PCX®

Build The Future More Efficiently™

FLX-Power™ Switchboards

Installation & Maintenance Guide

WARNINGS, CAUTIONS & NOTES, AS USED IN THIS PUBLICATION

WARNINGS

- Warning notices are used in this publication to emphasize that hazardous voltages, currents, or other conditions that could cause personal injury are present in this equipment or may be associated with its use.

- Warning notices are also used for situations in which inattention or lack of equipment knowledge could cause either personal injury or damage to equipment.

CAUTIONS

- Caution notices are used for situations in which equipment might be damaged if care is not taken.

NOTES

- Notes call attention to information that is especially significant to understanding and operating the equipment.

- This document is based on information available at the time of its publication. While efforts have been made to ensure accuracy, the information contained herein does not cover all details or variations in hardware and software, nor does it provide for every possible contingency in connection with installation, operation, and maintenance.

- Features may be described herein that are not present in all hardware and software systems. PCX Corporation assumes no obligation of notice to holders of this document with respect to changes subsequently made.

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Chapter 1 – Receiving, Handling and Storage

Receiving

Before leaving the factory, the switchboard is given a final inspection and packed by workers experienced in the proper handling and packing of electrical equipment. Upon receiving any apparatus, you should make an immediate inspection for any damage sustained in transit. If damage is noted or if indication of rough handling is visible, file a claim for damage with the carrier.

Regarding claims for damaged shipments, shortages, or incorrect material, the following is an excerpt from the published Terms and Conditions of Sale for products of PCX Corporation.

"All risks of loss shall be on buyer from point of shipment."

Handling

Equipment may be moved into position with forklift, pallet jack, or construction rollers under the shipping skids. Lifting by crane or other hoisting method should be done as shown in Figure 1 only when such lifting provisions are provided.

To remove the switchboard from the skids, take out the shipping bolts, then carefully slide the equipment so that the rear is off the skids and resting on the floor, as shown in **Figure 2**. Tilt the entire equipment slightly to the rear to release the skids. Be careful when sliding and tilting this equipment. Because of its height and weight, it can become top heavy if tilted too far. Slide the switchboard into place by pushing on its frame. Blow out any dust or loose particles of packing material that may have collected on the device parts.

Storage

If it is necessary to store the equipment for any length of time, observe the following precautions to prevent corrosion or breakage:

1. Uncrate the equipment.

2. Store the equipment in a clean, dry rodent-free area in moderate temperature. Cover the equipment to prevent deposits of dirt or other foreign material on movable parts and electrical contact surfaces. (Heavy-duty plastic is recommended for covers.)

3. If the equipment is stored in cool or damp areas, apply heat to keep it dry. On indoor switchboards, two standard 100 W, 120 Vac lamps can be installed in each switchboard section.

CAUTION: Remove all cartons and other miscellaneous packing materials from inside the units before energizing any heaters or lamps.

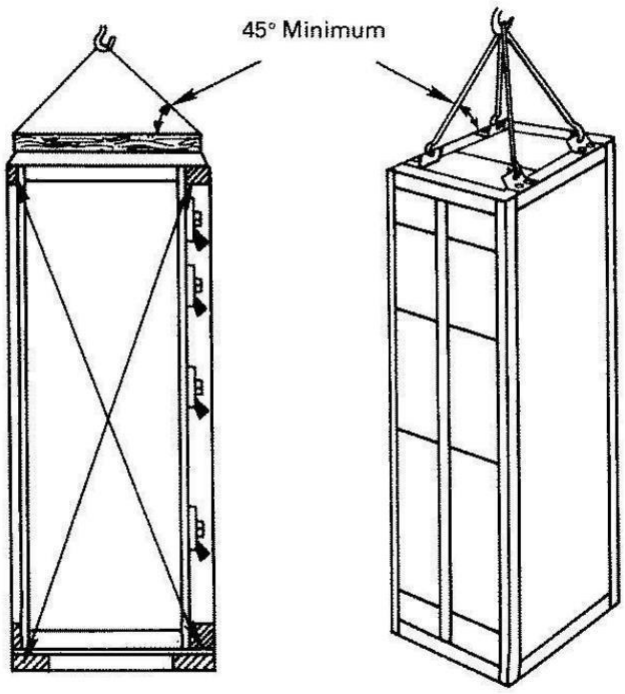
Lifting Instructions

Observe the following points when top lifting the equipment:

