Power-Style™ QED-2 Switchboards

Class 2700

ENGLISH

Instruction Bulletin

80043-055-12
05/2015

Retain for future use.

SQUARE D™
by Schneider Electric

Hazard Categories and Special Symbols

Read these instructions carefully and look at the equipment to become familiar with the device before trying to install, operate, service, or maintain it. The following special messages may appear throughout this bulletin or on the equipment to warn of hazards or to call attention to information that clarifies or simplifies a procedure.

The addition of either symbol to a “Danger” or “Warning” safety label indicates that an electrical hazard exists which will result in personal injury if the instructions are not followed.

This is the safety alert symbol. It is used to alert you to personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

⚠ DANGER

DANGER indicates a hazardous situation which, if not avoided, **will result in** death or serious injury.

⚠ WARNING

WARNING indicates a hazardous situation which, if not avoided, **could result in** death or serious injury.

⚠ CAUTION

CAUTION indicates a hazardous situation which, if not avoided, **could result in** minor or moderate injury.

NOTICE

NOTICE is used to address practices not related to physical injury. The safety alert symbol is not used with this signal word.

NOTE: Provides additional information to clarify or simplify a procedure.

Please Note

Electrical equipment should be installed, operated, serviced, and maintained only by qualified personnel. No responsibility is assumed by Schneider Electric for any consequences arising out of the use of this material.

Table of Contents

ENGLISH

Section 1—Introduction 9
Inspection and Packaging 9
Document Replacement 9

Section 2—Safety Precautions 10

Section 3—Receiving, Handling, and Storing 11
Receiving 11
Handling 11
Handling with Lifting Straps 11
Handling without Lifting Straps 13
Storing 14

Section 4—Installation 16
Location 16
Foundation Preparation 16
Switchboard Preparation 17
General Installation 17
Joining Shipping Sections—Outdoor Switchboards 18
Joining Shipping Sections—Indoor Switchboards 19
Anchoring for Seismic Qualifications 20
Responsibility for Mitigation of Seismic Damage 20
Maintaining Seismic Certification 20
Anchoring QED-2 Equipment for Seismic Applications 21
Base Anchoring 22
Top Anchoring/Restraint 24
Anchoring the Switchboard 26
Through Bus Splice Connections 26
Ground Bus Splice Connections 27
Grounding and Bonding 28
Service Equipment—Grounded System 28
Service Equipment—Ungrounded System 30
Not Service Equipment 30
High-Impedance Grounded Neutral Systems 30
Busway Connections 30
Busway Connection—NEMA Type 1 (Indoor) Only (Qwik Flange™) 30
Busway Connections—NEMA Type 1 (Non-Qwik Flange) and NEMA Type 3R 32
Conduit Area 33
Cable Pulling 34
Cable Terminations 34
Cable Restraint for Short-Circuit Current Rating (SCCR) 35

Section 5—Pre-energizing Checkout Procedure 38
Ground Fault Protection Systems 40

Section 6—Energizing the Switchboard 41

Section 7—Maintaining the Switchboard 42
General Inspection and Cleaning 42
Bus Bar Joints, Lug Terminations, and Insulating Materials 43
General Lubrication Information 43
Automatic Transfer Switches 43
Bolt-Loc Bolted Pressure Contact Switch Maintenance (800–4,000 A) 44

© 1988–2015 Schneider Electric All Rights Reserved

ENGLISH

Circuit Breakers 45
QMB/QMJ/QMQB1 Fusible Switches 47
Switch Maintenance 47
Fuse Replacement (Fusible Switches Only) 47
Installing QMB/QMJ/QMQB1 Fusible Switches 48
Removing QMB/QMJ/QMQB1 Fusible Switches 49
Ground-Fault Protection Systems 49

Section 8—Adverse Circumstances 50
Inspection Following a Short Circuit 50
Clean-up Following a Short Circuit 50
Water-Soaked Switchboards 50
Water-Sprayed or Splashed Switchboards (Clean Water Only) 51
Inspection and Clean-up of Clean Water Sprayed or Splashed Switchboards 51

Section 9—Torque Values for Electrical Connections 53

Section 10—Switchboard Insulation Resistance Chart 55

Section 11—Reference Publications 56

Section 12—Installation and Maintenance Log 57

 © 1988–2015 Schneider Electric All Rights Reserved

ENGLISH

List of Figures

Figure 1 – Lifting with an Overhead Crane, Lifting Straps, and Cables or Chains 11
Figure 2 – Warning Label, Rainproof Switchboards 12
Figure 3 – Handling Instruction Label, Switchboards without Lifting Straps 13
Figure 4 – Forklift Safety Label 15
Figure 7 – Belleville Washer 21
Figure 8 – Base Channel Floor Anchor Bolt Locations 23
Figure 9 – Base Channel Mounting Hardware 24
Figure 10 – Top Anchor Hard-Point Locations 25
Figure 11 – Top Anchor Mounting Hardware 25
Figure 12 – Switchboard Base Channels 26
Figure 13 – Proper Orientation of U-shaped Splice Connector 27
Figure 14 – Ground Bus Splice Connection 27
Figure 15 – Series 2 Ground Bus Splice Connection 27
Figure 16 – Grounding Electrode Connector 28
Figure 17 – Main Bonding Jumper 29
Figure 18 – Series 2 Main Bonding Jumper 29
Figure 19 – Qwik Flange Installation 31
Figure 20 – Qwik Flange 31
Figure 21 – Removing the Busway Dummy Flanged End 32
Figure 22 – Flanged-End Connections 32
Figure 23 – Reinstalling the 1/2-In. (13 mm) Hardware 33
Figure 24 – Cable Restraint Example 35
Figure 25 – Wrapping Cables (neutral cables not shown) 36
Figure 26 – Wrapping the Space Between Cables 36
Figure 27 – Finish Wrapping the Space Between Cables 37
Figure 29 – Type BP Bolt-Loc Fusible Switch 44
Figure 30 – PowerPact™ R-Frame Circuit Breaker 45

© 1988–2015 Schneider Electric All Rights Reserved

ENGLISH

List of Tables

Table 1 – Enclosure X,Y, Z Dimensions in Inches (mm) 22
Table 2 – Cable Restraint Criteria 35
Table 3 – I-Line™ Blank Fillers and Extensions 46
Table 4 – QMB/QMJ Fusible Switch Blank Fillers 48
Table 5 – QMQB1 Fusible Switch Blank Fillers 48
Table 6 – Incoming, Branch, and Neutral Lug 53
Table 7 – Multiple Conductor Neutral and/or Ground Bar 53

© 1988–2015 Schneider Electric All Rights Reserved

ENGLISH

Section 1—Introduction

This manual contains instructions for the proper installation, operation, and maintenance of Power-Style™ QED-2 switchboard equipment manufactured by Schneider Electric. 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-2 switchboard installations by Schneider Electric. When special features or non-standard components are incorporated in the switchboard, detailed instructions for these components are included in the instruction material holder.

NOTE: There are references to Series 2 switchboards in several places in this instruction bulletin. To determine if the QED-2 switchboard is a Series 2 model, check the rating nameplate located on the front cover. If the switchboard is a Series 2 model, the nameplate indicates that. If it is not a Series 2 model, there is not a Series designation.

Inspection and Packaging

Every Power-Style QED-2 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 local Schneider Electric representative to replace lost or damaged wiring diagrams and instruction sheets. Use the factory order number as a reference.

© 1988–2015 Schneider Electric All Rights Reserved

ENGLISH

Section 2—Safety Precautions

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E or CSA Z462.
- This equipment must be installed and serviced only by qualified personnel.
- Perform such work only after reading and understanding all of the instructions contained in this bulletin.
- Turn off all power supplying this equipment before working on or inside equipment.
- Before performing visual inspections, tests, or maintenance on this equipment, disconnect all sources of electric power. Assume all circuits are live until they are de-energized, tested, and tagged. Pay particular attention to the design of the power system. Consider all sources of power, including the possibility of backfeeding.
- Always use a properly rated voltage sensing device to confirm power is off.
- Practice lock-out/tag-out procedures according to OSHA requirements.
- Handle this equipment carefully and install, operate, and maintain it correctly in order for it to function properly. Neglecting fundamental installation and maintenance requirements may lead to personal injury, as well as damage to equipment or other property.
- Carefully inspect your work area and remove any tools and objects left inside the equipment.
- Replace all devices, doors, and covers before turning on power to this equipment.
- All instructions in this manual assume that the customer has taken these measures before performing maintenance or testing.

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

© 1988–2015 Schneider Electric All Rights Reserved

ENGLISH

Section 3—Receiving, Handling, and Storing

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 occurred in transit. If damage is found or suspected, file a claim with the carrier immediately and notify the nearest Schneider Electric representative.

Handling

⚠ WARNING

SPECIAL HANDLING REQUIREMENTS

- Do not lay the equipment on its front or sides.
- Lay equipment only on its back when special handling is required.
- Do not ship the equipment lying down.

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

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

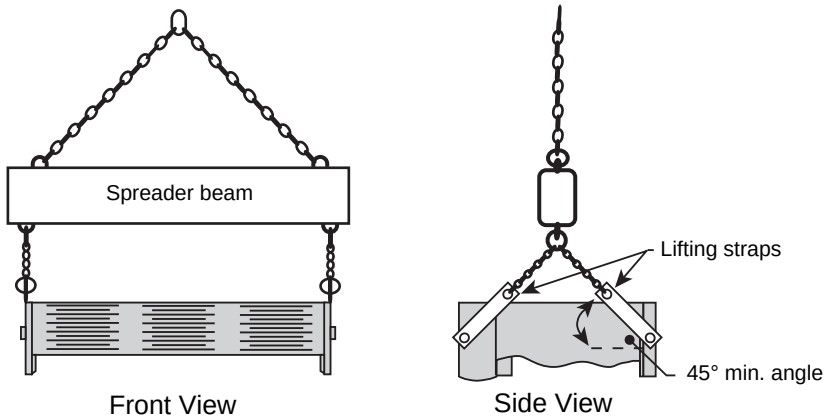
The shipping weight of each shipping section is marked on the packing list. Verify the lifting capacity of the equipment being used to handle the switchboard in accordance with the shipping weight of each shipping section. Keep the switchboard upright during handling.

Schneider Electric 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

Schneider Electric provides lifting straps as standard equipment for NEMA Type 1 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 helps avoid damage to the frame or finish.

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



© 1988–2015 Schneider Electric All Rights Reserved

ENGLISH

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.

Follow these instructions for laying equipment on its back:

1. Remove shipping skid and equipment back covers.
2. Use overhead cranes, lifting straps, and cables or chains for laying equipment on its back.
3. Rate of drop or pickup for laying equipment on its back is four feet per minute or less.
4. Reverse the procedure to stand the equipment in its upright position.
5. Reinstall back covers.

The warning label (Figure 2) is attached to both the front and rear of the switchboard.

