Installation

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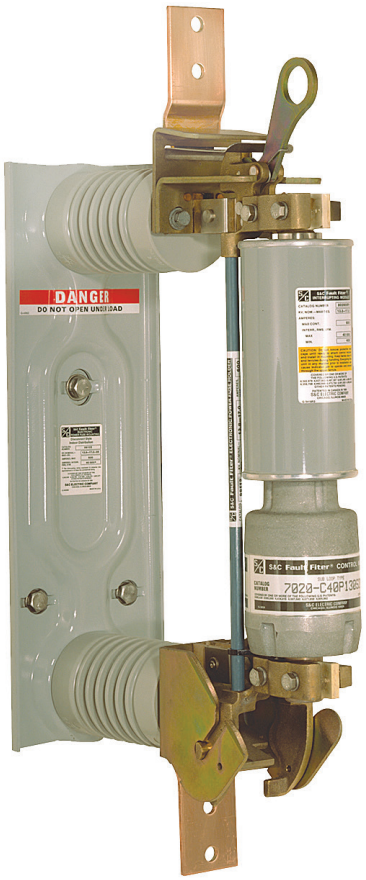


Qualified Persons

⚠ 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 S&C Instruction Handbook before installing or operating your Fault Fiter Electronic Power Fuses. Familiarize yourself with the Safety Information and Safety Precautions on pages 3 and 4. 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 your S&C Fault Fiter Electronic Power Fuses. Designate a location where you 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 S&C Fault Fiter Electronic Power Fuses are listed in the ratings table in Specification Bulletin 441-31. The ratings are also 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 your Fault Fiter Electronic Power Fuse. Familiarize yourself 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 you do not understand any portion of this instruction sheet and need assistance, contact your 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 Monitoring and Support Center at 1-888-762-1100.

NOTICE

Read this instruction sheet thoroughly and carefully before installing your Fault Fiter Electronic Power Fuse.

Replacement Instructions and Labels

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

⚠ DANGER

Fault Fiter Electronic Power Fuses operate 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 Fault Fiter Electronic Power Fuses must be restricted only to qualified persons. See the "Qualified Persons" section on page 2.
2. **SAFETY PROCEDURES.** Always follow safe operating procedures and rules. Always maintain proper clearance from energized components.
3. **PERSONAL PROTECTIVE EQUIPMENT.** Always use suitable protective equipment, such as rubber gloves, rubber mats, hard hats, safety glasses, arc-flash clothing, and fall-protection, in accordance with safe operating procedures and rules.
4. **SAFETY LABELS AND TAGS.** Do not remove or obscure any of the "DANGER," "WARNING," "CAUTION," or "NOTICE" labels and tags. Remove tags ONLY if instructed to do so.
5. **ENERGIZED COMPONENTS.** Always consider all parts live until de-energized, tested, and grounded. All voltage transformers must be disconnected when external voltage is used to test any secondary-side wiring or devices, to avoid energizing the high-voltage conductors through the voltage transformers. Draw out the voltage transformers completely if draw out-type transformers are provided. Otherwise, remove the primary fuses of the voltage transformers and disconnect the secondaries by removing the secondary fuses or by disconnecting the secondary leads.
6. **TEST FOR VOLTAGE.** Qualified persons should be certain that they have, and know how to operate, the correct test equipment for determining the voltage on both sets of power terminals in any circuit breaker, power fuse, or interrupter switch equipment.
7. **MAINTAINING PROPER CLEARANCE.** Always maintain proper clearance from energized components.
8. **DO NOT REMOVE THE INTERRUPTING OR CONTROL MODULES FROM THEIR CARTONS UNTIL READY TO USE.**
9. **HANDLE INTERRUPTING AND CONTROL MODULES WITH CARE.** Do not drop or throw them.
10. **ENERGIZING EQUIPMENT.** When returning the equipment to service, the following procedure should be observed:
    - Make certain each switchgear or vault door permitting access to high voltage is closed and latched before energizing the circuit or operating any switching device.
    - Make sure any grounding switch is opened, or other grounding means removed before closing the associated interrupter switch(es).
    - Lock interrupter switches in the **Open** or **Closed** position as dictated by circumstances.
    - Make sure all doors and switch-operating handles are fully locked before leaving the installation site, even momentarily. Observe this procedure even in those cases where the gear is accessible only to qualified persons.