Do not pass cables or ropes through support holes

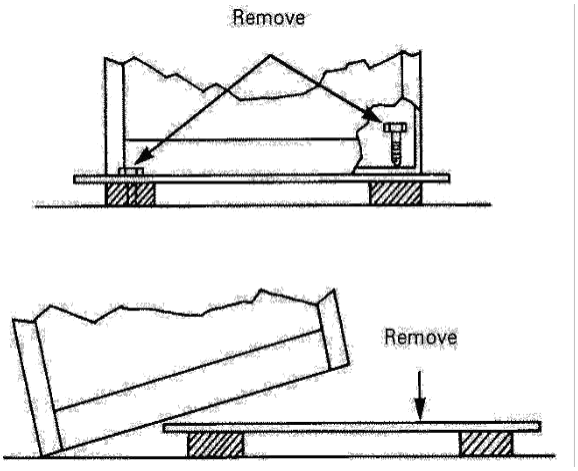
Always use load-rated shackles or safety hooks in support holes Rig slings so that the legs are no less than 45° from horizontal, as shown in Figure 1.

Figure 1: Lifting the Equipment with a Crane or Other Lifting Means



Lifting Slings, Spreader and Blocking. (Not Furnished with Equipment)	Lifting Plates, Angles or Beams. (Furnished with Equipment)

Figure 2: Removing the Shipping Bolts and Sliding the Unit Off the Skid



Chapter 2 – Installing the Switchboard

Before Installation

Before any installation work is performed, study all drawings furnished by the supplier for the installation. These include arrangement drawings (front, end, and plan views), connection diagrams, and schedule of equipment. Any material external to the equipment that may be required to meet any local codes (such as mats, screens or railings) is not furnished.

Location

When locating the switchboard, check all applicable codes for aisle, working space, and placement requirements. The space at the front must be sufficient to allow the doors to be opened and removable breakers to be removed.

Clearance

We recommend a clearance of one inch between the back of the switchboard and the wall or obstruction. However, this clearance is not required unless a 30 KVA or larger transformer is integral to the switchboard.

Rear Access

Some switchboards may require access to field wiring terminals from the rear.
Do not install these switchboards against a back wall.

Foundation Requirements

Indoor Equipment

The floor or foundation must be strong enough to prevent sagging from the weight of the switchboard structure. If the foundation is subject to vibrations, the equipment must be specially mounted to prevent transmitting vibrations to the equipment.

The switchboard must be bolted directly to the floor, as shown in Figure 3. The floor must be level without any high spots that might cause misalignment. If the floor is not level, use floor channels.

NOTE: For seismically certified equipment, refer to the installation instructions on page 8.

If steel floor channels are used, embed them in a level concrete slab, with the top surface of the channels flush with the finished floor. To avoid distortion of the structure, the steel channels must be level and aligned with each other before the equipment is anchored. The recommended foundation construction and method of mounting the switchboard to the foundation are shown in Figure 4. Channels should be grouted after installation.

Conduits

Any conduits or sleeves required for power and control cables that are to enter the equipment from underneath should be located and installed within the available space shown on the floor-plan drawings. Consider installing conduits or sleeves that might be required for future connections. Conduit stubs should extend above the floor enough to prevent water entering. Also consider the locations of components in the switchboard and allow space for swinging cables after they leave the conduit. The lowest live metal part in the switchboard will be approximately 8 inches above the bottom of the switchboard. Note that the switchboard must be lifted over the conduit stubs. Terminate the conduits at the switchboard with the appropriate conduit connectors. Conduits may require grounding or electrical connection to the switchboard enclosure.

