TYPE FTDF
INSTRUCTIONS FOR INSTALLATION AND OPERATION
15kV • 25kV

Figure 1. External views of elbow compartment (at top) and fuse compartment (at bottom) of FTDF enclosure.

Qualified Persons

⚠ WARNING

The equipment covered by this publication must be selected for a specific application and it must be operated and maintained by **Qualified Persons** who are thoroughly trained and knowledgeable in the installation, operation, and maintenance of underground power distribution equipment along with the associated hazards that may be involved. This publication is written only for such qualified persons and is not intended to be a substitute for adequate training and experience in safety procedures for this type of equipment. Proper installation is the responsibility of the operating and construction personnel and the utility performing and authorizing the work. Completion of these instructions implies no further warranty by the manufacturer.

A **Qualified Person** is defined in the National Electrical Code (NEC/NFPA-70) as:

One who has skills and knowledge related to the construction and operation of the electrical equipment and installations and has received safety training to recognize and avoid the hazards involved.

The specific electrical safety training requirements to be considered a qualified person are detailed in **NFPA-70E, Article 110.1(D), Employee Training**. Some of the requirements from the 2012 edition are shown below. For the specific detailed training requirements for a Qualified Person make certain to refer to the most recent applicable edition.

These training requirements would include, but are not limited, to the following key points:

- The skills and techniques necessary to distinguish exposed energized parts from other 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 the special precautionary techniques, personal protective equipment, insulating and shielding materials, and insulated tools for working on or near exposed energized parts of electrical equipment.
- Tasks performed less often than once per year have additional training requirements.

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. Additionally, the recommendations in this instruction bulletin are not intended to supersede or to take the place of established utility safety guidelines and established practices. If there is any question, consult with your foreman or supervisor, as appropriate.

Please refer to OSHA 29 CFR 1910.399 and NFPA 70E Articles 100 and 110.

SAFETY INFORMATION

Understanding Safety-Alert Messages

There are several types of safety-alert messages which may appear throughout this instruction bulletin as well as on labels attached to the pad-mounted switchgear. Familiarize yourself with these types of messages and the importance of the various signal words, as explained below.

⚠ DANGER

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

⚠ WARNING

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

⚠ CAUTION

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

NOTICE

NOTICE is used to address practices not related to physical injury.

SAFETY INSTRUCTIONS

Safety Instructions (or equivalent) signs indicate specific safety-related instructions or procedures.

SAFETY PRECAUTION

⚠ DANGER

Federal Pacific Fuse Mountings in conjunction with appropriate fuses are designed to protect equipment and to disconnect faulted equipment from the system. The fuses cannot protect personnel from injury or electrocution if contact is made with energized circuits or hardware.

FOLLOWING SAFETY INSTRUCTIONS

NOTICE

Thoroughly and carefully read this instruction bulletin before installation of the pad-mounted switchgear, before switching with elbows or operating the fuse mountings in this equipment, and before performing any maintenance on the equipment.

If you do not understand any portion of this instruction bulletin and need assistance, contact the Switchgear Division of Federal Pacific at 276-466-8200.

Replacement Instructions & Labels

If you need additional copies of this instruction bulletin, contact Federal Pacific at 276-466-8200.

It is important that any missing, damaged, or faded labels on the equipment be replaced immediately. Replacement labels are available by contacting Federal Pacific.

Introduction

FTDF pad-mounted switchgear is designed to provide dependable on-the-line service and to make installation, operation and maintenance as simple as possible.

High quality materials and careful workmanship have been combined to provide the best switchgear available. The switchgear has been thoroughly inspected and adjusted at the factory. However, successful operation depends on proper installation and care.

This manual has been written to assist you in obtaining long and economical service from your switchgear.

Read this manual before installing and operating your switchgear.

Receiving

Upon receipt of the switchgear, check each item received for shipping damage. Each item should be checked against the shipping manifest to assure that the proper number of items were received. Should any shortage or damage exist, note it on the shipping papers. A claim should be filed at once with the carrier and the Federal Pacific agent or sales office should be notified.

NOTICE

The carrier is responsible for all damage occurring during transit. Receiving personnel must note all damage to equipment on shipping papers so that claims can be processed.

Handling

Removable lifting plates are provided to allow the use of hooks to lift the complete enclosure. The lifting device should be arranged to evenly distribute the lifting force between the lifting plates.

⚠ CAUTION

Do not lift at an angle less than 60° from the horizontal. See Figure 2. Failure to comply with this requirement may result in damage to the equipment.

The switchgear is securely mounted to a sturdy shipping pallet with provisions for forklift use. The use of a forklift truck is not recommended, but if this method is used the forks must extend completely through the skid to avoid damaging the equipment.

Storage

The switchgear as received may be wrapped in a protective plastic film, which must be removed for storage.

NOTICE

To avoid damage to the enclosure finish, the protective film must be removed for outdoor storage of unit.

Export or special packing is available as an option based on customer's requirements and special conditions. Separate instructions are available for these situations.

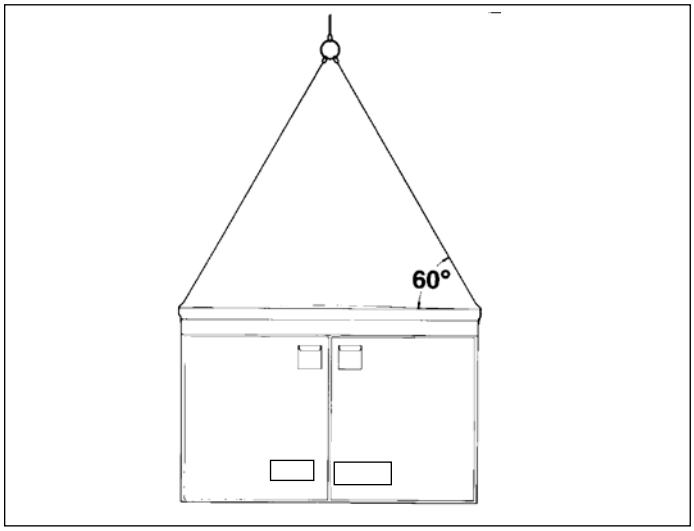


Figure 2. Lifting Method

General Description

FTDF dead-front pad-mounted switchgear consists of one or more single-pole, single-throw fuse mountings equipped with 200 ampere bushing wells to accommodate 200 ampere load-break (or non-loadbreak) inserts and elbows. Alternately, fuse mountings may be optionally equipped with 600 ampere bushings to accommodate 600 ampere elbow connectors. When used in conjunction with power fuses, expulsion or current-limiting type, and other protective devices, the FTDF switchgear provides a secure and efficient means of single-pole switching with elbows on the incoming lines and circuit protection with fuses, which alternately can provide single-pole live switching of fuses on load feeders when equipped with load-break fuse mountings.

Security Features

FTDF pad-mounted switchgear incorporates a number of security features to minimize hazards to operating personnel.