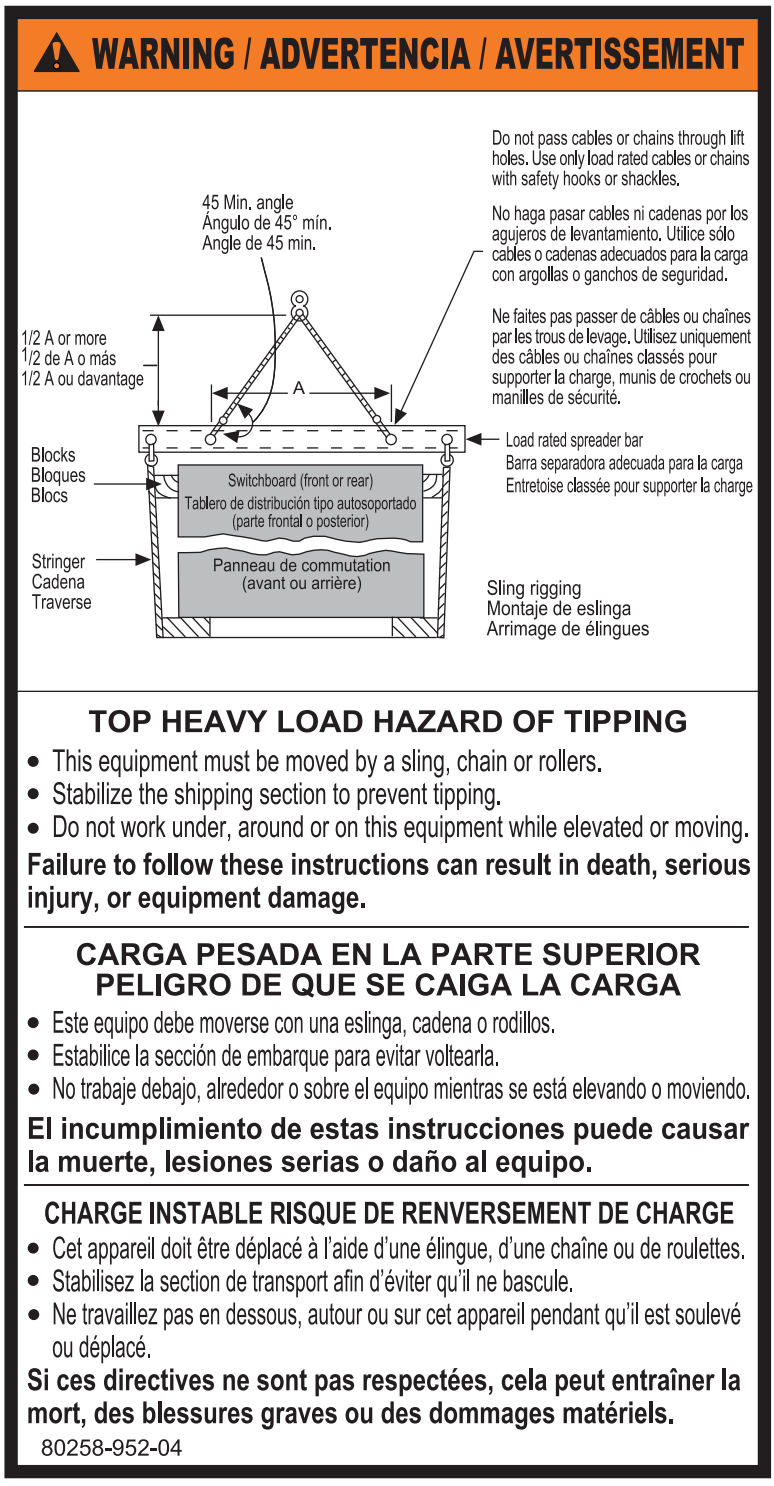
Figure 2 – Warning Label, Rainproof Switchboards

© 1988–2015 Schneider Electric All Rights Reserved

Handling without Lifting Straps

Lifting straps are not furnished on shipping sections rated more than 3,000 A, or on rainproof switchboards. Use rollers, slings, or other means to handle the shipping sections. The handling label (Figure 3) is affixed to each of these sections.

Figure 3 – Handling Instruction Label, Switchboards without Lifting Straps



 © 1988–2015 Schneider Electric All Rights Reserved

⚠ WARNING

TOP HEAVY LOAD—HAZARD OF TIPPING

- Stabilize the shipping section to reduce the possibility of tipping.
- Consult with a certified rigging and lifting expert for any situation not covered in these instructions.

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

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

- 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.

NOTE: A forklift is an alternative method of handling the switchboard. 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 4 on page 15).

Storing

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.

If a switchboard is not installed and energized immediately, store it in a clean, dry space with a consistent temperature to prevent condensation. Store the switchboard indoors, if possible. Preferably, store it in a heated building with adequate air circulation and protect it from dirt, fumes, water, and physical damage. Storing the switchboard outdoors can cause harmful condensation inside the switchboard.

NOTE: Install portable electric heaters of approximately 250 watts per vertical section 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; treat them the same as indoor switchboards until after installation.

 © 1988–2015 Schneider Electric All Rights Reserved

Figure 4 – Forklift Safety Label

⚠ WARNING

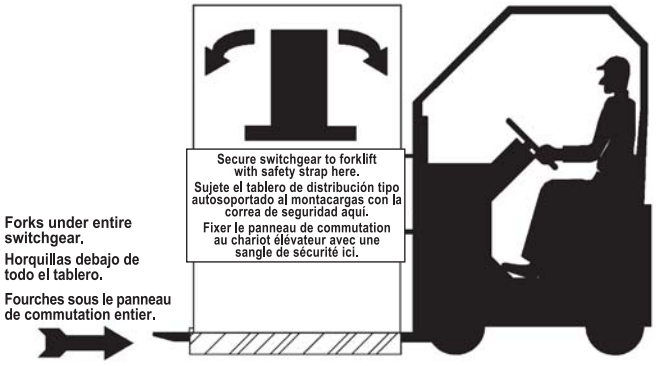
HAZARD OF EQUIPMENT DAMAGE
• Secure to forklift with safety strap.
Failure to follow these instructions can result in death, serious injury, or equipment damage.

⚠ ADVERTENCIA

PELIGRO DE DAÑO AL EQUIPO
• Sujete al montacargas con la correa de seguridad.
El incumplimiento de estas instrucciones puede causar la muerte, lesiones serias o daño al equipo.

⚠ AVERTISSEMENT

RISQUE DE BLESSURES OU DE DOMMAGES MATÉRIELS
• Fixer au chariot élévateur avec une sangle de sécurité.
Si ces directives ne sont pas respectées, cela peut entrainer la mort ou des blessures graves ou des dommages matériels.



Remove label after installation.
Retire la etiqueta después de la instalación.
Enlever l'étiquette après l'installation.

Special Handling Requirements

Do not lay the equipment on its front or sides. Doing so will damage unit.
Lay equipment only on its back when special handling is required.
See Instruction Bulletin for special handling instructions for laying equipment on its back.
Equipment is NOT to be shipped lying down.
Failure to follow these instructions can result in death, serious injury or equipment damage.

Requisitos especiales de manejo

No coloque el equipo sobre su frente o lados ya que podría dañarse la unidad.
Coloque el equipo sobre su parte posterior solamente cuando sea necesario manejarlo de manera especial.
Consulte el boletín para obtener las instrucciones especiales de manejo para colocar el equipo sobre su parte posterior.
El equipo NO deberá transportarse acostado.
El incumplimiento de estas instrucciónes puede causar la muerte, lesiones serias o daño al equipo.

Exigences de manutention spéciales

Ne couchez pas l'appareil sur sa face avant ou sur las côtés. Faire ainsi l'endommagerait.
Couchez l'appareil sur le dos uniquement lorsqu'une manutention spéciale est nécessaire.
Consultez les directives d'utilisation pour les instructions de manutention spéciales pour coucher l'appareil sur le dos.
N'expédiez PAS l'appareil sur son dos.
Si ces directives ne sont pas respectées, cela peut entrainer la mort ou des blessures graves ou des dommages matériels.

© 1988–2015 Schneider Electric All Rights Reserved

ENGLISH

Section 4—Installation

Correct installation of Power-Style QED-2 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 planning.

NOTE: The top of the switchboard will not support the weight of the installer.

Location

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®) or Section 2-308 of the Canadian Electrical Code (CEC) Part 1.

- Front-accessible switchboards require field connections, including mains, branches, ground bus, and neutral bus, to be accessible and maintainable from the front.
- For switchboards having rear ventilation, allow a minimum 1/2-in. (13 mm) clearance between the rear of the switchboard and the wall for proper ventilation. Equipment drawings identify switchboards requiring rear or side access.
- Switchboards that require rear access for installation, field connections, or maintenance (such as filter replacement), require 30 in. (762 mm) of working space per NEC 110-26.
- If the switchboard is in a wet location or outside of the building, enclose it in an outdoor enclosure or equipment to prevent moisture or water from entering and accumulating within the enclosure. Outdoor-rated switchboards drain to the rear, so there must be at least a 1/2-in. (13 mm) clearance between the rear of the switchboard and a wall or other obstruction for proper drainage.

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 20 before pouring the floor or foundation.

Power-Style QED-2 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 in. (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

© 1988–2015 Schneider Electric All Rights Reserved

clear the conduit hubs will be necessary. Before pouring the foundation, consider installing additional conduits for future circuits.

Switchboard Preparation

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. For switchboards greater than 24 in. (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, the customer must make any holes necessary for conduit entering the bottom of the switchboard. After making the holes, reinstall the closure plate.

General Installation

NOTICE

HAZARD OF EQUIPMENT DAMAGE

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 these instructions can result in equipment damage.

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 11.
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 might 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 preceding section before installing the next section.

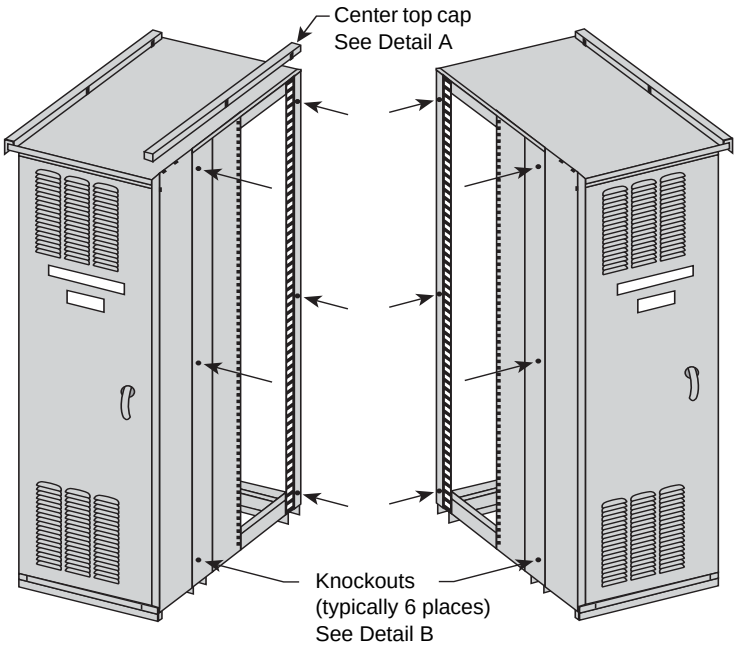
 © 1988–2015 Schneider Electric All Rights Reserved

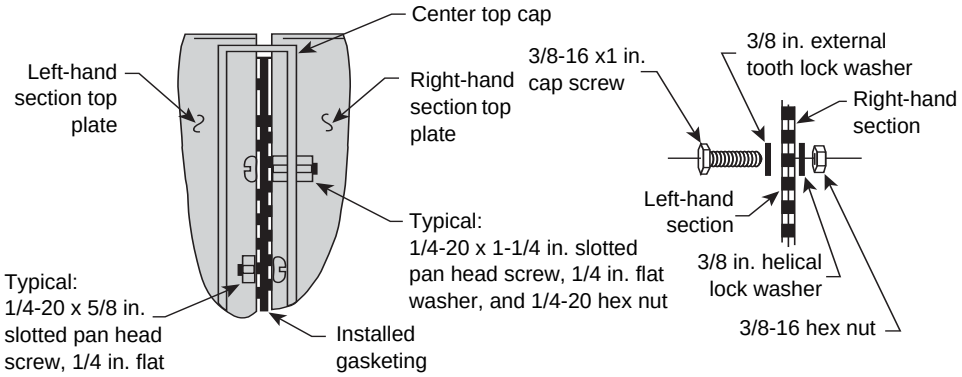
ENGLISH

Joining Shipping Sections—Outdoor Switchboards

1. Remove the center top cap (Figure 5) from the left-hand section, and retain all hardware for reuse.

Figure 5 – Joining Adjacent Sections—Outdoor Switchboards





Detail A **Detail B**

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-in. (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 the arrows in Figure 5.
4. Position each adjacent section, carefully leveling it and aligning it with the previous section. If lifting straps are provided, completely remove them from

© 1988–2015 Schneider Electric All Rights Reserved

the sides being bolted together so the sections can be joined flush. The only gasket required between sections is provided on the roof flange.