A Fault Fiter Electronic Power Fuse consists of a mounting, a holder, a control module, and an interrupting module, as shown in Figure 1. The control module includes a current transformer and electronic circuits that provide source power, current sensing, and electronically determined time-current characteristics for the fuse.

The interrupting module carries load current continuously through a main current section and, during a fault condition, transfers current to a circuit-interrupting section in response to a signal from the control module. Following a fault-clearing operation, the interrupting module is replaced. The control module is reusable.

The following instructions are for installation of interrupting modules and control modules in S&C Fault Fiter Electronic Power Fuse Mountings and S&C TransFuser™ Mountings.●

● S&C TransFuser Mountings are available in S&C PME Pad-Mounted Gear only.

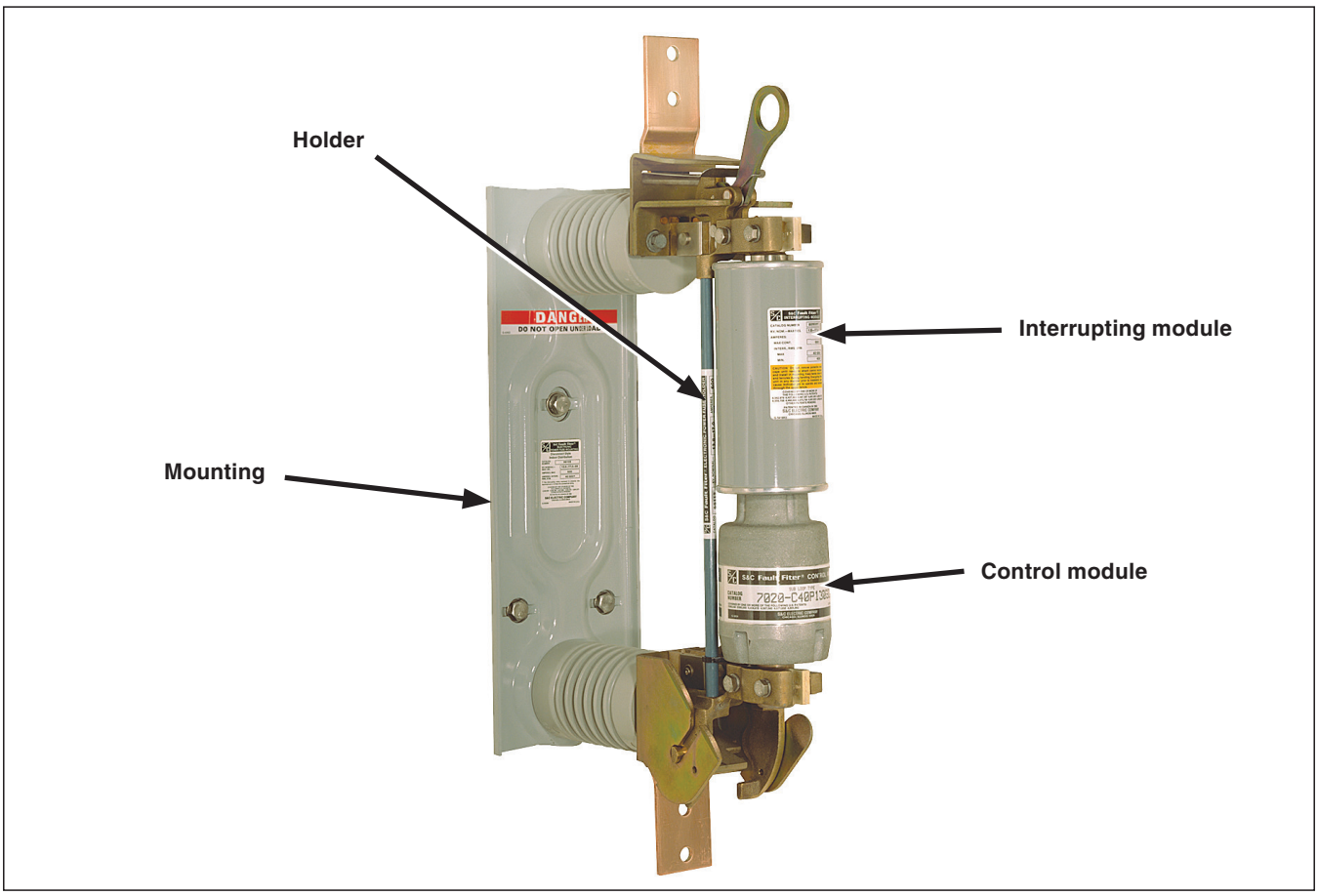


Figure 1. A Fault Fiter Electronic Power Fuse (600-ampere disconnect style shown).

S&C Fault Fiter Electronic Power Fuses with instantaneous- or compound-curve type control modules may not be applied in series with current-limiting fuses unless they are installed in conjunction with a separate relay-actuated three-phase load-interrupter switch, such as a switch-operator driven S&C Mini-Rupter® Switch with an S&C Type SPD Open-Phase Detector. This will provide electrical isolation of the circuit in the event either the Fault Fiter fuse or the series current-limiting fuse is left in a partially operated condition resulting from miscoordination and the attendant response of both fuses to the same system fault. See Table 1.

Table 1. Minimum Distances to Source-Side Capacitor Banks①

S&C Fault Fiter Fuse Voltage Rating, kV, Nom.	Maximum Available Short-Circuit Current at Fault Fiter Fuse, Amperes, RMS Sym.②	Minimum Distance to Nearest Source-Side Capacitor Bank, Feet (m)③	
		Overhead Line	Cable