1. Rugged 11-gauge steel, using all welded construction of the enclosure, with a bolted roof, and hinged and bolted doors assures a tamper-resistant design.
2. Padlockable doors with security bolts provide customer-controlled access.
3. Positive latch indicators on load-break fuse mountings verify positive latching of installed fuses.
4. Hazard-alert signs and labels, both external and internal, indicate potential hazards to personnel.
5. Full-width fiberglass barriers (or optional clear polycarbonate barriers) behind doors on fuse compartment.

Pad-Mounted Door System

The door system consists of an Active Door, with a latching mechanism, which typically overlaps a Passive Door, which, in turn, is secured by means of security bolts or latches. In this design, the active door must be unlatched and opened, prior to gaining access to the security bolts or latches on the passive door.

In some designs, all doors are "active", each having its own door latch mechanism.

Figure 3. The door handle and door latch pocket are stainless steel. The padlock is removed, allowing access to the security bolt.

Active Door with Three-Point Latching System

The "Slim-Line" (also called a "pocket-handle") Manual Door Latch System incorporates a flush door handle and lock cover recessed in the door latch pocket on the exterior of the Active Door, with a manual, three-point latching system on the interior.

In order to operate the "Slim-Line" manual latch, the padlock securing the door handle/cover to the door latch pocket must first be removed, allowing access to the security bolt. See Figure 3.

The captive pentahead (or optional hexhead) security bolt is rotated counter-clockwise for several revolutions, until the security bolt is freed from the door latch pocket. Do not use power tools. See Figure 4.

Figure 4. Door handle cover is secured closed by a penta-head (or hex-head) bolt. Turn socket counter-clockwise to loosen bolt. ***Do not use power tools.***

Next, the door handle/cover is lowered by means of the hinge connecting the bottom of the door handle to the bottom of the door pocket (see Figure 5). This lowering of the handle/cover operates the manual three-point latching system on the interior (see Figure 6), thereby releasing the active door.

Figure 5. Lower handle to unlatch the door.

After the door is unlatched and opened, the door is secured open with a wind-brace at the top of the door. See Figure 12 on page 6.

Passive Door

The passive door is overlapped by the active door, ensuring that the primary latching mechanism must first be released and the active door opened before accessing the passive door. Once accessed, the passive door is released by loosening two captive security bolts (pentahead, standard or hexhead, optional), or, in some cases, a retaining door latch. See Figure 12 on page 6.

Once again, a wind-brace at the top of the door is used to secure the door in the open position.

Figure 6. Interior vieew of the active door showing the three-point door latch mechanism (to the right). This door is also equipped with optional fuse-storage hooks and is pictured with a complete fuse assembly in the stored position.

Slim-Line Door Latch Features

- Stainless steel door handle/lock cover and the door latch mechanism pocket. See Figure 3.
- The slim-line latch provides secure manual three-point latching of the active door. See Figure 6.
- Stainless steel interior manual latching system ensures reliable operation. See Figure 6.
- Padlock must be removed before accessing security bolt and cannot be reinstalled until the security bolt had been fully tightened. See Figure 7.
- Padlock directly secures the active door to the enclosure. See Figure 8.
- Stainless steel wind braces. See Figure 12 on page 6.
- A closed, latched, and padlocked door can successfully withstand a "pull" greater than 600 pounds at any point on the door.

Figure 7. Padlock cannot be inserted until pentahead bolt is fully tightened.

Figure 8. Always close, latch and padlock the enclosure door before leaving the unit or when working on the opposite side.

Installation

Each unit is shipped with this instruction bulletin which is located inside the fuse compartment door. These instructions should be reviewed prior to placing unit on pad.

Placement of Unit

Remove unit from shipping pallet per handling procedures on Page 3 (see Figure 2). When unit has been correctly oriented and placed on pad (see Figure 9), verify that unit is level and shim if necessary between unit base and pad. Secure unit to pad using four (4) tie-down clips as furnished (see Figures 10 and 11). Check compartment door operation for any binding due to enclosure distortion and re-shim if necessary. A recessed grouting should then be applied between unit base and pad to prevent entry of foreign objects and moisture.

Customer Cable Connections

1. Make up the primary cable connections per user's standard URD operating procedures, cable manufacturer instructions, and elbow terminator manufacturer instructions.

2. Connect the concentric neutral wires to the enclosure ground pads inside enclosure to facilitate ground system conforming to user's grounding procedures.

⚠WARNING

The maximum momentary rating of the switchgear must be considered when selecting cable size for connecting switchgear to system ground. Refer to unit rating sheet on inside of doors.

3. Install fault indicators, if applicable in accordance with the manufacturer's instructions.

⚠WARNING

Before energizing the switchgear, remove all yellow and red shipping caps on bushings and bushing wells, and replace them with a suitable system of insulated separable connectors (elbows), insulating protective covers, or plugs, as appropriate.

Failure to replace the shipping caps may result in flashover, equipment damage, serious personal injury, or death.

