

FlexSeT™ Switchboards

Instruction Bulletin

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Safety Information


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 user guide 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.

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.

A qualified person is one who has skills and knowledge related to the construction, installation, and operation of electrical equipment and has received safety training to recognize and avoid the hazards involved.

Electrical equipment should be transported, stored, installed, and operated only in the environment for which it is designed.

Introduction

This manual contains instructions for the proper installation, operation, and maintenance of FlexSeT™ switchboard equipment manufactured by Schneider Electric™. Engineering, installation, and operating staff supervisors must 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 FlexSeT 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.

Inspection and Packaging

Every FlexSeT 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. 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.

FlexSeT Tool List

NOTE: Use appropriate tool sizes for the procedure(s) being performed.

Table 1 - Recommended Tools

Impact sockets (multiple sizes)		Cordless impact driver	
Socket wrench		Hex bit sockets (multiple sizes)	
Socket extension		Hammer drill	
Torque wrench (70 ft-lb. minimum)		Masonry drill bit	
Flat blade screwdriver		Hole alignment pin	
Phillips head screwdriver		Wire stripping tool (as needed)	
Box wrenches (multiple sizes)		Conduit punching tools (as needed)	

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 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.

⚠ WARNING

HAZARD OF COMPROMISE OF SYSTEM AVAILABILITY, INTEGRITY, AND CONFIDENTIALITY

- Change default passwords to help prevent unauthorized access to device settings and information.
- Disable unused ports/services and default accounts, where possible, to minimize pathways for malicious attacks.
- Place networked devices behind multiple layers of cyber defenses (such as firewalls, network segmentation, and network intrusion detection and protection).
- Use cybersecurity best practices (for example: least privilege, separation of duties) to help prevent unauthorized exposure, loss, modification of data and logs, interruption of services, or unintended operation.

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



WARNING: This product can expose you to chemicals including Nickel compounds), which are known to the State of California to cause cancer, and Bisphenol A (BPA), which is known to the State of California to cause birth defects or other reproductive harm. For more information go to www.P65Warnings.ca.gov.

Moisture Contamination Avoidance and Mitigation

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Store the equipment in a clean, dry (including no condensation), well-ventilated area with an ambient temperature of approximately 70°F (21°C).
- If heaters are furnished in the assembly, energize them from an external source. When energizing heaters from an external source, remove the primary and secondary overcurrent protective devices from the control power transformer.
- If heaters are not installed in the assembly, and the area is cold and damp, use a temporary heating source within the assembly. A minimum of 250 W of heat per section is recommended.
- Avoid greasy, smoky heaters that can deposit carbon on insulation, which could lead to tracking and insulation breakdown.

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

⚠ WARNING

HAZARD OF FIRE

Remove all flammable material in the vicinity of the heaters, such as packaging, accessories in boxes, and documentation, before energizing the heaters.

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

Shipping and Storage Requirements

This equipment does not achieve its ratings until it is installed per record/as-built drawings, installed per the instructions contained in this document, and has operational environmental controls with appropriate settings to help mitigate environmental influences. This equipment can also be stored in a climate-controlled area that uses both heating and cooling to maintain acceptable environmental conditions. Indoor and outdoor rated equipment is not suitable for outdoor storage.

- The equipment should be treated as if it is in storage until it is installed and operational. The storage area should be clean, dry (75% or less relative humidity), and climate controlled with proper ventilation.
- To keep the equipment dry, the use of heaters is required in some cases (for example, during seasonal or low periods of electrical loading and equipment de-energization).
 - Consult the engineer of record for the appropriate environmental control settings or means to mitigate environmental influences.
 - If so equipped, ensure that the thermostats and/or humidistats are set to mitigate condensation. A minimum of 250 W of heat per section is suggested.
 - If heaters are used with the equipment that were not included in the equipment by Schneider Electric, they must be clean and free of debris and grease. Greasy and/or smoky heaters can contaminate electrical insulation and lead to dielectric breakdown and/or tracking.
- Shipping packaging is not suitable for and cannot be used by itself for equipment storage unless otherwise indicated on the shipping packaging labeling.

- When receiving equipment, the equipment may be at a lower temperature than the ambient air temperature. Allow time for the equipment to rise to ambient air temperatures before making openings in or otherwise disturbing the packaging. Condensation can occur on and inside the equipment if warm air contacts cold surfaces of the equipment. Moisture damage can occur, destroying the dielectric capabilities of the equipment and rendering it unusable. Once the equipment is unwrapped, follow the instructions contained in this document.
- The factory shipping wrap around the equipment on shipping pallets is not suitable for non-enclosed over-the-road transportation that risks exposing the equipment to the elements. The factory shipping wrap around the equipment should remain on the equipment until the equipment is ready to be inspected and stored or inspected and installed. After receiving the equipment and allowing it to acclimate to the environment, remove the packaging and inspect the equipment for damage that may have occurred in transit. If damage is found or suspected, immediately file a claim with the carrier and notify your Schneider Electric representative.
- Follow these guidelines every time the equipment is moved to a new storage location or to its final destination.

Installation, Operation, and Maintenance Requirements

This equipment does not achieve its ratings until it is installed per record/as-built drawings, installed per the instructions contained in this document, and has operational environmental controls with appropriate settings to help mitigate environmental influences. This equipment can also be operated in a climate-controlled area that uses both heating and cooling to maintain acceptable environmental conditions. Indoor and outdoor rated equipment is not suitable for outdoor storage.

In some cases (such as seasonal electrical loading, de-energized equipment, and standby/alternate power sources), the heat generated by equipment loading is insufficient to prevent condensation and alternate heat sources are required. If environmental controls such as a thermostat or humidistat are used, ensure their settings are sufficient to mitigate condensation and always remain operational. Consult the engineer of record for the appropriate environmental control settings.

Exposure to Moisture and Chemicals

If liquids such as moisture, chemicals, and condensation contact the electronics, circuit breaker, fuses, bussing, or other electrical components, do not attempt to clean or repair the equipment as this may lead to unrepairable damage. If the equipment is energized, de-energize it. If equipment is not energized, do not energize it. Contact the Schneider Electric Customer Care Center at 888-778-2733.

Receiving, Handling, and Storing

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

If signs of moisture contamination are present, do not follow the instructions in this section; proceed [Moisture Contamination Avoidance and Mitigation](#), page 10.

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

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

NOTICE

HAZARD OF EQUIPMENT DAMAGE

- Do not lay the equipment on its front or sides.
- Lay equipment on its back only when special handling is required.
- Do not ship the equipment in a horizontal position.

Failure to follow these instructions can result in 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 eyes as standard equipment for NEMA Type 1 FlexSeT switchboards. Instruction labels on each shipping section include drawings and written instructions outlining the proper use of the lifting straps (see 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

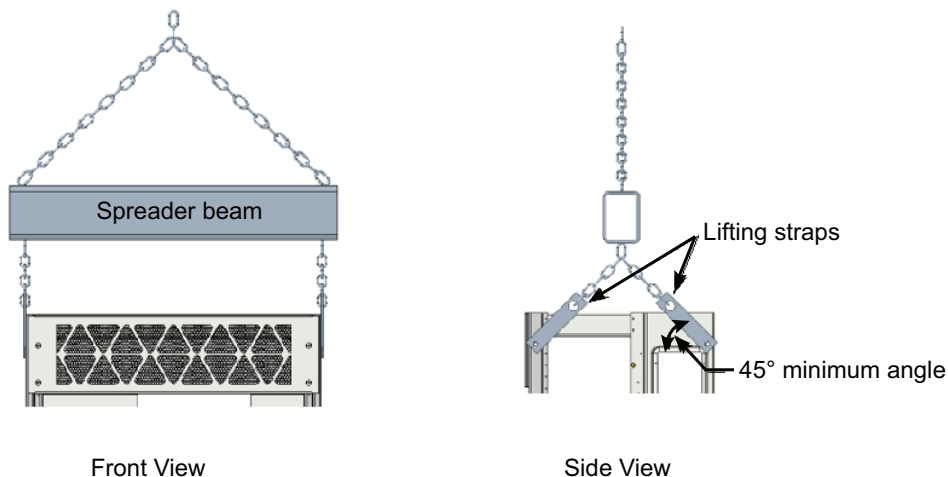


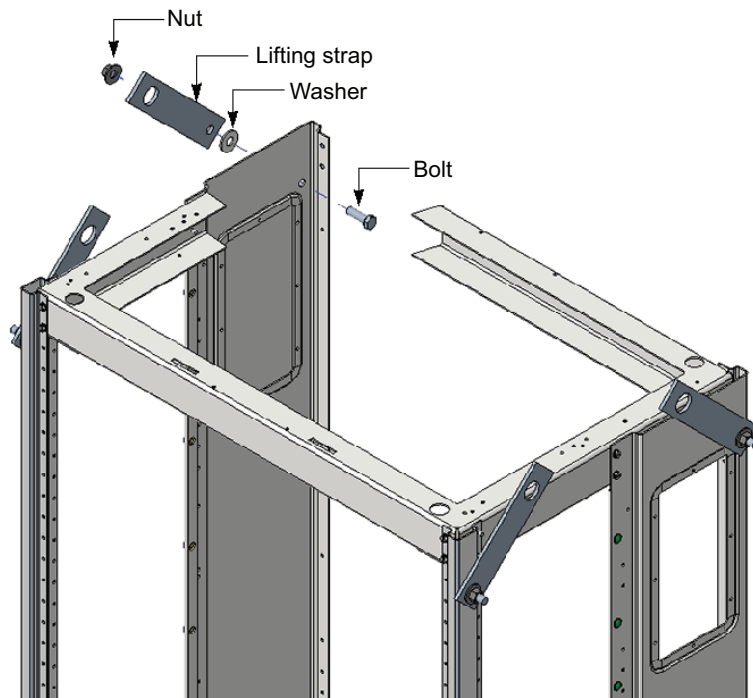
Figure 2 - Handling Instruction Label-Switchboards with Lifting Straps

<p>⚠ WARNING</p> <p>HANDLING AND LIFTING HAZARD</p> <p>Keep area below equipment clear of any personnel or property.</p> <p>Before lifting enclosure:</p> <ul style="list-style-type: none"> Inspect lifting straps for damage. Do not pass cables or chains through holes in lifting straps. Use only load rated cables or chains with safety hooks or shackles. Use a load rated spreader beam to prevent structure damage. Tie to the MINIMUM angle between lifting cables or chains and equipment top is 45° (see figure below). Failure to follow these instructions can result in death, serious injury, or equipment damage.
<p>⚠ ADVERTENCIA</p> <p>PELIGRO AL LEVANTAR O MANEJAR EL EQUIPO</p> <p>Mantenga el área debajo del equipo libre de personal o bienes materiales.</p> <p>Antes de levantar el gabinete:</p> <ul style="list-style-type: none"> Realice una inspección visual a las correas de levantamiento para ver si encuentran daños. No pase los cables ni las cadenas por los agujeros en las correas de levantamiento. Utilice sólo cables o cadenas adecuados para la carga con argilletas o ganchos de seguridad. Emplee una viga separadora para la carga para evitar daños a la estructura. Asegure de manera que el ángulo MINIMO entre los cables o las cadenas de levantamiento y la parte superior del equipo sea de 45° (véase la figura de abajo). El incumplimiento de estas instrucciones puede causar la muerte, lesiones serias o daños al equipo.
<p>⚠ AVERTISSEMENT</p> <p>RISQUE EN COURS DE LEVAGE ET DE MANUTENTION</p> <p>Maintenez la zone en dessous de l'appareil délogée de tout personnel ou matériel.</p> <p>Avant de soulever l'armoire:</p> <ul style="list-style-type: none"> Assurez-vous que les élingues de levage ne sont pas endommagées. Né faites pas passer de câbles ou chaînes par les trous de l'élingue. Utilisez uniquement des câbles ou chaînes classés pour supporter la charge, munis de crochets ou manilles de sécurité. Utilisez une entretoise classée pour supporter la charge afin d'éviter tout dommage de structure. Assurez de façon à ce que l'angle MINIMUM entre les câbles ou chaînes de levage et la partie supérieure de l'appareil soit de 45° (voir la figure ci-dessous). Si ces directives ne sont pas respectées, cela peut entraîner la mort, des blessures graves ou des dommages matériels.