4.16	10 000 20 000 30 000 40 000	450 (137) 750 (229) 850 (259) 1 350 (411)	1 600 (488) 2 700 (823) 3 000 (914) 4 700 (1433)
13.8	10 000 20 000 30 000 40 000	1 200 (366) 2 000 (610) 2 400 (732) 3 700 (1128)	4 200 (1280) 7 000 (2134) 8 400 (2560) 13 000 (3962)
25	10 000 20 000 30 000 40 000	2 000 (610) 3 400 (1036) 4 100 (1250) 6 200 (1890)	7 000 (2134) 12 000 (3658) 14 500 (4420) 21 700 (6614)

① Distance restrictions do not apply to Fault Fiter fuses with inverse or time-delayed compound-curve-type control modules, nor do they apply to capacitor banks located on the remote side of a transformer.

② The short-circuit-current value selected should reflect anticipated system growth.

③ Shorter distances may apply in the case of certain circuit configurations. Refer to the nearest S&C Sales Office for information.

S&C Fault Fiter Electronic Power Fuses may sometimes be installed in proximity to source- or load-side capacitor banks. In such circumstances, minimum overhead-line or cable distances between the capacitor bank and Fault Fiter fuse may be required to ensure proper response of a Fault Fiter fuse to system conditions. The minimum overhead-line and cable distances listed in Tables 1, 2, and 3 apply only to S&C Fault Fiter Electronic Power Fuses with instantaneous- or compound-curve type control modules applied in proximity to capacitor banks. S&C Fault Fiter Electronic Power Fuses with inverse- or time-delayed compound-curve type control modules are not affected by nearby capacitor banks.

Moreover, the minimum overhead-line and cable distances listed in the tables do not apply to Fault Fiter fuses when nearby capacitor banks are located on the remote side of a transformer. In addition, inductance in the form of series reactors, which may typically be present in source-side substations, will minimize the effects of nearby capacitor banks, thereby reducing or eliminating the minimum distance requirement. For application assistance, refer to the nearest S&C Sales Office.

