SIEMENS-ALLIS

Switchgear

INSTRUCTIONS

LOW VOLTAGE METAL-ENCLOSED SWITCHGEAR TYPE ME AND OME 600 VOLTS

18X1315-05
October, 1978

INDEX

The information contained within is intended to assist operating personnel by providing information on the general characteristics of equipment of this type. It does not relieve the user of responsibility to use sound engineering practices in the installation, application, operation and maintenance of the particular equipment purchased.

If drawings or other supplementary instructions for specific applications are forwarded with this manual or separately, they take precedence over any conflicting or incomplete information in this manual.

ILLUSTRATIONS

INTRODUCTION

General

This manual contains instructions for receiving, handling, storage, installation, inspection, testing, and maintenance of Siemens-Allis Low-Voltage Metal-Enclosed Switchgear. The switchgear described herein consists of the 600 volt class indoor and outdoor designs. The contents of this manual are applicable to all "ME" and "OME" switchgear classes and designs unless noted otherwise. Siemens-Allis low voltage switchgear carries letter designations as follows: "ME" for indoor and "OME" for outdoor equipment. These designations may appear on drawings and other media, and familiarity with them will simplify communication with the factory. Figures 1 and 2 show some typical installations. Standard construction details of necessary auxiliary and accessory equipment are included in appropriate sections. Instructions for special mechanical and electrical devices, as specified in the purchase order, are covered by supplementary data submitted with this instruction manual. Ratings described in this manual are in accordance with NEMA, IEEE and ANSI standard requirements.

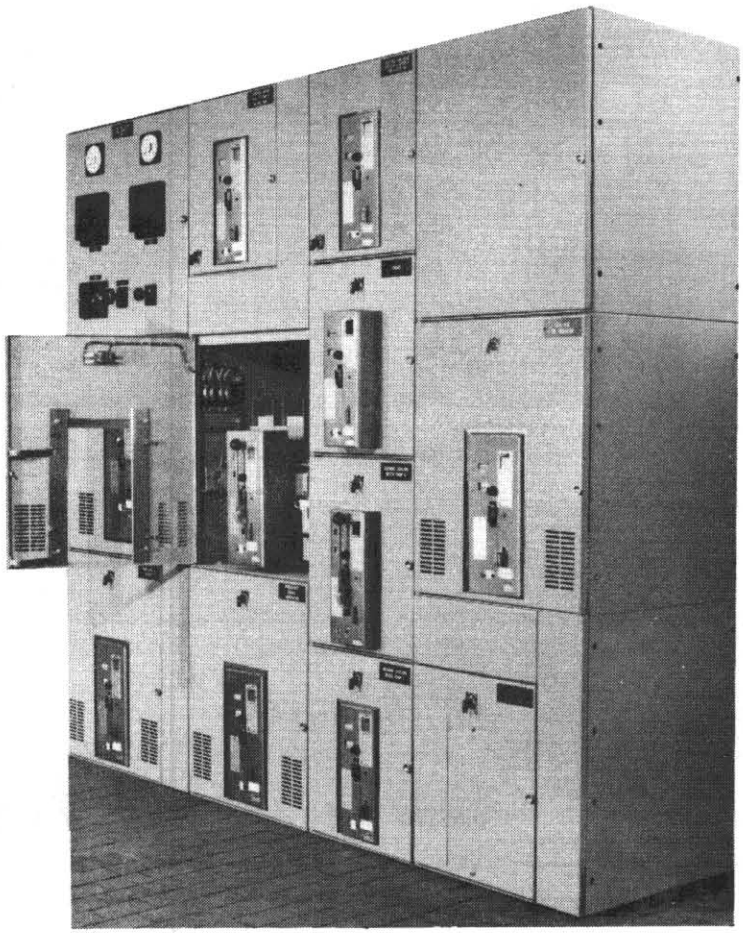
Warranty

For specific warranty coverage, see the sales contract.

Furnished equipment has been designed to operate in a system having the circuit capacity specified by the purchaser. If for any reason the equipment is later used in a different system, or if the short-circuit capacity of the system is increased, a check must be made of the rating of the switchgear, the interrupting capacity of the circuit breakers and the bus capacity. Failure on the part of the user to obtain approval of intended changes from Siemens-Allis may be cause for voiding the warranty.

General Description

The switchgear described in this manual is the metal-enclosed type. Units are of modular construction consisting of individual compartments to house circuit breakers and auxiliary equipment. Frames in the rear of the switchgear support bus work and customer connections. Interlocks are provided, where necessary, to insure proper sequence and safe operation.



A340065-76

Figure 1. – Typical Indoor Low Voltage Switchgear - Type ME

Indoor switchgear consists of one or more cubicles secured together as a single group. It is completely operational when installed and connected to the customer's power and equipment. Each cubicle consists of three or four stacked compartments, framed and secured together as a single unit. Circuit breaker compartments are provided with hinged access doors for installing or removing circuit breakers. Auxiliary compartments are designed with hinged panels for mounting of instruments, relays and switches.

Outdoor switchgear (OME) is similar to indoor switchgear, except that it is enclosed in a weatherproof steel housing. This equipment is designed so that weather conditions will not affect operation. An illuminated service aisle is provided at the front of the switchgear which allows inspection and maintenance without exposure to the elements. Access to this aisle is by means of full length hinged doors. Hinged doors are also provided at the rear of the shelter for access to primary entrance compartments.

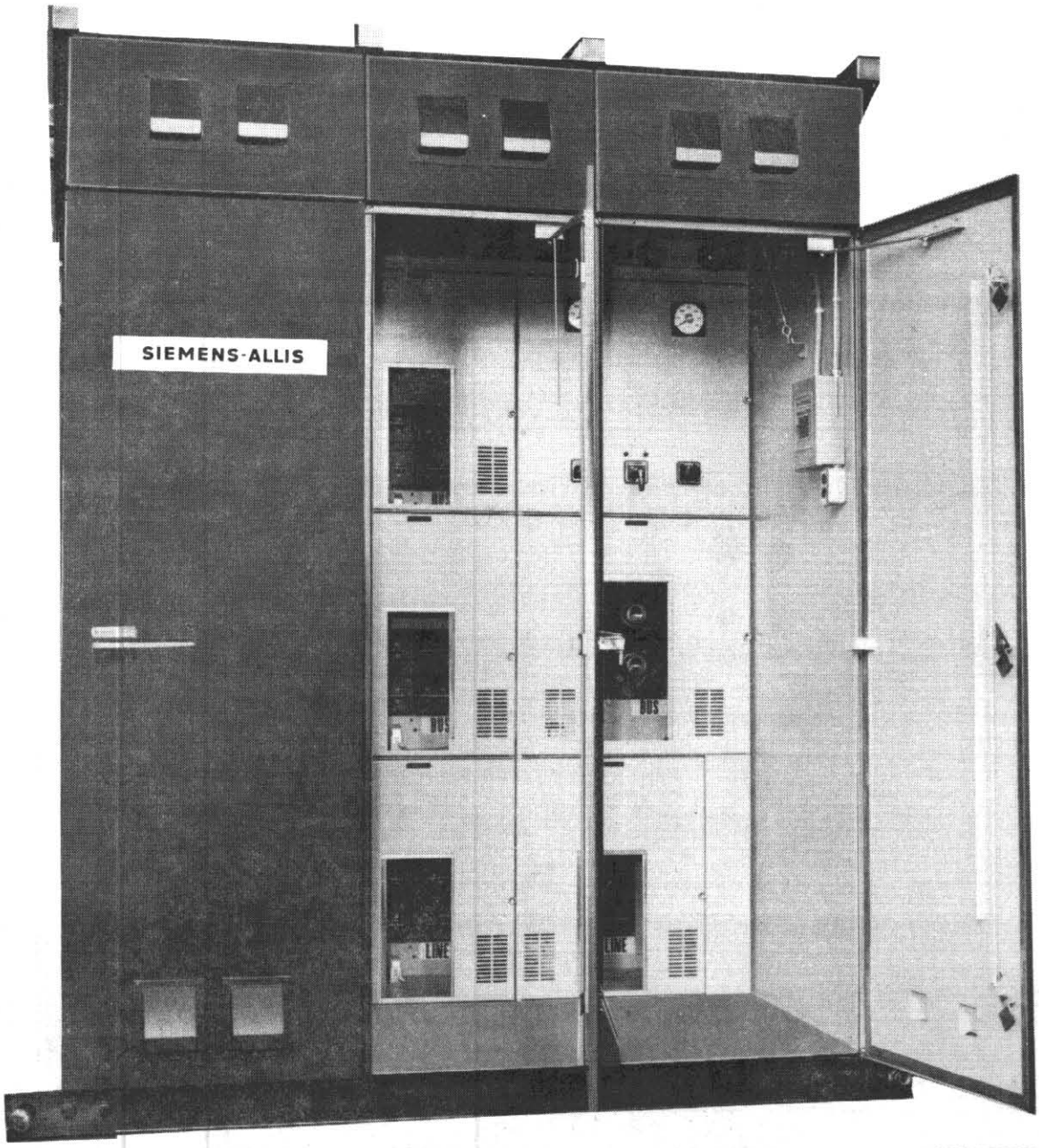


Figure 2. – Typical Outdoor Low Voltage Switchgear - Type OME

RECEIVING AND HANDLING

General

Each shipping section of switchgear is securely blocked and braced for shipment. It is crated, boxed or covered as required by shipping conditions. Whatever method of shipment is employed, every precaution is taken to insure its safe arrival. If special handling is required, it is so indicated on the shipment. All moving parts are secured. However, relatively delicate instruments are included which requires that each section be handled carefully until installed in its final location.

NOTE

When circuit breakers are shipped installed in their respective compartments, they are secured in the fully connected position, and closed. A bolt is placed through the trip button to prevent accidental tripping during shipment. (See Figure 30)

Identification

In the case of multiple sections of load center substations, the low voltage circuit breakers may be key interlocked with the transformer primary switches. Check substation numbers on the packaging of the switchgear and primary switches with those noted on the applicable General Arrangement and Floor Plan drawings. These numbers insure that all the components, applying to a particular substation, are correctly located before uncrating.

Inspection and Uncrating

Inspect the shipment as soon as possible after receiving for any damage that may have occurred in transit. Before uncrating, examine the crate itself for damage. A splintered crate indicates that the area within may have been damaged. Be careful when uncrating the shipment. The use of sledgehammers and crowbars may damage the finish, if not the item itself. Use nailpullers. After uncrating, examine each item for any possible damage. Check the shipping manifest to be certain that all items have been received. Do not destroy any packing material until all items listed on the shipping manifest have been accounted for. Do not remove identification cards from apparatus until the switchgear is completely installed. If there is a shortage, make certain it is noted on the freight bill and contact the carrier immediately. Notify the representing Siemens-Allis sales office of any shortage or damage. Unusual circumstances may require partial shipments of switchgear. Should a case of this nature exist, provision is made for easy installation of these portions.

Handling

General

There are a number of methods that can be used in handling the switchgear which when properly employed, will not damage the switchgear sections. The handling equipment and method used will be determined by conditions at the installation site. Lifting with a crane is the preferred method of handling however, roller bars, jacks or forklift may be used prior to removal of the wooden skid.

Each switchgear shipping section has provisions for attaching lifting equipment (see figures 3 and 4). Though the lift points vary in location among indoor and outdoor sections, each is designed for use with a crane of adequate height and capacity. To determine the required crane capacity, check the shipping manifest or multiply the number of vertical sections in the shipping section by 3000 pounds (1365 Kg).

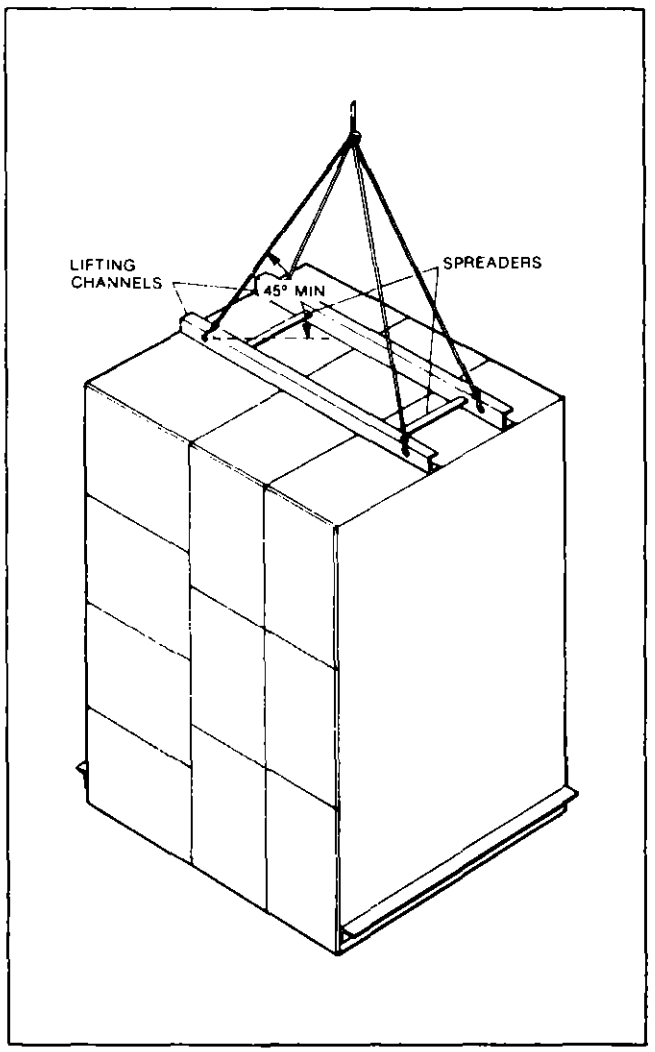


Figure 3. – Lifting Indoor Shipping Sections

Lifting Indoor Sections (see figure 3)

CAUTION

Lifting channels on indoor sections must not be removed under any circumstances until the switchgear is installed in its final location. These channels insure the true alignment of the cubicles in a shipping section until it is leveled and anchored.

Lifting channels are mounted on top of indoor shipping sections. They are normally furnished with lift point spreaders which can be discarded after installation. The load angle on lifting cables must be at least 45 degrees. A lesser angle could damage the shipping section.

Lifting Outdoor Sections (see figure 4)

Lift outdoor shipping sections by attaching cables to four lifting angles mounted on the ends of the channel base. Cable spreaders are required above the roof of the shipping section to protect it from damage. Wooden cable spreaders, if used, must be timbers of sufficient strength to withstand the compressive force of the cables. Wooden spreaders should have steel bands or studs to prevent splitting.

Moving Shipping Sections Without Crane

Within buildings and obstructed areas where a crane cannot be used, the shipping sections are moved with rollers, cribbing and jacks. These methods are illustrated in figures 5 and 6 for indoor handling and figures 7 and 8 for outdoor handling. To prevent distortion of shipping sections, rollers and/or cribbing should be of uniform size and used in sufficient numbers to evenly distribute the load. Remove the rollers and lower shipping section carefully. Leave wooden skids (when provided) in place during moving and until final location is reached. Jacking angles are provided on either side of indoor shipping sections. Four angles are furnished for attaching to the corners of outdoor shipping sections. Indoor jacking angles are removed and discarded when final location is reached. Outdoor jacking angles may be removed when the jacks are no longer required.

