

SIEMENS-ALLIS

Installation • Operation • Maintenance

Instructions



**5 kV and 15 kV
Metal Enclosed
Load Interrupter Switches
SG 3328**

INTRODUCTION

THIS EQUIPMENT CONTAINS HAZARDOUS VOLTAGES SEVERE PERSONAL INJURY OR PROPERTY DAMAGE CAN RESULT IF SAFETY INSTRUCTIONS ARE NOT FOLLOWED. ONLY QUALIFIED PERSONNEL SHOULD WORK ON OR AROUND THIS EQUIPMENT AFTER BECOMING THOROUGHLY FAMILIAR WITH ALL WARNINGS, SAFETY NOTICES, AND MAINTENANCE PROCEDURES CONTAINED HEREIN. THE SUCCESSFUL AND SAFE OPERATION OF THIS EQUIPMENT IS DEPENDENT UPON PROPER HANDLING, INSTALLATION, OPERATION AND MAINTENANCE.

QUALIFIED PERSON

FOR THE PURPOSE OF THIS MANUAL AND PRODUCT LABELS, A QUALIFIED PERSON IS ONE WHO IS FAMILIAR WITH THE INSTALLATION, CONSTRUCTION AND OPERATION OF THE EQUIPMENT, AND THE HAZARDS INVOLVED. IN ADDITION, HE HAS THE FOLLOWING QUALIFICATIONS:

- (a) Is qualified and authorized to energize, de-energize, clear, ground and tag circuits and equipment in accordance with established safety practices.
- (b) Is qualified in the proper care and use of protective equipment such as rubber gloves, hard hat, safety glasses or face shields, flash clothing, etc., in accordance with established safety practices.

DANGER

FOR THE PURPOSE OF THIS MANUAL AND PRODUCT LABELS, **DANGER** INDICATES DEATH, SEVERE PERSONAL INJURY OR SUBSTANTIAL PROPERTY DAMAGE WILL RESULT IF PROPER PRECAUTIONS ARE NOT TAKEN.

WARNING

FOR THE PURPOSE OF THIS MANUAL AND PRODUCT LABELS, **WARNING** INDICATES DEATH, SEVERE PERSONAL INJURY OR SUBSTANTIAL PROPERTY DAMAGE CAN RESULT IF PROPER PRECAUTIONS ARE NOT TAKEN.

CAUTION

FOR THE PURPOSE OF THIS MANUAL AND PRODUCT LABELS, **CAUTION** INDICATES MINOR PERSONAL INJURY OR PROPERTY DAMAGE CAN RESULT IF PROPER PRECAUTIONS ARE NOT TAKEN.

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NOTE

THESE INSTRUCTIONS DO NOT PURPORT TO COVER ALL DETAILS OR VARIATIONS IN EQUIPMENT, NOR TO PROVIDE FOR EVERY POSSIBLE CONTINGENCY TO BE MET IN CONNECTION WITH INSTALLATION, OPERATION OR MAINTENANCE. SHOULD FURTHER INFORMATION BE DESIRED OR SHOULD PARTICULAR PROBLEMS ARISE WHICH ARE NOT COVERED SUFFICIENTLY FOR THE PURCHASER'S PURPOSES, THE MATTER SHOULD BE REFERRED TO THE LOCAL SIEMENS-ALLIS SALES OFFICE.

THE CONTENTS OF THIS INSTRUCTION MANUAL SHALL NOT BECOME PART OF OR MODIFY ANY PRIOR OR EXISTING AGREEMENT, COMMITMENT OR RELATIONSHIP. THE SALES CONTRACT CONTAINS THE ENTIRE OBLIGATION OF SIEMENS-ALLIS. THE WARRANTY CONTAINED IN THE CONTRACT BETWEEN THE PARTIES IS THE SOLE WARRANTY OF SIEMENS-ALLIS. ANY STATEMENTS CONTAINED HEREIN DO NOT CREATE NEW WARRANTIES OR MODIFY THE EXISTING WARRANTY.

INTRODUCTION

SWITCH RATINGS*

| kV | | Amperes | | | | BIL kV |
|---------|---------|---------|------|-----------|---------------|-----------|
| Nominal | Maximum | Cont. | Int. | Momentary | Fault Closing | |
| 4.16 | 4.76 | 600 | 600 | 61,000 | 61,000 | 60 |
| 4.16 | 4.76 | 1200 | 1200 | 61,000 | 61,000 | 60 |
| 13.8 | 15.0 | 600 | 600 | 61,000 | 61,000 | 95 |
| 13.8 | 15.0 | 1200 | 600 | 61,000 | 61,000 | 95 |

*FOR ALL ELECTRICALLY AND/OR 15KV 1200A INTERRUPTING SWITCHES SUPPLEMENTAL INSTRUCTIONS.



Figure 1. QB-36 Indoor Switch Cubicle with Type SE2A Operator

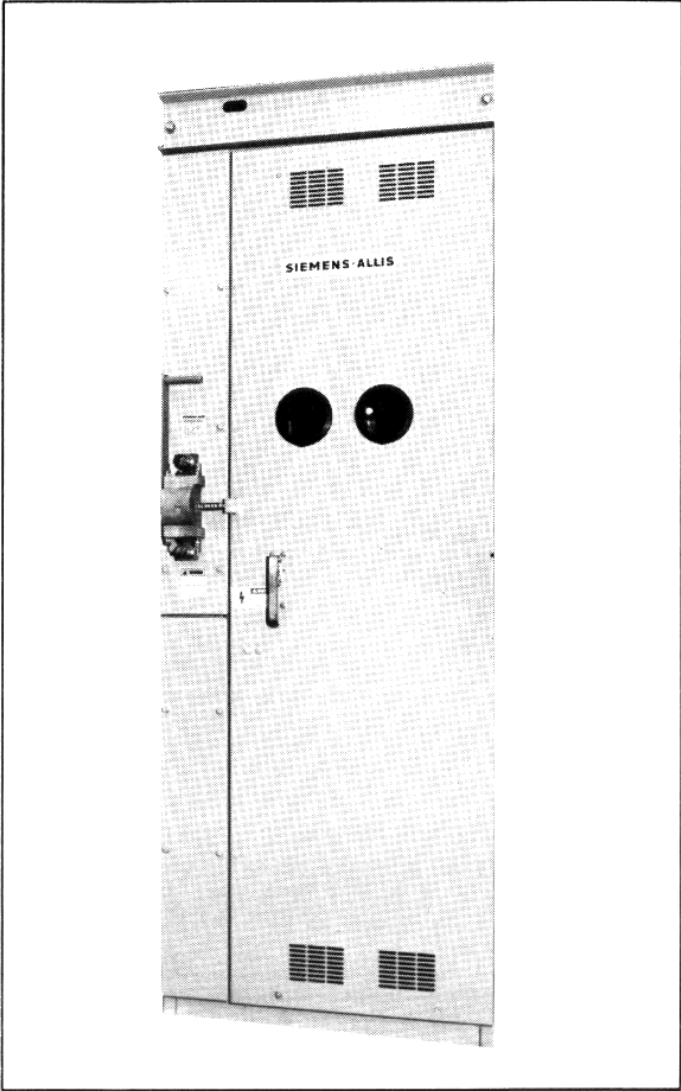


Figure 2. QB-36 Indoor Switch Cubicle with Type SE4 Operator

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GENERAL INFORMATION

These instructions apply to Siemens-Allis Type QB Indoor and Type QQB Outdoor Metal Enclosed Load Interrupter Switches (LIS) as covered by ANSI Switchgear Standard C37.20. This equipment is described in detail in catalog section SG-3041.

A standard 36-inch cubicle (QB-36) can be used individually with an open dry-type transformer, or adjacent to any auxiliary high voltage unit in which proper bus entry and alignment can be made. A 14-inch wide transition unit and a throat are added when the 36-inch wide cubicle is used with liquid-filled or sealed dry-type transformers.

This equipment has been designed to operate within the limits specified on the rating label. If for any reason the equipment is later used in a different system, or if the short-circuit capacity of the system is increased, the momentary rating of the switch, the interrupting capacity of the fuses, and the bus capacity must be checked. Failure on the part of the user to receive approval of intended changes from the supplier may be cause for voiding the warranty.

WARRANTY

For warranty coverage, see the sales contract.

GENERAL DESCRIPTION

Type QB-36 refers to the complete cubicle. QB SE2A and SE4 refers to Load Interrupter Switch (LIS) with quick-make, quick-break over center spring stored energy operator and chain. It is manually-operated, single-throw, gang-operated switch that is used as a disconnect and circuit interrupter. A quick-break blade, combined with an arc chute, provides positive, three-phase interruption of transformer magnetizing and load currents.

Available in either fused or unfused arrangements, the QB SE2A and SE4 switch is rated to interrupt load current at distribution voltages from 2.4 through 13.8kV. An interrupter switch differs from a circuit breaker in that it will interrupt *full load current, but not overload or fault currents*. When fuses are included, they provide fault current interruption capability.

Opening and closing energy is supplied by rotating the operating handle. The resulting high-speed closing and opening assures safe operation and long life.

The handle for the operation is mounted on the front of the unit at chest-level. Eye-level inspection windows are provided through which the position of the switch may be visually checked.

The metal enclosed load interrupter switch is available in three versions:

standard switch—two-position (open/closed).

duplex switch—two 2-position type switches bussed together on the load side, to provide selection of either of 2 incoming services.

selector switch—three visually identified positions of "line 1," "open" and "line 2." This switch consists of a 2-position (open/close) 600-amp interrupter switch in series with a 2-position (line 1/line 2) disconnect. The disconnect is mechanically interlocked to prevent operation when the interrupter is closed. The interrupter is identical to single feeder units and interrupts its rated load current. The disconnect is mounted in the rear of the compartment and is operated from the front of the unit.

WEIGHTS

| INDOOR | |
|---------------------|-----------|
| QB36 | 1800 lbs. |
| QBF36 | 2100 lbs. |
| OUTDOOR | |
| OQB36 | 1900 lbs. |
| OQBF36 | 2200 lbs. |
| ADDITIONS | |
| Selector Switch | 300 lbs. |
| 14" Transition Unit | 300 lbs. |

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RECEIVING AND HANDLING

The cubicles are securely blocked and braced for shipment. They are crated, boxed or covered, depending on shipping conditions. Whatever the method of shipment, every precaution has been taken to insure safe arrival of the equipment. If special handling is required, it is so indicated. Although all moving parts are blocked, avoid rough handling when unloading.

To facilitate unloading, four lifting bars are bolted to the sills at the front and rear of outdoor units, while lifting bars or channels are used on indoor units. When lifting outdoor units, use cable spreader bars at the top to prevent distorting the cubicle. After installation, remove and scrap the lifting bars.

If means for lifting are not available, the group may be moved by placing pipes or rollers under the wooden skids. To prevent distortion of the assembly, place at least one roller at each end. When removing the rollers, lower the assembly carefully to avoid dropping.

NOTE Do not remove wooden skids when either rolling units or moving them with a forklift truck.

CAUTION Forklift trucks should be used with discretion as improper lift points could cause extreme damage to shipping sections.

When groups of load center substations are shipped together, each substation is numbered. All crates for a particular substation are numbered the same, in accordance with the "General Arrangement and Floor Plan" drawing of that substation.

UNCRATING

Be careful when uncrating equipment. The use of sledge hammers and crowbars may damage the finish and equipment. Use nail pullers.

Check all packing material to insure against accidentally throwing away small parts.

Do not remove identity cards until the switchgear installation is complete.

INSPECTION

As soon as possible after uncrating, inspect the equipment for any damage which may have occurred in transit. Also check the shipping manifest to be sure all items have been received. If any damage or shortage is detected, note this on the freight bill and contact the carrier immediately.

NOTE This inspection must be made within 15 days after equipment is received or carrier will not allow claim.

Also report any shortage or damage to the nearest Siemens-Allis sales office within the 15-day period.

Unusual circumstances may require partial shipment of equipment. In these cases, provisions are made for easy installation of these portions of the complete job.

STORAGE

If the switches will not be installed immediately, uncrate, inspect and store in a clean, dry place.

Before placing in storage, inspect and grease unfinished steel surfaces, etc., to prevent rusting. Protect mechanism, contacts, etc., from dust and grit with suitable covers. Energize the space heaters to prevent damage from condensation. (Space heaters are standard on all outdoor units and are available as an option on some indoor switch cubicles.)

Indoor cubicles are neither weatherproof nor drip-proof; therefore, store them indoors. If they must be stored outdoors, provide an adequate covering, and place a heat source of approximately 500 watts output per unit inside the cubicles to prevent condensation.

INSTALLATION

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FOUNDATION

Whether installing the switch cubicle on an existing floor or on a new floor, follow the sill channel and anchor bolt dimensions shown on the "General Arrangement and Floor Plan" drawing. Typical floor plans for indoor and outdoor equipment are shown in Fig. 3 and 4. For outdoor switch cubicles, remove the lifting channel cover plates. The anchor bolts may then be installed. When replacing the cover plates, omit the lifting bars and replace screws in tapped holes.

CONDUIT

Install conduit for power and control connections in the area indicated on the "General Arrangement and Floor Plan." Keep conduit ends a maximum of 2" above the finished floor to prevent wash water from soaking the cables. Cap and tape ends to keep out moisture and vermin. In indoor installations, conduit ends should be a maximum of 2 in. (51 mm) above the unit's floor line.

ERECTION

Switch cubicles are usually shipped as single groups. If the shipment includes several groups, the "General Arrangement and Floor Plan" drawing will indicate the size and relative location of each group. Before installing, make sure that the floor is level within 1/16".

When only a single unit is involved, set in place and anchor. If multiple units are involved, align the front of each succeeding unit with the first and bolt the units together before anchoring.