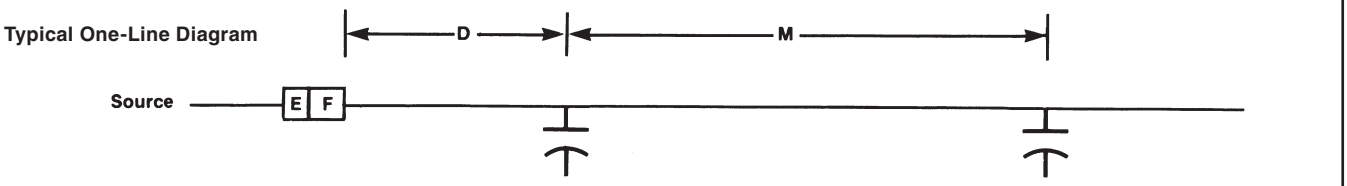
Table 2. Minimum Distances to Load-Side Capacitor Banks—Single Banks①

S&C Fault Fiter Fuse Voltage Rating, kV, Nom.	Capacitor-Bank Rating, kvar, Three-Phase	Minimum Distance to Nearest Load-Side Capacitor Bank, Feet (m)	
		Overhead Line	Cable
4.16	900 or less	No restrictions apply	No restrictions apply
	1200●	450 (137)	1600 (488)
13.8	2700 or less	No restrictions apply	No restrictions apply
	3000 3600●	950 (290) 1200 (366)	3400 (1036) 4200 (1280)
25	3600● or less	No restrictions apply	No restrictions apply

① Distance restrictions do not apply to Fault Fiter fuses with inverse or time-delayed compound-curve type control modules, nor do they apply to capacitor banks located on the remote side of a transformer.

● For larger capacitor banks, refer to the nearest S&C Sales Office.

Table 3. Minimum Distances to Load-Side Capacitor Banks—Two Banks①



S&C Fault Fiter Voltage Rating, kV, Nom.	Capacitor-Bank Rating, ② kvar, Three-Phase	Minimum Distance (M) Between Capacitor Bank, Feet (m)			
		Overhead Line		Cable	
4.16		**D = less than 500 feet (152)**	**D = 500 feet (152) or more**	**D = less than 1800 feet (549)**	**D = 1800 feet (549) or more**
	450 or less	150 (46)	No restrictions apply	550 (168)	No restrictions apply
	600	250 (76)	No restrictions apply	900 (274)	No restrictions apply
	900	1200 (366)	400 (122)	4200 (1280)	1400 (427)
13.8		**D = less than 1500 feet (457)**	**D = 1500 feet (457) or more**	**D = less than 5400 feet (1646)**	**D = 5400 feet (1646) or more**
	2700 or less	450 (137)	No restrictions apply	1600 (488)	No restrictions apply
	1800	750 (229)	No restrictions apply	2700 (823)	No restrictions apply
	2400	3600 (1097)	1200 (366)	12 600 (3840)	4200 (1280)
25		**D = less than 2500 feet (762)**	**D = 2500 feet or more (762)**	**D = less than 8500 feet (2591)**	**D = 8500 feet or more (2591)**
	2400 or less	No restrictions apply	No restrictions apply	No restrictions apply	No restrictions apply
	2700	750 (229)	No restrictions apply	2600 (792)	No restrictions apply
	3300	1200 (366)	No restrictions apply	4200 (1280)	No restrictions apply
	3600	1450 (442)	No restrictions apply	5100 (554)	No restrictions apply

① Distance restrictions do not apply to Fault Fiter fuses with inverse or time-delayed compound-curve type control modules, nor do they apply to capacitor banks located on the remote side of a transformer.

② Minimum distances are based on two capacitor banks of the same rating. For applications involving capacitor banks of unlike ratings, ratings larger than those listed, or more than two load-side capacitor banks, refer to the nearest S&C Sales Office.

A Note on System Voltage Ratings

Fault Fiter Electronic Power Fuses should be selected having a maximum voltage rating equal to or greater than the system line-to-line voltage because the fuse can be exposed to full system line-to-line voltage in clearing faults. To ensure proper coordination of Fault Fiter fuses with system surge arresters, it is also important the system voltage not be too low relative to the Fault Fiter fuse's voltage rating. To satisfy both of these requirements, the following specific system-voltage recommendations should be observed:

Table 4. System Voltage Ratings

S&C Fault Fiter Voltage Rating, kV		Applicable System Voltage, kV
Norm.	Max	
4.16	5.5	4.16 and 4.8
13.8	17.0	12.0 through 16.5
25	29	22.9 through 27.6

Complete the following steps when setting up the fuse:

STEP 1. Remove the Fault Fiter fuse interrupting module and control from their shipping cartons. Then, remove the plastic cap from the control module and the two orange-colored protective end-caps from the interrupting module.

