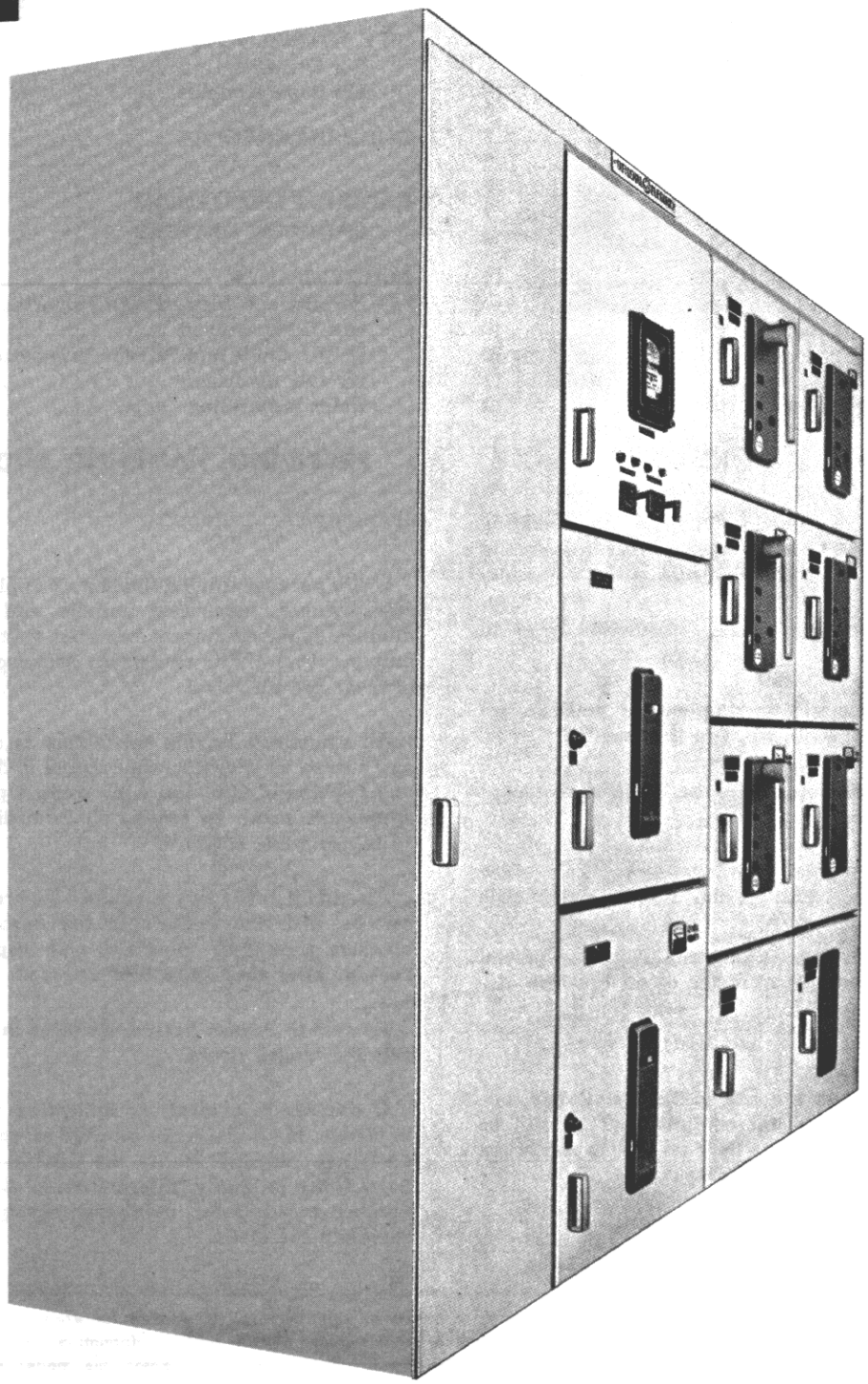
GEK-72101
8-77

INSTRUCTIONS

TYPE AKD-6
LOW VOLTAGE SWITCHGEAR



GENERAL ELECTRIC

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INTRODUCTION

This book contains instructions for installing, operating and maintaining AKD-6 Low Voltage Switchgear. It should be read carefully before installation and initial operation.

For application and specification information, refer to Bulletin GEA-10279.

Separate publications will be supplied for breakers, relays or other devices not described in this manual.

In addition to instruction books, the following drawings will be supplied:

1. Front View and Floor Plan drawings. These show the general arrangement, height, recommended aisle space, etc.
2. Summary of switchgear equipment. This is a partial parts list, giving catalog numbers of all breakers, devices, etc.
3. Electrical diagrams (when required).

All of these documents are needed for installation, operation and maintenance of the equipment. They will be found in a packet inside the auxiliary unit, or in one of the instrument or breaker compartments.

RECEIVING, HANDLING AND STORAGE

RECEIVING

Every package leaving the factory is plainly marked with case number, requisition number and customer's order number. If the equipment has been split for shipment, the unit numbers of the equipment enclosed in each shipping package are identified.

All equipment leaving the factory is carefully inspected and packed by personnel experienced in the proper handling and packing of electrical equipment. Upon receipt of any apparatus, make an inspection immediately for damage sustained while en route.

Air circuit breakers are shipped separately in individual cartons with the breaker in the open position. Circuit breakers should be unpacked and inspected as soon as possible after they have been received.

Be sure to inspect devices mounted in compartments inside the hinged doors.

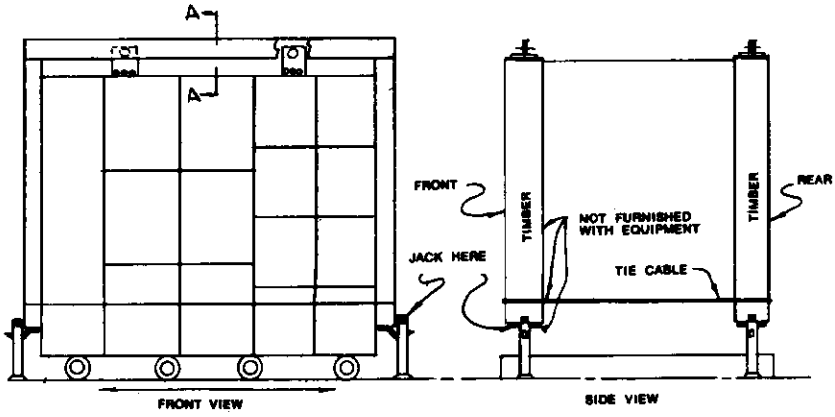
If damage is evident, or indication of rough handling is visible, file a claim for damage at once with the transportation company. Notify the General Electric Company Sales Office promptly. Information on damaged parts, part number, case number, requisition number, etc., should accompany the claim.

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 General Electric Company.

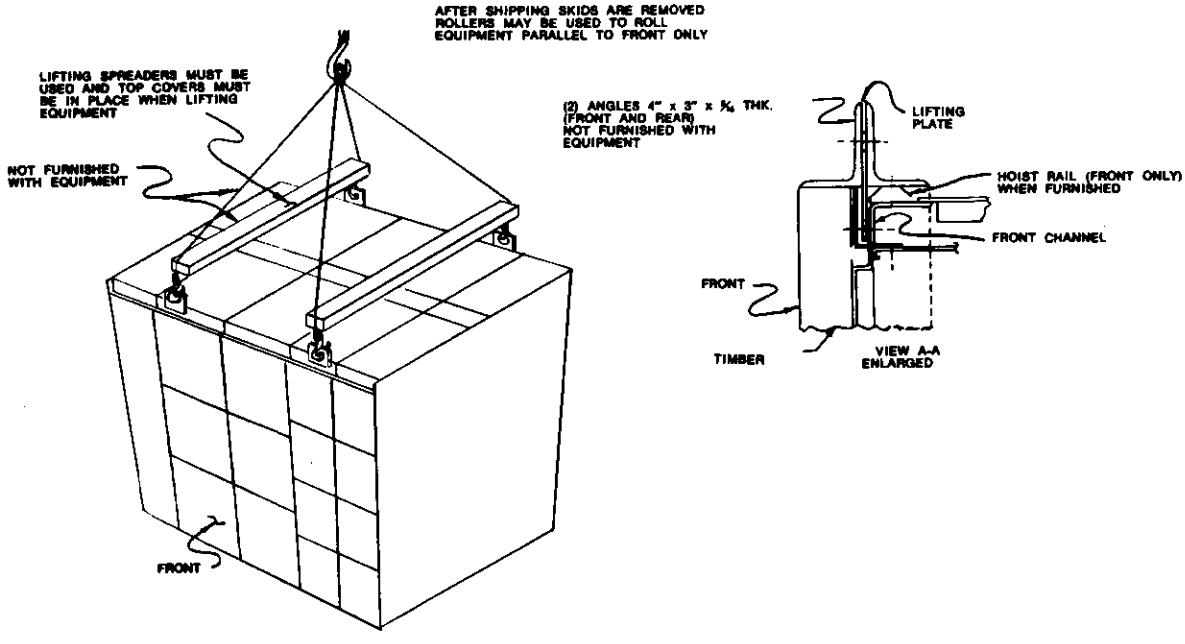
The contents of each shipping package are listed on the Master Packing List. This list indicates the number of the case in which miscellaneous parts needed to install and operate the equipment (such as contact lubricant, touch-up paint, breaker closing devices, etc.) are located. If such items are packed in a switchgear unit instead of a separate crate, the list will indicate the appropriate unit number in which they are stored.

Large items (such as hoist dollies and hoist carriages used with indoor equipment) will always be shipped in separate crates or cartons.

To avoid the loss of small parts when unpacking, the contents of each case should be carefully checked against the packing list before discarding the packing material.



RECOMMENDED METHOD OF JACKING



RECOMMENDED METHOD OF LIFTING

FIG. 1 (0673D0500-265) Methods of Handling Indoor Equipment

HANDLING

The switchgear units are best handled by crane. Removable lugs are provided on top of the indoor switchgear. When using a crane for lifting, a cable spreader must be used to obtain a vertical pull on the lifting lugs. Recommended lifting method is shown in Figure 1.

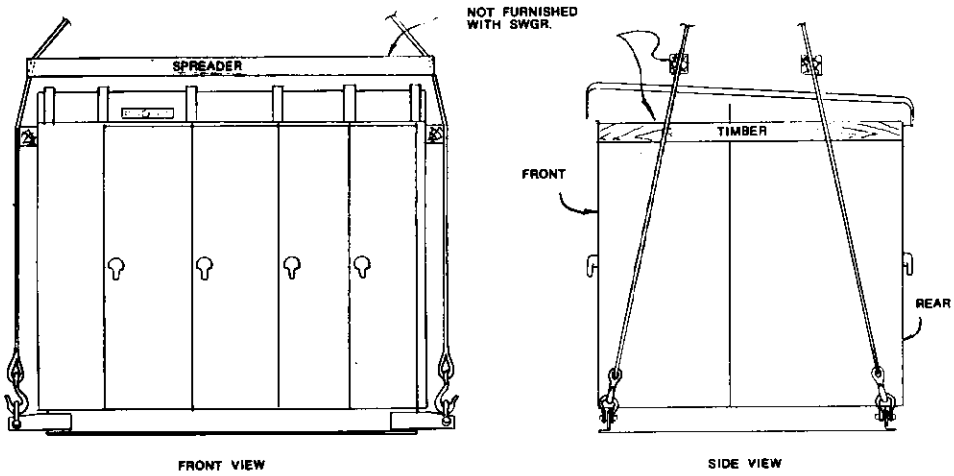
If practical, the shipping skid should be left on the equipment until it is at or near its final location.

If crane facilities are not available, the equipment may be moved into position by means of construction rollers placed under the shipping skid. Where overhead clearance is insufficient, the shipping skid may be removed and the equipment moved by rollers placed under the three channels under the equipment.

The skid is bolted to the equipment through the anchor bolt holes used for final installation. The bolts in the rear of the equipment may be reached by opening the rear doors. To reach the bolts in the front, the inner housing in the bottom breaker compartment must be brought out to the disconnected position. Fig. 3 shows the front bolt locations, and the drawout procedure is explained on Pages 16 and 17.

CAUTION: *IF THE SKID HAS BEEN REMOVED, BE SURE THE ROLLERS USED ARE SPACED SO THAT THE THREE CHANNELS REST ON TOP OF THE ROLLERS. A DIRECT APPLICATION OF THE ROLLERS BETWEEN THE CHANNELS MAY TEAR OR DISTORT THE EQUIPMENT.*

Jacks may also be used to handle the equipment when a crane is not available. See Figures 1 and 2.



RECOMMENDED METHOD OF LIFTING

RECOMMENDED METHOD OF JACKING

FIG. 2 (0673D0500-266) Methods of Handling Outdoor Equipment

Methods of handling outdoor switchgear, shown in Figure 2,-are much the same as for indoor equipments except that lifting plates are provided at the base of the structure. The lifting plates should be removed after the equipment is permanently anchored so that passageway at the ends of the equipment will not be obstructed.

Store the circuit breakers in a clean, dry location in an upright position. They must be properly supported to prevent bending of the studs or damage to any of the breaker parts. Do not remove any protective grease until they are ready to be installed. A covering of kraft or other non-absorbent paper will prevent dust from settling on the breakers.

STORAGE

If breakers are not to be placed in service at once, remove them from their shipping cartons and thoroughly inspect them. If everything is in satisfactory condition, replace the breakers in their shipping cartons for storage. Do not remove the shipping members at this time.

If it is necessary to store the equipment for any length of time, the following precautions should be taken to prevent corrosion or deterioration.

1. Uncrate the equipment. Check thoroughly for damage.
2. Store in a clean, dry, rodent free location with moderate temperature and provide protective coverings to prevent dirt, water, or other foreign substances from entering the switchgear.
3. If dampness or condensation may be encountered in the storage location, heaters must be placed inside the units to prevent moisture damage. Approximately 250 watts of heat in each unit is required. On outdoor switchgear this may be accomplished by making a temporary power supply connection to the heaters already installed in the equipment.