NOTE When connecting the switch to the system, avoid placing any stress on the insulators or bushings.

BUS BAR JOINTS

When it is necessary to make bus bar joints in the field, all required hardware is furnished. Connections are made with 1/2 in. (12.7 mm) bolts, tightened with a torque wrench to 50-75-foot-pounds (70 N.m). Tightening the bolts as specified will prevent connections from becoming loose as bus bars alternately heat and cool during changes in load.

Bolts provided for these connections are specially designed to withstand the stresses imposed by the torque specified and by the subsequent expansion of the bus bars. Do not replace them with standard bolts. If replacements are needed, use SAE Grade 5 heat-treated bolts.

TRANSFORMER CONNECTIONS

VENTILATED DRY TRANSFORMERS

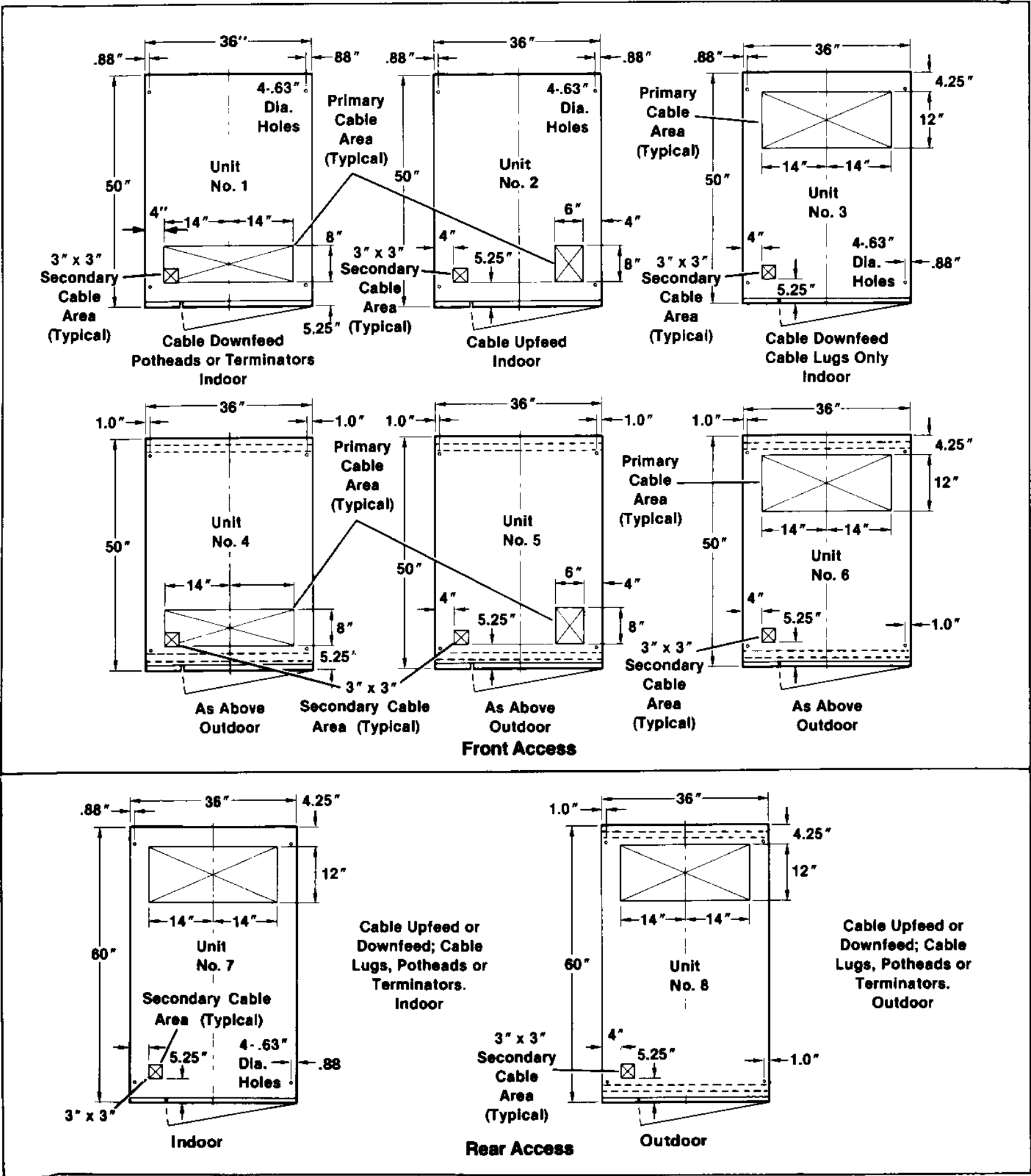
In line-ups with ventilated dry transformers, the switch is placed against the transformer and bolted together. This results in a more rigid line-up than an unbolted assembly and can also correct for minor variations in the plumbness of these adjacent pieces of equipment.

Figure 5 shows location of bolt holes to be used for this purpose. Two holes are provided on load interrupter switch units; three holes are in-line with captive nuts provided on the vent dry transformer frame and are "plugged" with .38-16 hardware prior to shipment. To connect the transformer to the switchgear the procedure is:

BOLTING PROCEDURE

1. Remove .38-16 hardware from bolt holes shown in Figure 5; (Note that this hardware is hex head and all other hardware holding side plates in place is flat head type). Save all hardware except for hex head nut.
2. Move switch into its final position to the dry type transformer.
3. Inspect front and rear of joints between switch and transformer. If units are perfectly plumb and the floor is perfectly level, there should be no gap evident between

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- equipment at these joints. If there is a gap larger than .13" at top or bottom, proceed to step 4; if no crack exists, proceed to step 5.
4. If a gap larger than .13" appears at joints, it will be necessary to level and plumb all equipment, and not try to draw equipment together by bolting since this is apt to disturb cubicles which, in turn, may cause malfunctions. Check plumb on all equipment to determine which is causing the problem. Once this has been determined use suitable shims under the equipment base to reduce the gap to a maximum of .13".
5. Using the .38-16 bolts, flat and lockwashers removed in Step 1, bolt the switch to the transformer case.

LIQUID IMMERSED TRANSFORMERS

Connections to liquid immersed transformers are protected by a hood assembly, consisting of a hood, cover, and an angle for sealing the 1-in. (25 mm) space between the switch and the transformer top plate shown in Fig. 6. Gaskets are furnished for the throat connection on outdoor units only.

Before making the primary connections to a liquid immersed transformer it will be necessary to remove the Hood Assembly for access. The Hood Assembly is shipped assembled. To connect the transformer to the switchgear the procedure is:

1. Remove the top cover (for Outdoor Equipment remove roof channel before top cover).

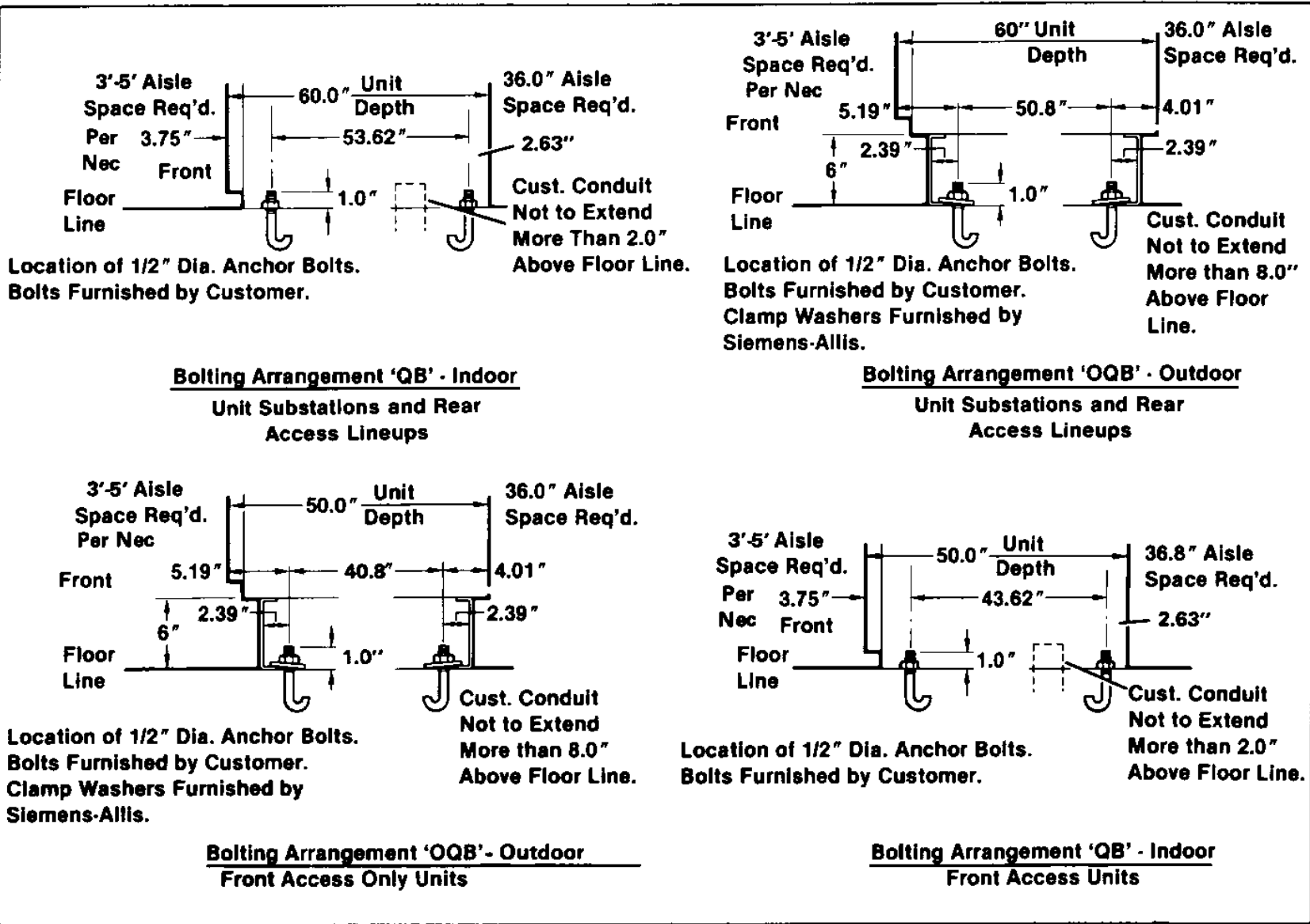


Figure 4. Bolting Arrangements

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2. Remove the center cover.
3. Loosen the angle and adjust to the lowest position.
4. Position the transformer and/or the switchgear according to the dimensions shown on the general arrangement.
5. Connect cable to the transformer. Fig. 7.
6. Slide angle up to contact the bottom edge of the throat range.
7. Slide the center cover over the transformer throat and reassemble.
8. Replace the top cover.
9. For Outdoor applications, caulk the vertical seams between the covers and the switchgear and also the horizontal seam at the top of the cover.

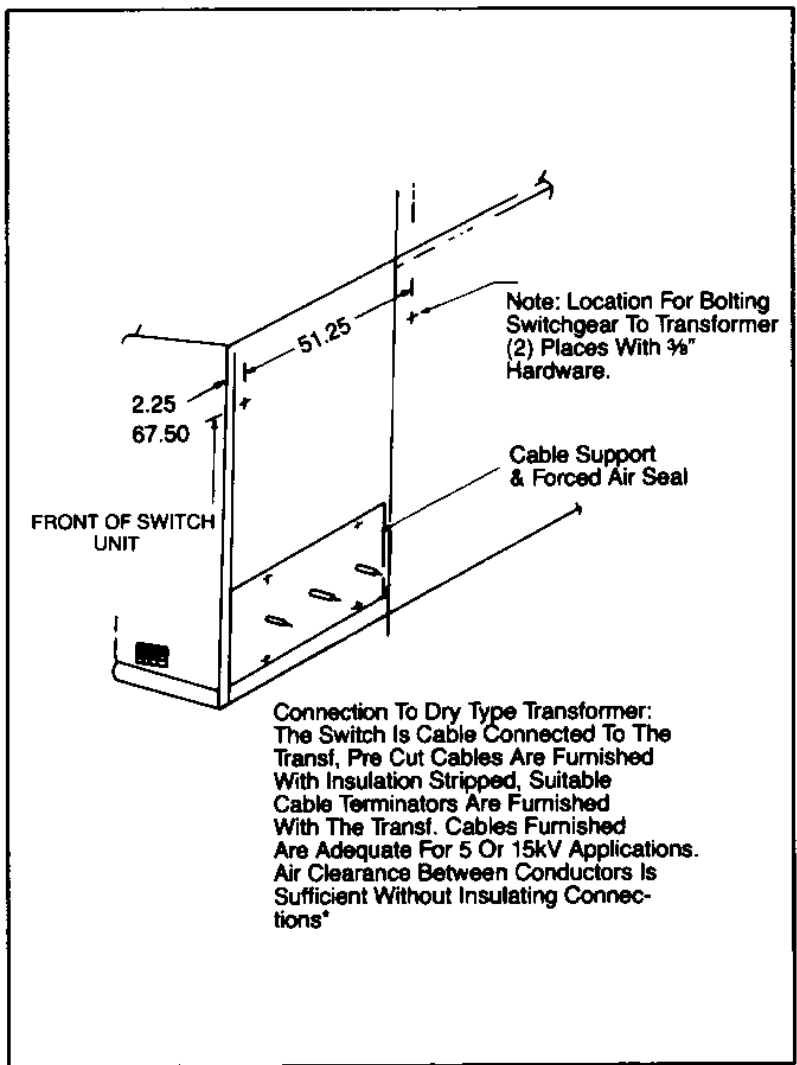


Figure 5. Bolting Procedure for Ventilated Dry Transformers

Precut factory installed cables with suitable cable lugs are provided for making connections to a liquid-filled transformer, as shown in Fig. 7. To insure ease of assembly and proper

fit of mating parts, position the switch and transformer according to dimensions indicated on the "General Arrangement" drawing.