Follow these instructions to handle the switchboard:

1. When attaching lifting straps to the switchboard, assemble the hardware in the order shown in Figure 3.

Figure 3 - Hardware Assembly Order



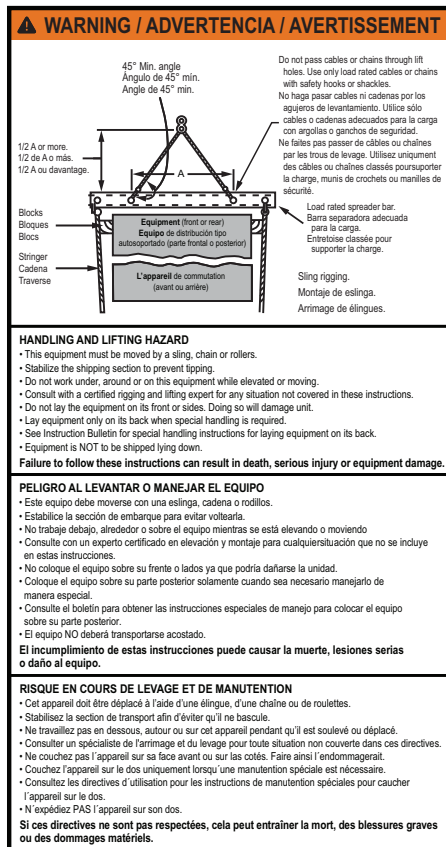
2. Use load-rated cables or chains with safety hooks ¹ or shackles. Do not pass cables or chains through holes in lifting straps.
3. Use a load-rated spreader beam to help prevent structure damage. Rig so that the minimum angle between the lifting cables or chains and equipment top is 45°.

1. As defined in OSHA standard 29 CFR §1910.181(a)(29).

Handling without Lifting Straps

Lifting eyes are not furnished on skid mounted or outdoor subassembly. Use rollers, slings, or other means to handle the shipping sections. The handling label (see Figure 4) is affixed to each of these sections.

Figure 4 - Handling Instruction Label-Switchboards without Lifting Straps



WARNING

HAZARD OF TOP HEAVY LOAD-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, serious injury, or equipment damage.

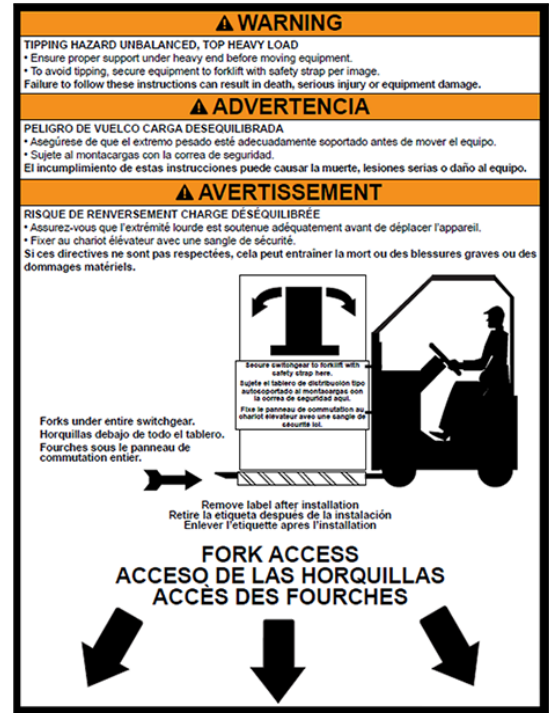
When elevating a shipping section not equipped with lifting eyes, use an overhead crane equipped with either of the following:

- A chain coupled to a sling rigging. Wrap the sling completely around the switchboard and shipping stringers.
- A wire cable with safety hooks and shackles.

A forklift is an alternative method of handling the switchboard. Before using a forklift:

- Read the fork access labels on the switchboard sections (see Figure 5).
- Check the fork lengths to ensure the forks extend under the entire switchboard.
- Carefully balance the load.
- Use a strap when handling or moving a switchboard with a forklift.

Figure 5 - Handling with a Forklift



Storage

When storing the switchboard before installation, cover the top and openings of the equipment during the construction period to help 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 help 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 W 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.

Installation

Correct installation of FlexSeT 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®).

- 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 help prevent moisture or water from entering and accumulating within the enclosure. Install portable electric heaters of approximately 250 W per vertical section in both indoor-type and rainproof-type switchboard enclosures for adequate protection during storage.
- 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 must gently slope toward a drain.

NOTE: For seismic qualifications, read the section [Anchoring for Seismic Qualifications](#), page 24 before pouring the floor or foundation.

FlexSeT switchboards are assembled on true and level floors at the assembly plant. For 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 make sure the floor channels are level over their entire length to avoid distortion of the switchboard structure. Each channel must 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 two 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 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.

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 IMPROPER STRESS ON BUS

Level and align adjacent shipping sections with one another. Check for proper alignment of the through bus bridge.

Failure to follow these instructions can result in equipment damage.

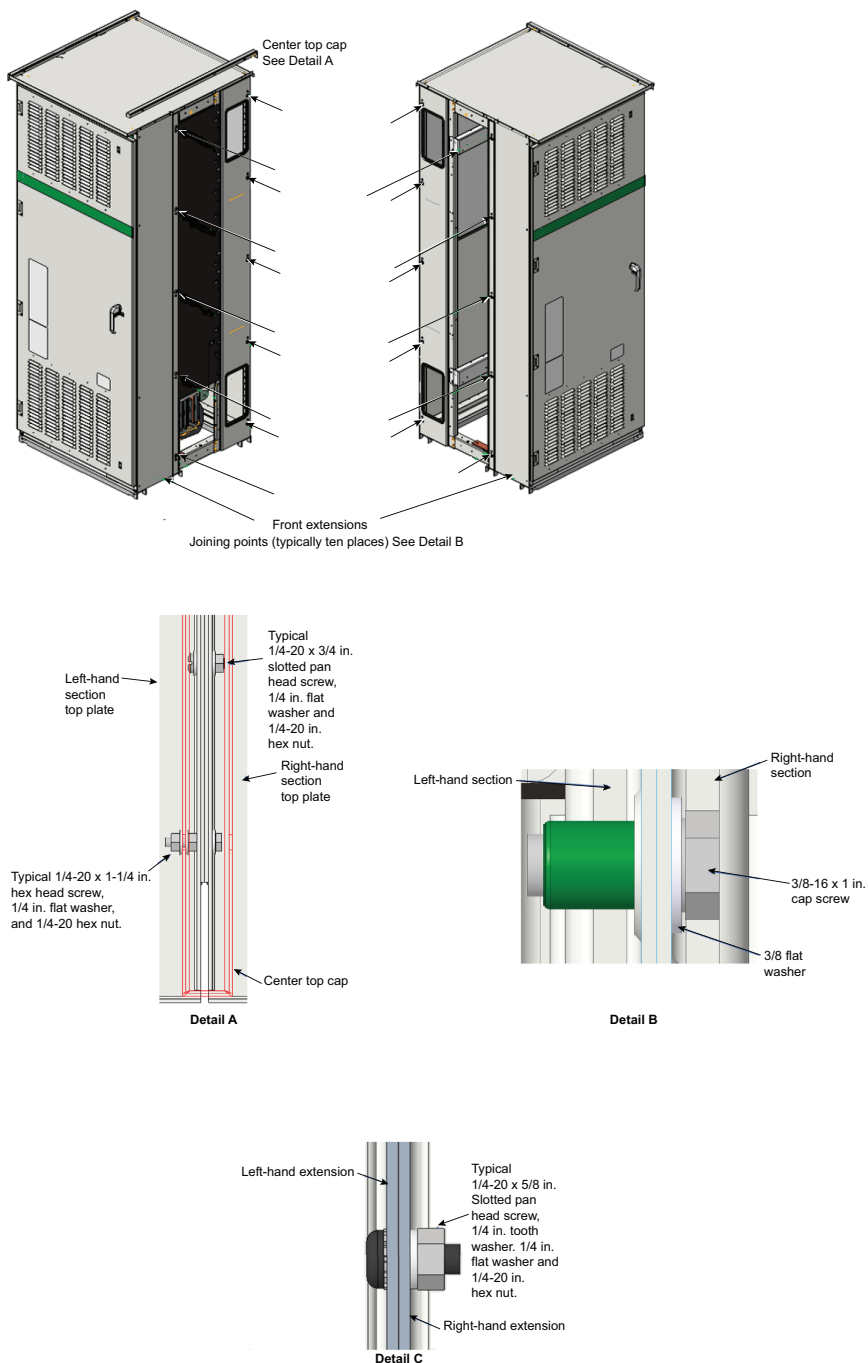
Install the switchboard into its final position by leveling progressively each section and bolting the frames together, if separated. Position shipping sections as follows:

1. Maneuver each shipping section into the desired position using the procedures under “Handling”, page 12.
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.

Joining Shipping Sections—Outdoor Switchboards

1. Position each adjacent section, carefully leveling and aligning it with the previous section.
2. Remove the front panels and rear access panels, providing access to bolt adjacent sections together (see Figure 6).

Figure 6 - Joining Shipping Sections—Outdoor Switchboards

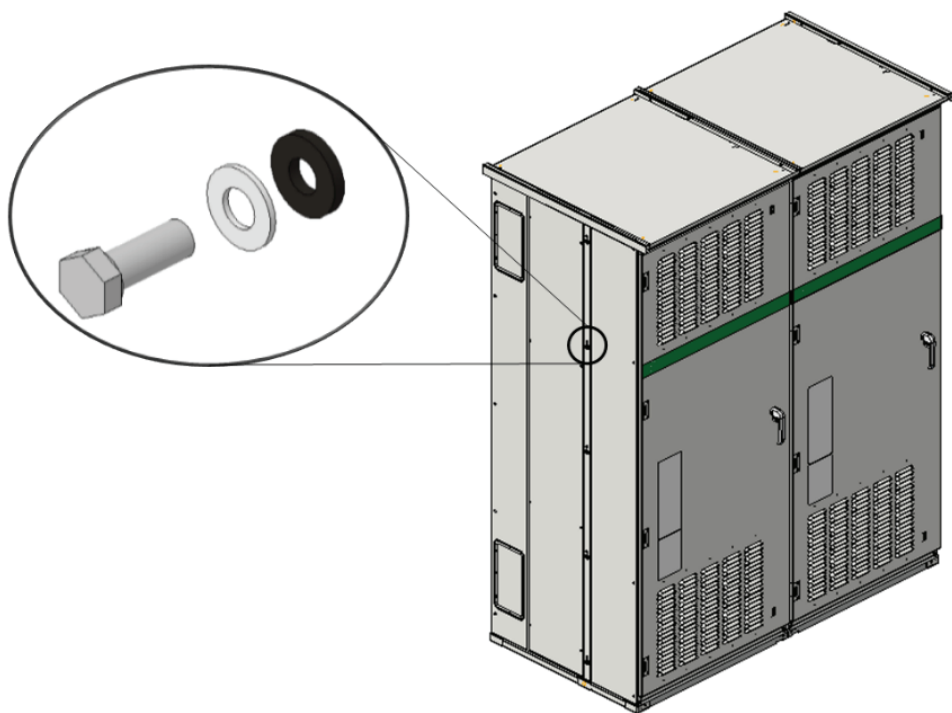


3. Remove five 0.5 in. (13 mm) diameter knockouts from the front vertical corner channel (only on bolt head side) and five from the rear vertical corner channel (a total of ten per frame side), as indicated by the arrows in Figure 6.

4. Position each adjacent section, carefully leveling it and aligning it with the previous section. The only gasket required between sections is provided across the height of the rear corner channel.
5. Place the ten bolts (3/8-16 x 1 in.) provided in the FLEXBRIDGE2000 kit through the holes created in step 3 to join adjacent sections.
6. Remove four 0.31 in (8 mm) diameter knockouts from each front extension (a total of eight).
7. Place hardware provided in the FLEXEN3ACAP kit on the front extensions as in Figure 6, Detail C.
8. Make the bridge connection to the preceding section.
9. Install the center top cap provided in the FLEXEN3ACAP kit (see Figure 6, Detail A).
10. Replace and secure the front and rear panels removed in step 2.

NOTE: Once the sections are joined, verify the sealing hardware provided in the FLEXEN3ACVR kit is installed on both ends of the front and rear vertical corner channel (see Figure 7).

