



INSTRUCTIONS

SWX-100-ENCL ISOLATION SWITCH



INTRODUCTION

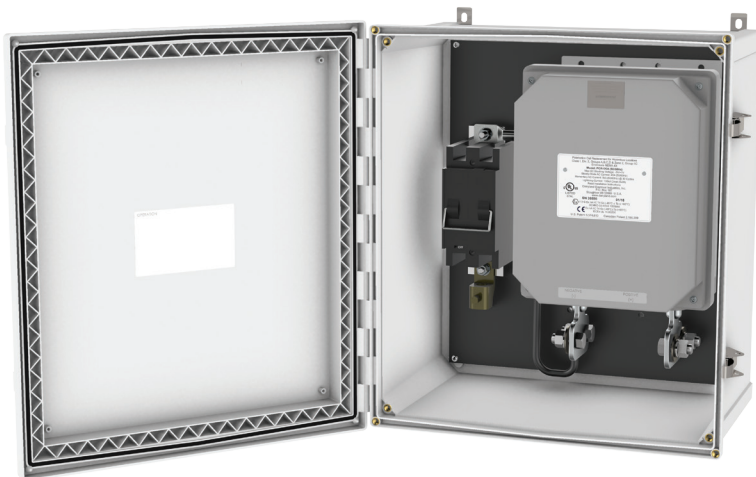
The Dairyland Isolation Switch, models SWX-100-ENCL1816 and SWX-100-ENCL2424, consist of a pull-style isolation switch packaged together with a Dairyland SSD, PCR, or PCRX decoupler mounted in a NEMA4X enclosure and can be provided with or without the decoupler. The SWX-100-ENCL1816 and SWX-100-ENCL2424 accommodate all SSDs and PCRs. A PCRX may only be used with the SWX-100-ENCL2424. These instructions outline how to connect the switch to the cable leads connected to the pipeline and ground.

Dairyland isolation switch model SWX-100X2-ENCL consists of dual single-pole pull-style disconnect switches mounted in a NEMA4X enclosure. This switch has universal applications, one of which could be rectifier disconnect.

The switch has a bolted terminal which accepts conductor leads up to #1/0 AWG. To aid installation, Dairyland provides a wide range of MTL conductor lead kits suitable for most applications. See www.dairyland.com/accessories.

WORKER SAFETY

For worker safety during installation, it is recommended that the user obtain certain equipment; namely a pair of electrically insulated gloves, a shorting cable of approximate 3 foot length with insulated clamps on each end, and a multi-meter to measure AC voltage. (Of these items, Dairyland offers a suitable 3 foot long 1/0AWG shorting cable with insulated clamps, Model# BCL-1/0 for all decoupler ratings.) The following installation procedure assumes that these items are available. It is suggested that a grounding jumper be used as a safety precaution in the event the pipeline lead rises to an unsafe potential when it is removed from the decoupler, which is a necessary step during the installation process or if an electrical disturbance occurred while the Isolation Switch is being installed. If the voltage one is working with is not at a safe touch potential (i.e., >15VAC to ground), then insulating gloves should be used.



Dairyland model SWX-100-ENCL 1816 with PCR

! WARNING

When isolation switches are used in AC voltage mitigation applications, if multiple or all decouplers are disconnected, the pipeline voltage may rise to an unsafe level (i.e., above the 15Vac that NACE standards consider safe). Therefore, safety precautions should be taken by the user when decouplers used for AC voltage mitigation are isolated from the pipeline, particularly at any pipeline contact point. Dairyland provides suggested procedures for installing and operating the Isolation Switch, but the user must be responsible for and approve the procedures to be used by its workers when initially installing the Isolation Switch in a field retrofit installation because Dairyland cannot be familiar with each user's safety guidelines.

! WARNING

Measure the AC voltage at the decoupler, as outlined in step 1, before contacting any terminals or connections, and follow the described safety procedures.

NOTICE

When a decoupler is being used to provide AC grounding for electrical equipment, via installation in a code-covered grounding conductor or bond, an Isolation Switch should not be installed, because per electric codes, such equipment must always be solidly AC grounded under all conditions.

! WARNING

Isolation Switches are not to be installed in a defined hazardous location, but rather in an "ordinary" location.



