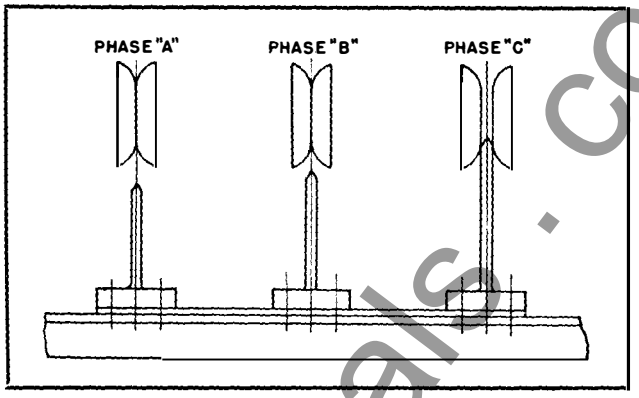

FIG. 5. Phasing Sequence C-B-A or H3-H2-H1.

or "ground" position and then the interlock arm can be moved, which will free the tap changer operating mechanism. The arm of the interlock must be moved back, locking the tap changer, before the switch can be closed.

Phasing-Out Contacts. These contacts are provided so that one phase of the cable can be grounded at a time. Buttons are provided on the operating handle for this operation. Sequence of grounding may be either H_1-H_2-H_3 or H_3-H_2-H_1. The former is standard and will be furnished unless otherwise specified on the order. See Fig. 4 and 5.

Phasing-Out High Voltage Cables. Move the switch handle from "transformer" toward "ground" with the latch pins on the switch control set for phasing out cable. See Fig. 6.

Caution: High voltage cable must be de-energized.

1. When pin marked A on the handle stops the movement, the contacts are engaged for phase A as shown in Fig. 4, Phases B and C are open-circuited. Check for circuit through phase A with test voltage, then tag.

2. Release pin A on the handle and move the switch handle until pin marked AB stops movement. The contacts are then engaged for phases A and B. Phase C is open-circuited. Check for a circuit through phase B with test voltage, then tag.

3. With the switch in "ground" position, all three contacts are fully engaged.

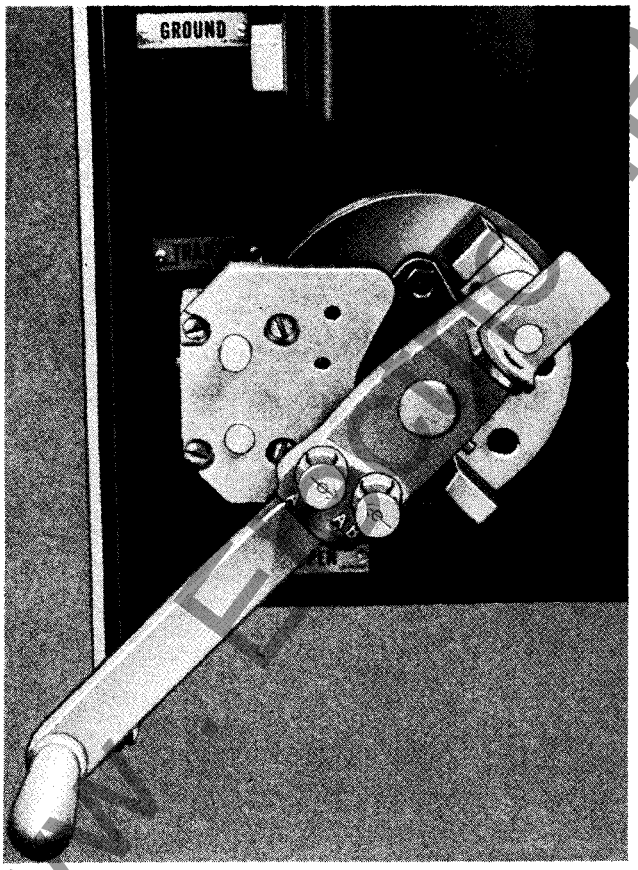

FIG. 6. Side View of Switch Showing Handle in Open Position.