Figure 7 - Verify Sealing Hardware



Doorstop Instructions—Outdoor Switchboards

⚠ WARNING

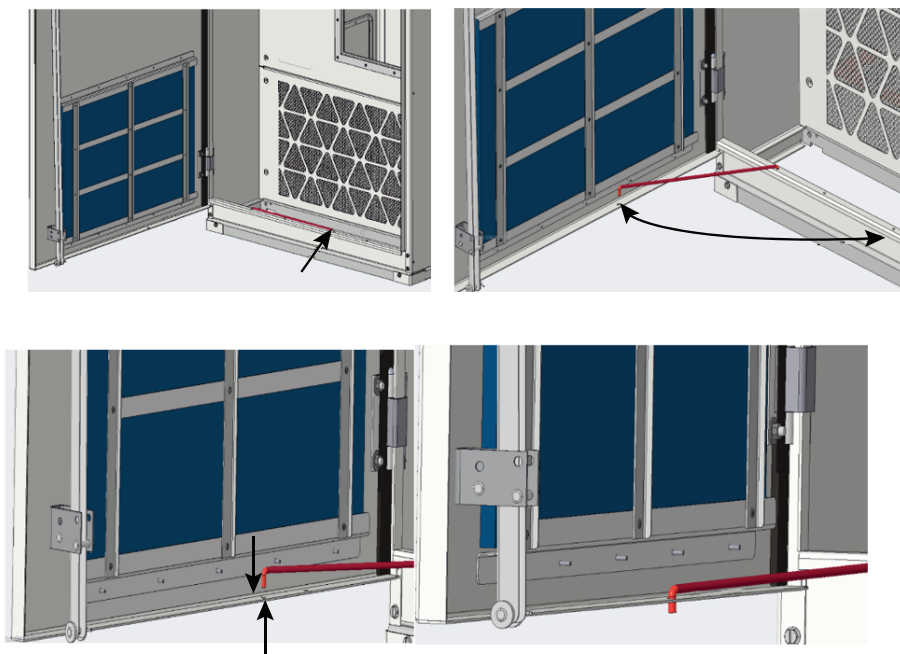
HAZARD OF BLUNT FORCE OR PINCH INJURY

- Install doorstop to secure the door in the open position.
- Remove the doorstop and install back in the base channel before closing the door.

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

1. Locate and lift the far-right side of the doorstop out of the base channel.
2. Rotate the doorstop towards open such that the far-right side aligns with the open hole at the bottom of the door (see Figure 8).
3. Insert the doorstop in the open hole at the bottom of the door.

Figure 8 - Doorstop Insertion



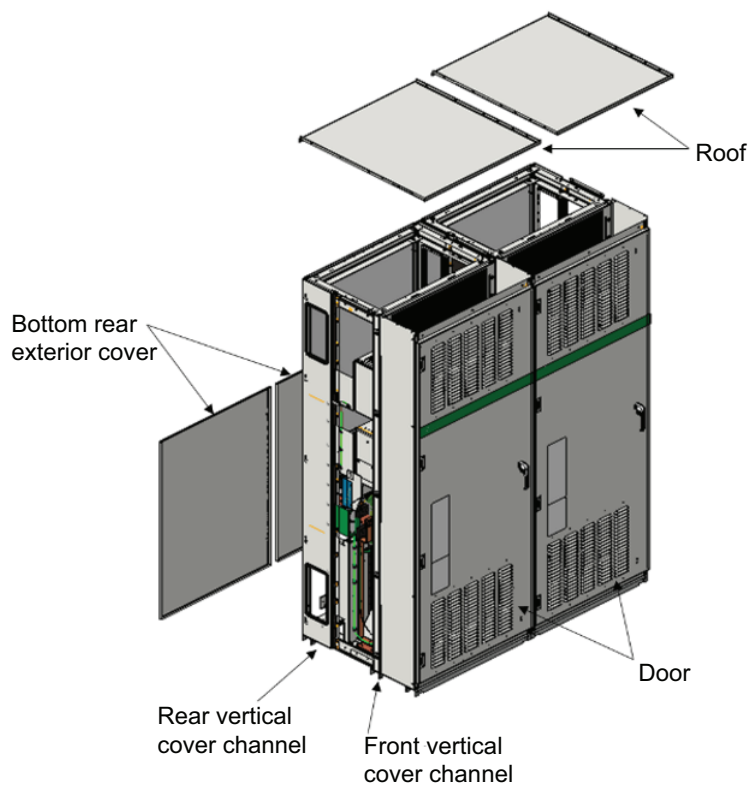
NOTE: Keep door filters clean. Periodic inspection and maintenance of filters recommended based on site conditions.

Gasket Inspection-Outdoor Switchboards

When parts are removed for installation or maintenance purposes (see Figure 9), make sure the gasket is not damaged. Examples of damaged gaskets are shown in Figure 10.

NOTE: Retain all hardware for reuse.

Figure 9 - Side Panels Removed



⚠ DANGER

HAZARD OF ELECTRIC SHOCK OR ARC FLASH

Damage in gasket can result in arc fault. Replace a damaged gasket.

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

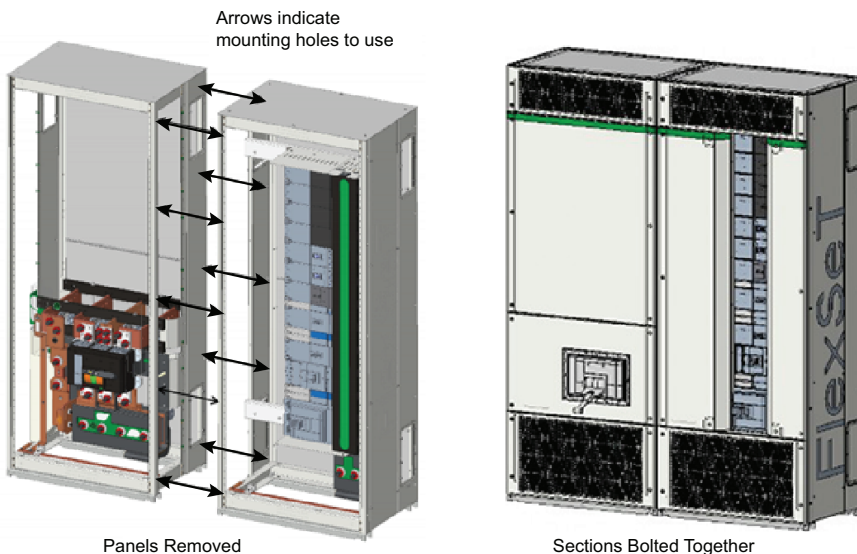
Figure 10 - Example of Damaged Gaskets



Joining Shipping Sections–Indoor Switchboards

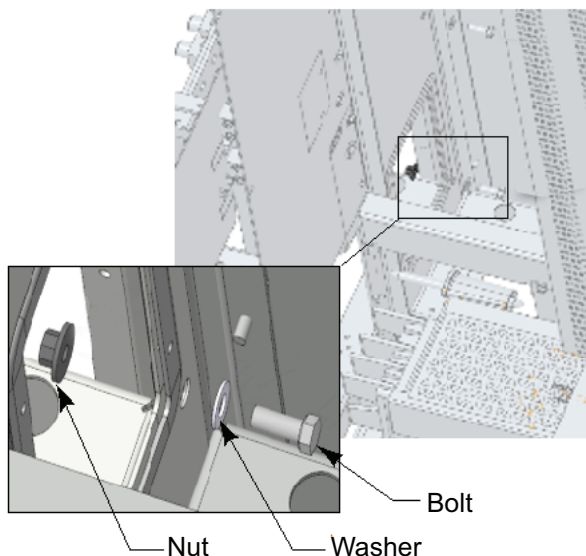
1. Position each adjacent section, carefully leveling and aligning it with the previous section. If lifting straps are provided, completely remove them from the sides being bolted together so the sections can be joined flush.
Leave the other lifting straps on the switchboard if their removal is not required to join adjacent sections flush.
2. Remove the front panels and rear access panels, providing access to bolt adjacent sections together (see Figure 11).

Figure 11 - Joining Indoor Switchboard Sections



3. Ten bolts (3/8-16 x 1 in.), washers, and Keps® nuts are provided with every bus bridge (FLEXBRIDGE) kit. To join adjacent sections, place washers on bolts, insert bolts into existing mounting holes in the front and rear vertical corner channels, and fasten with Keps nuts (see Figure 12).

Figure 12 - Hardware Orientation



Anchoring for Seismic Qualifications

FlexSeT 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 FlexSeT equipment. To maintain the validity of this certification, anchorage of equipment to the primary building structure is required.

Responsibility for Mitigation of Seismic Damage

For the purposes of the model building codes, FlexSeT 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 ($I_p = 1.5$) 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. ASCE/SEI 7 recognizes AC 156 as an appropriate methodology for qualifying equipment to its requirements.

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. 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 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.

Tie-Down Locations for Rigid Floor Mounted Equipment

The equipment enclosure provides anchorage tie-down points to accept anchor attachments to the building structure or foundation. Type 1 indoor enclosures provide enclosure base frame clearance holes for anchorage attachments (see Figure 13 and Figure 14 for Outdoor Switchboard).

Figure 13 - Base Channel Floor Anchor Bolt Locations

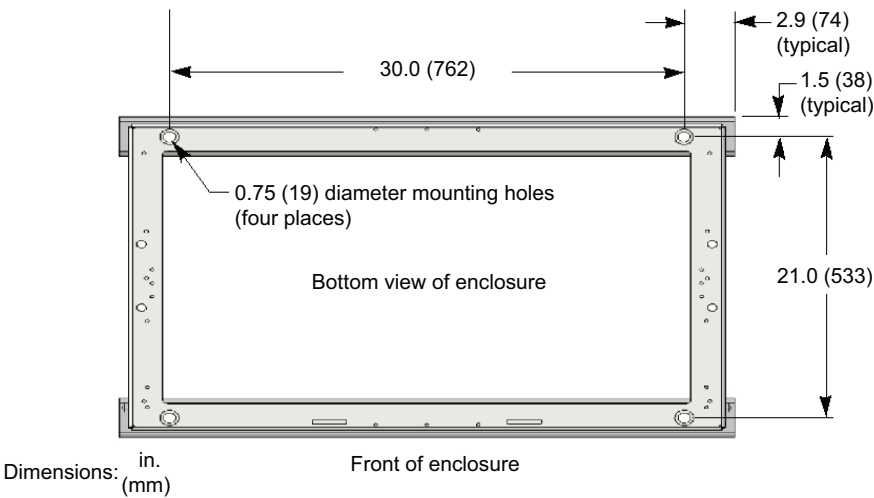
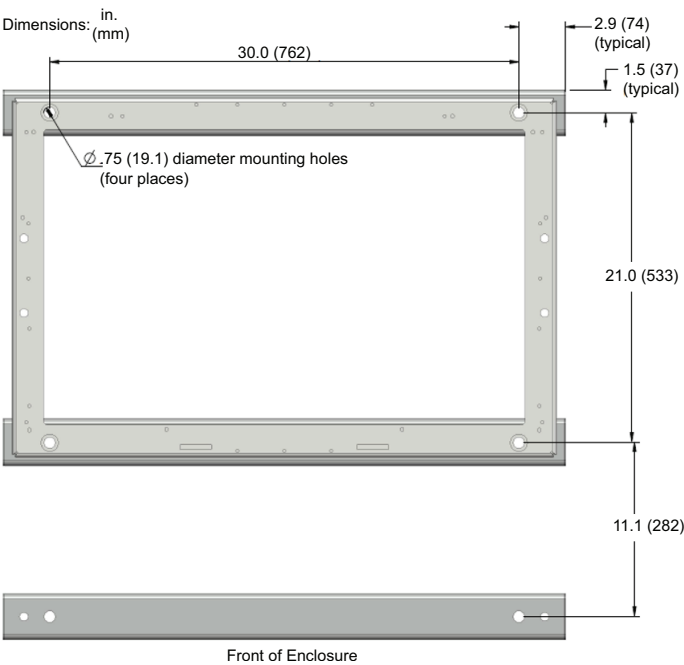


Figure 14 - Outdoor Switchboard Base Channel Floor Anchor Bolt Locations



Anchoring FlexSeT Equipment for Seismic Applications

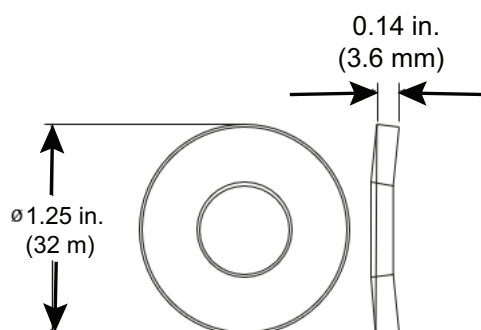
Formed base channels run the width of the section. Both sides of every FlexSeT switchboard lineup have two pre-installed access plates which provide easier access to the base channels (see Figure 15). The channels and connecting braces provide a minimum 0.75 in. (19 mm) diameter hole for fastening the section to the floor. To anchor the FlexSeT 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 Anchoring Detail, page 27).

Figure 15 - Access Plates



Use one 1.25 in. (32 mm) outer diameter Belleville washer (provided by customer; see Figure 16) under the head of each bolt or anchor nut.

Figure 16 - Belleville Washer



After the FlexSeT 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 FlexSeT switchboard can move in any direction. Any top incoming cables must accommodate this motion.

Anchoring the Switchboard

Although switchboard sections are freestanding, a hard bump or shifting movement can result in damage to the through bus bridge between sections and to conduit hubs connected to the sections. Therefore, each individual section must be anchored to the floor.

Formed base channels run the width of the shipping section. Both sides of every FlexSeT switchboard lineup have two pre-installed access plates which provide easier access to the base channels. There are 0.75 in. (19 mm) diameter mounting holes near the ends of each base channel for anchoring the section to the floor.

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

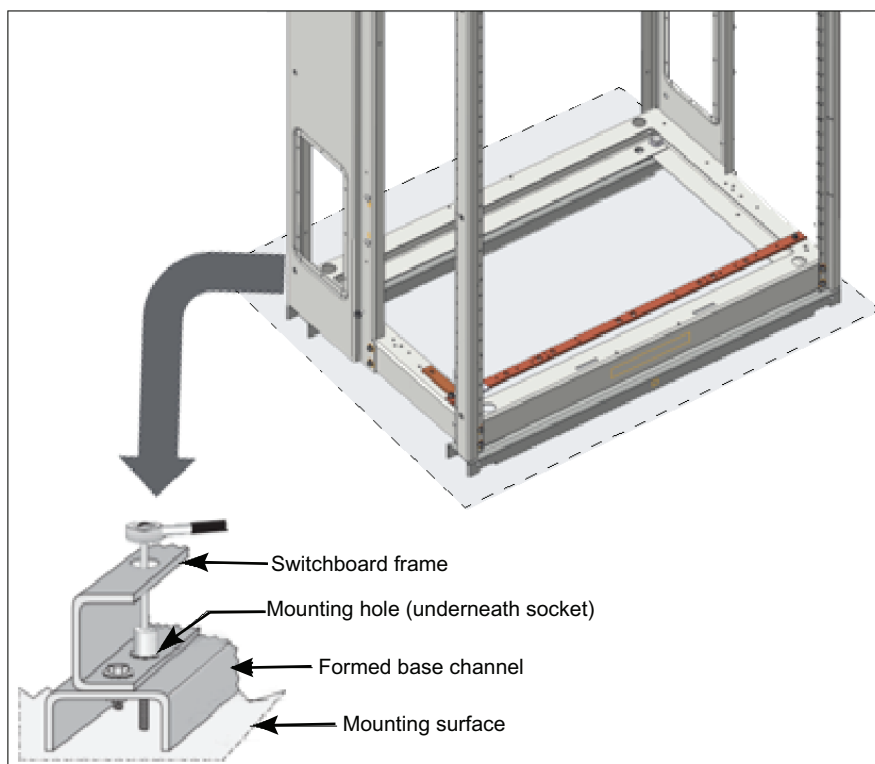
Reinstall the access plates after anchoring the switchboard sections.

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

To anchor a switchboard section, refer to *Access Plates*, page 26 and Figure 17, and follow these steps:

1. Remove and retain the four screws from the bottom access plate on each side of the section.
2. Remove and retain the access plates.
3. Using customer-supplied hardware suitable for installation of electrical equipment, anchor the section to the mounting surface using the mounting holes closest to the surface.
4. Once anchoring is complete, reattach the access plates with the screws removed in step 1.

Figure 17 - Anchoring Detail

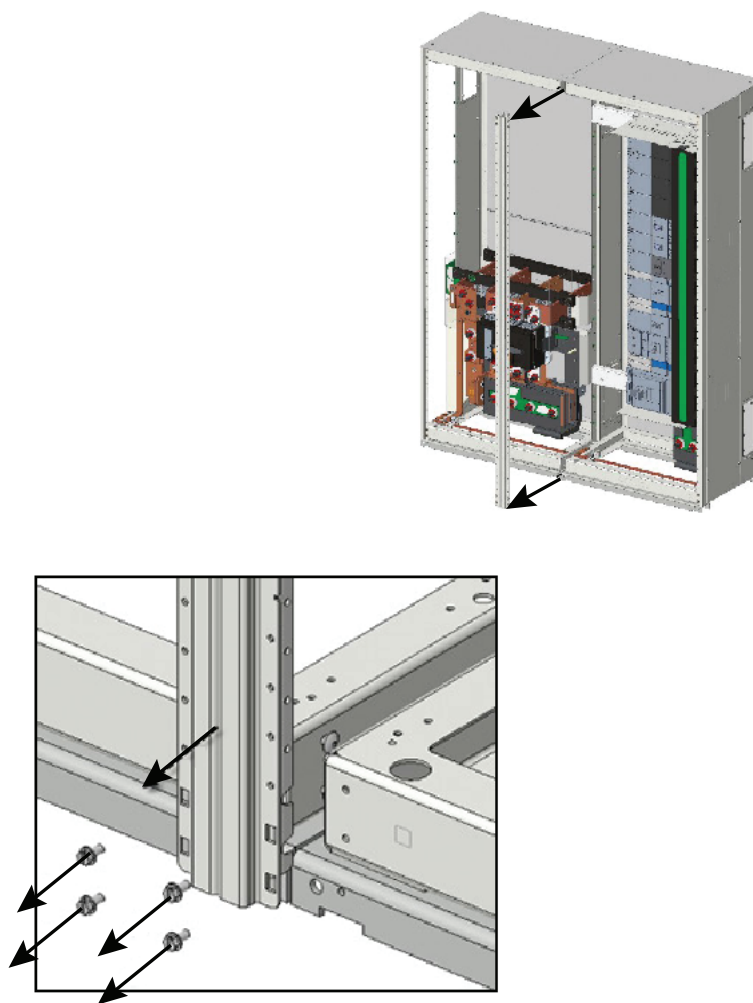


Removing Front Corner Channels (Optional)

Removing the front corner channels on the right side of the Main section and left side of the I-Line™ section makes it easier to install the bridge assembly and to pull cables in the Main section. The two corner channels will be bolted together, as outlined earlier in the Joining Shipping Sections, so they will be removed as one unit.

1. Remove the two 1/4-20 screws from the bottom end of each front corner channel (Figure 18).

Figure 18 - Channel Removal



2. Remove the two 1/4-20 screws from the top end of each front corner channel and remove the two front corner channels as one unit. Retain the channels and all screws for re-installation.

Conduit Area

1. Locate and terminate all conduit in the switchboard enclosure in the “available conduit area” designated on the equipment drawing.
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 where seismic restraint is required.
2. Install the conduit properly. Use hubs, locknuts, and bushings to help protect the cables and minimize condensation on the conduit from entering the switchboard.
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 helps 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.

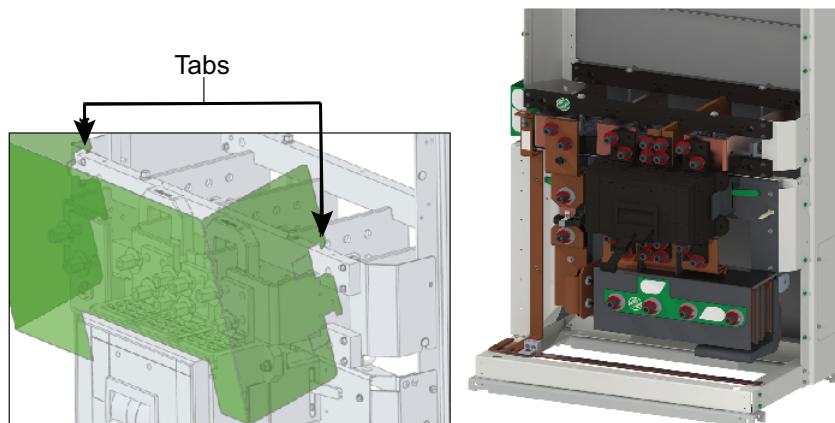
Cable Pulling

FlexSeT 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 help 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.
7. Remove the service entrance barrier by flexing the tabs that engage the rear side of the lug pad assembly supports (see Figure 19).

8. Tilt the barrier forward and lift it away.

Figure 19 - Barrier Removal



NOTE: The bus assembly can be rotated outward to provide easy access for pulling cable (see Figure 20).

Figure 20 - Rotating Bus Assembly

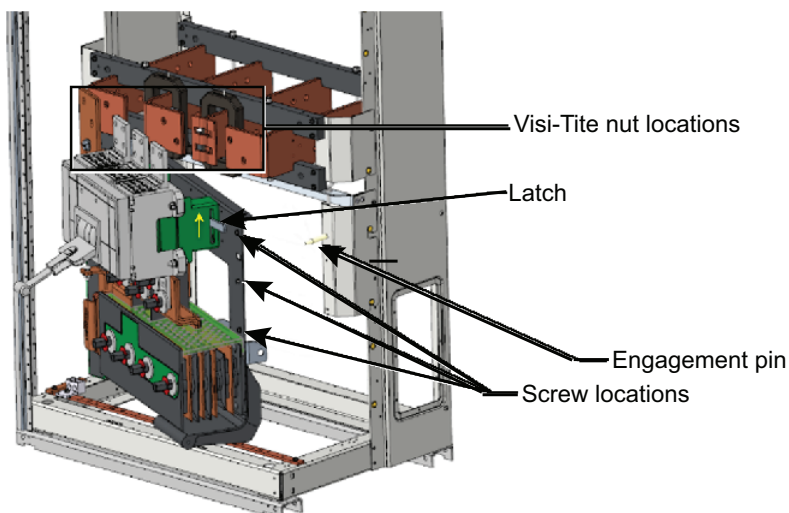


Figure 21 - Barrier Label

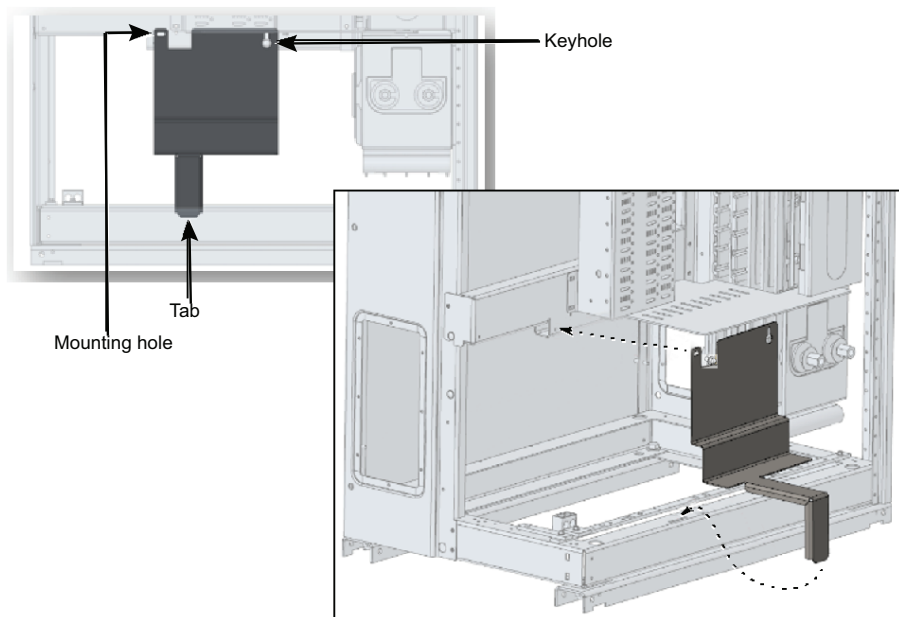


9. Remove and retain the Visi-Tite™ nuts, 1/2 in. carriage bolts, and washers from the line side of the main circuit breaker.
10. Remove and retain three 1/4-20 screws on the right side of the hinge pan and swing the bus assembly outward. When the bus assembly is completely open, a latch engages to keep the assembly open.
11. When cabling is complete, lift the latch to disengage it and swing the bus assembly inward. The hinge pan will engage the alignment pin.
12. Push the bus assembly completely closed and fasten with the Visi-Tite nuts, 1/2 in. carriage bolts, washers and the three 1/4-20 screws.
13. Torque the Visi-Tite nuts until the outer nut breaks off. Discard the broken nuts and red tags.
14. Re-install the service entrance barrier (see Figure 19). The barrier snaps on with tabs that engage the rear side of the lug pad assembly supports.

Installing Bridge Assembly Support

1. Position the support keyhole over the shoulder rivet on the mounting cross bar (see Figure 22).

Figure 22 - Bridge Assembly



2. Insert the support tab into the switchboard base slot and push the support down as far as it will go.
3. Insert a 1/4-20 hex head screw through the support mounting hole and tighten securely.

Through Bus Bridge Connections

NOTE: If the switchboard consists of only one shipping section, proceed to “Grounding and Bonding”, page 37.

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

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

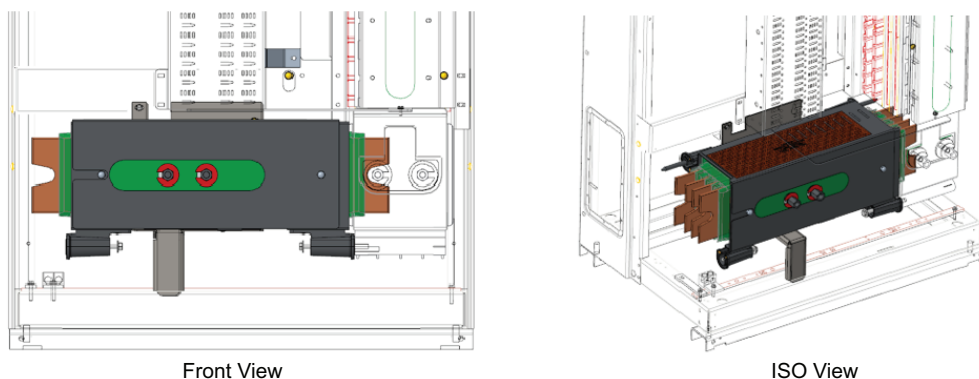
Failure to follow these instructions will result in death or serious injury.

Through bus bridge connectors and/or hardware, along with installation instructions, are provided with each shipping split. Follow the installation instructions, and then torque each Visi-Tite bolt until the outer nut breaks off. If the outer nuts are already broken off, torque the bolts to the value given in Torque Values for Electrical Connections, page 61.

Installing Bridge Assembly

A bridge assembly is used to connect an I-Line feeder section to a main section or to another I-Line section. A correctly installed bridge assembly is shown in Figure 23.

Figure 23 - Completed Bridge Assembly in the I-Line Section

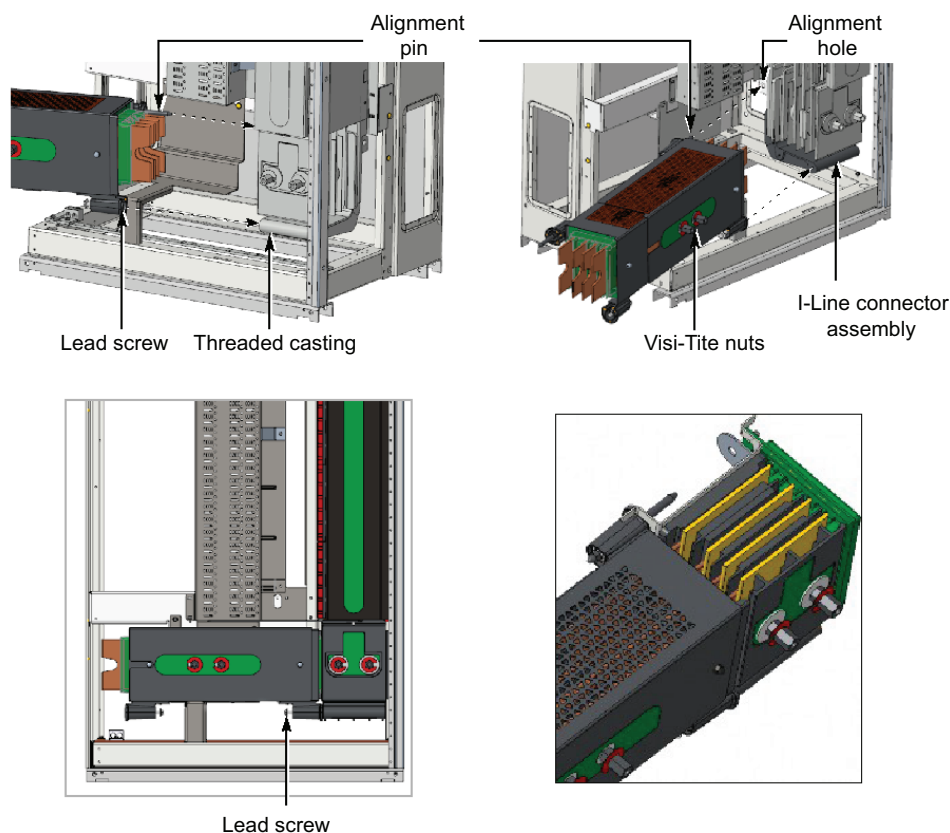


Bridge Installation to I-Line Stack

NOTE: Before installing the bridge assembly, make sure cables are pulled for the Main section and the I-Line section.

1. Rest bridge assembly on the support pan (see Figure 24).

Figure 24 - Bridge Assembly Installation



2. Loosen the two Visi-Tite nuts on the I-Line connector assembly.
3. Grasp the bridge assembly and slide it towards the I-Line connector assembly until the alignment pin enters the alignment hole.

NOTE: The bridge bus goes behind the I-Line stack vertical bus.

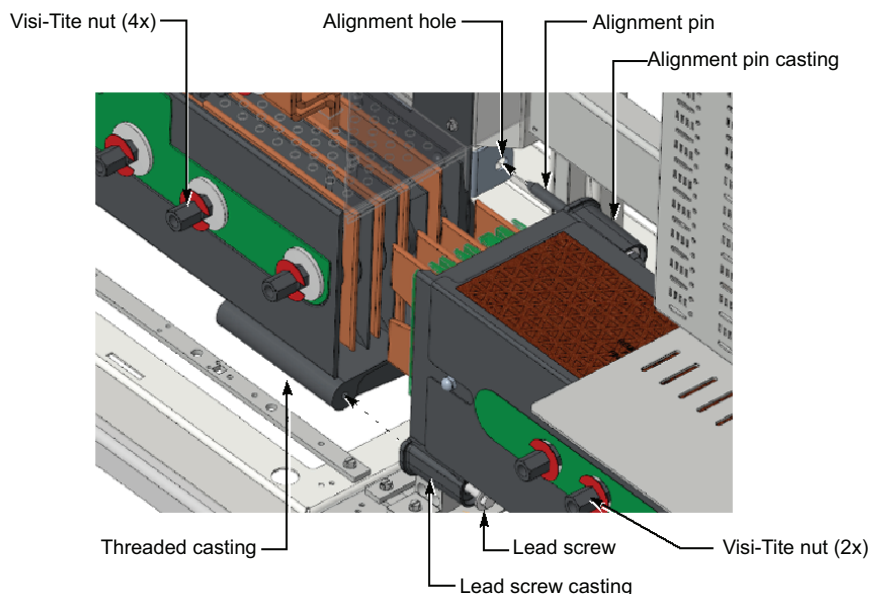
4. Using both hands, firmly push the two bus assemblies together. Make sure the two Visi-Tite nuts in the I-Line connector assembly are still loose to ease the installation effort.
5. Finish connecting the assemblies by inserting the lead screw into the threaded casting and tightening it.

NOTE: Do not tighten the Visi-Tite nuts at this point. They are tightened after the bridge assembly is connected to the Main section.

Bridge Installation to Main

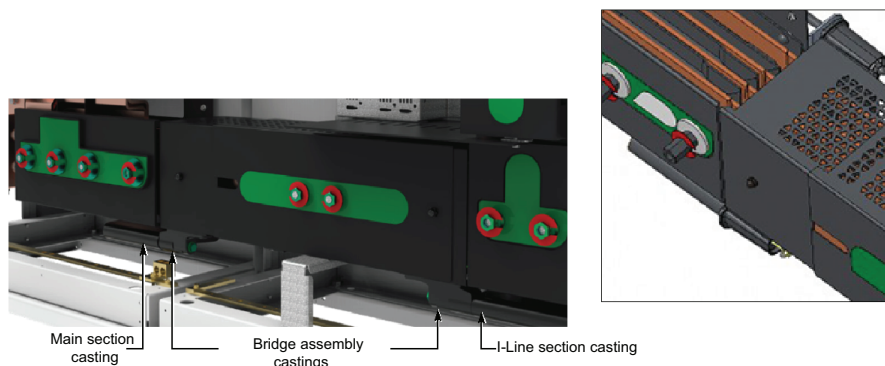
1. Loosen the four Visi-Tite nuts in the main bus assembly and the two Visi-Tite nuts in the bridge assembly (see Figure 25).

Figure 25 - Connecting Assemblies



2. Holding the alignment pin casting and the lead screw casting on the bridge assembly, slide the bridge assembly towards the main bus assembly until the alignment pin enters the alignment hole.
- NOTE:** The bridge assembly bus goes behind the main bus.
3. Using both hands, firmly push the two bus assemblies together. Make sure the Visi-Tite nuts in the main assembly and bridge assembly remain loose to ease the installation effort.
 4. Finish connecting the assemblies by inserting the lead screw on the bridge assembly into the threaded casting on the main assembly and tighten.

Figure 26 - Fully Connected Bridge Assembly

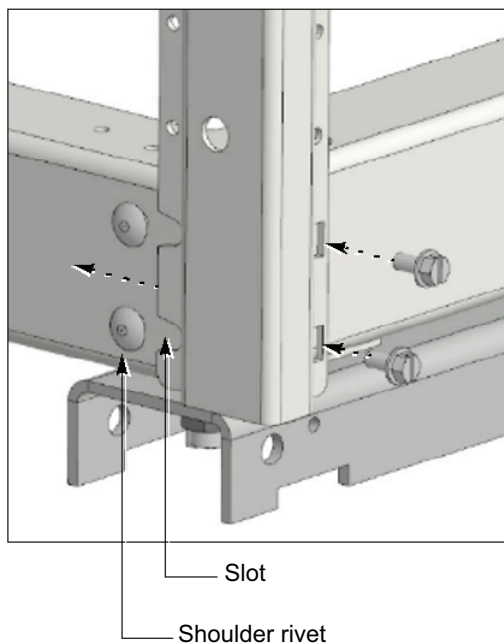


Re-installing Front Corner Channels

Re-assemble the front corner channels:

1. Insert the front corner channel slots under the heads of the shoulder rivets and push the corner channel into the switchboard frame (see Figure 27).

Figure 27 - Installing Front Corner Channels



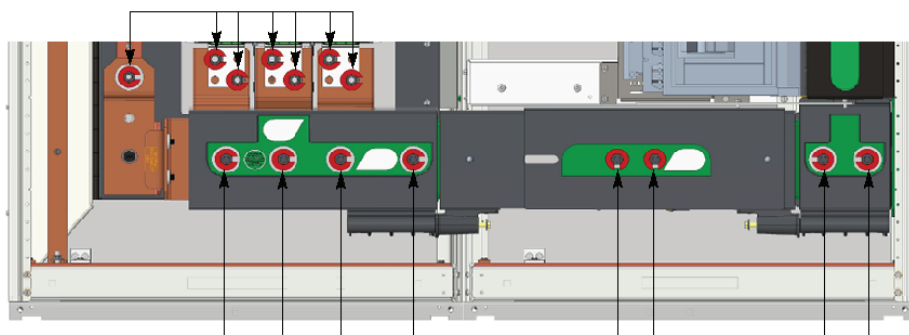
2. Install and loosely tighten the two 1/4-20 screws at the bottom of each front corner channel.
3. Install and loosely tighten the two 1/4-20 screws at the top of each front corner channel.
4. Once all corner channels are in place, fully tighten all screws.

Torque Bus Assemblies

After all electrical connections are made (including the cable connections), tighten all Visi-Tite nuts in the center of the bridge, in both the main section and the I-Line feeder section, until the outer head breaks off and the red disk falls off (see Figure 28). Discard the outer head and disk.

NOTE: If the outer heads of the Visi-Tite nuts have already been broken off; use the torque values listed in *Torque Values for Electrical Connections*, page 61.

Figure 28 - Visi-Tite Nuts

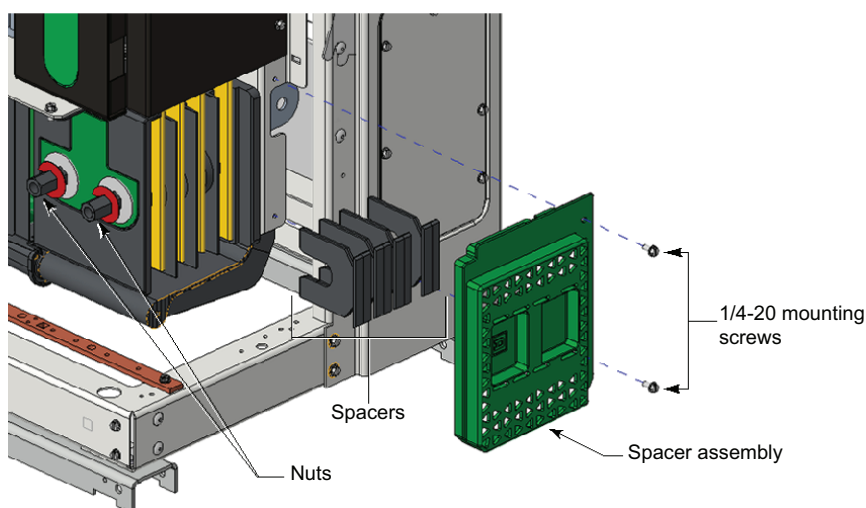


Connecting I-Line Sections

I-Line feeder sections are shipped with pre-assembled spacers. Before you can connect two I-Line sections, first remove the spacer assembly from the preceding I-Line section in the line-up.

1. Loosen the two nuts on the bottom of the I-Line stack (see Figure 29).

Figure 29 - Removing Spacer Assembly



2. Remove the two 1/4-20 spacer assembly mounting screws.
3. Remove and discard the spacer assembly and four spacers.
4. Install the bridge assembly using the steps starting in *Installing Bridge Assembly*, page 32.

Ground Bus Splice Connections

⚠ DANGER

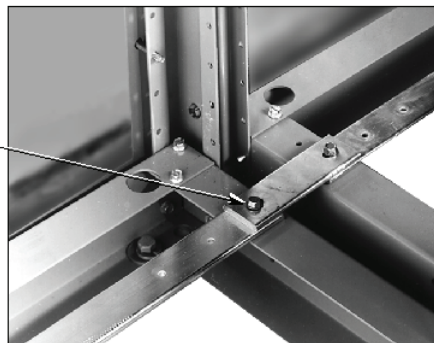
HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

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

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

Figure 30 - Ground Bus Splice Connection

Ground bus splice
(14-20 thread-forming
hardware provided)



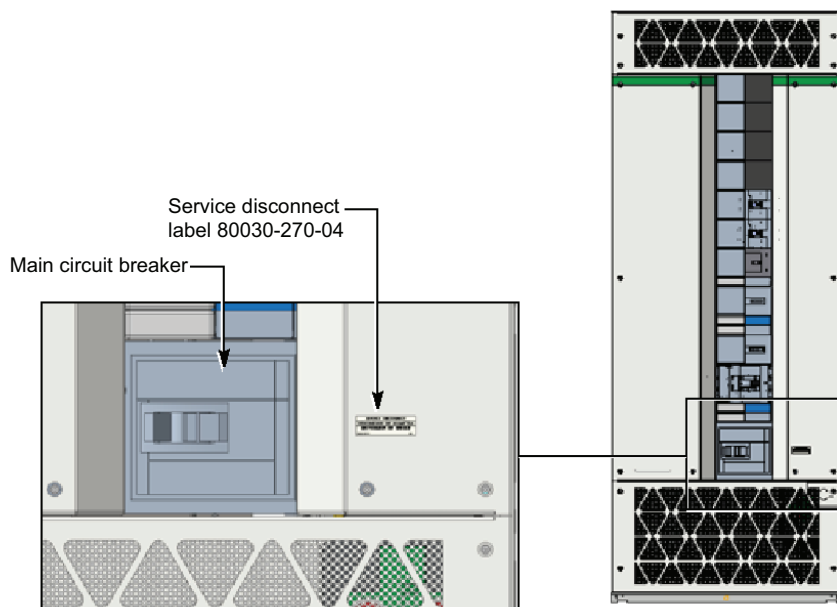
Grounding and Bonding

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.

Attach Service Disconnect Labels

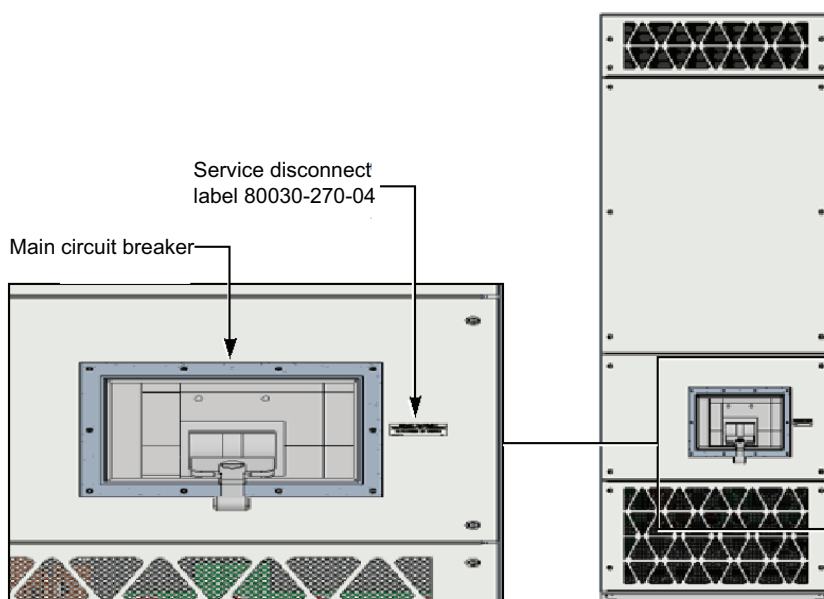
1. Apply service disconnect label 80030-270-04 (located inside the data pocket on the back of the I-Line dead front) to the dead front cover next to the main breaker (see Figure 31).

Figure 31 - Label Location on I-Line



2. Apply service disconnect label 80030-270-04 to the main circuit breaker cover next to the breaker (see Figure 32).

Figure 32 - Label Location on Main Circuit Breaker

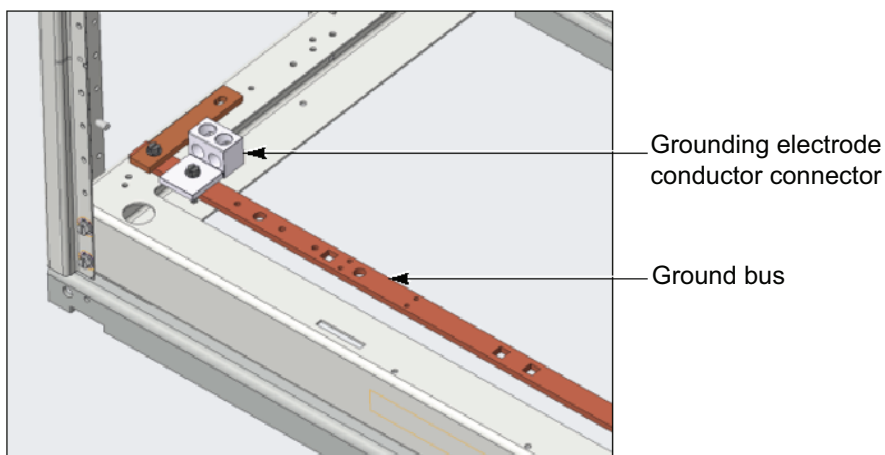


Service Equipment–Grounded System

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) (see Figure 33). 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 33 - Grounding Electrode Connector



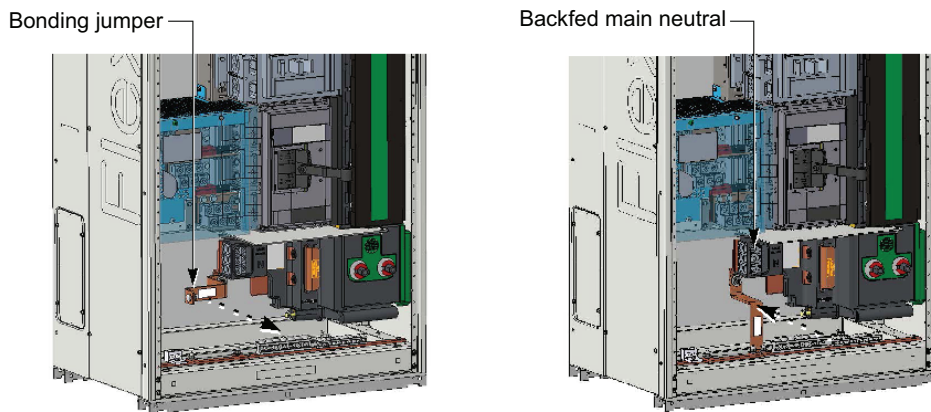
2. Install the main bonding jumper between the neutral or main and the ground bus.

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.

Backfed Neutral Bonding Jumper Installation

1. Remove and retain the 3/8 in. hardware from the attached and unattached ends of the bonding jumper (see Figure 34).

Figure 34 - Bonding Jumper Connection at Backfed Neutral

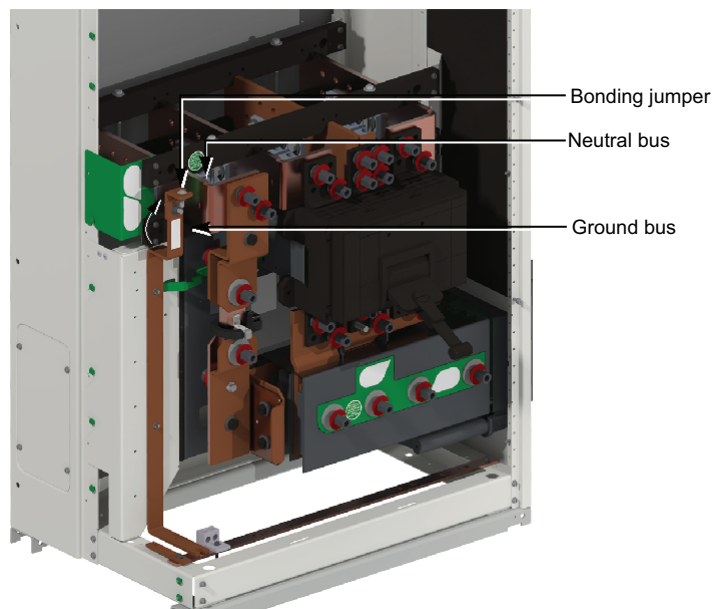


2. Completely remove the bonding jumper from the section.
3. Rotate the bonding jumper 90° counter-clockwise and attach to the ground bus and the backfed main neutral with the 3/8 in. hardware removed in step 1.
4. Torque the 3/8 in. hardware at both the ground bus and backfed main neutral ends to 200 lb-in. (22.5 N•m).
5. To disconnect the main bonding jumper, perform steps 1–3 in reverse order.

Main Bonding Jumper Installation

1. Remove and retain the 3/8 in. hardware from the unattached end of the bonding jumper (see Figure 35).

Figure 35 - Bonding Jumper Connection at Main



2. Loosen the 3/8 in. hardware attaching the bonding jumper to the ground bar.
3. Rotate the bonding jumper 90° clockwise and attach the unattached end to the neutral bus with the 3/8 in. hardware removed in step 1.
4. Torque the 3/8 in. hardware at both the ground bus and neutral ends to 200 lb-in. (22.5 N•m).
5. To disconnect the main bonding jumper, perform steps 1–3 in reverse order.

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 (see Figure Grounding Electrode Connector, page 39).
2. Select the material and size of this grounding electrode conductor to comply with Sections 250-62 and 250-66 of the NEC, and install it as specified in Section 250-64 of the NEC.

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 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.

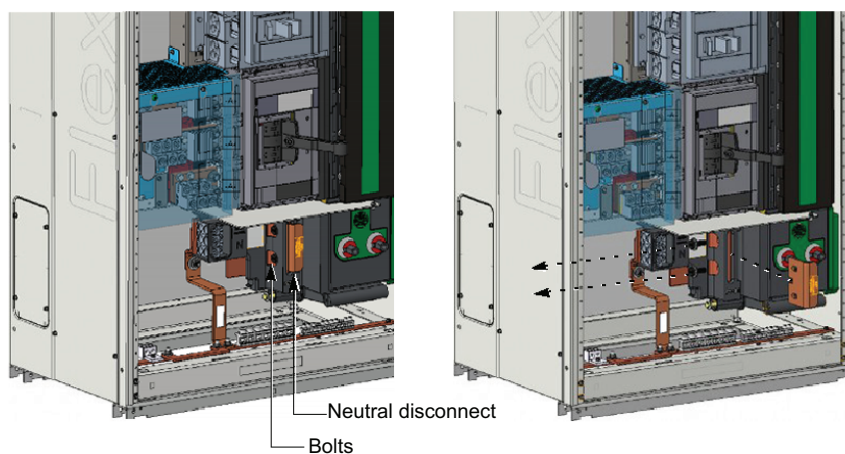
Neutral Disconnect

When the line and load sides of the neutral must be disconnected for procedures such as testing, follow the steps below and in Main, page 43.