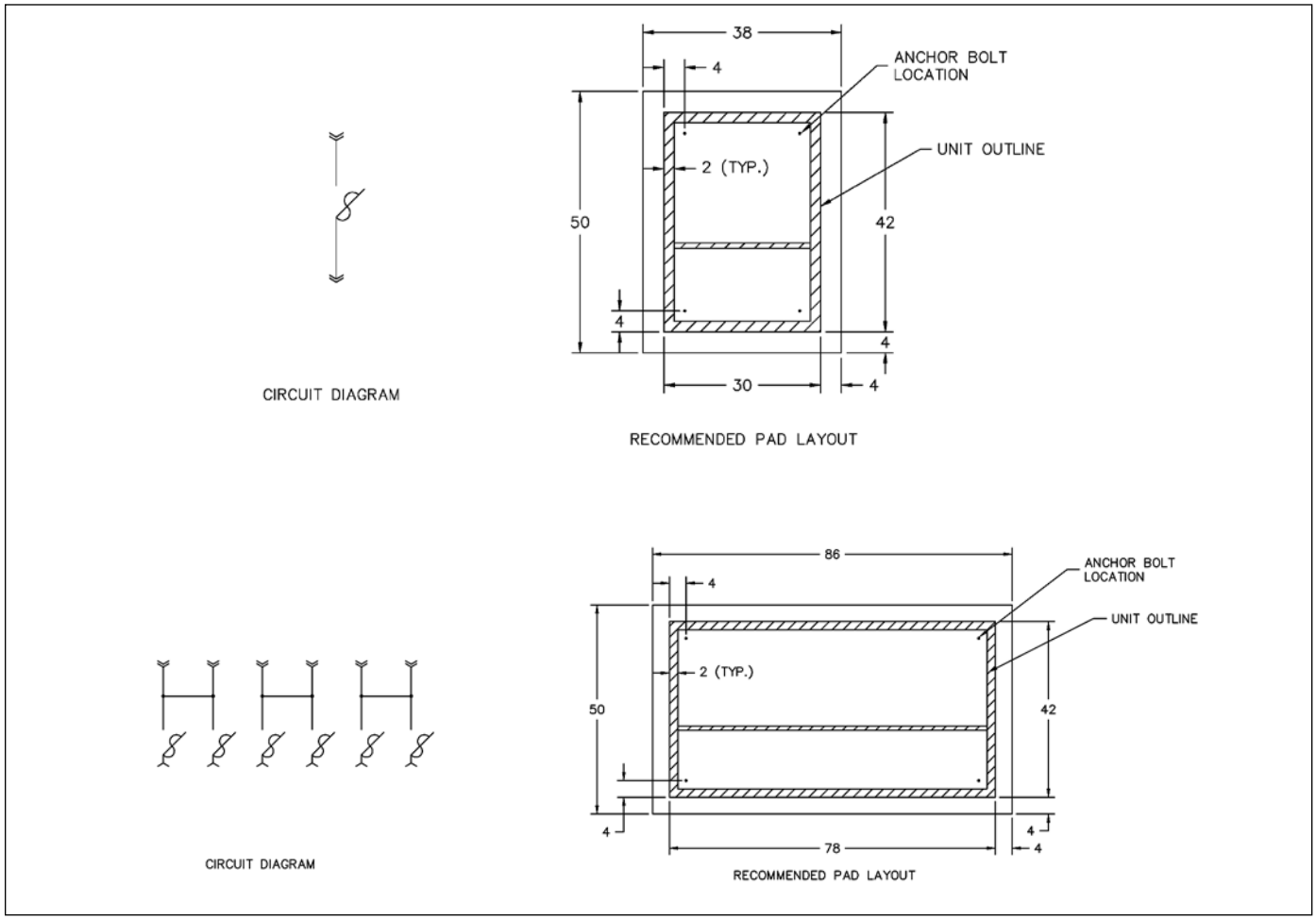


Figure 9. Typical pad layouts and associated circuit diagrams. DO NOT USE FOR CONSTRUCTION PURPOSES.

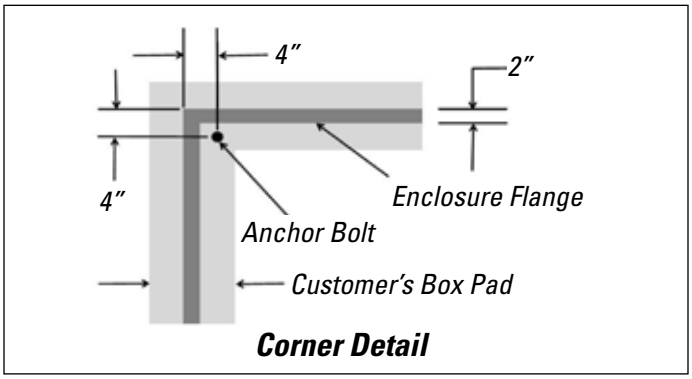


Figure 10. Typical Anchor Bolt Location

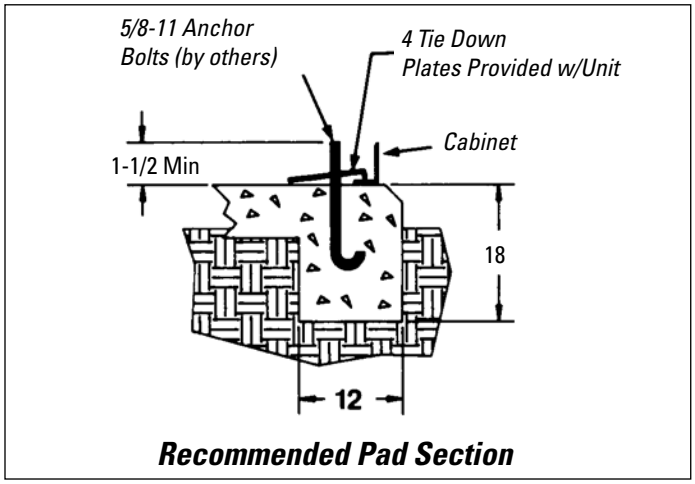


Figure 11. Bolting Units to Pad

Bushing Wells and Bushings

Federal Pacific FTDF Pad-Mounted Switchgear is furnished with a choice of either 200- ampere bushing wells or 600 ampere bushings on the line side or load side. The bushing wells and bushings meet ANSI 386 standard requirements.

Bushing Wells

The 200 ampere bushing wells accommodate 200 ampere elbow (separable insulated) load-break connectors and accessories. The units are shipped with a yellow dust cover over each bushing well to prevent contamination. Dust covers are NOT capable of providing any electrical insulation at medium voltage levels. Therefore, if an elbow is not to be connected to a bushing well, prior to energization the dust cover MUST be removed and replaced with an insulating protective bushing well plug. See Figure 12.

Install load-break inserts following the insert manufacturer's instructions supplied therewith. Terminate cables and install 200 ampere load-break elbows and accessories following instructions provided by the cable manufacturer and the elbow manufacturer. The 200 ampere elbows are a load-break device and, if standard system operating practices and conditions permit, may be removed when the equipment is energized, providing single-pole load-break live switching is performed using insulated shotgun clamp sticks. Before performing any live-switching with elbows, install insulating feed-through standoff bushings on the parking stand adjacent to the load-break elbow to be switched.

Figure 12. Views of FTDF elbow-compartment side with doors closed (at left) and open (at right) to show customer selected bushing wells (pictured) or, if specified optional 600-ampere bushings. The 200-ampere bushing wells accommodate loadbreak inserts and elbow connectors. Dust covers (yellow discs) must be removed from all unused positions and replaced with protective insulating bushing-well plugs (or bushing covers when furnished with 600-ampere bushings, which have red dust covers).

⚠ DANGER

For all un-terminated phase positions, failure to remove dust covers and replace with a protective insulating bushing-well plug prior to energization may result in equipment damage, personal injury or death.

When removing energized 200 ampere elbows (separable insulated) connectors, do not allow the elbow probe to touch any grounded surface. Before working on any cables or circuits, test for voltage and ground the circuit. Failure to follow proper procedures while the equipment is energized will result in equipment damage, personal injury or death.

Always follow user's and manufacturer's standard operating procedures when installing, maintaining or removing 200 ampere load-break elbow connectors and accessories. Such procedures should always include:

1. Verifying the correct circuit is being maneuvered,
2. Installing portable feed-through standoff bushings on the parking stand adjacent to the load-break elbow to be switched,
3. Recognizing that the unit may be subject to back feed and taking necessary precautions to isolate the equipment from such possibility before maneuvering 200 amp elbows when dead-break procedures are to be followed,
4. Testing for voltage, and
5. Grounding the circuits before any other work is attempted.

Bushings

The 600 ampere bushings accommodate 600 ampere elbow (separable insulated) connectors and accessories. The units are shipped with a red dust cover over each bushing to prevent contamination. Dust covers are NOT capable of providing any electrical insulation at medium voltage levels. Therefore, if an elbow is not to be connected to a bushing, prior to energization the dust cover MUST be removed and replaced with an insulating protective bushing cover. See Figure 12.

