

# Installing a Surge Protection Device in FLEXware ICS Combiner Box

The intent of this document is to explain how to install a surge protection device (SPD) in the OutBack Power FLEXware ICS combiner box. The first part of the document addresses mounting the SPD and the second addresses wiring considerations.

## Introduction

Surge protection devices are used to minimize damage to electronics caused by surges and lightning by placing themselves in parallel with the source of the surge and the device being protected. Some use metal oxide varistors (MOVs) while others employ silicon oxide varistors. In either case, follow the SPD manufacturer's installation guidelines, keeping in mind the points outlined in this document.

## Mounting the Surge Protection Device

The SPD should be mounted in such a way as to minimize the entry of moisture into the enclosure and maintaining its NEMA 3R rating. The two recommended ways to mount an SPD are either in the existing 1-½" knockout or by punching/cutting a new hole in the enclosure. Note that 1-½" is the trade size, so the actual dimension of the hole is closer to about 2". Some of the common SPD's on the market have a mount that is about ¾" in diameter, so if a hole is punched, it should be a ½" (trade size) hole.

If the existing 1-1/2" knockout (KO) is used, reducing washers must be used in order to mount the SPD. In the example shown in *Images 1-3*, a pair of 1-½" to ½" reducing washers are used to mount the SPD. Some notes about using reducing washers:

- It is shown being mounted on the side of the combiner box, but may need to be installed on the bottom if conductors larger than #1 AWG are used, as these must be run through the side KO in order to maintain the bending radius at a level acceptable by UL1741.
- 1-½" to ½" reducing washers can sometimes be difficult to find in standard hardware stores but are readily available at electrical supply stores.
- As the knockout is below the electrical components in the combiner, and as the combiner contains a drain hole, there is very little risk water reaching any electronics. However, sealant may be used in conjunction with the reducing washer to make the connection more weatherproof if deemed necessary.

An alternative to using reducing washers is to punch/cut a new hole that will accommodate the SPD.

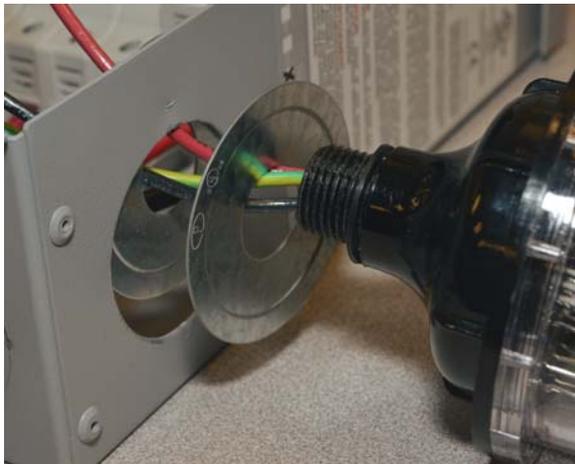
- A knockout punch or hole saw can be used to create the hole, but be sure to remove any sharp burrs left behind by the hole saw. Because it is generally easier and creates a cleaner hole, it is recommended to use a knockout punch.
- Knockout punches are often designated by nominal trade sizes while hole saws are designated by the actual hole diameter they create. For example, use a ½" punch or a ¾" hole saw to create a hole for a SPD with a ¾" mounting diameter.
- Punch the hole below the lowest level of the electrical terminals. This will ensure that even if water enters through the punched hole, it does not come into contact with live electrical parts. Refer to *Image 4*.

In either case, make sure not to over-torque the SPD such that its rubber washer bulges or is otherwise prevented from forming a proper seal.

## Wiring the Surge Protection Device

Wiring the SPD is straightforward but there are some details to observe. The first is to ensure the terminal bars are utilized properly, as there are restrictions on how they can be wired:

- The SPD will come with wires for both positive (red) and negative (black) and they should be landed in the combining terminal blocks of corresponding polarity. Refer to *Images 3-4*.
  - It is critical to land the wires in the open terminal on the PV input side of the terminal block. Refer to *Image 5 (macro photo)*. Do not install the SPD wires into terminals occupied by PV input wires nor the output terminals.
- The green ground wire of the SPD is installed on the ground bar in the combiner.
- Ensure that all terminals are tightened to the appropriate torques, as shown in the installation manual for the combiner box.
- Finally, to maintain effectiveness of the SPD, do not cut its wires so short that sharp bends are required in order to terminate the conductors; larger bend radii optimize performance of the SPD. See *Images 3-4*.



*Image 1: Installing SPD using reducing washers.*



*Image 2: Installing SPD using reducing washers.*

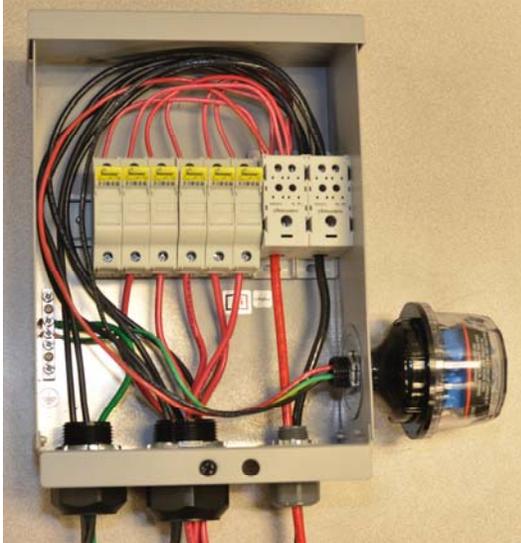


Image 3: SPD installed with reducing washers.

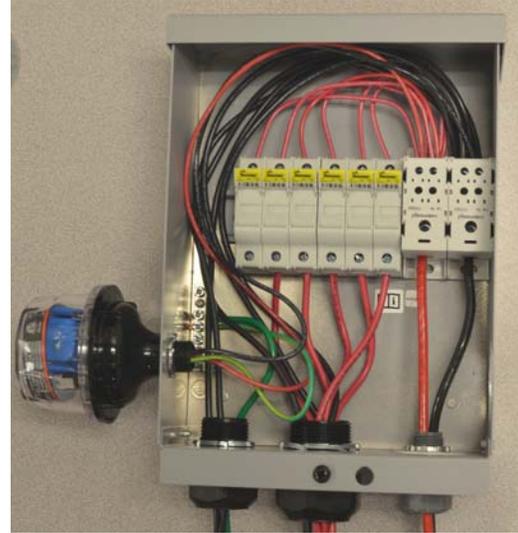


Image 4: SPD installed in a newly punched hole.



Image 5: SPD must be wired to their own dedicated terminals. This photo shows the six pre-wired PV+ wires and an example system consisting of five strings of PV circuits, hence only five PV- wires.

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