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

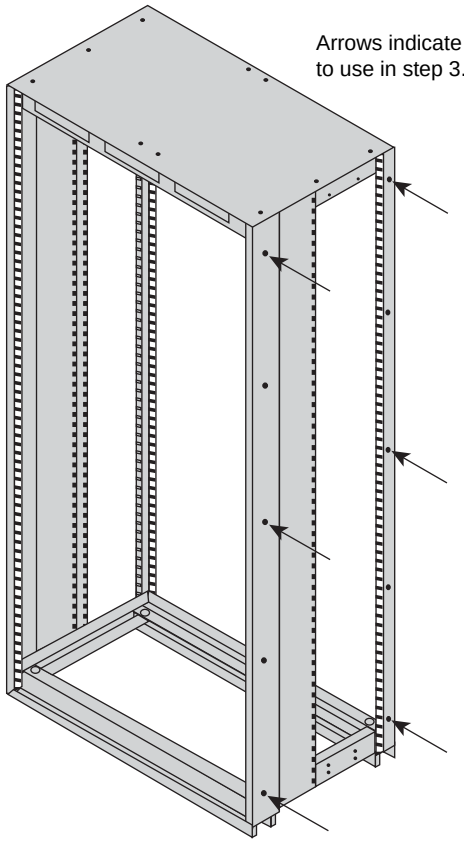
5. Six bolts (3/8-16 x 1 in.) are provided. Place them through the holes created in step 3 to join adjacent sections.
6. Make the through bus splice connections to the preceding section.
7. Replace the center top cap removed in step 1.
8. Replace and secure the front and rear doors and panels removed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

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.

   Figure 6 – Indoor Switchboards



2. Open or remove the front and rear doors and panels, providing access to bolt adjacent shipping sections together.
3. Six bolts (3/8-16 x 1 in.) are provided. Place the bolts through the existing holes in the front and rear vertical corner channels to join adjacent sections (Figure 6).
4. Make the through bus splice connections to the preceding section.
5. Replace and secure all front and rear doors and panels removed in step 2.

 © 1988–2015 Schneider Electric All Rights Reserved

Anchoring for Seismic Qualifications

QED-2 equipment that is seismically certified has been qualified to the site-specific seismic requirements of the listed model building codes and/or standards. Optional construction features may be required, depending on the location of the installation and the particular code and/or standard of interest. Seismic certificates of compliance are provided with all seismically certified QED-2 equipment. To maintain the validity of this certification, the installation instructions provided in this bulletin must be followed.

Responsibility for Mitigation of Seismic Damage

For the purposes of the model building codes, QED-2 equipment are considered nonstructural building components. Equipment capacity was determined from triaxial seismic shake table test results as defined in the International Code Counsel Evaluation Service (ICCES) Acceptance Criteria for Seismic Qualification Testing of Nonstructural Components (AC156). Unless otherwise indicated, an equipment importance factor of 1.5 (Ip = 1.5) was used, indicating that equipment functionality was verified before and after shaker table seismic simulation testing. This importance factor is indicative of critical facilities where maximizing the probability of post event functionality is a priority. The Building Seismic Safety Council (BSSC) recognizes AC 156 as an appropriate methodology in the 2003 National Earthquake Hazard Reduction Program (NEHRP) Commentary (FEMA 450 Part 2). The National Institute of Building Sciences established the BSSC in 1979 to develop and promote regulatory provisions for earthquake risk mitigation at the national level.

Incoming and outgoing cable and conduit must also be considered as related but independent systems. They must be designed and restrained to withstand the forces generated by the seismic event without increasing the load transferred to the equipment. For applications where seismic hazard exists, bottom entry and/or exit of cable and conduit is preferred. This system must be able to transfer the loads created by a seismic event to the load-bearing path of the building structural system.

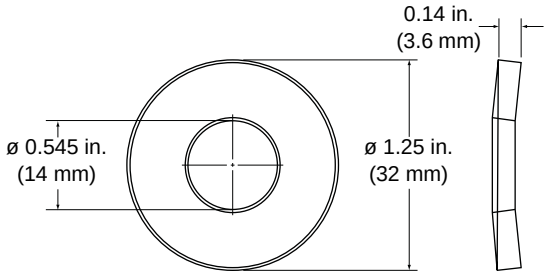
Maintaining Seismic Certification

Seismic qualification of nonstructural components by Schneider Electric is just one link in the total chain of responsibility required to maximize the probability that the equipment will be intact and functional after a seismic event. During a seismic event, the equipment must be able to transfer the loads that are created through the mounting pad and anchorage to the load-bearing path of the building structural system. The structural civil engineer or design engineer of record is responsible for detailing the equipment connection and anchorage requirements for the given installation. The installer and manufacturers of the anchorage restraint system are responsible for assuring that the mounting requirements are met. Schneider Electric is not responsible for the specification and performance of these systems.

© 1988–2015 Schneider Electric All Rights Reserved

Anchoring QED-2 Equipment for Seismic Applications

Figure 7 – Belleville Washer



Formed base channels run the width of the section. The channels and connecting braces provide a minimum 0.75-in. (19 mm) diameter hole for fastening the section to the floor. To anchor the QED-2 switchboard to the floor properly, use all four mounting locations for NEMA Type 1 enclosures less than 36 in. deep, all six mounting locations for 36–70 in. deep enclosures, and six of the eight mounting locations for enclosures greater than 70-in. deep (see Figure 8 on page 23).

Use 0.5 in. (13 mm) diameter anchor bolts (Grade 5 minimum, provided by others) for the installation of equipment. Use one 1.25 in. (32 mm) outer diameter Grade 5 Belleville washer (provided by others; see Figure 7) under the head of each bolt or anchor nut. To develop the full strength of the anchor, torque the hardware to the value specified by the anchor manufacturer, or as recommended in the seismic restraint detailing supplied by the Structural Civil Engineer of record for the project (see Figure 9 on page 24).

Additionally, each NEMA Type 1 enclosed section includes four top-located hard points for attaching two upper lateral braces (braces and hardware supplied by others) to the QED-2 structure for top structural restraint (see Figures 10 and 11 on page 25).

Top structural restraint is required for all QED-2 equipment installed:

- where the site-specific 0.2 second spectral ground motion exceeds 2.67 g (as determined from the code-referenced ground motion maps or the site-specific seismic hazard engineering study), or
- when displacement at the top of the equipment cannot be tolerated, or
- for all QED-2 corner sections used for seismic applications.

To develop the full strength of the upper structural anchor, install and torque the hardware as specified by the anchor manufacturer or the seismic restraint detailing supplied by the Structural Civil Engineer of record for the project.

NOTE: Anchoring hardware is not furnished with the QED-2 equipment.

After the QED-2 switchboard and adjacent equipment are properly joined and the entire structure is bolted to the floor, install the incoming service conductors and load side cables. During an earthquake, the top of the QED-2 switchboard can move in any direction. Any top incoming cables must accommodate this motion. Do not use the QED-2 enclosure (particularly the top) to mount exterior equipment.

 © 1988–2015 Schneider Electric All Rights Reserved

Base Anchoring

1. To anchor the switchboard to the floor properly, use all of the designated 0.75 in. (19 mm) diameter mounting hole locations as illustrated in Figure 8 on page 23. The enclosure dimensions corresponding to Figure 8 are listed in Table 1.

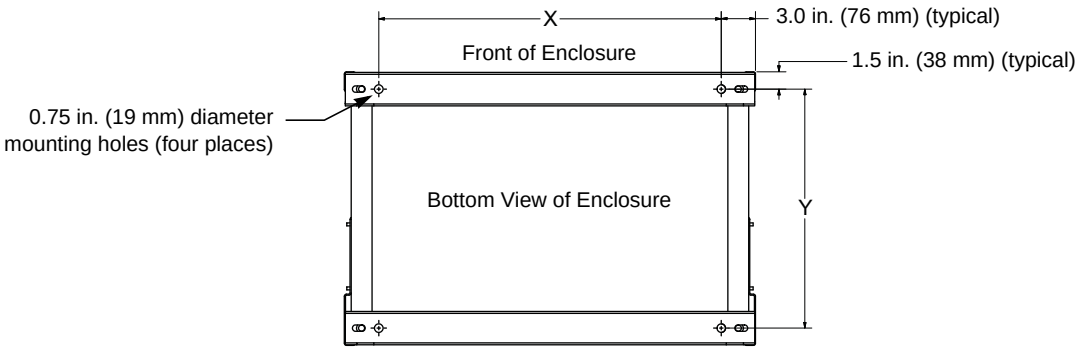
Table 1 – Enclosure X,Y, Z Dimensions in Inches (mm)

