Operation

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February 19, 2024

Qualified Persons

⚠ WARNING

Only qualified persons who are 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 who is 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 the 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 on S&C's website at **sandc.com/en/contact-us/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 specific applications. The applications must be within the ratings furnished for the equipment. Ratings for the EdgeRestore Underground Distribution Restoration System are listed in the ratings table in S&C Specification Bulletin 676-31. The ratings are also available on the nameplate affixed to the product.

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 EdgeRestore Underground Distribution Restoration System. 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 Labels

Location	Safety Alert Message	Description	Part Number
A	NAMEPLATE	Identification nameplate. Includes QR code that takes the user to important 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 the 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.

Overview of EdgeRestore System Operation—Loop Fault

The EdgeRestore Underground Distribution Restoration System is most effective when used in conjunction with lateral reclosers on the risers. The reclosers will interrupt fault current and de-energize the cables up to the normally open point on a loop to allow the EdgeRestore system to isolate a fault and restore power. In Figure 1, an example loop system is shown consisting of lateral reclosers on the riser poles serving the loop and nine ANSI distribution transformers with EdgeRestore Underground Distribution Restoration Systems installed. EdgeRestore system "5" is the normally open point. Each number represents a bushing well interrupter installed on the H1A and H1B transformer primary bushing wells.

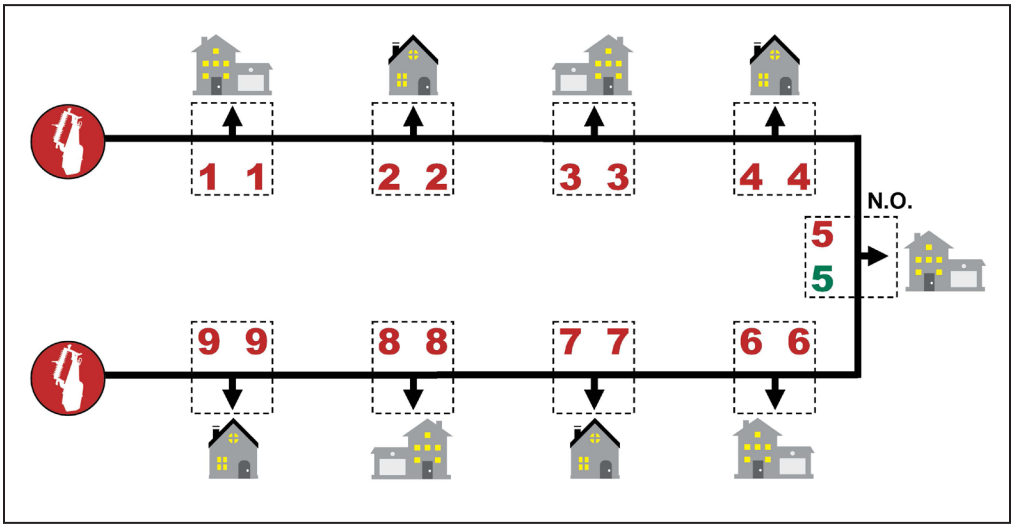


Figure 1. An underground lateral loop in a residential neighborhood equipped with EdgeRestore systems with a normally open tie point in the middle.

In Figure 2, an underground cable fault occurs between Transformers 2 and 3.

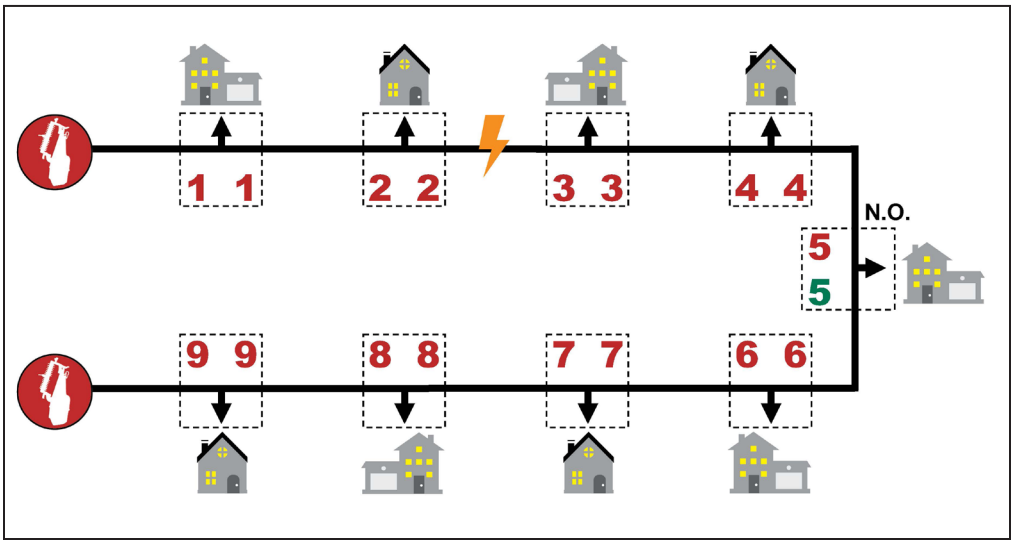


Figure 2. An underground lateral loop with a fault occurring between Transformers 2 and 3.

At time=0s, the fault occurs and the lateral recloser on the riser trips, interrupting the fault and de-energizing one-half of the loop circuit up to the normally open point. See Figure 3.

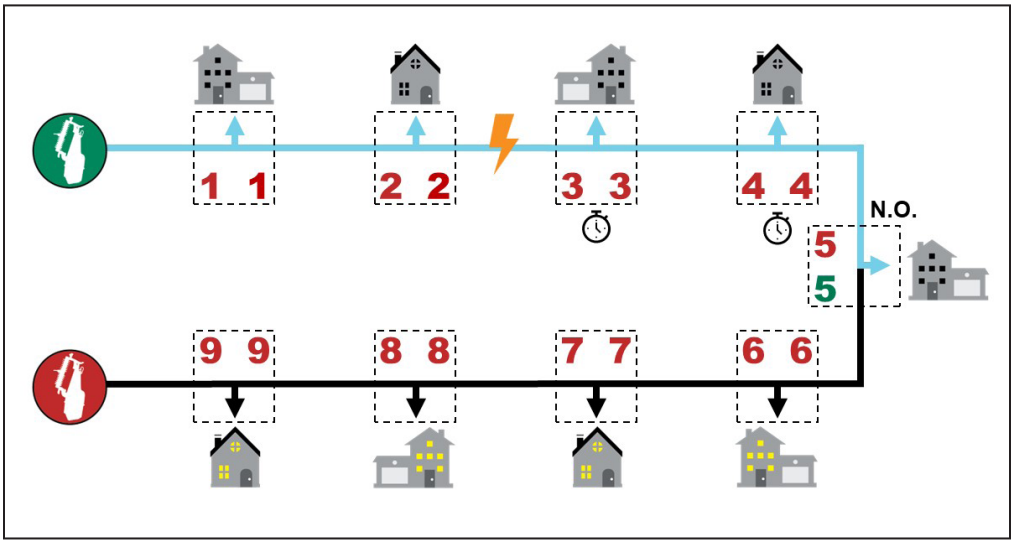


Figure 3. The recloser on the riser operates to open one-half of the loop.

While the lateral recloser is open, the transformers on the source-side of the fault, having sensed an overcurrent and loss of voltage, will open their load-side bushing well interrupters and send a "clear to close" signal toward the source, as shown in Figure 4. Transformer 1 will close after receiving the "clear to close" message. The load-side bushing well interrupter on Transformer 2 will remain open.