CAUTION: *REMOVE ALL CARTONS AND OTHER MISCELLANEOUS PACKING MATERIAL FROM INSIDE THE UNITS BEFORE ENERGIZING ANY HEATERS.*

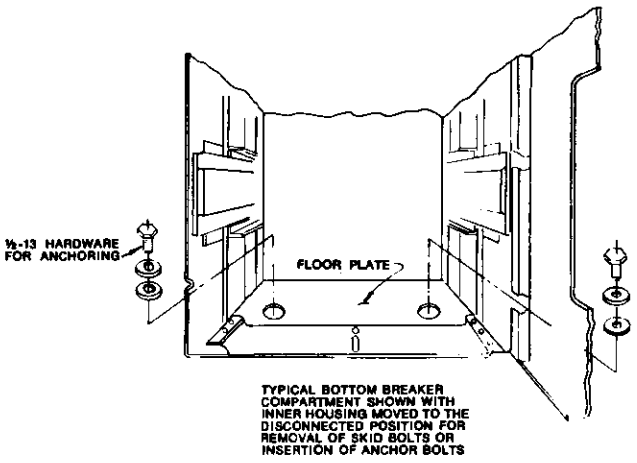


FIG. 3 (0673D0500-265) Location of skid bolts (and anchor bolts) in front of Indoor Equipment

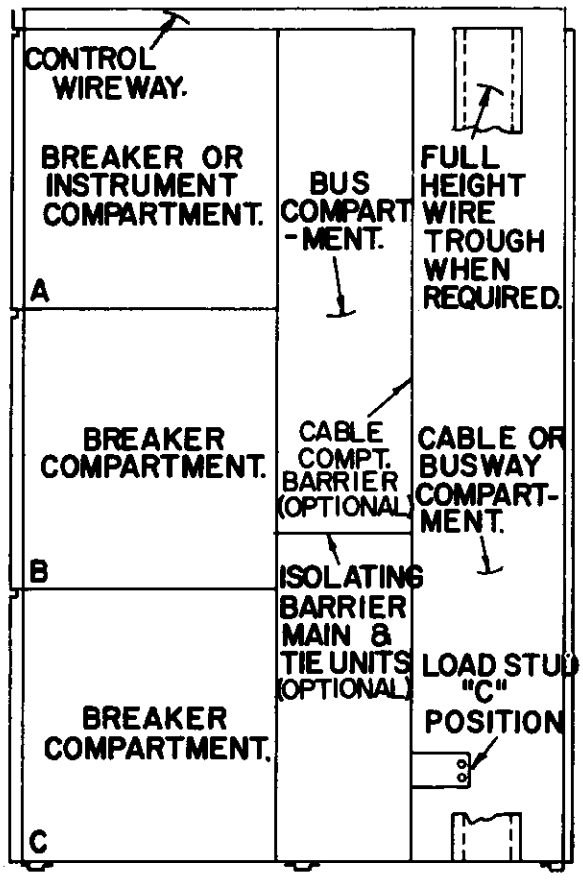


FIG. 4 (0148A5073-0) Side View showing Compartmentation

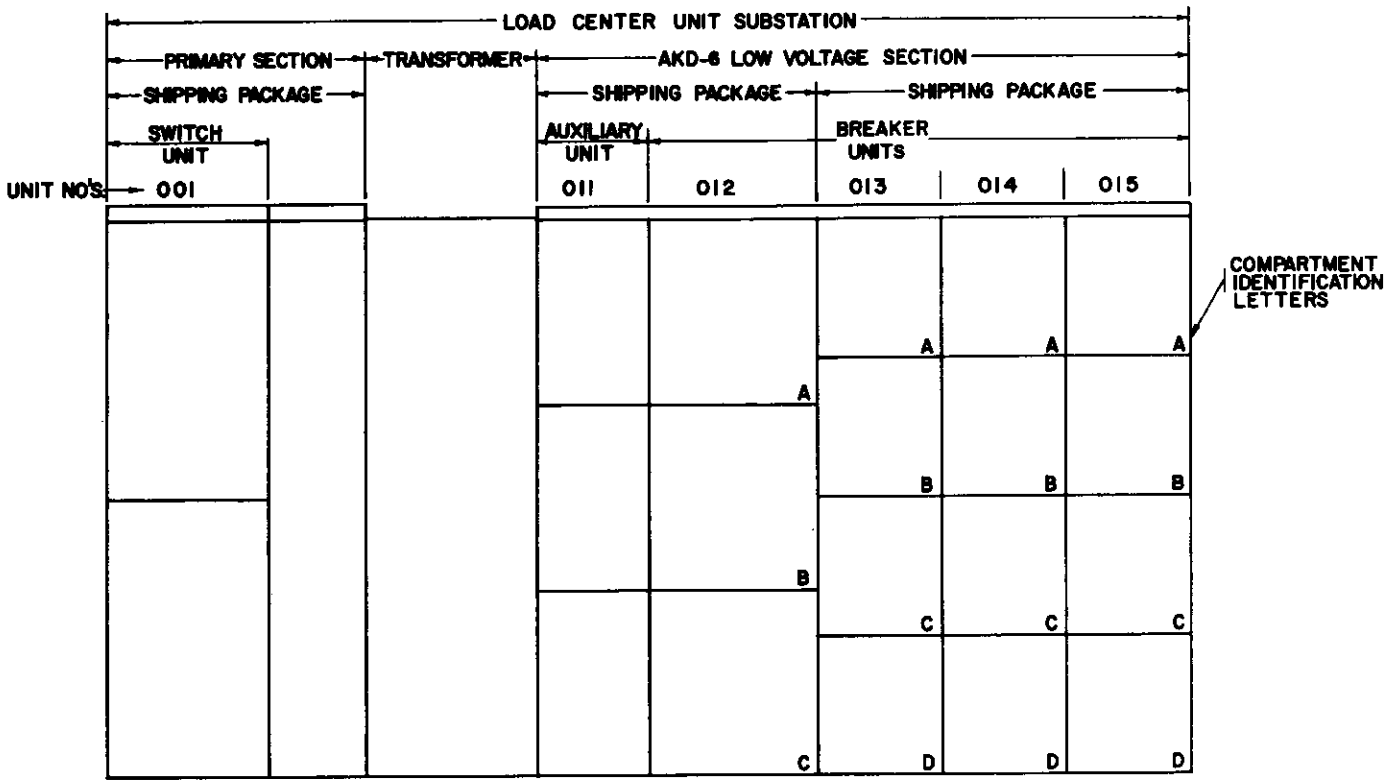


FIG. 5 (0102C5207-0) Outline of a typical Load Center Unit Substation showing nomenclature

DESCRIPTION

General Electric AKD-6 Low Voltage Switchgear is a free-standing assembly of metal-enclosed units of Power Circuit Breakers and other auxiliary power circuit protective devices. It may also be a part of a single-ended or double-ended Load Center Unit Substation.

Figure 4 is an outline of a side view of a typical unit showing compartmentation, and Figure 5 is an outline of a typical single-ended Load Center Unit Substation illustrating the nomenclature used for all equipment.

All of the switching and protective devices, control and metering devices, control fuses and instrument transformers are mounted in the enclosure. The breaker positions are all of the drawout type. The breakers are provided with self-coupling primary and secondary disconnecting contacts and incorporate positive and indirect interlocks to insure proper operating sequence. Each of the individual units, compartments and devices is described in the following paragraphs.

FRONT ENCLOSURE

The front enclosure of each unit is divided into individual compartments. These compartments either house a power circuit breaker or are used to mount instruments and other protective devices and control components.

BREAKER COMPARTMENTS—AK BREAKERS—MOUNTING CODE 2A, 3A, 4A, OR 5A

These breakers are supported within their compartments by a rollout track which is part of the drawout mechanism attached to the sides of the compartment. See Figure 6. The drawout mechanism is shown in an exploded view, Figure 19, and its operation is explained in detail under "Drawout Mechanism Operation."

BREAKER COMPARTMENTS—AKR, AKRU, AKRT BREAKERS-MOUNTING CODE 3A, 4A OR 5A

These breakers are supported on a rollout track in the same manner as the AK breakers. However, since the rackout mechanism is mounted on the breaker, there are no jackshafts in the enclosure. See Figure 7. Racking arms on both sides of the breaker frame engage the drawout mechanism pins fastened to both sides of the compartment.

Note that extra items shown in Figures 6 and 7 (such as secondary disconnects, position switches and ground sensor secondary disconnects) may appear in any compartment or not be included at all, depending on the equipment specified. Also note that the bracing for the primary disconnects shown in Figure 7 may be a single piece of insulating material instead of three separate pieces.

A stop link is located on each side of all AK breaker compartments. These links prevent an operator from manually pushing a breaker set on the tracks all the way into the compartment when the racking mechanism is in the connected position. In a compartment made for AKR breakers, the latches that rest on the drawout mechanism pins prevent the inner house from being manually moved all the way into the compartment when no breaker is set on the tracks.

All AK or AKR circuit breakers of the same type and rating which have duplicate wiring may be interchanged.

Each breaker compartment has four positions. They are illustrated in Figure 18 and described below.

1. **CONNECTED POSITION**—The breaker is in operating position, both primary and secondary contacts made and the door closed.
2. **TEST POSITION**—The primary contacts are separated by a safe distance, but the secondary contacts are made. Any breaker test not involving power may be made in this position. The door may be closed in this position, and must be closed before charging the spring on a manually operated AKR breaker because an open door will interfere with the breaker handle travel.
3. **DISCONNECTED POSITION**—Neither the primary nor the secondary contacts are made. The door may be closed.
4. **WITHDRAWN POSITION**—The breaker is completely out of its compartment ready for removal from the equipment. The door must be open.

NOTE: *ALTHOUGH THE BREAKER COMPARTMENT DOOR MAY BE OPENED IN ANY POSITION, IT IS RECOMMENDED THAT THE DOOR ONLY BE OPENED WHEN THE BREAKER IS IN THE DISCONNECT OR WITHDRAWN POSITION.*

CAUTION: *NEVER OPEN THE BREAKER DOOR WHEN THE BREAKER IS CLOSED AND IN THE CONNECTED POSITION.*

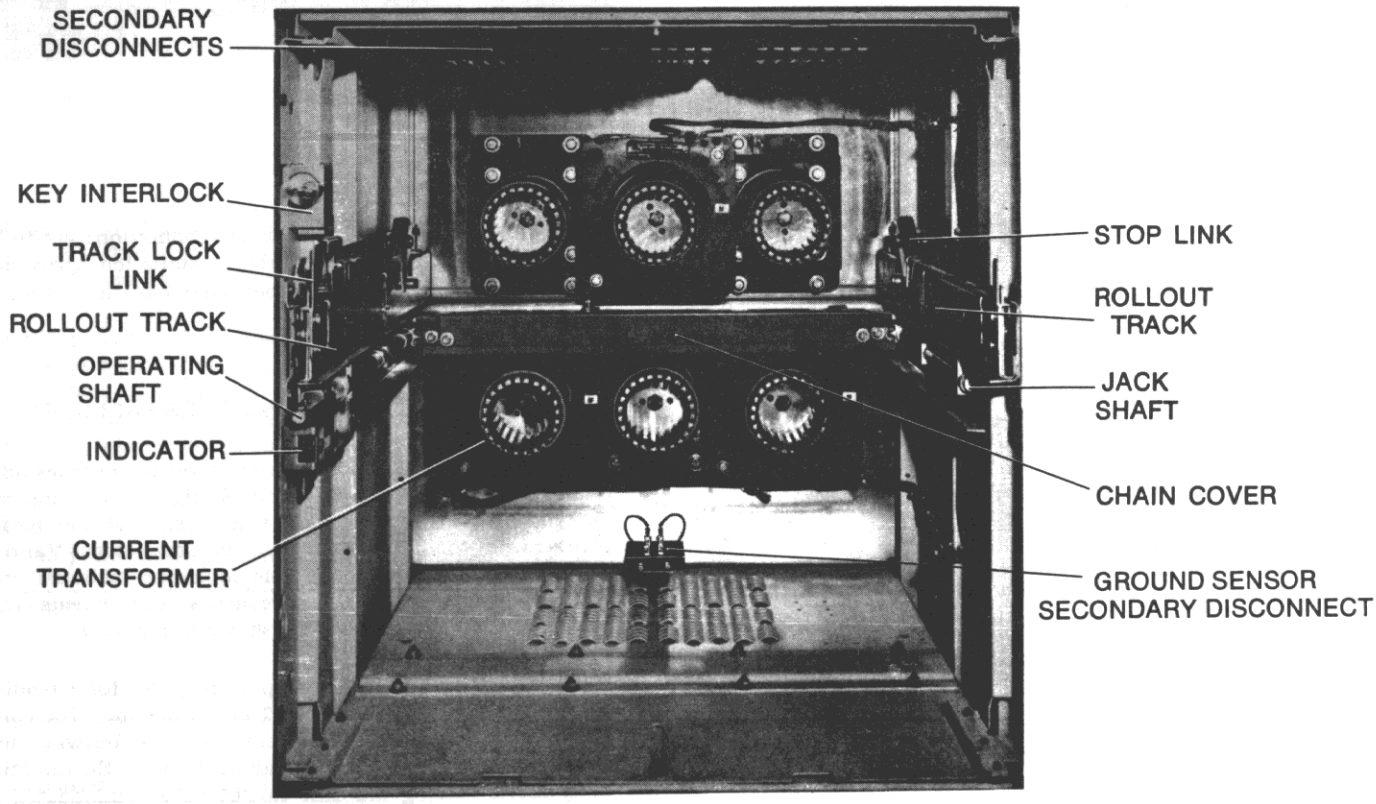


FIG. 6 (8042645) Typical AK breaker compartment

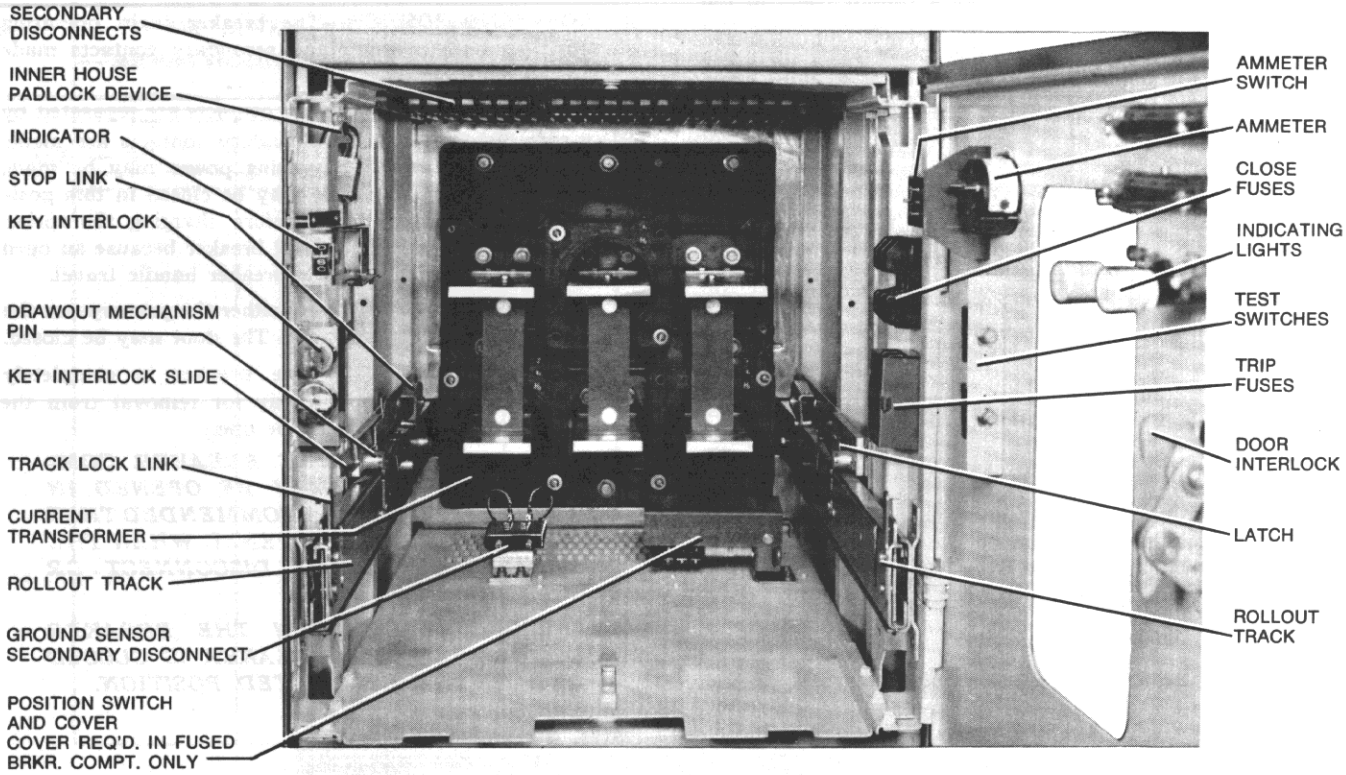


FIG. 7 (8041585) Typical AKR breaker compartment

BUS COMPARTMENT

The bus compartment, between the front enclosure and the rear cable compartment, contains all of the bus and necessary bus supports for a particular section. This bus compartment is isolated from the breaker and instrument compartments by barriers. Isolation barriers between the bus and cable compartments are optional. A typical arrangement with an all-welded aluminum bus is shown in Figure 8. Bolts are used for supports or at connections which must be made in the field. Bolted copper buses are optional.

On main breaker and tie breaker units the bus compartment may be divided into an upper and lower section by an optional isolation barrier. For main breakers, the upper section contains the incoming line bus, fed from the bus connections in the auxiliary unit, while the lower section contains the main bus which connects with the other units. Optional barriers at tie breakers isolate the two main bus sections from each other.

Aluminum buses run continuously from one unit to another. At shipping splits, or where connections are to be made to other equipment during installation, provision is made for a bolted joint. Copper buses have bolted joints between each unit.