Terminate cables and install 600 ampere elbows and accessories following instructions provided by the cable manufacturer and the elbow manufacturer. The 600 ampere elbows are a dead-break device and must NOT be removed when the equipment is energized.

⚠ DANGER

Failure to remove dust covers and replace with a protective insulating bushing cover prior to energization may result in equipment damage, personal injury or death.

Do not attempt to remove 600 ampere elbows (separable insulated) connectors when the equipment is energized. Any attempt to remove 600 ampere elbows while the equipment is energized will result in equipment damage, personal injury or death.

Always follow user's and manufacturer's standard operating procedures when installing, maintaining or removing 600 ampere elbow connectors. Such procedures should always include:

1. Opening adjacent load-interrupting devices to completely de-energize the unit,
2. Recognizing that the unit may be subject to back feed and taking necessary precautions to isolate the equipment from such possibility before maneuvering 600 amp elbows,
3. Testing for voltage to verify circuit is de-energized before maneuvering 600 amp elbows, and
4. Grounding the circuits before any other work is attempted.

Removal of Load-Break Elbows

1. Remove the padlock and fully loosen the penta-head bolt. Pull and lower the door handle cover to open the active elbow-compartment door and secure with the windbrace.
2. Loosen the two pentahead bolts that secure the passive elbow compartment door and secure it open using the windbrace. See Figure 12.
3. System operating practices may allow load-break elbows to be switched while the associated cable is energized. Follow load-break elbow manufacturer's procedures for proper technique when live switching is to be preferred using the elbows. If live switching is not permitted with elbows, appropriately rated voltage testers should be used to verify that the circuit is completely de-energized.
4. Using the shotgun clamp stick, install and secure the feed-through standoff bushing on the parking stand. See Figure 12.
5. If live switching of elbows is not permitted for operating circumstances of the system, test the elbow to be moved for voltage. After verifying that voltage is not present, or if live switching is permitted, use the shotgun clamp stick to remove the elbow connector from the appropriate bushing well, following standard system operating procedures and the elbow manufacturer's instructions. Move the elbow connector onto a standard feed-thru standoff bushing that is placed in the parking stand.
6. Install an insulating protective cover on the exposed 200 amp bushing-well insert following grounding-elbow manufacturer's instructions. Connect the ground-clamp connector from the grounding elbows to the enclosure ground rod.

⚠WARNING

Before installing grounding elbows, test for voltage. Failure to properly test for voltage to establish that the circuit is de-energized before installing grounding elbow may result in equipment damage, personal injury or death.

7. If appropriate for operating circumstances of the system, test the remaining feed through standoff bushings for voltage and, after confirming that voltage is not present, then install a grounding elbow on the remaining bushing.
8. Repeat the above procedures for each 200 ampere load-break elbow that is to be moved.
9. After completing the work to be performed, the ground elbows are to be removed. First, remove the grounding elbow from the feed-thru bushing. Then, remove the ground connector from the ground rod.
10. If applicable, remove the insulating protective cover from the bushing-well insert.
11. Following elbow manufacturer's proper procedure for positioning, removal and closing circuit using elbows, move the elbow connector from the feed-through standoff bushing and secure it onto the 200 ampere bushing-well insert.
12. Remove the feed-through standoff bushing.
13. Remove and store the windbrace.
14. Close and secure the passive door by fully tightening both the top and bottom pentahead bolts.
15. Close and padlock the main doors before leaving the gear.

Fuse Description

The FTDF fuse mounting is either the standard non-loadbreak fuse mounting or optionally the Auto-jet® load-break fuse mounting. Non-loadbreak fuse mountings (see Figure 13) must ONLY be operated AFTER the elbow connectors are removed from the line side of the fuses AND if backfeed is likely, the load side of the fuses.

⚠ WARNING

Failure to remove line-side and, if applicable, load-side elbow connectors prior to opening the fuse in a non-loadbreak fuse mounting may result in a substantial arc flash that will cause equipment damage, severe personal injury or death.

The optional Auto-jet® fuse mounting has an integral load-break device that permits single-pole live switching in single-phase or three-phase circuits by the use of an ordinary universal pole equipped with a grappler. The integral load-break device has a 200 ampere continuous and load-break rating and has a 3-time fault-close duty-cycle when the fuse is closed briskly without hesitation. The overall unit rating may be limited by the fuse rating or elbow rating.

The Auto-jet® load-break fuse mountings incorporate the same unique laminated air-jet interrupter system used in the Federal Pacific 3-pole group-operated switches.