MAINTENANCE

Make a periodic examination at least every six months to keep the switch in good condition and to insure trouble-free operation. All cover bolts should be tightened with a wrench for one-half inch bolts. Oil the pushbuttons on the operating mechanism with a fine grade of light machine oil. Check the packing gland for possible leaks.

Repacking the Gland. If, after several years of service, the packing becomes worn and it is impossible to tighten the gland sufficiently to stop leaks, it will be necessary to repack the gland. To do this, drain the oil from the chamber to a point below the shaft. Use ring-type packing S# 1263592.

Remove the packing gland by driving out the taper pin that holds the handle in place. Take off the guide plate for the toggle and remove the nuts from the gland. Take off the gland and remove the packing, using a sharp hooked instrument. Slip new packing in place, taking care that pointed end is on inside and replace gland, guide plate, and handle. Make sure handle is in correct position and pin to shaft. Refill the chamber and test for leaks. Oil the toggle buttons with light machine oil.

Gaskets. All gaskets used on network switches are made of a fine grade of cork, and for satisfactory results, they should be replaced with gaskets made of cork. Before replacing a gasket, carefully and thoroughly clean the steel surfaces between which the gaskets are compressed to remove rust, oil, grease, paint and other foreign material. The cleaning may be done by scraping or wire-brushing and then wiping the gasket surface with denatured alcohol. Use gasket cement M-7386 (S# 1150419) when applying gaskets.

For switch covers and bushings, thoroughly brush the cement on all sides and surfaces of the gaskets. Place gasket and cover in place and immediately bolt together under uniform pressure. After unit has been in service for a period of six months, retighten all the bolts.

Quick-Break Mechanism. Normally the quick-break mechanism will not require maintenance. The mechanism uses an auxiliary contact arm which maintains the circuit as the switch is moved from "transformer" toward the "open" position. When sufficient clearance between main blade and its contact has been obtained, the auxiliary contact arm opens the circuit by quick-break action, regardless of the speed at which the operating handle is moved. See Fig. 7.

If a bushing or the quick-break arm is replaced, it should be adjusted so that all arms break or snap at the same time. This may be done by filing the end of the arm as much as is necessary.

Replacing Bushings. The bushings between the switch chamber and the transformer tank, as well as those between the switch chamber and the terminal chamber, are designed with a gasket seal between the cap and the porcelain. This seal cannot be made successfully outside the factory

