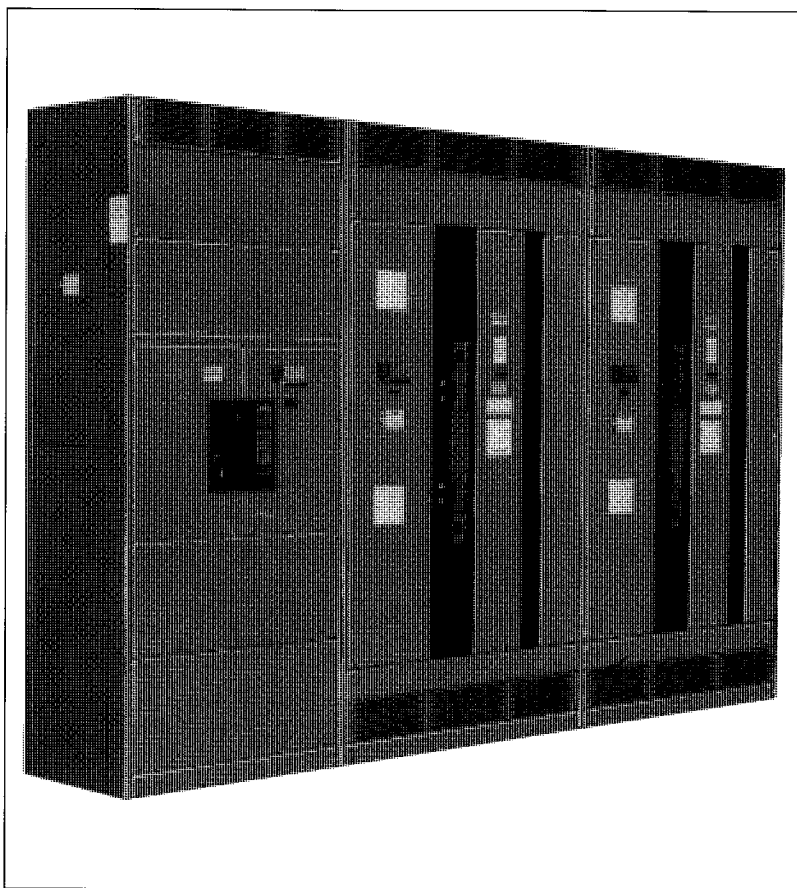


# Instruction Bulletin

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Seneca, SC, USA

## POWER-STYLE® QED Switchboards Class 2700



SQUARE D

## CONTENTS

SECTION 1—INTRODUCTION .....	5
Inspection and Packaging .....	5
Document Replacement .....	5
SECTION 2—SAFETY PRECAUTIONS .....	5
SECTION 3—RECEIVING, HANDLING, AND STORAGE .....	5
Receiving .....	5
Handling .....	6
Handling with Lifting Straps .....	6
Handling without Lifting Straps .....	7
Storage .....	8
SECTION 4—INSTALLATION .....	9
Location .....	9
Foundation Preparation .....	9
Switchboard Preparation .....	10
General Installation .....	10
Joining Shipping Sections—Outdoor Switchboards .....	10
Joining Shipping Sections—Indoor Switchboards .....	11
Anchoring for Seismic Qualifications .....	12
Anchoring the Switchboard .....	13
Through Bus Splice Connections .....	13
Ground Bus Splice Connections .....	14
Grounding and Bonding .....	14
Service Equipment—Grounded System .....	14
Service Equipment—Ungrounded System .....	15
Not Service Equipment .....	15
Busway Connections .....	15
QWIK FLANGE Busway Connection—NEMA Type 1 (Indoor) Only .....	16
Busway Connections—NEMA Type 1 (Non-QWIK FLANGE) and NEMA Type 3R .....	17
Conduit Area .....	18
Cable Pulling .....	18
Cable Terminations .....	19
Ground Fault Protection Systems .....	19
SECTION 5—PRE-ENERGIZING CHECKOUT PROCEDURE .....	19
SECTION 6—ENERGIZING THE SWITCHBOARD .....	21
SECTION 7—MAINTAINING THE SWITCHBOARD .....	22
General Inspection and Cleaning .....	22
Bus Bar Joints, Lug Terminations, and Insulating Materials .....	23
General Lubrication Information .....	23
Automatic Transfer Switches .....	23
BOLT-LOC Bolted Pressure Contact Switch Maintenance (800—4,000 A) .....	23
Molded Case Circuit Breakers .....	24
QMB/QMJ Fusible Switches .....	26
Switch Maintenance .....	26
Fuse Replacement .....	26
Installing QMB/QMJ Fusible Switches .....	26
Removing QMB/QMJ Fusible Switches .....	27
Ground Fault Protection Systems .....	27

SECTION 8—ADVERSE CIRCUMSTANCES .....	27
Inspection Following a Short Circuit .....	27
Clean-up Following a Short Circuit .....	28
Water-Soaked Switchboards .....	28
Water-Sprayed or Splashed Switchboards (Clean Water Only) .....	28
Inspection and Clean-up of Clean Water Sprayed or Splashed Switchboards .....	28
SECTION 9—TORQUE VALUES FOR ELECTRICAL CONNECTIONS .....	30
SECTION 10—SWITCHBOARD INSULATION RESISTANCE CHART .....	32
SECTION 11—REFERENCE PUBLICATIONS .....	33

## FIGURES

Figure 1: Lifting with an Overhead Crane, Lifting Straps, and Cables or Chains .....	6
Figure 2: Warning Label, Rainproof Switchboards .....	7
Figure 3: Handling Instruction Label, Switchboards without Lifting Straps .....	7
Figure 4: Switchboard in Sling Rigging .....	8
Figure 5: Forklift Safety Strap .....	8
Figure 6: Joining Adjacent Sections—Outdoor Switchboards .....	11
Figure 7: Indoor Switchboards .....	12
Figure 8: Switchboard Base Channels .....	13
Figure 9: Ground Bus Splice Connection .....	14
Figure 10: Grounding Electrode Connector .....	14
Figure 11: Main Bonding Jumper .....	15
Figure 12: QWIK FLANGE Installation .....	16
Figure 13: QWIK FLANGE .....	16
Figure 14: Removing the Busway Dummy Flanged End .....	17
Figure 15: Flanged-End Connections .....	17
Figure 16: Reinstalling the 1/2-Inch Hardware .....	18
Figure 17: Instantaneous Trip Setting .....	20
Figure 18: BOLT-LOC Switch .....	24
Figure 19: Molded Case Circuit Breaker .....	25

## TABLES

Table 1: Blank Fillers and Extensions .....	25
Table 2: QMB/QMJ Fusible Switch Blank Fillers .....	27
Table 3: Incoming, Branch, and Neutral Lug .....	30
Table 4: Multiple Conductor Neutral and/or Ground Bar .....	30
Table 5: QED-3 Circuit Breaker Connector Bolts .....	30



## SECTION 1— INTRODUCTION

This manual contains instructions for the proper installation, operation, and maintenance of POWER-STYLE® QED switchboard equipment manufactured by Square D Company. The purchaser's engineering, installation, and operating staff supervisors should familiarize themselves with this manual and become acquainted with the appearance and characteristics of each piece of equipment mounted or contained in the switchboard.

These instructions and procedures apply to POWER-STYLE QED switchboard installations by Square D Company. When special features or nonstandard components are incorporated in the switchboard, detailed instructions for these components are included in the instruction material holder.

### Inspection and Packaging

Every POWER-STYLE QED switchboard is carefully inspected and packaged at the assembly plant. Construction of the switchboard is checked, both structurally and electrically, for compliance with all specifications, codes, and standards. After a complete inspection, the switchboard is prepared for shipment. Each section is shipped separately for easier handling before installation. The factory order number, an identification number, and the shipping weights are plainly marked on each shipping section.

### Document Replacement

Contact your nearest Square D field office to replace lost or damaged wiring diagrams and instruction sheets. Use the factory order number as a reference.

## SECTION 2— SAFETY PRECAUTIONS



### **⚠ DANGER**

#### **HAZARD OF ELECTRIC SHOCK, BURN, OR EXPLOSION**

- Work on this equipment must be performed by qualified personnel who have training in the operation and maintenance of electrical power systems. Work on these devices requires training and experience with high capacity circuits and equipment and an understanding of the hazards involved. Perform such work only after reading this complete set of instructions.
- The successful operation of switchboards is dependent upon proper handling, installation, operation, and maintenance.
- Follow all applicable OSHA 29 CFR Part 1910, NFPA 70E Part II, and any other applicable local standards and regulations when working on this equipment.
- Energizing a switchboard for the first time after initial installation or maintenance is potentially dangerous.
- Unless otherwise specified, inspect and perform preventive maintenance only on switchboards and equipment to which power has been turned off, disconnected, and electrically isolated so that no accidental contact can be made with energized.
- Carefully inspect your work area and remove any tools and objects left inside the equipment.

**Failure to follow these instructions will result in death or serious injury.**

## SECTION 3— RECEIVING, HANDLING, AND STORAGE

### Receiving



Upon receipt, check the packing list against the equipment received to ensure the order and shipment are complete. Also upon receipt, immediately inspect switchboard sections for any damage that may have occurred in transit. If damage is found or suspected, file a claim with the carrier immediately and notify the nearest Square D Company representative.

## Handling

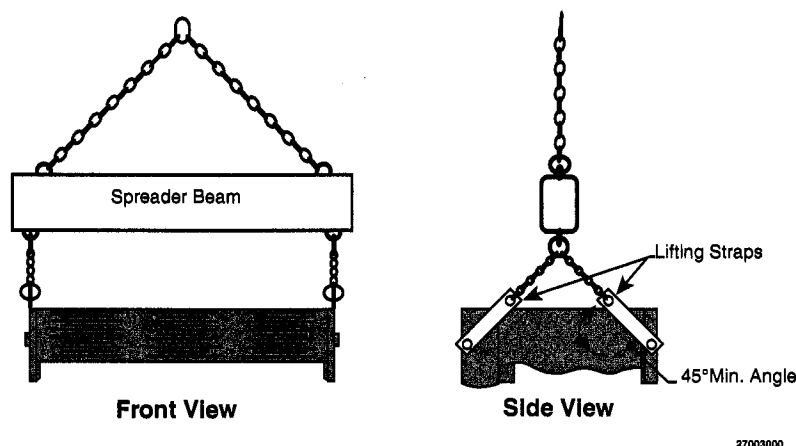
Ensure that proper equipment, such as an overhead crane, is available at the installation site to handle the switchboard. This equipment will help avoid injury to personnel and damage to the switchboard.