REQUIRED TOOLS: SWX-100-ENCL

Required installation tools include:

- Ratchet wrench with 1/2" (for SSD) or 3/4" (for PCR or PCRX) sockets.
- 1/2" (for SSD) or 3/4" (for PCR) box end wrench.
- Suitable grounding jumper cable and electrically insulated gloves as described under "WORKER SAFETY".
- 1/4" hex key
- Multimeter to measure AC voltage
- 1 padlock that fits a 3/8" hole in the enclosure latches.
- Conduit fittings, quantity dependent on user.
- Flexible rain tight conduit, quantity dependent on mounting location. Cutting tool needed for conduit.
- Punch or other device for creating conduit hole/s in enclosure. Diameter depends on conduit used.
- Phillips screwdriver
- #2AWG insulated conductors, length dependent on mounting location. 2 conductor terminals with 5/16" hole for SSD or with 1/2" hole for PCR or PCRX. Dairyland's MTL accessory conductor kits are recommended, or can be user supplied.
- Tef-Gel (supplied with the SWX-100-ENCL)

INSTALLATION PROCEDURE: SWX-100-ENCL

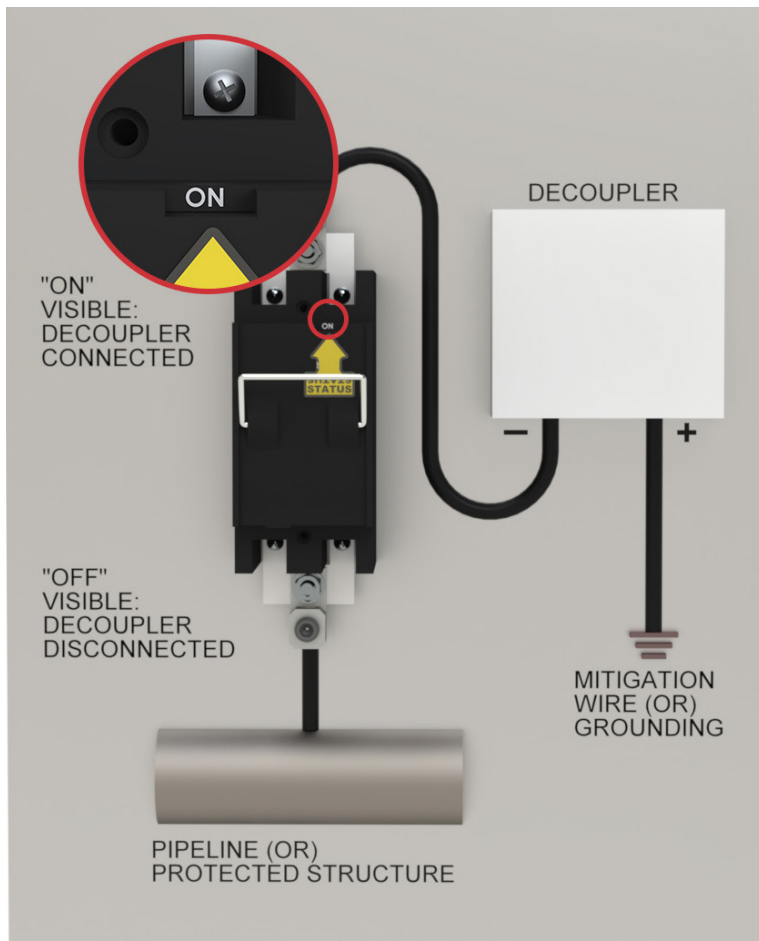
Note: The photos used in the following installation steps will show the SWX-100-ENCL2 with an SSD. All of the same steps apply when used with a Dairyland SSD, PCR, or PCRX.

- Before beginning the installation, it is important to know the voltage associated with the pipeline leads to be handled during the installation process. Do not contact the decoupler terminals or existing wiring connections before determining if such action is safe. If NACE guidelines were followed for the AC mitigation design, the voltage measured should, but may not be, less than the 15VAC that NACE considers safe, which is the reason for recommending this measurement. Your company may have a different, and lower, voltage limitation for safety. It is recommended that the installer measure the AC voltage from the negative lead (the connection to the pipeline) to an earth reference (e.g., a long shank screwdriver or a reference cell) contacting the earth where the worker will be standing to install the switch, as this will represent the worker touch potential. If the voltage measured is not considered safe then use electrically insulated gloves when handling the pipeline leads. The use of insulated gloves is not shown in the following steps. Their use, if required, will make the installation more difficult, but should be used whenever the touch potential is above either your company's safety guidelines or NACE guidelines.