Figure 3: Switchboard bolted to the floor

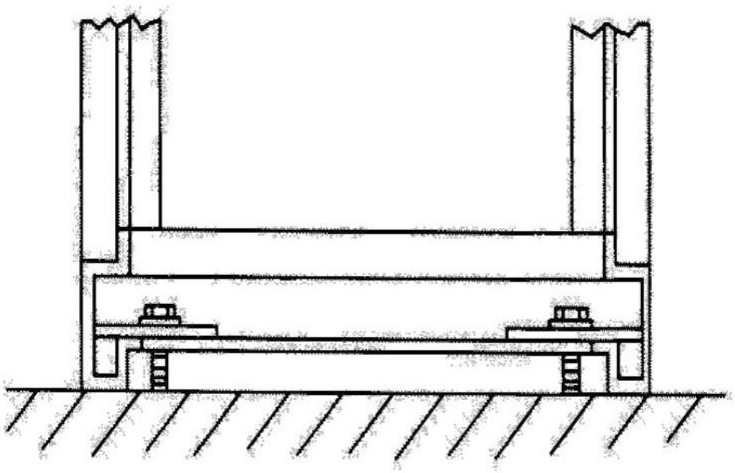
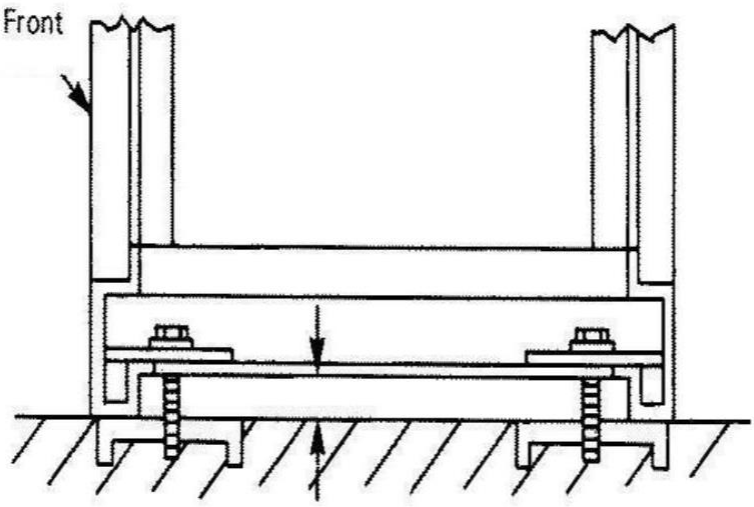


Figure 4: Switchboard mounted on floor channels



Seismically Certified Equipment

For seismically certified switchboards of UBC Zones 3-4, follow the previous instructions with the following modifications. Locate the seismic kit shipped with each section before installation. The kit for each section is located in the rear of the switchboard section attached to the horizontal ground bus. The kit should contain four 1-inch spacers per section. These spacers should be installed as shown in **Figure 5** or **Figure 6**. When floor channels are used, these spacers should be installed as shown in **Figure 7**.

Figure 5: Installation of Seismically Certified Switchboards Without Floor Sills

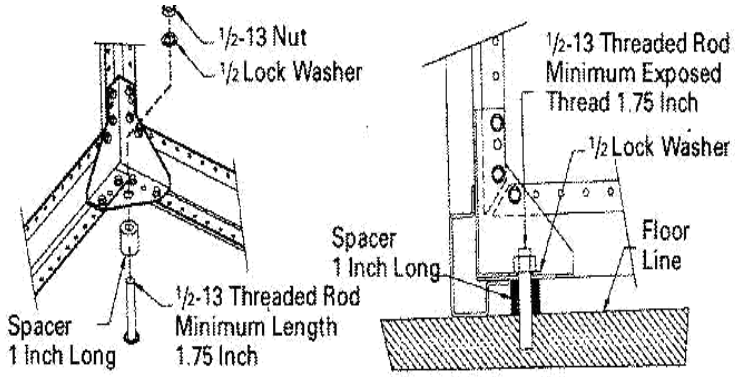


Figure 6: Alternate Installation of Seismically Certified Switchboards Without Floor Sills

