

MidNite Solar PV Combiners explained (MNPV)

The MNPV6 PV combiner is designed to work with 6 150V breakers or 4 touch safe 600VDC fuse holders. Busbars for both configurations are included. Based on sales, this little combiner has become the favorite of the RE industry. It is the first PV combiner to come with a custom deadfront to hide wiring when the metal cover is opened. One comment we have received is that the fuse holder configuration results in a compromise when the plastic dead front is used. It is difficult to make one deadfront that works well for both scenarios.

The picture below shows how the touch safe fuse holders look when used with the deadfront as compared to breakers. The breakers are a better match with the deadfront. There is a gap around touch safe fuse holders. This is not a safety issue, but rather a cosmetic one.



Not wanting to have a cosmetically challenged combiner, we recently designed a snap in adapter that will be included with all MNPV3 and 6 combiners. (February or March 2009).

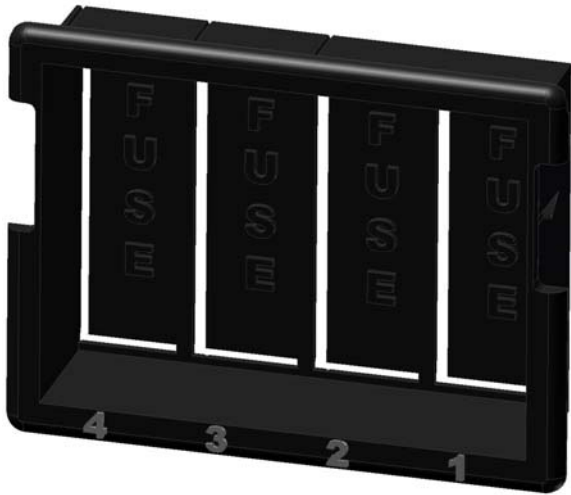


Check out the CAD pictures here.

The fuse adapters and dead fronts are actually black. The left picture has fuse holders installed.



The snap in adapter has notches built in to act as a guide for cutting down for MNPV3 applications. To use for MNPV3 applications, cut the large piece down to 2 or 3 spaces using a Stanley knife. The two pieces will need to be glued or taped together. Material is ABS, so common ABS pipe glue should work nicely.