The shipping weight of each shipping section is marked on the packing list. Verify the lifting capacity of the equipment being used to handle the switchboard in accordance with the shipping weight of each shipping section.

Square D recommends using an overhead crane, lifting straps, and cables or chains to handle the switchboard. This method and alternative handling methods are discussed in this section.

## Handling with Lifting Straps

Square D provides lifting straps as standard equipment for switchboard shipping sections rated 3,000 A or less. Instruction labels on each shipping section include drawings and written instructions outlining the proper use of the lifting straps (Figure 1). Use rigid spreaders or a spanner bar to provide vertical lift on the lifting straps. This will help to avoid damaging the frame or finish.



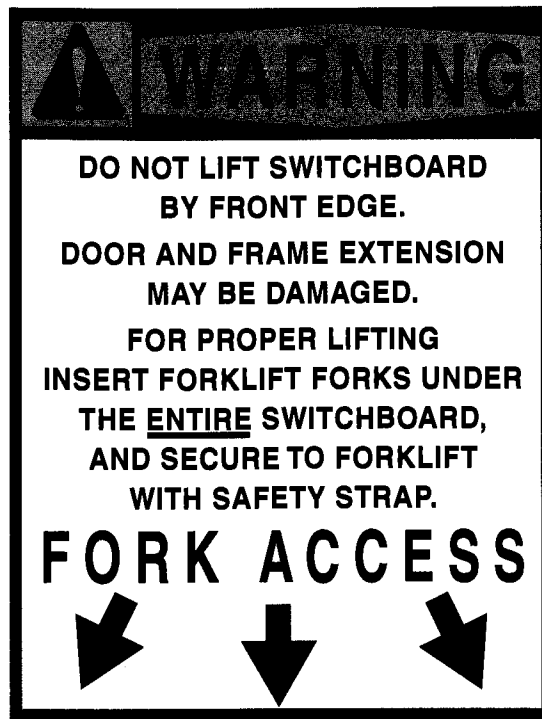
**Figure 1: Lifting with an Overhead Crane, Lifting Straps, and Cables or Chains**

Follow these instructions to handle the switchboard:

1. Use load-rated cables or chains with safety hooks or shackles. Do not pass cables or chains through holes in lifting straps.
2. Use a load-rated spreader beam to prevent structure damage. Rig so that the minimum angle between the lifting cables or chains and equipment top is 45 degrees.

### Rainproof switchboards:

To prevent damage to the drip hood and the door, use care when handling the section with lifting straps. Remove both the left and right top caps before rotating lifting straps into lifting position. The warning label (Figure 2) is attached to both the front and rear of the switchboard.

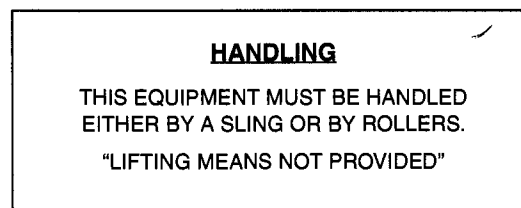


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**Figure 2: Warning Label, Rainproof Switchboards**

#### Handling without Lifting Straps

Lifting straps are not furnished on shipping sections rated more than 3,000 A. Rollers, slings, or other means must be used to handle the shipping section. The handling label (Figure 3) is affixed to each of these sections.



**Figure 3: Handling Instruction Label, Switchboards without Lifting Straps**

When elevating a shipping section not equipped with lifting straps, an overhead crane equipped with either of the following may be used:

- A chain coupled to a sling rigging
- A wire cable with safety hooks and shackles

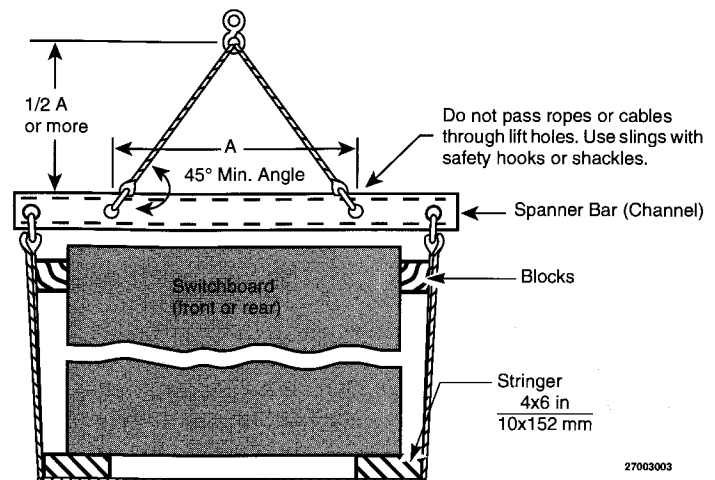
Wrap the sling completely around the switchboard and shipping stringers (Figure 4).

**⚠ WARNING**

**HAZARD OF EQUIPMENT DAMAGE—TOP HEAVY LOAD**

Stabilize the shipping section to reduce the possibility of tipping.

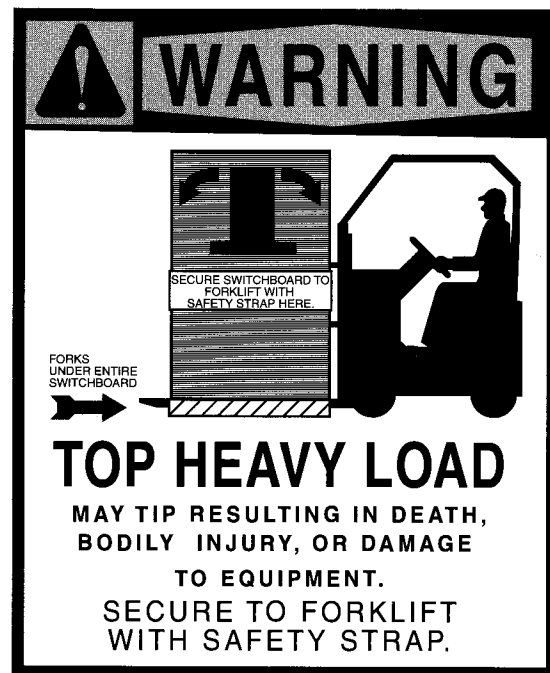
**Failure to follow this instruction can result in death or serious injury.**



**Figure 4: Switchboard in Sling Rigging**

A forklift is an alternate method of handling the switchboard.

*NOTE: Always check the fork lengths to ensure that the forks extend under the entire switchboard. Carefully balance the load and always use a safety strap when handling or moving a switchboard with a forklift (Figure 5).*



**Figure 5: Forklift Safety Strap**

## Storage

When storing the switchboard before installation, cover the top and openings of the equipment during the construction period to protect the switchboard from dust and debris.

A switchboard that is not installed and energized immediately should be stored in a clean, dry space with a consistent temperature to prevent condensation. Store the switchboard indoors, if possible. Preferably, it should be stored in a

## SECTION 4— INSTALLATION

### Location

heated building with adequate air circulation and should be protected from dirt, fumes, water, and physical damage. Storing the switchboard outdoors may cause harmful condensation inside the switchboard.

*NOTE: Portable electric heaters of approximately 250 watts per vertical section must be installed in both indoor-type and rainproof-type switchboard enclosures for adequate protection during storage.*

Before energizing the space heaters, remove all loose packing or flammable materials inside the switchboard. Outdoor switchboards are not weather resistant until completely and properly installed and should be treated exactly the same as indoor switchboards until after installation.

Correct installation of POWER-STYLE QED switchboards is essential for proper operation of all switchboard components. Study the associated instruction books and all drawings carefully. In most cases, all drawings are sent to the purchaser before a switchboard is shipped to enable adequate advance planning.

*NOTE: While installing switchboards, do not use the top of the switchboard as a support for the weight of the installer.*

Find the designated area on the building floor plan where the switchboard will be installed. The location chosen for installation should provide working clearances complying with section 110-26 of the National Electrical Code® (NEC®). Front-accessible switchboards require field connections including mains, branches, ground bus, and neutral bus to be accessible and maintainable from the front. Equipment drawings identify switchboards requiring rear or side access.

If in a wet location or outside of the building, the switchboard should be enclosed in an outdoor enclosure or equipment to prevent moisture or water from entering and accumulating within the enclosure.

### Foundation Preparation

The floor or foundation must be strong enough to support the weight of the switchboard without sagging. The surrounding floor area should gently slope toward a drain.

*NOTE: For seismic qualifications, read the section "Anchoring for Seismic Qualifications" on page 12 before pouring the floor or foundation. When anchoring for seismic qualifications, the pad should be made of concrete mix that has at least 3,000 psi strength.*

POWER-STYLE QED switchboards are assembled on true and level floors at the assembly plant. To ensure correct bus bar alignment, the mounting pad or final installation site must be smooth and level. If parallel steel floor channels are imbedded for mounting the switchboard, take extra care to ensure the floor channels are level over their entire length to avoid distortion of the switchboard structure. Each channel should be level with the finished floor.

When pouring the foundation, make provisions for conduits entering the switchboard from below and carrying the incoming and/or outgoing cables, control wiring, and ground cable. The bottom view in the equipment drawing shows the available conduit area for correct layout.

Conduits should project above the finished floor by about 2 inches (51 mm). However, to simplify moving the shipping sections into place, install the conduits flush with the concrete and, after the sections are in their final position, add the appropriate extension sleeves. Otherwise, raising the shipping section on timbers or lifting it by a crane to clear the conduit hubs will be necessary.



### Switchboard Preparation

Before pouring the foundation, consider installing additional conduits for future circuits.

Remove dirt and debris from the foundation and surrounding area before moving the switchboard into final position.

After the switchboard has been moved to its final installation site, take each shipping section off its shipping stringers. Base channels can be removed, if desired. For switchboards greater than 24 inches (610 mm) deep, the center base channel can be removed.

Remove all packing materials. If the switchboard is equipped with a bottom closure plate in each vertical section, remove and retain the plates for reuse.

When bottom closure plates are furnished, holes for any conduit entering the bottom of the switchboard must be made by the customer. After making the holes, re-install the closure plate.

### General Installation

#### **DANGER**

##### **HAZARD OF ELECTRIC SHOCK, BURN, OR EXPLOSION**

Level and align adjacent shipping sections with one another. Ensure proper alignment of horizontal main through bus and proper splice bus connections.