FEEDER CABLE AND BUSWAY COMPARTMENT

The rear cable and terminal compartment provides adequate room for cable installation. Straight cable runs can be made from the bars at the load side of the feeder breakers to conduits entering above or below. Various arrangements of single or double cable terminals are provided, depending upon the purchaser's requirements. One typical terminal arrangement is shown in Figure 9.

An add-on unit, 18 inches deep, is available for extending the cable compartment of the 22 inch wide unit. The compartment is extended when more than two busway runs from above or below are used, and also when the quantity of conduits leaving the unit cannot be accommodated in the normal available space.

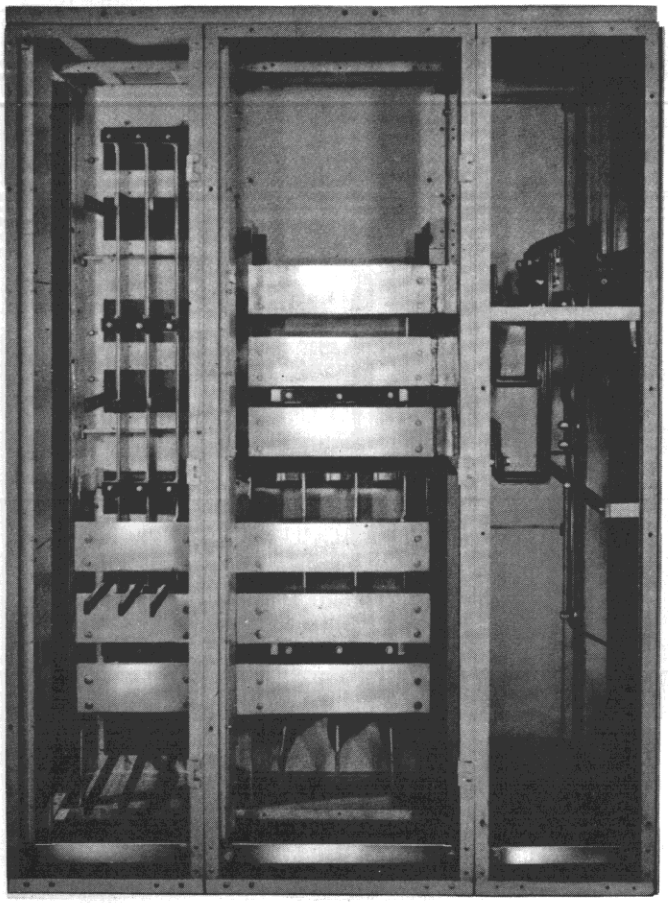


FIG. 8 (8042652) Bus Compartment

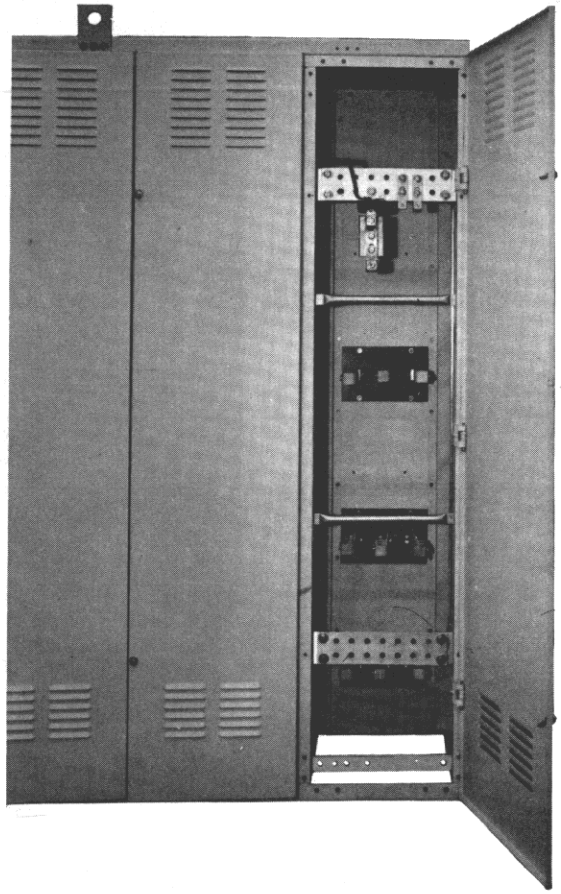


FIG. 9 (8042651) Typical Terminal Arrangement in a 4-high unit

Conduits for large cables should be near the rear of the cable compartment to provide space for bending these cables as necessary.

Beside power cable connections, some equipments include an enclosed wiring trough on the left side (rear view) of the cable compartment, providing for control circuit connections. Terminal boards are provided in this trough for making control wiring connections during installation.

A neutral bus is provided in the cable compartment on switchgear designed for four wire systems. It consists of bars with plated connection areas, and is installed at either a height of about 18 inches from the floor or at about 6 feet. In most equipments the neutral bus is insulated from ground.

GROUND BUS

CAUTION: *IT IS VERY IMPORTANT THAT EQUIPMENT BE ADEQUATELY GROUNDED FOR SAFETY.*

The ground bus is bolted to the rear of the cable compartment near the bottom. A 4/0 connector is included on each equipment for making the connection to the station ground. A recommended location for this connection is shown on the floor plan drawing.

Where AKD-6 switchgear is shipped in more than one package, the ground bus must be connected at the shipping splits.

OUTDOOR EQUIPMENT

Outdoor switchgear is constructed as a basic indoor equipment completely enclosed in a weatherproof housing with a walk-in front aisle, Figure 10. Space heaters are provided in all outdoor equipments. There is one 115v. ac 250 watt heater located in the bus compartment of each unit. These heaters should be energized at all times to reduce condensation in the equipment.

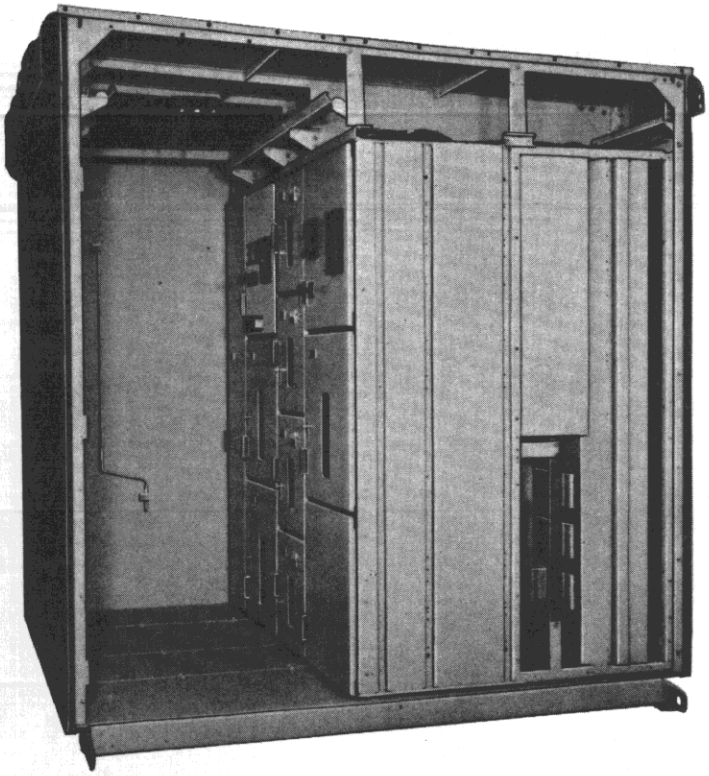


FIG. 10 (8042659) Typical Outdoor Shipping Section

EQUIPMENT INSTALLATION

PRIOR TO INSTALLATION

Before any installation work is performed, study all drawings furnished by G.E. Co. for the particular installation. These include arrangement drawings (front and plan view), connection and elementary diagrams, installation drawings and a summary of the equipment. When requesting information from the factory on any specific item furnished with the equipment, refer to the item by summary and identification number wherever possible. Any material external to the equipment which may be required to meet local codes (such as mats, screens, railings, etc.) is not furnished.

LOCATION

In locating AKD-6 switchgear, provide adequate aisle space at the front and rear of the equipment. The recommended aisle space is shown on the floor plan drawing, and is in accordance with N.E.C. Article 110. Local codes should be checked for any special aisle requirements.

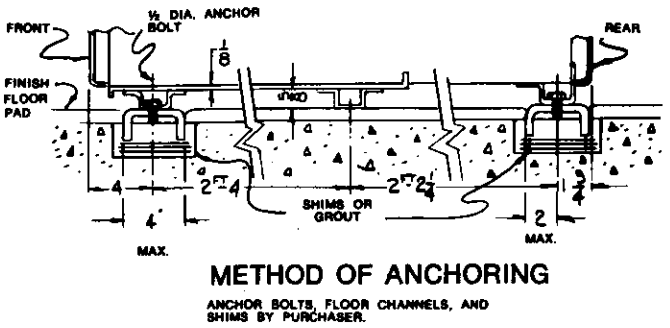
The equipment should be placed in an area where clean air is free to circulate around and above it. Since air is taken into the units at the bottom and is exhausted at the top, a location with good air flow will provide more efficient operation.

FOUNDATION REQUIREMENTS

Indoor Equipment—Suitable means must be provided by the purchaser for mounting and anchoring the switchgear to the floor.

> **CAUTION:** *IF THE FOUNDATION IS SUBJECT TO VIBRATIONS, SPECIAL MOUNTING MUST BE PROVIDED TO PREVENT THE TRANSMITTAL OF VIBRATIONS TO THE EQUIPMENT.*

Although the equipment is furnished with built-in channels so that it can be mounted directly on a smooth, level floor, it is recommended that recessed steel channels be installed by the purchaser for supporting the equipment. The floor channels under the front and rear switchgear channels should be embedded in a level concrete slab with their top surfaces flush with the finished floor. It is essential that these steel channels be level and aligned with each other prior to final anchoring, and that the center switchgear channel be supported by the finish floor to avoid distortion of the switchgear structure. If the gear is raised above the floor level by the mounting channels, the center switchgear channel must be supported at the same level. If other equipment is installed in the same lineup, all channels must be level and aligned with each other.

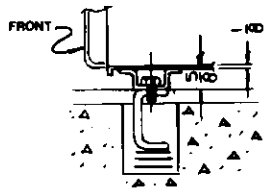


METHOD OF ANCHORING

ANCHOR BOLTS, FLOOR CHANNELS, AND SHIMS BY PURCHASER.

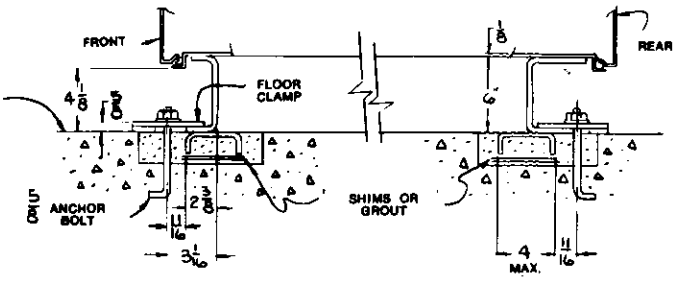
FOUNDATION DATA

EQUIPMENT IS FURNISHED WITH BUILT-IN CHANNELS. EMBEDDED CHANNELS SHOULD BE SET LEVEL WITH EACH OTHER AND SHOULD BE LEVEL OVER THEIR ENTIRE LENGTH. CENTER CHANNEL MUST BE SUPPORTED. ¼ THK. FORMED CHANNELS ARE RECOMMENDED FOR LEVELING PURPOSES. FINISH FLOOR SHOULD HAVE SLIGHT PITCH AWAY FROM MOUNTING CHANNELS AND IN NO CASE SHOULD THE FINISH FLOOR BE HIGHER THAN MOUNTING CHANNELS.



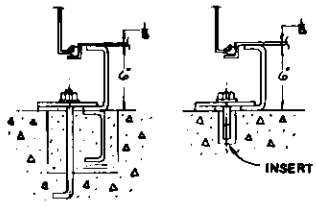
ALTERNATE METHOD OF ANCHORING

FIG. 11 (0673D0500-265) Foundation for Indoor Equipment. Anchor bolts, floor steel and other foundation material furnished by purchaser

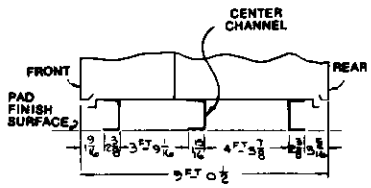


METHOD OF ANCHORING

ANCHOR BOLTS, FLOOR CHANNELS & SHIMS BY PURCHASER



ALTERNATE METHODS OF ANCHORING



SIDE VIEW OF FLOOR FRAME SHOWING BEARING SURFACES OF FRONT, REAR AND CENTER CHANNELS

FOUNDATION DATA

EQUIPMENT IS FURNISHED WITH BUILT-IN FLOOR FRAME. EMBEDDED CHANNELS SHOULD BE SET LEVEL WITH EACH OTHER AND SHOULD BE LEVEL OVER THEIR ENTIRE LENGTH. CENTER CHANNEL MUST BE SUPPORTED. ¼ THICK FORMED CHANNELS ARE RECOMMENDED FOR LEVELING PURPOSES. FINISH PAD SHOULD HAVE SLIGHT PITCH AWAY FROM MOUNTING CHANNELS AND IN NO CASE SHOULD THE FINISH PAD BE HIGHER THAN MOUNTING CHANNELS.

FIG. 12 (0673D0500-266) Foundation for Outdoor Equipment. Anchor bolts, floor steel and other foundation material furnished by purchaser

Recommended method of embedding channels and mounting the switchgear to the foundation is shown in Figure 11. This information is also sent to the purchaser with other requisition drawings.

Outdoor Equipment—Recommended method of embedding channels and mounting the switchgear to the foundation is shown in Figure 12. Otherwise, comments under Indoor Equipment apply. Outdoor equipment also has a center channel in the floor frame which must be supported by the pad or other means.

ANCHORING

The switchgear should be mounted on top of the channels as shown in Figures 11 and 12 and securely anchored to them.

There are two methods of anchoring indoor equipment to the channels. One is to use ½ inch anchor bolts through the holes provided in the bottom of the equipment as shown in the floor plan. Another is to tack weld the bottom channels of the equipment to the foundation channels.

Two suggested methods for anchoring outdoor AKD-6 switchgear are illustrated in Figure 12. Both use an anchor bolt and floor clamp to secure the supporting channel to the foundation.

NOTE: *DO NOT BOLT OR WELD THE EQUIPMENT TO THE FLOOR CHANNELS UNTIL THE SHIPPING PACKAGES HAVE BEEN BOLTED TOGETHER AS DESCRIBED UNDER "ASSEMBLY OF EQUIPMENT."*

ASSEMBLY OF EQUIPMENT

Before assembly of the equipment is begun all components should be on hand to facilitate installation. The individual shipping packages must be connected together on the foundation. If there is no transformer in the lineup and the equipment has been split for shipment, place the middle package on the foundation first and assemble in both directions. If the equipment is part of a Load Center Unit Substation, the transformer section should be set on its pad in accordance with the instructions furnished with the transformer, and then packages of equipment added.

NOTE: *WHEN AKD-6 SWITCHGEAR IS INSTALLED IN THE SAME LINEUP WITH TRANSFORMERS AND OTHER EQUIPMENT, IT IS IMPERATIVE THAT ALL MOUNTING SURFACES BE LEVEL.*

Proceed to assemble the equipment as follows:

1. The switchgear packages should be placed on the foundation with the aid of cranes or jacks as shown in Figure 1 for indoor equipment or Figure 2 for outdoor equipment.

2. For Indoor Equipment, the packages should be fastened together at the shipping splits by bolting the front and rear upright channels together. Use 3/8-16 hardware furnished with the equipment at the end of the packages. If a transformer is in the lineup, hardware for connecting the flange to the switchgear is supplied with the equipment.

3. For Outdoor Equipment, remove the lifting plates from front and rear of the switchgear base at both ends of the shipping split joint and assemble the front and rear splice plates as shown in Figure 14.