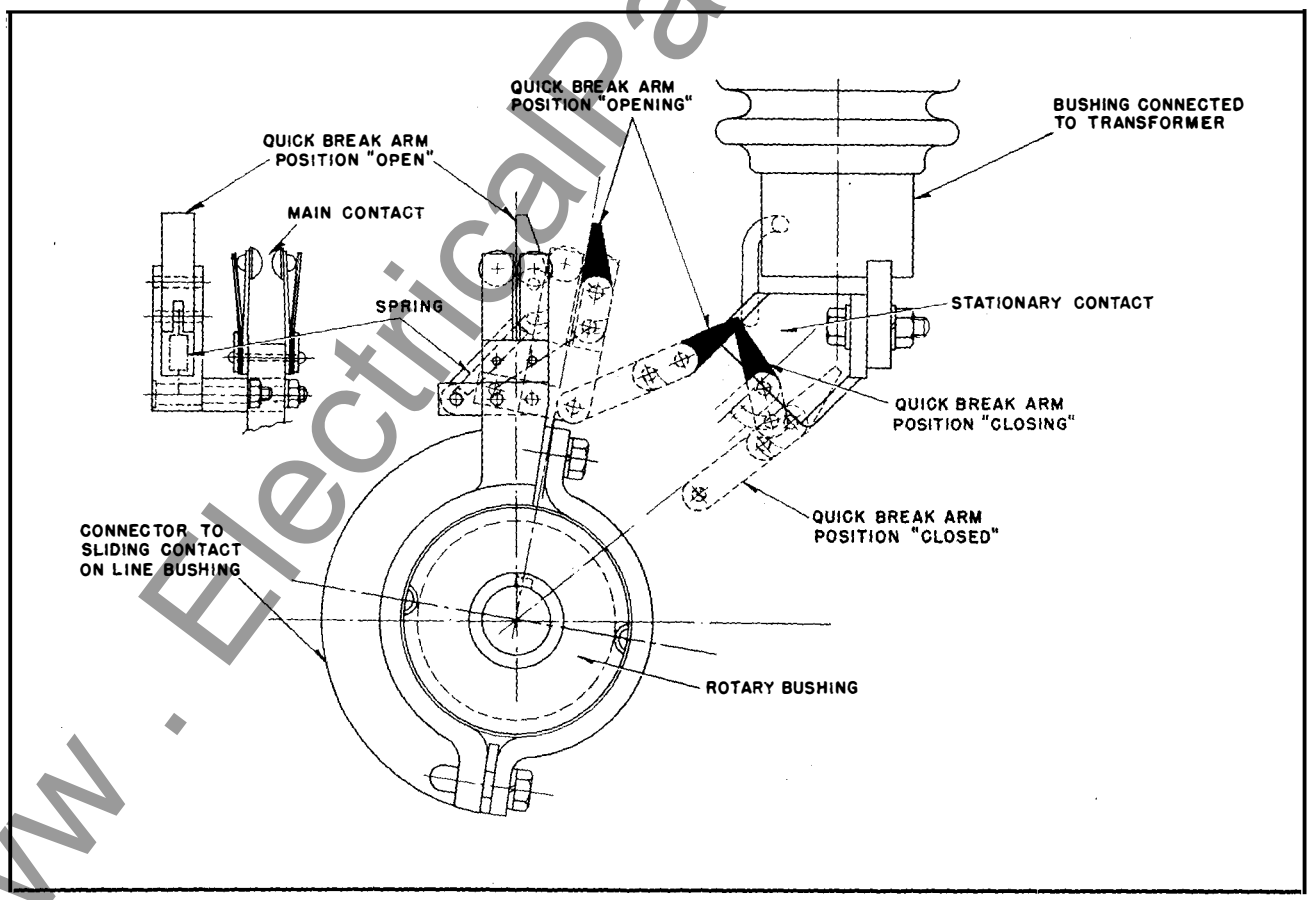

FIG. 7. Quick Break Mechanism Operation.

DESCRIPTION • INSTALLATION • MAINTENANCE

INSTRUCTIONS

INERTEEN® AND OIL INSULATED FEEDER SWITCHES

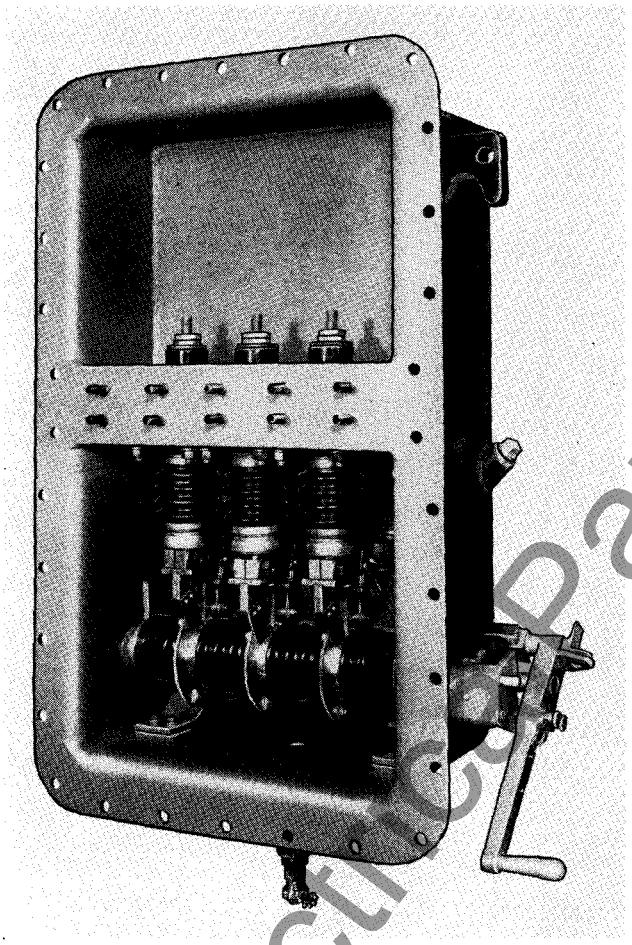

FIG. 1. Rotary Switch in Transformer Position.