**Failure to follow this instruction will result in death or serious injury.**

Install the switchboard into its final position by leveling progressively each section and bolting the frames together, if separated. Position shipping sections as follows:

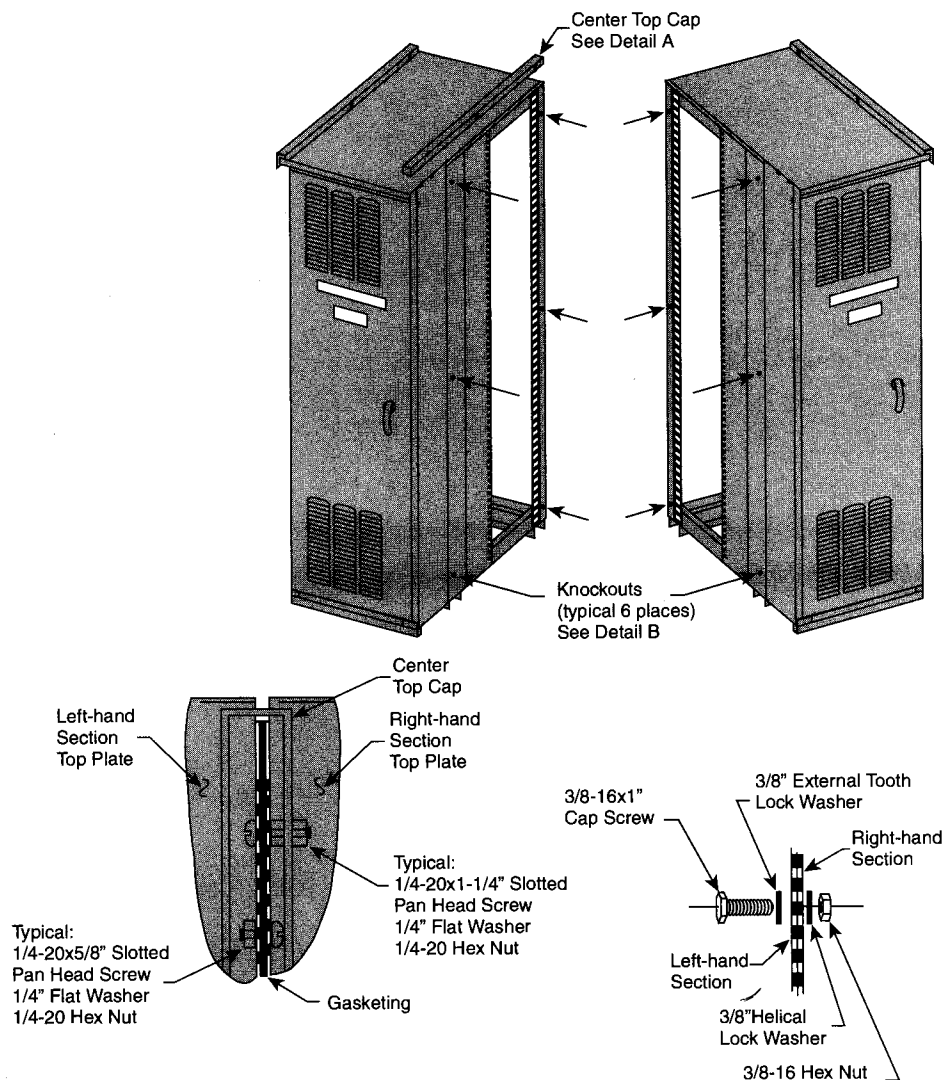
1. Maneuver each shipping section into the desired position using the procedures under "Handling" on page 6.
2. Carefully lower the section over the conduit stubs to comply with the "available conduit area" as shown in the bottom view of the equipment drawings. Otherwise, there may not be sufficient cable bending space.
3. Level the shipping section.
4. After installation of each section is complete, make the through bus splice connection to the proceeding section before installing the next section.

### Joining Shipping Sections— Outdoor Switchboards

1. Remove the center top cap (Figure 6) from the left-hand section and retain all hardware for reuse.
2. When possible, open or remove the front and rear doors and panels, providing access to bolt adjacent shipping sections together.
3. Remove three 0.5-inch (13 mm) diameter knockouts from the front vertical corner channel and three from the rear vertical corner channel (a total of six per frame side) as indicated by arrows in Figure 6.
4. Position each adjacent section, carefully leveling it and aligning it with the previous section. If lifting straps are provided, completely remove the straps from the sides being bolted together so the sections can be joined flush.

*NOTE: If lifting strap removal is not required to join sections, leave the lifting strap on the switchboard. Verify the bolt is tight to maintain 3R integrity.*

5. Six bolts (3/8-16x1 inch) are provided. Place them through the holes created in step 3 to join adjacent sections.
6. Make the through bus splice connections to the proceeding section.
7. Replace the center top cap removed in step 1.
8. Replace and secure the front and rear doors and panels removed in step 2.

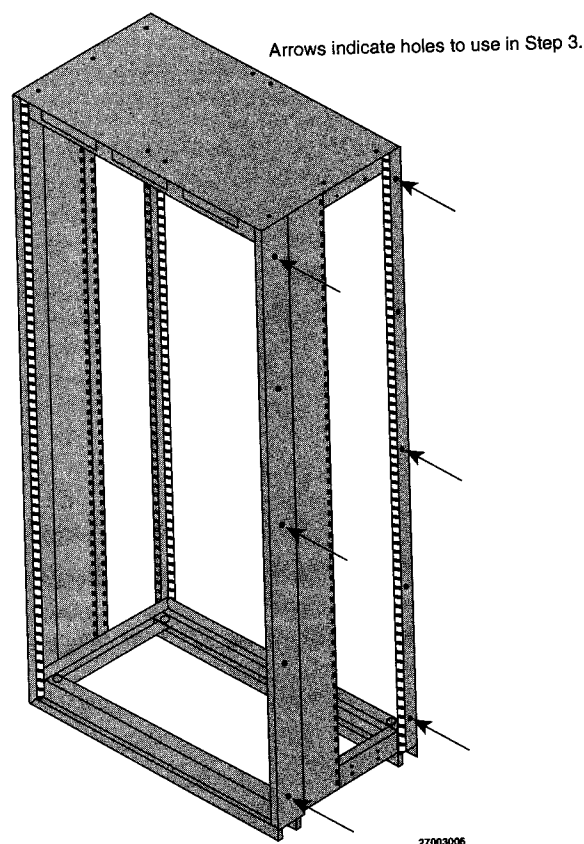


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**Figure 6: Joining Adjacent Sections—Outdoor Switchboards**

#### Joining Shipping Sections— Indoor Switchboards

1. Position each adjacent section, carefully leveling and aligning it with the previous section. If lifting straps are provided, completely remove them from the sides being bolted together so the sections can be joined flush.  
*NOTE: Leave the other lifting straps on the switchboard if their removal is not required to join adjacent sections flush.*
2. Open or remove the front and rear doors and panels, providing access to bolt adjacent shipping sections together.
3. Six bolts (3/8-16x1 inch) are provided. Place the bolts through the existing holes in the front and rear vertical corner channels to join adjacent sections (Figure 7).
4. Make the through bus splice connections to the proceeding section.
5. Replace and secure all front and rear doors and panels removed in step 2.



**Figure 7: Indoor Switchboards**

#### **Anchoring for Seismic Qualifications**

Formed base channels run the width of the shipping section. The channels have a 1.13-inch (29 mm) diameter hole for fastening the section to the floor. To properly anchor the switchboard to the floor, all four mounting locations must be used.

When anchoring to a concrete pad, use 3/4-inch diameter (grade 2 minimum) concrete anchor bolts or sleeve anchors suitable for installation of electrical equipment. For proper anchoring performance, use anchoring hardware that is at least 5 inches (127 mm) long. Use a 3/4-inch flat washer (approximately 1.5-inch OD) and lock washer under the head of each bolt or anchor nut and torque to 70 lb-ft (95 N•m). Properly applied stud anchors, sleeve anchors, or concrete anchor bolts are recommended (follow manufacturer's instructions for recommended hole size). Expansion shields such as "lag screw shields" should not be used. The concrete pad should be constructed from 3,000 psi (minimum) strength concrete mix.

When anchoring sections to a floor other than concrete, use four 3/4-inch (grade 2 minimum) bolts or studs through the holes at each corner of the switchboard. These bolts or studs must be secured to the floor with anchors or other means to achieve the full strength of the bolts or studs. Use a 3/4-inch flat washer (approximately 1.5 inch OD) and lock washer under the head of each bolt or anchor nut and torque to 70 lb-ft (95 N•m).

**NOTE:** Anchoring hardware is not furnished with the switchboard.

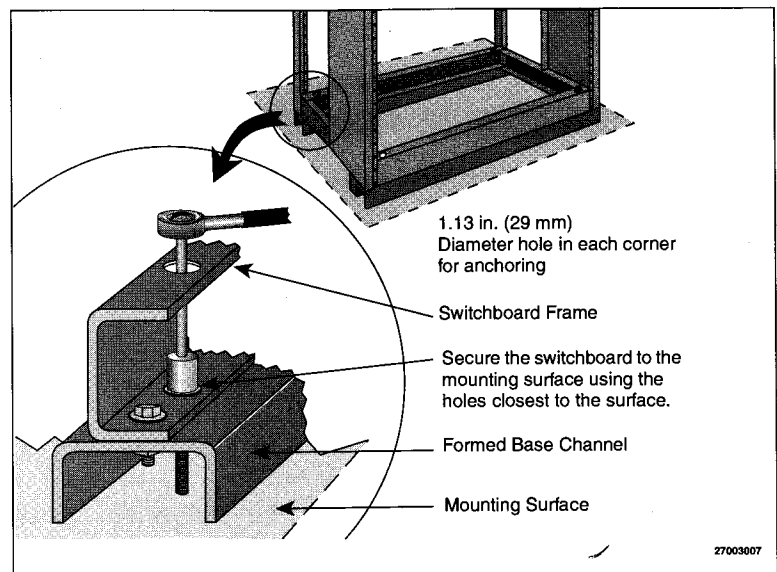
After all switchboard sections are properly joined together and the entire structure is bolted to the floor, install the incoming service conductors and

### Anchoring the Switchboard

load side cables. During an earthquake, the top of the switchboard can move in any direction. Any top incoming cables must accommodate this motion. The switchboard enclosure (particularly the top) should not be used to mount exterior equipment.

Although sections are freestanding, a hard bump or shifting movement can result in damage to the splice joints between sections and conduit hubs connected to the sections. Therefore, each vertical section must be anchored to the floor.

Formed base channels run the width of the shipping section. The channels have 1.13-inch (29 mm) diameter holes for fastening the section to the floor (Figure 8). Anchor each section to the floor with 3/4-inch (grade 2 minimum) bolts with flat washers and anchors suitable for installation of electrical equipment (not furnished).