When joining shipping packages, special procedures for weather-proofing must be followed as indicated in Figure 14. The joint in the roof at shipping splits must be weatherproofed. This is done as shown in Figure 14 by placing a rubber seal on each side of the top edge of the roof support batten so that the roof sections butt up against this seal on both sides. Bolt this joint togeher, using 3/8-16 hardware. A roof cap is placed over this seam and held in place by the roof trim. Joints between transformer throat and switchgear and between shipping splits must be weather-proofed as shown in Figure 14. Install a front and rear batten and rubber seal at the shipping split joints and bolt them together with the furnished 3/8-16 hardware. The gasket for an outdoor transformer is furnished with the transformer, and hardware for connecting the transformer flange to the switchgear is supplied with the equipment. Check alignment of doors on the outdoor equipment to see that the weatherproof seal has not been disturbed.

4. Bolt the main buses, ground buses, and neutral buses of adjacent shipping packages together using the splice bars furnished with the equipment. See Figure 13 and 14 for details of splice bar connections. The ground bus is mounted directly on the rear upright channels. It is particularly important that this bus be connected since it provides an integral ground for all the equipment that should be connected to the station ground. Neutral buses are mounted on molded insulators that are attached to the rear upright channels. If a transformer is present in the lineup, make the necessary connections from the equipment to the flexible connectors furnished with the transformer as shown in Figures 13 and 14. Connection hardware is supplied with the equipment. The ground connection bar in the bus entrance compartment will be shipped turned in. This bar should be reassembled in the correct position and connected at the offset portion to the transformer ground pad with a ½ inch bolt. Consult transformer instructions for proper connection procedure.

All bolted bus joints should be made up using the proper torque values as shown in Table A.

5. Bolt or weld the equipment to the foundation as specified under "Anchoring."

6. All shipping supports must be removed from the switchgear. These are painted yellow.

7. Busway runs must be lined up and connected to the equipment. Hardware for this joint is furnished with the busway.

8. Connect control cables between units at the shipping splits. A tag at the top of the unit adjacent to the split will indicate where the wires that cross the split are located. These wires are all tagged and should be laid across the split and connected to the shipping split terminal blocks as indicated.

9. Connect control cables to the switchgear unit as follows:
   a. When control conduits enter the switchgear from below, they should not extend more than one inch above the floor. The control cables may be pulled through the conduits before or after the switchgear is installed.
   b. Route the control cables from the conduits through the wiring trough at the side of the cable compartment and connect the cables to the terminal blocks in accordance with the connection diagrams for the equipment.
   c. If the control conduits enter from above, drill the top cover within the available space indicated. Control cables should be routed to the wiring trough and connected to the terminal blocks as above.

10. Connect the main cables to the units. Before any main cable connections are made, the cables should be identified to indicate their phase relationship with equipment. Adequate electrical and mechanical clearances must be provided between conduits, cables and bus. Where the cables enter the unit, they can be lashed to cable supports at the rear of the cable compartment as required. See Figure 9.

Cable terminals are included with the switchgear, and are mounted at the ends of the bars in the cable compartment. Check to see that the proper size and quantity of terminals are located at each connection point, and that they are positioned correctly to receive cables coming from above or below. In all cases, carefully follow the cable manufacturer's recommendations for installation of cable, as well as the instructions contained in this book.

It is imperative that all cables be adequately supported to take their weight off terminals and studs, and to prevent movement during short circuit.

Train the cables in the proper path to the terminals, using temporary lashing if required, and cut to the proper length. Strip the insulation to the desired dimension, being careful not to damage any strands.

For copper cables, coat the cables with D50H47 grease, insert the cables into the terminals and tighten the set screws in accordance with values shown in Table B.

For aluminum cables, wire brush the cable strands thoroughly. Immediately after wire brushing, coat the cable strands with a quality oxide inhibiting compound such as Penetrox A. (or other similar oxide inhibiting compound). Insert cables into the terminals and tighten the set screws in accordance with values shown in Table B. This should result in the oozing of compound from between individual strands. Wipe off the excess compound.

Bolt the cable terminal connectors to the ends of the bars in the cable compartment. A non-oxidizing lubricant (such as D50H47 furnished with each equipment) can be used at these connection surfaces.

Lash the cables permanently to the cable supports.

11. Remove the lifting brackets from the front and rear channels. If equipment is furnished with "add-on" compartments, brackets at the rear cannot be removed.

12. Remove all blocking on relays and devices.

13. Make a final inspection to see that there are no tools, construction materials, or other foreign matter left in the switchgear.

TABLE B

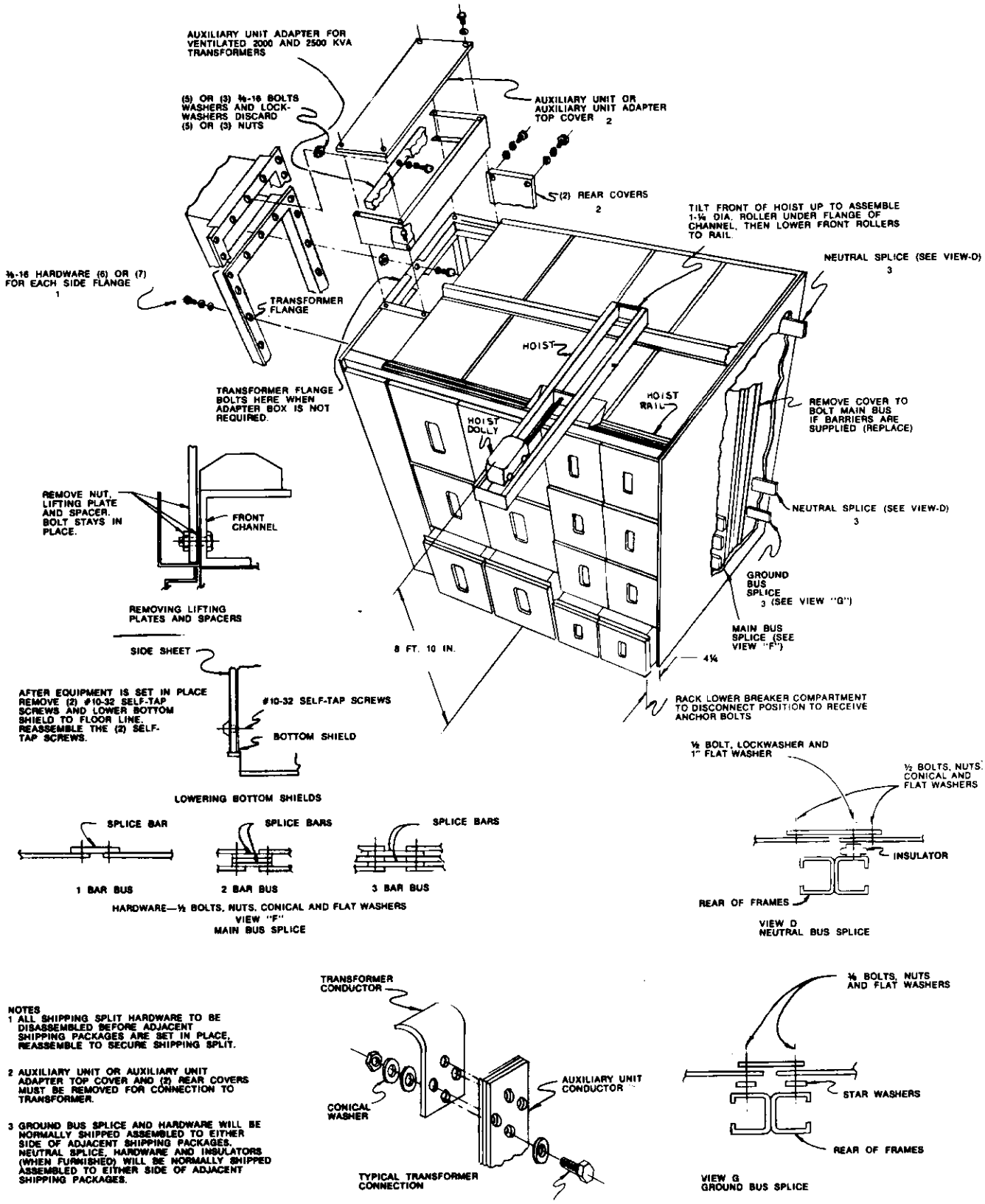
TORQUE VALUES FOR CABLE TERMINALS

Wire Size	*Inch-Pounds*	*Wire Size*	*Inch-Pounds*
6	100	350,000	250
5	100	400,000	250
4	100	500,000	300
3	125	600,000	300
2	125	700,000	300
1	125	750,000	300
0	150	800,000	400
00	150	900,000	400
000	200	1,000,000	400
0000	200	1,250,000	500
200,000	200	1,500,000	500
250,000	250	1,750,000	500
300,000	250	2,000,000	500

TABLE A

TORQUE VALUES FOR LOW VOLTAGE EQUIPMENT HARDWARE (COPPER OR ALUMINUM)

Bolt Size	*Foot Pounds*		
	With Finished Machine Nut		*With Prevailing Torque Locknut*
	Lockwasher And Flat Washer	*Conical Spring Washer And Flat Washer*	*Conical Spring Washer And Flat Washer Or Flat Washer Only*
¼-20	5-7	9	10
⅜-16	15-25	25	30
½-13	25-35	35	42
⅝-11	35-45	45	55



NOTES
1 ALL SHIPPING SPLIT HARDWARE TO BE DISASSEMBLED BEFORE ADJACENT SHIPPING PACKAGES ARE SET IN PLACE, REASSEMBLE TO SECURE SHIPPING SPLIT.

2 AUXILIARY UNIT OR AUXILIARY UNIT ADAPTER TOP COVER AND (2) REAR COVERS MUST BE REMOVED FOR CONNECTION TO TRANSFORMER.

3 GROUND BUS SPLICE AND HARDWARE WILL BE NORMALLY SHIPPED ASSEMBLED TO EITHER SIDE OF ADJACENT SHIPPING PACKAGES. NEUTRAL SPLICE, HARDWARE AND INSULATORS (WHEN FURNISHED) WILL BE NORMALLY SHIPPED ASSEMBLED TO EITHER SIDE OF ADJACENT SHIPPING PACKAGES.

FIG. 13 (0673D0500-265) Assembly of Indoor Equipment

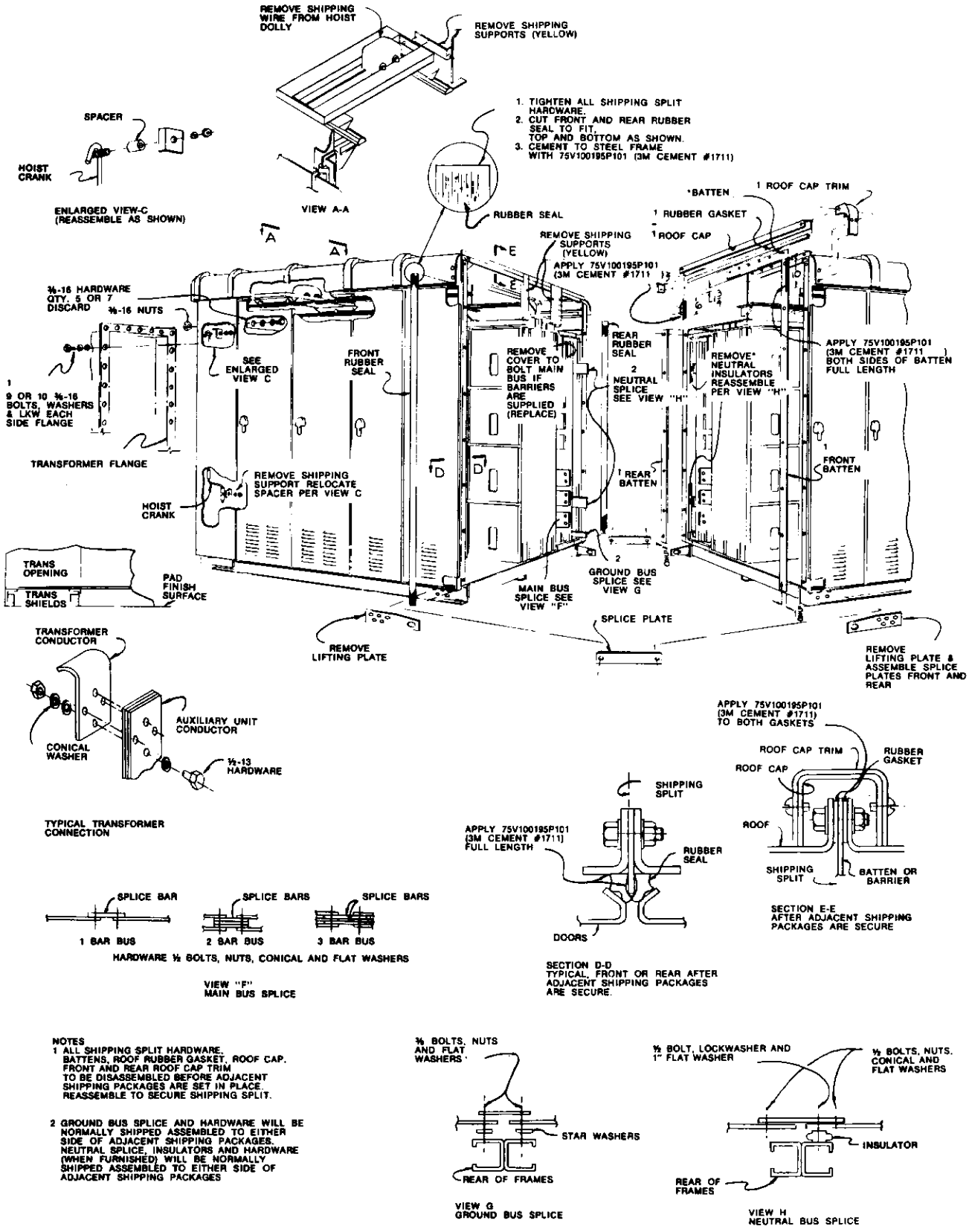


FIG. 14 (0673D0500-266) Assembly of Outdoor Equipment

ASSEMBLY OF EQUIPMENT (cont.)

14. Install the breaker hoist. When supplied with indoor equipment, this is shipped completely assembled in a separate carton. To install it, remove the lifting plates from the front of the equipment. Lift the hoist into position on top of the switchgear so that the end with the single roller is toward the rear of the equipment. A channel is provided on the top of the equipment which serves as the track for the single wheel on the rear of the hoist assembly. If space is available at the end of the equipment, the hoist may be assembled by sliding the rear wheel under the top leg of the channel and then lifting the front end of the hoist over the stop clip and positioning the front wheels so that they will straddle the tapered front track. If space at the ends of the equipment is restricted, the angle which is bolted to the hoist side frames immediately in front of the single rear roller must be removed. The rear wheel can then be hooked under the channel and the front wheels can be positioned on the front track. The retaining angle at the rear should then be reassembled. Stop clips are provided at each end of the front track to prevent the hoist from riding off the ends of the track.

When a hoist is provided with outdoor equipment, it is shipped mounted and secured in place. The yellow shipping supports at either end of the hoist movable track must be removed as shown in Figure 14. To free the hoist dolly, remove the wire that is used to keep it in place during shipment.

15. Before placing breakers in the equipment, check each breaker compartment for bolted joints in the primary disconnect bars. Where such joints exist, check the bolts for tightness. Refer to Table A for the proper torque values. Also check the contact areas on each primary disconnect bar or cluster of fingers for foreign matter that may have accumulated. Clean these areas if necessary. Be sure that a thin film of D50H47 grease covers the contact areas before putting a breaker in the compartment.

Check to see that the breakers match their respective compartments. Each breaker is assigned a part or mark number. This number is shown on the breaker sheets of the summary, the front view drawings, the breaker nameplate, and on the identification card on the breaker shipping carton.

To locate the breaker in the proper compartment, refer to the breaker location list on the front view drawing. Find the proper breaker by the identification card on the breaker carton, or the mark number on the breaker nameplate. All identical breakers will have the same mark number.

BREAKER INSERTION

Before installing or operating a breaker, refer to the breaker instruction manual for preoperation inspection and test. Check thoroughly for any damaged or loose parts and for any dirt or foreign matter which may be in the breaker. Be sure that a thin film of D50H47 grease is present on disconnects before installing the breaker.