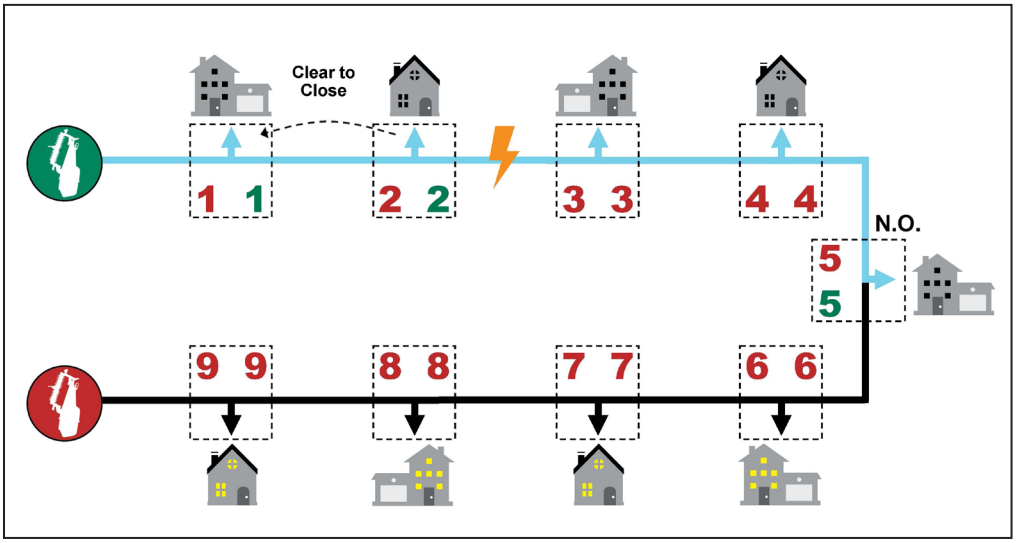


Figure 4. The control on Transformer 2 sends a "clear to close" message to the upstream transformer.

Then, the lateral recloser can close back in, restoring power up to the faulted segment downstream of Transformer 2. See Figure 5.

Meanwhile, after the loss of voltage from the fault, EdgeRestore systems in Transformers 3 and 4 begin timing. At time=50s, the timers expire, and the source side bushing well interrupters of Transformer 3 and Transformer 4 open.

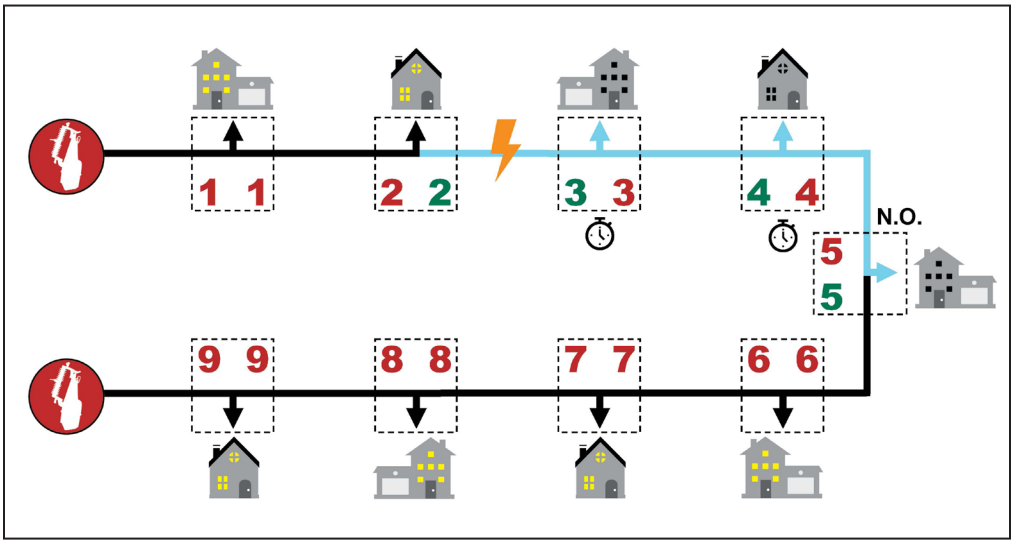


Figure 5. EdgeRestore systems downstream of the fault will isolate the fault after timers expire.

The transformers will then send a "clear to close" message toward the load, as shown in Figure 6. Transformer 3's source-side bushing well interrupter will remain open.

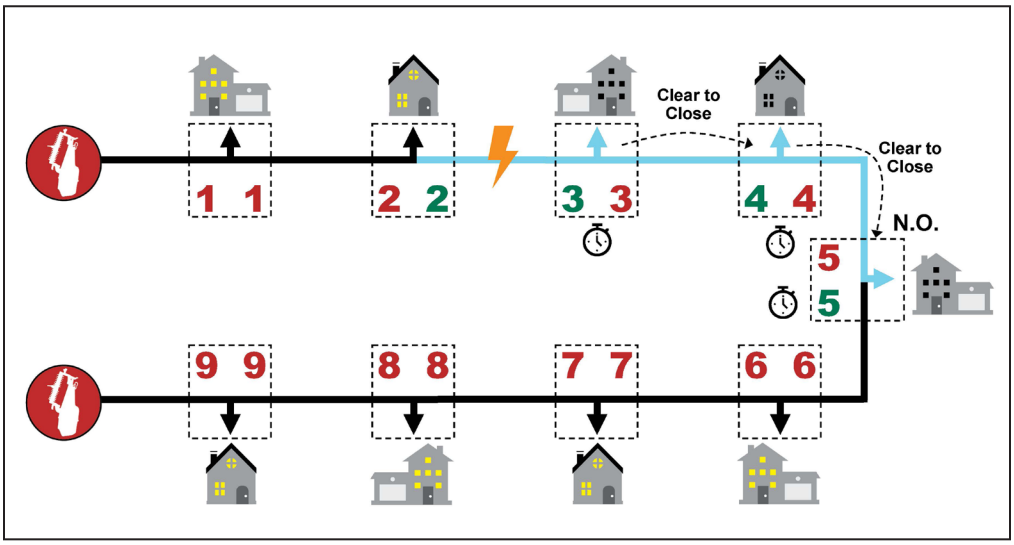


Figure 6. The source-side controls will open the bushing well interrupters and coordinate isolating the fault.

When the fault is fully isolated, the EdgeRestore system will restore service by closing the normally open transformer at time=54s. See Figure 7.

All of this occurs automatically, restoring the circuit without a crew in less than 60 seconds.

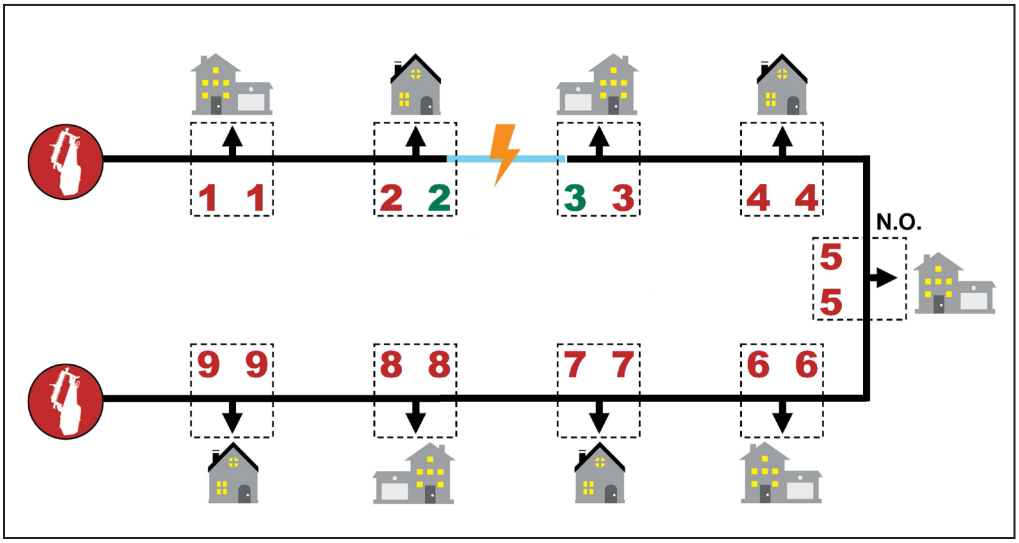


Figure 7. The circuit after an EdgeRestore system re-configuration.