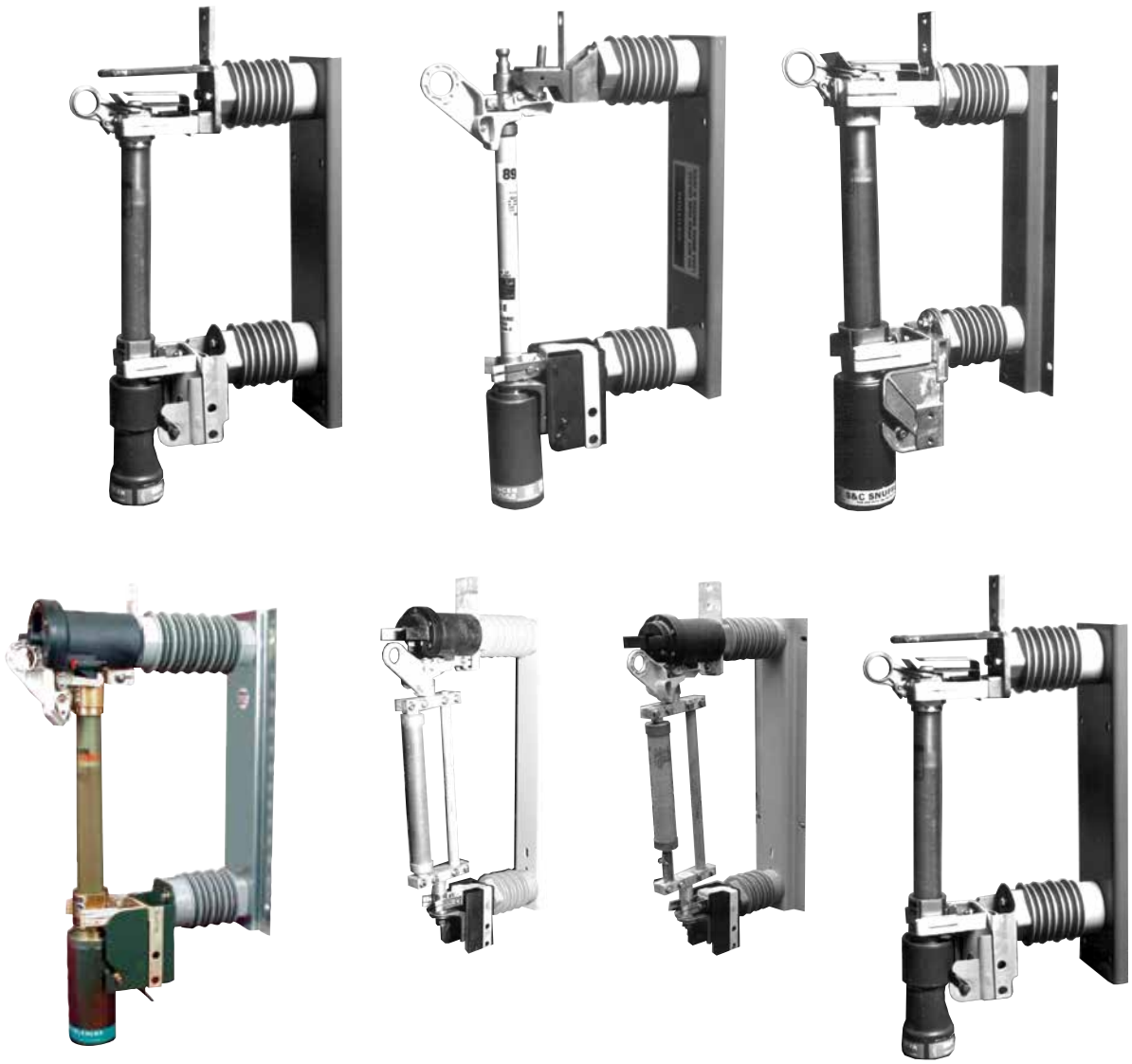


Figure 13. Typical non-loadbreak fuse mountings are pictured in top row and loadbreak fuse mountings are pictured in bottom row.

Non-Loadbreak Fuse Operation

When non-loadbreak style fuse mountings are furnished, such as the clip style mountings to accommodate Cooper (McGraw-Edison) Type NX, the fuse replacement procedure would be similar to those for the Auto-jet® load-break fuses. However, the following precautions should be observed when work is performed on non-loadbreak fuses:

⚠ DANGER

Do Not open non-loadbreak style fuse mountings or otherwise attempt to disconnect such fuses when the circuit is energized.

1. All upstream and downstream devices which could energize the fuse must be opened and rendered de-energized to remove possibility of inadvertently energizing the fuse.
2. Upon opening the fuse compartment door, the equipment should be tested for the presence of voltage using a suitable voltage sensing device installed on a universal pole.
3. If no voltage is present, the appropriate fuse terminal should be grounded using proper grounding techniques and devices.
4. Fuse(s) may then be removed and replaced using the user's and fuse manufacturer's appropriate standard fuse replacement procedures.

Preliminary Check of Load-break Fuse Mountings Before Energizing

⚠ WARNING

The following preliminary check for load-break fuse mountings must only be performed with the unit completely de-energized and isolated from voltage. Any attempt to perform this check with the unit energized may result in electrical arc flash that can cause equipment damage, personal injury or death.

1. With the fuse assembly properly installed in the hinge of the fuse mounting (see top photo of Figure 14) and the grappler prong positioned in the pull ring of the fuse end fitting, move the fuse toward the closed position. Make certain that the contact rod (see Figures 15 and 16) at the top of the fuse-assembly end fitting engages the face of the latch pawl at a location ABOVE the bottom edge. If the contact rod does not properly engage the latch face, an inspection must be performed to establish what adjustment is necessary as described below.
2. Verify that the fuse assembly is assembled correctly, consistent with the fuse manufacturer's instructions.
3. In addition, with the fuse assembly fully closed and latched, the fingers on the upper end fitting must be behind the ramp on the latch housing (see Figure 15b). Furthermore, the gap between the ramp and the fingers must not exceed 1/8" (see Figure 15b and Figure 15c).
4. Make certain that there is no play in the top end fitting which allows it to rotate on the fuse unit, and that the contact rod is not damaged, deformed or loose.
5. Make certain the hinge of the fuse mounting is secure on the insulator and the insulator is secure to the fuse-mounting plate.
6. If any loose bolts are discovered or if the appropriate engagement is not observed, perform the adjustment illustrated in Figures 16 and 17.

Figure 14. View of FTDF Fuse-Compartment side with extenal door and hinged barriers secured open. Top photo shows exterior door secured open and hinged barriers secured in place with penta-head (or optional hex-head) bolts. Center inset shows hinged barrier secured to enclosure door by inserting large cable-connected cotter pin into clip on barrier. Center photo shows fuse assembly positioned in the hinge of the fuse mounting prior to verifying proper engagement of contact rod. Bottom photo shows fuse assembly fully closed and latched.

Load-Break Fuse Operating Sequence

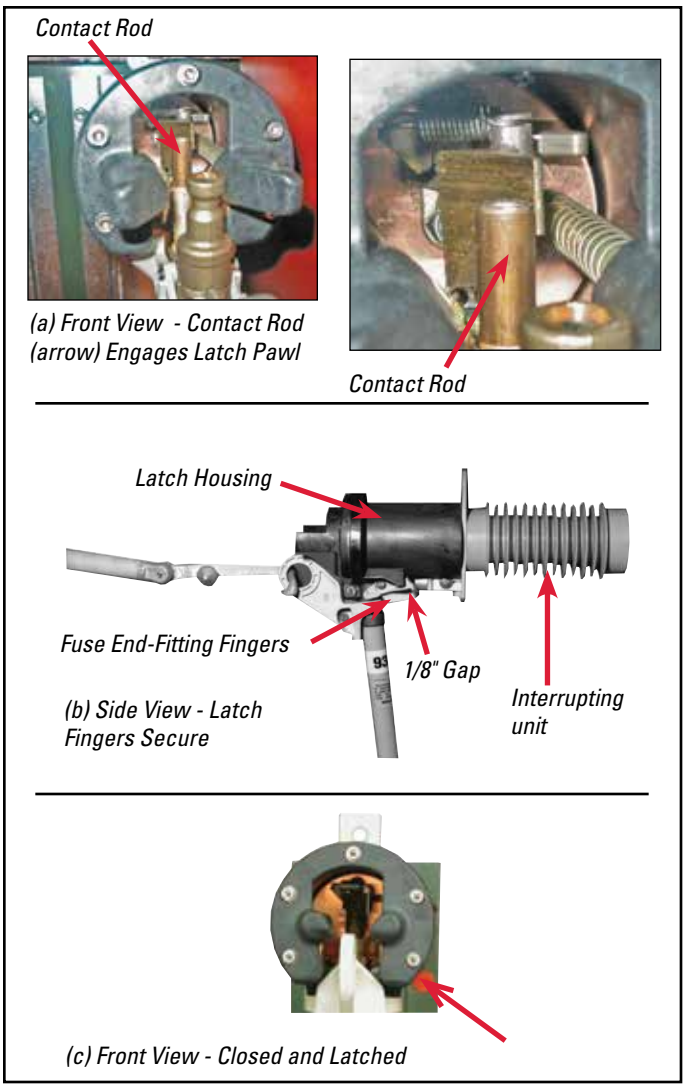


Figure 15. (a) Contact rod engages face of latch pawl as fuse is being closed; fuse is latched when (b) end fitting fingers are positioned behind interrupter housing and (c) Positive Latch Indicator target is extended in view from front.

