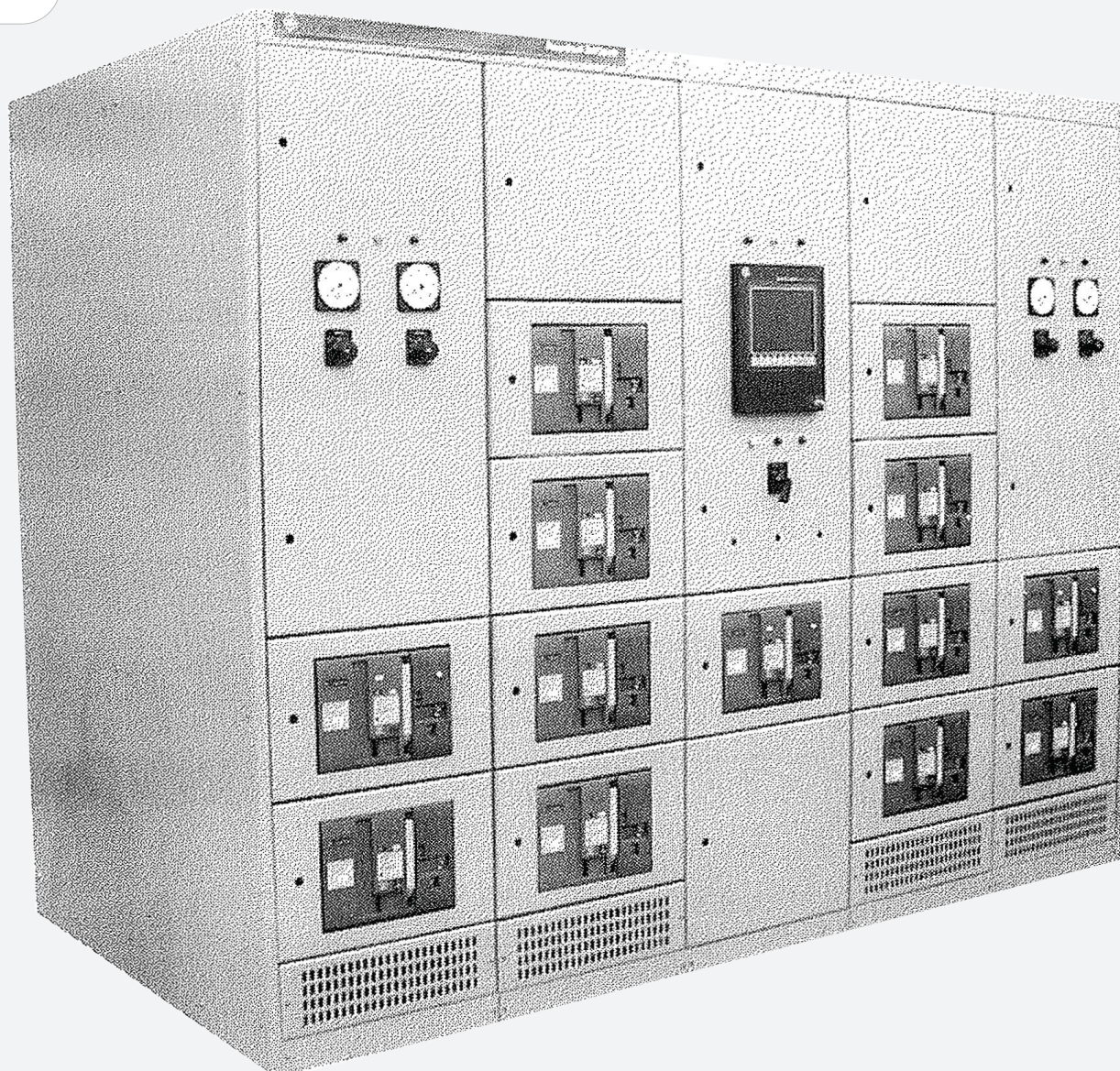


INSTALLATION AND MAINTENANCE [GE LEGACY DOCUMENT]

Power-break II switchboards

GE legacy product
documentation



GEH-5546
POWER BREAK II SWITCHBOARDS
INSTALLATION AND MAINTENANCE

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These instructions do not purport to cover all details or variations in equipment nor do they 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 purpose, the matter should be referred to the General Electric Company.

SECTION 1—Introduction

A. General

This manual contains procedures for receiving, handling, storage, equipment installation, testing and inspection, and maintenance and service of POWER BREAK II Switchboards, which is manufactured by General Electric Company, 510 East Agency Rd., Burlington, Iowa, 52601, USA.

NOTE: The personnel responsible for installing, operating and servicing this equipment should be thoroughly familiar with the contents of this manual.

Before any installation work is performed, thoroughly read and understand the material in this instruction manual and the drawings furnished with the equipment. The documentation shipped with the equipment includes:

1. General arrangement drawings, including the front view and floor plan.
2. Elementary and connection drawings, which indicate and identify test and connection points including terminal blocks, device studs, switch development contacts and remote connections.
3. Summary of switchboard equipment, which is a list of all electrical and mechanical components furnished with the equipment.
4. This instruction manual, and when required, manuals for the ground fault system and instructions for crimp-style (compression) cable lugs.

This material is located in a forward compartment as noted on a label on the top header of each section. The documentation provides all of the information necessary for installation of the switchboard.

When requesting information from General Electric Company, please include the complete data appearing on the equipment nameplate - the GE Requisition Number, Summary Number and Elementary Diagram Number. This 1 1/4 inch high by 2 3/8 inch wide nameplate is located on bottom left-front corner of the first vertical section (looking at the front of the line-up, starting from the left) of the complete line-up.

When requesting information concerning any specific item furnished with the switchboard, refer to that item by description, part number, its location within this manual, and any applicable drawing number. Any material external to the equipment, which may be required to meet local codes (such as mats, screens, railings, etc.), is not furnished by General Electric Company.

Addendums to this instruction book are the available service and maintenance publication supplied separately for circuit breakers, relays and other devices not described in this instruction book.

If there are any questions or requirements not covered in this manual or in the accompanying drawings, please contact the local sales office of General Electric Company.

SECTION II—Receiving, Handling and Storage

A. Receiving

A.1. Equipment Packages

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

NOTE: To avoid the loss of any parts when unpacking, the contents of each container should be carefully checked against the packing list before discarding the packing material.

The contents of each shipping package are listed on the Master Packing List. In addition, this list includes the number of the shipping crate in which miscellaneous parts needed to install and operate the equipment (such as hardware, contact lubricant, touch-up paint, breaker closing devices, etc.) are located. Normally, such devices are packed in a cardboard carton and the carton secured in an empty compartment. If such items are packed in a section instead of a separate crate, the list will indicate the appropriate section 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.

A.2. Inspection for Damage

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 equipment, immediately perform a visual inspection to ascertain if any damage has been sustained in shipping or if there are any loose parts.

All drawout circuit breakers are shipped separately in individual containers with the breaker in the open position. Circuit breakers should be unpacked and visually inspected for damage or loose parts as soon as possible after they have been received.

Be sure to inspect all devices mounted or packed inside compartments of each section to see if any have been dislodged or damaged.

A.3. Filing A Claim

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

SECTION II—Receiving, Handling and Storage

B. Handling

NOTE: It is preferable to leave the shipping skids in place under the switchboard until it reaches its final location. The equipment should be installed in its final location before installing the drawout circuit breakers

B.1. Lifting

The switchboard sections are best handled by lifting with a crane as shown in Fig. II-1. Removable lifting plates are provided, as standard equipment, on the top of each switchboard section. To preserve the external appearance of the equipment, it is suggested that the lifting plates be left in place except where adjacent equipments must be bolted together, i.e. shipping splits, etc.

Utilize four equal length cables and an overhead crane, each with a minimum load rating of twice the weight of the equipment and any installed devices.

Example: Switchboard and Device Weight = 5,000 pounds. The crane and the four lift cables must have a minimum load lifting capacity of 10,000 lbs.

NOTE: The angle between the cables and the top of the equipment must be at least 45 degrees. If this is not possible because of lack of head space, spreader bars must be used. Also, lift cables with greater load capability may be necessary, depending upon the angle between the cables and the crane hook.