Overview of EdgeRestore System Operation—Loss of Source

The EdgeRestore system will also reconfigure if a single loss of source occurs. In this case, the EdgeRestore system that experienced the loss of voltage will open the source-side bushing well interrupters at time=50s. The controls send a "clear to close" message to the normally closed EdgeRestore system on the load side. All bushing well interrupters that experienced a loss of voltage, except the source-side bushing well interrupter of Transformer 1, will close. Then, the normally open transformer will close at time=54s, restoring power to the loop from the second source. Figure 8 shows what the loop circuit would look like after the operation finished. The system would automatically return to normal five minutes after the lost source returns.

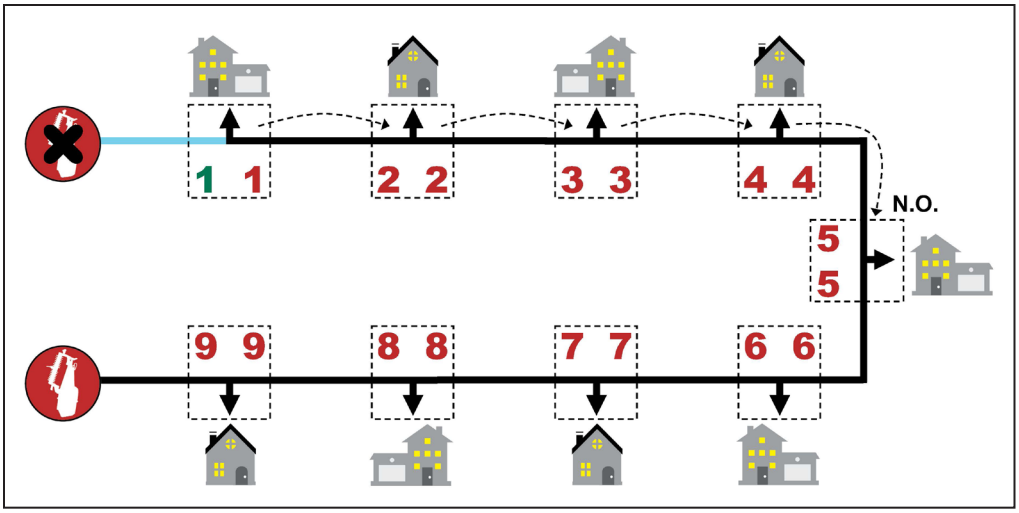


Figure 8. The EdgeRestore system after a single source loss of voltage.

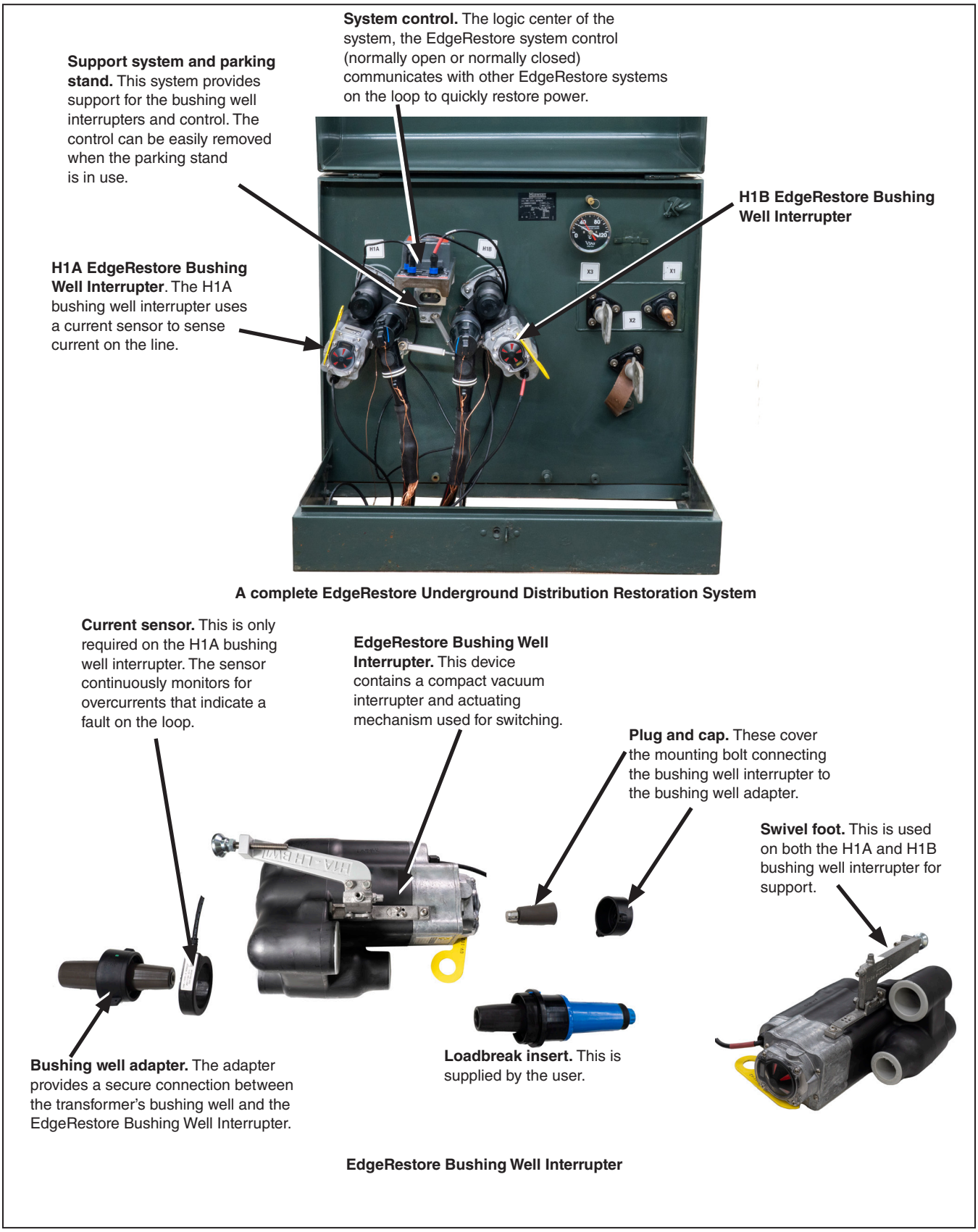


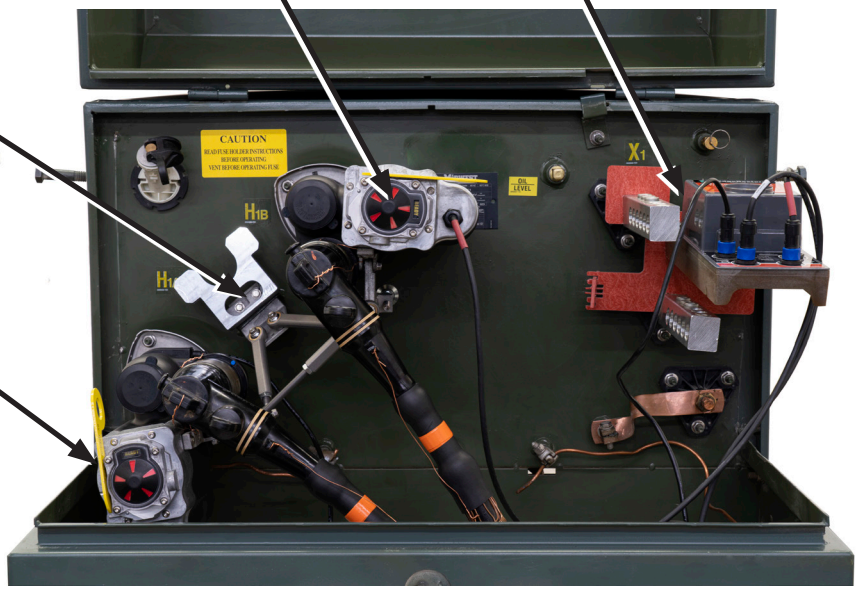
Figure 9. An EdgeRestore Underground Distribution Restoration System installed in a ANSI Type 1 Transformer overview.