Figure 16. Adjust fuse-hinge assembly when contact rod does NOT engage latch face or latch gap exceeds 1/8".

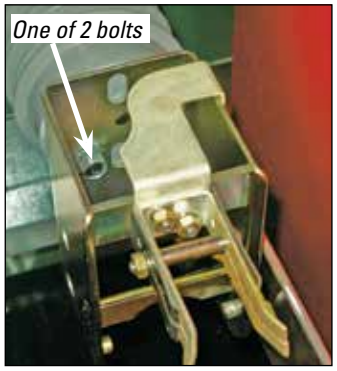


Figure 17. Loosen bolts that secure hinge to insulator; re-install fuse assembly; pull up on hinge until gap is 1/8" or less and the contact rod engages the latch face.

Load-break Fuse Latching

It is important to know the proper installation and operating procedures for the load-break fuse assemblies when used in FTDF gear in order to prevent malfunction of the unit.

The interrupter assembly, shown in Figure 15, has a latch contact inside the black housing that is connected to a built-in interrupting device.

The fuse assembly must be in the proper latched position with the contact rod on the upper fuse end fitting engaging the latch face during the closing operation (see "Preliminary Check Before Energizing") and secured behind the latch face after complete closure has been achieved. In addition, the fingers of the fuse end fittings must be positioned completely behind the black latch housing and the Positive Latch Indicator target extended. See Figure 15. This allows the interrupter to function properly so that as the fuseholder is pulled, the interrupting plunger will be pulled forward to it. See "Load-break Fuse Operation (Illustrations)" (Figure 18 through Figure 26) on this page. The arc is then extinguished safely and properly by the puffer mechanism before the fuseholder breaks free of the receiver. See Figure 15.

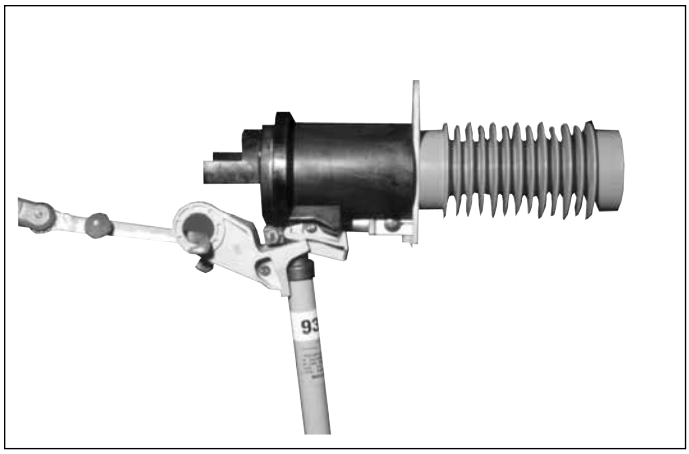


Figure 18. Fuse holder being pulled open (or pushed closed).

Load-break Fuse Operation (Illustrations)

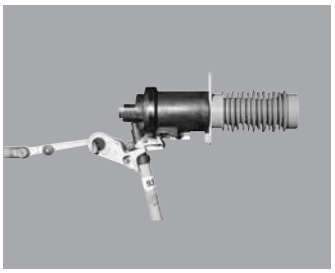


Figure 19. Contacts extending.

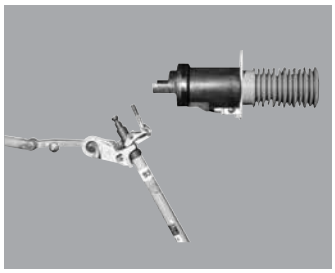


Figure 20. Full open.

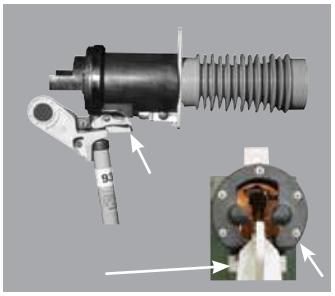


Figure 21. Unlatched condition and latch indicator NOT extended.

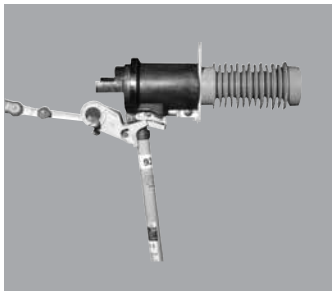


Figure 22. Fuseholder being opened.

Figure 23. Unlatched.

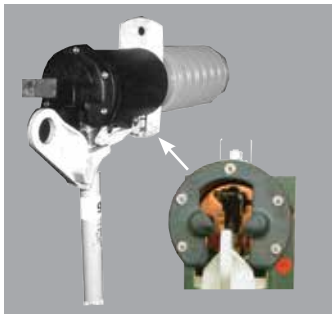


Figure 24. Latched and indicator extended.

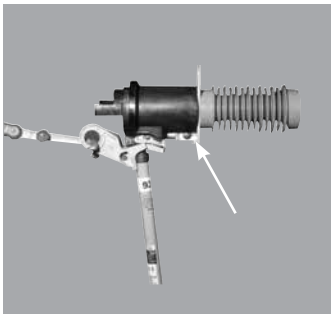


Figure 25. Unlatched.

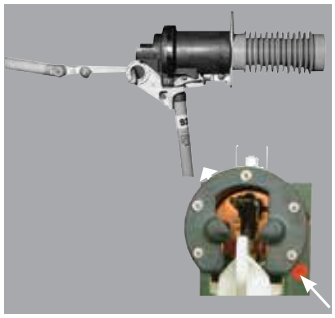


Figure 26. Latched and indicator extended.

⚠WARNING

1. If the contact rod does not engage the latch face, the interrupter floating contact assembly will not be pulled forward. If this is the case, the fuse assembly may not be correctly assembled or the hinge assembly may be positioned too low.

2. Examine the fuse assembly and confirm that it is correctly assembled in accordance with the fuse manufacturer's instructions.

3. Inspect the fuse mounting and verify that all bolts are secure and that the fuse assembly properly fits into the hinge assembly.

4. If the fuse assembly is not in the proper latched position, the fuse-assembly upper end fitting will not have been pushed far enough forward into the receiver for the end-fitting fingers to be caught by the receiver housing and the Positive Latch Indicator is **not** extended (see Figure 21). When this is the case, if the fuse assembly is pulled open (see Figure 22), the interrupter mechanism may not be pulled forward with it and, therefore, may not extinguish the arc. This could result in a flashover. **DO NOT ATTEMPT TO OPEN A FUSE THAT IS NOT COMPLETELY LATCHED!**

While maintaining a safe distance between operator and any energized parts, visually check to ensure that the outside fingers of the fuse end fittings have been properly latched behind the nodes on the receiver housing and that the Positive Latch Indicator red target is extended. Figures 15, 24 and 26 show the fingers properly latched and the Positive Latch Indicator target extended.