> **⚠ CAUTION**
>
> Do not remove protective end-caps from the interrupting module until ready to attach the control module and install it in the mounting. When handling, keep hands clear of the indicator ferrule. Energizing this unit in any manner prior to installation can cause the indicator pin to operate and extend through the indicator ferrule.

STEP 2. Assemble the control module to the interrupting module, as shown in Figure 2, taking care to align the two modules before engaging the threaded connection. The two modules should be hand-tightened only.

STEP 3. Loosen the ⅜-inch stainless steel bolts on the upper (latch-end) clamp of the holder. See Figure 3 on page 10.

Note: Holders for S&C TransFuser Mountings rated 13.8 kV include an adapter prong that should be removed from the upper clamp of the holder and installed (and fully seated) on the control-module ferrule at this time. Tighten the clamping screw on the adapter prong. See Figure 4 on page 10.

STEP 4. Loosen the ⅜-inch stainless steel bolts on the lower clamp, and remove the clamp from the holder.

STEP 5. Place the control module and interrupting module assembly in the holder by seating the ferrules in the clamps, as shown in Figure 3 or 4 (as appropriate) on page 10. Make sure the interrupting module is positioned toward the pull-ring when installed in holders for Fault Fiter Electronic Power Fuse mountings (see Figure 3 on page 10) and toward the pivot casting when installed in holders for S&C TransFuser Mountings. See Figure 4 on page 10. Rotate the control module and interrupting module assembly so the specification data stamped on the control-module housing can be viewed when operating the fuse; i.e., when facing the pull-ring.

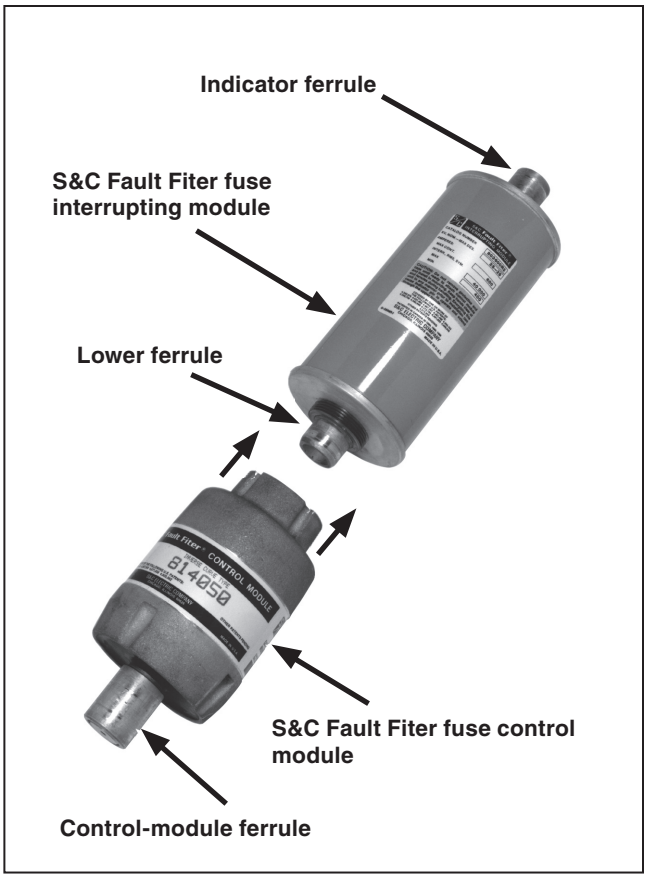


Figure 2. Assembling the control module to the interrupting module.

