TYPE PSI/II

PAD-MOUNTED SWITCHGEAR INSPECTION & MAINTENANCE RECOMMENDATIONS

15kV • 25kV

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.

FOLLOWING SAFETY INSTRUCTIONS

NOTICE

Thoroughly and carefully read this instruction bulletin before installation of the pad-mounted switchgear, before switching or operating the switches or 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 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.

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.

The procedures required for operation of the Federal Pacific Auto-jet® II Load-Interrupter Switches, the Auto-jet® Load-break Fuse Mountings with Integral Load-Interrupters, the doors, the barriers and other accessory components are covered in detail in the Federal Pacific Instruction Bulletin Section IB-1A-110. The inspection and maintenance recommendations covered in this bulletin are expected to be performed in conjunction with a review of IB-1A-110. This bulletin does not cover all the detailed and specific operational procedures and checks. In addition, these instructions are not intended as a substitute for the user's standard operating practices and procedures. A copy of Instruction Bulletin Section IB-1A-110 can be printed from the internet at www.federalpacific.com.

⚠ CAUTION

When cleaning components, NEVER use any industrial strength cleaners. NEVER apply lubricants to the probe contact or the tulip contact which are the interrupting contacts. NEVER use any solvent-based or flammable products on any components in the pad-mounted switchgear. Solvents and flammable products can attack non-metallic components of the equipment and reduce electrical and mechanical properties.

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.

Security Inspection (Exterior)

⚠ CAUTION

Ensure that proper Personal Protective Equipment (PPE) is used and follow applicable Safety and Work Practices.

1. Verify Security Devices

Verify the operational integrity of security devices such as door latches, penta-head bolts, hinges and key-interlock systems. Make certain padlocks are properly installed on all doors and covers.

2. Maintaining the Exterior

The exterior finish can be maintained by periodic washing, touch up of any scratches and abrasions, and waxing.

For areas to be touched-up, clean the area removing all rust. Apply a red-oxide primer, available in spray cans from a local paint supplier or home improvement store. Spray cans of the topcoat finish are available from Federal Pacific (specify the original color).

3 Replacing Labels

Replace any missing, damaged or obscure labels. Replacement labels are available from Federal Pacific.

4. Replacement Parts

If parts or labels are required they may be ordered by contacting Federal Pacific at 276-466-8200 or your local Federal Pacific Manufacturer's Representative. A directory of the representatives can be found at www.federalpacific.com. If parts are ordered, the unit serial number and date of manufacture must be provided along with the part description.

Before Opening the Switchgear

Visual Inspection (Interior - without Entry)

⚠ WARNING

Ensure that Personal Protective Equipment, (PPE) suitable for exposure to energized parts is used as required by Safety and Work practices. All approach distance requirements must be followed. In certain cases the switchgear will be required to be de-energized and grounded. Failure to take these precautions could result in death or serious injury

5. Exercising

Yearly mechanical exercising of the switch is recommended. Refer to Instruction Bulletin Section IB-1A-110 for information on operating the switch.

6. Cleanliness

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 and non-solvent based cleaner that does not leave any residue when dry. Residue must be removed.

7. Electrical Clearances

Check for proper electrical clearances as described in Recommended Clearances.

Before Entering the Switchgear
Visual Inspection (Interior - with Entry)

⚠ DANGER

The switchgear must be completely de-energized from all sources and grounded before any attempt is made to enter the switchgear. Follow normal system operating practices to de-energize the unit, test for voltage, and ground the unit before any work is done inside the switchgear. Any attempts to perform inspection or maintenance inside energized switchgear will result in death or serious injury.

8. Fuse Operation

Open and close fuses and insure proper latching as described on the label on the inside of the compartment door and in Instruction Bulletin Section IB-1A-110. Inspect fuse contact interfaces for damage and overheating, which will be evidenced by distortion or discoloration of the contacts. Note that contacts are copper and may be silver plated. There will be normal oxidation of these parts. Slight irregularities can be burnished with an emory cloth or paper. See "Lubrication".