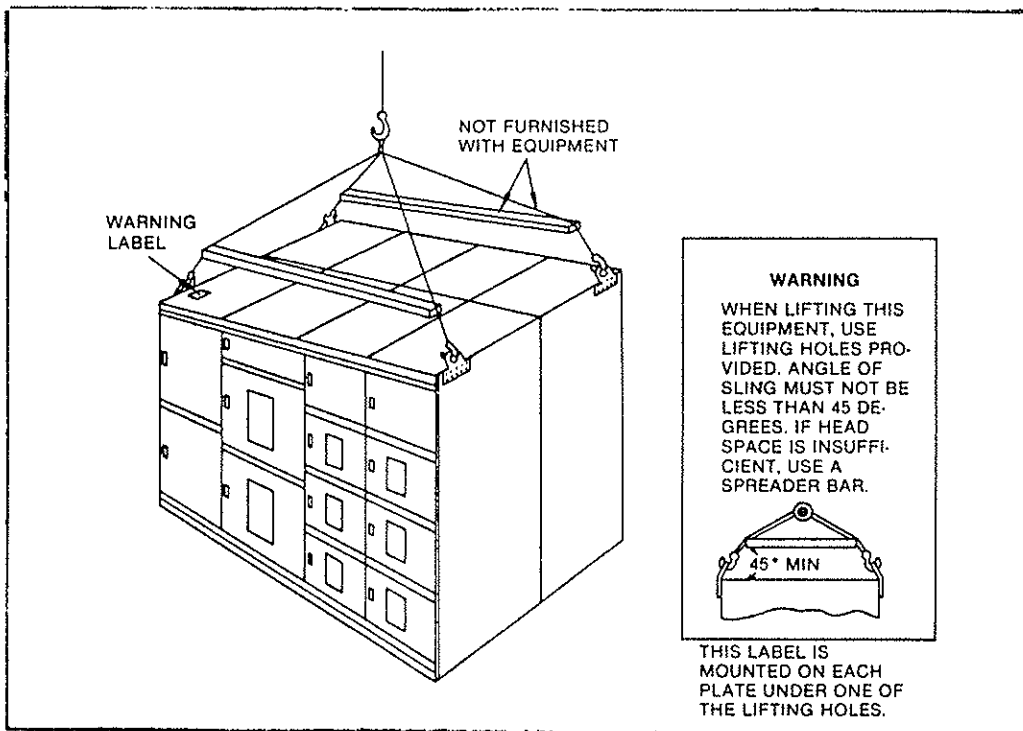


Fig. II-1 Recommended method of lifting equipment

SECTION II—Receiving, Handling and Storage

Connect a cable from the crane to the four lifting plates located on the top-front and rear of the equipment (Fig. II-1).

Take up the slack in the lifting device very carefully and manually stabilize the switchboard to prevent it from rotating.

WARNING: DO NOT STAND UNDER SWITCHBOARD WHILE IT IS BEING MOVED. SERIOUS INJURY MAY OCCUR IF THE CABLES OR LIFTING DEVICE FAIL.

CAUTION: GENTLY LOWER THE SWITCHBOARD SECTION ONTO THE LEVEL SITE LOCATION. IF THE SWITCHBOARD IS ROUGHLY HANDLED OR JARRED, IT IS POSSIBLE TO DAMAGE OR MISALIGN INTERNAL COMPONENTS.

Methods of lifting outdoor switchboard sections are much the same as for indoor equipment except the lifting plates are provided at the base of the structure.

If lifting outdoor switchboard sections, side support timbers must be placed along the sides to prevent any damage that could be caused by the lifting cables. In addition, a spreader bar must be inserted between each lift cable. Both front and rear, above the equipment as shown in Fig. II-2. Proceed to lift and place the outdoor equipment utilizing all the precautions and requirements that apply to lifting the indoor equipment.

The outdoor lifting plates should be removed after the equipment is permanently anchored so passageways at the ends of the equipment will not be obstructed.

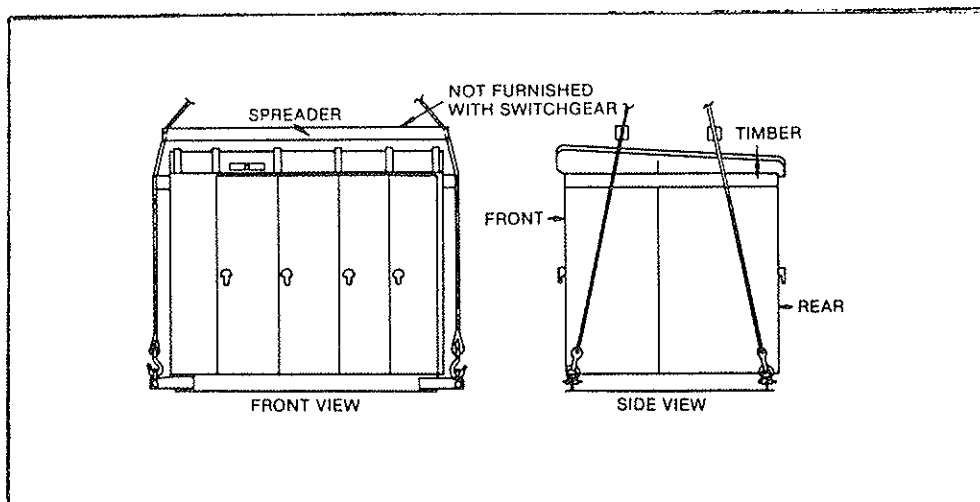


Fig. II-2 Recommended method of lifting outdoor equipment by crane

SECTION II—Receiving, Handling and Storage

B.2. Rollers

If crane facilities are not available, the equipment may be moved into position by means of construction rollers placed under the shipping skids (see Fig. II-3). The shipping section may be raised enough for the placement of rollers by means of forklift or jack. There should never be less than four rollers under the equipment unless the line-up is less than five feet long. Use one roller for each eighteen inches of equipment length.

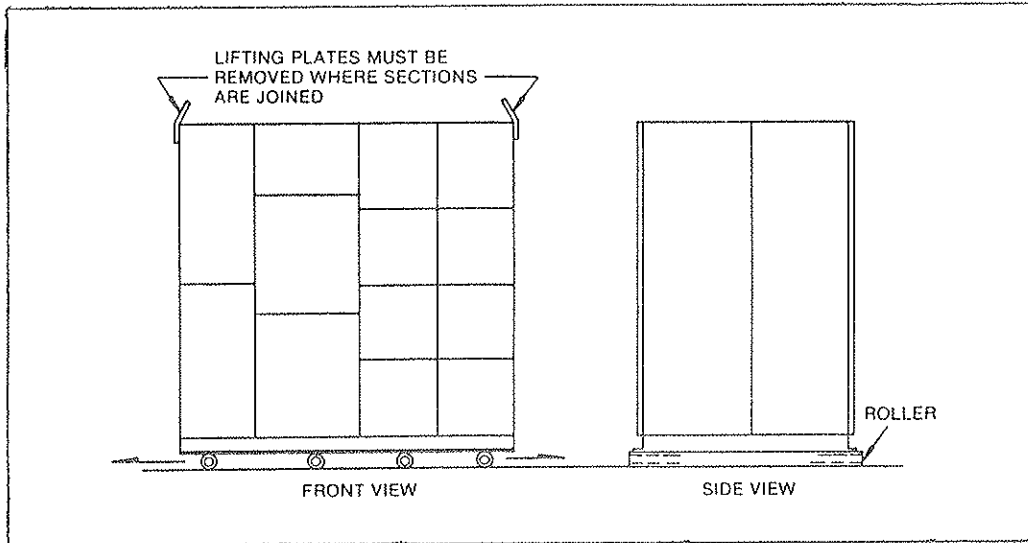


Fig. II-3 Method of rolling equipment into place.

B.3. Forklifts

When using a forklift to raise the line-up to position rollers underneath, proceed as follows.

NOTE: Do not attempt to lift or move the equipment with forklift positioned in the front or rear of the equipment.

NOTE: If shipping skids are removed prior to final placement of the equipment, rollers may only be used to move the equipment in a direction parallel to the front.

1. Expand the forklift tines to their maximum (widest) extension.
2. Carefully insert tines of forklift below one side of the line-up at the approximate center of the skid as shown in Fig. II-4.
3. Position one man in the front and one man in the rear of the shipping section to stabilize the equipment as it is being raised.
4. Position one roller under the skids close to the raised end of the skid. Carefully lower the skid until it rests on the roller. See Fig. II-5.
5. Repeat the lifting process at the other end. Place the appropriate number of rollers under the skids spacing them evenly across the width of the line-up and carefully lower the skid until it rests on the rollers.

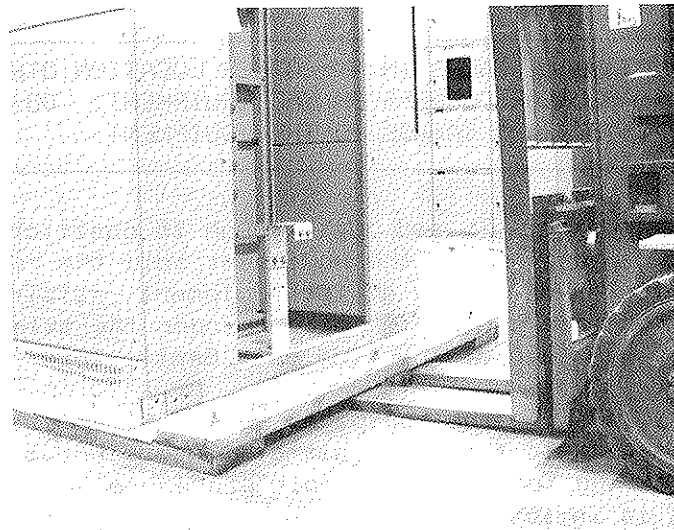


Fig. II-4. Place tines under skid.

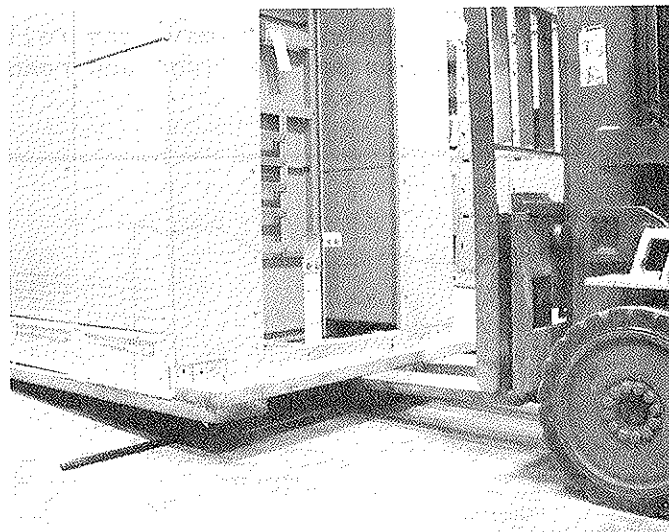


Fig. II-5. Place rollers under skid.