STEP 6. Replace the lower clamp and fully tighten both bolts. Next, fully tighten the two bolts on the upper clamp. The holder is now ready for installation in the S&C Fault Fiter Electronic Power Fuse Mounting or TransFuser Mounting (as appropriate).

Note: For instructions on the operation of S&C Fault Fiter Electronic Power Fuses, refer to S&C Instruction Sheet 441-535 or 441-540, as applicable. For instructions on the operation of S&C TransFuser Mountings, refer to S&C Instruction Sheet 665-500.

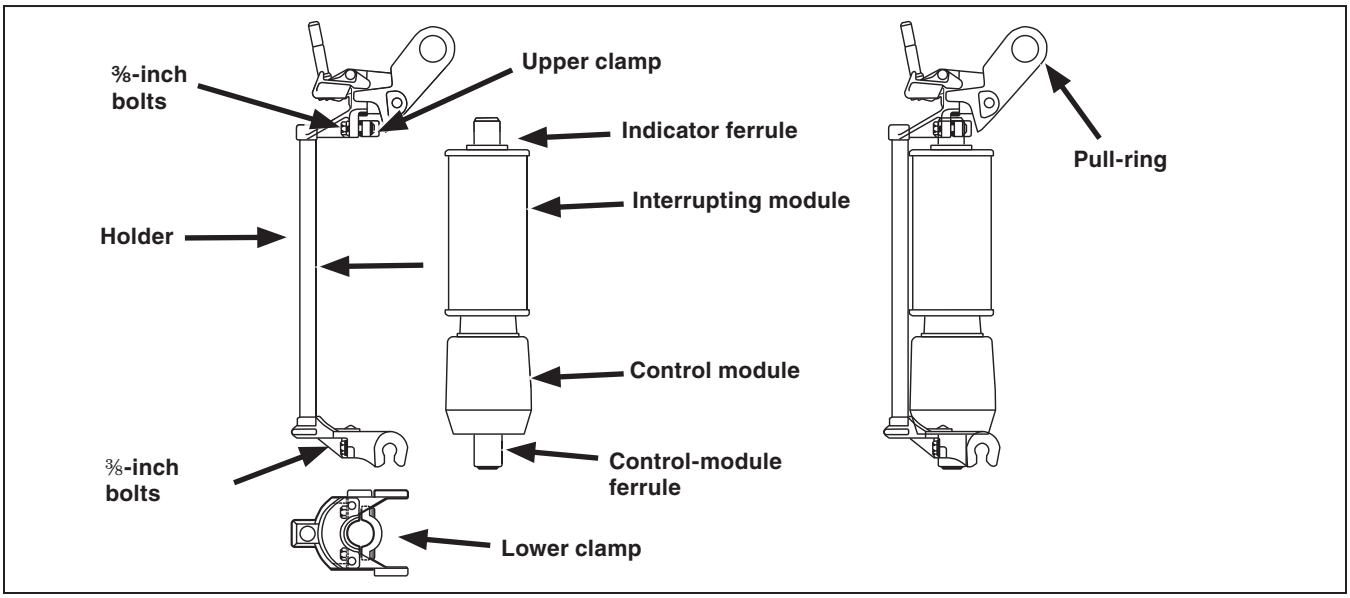


Figure 3. Installing the control module and interrupting module assembly in holders● for S&C Fault Filter Electronic Power Fuse Mountings with Uni-Rupter® Interrupters.

● Holder for mounting with Uni-Rupter Interrupter illustrated; the installation procedure for a holder for a 600-ampere disconnect-style mounting is similar.