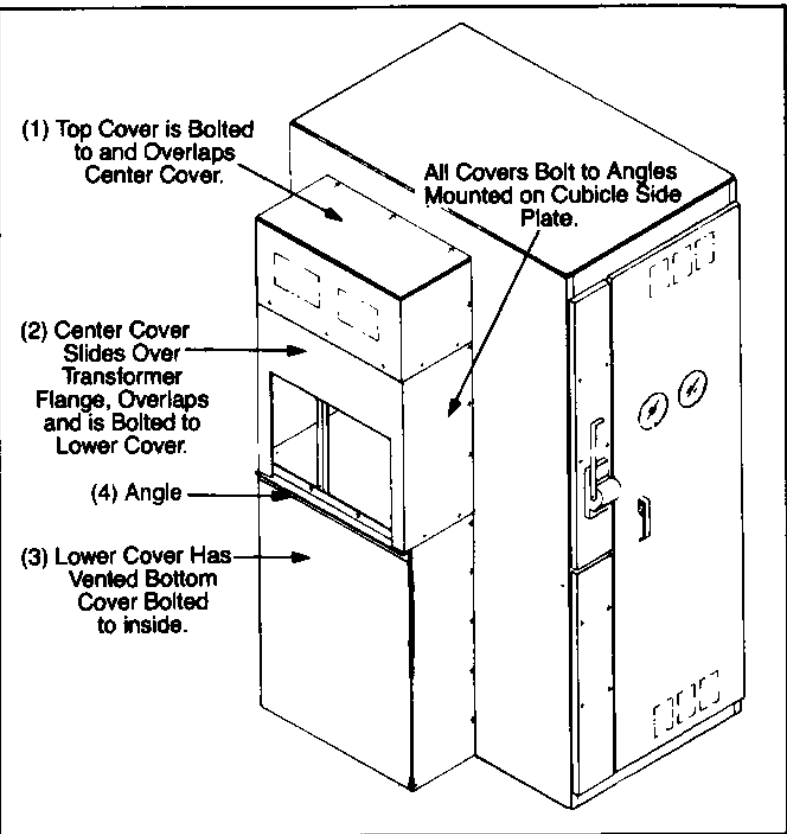


Figure 6. Flexible Cable Connections to the Transformer, Protected by a Hood Assembly.

CABLE CONNECTIONS

See typical terminal locations, Figure 8A-G. Before making cable connections, consider phase rotation. When the switch is feeding a transformer, phasing is traced from the transformer throat. For typical customer's cable connections, see Figure 9. Refer to cable manufacturer's recommendations for detailed information.

TAPING JOINTS

NOTE Taping of joints is required only on customer's cable connections to 15-kv selector switch primary terminals (see Fig. 10) and customer's cable connections to 15-kv potheads Fig. 11.

When insulated supports for incoming cable are furnished, lash cables securely to the horizontal supports.

INSTALLATION

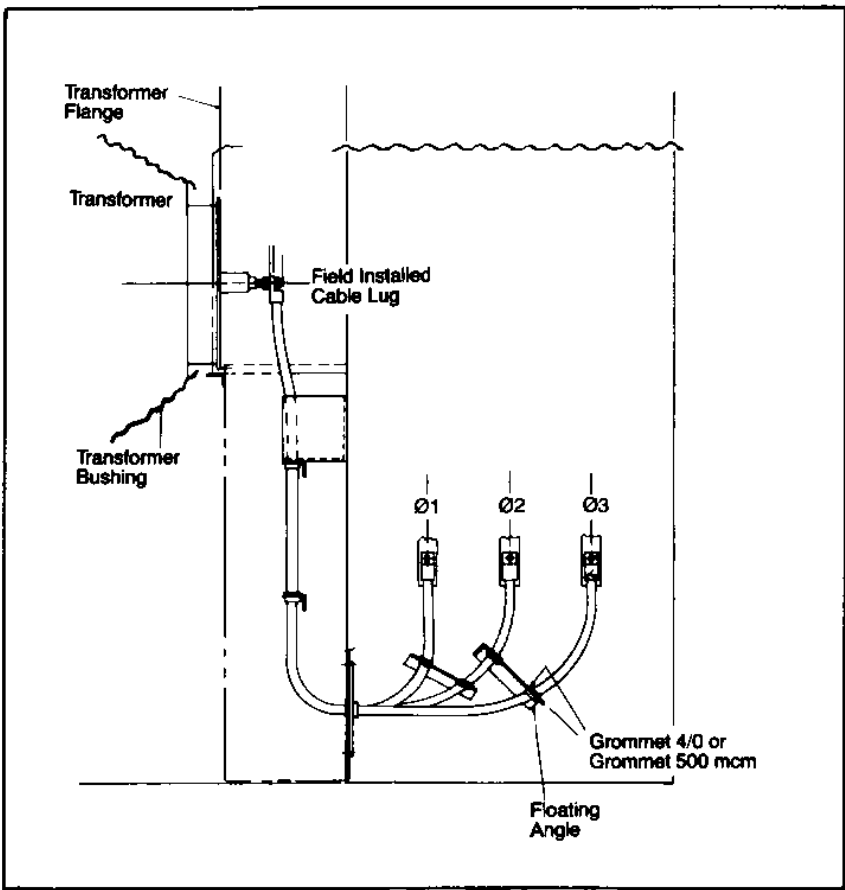


Figure 7. Cable Connection to Liquid Immersed Transformer

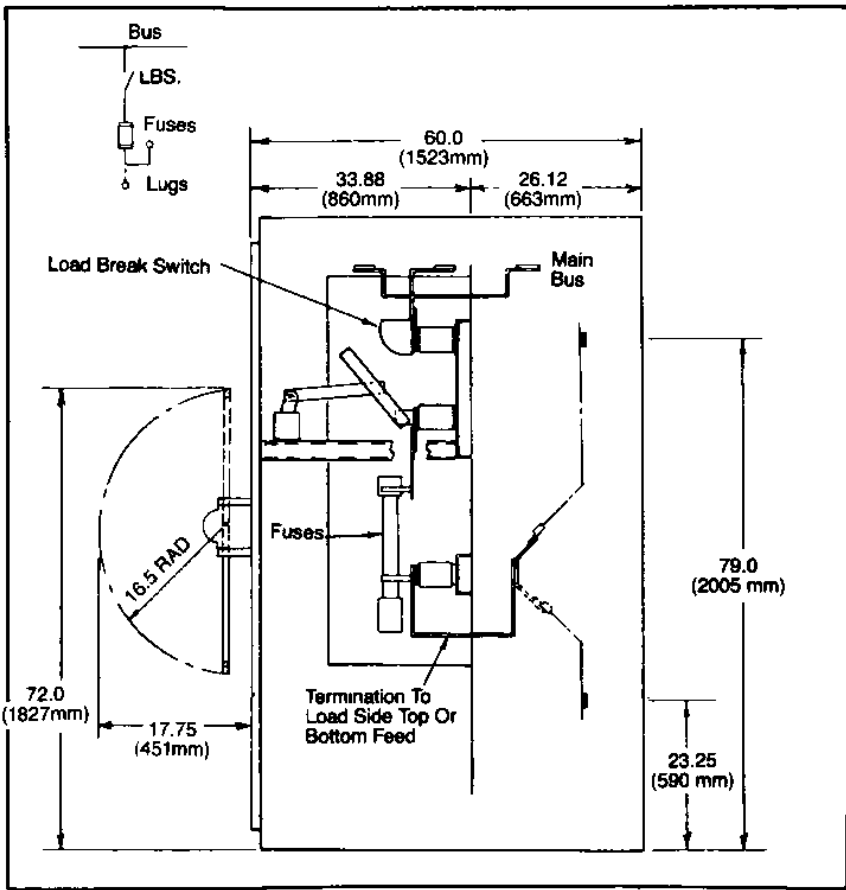


Figure 8A. Indoor Upfeed or Downfeed Cable Connections to Feeder Switch (Front Access Lugs)