Enclosure Depth \ Enclosure Width	12 in. (305 mm)	24 in. (610 mm)	30 in. (762 mm)	36 in. (914 mm)	42 in. (1067 mm)	48 in. (1219 mm)	54 in. (1372 mm)
24 in. (610 mm)	X = 6 (152) Y = 21 (533)	X = 18 (457) Y = 21 (533)	X = 24 (610) Y = 21 (533)	X = 30 (762) Y = 21 (533)	X = 36 (914) Y = 21 (533)	X = 42 (1067) Y = 21 (533)	X = 48 (1219) Y = 21 (533)
36 in. (914 mm)	X = 6 (152) Z = 16.5 (419) Y = 33 (838)	X = 18 (457) Z = 16.5 (419) Y = 33 (838)	X = 24 (610) Z = 16.5 (419) Y = 33 (838)	X = 30 (762) Z = 16.5 (419) Y = 33 (838)	X = 36 (914) Z = 16.5 (419) Y = 33 (838)	X = 42 (1067) Z = 16.5 (419) Y = 33 (838)	X = 48 (1219) Z = 16.5 (419) Y = 33 (838)
48 in. (1219 mm)	X = 6 (152) Z = 22.5 (572) Y = 45 (1143)	X = 18 (457) Z = 22.5 (572) Y = 45 (1143)	X = 24 (610) Z = 22.5 (572) Y = 45 (1143)	X = 30 (762) Z = 22.5 (572) Y = 45 (1143)	X = 36 (914) Z = 22.5 (572) Y = 45 (1143)	X = 42 (1067) Z = 22.5 (572) Y = 45 (1143)	X = 48 (1219) Z = 22.5 (572) Y = 45 (1143)
54 in. (1372 mm)	X = 6 (152) Z = 25.5 (648) Y = 51 (1295)	X = 18 (457) Z = 25.5 (648) Y = 51 (1295)	X = 24 (610) Z = 25.5 (648) Y = 51 (1295)	X = 30 (762) Z = 25.5 (648) Y = 51 (1295)	X = 36 (914) Z = 25.5 (648) Y = 51 (1295)	X = 42 (1067) Z = 25.5 (648) Y = 51 (1295)	X = 48 (1219) Z = 25.5 (648) Y = 51 (1295)
60 in. (1524 mm)	X = 6 (152) Z = 28.5 (724) Y = 57 (1448)	X = 18 (457) Z = 28.5 (724) Y = 57 (1448)	X = 24 (610) Z = 28.5 (724) Y = 57 (1448)	X = 30 (762) Z = 28.5 (724) Y = 57 (1448)	X = 36 (914) Z = 28.5 (724) Y = 57 (1448)	X = 42 (1067) Z = 28.5 (724) Y = 57 (1448)	X = 48 (1219) Z = 28.5 (724) Y = 57 (1448)
72 in. (1829 mm)	X = 6 (152) Z_1 = 28.5 Z_2 = 40.5 (1029) Y = 69 (1753)	X = 18 (457) Z_1 = 28.5 (724) Z_2 = 40.5 (1029) Y = 69 (1753)	X = 24 (610) Z_1 = 28.5 (724) Z_2 = 40.5 (1029) Y = 69 (1753)	X = 30 (762) Z_1 = 28.5 (724) Z_2 = 40.5 (1029) Y = 69 (1753)	X = 36 (914) Z_1 = 28.5 (724) Z_2 = 40.5 (1029) Y = 69 (1753)	X = 42 (1067) Z_1 = 28.5 (724) Z_2 = 40.5 (1029) Y = 69 (1753)	X = 48 (1219) Z_1 = 28.5 (724) Z_2 = 40.5 (1029) Y = 69 (1753)

 © 1988–2015 Schneider Electric All Rights Reserved

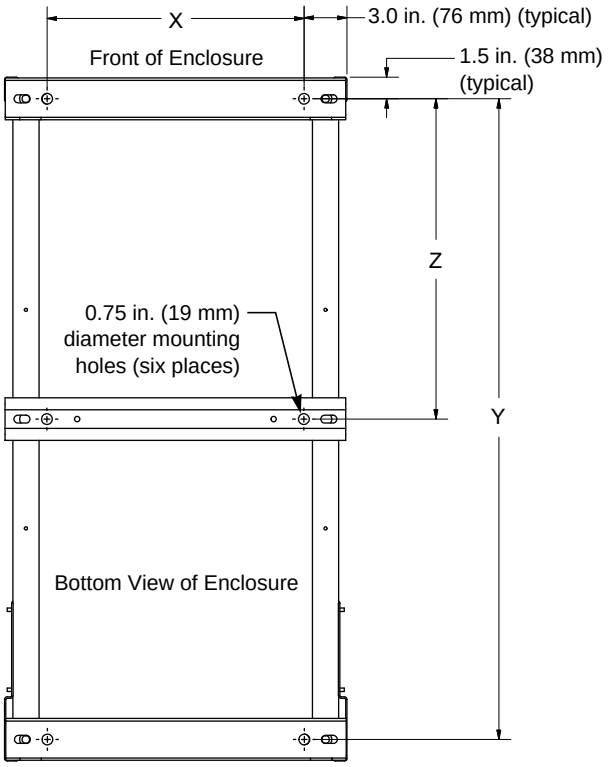
ENGLISH

Figure 8 – Base Channel Floor Anchor Bolt Locations

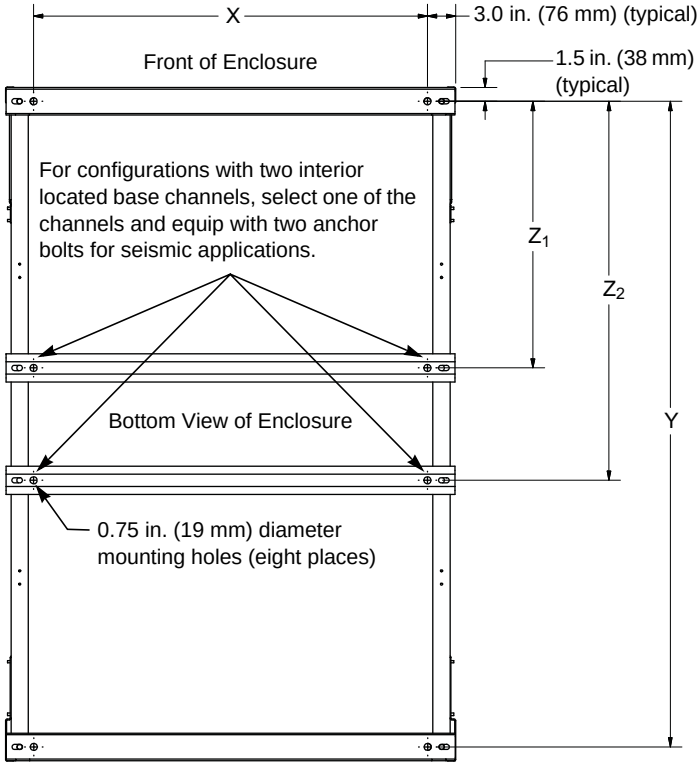


Enclosures < 36 in. Deep

NOTE: See Table 1 on page 22 for X, Y, Z dimensional values.



Enclosures 36–70 in. Deep

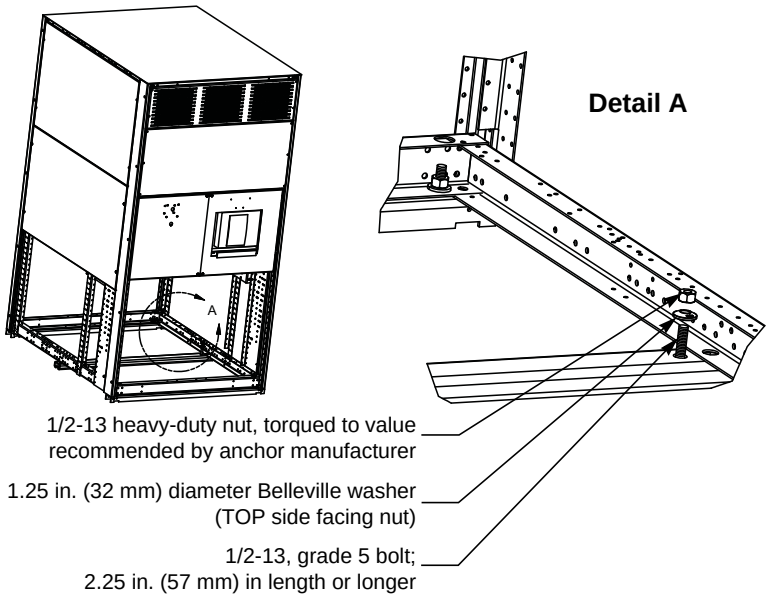


Enclosures > 70 in. Deep

© 1988–2015 Schneider Electric All Rights Reserved

2. Depending on the frame size (see Figure 8 on page 23), use either four or six 1/2-13 Grade 5 bolts in the locations shown in Figure 9.

Figure 9 – Base Channel Mounting Hardware



NOTE: Base channel mounting hardware detail shown for reference purposes only. Anchoring hardware is not furnished with the switchboard. Covers and internal hardware shown removed for illustration purposes.

3. Once the switchboard is in place, secure the base channels to each bolt using a 1.25 in. (32 mm) diameter Belleville washer between a 1/2-13 hardened nut and the switchboard frame as illustrated in Figure 9.

   NOTE: The “TOP” side of the Belleville washer must be facing the nut.

4. Torque each nut to the value recommended by the anchor manufacturer to develop the full strength of the anchor.

Top Anchoring/Restraint

For installation at locations with an Ss greater than 2.67 g (as determined from the current version of the International Building Code), or where displacement cannot be tolerated at the top of the switchboard during a seismic event, use top restraints attached to the equipment hard points.

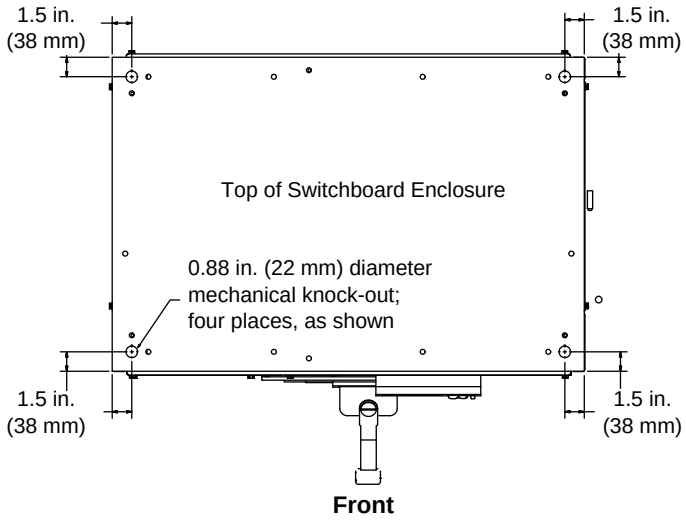
NOTE: Anchoring hardware is not furnished with the switchboard.

1. The four 0.88-in. (22 mm) diameter mechanical knock-outs shown in Figure 10 on page 25 serve as hard points for application of a top restraint system.

   NOTE: By code, it is the responsibility of the Building Design Professional to determine the top restraint methodology for the intended building application.

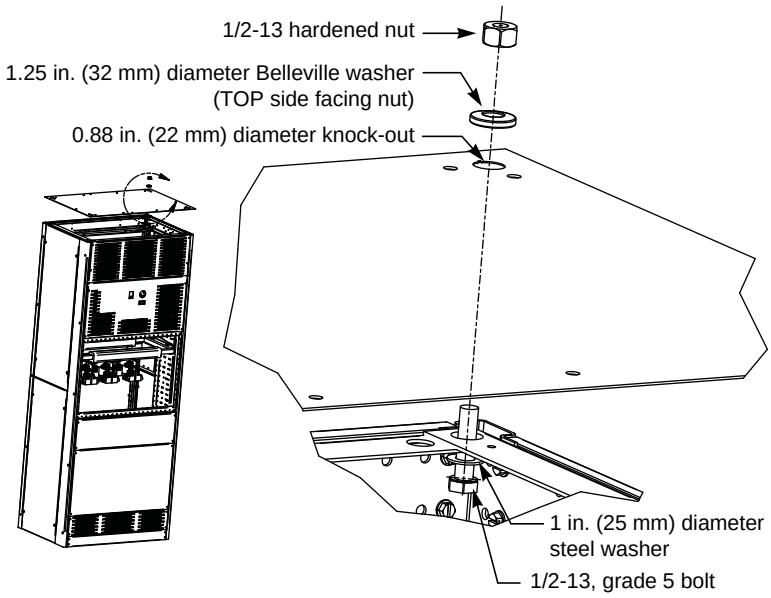
 © 1988–2015 Schneider Electric All Rights Reserved

Figure 10 – Top Anchor Hard-Point Locations



2. Detach the top plate from the main switchboard enclosure. Retain the screws.
3. Remove the four 0.88 in. (22 mm) diameter mechanical knock-outs as directed by the Building Design Professional.
4. With the knock-outs removed, reattach and re-secure the top plate to the enclosure using the screws removed in Step 2.
5. Attach the top restraint system using a 1/2-13, Grade 5 bolt, a 1 in. (25 mm) diameter steel washer, a 1.25 in. (32 mm) diameter Belleville washer, and a hardened 1/2-13 nut as shown in Figure 11.