- Regardless of the voltage measured in Step 1, as a precaution use the grounding jumper cable to ground the pipeline by connecting the black clamp of the jumper cable to the positive or ground lead and connect the red clamp to the pipeline negative lead bare terminal (not the decoupler terminal pad). The reason for this step is that the voltage on this pipeline conductor may shift higher when it is not grounded. In addition, transient electrical effects on the pipeline must be addressed. Leave the grounding jumper connected throughout the installation process.

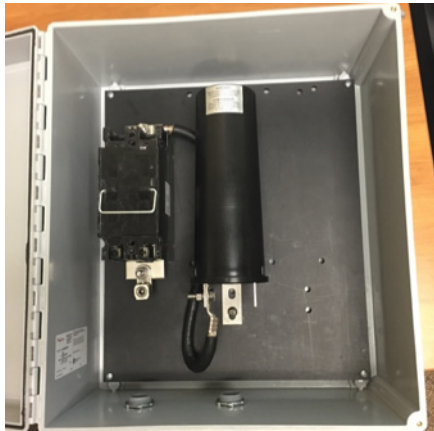
SWX-100-ENCL with Factory-Installed Decoupler – Continue to Step 3

SWX-100-ENCL with Field-Installed Decoupler – Continue to Step 9





- Determine the mounting location and attach the product to a suitable flat surface (panel, unistrut frame, etc) using the enclosure mounting points seen in drawings 100095 (ENCL1816), and 100111 (ENCL2424). Considering the final enclosure mounting location, drill one or more holes for conduit fittings, as appropriate, in the enclosure through which the pipeline and ground leads will enter the enclosure. It is recommended that the leads enter through the bottom of the enclosure. If necessary, they can enter through the lower part of the side panels. When locating the conduit hole(s), note that the ground lead will connect to the positive terminal of the decoupler on the right side and the pipeline lead to the lower bolted terminal of the switch on the left side. Install conduit fittings.

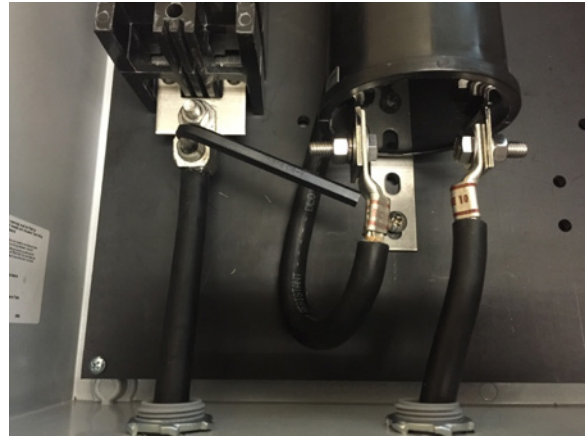


- Determine the length of the leads and rain tight conduit required for connections to the switch and decoupler positive terminal and cut to length. Insert the conductor leads through the conduit but do not yet connect the conduit to the conduit fittings.

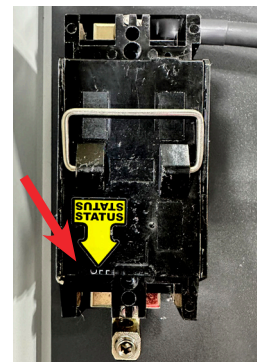
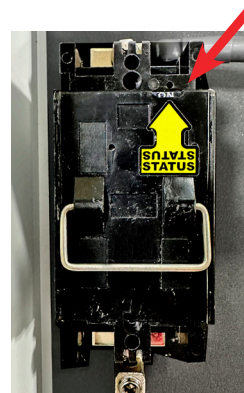
- Apply Tef-Gel corrosion inhibitor (provided) to all flat mating surfaces of the lead terminals and to bolt threads. Attach the ground conductor lead to the positive terminal of the decoupler using the hardware provided with the decoupler. Place a flat washer, lock washer and nut on other side of bolt and firmly tighten using a ratchet with 1/2" socket and 1/2" box wrench for SSD devices. For a PCR or PCRX, use ratchet with 3/4" socket and 3/4" box wrench and 1/2" hardware (provided).