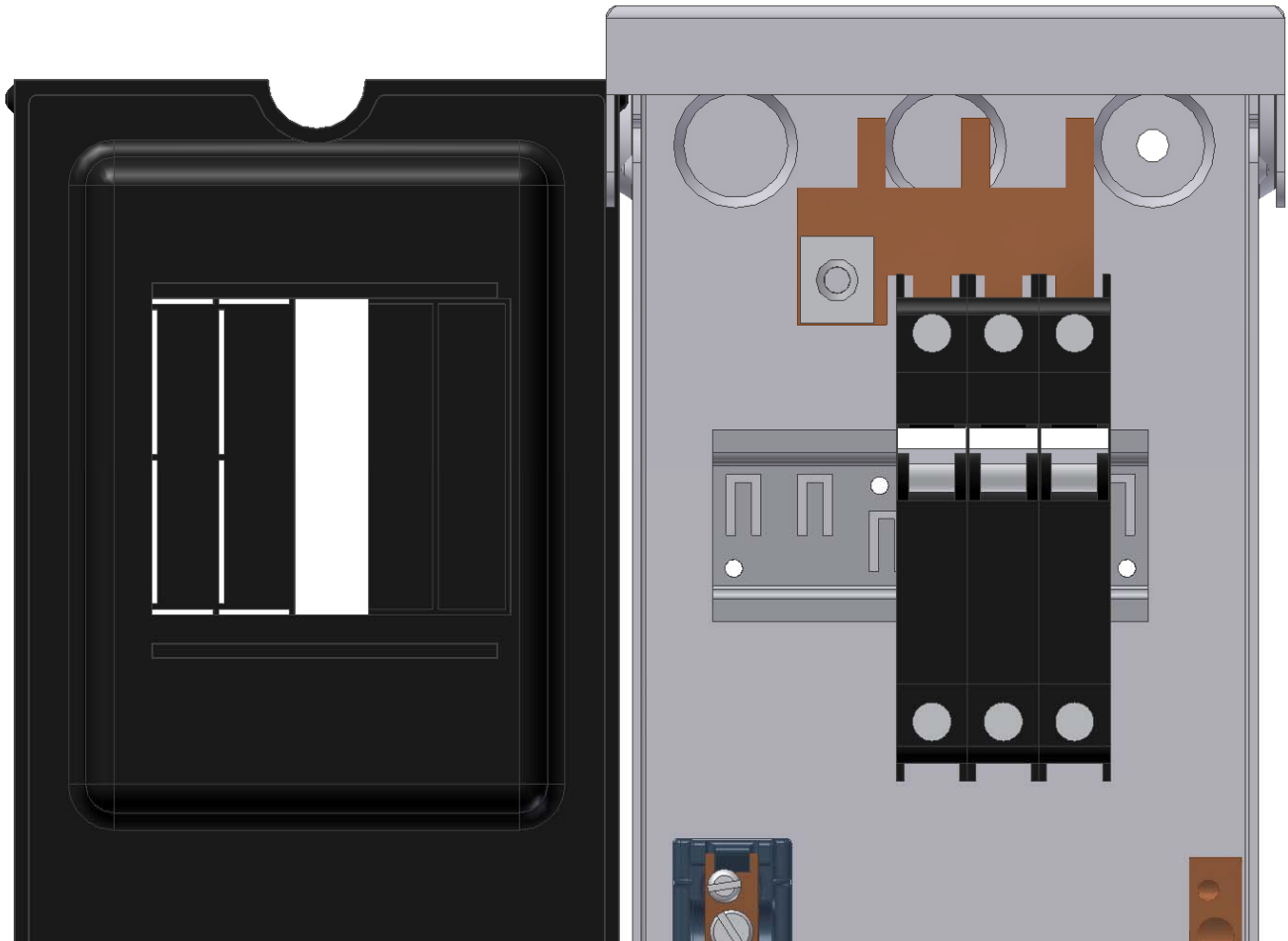


Snap in adapter ready for the MNPV6 combiner



Snap in adapter cut down and ready to glue together for installation into the MNPV3 combiner

BusBars for the MNPV3: We never thought customers would be using the MNPV3 with touch safe fuse holders. Well, we were wrong big time. These are used all the time for high voltage applications. They are used as a combiner for string inverters as well as a high voltage disconnect. The problem is that they do not come with a fuse holder busbar. Starting sometime in February 2009, the MNPV3 will come with a new internal combining busbar. The new busbar is shown below



The new 1/8" thick copper busbar is rated for 83 amps and is reversible for use with fuses or breakers. In the past, customers would use the MNPV6 fuse busbar (\$13.00 list) and cut it down for use in the MNPV3. Notice how the new MNPV3 busbar is set up for three breakers or three fuses. Each breaker is 1/2" wide where as the fuse holders are almost 3/4" wide, thus separate finger arrangement for each application. The fact that we are putting three fuse holder fingers on the new busbar presents another problem. The MNPV3 Deadfront has three 1/2" knockouts. Three circuit breaker knockouts is the same width as two fuse holders. Take a close look at the **back** of the deadfront above. There have always been notches that would allow up to two more breakers. Now the numbers don't exactly work out perfectly for three fuse holders, but they do fit ($3/4" \times 3 = 2 \ 1/4"$ vs. $1/2" \times 5 = 2 \ 1/2"$). There will be a 1/8" gap on either side. The new adapter helps cover this gap somewhat though. All the MNPV3 combiners now come with a din rail that will accept up to 5 breakers, so three fuse holders is not a problem. We do not supply a busbar for more than three breakers, but the MNPV6 breaker busbar is available for \$15.00. At this point you may just want to consider the MNPV6 as it has sufficient room for more than three breakers. PV minus and ground busbars inside the MNPV6 accommodate up to 14 wires while the MNPV3 accommodate 6.