HOISTING AND INSERTING AK BREAKERS

With the inner housing in the compartment in the CONNECTED position, proceed as follows:

1. Put the breaker in front of the unit in which it is to be installed. Be sure it is tripped.

2. Insert handle on jackscrew shaft located on left hand side of compartment.

3. Rotate handle counter-clockwise until jackscrew is stopped. (Indicator should read DISC). Inner house is now in the DISCONNECTED position.

4. Remove handle and open compartment door.

5. Rotate the two track lock links and pull the right track to the limit of its travel. See Figure 16A.

6. Pay out enough hoist cable to place the hooks in the slots on the breaker side frames. See Figure 16B.

CAUTION: *DO NOT UNWIND CABLE COMPLETELY FROM DRUM. OPERATING CRANK MUST TURN CLOCKWISE TO HOIST THE BREAKER, COUNTER-CLOCKWISE TO LOWER IT.*

7. Place the cable eye just under the ball nearest the hoist (fourth ball from the hooks) and take the slack out of the cable with the hoist. See Figure 16C.

WARNING: *DO NOT STAND UNDER BREAKER DURING HOISTING OPERATION.*

8. Raise the breaker until the breaker mounting pins are approximately one inch above the tracks. See Figure 16D.

9. Pull the remaining track out to the limit of its travel and lower breaker so the breaker mounting pins drop into the slots in the track. Remove the lifting device. See Figures 16E and F.

10. Push the breaker in against the track stops. Rotate the two track lock links to lock the breaker in place. Close the compartment door. See Figure 16G.

11. Insert handle on jackscrew shaft and rotate clockwise to move breaker into the compartment. Breaker is in CONNECTED position when jackscrew can no longer be rotated. (Indicator should read CONN).

HOISTING AND INSERTING AKR AND AKRU BREAKERS

With the inner housing in the compartment in the CONNECTED position proceed as follows:

1. Put the breaker in front of the unit in which it is to be installed. Be sure it is tripped.

2. Open the compartment door and remove the bolt with the yellow head and the shipping tag from the track assembly. Discard the bolt and tag.

3. Pull inner house forward as far as possible. It is now in the DISCONNECTED position.

4. Rotate the two track lock links, and pull the right track all the way forward. See Figure 16A.

5. These breakers require a spreader bar when hoisting them to avoid damaging their arc chutes. For hoisting, there are two slots in each of the breaker's side frames. When hoisting the non-fused breaker, the spreader bar's hooks are positioned in the forward slots. When hoisting the fused breaker, the hooks are positioned in the rear slots.

Pay out enough hoist cable to install one hook in the hole in the center of the spreader bar. Figure 17 shows a fused breaker, spreader bar and hoist cable.

CAUTION: *DO NOT UNWIND CABLE COMPLETELY FROM DRUM. OPERATING CRANK MUST TURN CLOCKWISE TO HOIST THE BREAKER; COUNTER-CLOCKWISE TO LOWER IT.*

6. Raise the breaker until the breaker mounting pins are approximately one inch above the tracks. See Figure 16D.

WARNING: *DO NOT STAND UNDER BREAKER DURING HOISTING OPERATION.*

7. Pull the remaining track out to the limit of its travel and lower breaker so the breaker mounting pins drop into the slots in the track. Remove the lifting device. See Figures 16E and F.

CAUTION: *THE TRACKS OF INNER HOUSES FOR AKR BREAKERS ARE EQUIPPED WITH PINS SO THAT BREAKERS OF AN INCORRECT RATING CANNOT BE SET ON THE TRACKS. THIS PREVENTS INSERTION OF A LOWER RATED BREAKER IN A COMPARTMENT.*

8. Engage the racking handle. This is done by pushing the trip button in the breaker escutcheon, sliding the cover below it to the right, and inserting the handle on the jackshaft.

9. Turn the handle counter-clockwise as far as it will go (if it will move in that direction) and remove the handle.

10. Push the breaker in against the track stops. Rotate the two track lock links to lock the breaker in place. Close the compartment door. See Figure 16G.

11. Engage the racking handle again as in Step 8, and rotate the handle clockwise as far as it will go. Towards the end, a high force requirement will be felt as the disconnect fingers on the breaker engage the stationary studs. A couple of turns later, and the stop will be encountered. The position indicator will now show CONN.

NOTE: *ALL BREAKER COMPARTMENTS DESIGNED FOR FUTURE USE HAVE PROTECTIVE BARRIERS INSTALLED THEREIN. SEE FIGURE 15.*

BREAKER REMOVAL—AK BREAKERS

1. Trip the breaker.

2. Insert handle on jackscrew shaft located on left hand side of compartment.

3. Rotate handle counter-clockwise until jackscrew is stopped. (Indicator should read DISC).

4. Remove handle and open compartment door.

5. Rotate the two track lock links and pull the breaker all the way forward. The breaker may now be lifted from the tracks by the lifting device.

BREAKER REMOVAL—AKR AND AKRU BREAKERS

1. Trip the breaker.

2. Engage the racking handle. This is done by pushing the trip button in the breaker escutcheon, sliding the cover below it to the right, and inserting the handle on the jackshaft.

3. Turn the handle counter-clockwise as far as it will go. If the breaker closing spring is fully charged, it will be discharged automatically a few turns before the end of the action. (Indicator should read DISC.)

4. Remove handle and open compartment door.

5. Rotate the two track lock links and pull the breaker all the way forward. The breaker may now be lifted from the tracks by the lifting device.

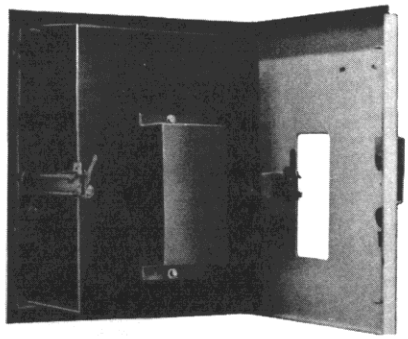


FIG. 15 (8042650) Provision for future breaker with protective barrier

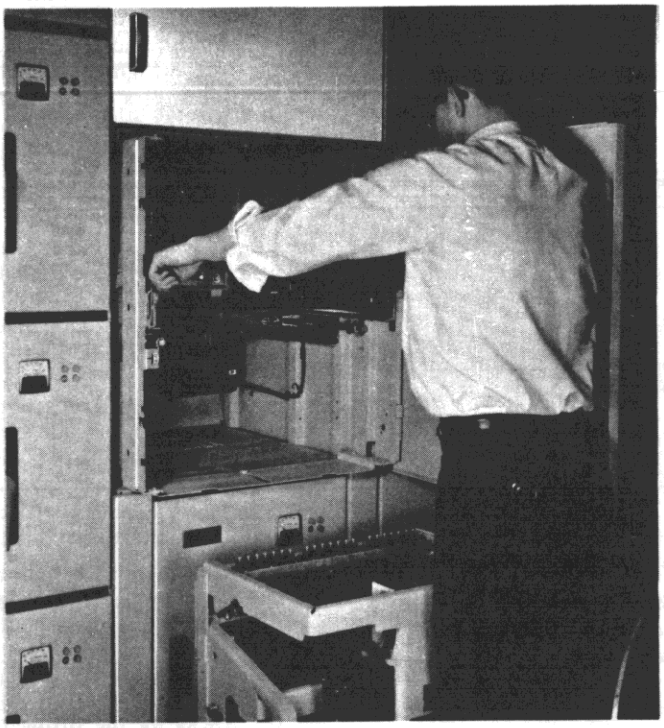


FIG. 16A (8035642) With innerhouse in DISCONNECTED position, open the compartment door. Rotate the two track lock links. Pull out right track completely

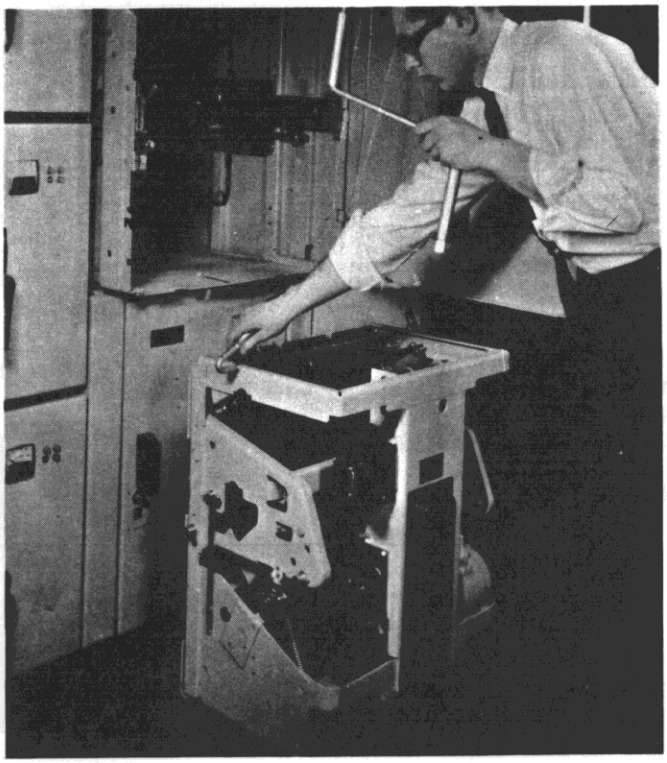


FIG. 16B (8035640) Let out Hoist Cable. Place hooks in slots

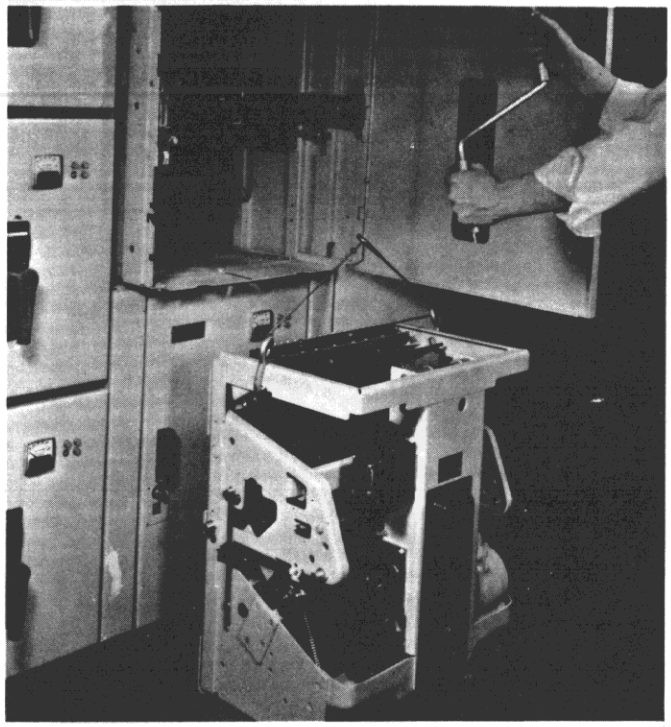


FIG. 16C (8035639) Adjust cable to balance breaker. Cable eye must be under ball nearest the hoist

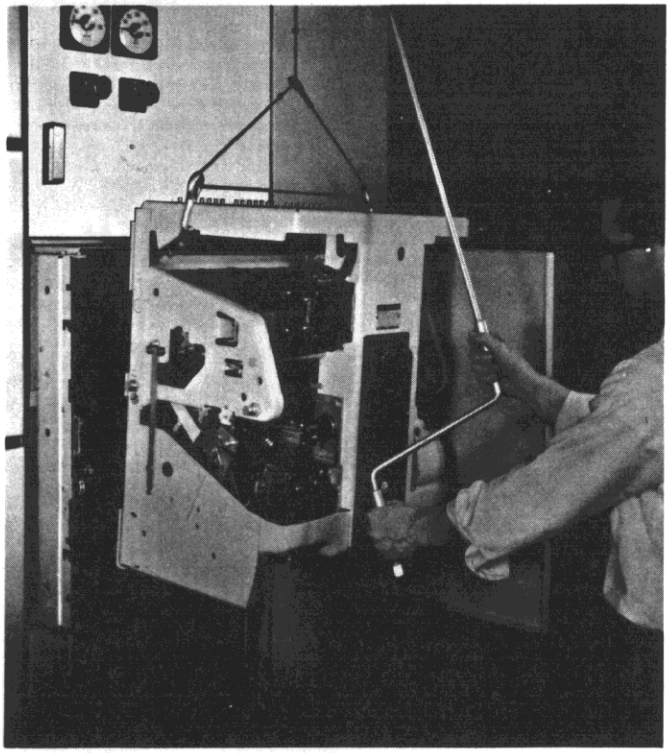


FIG. 16D (8035637) Raise breaker until mounting pins are about one inch above tracks

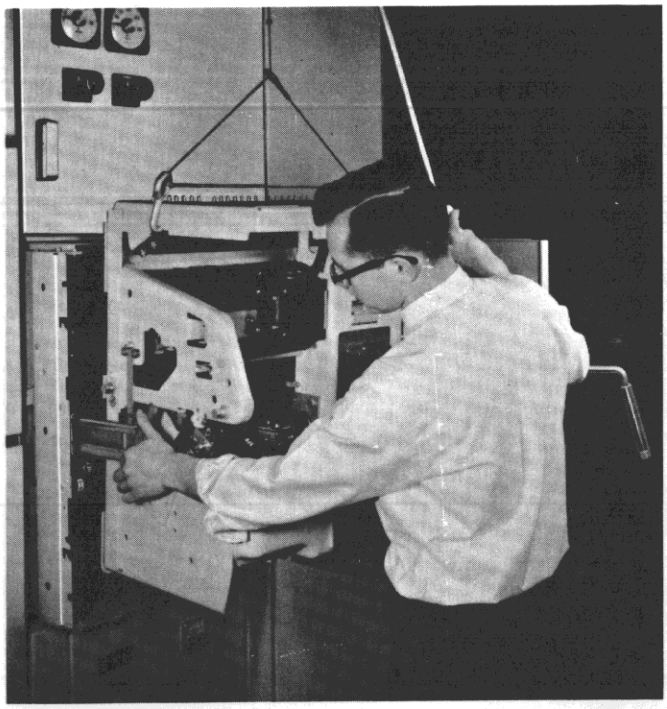


FIG. 16E (8035641) Pull left track out completely

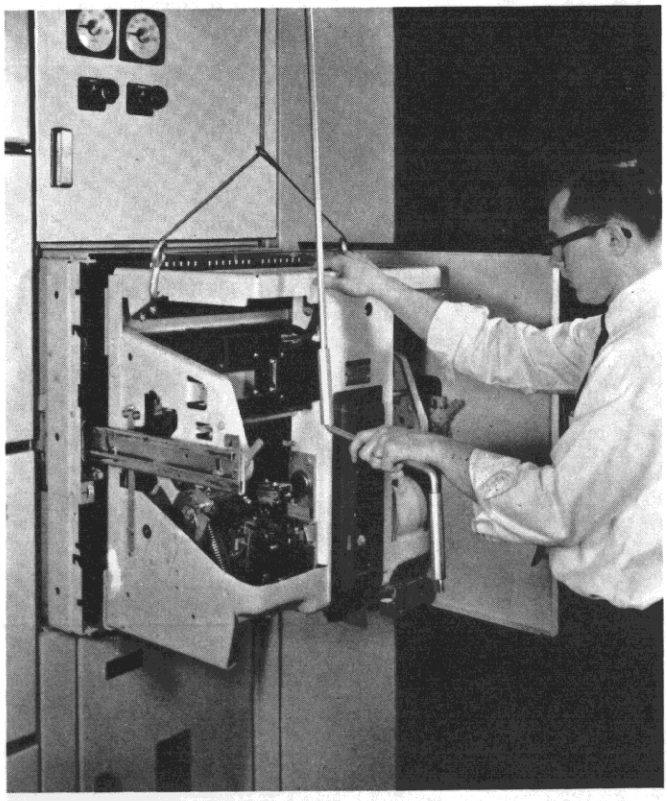


FIG. 16F (8035635) Lower the Breaker into the track slots. Remove the Hoist Cable