- Remove about 5/8" of the insulation from the end of the pipeline conductor and apply Tef-Gel corrosion inhibitor to the bare lead end. Insert the lead into the bolted terminal of the switch and firmly tighten with 1/4" hex key (provided). Then, insert the conduit into the conduit fitting and securely tighten so as to prevent any water leak into the enclosure.



- MTR Terminal Extension Kits are available from Dairyland as an optional accessory allowing users to attach up to four pipeline conductors to the switch.
- This switch is a pull-out model. The switch position is indicated as ON (connected) in the upper right corner, or OFF (disconnected) in the lower left corner.



If the decoupler is to be left connected to the pipeline, no further action is required because the pull out switch is shipped in the ON position (decoupler connected). To operate the switch, pull out by the handle with a brisk motion, rotate 180° and plug back in so that the desired position label is indicated. If the decoupler is to be left disconnected, then return the switch to its OFF position. Confirm that the isolation switch is left in the desired position, then close the enclosure cover and lock. This completes the installation instructions.



The isolation switch operating instructions are found inside the enclosure cover. Read and follow these instructions. Certain steps recommend abruptly pulling out and reinserting the switch mechanism and the reason for this is to minimize arcing time on the switch contacts.

SWX-100-ENCL with Field-Installed Decoupler

9. These instructions apply to any Isolation Switch model that is to be installed on an in-service Dairyland decoupler model SSD, PCR, or PCRX. Assure that safety steps 1 and 2 have been followed, then proceed.

10. This step involves removing the pipeline lead from the decoupler negative terminal. In most cases, it is expected that the voltage on this lead to earth will be at a safe touch potential, so if the touch voltage measured was safe with the lead connected, it will remain safe after it is removed provided the lead remains shorted to ground with the jumper cable. Use ratchet with $\frac{1}{2}$ " socket and $\frac{1}{2}$ " box wrench to disconnect the lead from the SSD negative terminal and save the hardware for reinstallation. Repeat for the positive terminal lead. (Use $\frac{3}{4}$ " wrenches for PCR or PCRX.)

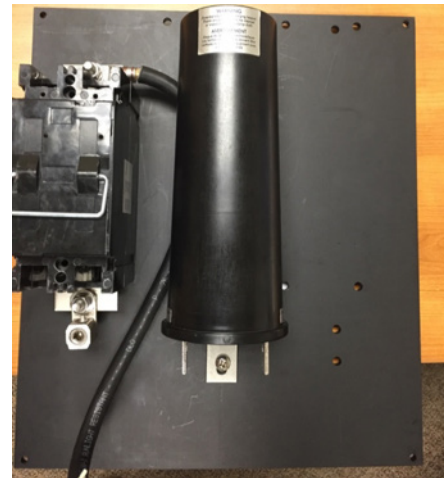
Note, in some applications there may be several leads from the negative decoupler terminal to the cathodically protected structure. Attaching the red clamp to just one of these leads will ground all of the leads if they are bonded to a common structure, but confirm that this is the case.

11. For SSDs, record the model and serial number of the SSD nameplate onto the label provided with the SWX-100-ENCL using a permanent ink pen. Attach the label to the inside door surface of the enclosure so that it will be visible once installed in the enclosure. Otherwise, it is difficult to read the SSD nameplate data once installed in the enclosure. This step does not apply to the model PCR or PCRX.

12. Remove the backplate from the enclosure by removing the screws using a Phillips screwdriver.

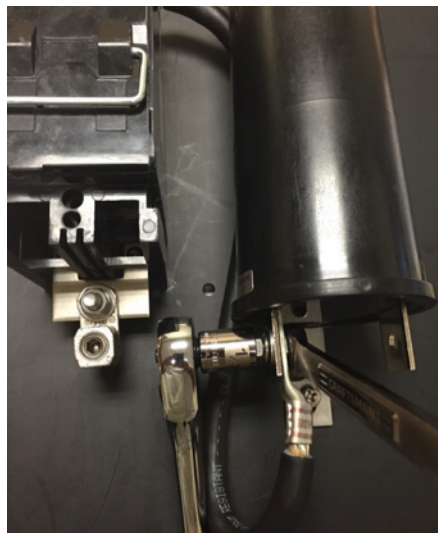


13. Mount the decoupler to the backplate using the $\frac{1}{4}$ "-20 screws, flat washer, lock washer and nut provided with the SWX-100-ENCL. Firmly tighten using Phillips screwdriver and $\frac{3}{8}$ " box wrench. See page 5 of the attached installation drawings 100095 or 100111, for the proper mounting location of both the SSD and PCR decouplers. The SSD location shown leaves additional room for optional equipment installation.