THE INERTEEN AND OIL INSULATED FEEDER SWITCH provides complete switching facilities in a minimum space. The switch, immersed in oil or Inerteen, is mounted on and becomes an integral part of the transformer. It will not interrupt load current but may be adapted to interrupt the transformer exciting current. The switch can be built for any current range from 200 to 2400 amperes and for any voltage up to the 34 kv class.

In the "ground" position the switch will withstand a short circuit current of 15,000 amperes for two seconds without any appreciable movement of the contacts. The switch is adaptable to many types of feeder distribution systems and uses such as: the radial feeder system in which a two-position switch is required (open and transformer); the double radial feeder where it is desired to select one of two feeders; a three-position switch (open-transformer-ground) to ground the feeder for repair.

DESCRIPTION

The switch is the rotary type and consists of a porcelain insulating tube keyed to the operating shaft. On this porcelain tube there is babitted a segment of a disk and button-type contacts for each phase.

The disk segment slides in a button-type contact mounted on the outlet or line bushing and makes contact through the entire range of travel of the drum. See Fig. 1.

The button-type contact mounted on the rotating drum makes contact with the transformer bushing and the ground bushing which are arranged on the arc of a circle.

The three-position disconnect and grounding switch is designed to have the following sequence: "open", "transformer", "ground". The operating mechanism compels a pause in the "transformer" position to allow the electrical interlock to "pick-up", or lock the switch in the "transformer" position in case the feeder is energized. This action prevents grounding a live feeder.

The three-position two-feeder switch has the sequence of "Feeder #1", "open" and "Feeder #2". The operating mechanism enforces a pause in the "open" position.

Two-position switches are also manufactured and may have the "open" and "transformer" positions, or have "transformer" and "ground" positions.

The operating mechanism on both two- and three-position switches includes a latching device which holds the switch in any normal operating position