By the way, don't ever open a touch safe fuse holder under load!!! The following pictures are the result of a 250 volt array that had only 5 amps flowing through it when the fuse holder was opened. This fuse holder is UL listed to 1000VDC and 30 amps. It does say "**Do not open under load**". It's a good thing we build our combiners out of metal. The arc and fire lasted for about two full minutes until it burned out.



The upcoming 250VDC MidNite Classic controller presents some problems. There will be consumers installing this high voltage controller. **We highly recommend professional installation.** The pictures above show a very real issue. MidNite has addressed this potential problem by creating high voltage circuit breakers and new combiners to house the new breakers. The high voltage breakers are UL listed at 250VDC. MidNite has employed ETL to conduct tests to bring the listing up to 300VDC.



Notice the copper plate at the bottom of the high voltage breaker. The input and output of this breaker is from the top surface. The breaker is essentially two of our 150VDC breakers in series. They are internally ganged so when one pole trips, the other also trips at the same time. It is not sufficient to handle tie two 150VDC breakers externally. They would not withstand the high voltage. High voltage arcing tends to weld internal contacts together so when you need the breaker to trip, it would in fact fuse itself in the **on** position. That could ruin your entire day or worse, so use the breakers that are designed for this extreme high voltage DC.

The following picture shows six 300VDC breakers installed in the **MNPV12-250**. The large reliefs in the busbars allow PV wiring to easily enter the upper left pole of each breaker. These 168 amp busbars may be combined as shown or set up as two separate systems with three each high voltage breakers. The high voltage breakers currently stocked are 10A, 15A and 50A. Additional values are on order so check with us for available current ratings. These are very custom breakers with long lead times, so be aware not all values may be available for a while. These breakers are only available from MidNite Solar. List price for a 300VDC breaker is **\$34.00**.



This is the regular **MNPV12** combiner with the dead front and metal cover removed. In this picture the reversible busbar is combining ten touch safe fuse holders. The 200 amp busbars can be configured for up to 12 150VDC breakers or 10 fuses either separated into two systems or combined as shown. The MNPV12 and MNPV12-250 has recently passed ETL testing. Notice the picture of the MNPV12 deadfront to the right. You will notice a snap in adapter for use with fuse holders. Each combiner comes with the main large deadfront and two fuse holder adapters. This combiner with its 200 amp busbar is well equipped to handle the newer more powerful PV modules. Most existing combiners can't handle a bunch of 20 amp breakers or fuse holders.



MNPV16: This new combiner has also passed ETL testing (December 08). It is intended for use with up to 16 touch safe fuse holders. The current rating is 240 amps. It can accommodate up to 250MCM output wires. There is plenty of room for PV and ground wiring. The input knockouts are concentric 1/2" / 7/8"

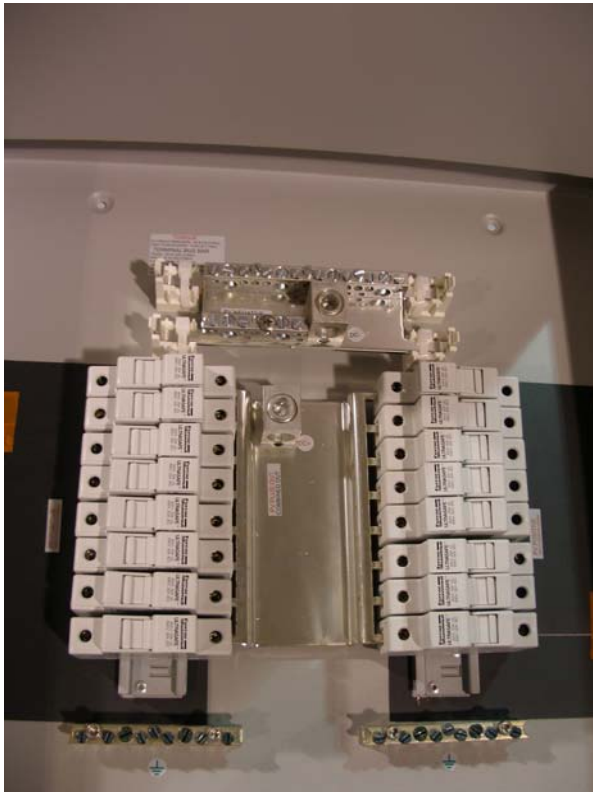
knockouts. The ½" inner knockout can be used to install bulkhead mounted MC connectors for ease of installation at the jobsite. See pictures below.