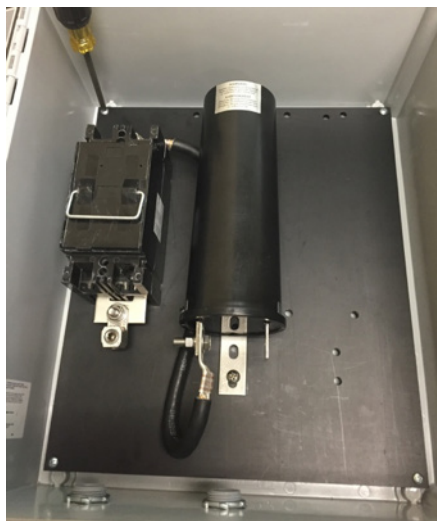




14. Attach the conductor lead with the compression terminal from the switch to the negative terminal of the decoupler using the hardware that was removed. Apply Tef-Gel corrosion inhibitor to all flat mating surfaces of the terminals and to hardware threads. Use a set of 1/2" wrenches (for SSD) or 3/4" wrenches (for PCR or PCRX) and firmly tighten.



15. Re-mount the backplate onto the enclosure using the screws removed in step 12.



16. Refer to steps 3 through 8 to complete the installation.

INTRODUCTION: SWX-100X2-ENCL

In addition to various other applications, Dairyland isolation switch model SWX-100X2-ENCL can be used to safely disconnect and isolate a cathodic protection rectifier from the DC output field connections with the protected structure and also the impressed current ground bed. This allows rectifier maintenance without voltage or influence from the protected structure or ground bed. This scenario is outlined in the remainder of this document. Observe all instructions, warnings, and cautions outlined here, in addition to any specific company, facility owner, and industry safety practices and procedures.

! WARNING

Before contacting the rectifier or beginning installation of the isolation switch, assure that the rectifier is unpowered by opening the AC input breaker and verifying via voltage measurement on the DC output.

REQUIRED TOOLS & SUPPLIES: SWX-100X2-ENCL

- Enclosure mounting hardware, (4) 5/16" dia. bolts/screws, and associated tools
- Conduit fittings, quantity dependent on user
- Flexible rain-tight conduit, quantity dependent on mounting location. Cutting tool needed for conduit.
- Punch or other device for creating conduit holes in enclosure(s). Diameter depends on conduit used.
- 1/4" hex key for cable terminations (provided)
- Tef-Gel (provided)

INSTALLATION PROCEDURE: SWX-100X2-ENCL

When used in a rectifier disconnect application, the SWX-100X2-ENCL (SWX-100X2) should be installed in series in the rectifier positive and negative DC output leads, and should be located near the rectifier. The output connections from the SWX-100X2 will now act as the connection to the cathodically protected structure (negative) and the impressed current anode bed (positive).

After installing the two stainless steel mounting brackets to the enclosure using the included hardware, mount the SWX-100X2 where desired, using (4) 5/16" bolts/screws (user-supplied) in the slots in each enclosure flange. Considering the final enclosure mounting location, drill holes for conduit fittings, as appropriate, in the enclosure through which the leads will enter the enclosure. Install conduit fittings.



Turn the rectifier off before making the connections to the SWX-100X2. With the rectifier OFF, measure and determine if there is any voltage on the output leads due to rectification of induced AC voltage that may be on the cathodically protected system (e.g., such as a cathodically protected pipeline in an electric transmission line corridor). If voltage is present and above what your company considers safe, take the necessary safety precautions to prevent electric shock when making the required lead connections (e.g. use electrically insulated gloves or other approved means).

Determine the length of the leads and Type NM flexible rain-tight conduit required for all four lead connections to the switch and cut each to length (i.e. two leads from the rectifier positive and negative to the switch and two leads from the switch; one to the cathodically protected structure and one to the impressed current ground bed). Insert the conductor through each flexible conduit but do not yet connect the conduit to the conduit fittings.

It is suggested that the two leads from the rectifier be connected to the SWX-100X2 first. Remove 5/8" of the insulation from the end of each lead to be connected to the switches. Paying attention to the polarity, insert the appropriate lead through each of the top conduit fittings so the bare conductor is fully inserted into the switch terminals, applying Tef-Gel to the bare lead ends.