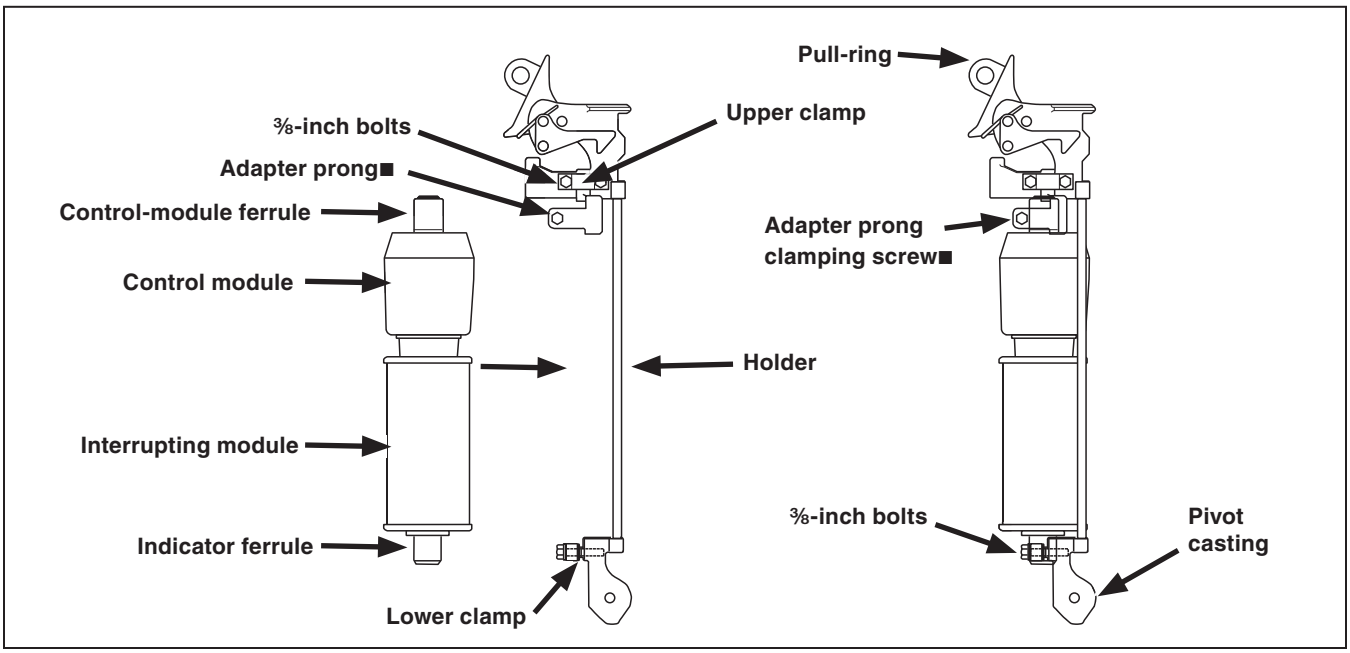


Figure 4. Installing the control module and interrupting module assembly in holders for S&C TransFuser Mountings.▲

■ Adapter prong must be removed from the holder and be installed on the control-module ferrule prior to placement of the control module and interrupting module assembly in the holder (13.8-kV holders only).

▲ S&C TransFuser Mountings are offered in S&C PME Pad-Mounted Gear only.

The interrupting module features a blown-fuse indicator (to indicate when re-fusing is required) that projects from the indicator ferrule when the fuse has operated. See Figure 5.

Complete the following steps when re-fusing:

STEP 1. Remove the interrupting module and control module assembly from the holder by loosening the bolts on the upper clamp and by removing the lower clamp. See Figures 3 and 4 on page 10, as appropriate.

STEP 2. Unscrew the blown interrupting module from the control module. Discard the blown interrupting module.

STEP 3. Remove the replacement interrupting module from its shipping carton. Then, remove the two orange-colored protective end caps from the module.

⚠ WARNING

Do not remove protective end-caps from the interrupting module until ready to attach the control module and install it in the mounting. When handling, keep hands clear of the indicator ferrule. Energizing this unit in any manner prior to installation can cause indicator pin to operate and extend through the indicator ferrule.

STEP 4. Assemble the replacement interrupting module to the control module as shown in Figure 2 on page 9, taking care to align the two modules before engaging the threaded connection. The two modules should be hand-tightened only.

When re-fusing a disconnect style Fault Fiter Electronic Power Fuse Mounting or S&C Trans-Fuser Mounting, install the interrupting module and control module assembly in a holder as described in Steps 5 and 6 of the "Fusing" section on pages 9 and 10.