**Figure 8: Switchboard Base Channels**

After all switchboard sections are properly joined together and the entire structure is bolted to the floor, install the incoming service conductors and load side cables.

*NOTE: If the switchboard consists of only one shipping section, proceed to "Grounding and Bonding" on page 14.*

### Through Bus Splice Connections

#### **⚠ DANGER**

##### **HAZARD OF ELECTRIC SHOCK, BURN, OR EXPLOSION**

Do not install through bus splice connectors with the switchboard energized.

**Failure to follow this instruction will result in death or serious injury.**

Through bus splice kits with installation instruction sheets are provided for each shipping split. Follow the installation instructions and torque splice bolts to the value given in "Section 9—Torque Values for Electrical Connections" on page 30.

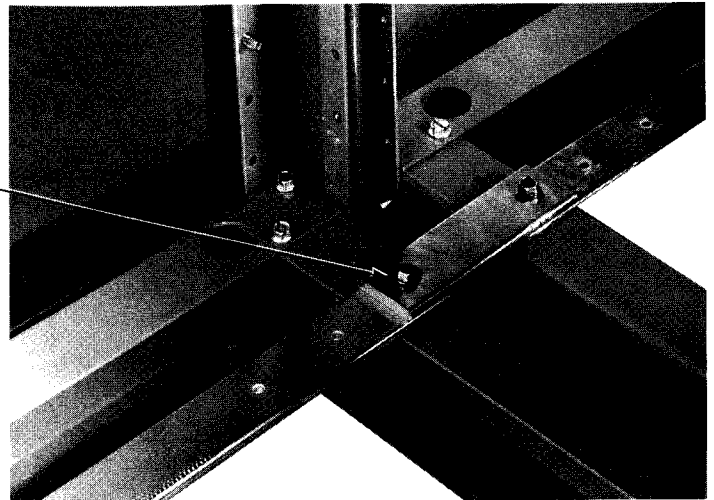
If through bus bars are wrapped with an insulative material, cover the splice connections with the material provided as directed in the instruction sheet.

### Ground Bus Splice Connections

Align and secure the ground bus splice connection between shipping sections. Torque connections to 100 lb-in (11 N•m) (Figure 9).

*NOTE: Proper installation is essential for equipment ground fault systems.*

Ground Bus Splice  
(1/4-20 thread-forming  
hardware provided)



**Figure 9: Ground Bus Splice Connection**

### Grounding and Bonding

*NOTE: A system is “grounded” if it is grounded at any point ahead of the switchboard, whether the grounded conductor (neutral) is carried through to the loads, or not.*

#### Service Equipment— Grounded System

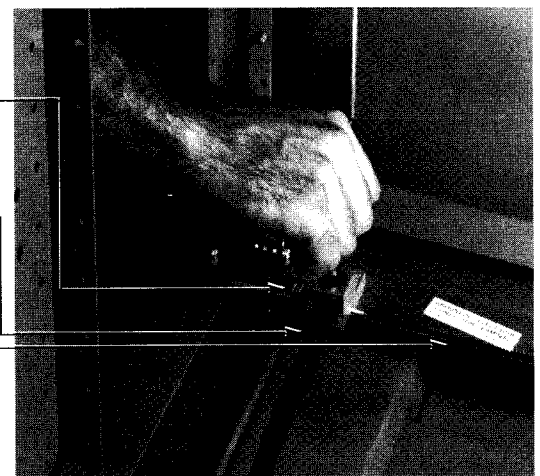
For *grounded* systems used as either service equipment or as a main switchboard on a separately derived system:

1. Run a grounding electrode conductor from the grounding electrode at the installation site to the grounding electrode conductor connector (ground lug) located on the switchboard ground bus (or on the neutral bus, if so indicated on the equipment drawing) (Figure 10). Select the proper material and size of the grounding electrode conductor to comply with sections 250-62 and 250-66 of the NEC. Install the grounding electrode conductor as specified in section 250-64 of the NEC.

Grounding Electrode  
Conductor Connector

Grounding Electrode  
Conductor

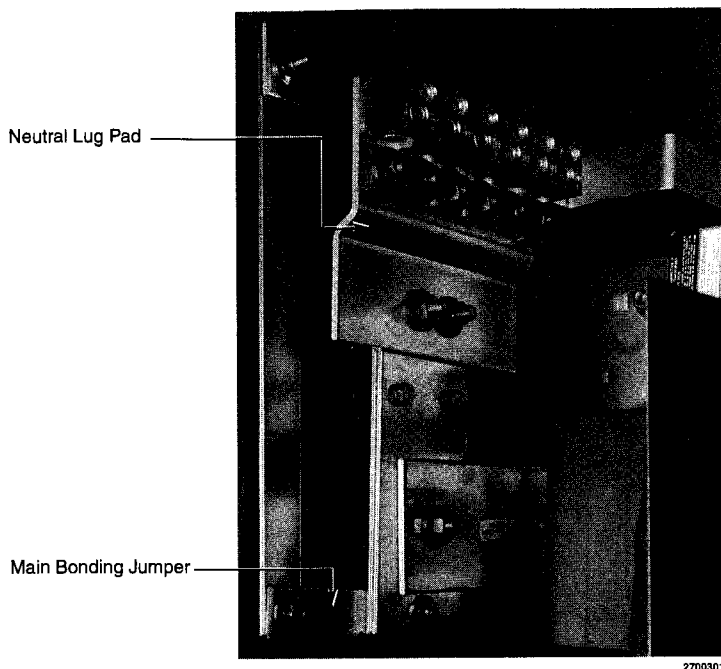
Ground Bus



**Figure 10: Grounding Electrode Connector**

2. Install the main bonding jumper between the neutral bus and the ground bus (Figure 11). Refer to "Section 9—Torque Values for Electrical Connections" on page 30 for torque values.

*NOTE: If the switchboard is fed from multiple sources (for example, double-ended systems), there are two or more main bonding jumpers to install.*



27003010

**Figure 11: Main Bonding Jumper**

Service Equipment—  
Ungrounded System

For *ungrounded* systems used as either service equipment, or as a main switchboard on a separately derived system:

- A. Run a grounding electrode conductor from the grounding electrode at the installation site to the grounding electrode conductor connector (ground lug) located on the switchboard ground bus (Figure 10).
- B. Select the proper material and size of the grounding electrode conductor to comply with sections 250-62 and 250-66 of the NEC. Install the grounding electrode conductor as specified in section 250-64 of the NEC.

Not Service Equipment

For either *grounded* or *ungrounded* systems, when a switchboard is used neither as service equipment, nor as a main switchboard on a separately derived system:

Use equipment grounding conductors sized according to section 250-122 of the NEC to connect the switchboard frame and ground bus to the service ground.

### Busway Connections

Square D switchboards are manufactured with two different styles of busway connections. QWIK FLANGE™ is used on indoor switchboards only.

The other type of busway connection is the "dummy" flanged end. This type is used on some indoor switchboards, but primarily on outdoor units. The dummy flanged end must be removed to allow actual busway flanged end installation. Either the dummy or actual busway flanged end must be in place before energizing the switchboard.

*NOTE: Do not use the top of the switchboard to support the weight of the busway connection. Support busway independently.*

QWIK FLANGE™ Busway  
Connection—NEMA Type 1  
(Indoor) Only

**⚠ DANGER**

**HAZARD OF ELECTRIC SHOCK, BURN, OR EXPLOSION**

Turn off all power supplying the switchboard and busway before installing connections.

**Failure to follow this instruction will result in death or serious injury.**

Follow the instructions in this section to make QWIK FLANGE busway connections (Figures 12 and 13):

1. Remove the insulating cover from the top plate of the switchboard.
2. Slip the busway joint into the switchboard connectors.
3. Check the joint bolt alignment; the centerline (C/L) of the joint bolt to the switchboard surface should be 0.95 inches (24 mm) (Figure 12).
4. Attach the side closing plates using two 5/16-inch bolts (provided). When properly installed, the holes in the side closing plates will align with the holes in both the switchboard and busway.

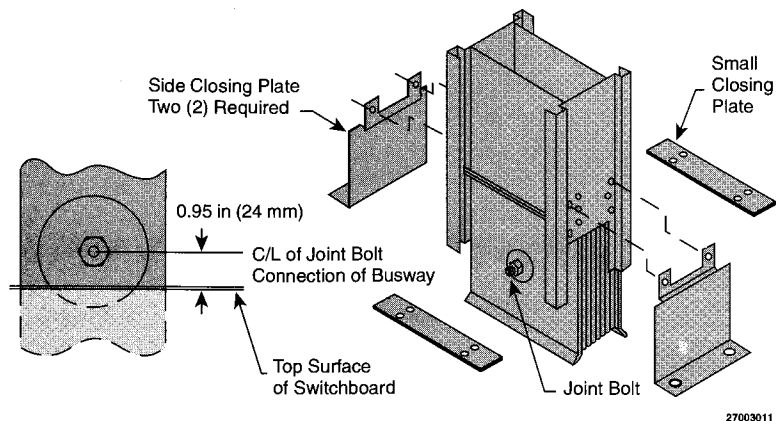


Figure 12: QWIK FLANGE Installation

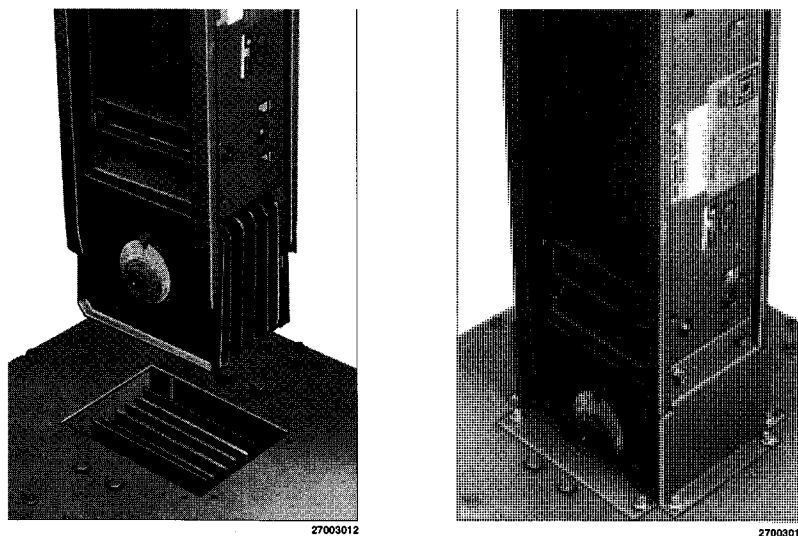


Figure 13: QWIK FLANGE

5. Use an 18-inch (457 mm) or longer wrench to torque the joint bolt until the outer break-away head twists off. Do not allow the break-away bolt head or red warning disc to drop into the switchboard.

