Installation

Table of Contents

Qualified Persons

⚠ WARNING

Only qualified persons knowledgeable in the installation, operation, and maintenance of overhead and underground electric distribution equipment, along with all associated hazards, may install, operate, and maintain the equipment covered by this publication. A qualified person is someone trained and competent in:

- The skills and techniques necessary to distinguish exposed live parts from nonlive parts of electrical equipment
- The skills and techniques necessary to determine the proper approach distances corresponding to the voltages to which the qualified person will be exposed
- The proper use of special precautionary techniques, personal protective equipment, insulated and shielding materials, and insulated tools for working on or near exposed energized parts of electrical equipment

These instructions are intended only for such qualified persons. They are not intended to be a substitute for adequate training and experience in safety procedures for this type of equipment.

Read this Instruction Sheet

NOTICE

Thoroughly and carefully read this instruction sheet and all materials included in the product's instruction handbook before installing or operating an EdgeRestore Underground Distribution Restoration System. Become familiar with the Safety Information and Safety Precautions on pages 4 through 6. The latest version of this publication is available online in PDF format at **sandc.com/en/support/product-literature/**.

Retain this Instruction Sheet

This instruction sheet is a permanent part of the EdgeRestore Underground Distribution Restoration System. Designate a location where users can easily retrieve and refer to this publication.

Proper Application

⚠ WARNING

The equipment in this publication is only intended for a specific application. The application must be within the ratings furnished for the equipment. Ratings for the equipment can be found on the nameplate affixed to each bushing well interrupter as well as in S&C Specification Bulletin 676-31.

Warranty

The warranty and/or obligations described in S&C's Price Sheet 150, "Standard Conditions of Sale—Immediate Purchasers in the United States," (or Price Sheet 153, "Standard Conditions of Sale—Immediate Purchasers Outside the United States"), plus any special warranty provisions, as set forth in the applicable product-line specification bulletin, are exclusive. The remedies provided in the former for breach of these warranties shall constitute the immediate purchaser's or end user's exclusive remedy and a fulfillment of the seller's entire liability. In no event shall the seller's liability to the immediate purchaser or end user exceed the price of the specific product that gives rise to the immediate purchaser's or end user's claim. All other warranties, whether express or implied or arising by operation of law, course of dealing, usage of trade or otherwise, are excluded. The only warranties are those stated in Price Sheet 150 (or Price Sheet 153), and THERE ARE NO EXPRESS OR IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. ANY EXPRESS WARRANTY OR OTHER OBLIGATION PROVIDED IN PRICE SHEET 150 (OR PRICE SHEET 153) IS GRANTED ONLY TO THE IMMEDIATE PURCHASER AND END USER, AS DEFINED THEREIN. OTHER THAN AN END USER, NO REMOTE PURCHASER MAY RELY ON ANY AFFIRMATION OF FACT OR PROMISE THAT RELATES TO THE GOODS DESCRIBED HEREIN, ANY DESCRIPTION THAT RELATES TO THE GOODS, OR ANY REMEDIAL PROMISE INCLUDED IN PRICE SHEET 150 (OR PRICE SHEET 153).

Understanding Safety-Alert Messages

Several types of safety-alert messages may appear throughout this instruction sheet and on labels and tags attached to the product. Become familiar with these types of messages and the importance of these various signal words:

⚠ DANGER

"DANGER" identifies the most serious and immediate hazards that will likely result in serious personal injury or death if instructions, including recommended precautions, are not followed.

⚠ WARNING

"WARNING" identifies hazards or unsafe practices that can result in serious personal injury or death if instructions, including recommended precautions, are not followed.

⚠ CAUTION

"CAUTION" identifies hazards or unsafe practices that can result in minor personal injury if instructions, including recommended precautions, are not followed.

NOTICE

"NOTICE" identifies important procedures or requirements that can result in product or property damage if instructions are not followed.

Following Safety Instructions

If any portion of this instruction sheet is unclear and assistance is needed, contact the nearest S&C Sales Office or S&C Authorized Distributor. Their telephone numbers are listed on S&C's website **sandc.com**, or call the S&C Global Support and Monitoring Center at 1-888-762-1100.

NOTICE

Read this instruction sheet thoroughly and carefully before installing the EdgeRestore Underground Distribution Restoration System.

Replacement Instructions and Labels

If additional copies of this instruction sheet are required, contact the nearest S&C Sales Office, S&C Authorized Distributor, S&C Headquarters, or S&C Electric Canada Ltd.

It is important that any missing, damaged, or faded labels on the equipment be replaced immediately. Replacement labels are available by contacting the nearest S&C Sales Office, S&C Authorized Distributor, S&C Headquarters, or S&C Electric Canada Ltd.

Location of Label

Reorder Information for Label

Location	Safety Alert Message	Description	Part Number
A	NAMEPLATE	Identification nameplate. Includes QR code that takes users to serial number information.	G-9671-1●

● One per bushing well interrupter.

⚠ DANGER

The EdgeRestore Underground Distribution Restoration System operates at high voltage. Failure to observe the precautions below will result in serious personal injury or death.

Some of these precautions may differ from your company's operating procedures and rules. Where a discrepancy exists, follow your company's operating procedures and rules.

1. **QUALIFIED PERSONS.** Access to the EdgeRestore Underground Distribution Restoration System must be restricted to qualified persons. See the "Qualified Persons" section on page 2.
2. **SAFETY PROCEDURES**. Always follow safe operating procedures and rules. Always maintain clearance from energized components.
3. **PERSONAL PROTECTIVE EQUIPMENT.** Always use suitable protective equipment, such as rubber gloves, rubber mats, hard hats, safety shoes, safety glasses, and arc-flash clothing, in accordance with safe operating procedures and rules.
4. **DOORS.** Doors must be securely closed and latched, with padlocks in place at all times unless work is being performed inside the transformer.
5. **SAFETY LABELS**. Do not remove or obscure any of the "DANGER," "WARNING," "CAUTION," or "NOTICE" labels.
6. **HANDLING TOOLS.** The EdgeRestore Underground Distribution Restoration System is designed for operation with a shotgun-style hot stick.
7. **ENERGIZED BUSHINGS.** Always assume the transformer or EdgeRestore Underground Distribution Restoration System bushings are energized unless tested and/or grounded per utility operating procedures.
8. **GROUNDING.** The EdgeRestore Underground Distribution Restoration System must be bonded to an earth or transformer ground before energizing and at all times when energized.
9. **BACKFEED.** The transformer, bushings, and cables may be energized by backfeed from the loop side.
10. **MAINTAINING PROPER CLEARANCE.** Always maintain proper clearance from energized components. The open vacuum interrupter does not provide a working clearance. Insulated caps or other suitable provisions should be used if one elbow is parked and the EdgeRestore Bushing Well Interrupter is open.
11. **VACUUM INTERRUPTER POSITION.** Always confirm the **Open/Close** position of each EdgeRestore Bushing Well Interrupter by visually observing its indicator.
12. **CABLE THUMPING.** The elbow must be disconnected from the EdgeRestore Bushing Well Interrupter before thumping a cable section.

Packing

A complete EdgeRestore Underground Distribution Restoration System consists of three cartons that include the following:

- The H1A EdgeRestore Bushing Well Interrupter
- The H1B EdgeRestore Bushing Well Interrupter
- The installation kit, including the control, a current sensor, a bushing well interrupter support system that includes a parking stand, and miscellaneous installation supplies and hardware

Note: When ordering multiple EdgeRestore Underground Distribution Restoration Systems, the three cartons (H1A, H1B, and installation kit) may come palletized with each bushing well interrupter carton type on its own pallet and the installation kit cartons on a third pallet. Check and sort the shipment to make sure a complete system consisting of H1A bushing well interrupter, H1B bushing well interrupter, and installation kit with the correct control configuration (normally open or normally closed) are available before leaving for the installation site.

Inspection

Examine the shipment for external evidence of damage as soon after receipt as possible, preferably before removal from the carrier's conveyance. Check the bill of lading to make sure the listed shipping containers are present.

If there is visible loss and/or damage:

1. Notify the delivering carrier immediately.
2. Ask for a carrier inspection.
3. Note the condition of shipment on all copies of the delivery receipt.
4. File a claim with the carrier.

If concealed damage is discovered:

1. Notify the delivering carrier within 15 days of receipt of shipment.
2. Ask for a carrier inspection.
3. File a claim with the carrier.

Also, notify S&C Electric Company in all instances of loss and/or damage.

Handling

Work gloves should be worn at all times when handling the bushing well interrupters. Paint from the bushing well interrupters may transfer to hands and clothing.

⚠ WARNING

DO NOT disassemble the EdgeRestore Bushing Well Interrupters or the control. There are no customer-serviceable parts inside the bushing well interrupters or control. Disassembly will defeat the moisture seal and void the warranty. Operating a bushing well interrupter that has been disassembled can result in arcing, burns, and electric shock.

NOTICE

DO NOT drop the EdgeRestore Bushing Well Interrupters or the control or subject any of its parts to undue stress during installation. Only remove the EdgeRestore Bushing Well Interrupters from their carton when ready for installation. Do not place the bushing well interrupters on the ground. Placing the bushing well interrupters on the ground may introduce dirt and contamination at the connection points.

NOTICE

Inspect the conductive black paint on the bushing well interrupters for deep scratches where the Cypoxy™ Insulator material may be exposed. If deep scratches are found, contact S&C Electric Company before installation. Energizing bushing well interrupters with deep scratches in the black paint may affect product function.

Storage

EdgeRestore Underground Distribution Restoration Systems are shipped in packages and stacked on pallets. The packaging is designed to protect the EdgeRestore Underground Distribution Restoration System from freight damage. The packaging will absorb moisture if stored unprotected outside.

After receipt, to avoid damage from moisture and UV radiation, S&C recommends storing the EdgeRestore system indoors in its shipping packaging. Storing the bushing well interrupters outside of the shipping carton may expose them to extended UV radiation which can damage the product.

While the system components inside the packaging are moisture-proof, storing the EdgeRestore Underground Restoration System unprotected outdoors can damage the packaging.

Normally closed control

Normally open control

System Control. The logic center of the system, the EdgeRestore system control (normally open or normally closed) communicates with other EdgeRestore systems on the loop to quickly restore power.

H1B EdgeRestore Bushing Well Interrupter

Support system and parking stand. The system provides support for the bushing well interrupters and control. The control can be easily removed when the parking stand is in use.

H1A EdgeRestore Bushing Well Interrupter. The H1A bushing well interrupter uses a current sensor to sense current on the transformer.

Complete EdgeRestore Underground Distribution Restoration System

Current sensor. This is only required on the H1A bushing well interrupter. The sensor continuously monitors for the presence of current, signaling the control module in the event of an outage.

EdgeRestore Bushing Well Interrupter. This contains a compact vacuum interrupter and an actuating mechanism used for switching.

Plug and cap. These cover the mounting bolt connecting the bushing well interrupter to the bushing well adapter.

Swivel foot. This is used on both the H1A and H1B bushing well interrupter for support for ANSI Type 1 transformers.

Bushing well adapter. The adapter provides a secure connection between the transformer's bushing well and the EdgeRestore Bushing Well Interrupter.

Loadbreak insert. (User supplied.)

EdgeRestore Bushing Well Interrupter

Figure 1. EdgeRestore Underground Distribution Restoration System Overview.