6. While carefully pushing the equipment to its final site position, the rollers that freed from the rear of the equipment are then repositioned at the forward end. This procedure should be continued until the line-up is in its final location.
7. When the equipment is in its final position, remove all lag bolts holding the shipping skids to the line-up.
8. Insert the tines of the forklift at one end of the line-up, raise slightly, remove the loose rollers, and lower the line-up carefully to the floor.
9. Raise the other end of the line-up slightly and remove the remaining roller at that end.

B.4. Jacks

Jacks may be used in place of forklifts to raise and lower switchboard.

1. Place a jack under the front and rear corners of one end of the line-up. Figures II-6 and II-7 illustrate the use of jacks with outdoor equipment.

SECTION II—Receiving, Handling and Storage

CAUTION: DO NOT PLACE JACKS IN ANY OTHER LOCATION OTHER THAN THE FRONT AND REAR CORNERS OF THE EQUIPMENT. DOING SO MAY RESULT IN SERIOUS DAMAGE TO THE EQUIPMENT.

2. Raise the equipment evenly and just enough to position a roller beneath the equipment. Gently lower the equipment onto the roller. Repeat the procedure at the opposite end of the equipment, raising it far enough to place the appropriate number of rollers under the skids, spacing them evenly across the width of the line-up. Gently lower the line-up onto the rollers.
3. While carefully pushing the equipment to its final site position, the rollers that are freed from the rear of the equipment are then repositioned at the forward end. This procedure should be continued until the equipment is in its final location.
4. When the equipment is in its final position, remove all lag bolts holding the shipping skids to the equipment line-up.
5. Place one jack at each corner, front and rear, of the equipment. Carefully raise the line-up evenly and remove the rollers and the shipping skids. Evenly lower the line-up to the floor and remove the jacks.

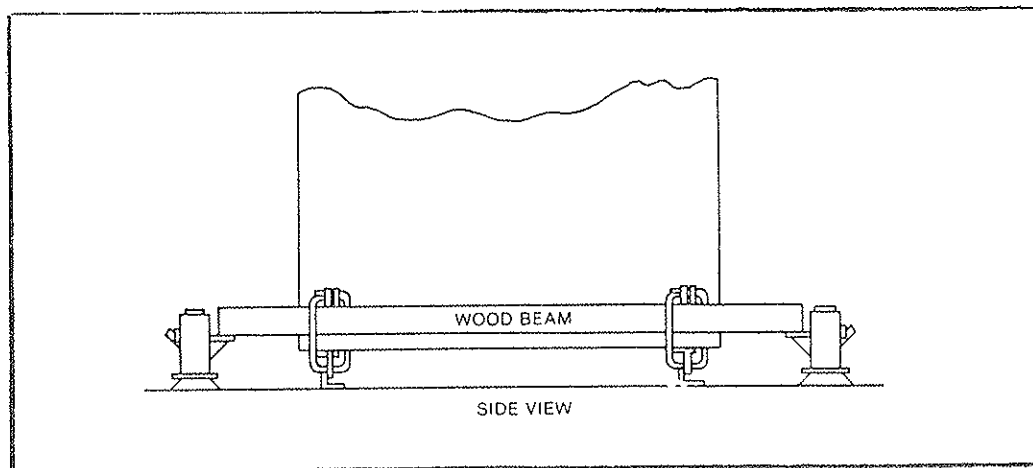


FIG II-6 Recommended method jacking outdoor equipment

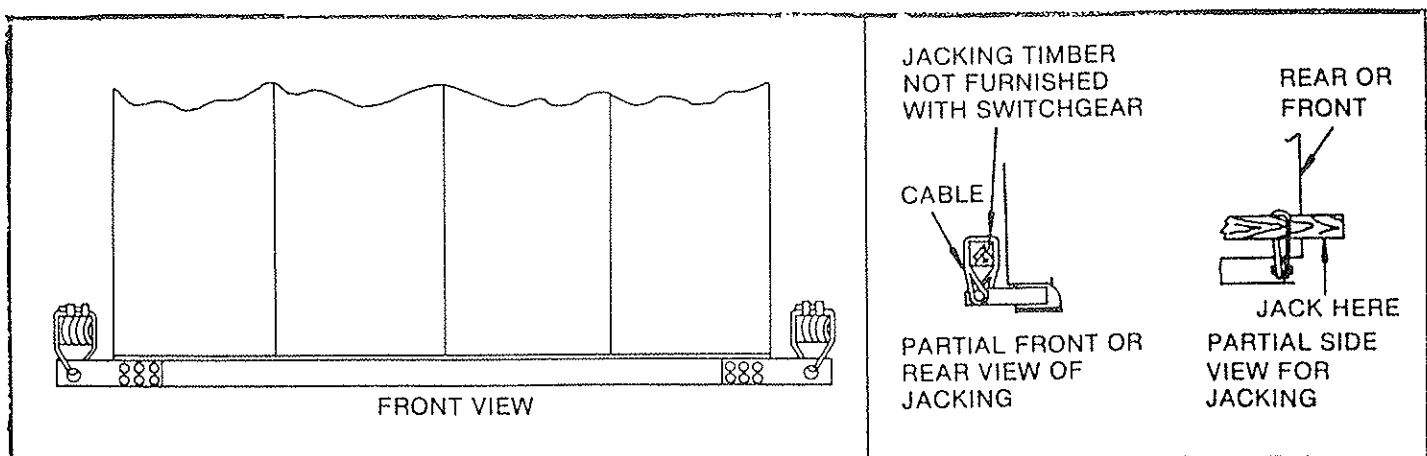


FIG II-7 Recommended method of jacking outdoor equipment

SECTION II—Receiving, Handling and Storage

C. Storage

C.1. Equipment

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

1. Remove protective covering. 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 switchboard.

CAUTION: REMOVE ALL CARTONS, CONTAINERS AND ANY OTHER MISCELLANEOUS PACKAGING AND PACKING MATERIAL FROM INSIDE THE SWITCHBOARD SECTIONS BEFORE ENERGIZING ANY INTERNAL HEATERS. TO PREVENT FIRE, REMOVE ANY PLASTIC OR POLYETHYLENE SHROUDING FROM THE EQUIPMENT SECTIONS BEFORE ENERGIZING ANY INTERNAL HEATERS.

3. If dampness or condensation may be encountered in the storage location, heaters must be placed inside the sections to prevent moisture damage. Approximately 250 watts of heat in each section is required. Incandescent lamps may be used for this purpose. These lamps should be located in the bottom breaker compartment of each section and supported so the bulb will not touch adjacent materials. On outdoor equipment, this may be accomplished by making a temporary power supply connection to the heaters already installed in the equipment.

CAUTION: IF THE SPACE HEATERS ARE TO BE TEMPORARILY ENERGIZED FROM EXTERNAL SOURCE, IT IS IMPORTANT TO REMOVE THE FUSES ON THE SECONDARY SIDE OF THE CONTROL POWER TRANSFORMER. THIS PRECAUTION IS TO PREVENT A FEEDBACK OF HIGHER VOLTAGE TO OTHER PORTIONS OF THE EQUIPMENT THROUGH THE CPT PRIMARY.

B. Circuit Breakers

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

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 the circuit breakers are ready to be installed. A plastic or canvas-type cover should be provided to reduce the possibility of damage to the breakers due to dust and water.

SECTION III—Equipment Installation

A - General

This section contains complete instructions for installing a General Electric POWER BREAK II Switchboard.

CAUTION: EQUIPMENT INSTALLATION PERSONNEL MUST BE THOROUGHLY FAMILIAR WITH THIS INSTRUCTION MANUAL AND ALL ARTICLES OF THE NATIONAL ELECTRICAL CODE APPLICABLE TO THE INSTALLATION OF THIS SWITCHBOARD. IN ADDITION, ALL DRAWINGS, BOTH MECHANICAL INSTALLATION AND ELECTRICAL, MUST BE UNDERSTOOD AND STRICTLY FOLLOWED TO PREVENT DAMAGE TO THE SWITCHBOARD OR EQUIPMENT BEING PROTECTED BY THE SWITCHBOARD.

NOTE: Before installation work is started, it is important to review all of the drawings provided, including the General Electric equipment arrangement drawings, site installation drawings, elementary and remote connection drawings, elementary and remote connection drawings, mechanical connection drawings, and the summary of equipment list.

All expendable hardware (for shipping purposes only) is painted yellow or tagged with yellow adhesive tape and may be discarded at completion of installation phase.

B. Site Location

In general, the location of the equipment will have been predetermined during the specification and/or procurement of equipment phases. Indoor locations within buildings impose certain requirements which must be met so that the switchboard may operate efficiently with a minimum of maintenance.

In locating the POWER BREAK II Switchboard, adequate aisle space must be provided at the front and rear of the equipment to ensure proper ventilation of the equipment and to allow service and maintenance of the equipment with the front and rear doors open. The recommended aisle space is shown on the floor plan supplied with the equipment drawings.

The equipment should be placed in an area where clean, dry air is free to circulate around and above it. Since air is taken into the equipment at the bottom of each section and exhausted at the top, a location with good air flow must be provided for efficient operation. A minimum of 30 inches of clear space above the equipment is recommended.