MNPV12 chassis showing concentric knockouts



MNPV16 with bulkhead mount MC connectors



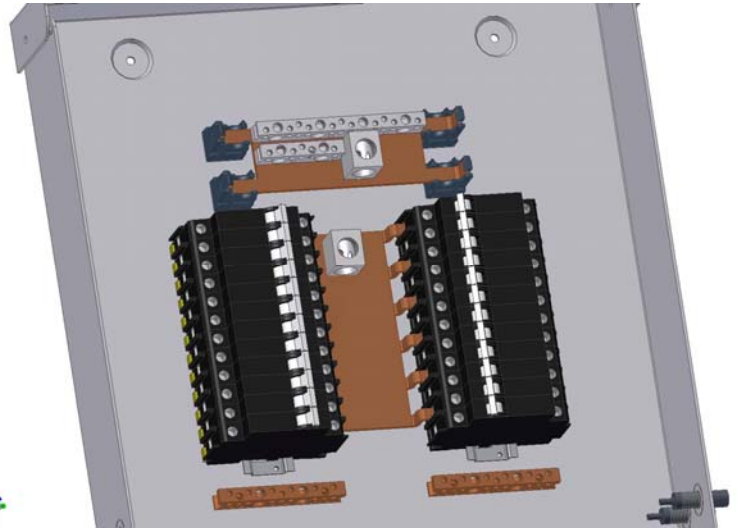
MNPV16 is for 16 600VDC fuse holders

MNPV16-150 is for 24 150VDC circuit breakers

MNPV16-250 is for 12 300 volt breakers

Go to www.midnitesolar.com to get wiring diagrams for each specific application.

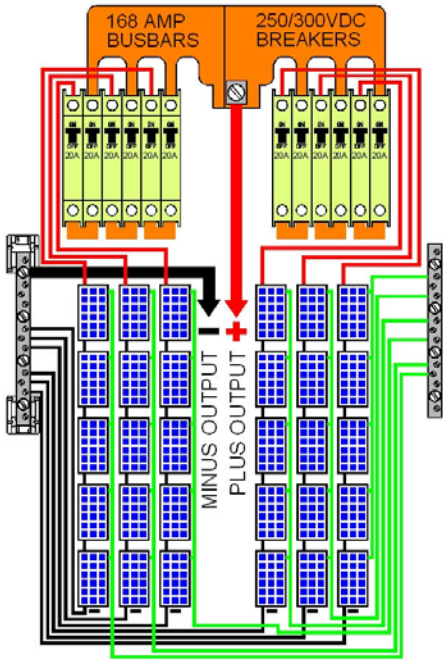
**Midnite Solar 17722 67th Ave NE unit C Arlington, WA.
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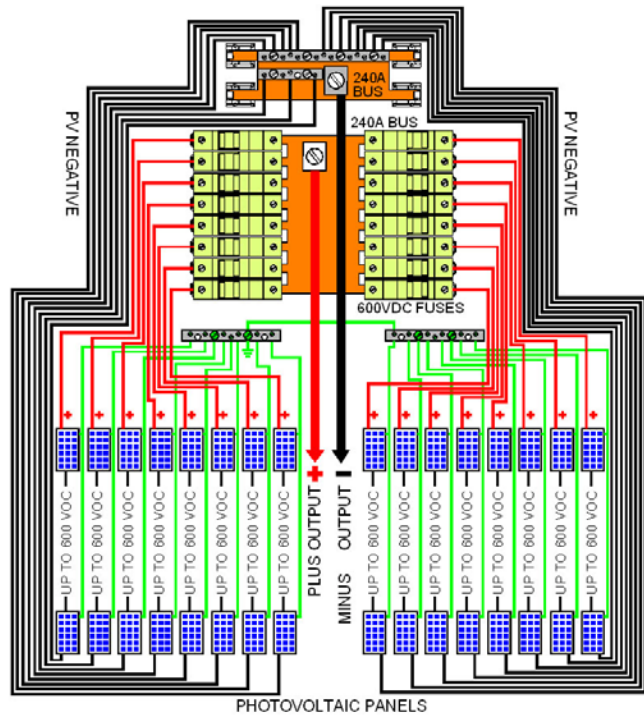
The MNPV16 can be used with up to twenty four 150VDC circuit breakers or 12 300VDC breakers. Each version requires a different busbar arrangement, so different model numbers apply