Overview

The EdgeRestore Underground Distribution Restoration System is installed in pad-mounted distribution transformers. The EdgeRestore systems will work together to isolate faults and restore service using peer-to-peer communications.

Become familiar with the parts of the installation. A completed installation is shown in Figure 1 on page 8.

Before Starting

⚠ DANGER

Make sure the transformer is de-energized, isolated from all power sources, and grounded before starting installation. **Failure to completely de-energize the transformer before installing the EdgeRestore Underground Distribution Restoration System will result in severe personal injury or death.**

Tools and Supplies Required

In addition to the contents of the installation kit, the following tools, supplies, and parts are required:

- A ⅜-inch, long-style Allen wrench (hex key) or an extra-long hex ⅜-inch bit for socket wrench (Shaft length should be more than 5 inches [127 mm].)

Note: A long-style or long-reach bit for a socket wrench is recommended. See Figure 2. T-handled or L-handled Allen wrenches may not properly clear the top of the bushing well interrupter during installation.

- A ⅜-inch socket
- A 3⁄16-inch Allen wrench (hex key)
- A 9⁄16-inch combination wrench
- Torque wrench(es) (6 ft-lb through 25 ft-lb torques required for installation) that can accommodate the ⅜-inch socket and 3⁄16-inch Allen wrench
- A #2 Phillips head screwdriver
- A bushing well interrupter torque tool (S&C recommends the Speed Systems Inc. BIT/E180AT Loadbreak Torquing Tool. See Figure 3.)
- Two loadbreak inserts
- A shotgun stick or hookstick with a distribution prong
- Shop towels or microfiber cloths
- Cotton or soft leather-palmed work gloves

Figure 2. An example of a long-style Allen hex key for a socket wrench.

Figure 3. Speed Systems' BIT/E180AT Loadbreak Torquing Tool.

Preparing the Bushing Wells

Follow these steps to prepare the bushing wells:

STEP 1. If installed, remove the bushing well caps or loadbreak inserts from the H1A and H1B bushing wells. See Figure 4 and Figure 5.

STEP 2. Clean the H1A bushing well and H1B bushing well if required, removing all dirt, grease, and moisture with a soft cloth.

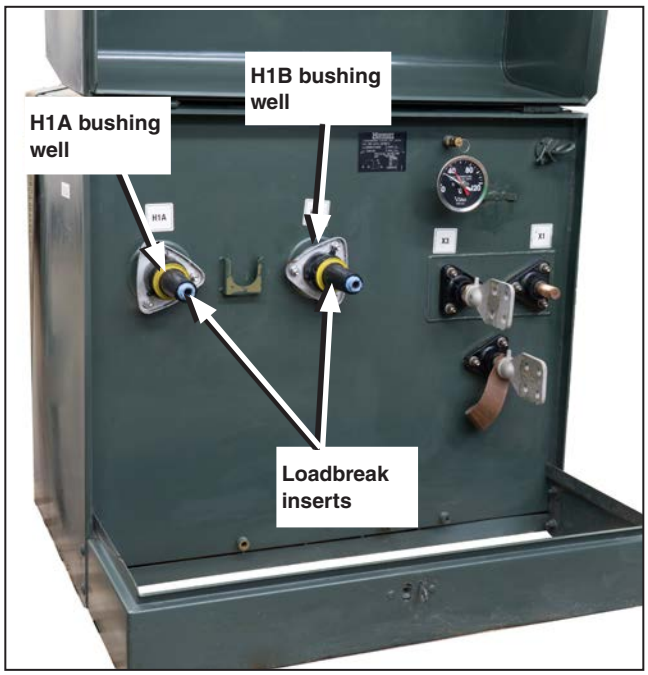

Figure 4. Location of bushing wells and loadbreak inserts.

Figure 5. Bushing wells with loadbreak inserts removed.

NOTICE

The bushing well adapters provided in the installation kit are required for the installation. Standard loadbreak inserts cannot support the weight of a bushing well interrupter. **Failure to install the provided bushing well adapters may result in damage to both the bushing well and bushing well interrupter and may inhibit appropriate installation of the EdgeRestore system.**

STEP 3. Clean the bushing well adapters for the H1A and H1B bushings with a soft cloth. The bushing well adapters are included in the installation kit. They look like loadbreak inserts but are shorter and gray. See Figure 1 on page 8.

STEP 4. Grease the bushing well adapters tapers to be inserted with the silicone lubricant included in the installation kit. The larger taper is inserted into the bushing well.

STEP 5. Install one greased bushing well adapter into the H1A bushing well. See Figure 6. Torque the bushing well adapter using a bushing well interrupter torque tool.

The recommended bushing well interrupter torque tool will make a distinct snap sound when proper torque of 15 ft-lbs is reached. Grease the exposed taper with silicone lubricant provided in the kit.

STEP 6. Install the remaining bushing well adapter into the H1B bushing well. See Figure 7. Torque the bushing well adapter using a bushing well interrupter torque tool.

The recommended bushing well interrupter torque tool will make a distinct snap sound when proper torque of 15 ft-lbs is reached. Grease the exposed taper with silicone lubricant provided in the kit.

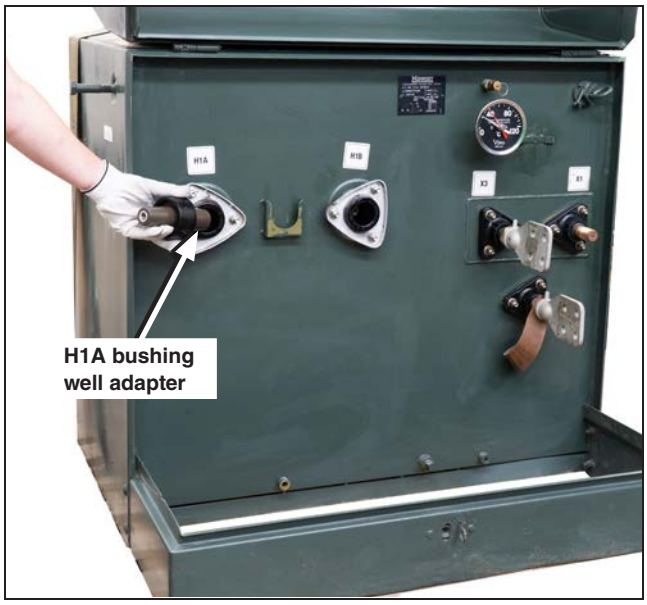

Figure 6. Before installing the bushing well adapter, grease the taper to be inserted.

Figure 7. Installed bushing well adapters.

Assembling the Parking Stand Link Bracket

The parking stand link bracket comes unassembled. One bracket, three ¼–20 flange-head bolts, and one adjustable link comes with the bracket kit. See Figure 8.

To assemble the parking stand link bracket, connect the adjustable link to the right bracket post, as shown in Figure 9, using a ¼–20 flange-head bolt. Make sure the non-adjustable end of the link is attached to the bracket.

Note: The other post will not be used for installation on an ANSI Type 1 transformer.

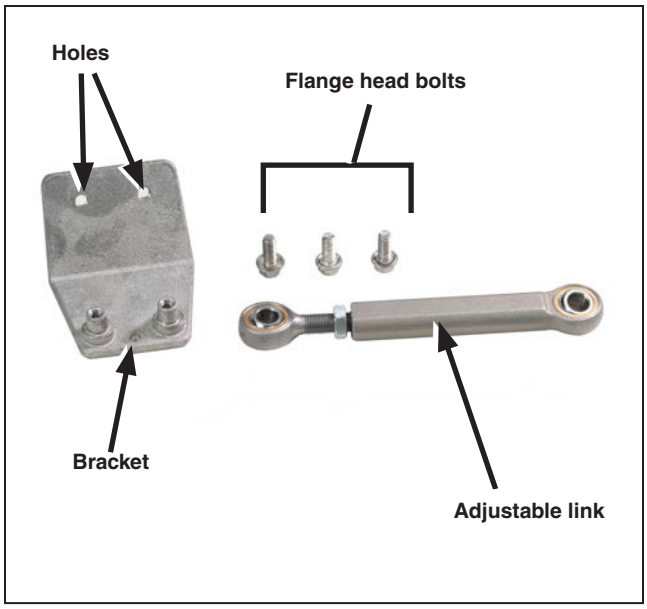

Figure 8. Parking stand link bracket parts.

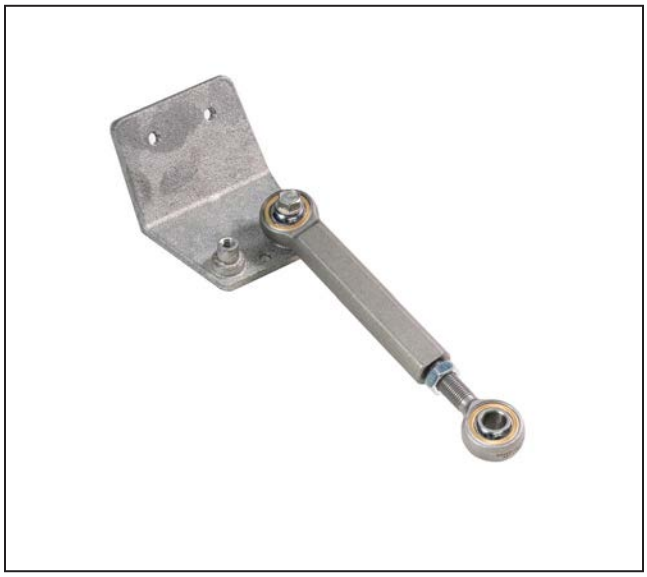

Figure 9. A completed parking stand link bracket assembly.

Installing the Parking Stand Link Bracket

STEP 1. Insert the parking stand link bracket into the original transformer parking stand, as shown in Figure 10 by sliding it in (from the bottom).

STEP 2. Attach two ¼–20 × ⅝-inch flange-head bolts to the two holes on the bracket as shown in Figure 11 and Figure 12. Pull down on the bolts to hit the radius of the parking stand.

Figure 10. Slide the parking stand link bracket in from the bottom.

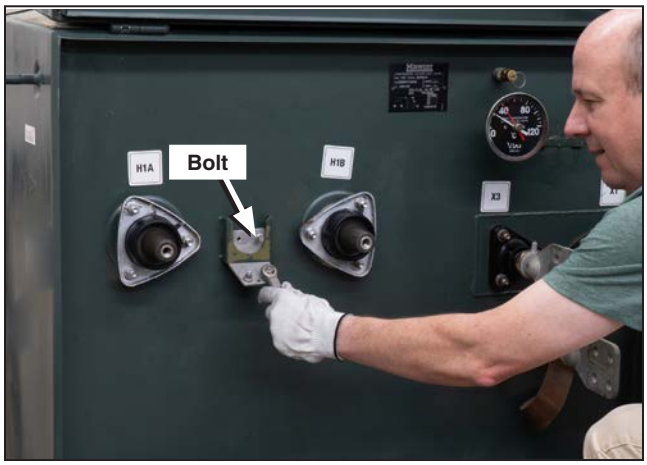

Figure 11. Install the bolts.