Figure 11 – Top Anchor Mounting Hardware



6. After all switchboard sections are properly joined and the entire structure is properly anchored, install the incoming service conductors and load side cables.
7. Do not use the switchboard enclosure (particularly the top) to mount exterior equipment, except for conduit.

 © 1988–2015 Schneider Electric All Rights Reserved

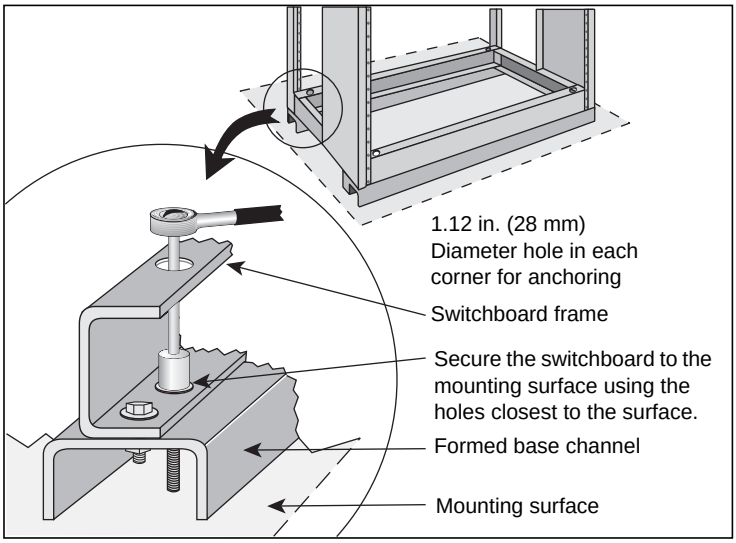
ENGLISH

Anchoring the Switchboard

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 1.12-in. (28 mm) diameter holes for fastening the section to the floor (Figure 12). Anchor each section to the floor with 1/2-in. (Grade 2 minimum) bolts with flat washers and anchors suitable for installation of electrical equipment (not furnished).

Figure 12 – Switchboard Base Channels



After all switchboard sections are properly joined 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 28.

Through Bus Splice Connections

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

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

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

Through bus splice connectors and/or hardware, along with installation instructions, are provided with 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 53.

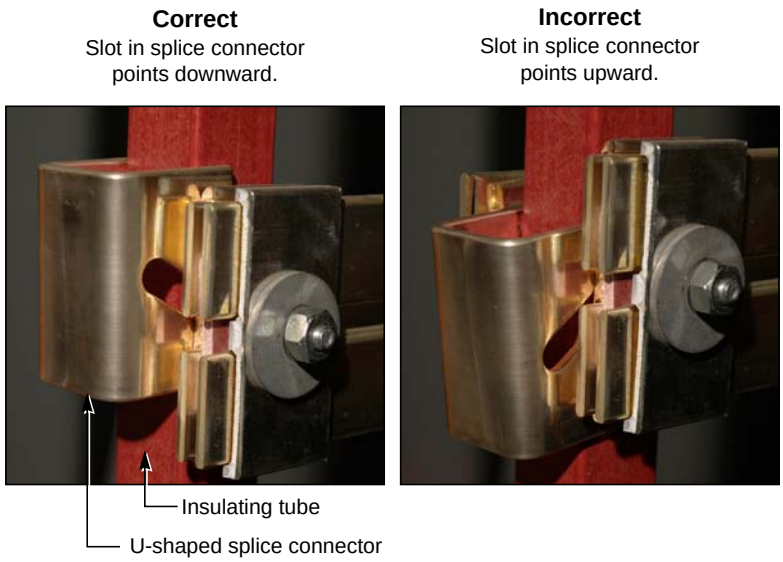
If through bus bars are wrapped with an insulative material, cover the splice connections with the material provided.

For splice connections with bus on the front and rear of an insulating tube, ensure the U-shaped, copper connector is centered around the tube. Figure 13 on page 27 shows the proper orientation of the connector.

 © 1988–2015 Schneider Electric All Rights Reserved

NOTE: The U-shaped connector will fit snugly against the insulating tube when installed correctly. It is pulled away from the insulating tube in Figure 13 to show the orientation of the connector slot.

Figure 13 – Proper Orientation of U-shaped Splice Connector



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 14 or 15).

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

Figure 14 – Ground Bus Splice Connection

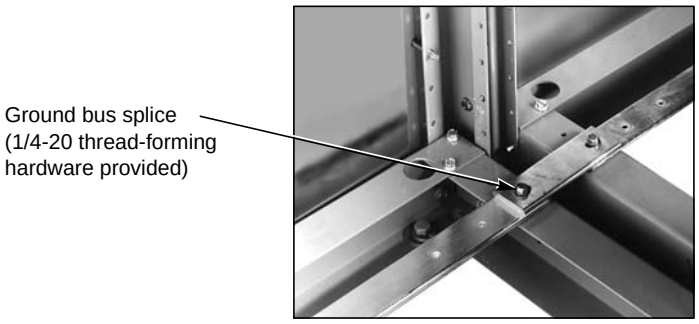


Figure 15 – Series 2 Ground Bus Splice Connection

 © 1988–2015 Schneider Electric All Rights Reserved

ENGLISH

Grounding and Bonding

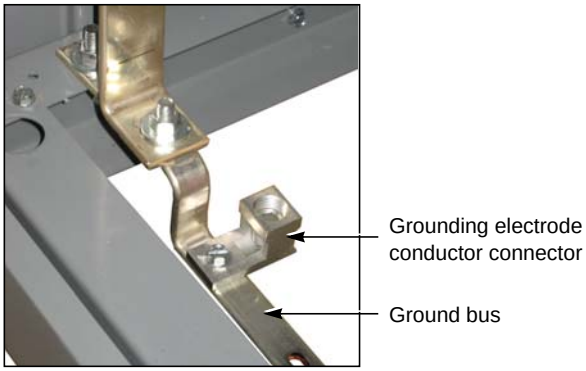
NOTE: A system is “grounded” if it is grounded at any point ahead of the switchboard, whether the grounded conductor (neutral) is carried through to the loads, or not.

Service Equipment—Grounded System

For solidly *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 16). Select the material and size of this grounding electrode conductor to comply with Sections 250-62 and 250-66 of the NEC or Sections 10-204 and 10-206 of the 1998 CEC, and install it as specified in Section 250-64 of the NEC or Section 10-908 of the 1998 CEC.

Figure 16 – Grounding Electrode Connector



2. Install the main bonding jumper between the neutral bus and the ground bus (Figure 17 or 18 on 29). For torque values, refer to “Section 9—Torque Values for Electrical Connections” on page 53.

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

© 1988–2015 Schneider Electric All Rights Reserved

Figure 17 – Main Bonding Jumper

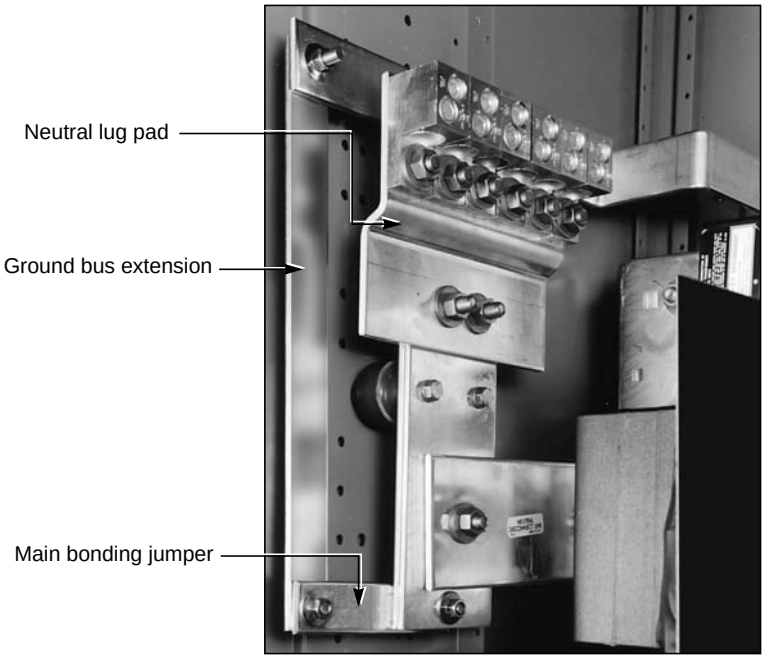
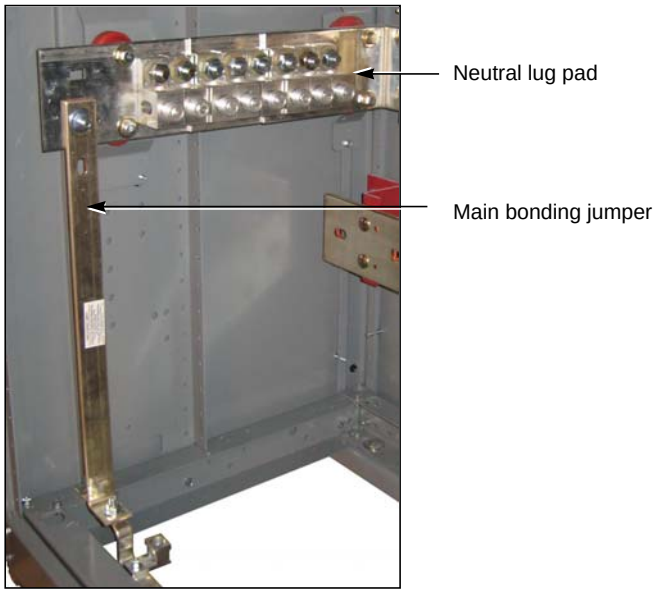


Figure 18 – Series 2 Main Bonding Jumper



In Canada, a main bonding jumper bus or cable is provided between the neutral bus and ground bus. When the bonding jumper must be disconnected (for example, for a Megger® test), remove the main bonding jumper bus or cable lug with cable from the neutral bus. This is normally located near the line neutral lugs. Secure the main bonding jumper bus or cable and lug to maintain the required distance from phases and neutral.

NOTE: If the switchboard is fed from multiple sources (for example, a double-ended system like a main-tie-main), there may be two or more main bonding jumpers installed.

 © 1988–2015 Schneider Electric All Rights Reserved

Service Equipment—Ungrounded System

For *ungrounded* 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 (Figure 16 on page 28).
2. Select the material and size of this grounding electrode conductor to comply with Sections 250-62 and 250-66 of the NEC or Sections 10-700 and 10-702 of the 1998 CEC, and install it as specified in Section 250-64 of the NEC or Section 10-204 of the 1998 CEC.

Not Service Equipment

For either *grounded or ungrounded* systems, when a switchboard is not used 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 or Section 10-206 of the 1998 CEC to connect the switchboard frame and ground bus to the service ground.