C. Foundation Requirements

For optimum performance of your General Electric equipment, the foundation requirements expressed in this section should be strictly adhered to.

NOTE: The foundation for the outdoor switchboard must provide proper drainage of ground and/or surface water accumulations away from the equipment.

The foundation must be smooth and level in all planes.

D. Foundation Preparation

D.1. Indoor Equipment

Refer to the owner's foundation construction drawings, and the General Electric supplemental installation drawings. Although the indoor equipment can be mounted directly on a smooth, level floor, it is recommended that recessed steel channels be installed for supporting the equipment. Channel sills, when supplied by the General Electric Company, are 5 inches x 1 3/8 inches nominal, with tapped holes for 1/2 - 13 anchor bolts. The bolts are not supplied by General Electric.

NOTE: When the equipment is installed on a surface subject to impact (shock) loads due to operating conditions or environmental seismic (earthquake) conditions, the anchor bolts should be fabricated of medium carbon steel (grade 5 load rating).

The tapped holes on channel sills supplied by General Electric, are offset one inch from the center line to allow the sills to extend 1/2 inch in front of, and to the rear of, the equipment. The floor channels under the front and rear equipment anchor points 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, to prevent distortion of the equipment structure, to assure proper mechanical and electrical connections between shipping splits, and to assure proper interfacing other close-coupled equipments.

POWER BREAK II Switchboard and Load Center Substations are frequently mounted on steel floors and/or structural steel in industrial installations (such as mezzanine) to minimize usage of production floor space. Regardless of the type of mounting surface, the requirements for a smooth level surface remain.

If studs or anchor bolts are to be used, they should be installed in the foundation as it is poured. It is important that the studs or bolts are spaced to agree with dimensions given on the General Electric job drawings and Fig. III-1. The dimensions between anchor bolts for a particular installation are dependent upon the configuration of equipment ordered. The front view diagram illustrates the space available for conduit and/or cable entrance through the bottom or top of each equipment section. The space required for control wiring entry to the operational wiring terminal board is also shown.

SECTION III—Equipment Installation

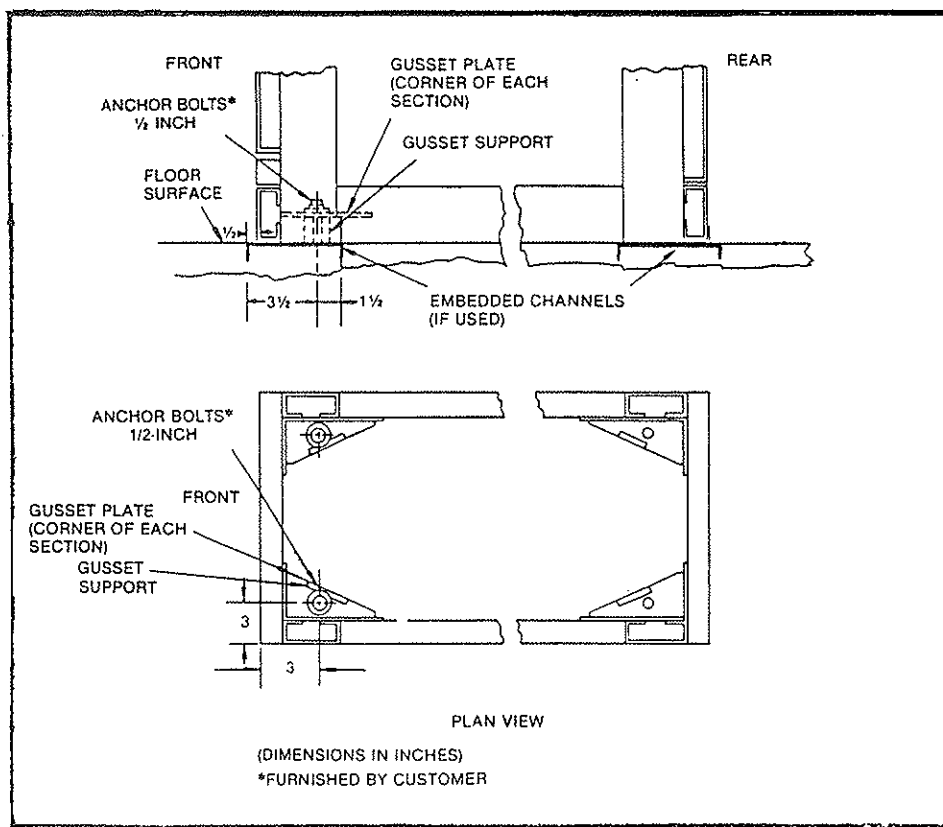


FIG III-1 Indoor enclosure - location of equipment anchor points.

E. Assembly and Installation of Equipment

E.1. General Requirements

Before assembling or installing the equipment, all components should be available at the site location. This will facilitate equipment component identification as well as installation. The foundation should be prepared in accordance with the previous instructions and all embedded conduits installed and capped.

NOTE: If rollers are to be used for movement of the equipment to its permanent installation, it is recommended that the shipping skid not be removed until the equipment is placed in position over the anchor bolts.

If a transformer is not part of the installation, and/or the equipment has been split for shipment, place the center section on the foundation first. Assemble the remaining sections outward from the center section, in each direction.

If the switchboard is part of a Load Center Unit Substation, the transformer section should be set on its pad first in accordance with the instructions furnished with the transformer. All remaining sections of the switchboard should then be installed.

E.2. Assembly and Installation Instructions of Indoor Equipment

The recommended procedure for installation of an indoor switchboard or Load Center Unit Substation is as follows:

- A. **POSITION THE EQUIPMENT** - Position the equipment or sections of the complete equipment in their final location. Once the lifting plates have been removed, they may be discarded.

NOTE: If the equipment line-up was split into shipping sections, the lifting plates on corners of adjacent sections must be removed. Failure to remove these plates will interfere with proper alignment of sections and prevent installation of bus, splices, etc.

NOTE: In the event the lifting plates must be reassembled on the equipment for lifting purposes, they must be moved to locations where unused screw holes are available, generally achieved by shifting the plate horizontally on the mounting surface one bolt - hole from its previous location. When remounting the lifting plates, torque the mounting bolts to 7-9 ft. lbs.

NOTE: All mating sections of the equipment line-up (including the transformer, if applicable) must be securely fastened together prior to tightening anchor bolts fastening the equipment to the mounting surface.

- B. **REMOVE THE SHIPPING SKIDS** - The equipment is fastened to the shipping skids with lag screws through the equipment anchoring holes. Equipment shipping sections up to ten feet long will be fastened to the skid with four lag screws, one in each corner. The shipping skid and lag screws are expendable material and may be disposed of at the purchaser's discretion.
- C. **FASTEN SECTIONS TOGETHER** - After placement of the equipment and installing the anchor bolts loosely, the various shipping sections must be rigidly fastened together. Through-bolts fasten each section of the equipment to the adjacent section at accessible locations in the front and rear vertical posts and along the upper and lower depth posts in the bus and cable compartment. Torque the 3/8 inch diameter hardware to 25-30 ft. lb.

All of the hardware required for assembling the equipment across the shipping splits is furnished with the equipment. If a transformer is included in the line-up of equipment, the transformer flange should be aligned with the opening in the side of the transition compartment and fastened together using the 3/8 inch diameter bolts, nuts and washers supplied with the equipment. The fastener assembly should be tightened with a torque of 25-30 ft.lbs.

SECTION III—Equipment Installation

- D. COMPLETE THE ELECTRICAL INTERCONNECTIONS - After completing the mechanical connections between the several sections of equipment, the electrical interconnections should be completed. This includes the installation of the main bus bars, the neutral bus splice, the ground bus splice in addition to the control and metering circuits. Figure III-2 illustrates the general location of the buses that must be spliced across the shipping splits. Electrical clearances are defined in Table A-2 in the Appendix.

WARNING: ALL SWITCHBOARD EQUIPMENT MUST BE ADEQUATELY GROUNDED FOR SAFETY. FAILURE TO GROUND EQUIPMENT PROPERLY MAY RESULT IN SERIOUS INJURY.

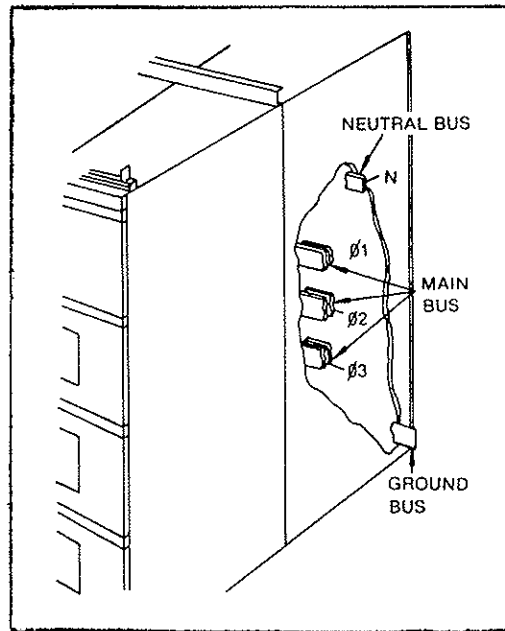


FIG III-2 Typical location of buses at a shipping split

D.1 Ground Bus

The ground bus is mounted directly on the rear upright channels.

NOTE: It is particularly important that the ground bus be connected first since it provides an integral ground for all the equipment. It must also be connected to the station ground prior to proceeding with the installation.