9. Barrier Removal

⚠ WARNING

Fuse and Switch Dual-Purpose Barriers should not be left in the slide-in position for more than one week. Accumulation of contamination on the barrier may cause tracking that can ultimately lead to a flashover. Clean any contaminated barrier per "Maintenance" instructions above.

The use of interphase, phase-to-ground, and dual purpose front barriers enhances the operation of pad-mounted switchgear by field personnel. The standard barrier system for Type PSI/II pad-mounted switchgear includes removable interphase barriers which maintain all the features of a fixed barrier system while allowing removal of phase-to-phase barriers from both the switch and fuse compartments during cable termination when the switchgear is de-energized.

⚠ WARNING

When removing barriers, care must be taken to keep the barrier clean and dry. Contamination on barrier can lead to tracking and arcing. Clean off any contamination with a non-alcohol and non-solvent based cleaner that does not leave any residue.

Removal of the barriers is readily accomplished as follows:

a. Completely disconnect the unit from all power sources.

b. Open main door (see Door System on page 4 of Instruction Bulletin IB-1A-110) and secure with door keeper.

c. Remove the dual-purpose barriers from their normal hanging position (see instructions on pages 9 and 12 of Instruction Bulletin IB-1A-110). If the optional B4/B5 barrier is provided, it must be opened and secured before dual-purpose barriers may be accessed (see page 6 of Instruction Bulletin IB-1A-110).

d. Test for voltage, and ground the unit using the user's standard practice procedures and using grounding clamps suitable for the short-circuit rating of the equipment.

e. Grasp center of interphase barriers. With lifting and pulling up action, remove barriers from switch (see page 6 of Instruction Bulletin IB-1A-110). See Figure 8 of Instruction Bulletin IB-1A-110. Barriers may then be cleaned with an appropriate non-solvent and non-flammable cleaner.

f. Barriers may be reinstalled by grasping the top and center of barrier, placing in front guide slots and inserting barrier through front slots into rear guides.

g. Dual purpose barriers may then be reinstalled.

h. Do not leave dual-purpose barriers in the slide-in position for more than one week if a switch contact on either side of the barrier is energized.

10. Electrical Clearances

Check for proper electrical clearances as described in Reference A, Recommended Clearances.

11. Switch Operation

⚠ CAUTION

Do not put any lubricant on switch probe or puffer contacts. Refer to section "12. Lubrication".

Check switch for proper operation refer to Instruction Bulletin IB-1A-110. If the switch is closed on a short circuit within the fault closing rating and the short circuit is cleared by circuit breakers or fuses, the switch will not sustain damage which would require major repairs. However, the switch should be inspected before returning to service to determine switch condition. See Lubrication.

12. Lubrication

When maintenance is performed, check for lubrication at the following locations:

⚠ WARNING

Lubrication is NOT required on any other surfaces than the locations identified below. Applying lubrication in other areas may reduce mechanical and electrical performance. DO NOT OVER LUBRICATE!

LUBRICATE ONLY:

1. On the switch main-contact stab. See Figure 1.
2. On the contact interface at the fuse-mounting stationary main contact. See Figure 2.
3. On the forward contact that engages the fuse contact rod and on the fuse hinge contacts that engage the fuse contact ferrule The contact rod and fuse ferrule on the fuse assembly. Refer to fuse manufacturer's instructions.
4. **DO NOT LUBRICATE ANY OTHER AREAS.**
5. If lubrication is required apply a coating of NYE Rheolube 363, which is the only approved lubricant.

13. Specification

Torque Value: For bus bar connections, apply 50 ft-pounds torque to 1/2-13 UNC 18-8SS (or equivalent) hex bolts. For other bolted connections, refer to factory.

High-Pot Test Value: After cleaning and restoring equipment, Per IEEE C37.74 — 75% of 35kV for 1 minute.