Backfed Neutral

1. Remove and retain the two 1/2 in. bolts and washers that attach the neutral disconnect to the backfed neutral (see Figure 36).

Figure 36 - Removing Neutral Disconnect at Backfed Neutral

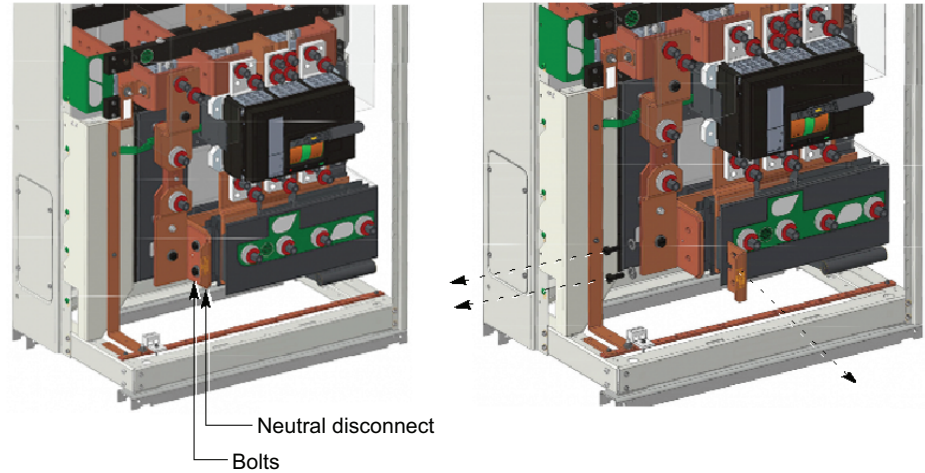


2. Remove the neutral disconnect by pulling it straight out.
3. To replace the disconnect, perform steps 1 and 2 in reverse order and torque the 1/2 in. bolts to 545 lb-in. (60 N•m).

Main

1. Remove and retain the two 1/2 in. bolts and washers that attach the neutral disconnect to the main neutral (see Figure 37).

Figure 37 - Removing Neutral Disconnect at Main



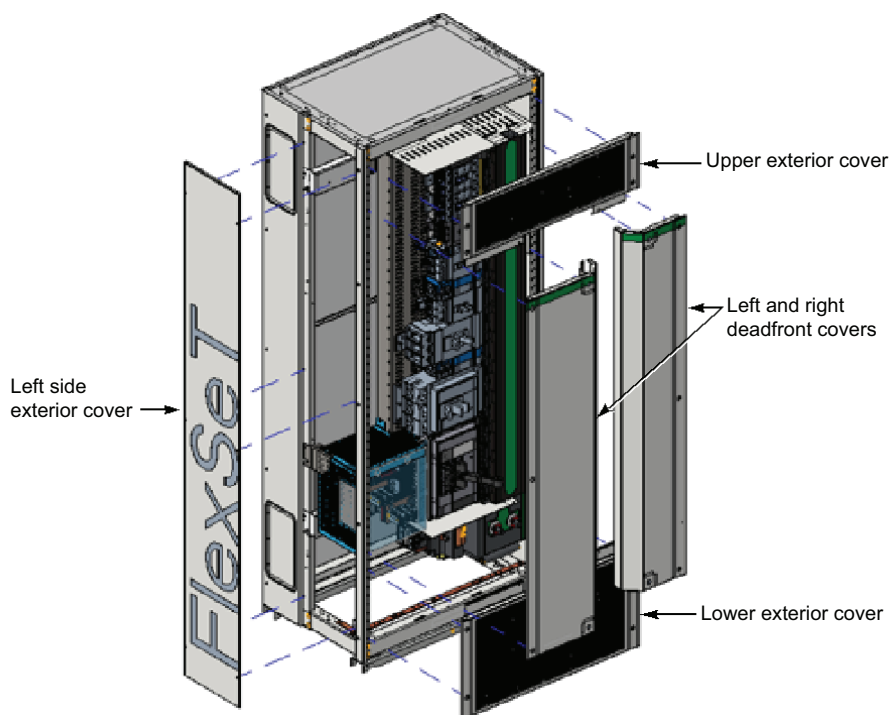
2. Remove the neutral disconnect by pulling it straight out.
3. To replace the disconnect, perform steps 1 and 2 in reverse order and torque the 1/2 in. bolts to 545 lb-in. (60 N•m).

1600 A Backfed Main Section

1. Remove left and right dead front covers by removing five 1/4-20 screws from each cover (see Figure 38).

NOTE: Note all screws are captive to the covers; do not try to separate.

Figure 38 - Removing Covers



2. Remove upper and lower front exterior covers by removing four 1/4-20 screws from each cover.
3. Remove left side exterior cover by removing six 1/4-20 screws.
4. Remove two 1/4-20 screws from both the top and bottom ends of the front corner channel and pull the channel away from the section (see Figure 39).

NOTE: Removing the front corner channel is optional but provides easier access for pulling cables.

5. Remove the service entrance barrier from the backfed box by removing one 1/4-20 screw and lifting the barrier off the retaining pin.

Figure 39 - Removing Front Corner Channel and Barrier

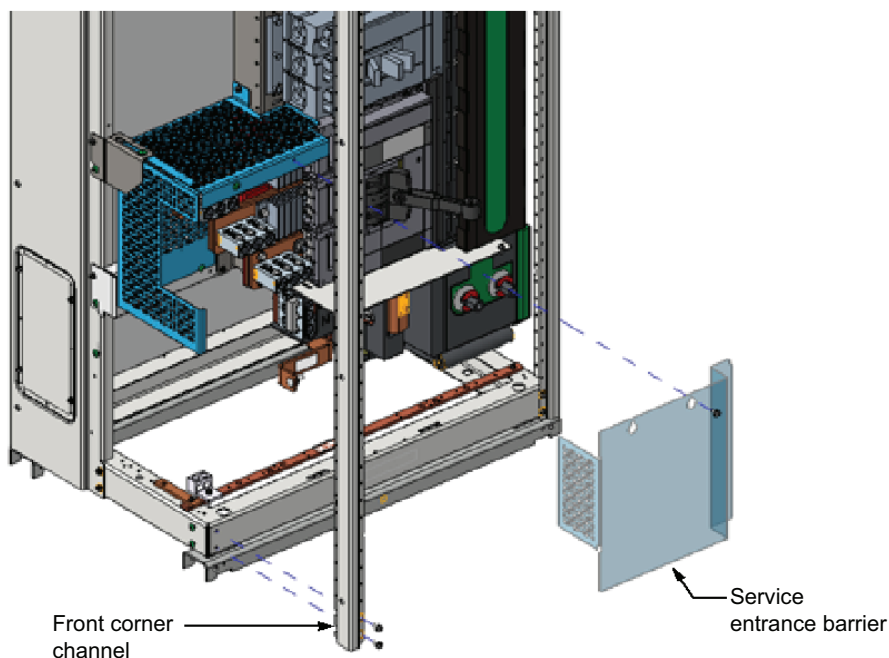


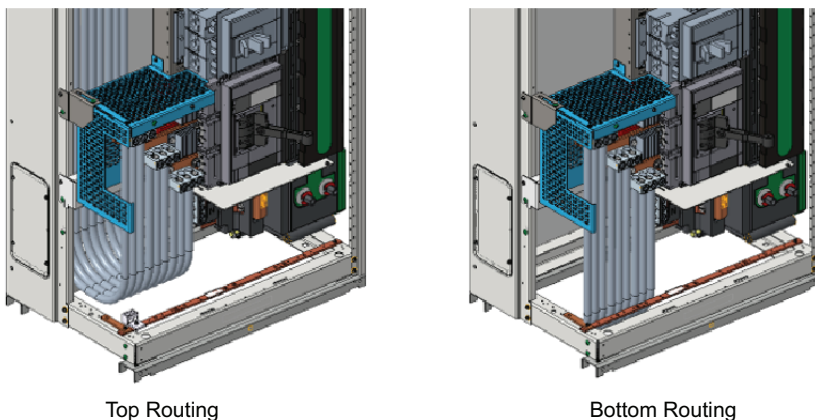
Figure 40 shows the unit barrier label.

Figure 40 - Barrier Label



6. Route cables from either top or bottom and attach to appropriate lugs (see Figure 41).

Figure 41 - Routing Cables



⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

Carefully inspect your work area and remove any tools or other objects left inside the equipment.

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

7. Remove any debris, wire strands, or foreign particles on the bus bars before re-installing the service entrance barrier.
8. Re-install the service entrance barrier, front corner channel, and exterior covers by performing steps 1 through 5 in reverse order.

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 *Torque Values for Electrical Connections*, page 61.

5. FlexSeT Individually mounted main sections can accommodate compression lugs with the following specifications:

Description	Cable Size	Stud Size	Hole (center-to-center)	Standards
Two-hole compression lug connector	Up to 750 kcmil	0.5 in.	1.75 in.	CSA Certified, UL listed, ZMVV lugs

Cable Restraint for Short-Circuit Current Rating (SCCR)

Cable restraint is recommended for lugs mounted on bus.

Figure 42 - Cable Restraint Examples



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

NOTICE

HAZARD OF CABLE MOVEMENT UNDER SHORT-CIRCUIT CONDITIONS

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

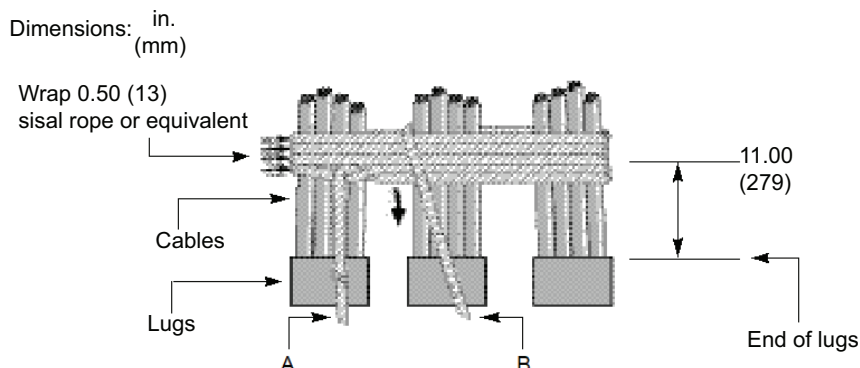
Failure to follow these instructions can result in equipment damage.

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.

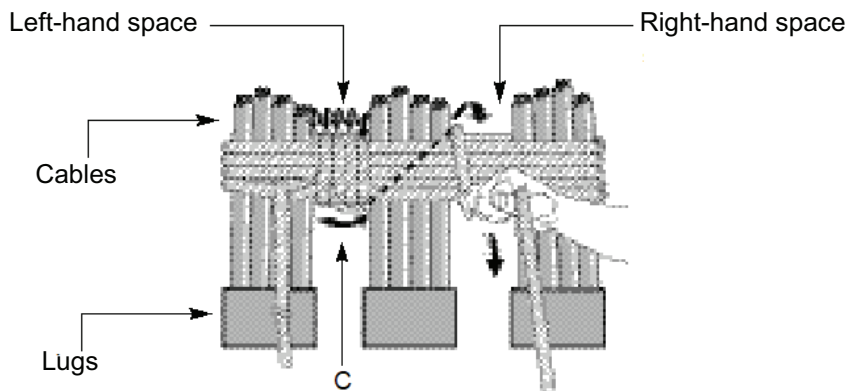
1. Begin wrapping the cables (see Figure 43) a maximum distance of 11 in. (279 mm) from the end of the lugs. Continue to wrap the cables on 11 in. (279 mm) center(s) up to the point where the cables leave the enclosure:
 - a. Wrap the cables four times as shown, leaving three ft. (1 m) of excess rope at the first end (A).
 - b. Pull the rope (B) taut.