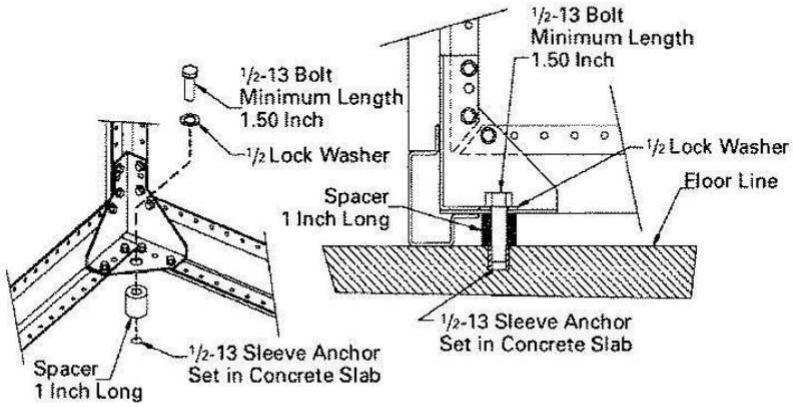
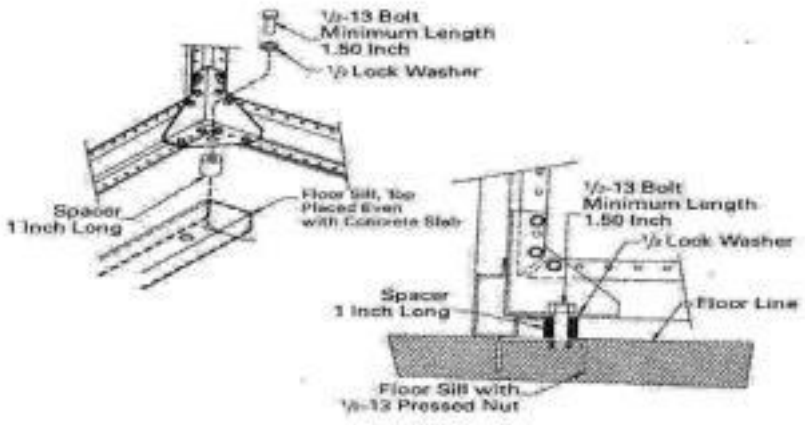


Figure 7: Installation of Seismically Certified Switchboards with Floor Sills



Testing and Inspection

After the equipment has been installed and all connections made, test and inspect the switchboard *before energizing*. Although the equipment and devices have been inspected at the factory, perform a final field test to be certain that the equipment has been properly installed and that all connections are correct and have not loosened during transportation. Completely check the wires and all bolts and terminals for tightness. Check all Kirk key interlocking schemes to insure desired performance. Make sure that the incoming line is de-energized while all tests are in progress.

In addition to these mechanical checks, use a megohmmeter to test the switchboard. Open all switchboard devices and remove all instrumentation and control fuses. Use a megohmmeter developing 500 volts. Switchboards tested when leaving the factory show typical minimum values of 100 megohms. If any switchboard tested under the above conditions shows resistance values considerably below this, inspect it for possible tracking on insulation or insulation breakdown.

All scraps of wire, plaster, dust, and other foreign material must be removed. Vacuum cleaning is recommended for cleaning.

After thorough cleaning and inspection, if the megohm reading is still low, it may still be safe to energize the equipment. When restoring flooded or wet equipment to service, for example, the accepted practice is to require a minimum of *1 megohm* before energizing. Under damp or humid conditions, it is considered good practice to operate the equipment at lower-than-rated voltage for a short time, if possible, to improve the low reading.