The arc here is from **only 165 VDC**. This arc is quenched inside the circuit breaker. A 300 VDC arc is only going to be worse. Any volunteers to run the ETL test?



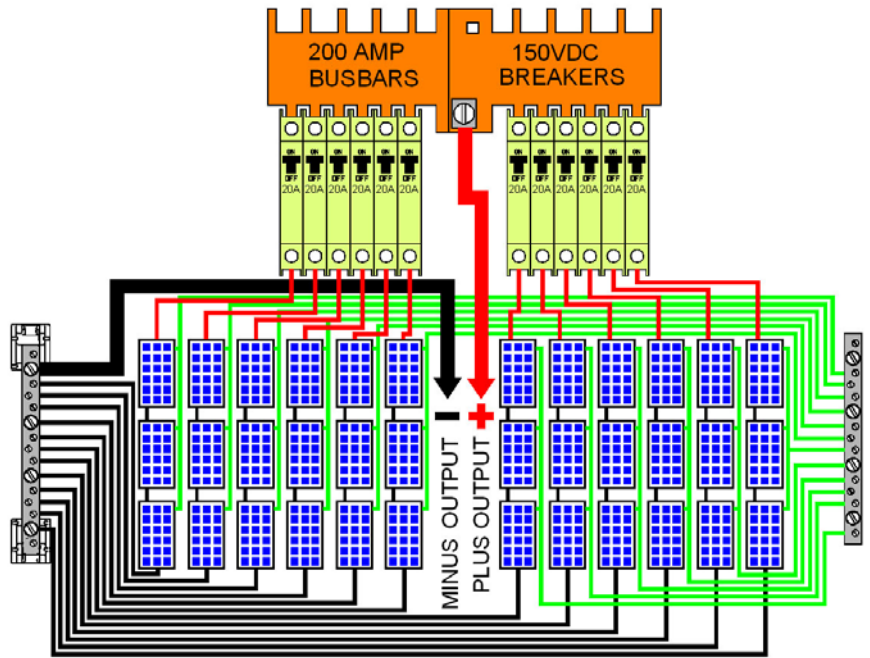
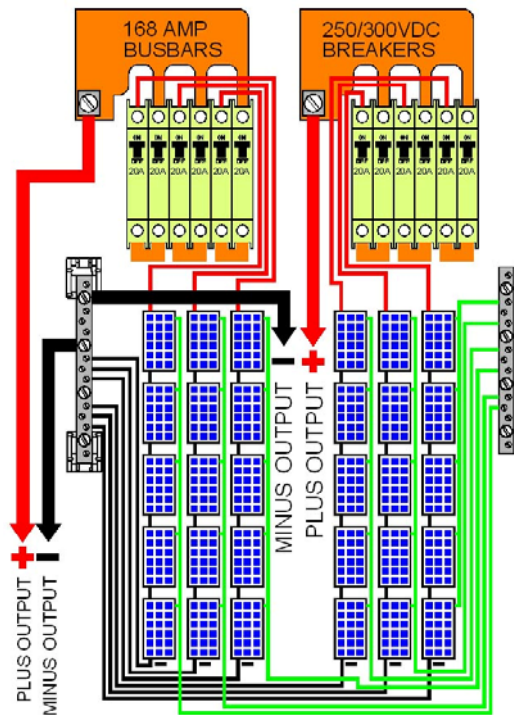
MNPV12-250