Figure 43 - Wrapping Cables (neutral cables not shown)



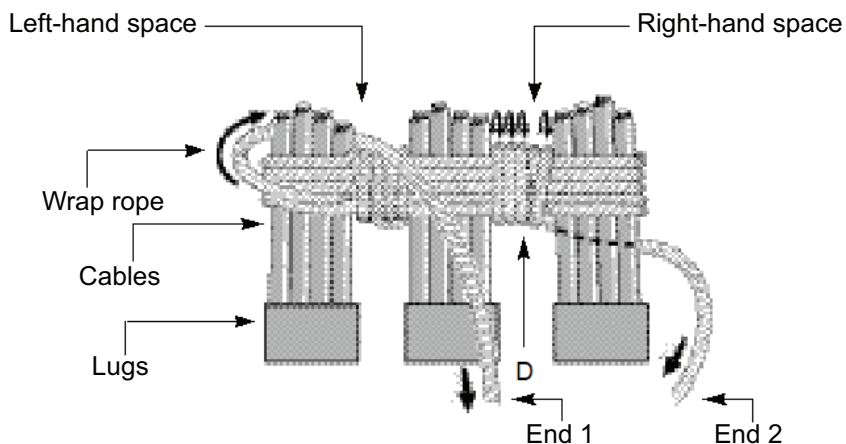
2. Wrap the rope several times (see Figure 44) until the space between the cables is completely filled:
 - a. Weave the final rope loop underneath the previous loop (C).
 - b. Bring the rope through the right-hand space.
 - c. Pull the rope taut.

Figure 44 - Wrapping the Space Between Cables



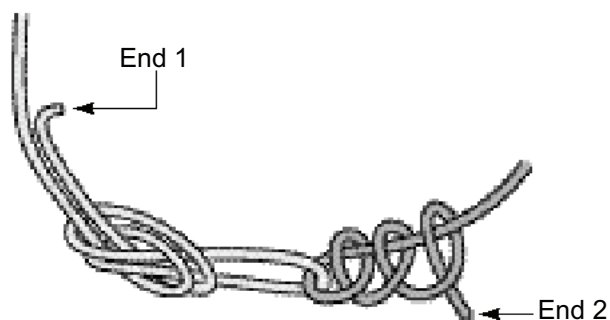
3. Wrap the rope several times until the space between the cables (see Figure 45) is completely filled:
 - a. Weave the final rope loop underneath the previous rope loop (D).
 - b. Pull the rope taut.

Figure 45 - Finish Wrapping the Space Between Cables



4. Tie the rope ends (1) and (2) together (see Figure 46) until they are taut. Cut off excess rope, and tape ends to help prevent fraying.

Figure 46 - Tying Rope Ends Together



5. Recheck torques of wire binding screws after securing the cables.
Refer to the torque label supplied with the switchboard for torque values.

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 before energizing the switchboard.

<input type="checkbox"/>	Check all field-installed bus bar connections. Torque values are listed in <i>Torque Values for Electrical Connections</i> , page 61.
<input type="checkbox"/>	Check all accessible connections for tightness.
<input type="checkbox"/>	Check all factory- and field-installed lug terminations for tightness.
<input type="checkbox"/>	Check the rigidity of all bus bar supports.
<input type="checkbox"/>	Check the switchboard enclosure for dents or other damage that reduces electrical clearances inside the switchboard.
<input type="checkbox"/>	Remove all foam blocks, or other temporary cushioning or retaining material, from the electrical devices.
<input type="checkbox"/>	Manually open and close all switches, circuit breakers, and other operating mechanisms, checking for correct alignment and free operation.
<input type="checkbox"/>	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.
<input type="checkbox"/>	Check all relays, meters, and instrumentation to verify that all field- installed wiring connections are made properly and that the devices function properly.
<input type="checkbox"/>	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.
<input type="checkbox"/>	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.
<input type="checkbox"/>	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 an external electrical 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.
<input type="checkbox"/>	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.
	For molded case circuit breakers, refer to <i>Reference Publications</i> , page 64 for circuit breaker information.
<input type="checkbox"/>	Check the torque on all bolts of the fuses mounted in Bolt-Loc™ switches, 250–360 lb-in. (28–41 N•m), and in QMB/QMJ switches (as marked on the device).

NOTICE

HAZARD OF FUSE CLIP OVERHEATING

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

Failure to follow these instructions can result in equipment damage.

<input type="checkbox"/>	Examine fuse clip contact pressure and contact means (QMB/QMJ fusible switches). If there is any sign of looseness, contact Schneider Electric Services at 1-888-778-2733 (US). Loose fuse clips can result in overheating.
<input type="checkbox"/>	Check all QMB/QMJ fusible switches, verifying that the proper fuses with the required interrupting rating and continuous current rating are installed. Do not use renewable link fuses in SquareD™ brand fusible switches.

<input type="checkbox"/>	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 (see Main Bonding Jumper Installation, page 41).
--------------------------	--

⚠ CAUTION

HAZARD OF OVERVOLTAGE TO CONTROL AND PROTECTION COMPONENTS

- 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 personal injury or equipment damage.

<input type="checkbox"/>	Conduct an electrical insulation resistance (Megger®) test to minimize risk that the switchboard is free from short circuits and undesirable grounds.
<input type="checkbox"/>	Check all QMB/QMJ fusible switches, verifying that the proper fuses with the required interrupting rating and continuous current rating are installed. Do not use renewable link fuses in SquareD brand fusible switches.
<input type="checkbox"/>	Open all control power and metering disconnects or remove the fuses from the control circuits.
<input type="checkbox"/>	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.
<input type="checkbox"/>	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.
<input type="checkbox"/>	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.
<input type="checkbox"/>	Consult Schneider Electric Services at 1-888-778-2733 (US) to help correct any problems.
<input type="checkbox"/>	After completing the electrical insulation resistance test, replace all control power fuses that were removed and close power disconnects that were opened.
<input type="checkbox"/>	Check all field-installed wiring. Make certain it is clear of all live parts, and when instructed, secured to withstand external electrical fault currents.
<input type="checkbox"/>	Verify that all control wiring between sections is connected.
<input type="checkbox"/>	Vacuum to remove any dust, scrap wire, or other debris.

NOTICE

CONTAMINATION HAZARD

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.

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 any of the following conditions exist:
 - 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.
 - 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 protection 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.

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

Maintenance Mode Switch (MMS) Testing

Figure 47 - MMS Switch



MMS system testing must be completed per MFR70008. When the MMS switch is turned ON, the associated circuit breaker will be set to the “trip with no intentional delay mode” (in the Maintenance Mode Setting).

- For an I-Line mounted, backfed main application on FlexSet Switchboards, when the MMS is turned ON and the main circuit breaker is OPEN, the blue light will not illuminate, and the main circuit breaker will be set to “trip with no intentional delay mode” (in the Maintenance Mode Setting).
- For an I-Line mounted, branch circuit breaker application on FlexSet Switchboards, when the MMS is turned ON and the main circuit breaker is CLOSED, the blue light will illuminate, and the branch circuit breaker will be set to “trip with no intentional delay mode” (in the Maintenance Mode Setting).
- For an I-Line mounted, branch circuit breaker application on FlexSet Switchboards, when the MMS is turned ON and the main circuit breaker is OPEN, the blue light will not illuminate, and the branch circuit breaker will be set to “trip with no intentional delay mode” (in the Maintenance Mode Setting).

Energizing the Switchboard

DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Correct short-circuit conditions detected during the checkout procedures described in *Pre-energizing Checkout Procedure*, page 50.
- 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).

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.
- 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 an external electrical fault. (Refer to [Adverse Circumstances](#), page 58). 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 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 compromise insulation systems and cause 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 CONTAMINATION

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

4. Check for signs of rodent nesting in the switchboard. If required, use a good exterminating technique in the general area of the switchboard.
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.

<i>NOTICE</i>
HAZARD OF PLATING DAMAGE <ul style="list-style-type: none"> • 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). 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.

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:

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 [Reference Publications](#), page 64 for the appropriate number, or contact your local Schneider Electric representative.

Table 2 - I-Line Blank Fillers and Extensions

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

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 48 - PowerPacT™ R-Frame Circuit Breaker

NOTE: Schneider Electric instruction bulletin 0600IB1201, *Field Testing and Maintenance Guide for Thermal-Magnetic and MicroLogic™ Electronic Trip Molded Case Circuit Breakers*, provides more in-depth information.

⚠ 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 2.

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

NOTICE

HAZARD OF PLUG-ON CONNECTOR 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. A full function test kit, catalog number FFTK, is available from Schneider Electric to test PowerPacT M, 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 from Schneider Electric to test 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.

To test MasterPact NW circuit breakers with MicroLogic trip units, use the full-function test set, catalog number S33595, or the hand-held test set, catalog number S33594, which are available from Schneider Electric.

Plug-on Neutrals

Plug-on neutrals are used with three- phase four-wire FlexSeT switchboards only. For installation, maintenance, or other information on plug-on neutrals, please refer to instruction bulletin NNZ9919501, FLEXPON 570/1200/1200S Plug-on Neutrals.

Ground Fault Protection Systems

NOTE: The ground fault test log card is in the data pocket behind the I-Line section dead front.

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).

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).

Refer to the ground fault field test instruction manual for additional testing information. If the manual is not available, refer to [Reference Publications](#), page 64 to obtain the appropriate number. Contact your local Schneider Electric representative to obtain this manual.

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) 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 *Reference Publications*, page 64.

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).

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 Reference Publications, page 64.

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).

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.

⚠ CAUTION

HAZARD OF OVERVOLTAGE TO CONTROL AND PROTECTION COMPONENTS

- 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 personal 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 "Switchboard Insulation Resistance Chart", page 63.
9. If resistance measurements are less than 0.5 megohm, call Schneider Electric Services at 1-888-778-2733 (US) for recommendations.
10. If resistance measurements are greater than 0.5 megohm, the equipment can be energized using the procedures listed in "Energizing the Switchboard", page 53.

Torque Values for Electrical Connections

NOTICE

HAZARD OF ELECTRICAL CONNECTION OVERHEATING

Torque electrical connections to the values recommended in the tables below.

Failure to follow these instructions can result in equipment damage.

Table 3 - Incoming and Plug-on Neutral Lug

Socket Size Across Flats	Torque Value lb-in. (N•m)
1/4 in.	180 (20)
5/16 in.	250 (28)
3/8 in.	340 (38)
1/2 ¹	450 (51)

¹ Certain lugs require 620 (70) and are marked as such.

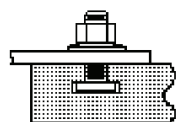
Table 4 - Multiple Conductor Neutral and/or Ground Bar

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



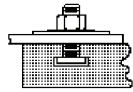
Carriage bolt
Hex nut
Conical washer

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



Square head (Tee) bolt
Conical washer assembly
Keps nut

Hardware Description	Torque Value lb-in. (N•m)
1/4 in.	50–75 (6–8)
3/8 in.	175–225 (20–25)
1/2 in.	250–350 (28–40)



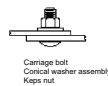
Square head (Tee) bolt
Conical washer

Hardware Description	Torque Value	
	Conical Washer OD in. (mm)	Square Head (Tee) Bolt Conical Washer lb-in. (N•m)
3/8 in.	0.87 (22)	250–280 (28–32)
	1.00 (25)	130–150 (15–17)
1/2 in.	1.25 (32)	450–550 (51–62)
	2.25 (57)	



Hex head bolt
(2) Conical washers

Hardware Description	Torque Value	
	Conical Washer OD in. (mm)	Hex Head Bolt (2) Conical Washers lb-in. (N•m)
5/16 in.	0.90 (23)	145–160 (16–18)
3/8 in.	0.87 (22)	250–280 (28–32)
	1.00 (25)	130–150 (15–17)
1/2 in.	1.25 (32)	720–840 (81–95)
	2.25 (57)	
	3.00 (76)	



Carriage bolt
Conical washer assembly
Keeps nut



Hex head bolt
Conical washer assembly
Keeps nut

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

Switchboard Insulation Resistance Chart

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

NOTE: The Neutral–Ground column in the table below 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.

⚠ CAUTION

HAZARD OF OVERVOLTAGE TO CONTROL AND PROTECTION COMPONENTS

- 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 personal injury or equipment damage.

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

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. 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

Installation and Maintenance Log

Table 5 - Installation and Maintenance Log

[illegible]

Schneider Electric USA, Inc.
800 Federal Street
Andover MA 01810
USA

1-888-778-2733

www.schneider-electric.us

As standards, specifications, and design change from time to time,
please ask for confirmation of the information given in this publication.

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