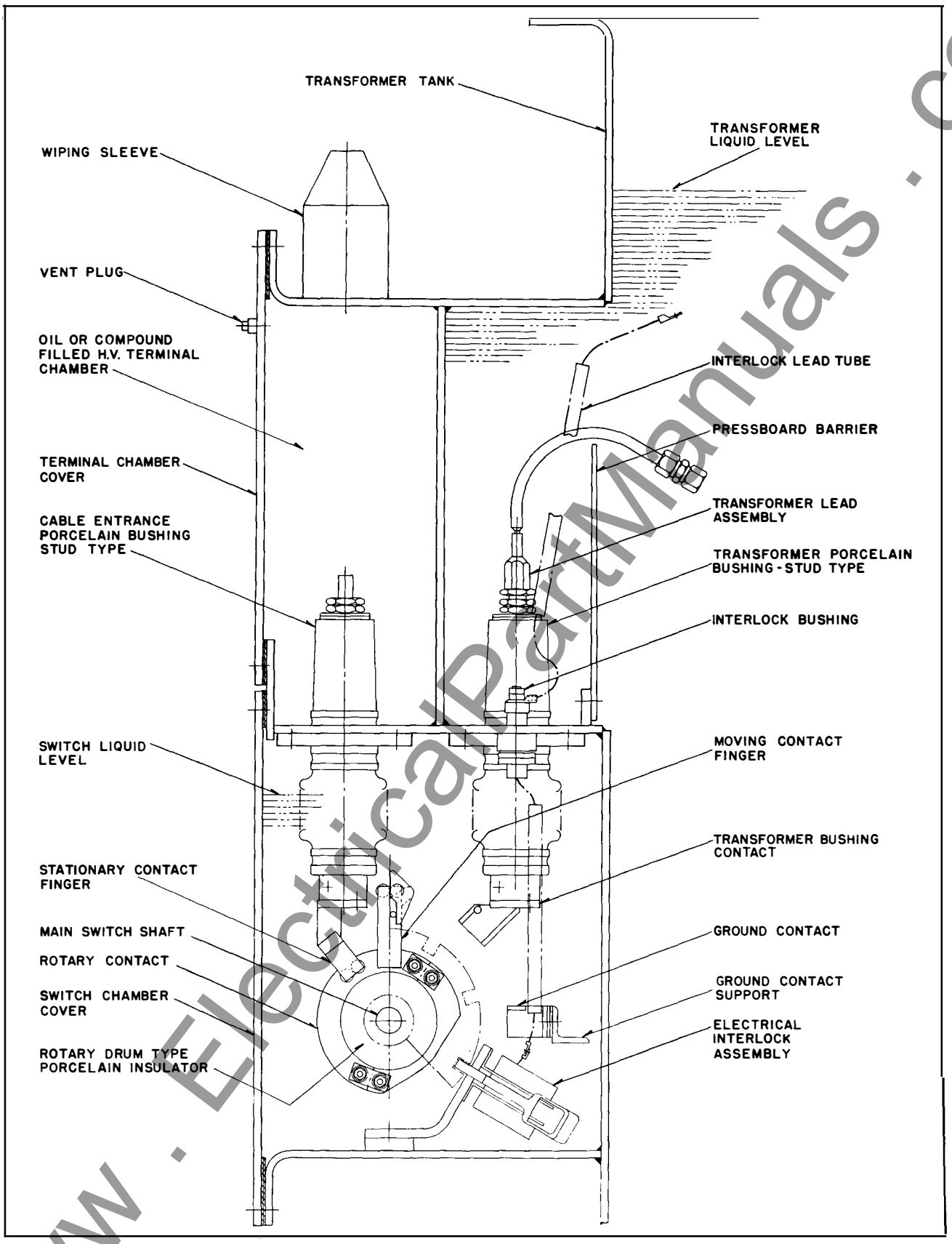

FIG. 2. Assembly Drawing of a 3-Position Disconnect and Grounding Switch Welded to Transformer Tank.

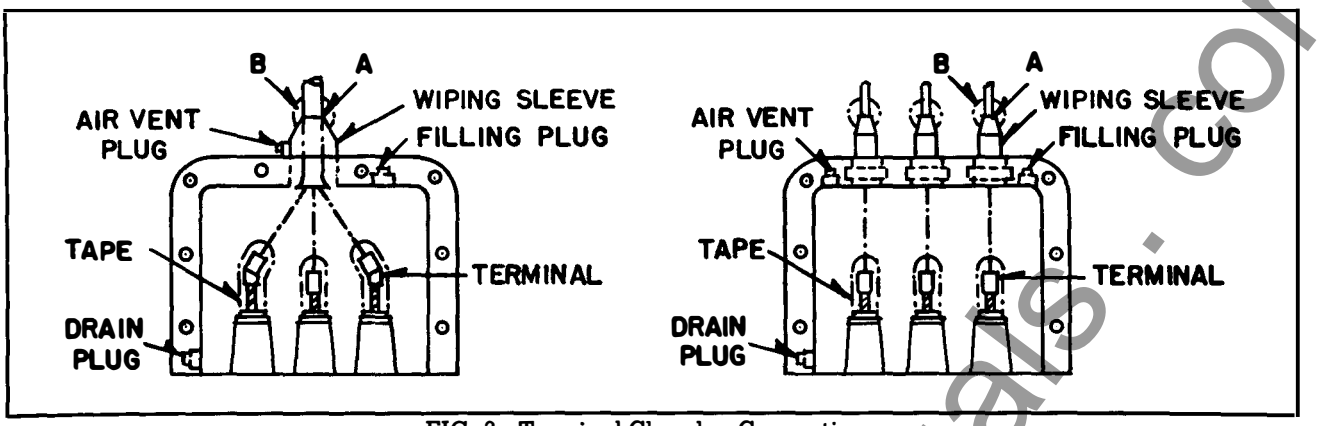

FIG. 3. Terminal Chamber Connections.

unless released by the operator and also provides a means by which the customer may padlock it to prevent unauthorized operation.