FIG. 16G (8035636) Push the breaker in completely and rotate the two track lock links. Close the door

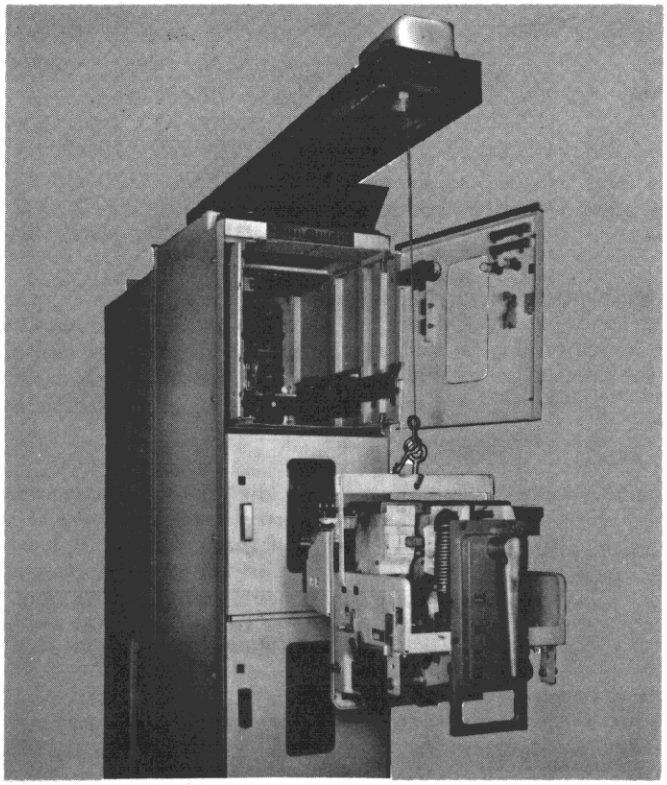


FIG. 17 (8041582) AKRU or AKR breaker and spreader on hoist cable

BREAKER OPERATION

CLOSING MANUALLY OPERATED AK BREAKERS

Manually operated AK breakers are closed by rotating the closing handle counter-clockwise through approximately 120 degrees, and then clockwise back to the normal handle position. Four such complete movements of the handle are required to close the breaker. During the four counter-clockwise movements and the first three clockwise movements of the handle, the springs are charged. After approximately 70 degrees travel of the fourth clockwise handle movement, the spring charged mechanism is driven over center and the breaker closes. A charge indicator, numbered 1 to 4, viewed through the breaker front escutcheon, moves with each complete handle movement and indicates the number of complete handle movements that have been performed.

CLOSING MANUALLY OPERATED AKR BREAKERS

Manually operated AKR breakers are equipped with a handle and a push button marked CLOSE on the front of the escutcheon. The closing spring must be charged first. A complete charge is accomplished by either rotating the handle counter-clockwise through about 135 degrees and then clockwise back to the normal position or by using three similar cycles of about 50 degrees each. The charge indicator should read CHARGED at this point. Now the breaker can be closed by pushing the CLOSE button.

CLOSING ELECTRICALLY OPERATED AK OR AKR BREAKERS

Electrically operated breakers may be operated by ac control power, or dc (normally station battery) control power.

They may be controlled by a pushbutton switch on the breaker escutcheon, by a breaker control switch, or by a relay contact. The control switch or relays may be located in the equipment which houses the breaker, or may be in some remote location.

MANUAL TRIPPING—AK OR AKR BREAKERS

A mechanically operated trip button, mounted on the breaker escutcheon, operates the trip shaft to open the breaker.

ELECTRIC TRIPPING—AK OR AKR BREAKERS

A shunt trip device is an accessory used for electrical tripping. A normally open auxiliary switch "a" contact opens the control circuit after the breaker opens.

NOTE: *FOR FURTHER INSTRUCTIONS REFER TO THE INSTRUCTION BOOK FURNISHED WITH THE BREAKER.*

TESTING AND INSPECTION

Although the equipment and devices have been tested at the factory, they must be tested and inspected in the field before being placed in service. This will insure that the equipment has been properly installed, and that all connections are correct.

All bolted connections and control wire connections should be checked for tightness.

WARNING: *PRIMARY EQUIPMENT MUST BE COMPLETELY DE-ENERGIZED WHILE TESTS ON CONTROL CIRCUITS, ETC. ARE BEING CONDUCTED. BE SURE THAT ALL AREAS OF FEEDBACK FROM SECONDARY CIRCUITS AS WELL AS OUTSIDE SOURCES ARE DISCONNECTED.*

Directions for testing relays, instruments and meters are given in the instruction book furnished for each device. The settings of protective relays must be coordinated with other relays on the system and therefore these relay settings must be made by the purchaser. General instructions on setting the relays are given in the Relay Instruction Book.

NOTE: *ALL BREAKERS ARE SHIPPED WITH THE TRIP DEVICES SET AT THE MINIMUM LEVEL. BEFORE ENERGIZING THE EQUIPMENT, CHECK TO SEE THAT ALL TRIP DEVICES ARE SET AT THE PROPER VALUES.*

The extent of the tests on the equipment as a whole will depend on the type and function of the equipment. Tests which should be performed, however, include circuit breaker operation, and switchgear metering, phasing, and grounding checks.

High potential tests to check the integrity of the insulation are not necessary if the installation instructions are carefully followed. If local codes demand this test or the purchaser wishes to make high potential tests, the voltage should not exceed 75% of the ANSI factory test voltage. For the power circuit the ANSI factory test voltage is two times switchgear rating plus 1000 volts.

CAUTION: *POTENTIAL TRANSFORMERS, CONTROL POWER TRANSFORMERS, AND ANY OTHER DEVICES CONNECTED TO PRIMARY CIRCUITS MUST BE DISCONNECTED DURING HIGH POTENTIAL TESTS.*

KEY INTERLOCKS

After initial installation of the switchgear equipment, all necessary interlock keys should be inserted into the appropriate locks and all spare keys should be placed in the hands of a responsible person. Refer to the key interlock schematic included in the summary furnished with the equipment to determine the sequence of operation and the correct number of operating keys required. This precaution is necessary since improper use of spare keys will defeat the interlocking scheme.

BREAKER OPERATION TEST

All compartments housing all AK and AKR circuit breakers have a TEST position, in which the breaker primary contacts are disconnected while the secondary contacts are still engaged. This TEST position permits complete testing of the electrical control circuit without energizing the primary power circuit. When the breaker is first put into service, its control circuit must be thoroughly tested while in this position to make sure that all closing and tripping circuits are complete and functioning properly.

The TEST position is not suitable for inspection and maintenance of the breaker, and should therefore be used only for testing breaker operation.

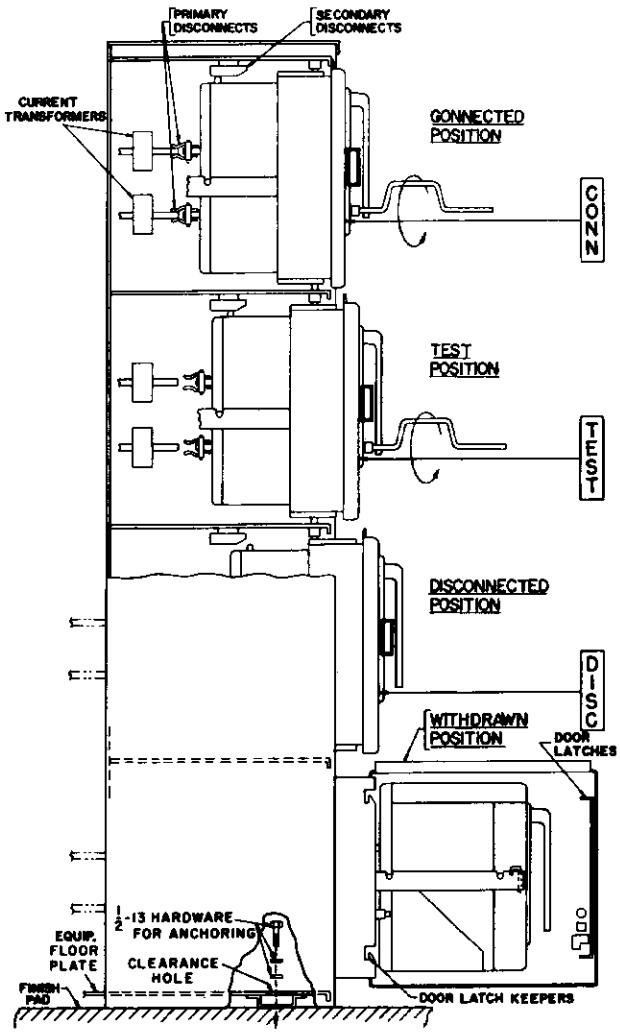


FIG. 18 (0121C1508) Side view of breaker stack

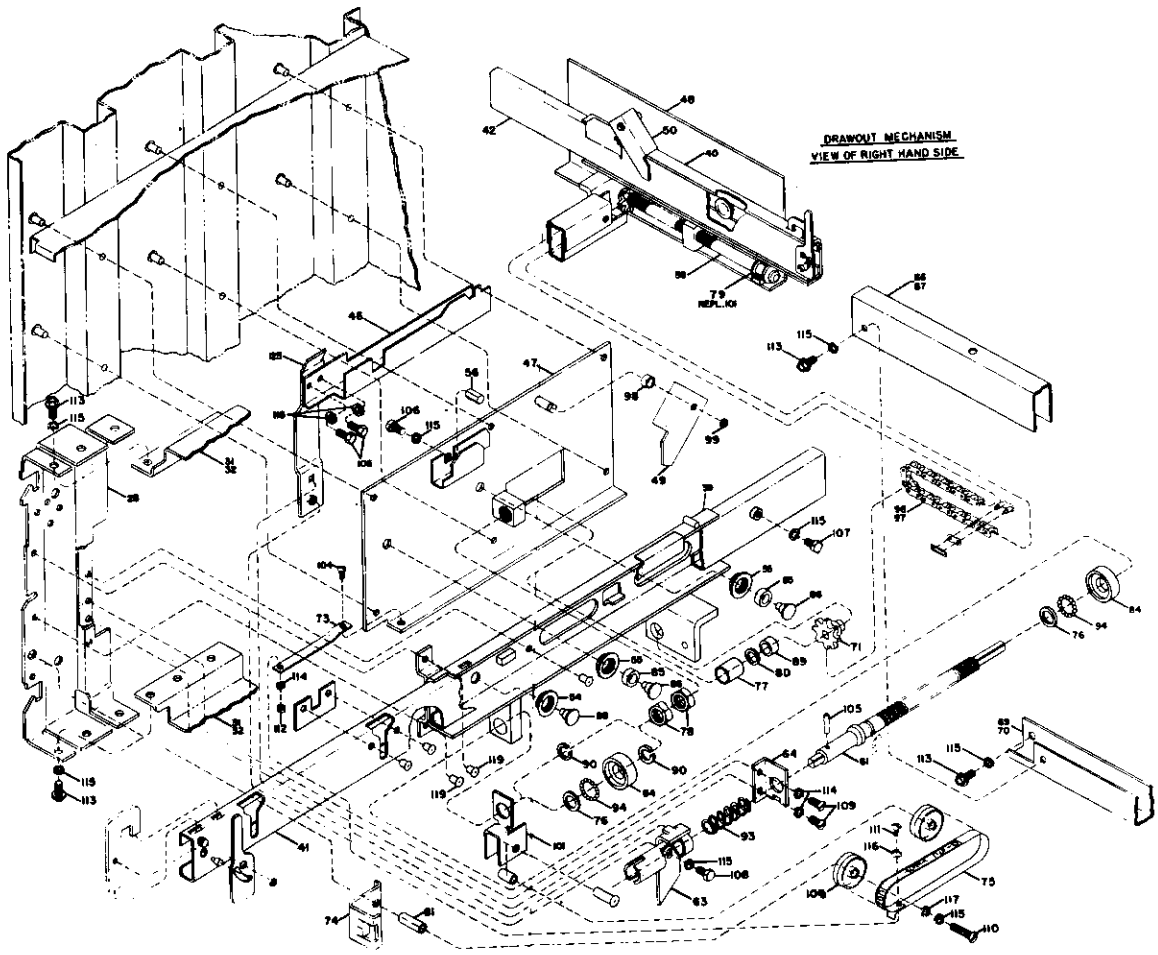


FIG. 19 (0625E0376) Rackout mechanism for AK breakers

RACKOUT MECHANISM OPERATION

AK BREAKERS

Part numbers in Figure 19 refer to part numbers on Drawing 0673D0500 Sheet 627 Groups 05 or 06.

The rackout mechanism is operated by pushing the handle onto the end of the jackscrew shaft and rotating the handle. Clockwise rotation moves the breaker into the house and counter-clockwise rotation moves the breaker out. Approximately 17 turns of the handle will move the breaker from the DISCONNECTED to the CONNECTED position. To properly engage the handle with the jackscrew shaft, the slot in the end of the handle should align with the pin through the shaft. When the pin is so aligned, the square hole in the handle will be engaged with the square drive end of the shaft.

The rackout mechanism is interlocked so that the circuit breaker must be open before the operating handle can be inserted. When the breaker is closed, an interlock link operated by the breaker cross bar blocks the interlock linkage on the rackout mechanism and prevents the tube (63) from being moved back to fully expose the square shaft end. The pin (105) in the jackscrew shaft engages in a slot in the tube. This slot prevents rotation of the shaft and also assures that the interlock linkage must be moved through a prescribed distance before operation of the mechanism is possible. When the tube is pushed back so that it will clear the pin, a cam surface on the interlock slide (46) engages a trip link on the side of the breaker and holds it trip free as long as the handle is engaged or the interlock tube is in the retracted position.

There is also a stationary cam in the house which holds the breaker trip free as it is moved between the CONNECTED and TEST positions. This stationary cam comes into operation before the primary disconnects have parted and is operable whether or not the rackout handle is engaged. The breaker thus cannot be closed when it is between the TEST and the CONNECTED positions. From the TEST to the DISCONNECTED position, the breaker can be closed when the rackout handle is disengaged and the pin in the jackscrew is aligned with the slot in the interlock tube so that the interlock linkage is in the reset position.

An indicator (75) which is visible through an opening in the front of the door shows the position of the breaker in the house. The TEST position is reached when the line on the indicator label marked TEST is aligned with the stationary line on the indicator housing. In this position, the breaker can be operated when the pin (105) and the slot in the interlock tube are aligned and the rackout handle is disengaged. The secondary control power disconnects are engaged and the primary power disconnects are open in this position.

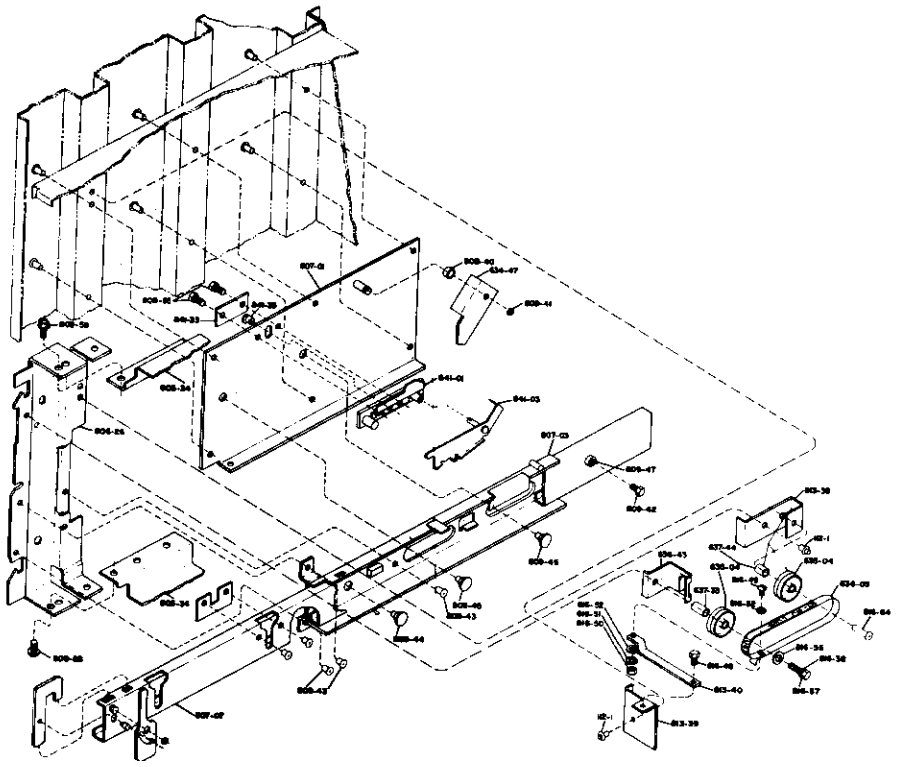


FIG. 20 (75E180001) Rackout mechanism for AKR breakers

The DISCONNECTED and CONNECTED positions are indicated by the sight indicator and by the jackscrew reaching the end of its travel. The adjusting nuts (78) are set so that when the CONNECTED position is reached, the pin and the interlock tube slot will be aligned and the breaker can be closed upon removal of the rackout handle. In the DISCONNECTED position, it may be necessary to rotate the jackscrew pin to match the slot in the interlock tube.