Bolts

Switchboards are furnished with medium carbon steel hardware with tensile strengths listed in Table 1. Similar hardware must be used for any additional bolting. Use a torque wrench when tightening to the nominal values given, for either copper or aluminum connections. Use flat and lock washers for all connections. Do not place washers under the heads of carriage bolts.

Bolt Size	Tensile Strength, PSI	Torque, lb-ft
1/4-20	120,000	4
5/16-18	120,000	9
3/8-16	120,000	16
1/2-13	60,000	39
1/2-13 with 2 1/4" Belleville washer[1]	60,000	70
5/8-16	60,000	80

[1] EUSERC Utilities

Table 1. Tightening torques for supplied hardware.

Electrical Clearances

Maintain the minimum clearances listed in Table 2 except at terminals of circuit breakers and switches.

	Voltage Difference		
Condition	**0-125 V**	**126-250 V**	**251-600 V**
Between uninsulated live parts of opposite polarity			
Through air	1/2"	3/4"	1"
Over surface	3/4"	1 1/4"	2"
Between uninsulated live parts and grounded metal through air or over surface	1/2"	1/2"	1"

*A through-air spacing of not less than 1/2 inch is acceptable at a circuit breaker or a switch, other than a snap switch, and between grounded dead metal and insulated neutral of a 277/480 Vac three-phase, four-wire panelboard or switchboard.

Table 2. Minimum clearances for live parts (UL).

Grounding

The ground bus is bolted to the uprights of the rear frame structure. It is arranged so that connections to the station ground can be made in any section. A ground lug is included in each complete equipment for tying the switchboard to the station ground.

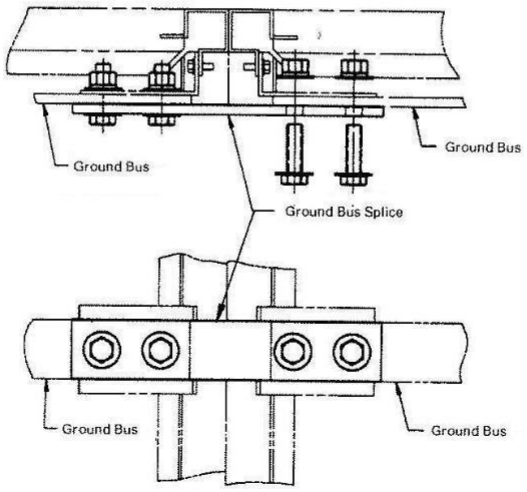
WARNING: The equipment must be adequately grounded to ensure that all parts of the equipment, other than live parts, are at ground potential. Failure to observe this precaution can result in serious injury or death.

Chapter 3 – Splicing the Switchboard Sections

Splicing the Switchboard Sections

Align the sections according to the drawings furnished by the supplier for the installation. Connect the ground bus splices as shown in Figure 8.

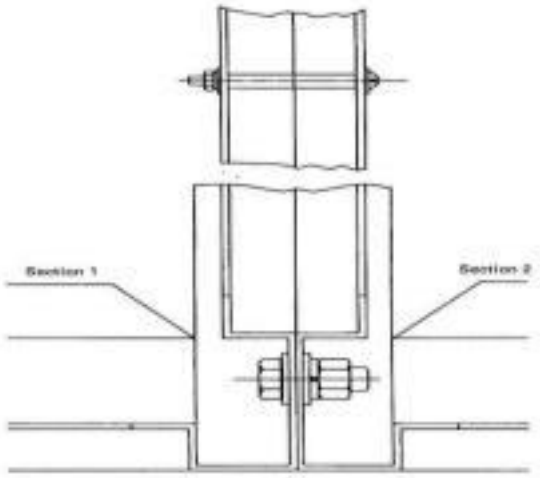
Figure 8: Splicing Diagram for Sections with 800-4000 A Aluminum or Copper Ground Bus



Chapter 4 – Connecting the Section Frames

The section frames are connected as shown in Figure 9. The joining of the sections contains two bolted connections on the top and bottom depth-frame members. In addition, two bolted connections are made on each vertical frame member. The vertical connections are located one-third and two-thirds up from the bottom of the switchboard.