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. This system provides support for the bushing well interrupters while keeping the parking stand available for use.

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



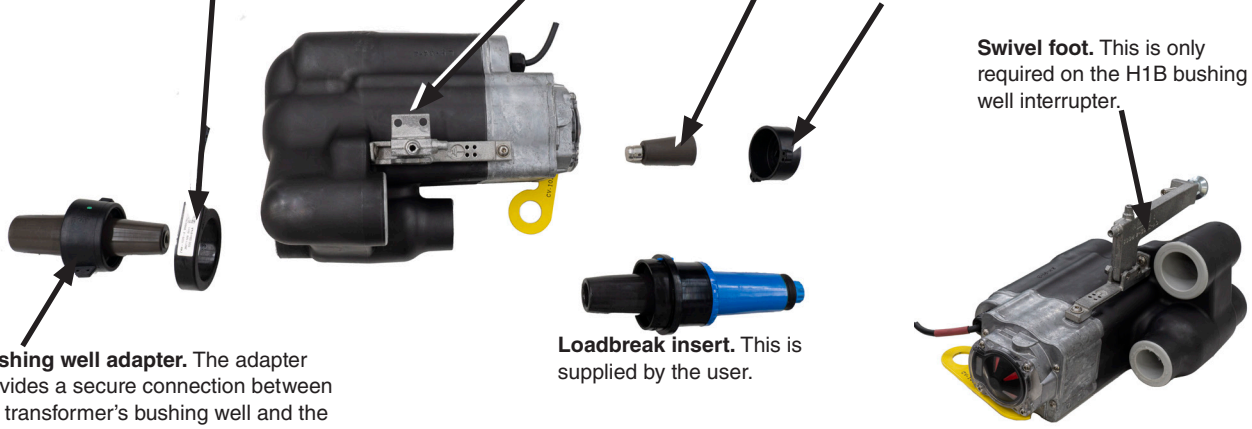
A complete EdgeRestore Underground Distribution Restoration System

Current sensor. This is only required on the H1A bushing well interrupter. The sensor continuously monitors for overcurrents that indicate a fault on the loop.

EdgeRestore Bushing Well Interrupter. This device contains a compact vacuum interrupter and 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 only required on the H1B bushing well interrupter.



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

Loadbreak insert. This is supplied by the user.

EdgeRestore Bushing Well Interrupter

Figure 10. An EdgeRestore Underground Distribution Restoration System installed in a ANSI Type 2 Transformer overview.

Manually Opening the EdgeRestore® Bushing Well Interrupters

Complete the following steps to manually open the EdgeRestore Bushing Well Interrupters:

STEP 1. A closed bushing well interrupter will display a red **Closed** indicator and show the word "Ready." See Figure 11. With a shotgun-style hotstick, a hotstick fitted with a distribution prong, or a gloved hand, pull the operating lever away from the transformer until the vacuum interrupter operates. Upon successful operation, a green **Open** indicator appears, and the indicator will change to show the word "Locked." See Figure 12 .

STEP 2. Release the lever without pushing it in. The bushing well interrupter will remain in the **Open and Locked** position. Bushing well interrupters in the **Open and Locked** position will disable automatic restoration.

⚠ WARNING

After an Automatic Restoration event, the bushing well interrupters that open will be in the **Open and Ready** position.

To disable the automatic restoration system and prevent automatic operation, move the operating levers on the bushing well interrupters located on either side of the circuit to be repaired to their **Open and Locked** position. To do so, toggle the lever on each bushing well interrupter away from the transformer and release it. Confirm the position indicates **Open and Locked.**

Failure to operate the open bushing well interrupters to their **Open and Locked** position before performing work on the system may allow automatic operation of the system and re-energization of isolated sections of the circuit. **This may result in equipment damage, injury, or death.**

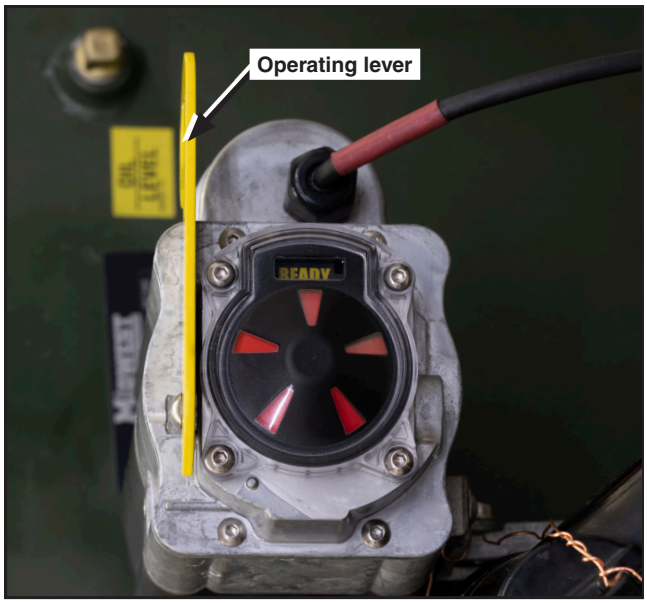


Figure 11. Pull the yellow operating lever away from the transformer.

Figure 12. The bushing well interrupter in the Open and Locked position.

Manually Closing the EdgeRestore Bushing Well Interrupters

Complete the following steps to manually close the EdgeRestore Bushing Well Interrupters:

STEP 1. If control power is unavailable, use the cordless power module to power the control. See the "Powering a Control Without Transformer Power" section on page 25.

STEP 2. With a shotgun-style hotstick or a hotstick fitted with a distribution prong, engage the yellow operating lever. See Figure 13 and Figure 14. Starting in the **Open and Locked** position, toggle the operating lever toward the transformer to the **Open and Ready** position three times, leaving it in the **Open and Ready** position on the third toggle. Then, carefully release the lever. Each toggle must be completed within 10 seconds, and the sequence of three toggles must be completed within 30 seconds.

The DELAY LED on the control will immediately begin flashing, and the bushing well interrupter will close in 10 seconds into the **Closed and Ready** position. See Figure 15 on page 15. Toggling the operating lever at any time during the **Closing** sequence will cancel the **Closing** process.

Note: The **Closing** sequence will be canceled if any of the following conditions occur:

- The time between operating lever toggles exceeded 10 seconds.
- The time to complete three operating level toggles exceeded 30 seconds
- More than three toggles occur.
- The operating lever ended in the **Locked** position.
- The operating lever is moved at any time after the DELAY LED begins flashing.
- The control does not have enough power to close the bushing well interrupter.