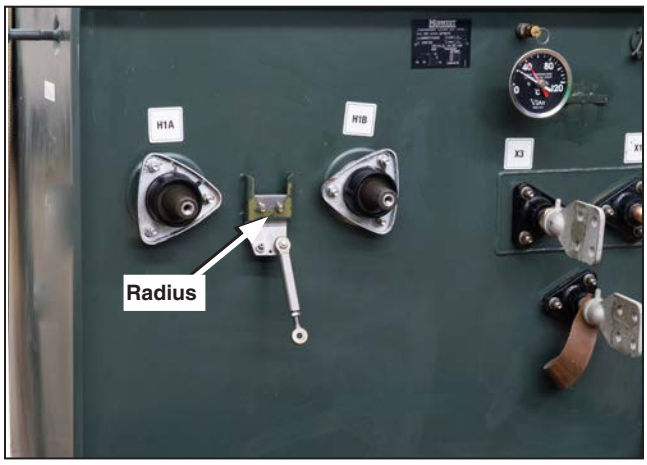

Figure 12. Pull down until the bolts hit the radius of the parking stand.

STEP 3. Insert the parking stand bracket onto the two bolts by aligning the two open slots with the bolts, as shown in Figure 13. Make sure the bolts are loose enough to accommodate the parking stand bracket.

STEP 4. Slide the bracket onto the bolts, and then slide the bracket to the right until the bolts are fully into the grooves. Pull back on the parking stand bracket (angled portion) to hold the bolts against the parking stand radius. See Figure 14.

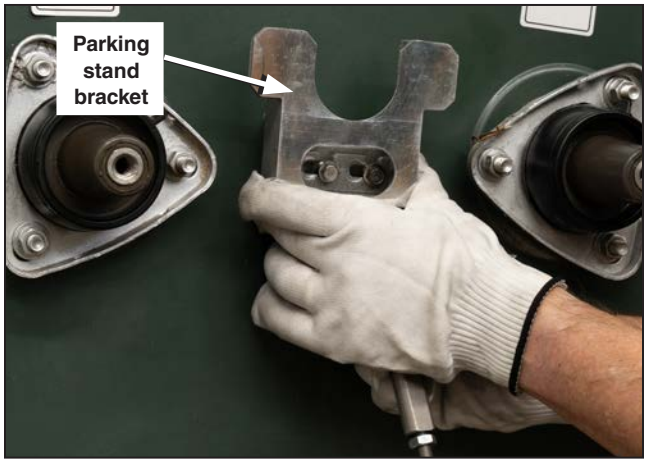

Figure 13. Slide the parking stand bracket onto the two bolts.

Figure 14. Slide the bolts into the grooves. Pull back on the bracket to hold the bolts against the parking stand radius.

STEP 5. Tighten the two bolts with a wrench equipped with a ⅜-inch socket to a torque of 6 ft-lbs. See Figure 15. The completed installation is shown in Figure 16.

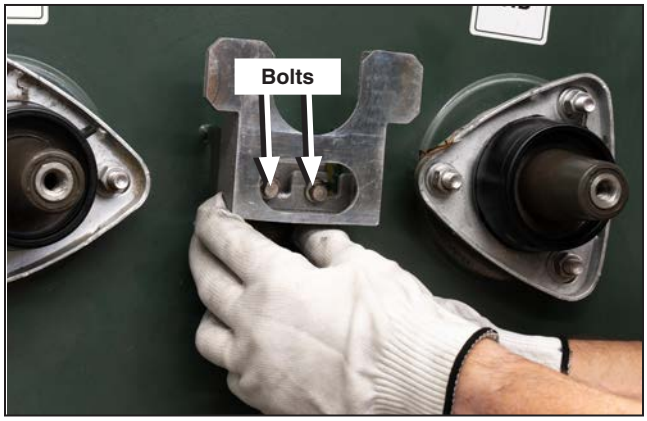

Figure 15. Tighten the bolts.

Figure 16. A completed parking stand link bracket installation.

Assembling the H1A Bushing Well Interrupter Swivel Foot

Complete the following steps to assemble the H1A bushing well interrupter:

STEP 1. Place the swivel foot under the H1A bushing well interrupter's mounting boss, as shown in Figure 17 and Figure 18.

STEP 2. Insert the two ¼–20 × ⅝-inch flange-head bolts from the top of the bracket and thread them into the holes on the bushing well interrupter's mounting boss. Tighten the bolts.

Figure 17. H1A bushing well interrupter swivel foot parts.

Figure 18. Install the swivel foot on the H1A bushing well interrupter.

Installing the EdgeRestore® Bushing Well Interrupters

The EdgeRestore Bushing Well Interrupters are shipped in the **Closed** position. If utility practice requires they be installed in the **Open** position, they can be opened by pulling the bushing well interrupter's yellow lever forward.

Note: When open, the bushing well interrupters can only be closed again when control power is applied to the control after energization or before energization by using the cordless power module to supply power to the control.

NOTICE

Wear work gloves during installation to avoid damage to the black conductive paint covering the bushing well interrupters. Handle with care to avoid scratching the paint. If the paint is scratched and the underlying Cypoxy™ Insulator material is exposed, contact S&C Electric Company.

Follow these steps to install the bushing well interrupters:

H1A Bushing Well Interrupter Installation

STEP 1. Remove the shipping caps from the H1A bushing well interrupter. If not already lubricated, grease the exposed taper of the H1A bushing well adapter with silicone lubricant.

STEP 2. Slide the current sensor onto the H1A bushing well adapter with the arrow pointing toward the transformer, as shown in Figure 19.

STEP 3. There is a captive bolt inside the bushing well interrupter. Install the bushing well interrupter onto the bushing well adapter with the yellow lever in the vertical orientation, as shown in Figure 20.

NOTICE

Tighten the captive bolt to the recommended torque only. Failure to tighten the captive bolt to the recommended torque or over tightening it may result in equipment damage.

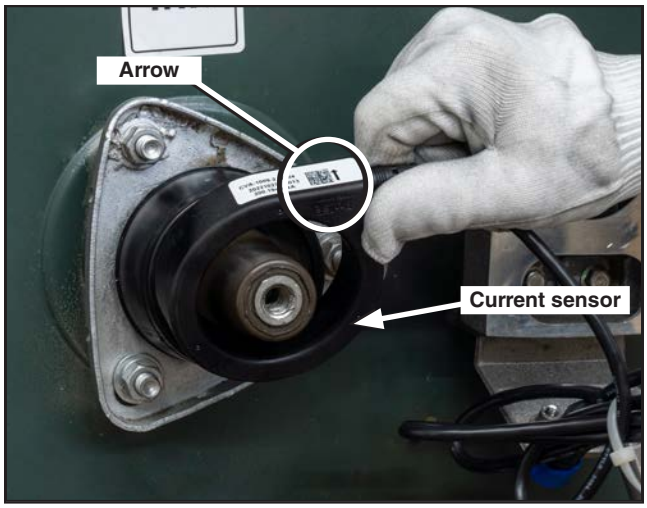

Figure 19. Current sensor installation. The arrow should be pointing toward the transformer.

Figure 20. Align the bushing well interrupter with the bushing well insert. Torque the captive bolt.

STEP 4. Tighten the captive bolt using a ⅜-inch long-style Allen wrench to a torque of 25 ft-lbs.

STEP 5. Rotate the current sensor so the writing is facing up and the flat side is horizontal with the wire going under the secondary terminals. When properly installed, the sensor will rest on the bushing well interrupter with the arrow on the label pointing towards the back of the transformer.

Adjusting the H1A Bushing Well Interrupter Swivel Foot

STEP 1. The hex socket at the top of the swivel foot is keyed for a 3⁄16-inch Allen wrench. Tighten the swivel foot until it is "hand tight" against the transformer wall. See Figure 21.

STEP 2. Tighten the swivel foot two additional turns tighter (2 × 360 degrees) using a 3⁄16-inch Allen wrench. This enables the foot to support the weight of the bushing well interrupter.

Note: DO NOT adjust the nut at the bottom of the swivel foot.

H1B Bushing Well Interrupter Installation

STEP 1. Remove the shipping caps from the H1B bushing well interrupter. If not already lubricated, grease the exposed taper of the H1B bushing well adapter with silicone lubricant.

STEP 2. There is a captive bolt inside the bushing well interrupter. Install the bushing well interrupter onto the bushing well adapter with the yellow lever positioned at approximately 45 degrees as shown in Figure 22.

NOTICE

To avoid damaging the product, tighten the captive bolt to the recommended torque only.

STEP 3. Tighten the captive bolt using a ⅜-inch long-style Allen wrench to a torque of 25 ft-lbs.

Note: The weight of the H1B bushing well interrupter may cause it to rotate slightly. This rotation will be corrected when the support struts are installed.

Note: There is a red band on the H1B control cable to help differentiate the cables when making connections to the control.

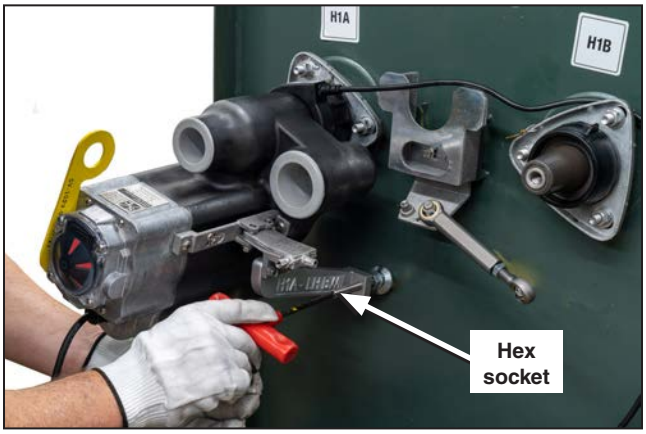

Figure 21. The hex socket at the top of the H1A bushing well interrupter swivel foot.

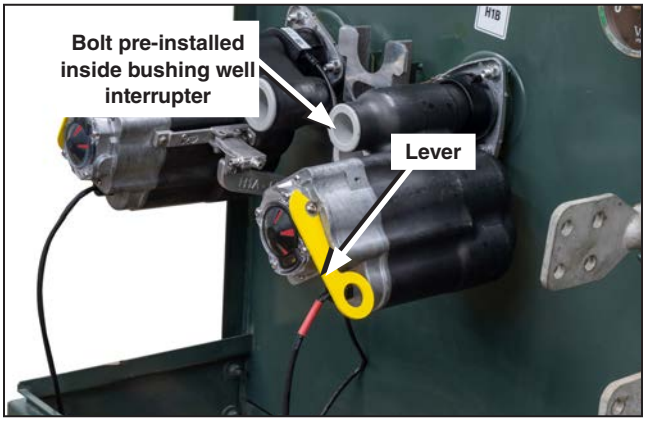

Figure 22. H1B bushing well interrupter installation.

Installing the Support Strut System

⚠ WARNING

DO NOT force components into place. Forcing the components into place may cause stress or pressure on the bushing well and bushing well adapter. Loosen and re-adjust the adjustable links if necessary. Over time, stress may cause damage to the bushing well, resulting in arcing or personal injury.

Follow these steps to install the support strut system:

Installing the H1B Support Strut

STEP 1. Loosen the jam nut of the adjustable link of the support strut. Adjust the length of the H1B adjustable link until the ball joint just fits onto the boss on the H1B bushing well interrupter swivel foot bracket. See Figure 23. It may be necessary to rotate the bushing well interrupter to the correct position.