Busway Connections—NEMA  
Type 1 (Non-QWIK FLANGE)  
and NEMA Type 3R

**⚠ DANGER**

**HAZARD OF ELECTRIC SHOCK, BURN, OR  
EXPLOSION**

Turn off all power supplying the switchboard  
and busway before installing connections.

**Failure to follow this instruction will result in  
death or serious injury.**

6. Slip the remaining two small closing plates into position by aligning with the holes in the switchboard. Use four 1/4-20 screws provided to secure.
7. Confirm proper phasing of the installed busway before energizing.

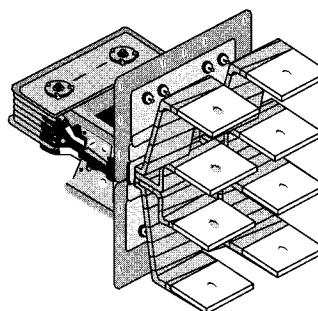
If this style of connection for busway is furnished, the busway “dummy” flanged end must be removed before installing busway (Figure 14).

1. From inside the switchboard, remove the 1/2-inch bolts that fasten the switchboard bus to the busway dummy masonite flanges. Retain all hardware for reuse.
2. Remove all screws securing the busway dummy flanged end to the switchboard enclosure.
3. Remove the busway dummy flanged end (Figure 14).



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**Figure 14: Removing the Busway Dummy Flanged End**



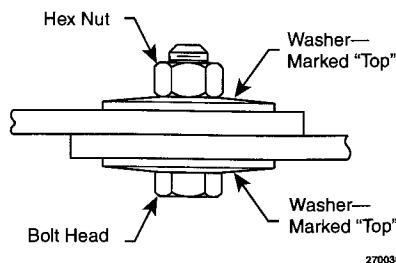
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**Figure 15: Flanged-End Connections**

4. Install the actual busway flanged end to the switchboard bus connectors provided in the switchboard (Figure 15). Insert the flanges between the switchboard bus connectors so that the mounting holes in the collar of the flanged end align with the pre-drilled holes in the switchboard enclosure.



5. Line up the holes in the bus bar flanges and reinstall the 1/2-inch hardware that was removed per step 1 as shown below (Figure 16):



*NOTE: The convex side (marked “Top”) of one conical washer should be against the bolt head and the convex side of the second conical washer should be against the hex nut.*

**Figure 16: Reinstalling the 1/2-Inch Hardware**

6. Torque the bolts inserted in step 5 per “Section 9—Torque Values for Electrical Connections” on page 31.
7. Assemble the busway collar to the switchboard enclosure with the screws provided.
8. Ensure that the busway integral ground is connected to the switchboard ground bus.
9. Confirm busway phasing before energizing.

## Conduit Area

1. Locate and terminate all conduit in the switchboard enclosure in the “available conduit area” designated on the equipment drawing.  
*NOTE: On switchboards greater than 24 inches (610 mm) deep, the center base channel can be removed for additional conduit area.*
2. Install the conduit properly. Use hubs and ring connectors to protect the cables and to prevent condensation on the conduit from entering the switchboard.

*NOTE: If top entry, do not use the top of the switchboard to support the weight of the conduit. Support the conduit independently.*

*If bottom closure plates are furnished, holes for any conduit entering the bottom of the switchboard must be made by the customer. After making the holes, reinstall the plate.*

*Under seismic conditions the top of the switchboard can move as much as 3 inches in any direction. Any top incoming cables must accommodate this motion.*

3. Bond all conduit, stubs, and ring connectors to the switchboard enclosure with approved electrical connections.

## Cable Pulling

POWER-STYLE QED switchboards are constructed to customer specifications for the cable entrance arrangement (for example, top or bottom feed). Switchboard components are arranged to give proper cable clearance and bending space for cables entering or exiting the switchboard as specified on the equipment drawing.

1. Use only cable sizes suitable for a proper fit with the corresponding lugs.
2. Pull the proper number of line side and load side cables according to the load served and the NEC.
3. Position the cables inside the switchboard so that they are not subject to physical damage.
4. Maintain the maximum possible bending radii and proper clearance to bus bars and grounded parts. If any cables are lying or bearing on structural members, support them to relieve this condition or place suitable protective material at the bearing point to protect the cable insulation.

### Cable Terminations

5. Where cables enter or leave the switchboard, or pass through any metal that has magnetic properties, be certain to run all phase conductors, including the neutral, through the same opening. Otherwise, overheating can result. See section 300-20(a) of NEC.
6. When instructed, brace or cable lace the conductors.
1. Strip a length of insulation from the end of the cable sufficient to fit into the full length of the lug barrel, being careful not to nick or ring the strands. Use a proper insulation stripping tool.
2. Thoroughly clean aluminum cable contact surfaces with a wire brush or scrub them with an abrasive cloth to remove oxides and foreign matter.
3. Immediately apply an acceptable joint compound to the bare aluminum surfaces.
4. If compression-type lugs are furnished on any switch or circuit breaker, or as the main incoming power lugs, unbolt and remove them to create sufficient room for crimping the lugs to the cables with the crimping tool.
  - A. Insert the cable into the lug barrel and, using the crimping tool, make the specified number of crimps per the manufacturer's recommendations.
  - B. Wipe excess joint compound from the connector and insulation.
  - C. With the cables connected, remount the lugs onto the bus bars, switches, or circuit breakers. Torque the bolts to the values given in "Section 9—Torque Values for Electrical Connections" on page 30.
5. Set screw-type lugs may be furnished as main incoming lugs and are standard on molded case circuit breakers and QMB/QMJ fusible switches. Torque these lugs **to, but do not exceed**, the specified values. Torque values for circuit breaker and switch lugs are marked on these units. Torque values for other switchboard lugs are marked on the switchboard (Table 3 on page 30).

### Ground Fault Protection Systems

According to section 230-95(c) of the NEC, "The ground-fault protection system shall be performance tested when first installed ... A written record of this test shall be made and shall be available to the authority having jurisdiction."

Although Square D Company tests and acknowledges the ground fault tests in writing for factory installed ground fault, improper grounding of the switchboard and devices downstream at the job site will defeat the ground fault. Performance testing of the ground fault, as stated in the NEC, requires injecting sufficient current into the system to test the ground fault. High current injection by a certified testing organization will test the polarity of the ground fault current sensor, interconnection wiring, and proper bonding of the neutral.

*NOTE: Some ground fault systems require field connections at the job site. Consult the switchboard interconnection wiring drawing for details.*

### SECTION 5— PRE-ENERGIZING CHECKOUT PROCEDURE

Conduct a complete inspection **before** the switchboard is energized to ensure that all components function and operate properly. **Complete every step of the checkout procedure listed before energizing the switchboard.**

1. Check all field-installed bus bar connections. Torque values are listed in "Section 9—Torque Values for Electrical Connections" on page 31.
2. Check all accessible connections for tightness.
3. Check all factory and field-installed lug terminations for tightness.
4. Check the rigidity of all bus bar supports.
5. Check the switchboard enclosure for dents or other damage that reduces electrical clearances inside the switchboard.

6. Remove all foam blocks, or other temporary cushioning or retaining material, from the electrical devices.
7. Manually open and close all switches, circuit breakers, and other operating mechanisms, checking for correct alignment and free operation.
8. Operate all electrically operated switches, circuit breakers, and other devices equipped with remote operators (not under load). An auxiliary source of control power may be necessary to accomplish this.
9. Check all relays, meters, and instrumentation to verify that all field installed wiring connections are made properly and that the devices function properly.
10. Current transformers (CTs) supplied for customer use require connection to a metering device load before energizing. Verify that the metering device load is properly connected, including main switchboard connections to remote equipment.
11. All CT circuits supplied by Square D for customer metering use are shorted for shipment. Remove shorting terminal screws on shorting terminal blocks or jumpers and store in the block.
12. Factory-installed molded case circuit breakers, 250 A frames or larger, have an adjustable magnetic trip, which is shipped on the "LO" setting. The markings between "LO" and "HI" settings represent a range of instantaneous magnetic trip values of 5–10 times the circuit breaker's continuous current rating. To provide coordinated operation during a fault, adjust the magnetic trip as outlined in the respective instruction manual. All poles are adjusted simultaneously, using a screwdriver, by the single setting (Figure 17).

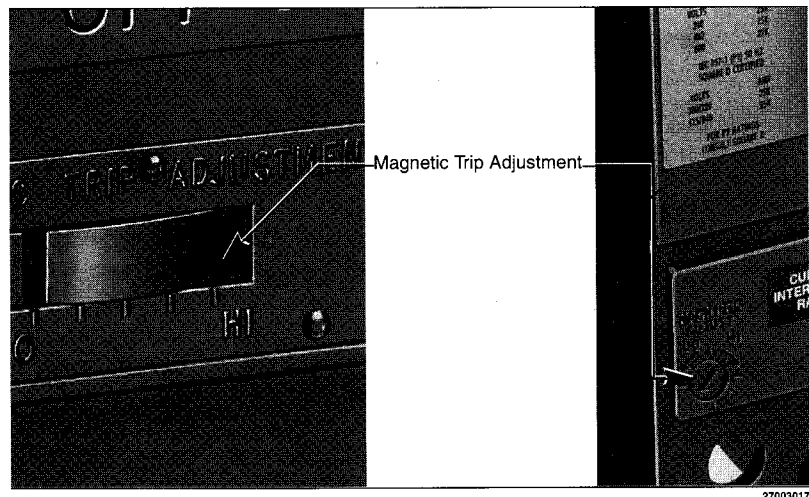


Figure 17: Instantaneous Trip Setting

13. On switchboards containing an electronic trip circuit breaker, set the tripping characteristic curve of the adjustable electronic trip unit as outlined in the respective instruction manual.
14. If ground fault protection is furnished on type BP switch, adjust the relay to the desired ground current pickup setting. The relay is shipped from the factory at the "LO" setting of 100 A for the Type GC relay. Relay pickup range is from 100–1,200 A for the Type GC relay.

*NOTE: For molded case circuit breakers, refer to "Section 11—Reference Publications", beginning on page 33 for circuit breaker information.*

### **⚠ CAUTION**

#### **HAZARD OF EQUIPMENT DAMAGE**

Do not pry open or spread the fuse mounting clips. This can cause a loose connection, resulting in overheating.