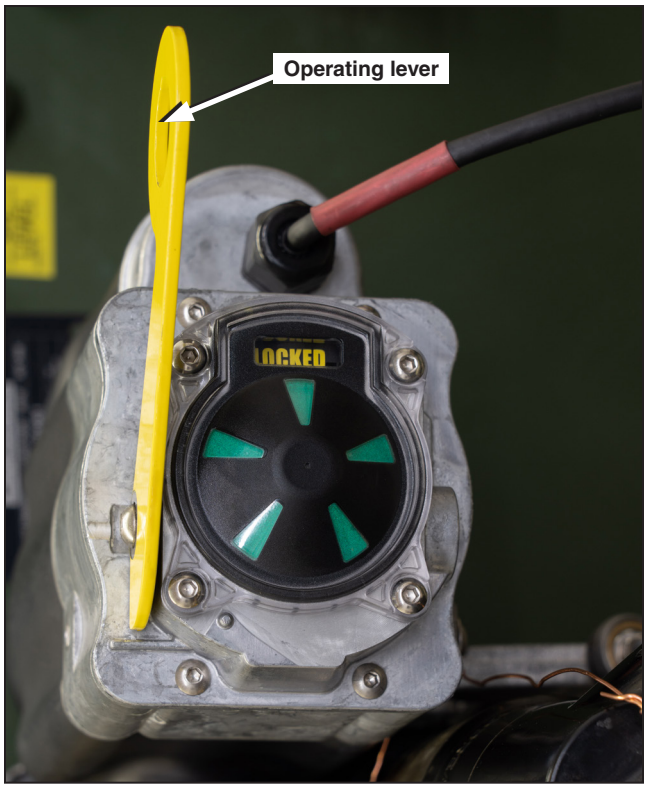


Figure 13. Toggle the yellow operating lever toward and away from the transformer three times, ending in the Ready (back) position.

Figure 14. A bushing well interrupter, before closing, in the Open and Ready position.

STEP 3. Confirm the bushing well interrupter indicator shows the **Closed and Ready** position. See Figure 15.

NOTICE

Manually closing a normally open bushing well interrupter, or all bushing well interrupters in a loop, will tie the loop together. Follow your standard operating practice when manually closing a loop.

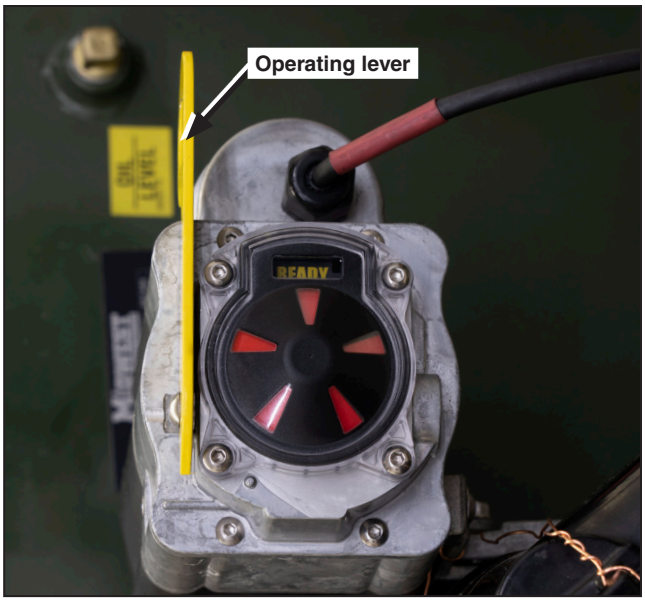


Figure 15. A bushing well interrupter in the Closed and Ready position.

Locating an EdgeRestore System in an Abnormal State

Following an **Automated Restoration System** operation, EdgeRestore systems will be in an **Abnormal** state. This indication can be used to assess where a fault may have occurred on the loop. An **Abnormal** state includes conditions where a normally closed bushing well interrupter is open, and vice versa. If a fault occurs immediately adjacent to a normally open point and the normally open point does not change state, as shown in Figure 16, the control's ABNORMAL/PLC LED will also indicate the system is in an **Abnormal** state by showing a red LED. To confirm whether an EdgeRestore system is in an **Abnormal** state, check whether the ABNORMAL/PLC LED is red. Then, check the indicators on the bushing well interrupters to determine which one is open. For a normally closed transformer, the fault is on the side of the transformer with the bushing well interrupter in the **Open and Ready** position.

For a normally open transformer, if a bushing well interrupter is still in the **Open and Ready** position, the fault is located on the open side of the loop between the normally open transformer and the next EdgeRestore system on the loop.

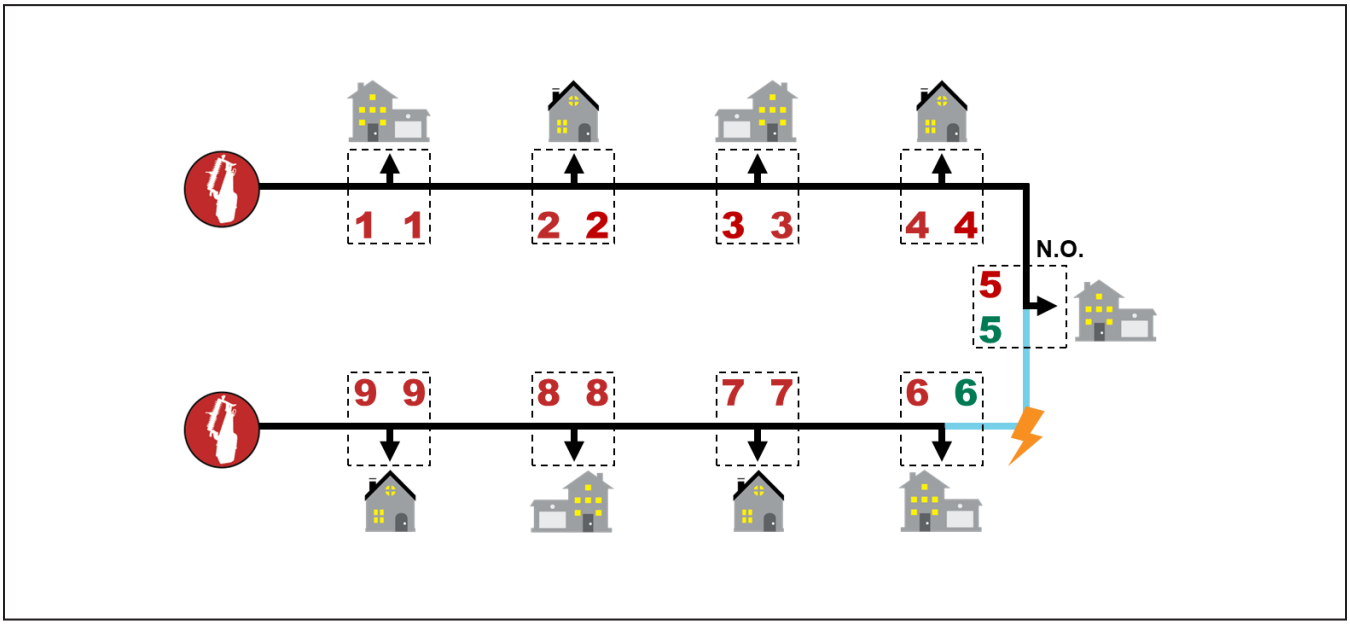


Figure 16. A loop with the faulted section of cable between the normally open Transformer 5 and the normally closed Transformer 6.

In some cases, not all transformers will have an EdgeRestore system installed. See Figure 17. In this example, there is no EdgeRestore system on Transformer 3. The fault location can be narrowed down to between Transformer 2 and Transformer 4. Testing will be required to see that the fault is between Transformer 2 and 3.

After locating a faulted section of the loop, follow the instructions in the "Disabling the EdgeRestore System After an Automatic Restoration System Operation" section on page 18 if standard utility practice requires disabling the system before repairs. Disable operation at both open bushing well interrupters on either side of the faulted section of cable.