⚠WARNING

If the fingers do not appear to be properly latched or the Positive Latch Indicator is NOT fully extended (Figures 21, 23 and 25 show an unlatched condition), DO NOT attempt to open the fuse assembly and re-seat it. Opening a fuse assembly that is not fully latched can result in electrical arc damage, personal injury or death.

If the fingers do not appear to be seated and properly latched or the Positive Latch Indicator target is NOT fully extended, place the grappler (see Figure 25) in the fuse pull ring (or against the fuse-unit barrel) and strike the back end of the universal pole with a sharp forward force and the fingers should latch behind the nodes on the receiver and the indicator target should extend, indicating proper latching. See Figure 26.

Again verify that the fingers are properly secured and the indicator has extended. Repeat the procedures as necessary, checking the fingers and indicator for latching after each thrust of the hookstick.

Load-break Fuse Operation

⚠WARNING

All single-pole switching operations are intended to be performed using a grappler tool attached to a universal fitting of an insulated pole. The hook on a shotgun clamp stick is NOT to be used, NOR is a prong fitting. Verify that the fuse mounting is identified as a "Loadbreak" fuse mounting, as described under "Loadbreak Fuse Latching". See Figure 17.

1. Open appropriate fuse compartment door and secure with the wind brace.
2. Open and secure the inner hinged barrier permitting access to the desired fuse.
3. Verify that the fuse is latched (see Figures 15 and 27a) and that the Positive Latch Indicator target is extended (see Figure 27b) and then install long prong of the grappler tool into pull ring of fuse end fitting with the prong pointing down. See Figures 18 and 27b.
4. Pull the fuse open with one swift, non-hesitating motion to the fully open position (45°). Maintain downward force on fuse until fuse opening motion has ceased to prevent fuse from bouncing back closed. See Figure 27c.

⚠ WARNING

Do not assume that an open fuse position indicates the fuse to be de-energized. Backfeed may exist.

⚠ CAUTION

Do not attempt to close main door unless open fuse has been closed or removed from unit.

5. Reinstall grappler with cone in pull ring and prongs cradled onto fuse assembly and while grasping pole firmly, lift fuse assembly up and out of mounting. See Figure 27d.
6. Re-fuse using the procedures included with the replacement fuse unit.
7. Reinstall grappler with cone in pull ring of fuse assembly and prongs cradling fuse. Then place fuse assembly on cross bar of hinge of fuse mounting and allow to rest in the 45° open (disconnect) position. See Figure 27d.
8. Insert long prong of grappler into fuse pull ring with prong pointing down. Then, push up briskly on the fuse assembly, completing the closing stroke in one swift, non-hesitating motion. See Figure 27b and Figure 27c.
9. Before removing grappler from fuse pull ring, push firmly to assure that the fuse is completely closed and latched and that the Positive Latch Indicator is fully extended (see Figure 15c and Figure 27b). See page 13 section on "Load-break Fuse Latching".
10. Bolt closed the hinged inner barriers by tightening the penta-head bolts.
11. Secure the passive door by tightening the penta-head bolts. Then, close, latch, and padlock the main door before leaving the gear.

Figure 27. Before opening fuse (a), verify that fuse is latched (b). Place long prong of grappler in pull ring with prongs pointing down. Open/close fuse in a swift non-hesitating motion. And, (d) Reposition grappler with cone in pull ring and prongs cradling fuse. Then, lift fuse up and out of mounting to remove fuse (or lower onto cross bar of hinge if installing fuse assembly).

Fuse Ratings

Fuse Manufacturer & Type	Amperes RMS				3-Phase MVA SYM
	Max. Cont.	Loadbreak*	Interrupting Sym	Momentary & 3-Time (11) Fault-Close ASYM (12) †	
At 14.4kV Nominal Voltage - 95kV BIL					
S&C SM-4 ①	200	200	12,500	20,000	310
S&C SMU-20 ②	200	200	14,000	22,400	350
S&C SM-5S ③	400	NLB	25,000	40,000	620
Eaton DBU ④	200	200	14,000	22,400	350
Cooper (M-E) NX ⑤	⑤	(13)	50,000	40,000	620
At 25kV Nominal Voltage - 125kV BIL					
S&C SM-4 ⑥	200	200	12,500	20,000	540
S&C SMU-20 ⑦	200	200	12,500	20,000	540
S&C SM-5S ⑧	CONSULT FACTORY				
Eaton DBU ⑨	200	200	12,500	20,000	540
Cooper (M-E) NX (10)	(10)	(13)	50,000	40,000	1,080

**In conjunction with Auto-jet® II Fuse Mountings.*
† Three-time fault-close rating: The Auto-jet® II fuse mounting can withstand a fuseholder or fuse with end fitting being closed into a fault of the magnitude specified three times when closed briskly without hesitation and remain operable and able to carry and interrupt the rated continuous current. (The fuse unit must be replaced after each interruption or fault closing. Refer to S&C instruction manual for SML-4Z holder and SML-20 end fitting maintenance required after each fault close or fault interruption).

① SM-4 fused units require one S&C Cat. No. 92352 SML-4Z fuseholder and one S&C SM-4 fuse refill per fuse mounting. ††

② SMU-20 fused units require one S&C Cat. No. 3097 SML-20 fuse end fitting and one S&C SMU-20 fuse unit per fuse mounting. ††

③ SM-5 fused units are non-loadbreak type and require one S&C Catalog No. 86642R2 SM-5S fuse holder and one SM-5 fuse refill per fuse mounting.

④ DBU fused units require one FP Cat. No. EFA-42 DBU end fitting and one Eaton (Cutler-Hammer) DBU fuse unit per fuse mounting. ††

⑤ NX fused units: Auto-jet® fuse mountings will accommodate one 100 ampere Cooper (McGraw-Edison) Type NX current-limiting fuse rated 8.3kV, one 100 ampere fuse rated 13.5kV, or one 80 ampere fuse rated 15kV. One set of end fittings and one appropriately rated fuse is required in each fuse mounting. ††

⑥ SM-4 fused units require one S&C Cat. No. 92353 SML-4Z fuseholder and one S&C SM-4 fuse refill per fuse mounting. ††

⑦ SMU-20 fused units require one S&C Cat. No. 3097 SML-20 fuse end fitting and one S&C SMU-20 fuse unit per fuse mounting. ††

⑧ For SM-5 fused units consult factory.