A 4/0 cable connector is located in the bottom of the transition section (or in the incoming line compartment if a transition section is not included) for terminating the purchaser's cable connection to ground. The specific location of the station ground connection is shown on the site floor plan drawing and in the electrical drawings supplied with the equipment. All grounding of the switchboard should be in accordance with National Electrical Code.

Figure III-3 illustrates the installation of the ground bus splice plate across a shipping split. In addition to the bolted fastening of the splice plate to the two ends of the ground bus, self-tapping 1/4 - 20 bolts pass through the splice plate and ground bus stubs, and thread into the equipment frame. These bolts should be fastened with a torque of 7-9 ft.lbs.

CAUTION: TO ACHIEVE THE MINIMUM CONTACT RESISTANCE ACROSS A BOLTED BUS JOINT, IT IS RECOMMENDED THAT THE JOINT CONTACT SURFACES BE COATED WITH A FILM OF GE LUBRICATING GREASE 0282A2048P009. A CAN OF THIS GREASE IS SUPPLIED WITH THE EQUIPMENT. DO NOT PUT GREASE ON THE BOLT THREADS AS THIS WILL AFFECT THE CLAMPING FORCE EXERTED BY THE BOLT.

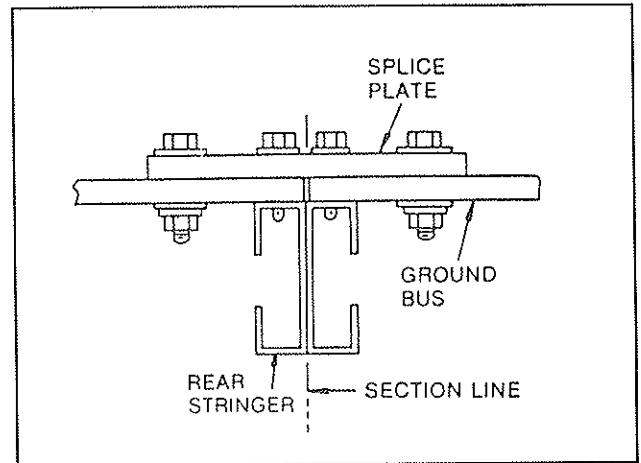


Fig. III-3. Plan view of ground bus splice.

If a GE transformer (rated above 750 KVA) is present in the line-up, a ground bar located in the transition compartment, Fig. III-4, is provided for connection of the transformer ground pad to the equipment ground. As shipped, the ground bar is mounted so it does not protrude beyond the outer surface of the equipment. When the equipment is installed in its final location, the ground bar must be reassembled using the outer bolt holes in the horizontal ground bus spanning the width of the transition compartment.

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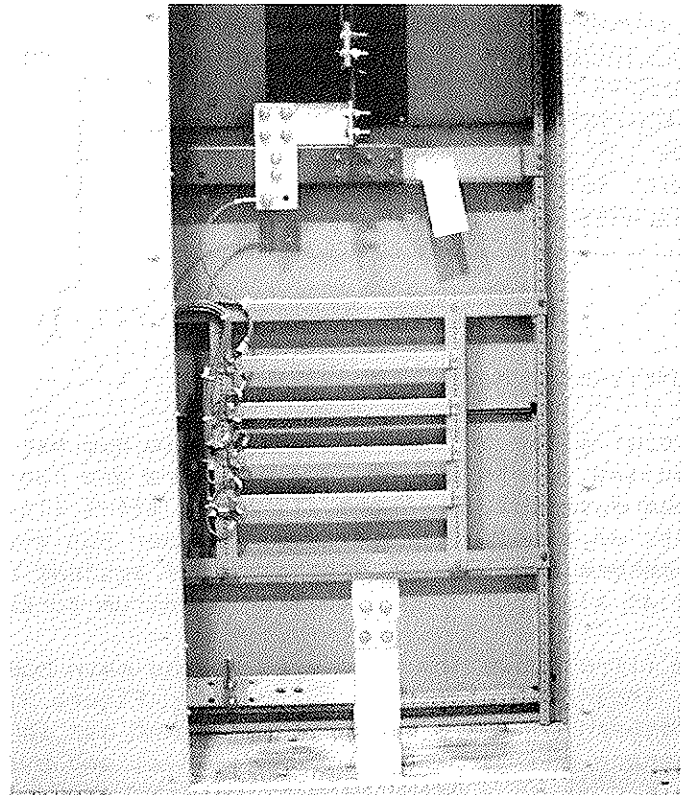


Fig. III-4. Flange opening on a transition section to a GE transformer (above 750KVA).

SECTION III—Equipment Installation

The offset portion of the ground bar will permit connection to the transformer ground pad with the 1/2 - 13 bolt assembly supplied with the switchboard. If an optional floor plate is supplied for the transition compartment, it will be necessary to remove the floor plate to permit relocation of the ground connection bar.

All bolted bus joints should be made using the proper torque as shown in Table A-1 in the Appendix.

Transformers not manufactured by General Electric may require special mounting and bus connection hardware.

D.2. Neutral bus

The neutral bus is insulated from the grounded frame of the switchboard equipment and is mounted on insulators throughout the equipment. Installation of the neutral bus splice plate across a shipping split is similar to the ground bar splice except that the splice plate is not bolted to the equipment frame. Figure III-5 illustrates the installation of the neutral splice plate.

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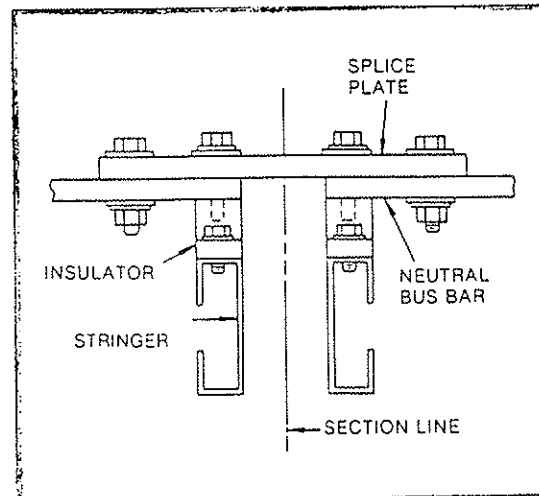


FIG. III-5 Plan view of neutral splice.

D.3 Horizontal Main (Supply) Bus

The installation of the horizontal main bus bars is intended to be accomplished with bolted joints whether the bus bars are fabricated of either copper or aluminum material. Figures III-6 and III-7 illustrate the assembly of the main bus bars on a bolted bus system. Copper bus systems are normally supplied with flat washers and lockwashers; aluminum systems are supplied with a belleville washer at aluminum-to-aluminum or aluminum-to-copper joints.

Figure III-6 shows the rear view of the main bus area with the installed splice plates indicated with cross-hatching. Figure III-7 shows that a spacer is used both between bus bars when more than one bar is used per phase (normally the 2500 ampere and larger main bus ratings) and over the outer bars of a single or double bar joint. After assembly of the main bus bar and spacers, the 1/2 - 13 bolts should be tightened to a torque of 35-40 ft.-lbs. The joint covers may be mounted and secured by the insulated 3/8 inch diameter bolt if the bus insulation option has been supplied with the equipment.

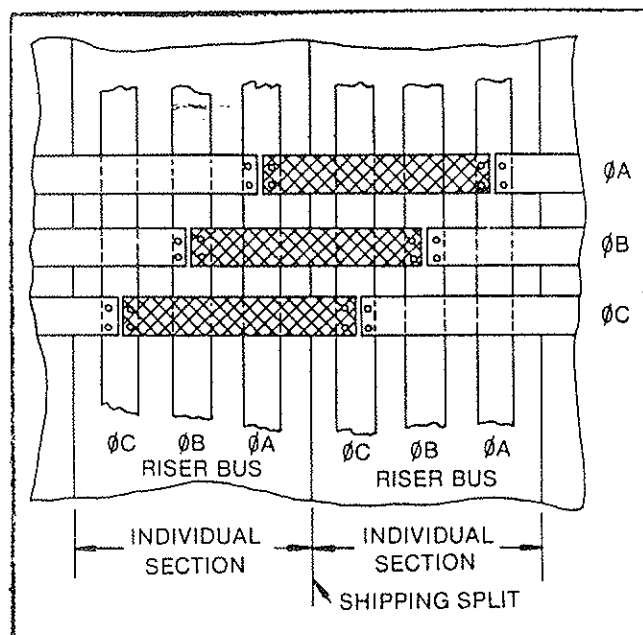


FIG III-6 Rear view of main bus at a shipping split

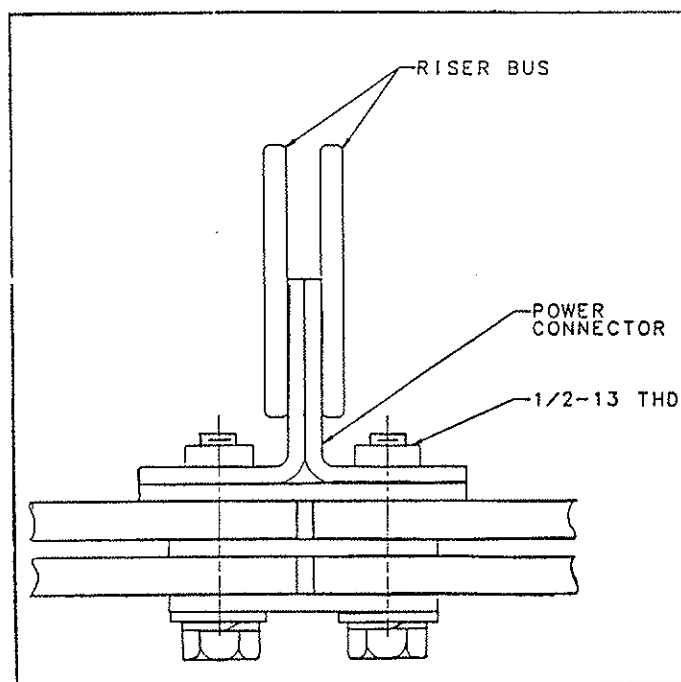


FIG III-7 Plan view of a two bar main bus connection

CAUTION: TO ACHIEVE THE MINIMUM CONTACT RESISTANCE ACROSS A BOLTED BUS JOINT, IT IS RECOMMENDED THAT THE JOINT CONTACT SURFACES BE COATED WITH A FILM OF GE LUBRICATING GREASE 0282A2048P009. A CAN OF THIS GREASE IS SUPPLIED WITH THE EQUIPMENT. DO NOT PUT GREASE ON THE BOLT THREADS AS THIS WILL AFFECT THE CLAMPING FORCE EXERTED BY THE BOLT.