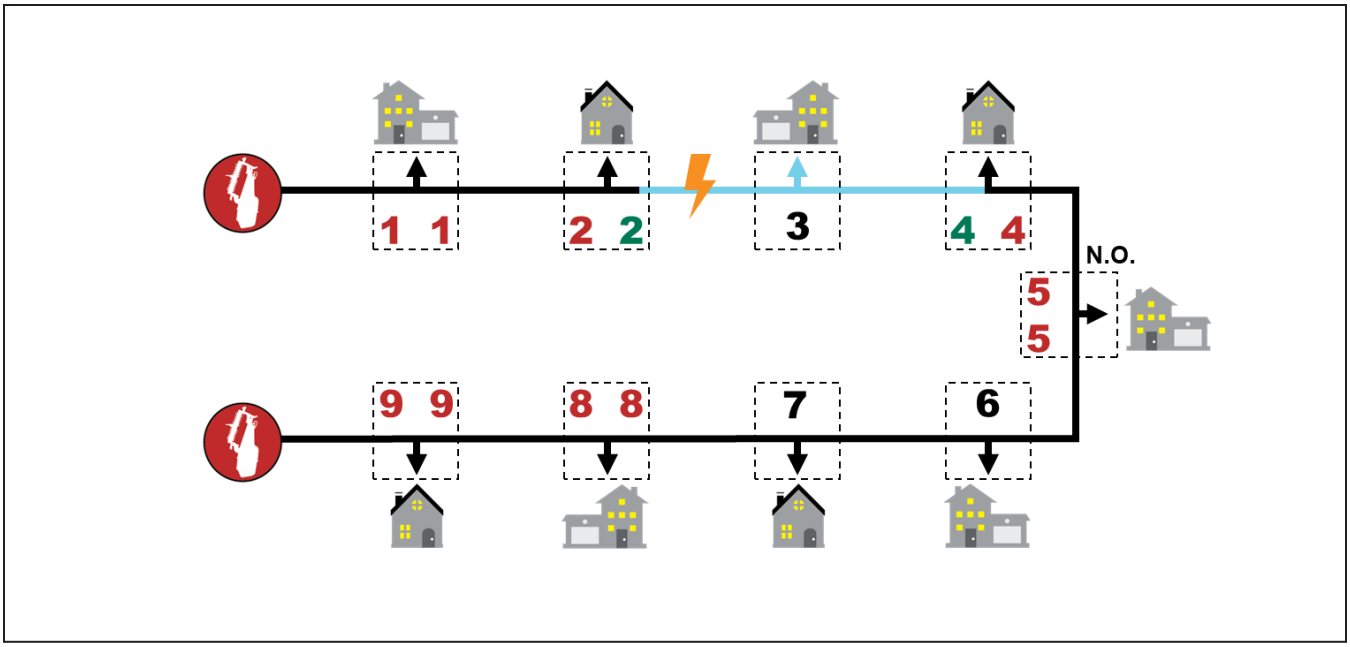


Figure 17. A loop with a faulted section of cable between Transformer 2 and 3.

Disabling the EdgeRestore System After an Automatic Restoration System Operation

⚠ WARNING

After an Automatic Restoration event, the bushing well interrupters around the faulted section of cable will be in the **Open and Ready** position and the ABNORMAL LED on the control will be red.

To disable the automatic restoration system and prevent automatic operation, move the operating levers on the bushing well interrupters located on either side of the circuit to be repaired to their **Open and Locked** position. To do so, toggle the lever on each bushing well interrupter away from the transformer and release it so it is in the **Open and Locked** position. Then, check that the bushing well interrupter position indicators show they are **Open and Locked.**

Failure to operate the open bushing well interrupters to their **Open and Locked** position before performing work on the system may allow automatic operation of the system and re-energization of isolated sections of the circuit. **This may result in equipment damage, injury, or death.**

Note: This procedure should be used to disable the EdgeRestore system even if an automatic restoration event has not occurred before maintenance is performed on the loop.

Following an automatic EdgeRestore system operation, the bushing well interrupters on either side of the faulted section of cable will be in the **Open and Ready** position, isolating the faulted section. See Figure 18. Complete the following steps to disable the automatic restoration system before performing system repairs:

STEP 1. Open the transformer enclosure to confirm the EdgeRestore system has operated. See the "Locating an EdgeRestore System in an Abnormal State" section on page 16.

For a normally closed EdgeRestore system: The bushing well interrupter adjacent to the faulted section will be in the **Open and**

Figure 18. A bushing well interrupter in the Open and Ready position. In this position, automatic operation is still enabled.

Ready position. The ABNORMAL/PLC LED indicator will be red.

For a normally open EdgeRestore system: If the faulted section is between the normally open point and a neighboring normally closed transformer, the position indicator in the **Open and Ready** position will indicate the side of the transformer where the fault has occurred on the cable. The other bushing well interrupter will be in the **Closed and Ready** position, indicating the side where power restoration occurred. The ABNORMAL/PLC LED indicator will be red.

STEP 2. With a shotgun-style hotstick, a hotstick fitted with a distribution prong, or a gloved hand, pull the yellow operating lever of the bushing well interrupter that is in the **Open and Ready** (green) position away from the transformer once. The bushing well interrupter will still show a green position indicator but the system state will show "Locked." See Figure 19. When a bushing well interrupter is in the **Open and Locked** position, the automatic restoration system is disabled.

Figure 19. Toggle the yellow operating lever away from the transformer to the Open and Locked position. Automatic operation is disabled.

Enabling Automatic Return to Normal on the EdgeRestore System

NOTICE

The EdgeRestore system's automatic restoration system will be disabled on any bushing well interrupter in the **Open and Locked** position. Make sure all bushing well interrupters are in the **Open and Ready** or **Closed and Ready** position to facilitate automatic return to normal.

The automatic restoration system will only operate when all the bushing well interrupters are in their normal state.

For normally closed controls: The bushing well interrupters are both in the **Closed and Ready** position and the ABNORMAL/PLC LED is green.

For normally open controls: The bushing well interrupter for the normally closed side is in the **Closed and Ready** position, the bushing well interrupter in the normally open position is in the **Open and Ready** position, and the ABNORMAL/PLC LED is green.

Upon restoring power after a loss of source, an automatic return to normal is initiated when the source bushing well interrupter in the **Open and Ready** position experiences uninterrupted good voltage from its normal source for 5 minutes. When the 5-minute **Good Voltage** timer expires, the normally closed EdgeRestore system closest to the source sends a **Return to Normal** command to the normally open EdgeRestore system.

Both EdgeRestore systems then perform an open or closed transition to their normal positions based on their programming type. No manual operations are required for an automatic return to normal after a loss of source.

Refer to Figure 21 on page 21 to follow the sequence of events for initiating automatic return to normal after a cable fault.

After completing cable repairs, an automatic return to normal is initiated when the load-side source bushing well interrupter (B) is toggled to the **Open and Ready** position and has measured uninterrupted good voltage (while in the **Open and Locked** or **Open and Ready** position) from its normal source for 5 minutes. This can either be achieved by first toggling the load-side source bushing well interrupter (B) once to the **Open and Ready** position and then manually closing (toggling three times to the **Open and Ready** position) the source-side load bushing well interrupter (A), or vice versa.

Figure 20. A bushing well interrupter in the Open and Ready position. In this position, automatic operation is enabled.

If the source-side load bushing well interrupter (A) is closed first, the 5-minute **Good Voltage** timer starts on the load-side source bushing well interrupter (B) while in the **Open and Locked** position. When the 5-minute **Good Voltage** timer expires, the load-side EdgeRestore system (B) flashes the DELAY LED for 10 seconds before sending a **Return to Normal** command to the normally open EdgeRestore system (C). Both EdgeRestore systems (B & C) then perform an open or closed transition to their normal positions based on their programming type.

On an open transition system: The normally open control responds by opening the normally open bushing well interrupter first, then the upstream normally closed control closes the source-side bushing well interrupter when it senses the loss of voltage from the normally open EdgeRestore system.