⑨ DBU fused units require one FP Cat. No. EFA-42 DBU end fitting and one Eaton (Cutler-Hammer) DBU fuse unit per fuse mounting. ††

(10) NX fused units: Auto-jet® fuse mountings will accommodate one 100 ampere Cooper (McGraw-Edison) Type NX current-limiting fuse rated 13.5kV, one 80 ampere fuse rated 15kV, or one 40 ampere fuse rated 23kV, or one 50 ampere fuse rated 27KV. One set of end fittings and one appropriately rated fuse is required in each fuse mounting. ††

(11) Unit overall ratings are limited to the lowest component rating.

(12) Ratings expressed in RMS amperes symmetrical are 0.625 times the asymmetrical values listed.

(13) Load-break rating same as maximum continuous rating.

†† For fuse application and ordering information refer to the current issue of:

- *S&C Bulletin 252-31*
- *Cooper (McGraw-Edison) Cat. Sect. 240-60*
- *Eaton Pub. No. BR01303001E/Z11783*

◊ *SM-5 fuses used in Pad-mounted Switchgear are non-loadbreak. Please refer to the factory for SM-5 applications. See S&C Instruction Bulletin 252-506*

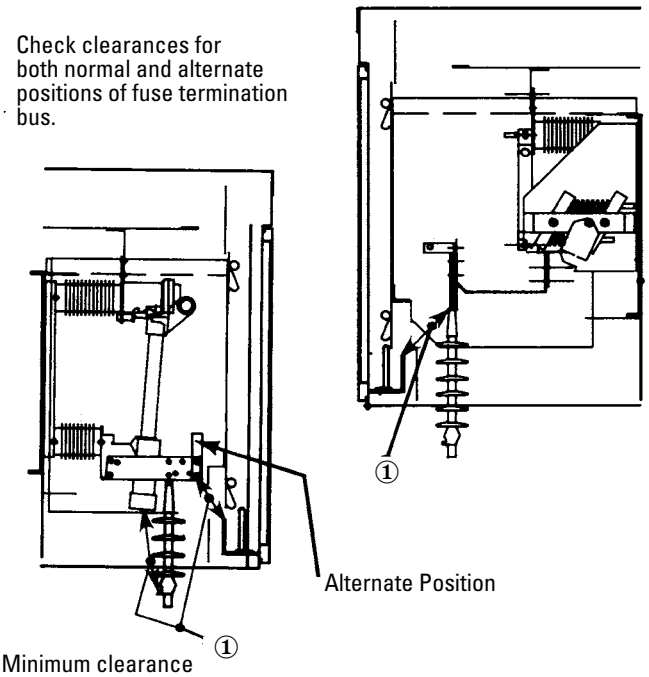
⚠WARNING

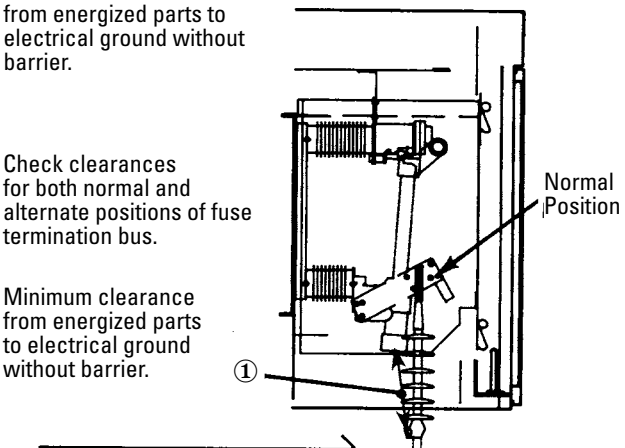
Failure to observe the electrical clearances specified in the table and illustrated in the diagrams on page 17 may result in electrical arc damage, personal injury or death.

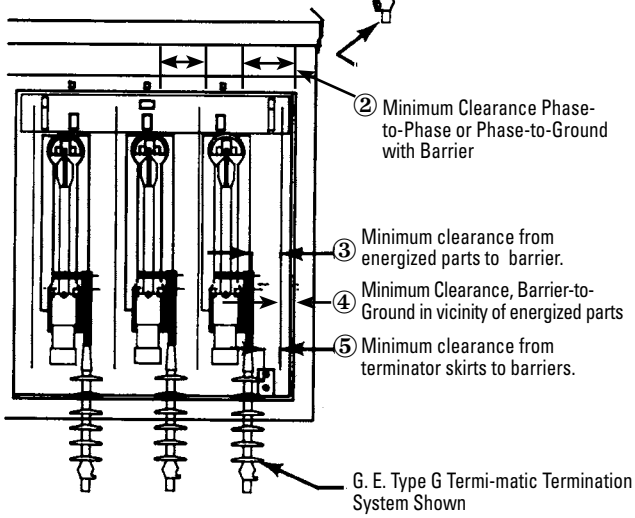
Recommended Clearances

15kV, 25kV Pad-mounted Unit Rating kV, BIL	Recommended Clearances (Minimum) in Inches				
	Phase-to-Phase or Phase-to-Ground without Barrier NOTE ①	Phase-to-Phase or Phase-to-Ground with Barrier NOTE ②	Energized Bus (or device) to Barrier NOTE ③	Barrier to Ground in Vicinity of Energized Bus (or device) NOTE ④	Terminator Skirts to Barriers NOTE ⑤
95	5-1/2	3"	1"	3/4"	1/2"
125	7-1/2	5"	2-1/4"	2"	1-1/4"

Notes ① to ⑤







Maintenance

Federal Pacific switchgear does not require routine mechanical or electrical maintenance. However, the following are some recommendations for enhancing continued service of the equipment.

1. Yearly mechanical exercising of the load-break fuses is recommended.

⚠ WARNING

The switchgear must be completely de-energized from all sources before any attempt is made to enter switchgear.

2. Check for cleanliness generally, but particularly for accumulation of any foreign material on insulators and barriers.

NOTICE

Barriers and insulators can be cleaned with a non-alcohol based cleaner that does not leave any residue when dry. Residue must be removed.

⚠ CAUTION

Do not put any lubricant on probe or puffer.

3. If the fuse is closed on a short circuit within the fault-closing rating and the short circuit is cleared by circuit breakers or fuses, the fuse mounting will not sustain damage which would require major repairs. However, the fuse mounting contacts should be inspected before returning to service to determine compartment condition.

Optional Features

Standard options can be supplied that best serve the customer's needs and operating practices. These are listed below with the applicable catalog number suffix.

Base Spacer-Non-compartmented or compartmented suffix beginning with letter "-A" — followed by a number, or "-AS" followed by a number when of stainless steel.

Barriers — Inner Door (-B4 or -B5)

Fuse Storage Hooks (-E through -E2)

Finish Color and Special Cabinet Material

Fault Indicators

Copper Bus (-C)

Strip Heaters

This Page Intentionally Left Blank

Every effort is made to ensure that customers receive an up-to-date instruction manual on the use of Federal Pacific products; however, from time to time, modifications to our products may without notice make the information contained herein subject to alteration.

601 Old Airport Road • Bristol, VA 24201 Phone (276) 466-8200 • FAX (276) 645-8212 • www.federalpacific.com • ISO 9001:2008 Registered