CAUTION

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

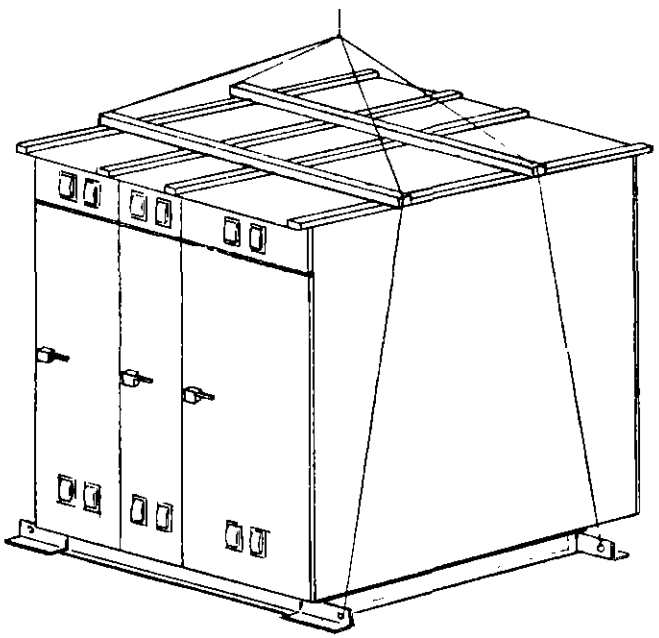


Figure 4. – Lifting Outdoor Shipping Sections

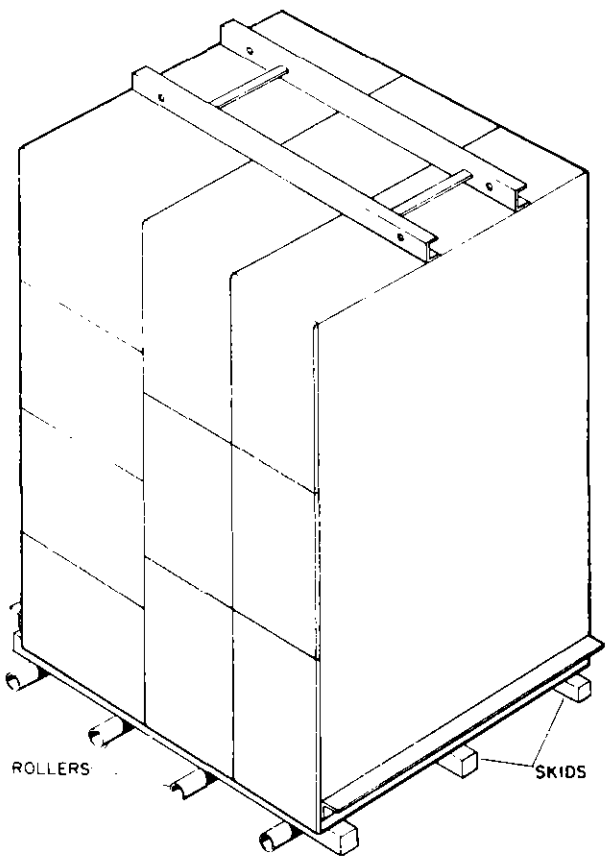


Figure 5. – Moving Indoor Sections with Rollers

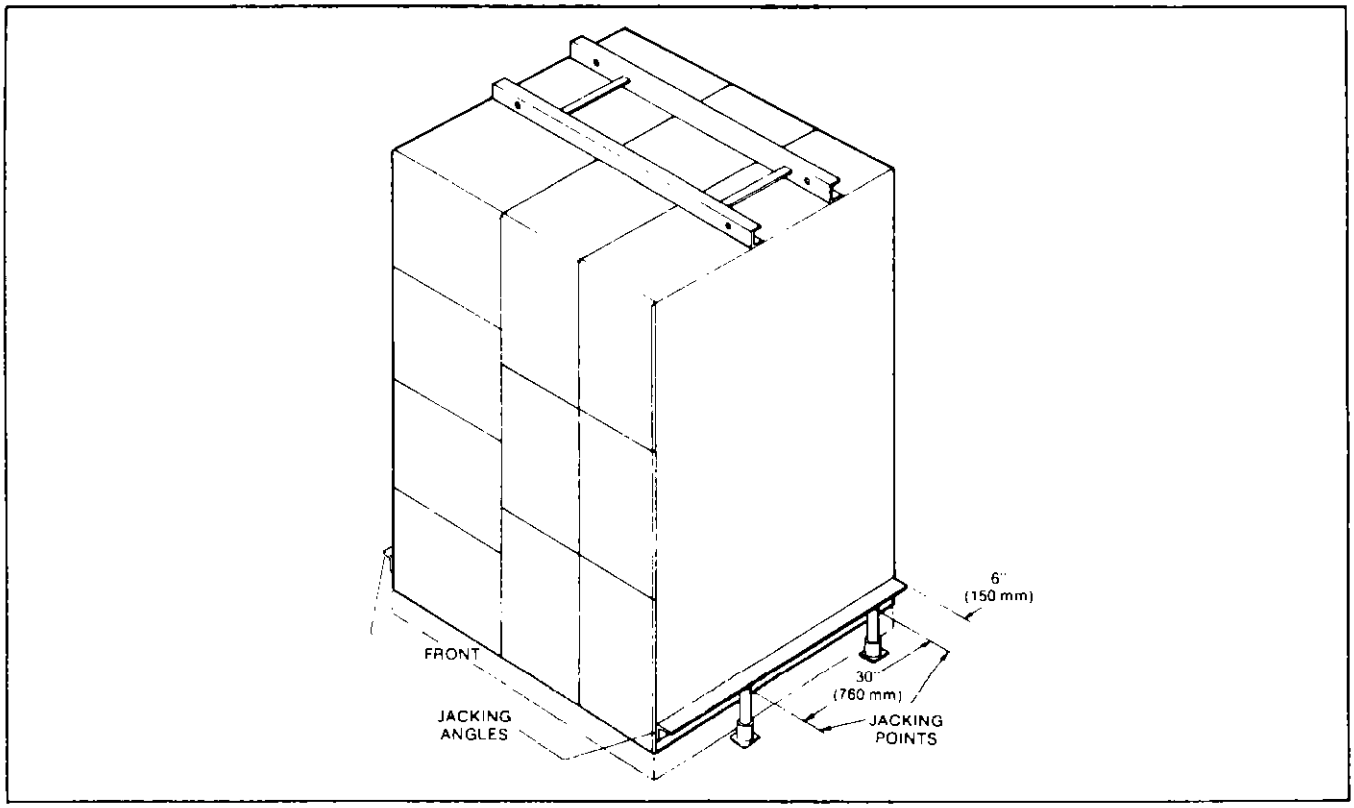


Figure 6. – Handling Indoor Sections with Jacks

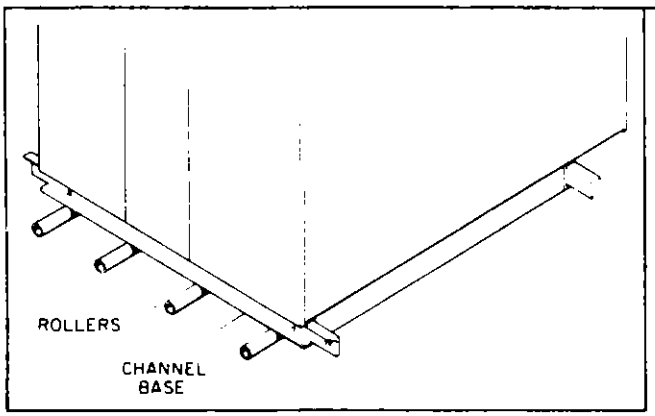


Figure 7. – Moving Outdoor Sections with Rollers

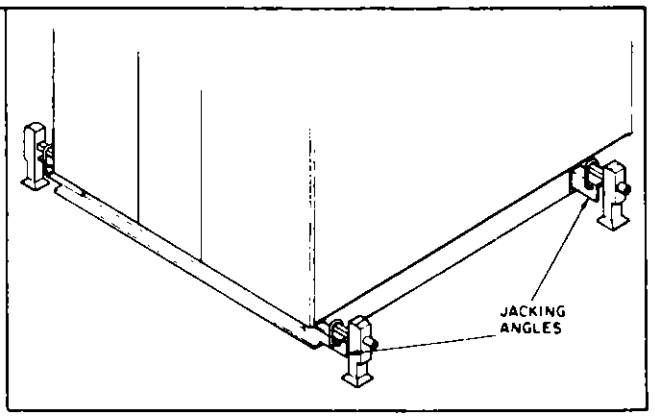


Figure 8. – Handling Outdoor Sections with Jacks

STORAGE

Indoor Switchgear

When switchgear is not to be installed immediately, it should be processed as previously described in Inspection and Uncrating. Indoor switchgear should be stored indoors because it is neither waterproof nor dripproof. If it must be stored outdoors, or in a humid, unheated area, provide adequate covering and place a heat source of approximately 500 watts output within each vertical section to prevent condensation. Space heaters are not standard equipment on indoor switchgear. Oil or grease any moving parts such as hinges if subjected to prolonged storage. When batteries are supplied, connect them to a charger.

Outdoor Switchgear

When storing outdoor switchgear in an area exposed to the weather or humid conditions, the space heaters provided must be energized. Access to the heater circuit is gained by opening the door to the metering compartment. Connect batteries (if furnished) to a charger – never leave them in dead storage. Oil hinges and other moving parts.

INSTALLATION

Introduction

Prior to installation, review this instruction book and the drawings mailed to you earlier. This previously supplied drawing packet includes:

General Arrangement and Floor Plan
Three Line Diagram
Schematic Diagram
Panel Arrangement
Panel Arrangement Bill of Material
Nameplate Engraving List
Installation Instruction Drawing
Master Wiring Diagram
Unit Wiring Diagrams
Circuit Breaker Control Schematic
Accessories Drawing

Foundation

Extreme care should be taken in the layout of the foundation or floor. Refer to the General Arrangement drawing of each substation involved and figures 9 and 10 for exact locations, limitations and instructions.

Floors, sills, piers or pilings, whichever type of foundation is used, must have smooth level surfaces and be in the same horizontal plane to within 1/16 inch (1,6 mm). Foundations must be sufficiently strong to support the weight of the cubicles and circuit breakers. Acceptable methods of setting channel sills for indoor switchgear are illustrated in Views A through C, figure 11. Anchor bolt mounting of outdoor switchgear is shown in figure 12.

Indoor Foundation

Supporting surfaces for the switchgear at each mounting bolt location must be level and in the same plane. There must not be any projection above this plane within the area covered by the switchgear cubicles. If customers floor or grouted sill channels do not meet this requirement, it will be necessary to shim when erecting the switchgear.

Outdoor Foundation

The supporting surface for the switchgear base must be level and in the same plane within 1/16" (1,6 mm). If concrete, grouted sill channels, pier support plates, etc. do not meet this requirement, or if there are any projections higher than the support points and in line with the support members shims must be installed when erecting the switchgear to provide equivalent true surface for switchgear support. The switchgear must be supported along the length of its base at points not exceeding a span of six (6) feet (1830 mm). If pilings are used, the diameter of these pilings is to be determined by the customer for proper loading. However, they must not be less than twelve (12) inches (305 mm) for sufficient contact with base, allowing for space for shipping split and space for grouting in of bed plate if used. All shipping splits must be supported and taken into consideration when foundation is constructed.

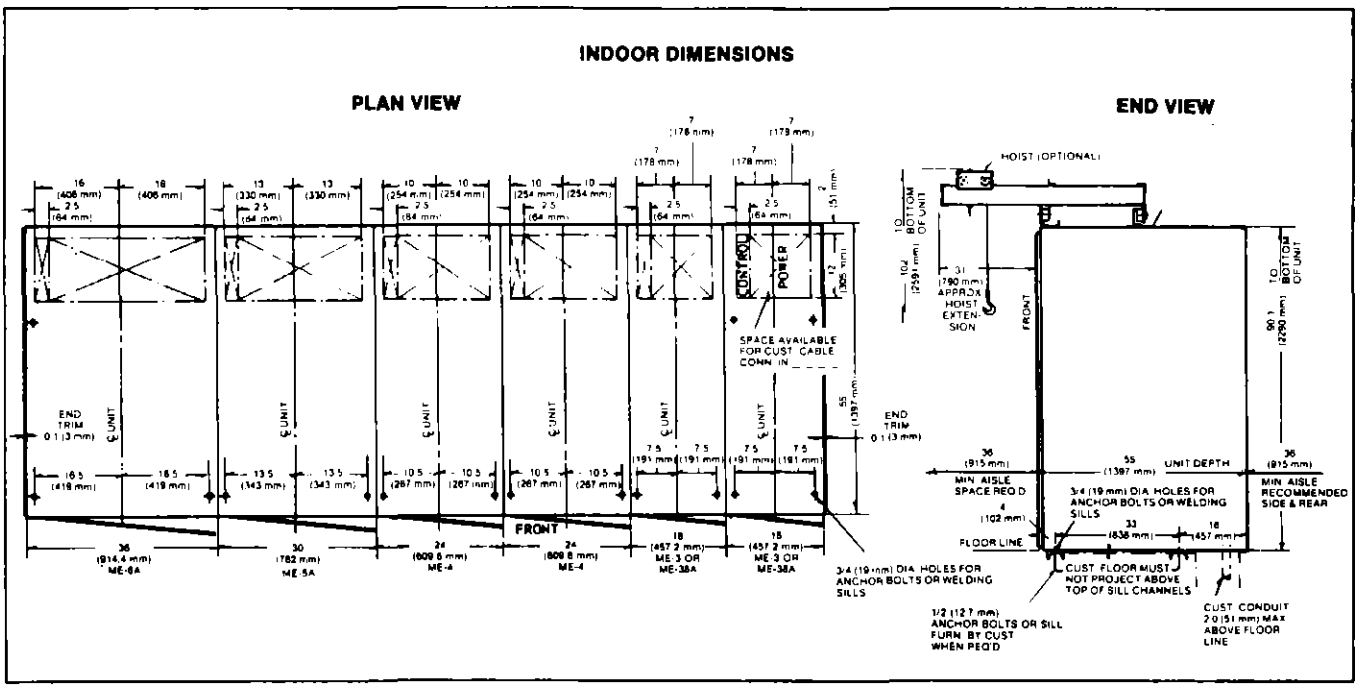


Figure 9. – Typical Indoor Installation

Make certain that all conduits are perpendicular to the base plane and are located to fit in the area provided as shown on the General Arrangement drawing.

Secondary control conduits must not exceed a 2 inch (51 mm) nominal pipe size (2-3/8 inches (60.3 mm) O.D.). Though the conduit should extend above floor or slab to enter the cubicle and exclude water, it should not exceed 1-1/2 inches (38 mm) on indoor switchgear. On outdoor switchgear the secondary control conduit should extend approximately 7 inches (178 mm) above the slab or base plane but not exceed a maximum of 8 inches or a minimum of 6-3/4 inches (171 mm). In cases where shipping sections cannot be lowered over the conduit because of headroom or other restriction, conduit couplings can be grouted in flush with the slab. Conduit nipples can then be added after switchgear is in place. Keep conduit ends capped during construction until ready to make electrical connections. This precaution will prevent dirt, moisture and vermin from entering the conduit.

If the primary power conduit is grouted into the foundation, follow the preceding instruction. (This conduit may often enter through a trench or planned opening.)

When grouted anchor bolts are required, they must be located as shown on the General Arrangement drawing.

Installing Shipping Sections

General

The proper method of installation depends on whether the switchgear is shipped as one complete unit or in two or more shipping sections. The General Arrangement drawing will indicate the shipping sections and their location within the line-up. Sections are assembled and wired in accordance with the arrangement as in final installation.

As previously covered under "Foundation", mounting surfaces, sills, slab, piers or piling must be level and in the same plane. Also, conduits must be properly located and perpendicular to such a degree that they will clear the floor plate cutouts. Mounting surfaces must be swept free of stone, chips or other debris which might impede rollers or leveling of the switchgear.

Standard accessories for outdoor units include all those provided for indoor switchgear. In addition, a light is mounted inside and above the front door of each unit and is controlled by a switch on the wall. Each group of units contains a convenience outlet and switches.