High-Impedance Grounded Neutral Systems

For high-impedance grounded neutral systems:

Ground the system following the instructions provided with the system grounding equipment and in compliance with Section 250-36 of the NEC. Confirm that the switchboard frame and ground bus are bonded in accordance with Section 250-102 of the NEC.

Busway Connections

Schneider Electric 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 switchboard to support the weight of the busway connection. Support busway independently. When busway is installed, make sure no areas of the roof are bowed downward. This will help prevent pooling of water.

Busway Connection—NEMA Type 1 (Indoor) Only (Qwik Flange™)

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

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

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

Follow the instructions in this section to make Qwik Flange busway connections (see Figures 19 and 20 on page 31):

1. Remove any protective covering from the opening in the switchboard.
2. Slip the busway joint into the switchboard connectors.
3. Check the joint bolt alignment; the center line (C/L) of the joint bolt to the switchboard surface should be 0.95 in. (24 mm) (Figure 19 on page 31).
4. Attach the side closing plates using two 5/16-in. bolts (provided). When installed properly, the holes in the side closing plates align with the holes in both the switchboard and busway.

 © 1988–2015 Schneider Electric All Rights Reserved

Figure 19 – Qwik Flange Installation

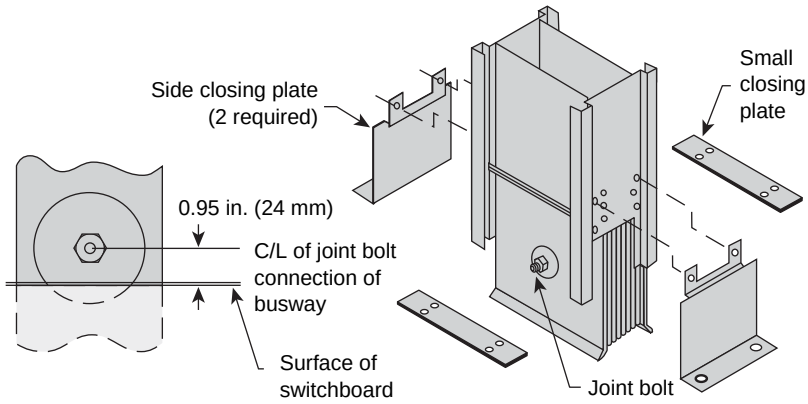
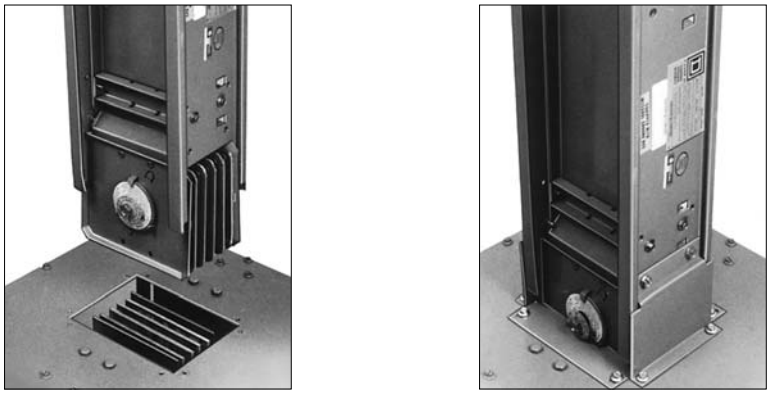


Figure 20 – Qwik Flange



5. Use an 18-in. (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.
6. Slip the remaining two small closing plates into position by aligning with the holes in the switchboard. Use the four 1/4-20 screws provided to secure the equipment.
7. Confirm proper phasing of the installed busway before energizing.

 © 1988–2015 Schneider Electric All Rights Reserved

Busway Connections—NEMA Type 1 (Non-Qwik Flange) and NEMA Type 3R

If this style of connection for busway is furnished, the busway "dummy" flanged end must be removed before installing busway (Figure 21 on page 32).

⚠ DANGER

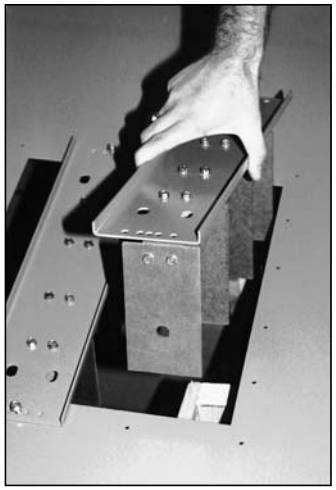
HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

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

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

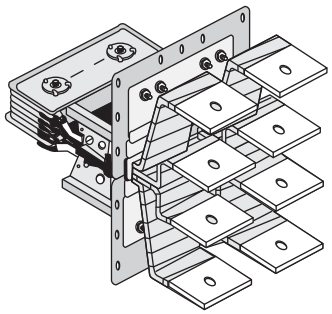
1. From inside the switchboard, remove the 1/2-in. bolts that fasten the switchboard bus to the busway dummy nonmetallic flanges. Retain all hardware for reuse.
2. Remove all screws securing the busway dummy flanged end to the switchboard enclosure.
3. Remove the busway dummy flanged end (Figure 21).

Figure 21 – Removing the Busway Dummy Flanged End



4. Install the actual busway flanged end to the switchboard bus connectors provided in the switchboard (Figure 22). 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.

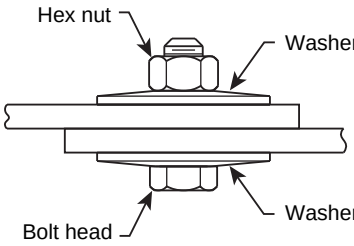
Figure 22 – Flanged-End Connections



 © 1988–2015 Schneider Electric All Rights Reserved

5. Line up the holes in the bus bar flanges, and reinstall the 1/2-in. (13 mm) hardware that was removed in step 1 on page 32 and as shown in Figure 23.

Figure 23 – Reinstalling the 1/2-In. (13 mm) Hardware



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.

6. Torque the bolts inserted in step 5 as indicated in “Section 9—Torque Values for Electrical Connections” on page 53.
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 in. (610 mm) deep, the center base channel can be removed for additional conduit area. **Exception:** Do not remove any base channels when seismic restraint is required.
2. Install the conduit properly. Use hubs, locknuts, and bushings to protect the cables and 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. When conduit is installed, make sure no areas of the roof are bowed downward. This will help prevent pooling of water.

   If bottom closure plates are furnished, the customer must remove the plates, make holes in them for any conduit entering the bottom of the switchboard, and then reinstall the plates.

   Under seismic conditions, consider using top restraints if movement of the top of the switchboard is an issue.
3. Bond all conduit hubs to the switchboard enclosure with approved electrical connections.

 © 1988–2015 Schneider Electric All Rights Reserved

Cable Pulling

Power-Style QED-2 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 or CEC.
3. Position the cables inside the switchboard so that they are not subject to physical damage.
4. Maintain the largest 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.
5. Be certain to run all phase conductors, including the neutral, through the same opening where cables enter or leave the switchboard, or pass through any metal that has magnetic properties. Otherwise, overheating can result. See Section 300-20(a) of NEC.
6. When instructed, brace or cable-lace the conductors.

Cable Terminations

1. Use a proper insulation stripping tool to strip a length of insulation from the end of the cable sufficient to fit into the full length of the lug barrel. Be careful not to nick or ring the strands.
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 recommendations of the manufacturer.
   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 53.
5. Set screw-type lugs may be furnished as main incoming lugs and are standard on molded case circuit breakers and QMB/QMJ/QMQB[1] 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 7 on page 53).

[1] QMQB switches are available in Canada only.

 © 1988–2015 Schneider Electric All Rights Reserved

Cable Restraint for Short-Circuit Current Rating (SCCR)

Cable restraint is recommended for lugs mounted on bus when the following conditions are met:

- Unsupported cable lengths are greater than 3.5 ft. (1 m) [1]

AND

- Cables meet the **Yes** criteria shown in Table 2.

Table 2 – Cable Restraint Criteria

Cable Ampacity	Available Short Circuit Fault Current (RMS)			
	< 65 kA	65 to < 85 kA	85 to < 150 kA	150 to 200 kA
≤ 800 A	No	Yes	Yes	Yes
1200 A	No	No	Yes	Yes
1600 A	No	No	Yes	Yes
2000 A	No	No	Yes	Yes
2500 A	No	No	No	Yes
3000 A	No	No	No	Yes
≥ 4000 A	No	No	No	No

OR

- When otherwise specified.

NOTE: For I-Line™ circuit breakers, or if the lugs are in the circuit breaker, refer to the instruction bulletin for the specific circuit breaker.

Figure 24 – Cable Restraint Example

[1] Cable length is measured from the end of the lug to the conduit fitting through which the cable exits.

 © 1988–2015 Schneider Electric All Rights Reserved

ENGLISH

NOTICE

HAZARD OF CABLE MOVEMENT UNDER SHORT-CIRCUIT CONDITIONS

Restrain all cables, including neutral cables, in the switchboard installation when the conditions stated on page 35 are met.

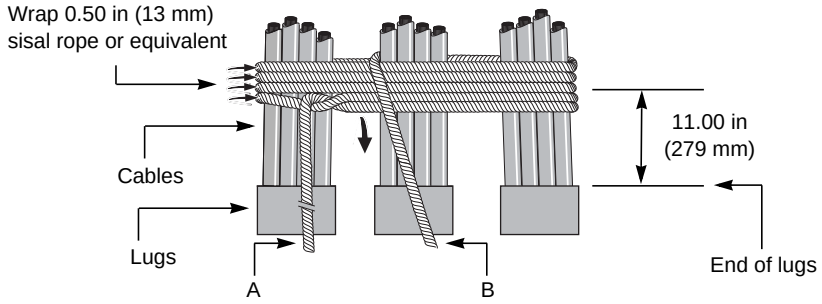
Failure to follow these instructions can result in equipment damage.

When cable restraints are required, perform the following steps.

NOTE: Wrap cables using 1/2-in. (13 mm) diameter sisal rope, 3/8-in. (9.5 mm) diameter nylon rope, or equivalent.

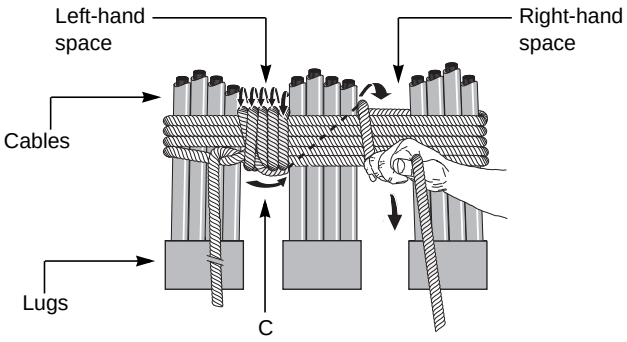
1. Begin wrapping the cables (Figure 25) a maximum distance of 11 in. (279 mm) from the end of the lugs. Continue to wrap the cables on 11-in. (279 mm) center(s) up to the point where the cables leave the enclosure.
   a. Wrap the cables four (4) times as shown, leaving 3 ft. (1 m) of excess rope at the first end (A).
   b. Pull the rope (B) taut.