Securely tighten each switch terminal using the provided 1/4" hex key. Then, insert the flexible conduit over each lead and fully into the conduit fitting and securely tighten the fitting so as to prevent any water leak into the enclosure. Then attach the other end of these leads to the rectifier using conduit fittings.

Next, connect the leads from the anodes and from the pipeline (or other cathodically protected structure) to the switch through the bottom conduit fittings. Follow the same sequence of steps outlined above, again paying attention to the polarity.

NOTICE

Before finalizing the installation, carefully check the polarity of the connections from the rectifier, through the switch, and to the field connections, to assure that the negative connection serves the protected structure (e.g. pipeline, etc) and the positive connection goes to the impressed current ground bed. Reversed polarity will cause rapid corrosion of the structure that is attempting to be protected.



OPERATION: SWX-100X2-ENCL

Although the switch can be safely used as a load-make or load-break switch within the ratings specified on the cover nameplate, some users have preferred to only operate the switch after the AC power to the rectifier has been turned OFF and this is reflected in the instructions below.

OPERATION

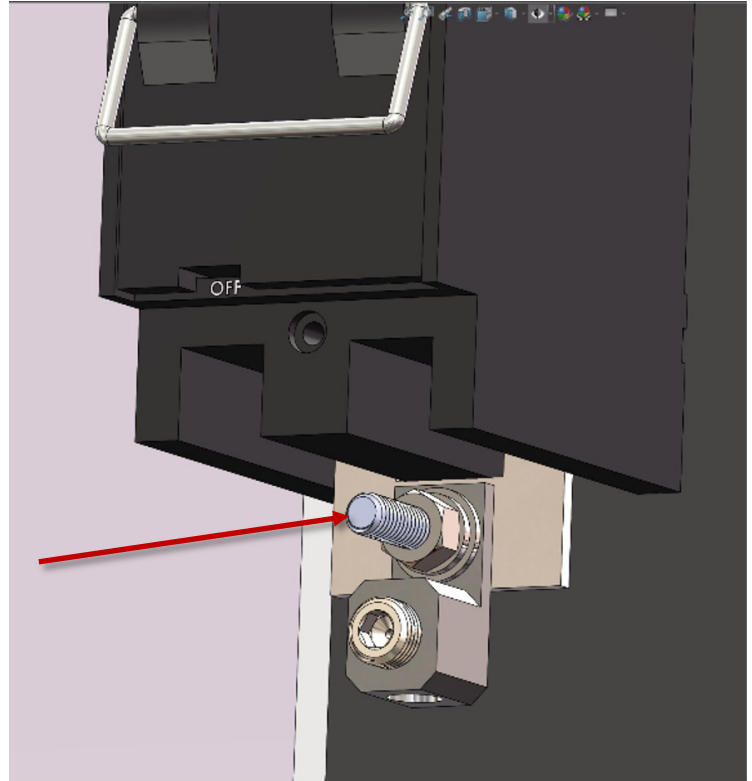
A. To disconnect the rectifier from the cathodically-protected system

Note: when rectifier is connected, switch is closed and ON will be visible in the upper-right corner of switch.

1. AC power to the rectified is to be turned OFF **before** the SWX-100X2-ENCL is turned OFF (i.e., Disconnected).
2. To disconnect the rectifier from the cathodically-protected system, pull out the switch by the handle provided, rotate 180° and fully re-insert. **OFF** will then be visible in the lower-left corner of the switch.

B. To reconnect the rectifier to the cathodically-protected system

1. Verify that rectifier AC power is OFF.
2. Pull out the switch by the handle provided, rotate 180° and rully re-insert. ON will then be visible in the upper-right corner of the switch.
3. AC power can then be reapplied to the rectifier.



It is suggested that the rectifier be turned OFF whenever the switch is to be operated to prevent arcing of the switch contacts even though the switch is rated to safely make or break load current of 100Adc at 125Vdc. If the switch is operated with the rectifier energized, it is suggested that the switch be operate with a firm, quick motion for both load-make and load-break to minimize arcing time of the switch contacts.

Another feature of the SWX-100X2 is the long bolt pictured below, which is found on both sides of the switch body. If desired, with the switch in the open position, an interrupter can be installed across the switch, utilizing the protruding bolts and connected with a ring terminal or alligator-type clip.