**Failure to follow this instruction can result in injury or equipment damage.**

### **⚠ CAUTION**

#### **HAZARD OF EQUIPMENT DAMAGE**

Do not use an air hose to blow out the switchboard. The dust may settle inside relays and overcurrent devices, causing overheating and improper operation.

**Failure to follow this instruction can result in injury or equipment damage.**

## **SECTION 6— ENERGIZING THE SWITCHBOARD**

15. Check the torque on all bolts of the fuses mounted in BOLT-LOC® switches, 21–30 lb-ft (28–41 N•m), and in QMB/QMJ switches (as marked on the device).
16. Examine fuse clip contact pressure and contact means (QMB/QMJ fusible switches). If there is any sign of looseness contact Square D Field Services at 1-800-634-2003. Loose fuse clips can result in overheating.
17. Check all QMB/QMJ fusible switches, verifying that the proper fuses with the required interrupting rating and continuous current rating are installed. Do not use renewable link fuses in Square D fusible switches.
18. Verify that all grounding connections are correctly made. If the switchboard is used as a service entrance, double check to see that the main bonding jumper is connected (Figure 11 on page 15).
19. Conduct an electrical insulation resistance (megger) test to ensure that the switchboard is free from short circuits and undesirable grounds. Open all control power and metering disconnects or remove the fuses from the control circuits. With the neutral isolated from the ground and the power switches and circuit breakers open, conduct electrical insulation tests from phase to phase, phase to ground, phase to neutral, and neutral-to-ground. If the resistance reads less than one megohm while testing with the branch circuit devices in the open position, the system may be unsafe and should be investigated. Consult Square D Field Services at 1-800-634-2003 to help you correct any problems.
20. After completing the electrical insulation resistance test, replace all control power fuses that may have been removed and close power disconnects that have been opened. Energize supplies as desired.
21. Check all field-installed wiring. Make certain it is clear of all live parts and secured, when instructed, to withstand fault currents.
22. Verify that all control wiring between sections is connected.
23. Vacuum to remove any dust, scrap wire, or other debris.
24. Replace all covers; check for any pinched wires, and close doors. Make certain all enclosure parts are properly aligned and fastened securely.

### **⚠ DANGER**

#### **HAZARD OF ELECTRIC SHOCK, BURN, OR EXPLOSION**

- Correct short circuit conditions detected during the checkout procedures described in “Section 5—Pre-energizing Checkout Procedure”, beginning on page 19.
- Qualified electrical personnel must be present when energizing this equipment for the first time.
- Follow the instructions in this section to properly energize the switchboard.

**Failure to follow these instructions will result in death or serious injury.**

1. No load should be on the switchboard when it is energized. Turn off all downstream loads.
2. Energize the switchboard in the following sequence:
  - A. Turn on all control power disconnects before energizing the switchboard. Refer to the record drawings supplied with equipment to see if control power disconnects are supplied.
  - B. Close any open doors and/or covers.
  - C. Close the main device(s).
  - D. Close each branch circuit breaker or branch fusible switch.
  - E. Proceed to each panelboard and other downstream load.

## SECTION 7— MAINTAINING THE SWITCHBOARD

### **⚠ DANGER**

#### **HAZARD OF ELECTRIC SHOCK, BURN, OR EXPLOSION**

- Inspect and perform preventive maintenance only on switchboards and equipment to which power has been turned off, disconnected, and electrically isolated (unless otherwise specified) so that no accidental contact can be made with energized parts.
- Follow safety related work practices as described in NFPA 70E, Part II at all times.

**Failure to follow these instructions will result in death or serious injury.**

#### **General Inspection and Cleaning**

### **⚠ CAUTION**

#### **HAZARD OF EQUIPMENT DAMAGE**

- Do not use an air hose to blow out the switchboard. The dust may settle inside relays and overcurrent devices, causing overheating and improper operation.
- Do not allow paint, chemicals, or petroleum-based solvents to contact plastics or insulating materials.

**Failure to follow these instructions can result in injury or equipment damage.**

3. After all overcurrent protective devices are safely closed, turn on all loads (for example, lighting circuits, contactors, heaters, and motors).

Periodic maintenance on the switchboard includes cleaning, lubrication, and exercising component parts. The interval between maintenance checks can vary depending upon the amount of usage and environmental conditions of each installation. The maximum recommended inspection interval is one year. This definition for periodic maintenance applies throughout this manual, unless otherwise noted.

Always inspect the switchboard after a fault. (Refer to "Section 8—Adverse Circumstances", beginning on page 27). Service bulletins for the various disconnecting and overcurrent devices mounted in the switchboard are available through your local Square D field office.

1. Vacuum the switchboard interior to remove any dirt or dust deposits. Wipe all bus bars, insulators, cables, and so forth, with a clean, dry, lint-free cloth.
2. Check the switchboard interior carefully for moisture, condensation build-up, or signs of any previous wetness. Moisture can cause insulation failures and rapid oxidation of current carrying parts. Inspect all conduit entrances and cracks between the enclosure panels for dripping leaks. Condensation in conduits may be a source of moisture and must not be allowed to drip onto live parts or insulating material. Take the necessary steps to eliminate the moisture and seal off all leaks.
3. Inspect the switchboard for any signs of overheating. Discoloration and flaking of insulation or metal parts are indications of overheating.

*NOTE: If overheating occurs, be sure that all conditions that caused the overheating have been corrected. Loose or contaminated connections can cause overheating.*

4. Check for signs of rodent nesting in the switchboard. If required, use a good exterminating technique in the general area of the switchboard.  
*NOTE: Do not place or use exterminating substances and chemicals inside the switchboard. Some of these products attract rodents.*
5. Carefully inspect all devices for any visibly worn-out, cracked, or missing parts.
6. Manually open and close switches and circuit breakers several times to verify they are working properly.
7. Verify that all key interlocks and door interlocking provisions are working properly.

## Bus Bar Joints, Lug Terminations, and Insulating Materials

### ⚠ CAUTION

#### HAZARD OF EQUIPMENT DAMAGE

- Do not sand or remove plating on any bus bar, splice bar, or terminal lug.
- Damage to plating can result in overheating. Replace damaged part. Contact Square D Field Services at 1-800-634-2003.

**Failure to follow these instructions can result in injury or equipment damage.**

#### General Lubrication Information

1. Bus bar joints are maintenance-free. Do not retighten them after the pre-energizing checkout procedure is complete.
2. Check all bus bar joints and terminal lugs for any pitting, corrosion, or discoloration resulting from high temperatures or subjection to high fault conditions. If any damage has occurred, replace the bus bars or lugs. If cleaning is required, use LECTRA-CLEAN®, made by CRC.
3. Inspect all insulating materials. Before re-energizing the switchboard, replace insulators having any visible damage (such as cracks).

For field maintenance re-lubrication of blade/jaw components in switches 600 V and below, use Square D catalog number SWLUB, BG20 High Performance Synthetic Grease from Dow Corning. This grease is applicable for the following switches:

- BOLT-LOC
- QMB Main and Branch
- QMJ Branch

For bus/plug-on connections use Square D catalog number PJC7201 Electric Joint Compound.

For SED and NED circuit breaker drawout connections, Square D catalog number PJC8311 Electric Joint Compound **must** be used.

Consult the manufacturer's bulletin about these devices for all installation, operation, and maintenance instructions.

Refer to the BOLT-LOC switch installation and maintenance manual for complete information (manual is shipped with the switchboard). If the manual is not available, refer to "Section 11—Reference Publications" beginning on page 33, and contact your local Square D field office to obtain the appropriate manuals.

1. Exercise the operating mechanism at least once a year to ensure proper operation.
2. The BOLT-LOC switch is shipped from the factory properly lubricated. Periodic cleaning and lubrication of the switch is required. The maintenance interval between lubrications depends on factors such as usage and ambient conditions. The maximum recommended maintenance interval is one year for current carrying parts and five years for operating mechanisms.
3. To replace the fuse:
  - A. Open the switch before opening the fuse door.

#### Automatic Transfer Switches

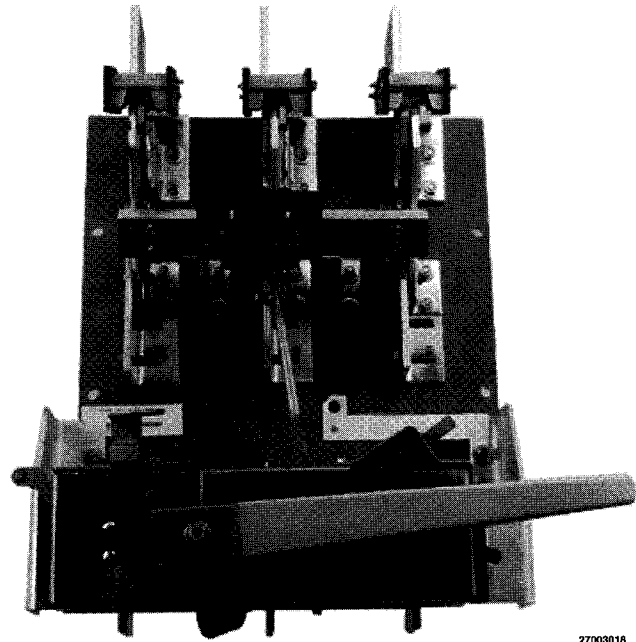
#### BOLT-LOC Bolted Pressure Contact Switch Maintenance (800–4,000 A)

### ⚠ DANGER

#### HAZARD OF ELECTRIC SHOCK, BURN, OR EXPLOSION

Always check line and load ends of the fuses for voltage before starting the replacement procedure. The BOLT-LOC switch can be part of a multiple source system in which the fuses can be energized when the BOLT-LOC switch is in the "open" position.

**Failure to follow this instruction will result in death or serious injury.**



27003016

**Figure 18: BOLT-LOC Switch**

- B. Open the fuse door, releasing the interlock per instructions on the door.
  - C. Observe the switch blades to confirm the switch is "open."
  - D. Check the line and load ends of fuses for voltage using a properly rated voltage sensing device. There should be no voltage present.
  - E. Remove the fuse(s).
  - F. Using a nonabrasive cleaner, such as LECTRA-CLEAN®, made by CRC, wipe clean the fuse mounting pads on the switch and the terminals of each new fuse. Check the alignment of fuse terminals before installing the new fuse(s).
  - G. Install the new fuse(s), using the same hardware removed in step E, and tighten to 21–30 lb-ft (28–41 N•m).
4. Close the fuse door and check the fuse door interlock with the switch on. The fuse doors should not open using normal hand force.

### Molded Case Circuit Breakers

Square D molded case circuit breakers are designed and manufactured as totally sealed units requiring minimal periodic maintenance.