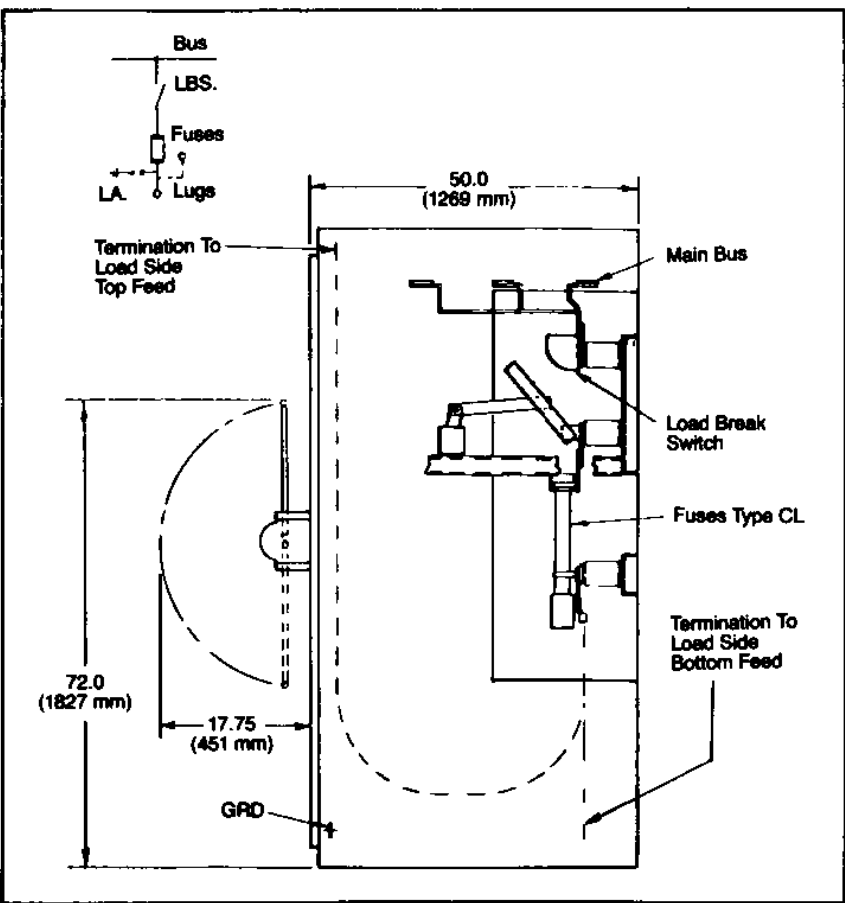


Figure 8B. Rear Access Lugs

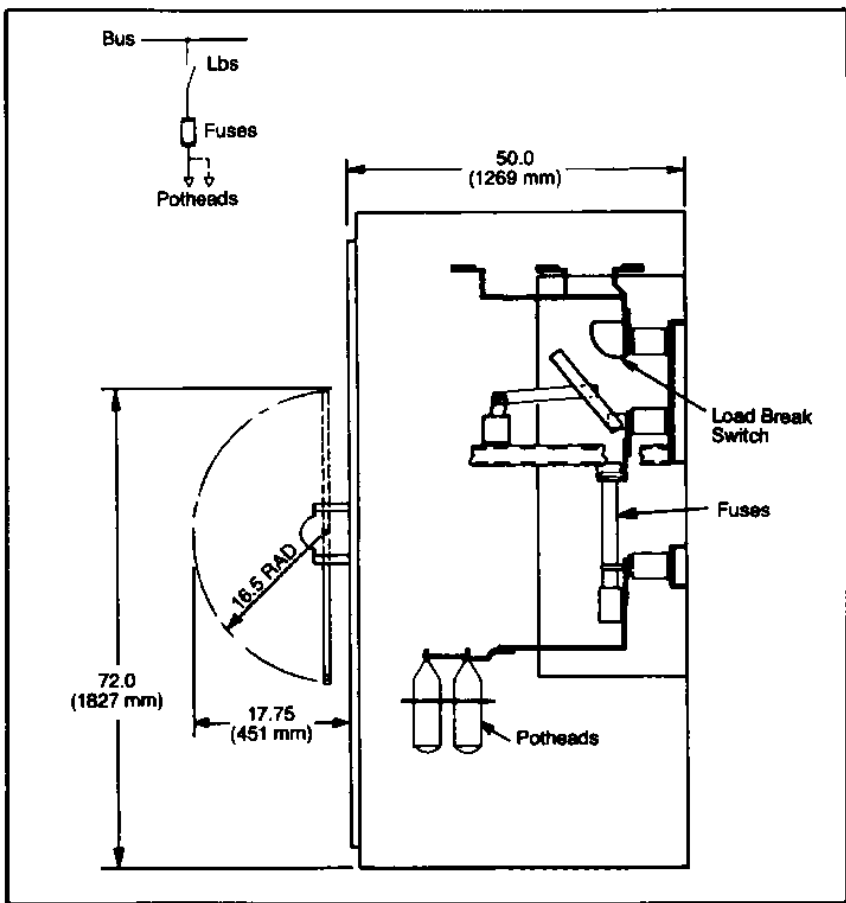


Figure 8C. Rear Access Potheads

INSTALLATION

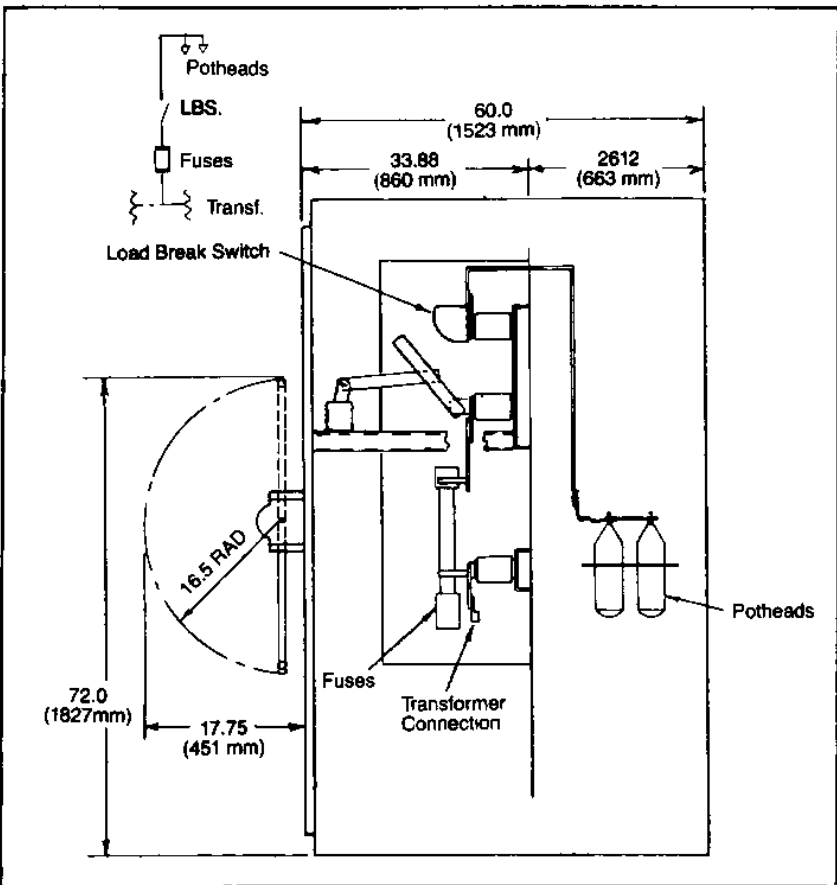


Figure 8D. Front Access Potheads

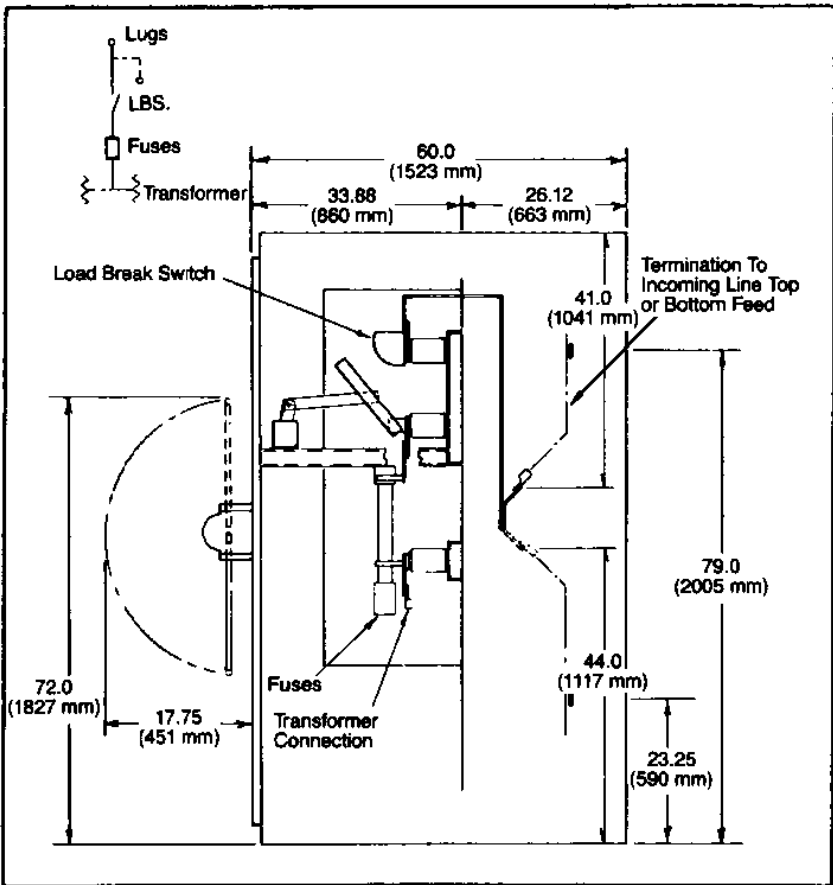


Fig. 8E. Rear Access Lugs

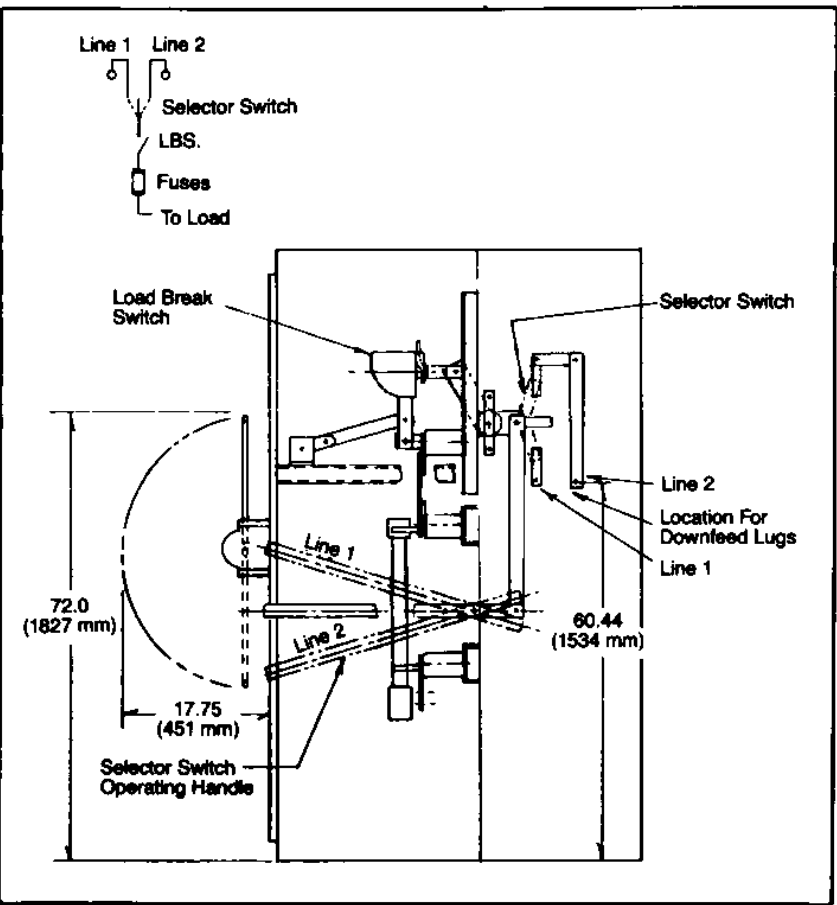


Fig. 8F. Downfeed Connection thru Selector Switch

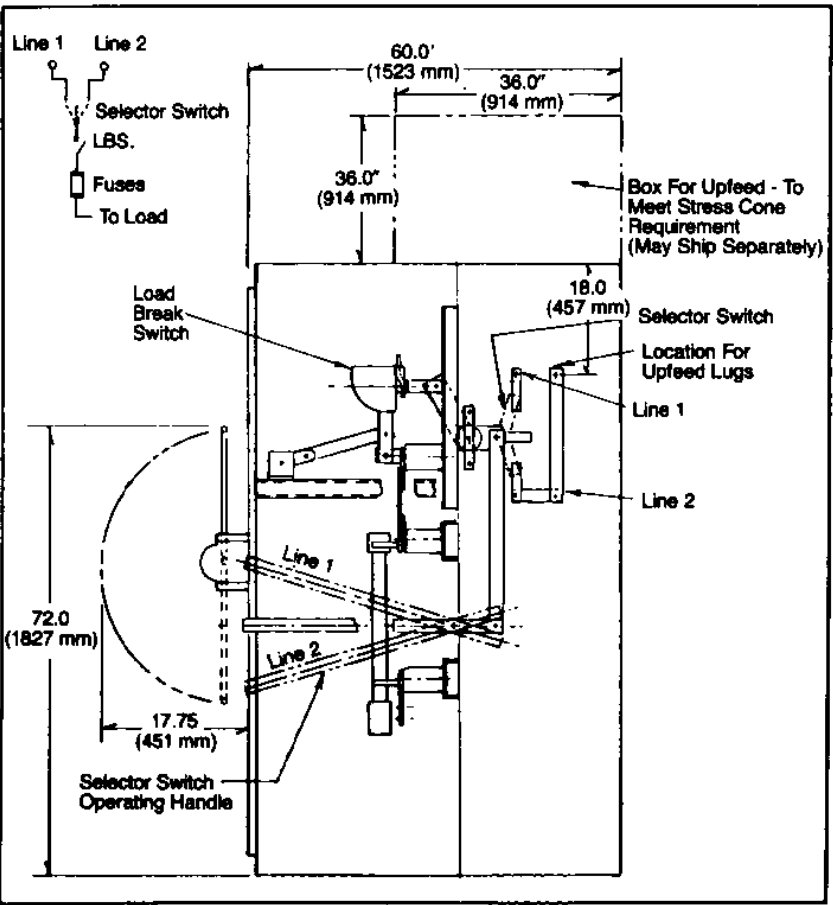


Figure 8G. Upfeed Connection Thru Selector Switch

INSTALLATION

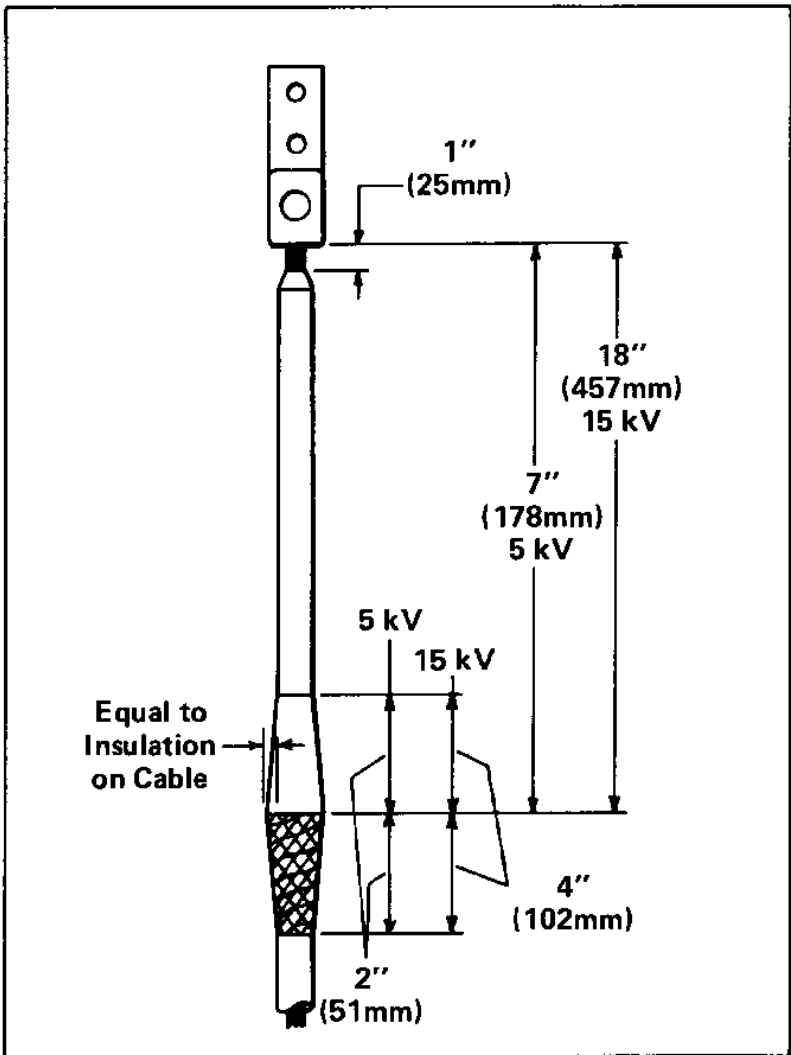


Figure 9. Typical Customer's Cable Connections

After completing the primary connections (Figure 9) when necessary as indicated in NOTE on page 7, proceed as follows: Insulate high voltage connector joints and wrap them with Siemens-Allis no-corona tape. Use approximately 2 ft. (610 mm) of this metallic mesh tape to form a regular, but not necessarily straight surface over the bolt heads.

Wrap joints with three layers of insulating cloth sheet 0.010 in. (.25 mm) thick, so that edges overlap adjoining insulation about 3 in. (76 mm) and long enough to overlap ends 3 in. (76 mm). Stagger the overlapping of the ends as much as possible, and tie the layers firmly with bias cut yellow Empire cloth tape 0.010 in. thick by 3/4 in. (.25 x 19 mm) wide (approximately 30 ft. (9 meters) long).

Perform this insulation operation twice for 5-kV and 7.5kV

equipment and three times for 15-kV equipment, using six sheets and nine sheets, respectively, of 0.010 in. (.25 mm) thick Empire cloth per joint. Then tape joints with one layer of half-lapped electrical tape (one roll). See Figures 10 and 11 for typical insulated joints.