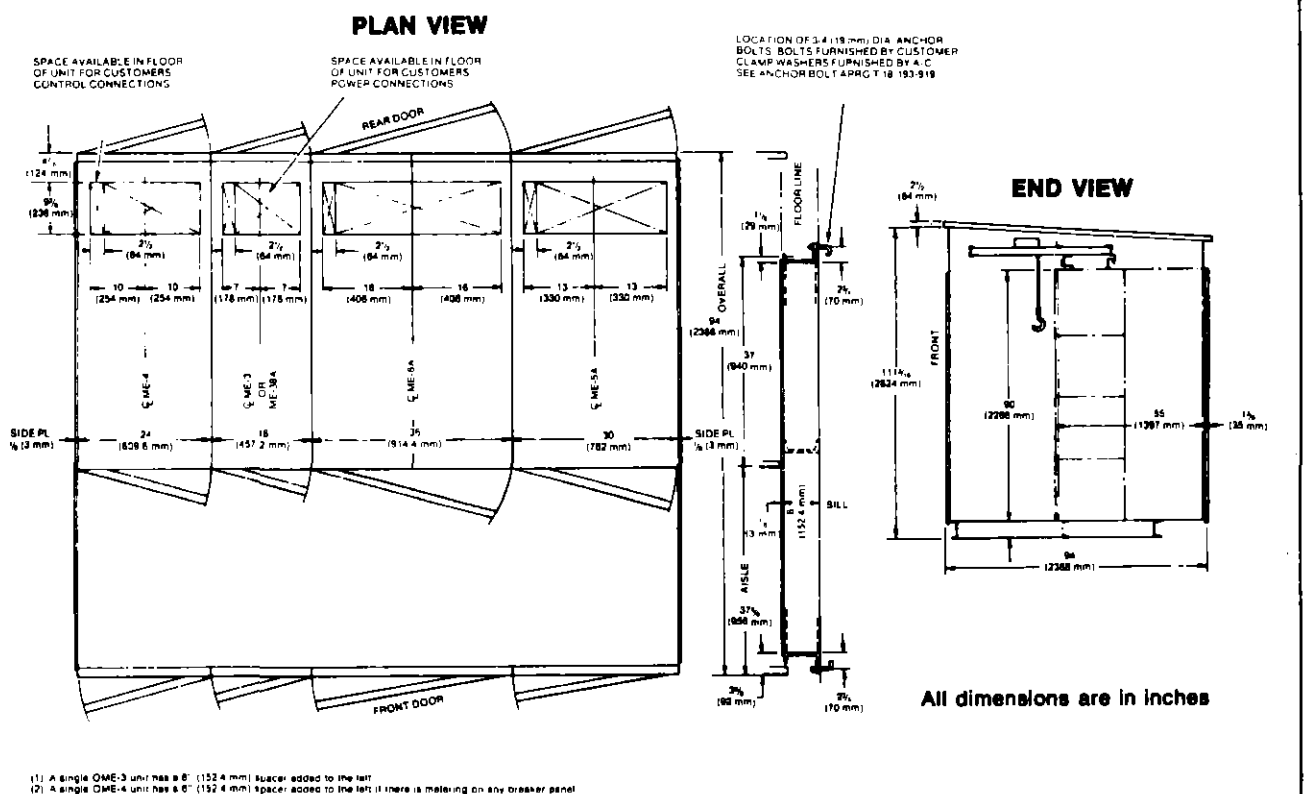


Figure 10. – Typical Outdoor Installation

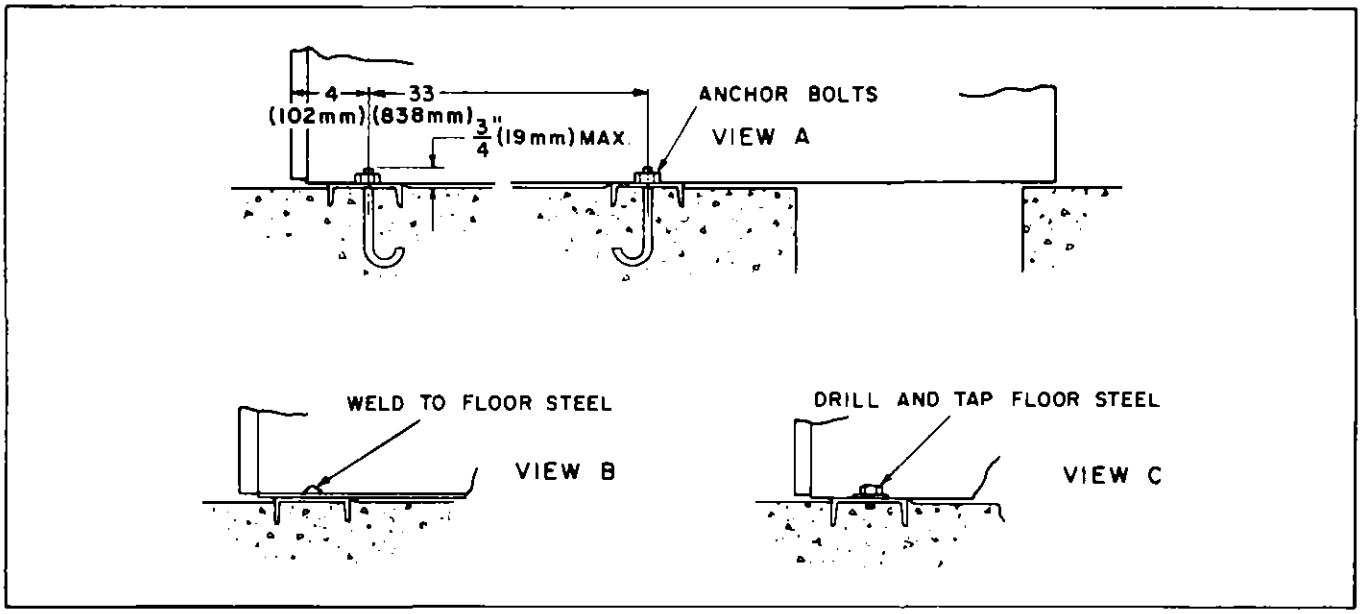


Figure 11. – Indoor Methods of Anchoring

Setting Shipping Sections

After checking each shipping section for its proper location sequence, as shown on the General Arrangement drawing, move the first section of switchgear to its location. When a transformer is part of the installation, the switchgear is positioned next to the transformer as shown in figures 13 and 14. The sections are to be kept just high enough to clear conduits. The switchgear is then moved toward the transformer to the dimensions shown on the General Arrangement drawing. At the same time, properly align anchor bolts and conduit below the switchgear. With all points aligned, conduit caps and floor plate conduit covers removed, carefully lower the sections to their permanent location. It is important that the first section be accurately positioned and leveled as each successive section will depend on the first.

On line-up with ventilated dry transformers, the switchgear is placed against the transformer. Only the flexible connectors are bolted to transformer terminals. (See figures 12A and 13.)

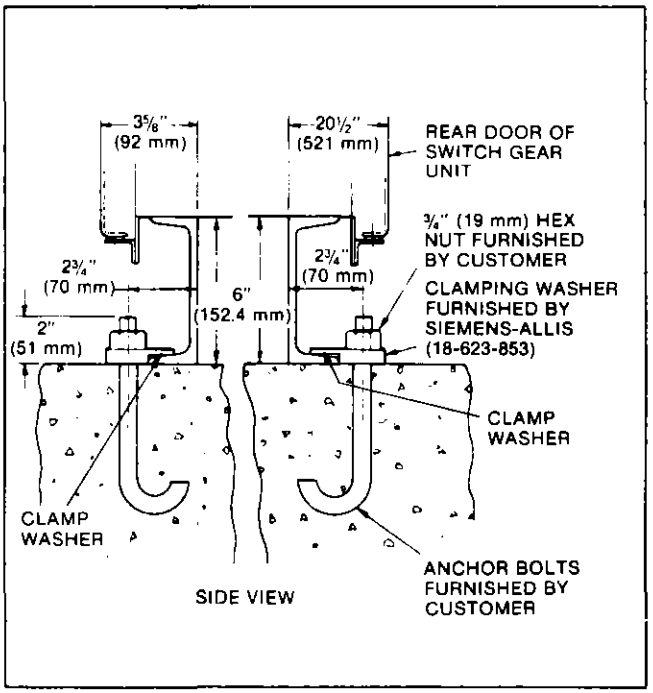


Figure 12. – Outdoor Method of Anchoring

Bolting Procedure

As a customer option, provision is made on Siemens-Allis load break switches and low voltage switchgear for bolting to the adjacent dry type transformer frame. 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 12A shows location of bolt holes to be used for this purpose. Two holes are provided on load break switch units and four are provided on low voltage switchgear; these holes are in-line with captive nuts provided on the vent dry transformer frame and are "plugged" with .38-16 hardware prior to shipment.

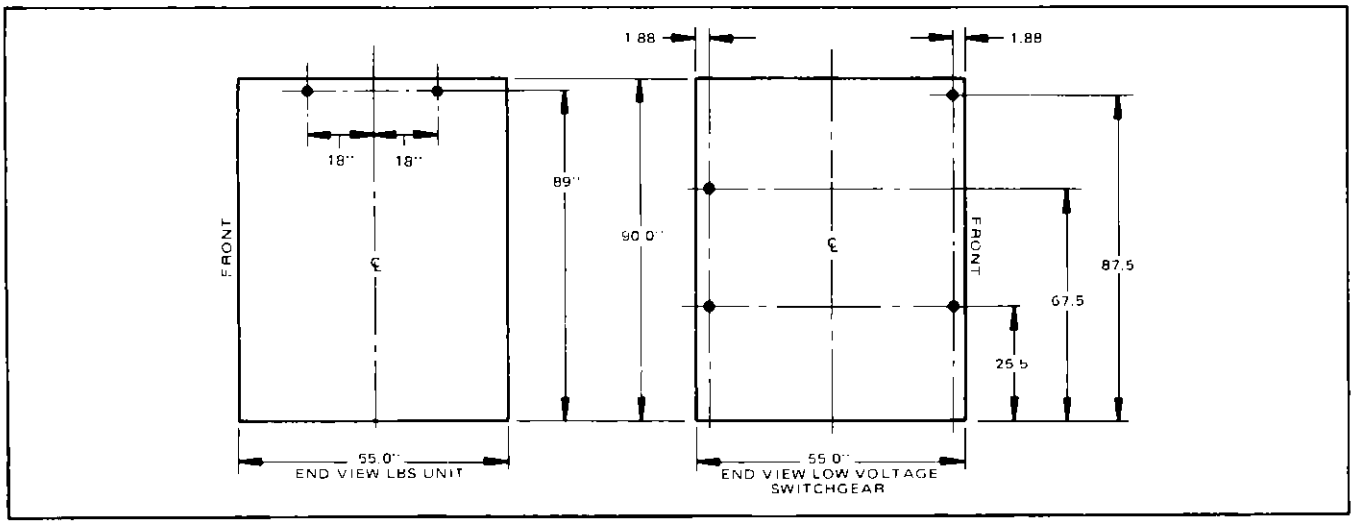


Figure 12A. — Bolting Procedure

Bolting Procedure

1. Remove .38-16 hardware from bolt holes shown in above sketches; (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 and/or low voltage switchgear into its final position bolted closely to the dry type transformer.

3. Inspect front and rear of joints between switch and transformer and between low voltage switchgear and transformer. If all units are perfectly plumb and the floor is perfectly level, there should be no gap evident between 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 & plumb all equipment, and not try to drain 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 & lockwashers removed in Step 1, bolt the switch and/or switchgear to the transformer case.

On installation with liquid transformers, the switchgear is placed as shown on the General Arrangement drawing, with the side one inch from the edge of the transformer cover. The flexible connectors are bolted to transformer terminals (see General Arrangement drawing) and a hood is bolted to the side of the switchgear and the top of the transformer tank.

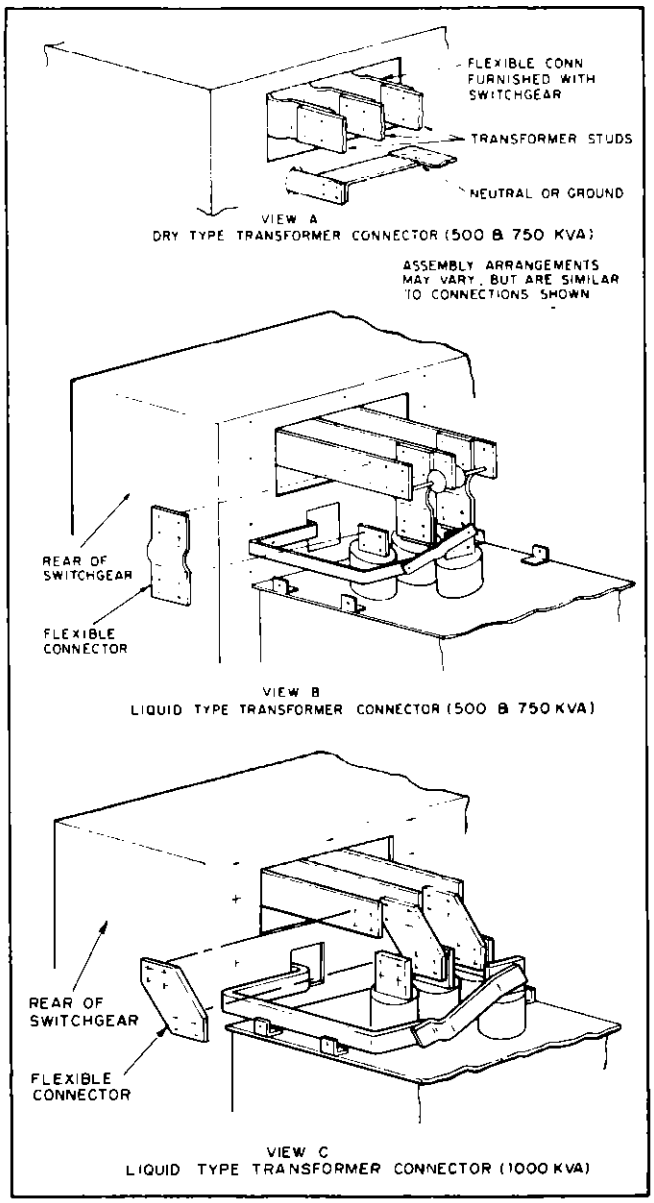


Figure 13. – Positioning Indoor Switchgear and Transformer

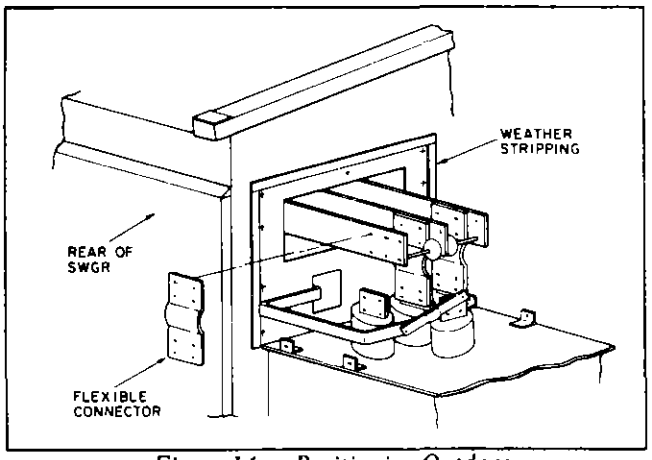


Figure 14. – Positioning Outdoor Switchgear and Transformer

NOTE

On 112-1/2, 150, 500 and 1000 KVA transformers, adaptors are furnished which are normally mounted on low voltage bushings. The flexible connectors are to be attached to these adaptors.

The hood assembly consists of three parts: a box, a cover and an off-set angle along with attaching hardware (See figures 15 and 16). When necessary, weather sealing hardware and weather stripping are furnished. The off-set angle seals the one inch space between the switchgear and the transformer top cover.

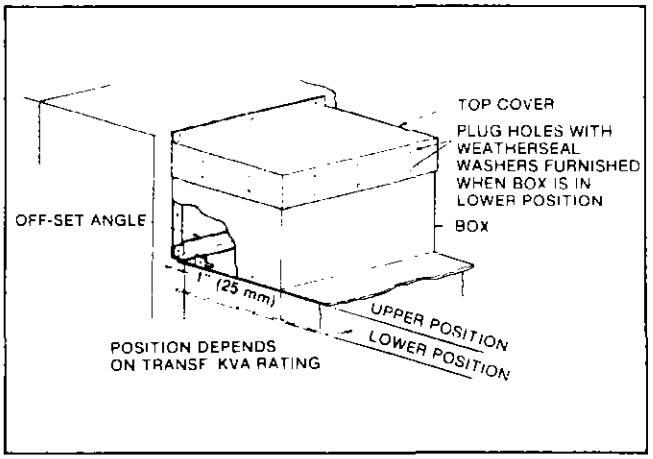


Figure 15. – Indoor Hood Assembly

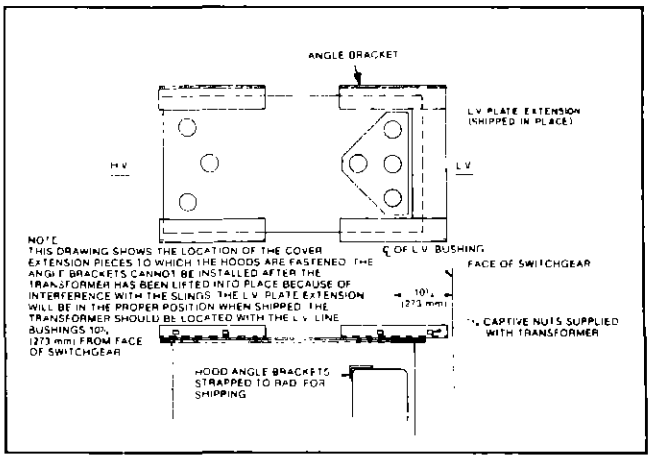


Figure 16A. — H.V. & L.V. Hood Brackets for 750 & 1000 KVA Transformers

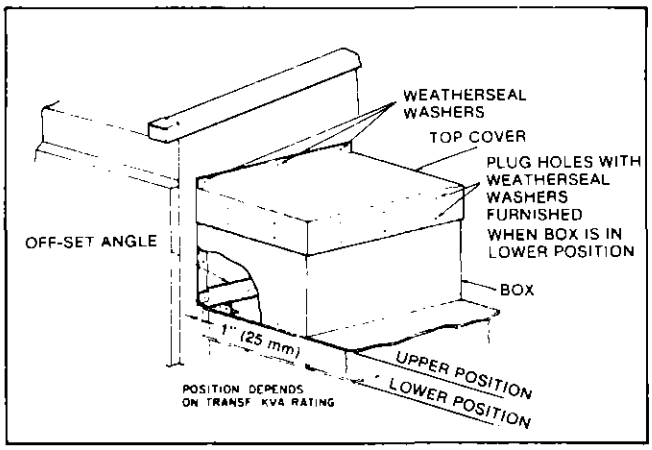


Figure 16. – Outdoor Hood Assembly Installed With Weather Seal

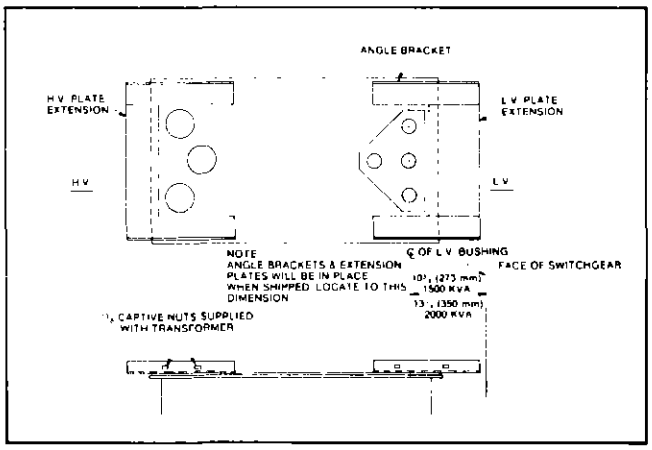


Figure 16B. — H.V. & L.V. Hood Brackets for 1500, 2000 & 2500 KVA Transformers

* DO NOT USE METAL HARDWARE.