On a closed transition system: The normally closed control responds by closing first, then the normally open control opens the normally open bushing well interrupter when it senses the return of voltage from the normally closed EdgeRestore system.

Note: A closed transition to normal can be performed manually on an open transition system. This is done by first closing the bushing well interrupter closest to the normally open transformer (not applicable if the open bushing well interrupter is the normally open point). Then, closing the bushing well interrupter closest to the source, and finally open the normally open bushing well interrupter in the normally open transformer.

NOTICE

The system does not need to be energized to be in the **Ready** state. If all normally open and normally closed controls and bushing well interrupters are in the **Ready** state and the vacuum interrupters are in the correct **Open** or **Closed** position, the automatic restoration system will be ready to operate when energized.

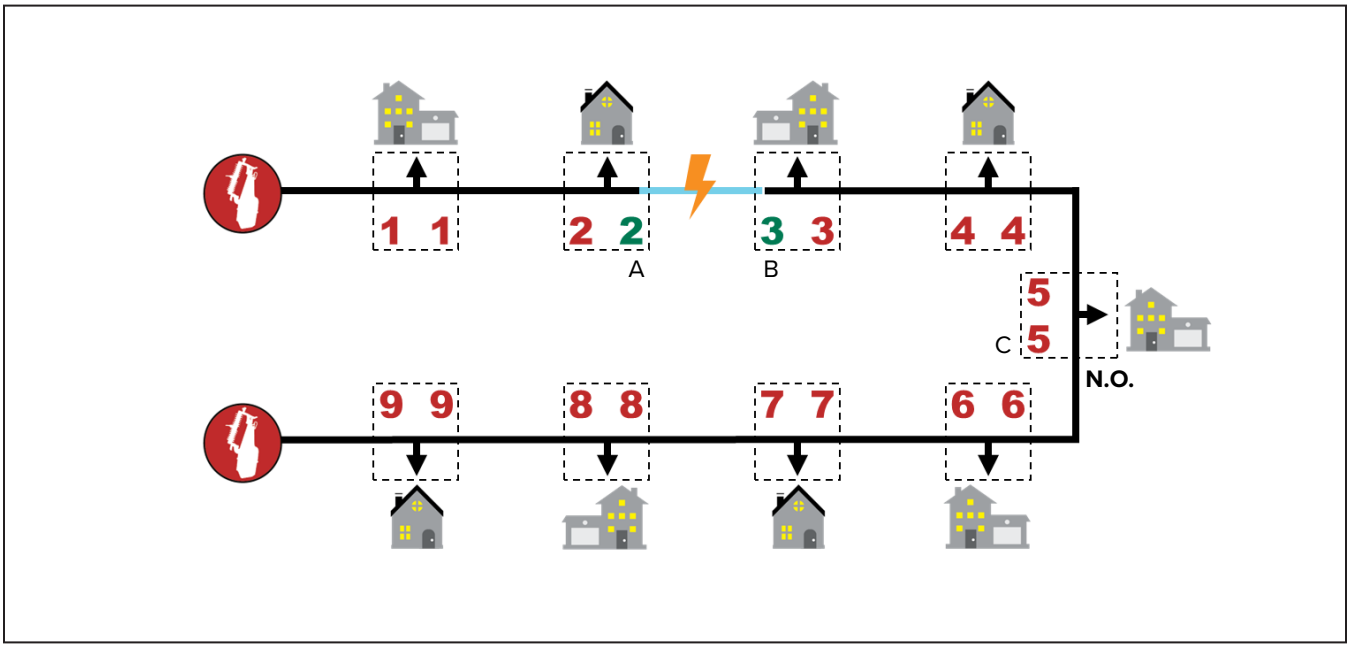


Figure 21. A loop with a faulted section of cable between Transformer 2 and 3.

Understanding the CONTROL LED Indicators

⚠ WARNING

The voltage indicator LEDs provide an indication of voltage. The absence of a voltage LED light should NOT be used to check for voltage on the cables. Test the cables for voltage in accordance with your utility practices before performing any work on the circuit.

Failure to follow these operating and safety procedures can result in serious injury.

The control provides various LED indications viewable locally. See Figure 22 and Figure 23 and Table 1 on page 23 and Table 2 on page 24.

Note: A Molex 2042200002 connector is provided to connect the control to monitoring systems that can detect a dry contact in the EdgeRestore control, which provides indication if the control is in an **Abnormal** state.

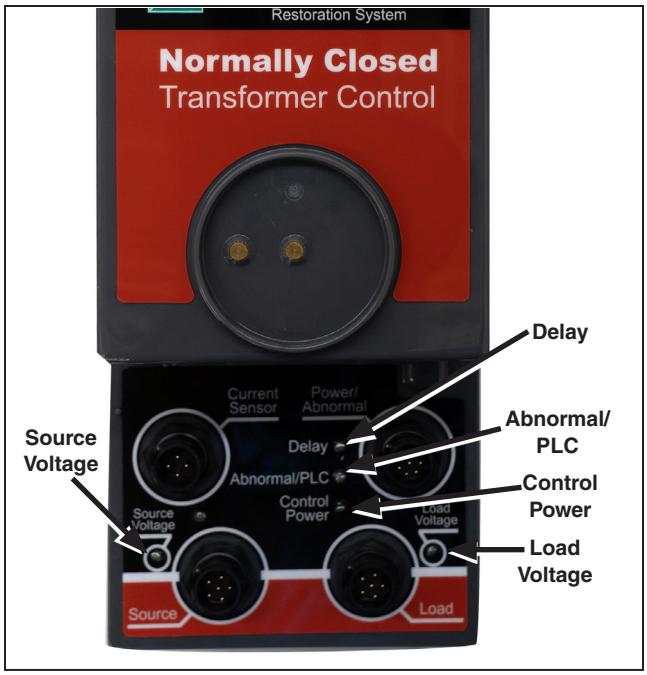


Figure 22. LED indicators on a normally closed control.

Figure 23. LED indicators on a normally open control.

Table 1. CONTROL LED Indicators – Normally Closed Control

LED Description	State	Description
No LED Indication	All LEDs dark	Indicates no control power. Use the cordless power module as required.
Delay	Red/Flashing	Flashes once per second for 10 seconds during a **Closing** sequence. Otherwise off.
Control Power	Red/Solid	Lit when control is powered either through 120 Vac or when using the 9-Vdc cordless power module.
	Red/Flashing	Indicates control power is present but the control is not charged enough to close a bushing well interrupter.
Source Voltage	Red/Solid	Solid light indicates the presence of good voltage.
	Red/Flashing	Alternating flashing of the two source voltages indicates 25% or greater system voltage across the open bushing well interrupter. In this state it will not close.
Load Voltage	Red/Solid	Solid light indicates the presence of good voltage.
	Red/Flashing	Alternating flashing of the two source voltages indicates 25% or greater system voltage across the open bushing well interrupter. In this state it will not close.
Abnormal/PLC	Green/Solid	Power line carrier communications is functioning and the control is in its **Normal** state.
	Green/Flashing	Power line carrier communications is functioning and control power is off. The control will flash green in its normal state.
	Red/Solid	One or both bushing well interrupters is in the **Open** position, an operating lever is locked out, or voltage normalization is not working.
	Red/Flashing	The system is in an abnormal condition—either because it is in the wrong state, an operating lever is locked out, or voltage normalization is not working—and the control power is off.
	White/Solid	Power line carrier communications is in **Testing** mode. Will remain white while searching for neighboring controls, and then change to green when it communicates with a neighbor control.
	White/Flashing	If only this LED and the DELAY LED are flashing, the control is in **Testing** mode and without control power. This is a normal state. If the CONTROL POWER LED (red), SOURCE VOLTAGE LED (red), LOAD VOLTAGE LED (red), and the ABNORMAL/PLC LED (white) are all blinking, the firmware has not passed its integrity check. Contact your local S&C Sales Office for more information.
	Blue/Solid	One or both bushing well interrupters are at their end of life, and the control is in a normal condition.
	Blue/Flashing	One or both bushing well interrupters are at their end of life, and there is no control power. The control is in its normal state.
	Blue/Red Alternating or Blue-off- Red-off flashing	One or both bushing well interrupters are at end of life, and the system is in an abnormal condition because it's either in the wrong state, a lever is locked out, or voltage normalization is not working. (The LED will flash blue-off/red-off when the control power is disconnected.)