Exercise circuit breakers at least once a year to ensure proper operation. For general maintenance:

1. Trip the circuit breaker by pushing the Push To Trip button located on the face of the circuit breaker (Figure 19). (On most molded case circuit breakers this button will be yellow.) This tests alarm switches if they are built into the circuit breaker, or electrical interlocks between two circuit breakers. This also exercises the trip mechanism.
2. Manually open and close the circuit breaker two or three times.

## ⚠ DANGER

### HAZARD OF ELECTRIC SHOCK, BURN, OR EXPLOSION

- If circuit breaker settings are adjusted, do not set the long time trip rating at a higher ampacity than the rating of the bus bar or load cables it supplies; overheating can occur.
- Before energizing the switchboard, all unused I-LINE breaker mounting spaces **must** be filled with blank fillers and/or extensions as listed in Table 1.

**Failure to follow these instructions will result in death or serious injury.**

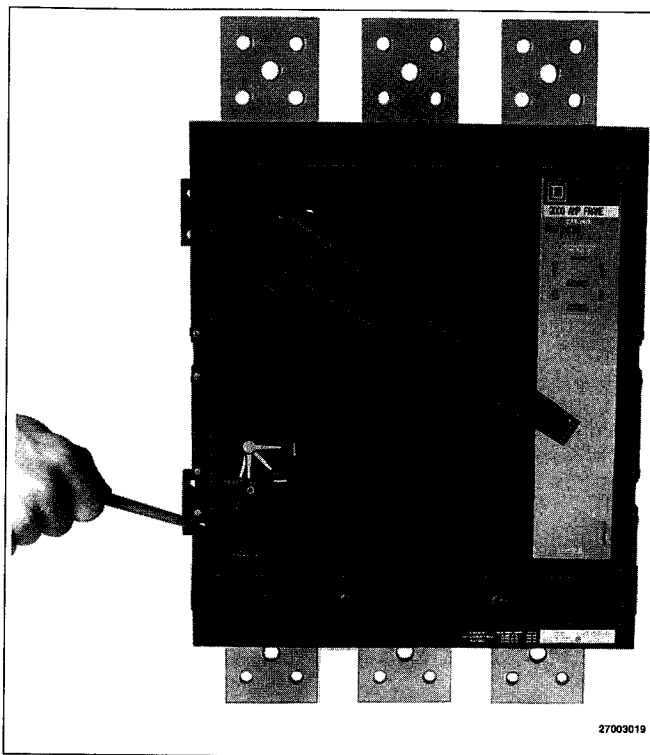
*NOTE: If additional lubrication is required, apply a coating of electrical joint compound, catalog number PJC7201, to the plug-on connectors' contact surfaces.*

## ⚠ CAUTION

### HAZARD OF EQUIPMENT DAMAGE

Do not remove the protective lubricant on the plug-on connectors.

**Failure to follow this instruction can result in injury or equipment damage.**



**Figure 19: Molded Case Circuit Breaker**

*NOTE: Square D bulletin number 0600PD9602, Field Testing Industrial Molded Case Circuit Breakers, provides more in-depth information. (Refer to "Section 11—Reference Publications", beginning on page 33). Contact your local Square D field office to obtain this bulletin.*

*Refer to individual circuit breaker instruction manuals shipped with the switchboard for additional maintenance information, such as changing rating columns or adjustable settings and removing circuit breakers. If the instruction manual is not available, see "Section 11—Reference Publications" of this manual for the appropriate number, and contact your local Square D field office to obtain this manual.*

**Table 1: Blank Fillers and Extensions**

	Height	Catalog No.
<b>Blank Fillers</b>	1.5 in. (38 mm)	HNM1BL
	4.5 in. (114 mm)	HNM4BL
<b>Blank Extensions</b>	1.5 in. (38 mm)	HLW1BL
	4.5 in. (114 mm)	HLW4BL

3. The universal test set, catalog number UTS3, is available to test all Square D circuit breakers equipped with MICROLOGIC trip units. It runs trip unit tests automatically, with prompts to the user for initial information. Test modules for each breaker frame are used to store data necessary for automatic tests. Series B MICROLOGIC trip units require test module CBTMB, which is included in UTS3.

*NOTE: Tests may be conducted with a breaker installed in the switchboard; breaker removal is not required. **The switchboard must be de-energized.***



## QMB/QMJ Fusible Switches

Refer to the QMB instruction manual for complete maintenance information. If the instruction manual is not available, refer to "Section 11—Reference Publications", beginning on page 33 of this manual for the appropriate number. Contact your local Square D field office to obtain the manual.

### Switch Maintenance

1. Periodically exercise the switch to ensure proper operation. This period should not exceed one year.
2. Check the cover interlock with the switch on. The cover should not open using normal hand force.
3. Inspect the switch interior for any damaged or cracked parts and replace as necessary.
4. Check the fuse mounting clips or bolted contact area for corrosion or discoloration (indicating overheating). Replace them if necessary.
5. For additional maintenance instructions, see the inside of the cover door.

### Fuse Replacement

#### **⚠ DANGER**

##### **HAZARD OF ELECTRIC SHOCK, BURN, OR EXPLOSION**

Always check line and load ends of the fuses for voltage before starting the fuse replacement procedure with a properly rated voltage sensing device.

**Failure to follow this instruction will result in death or serious injury.**

1. Turn the switch "OFF" before opening the door.
2. Observe the switchblades to confirm that the switch is in the "OFF" position.
3. Using a properly rated voltage sensing device, verify that line and load ends of the fuse are not energized.
4. Observe all warning labels specifying which type of fuse to use. Do not substitute a noncurrent limiting fuse, or attempt in any way to defeat the rejection feature of the fuse clips furnished with the switch. Do not use renewable link fuses in Square D fusible switches.

#### **⚠ CAUTION**

##### **HAZARD OF EQUIPMENT DAMAGE**

Do not pry open or spread the fuse mounting clips. This can cause a loose connection, resulting in overheating and nuisance fuse blowing.

**Failure to follow this instruction can result in injury or equipment damage.**

### Installing QMB/QMJ Fusible Switches

#### **⚠ DANGER**

##### **HAZARD OF ELECTRIC SHOCK, BURN, OR EXPLOSION**

- Remove power for these sections before installing or removing QMB/QMJ switches.
- Do not use a main as a branch unit or a branch as a main.
- All unused spaces must be filled with blank fillers before energizing the switchboard. See the following chart for sizes and catalog numbers.

**Failure to follow these instructions will result in death or serious injury.**

1. Turn off the main power.
2. Turn the switch handle(s) "OFF". Align switch plug-on connectors with QMB panel vertical bus and plug switch onto panel.
3. Start all unit mounting screws that mount to the QMB panel mounting rails.
4. Tighten the screws evenly. The unit mounting flange and plug-on connectors must be seated securely.

## **⚠ CAUTION**

### **HAZARD OF EQUIPMENT DAMAGE**

Do not remove the protective lubricant on the plug-on connectors.

**Failure to follow this instruction can result in injury or equipment damage.**

Removing QMB/QMJ Fusible  
Switches

Ground Fault Protection  
Systems

**Table 2: QMB/QMJ Fusible Switch Blank Fillers**

Height	Catalog No.
1.5 in. (38 mm)	QMB1BLW
3 in. (76 mm)	QMB3BLW
6 in. (152 mm)	QMB6BLW
15 in. (381 mm)	QMB15BLW

1. Turn off the main power.
2. Turn switch handle(s) "OFF."
3. Disconnect the load wires.
4. Remove mounting screws holding the switch to the mounting rail.
5. Unplug the switch.

Check the terminal connections on the ground fault protection system at least once a year for tightness and corrosion. If the system can be tested with or without tripping the main or branch device, directions for testing the system are in the device manual. Otherwise, testing the ground fault protection system will trip the main or branch device to which it is connected. If the ground fault sensor or relay is physically or electrically damaged, replace it.

If the ground fault protection system does not operate properly and additional equipment has been connected to the installation since the last maintenance test/check, de-energize the entire system and check for grounds on the neutral downstream from the main bonding jumper. If no downstream grounds are detected and the ground fault system is not operating properly, contact Square D Field Services at 1-800-643-2003.

If no additions have been made to the installation and the ground fault protection system does not operate properly, contact Square D Field Services at 1-800-643-2003.

Refer to the ground fault field test instruction manual for additional testing information. If the manual is not available, refer to "Section 11—Reference Publications", beginning on page 33 of this manual to obtain the appropriate number. Contact your local Square D field office to obtain this manual.

This section includes, but is not limited to, all electrical components of the switchboard.

## **SECTION 8— ADVERSE CIRCUMSTANCES**

Inspection Following a  
Short Circuit

## **⚠ DANGER**

### **HAZARD OF ELECTRIC SHOCK, BURN, OR EXPLOSION**

- Turn off all power supplying the switchboard before cleaning.
- Before energizing the switchboard, all unused breaker mounting spaces must be filled.

**Failure to follow these instructions will result in death or serious injury.**

*NOTE: Before attempting to re-energize the switchboard following a fault, contact Square D Field Services, 1-800-634-2003, for special instructions.*

If a short circuit occurs, make a thorough inspection of the entire system and verify that no damage to conductors or insulation has occurred. High mechanical and thermal stresses developed by short circuit currents may damage conductors and insulation. Check the overcurrent protection device that interrupted the short circuit current for possible arcing damage.

### Clean-up Following a Short Circuit

Do not open sealed devices, such as molded case circuit breakers. These devices should be replaced if damaged. Before energizing the switchboard, all unused breaker mounting spaces must be filled. For more information about these devices, refer to the appropriate instruction manual listed in "Section 11—Reference Publications", beginning on page 33.

The insulating properties of some organic insulating materials may deteriorate during an electrical arc. Replace carbon-tracked insulation.

*NOTE: Contact Square D Field Services before cleaning a switchboard that has been subjected to a short circuit situation.*

### Water-Soaked Switchboards

Do not clean or repair a switchboard that has been exposed to large volumes of water or submerged at any time. Current carrying parts, insulation systems, and electrical components may be damaged beyond repair. **Do not energize the switchboard.** Contact Square D Field Services.

### Water-Sprayed or Splashed Switchboards (Clean Water Only)

#### **⚠ DANGER**

#### **HAZARD OF ELECTRIC SHOCK, BURN, OR EXPLOSION**

Turn off all power supplying this equipment before working on it.

**Failure to follow this instruction will result in death or serious injury.**

If the switchboard has been sprayed or splashed with small amounts of clean water, make a thorough inspection of the entire system and verify that no damage to conductors or insulation has occurred. Do not open sealed devices such as molded case circuit breakers or fuses. These devices should be replaced if damaged. For more information about these devices, refer to the appropriate instruction manual listed in "Section 11—Reference Publications".