Plumb Line Instructions

After setting either single or multiple sections, check each section with a plumb line to be certain that it is vertical to within 1/8 inch (3.2 mm) and that no shifting has occurred during handling. This check must be made at either end of a section near the front panel.

If a line-up consists of multiple sections, move the next section into position, with the front of the sections in line and tight against the adjacent section. Do not bolt sections together at this time. Check for plumb as on the previous section and bolt sections together with hardware provided. Repeat for any additional sections.

Leveling Indoor Switchgear

With the first section of cubicles in place and lifting channels still rigidly attached, examine each cubicle through anchor bolt holes to be certain that each point of anchor is in firm contact with sill channel or floor. If there is no contact, shims must be added adjacent to the anchor bolt holes. These shims will prevent distortion of the section when anchor hardware is drawn tight. The shims should be approximately four inches square with thickness determined by existing requirement or attained by stacking. Tighten anchoring hardware and check for level.

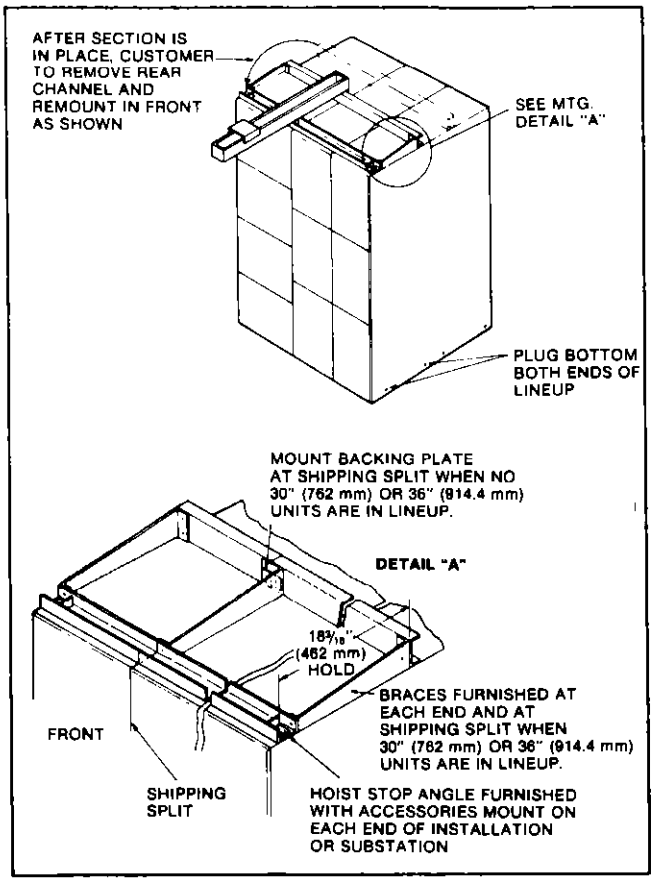


Figure 17. – Traveling Crane Installation

Traveling Crane Installation

The traveling crane is furnished as standard on outdoor switchgear and is shipped installed. The traveling crane is only furnished when specified for indoor switchgear. The location of lifting channels on indoor switchgear makes it necessary to install the traveling crane after the shipping sections are in place, leveled and securely fastened to the floor. Remove rear lifting channel and install in front as shown in figure 17. Install hoist mounting equipment, consisting of braces (if provided), hoist stop angles and reinforcing strips with hardware supplied. (See Detail "A", figure 17.) Then mount the hoist (if furnished with accessories) as shown on the end of view of figure 9.

Leveling Outdoor Switchgear

In outdoor arrangements the switchgear, as received, is true and in correct position relative to its welded support channels. These channels must be in firm contact with the foundation in the area of each anchor bolt. If necessary, four inch square steel shims should be installed to obtain this firm contact. Tighten anchor hardware and check for level. Install roof channels, one for each shipping split as shown in figure 18. Roof channels and attaching hardware are furnished with accessories.

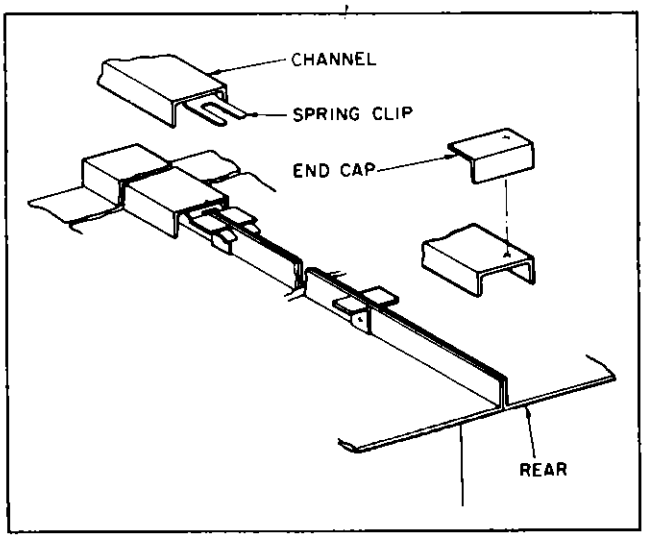


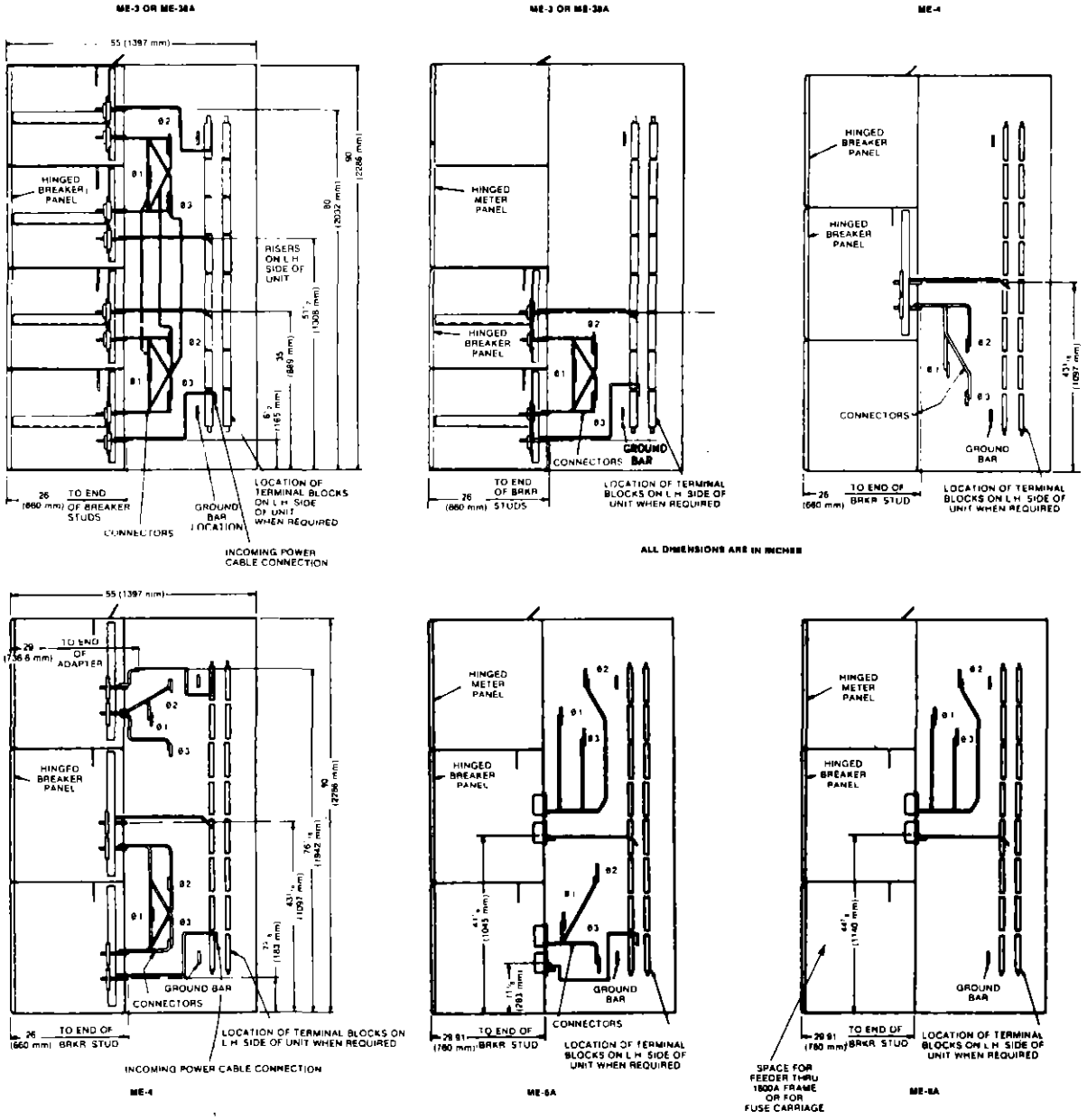
Figure 18. – Roof Channel Installation

Electrical Connections (See figure 19 for typical locations)

Bus Bars

Bus bars are completely installed at the factory. However, splice bars are furnished when an order consists of two or more shipping sections and neutral and ground bus connections between shipping sections are to be made as shown in figures 20 through 24 with furnished hardware.

CUBICLE SIDEVIEWS



Breaker Type	Interrupting Capacity at 600 Volts (RMS Amperes)	Frame Size (Maximum Current Rating, Amperes)	Method of Operation	Unit Type	Indoor		Outdoor	
					Width	Depth	Width	Depth (1)
LA-600A	22,000	600	Manual or Electrical	ME-3	18 (457.2 mm)	55 (1397 mm)	18 (457.2 mm)	94 (2388 mm)
LA-800A	30,000	800		ME-38A	18 (457.2 mm)	55 (1397 mm)	18 (457.2 mm)	94 (2388 mm)
LA-1600A	42,000	1,600		ME-4	24 (609.6 mm)	55 (1397 mm)	24 (609.6 mm)	94 (2388 mm)
LA-3000A	65,000	3,000		ME-5A	30 (762 mm)	55 (1397 mm)	30 (762 mm)	94 (2388 mm)
LA-4000A	85,000	4,000		ME-6A	36 (914.4 mm)	55 (1397 mm)	36 (914.4 mm)	94 (2388 mm)
	Standard Auxiliary Unit			ME-3 or ME-4	18 or 24	55 (1397 mm)	18 or 24	94 (2388 mm)

(1) Including 38" walk-in aisle.

Figure 19. – Views of Typical Electrical Connector Locations

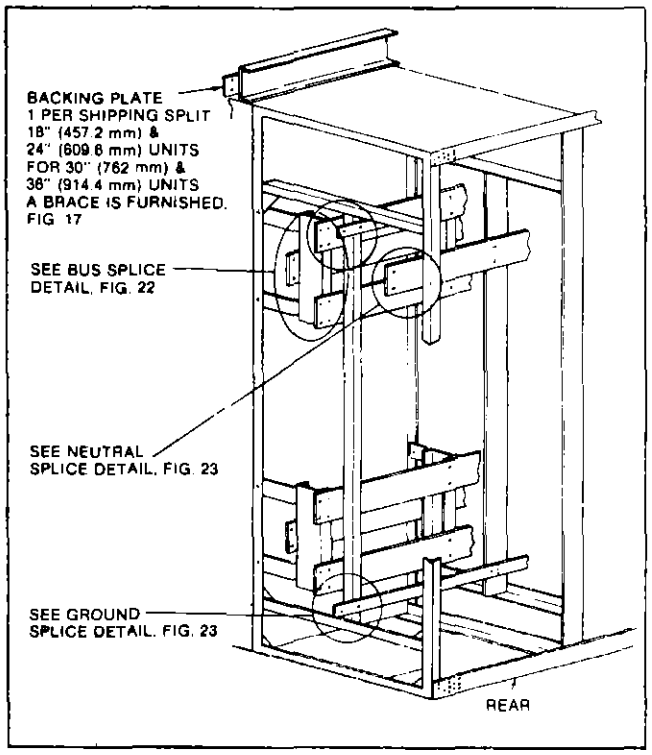


Figure 20. – Neutral and Ground Bus Bar Connections on Indoor Switchgear

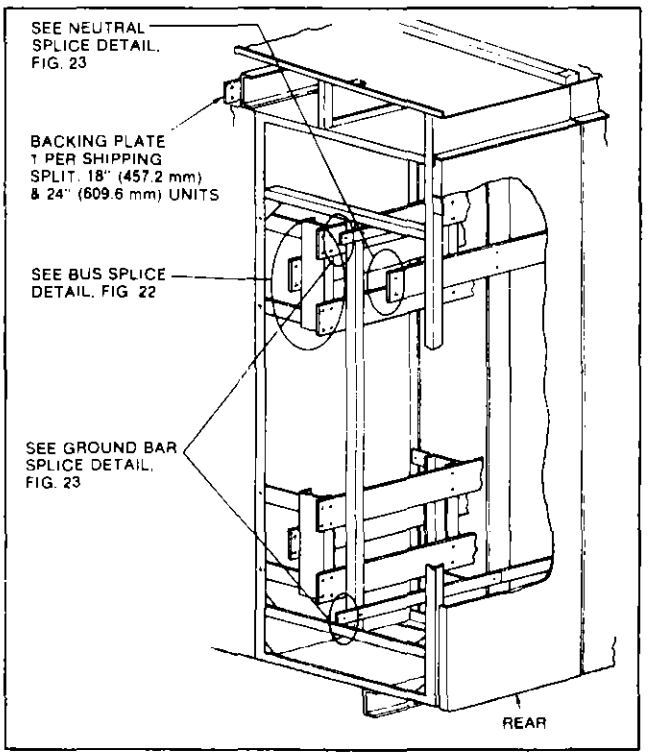


Figure 21. – Neutral and Ground Bus Bar Connection on Outdoor Switchgear

Bolt all bus bar joints as follows:

1. All surfaces must be free of dust, dirt and foreign material.
2. Do not use any abrasive cleaner on plated contact surfaces. Cleaning normally is not necessary and should not be done unless parts are badly tarnished. If cleaning is necessary, use a mild cleaner and thoroughly rinse the parts to remove all residue.
3. Assemble all joints with parts dry. Do not use any grease or "no-oxide" product even where aluminum buses are used. Aluminum buses are tin plated and can be applied directly to other tin plated aluminum bars or to silver plated copper bars without the use of a "no-oxide" product.
4. For method of bolting joints see figure 24.

NOTE

All hardware furnished is plated, high strength steel. Cap screws are 1/2-13 SAE Grade 5.* Hex nuts are SAE Grade 2 (except for LA-4000A bus bar joints, 1/2-13 stainless steel cap screws and nuts are furnished).

Tighten 1/2-13 * steel screws to within torque range of 50-75 ft. lb. (67.8 to 101.7 N·m) and silicon bronze screws to within torque range of 30-40 ft. lb. (40.7 to 54.2 N·m). Arrange the hardware as shown in figure 24 with a flat washer on each side of the joint and a lockwasher between the flat washer and the nut. The only exception to this

*Do not use metric hardware.

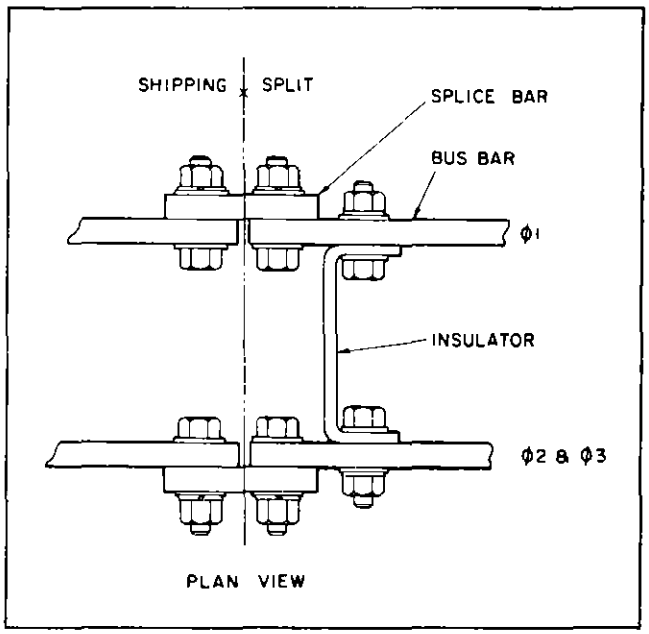


Figure 22. – Bus Splice Detail

arrangement occurs when aluminum bus is used. In this case, one Belleville spring washer replaces the flat washer and lockwasher under the nut. The concave side of the Belleville spring washer is placed against the bus joint. These washers ensure an evenly distributed force about each screw and produce a low resistance joint. The torque values, noted above, produce a joint of adequate pressure without cold flow.

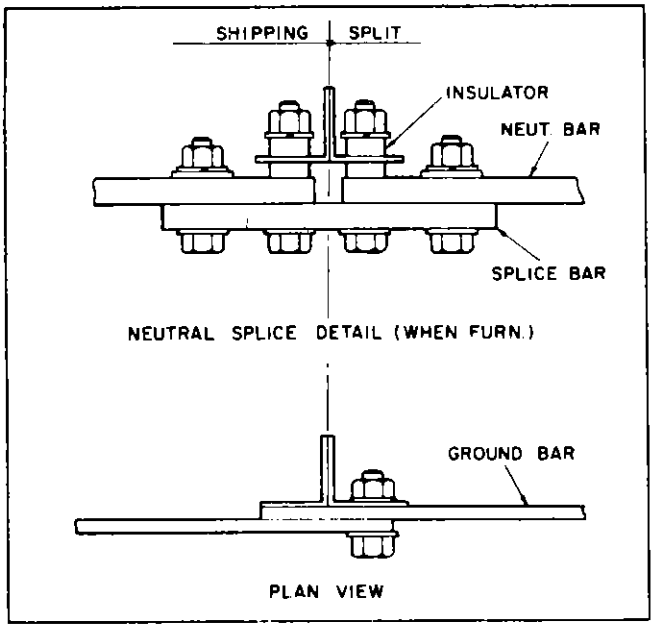


Figure 23. – Neutral Bus Splice Detail

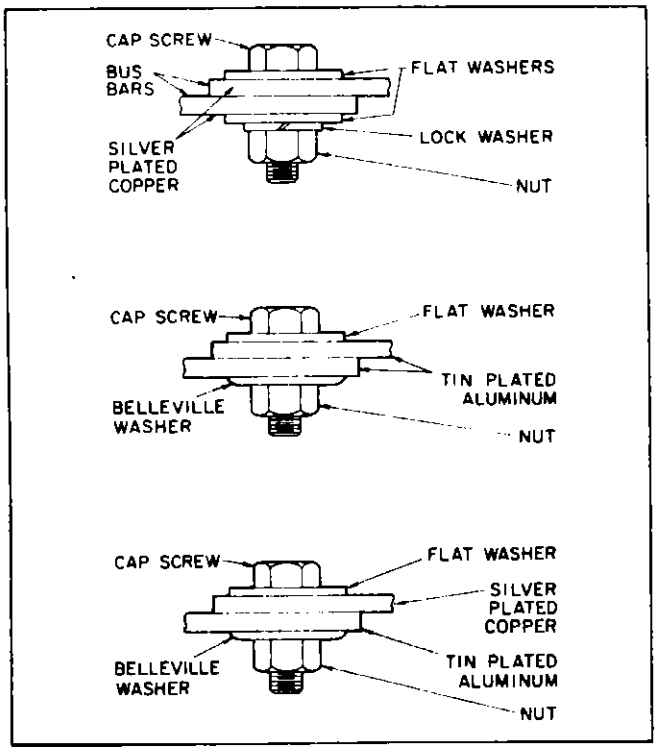


Figure 24. – Method of Bolting Bus Bar Joints

Transformer Bus Joints

Connecting transformer and installing the hood assembly is described in the Installation Section under Setting Shipping Sections (page 8, Figs. 13 & 14).

Typical Cable Lug Mounting

Detail A through E, figure 25, illustrate typical lug mountings.

Primary Cable Connections

Because of considerable variations in customer requirements and available cables, Siemens-Allis furnishes a single bolt and clamp terminal lug only, unless specified otherwise by the customer.

Primary and secondary cables should enter the switchgear through the space shown on the General Arrangement drawing. Always arrange cables in smooth curves and anchor securely to cable supports to relieve strain on termination. If cable entry is from above, customer is to drill top plate or roof to suit. If cable entry is through the roof, install weather seal.

Before the cable connections are made, phase rotation will have to be considered (refer to Phasing Out under Inspecting and Testing, page 24).

Current Transformers

CAUTION

Do not operate any current transformer with secondaries open circuited.

Current transformers for metering are generally mounted on the stationary primary disconnect studs and are readily accessible for inspection and replacement (see figure 30). In some applications they must be located in the bus compartment.

Current transformers for static trip device use are called "tripping transformers". They have a one ampere secondary and are not suitable for metering. They are mounted on the circuit breaker except when a ground fault trip element is furnished for a four-wire application. In this case, a fourth tripping transformer is mounted in the cable compartment on the neutral bus. This will be shown on the three-line diagram and may require that the neutral cables be connected to it with the cable lugs furnished.

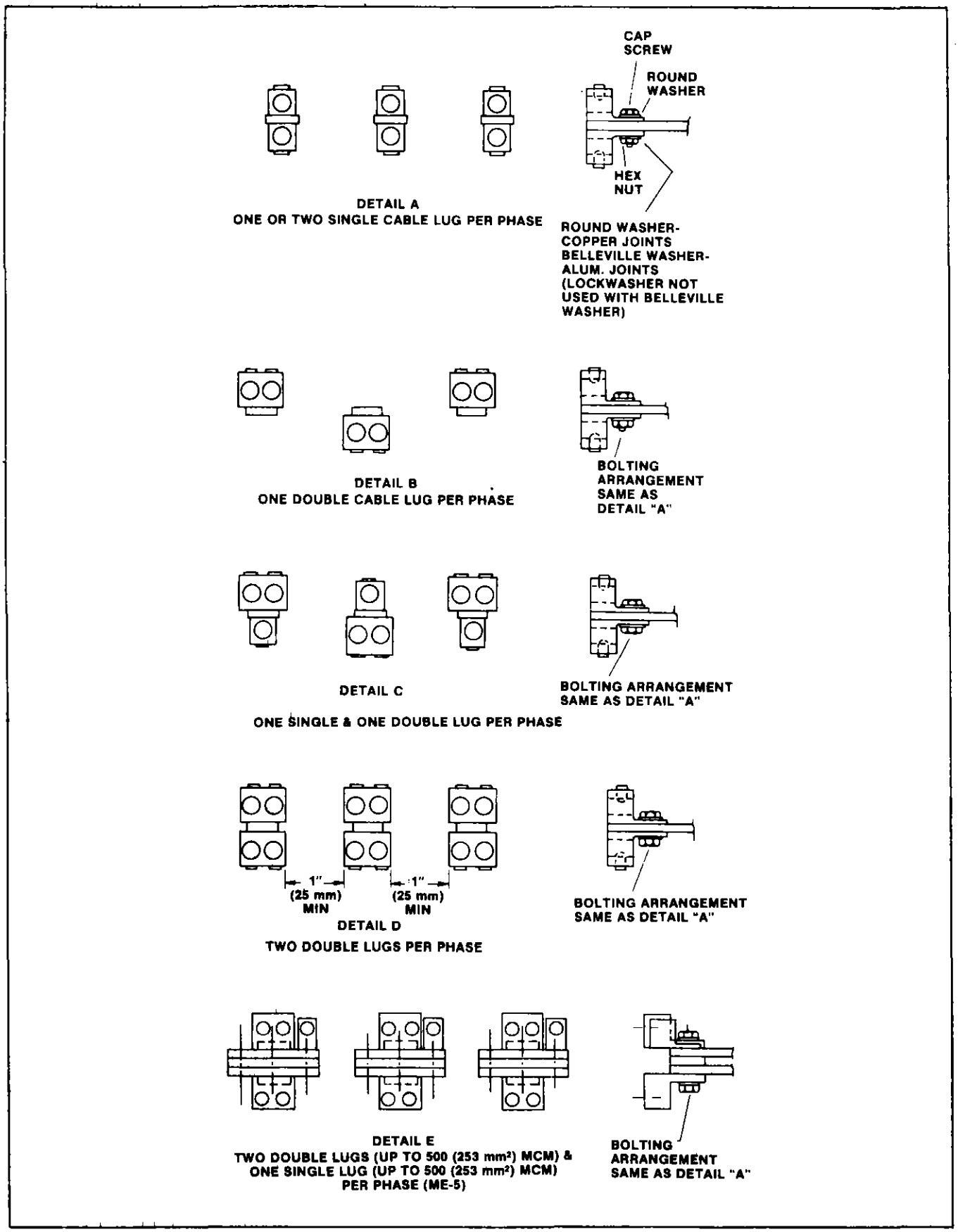


Figure 25. – Typical Lug Mounting

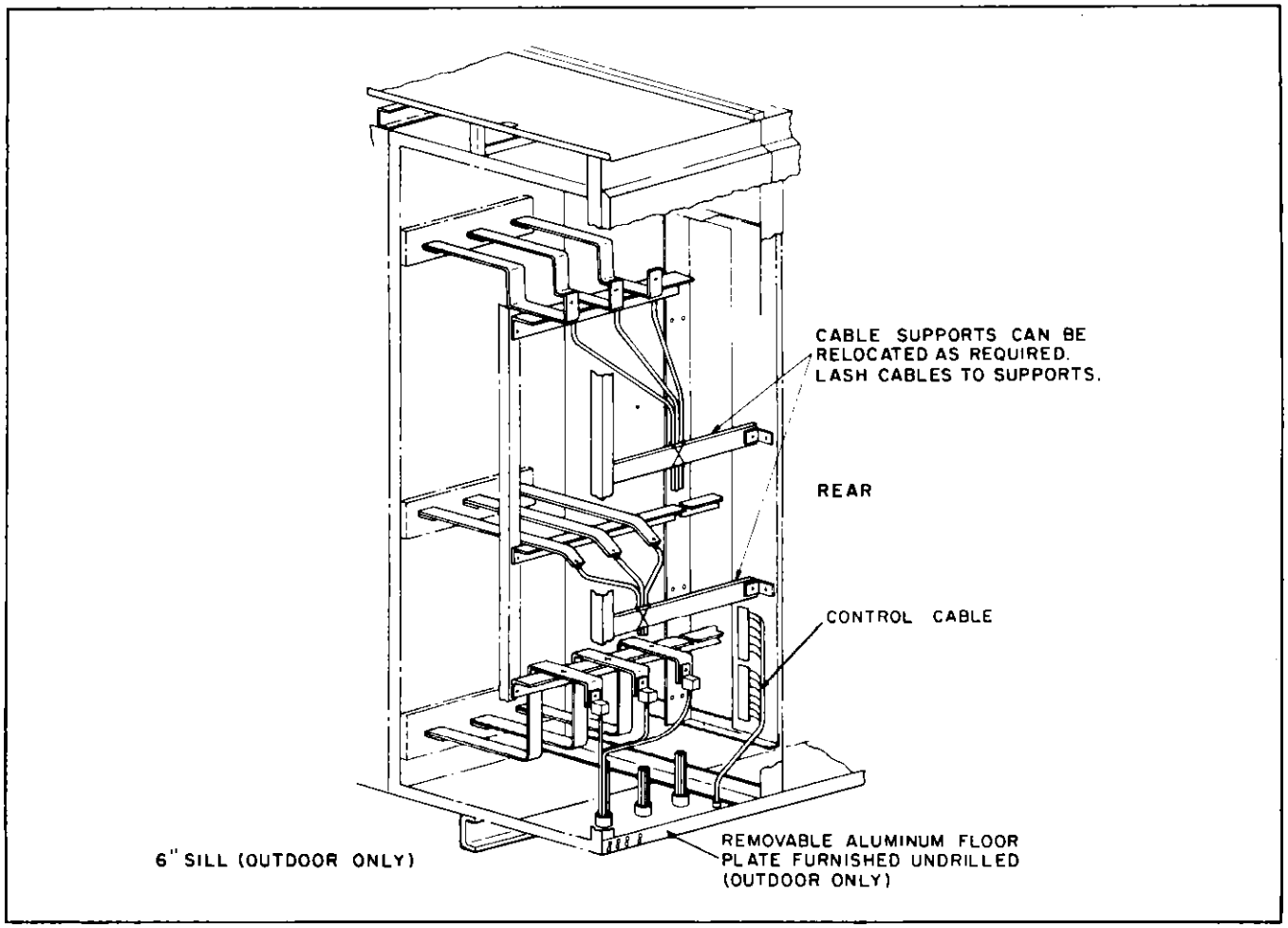


Figure 26. — Typical Control Cable Connections

Secondary Control Wiring

Terminal blocks are provided for the customers' control connections as shown on the master wiring diagram. Intersection wiring at shipping breaks is connected as tagged, and as shown on the master wiring diagram. On ventilated dry transformer installations, a conduit is furnished for wiring between the switchgear auxiliary component and the temperature control system box on the transformer. This conduit is to be installed and wired by the customer in the field.

On liquid transformer installations, the conduit is furnished with the transformer for connecting to the switchgear in the field.

All secondary wiring installed by the factory is neatly bundled and cleated to the cubicle side plate. Make all field connections in a similar manner. Figure 26 and figure 27 show a typical control cable installation.

Ground Connection

A common ground bus is incorporated in all units for properly grounding the switchgear after installation. The ground bus extending through the switchgear is accessible in the primary cable compartments of all cubicles. Provision for connecting this ground bus to the station ground must

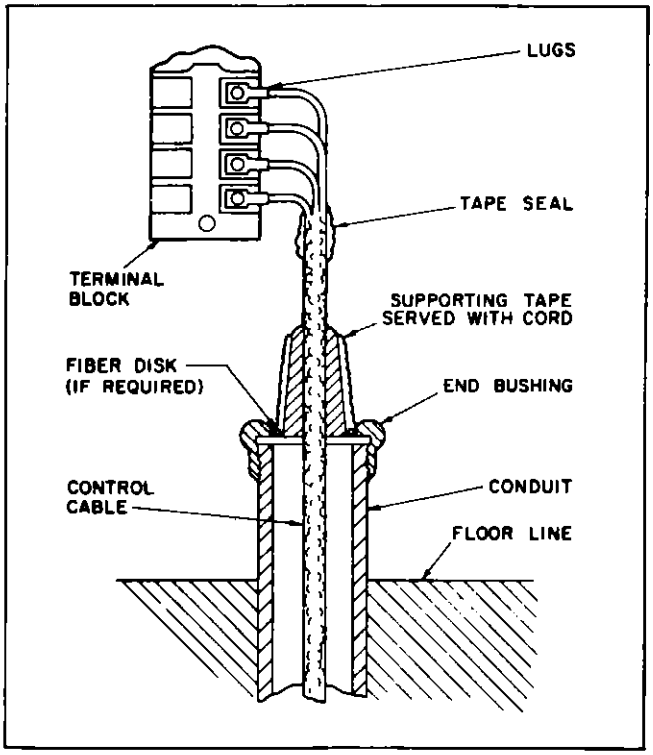


Figure 27. — Secondary Control Cable Connections

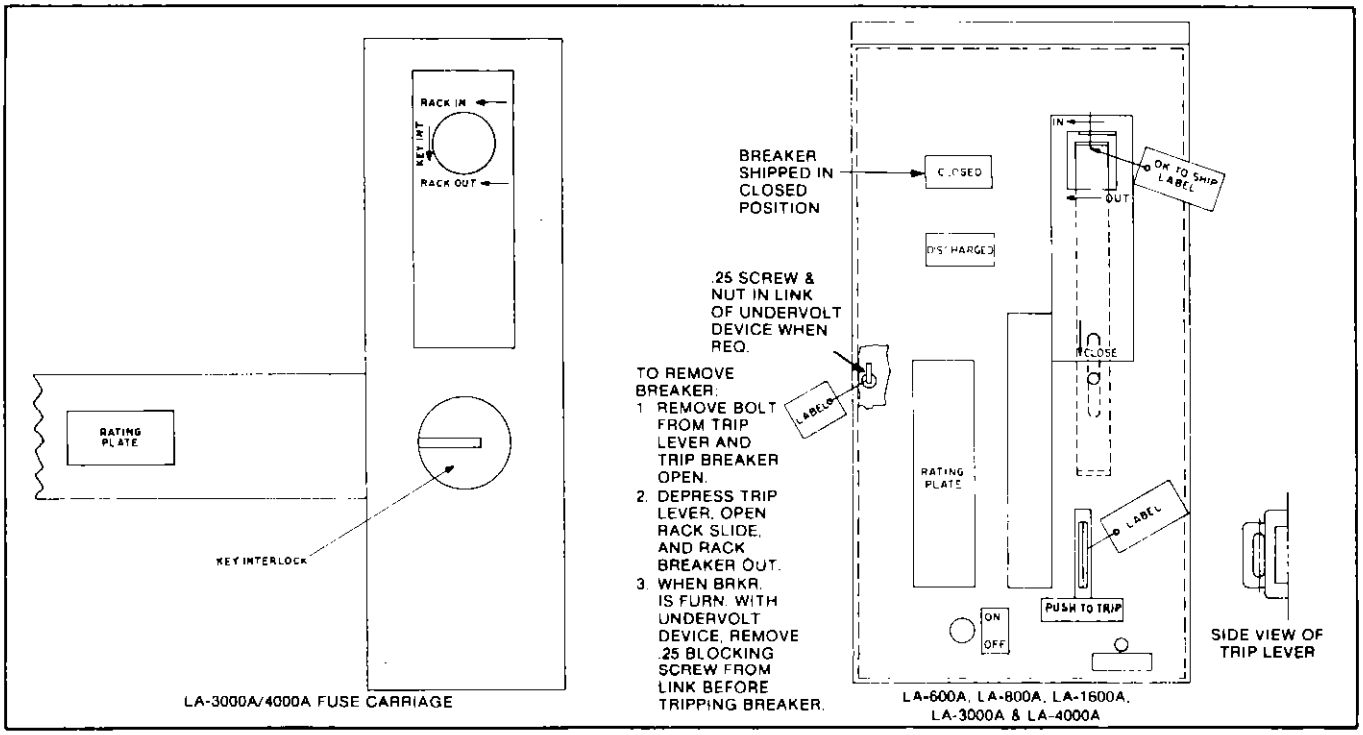


Figure 28. — Remove all Tags and Blocking Before Opening Circuit Breaker

be made in a manner that a reliable ground connection is obtained. Consult the latest edition of the National Electric Code for ground connection standards.

Circuit Breaker Installation

1. Determine the switchgear compartment for each circuit breaker by checking the three line diagram furnished with the drawings. The three line diagram shows the following for each circuit breaker compartment:
   a. Circuit Breaker Type (LA-600A, LAF-600A, LA-800A, etc.)
   b. Trip "XFMR" or "Sensor" Rating
   c. Static Trip Type (TS, TIG, LTS, etc.)
   d. Types of Operator (Manual Operation (MO) or Electrical Operation (EO)
   e. Wiring Diagram Number
   f. Special Accessories (Undervoltage Trip, etc.)

CAUTION

Be certain that the circuit breaker placed in the compartment agrees in these 6 areas.

2. Circuit breakers are shipped in the closed position and are blocked to prevent accidental tripping during shipment. Remove all blocking and tags before opening circuit breaker (See Figure 28). If breakers are shipped separately, the procedures for installation are outlined below. If breakers are shipped in their respective switchgear compartment, follow instructions in Figure 28 to remove from switchgear.
3. Circuit Breaker Preparation

   Refer to the circuit breaker instruction manual for detailed operating information. Lubricate disconnect contacts (see page 25).

4. Use the traveling crane or other suitable means for lifting the circuit breaker for insertion or removal.

CAUTION

Make certain that the hoist is properly lubricated before using, as outlined under Maintenance, Page 25.

Circuit Breaker Insertion

Models: LA-600A, LA-800A, LA-1600A, LAF-600A, LAF-800A or LAF-1600A

Place the circuit breaker in front of the cubicle and attach the lifting yoke (furnished with accessories) to the lifting holes provided on the circuit breaker. Then connect the hook from the hoist to the yoke (Fig. 29). Insert crank in the hoist eye-nut. Turn the crank to raise the breaker into position with rails (View A, 4, figure 30). Align breaker and compartment guide rails so the breaker will slide freely. With the breaker in position on the compartment guide rails, use the following sequence to rack the breaker in the CONNECTED position.

NOTE

On electrically operated breakers, be certain that the control toggle switch on the front of the breaker is in the OFF position.

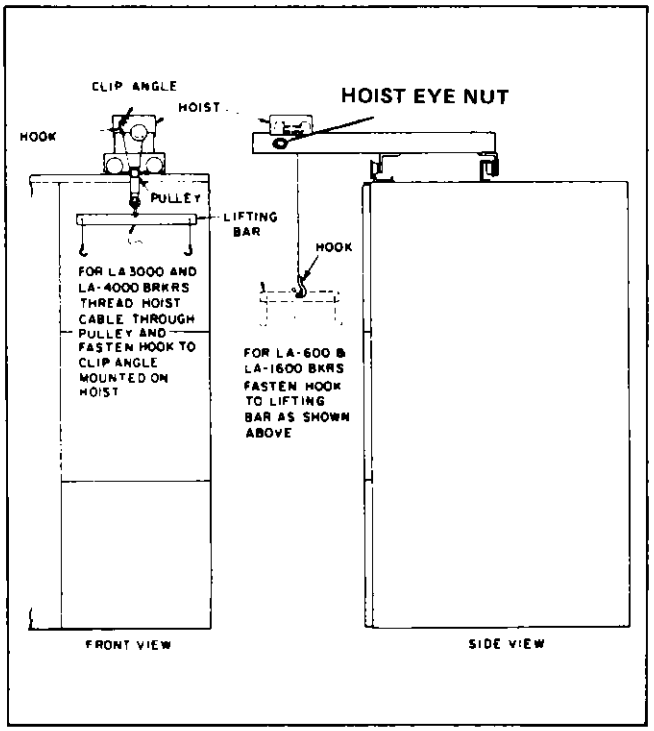


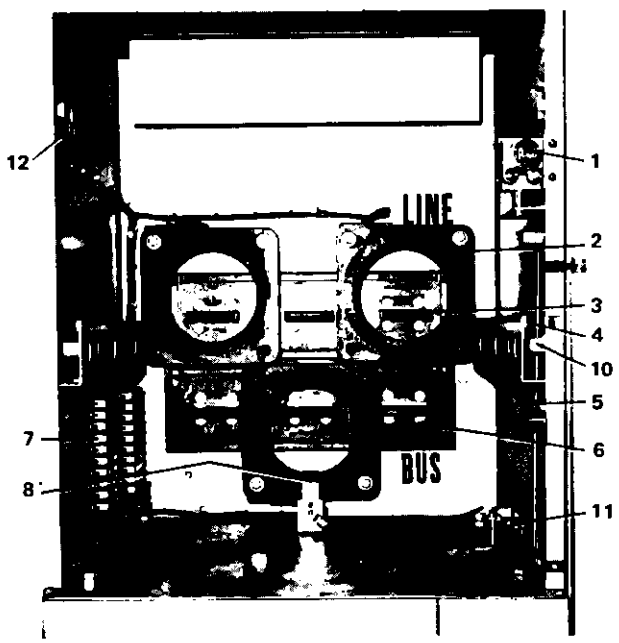
Figure 29. — Breaker Hitching Instructions

1. Depress trip bar and lower the interlock slide to expose racking screw. While the interlock slide is in this position, the breaker is "trip-free" and cannot be closed. (See figures 31 and 32.)

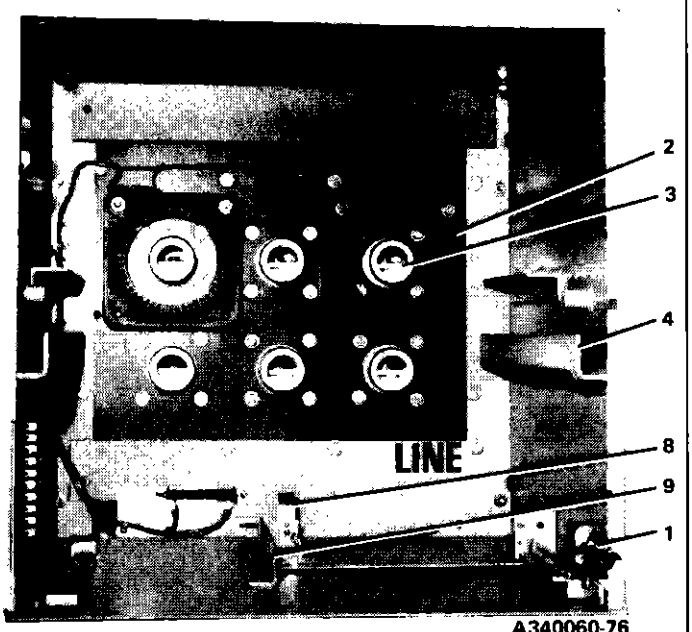
2. With racking crank (furnished with accessories), rotate racking screw to move racking clevises to the position shown in figure 32 where they will engage with pins (10, figure 30) on the compartment rails.

3. The breaker should now be pushed along the rails to the DISCONNECTED position. At the same time racking clevises should be checked to see that they are in correct alignment with pins on the compartment rails. (See figures 30 and 32). Counterclockwise rotation of the racking crank will now move the breaker into the TEST and CONNECTED positions. At TEST and CONNECTED positions, interlock is in its normal horizontal position. By removing racking crank and then raising interlock slide, trip rod returns to its extended position, permitting trip shaft to reset and the breaker may be operated. Between TEST and CONNECTED positions, an interlock cam (11, figure 30) mounted on the com-

1. Key Interlock
2. Front Access Current Transformers
3. Stationary Primary Connections
4. Teflon Lubricated Guide Rails
5. Breaker Drawout Stop
6. Pyro-Shield Primary Disconnect Support Molding
7. Stationary Secondary Disconnects
8. Breaker Ground Clip
9. Safety Interlock
10. Clevis Pin
11. Interlock Cam



LA-600A, LA-800A or LA-1600A Compartment



LA-3000A or LA-4000A Compartment

Figure 30. — Circuit Breaker Compartments

A340074-76

Figure 31. — Lowering Interlock Slide

partment floor, raises the interlock in the breaker. The trip rod and trip shaft are held in the TRIP FREE position so the breaker cannot be closed, even if the interlock slide is raised (see figure 32). This prevents movement of a closed breaker into or out of the CONNECTED position.

NOTE

Normally racking is done with compartment doors closed, however for maintenance purposes, position indicating labels are placed on the left hand compartment rail to show breaker TEST and CONNECTED positions. With the door closed, breaker position is indicated by lines on breaker cover, using door iris as the indicator. (See figure 33.)

CAUTION

To avoid damage to the racking mechanism, do not rotate the racking crank in the counterclockwise direction after the breaker has reached the fully connected position.

4. The procedure is the same for withdrawing the breaker from the CONNECTED position, except the racking crank is turned clockwise. A breaker drawout stop (5, figure 30) angle, mounted on the right hand side below compartment rail, prevents accidental removal of the breaker from the compartment. The angle must be raised to remove breaker from the compartment.

Circuit Breaker Insertion

Models: LA-3000A, LA-4000A, LAF-3000A or LAF-4000A.

Connect extension rails to the compartment rails as shown in figure 34. Place the circuit breaker in front of the cubicle.

Attach lifting yoke (furnished with accessories) to lifting holes provided on the circuit breaker. Then thread the hoist hook through the pulley on lifting yoke and attach to angle mounted on hoist (fig. 29). Insert hoist crank in the hoist eye nut and turn the hoist crank to raise the breaker to the level of the extension rails and check wheel alignment. (The hoist is optional for indoor switchgear.)

Position the breaker on the rail extensions being careful to not damage the secondary disconnect contacts. Remove the racking yoke and use the following sequence to rack the breaker into the CONNECTED position (see figure 36):

NOTE

On electrically operated breakers, be certain that the control toggle switch on the front of the breaker is in the OFF position.

1. Depress the trip bar and lower the interlock slide to expose the racking screw. While the interlock slide is in this position, the trip bar is held in the depressed position

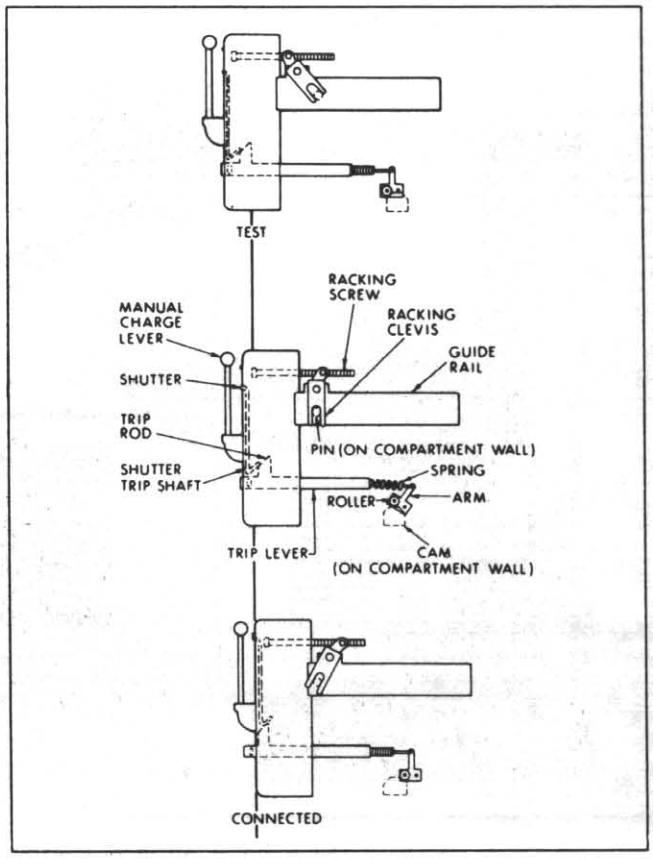


Figure 32. — Circuit Breaker Positioning Diagram

A340071-76

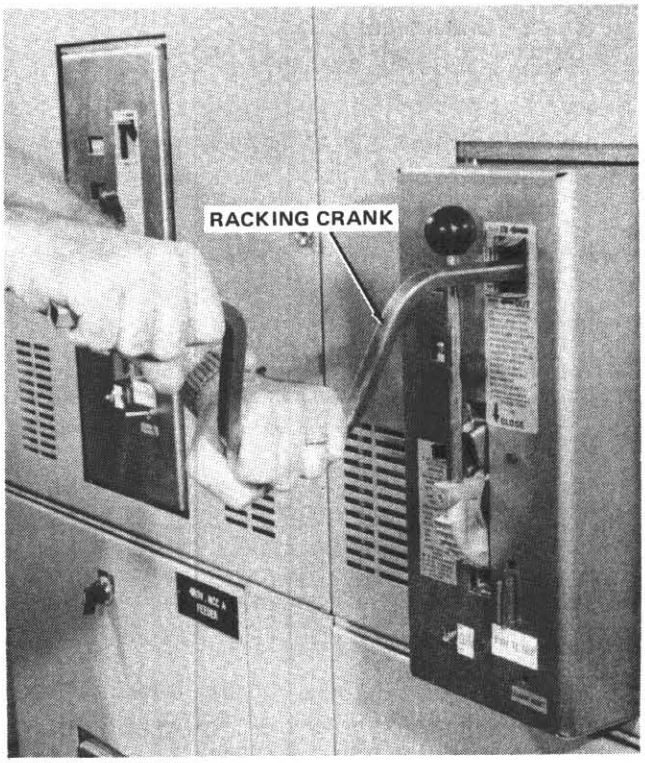


Figure 33. — Using Racking Crank

and the breaker is "trip free" and cannot be closed. Also, the key interlock mechanism is raised to clear the angle mounted on the floor of the cubicle.

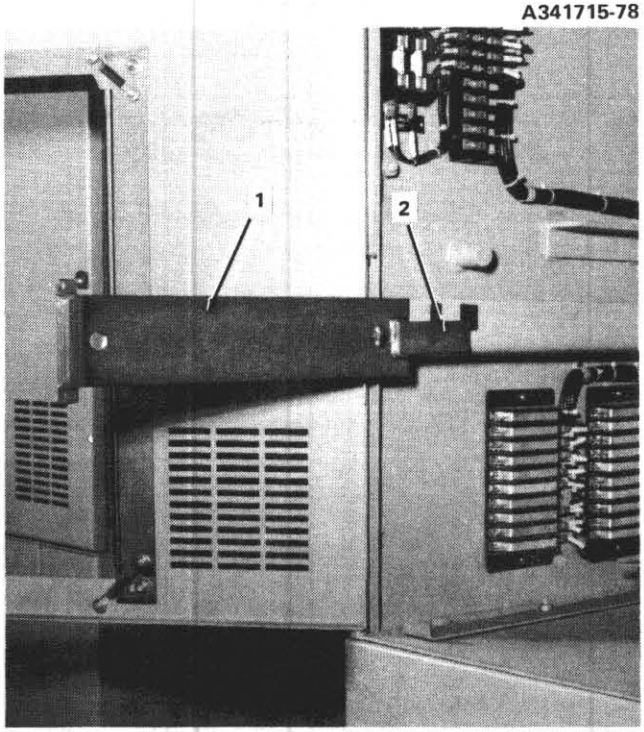
2. Push breaker along the rail extension to the DISCONNECTED position. If needed, use the racking crank to rotate the racking clevises of the breaker so they engage the pins on the compartment rails. Remove the rail extensions.
3. Check to make certain that both racking clevises engage the cubicle pins. Counterclockwise rotation of the racking crank will now move the breaker along the rails into the TEST and CONNECTED positions. At the TEST and CONNECTED positions, the interlock slide is free to move.

After removing the racking crank, the interlock slide can be closed allowing the trip bar to return to its extended position and the breaker can be operated. Between the TEST and CONNECTED positions, the interlock slide engages a pin in the racking mechanism and cannot be closed; this holds the trip bar depressed and the breaker is "trip free."

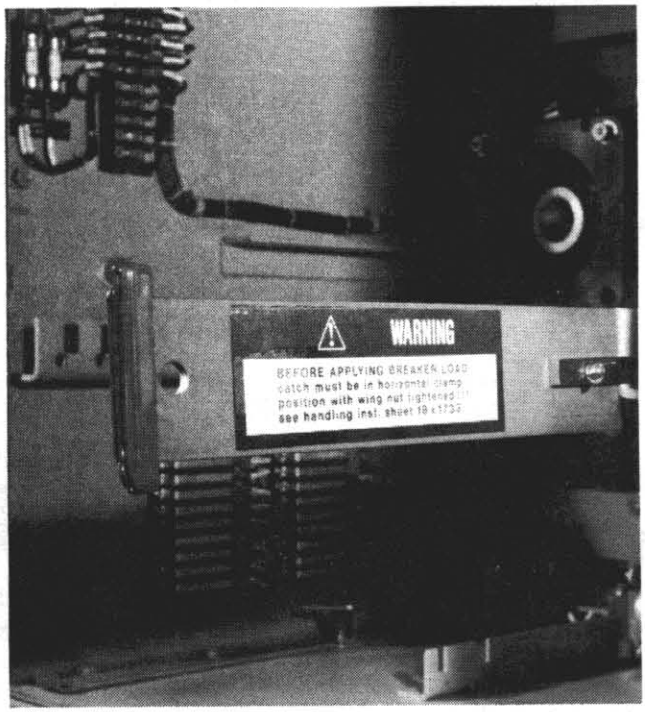
NOTE

Normally, racking of the breaker is done with the compartment door closed and breaker position is indicated by lines on the breaker cover with the door iris acting as the indicator. However, position indicating labels are also placed on the left hand compartment rail for maintenance purposes with the compartment door open.

A341715-78



A341719-78



NOTE: Rail catches (2) must be tightened to secure extension rails (1).

Figure 34. — Installation of Extension Rails

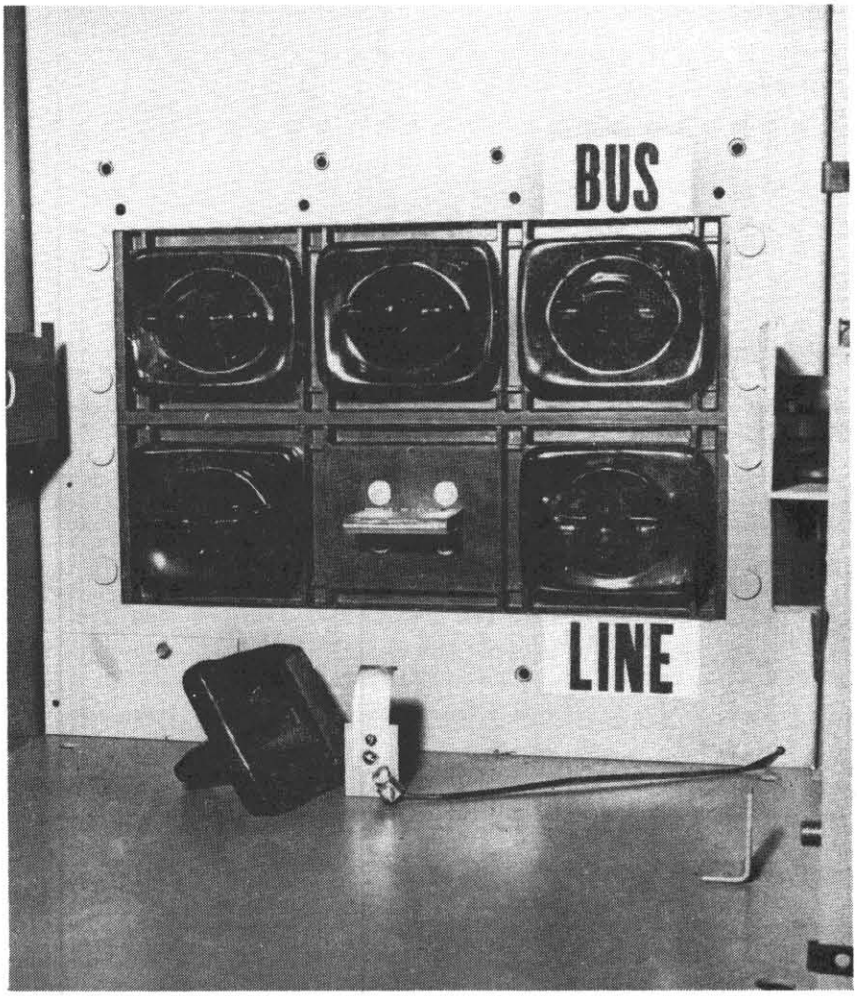


Figure 35. — Molded PVC Boots Prevent Accidental Contact with Live Parts

4. To move the breaker out of the CONNECTED position, the procedure is the same as that described above, except that the racking crank is rotated clockwise. A breaker drawout stop is mounted on the compartment floor to prevent accidental removal of the breaker. This stop must be moved aside to remove the breaker from the compartment.

5. Separately mounted fuse drawouts are used with the LAF-3000A and LAF-4000A breakers. For these combinations, both the breaker and its associated fuse drawout are handled as described in the above manner. An additional "key" interlock system requires that the breaker be fully disconnected before the fuse drawout can be racked into or out of the CONNECTED position. Refer to breaker/fuse drawout instruction books.

NOTE

The fuse carriage is intended for installation in one specific compartment only; observe all labeling.

Future Breaker Compartments

These compartments have the primary contacts and bus work installed for future addition of circuit breakers. To prevent accidental contact with live parts, primary contacts are covered with polyvinylchloride (PVC) boots (see figure 35).

Secondary Disconnect

The secondary disconnect (7, figure 29) mounted on the left hand side of the breaker compartment, contains all the electrical control circuit connections for the circuit

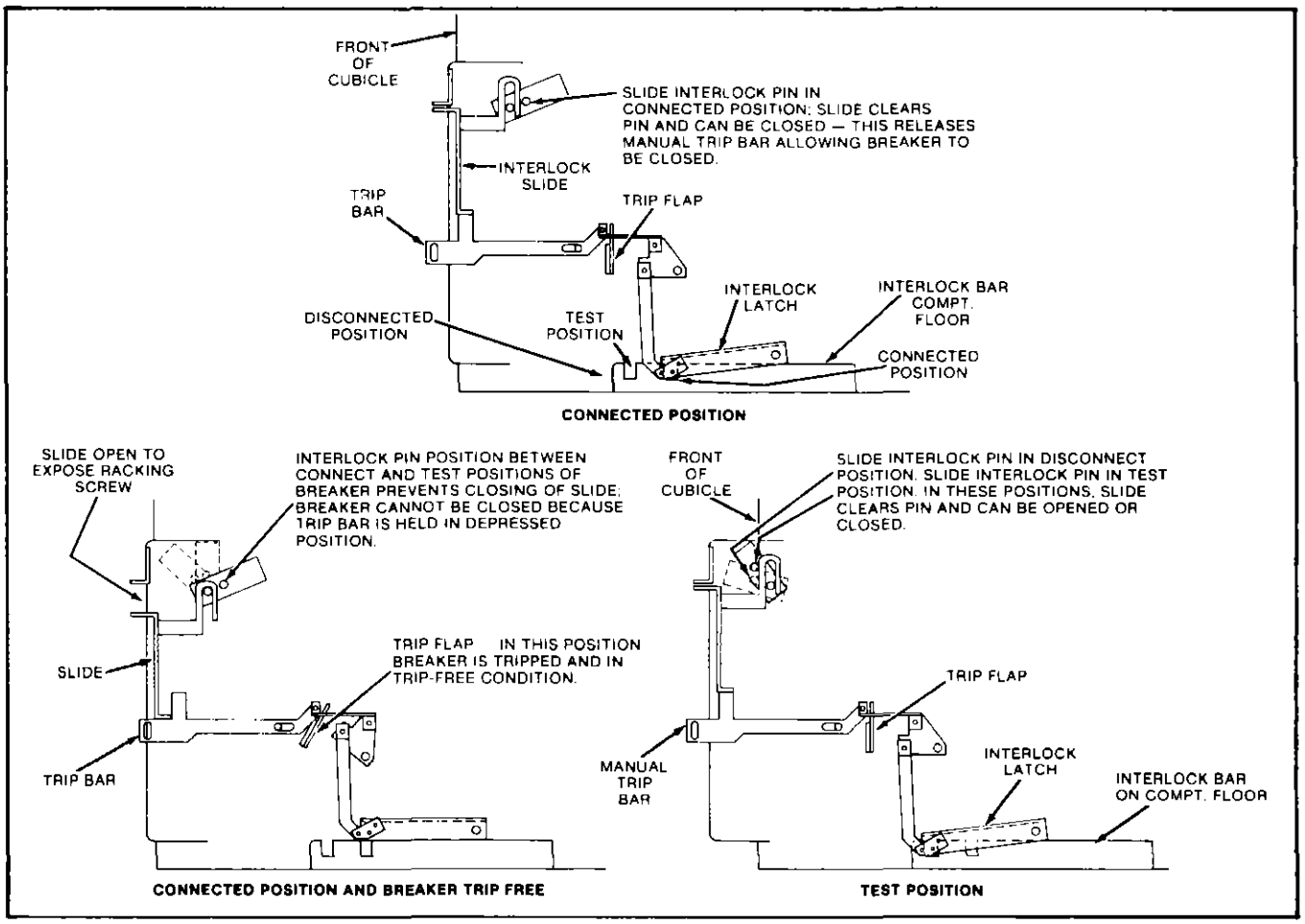


Figure 36. — Interlock Diagram, LA-3000A & LA-4000A

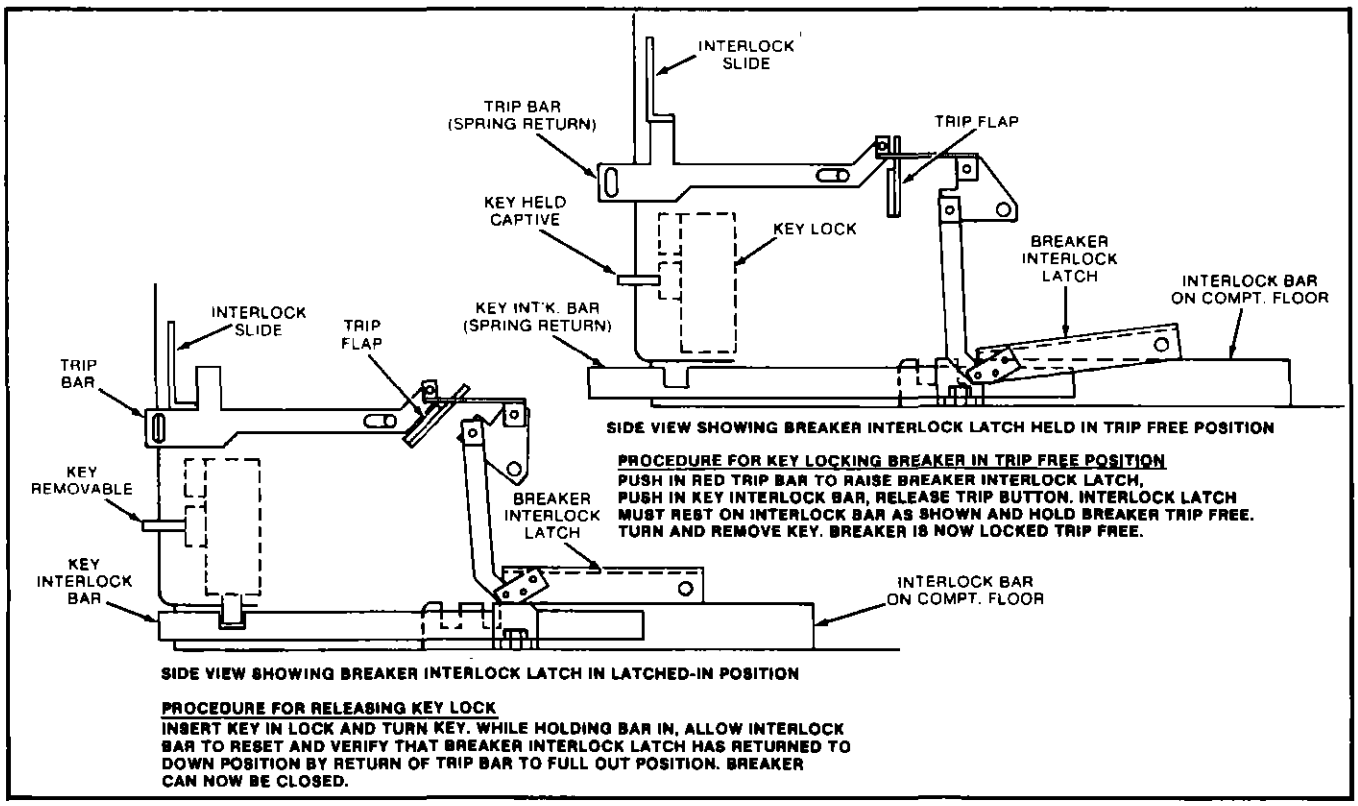


Figure 37. — Key Interlock — LA-3000A and LA-4000A Circuit Breakers

breaker. It mates with the secondary disconnect block (refer to the circuit breaker manual) on the circuit breaker.

Ground Clip (See 8, figure 29)

This clip engages a sliding silver plated, copper bar (refer to circuit breaker manual) on the circuit breaker and makes the ground connection for the circuit breaker electrical circuitry. The sliding contact bar engages the ground clip at the TEST position and maintains contact until withdrawn past the TEST position.

Key Interlocks

When specified, key interlocks are provided to lock circuit breakers in the trip free position. For LA-600A, LAF-600A, LA800A, LAF800A, LA-1600A and LAF1600A see figure 38. For LA-3000A, LAF-3000A, LA-4000A and LAF-4000A see figure 37 for application.

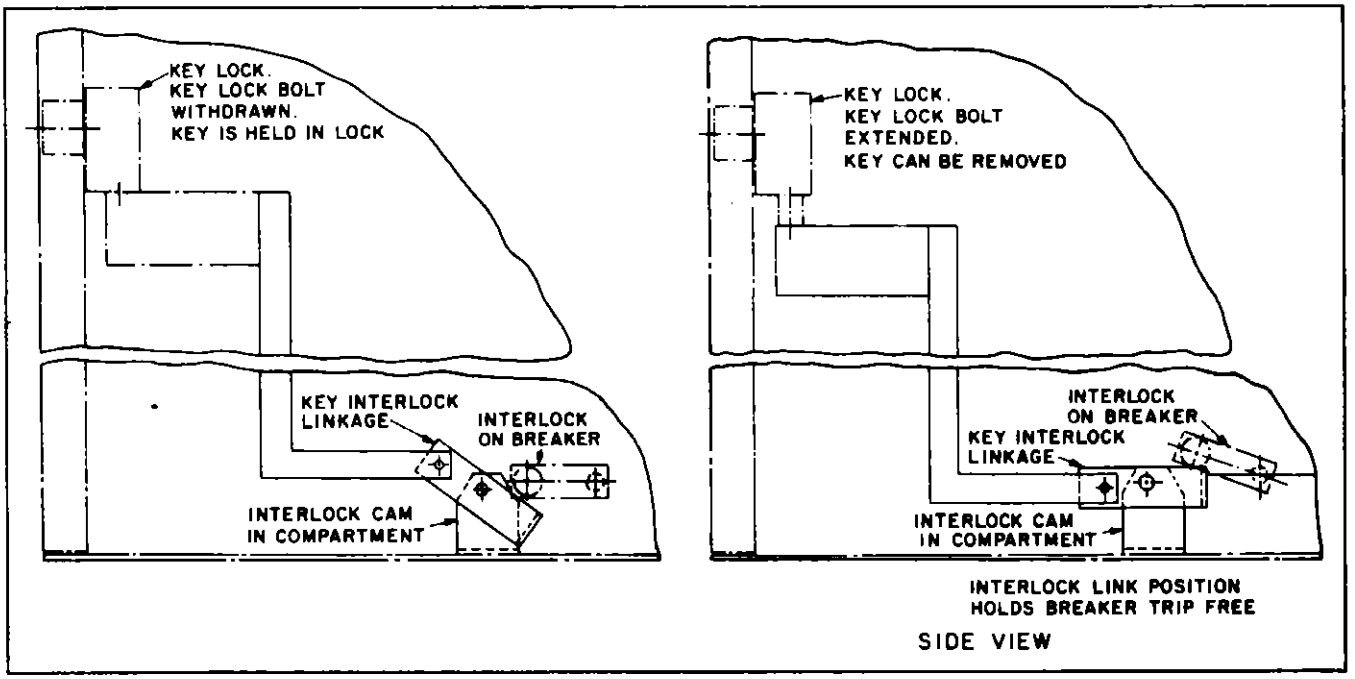


Figure 38. — Key Interlock — LA-600A, LA-800A and LA-1600A Circuit Breakers

INSPECTING AND TESTING BEFORE OPERATION

General

Before the switchgear is put in service, a thorough inspection and test should be made.

Inspection

Check for loose connections that may have developed in shipment. A thorough visual inspection and tightening of all bolted connections is definitely recommended. Before main power is turned on, all electrical switches and manual controls should be checked for proper position.

Testing

General

If desired, primary circuits may be resistance tested phase to phase and to ground. In switchgear having remote connections, some of the circuits must be externally wired when the gear is installed. These circuits should be electrically tested before placing in service.

Current Transformers

Current transformer circuits are tested for continuity as shown in figure 39. With the switchgear installed but not energized, disconnect the "grounded" lead at the current transformer and pass a measurable amount of current not to exceed five amperes through the lead to ground. Pass sufficient current to observe operation of relays and instruments.

Manipulate the instrument switches and observe the phasing. Repeat with each transformer. Do this for metering and relaying current transformers only – not tripping current transformers.

Secondary Load Circuits

Disconnect potential transformers at the secondaries. Test secondary lead circuit for open circuit between phases and then energize the circuit with test potential. See that proper potential appears at the terminals of each device.

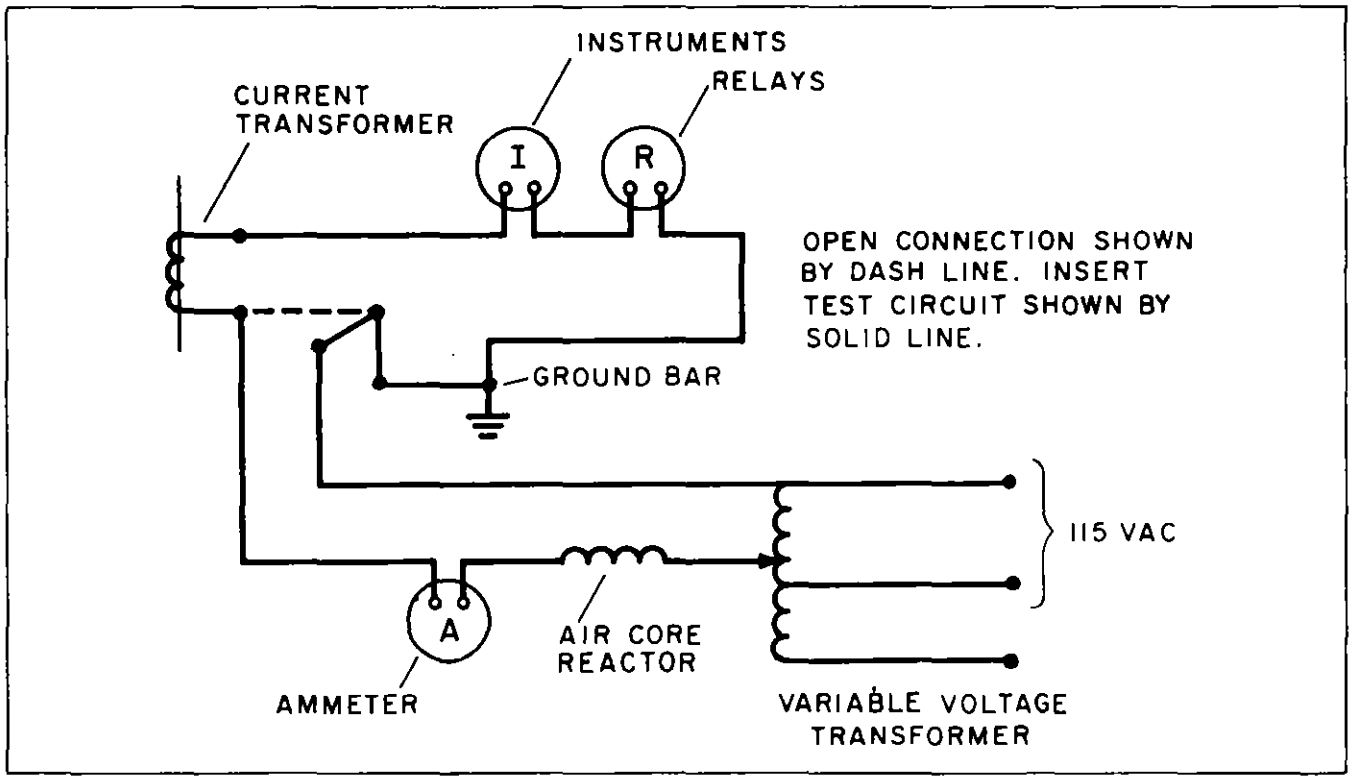


Figure 39. – Current Transformer Testing

Control Circuits

Test all control circuits for short circuits, open circuits and grounds. Apply the proper voltage and test the functioning of electrically operated devices.

Watt Meters, Watt-Hour Meters and Directional Relays

Check watt meters, watt-hour meters and directional relays for proper direction of rotation in actual service. Most present day directional control relays require the closing of the over current element in order for the directional element to operate. Ground directional relays can be tried on load by removing one of the three potential fuses and short-circuiting the other two current transformers of the remaining two phases. The relay should then operate in the tripping position. The directional control overcurrent element may have to be closed by hand, if the current is insufficiently high to operate it. In this test, the trip circuit of the relay can be opened so as not to cause an outage.

Static Overcurrent Trip Devices

For information concerning static overcurrent trip devices, refer to the devices' instruction manual. See Instruction Book References, Page 26.

High Potential Tests

If high potential tests are desired, observe the following rules:

NEMA standards for field tests on assembled switchgear previously tested at the factory.

Rated 250 volts	75% of 1500 volts or 1125 volts
Rated 600 volts	75% of 2200 volts or 1650 volts
Secondaries and control	75% of 1500 volts or 1125 volts

CAUTION

Certain control devices (motors pushbuttons, bell alarm contacts, etc.) – 75% of 900 volts or 675 volts.

These test voltages are for use at altitudes not over 3300 feet above sea level in an ambient temperature not exceeding 40 deg. C. Above that, correction factors are as follows:

3300 feet (1000 meters)	1.00
4000 feet (1200 meters)	0.98
5000 feet (1500 meters)	0.95
10,000 feet (3000 meters)	0.80

Open-circuit all potential and auxiliary transformers and remove all grounds while high-potting primary or secondary connections.

Phasing-Out

After the switchgear is installed and tested, it should be properly phased-out (see figure 40). This means:

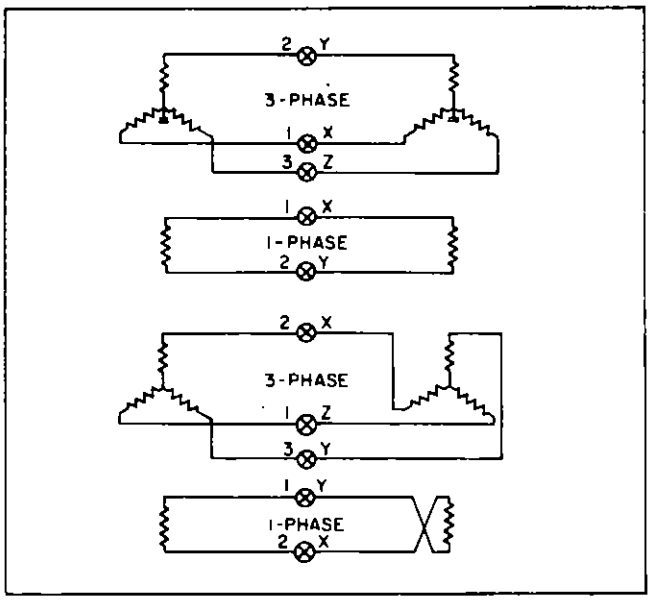


Figure 40. – Proper Phasing

1. Phase rotation must be in 1-2-3 sequence so that correctly connected motors run in the right direction, and so that instruments and relays on the switchgear may operate or function properly.
2. Phases labeled 1-2-3 in one section of the installation site must likewise be 1-2-3 in other parts of the site so that identically labeled phases are tied together.

Phasing-out is essential in stations supplied from more than one source as paralleling out of phase means a three-phase short circuit. A positive phasing-out against a circuit of known phase relations establishes correct phase rotation as well.

Phasing-out consists of connecting the two sources through lamps. If the two sources are in phase, the lamps will not glow as there is no potential across them. If the circuits are out of phase, the lamps will glow.

In phasing-out three-phase sources, the three lamps should have a voltage rating equal to phase-to-phase voltage. In phasing-out single-phase circuits, use two lamps in series.

MAINTENANCE

General

Thorough periodic inspections are important for satisfactory operation. The frequency of inspections depends on the site conditions and is determined by experience and practice. Make inspections at least once a year – more frequently if required by local conditions. Factors affecting inspection and maintenance scheduling are weather and atmosphere, unusual number of operations, experience of operating and maintenance personnel, and special operating requirements.

CAUTION

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.

Inspection

After the frequency of inspections has been established, include the following items in your procedures:

1. Inspect switchgear interior for accumulation of dust, dirt or any foreign matter. Remove dust from all insulators.
2. Clean air filters by washing in any mild household detergent.
3. Check instrument and control switches and inspect their contacts.
4. Examine indicating lamps and replace if required.
5. Check test block contacts for loose connections.
6. Inspect bus bars and connections for proper condition. If bus bars are overheating, check for poor or loose connections, or for overload.
7. Check for proper condition of instrument transformers. Replace burned out fuses. Check primary and secondary connections.
8. Examine all safety interlocks.
9. Perform maintenance of circuit breakers as outlined in the circuit breaker instruction manual.
10. Check space heaters and thermostats (if equipped) for proper operation.

Lubrication

General

It is essential that the switchgear be lubricated carefully and properly to guard against corrosion and to insure that all operating parts work freely. A tube of electrical contact lubricant is furnished by Siemens-Allis for electrical contacts. It is packed with the accessories. Old grease should be removed annually and parts relubricated. Relubricate at more frequent intervals, if required. A spray lubricant is available for general use on rollers and latches.

Electrical Contacts

Prior to use, lubricate stationary silver-surfaced contacts with contact lubricant furnished by Siemens-Allis as follows:

1. Wipe contacts clean.
2. Apply contact lubricant to contact surfaces (Siemens-Allis No. 15-171-370-002, 8 oz. (.23 Kg) tube).
3. Wipe off excess lubricant, leaving a thin film.

NOTE

If breakers have been installed at factory prior to shipment, stationary silver surfaced contacts were lubricated at factory; re-lubrication is required at normal maintenance intervals.

CAUTION

Avoid getting lubricant on the insulation.

Corrosive Atmospheres

The switchgear is designed to give top performance when installed indoors or outdoors under normal conditions. Where abnormal conditions such as corrosive atmospheres, are encountered, special precautions must be taken to minimize their effect. Exposed metallic surfaces, e.g., non-insulated bus bars, disconnect switches, primary and secondary disconnecting contacts, wire ends, instrument terminals, etc., must be protected. Lubricate contact surfaces with a layer between 1/32" and 1/16" (1 and 2 mm) thick. Use only Siemens-Allis Electrical Contact Lubricant No. 15-171-370-002.

NOTE

Other exposed members can be protected with a coat of glyptal lacquer, or any other corrosion-resisting paint.

When old grease becomes dirty, wipe the parts clean and apply new grease immediately.

Traveling Crane Hoist

Make certain that the hoist is properly lubricated before and during use as follows:

1. Keep the gearing well lubricated; never allow it to run dry. Use a heavy gear lubricant such as:
   a. Shell Macoma 85
   b. Standard Oil MP Gear Lubricant 250
   c. Citgo Trojan MP Gear Lubricant 250
   d. Mobil Grease – Outboard
2. Lubricate at other points of friction every 10 hours of operation with a good medium duty grade oil.

Relays and Instruments

To insure satisfactory operation of relays and instruments, do not leave device covers off longer than necessary. When a glass has been broken, cover the device temporarily and replace broken glass as soon as possible.

Equipment Surfaces

Matching paint is furnished with each order in spray-on one pint cans, one can per three vertical sections. This paint is thinned, ready for touching up any scratches, etc., resulting from installation. Inspect all surfaces and retouch where necessary.

INSTRUCTION BOOK REFERENCES

Static Overcurrent Trip Device (II)	18X4827
Description of Operation – Static Overcurrent Trip Device (II)	18X4814
Types LA-600A, LA-800A & LA-1600A (unfused) (M.O. or E.O.) Circuit Breaker and Types LAF-600A, LAF-800A & LAF-1600A (fused) (M.O. or E.O.) Circuit Breaker	18X5214-02
Renewal Parts for LA-600A, LA-800A, LA-1600A, LAF-600A, LAF-800A and LAF-1600A	18X5215-02
Portable Test Set Type PTS-2 For Static Trip II	18X4955-02
Portable Test Set Type PTS-3 For Static Trip and LimiTrip	18X10366
LimiTrip	18X10107
LA-3000A (M.O. or E.O.) Circuit Breaker	18X5689
LA-4000A (M.O. or E.O.) Circuit Breaker	18X5689
LA-3000A & LA-4000A Renewal Parts Guide	18X5690
Fuse Drawout for LAF-3000A and LAF-4000A	18X10238

SIEMENS-ALLIS
Switchgear Division
P.O. Box 14505
West Allis, Wisconsin 53214