Table 2. CONTROL LED Indicators – Normally Open Control

LED Description	State	Description
No LED Indication	All LEDs dark	Indicates no control power. Use the cordless power module as required.
Delay	Red/Flashing	Flashes once per second for 10 seconds during a **Closing** sequence. Otherwise off.
Control Power	Red/Solid	Lit when control is powered either through 120 Vac or when using the 9-Vdc cordless power module.
	Red/Flashing	Indicates control power is present but the control is not charged enough to close a bushing well interrupter.
NC Voltage	Red/Solid	Solid light indicates the presence of good voltage.
	Red/Flashing	Alternating flashing of the two source voltages indicates 25% or greater system voltage across the open bushing well interrupter. In this state it will not close.
NO Voltage	Red/Solid	Solid light indicates the presence of good voltage.
	Red/Flashing	Alternating flashing of the two source voltages indicates 25% or greater system voltage across the open bushing well interrupter. In this state it will not close.
Abnormal/PLC	Green/Solid	Power line carrier communications is functioning and the control is in its **Normal** state. **Note:** The normally open control may display a white (not-green) LED indication if there are no normally closed EdgeRestore system controls communicating on both sides of the normally open control.
	Green/Flashing	Power line carrier communications is functioning and control power is off. The control will flash green in its normal state.
	Red/Solid	One or both bushing well interrupters is not in its normal position, there is no voltage on the normally open cable, an operating lever is locked out, or voltage normalization is not working.
	Red/Flashing	The system is in an abnormal condition—either in the wrong state, an operating lever is locked out, a fault is next to the normally open bushing well interrupter, or voltage normalization is not working—and the control power is off.
	White/Solid	Power line carrier communications is in **Testing** mode. Will remain white while searching for neighboring controls.
	White/Flashing	If only this LED and the DELAY LED are flashing, the control is in **Testing** mode and without control power. This is a normal state. If the CONTROL POWER LED (red), SOURCE VOLTAGE LED (red), LOAD VOLTAGE LED (red), and the ABNORMAL/PLC LED (white) are all blinking, the firmware has not passed its integrity check. Contact your local S&C Sales Office for more information.
	Blue/Solid	One or both bushing well interrupters are at their end of life, and the control is in a normal condition.
	Blue/Flashing	One or both bushing well interrupters are at their end of life, and there is no control power. The control is in its normal state.
	Blue/Red Alternating or Blue-off- Red-off flashing	One or both bushing well interrupters are at end of life, and the system is not in its normal position, either because there is no voltage on the normally open cable, an operating lever is locked out, or voltage normalization is not working. (The LED will flash blue-off/red-off when the control power is disconnected.)

Powering a Control Without Transformer Power

NOTICE

Control power must be present to close the bushing well interrupters.

The EdgeRestore system's control is powered using the transformer secondaries. If the transformer is not energized, using a temporary 9-Vdc external cordless power module can power the control and allow closing of the bushing well interrupters.

The cordless power module comes in a foam-padded carrying case. See Figure 24. When not in use, the cordless power module should be stored in its carrying case. The carrying case should be stored in a protected area, such as inside a truck or indoors in a service center. Use care not to drop the cordless power module.

Contents of Cordless Power Module Kit

- Case
- Cordless power module (part number 5954 or 5955)

Note: The cordless power module for the EdgeRestore system is the same as the cordless power module for TripSaver® II Cutout-Mounted Recloser.

NOTICE

The cordless power module is not designed for extended use on an EdgeRestore Underground Distribution Restoration System.

Figure 24. The cordless power module kit.

Assembling the Cordless Power Module and Battery Replacement

Follow these steps to assemble the power module:

STEP 1. Unscrew the pull-ring from the base of the module. See Figure 25.

STEP 2. Carefully separate the battery from the battery contacts.

STEP 3. Attach the new battery to the battery contacts and train the wires back into the body of the module. Insert the battery into the body of the module. See Figure 26 and Figure 27.

STEP 4. Screw the pull-ring onto the base of the module.

Battery Life

Battery life depends on the brand of 9-Volt battery used in the cordless power module. S&C recommends using a 9-Volt lithium (L522) battery. Do not use rechargeable or zinc-carbon batteries.

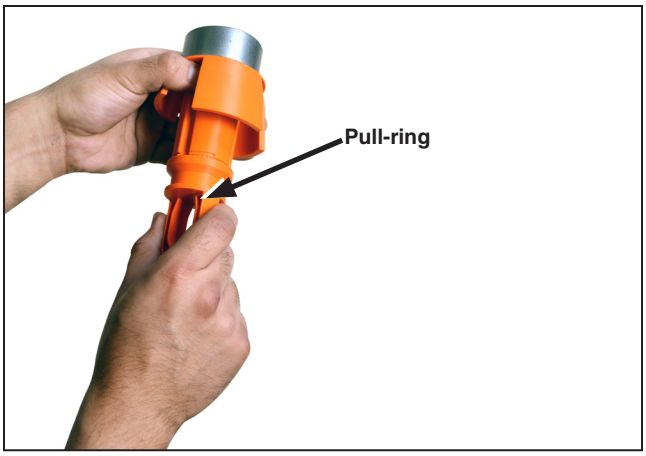


Figure 25. Unscrew the pull-ring from the base of the module.

Figure 26. The battery compartment inside the cordless power module.

Figure 27. Train the wires inside the body of the module and replace the pull-ring.

Using the Cordless Power Module

To power the control, attach the cordless power module as shown in Figure 28. Wait for the battery to charge the control. During charging, the CONTROL POWER LED will flash, and will turn solid when there is enough power to close the bushing well interrupters. After closing the bushing well interrupters, make sure to remove the power module.

Cable Testing

Disconnect the section of cable being thumped from the EdgeRestore Bushing Well Interrupter before testing.

⚠ WARNING

When it is necessary to test the cables connected to a transformer, proper isolation of the power-frequency source from the dc test source must be maintained. Follow the recommendations of the manufacturer of the dc test equipment or fault-locating equipment. The user's operating and safety procedures should be followed for grounding the cable, connecting the dc test source (in case of flashover), ungrounding the cable, applying the dc test source, discharging the cable, and regrounding the cable.

Failure to follow these operating and safety procedures can result in serious personal injury, death, or equipment damage.

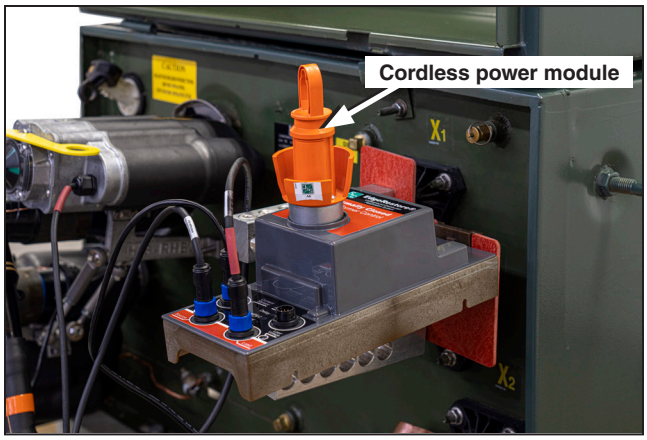


Figure 28. The power module connected to the control.

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.