The switch is assembled in the switch chamber which is either bolted or welded to the transformer tank. The incoming cables are brought into a terminal chamber which is an integral part of the switch chamber.

INSTALLATION

Before the transformer is installed, carefully examine the switch chamber for leaks. All switch chambers are tested at the factory at 8 pounds per square inch pressure. It is advisable to make a test at installation to make sure that no joints have opened during shipment.

Operate the switch a few times to make sure that all parts move freely. The switch chamber is shipped filled with liquid unless otherwise requested and the cover is sealed in place. It is not necessary to open the switch chamber since all cables are terminated in the terminal chamber.

Terminal Chamber. The terminal chamber cover gasket and wiping sleeve gasket are cemented to the chamber. Cement is not used on the other side of these gaskets to facilitate removal of the cover and wiping sleeve.

The terminal chamber is shipped dry and must be filled with insulating compound after making cable connections and replacing cover. Refer to Fig. 3, selecting the arrangement that applies.

Cable Installation. The following instructions for cable installation apply to paper-covered or varnished cambric lead covered cable used without stress cones.

Follow cable manufacturer's instructions for stress cones and other types of cables.

1. Remove the wiping nipple and cut off end at A until inside diameter is slightly larger than the diameter of the lead cable. Slip flange and wiping nipple back over lead cable.

2. Remove the lead covering from cable for a distance of approximately 8 inches and bell end away from conductor approximately ½ inch. This forming of the lead sheath is important and care should be taken that all sharp edges are removed.

3. Remove insulation from conductor for a distance of approximately 1 inch. Slip the cable into the terminal and tighten terminal bolts securely. Tape from 1 inch above the connection to the porcelain bushing with treated tape (supplied by customer) to a minimum thickness of ⅛ inch.

4. Replace the wiping nipple after inspecting gasket, and tighten the bushing flange. Wipe lead cable to nipple at point B. Warm the metal parts of terminal chamber to drive off all moisture and wipe the porcelain bushings dry before replacing cover.

5. Replace the filling plug with standpipe and remove air vent plug. Fill terminal chamber with compound ✻M1845-1 (35 lb. pail is S✻1512 978-A) until compound comes out at air vent plug. Insulating compound ✻M1845-1 should be heated to a temperature of 105° to 115° C for a period of one hour and then poured into terminal chamber while hot.

6. Disconnect standpipe, replace plugs.

SPECIAL ACCESSORIES

Switches when so ordered may be equipped with auxiliary devices, such as quick-break mechanism, phasing-out contacts, and switch-to-tap changer interlocks.

Liquid Dielectric Tests. For information regarding sampling and testing either oil or Inerteen, refer to the accompanying instructions.

Insulation Test. Place switch in "open" position and test to ground for one minute at the following voltages based on the voltage rating of the transformer:

Rated Voltage of Transformer	Test Voltage
2500 to 15000	47,000 volts D.C. for 5 min.
15001 to 25000	65,000 volts D.C. for 5 min.
25001 to 34500	82,500 volts D.C. for 5 min.

Renewal Parts. Order renewal parts from the nearest Westinghouse Sales Office, giving description of parts wanted, as well as all data on the nameplate of the transformer.

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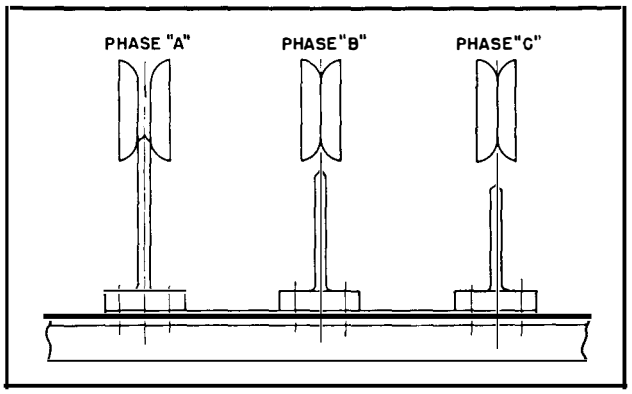

FIG. 4. Standard Phasing Sequence A-B-C, Left to Right, Facing Switch

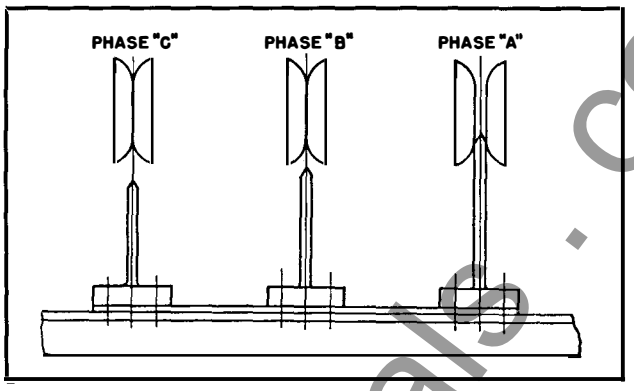

FIG. 5. Special Phasing Sequence A-B-C, Right to Left, Facing Switch

Electrical Interlock Circuits. For arrangement of the electrical interlock circuits and locking cams refer to the diagram instruction plate on the transformer, and to the interlock instruction leaflet.

Important: Care must be exercised when installing a unit with quick-break mechanism. Some load interlocks are arranged to lock when energized while others are locked when de-energized. The load switch must be arranged for the proper connection.

Tap Changer Mechanical Interlock. This manually operated interlock is designed to prevent operation of the tap changer unless the switch is in "open" or "ground" position. It also prevents operation of the switch from "open" or "ground" position unless the tap changer is on one of its various positions. The interlock will normally be in position to lock the tap changer. To operate the tap changer, move the switch to "open" or "ground" position and then the interlock arm can be moved, which will free the tap changer operating mechanism. The arm of the interlock must be moved back, locking the tap changer, before the switch can be closed.

Phasing-Out Contacts. On the three-position disconnect and grounding switch, phasing-out contacts may be provided so that one phase of the cable can be grounded at a time. Buttons are provided on the operating handle for this operation. Sequence of grounding may be either left to right, per Fig. 4, or right to left, per Fig. 5. The former is standard and will be furnished unless otherwise specified on the order. See Figs. 4 and 5.

Phasing-Out High Voltage Cables. Move the switch handle from "transformer" toward "ground" with the latch pins on the switch control set for phasing out cable.

Caution: High voltage cable must be de-energized.

1. When pin marked A on the handle (See Fig. 6) stops the movement, the contacts are engaged for phase A as shown in Figs. 4 and 5, Phases B and C are open-circuited. Check for circuit through phase A with test voltage, then tag.

2. Release pin A on the handle and move the switch handle until pin marked AB stops movement. The contacts are then engaged for phases A and B. Phase C is open-circuited. Check for a circuit through phase B with test voltage, then tag.

3. With the switch in "ground" position, all three contacts are fully engaged.

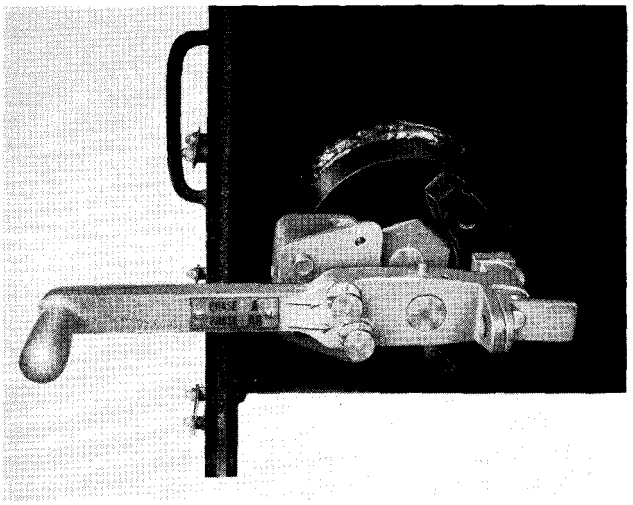

FIG. 6. Side View of Switch in Open Position

MAINTENANCE

Make a periodic examination at least every six months to keep the switch in good condition and to insure trouble-free operation. All cover bolts should be tightened with a wrench for one-half inch bolts. Oil the pushbuttons on the operating mechanism with a fine grade of light machine oil.

Gaskets. All gaskets used on network switches are made of Cortite, a gasket material consisting of cork and synthetic rubber; and for satisfactory results replacement gaskets should be of the same material. Before replacing a gasket, carefully and thoroughly clean the steel surfaces between which the gaskets are compressed to remove rust, oil, grease, paint and other foreign material. The cleaning may be done by scraping or wire-brushing and then wiping the gasket surface with denatured alcohol. Use gasket cement M-7386 (S#1150419) when applying gaskets.

For switch covers and bushings, thoroughly brush the cement on all sides and surfaces of the gaskets. Place gasket and cover in place and immediately bolt together under uniform pressure. After unit has been in service for a period of six months, retighten all the bolts.

Quick-Break Mechanism. Normally the quick-break mechanism will not require maintenance. The mechanism uses an auxiliary contact arm which maintains the circuit as the switch is moved from "transformer" toward the "open" position. When sufficient clearance between main blade and its contact has been obtained, the auxiliary contact arm opens the circuit by quick-break action, regardless of the speed at which the operating handle is moved.

If a bushing or the quick-break arm is replaced, it should be adjusted so that all arms break or snap at the same time. This may be done by filing the end of the arm as much as is necessary.

Replacing Bushings. The bushings between the switch chamber and the transformer tank, as well as those between the switch chamber and the terminal chamber, are designed with permanent rolled flange seals between the stud and bushing, and between bushing and bushing flange. The seal between bushing flange and switch chamber is by means of a recessed gasket which may be replaced. In the case of a leak at the permanent rolled flange seals the bushing must be replaced with a new one.

To replace a bushing, remove locking nuts from mounting bolts and pull bushing directly down to break gasket seal. Carefully remove any gasket material remaining on mounting surface. When installing new bushings draw down on all of the flange bolts until flange is flush with mounting surface. After all bushings are in place, close up the chamber, using a new cover gasket, and pressure test at 7 pounds per square inch. Check carefully for any leaks. If leaks are discovered, the gasket must be replaced as above and the test repeated.

Electrical Interlock. The electrical interlock is of the spring loaded type. The moving latch is equipped with an adjustable tension spring to adjust the pick-up and drop-out voltages of the interlock. This assembly is adjusted at the factory according to the following table:

INTERLOCK ADJUSTMENT

INTERLOCK COIL RATING	ADJUSTMENT	
	MAXIMUM PICK-UP VOLTS	MINIMUM DROP-OUT VOLTS
125V-60 cycle	80V	25V
266V-60 cycle	190V	35V
460V-60 cycle	240V	45V
125V-D-C	65V	5V
250V-D-C	125V	5V

Do not disturb this adjustment unless the interlock is dismantled. The interlock is located in the main switch chamber, to the rear and below the rotary bushing. The adjustment of the tension spring is varied by a screw attached to the spring and locked with two brass nuts.

Mechanical Interlock. The mechanical interlock may be connected with flexible metal tubing enclosing a solid rod or by a linkage mechanism. Since the mechanism is exposed, it is possible that it may become inoperative due to corrosion of the parts. To prevent this, it is advisable to clean the mechanism once a year. Working parts should have a light coating of vaseline applied to them. The interlock rod should be removed from the housing tube and have a light coating of graphite applied to its entire length. In assembling this type of mechanism, the ends of the housing must be clamped firmly to prevent any motion at these points.