STEP 2. Connect the adjustable link to the boss using a ¼–20 × ⅝-inch flange-head bolt. Hand-tighten the bolt. See Figure 24.

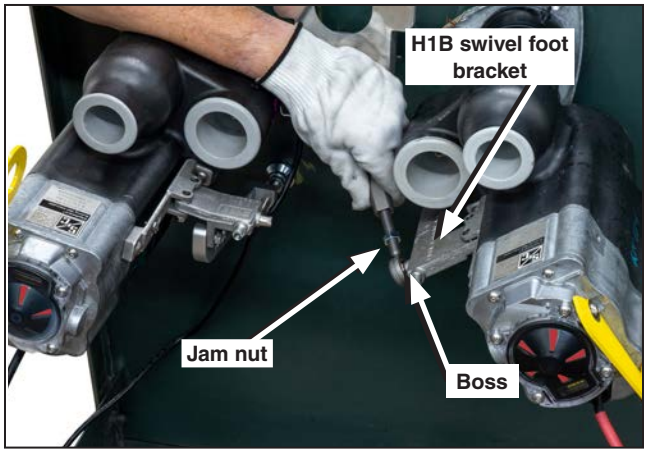

Figure 23. The support strut before installing to the boss.

Figure 24. Install a bolt to connect the adjustable link to the swivel foot bracket. Hand-tighten the bolt.

Adjusting the H1B Bushing Well Interrupter Swivel Foot

STEP 1. The hex socket at the top of the swivel foot is keyed for a 3⁄16-inch Allen wrench. Tighten the swivel foot until it is hand tight against the transformer wall. See Figure 25.

STEP 2. Tighten the swivel foot two additional turns tighter (2 × 360 degrees) using a 3⁄16-inch Allen wrench. This enables the foot to support the weight of the bushing well interrupter.

Note: DO NOT adjust the nut at the bottom of the swivel foot.

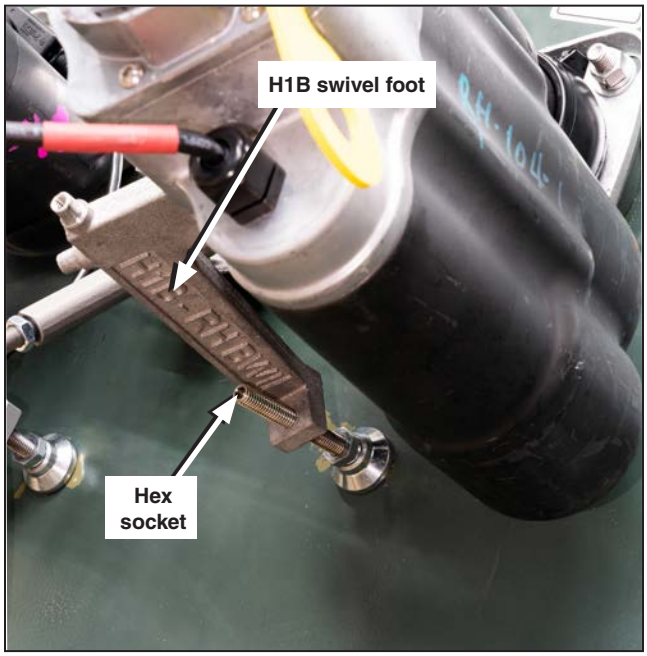

Figure 25. The hex socket at the top of the H1B bushing well interrupter swivel foot.

Installing the H1A to H1B Cross-Brace Link

STEP 1. Install the adjustable cross-brace link onto the H1B bushing well interrupter boss with the ¼–20 × ⅝-inch flange-head bolt finger tight, as shown in Figure 26.

STEP 2. Adjust the length of the cross-brace link until the ball joint just fits onto the boss on the H1A bushing well adapter bracket.

STEP 3. Install a ¼–20 × ⅝-inch flange-head bolt finger-tight on the end at the H1A bushing well interrupter boss.

STEP 4. Tighten the four ¼–20 × ⅝-inch flange-head bolts, two on each end of the adjustable link and two on the cross-brace link to a torque of 6 ft-lbs.

STEP 5. Tighten the two jam nuts, one on the adjustable link and one on the cross-brace link using the 9⁄16-inch combination wrench hand tight. See Figure 27.

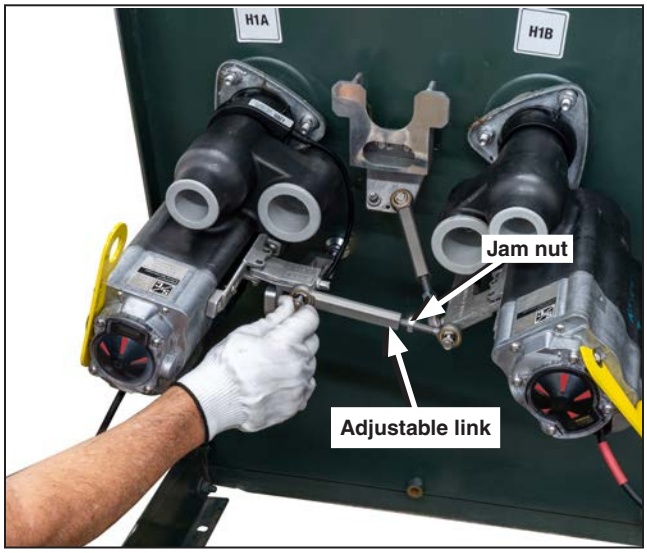

Figure 26. The adjustable cross-brace link.

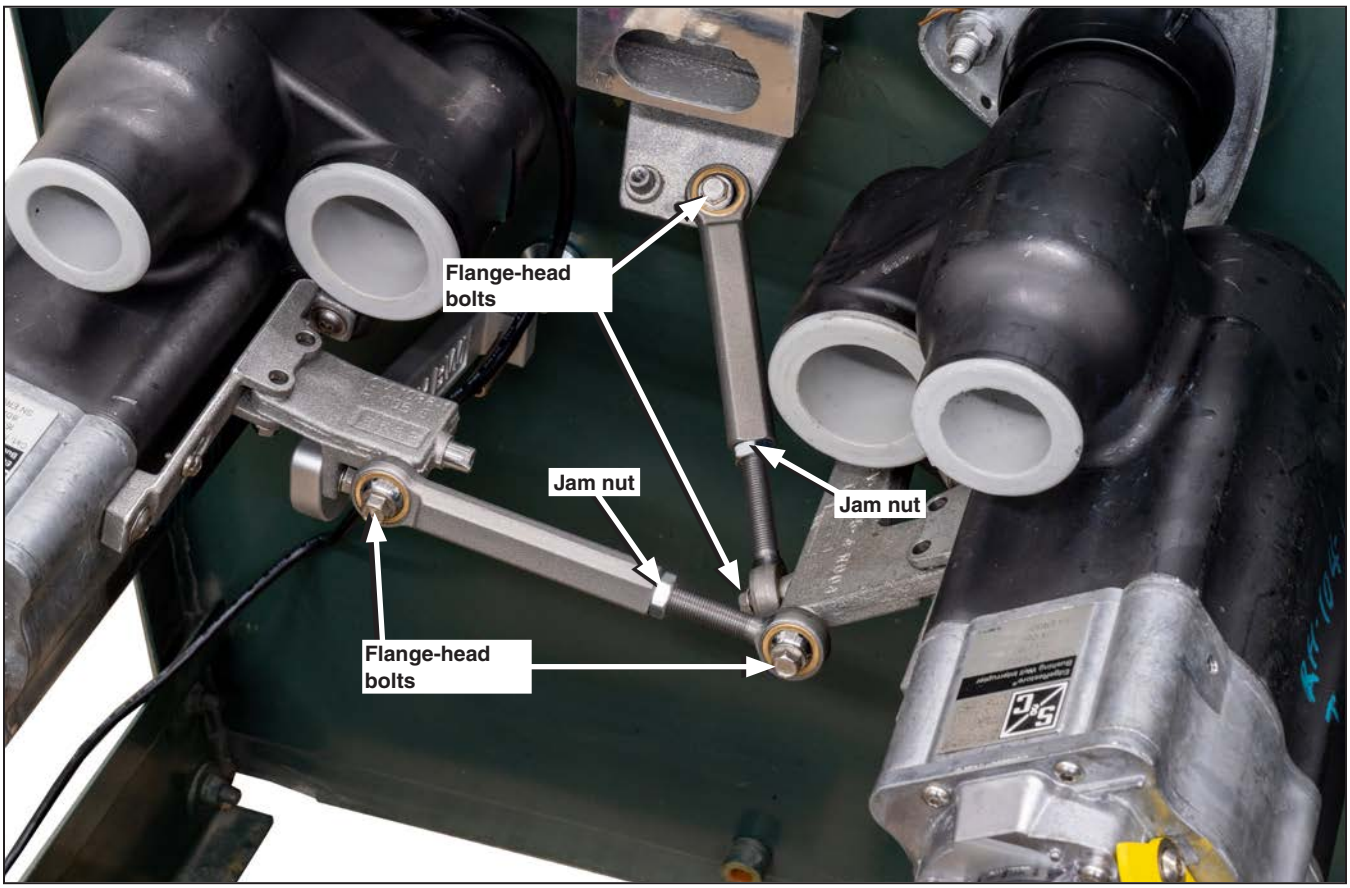

Figure 27. Tighten all bolts and jam nuts. Jam nuts shown properly tightened.

Installing the Parking Stand Spacer

The parking stand spacer provides additional clearance for elbows when using the parking stand. If installing the parking stand spacer with parking stand extender, skip to the "Installing the Parking Stand Spacer and Extender" section on page 24.

Follow these steps to install the parking stand spacer:

STEP 1. Make sure the two hex head ¼–20 × ⅝-inch flange head bolts are loose but still installed to the spacer back plate. See Figure 28.

STEP 2. Slide the parking stand spacer onto the parking stand. See Figure 29.

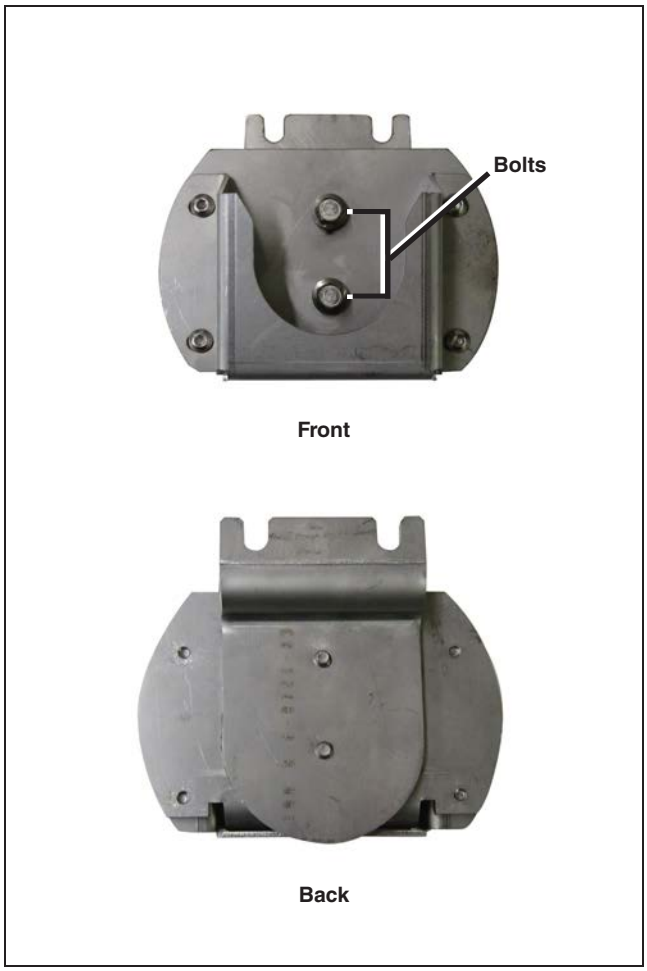

Figure 28. The parking stand spacer.

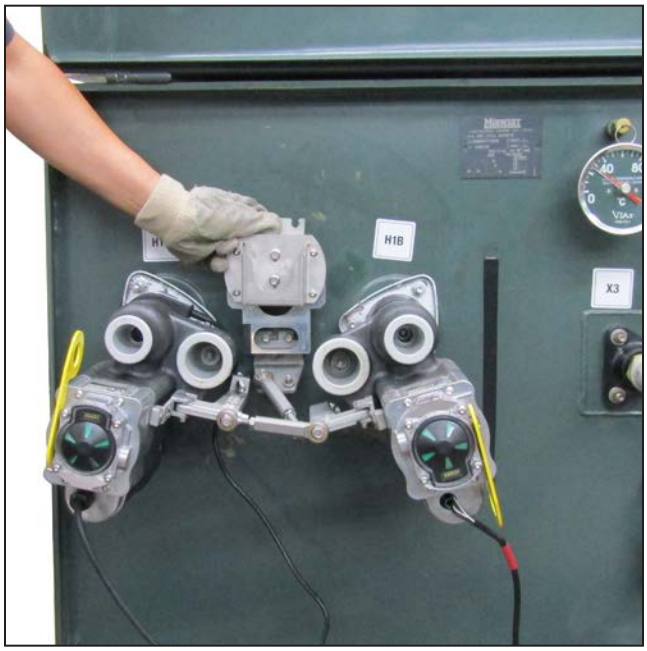

Figure 29. Sliding the parking stand spacer onto the parking stand.

STEP 3. Tighten the two ¼–20 × ⅝-inch flange head bolts to 6 ft-lbs. See Figure 30. This will secure the parking stand spacer to the parking stand. A completed parking stand spacer installation is shown in Figure 31.

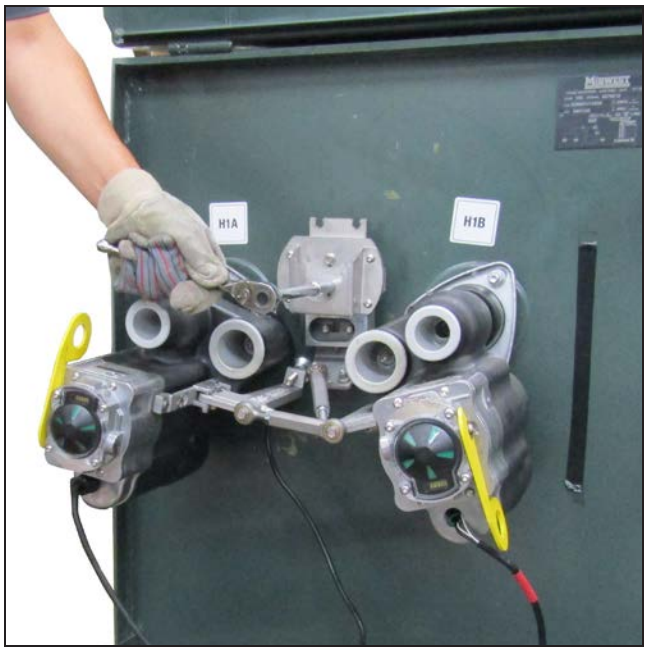

Figure 30. Tightening the bolts.

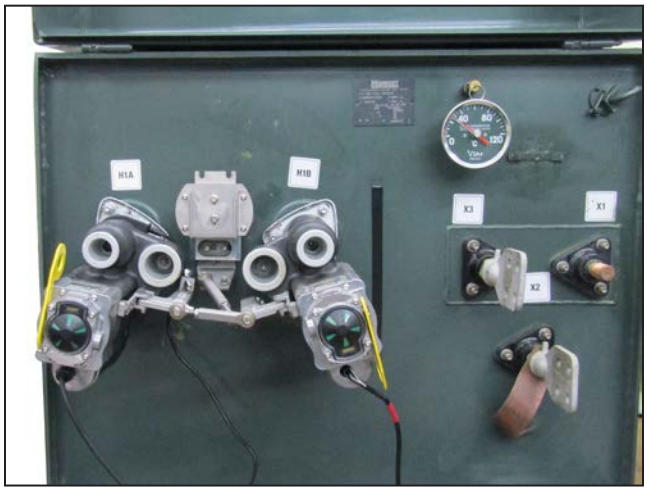

Figure 31. A complete parking stand spacer installation.

Installing the Parking Stand Spacer and Optional Parking Stand Extender

The parking stand spacer provides additional clearance for elbows when using the parking stand. The extender, if installed, adds more additional clearance. If installing only the parking stand spacer, use the procedure on "Installing the Parking Stand Spacer" section on page 22.

Follow these steps to install the parking stand spacer and parking stand extender:

STEP 1. Loosen the two ¼–20 × ⅝-inch flange head bolts that were tightened in Step 5 on page 15.

STEP 2. If the two hex head ¼–20 × ⅝-inch flange head bolts are installed on the parking stand extender, remove them and keep them aside for use in Step 6 on page 25. See Figure 32.

STEP 3. Slide the parking stand extender down into the parking stand spacer until the notches at the base of the extender rest on the two hex head screws loosened in Step 1 as shown in Figure 33 and Figure 34. Tighten the two bolts.

Figure 32. The parking stand extender and bolts.

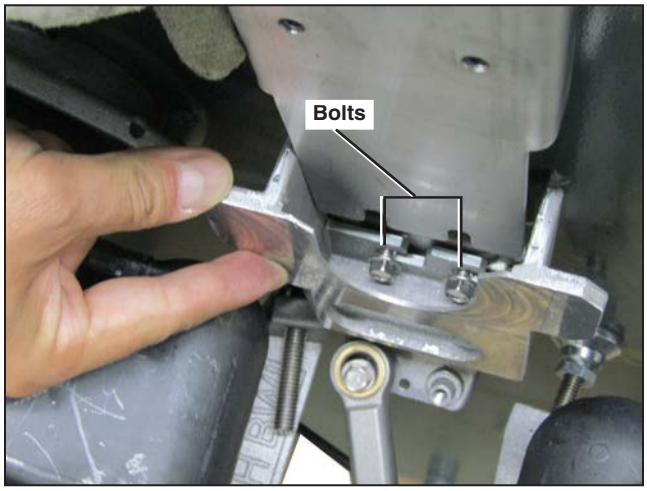

Figure 33. The parking stand extender should rest between the parking stand bolts and parking stand.

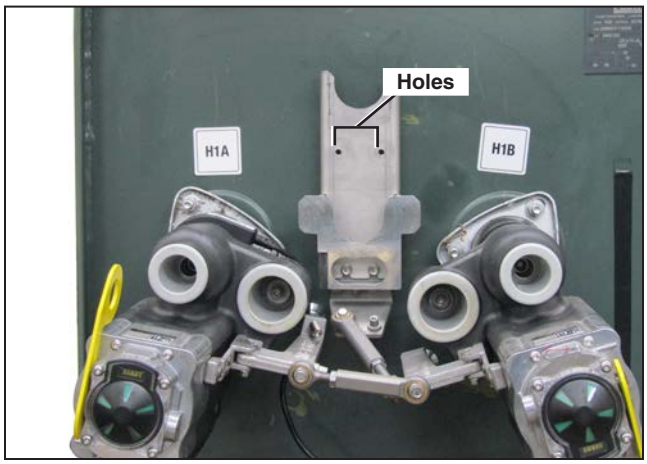

Figure 34. The parking stand extender installed.

STEP 4. Make sure the ¼–20 × ⅝-inch flange head screws are loose but still installed to the spacer back plate. See Figure 28 on page 22.

STEP 5. Slide the parking stand spacer onto the parking stand. See Figure 35.

STEP 6. Insert two ¼–20 × ⅝-inch flange head bolts into the holes on the parking stand extender. See Figure 34 on page 24.

STEP 7. Tighten the four ¼–20 × ⅝-inch flange head bolts (two on the parking stand spacer and two on the parking stand extender) to 6 ft-lbs. See Figure 36. This will secure the parking stand spacer to the parking stand and the extender. The completed parking stand extender and parking stand spacer installation is shown in Figure 37.

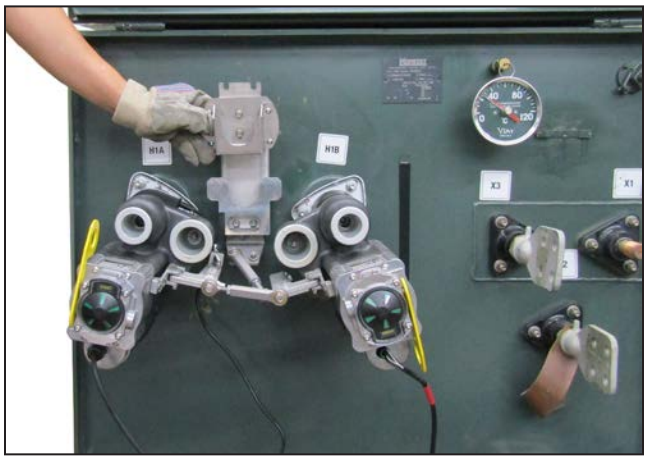

Figure 35. Slide parking stand extender onto parking stand.

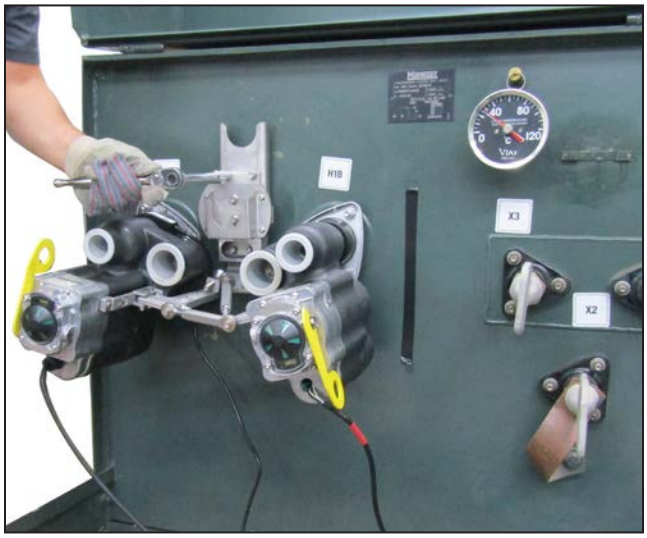

Figure 36. Insert screws into holes on extender. Tighten screws on parking stand spacer and parking stand extender.

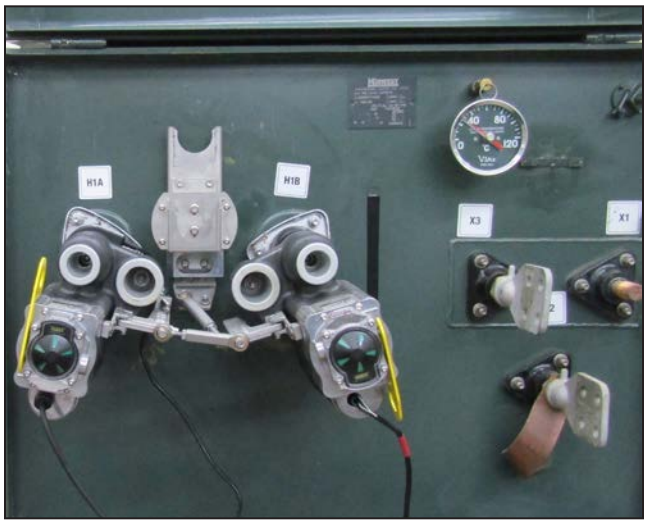

Figure 37. Completed parking stand extender and parking stand spacer installation.

Installing the Plugs and Caps

Follow these steps to install the plugs and caps:

Installing the H1A Plug and Cap

STEP 1. Grease the taper of the plug for the H1A bushing well interrupter with silicone lubricant.

STEP 2. Attach the plug install/removal tool to the end of the plug. The tool will not screw all the way flush to the plug. See Figure 38.

STEP 3. Install the plug in the H1A bushing well interrupter. This takes substantial force to snap into place and may be easier to do with a shotgun stick or a hookstick fitted with a distribution prong.

The plug should be flush with the opening in the bushing well interrupter. See Figure 39 on page 27 and Figure 40 on page 27. Remove the plug install/removal tool.

STEP 4. Install the plug cap over the plug on the H1A bushing well interrupter. See Figure 41 on page 27.

Figure 38. The plug install/removal tool installed onto the plug.

Installing the H1B Plug and Cap

STEP 1. Grease the taper of the plug for the H1B bushing well interrupter with silicone lubricant.

STEP 2. Attach the plug install/removal tool to the end of the plug. The tool will not screw all the way flush to the plug. See Figure 38 on page 26.

STEP 3. Install the plug in the H1B bushing well interrupter. This takes substantial force to snap into place and may be easier to do with a shotgun stick or a hookstick fitted with a distribution prong.

The plug should be flush with the opening in the bushing well interrupter. See Figure 39 and Figure 40. Remove the plug install/removal tool.

STEP 4. Install the plug cap over the plug on the H1B bushing well interrupter. See Figure 41.

Figure 39. Hold the plug with a shotgun stick or other tool.

Figure 40. Push into the bushing well interrupter until flush with the bushing well interrupter opening.

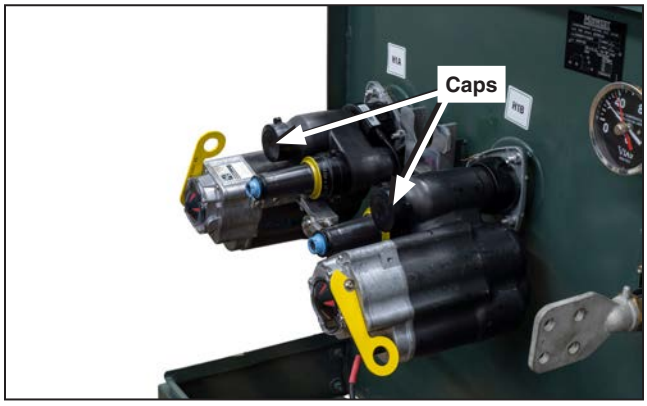

Figure 41. Install the cap onto the bushing well interrupter.

Grounding the Bushing Well Interrupters

NOTICE

The proper function of the **Power Line Communication (PLC)** feature depends on a good ground connection from the point where the elbow is grounded to the transformer ground bus to the bushing well interrupter grounding point. **Failure to make this connection may result in a Power Line Communications error. Contact the local S&C Sales Office before making any variations in grounding.** Additional grounding points are available if required by your company's standard operating practices.

Follow these steps to ground the bushing well interrupters:

Grounding the H1A Bushing Well Interrupter

STEP 1. Install the loadbreak insert according to standard utility practice.

STEP 2. Connect the drain wire from the tab on the loadbreak insert to the grounding point on the bushing well interrupter. See Figure 42 and Figure 43.

The grounding point on the bushing well interrupter is marked with the symbol for earth ground, and two holes and two screws are provided for attaching drain wires. See Figure 44.

STEP 3. Connect the other end of the ground wire to the transformer ground bus at the same point where the elbow is grounded.

Grounding the H1B Bushing Well Interrupter

STEP 1. Install the loadbreak insert according to standard utility practice.

STEP 2. Connect the drain wire from the tab on the loadbreak insert to the grounding point on the bushing well interrupter. See Figure 42 and Figure 43.

The grounding point on the bushing well interrupter is marked with the symbol for earth ground, and two holes and two screws are provided for attaching drain wires. See Figure 44.

STEP 3. Connect the other end of the cable to the transformer ground bus at the same point where the elbow is grounded.

Cable Terminations

Terminate the cables with elbows, following the elbow manufacturer's instructions.

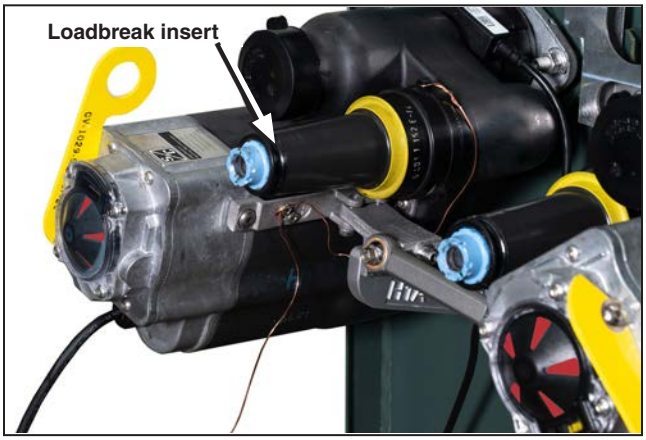

Figure 42. The grounding tab on the loadbreak insert.

Figure 43. The bushing well interrupter grounding point.

Figure 44. The bushing well interrupter grounding point marked with the "earth ground" symbol.

Installing and Making Connections to the Control

Complete the following steps to install the bracket on the control and make connections to the control:

STEP 1. The control and bracket, when properly assembled, will allow the control to hang securely in the parking stand. See Figure 45. Find the bracket, ¼–20 × ⅝-inch flange-head bolt, and control in the installation kit.

STEP 2. Slide the bracket onto the control, as shown in Figure 46, and secure with the ¼–20 × ⅝-inch flange-head bolt, as shown in Figure 47.

STEP 3. Mount the control on the parking stand, as shown in Figure 48. The control bracket is keyed to the parking stand.

STEP 4. Connect the current sensor connector to the control's four-pin connector labeled "Current Sensor." See Figure 49 and Figure 50 on page 30.

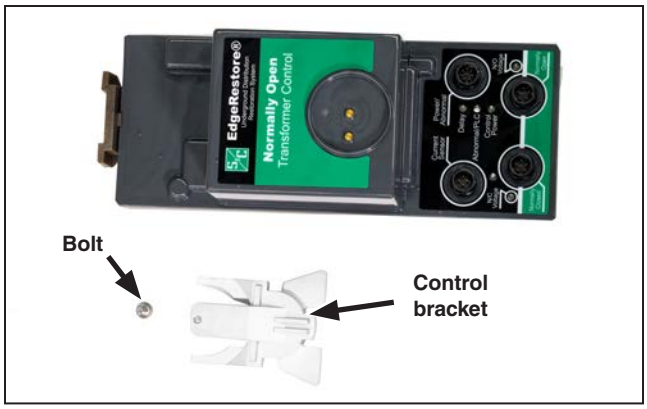

Figure 45. The control bracket parts.

Figure 46. Control bracket is slid onto control.

Figure 47. Control bracket secured to control with bolt.

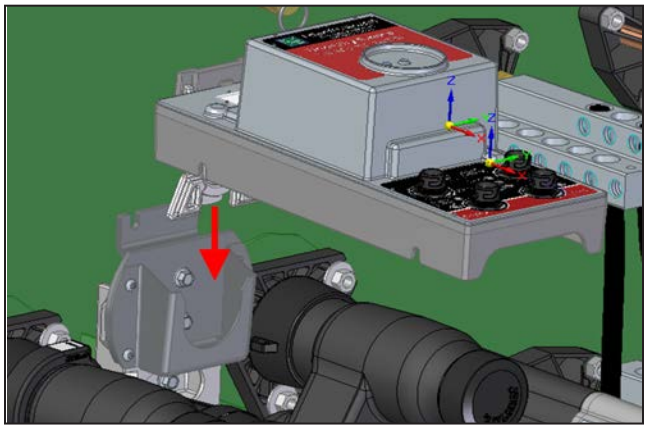

Figure 48. Control is slid onto parking stand.

NOTICE

Make sure the H1A and H1B cable connections are correctly connected to the control based on the direction of current flow (load or source) through the transformer.

For Normally Closed Control Connections

Complete the following steps. Normally closed controls are designed for installation on EdgeRestore systems that are normally in the **Closed** position and are identified by a red label.

Note: There is a red band on the H1B control cable to help differentiate the H1A and H1B cables from each other when making connections to the control.

STEP 1. Connect the control cable on the bushing well interrupter connected to the source (utility) side to the six-pin connector labeled "Source." See Figure 49.

STEP 2. Connect the control cable on the bushing well interrupter connected to the load (toward the normally open transformer) to the six-pin connector labeled "Load." See Figure 49.

A complete installation is shown in Figure 52 on page 31.

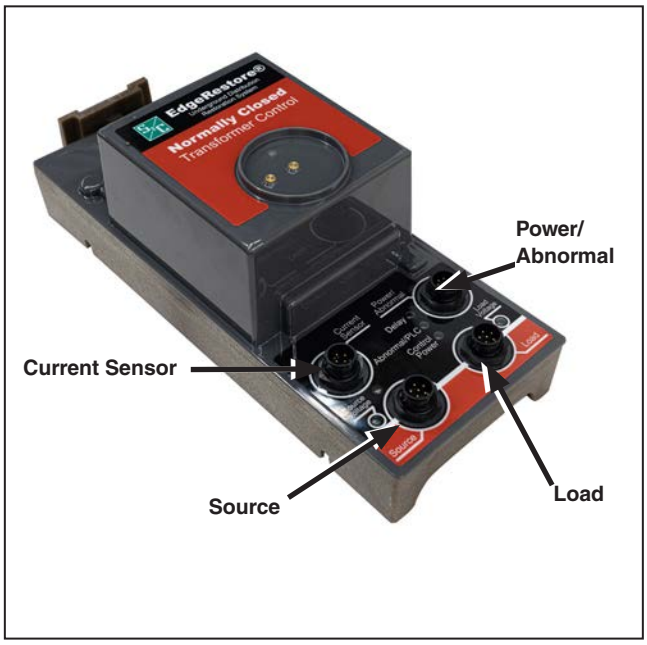

Figure 49. Control connections. A normally closed control shown.

For Normally Open Control Connections

Complete the following steps. Normally open controls are designed for installation on EdgeRestore systems that have one bushing well interrupter normally in the **Open** position and are identified by a green label.

Note: There is a red band on the H1B control cable to help differentiate the cables when making connections to the control.

STEP 1. Connect the control cable on the normally closed bushing well interrupter to the six-pin connector labeled "Normally Closed." See Figure 40.

STEP 2. Connect the control cable on the normally open bushing well interrupter to the "Normally Open" six-pin connector. See Figure 50.

A complete installation is shown in Figure 52 on page 31. A normally closed control is shown, but a normally open one is similar.

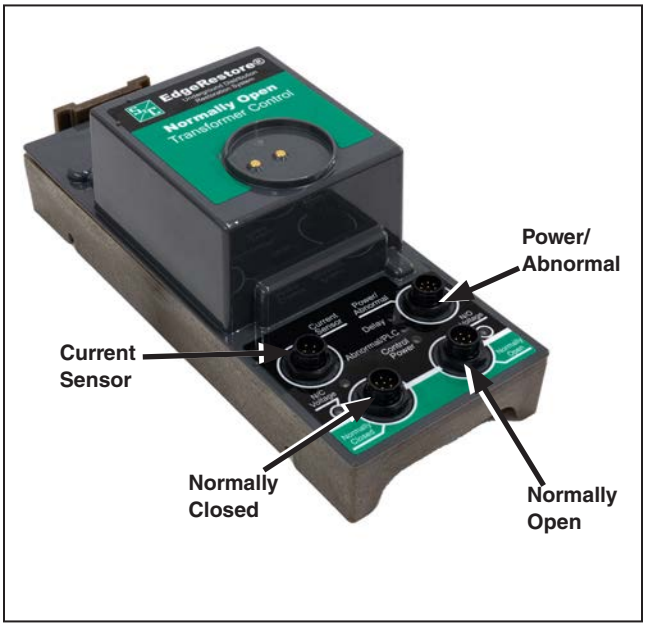

Figure 50. Control connections. A normally open control is shown.

Connecting 120-V Control Power

A control power connector is included in the installation kit. Connect the black 10-gauge wire to X1 or X3 on the secondary transformer and the white 10-gauge wire to X2. Typically there is a lighting connection on the transformer secondary connections that can be used for this purpose.

Plug the six-pin connector into the Power/Abnormal connector on the control. See Figure 49 on page 30, Figure 50 on page 30, and Figure 51 and Figure 52.

NOTICE

Train the control cables so they are not pinched by the enclosure cover when the cover is closed. Before closing the transformer cover, make sure the cover does not make contact with the control.

Connecting the Control to Remote Monitoring

A Molex 2042200002 connector is available to connect the control to monitoring systems that can detect a dry contact that indicates whether the control is in an **Abnormal** state. If the control won't be connected to remote monitoring, leave the connector and wire coiled, as shown in Figure 51. For more information, contact the local S&C Sales Office.

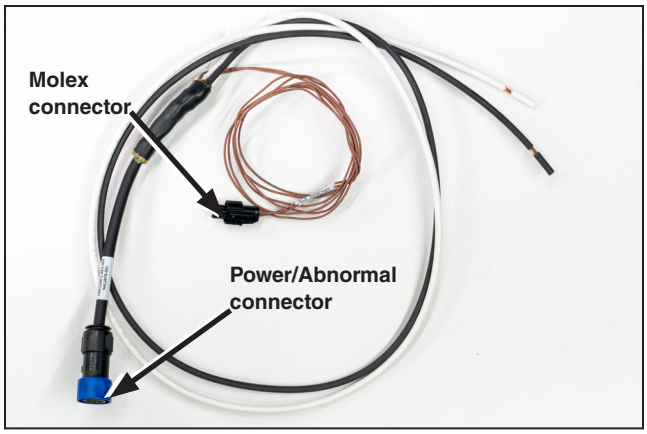

Figure 51. The power connector and Molex connector.

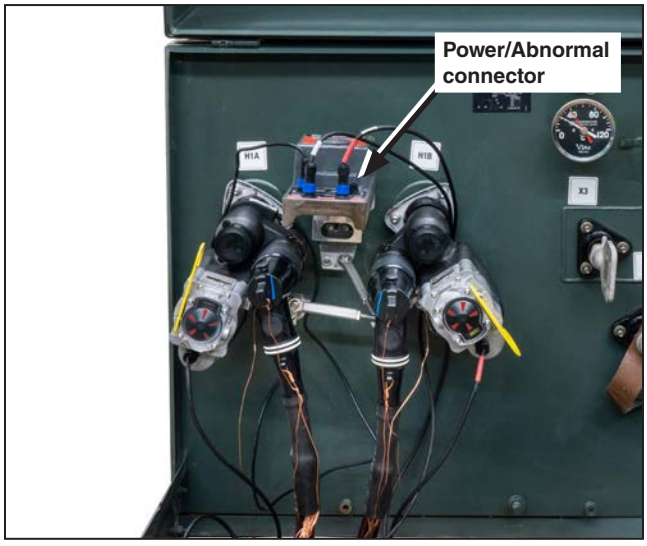

Figure 52. Completed control connections. A normally closed control is shown.

Post-Installation Inspection Checklist

☐ Make sure all of the following ¼-20 × ⅝-inch flange head bolts have been torqued to 6 ft-lbs.:

- ☐ The two on the parking stand link bracket (See Figure 15 on page 15.)
- ☐ The one attaching the adjustable link to the parking stand link bracket (See Figure 9 on page 12.)
- ☐ The two attaching the swivel foot bracket to the bushing well interrupter mounting boss (See Figure 18 on page 16.)
- ☐ The three attaching the adjustable link to the bushing well interrupter and cross-brace link (See Figure 27 on page 21.)

☐ Make sure all jam nuts are tight against the non-adjustable portion of the adjustable links and cross-brace link. See Figure 27 on page 21.

☐ Make sure the H1A and H1B bushing well interrupter swivel feet are secure against the transformer wall. See Figure 21 on page 18 and Figure 25 on page 20.

☐ Make sure the drain wire is properly connected between the loadbreak insert, bushing well interrupter grounding point, and the point on the transformer grounding bus where the elbow is grounded. See Figure 42 on page 28 and Figure 43 on page 28.

☐ Make sure the control cables from the H1A and H1B bushing well interrupters are connected to the control based on the direction of current flow (load or source for normally closed controls, normally open or normally closed for normally open controls) through the transformer. There is a red band on the H1B control cable to help differentiate the cables when making connections to the control. See Figure 49 on page 30 and Figure 50 on page 30.

☐ Make sure the black 10-gauge wire on the Power/Abnormal cable has been securely connected to X1 or X3 on the secondary transformer and the white 10-gauge wire to X2.

☐ Make sure all control cable connectors are secure and fully engaged with the control.

☐ Make sure all cables have been trained away from where the enclosure cover engages with the enclosure. See Figure 52 on page 31.

Table 1 lists the torques for the entire installation. After completing the post-installation inspection, the EdgeRestore system can be commissioned. See the "Commissioning" section beginning on page 33.

Table 1. Torque Values: EdgeRestore System Installed in a Type 1 Transformer

Fastener/Equipment		Tool/Tool Size	Torque Value	Page and Figure Reference
Bushing well adapter		Loadbreak torquing tool	15 ft-lbs	Figure 6 on page 11 and Figure 7 on page 11
Parking stand link bracket and support strut system	¼-20 × ⅝-inch flange-head bolts on parking stand link bracket and support strut system	⅜-inch socket on torque wrench	6 ft-lbs	Figure 15 on page 15 and Figure 27 on page 21
	Jam nuts on support strut system	9⁄16-inch combination wrench	Hand tight	Figure 27 on page 21
Bushing well interrupter	Captive socket-head bolt inside bushing well interrupter	⅜-inch long-reach Allen wrench bit for socket (torque) wrench	25 ft-lbs	Figure 20 on page 17
	H1A swivel foot	⅜-inch socket on torque wrench	6 ft-lbs	Figure 18 on page 16
	Swivel foot bracket adjustment	3⁄16-inch Allen wrench	Hand tight, then 2 turns tighter	Figure 21 on page 18 and Figure 25 on page 20

Planning for Commissioning

The EdgeRestore Underground Distribution Restoration System is highly flexible in how it can be applied on a loop. It can be installed either on all transformers or just on some, depending on the loop design and the amount of sectionalization desired. An example loop, including eight normally closed transformers and one normally open transformer, is shown in Figure 53.

S&C recommends exporting a diagram of each loop where the EdgeRestore system is to be installed from the utility's geographic information system (GIS). Record the transformer designations of each EdgeRestore system-enabled transformer, along with the designations of the load- and source-side cables for normally closed transformers.

Record the cable designations of the normally open and normally closed cables on the normally open transformer. Because each installation is unique, and standard utility practice varies by utility, a system example is used in Figure 53 to illustrate the recommended system planning.

Use the GIS export to fill out a system plan. A sample completed system plan can be found on page 34. Confirm the accuracy of the system plan after arriving at the installation site.

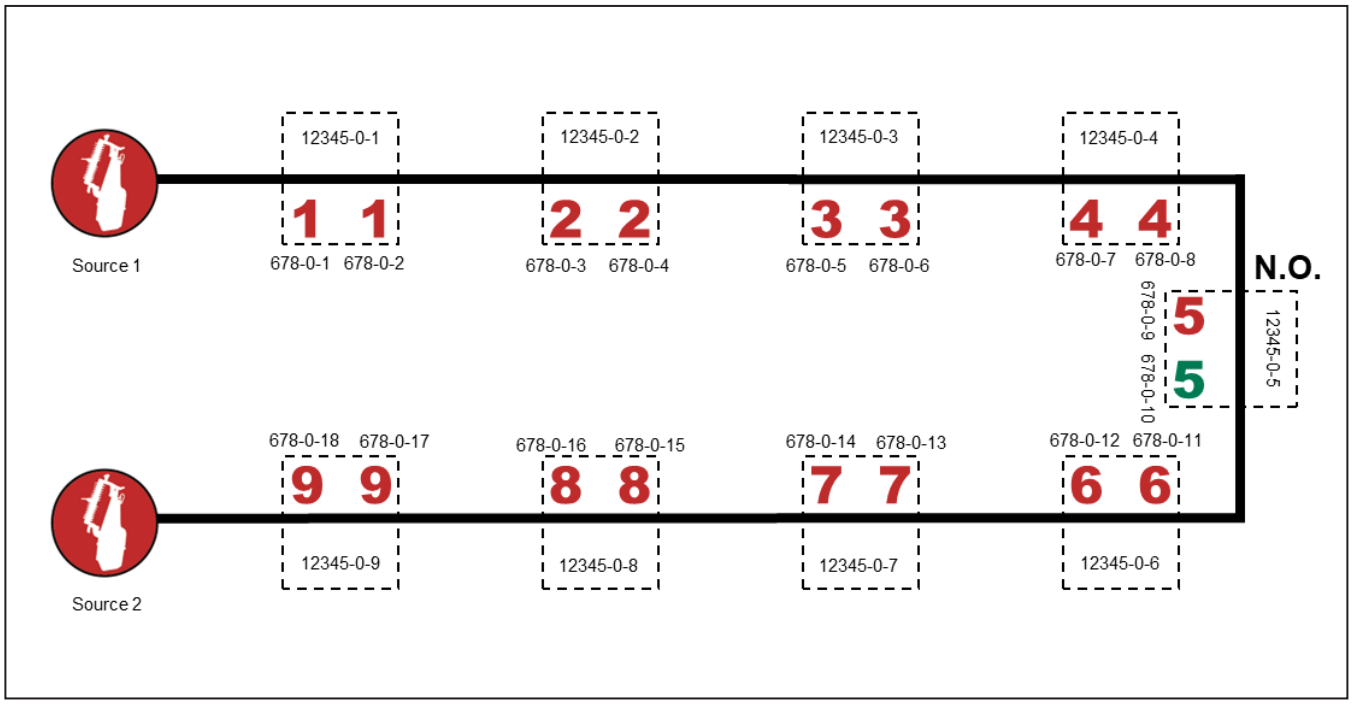

Figure 53. An example loop diagram.