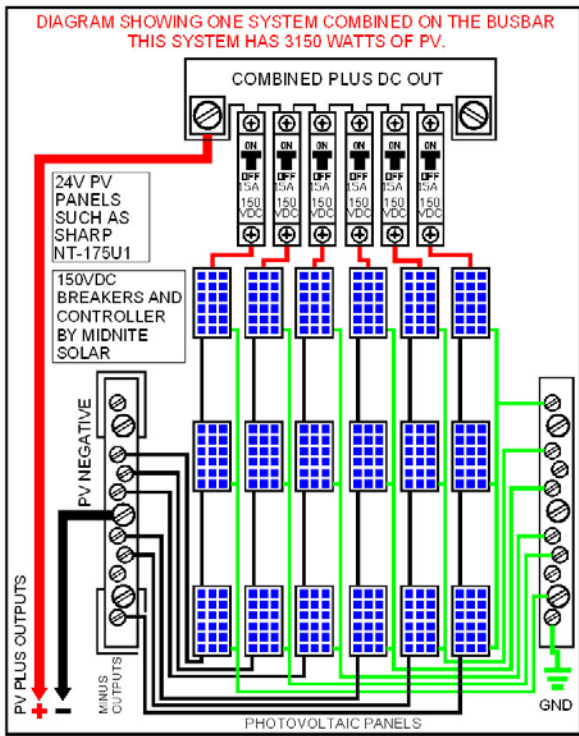


MNPV16 WITH FUSE HOLDERS

MNPV12-250

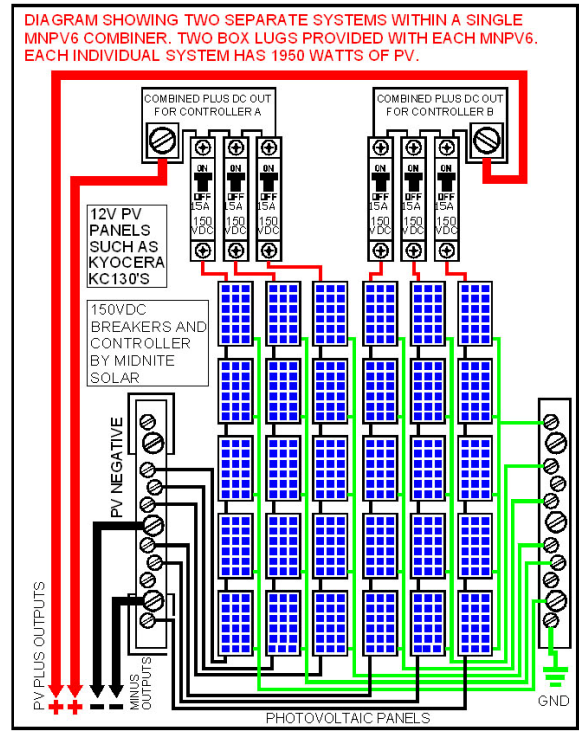
MNPV12 WITH 150VDC BREAKERS





MNPV6

MNPV6 WITH 250 BUSBARS



MNPV6

MNPV3