D.4 CONNECT THE TRANSFORMER SECONDARY (GE type, above 750 KVA)

The connection of the transformer secondary to the incoming bus bars in the transition is made using the flexible connection straps supplied with the transformer. These connections are always bolted joints. The recommended torque for tightening the 1/2 - 13 bolts fastening the transformer connection straps to the incoming bus bars is 35-40 ft.-lbs. See Fig. III-4.

D.5. INTERCONNECT CONTROL WIRING

Interconnection of control wiring across shipping splits is accomplished by connecting to terminal blocks located in the cross-section wiring trough under the front top cover of the section.

If terminal blocks are provided, each wire must be attached to the correct point on the terminal block, following the circuit identification number attached to each wire.

SECTION III—Equipment Installation

F. Anchoring Indoor Equipment

1. Anchoring by Anchor Bolts - Indoor equipments are normally secured to their final mounting surface by anchor bolts threaded into the embedded channel sills. The bolts were loosely threaded into place before reassembling the equipment shipping splits and connecting to the close-coupled transformer, if appropriate. The anchor bolts should now be tightened with a torque of 35-40 ft.-lbs.
2. Anchoring by Welding - An alternate method of anchoring the equipment to its foundation is to weld the equipment to floor sills (or the floor itself if constructed of steel). It is recommended that two 3/16 in. fillet welds, each 2.5 inches long, be used for each section to firmly tie the bottom width post to the channel sill along both the front and rear of the equipment.

G. Control Wire Connections

For external control wiring, refer to the front view diagram for the switchboard cable area dimensions, and connect the control wires to the switchboard section as follows:

1. When control conduits enter the equipment from below, they should not extend more than one inch above the floor. The control wires may be pulled through the conduits before or after the equipment is installed.
2. Route the control wires from the conduits through the wiring trough (2 inch wide by 7 inch deep area) at the side of the cable compartment. Connect the cables to the terminal blocks in accordance with the connection diagrams for the equipment.
3. If the control conduits enter from above, drill the top cover within the available space indicated. Control wires should be connected to the terminal blocks in accordance with the connection diagrams for the equipment.

H. Power Cable Connections

Connect the main cables to the main lugs. Before any main cable connections are made, the cables should be identified to indicate their phase relationship with the equipment. Adequate electrical and mechanical clearances must be provided between conduit, cables, and bus. Where the cables enter the section, they can be lashed to optional cable supports at the rear of the cable compartment as required.

Mechanical cable terminals are normally included with the equipment (compression terminals are supplied when ordered) and are mounted at the ends of the breaker runbacks in the cable compartment. Carefully follow the cable manufacturer's recommendations for installation of cable.

<p>NOTE: When assembling lugs to cable runbacks and adapters, reassemble the lugs as provided by the factory. Observe electrical clearances as defined in Table A-2 in the Appendix.</p>

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

For copper cables, coat the wires with GE lubricant 0282A2048P009, insert the cables into the terminals, and tighten the set screws in accordance with torque values shown on the label on the inside of the rear door of each section intended for use with cables.

For aluminum cables, wire brush the wire strands thoroughly. Immediately after wire brushing, coat the cable strands with a quality oxide inhibiting compound such as Penetrox A. Insert exposed wires into the terminals and tighten the set screws in accordance with values shown on the label on the inside of the rear door of each section intended for use with cables.

CAUTION: THE TORQUE VALUES SHOWN ON THE LABEL ARE FOR DRY THREADS ONLY. DO NOT GREASE OR OTHERWISE LUBRICATE THE THREADS ON THE CABLE TERMINALS AS THIS WILL PERMIT OVERTIGHTENING OF THE SCREW AND POSSIBLE DAMAGE TO THE TERMINAL OR CABLE.

This should result in the oozing of compound material from between individual strands. Wipe off any excess compound.

Bolt the cable terminal connectors to the ends of the bars in the cable compartment. GE lubricant 0282A2048P009 furnished with the equipment should be applied between these connection surfaces. The bolts should be tightened with a torque of 35-40 ft.lbs for 1/2-13 bolts. See Table A-1 in the Appendix.

Lash the cables securely to the cable support, if present, to take their weight off the runbacks and to brace them against short circuit forces in the event of a fault.

INSPECTION AFTER MAIN CABLE INSTALLATION

To prevent heating, there should be no closed loop of steel around a single conductor or group of conductors which does not include all the conductors (including the neutral) of the circuit. If the conductors must pass through separate holes in a piece of steel, slots should be cut between the holes. Do not allow cables carrying heavy current to come near instruments or meters as this may affect their accuracy. Use the minimum amount of cable necessary to accomplish the connections. The increased resistance of longer cables generates unnecessary heat. Main cable lashing should be checked bi-monthly.

J. Relays and Control Devices

Remove all blocking on relays and devices as shown in the instructions accompanying the devices.

SECTION IV—Installing the Switchboard Components

A. Stationary Mounted Devices (Circuit Breaker or Switch)

A.1. Description of Unit:

- It is not necessary to remove door to install or remove devices.
- Stationary mounted units are front-removable.
- Some devices are reverse-mounted (ie. Line at bottom.) Check label on inside of unit door.

A.2. Removing the Device

WARNING - HAZARD OF ELECTRICAL SHOCK OR BURN - WHEN REMOVING DEVICE, SWITCHBOARD MUST BE DE-ENERGIZED.

1. Put device in the OFF position by pushing the TRIP button .
2. Remove the line shield, if provided .
3. Disconnect control wires, if present, from terminal blocks.

CAUTION: Before removing the phase terminal bolts, be sure that the device is supported by external means in order to prevent the device from falling out of the compartment.

4. Remove the bolts on the phase terminals and to the device support to the compartment sidewall.
5. If the device is to be removed and switchboard re-energized, openings in the unit door should be covered to preclude access to "hot" studs.

A.3. Installing the Device

WARNING - HAZARD OF ELECTRICAL SHOCK OR BURN - WHEN INSTALLING DEVICE, SWITCHBOARD MUST BE DE-ENERGIZED.

1. The device must be in the OFF position prior to installing.
2. Place the device in the unit compartment using external supporting means to hold the device in place.
3. Line up the device terminal holes with the holes in the unit line and load adapters and reinstall the bolts. Refer to Table A-1 for bolt torques.

CAUTION: TO ACHIEVE THE MINIMUM CONTACT RESISTANCE ACROSS A BOLTED BUS JOINT, IT IS RECOMMENDED THAT THE JOINT CONTACT SURFACES BE COATED WITH A FILM OF GE LUBRICATING GREASE 0282A2048P009. A CAN OF THIS GREASE IS SUPPLIED WITH THE EQUIPMENT. DO NOT PUT GREASE ON THE BOLT THREADS AS THIS WILL AFFECT THE CLAMPING FORCE EXERTED BY THE BOLT.

4. Line up the device support holes to the bracket on the compartment sidewall. Install the bolts and torque to 7-9 ft. lb.
5. Reinstall the device line shield.
6. Reconnect any control wire, if present, to the terminal blocks.
7. Close the door, re-energize the switchboard, and turn the breaker to the ON position.

SECTION IV—Installing the Switchboard Components

B. Drawout Circuit Breakers

B.1 Description of Unit

- The drawout assembly is a self-contained, integral unit for use in POWER-BREAK II switchboards providing the convenience and safety inherent in drawout type construction. It permits activation of a new feeder, rapid replacement of a circuit breaker, and facilitates inspection and maintenance of POWER BREAK insulated case circuit breakers without making it necessary to de-energize the entire switchboard.
- The drawout assembly consists of a stationary frame and a movable carriage which supports the circuit breaker. Current is carried through primary disconnects which are connected to bus bars or terminal lugs for use with cable.
- The movable carriage is supported by rollers riding on two sets of retractable rails attached to the stationary frame. A crank operated screw mechanism provides the mechanical force for engaging and disengaging the primary disconnects.

B.2. Electrical Disconnects

The spring loaded fingers of the primary disconnects are mounted on the movable carriage and breaker assembly, permitting maintenance of the fingers without complete de-energization of the bus system. Accessory control circuits are made by means of secondary disconnects mounted within the stationary frame, with a matching set on the movable carriage.

B.3. Movable Carriage/Circuit Breaker Positions

The design features four position operation of the movable carriage relative to the stationary frame - ENGAGED, TEST, DISENGAGED and FULLY WITHDRAWN - with the first three positions being referenced by an indicator mounted on the right side of the unit.