Sample Loop Plan

Transformer 1 - Normally Closed

Transformer Number: 12345-0-1

Source Cable: 678-0-1

Load Cable: 678-0-2

Transformer 2 - Normally Closed

Transformer Number: 12345-0-2

Source Cable: 678-0-3

Load Cable: 678-0-4

Transformer 3 - Normally Closed

Transformer Number: 12345-0-3

Source Cable: 678-0-5

Load Cable: 678-0-6

Transformer 4 - Normally Closed

Transformer Number: 12345-0-4

Source Cable: 678-0-7

Load Cable: 678-0-8

Transformer 5 - Normally Open

Transformer Number: 12345-0-5

Normally Closed Cable: 678-0-9

Normally Open Cable: 678-0-10

Transformer 6 - Normally Closed

Transformer Number: 12345-0-6

Source Cable: 678-0-12

Load Cable: 678-0-11

Transformer 7 - Normally Closed

Transformer Number: 12345-0-7

Source Cable: 678-0-14

Load Cable: 678-0-13

Transformer 8 - Normally Closed

Transformer Number: 12345-0-8

Source Cable: 678-0-16

Load Cable: 678-0-15

Transformer 9 - Normally Closed

Transformer Number: 12345-0-9

Source Cable: 678-0-18

Load Cable: 678-0-17

EdgeRestore System Commissioning Procedure

Transfer transformer information in the sample loop plan to the EdgeRestore Underground Distribution Restoration System commissioning procedure. S&C recommends starting at Source 1 on the loop and commissioning each transformer in order around the loop ending with the transformer fed by Source 2.

Full instructions for using the cordless power module as well as opening and closing the bushing well interrupters can be found in S&C Instruction Sheet 676-540.

Use the procedures on this page as a template for a commissioning plan. Fill in the system designations from the GIS export as applicable. The transformer commissioning procedure will be the same for all normally closed transformers and all normally open transformers:

EdgeRestore System Normally Closed Transformer <#>: <Transformer Designation>

STEP 1. Make sure the EdgeRestore system installation procedure has been completed.

STEP 2. Make sure the source control cable <cable designation> is connected to the source connector on the control.

STEP 3. Make sure the load control cable <cable designation> is connected to the load connector on the control.

STEP 4. Apply power to the control using the cordless power module.

STEP 5. Wait until the CONTROL POWER LED stops blinking.

STEP 6. Open the H1A bushing well interrupter by pulling the yellow lever forward once.

STEP 7. Close the H1A bushing well interrupter by toggling the handle from the **Open** (green) **and Locked** position to the **Ready** position three times, ending in the **Ready** position.

STEP 8. Make sure the DELAY LED is blinking. It will blink 10 times and then the bushing well interrupter will close.

STEP 9. Make sure the indicator on the bushing well interrupter is in the **Closed** (red) **and Ready** position.

STEP 10. Open the H1B bushing well interrupter by pulling the yellow lever forward once.

STEP 11. Close the H1B bushing well interrupter by toggling the handle from the **Open and Locked** position to the **Ready** position three times, ending in the **Ready** position.

STEP 12. Make sure the DELAY LED is blinking. It will blink 10 times and then the bushing well interrupter will close.

STEP 13. Make sure the indicator on the bushing well interrupter is in the **Closed and Ready** position.

STEP 14. Remove the cordless power module.

EdgeRestore System Normally Open Transformer <#>: <Transformer Designation>

STEP 1. Make sure the EdgeRestore system installation procedure has been completed.

STEP 2. Make sure the normally closed control cable <cable designation> is connected to the normally closed connector on the control.

STEP 3. Make sure the normally open control cable <cable designation> is connected to the normally open connector on the control.

STEP 4. Apply power to the control using the cordless power module.

STEP 5. Wait until the CONTROL POWER LED stops blinking.

STEP 6. Open the H1A bushing well interrupter by pulling the yellow lever forward once.

STEP 7. Close the H1A bushing well interrupter by toggling the handle from the **Open** (green) **and Locked** position to the **Ready** position three times, ending in the **Ready** position.

STEP 8. Make sure the DELAY LED is blinking. It will blink 10 times and then the bushing well interrupter will close.

STEP 9. Make sure the indicator on the bushing well interrupter is in the **Closed and Ready** position.

STEP 10. Open the H1B bushing well interrupter by pulling the yellow lever forward once.

STEP 11. Close the H1B bushing well interrupter by toggling the handle from the **Open and Locked** position to the **Ready** position three times, ending in the **Ready** position.

STEP 12. Make sure the DELAY LED is blinking. It will blink 10 times and then the bushing well interrupter will close.

STEP 13. Make sure the indicator on the bushing well interrupter is in the **Closed** (red) **and Ready** position.

STEP 14. Open the normally open bushing well interrupter by pulling the lever forward once. Then push the lever once back towards the transformer into the **Open and Ready** position.

STEP 15. Remove the cordless power module.

Performing a Loss of Source Test

After completing installation of the EdgeRestore systems on a loop, S&C recommends testing the function of the restoration system. This can be done by performing a loss-of-source test. To perform a loss-of-source test, complete the following steps:

Loss of Source 1 Test

STEP 1. Make sure the protective devices at Source 1 and Source 2 are closed, all transformers have power, and the ABNORMAL LED on each transformer's control is green.

STEP 2. Disconnect Source 1 from the loop.

STEP 3. Wait at least 60 seconds.

STEP 4. Check the following at the EdgeRestore system-enabled transformer nearest to Source 1:

(a) Make sure the source bushing well interrupter is in the **Open** position.

(b) Make sure the load bushing well interrupter is in the **Closed** position.

(c) Make sure the ABNORMAL/PLC LED is red.

(d) Make sure the POWER LED is solid red.

(e) Make sure the SOURCE VOLTAGE LED is off.

(f) Make sure the LOAD VOLTAGE LED is on.

STEP 5. Check the following at all other EdgeRestore system enabled transformers:

(a) Make sure both bushing well interrupters are in the **Closed and Ready** position.

(b) Make sure the ABNORMAL/PLC LED is green on the normally closed transformers.

(c) Make sure the ABNORMAL/PLC LED is red on the normally open transformer.

(d) Make sure the POWER LED is solid red.

(e) Make sure the SOURCE VOLTAGE LED is on for normally closed transformers

(f) Make sure the LOAD VOLTAGE LED is on for normally closed transformers.

(g) Make sure the NC VOLTAGE LED is on for the normally open transformer.

(h) Make sure the NO VOLTAGE LED is on for the normally open transformer.

STEP 6. Reconnect Source 1 to the loop.

STEP 7. Wait at least 5 minutes, and then make sure the system has returned to normal by observing the following at all normally closed transformers:

(a) Make sure the normally closed bushing well interrupters are in the **Closed and Ready** position.

(b) Make sure the ABNORMAL/PLC LED is green.

(c) Make sure the POWER LED is solid red.

(d) Make sure the SOURCE VOLTAGE LED is on.

(e) Make sure the LOAD VOLTAGE LED is on.

STEP 8. Confirm the following at the normally open transformer:

(a) Make sure the normally open bushing well interrupter is in the **Open and Ready** position.

(b) Make sure the normally closed bushing well interrupter is in the **Closed and Ready** position.

(c) Make sure the ABNORMAL/PLC LED is green.

(d) Make sure the POWER LED is solid red.

(e) Make sure the NO VOLTAGE LED is on.

(f) Make sure the NC VOLTAGE LED is on.

Loss of Source 2 Test

STEP 1. Check that the protective devices at Source 1 and Source 2 are closed, all transformers have power, and the ABNORMAL LED on each transformer's control is green.

STEP 2. Disconnect Source 2 from the loop.

STEP 3. Wait at least 60 seconds.

STEP 4. Check the following at the EdgeRestore system enabled transformer nearest to Source 2:

(a) Make sure the source bushing well interrupter is in the **Open** position.

(b) Make sure the load bushing well interrupter is in the **Closed** position.

(c) Make sure the ABNORMAL/PLC LED is red.

(d) Make sure the POWER LED is solid red.

(e) Make sure the SOURCE VOLTAGE LED is off.

(f) Make sure the LOAD VOLTAGE LED is on.

STEP 5. Check the following at all other EdgeRestore system enabled transformers:

(a) Make sure both bushing well interrupters are in the **Closed and Ready** position.

(b) Make sure the ABNORMAL/PLC LED is green on the normally closed transformers.

(c) Make sure the ABNORMAL/PLC LED is red on the normally open transformer.

(d) Make sure the POWER LED is solid red.

(e) Make sure the SOURCE VOLTAGE LED is on for normally closed transformers

(f) Make sure the LOAD VOLTAGE LED is on for normally closed transformers.

(g) Make sure the NC VOLTAGE LED is on for the normally open transformer.

(h) Make sure the NO VOLTAGE LED is on for the normally open transformer.

STEP 6. Reconnect Source 2 to the loop.

STEP 7. Wait at least 5 minutes, and then make sure the system has returned to normal by observing the following at all normally closed transformers:

(a) Make sure the normally closed bushing well interrupters are in the **Closed and Ready** position.

(b) Make sure the ABNORMAL/PLC LED is green.

(c) Make sure the POWER LED is solid red.

(d) Make sure the SOURCE VOLTAGE LED is on.

(e) Make sure the LOAD VOLTAGE LED is on.

STEP 8. Observe the following at the normally open transformer:

(a) Make sure the normally open bushing well interrupter is in the **Open and Ready** position.

(b) Make sure the normally closed bushing well interrupter is in the **Closed and Ready** position.

(c) Make sure the ABNORMAL/PLC LED is green.

(d) Make sure the POWER LED is solid red.

(e) Make sure the NO VOLTAGE LED is on.

(f) Make sure the NC VOLTAGE LED is on.

This document contains statements that are required for compliance with the rules and policies of various national and international regulatory agencies.

United States of America – FCC (Federal Communication Commission)

This device complies with part 15 of the FCC rules and regulations regarding unlicensed transmissions. Operation is subject to the following two conditions: (1) This device may not cause harmful interference and (2) this device must accept any interference.

IMPORTANT! Changes or modifications not expressly approved by S&C Electric Company could void the user's authority to operate the equipment.

NOTE: This equipment has been tested and found to comply with the limits for a Class A unintentional emitter, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Canada – ISED (Innovation, Science & Economic Development Canada)

This device complies with ISED Canada ICES-003 standard(s).

CAN ICES-3 (A)/NMB-3(A)

IMPORTANT! Changes or modifications not expressly approved by S&C Electric Company could void the user's authority to operate the equipment.