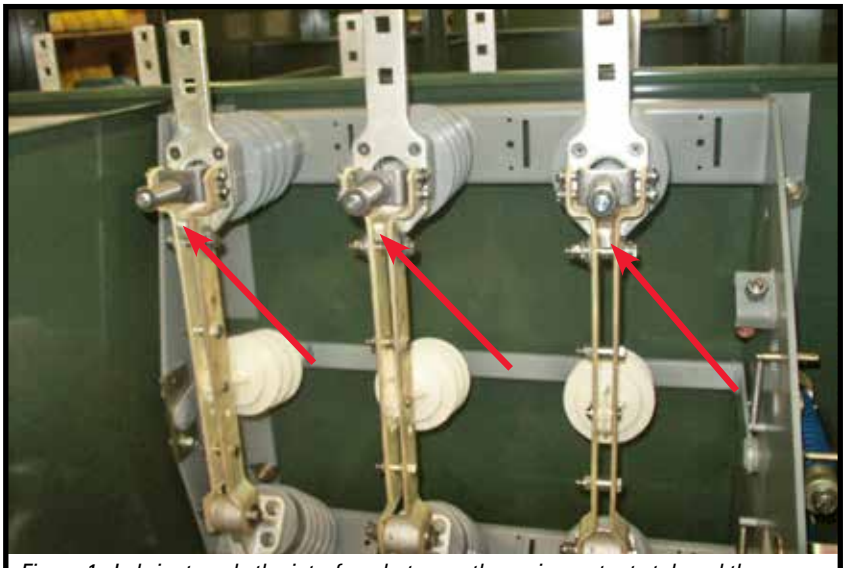


Figure 1. Lubricate only the interface between the main-contact stab and the switch blade marked by arrows.

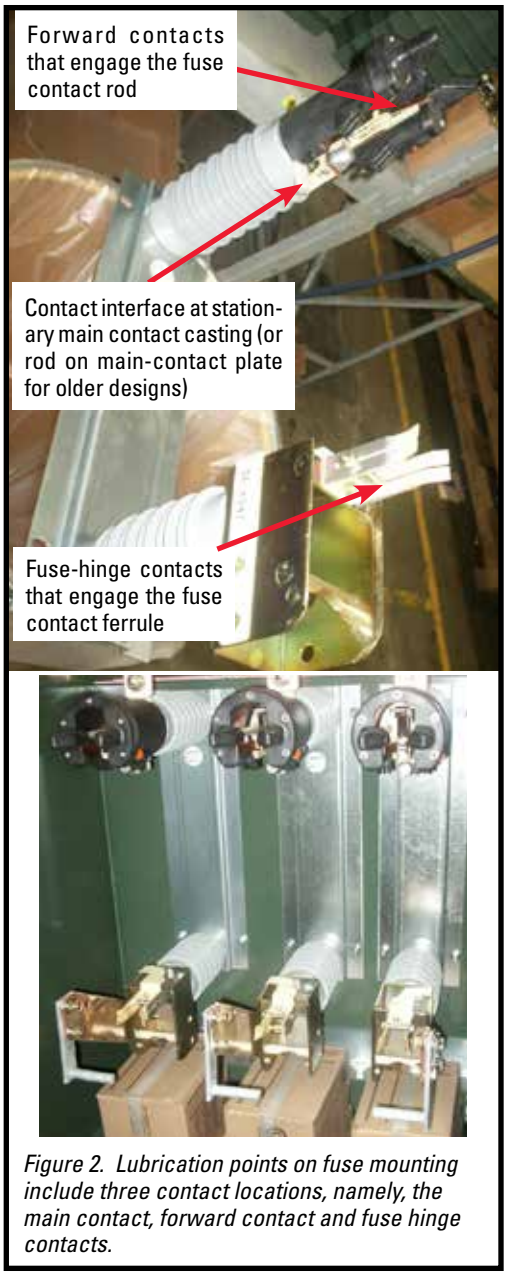


Figure 2. Lubrication points on fuse mounting include three contact locations, namely, the main contact, forward contact and fuse hinge contacts.

Figure 3. View shows present cast fuse main contact at left and previous main contact, which was a weldment, at right (removed from fuse mounting).