- In the ENGAGED position primary and secondary disconnects are completely engaged.
- In the TEST position, primary disconnects are disengaged, but secondary disconnects are still engaged permitting checkout of control circuits.
- In the DISENGAGED position, both primary and secondary disconnects are disengaged. The breaker is electrically disconnected from control circuits and system.

In FULLY WITHDRAWN position, the movable carriage is against the stop at the end of the rails. From this position the breaker and carriage can be removed from the equipment or tilted out for inspection.

SECTION IV—Installing the Switchboard Components

B.4. Features

RAILS: The compartment sidewalls have retractable rails on which the breaker rolls in and out. To operate, pull rails out as far as possible until they drop into the horizontal locked position.

INCORRECT BREAKER REJECTION FEATURE: A rejection feature is provided to permit installation of only the correct breaker.

DRAW OUT INTERLOCK PIN: Interacts with the breaker so that if the breaker racking shaft wrench lockout is deliberately defeated, a closed breaker will trip before the primary contacts engage on installation, or disengage on breaker removal.

DRAW OUT POSITION INDICATOR PIN: Actuates a compartment position indicator on the breaker.

SECONDARY DISCONNECTS

The secondary disconnects interact with corresponding finger units on the breaker for accessory circuits. Fourteen (14) inch high compartments can accommodate up to 24 circuits, and larger compartments can accommodate up to 48 circuits. RMS-9 MicroVersaTrip units are restricted to 22 and 46 circuits, respectively, since the two upper terminals at position "A" are reserved for neutral sensor connection.

NOTE: Secondary disconnects are required when the circuit breakers are electrically operated with auxiliary switches, RMS-9 MicroVersa trip neutral sensors or other control devices. A separate programmer-secondary disconnect is also available for optional programmer functions such as Zone Selective Interlocking.

B.5. Handling the Devices

Each drawout breaker is equipped with a lifting brace . An optional lifting mechanism (hoist) is available for installing and removing breakers.

When removed from the switchboard the circuit breaker should be placed in a vertical position on the working surface.

NOTE: Do not lay the breaker on the rear or sides as the primary disconnects or drawout mechanism assemblies may be damaged.

A. General

After the equipment has been installed and all connections made, it must be tested and inspected before it is put in service. Although the equipment and devices have been tested at the factory, a final field test must be made to be sure that the equipment has been properly installed and that all connections are correct.

WARNING: THE EQUIPMENT MUST BE COMPLETELY DE-ENERGIZED WHILE THE TESTS ARE IN PROGRESS.

Directions for testing relays, instruments, and meters are given in the instruction book furnished for each device. The proper settings of the protective relays and circuit breaker trip programmers are normally determined from a complete power system coordination study performed by the purchaser or his consultant; therefore, the settings of these devices must be made by the purchaser. When the equipment is shipped from the factory, the time dial of all inverse-time induction disc relays (i.e., IAC types) is set to zero to prevent contact bounce during transportation.

NOTE: The trip setting adjustments of the trip programmer on circuit breakers may be in any position when shipped from the factory and must be correctly positioned prior to energization of the equipment.

General instructions for setting the relays are given in the Relay Instruction Book.

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 switchboard meggering, 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 percent of the IEEE factory test voltage.

For the power circuit, the IEEE factory test voltage is two times switchboard rating plus 1000 volts. See Table V-1. Potential and control power transformers must be disconnected during high-voltage testing.

Table V-1

Switchgear Voltage Rating	Test Voltage
600 V	2000 V
480 V	1960 V
240 V	1480 V

SECTION V—Testing and Inspection

B. Key Interlocks

After initial installation of the equipment, all necessary interlock keys should be inserted into the appropriate locks and all spare keys should be stored in a location in accordance with the owner's established procedures.

CAUTION: 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 THE IMPROPER USE OF SPARE KEYS WILL DEFEAT THE INTERLOCKING SCHEME.

C. Circuit Breaker Operation

All compartments housing drawout 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.

Refer to the appropriate breaker instruction manual for other pre-operational checks on the breakers including the RMS-9 MicroVersatrip trip unit.

D. RMS-9 MicroVersaTrip Trip Unit

The calibration of the RMS-9 MicroVersaTrip programmer should be checked with the Type TVRMS test kit, a portable instrument designed for the field testing of RMS-9 MicroVersaTrip solid-state programmers. The complete trip system is comprised of the following components:

1. Solid-State Programmer
2. Phase Current Sensors
3. Flux Shifting Magnetic Trip Device
4. (Programmer) Rating Plug
5. Neutral Sensor for units continuing a Ground Fault Trip element.

All components, except the neutral sensor, are integrally mounted in the circuit breaker. When used, the neutral sensor is separately mounted in the bus or cable compartment of the switchboard. In drawout construction, it is automatically connected to the programmer in the breaker via the drawout secondary disconnect block.

CAUTION: NEVER DISENGAGE THE PROGRAMMER ON A BREAKER THAT IS ENERGIZED AND CARRYING LOAD CURRENT. THIS WILL OPEN-CIRCUIT THE CURRENT SENSORS, ALLOWING DANGEROUS AND DAMAGING VOLTAGES TO DEVELOP.

E. Before Energizing

The following steps should be taken before energizing the equipment:

1. Manually exercise all switches, circuit breakers, and other operating mechanisms to make certain they are properly aligned and operate freely.
2. Conduct an electrical insulation resistance test to make sure the equipment is free from short circuits and grounds. This should be done both phase-to-ground and phase-to-phase with the switches or circuit breakers both opened and closed.
3. Check any electrical relays, meters, or instrumentation to determine that connections are made properly and the devices function properly.
4. Electrically exercise all electrically operated circuit breakers, and other mechanisms (but not under load), to determine that the devices operate properly. An auxiliary source of control power may be necessary to provide power to the electrical operators.
5. Test the ground fault protection system (if furnished) in accordance with the manufacturer's instructions.
6. Set the adjustable current and voltage trip mechanisms to the proper values. Experience has indicated that damage from faults can be reduced if the devices used for overload and short circuit protection are set to operate instantaneously (that is, without intentional time delay) at 115 percent of the highest value of phase current which is likely to occur as the result of any anticipated motor starting or welding currents.
7. Make certain that field wiring is clear to live bus and where necessary, physically secured to withstand the effects of fault currents.
8. Check to determine that all grounding connections are made properly.
9. Remove all debris, scrap wire, etc., from the equipment interior before closing the enclosure.
10. Install covers, close doors, and make certain that no wires are pinched and that all enclosure parts are properly aligned and tightened.

SECTION VI—Energizing the Switchboard

A. General

CAUTION: ENERGIZING A SWITCHBOARD FOR THE FIRST TIME IS POTENTIALLY DANGEROUS. THEREFORE, QUALIFIED ELECTRICAL PERSONNEL SHOULD BE PRESENT WHEN THE EQUIPMENT IS ENERGIZED. IF PROBLEMS CAUSED BY DAMAGE OR POOR INSTALLATION PRACTICES HAVE NOT BEEN DETECTED IN THE CHECKOUT PROCEDURE DESCRIBED PREVIOUSLY, SERIOUS DAMAGE CAN RESULT WHEN POWER IS TURNED ON.

B. Energizing Procedures

1. There should be no load on the switchboard when it is energized.
2. Turn off all of the downstream loads, including those such as motor control centers and other devices which are remote from the switchboard.
3. The equipment should be energized in sequence by starting at the source end of the system and working toward the load end. In other words, energize the main devices, then the feeder devices, and then the branch-circuit devices.
4. Turn the devices on with a firm positive motion.

4. General

A periodic maintenance schedule should be established to obtain the best service from the switchboard. An annual check, and overall maintenance procedure for the switchboard 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 any repairs or adjustments that were performed. Maintenance employees should follow all recognized safety practices, such as those contained in the National Electrical Code, OSHA and in Company or other safety regulations during maintenance.

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.

1. Periodically inspect the switchboard while under load to determine if there is any indication of overheating. If overheating or any other unsatisfactory condition is found, completely de-energize the switchboard and investigate.

<p>WARNING: DE-ENERGIZE EQUIPMENT COMPLETELY BEFORE DOING MAINTENANCE WORK IN COMPARTMENTS. THIS INCLUDES DE-ENERGIZING ANY CONNECTIONS TO OUTSIDE PRIMARY OR SECONDARY SOURCES, SUCH AS TRANSFORMERS, TIE LINES, ETC.</p>

Particularly look for loose bolts and connections, or overloading. Remove any accumulation of dirt or other foreign matter in enclosure.

2. Plated parts may become dark over a period of time due to oxidation. Do not remove this discoloration, as it will reduce the thickness of the plating.
3. Retighten lugs and joints to eliminate possible hot points. Transmittal of vibration through building structure and conduit to switchboard may loosen lugs and joints.
4. Do not open sealed breaker or trip units as calibration may be disturbed. Return to factory for any replacement.

SECTION VII—Switchboard Maintenance

B. Bus Compartment

WARNING: DE-ENERGIZE EQUIPMENT COMPLETELY BEFORE DOING MAINTENANCE WORK IN COMPARTMENTS. THIS INCLUDES DE-ENERGIZING ANY CONNECTIONS TO OUTSIDE PRIMARY OR SECONDARY SOURCES, SUCH AS TRANSFORMERS, TIE LINES, ETC.