### Inspection and Clean-up of Clean Water Sprayed or Splashed Switchboards

Follow steps 1 through 8 only if:

- No signs of physical damage to the equipment are present.
- The switchboard has not been submerged or exposed to water for long periods of time.
- The water that has been in contact with the switchboard has not been contaminated with sewage, chemicals, or other substances that can negatively affect the integrity of the electrical equipment.
- The water that has been in contact with the switchboard has not entered any area of the enclosure that may contain wiring installed as intended and located above any live part. Specifically, inspect for water entering through conduits located above live parts.

If any of these conditions have not been met, contact Square D Field Services at 1-800-634-2003.

If **ALL** of the conditions listed above are true, proceed as follows:

1. Completely de-energize the switchboard. **Disconnect and electrically isolate the switchboard so no contact can be made with energized parts.**
2. Wipe off all moisture from the bus bars, insulators, and insulating material with a clean, dry, lint-free cloth. **Do not** use cleaning agents or water displacement sprays.
3. Prepare the switchboard for insulation resistance (megger) testing by disconnecting all line-side supply connections and all load-side cable connections to isolate the switchboard from the wiring system.
4. Turn all circuit breakers or switches to their "ON" position. The switchboard must remain completely de-energized.

5. Use a megohmmeter with a capacity of 500–1,000 Vdc and apply voltage from:
  - A. Each phase-to-ground with breaker “ON.”
  - B. Phase-to-phase with breaker “ON.”
6. Record resistance values (see “Always use a 500 or 1,000 Vdc megohmmeter when testing insulation resistance.” on page 32).
7. If resistance measurements are less than 0.5 megohm, call Square D Field Services for recommendations.
8. If resistance measurements are greater than 0.5 megohm, the equipment can be energized using the procedures listed in “Section 6—Energizing the Switchboard”, beginning on page 21.

## SECTION 9— TORQUE VALUES FOR ELECTRICAL CONNECTIONS

**Table 3: Incoming, Branch, and Neutral Lug**

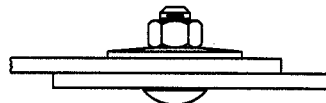
Socket Size Across Flats	Torque Value
1/4 in.	180 lb-in (20 N•m)
5/16 in.	250 lb-in (28 N•m)
3/8 in.	340 lb-in (38 N•m)
1/2 in.	620 lb-in (70 N•m)

**Table 4: Multiple Conductor Neutral and/or Ground Bar**

Screw Type	Lug Wire Range	Conductor Size	Torque Value
Slotted Head	14–4	14-10 Cu, 12-10 Al	20 lb-in (2 N•m)
		8 Cu-Al	25 lb-in (3 N•m)
		6-4 Cu-Al	35 lb-in (4 N•m)
	14–1/0	14-8 Cu-Al	36 lb-in (4 N•m)
		6-1/0 Cu-Al	45 lb-in (5 N•m)
Socket Head	14–1/0	All	100 lb-in (11 N•m)
	6–300 kcmil	All	275 lb-in (31 N•m)

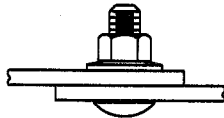
**Table 5: QED-3 Circuit Breaker Connector Bolts**

Circuit Breaker Type	Torque Value Line/Load Connector Bolts
FA, FH, FC, FI	55-65 lb-in (6–7 N•m)
KA, KH, KC, KI	65-75 lb-in (7–8 N•m)
LA, LH	145-160 lb-in (16–18 N•m)
MA, MH, MX, ME	130-150 lb-in (15–17 N•m)
NA, NC, NX, NE	130-150 lb-in (15–17 N•m)

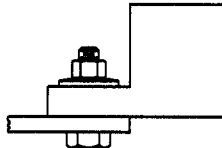


Carriage Bolt  
Hex Nut  
Conical Washer

Hardware Description	Torque Value
1/2 in.	780—900 lb-in (88—102 N•m)

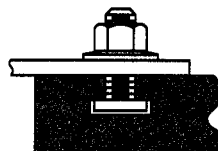


Carriage Bolt  
Conical Washer Assembly  
(Keps Nut)



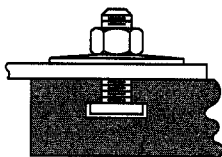
Hex Head Bolt  
Conical Washer Assembly  
(Kep Nut)

Hardware Description	Torque Value
1/4 in.	50—75 lb-in (6—8 N•m)
5/16 in.	80—125 lb-in (9—14 N•m)
3/8 in.	175—225 lb-in (20—25 N•m)
1/2 in.	250—350 lb-in (28—40 N•m)



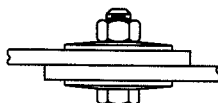
Square Head (Tee) Bolt  
Conical Washer Assembly  
(Keps Nut)

Hardware Description	Torque Value
3/8 in.	175—225 lb-in (20—25 N•m)
1/2 in.	250—350 lb-in (28—40 N•m)



Square Head (Tee) Bolt  
Conical Washer

Hardware Description	Torque Value	
	Conical Washer OD	Square Head (Tee) Bolt Conical Washer
3/8 in.	0.87 in. (22 mm)	250—280 lb-in (28—32 N•m)
	1 in. (25 mm)	130—150 lb-in (15—17 N•m)
1/2 in.	1.25 in. (32 mm)	450—550 lb-in (51—62 N•m)
	2.25 in. (57 mm)	



Hex Head Bolt  
(2) Conical Washers

Hardware Description	Torque Value	
	Conical Washer OD	Hex Head Bolt (2) Conical Washers
5/16 in.	0.90 in. (23 mm)	145—160 lb-in (16—18 N•m)
3/8 in.	0.87 in. (22 mm)	250—280 lb-in (28—32 N•m)
	1 in. (25 mm)	130—150 lb-in (15—17 N•m)
1/2 in.	1.25 in. (32 mm)	780—900 lb-in (88—102 N•m)
	2.25 in. (57 mm)	
	3.00 in. (76 mm)	

**SECTION 10—  
SWITCHBOARD INSULATION  
RESISTANCE CHART**

Always use a 500 or 1,000 Vdc megohmmeter when testing insulation resistance.

*NOTE: The Neutral–Ground column is provided to record the results of the pre-energizing checkout procedure only.*

**⚠ DANGER**

**HAZARD OF ELECTRIC SHOCK, BURN, OR  
EXPLOSION**

Turn off all power to the switchboard before testing.

**Failure to follow this instruction will result in death or serious injury.**

Date	Phase–Phase			Phase–Ground			Neutral–Ground
	All Disconnects Open						
	a-b	b-c	c-a	a-ground	b-ground	c-ground	Neutral–Ground
Date	All Disconnects Closed						
	a-b	b-c	c-a	a-ground	b-ground	c-ground	Neutral–Ground



## SECTION 11— REFERENCE PUBLICATIONS

The following Square D publications are available through your local Square D field office. These include device replacement procedures and spare parts listings to make ordering and servicing of replacement parts quick and convenient. Any maintenance procedure or device not listed, such as an I-LINE® panel, is not customer serviceable. Contact the nearest Square D field office for information at 1-800-634-2003.

Installation Instructions	Publication Number
FA, FH, FC, SFH Circuit Breakers	48940-158-02
NA, NC, SL 1200 I-LINE® Circuit Breakers	48040-797-04
LI, LC I-LINE Circuit Breakers	48040-732-03
KA, KH, KC, KI, SKC, SKI Instructions	48049-031-02
FI Instructions	48049-033-01
LA, LH, SLA, Q4 Instructions	48049-034-02
Q2 Instruction Sheet	48040-008-08
MA, MH, SMA, SMH Instructions	48049-032-02
PA, PH Instruction Sheet	48040-189-05
FA-M01 and KA-M01 Motor Operator	48049-085-01
LA-M01 and MA-M01 Motor Operator	48049-086-01
PA-M02 Motor Operator	48040-884-06
SE	48040-495-06
Ground Fault Module (GFM)	48040-756-05
Ground Fault Protection System—Type GC	40268-292-01
MASTERPACT® Universal Power Circuit Breaker	48049-071-02
QMB Fusible Switches	40268-525-02

Instruction and Maintenance Manuals	Publication Number
LE/LX Manual	48049-027-02
ME, MX Electronic Trip Circuit Breakers	48049-028-02
NE, NX Drawout Circuit Breakers	48049-029-01
PE/PX Manual	48040-940-03
SE Electronic Trip Circuit Breaker	48040-495-06
POWERLOGIC® Circuit Monitor (CM-2050, 2150, 2250, 2350, 2450)	3020IM9301R10/97
POWERLOGIC System Display for MICROLOGIC® Circuit Breakers (SD-100, SD-120)	3050IM9103
POWERLOGIC Power Interface for MICROLOGIC Circuit Breakers (PIF-3)	3050IM9101
POWERLOGIC Power Meter (PM-600, PM-620, PMD-32)	3020IM9503
BOLT-LOC Switches—Series 2	9810-10

Ground Fault Field Test Instructions	Publication Number
Ground Fault Module (GFM) Field Test Procedure	48040-757-04
ME/NE/PE and MX/NX/PX Electronic Trip Circuit Breakers	63020-271-01
Type GC—Ground Fault Protection System	80043-054-01




<b>Distribution Products Catalog</b>	<b>Section Number</b>
Molded Case Circuit Breakers	600
QMB Fusible Switches	4620
QMB Circuit Breaker Adapter Units	4620
Class 6035 POWER-ZONE® III	6035

<b>Other Reference Literature</b>	<b>Publication Number</b>
General Instructions for Proper Installation, Operation, and Maintenance of Switchboards Rated 600 V or Less	NEMA Publication PB2.1
Application Guide for Ground Fault Protective Devices for Equipment	NEMA Publication PB2.2
Circuit Breakers	NEMA Publication AB-4
Enclosed and Miscellaneous Distribution Switches	NEMA Publication KS-1
Electrical Equipment Maintenance	NFPA 70B-1999
MASTERPACT® Accessories Door Frame Adaptation	Merlin Gerlin No. 685403
Molded Case Circuit Breakers Field Test and Maintenance	Square D Bulletin No. 0600PD9602

For information about obtaining NEMA documents, write to:

National Electrical Manufacturers Association (NEMA)  
Attention: Customer Service  
1300 North 17th Street  
Suite 1847  
Rosslyn, VA 22209

Square D Company  
1990 Sandifer Blvd.  
Seneca, SC 29678 USA  
864-882-2414  
[www.squared.com](http://www.squared.com)

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