Figure 8: Connecting the Section Frames



Chapter 5 – Switchboard Maintenance

WARNING: De-energize this equipment before performing any work.

General Maintenance Procedures

To obtain the best service from this switchboard, establish a periodic maintenance schedule. At a minimum, perform an annual check and overall maintenance procedure for the switchboard devices and all connections. Equipment subject to highly repetitive operation may require more frequent maintenance.

Keep a permanent record of all maintenance work. Include a list of periodic checks and tests, the date they were made, the condition of the equipment, and any repairs or adjustments performed. Maintenance employees should follow all recognized safety practices such as those in the National Electric Code, in company and other safety regulations.

For specific information about the maintenance of devices such as circuit breakers, relays, and meters refer to the separate manuals provided with each device.

Observe the following important points:

Periodically inspect the switchboard while under load to determine if there is any indication of overheating. If overheating or any other unsatisfactory condition is found, completely de-energize the switchboard and investigate. Look particularly for loose bolts and connections or overloading. Remove any accumulation of dirt or other foreign matter in the enclosure. Do not touch live parts while the switchboard is energized.

Plated parts may become dark over a period of time because of oxidation. Do not remove the discoloration, as that will reduce the thickness of the plating.

Retighten lugs and joints to eliminate possible heating points. Transmission of vibrations through the building structure and conduits to the switchboard may loosen lugs and joints. Turning the load off and on causes expansion and contraction between lugs and cables, which tends to loosen the lugs.

Do not open sealed breakers or trip units, as this may disturb the calibration. Return such units to the factory for any replacement required.

Ambient Temperatures and Circuit Loading

Switchboards are designed for installation where the average ambient temperature does not exceed 77° F. For higher temperatures, derating is required. The conductor temperatures within the enclosure may be as high as 176° F. Some parts of the breakers, switches and fuses may run even hotter. It is recommended that thermal-magnetic molded-case breakers in switchboards not be loaded in excess of 80% of the rating when the load will continue for three hours or more, even with ambient-compensated breakers.

Short Circuits

Normally, the overcurrent protective device on the circuit will prevent any electrical damage except at the actual point of the short circuit. Make a thorough inspection of the entire system after any large fault current to ensure that there has been no mechanical damage to conductors, insulation, or equipment.

In addition, the individual overcurrent protection device or devices that performed the short-circuit interruption must be inspected for possible arcing damage to the contacts, arc chutes, and insulation. Do not open sealed devices such as breaker trip units. If there is any possibility that sealed units may have been damaged, they should be replaced. For additional details on the device, refer to the applicable instruction manual provided with the device.

Arcing Damage to Insulation

Some organic insulating materials carbonize when subjected to the heat of an electrical arc and lose their insulating properties. Any insulation found to be carbon-tracked must be replaced before applying power.

Water-Soaked Equipment

When equipment has become water soaked, observe the following points during maintenance:

Completely de-energize the switchboard.

Carefully clean and dry all parts of the switchboard. When using heaters, make sure the temperature does not exceed 180° F.

Replace all fuses.

Inspect all individual devices for the entrance of water, dirt, or foreign matter.

Do not open sealed devices, such as breaker trip units. Replace them.

Before re-energizing the switchboard, perform a megohm resistance test, as described in *Testing and Inspection* in Chapter 2.

If assistance or guidance is required, contact your local service engineer. Your supplier's service shop has facilities for reconditioning equipment and devices.

Spare Parts

A spare parts inventory for the components of the switchboard, such as bus and insulators, is not recommended. When components must be ordered, please refer to the nameplate marking and shop drawing number and order by description.

A spare parts inventory of devices, such as circuit breakers, meters, and switches will vary due to the variety of installations. Your application engineer will be happy to assist you in the proper selection of a device inventory list.

Questions, Concerns or Inquiries? Contact Us:

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