The motion of the rackout mechanism can be reversed at any point in the cycle by reversing the direction of rotation of the handle.

EMERGENCY OPERATION

If necessary, it is possible to remove the breaker from the house without using the rackout mechanism. This is done by rotating the track lock links after the breaker has been tripped and pulling the breaker manually off of the primary disconnects.

However, the breaker cannot be reinserted into the house far enough to engage the primary disconnects unless the stop links (49, 50) are retracted. The stop links retract automatically when normal racking procedures are used.

If it is necessary to insert the breaker into the house when the rackout mechanism is in the CONNECTED position, the stop links must be retracted and held until the interference pin or the breaker mounting pin has passed the stop link. It is recommended that the stop link be held up with masking tape when attempting to insert the breaker in this manner. The inertia of the breaker can then be used to aid in pushing it onto the primary disconnects.

RACKOUT MECHANISM OPERATION

AKR BREAKERS

Part numbers in Figure 20 refer to sheet and part numbers in the 0673D0500 series of drawings.

The rackout mechanism for AKR breakers is mounted on the breaker itself and a description and details of this mechanism are given in Maintenance Manual GEK-7310.

The rackout mechanism is operated by pushing the handle onto the end of the jackscrew shaft and rotating the handle. Clockwise rotation moves the breaker into the house and counter-clockwise rotation moves the breaker out. Approximately 18 turns of the handle will move the breaker from the DISCONNECTED to the CONNECTED position.

The rackout mechanism is interlocked so that the circuit breaker must be open before the operating handle can be inserted. When the breaker is closed, an interlock link operated by the breaker mechanism locks the sliding cover over the racking screw in the breaker escutcheon. To insert the racking handle the trip button must be depressed, and the sliding cover pushed to the right. When the handle is inserted the cover is held open and the breaker is in a trip free condition. As long as the handle is engaged, the breaker remains trip free.

There is also a stationary cam in the house which holds the breaker trip free as it is moved between the CONNECTED and TEST positions by keeping a lever which is connected to the breaker trip shaft in the raised position. See Figure 20, part 841-01. This stationary cam comes into operation before the primary disconnects have parted and is operable whether or not the rackout handle is engaged. The breaker

thus cannot be closed when it is between the TEST and the CONNECTED positions. From the TEST to the DISCONNECTED position, the breaker can be closed when the rackout handle is disengaged.

An indicator, 636-03, which is visible through an opening in the front of the door, shows the position of the breaker in the house. The TEST position is reached when the line on the indicator label marked TEST is aligned with the stationary line on the indicator housing. In this position, the breaker can be operated when the rackout handle is disengaged. The secondary control power disconnects are engaged and the primary power disconnects are open in this position.

The DISCONNECTED and CONNECTED positions are indicated by the sight indicator and by the rackout mechanism reaching the end of its travel. The adjusting nuts on the rackout mechanism (located on the breaker) are set to stop the rotation of the racking arms at the correct points at both ends of the action. The motion of the rackout mechanism can be reversed at any point in the cycle by reversing the direction of rotation of the handle.

CAUTION: *WHEN MOUNTING AN AKR TYPE BREAKER ON THE TRACKS PRIOR TO INSERTION, BE SURE THAT THE INNER HOUSE IS PULLED OUT AS FAR AS POSSIBLE TO THE DISCONNECTED POSITION BEFORE PULLING THE TRACKS OUT. SEE "HOISTING AND INSERTING AKR AND AKRU BREAKERS" ON PAGE 17. IF AN ATTEMPT IS MADE TO SET A BREAKER ON THE TRACKS AND PUSH IT INTO THE COMPARTMENT WHILE THE INNER HOUSE IS IN THE CONNECTED POSITION, IT WILL NOT GO ALL THE WAY IN BECAUSE IT WILL BE BLOCKED BY THE STOP LINKS (634-47 IN FIGURE 20). AT THIS POINT THE TRACK LOCK LINKS CANNOT BE ROTATED TO THE LATCHED POSITION AND THE RACKOUT MECHANISM WILL NOT FUNCTION CORRECTLY.*

NOTE: *THE "EMERGENCY OPERATION" DESCRIBED FOR AK-75/100 BREAKERS ON PAGE 25 CANNOT BE PERFORMED FOR AKR OR AKRU BREAKERS DUE TO DIFFERENCES IN THE DRAWOUT MECHANISMS.*

KEY INTERLOCKS

KEY INTERLOCKS FOR AK BREAKERS (OPTIONAL)

Part numbers in Figure 21 refer to sheet and part numbers in the 0673D0500 series of drawings.

The key interlock is mounted with two one-way screws and lock washers to the left side of the inner house.

The interlock system is designed so that the key may be removed from the lock only if the breaker is tripped and the lock bolt is extended. When the bolt is extended, the breaker is rendered trip free only in the CONNECTED position in the house.

The breaker may be operated (closed and tripped) in the TEST or DISCONNECTED positions even when the lock bolt is extended and the key removed.

The operation of the key interlock should be checked as follows:

1. With the breaker in the CONNECTED position, manually trip the breaker. This then allows the interlock trip slide (622-66) to be pushed in. The preferred way to do this is with the rackout operating handle. When the trip slide is in, the lock bolt may be extended and the key removed. The interlock slide may then be allowed to return to its normal reset position. The breaker will remain trip free in the CONNECTED position until the key is returned and the lock bolt is retracted.

2. If desired, the breaker may be moved to either the TEST or the DISCONNECTED position while the key is removed from the lock. In these positions the breaker can be operated for checking or maintenance.

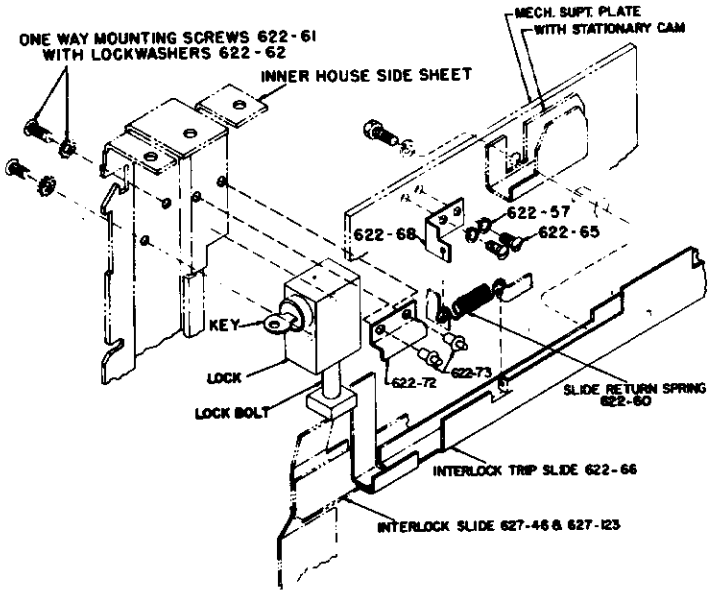


FIG. 21 (0121C1507) Key Interlock for AK breakers

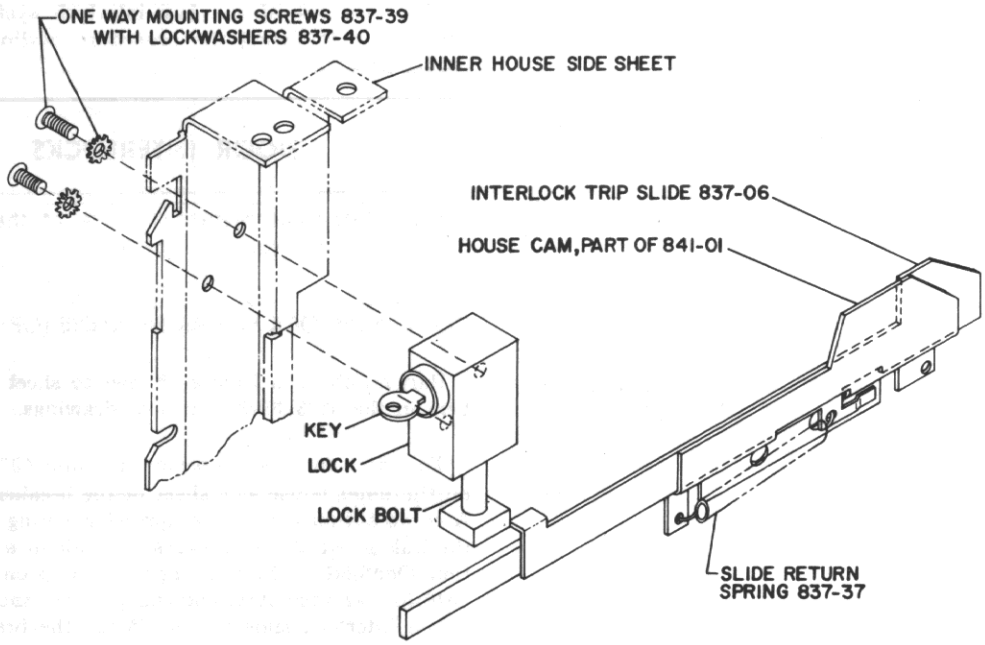


FIG. 22 (75C150021) Key Interlock for AKR breakers

KEY INTERLOCKS FOR AKR BREAKERS (OPTIONAL)

The key interlock is mounted with two one-way screws and lock washers to the left side of the inner house.

The interlock system is designed so that the key may be removed from the lock only if the breaker is tripped and the lock bolt is extended. When the bolt is extended, the breaker is rendered trip free only in the CONNECTED position in the house.

The breaker may be operated (closed and tripped) in the TEST or DISCONNECTED positions even when the lock bolt is extended and the key removed.

The operation of the key interlock should be checked as follows:

1. With the breaker in the CONNECTED position, manually trip the breaker. This then allows the interlock trip slide (837-06) to be pushed in. When the trip slide is in, the lock bolt may be extended and the key removed. The breaker will remain trip free in the CONNECTED position until the key is returned and the lock bolt is retracted.

2. If desired, the breaker may be moved to either the TEST or the DISCONNECTED position while the key is removed from the lock. In these positions the breaker can be operated for checking or maintenance.

KEY INTERLOCKS FOR FUSE ROLLOUTS (INCLUDED)

AK breakers that are used in AKD-6 switchgear cannot be equipped with fuses as an integral part of the breaker assembly. When fuses are required with these breakers, they are mounted inside a drawout frame similar to that used for the breaker. This assembly is known as a fuse rollout element, and a typical model is shown in Figure 23. A hinged panel made of perforated steel is positioned in front of the fuses so that they cannot be reached if the compartment door is opened. An interference angle is attached to the left side of this panel to prevent it from being swung open unless the fuse rollout is fully withdrawn.

The fuse rollout is usually located in a modified breaker compartment directly below the compartment for the breaker with which the fuses will be used. It is put into this compartment the same way an AK breaker is inserted into a compartment. See Page 16.

NOTE: *THE KEY LOCK BOLT IN THE FUSE ROLLOUT COMPARTMENT MUST BE RETRACTED BEFORE THE ROLLOUT CAN BE RACKED INTO THE CONNECTED POSITION.*

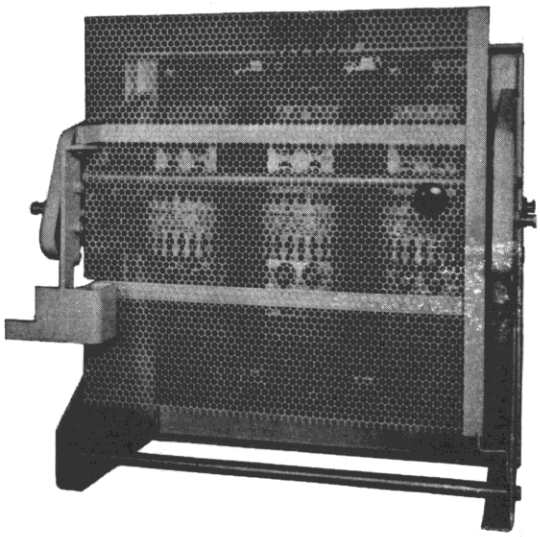


FIG. 23 (8040045) Fuse Rollout used with AK breakers

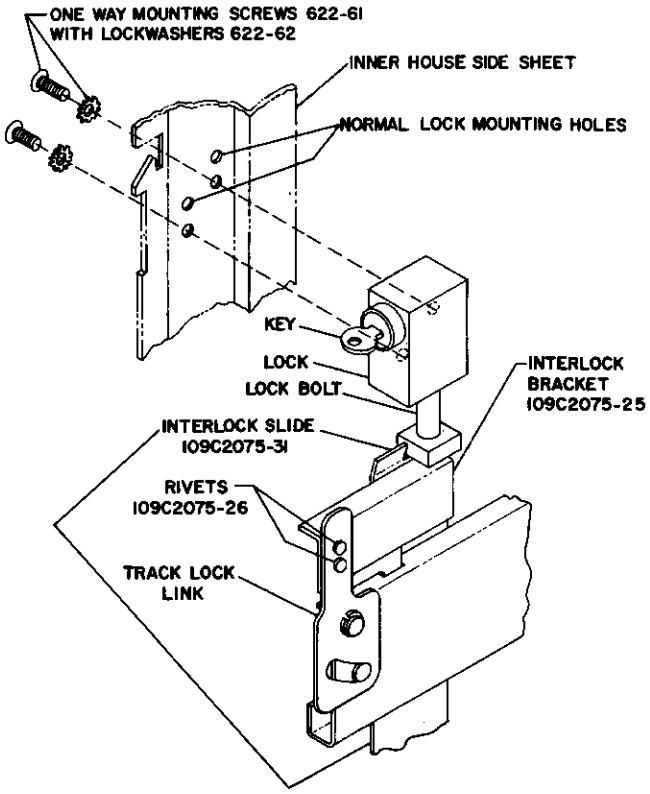


FIG. 24 (75C150022) Key Interlock for Fuse Rollout compartment

There is a key interlock system required in the equipment to keep the fuse rollout in the CONNECTED or DISCONNECTED position unless the breaker associated with it is locked open. A key interlock is installed in the breaker compartment in the normal position. (See Page 26) A companion key interlock is installed in the fuse rollout compartment. Figure 24 shows the position of the interlocking devices in this compartment when the key lock bolt is extended. Note that the interlock slide is held forward so that the racking wrench cannot be placed over the jackscrew shaft. This prevents the fuse rollout from being racked out of its compartment. Note also the interlock bracket shown in Figure 24. This holds the track lock link in the closed position when the lock bolt is extended and prevents the fuse rollout from being pulled out of the CONNECTED position by rotating the track lock links.

In Figure 24 the part numbers refer to sheet and part numbers in the 0673D0500 series of drawings except when a full drawing number is shown.

When the equipment is operating normally with the breaker closed, the interlock key is retained in the lock in the breaker compartment. In order to withdraw the fuse rollout, the associated breaker must be tripped, the interlock slide pushed in, the lock bolt extended, and the key removed. The key is then placed in the lock in the fuse rollout compartment and the lock bolt is retracted. Now the fuse rollout can be racked out to the DISCONNECTED position.

The operation of the key interlock system should be checked by following the procedure outlined in the preceding paragraph.

DOOR INTERLOCKS

These interlocks prevent opening of the compartment door when the breaker is closed.

DOOR INTERLOCK FOR AK BREAKERS (OPTIONAL)

Part numbers in Figure 25 refer to sheet and part numbers in the 0673D0500 series of drawings.

This door interlock consists of a link (074-03) mounted on the inner house side sheet of the breaker compartment. A combination torsion, compression spring is mounted on the link pivot pin and biases the link in a forward direction. One end of the link engages a clip on the door latch (640-02), and the other end engages with the rackout mechanism interlock slide 627-46. When the breaker is closed, a link operated by the breaker cross bar engages in a slot in the interlock slide. This prevents the slide from moving back, and then the door handle cannot be lifted.

When the breaker is open, the interlock slide is released from the link actuated by the breaker. It can now be moved back by pushing it in. The preferred way to do this is to use the rackout handle. The door can then be unlatched by raising the handle while the interlock slide is held in the retracted position.

If required, the door interlock can be defeated. A small hole is provided in the door in front of the interlock link. By inserting a tool such as a screwdriver through this hole, the link can be pushed back until it is free of the door latch. With the link held in this manner, the door latch can be raised and the door opened.

DOOR INTERLOCK FOR AKR BREAKERS (OPTIONAL)

Part numbers in Figure 26 refer to sheet and part numbers in the 0673D0500 series of drawings.

This door interlock does not operate in conjunction with the compartment door latch. It consists of a hook (844-04), link (844-03), spring (844-35), and bracket (844-05) all mounted on the rear of the compartment door. See Figure 26. When the door is open, the spring pulls down on the hook, and the assembly is held against the back of the door. When the door is closed with an open breaker in the compartment, the bracket on the breaker pushes against the bottom of the link (844-03) and rotates the top of the link away from the door. When the door is closed and latched, the link and hook assume the positions shown in the "Door Closed" portion of Figure 26. When the breaker is closed, the keeper swings up and under the hook, and the door cannot be opened.

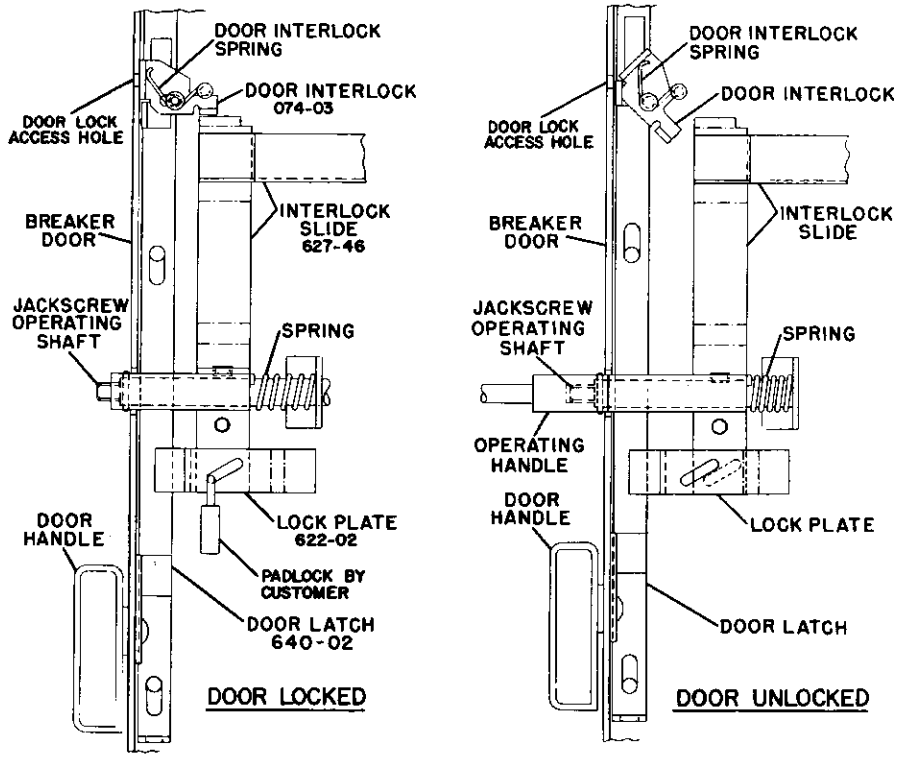


FIG. 25 (0121C1509) Door Interlock and Padlock device for AK breakers

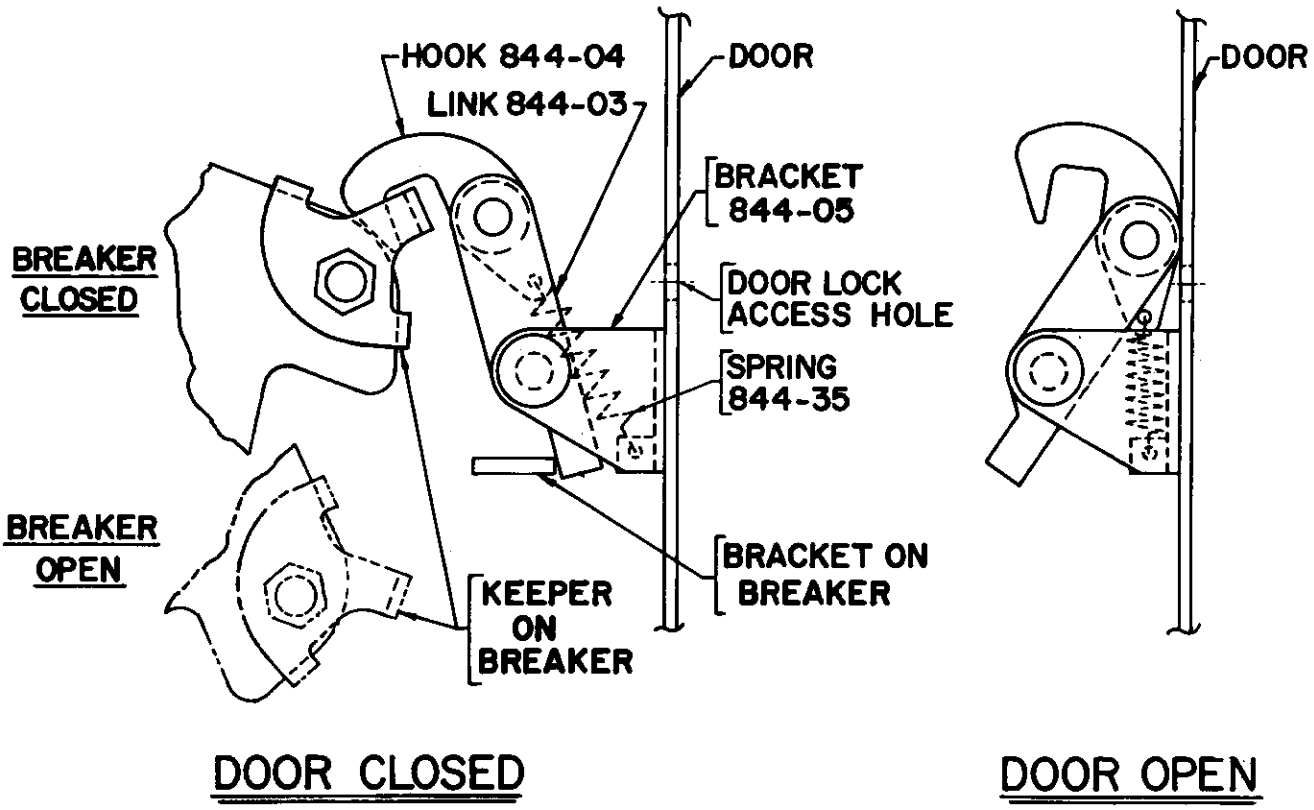


FIG. 26 (75C150023) Door Interlock for AKR breakers

When the door is closed with a closed breaker in the compartment, the bracket on the breaker causes the link to rotate away from the door. However, when the slope on the back side of the hook contacts the keeper, the hook will be lifted over the top of the keeper and will again drop into the position shown in Figure 26, thereby holding the door closed.

When the breaker is opened, the keeper swings down and away from the hook, and the compartment door can be opened.

If required, this door interlock can be defeated by inserting a small tool such as a screwdriver through the hole in the door above the bracket. This will push the lower part of the hook toward the rear of the compartment and the top will move up and away from the keeper. With the hook held in this position, the door can be unlatched and opened.

RACKOUT MECHANISM PADLOCK DEVICES

These devices are arranged so that the rackout mechanism may be padlocked in certain positions to prevent unauthorized operation.

PADLOCK DEVICE FOR AK BREAKERS (OPTIONAL)

This accessory consists of a slotted piece (622-02) which is riveted to the inner house side sheet. The slot matches the slot of the extension on the interlock slide. See Figure 25. When one to three padlocks are inserted into the slot in the plate, the interlock slide cannot be retracted and the jackscrew cannot be turned. The rackout mechanism can be locked anywhere in its travel. It is necessary to open the compartment door in order to place the padlocks in the device, but once the locks are secured, there is no interference with the door and the door may be opened or closed at will.

PADLOCK DEVICE FOR AKR BREAKERS (OPTIONAL)

This accessory consists of two plates, each having holes for padlock shackles. One of the plates is bolted to the unit side sheet and the other to the inner house. They occupy the upper left corner of the compartment. See Figure 7 for a pictorial view of the device. The holes match when the inner house is in the TEST or DISCONNECTED position, and these are the only two positions in which the rackout mechanism can be locked. Only one padlock can be used with this device. If more padlocks are required, a lockout device is furnished. This has a single ring and provisions for locking the ring with six padlocks, thus performing the multiple padlock function. The compartment door must be opened to put the padlock or lockout device on, but there is no interference with the door after they have been placed in position.

NOTE: *PADLOCK SHACKLE THICKNESSES MUST BE FROM ¼" TO ⅜" THE SUGGESTED THICKNESS IS 5/16". THIS APPLIES TO DEVICES FOR BOTH AK AND AKR BREAKERS.*

MAINTENANCE

A periodic maintenance schedule must be established to obtain the best service from the switchgear. An annual check and overall maintenance procedure for the switchgear devices and all connections should be followed as a minimum requirement. Equipment subject to highly repetitive operation may require more frequent maintenance.

A permanent record of all maintenance work should be kept. The record should include a list of periodic checks and tests made, the date they were made, the condition of the equipment and and any repairs or adjustments that were performed. Maintenance employees must follow all recognized safety practices, such as those contained in the National Electrical Safety Code and in company or other safety regulations during maintenance.

WARNING: *SOLID INSULATION SURROUNDING AN ENERGIZED CONDUCTOR AND POWER APPARATUS MUST NEVER BE RELIED UPON TO PROVIDE PROTECTION TO PERSONNEL.*

For specific information regarding the maintenance of devices, such as circuit breakers, relays, meters, etc., refer to the separate instruction book furnished for each device.

BREAKER AND INSTRUMENT COMPARTMENTS

Breakers—Test and inspect all circuit breakers for proper operation as follows:

a. Operate each breaker while in the TEST position and check all functions. This is particularly important for breakers that normally remain in either the opened or closed positions for long periods of time.

WARNING: *PRIMARY EQUIPMENT MUST BE COMPLETELY DEENERGIZED WHILE TESTS ON CONTROL CIRCUITS, ETC. ARE BEING CONDUCTED. BE SURE THAT ALL AREAS OF FEEDBACK FROM SECONDARY CIRCUITS AS WELL AS OUTSIDE SOURCES ARE DISCONNECTED.*

b. Remove the breakers from their compartments to a clean maintenance area. Perform the maintenance operation suggested in the appropriate breaker maintenance manual.

WARNING: *DE-ENERGIZE EQUIPMENT COMPLETELY BEFORE DOING MAINTENANCE WORK ON ANY DEVICES, CONNECTIONS, BUS WORK, BREAKER OR FEEDER CABLE COMPARTMENTS. THIS INCLUDES DE-ENERGIZING ANY CONNECTIONS TO OUTSIDE PRIMARY OR SECONDARY SOURCES, SUCH AS TRANSFORMERS, TIE LINES, ETC.*

INSTRUMENTS, INSTRUMENT TRANSFORMERS AND RELAYS

Check and inspect all devices to see that they are functioning properly. Check that all electrical connections are tight. Check mounting of the device.

BREAKER COMPARTMENT INTERIORS

a. Thoroughly clean interior of the breaker and instrument compartments. Use a vacuum cleaner and clean rags only. Do not use steel wool or oxide papers. Blowing with compressed air is not recommended.

b. Check indicating devices, mechanical and key interlocks.

c. Check primary disconnecting device contacts for signs of abnormal wear or overheating. Discoloration of the silvered surfaces is not ordinarily harmful. These contacts should be cleaned only by wiping with a lint-free cloth.

Before replacing the breaker, check the alignment and wipe off the primary disconnecting device contacts. Apply a thin coat of contact lubricant D50H47 to the house studs and fingers and to the primary disconnects on the breaker.

BUS COMPARTMENT

Before the following can be performed, remove the steel formed cover between units if such covers have been furnished with the equipment.

a. Inspect the buses and connections carefully for evidence of overheating or weakening of the insulating supports.

b. Check all connection bolts in the bus compartment and all bus mounting and bracing bolts for tightness.

c. Wipe and vacuum clean the buses and supports.

d. Check the insulation on the bars that run from the breaker studs through the bus structure to the cable compartment.

e. After cleaning, megger and record the resistance to ground and between phases of all insulated bars, and all buses and connections. Disconnect all control circuits before checking resistance. Do not use over a 1500 volt megger. Since definite limits cannot be given for satisfactory insulation resistance values, a record must be kept of the readings. Weakening of the insulation from one maintenance period to the next can be recognized from the recorded readings. The readings should be taken under similar conditions each time, if possible, and the record should include the temperature and humidity.

FEEDER CABLE AND BUSWAY COMPARTMENT

a. Inspect all main cable connections for signs of overheating, and tighten all connections.

b. Check all bolts that hold cable terminals to the connection bars for tightness.

c. Check neutral bus and ground bus connection and mounting bolts for tightness.

d. Check that all secondary control wiring connections are tight and that all control cabling is intact.

OVERALL SWITCHGEAR

a. Clean and inspect all painted surfaces and retouch where necessary.

b. Check to see that all anchor bolts and other structural bolts are tight.

c. Check that all breaker and instrument compartment door latches operate properly.

Under normal conditions, the protective relays do not operate; therefore, it is important to check the operation of these devices regularly. Refer to the Relay Instruction Book for detailed instructions.

PAINT REFINISHING

Indoor switchgear is finished with ANSI-61 Gray Glidden Aqualure Paint, Cat. 478-E-02115, which is applied with an electrostatic spray system and is oven baked. To refinish damaged areas, remove all loose paint, rust, scale, oil or grease. Sand any scratches smooth. Apply ANSI-61 Gray Glidden Semi-gloss Tie-Cote Lacquer, Cat. 468-E-02111, using a spray can supplied by the factory for touch-up purposes.

Outdoor switchgear is finished with an additional coat of ANSI-61 gray paint over the baked finish. The primer for the second coat is ANSI-61 gray Glidden Semi-gloss Tie-Cote Lacquer Cat. 468-E-02111 and the final coat is Diamond Vogel ANSI-61 Gray Acrylic Lacquer Cat. IC-0702. To refinish damaged areas, remove all loose paint, rust, scale, oil or grease. Sand any scratches smooth. Spray with ANSI-61 Gray Glidden Semi-gloss Tie-Cote Lacquer Cat. 468-E-02111 as a prime coat, and finish coat by spraying with Diamond Vogel ANSI-61 Gray Acrylic Lacquer Cat. IC-0702, using spray cans supplied by the factory.

GENERAL ELECTRIC CO.
DISTRIBUTION EQUIPMENT DIVISION
PLAINVILLE, CONN. 06062

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Printed
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