Inspect and check the bus area as follows:

1. Inspect the buses and connections carefully for evidence of overheating or weakening of the insulating supports. If bus insulation is present, remove the molded covers over the main bus connection to expose joints for inspection.
2. Check all connection bolts in the bus compartment and all bracing bolts for rightness. See the Table A-1 in the Appendix.
3. Vacuum and, with a clean rag, wipe the buses and supports.
4. Visually inspect the insulation on the bars that run from the breaker studs through the bus structure to the cable area.
5. 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 on 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 ambient temperature and humidity.

C. Cable Compartment

Inspect and check the cable and busway compartment as follows:

1. Inspect all power cable connections for signs of overheating and tighten all connections. If severe discoloration or if damage is apparent, remove the damaged portion of the cable.

CAUTION: BE SURE THE CONDITION WHICH CAUSED THE OVERHEATING HAS BEEN CORRECTED BEFORE ENERGIZING.

2. Check all bolts that hold cable terminals to the connection bars for tightness.
3. Check the neutral bus and ground bus connection and mounting bolts for tightness.
4. Check that all secondary control wiring connections are tight and that all control cabling is intact.

D. Breaker and Switch Compartment

WARNING: DE-ENERGIZE EQUIPMENT COMPLETELY BEFORE DOING MAINTENANCE WORK IN COMPARTMENTS. THIS INCLUDES DE-ENERGIZING ANY CONNECTIONS TO OUTSIDE PRIMARY OR SECONDARY SOURCES, SUCH AS TRANSFORMERS, TIE LINES, ETC.

Inspect and check the device compartments as follows.

1. Thoroughly clean the interior of the breaker and instrument compartments. Use a vacuum clean rags only. Do not use steel wool or oxide papers. Blowing with compressed air is not recommended.
2. Check indicating devices, mechanical and key interlocks.
3. Check primary disconnecting device contacts on drawout devices 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.
4. Clean the racking mechanism and lubricate with GE lubricant 0282A2048P009.
5. Before replacing the drawout breaker, wipe off the primary disconnect contacts. Apply a thin coat of GE lubricant 0282A2048P009 to the equipment stabs and to the primary disconnect fingers on the breaker.
6. Operate each drawout breaker while in the TEST position to be sure it functions properly. This is particularly important for breakers that normally remain in either the opened or closed positions for long periods of time.

E. Metering and Control Devices

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

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 books for detailed instructions.

SECTION VII—Switchboard Maintenance

F. Overall Equipment

Make the following checks on the complete switchgear equipment.

1. Clean and inspect all painted surfaces and retouch where necessary.
2. Check to see that all anchor bolts and other structural bolts are tight.
3. Check that all breaker and instrument compartment door latches operate properly.
4. If the switchboard is equipped with heaters, check to see that all heaters are energized and operating.
5. For exterior vent openings in equipment furnished with air filters, the foam filter elements should be removed and washed in warm soapy water, rinsed, and reassembled at least annually. Elements should be inspected before reassembly and replaced if any signs of deterioration are evident.

G. Paint Refinishing

Indoor switchboards are finished with ANSI-61 gray acrylic enamel paint GE part number 0282A4534P001. To refinish damaged areas, remove all loose paint, rust, scale, oil or grease. Sand any scratches smooth.

1. Refinishing with Acrylic Enamel (Standard ANSI 61 gray finish)

-Apply a coat of good acrylic enamel primer-sealer (0282A4534P005). Air dry the primer for 1/2 hour, then apply the finish color coat of acrylic enamel.

-If the area is to be spray-coated, thin the acrylic enamel with 0282A4534P006 (this thinning is only necessary if the paint was received in a five gallon drum). Use one part thinner to four parts enamel as a starting point to obtain the correct spraying viscosity. When paint is received in less than five gallon quantities the paint has been factory-thinned. Both the primer and paint should be applied only the temperature is above 55 degrees fahrenheit.

2. Refinishing with Acrylic Lacquer (Special colors by request of purchaser)

-Apply a coat of good acrylic lacquer primer-sealer (GE number 0282A4534P005). Air dry the primer for 1/2 hour, then apply the finish color coat of acrylic lacquer.

-If the area is to be sprayed-coated, thin the acrylic lacquer with a blush resistant thinner (0282A4534P007) (this thinning is only necessary if the paint was received in a five gallon drum). Use one part thinner to one part lacquer as a starting point to obtain the correct spraying viscosity. When paint is received in less than five gallon quantities, the paint has been factory-thinned. Both the primer and paint should be applied only when the temperature is above 55 degrees fahrenheit.

H. Breaker Lifting Mechanism (Hoist)

Under normal conditions, no special maintenance procedures or lubrication is required for this device. If the cable is abraded under any condition, it should be inspected for broken strands or other damage and replaced if necessary.

J. Ambient Temperatures and Circuit Loading

POWER BREAK II Switchboards are designed for installation where average ambient temperature will not exceed 40 degrees celcius (104 degrees fahrenheit). For higher temperatures, derating may be required. The conductor temperatures within the enclosure may be as high as 105 degrees C (220 degrees F). Some parts of breakers, switches and fuses may run hotter. Refer to the NEMA or UL standards for those devices and for switchboards for their maximum allowable or anticipated temperature rises above ambient.

K. Short Circuits

Normally, the overcurrent protective device on the circuit will prevent any electrical damage except at the actual point of short-circuit. A thorough inspection of the entire system after any fault current should be made to insure that there has been no mechanical damage to conductors, insulation or equipment.

In addition, the individual overcurrent protective device or devices which performed the short-circuit interruption MUST be inspected for possible arcing damage to contacts, arc chutes and/or insulation. Do not open sealed devices such as breaker trip units. If there is any possibility that sealed units may have been damaged, they should be replaced. For additional details on the particular device involved, refer to the applicable individual instruction book.

L. Arcing Damage

Some organic insulating materials carbonize when subjected to the heat of an electrical arc and lose their insulating qualities. Any insulation found to be carbon tracked must be replaced before applying power.

SECTION VII—Switchboard Maintenance

M. Water-Soaked Equipment

1. Completely de-energize switchboard.
2. Carefully clean and dry all parts of the switchboard. When using heaters, do not exceed 180 degrees F.
3. Replace all fuses.
4. Individual devices should be inspected for the possible entrance of water, dirt, or foreign matter.
5. Do not open sealed devices such as breaker trip units. Replace them.
6. Prior to re-energizing the switchboard it should be meggered. Refer to testing and inspection procedures.
7. If assistance or guidance is required contact your local General Electric Service Engineer. GE Shops have facilities for reconditioning.

N. SPARE PARTS

A spare parts stock for the components of the POWER BREAK II Switchboard, such as bus, insulators, etc. is not recommended. When components need to be reordered, please refer to the nameplate marking, shop drawing number, and order by description. A spare parts stock of devices such as circuit breakers, meters, switches, etc. will vary due to the variety of installations. Your General Electric Sales Engineer will be glad to assist you in the proper selection for a device stock list.

Common maintenance items referred to in this manual are listed below.

<u>GE Part Number</u>	<u>Description</u>
0282A2048P009	GE Lubricant D6A15A2, 1 pint can
0282A4534P001	Acrylic enamel paint ANSI 61 gray
0282A2048P015	0282A4534P001 paint ANSI 61 gray, 1 pint can
0282A2048P016	0282A4534P001 paint ANSI 61 gray, 1 quart can
0282A4534P005	Acrylic enamel (or lacquer) primer-sealer
0282A4534P006	Acrylic enamel thinner
0282A4534P007	Thinner for acrylic lacquer

A. BOLT TORQUE FOR ELECTRICAL JOINTS

POWER BREAK II Switchboard bus bar joints are furnished with Grade 5, 1/2 inch diameter medium carbon steel hardware having a high tensile strength. Similar hardware should be used for any additional bolting.

The use of a torque wrench is recommended to assure the proper torques is applied. These torques apply to aluminum or copper connections. When torquing bolts the following values are recommended.

Bolt	Torque Range
1/4" - 20	7 - 9 lb. ft.
3/8" - 16	25 - 30 lb. ft.
1/2" - 13	35 - 40 lb. ft.
5/8" - 16	45 - 55 lb. ft.

Table A-1 - Bolt torques for Electrical Bus Connections.

CAUTION: TO ACHIEVE THE MINIMUM CONTACT RESISTANCE ACROSS A BOLTED BUS JOINT, IT IS RECOMMENDED THAT THE JOINT CONTACT SURFACES BE COATED WITH A FILM OF GE LUBRICATING GREASE 0282A2048P009. A CAN OF THIS GREASE IS SUPPLIED WITH THE EQUIPMENT. DO NOT PUT GREASE ON THE BOLT THREADS AS THIS WILL AFFECT THE CLAMPING FORCE EXERTED BY THE BOLT.

Flat washers and lockwashers should be used for all copper connections and belleville spring washers in aluminum-aluminum and aluminum-copper connections.

B. ELECTRICAL CLEARANCES

The following minimum clearances should be maintained except at terminals of circuit breakers and switches:

	0-125V	126-250V	251-600V
Between live parts of opposite polarity:			
Through air	1/2"	3/4"	1"
Over surface	3/4"	1 1/4"	2"
Between live parts and ground metal through air or over surface	1/2"	1/2"	1"

Table A-2 - Minimum Clearances for Electrical Bus and Connections



ABB Inc.

Electrification Services
305 Gregson Dr.
Cary, NC 27511 USA

For further information, please visit:
www.electrification.us.abb.com/services

For service, call:
1-888-434-7378 (US)
1-540-387-8617 (International)

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