Solar Controller Disconnect

Principle of Operation

The goal is to provide power isolation to the solar controller. To do this we will interrupt power from the solar array and from the battery bank. This effectively isolates the solar controller from power permitting servicing the device.

This can be done in several ways:

- a single resettable inline automotive breaker on each side of the controller


- a maxi-fuse on each side of the controller

- a disconnect box of some sort, either a breaker box or an AC disconnect

Here we discuss the breaker box and AC disconnect method.

MidNite Solar Baby Box

The MidNite Solar *Baby Box Enclosure* is a small general enclosure box usable for solar disconnect, small inverter disconnect or AC/DC distribution. It is DC rated to 63 amps and accepts up to four 150 volt DIN mount breakers. Note that DIN breakers are required – there is no buss bar as in a typical US load center. The mounting rails you see are simply that – mounting rails. They carry no current. The cost is about $36 without breakers. DIN breakers that fit this box are shown below and cost about $15 for a single pole breaker.

The Baby Box is very tight to wire. If you need more space for wire manipulation look at the Big Baby Box, which is about 1" bigger. It runs about $45 and also holds 4 Din breakers.

Wiring a DIN Breaker

DIN breakers mount on a symmetric rail system. They snap onto the rail and can be mounted in either orientation (180 degrees out of phase). They are typically mounted in the same orientation, though. There is no common buss bar feeding power to them, so they differ from a typical USA residential load center, where breakers are fed power by snapping into a "hot" busbar. In the case of the DIN breakers discussed here, there are two wire terminals – one at each end of the breaker. Power is fed in from one side, and out the other – they are "in-line" breakers fed with individual wires.

If a common power source is used, then there are solid "jumper" bars that can be inserted in the tops to feed power to all the breakers. Or, you can jumper them together with appropriate sized wire daisy-chained between breakers. Typically one breaker would act as the "main" breaker and be sized to the input wire size. In the picture to the left there is a lug used to supply power to the busbar – this takes a breaker space and is functionally equivalent to a "main lug load center" in conventional residential wiring.

Used as a disconnect device the breakers are wired individually, not jumpered to a common source using the busbar.

To use as a solar controller disconnect the goal is to interrupt power on both the input (array) side and the output (battery) side of the controller. That effectively isolates the controller and makes it available for safe

servicing or disconnection from the circuit. To do this, you need two breakers – one on the array side positive, and one on the battery side positive. The negative feeds go directly to the controller. On the array side, feed the positive line into the top of the breaker and properly torque it down. Then attach another #4 cable (minimum) to the bottom of that same breaker and run it to the solar controller "Array In +" terminal. This effectively places the breaker "in line" between the array and the solar controller positive line. Turning off the breaker interrupts the current from the solar array.

Do the same thing from the controller to the battery bank. The output from the controller "Batt Out +" terminal goes to the second breaker – feed it to the top of the breaker. Then a second cable goes from the bottom of the breaker to the battery bank.

Make sure to mark these cables as positive – red tape is convenient if you are not using colored cable.

Also, make sure that the proper size cable is used. Interactive voltage drop calculators are available to determine the size wire to use to minimize voltage drop. For most installations the cable from the array should be no less than #4, and the cable to the battery should be larger – typically no less than #2. Why is the cable to the battery larger? Because it is often carrying more current at a lower voltage (13.6 volts to the battery, vs. 18+ volts from the array to the controller). Thus the cable size increase.