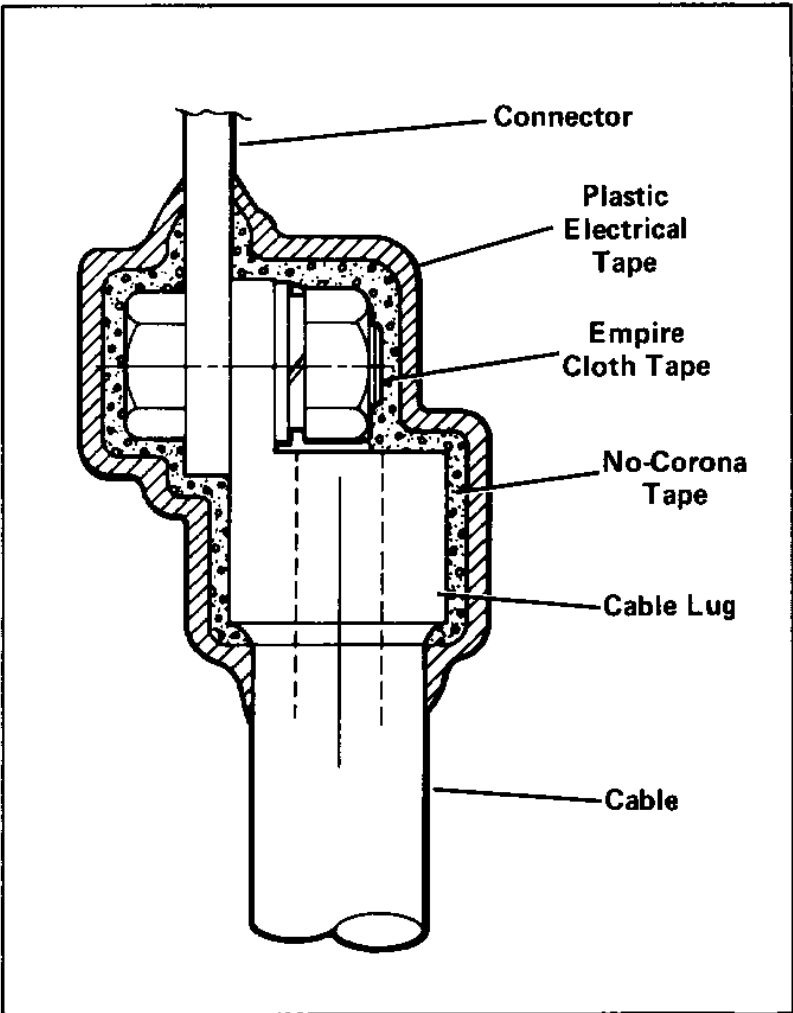


Figure 10. Example of Joint Taping for Cable Connections Required Only on 15 kV Selector Switch

GROUND CONNECTION

A common ground bus is incorporated in all units for properly grounding the equipment after installation.

The ground bus is accessible in the primary cable area. Connections to this ground bus must be made so that a reliable ground connection is obtained. Consult latest National Electrical Code for ground connection standards.

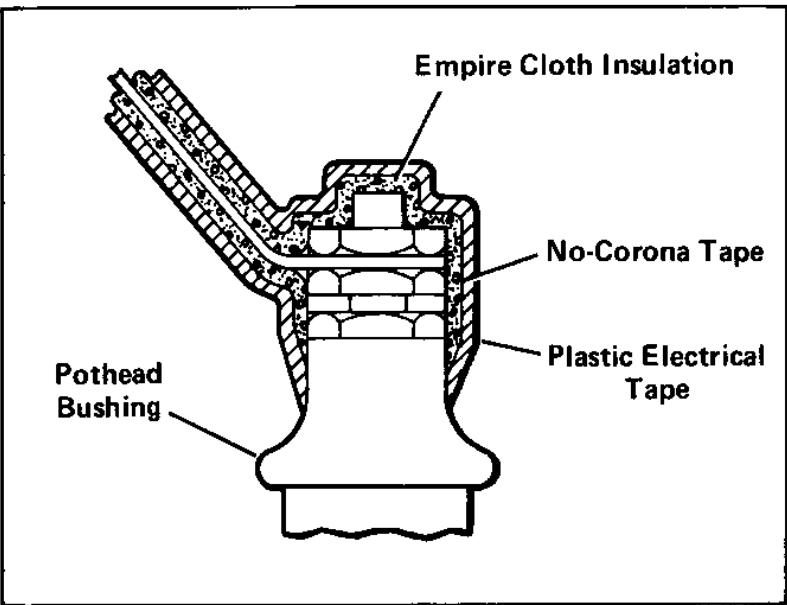


Figure 11. Typical Insulated Taped Joint on Pothead Bushing, 15 kV only

SECONDARY WIRING

Secondary wiring, when required, is carefully installed and tested at the factory. A terminal block is furnished for customer's connections as shown in the "Wiring Diagram" for the job.

If special connections are required, such as a source of supply for heaters, wired terminal blocks are provided for this purpose.

INSPECTION

A thorough inspection and test must be made before placing equipment in service.

Check the following points:

- 1. High voltage connections properly installed.
- 2. Electrical disconnecting contacts, machined parts, operating mechanism, etc., checked for lubrication and

operation.

- 3. Blockings, supports and temporary ties removed from switches, instruments, relays, etc.
- 4. Proper fuses, correctly placed.
- 5. Temporary wiring jumpers (used on the secondaries of current transformers tied to external devices, as shown on wiring diagrams) removed.
- 6. Incoming primary and secondary connections properly made and checked for shorts and undesired grounds.
- 7. All equipment removed during assembly, replaced.
- 8. Operating handles working easily.
- 9. Interlocks performing properly.

FINAL TESTING


- 1. Perform a Megger test on the high voltage circuit to be sure all connections made in the field are properly insulated. A Megger test on the control circuit is also advisable.
- 2. A dielectric test on the high voltage circuit for one minute at one of the following voltages (corresponding to the rated voltage of the equipment) should be made:

| Max. Rated kV | Test kV | |
|------------------|----------|------|
| | 60 Hertz | DC |
| 4.76 | 14.3 | 20.2 |
| 15.0 | 27.0 | 38.2 |

NOTE Potential transformers, lightning arresters, surge capacitors, etc., are disconnected during this test.

A dielectric test on secondary and control circuits is made at 1130 volts. The above test voltages are in accordance with NEMA standards.

OPERATION



⚠ Danger!

Disconnect switch from all external power sources before performing any inspection or maintenance except fuse replacement in units whose fuses cannot be energized by backfeed.

Unauthorized personnel should not be allowed near energized equipment. Failure to observe those precautions will result in serious burns or electrical shock causing serious personal injury, death, and/or property damage.

GENERAL INFORMATION

The load interrupter switch is completely adjusted, tested and inspected at the factory before shipment. No additional adjustment is necessary; however, check to be sure shipment and storage have not resulted in damage or change of adjustment.

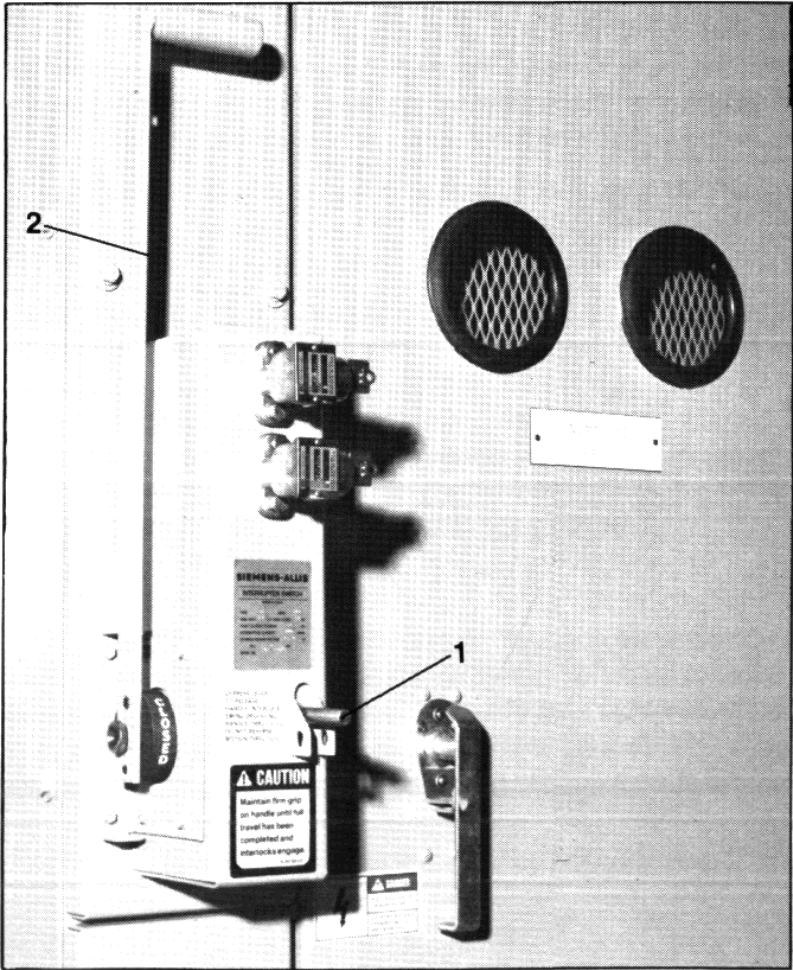


Figure 12A. Loan Interrupter Switch (SE2A Operator)

After installing the switch, close it manually to check proper functioning of the operator and contacts. See Section on "Slow Close Adjustment" before proceeding.

OPERATING SEQUENCE

TO CLOSE LOAD INTERRUPTOR SWITCH

Condition: Switch is open and panel is closed. (Fig. 12A & 12B)

1. Depress lower interlock handle (1) to disengage the interlock, and while holding lever in a depressed position, rotate operating handle slightly so interlock will not reset. (SE2A Operator Only)
2. Rotate the operating handle (2) 180° from the down position to the up position. (SE2A and SE4 Operators)

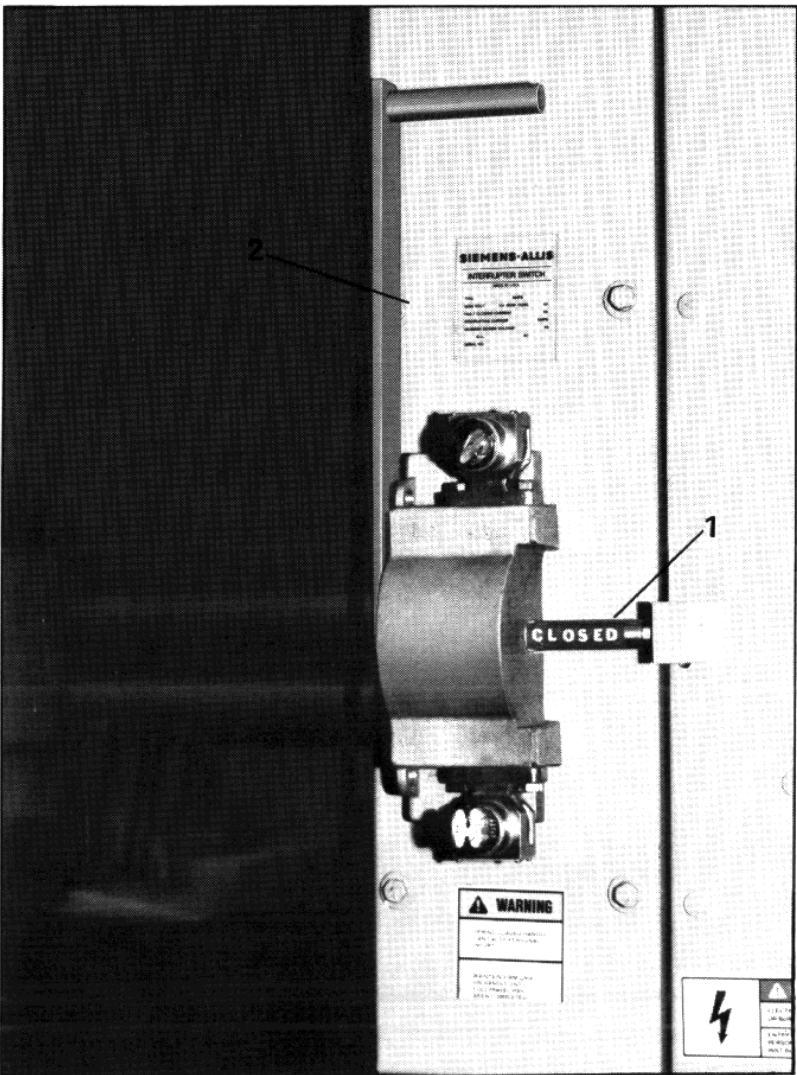


Figure 12B. Load Interrupter Switch (SE4 Operator)

TO OPEN LOAD INTERRUPTER SWITCH

Condition: Switch is closed and panel is closed. (Fig. 12A & 12B)

1. Depress lower interlock handle (1) to disengage the interlock, and while holding lever in a depressed position, rotate operating handle (2) slightly so interlock will not reset. (SE2A Operator Only)
2. Rotate the operating handle (2) 180° from the up position to the down position. (SE2A and SE4 Operators)

CAUTION Once operating handle motion has been initiated **Do Not** let go of the handle until the 180° travel has been completed.

OPERATOR MECHANISM

The spring mechanism (Figure 13) consists of a pair of compression springs (1) guided inside by a pair of spring guide rods (2). One end of the rod is pinned at the actuator (3) and the other end is guided by a hole on a post (4). The actuator is mounted on the shaft assembly (5) and is free to rotate. The large chain sprocket (6) is mounted on the shaft assembly and is also free to rotate. The large chain sprocket assembly is connected thru chain (7) to the small chain sprocket assembly (8) and the front handle assembly.

As the handle and small chain sprocket assembly are rotated, the large chain sprocket is also rotated thru the connecting chain. The slot in the large chain sprocket picks up the pin (9) in the actuator (3) and forces the actuator to rotate with the large chain sprocket. This rotation causes the springs to be compressed on the guide rods. As soon as the dead center position is passed, the compression springs release and cause the opposite end of the pin (10) on the actuator to contact the welded collar (11) on the shaft assembly thus rotating the entire shaft assembly.