Figure 25 – Wrapping Cables (neutral cables not shown)



2. Wrap the rope several times (Figure 26) until the space between the cables is completely filled.
   a. Weave the final rope loop underneath the previous loop (C).
   b. Bring the rope through the right-hand space.
   c. Pull the rope taut.

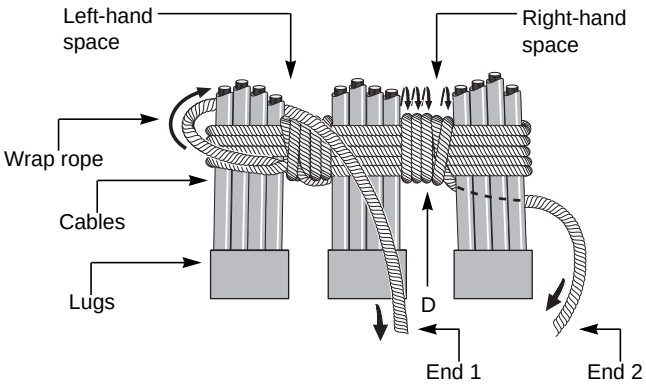
Figure 26 – Wrapping the Space Between Cables



© 1988–2015 Schneider Electric All Rights Reserved

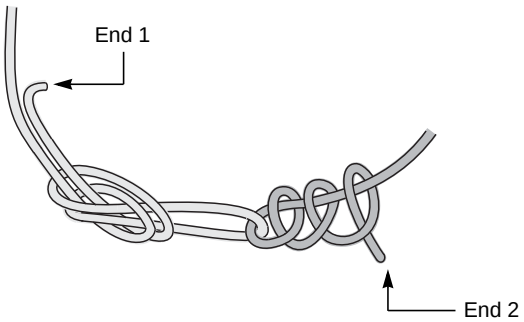
3. Wrap the rope several times until the space between the cables (Figure 27) is completely filled.
   a. Weave the final rope loop underneath the previous rope loop (D).
   b. Pull the rope taut.

Figure 27 – Finish Wrapping the Space Between Cables



4. Tie the rope ends (1) and (2) together (Figure 28) until they are taut. Cut off excess rope, and tape ends to prevent fraying.

Figure 28 – Tying Rope Ends Together



5. Recheck torques of wire binding screws after securing the cables.

   NOTE: Refer to the torque label supplied with the switchboard for torque values.

 © 1988–2015 Schneider Electric All Rights Reserved

ENGLISH

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 53.
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 Schneider Electric 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 circuit breakers may have an adjustable magnetic or electronic trip which is factory set to the lowest setting. To provide coordinated operation during a fault, adjust the trip as outlined in the instruction manual provided with the circuit breaker. All poles are adjusted simultaneously, using a screwdriver, by the single setting.
13. 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 lowest setting of 120 A for the relay. Relay pickup range is from 120–1,200 A for the relay.

    NOTE: For molded case circuit breakers, refer to “Section 11—Reference Publications” on page 56 for circuit breaker information.
14. 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/QMQB[1] switches (as marked on the device).

[1] QMQB switches are available in Canada only.

© 1988–2015 Schneider Electric All Rights Reserved

NOTICE

HAZARD OF EQUIPMENT DAMAGE

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

Failure to follow these instructions can result in equipment damage.

15. Examine fuse clip contact pressure and contact means (QMB/QMJ/QMQB[1] fusible switches). If there is any sign of looseness, contact Schneider Electric Services at 1-888-778-2733 (US) or 1-800-565-6699 (Canada). Loose fuse clips can result in overheating.
16. Check all QMB/QMJ/QMQB[1] 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™ brand fusible switches.
17. 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 17 on page 29).

⚠CAUTION

HAZARD OF EQUIPMENT DAMAGE OR INJURY

- Remove the long-time rating plug before electrical insulation testing a circuit breaker that has a label stating “Warning: Disconnect Plug Before Dielectric Test.”
- Some Micrologic™ trip units are not rated for voltages that would occur during electrical resistance insulation testing.
- Open all control and metering disconnects from the control circuits.

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

18. Conduct an electrical insulation resistance (Megger®) test to ensure that the switchboard is free from short circuits and undesirable grounds.
    a. Open all control power and metering disconnects or remove the fuses from the control circuits.
    b. Disconnect the neutral connection at any surge protective device or other electronic device before performing the electrical insulation resistance test; reconnect to the device after the test.
    c. 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.
    d. 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.
    e. Consult Schneider Electric Services at 1-888-778-2733 (US) or 1-800-565-6699 (Canada) to help correct any problems.
19. After completing the electrical insulation resistance test, replace all control power fuses that were removed and close power disconnects that were opened.
20. Check all field-installed wiring. Make certain it is clear of all live parts, and when instructed, secured to withstand fault currents.

 © 1988–2015 Schneider Electric All Rights Reserved

21. Verify that all control wiring between sections is connected.
22. Vacuum to remove any dust, scrap wire, or other debris.

NOTICE
HAZARD OF EQUIPMENT DAMAGE Do not use an air hose to blow out the switchboard. Dust can settle inside relays and overcurrent devices, causing overheating and improper operation. **Failure to follow these instructions can result in equipment damage.**

23. Replace all covers and barriers; check for any pinched wires, and close doors. Make certain all enclosure parts are aligned properly and securely fastened.

Ground Fault Protection Systems

Paragraph 230-95(c) of the National Electrical Code requires that all equipment ground-fault protection systems be tested when first installed. If the circuit breaker has equipment ground-fault protection installed, test it at this time.

1. Make sure the trip unit is powered. The trip unit is powered if:
   - — The circuit breaker is closed or bottom fed and has more than 100 V of load voltage on two phases (P or H trip unit only).
   - — The full-function or hand-held test kit is connected and on.
   - — The 24 Vdc external power supply is connected.
   - — An external voltage tap is installed and voltage of more than 100 V is present on two phases (P or H trip unit only).
2. If the system is a radial (single-ended) system, press the ground-fault Push-to-Test button. The circuit breaker trips, and the trip unit ground-fault indicator light comes on.
3. Record results on the ground fault system test log.

NOTE: If a complete check of the ground-fault system is necessary, use primary injection testing. If the system is multiple source and/or requires field connections at the job site, use primary injection testing.

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

 © 1988–2015 Schneider Electric All Rights Reserved

Section 6—Energizing the Switchboard

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Correct short-circuit conditions detected during the checkout procedures described in “Section 5—Pre-energizing Checkout Procedure” beginning on page 38.
- Qualified electrical personnel must be present when energizing this equipment for the first time.
- Follow the instructions in this section to energize the switchboard properly.

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

1. Make sure there is not a load 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 all main devices.
   d. Close each branch circuit breaker or branch fusible switch.
   e. Proceed to each panelboard and other downstream load.
3. After all overcurrent protective devices are closed, turn on all loads (for example, lighting circuits, contactors, heaters, and motors).

 © 1988–2015 Schneider Electric All Rights Reserved

ENGLISH

Section 7—Maintaining the Switchboard

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Inspect and perform preventive maintenance only on switchboards and equipment that has been de-energized and electrically isolated (unless otherwise specified). This helps ensure that accidental contact cannot 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.

Periodic maintenance of 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 50). Service bulletins for the various disconnecting and overcurrent devices mounted in the switchboard are available through your local Schneider Electric representative.

General Inspection and Cleaning

1. Vacuum the switchboard interior to remove any dirt or dust deposits. Wipe all bus bars, insulators, cables, etc., 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 can 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.

NOTICE

HAZARD OF EQUIPMENT DAMAGE

- Do not use an air hose to blow out the switchboard. Dust can 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 equipment damage.

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.

© 1988–2015 Schneider Electric All Rights Reserved

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 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

1. Bus bar joints are maintenance-free. Do not retighten them after the pre-energizing checkout procedure is complete.

NOTICE
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 Schneider Electric Services at 1-888-778-2733 (US) or 1-800-565-6699 (Canada). **Failure to follow these instructions can result in equipment damage.**

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 with any visible damage (such as cracks).

General Lubrication Information

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

- Bolt-Loc
- QMB Main and Branch
- QMJ Branch
- QMQB[1] Main and Branch

For bus/plug-on connections, use electric joint compound, Schneider Electric catalog number PJC7201.

For Masterpact™ NW drawout connections, use only Schneider Electric catalog number S48899 Electric Joint Compound.

Automatic Transfer Switches

Consult the documentation provided by the manufacturer for all installation, operation, and maintenance instructions for these devices.

[1] QMQB switches are available in Canada only.

 © 1988–2015 Schneider Electric All Rights Reserved

ENGLISH

Bolt-Loc Bolted Pressure Contact Switch Maintenance (800–4,000 A)

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” on page 56, and contact your local Schneider Electric representative 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.

⚠ DANGER

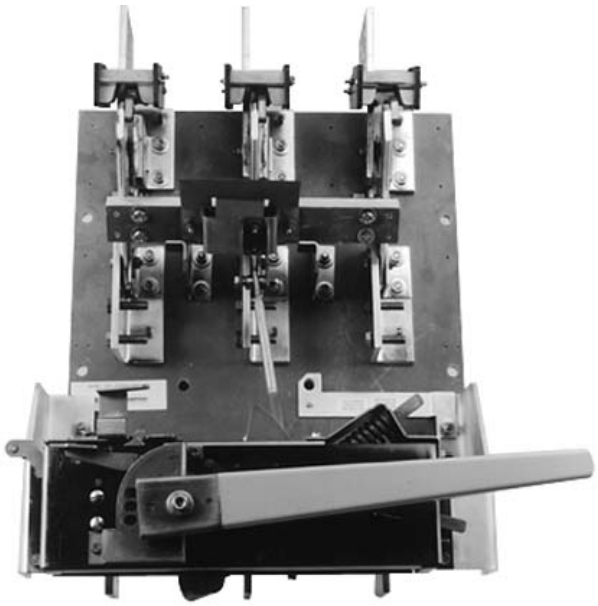
HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

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 these instructions will result in death or serious injury.

3. To replace the fuse:
   a. Open the switch before opening the fuse door.

Figure 29 – Type BP Bolt-Loc Fusible Switch



   b. Open the fuse door, releasing the interlock as described in the 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. No voltage should be present.

© 1988–2015 Schneider Electric All Rights Reserved

e. Remove all fuses. Retain the hardware for reuse.

f. Using a non-abrasive 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 new fuses.

g. Install new fuses using the same hardware removed in Step e. Tighten to 21–30 lb-ft (28–41 N•m).

4. Close the fuse door, and check the fuse door interlock with the switch in the ON position. The fuse doors should not open using normal hand force.

Circuit Breakers

Schneider Electric circuit breakers are designed and manufactured as 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 or “Open” button located on the face of the circuit breaker. Refer to the appropriate circuit breaker manual for the specific location of this button.
2. Manually open and close the circuit breaker two to three times.

Figure 30 – PowerPact™ R-Frame Circuit Breaker

NOTE: Schneider Electric instruction bulletin 48049-900-0x, *Field Testing and Maintenance Guide for Thermal-Magnetic and Micrologic™ Electronic Trip Molded Case Circuit Breakers*, provides more in-depth information.

 © 1988–2015 Schneider Electric All Rights Reserved

ENGLISH

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- If adjusting circuit breaker settings, 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, fill all unused I-Line circuit breaker mounting spaces with blank fillers and/or extensions as listed in Table 3.