Note: If a control module is replaced, for example, to obtain different time-current characteristics, transfer the plastic cap from the replacement control module to the original control module. When making such a replacement on S&C TransFuser Mountings, be sure to remove the adapter prong from the original control module and re-install on the replacement control module. Refer to Step 3 on page 9.

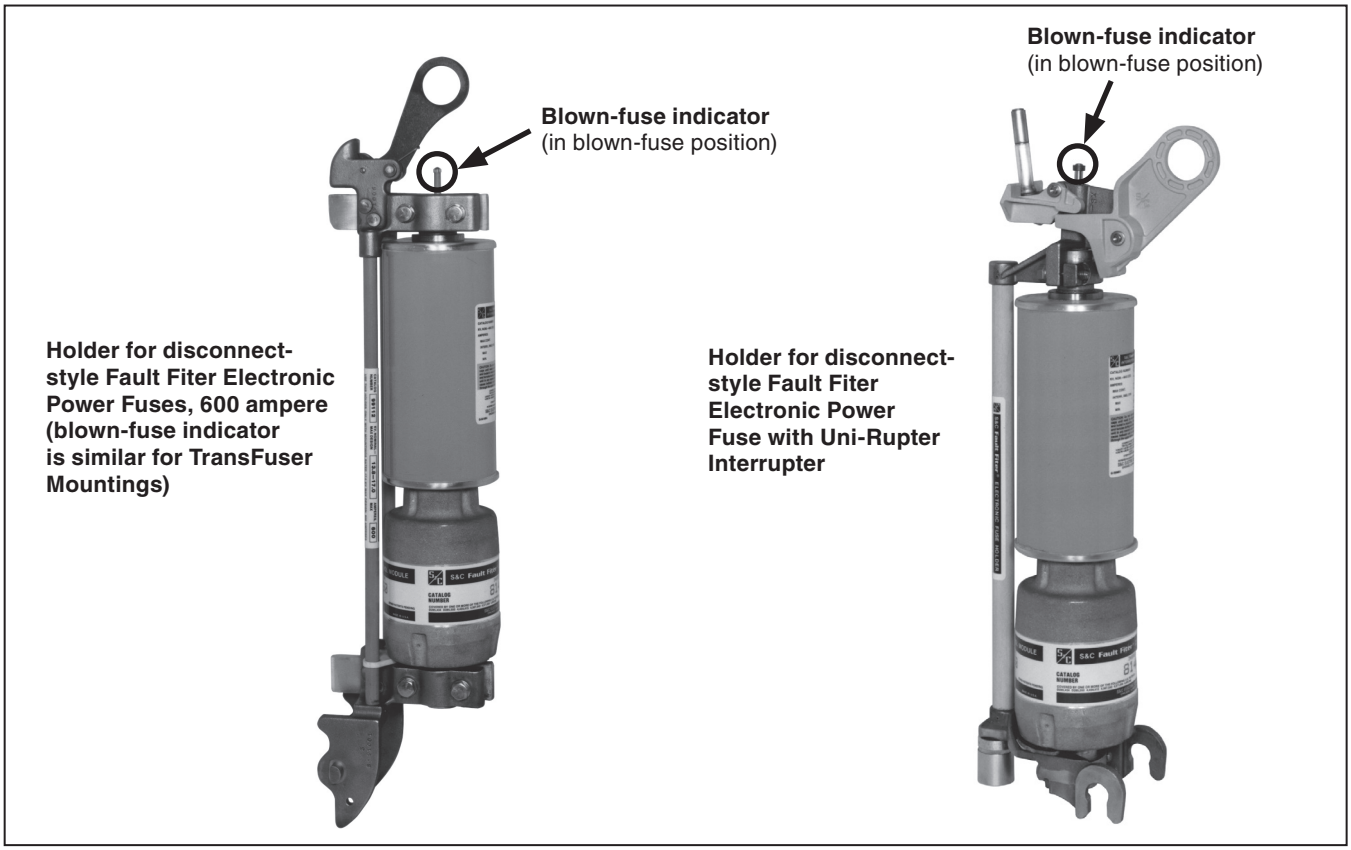


Figure 5. Blown-fuse indicator.