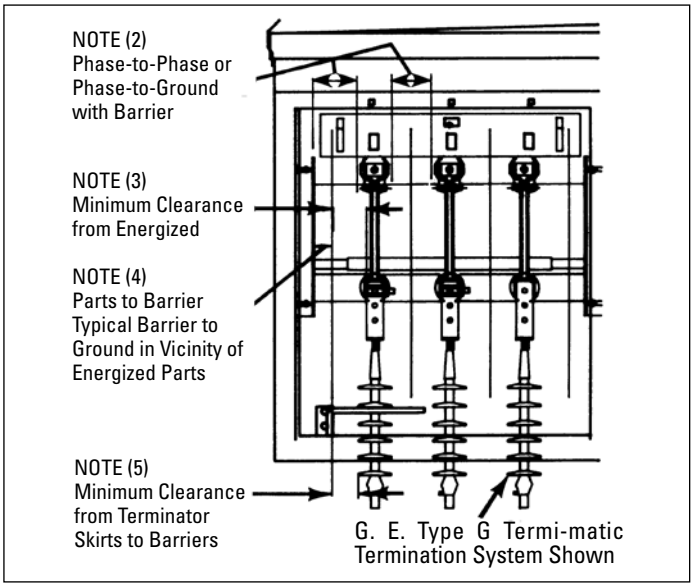
Reference A - Recommended Clearances

⚠ DANGER

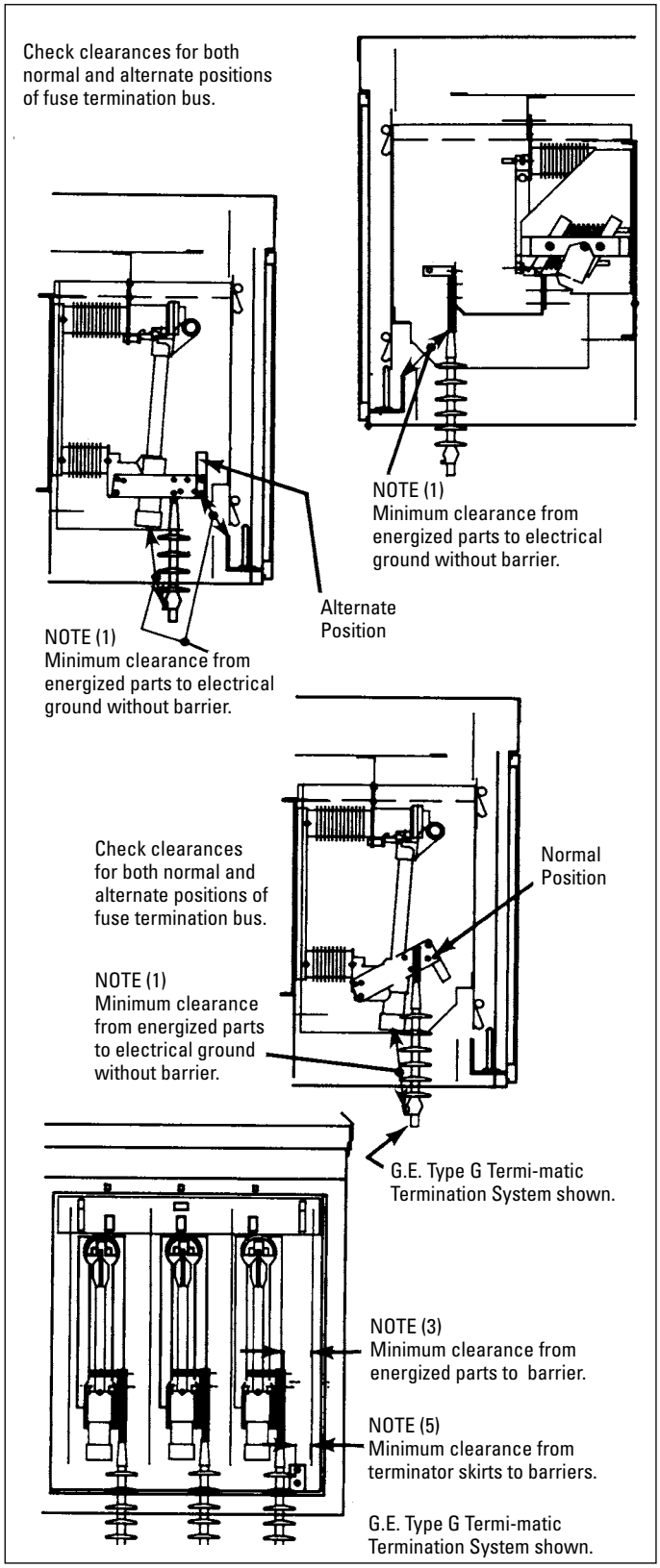
Failure to observe the electrical clearances specified in the table and illustrated in the diagrams on this page may result in electrical arc damage, personal injury or death.