Type SE2A Operators have two chains (No. 35, $\frac{3}{8}$ Pitch) are joined using two turnbuckles (12). Turnbuckles are used to adjust looseness in the chain and for proper closing and opening operation.

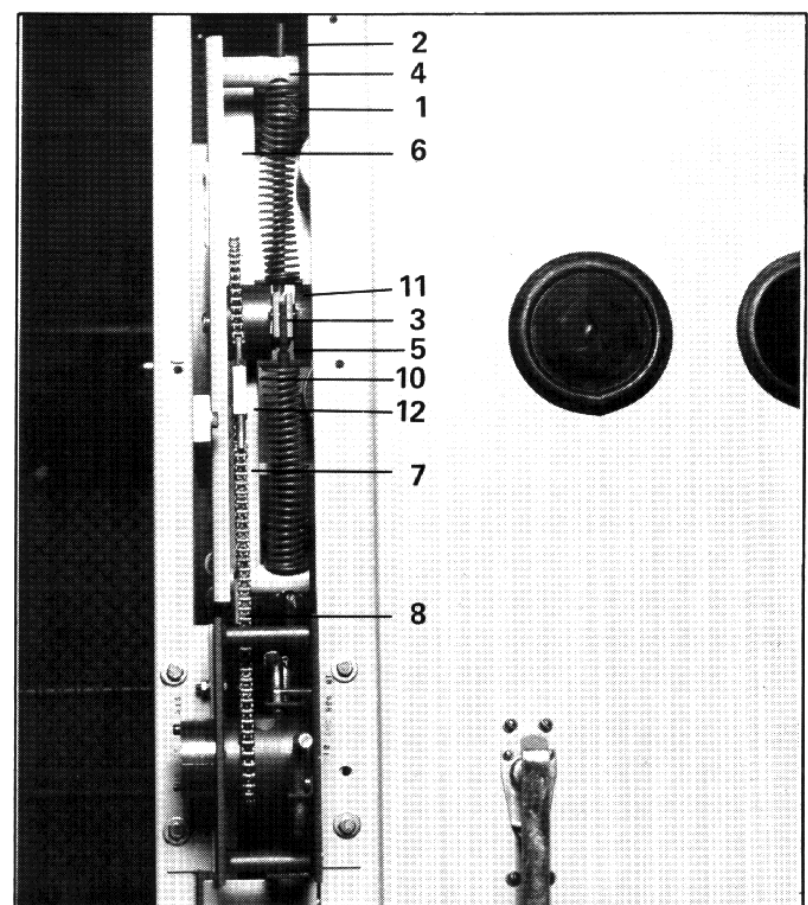


Figure 13. Operator Mechanism

OPERATION

Type SE4 Operators have one chain (No. 40, 1/2 Pitch) and one turnbuckle (12). The turnbuckle is used to adjust looseness in the chain and for proper closing and opening operation.

INTERLOCKS

SE2A

Mechanical interlocks (Figure 14A); supplied as standard, hold the main door closed when the switch is closed. To gain access to the switch compartment when the switch is open rotate door handle counter clockwise on the main door. The door is now free to be opened. Opening of the main door automatically engages the upper interlock rod which prevents rotation of the small chain sprocket thus preventing charging of the springs and closing of the switch.

Key interlocks (Figure 12A and 14A) can be supplied when specified. The upper key interlock engages the lower chain sprocket and prevent rotation in the open and/or closed position. The lower key interlock also prevents motion of operating handle and can only be used to lock the switch in the open position.

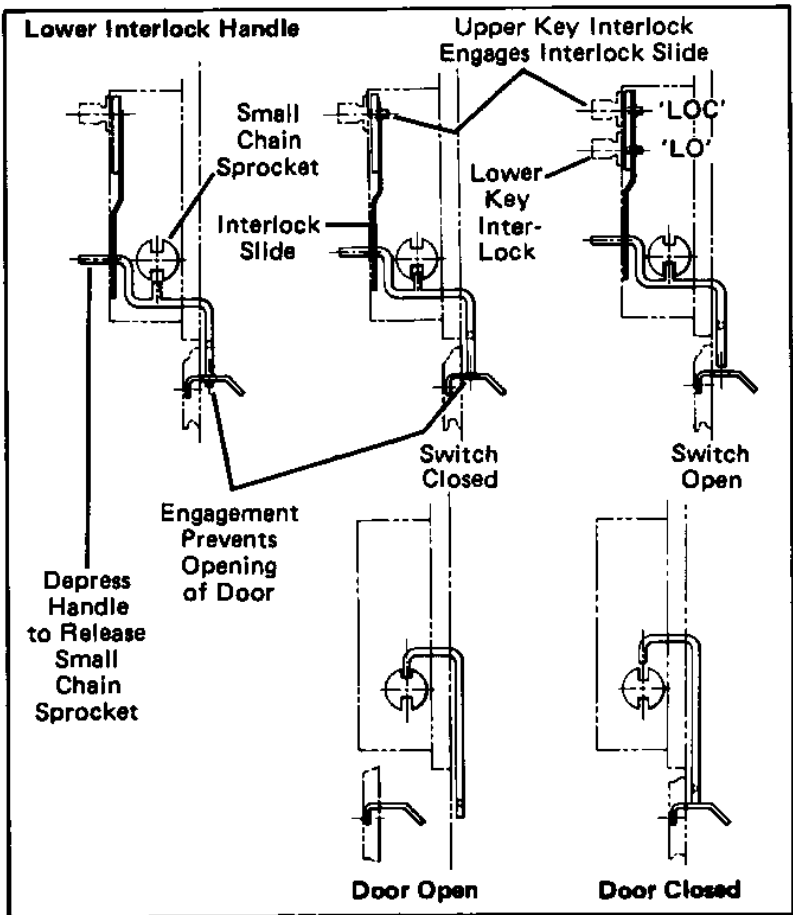


Figure 14A. Mechanical Interlocks (SE2A Operator)

SE4A

Mechanical Interlocks (Figure 14B), supplied as standard, hold the main door closed when the switch is closed. To gain access to the switch compartment when the switch is open rotate door handle counter clockwise on the main door. The door is now free to be opened.

Key interlocks (Fig. 12B and 14B) can be supplied when specified. The lower key interlock engages the lower chain sprocket and prevents rotation in the open and/or closed position. The upper key interlock also prevents motion of the operating handle and can only be used to lock the switch in the open position.

| | |
|--|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| | Warning! |
| | Do not attempt to defeat any interlocks. Failure to observe these precautions may result in serious burns or electrical shock causing serious personal injury, death, and/or property damage. |

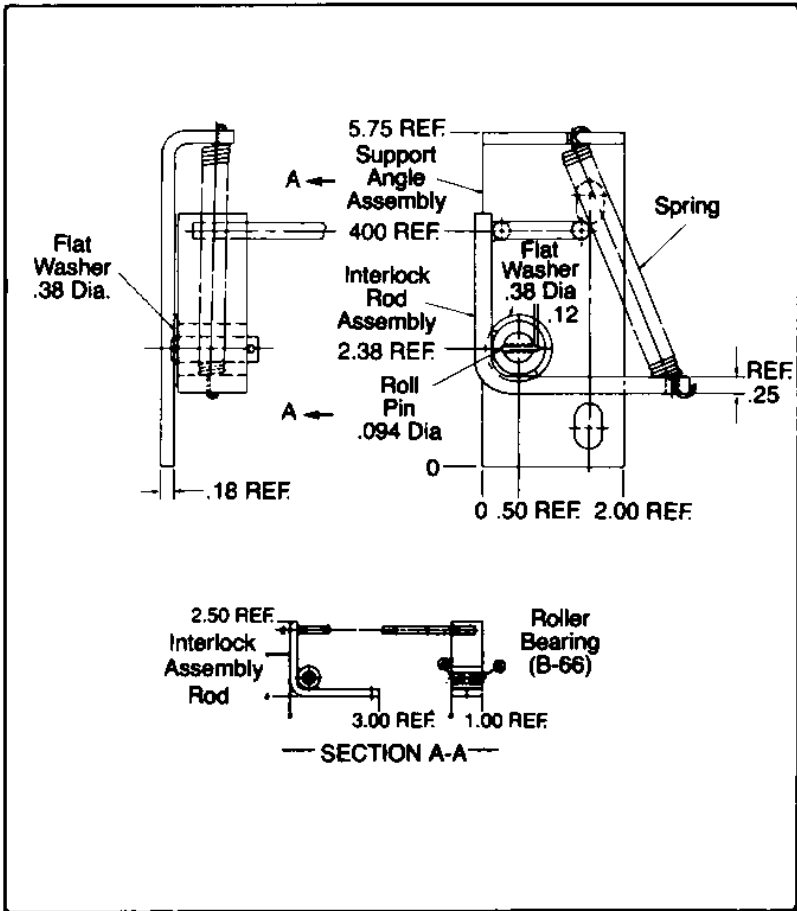


Figure 14B. Mechanical Interlocks (SE4 Operator)

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FAILURE TO PROPERLY MAINTAIN THE EQUIPMENT CAN RESULT IN SEVERE PERSONAL INJURY AND PRODUCT FAILURE. THE INSTRUCTIONS CONTAINED HEREIN SHOULD BE CAREFULLY REVIEWED, UNDERSTOOD AND FOLLOWED.


THESE INSTRUCTIONS DO NOT REPRESENT AN EXHAUSTIVE SURVEY OF MAINTENANCE STEPS NECESSARY TO ENSURE SAFE OPERATION OF THE EQUIPMENT. PARTICULAR APPLICATIONS MAY REQUIRE FURTHER PROCEDURES. SHOULD FURTHER INFORMATION BE DESIRED OR SHOULD PARTICULAR PROBLEMS ARISE WHICH ARE NOT COVERED SUFFICIENTLY FOR THE PURCHASER'S PURPOSES, THE MATTER SHOULD BE REFERRED TO THE LOCAL SIEMENS-ALLIS SALES OFFICE.

DANGEROUS VOLTAGES ARE PRESENT IN THE EQUIPMENT WHICH CAN CAUSE SEVERE PERSONAL INJURY AND PRODUCT FAILURE. ALWAYS DE-ENERGIZE AND GROUND THE EQUIPMENT BEFORE MAINTENANCE. MAINTENANCE SHOULD BE PERFORMED ONLY BY QUALIFIED PERSONNEL.

THE USE OF UNAUTHORIZED PARTS IN THE REPAIR OF THE EQUIPMENT, TAMPERING BY UNQUALIFIED PERSONNEL, OR WILL RESULT IN DANGEROUS CONDITIONS WHICH CAN CAUSE SEVERE PERSONAL INJURY OR EQUIPMENT DAMAGE. FOLLOW ALL SAFETY INSTRUCTIONS CONTAINED HEREIN.

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⚠ Danger!

Before any maintenance work is performed within primary compartments, make certain that the equipment is completely de-energized, tested, grounded, tagged or properly identified and released for work in an authorized manner.

Failure to observe these precautions will result in serious burns or electrical shock causing serious personal injury, death, and/or property damage.

PERIODIC INSPECTION

Thorough inspection at periodic intervals is important to satisfactory operation. Conditions affecting maintenance are weather and atmosphere, experience of operating personnel, and special operation requirements. The frequency of inspection and maintenance will, therefore, depend on installation conditions and can be determined only by experience and practice. It is recommended, however, that the following inspections be performed at least once a year or after 100 operations of a 600-amp switch or 20 operations of a 1200-amp switch whichever occurs first. More frequent inspection may be necessary if local conditions require.

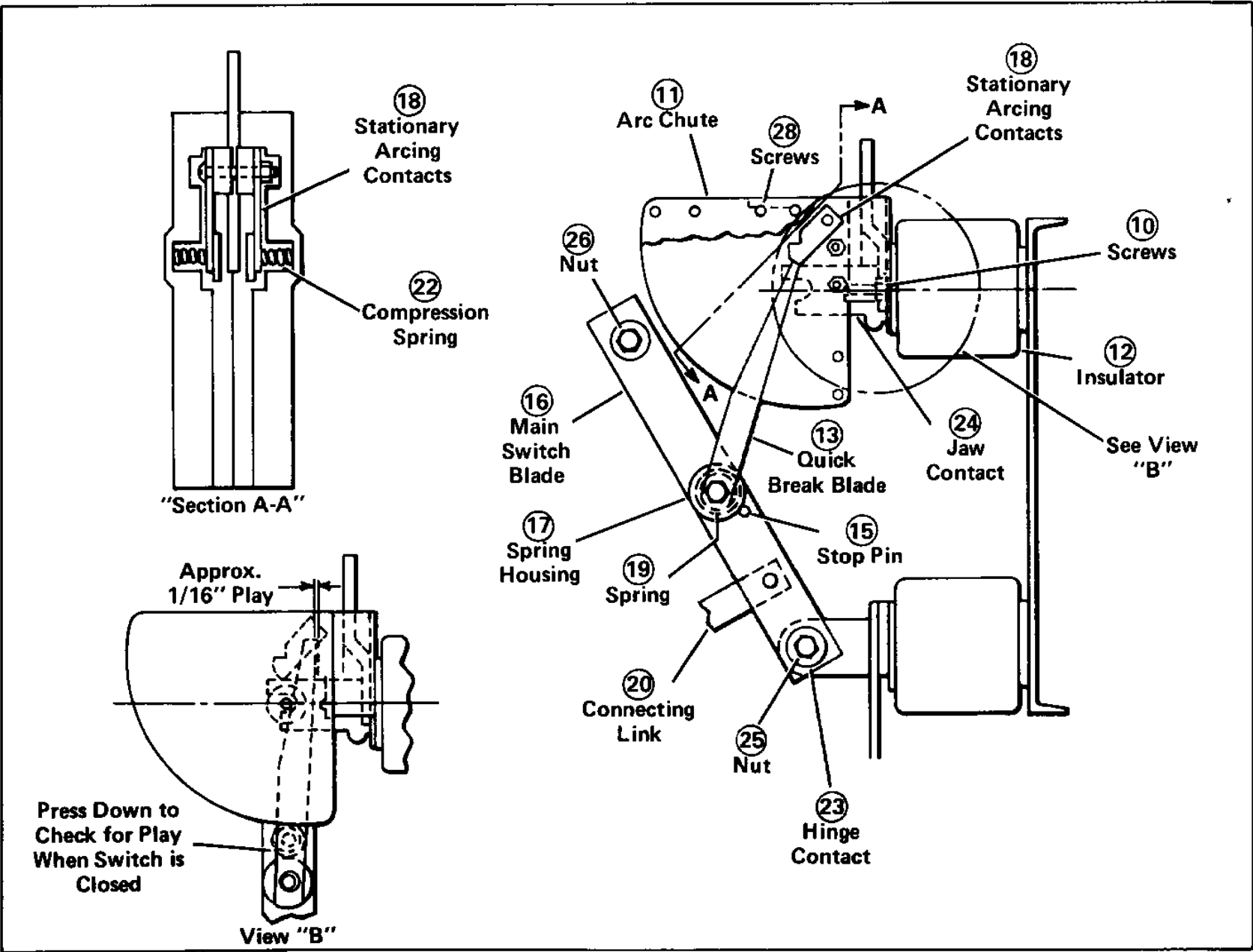


Figure 16. Typical Load Interrupter Switch Pole Unit

- 1. Inspect interior for dust and dirt accumulation. Remove dust from all insulators.
- 2. Inspect bus bars and cable connections to see that they are in proper condition. If they show signs of having overheated, check for poor or loose connections or for overloads.
- 3. Check condition of main contact, interrupting contact and arc chute. Replace any worn or damaged parts. Lubricate main contacts with S-A Contact Lubricant. **DO NOT LUBRICATE ARCING CONTACTS.**
- 4. Examine and test the switch by moving mechanism to and from the closed position. Check arc chutes for loose bolts and retighten if needed. Check fastening of switch shaft assembly. Apply grease to parts requiring lubrication.
- 5. Examine and test all safety interlocks.
- 6. Check stop bolt (Figure 18, items 7 and 13) position every 100 operations and adjust per instructions below.
- 7. Check mounting bolts for shaft bearing angle support (Figure 18, item 10) for tightness every 100 operations.

ADJUSTMENT OF LOAD INTERRUPTOR SWITCH


The following are principal components common to all types of load break switches. See Figure 16 for identification of parts referred to in this description unless otherwise indicated.

QUICK-BREAK BLADE

In the opening operation of a load interrupter switch, the break blades (13) should remain locked in position with stationary arcing contacts (18) until stop pin (15) of main switch blade (16) acts on blade spring housing (17). Continued opening movement of the main switch blades will draw the blades (13) through their stationary arcing contacts (18) to complete a quick opening of the circuit due to the action of spring (19) on the blades.

NOTE Adjustment of blade operation can only be accomplished by a slow closing alignment check.

If any of the blades start to move with the initial movement of the main switch blades (16), or if they start to withdraw from the stationary contacts (18) before stop pin (15) starts to act on spring housing (17), the blades (13) have not penetrated sufficiently into the stationary contacts (18). To rectify this, lengthen connecting link (20) by adjusting the eccentric spacer located on the opposite end of the connecting link. If the blades (13) continue to withdraw from their stationary contacts (18) before stop pin (15) has acted on spring housing (17), check for missing compression spring (22) on stationary contacts (18).



⚠ Danger!

Incoming service to the switch or main bus must be de-energized when performing slow closing alignment check.

Failure to observe these precautions will result in serious burns or electrical shock causing serious personal injury, death, and/or property damage.

SLOW CLOSING ADJUSTMENT

Slow closing (Figure 17) for checking load interruptor switch alignment can be accomplished in the following manner: Open the switch using the operator mechanism and open the main door panel. Insert pipe over protruding rod (1) on rotating shaft assembly and rotate the shaft assembly using the pipe as a lever. Main blades and arcing tips will not stay closed. Adjust arc chutes and main contacts per instructions below.

NOTE The slow closing operation can also be accomplished by using a rod over protruding pipe (1) to open and reclose a switch which is in the closed position.

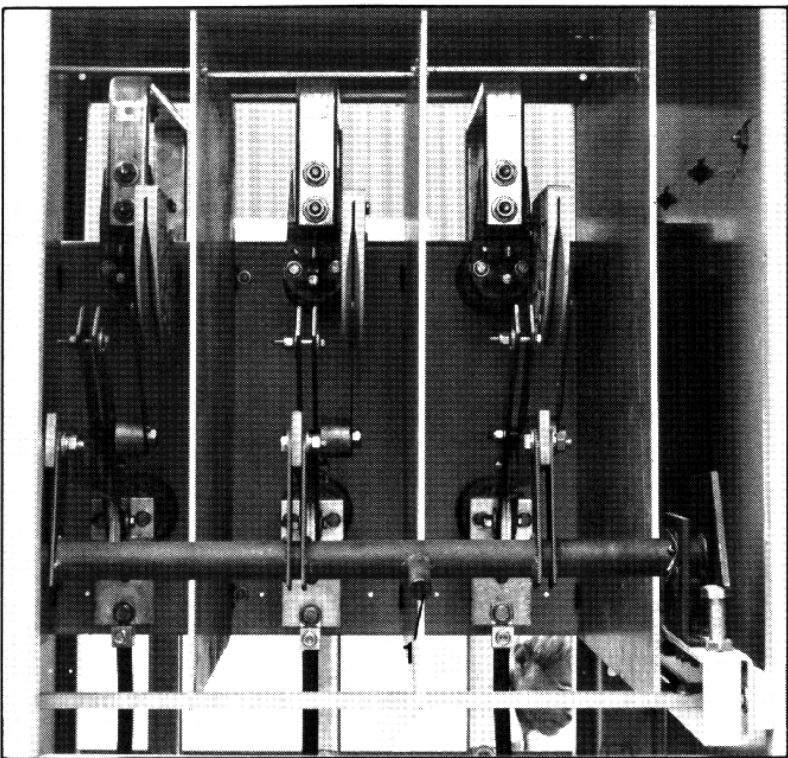


Figure 17. Slow Close

CAUTION Maintain firm grip and full engagement on pipe until switch has been slowly returned to initial position.

| | |
|--|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| | Warning! |
| | Remove pipe lever. After slow closing and before energizing equipment close and open switch to insure that the switch and interlocks functioned properly. Failure to remove pipe lever may result in serious personal injury. |

ARC CHUTE
The blade should be centered in the arc chute slot. If the blade does not center, loosen the two screws (10) holding jaw contact (24) and arc chute assembly (11) to insulator (12). Close switch assembly slowly while lining up arc chute (11) with blade (13). When correct alignment has been achieved, tighten the two screws (10).

MAIN CONTACTS
Check contacts of main switch blade with jaw contact (24) to assure centering. Make adjustment at jaw contact if necessary.

To check contact pressure of main switch blade at hinge contact (23) and jaw contact (24), slack off nuts (25) and (26) and then retighten until slight pressure exists. (There must be no visible clearance between moving parts when switch is closed.) Then tighten nuts (25) and (26) one turn.

| | |
|--|----------------------------------------------------------------------------------------------------------------|
| | Warning! |
| | Keep face and hands clear of blades. Failure to observe this precaution may result in serious personal injury. |

OPEN AND CLOSE POSITION ADJUSTMENTS
When replacing upper jaw contact or main blades the main blades must touch the stop bolt (7, Figure 18). When the hole (2) in the main switch blade (3), the hole (4) in the arm of the shaft assembly (5) and the center of the shaft assembly are held in a straight line, the stop bar (6) on the shaft assembly should be 1/8 inch (3 mm) above the closing stop bolt (7). The stop bolt height should be adjusted to achieve the correct height. Tighten the jam nuts to lock the bolt in position. This provides the proper over-toggle of the connecting link (8) in the closed position.

The connecting link (8) should be pinned to the main blades (3). The eccentric spacer (9) can then be rotated to align the holes in the connecting link and the arm on the shaft assembly. Verify that the eccentrics are rotated in the same direction on all links (8). After the bolts holding the connecting link and the arm are tightened the switch can be opened.

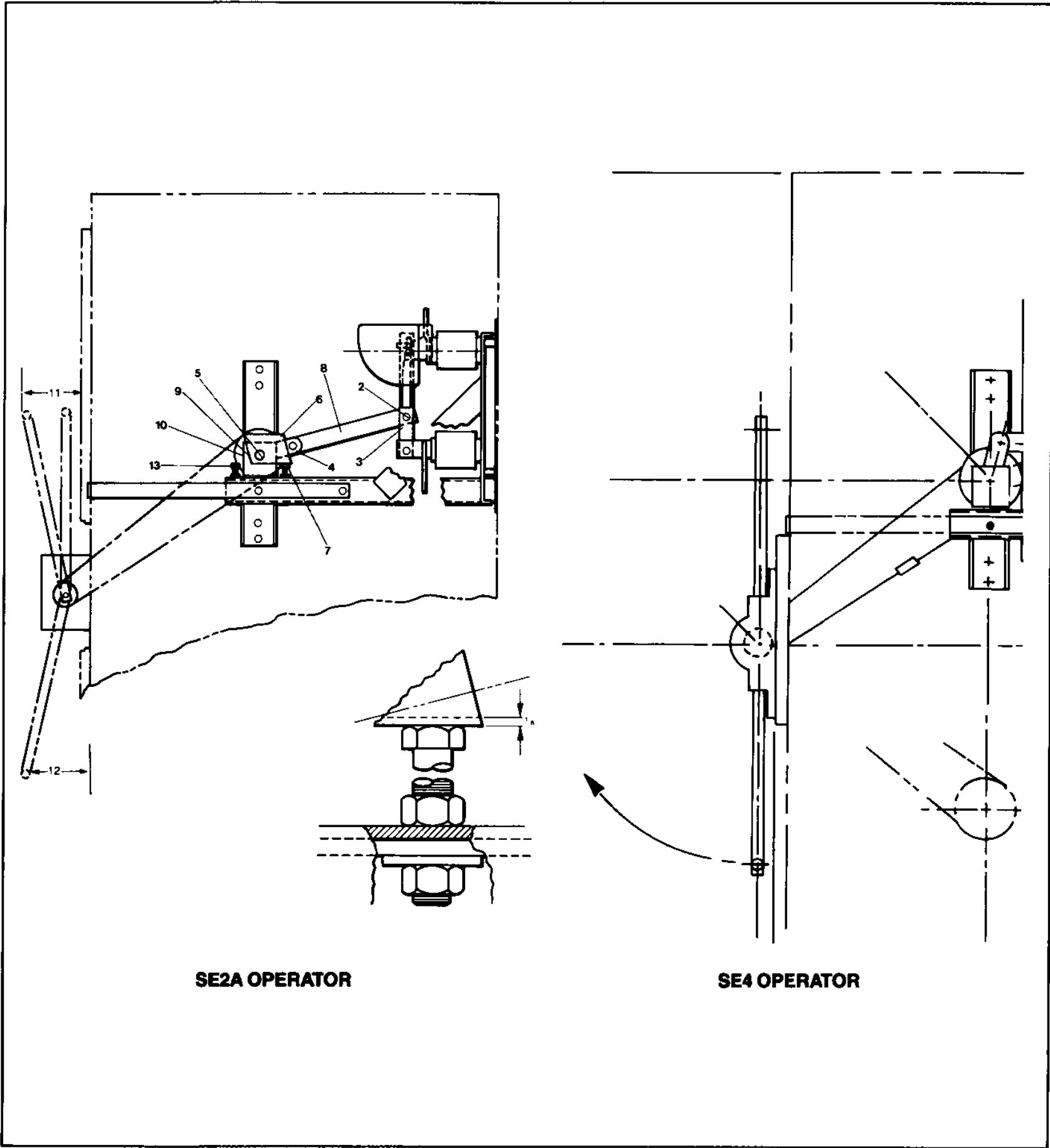


Figure 18. Typical Load Interrupter Switch Assembly

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The open position is located by adjusting the height of the opening stop bolt (13) until a gap of 6.62 to 6.88 inches (168 to 175 mm) exists between the upper jaw contacts and the main switch blades. Tighten the jam nuts to lock the stop bolt in place.

HANDLE AND CHAIN ADJUSTMENT

When the spring mechanism goes over center during opening and closing the position of the operating handle should be such that dimensions (11) and (12) in Figure 18 are approximately equal. This is adjusted (Figure 13) by turn buckles on chain.

CAUTION Be sure to tighten the nut on the turn-buckle after adjusting.

CORROSIVE ATMOSPHERES

This equipment is designed to give top performance when installed in normal indoor or outdoor locations. Where abnormal conditions such as corrosive atmospheres are encountered, special precautions must be taken to minimize these effects. Exposed metal surfaces of noninsulated bus bars, disconnect switches, wire ends, instrument terminals, etc., must be protected.

Lubricate contact surfaces with a generous coat of S-A Contact Lubricant or other equally nonhygroscopic grease. If this type of grease is not available, petroleum jelly may be used. Protect other exposed members with a coat of Glyptol lacquer or any other corrosion-resisting paint.

When old grease becomes dirty, wipe the parts clean and apply new grease immediately. Do not apply lubricants to surfaces of insulating materials.

SPACE HEATERS

Outdoor equipment is furnished with two space heaters per cubicle. Where humid conditions exist, start heaters well in advance of energizing the equipment to insure that the insulation is dry.

RECOMMENDED SPARE PARTS

| Item | Style Number | Qty* |
|-----------------------------|------------------|------|
| Movable Contact Assembly: | | |
| 600A Switch | 18-586-028-504** | 3 |
| 1200A Switch | 18-658-091-520** | 3 |
| Arc Chute | 18-735-793-501 | 3 |
| Stationary Contact (Lower) | 18-738-201-302 | 2 |
| Stationary Contact (Upper) | 18-738-201-324 | 3 |
| Insulator—15kV (Glass Poly) | 00-871-311-114** | 3 |
| Insulator—15kV (Porcelain) | 00-871-283-013 | 3 |
| Insulator—5 kV (Glass Poly) | 00-871-311-112 | 3 |
| Link (Operating) | 18-650-627-001 | 1 |
| S-A Contact Lubricant | 15-171-370-002 | 1 |
| Chain (SE2A) | | |
| Front Access | 15-171-955-007 | 2 |
| Rear Access | 15-171-955-006 | 2 |
| Chain (SE4) | | |
| Front Access | 15-171-955-009 | 1 |
| Rear Access | 15-171-955-010 | 1 |

FUSES (EXPLUSION)

| | | |
|--------------|--------|---|
| Fuse Holder | Note 1 | 1 |
| Fuse Refills | Note 1 | 3 |

FUSES (C.L.)

| | | |
|------------|--------|---|
| Fuse Units | Note 1 | 3 |
|------------|--------|---|

NOTE 1:
If unit contains fuses, spare parts should be ordered by specifying manufacturer of fuse, type of fuse and voltage/current rating required. For example,
"3-4.8 kV, 80E, G.E. Type EJO-1 Fuse Units."
Siemens-Allis part numbers can be determined by reference to drawings supplied with the unit.

TOUCH-UP SPRAY PAINT

| | | |
|-------------------|----------------|----------------|
| Light Gray, ASA61 | 18-168-000-001 | 1 pt. (473 ml) |
| Dark Gray, ASA24 | 18-168-001-002 | 1 pt. (473 ml) |

*Recommended quantities apply to one unit.
**Interchangeable only in sets.

FUSE SELECTION GUIDE (MINIMUM FUSE SIZE)

| System Voltage | Fuse Type ① | Symmetrical Interrupting Ratings (50-60 HZ) | | All fuses are "E" rated and meet all NEMA standards. ⑦ Fuse Size for Various Substation Sizes, Continuous Current Rating in Amperes | | | | | | | | | | | | | | | | | |
|----------------|-------------|---------------------------------------------|-------------------|----------------------------------------------------------------------------------------------------------------------------------------|------|------|---------|------|------|----------|------|------|----------|------|------|----------|------|------|----------|------|------|
| | | | | 500 kVA | | | 750 kVA | | | 1000 kVA | | | 1500 kVA | | | 2000 kVA | | | 2500 kVA | | |
| | | Total RMS kA ② | Max. 3-Phase MVA③ | Min. | 133% | Max. | Min. | 133% | Max. | Min. | 133% | Max. | Min. | 133% | Max. | Min. | 133% | Max. | Min. | 133% | Max. |
| 2,400 | CL-14 | 60.0 | 250 | 150 | 200 | 200 | 200 | 250 | 300 | 300 | 400 | 400 | 400 | — | — | — | — | — | — | — | — |
| | EJO-1 | 50.0 | 210 | 150 | 175 | 175 | 200 | 250 | 300 | 250 | 350 | 350 | 400 | — | — | — | — | — | — | — | — |
| | CLE-750 ④ | 40.0 | 166 | — | — | — | — | — | — | — | — | — | 600 | 600 | — | 600 | 750 | 750 | 750 | — | — |
| | SM-4S | 17.2 | 70 | 125 | 175 | 200 | 200 | — | — | — | — | — | — | — | — | — | — | — | — | — | — |
| | SM-5S | 37.5 | 155 | 125 | 175 | 300 | 200 | 250 | 400 | 250 | 400 | 400 | — | — | — | — | — | — | — | — | — |
| | RBA-200 | 19.0 | 80 | 125 | 200 | 200 | 200 | — | 200 | — | — | — | — | — | — | — | — | — | — | — | — |
| | RBA-400 | 37.5 | 155 | 125 | 200 | 250 | 200 | 250 | 400 | 250 | 400 | 400 | 400 | — | 400 | — | — | — | — | — | — |
| 4,160 | CL-14 | 60.0 | 430 | 80 | 100 | 125 | 125 | 150 | 150 | 200 | 200 | 250 | 250 | 300 | 400 | 400 | 400 | 400 | 400 | — | — |
| | EJO-1 | 50.0 | 360 | 125 | 125 | 125 | 150 | 200 | 200 | 150 | 150 | 200 | 250 | 300 | 300 | 300 | 400 | 400 | 400 | — | — |
| | CLE-750 ④ | 40.0 | 285 | — | — | — | — | — | — | — | — | — | — | — | — | — | — | 600 | 600 | — | — |
| | SM-4S | 17.2 | 125 | 80 | 100 | 200 | 125 | 150 | 200 | 150 | 200 | 200 | — | — | — | — | — | — | — | — | — |
| | SM-5S | 37.5 | 270 ⑤ | 80 | 100 | 200 | 125 | 150 | 250 | 150 | 200 | 400 | 250 | 300 | 400 | 300 | 400 | 400 | 400 | — | 400 |
| | RBA-200 | 19.0 | 137 | 80 | 100 | 150 | 125 | 150 | 200 | 150 | 200 | 200 | — | — | — | — | — | — | — | — | — |
| | RBA-400 | 37.5 | 270 | 80 | 100 | 150 | 125 | 150 | 250 | 150 | 200 | 300 | 250 | 300 | 400 | 300 | 400 | 400 | 400 | — | 400 |
| 4,800 | CL-14 | 60.0 | 500 | 65 | 80 | 100 | 100 | 125 | 150 | 150 | 200 | 200 | 200 | 250 | 300 | 300 | 400 | 400 | 400 | 400 | 400 |
| | EJO-1 | 50.0 | 415 | 80 | 80 | 100 | 100 | 125 | 125 | 125 | 175 | 175 | 200 | 250 | 300 | 250 | 350 | 350 | 350 | 450 | 450 |
| | SM-4S | 17.2 | 145 | 65 | 80 | 175 | 100 | 125 | 200 | 125 | 200 | 200 | — | 200 | — | — | — | — | — | — | — |
| | SM-5S | 27.0 | 225 | 65 | 80 | 175 | 100 | 125 | 250 | 125 | 200 | 300 | 200 | 250 | 400 | 250 | 400 | 400 | 300 | 400 | 400 |
| | RBA-200 | 19.0 | 158 | 65 | 80 | 125 | 100 | 125 | 200 | 125 | 200 | 200 | — | 200 | — | — | — | — | — | — | — |
| | RBA-400 | 37.5 | 310 | 65 | 80 | 125 | 100 | 125 | 200 | 125 | 200 | 250 | 200 | 250 | 400 | 250 | 400 | 400 | 300 | 400 | 400 |
| 7,200 | CL-14 | 40.0 | 500 | 50 | 65 | 80 | 80 | 80 | 100 | 100 | 125 | 150 | 150 | 200 | 200 | 200 | 200 | 200 | — | — | — |
| | EJO-1 | 50.0 | 620 | 50 | 65 | 100 | 65 | 80 | 80 | 100 | 125 | 125 | 125 | 175 | 200 | 175 | 250 | 250 | 250 | — | — |
| | SM-4S | 17.2 | 195 | 40 | 65 | 100 | 65 | 80 | 150 | 80 | 125 | 200 | 125 | 200 | 200 | 175 | 250 | 200 | — | — | — |
| | SM-5S | 27.0 | 325 | 40 | 65 | 100 | 65 | 80 | 150 | 80 | 125 | 200 | 125 | 200 | 300 | 175 | 250 | 400 | 250 | 300 | 400 |
| | RBA-200 | 16.6 | 205 | 40 | 65 | 100 | 65 | 80 | 125 | 80 | 125 | 150 | 125 | 200 | 200 | 200 | 200 | — | — | — | — |
| | RBA-400 | 29.4 | 365 | 40 | 65 | 100 | 65 | 80 | 125 | 80 | 125 | 150 | 125 | 200 | 250 | 200 | 250 | 300 | 250 | 300 | 400 |
| 12,000 | CL-14 | 40.0 | 830 | 30 | 40 | 50 | 40 | 50 | 80 | 65 | 65 | 100 | 80 | 100 | 125 | 125 | 150 | 150 | 150 | 200 | 200 |
| | EJO-1 | 50.0 | 1040 | 25 | 50 | 50 | 50 | 50 | 50 | 50 | 65 | 80 | 80 | 100 | 100 | 100 | 125 | 150 | 125 | 175 | 175 |
| | SM-4S | 12.5 | 260 | 25 | 40 | 65 | 40 | 50 | 100 | 50 | 65 | 125 | 80 | 100 | 200 | 100 | 150 | 200 | 125 | 200 | 200 |
| | SM-5S | 25.0 | 520 | 25 | 40 | 65 | 40 | 50 | 100 | 50 | 65 | 125 | 80 | 100 | 200 | 100 | 150 | 250 | 125 | 200 | 300 |
| | RBA-200 | 14.4 | 300 | 25 | 40 | 65 | 40 | 50 | 80 | 50 | 65 | 100 | 80 | 100 | 150 | 100 | 150 | 200 | 125 | 200 | 200 |
| | RBA-400 | 29.4 | 610 | 25 | 40 | 65 | 40 | 50 | 80 | 50 | 65 | 100 | 80 | 100 | 150 | 100 | 150 | 200 | 125 | 200 | 250 |
| 13,200 | CL-14 | 40.0 | 910 | 25 | 30 | 50 | 40 | 50 | 65 | 50 | 65 | 80 | 80 | 100 | 100 | 100 | 125 | 150 | 125 | 150 | 150 |
| | EJO-1 | 50.0 | 1140 | 25 | 30 | 30 | 50 | 50 | 50 | 50 | 65 | 65 | 80 | 100 | 100 | 100 | 125 | 125 | 125 | 150 | 175 |
| | SM-4S | 12.5 | 285 ⑥ | 25 | 40 | 65 | 40 | 50 | 80 | 50 | 65 | 100 | 80 | 100 | 175 | 100 | 125 | 200 | 125 | 150 | 200 |
| | SM-5S | 25.0 | 570 ⑥ | 25 | 40 | 65 | 40 | 50 | 80 | 50 | 65 | 100 | 80 | 100 | 175 | 100 | 125 | 250 | 125 | 150 | 300 |
| | RBA-200 | 14.4 | 325 | 25 | 40 | 65 | 40 | 50 | 80 | 50 | 65 | 100 | 80 | 100 | 150 | 100 | 125 | 200 | 125 | 150 | 200 |
| | RBA-400 | 29.4 | 670 | 25 | 40 | 65 | 40 | 50 | 80 | 50 | 65 | 100 | 80 | 100 | 150 | 100 | 125 | 200 | 125 | 150 | 250 |
| 13,800 | CL-14 | 40.0 | 955 | 25 | 30 | 40 | 40 | 50 | 65 | 50 | 65 | 80 | 80 | 100 | 100 | 100 | 125 | 150 | 125 | 150 | 150 |
| | EJO-1 | 50.0 | 1195 | 25 | 30 | 30 | 50 | 50 | 50 | 50 | 65 | 65 | 80 | 100 | 100 | 100 | 125 | 125 | 125 | 150 | 150 |
| | SM-4S | 12.5 | 300 | 25 | 40 | 65 | 40 | 50 | 80 | 50 | 65 | 100 | 65 | 100 | 175 | 100 | 125 | 200 | 125 | 150 | 200 |
| | SM-5S | 25.0 | 600 | 25 | 40 | 65 | 40 | 50 | 80 | 50 | 65 | 100 | 65 | 100 | 175 | 100 | 125 | 200 | 125 | 150 | 250 |
| | RBA-200 | 14.4 | 345 | 25 | 40 | 65 | 40 | 50 | 80 | 50 | 65 | 100 | 65 | 100 | 125 | 100 | 125 | 150 | 125 | 150 | 200 |
| | RBA-400 | 29.4 | 700 | 25 | 40 | 65 | 40 | 50 | 80 | 50 | 65 | 100 | 65 | 100 | 125 | 100 | 125 | 150 | 125 | 150 | 250 |

① Type CL-14 is GOULD current limiting type. Type EJO-1 is General Electric current limiting type. Type CLE-750 is WGH current limiting type. Type SM-4 and SM-5 are S & C expulsion type. Type RBA-200, 400 & 800 are WGH expulsion type. (Use RBA fuses for liquid transformer substation application only, except with switches having 3 insulators per pole.)

② These values for fuses correspond to momentary ratings for breakers.

③ The 3-phase MVA = 1.73 (kV) (fuse interrupting kA).

④ The minimum fuse size indicated will not operate on transformer inrush. (Fuse min. melt curve falls to right of inrush @ 0.1 sec. and is based on inrush of 8 x FLC.) The 133% fuse size indicated will permit operation of transformer at up to 133% of rating. The maximum fuse size indicated will provide transformer fault protection for phase to phase, 3-phase and phase to ground faults on secondary windings of transformer. It is selected so that fuse curve falls to left of 58% ANSI point (applicable point for Δ-Δ or Y-Δ connected units, larger fuses might possibly be used without sacrifice of thru-fault protection.)

The kVA value listed is the self-cooled rating. To select fuse for forced-cooled units, the 133% rating is applicable. TX impedance is 5.75% except 500 kVA at 5.0%.

⑤ Wye system only.

⑥ Use for delta-delta transformers only (Use only with switches having 3 insulators per pole.)

⑦ NEMA 'C' rated current limiting fuses are also available, but only with switches having 3 insulators per pole. Consult factory for information.

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