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

Refer to individual circuit breaker instruction manuals shipped with the switchboard for additional maintenance information, such as changing rating plugs, sensor plugs, or adjustable settings and removing circuit breakers. If the instruction manual is not available, refer to “Section 11—Reference Publications” on page 56 for the appropriate number, or contact your local Schneider Electric representative.

Table 3 – I-Line™ Blank Fillers and Extensions

Item	Height	Catalog No.	Branch Circuit Side	Circuit Breaker Frame
Blank Fillers	1.50 in. (38 mm)	HNM1BL	Both Sides	Not applicable
	4.50 in. (114 mm)	HNM4BL	Both Sides	
Blank Extensions	1.50 in. (38 mm)	HLW1BL	Wide Side	All applications except PowerPact H/J circuit breakers with Micrologic trip unit 5/6.
	4.50 in. (114 mm)	HLW4BL	Wide Side	
	1.50 in. (38 mm)	HLN1BL	Narrow Side	
	4.50 in. (114 mm)	HLN4BL	Narrow Side	
	4.50 in. (114 mm)	HLN4EBL	Narrow Side	Only PowerPact H/J circuit breakers with Micrologic trip unit 5/6.
	4.50 in. (114 mm)	HLW4EBL	Wide Side	

NOTICE

HAZARD OF EQUIPMENT DAMAGE

- Do not remove the protective lubricant on the plug-on connectors.
- If additional lubrication is required, apply a coating of electrical joint compound, catalog number PJC7201, to the contact surfaces of the plug-on connector.

Failure to follow these instructions can result in equipment damage.

3. The universal test set, catalog number UTS3, is available to test Schneider Electric Powerpact P and R 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 circuit 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.

   A pocket tester, catalog number S434206, or UTA tester, catalog number STRV00910, are available for Schneider Electric Powerpact H, J, and L circuit breakers with Micrologic trip units. These testers supply power to the Micrologic trip units and allow for settings to be adjusted through the keypad located on the circuit breaker or through a PC using the USB interface.

© 1988–2015 Schneider Electric All Rights Reserved

Masterpact NW trip units require the full-function test set, catalog number S33595, or the hand-held test set, catalog number S33594.

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

QMB/QMJ/QMQB[1] Fusible Switches

Refer to the QMB/QMJ/QMQB[1] instruction manual for complete maintenance information. If the instruction manual is not available, refer to "Section 11—Reference Publications" on page 56 of this manual for the appropriate number. Contact your local Schneider Electric representative 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 in the ON position. 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. For fusible switch units, 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 label on the inside of the door.

Fuse Replacement (Fusible Switches Only)

1. Turn the switch to the OFF position before opening the door.

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

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 these instructions will result in death or serious injury.

2. Observe the switch blades 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 the type of fuse to use. Do not substitute a non-current 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 Schneider Electric fusible switches.

NOTICE

HAZARD OF EQUIPMENT DAMAGE

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

Failure to follow these instructions can result in equipment damage.

[1] QMQB switches are available in Canada only.

 © 1988–2015 Schneider Electric All Rights Reserved

ENGLISH

Installing QMB/QMJ/QMQB[1] Fusible Switches

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Remove power for these sections before installing or removing QMB/QMJ/QMQB[1] 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. Refer to Tables 4 and 5 for sizes and catalog numbers.

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

Table 4 – QMB/QMJ Fusible Switch Blank Fillers

Height	Catalog No.
1.50 in. (38 mm)	QMB1BLW
3.00 in. (76 mm)	QMB3BLW
6.00 in. (152 mm)	QMB6BLW
15.00 in. (381 mm)	QMB15BLW

Table 5 – QMQB[1] Fusible Switch Blank Fillers

Height	Catalog No.
2x: 1.375 in. (35 mm)	QFS1
8x: 5.50 in. (140 mm)	QFS5
10x: 6.875 in. (175 mm)	QFS6
14x: 9.625 in. (244 mm)	QFS9
24x: 16.50 in. (419 mm)	QFS16

NOTICE

HAZARD OF EQUIPMENT DAMAGE

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

Failure to follow these instructions can result in equipment damage.

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

© 1988–2015 Schneider Electric All Rights Reserved

Removing QMB/QMJ/QMQB[1] Fusible Switches

1. Turn off the main power.
2. Turn switch handle(s) to the OFF position.
3. Disconnect the load wires.
4. For QMB and QMJ switches, remove mounting screws holding the switch to the mounting rail. For QMQB[1] switches, remove the bolts holding the switch to the line terminal.
5. Unplug the switch.

Ground-Fault Protection Systems

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 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 Schneider Electric Services at 1-888-778-2733 (US) or 1-800-565-6699 (Canada).

If no additions have been made to the installation and the ground-fault protection system does not operate properly, contact Schneider Electric Services at 1-888-778-2733 (US) or 1-800-565-6699 (Canada).

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” on page 56 of this manual to obtain the appropriate number. Contact your local Schneider Electric representative to obtain this manual.

[1] QMQB switches are available in Canada only.

 © 1988–2015 Schneider Electric All Rights Reserved

ENGLISH

Section 8—Adverse Circumstances

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

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Turn off all power supplying the switchboard before cleaning.
- Always use a properly rated voltage sensing device to confirm all power is off.
- Before energizing the switchboard, all unused circuit 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 adverse circumstances, contact Schneider Electric Services at 1-888-778-2733 (US) or 1-800-565-6699 (Canada) for special instructions.

Inspection Following a Short Circuit

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 can damage conductors and insulation. Check the overcurrent-protection device that interrupted the short-circuit current for possible arcing damage.

Do not open sealed devices, such as molded case circuit breakers. Replace these devices if they are damaged. Before energizing the switchboard, all unused circuit breaker mounting spaces must be filled. For more information about these devices, refer to the appropriate instruction manual listed in “Section 11—Reference Publications” on page 56.

Clean-up Following a Short Circuit

The insulating properties of some organic insulating materials can deteriorate during an electrical arc. If so:

1. Remove any soot or debris.
2. Replace carbon-tracked insulation.

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 Schneider Electric Services at 1-888-778-2733 (US) or 1-800-565-6699 (Canada).

© 1988–2015 Schneider Electric All Rights Reserved

Water-Sprayed or Splashed Switchboards (Clean Water Only)

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

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

Failure to follow these instructions 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. Replace these devices if they are 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 1–10 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 one or more of these conditions have not been met, contact Schneider Electric Services at 1-888-778-2733 (US) or 1-800-565-6699 (Canada).

If **ALL** of the conditions listed have been met, proceed as follows:

1. Turn off all power supplying this equipment before working on or inside the equipment.
2. Always use a properly rated voltage sensing device to confirm all power is off.
3. Disconnect and electrically isolate the switchboard so that no contact can be made with energized parts.
4. 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.
5. 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.

 © 1988–2015 Schneider Electric All Rights Reserved

⚠ CAUTION

HAZARD OF EQUIPMENT DAMAGE OR INJURY

- Remove the long-time rating plug before electrical insulation testing a circuit breaker that has a label stating “Warning: Disconnect Plug Before Dielectric Test.”
- Some Micrologic trip units are not rated for voltages that would occur during electrical resistance insulation testing.
- Open all control and metering disconnects from the control circuits.

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

6. Turn all circuit breakers or switches to their ON position. The switchboard must remain de-energized.
7. Use a megohmmeter with a capacity of 500–1,000 Vdc and apply voltage from:
   a. Each phase-to-ground with circuit breaker on.
   b. Phase-to-phase with circuit breaker on.
8. Record resistance values. Refer to “Section 10—Switchboard Insulation Resistance Chart” on page 55.
9. If resistance measurements are less than 0.5 megohm, call Schneider Electric Services at 1-888-778-2733 (US) or 1-800-565-6699 (Canada) for recommendations.
10. If resistance measurements are greater than 0.5 megohm, the equipment can be energized using the procedures listed in “Section 6—Energizing the Switchboard” on page 41.

 © 1988–2015 Schneider Electric All Rights Reserved

Section 9—Torque Values for Electrical Connections

Table 6 – 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. ★	450 lb-in (51 N•m)

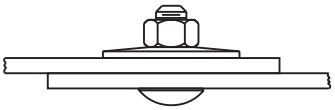
★ Certain lugs require 620 lb-in (70 N•m) and are marked as such.

Table 7 – 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)

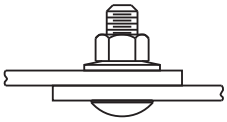
 © 1988–2015 Schneider Electric All Rights Reserved

ENGLISH

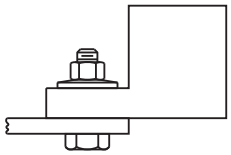


Carriage bolt
Hex nut
Conical washer

Hardware Description	Torque Value
1/2 in.	720–840 lb-in (81–95 N•m)

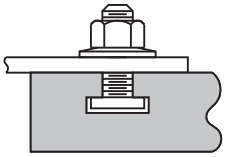


Carriage bolt
Conical washer assembly
Keps nut



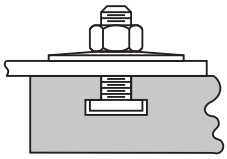
Hex head bolt
Conical washer assembly
Keps nut

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
1/4 in.	50–75 lb-in (6–8 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

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)
	1.00 in. (25 mm)	130–150 lb-in (15–17 N•m)
1/2 in.	1.25 in. (32 mm) 2.25 in. (57 mm)	450–550 lb-in (51–62 N•m)

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)
	1.00 in. (25 mm)	130–150 lb-in (15–17 N•m)
1/2 in.	1.25 in. (32 mm) 2.25 in. (57 mm) 3.00 in. (76 mm)	720–840 lb-in (81–95 N•m)

© 1988–2015 Schneider Electric All Rights Reserved

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, EXPLOSION, OR ARC FLASH

- Turn off all power to the switchboard before testing.
- Always use a properly rated voltage sensing device to confirm power is off.

Failure to follow these instructions 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

 © 1988–2015 Schneider Electric All Rights Reserved

ENGLISH

Section 11—Reference Publications

Schneider Electric publications are available through your local Schneider Electric representative. These publications include device replacement procedures and listings of spare parts to make ordering and servicing of replacement parts quick and convenient. Any maintenance procedure or device not listed, such as an I-Line interior, is not customer serviceable.

Contact your local Schneider Electric representative for information at 1-888-778-2733 in the US, or at 1-800-565-6699 in Canada. Or, refer to the Technical Library at http://www.schneider-electric.us/ to obtain the appropriate publications.

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

Other Reference Publications	Publication Number
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

© 1988–2015 Schneider Electric All Rights Reserved

ENGLISH

Section 12—Installation and Maintenance Log

Date	Initials	Maintenance Performed

Date	Initials	Maintenance Performed

© 1988–2015 Schneider Electric All Rights Reserved

ENGLISH

Schneider Electric USA, Inc.
800 Federal Street
Andover, MA 01810 USA
888-778-2733
www.schneider-electric.us

Standards, specifications, and designs may change, so please ask for confirmation that the information in this publication is current.

Bolt-Loc, I-LIne, Masterpact, Micrologic, PowerPact, Power-Style, Qwik Flange, Schneider Electric, and Square D are owned by Schneider Electric Industries SAS or its affiliated companies. All other trademarks are the property of their respective owners.

© 1988–2015 Schneider Electric All Rights Reserved

80043-055-12, 05/2015
Replaces 80043-055-11, 04/2014