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"



G. E. Type G Termi-matic Termination System Shown



Reference B - Inspection (and Proactive Maintenance) Cycles

Although Federal Pacific switchgear typically does not require maintenance, a cyclical inspection program can serve to verify and enhance the continued service of the switchgear.

The following inspection cycles are suggested. Based on the results of these inspections, a prioritized list of targeted proactive maintenance can be developed and then addressed in accordance with the customer's operational plan and safety procedures, as appropriate.

1) **Approximately 6 months after installation**, or when normal anticipated load has been applied, it is recommended that the switchgear be thoroughly inspected to ensure proper installation. See the section below describing a full inspection.

   a. Any deficiencies identified by inspection should be addressed as appropriate.

2) **Annually**, it is recommended that the switchgear enclosure and security components be inspected to ensure enclosure security and fitness for operation. See the section below describing a security inspection.

   a. Annual mechanical exercising of the Auto-jet switches is recommended. Refer to Instruction Bulletin IB-1A-110 for information on operating the switches.
   b. If feasible, a visual inspection of the switchgear is recommended. Refer to the section below describing visual inspection.
   c. Any deficiencies identified by inspection should be addressed as appropriate.

3) **Every five years (or on a schedule reflecting local operating conditions),** a full inspection of the switchgear is recommended. Refer to the section below describing a full inspection.

   a. Any deficiencies identified by inspection should be addressed as appropriate.

Recommended Inspection Guidelines

The following is a list of recommended inspection guidelines, ranging from the most frequent and least extensive to the least frequent and most extensive.

1) Security Inspection

a. Typically performed annually or as required by codes and ordinances.
b. This inspection does not require opening the switchgear doors.
c. Verification of enclosure security (doors and covers in good condition, bolted, padlocked, and secured, as appropriate).
d. Verification of enclosure integrity (no penetrating rust or corrosion, and no significant mechanical damage).
e. Switch and loop numbering is correct and legible.

2) Visual Inspection

a. Typically performed annually, if in conjunction with security inspections, or less frequently. In many cases, a full inspection is performed instead of a visual inspection.
b. This inspection does require opening the switchgear doors.
c. This may be performed with the switchgear energized, if permitted by the user's operating and safety policies, maintaining proper clearance from energized parts and user defined "hot planes".
d. Inspect for proper positioning and condition of barriers.
e. Inspect for proper positioning and condition of terminations and cables, with respect to the barrier boards.
f. Inspect for any signs of significant water intrusion.
g. Inspect for any obvious signs of intrusion of animals or vegetation.

3) Full Inspection

a. Typically performed every five years, or on a schedule reflecting local operating conditions.
b. A full inspection is also recommended to verify proper installation, typically six months after initial energizing or when full expected load is achieved.
c. This inspection does require opening the switchgear doors.
d. This inspection requires that the switchgear and the incoming cables be de-energized and grounded.
e. Inspect and verify proper positioning and condition of barriers. Clean or replace as needed.
f. Inspect and verify proper positioning and condition of terminations and cables, with respect to the barrier boards. Reposition or replace as needed.
g. Inspect for any signs of significant water intrusion. Clean or replace any affected components.
h. Inspect for any signs of intrusion of animals or vegetation. Clean, clear, and correct as needed.
i. Operate the auto-jet switches and lubricate, if needed.
j. Operate the fuse positions and verify proper latching and release.
k. Operate, clean, and lubricate the latching system as needed.
l. Evaluate the overall condition of the protective coating system (paint). Arrange for painting, if needed.
m. Verify that switch and loop numbering is correct and legible.

Notes: