

# OutBack

## Power Systems



## PS2AC & DC INSTALLATION INSTRUCTIONS

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The PS2AC & DC come standard with an impressive array of components that form the basis for your Renewable Energy system. Additional components may be required to customize the system to your specific application.

## STANDARD FEATURES

### PS2AC COMPONENTS

- Dual 50A bypass switch (no de-rating required).
- Dual 50A breaker for inverter AC input (charger + pass through).
- 1 15A load circuit breaker for the AC outlet.
- 1 20A circuit breaker for house loads.
- 2 BLACK insulated bus bars for Hot AC IN and OUT leg1.
- 2 RED insulated bus bars for Hot AC IN and OUT leg 2.
- 1 WHITE insulated bus bar for AC Neutral in and out.
- 1 GROUND bus bar bonded to cabinet.
- Knockouts for 8 additional OutBack style AC load breakers.
- 14 AWG wires for the include AC outlet / Outlet is a standard duplex outlet and not suitable for areas that require a Ground Fault Circuit Interrupter (GFCI) outlet.
- 6 AWG red, black and white wires for the inverter input, output and bypass hook-up.
- Provisions for mounting an X-240 (requires 2 of the additional AC breaker spaces).
- Knockouts on five surfaces to facilitate conduit and inverter hook-up.

### PS2DC COMPONENTS

- 1 or 2 inverter battery circuit breakers. 250A for 3524's, 2812's, 2012T's / 175A for 2024's, 3648's and 2524's / 100A for FX2548's and 3048's.
- 500A shunt for hookup to Tri-metric, E-meter, Trace Meter or OutBack smart shunt.
- Battery Negative / Ground bus bar (configurable for OB/GFP-2 ground installation).
- RED DC Positive bus bar with three 1/0 holes and nine 6AWG holes.
- Mounting brackets for MX-60 and MATE.
- Knockouts for eight 3/4" wide DC breakers.
- Knockouts to facilitate battery conduit, MX-60 interconnect, stacking another PS2 etc.
- Bus bar for adding another inverter battery breaker.

### ADDITIONAL COMPONENTS IN THE PS2 SYSTEM

- PS2MP mounting plate.
- 1 or 2 OutBack FX Inverters (Sealed or Vented).
- DCC Inverter cover for vented inverters or FX Turbo for sealed inverters
- DCA Adaptor
- ACA Adaptor

### OPTIONAL FEATURES

- Hub4 for stacking and communications.
- Mate or Mate2 for status and programming
- MX60 for solar charge control.
- X-240 Autoformer allows the series 120/240 system to divert all of the inverter power to either leg as required for surge loads and 1/2 power for continuous loads.
- Additional AC and DC breakers
- RTS (remote temperature sensor)

## MOUNTING PLATE INSTRUCTIONS

1. Determine the desired height of the assembly. Generally the height of assembly is arbitrary. However, if a battery storage box such as the OutBack PSR to be placed below the PS2 system, the bottom of the mounting plate (PS2MP) should be between 44" and 46" off the ground. The PSR is 42 inches high. Connection between the PS2 and PSR is made via a 3" or 6" long conduit nipple (2" diameter). The PS2DC bottom knockouts are located to match up with the PSR top knockouts. Figure 1 shows the dimensions of the PSR and PS2 system. If you are not using a PS2MP, but you will be using an X-240 Autoformer, **you must mount the X-240 to the PS2AC before you assemble the rest of the system.**

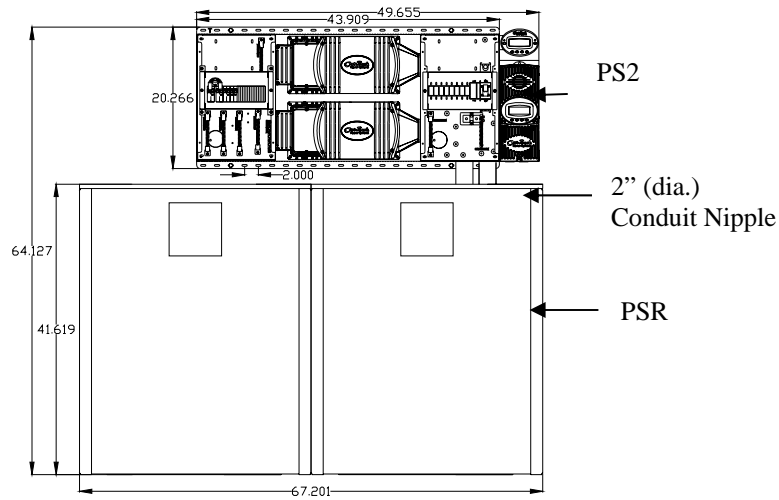


Figure 1 PS2 System Dimensions (inches)

2. Use four (4) 5/16" bolts (2 on top and 2 on bottom) to secure the mounting plate to 2x4 studs. **Make sure the "T" is in the top left corner** (Figure 2). You will be very unhappy with yourself if you install it all and the "T" is in the bottom right corner. When mounting to other than a 2x4 or 2x6 wall make sure the structure is adequate to hold **250 pounds**.

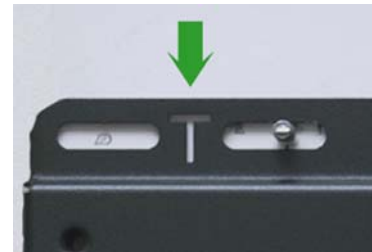


Figure 2 Make sure the 'T' is on the upper left corner

## ATTACHING THE PS2AC & DC ONTO THE MOUNTING PLATE

1. Locate all extruded funnel holes on the mounting plate that you will be using to mount the PS2DC, AC and FX's. Pre-tap these holes using 6mm self-tapping (TAPTITE®) screws and a #3 Phillips tip bit in a drill. It is much easier to do this now rather than when installing the equipment.
2. Mount the PS2AC cabinet and the PS2DC cabinet. For each cabinet, use six 6mm x 10mm pan head Phillips TAPTITE® screws and one star washer (included in hardware packet). At least one mounting screw from both the PS2AC and the PS2DC must have a star washer to bite through the powder coating and connect to ground. The washers ensure that all the equipment is grounded to the mounting plate. Placing a star washer under each screw will improve your lightning protection.
3. Determine the knock-outs you will use to run wires between the FX cabinets. Use a screwdriver to wiggle them free from the housings.
4. Leave all mounting screws loose until all 2 1/2" snap in bushings and the FX adapters (ACA & DCA) are installed between the PS2AC and the PS2DC.

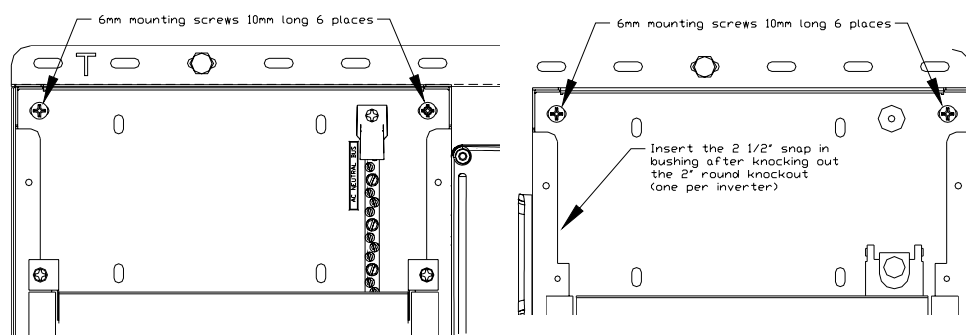


Figure 3 PS2AC (left) and PS2DC (right) screw type and placement.

## INSTRUCTIONS FOR MOUNTING AN FX

1. Make sure the extruded funnel holes have been pre-tapped with 6mm screws and a #3 Phillips tip bit in a drill.
2. Mount the FX inverter(s) using four (4) 6mm x 20mm pan head Phillips TAPTITE® screws (all hardware is provided in the hardware pack). For illustration see Figure 4. Once again, at least one screw must have a star washer to insure it bites through the powder coating. This is your equipment bonding and meets NEC code requirements for equipment bonding. Use four star washers for improved lightning protection.
3. Do not install the large FX DCC cover at this time. Figure 4 shows FX with cover installed.
4. If you are installing a turbo kit instead of the usual DCC (DC Cover), mount the DCA (Figure 5) with the two (2) M5 x 12mm screws provided. Normally, the screws for the DCC will hold down the DCA as well.
5. Install the ACA adapter (Figure 5) using two (2) M5 x 20mm screws inside the ACA and two (2) #10 x 3/8" screws outside the ACA. You must first remove the two chassis screws using a 4mm hex wrench.
6. Cut the 2 1/2" circle out of the plastic FX-ACA with a sharp knife (Figure 6). **Do not attempt to push or knock out the circle because the plastic will crack.**
7. Install the snap in bushings (Figure 7).

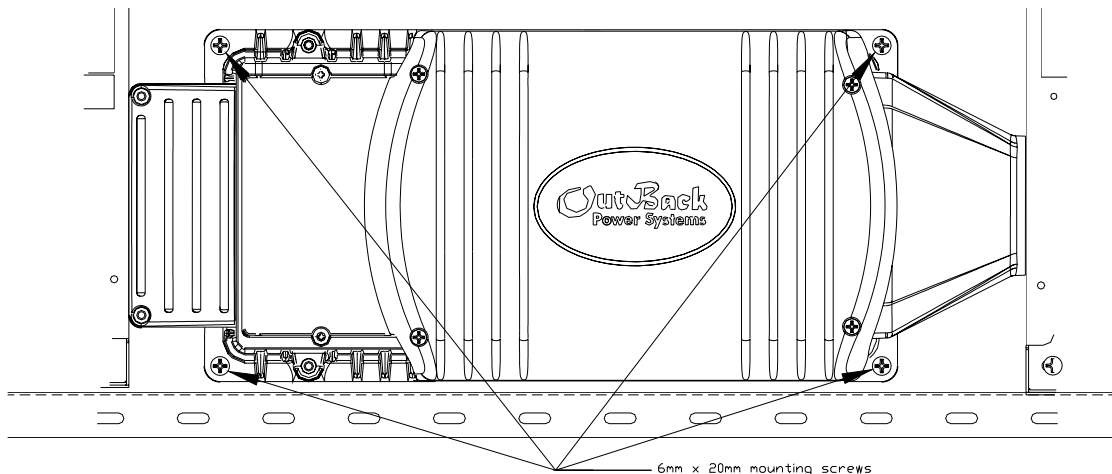


Figure 4 Use four (4) 6mm x 20mm Pan Head Philips TAPTITE® screws.

FX NOTE: It is highly recommended to have the Turbo kit installed on the sealed FX series of inverters. The Turbo kit adds up to 500 watts additional continuous power to each FX inverter and insures full charging in high temperature conditions. No external fan is required on installations using vented versions of the FX inverter.

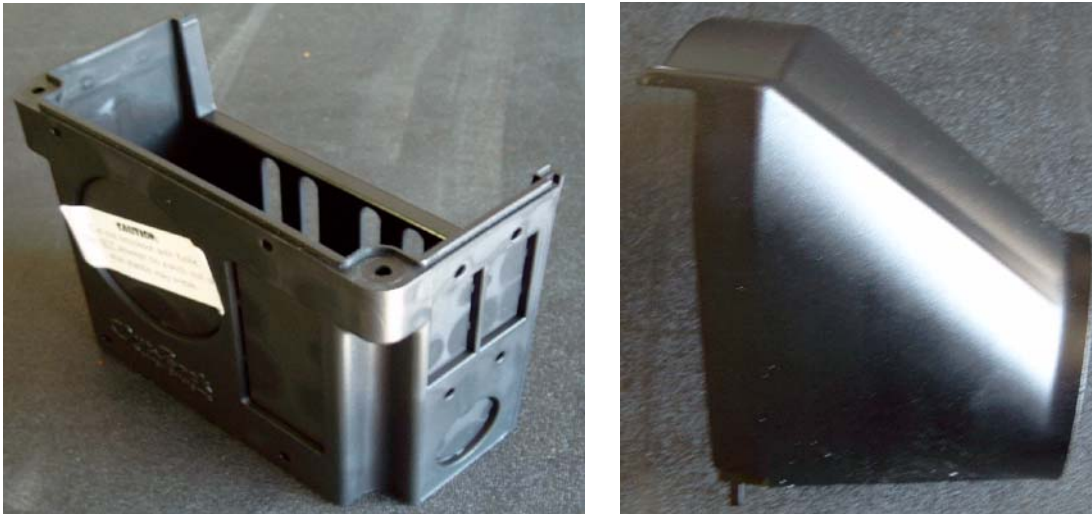


Figure 5 FX ACA (left) and DCA (right).



Figure 6. Cut the 2 1/2" circle out of the plastic FX-ACAS.



Figure 7 Snap in bushings



**Figure 8 Placement of HUB.**

**MOUNTING THE HUB**

Mount the HUB using two (2) #10 x 3/8” Phil PH screws. Figure 8 shows placement of the Hub4. Don’t forget to use the plastic bushings in the cabling holes. The old guy in the picture is me.

**WIRING THE PS2AC**

All equipment should now be mounted to the PS2MP mounting plate. If all bushings are in place, then tighten all screws. It is now time to wire the equipment. Before you connect any wires, make sure all the breakers are off. The DC box does not come with any wires or cables. The following is a list of supplied wires and their function in the PS2AC. Additional wiring may be required to complete your particular system. You will not use all of these wires if only one FX is being installed. Figure 10 is a diagram of where wires connect. Identical diagrams are on the insides of the cabinet covers.

Qty	Awg/Len.	Color	Function
2	6/22”	Black	AC Out Hot Leg1 Bus bar to left Bypass breaker top & left Inv output breaker top.
1	6/14”	Black	AC In Hot Leg 1 Bus bar to left Bypass breaker bottom
1	6/12”	Black	AC In Hot Leg 1 Bus bar to left Inv Input breaker bottom
2	6/20”	Red	AC Out Hot Leg 2 Bus bar to right Bypass breaker top & right Inv Output breaker top
1	6/16”	Black	Upper Inverter AC Hot In terminal to left Inverter Input breaker top
1	6/20.5”	Red	Lower Inverter AC Hot In terminal to right Inverter Input breaker top
2	6/12”	Red	AC In Hot Leg 2, Bus bar to right Bypass breaker, bottom & right Inverter Input breaker bottom.
1	6/12.5”	White	Upper Inverter AC Neutral In terminal to AC Neutral Bus
1	6/21”	White	Lower Inverter AC Neutral In terminal to AC Neutral Bus
1	6/27.5”	Black	Upper Inverter AC Hot Out terminal to left Inv Output breaker bottom
1	6/17”	Red	Lower Inverter AC Hot Out terminal to right Inv Output breaker bottom
1	14/17”	Green	AC outlet Ground-to-Ground Bus bar
1	14/18.75”	Black	AC Duplex Outlet Hot (brass screw) to 15A breaker top
1	14/25.75”	White	AC Duplex Outlet Neutral (silver screw) to Neutral Bus Bar
1	14/13.00”	Black	15A breaker bottom to AC out Leg 1 Bus bar

## PS2AC & DC INSTRUCTIONS

AC breakers are available in 15A single & dual, 20A, 25A & 30A dual, 50A single and dual configurations (example: OBAC15). The PS2AC will accommodate 8 additional breaker spaces.

The small 125VDC breakers for the PS2DC are available in 1A, 5A, 10A, 15A, 20A, 30A, 40A, 50A, 60A, 70A, and 80A configurations (example: OBDC-15). The big battery breakers are available in 100A and 125A (1" wide), and 175A or 250A (1.5" wide) versions. The FX 2024, GTFX25424, GVFX3648 and VFX3648 require 175A breakers (OBDC-175), while the FX2548 requires a 100A breaker (OBDC-100). The GTFX3048 can use either the 100A or the 125A 1" wide breaker. The FX2012, VFX2812, GVFX3524 and VFX3524 require 250A breakers. The PS2DC will accept up to 2 of the 1.5" breakers or 3 of the 1" wide battery breakers. There are 8 slots for ¾" wide DC breakers.

Use a flat tip screw driver to tighten the wires in the AC breakers to a torque of twenty (20) inch-pounds. Twenty is quite a lot of torque when you are attempting to hold the breaker from moving. The wires will loosen up afterwards if not properly torqued so pay attention to this one and recheck tightness after an hour. Don't use a Phillips head screw driver, you may not be able to torque the screws down without stripping them.



Figure 9 Picture of PS2AC wired with a fairly full compliment of breakers

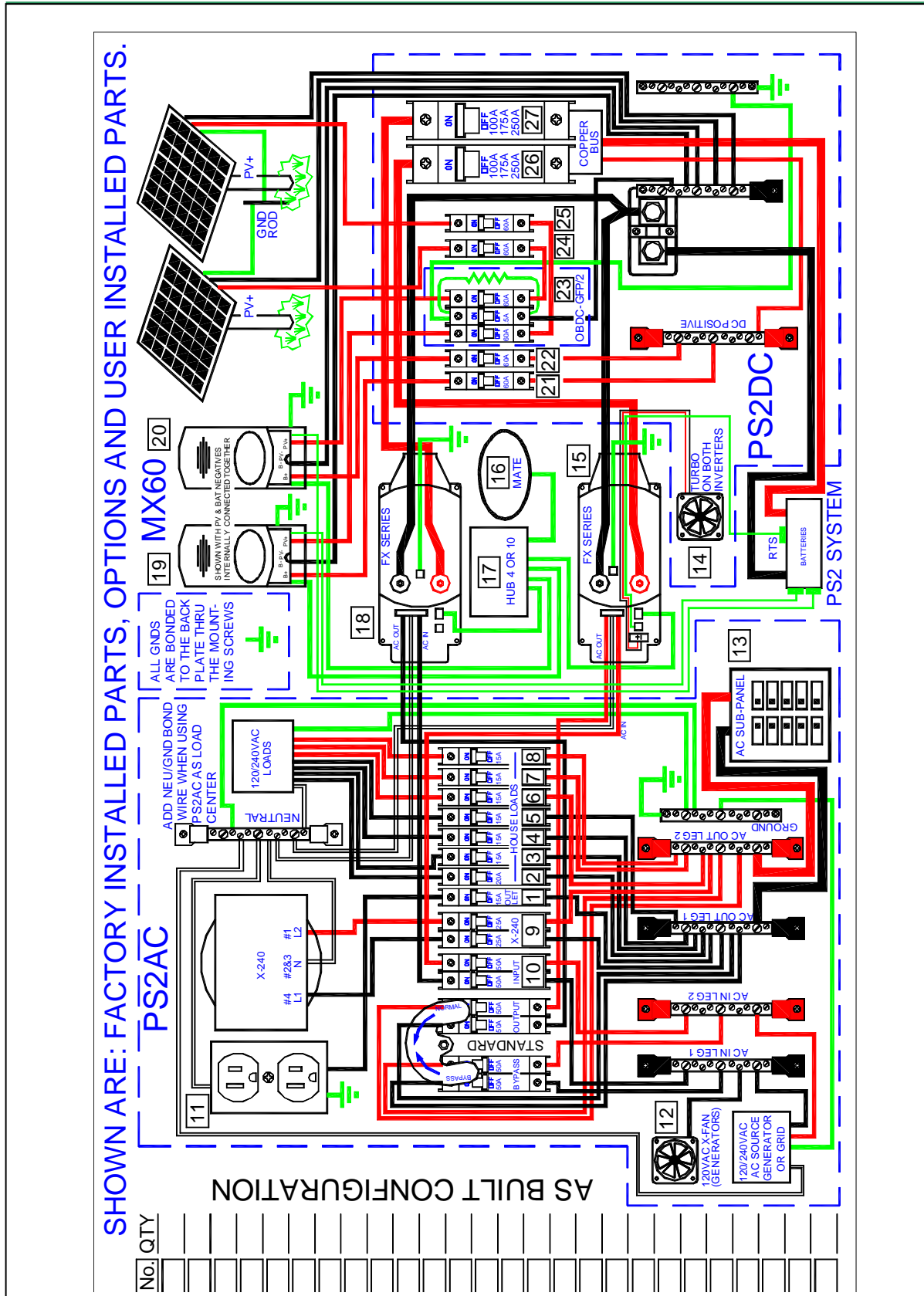


Figure 10 PS2 Wiring Diagram



**X-240 AUTOFORMER OPTION FOR PS2AC**

See the X-240 manual for installation. When the X-240 Autoformer is installed, run the Autoformer wires #1(red) and #4 (black) into the top of the 25A breaker provided. Autoformer wires #2 and #3 go to the neutral buss bar. Just as you have with all leg 1 and leg 2 wires in the box, keep black on the left and red on the right. Use 10AWG wire to connect up the bottom of the X-240 breakers to the Hot Out Leg 1 & 2 Bus bars. The red wire should be 18” and the black wire 12”. These wires are not supplied with the PS2AC.



Figure 11 Installed X-240

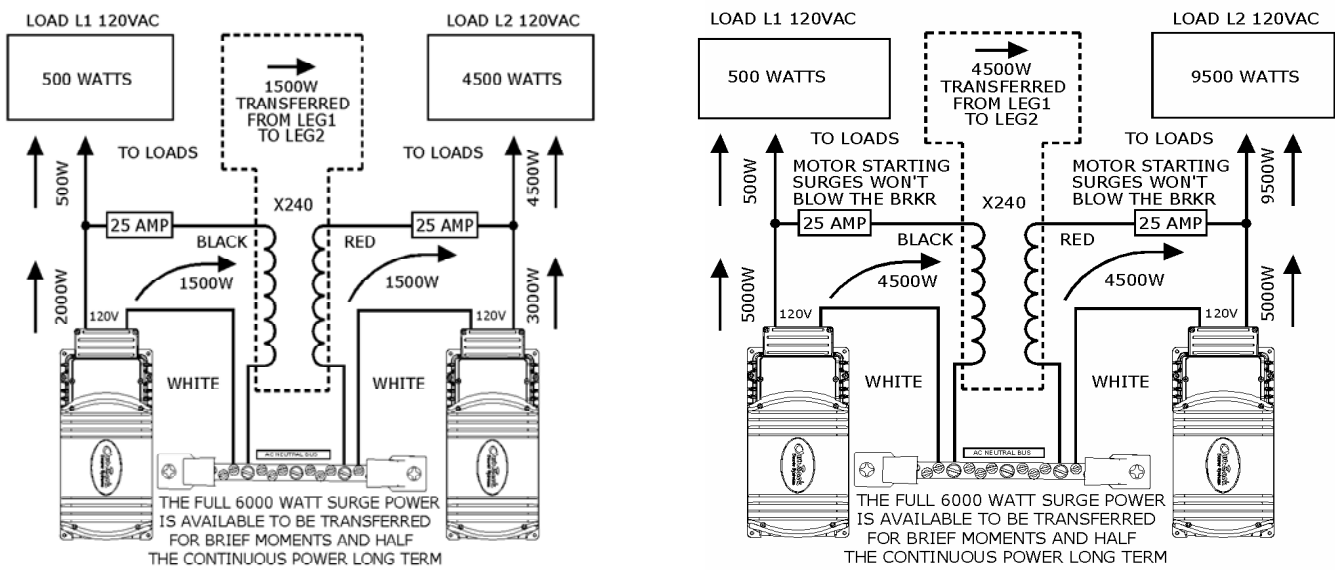


Figure 12. X-240 current flow for normal (left) and surge (right) operation

Figure 12 shows the current flow when an X-240 is used as an Autoformer under both normal and surge conditions. The X-240 balances the loads between the two legs. In this case, each inverter is capable of generating 2500W. The load on leg 1 is not consuming all of the power generated by inverter 1, but the load on leg two is greater than 2500W. One example of this type of situation is when a well pump kicks in, requiring large amounts of power on one leg. That situation is shown in the surge diagram (right). The Autoformer balances the power, allowing the excess power from leg 1 to be utilized by leg 2.

## WIRING THE PS2DC

Use 2/0 cable to connect the DC terminals of the FX's if using 100A, 125A or 175A battery breakers. Use 4/0 for systems requiring 250A breakers. The following is the proper length to cut your cable:

**Top FX negative terminal (black) 30"**  
**Top FX positive terminal (red) 23"**

**Bottom FX negative terminal 26"**  
**Bottom FX positive terminal 29"**

OutBack now has battery cable heat shrink with our logo on it (Figure 13). Ask your dealer for this special heat shrink to jazz your installation up a bit. When two inverters are mounted, you will need at least 4/0 cable from the PS2DC to the batteries. FX's using 250A breakers should use 4/0 to each unit throughout the DC wiring. Check the inverter manual for proper wire sizing. Note: The inverter negative wires should go to the right hand side of the shunt (Figure 14).



Figure 13 OutBack Heat Shrink

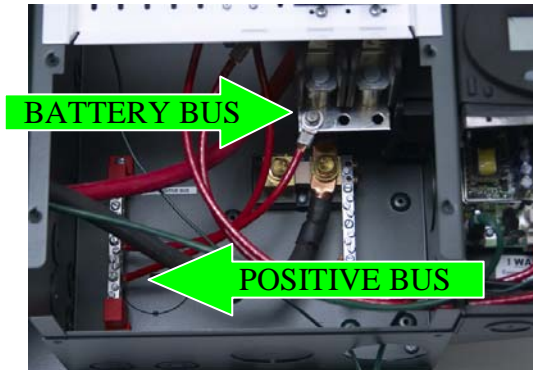


Figure 14 Inverter negative wired to the correct (right) side of the shunt

Figure 14 shows the inverter negatives wired to the correct side of the shunt. Also note how the Plus bus is wired to the battery bus. Figure 15 shows the inverter wiring with FX-ACA and FX-DCA installed. The FX-DCC cover is removed to show wiring. Note that the MATE and RTS wires both go to the DC end. You will need to notch out the Lexan cover a bit to accommodate this. The RTS by itself will fit without cutting or filing, but not the cat5 cable. The Lexan cover is not brittle and will not split or crack so notch away.

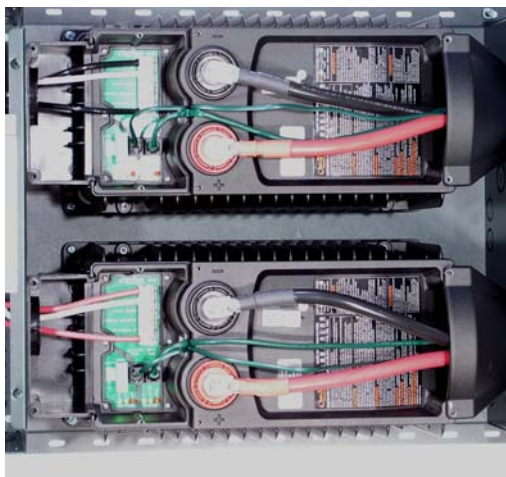


Figure 15 Inverter wiring without DCC.

## WIRING THE MX60

Mount the Mate and MX60 brackets to the side of the PS2DC (Figure 16). The MX60 wiring goes through a 1" nipple between the MX60 and the PS2DC (Figure 17). One wire protector is missing, probably because it was wired by an OutBack engineer). You can also use the 1" snap in bushing supplied with the PS2DC instead of the nipple. If you use the plastic bushing, you must ground the MX60 to the PS2DC using star washers.

1. Connect a RED 6 AWG wire between the MX60 PV+ and the breaker labeled MX60 #1 PV IN. The other side of the breaker gets tied to the PV+ in the PS2DC box. Figure 18 shows where all the wires from the MX 60 go.
2. Connect the MX60 PV- to the DC NEGATIVE bus bar in the PS2DC. The PV- from the PV array also connects to the negative bus bar.
3. Connect the MX60's BAT+ terminal to the MX60#2 BATTERY breaker. The other end of the breaker connects to the DC POSITIVE bus bar.
4. Connect the MX60's BAT- terminal to the DC NEGATIVE bus bar.



Figure 16. Brackets for MATE & MX60 (left) & lower 4 screw positions for MX60 (right).



Figure 17 MX-60 Wiring

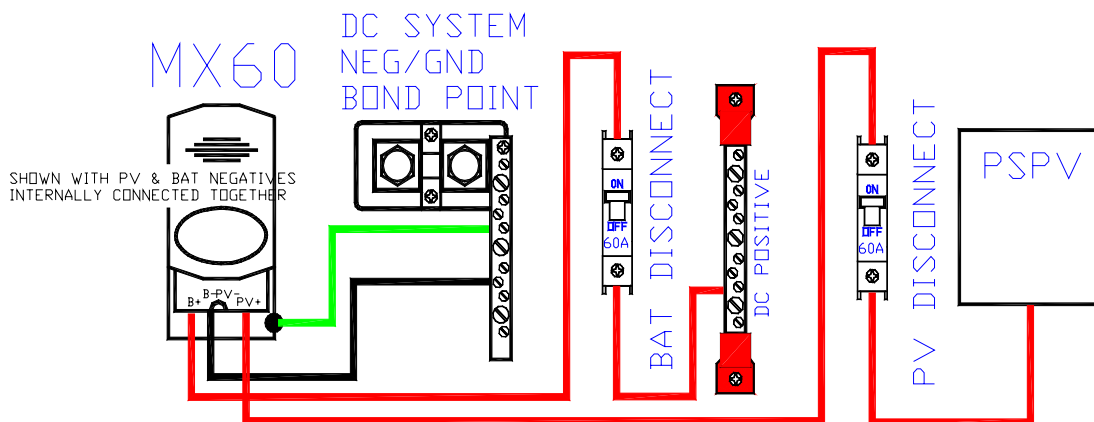
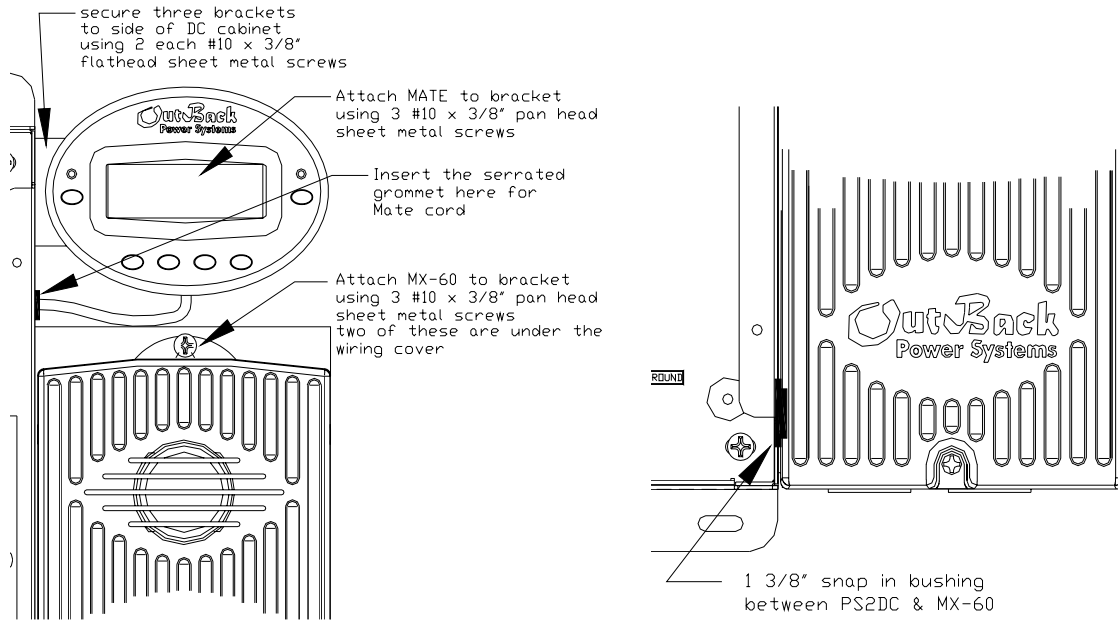


Figure 16. MX60 Wiring Diagram



**Figure 19 Placement and mounting position for MX60 and MATE. Snap in the 1-3/8" bushing to protect the wiring that runs between the PS2DC and the MX60.**

**WIRING THE MATE & HUB**

1. Connect the MATE’s CAT-5 network cable from the MATE to the HUB’s MATE1 port (Figure 20).
2. Connect the FX inverter CAT-5 cable(s) to port 1 (and port 2 if there are two inverters).

Figure 19 shows where to connect the inverters and the MATE. If only one inverter is being used, connect it into hub port 1. The CAT-5 cables are covered up by the plastic cover in the right picture. Don’t forget to use the plastic bushings in the cabling holes. **The master inverter must be connected into port 1.**



**Figure 20 Mounted HUB with cover (left) & HUB connected to 2 inverters (right). The far right arrow shows where the MATE connects.**

## CONNECTING EXTERNAL COMPONENTS

Now that you have your PS2 system all wired up, it's time to make it work. That means hooking up the batteries, PV panels, and any loads you have. This is where you will start if you were wise and purchased a pre-wired system. Figure 21 (on the next page) shows where you need to hook up wires. It will also be useful to refer back to your wiring diagram (Figure 10) to see how things connect.

## CONNECTING THE BATTERIES

Make sure the large (1" or 1.5") battery breakers are off. Always use caution when working with batteries, even though they are not hooked up to your system yet they still have a lot of power. If the plastic bushings have not been inserted into any knock-out holes or conduit nipples that wire will be running through, insert the bushings now. Use the appropriate cable based on breaker size (2/0 cables for 175A breaker or 4/0 cables for 250A breakers). Connect the positive battery terminal to the breaker bus bar. Connect the negative battery terminal to the left side of the shunt connected to the negative bus bar in the DC cabinet (Figure 10). The battery cabinet is up to you, but OutBack makes an ETL listed enclosure (the PSR) for a very clean and safe installation.

## CONNECTING THE PV PANELS

Connect the positive (red) cable(s) from the PV combiner to the PV disconnect breaker(s), typically an OBDC60, in the DC cabinet (Figure 10). Connect the negative cables to the negative bus bar in the DC cabinet. You will probably need to remove one (or more) knock-out(s) to run the wires into the cabinet. Don't forget to put a bushing in any hole or on the end of your conduit. You don't want sharp metal edges rubbing against your wires.

## CONNECTING HOUSEHOLD LOADS

Connect the wires from your household loads to the breakers in the AC cabinet (Figure 10). You may need to remove knock-outs in order to do that (again, don't forget to put bushings into any holes you make). Connect the inlets of the breakers to the AC out bus bars (Figure 10). If you have a 120/240 system, the X-240 in OutBack stacking will help balance your loads automatically. There is no load sharing between leg 1 and leg2 on classic stacked systems, so you will need to balance your loads between the two legs as best you can.

## GRID TIE WITHOUT A GENERATOR

If the grid will be your only AC power source, you also just connect the proper wires to the terminal bus bars in the AC cabinet. When you have excess power to sell, your inverter will switch from buying to selling (you can see what it is doing on the mate). Your inverter sells power back to the grid through the AC input, so there is no need to hook up any extra wires.

## NO GRID, JUST A GENERATOR

If you are going to be living off grid, you probably have a generator. If the generator is the only AC power source connect the output of your generator into the AC input terminal bus bars of the AC cabinet (again following Figure 10). If only one inverter is installed and you have a 240VAC generator, you may want to hook up the X-240 as a step down transformer to get more power out of the generator. Make sure to program your generator size into the system to keep from overloading the generator while charging.

# USER HOOK UP FROM A PRE-WIRED SYSTEM

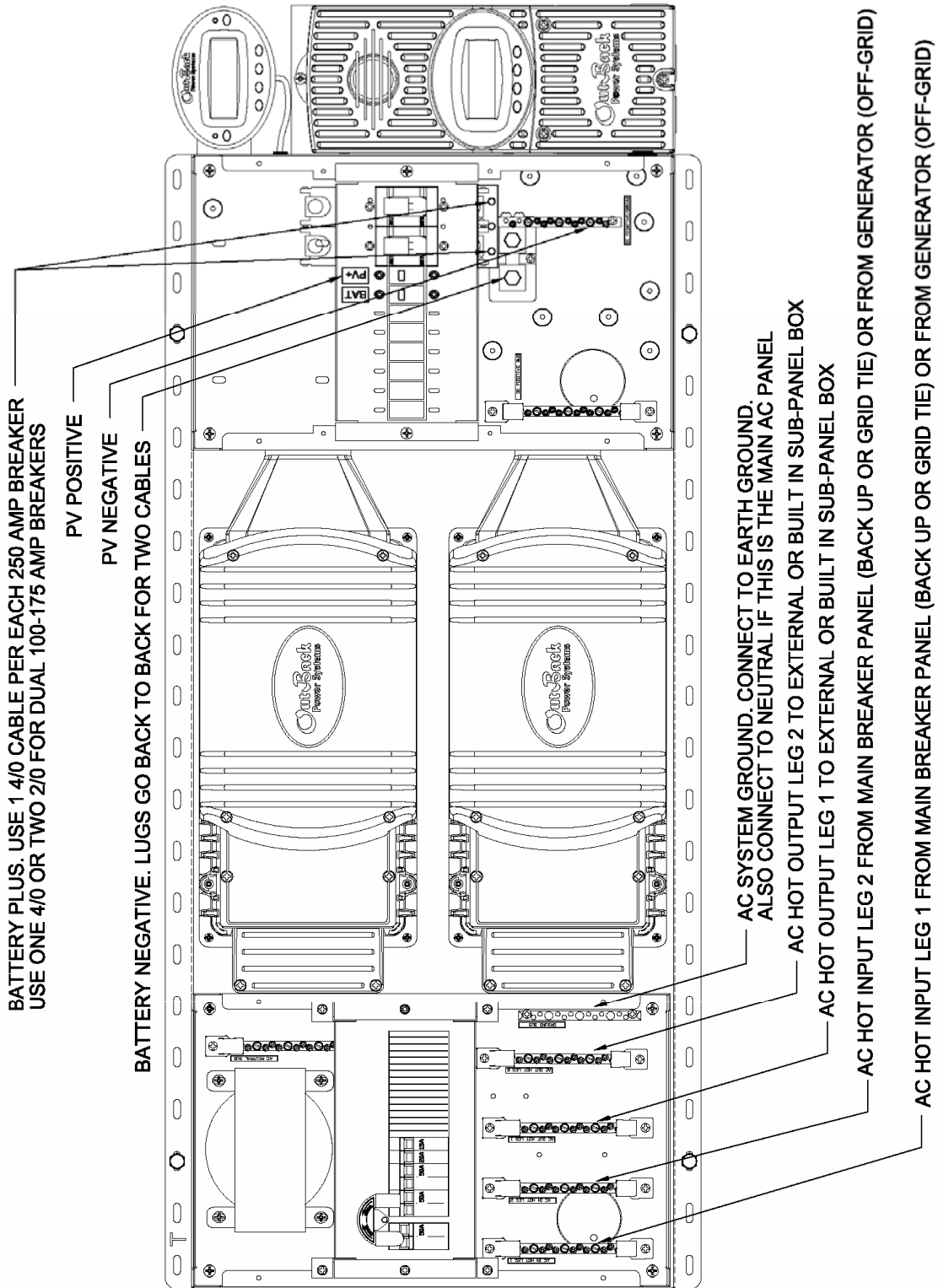


Figure 21. User Hook Up of Wired System

## GRID TIE WITH A GENERATOR

Because you can only connect one AC source to your system, if you want to have both a grid tie and a generator, you'll have to install an AC Transfer Switch. Any well stocked electrical supply house will carry AC transfer switches. Figure 22 shows a basic diagram of how an AC transfer switch works. The inverter must be set for generator condition when the inverter is running a generator (AC1 vs. AC2, see Inverter manual).

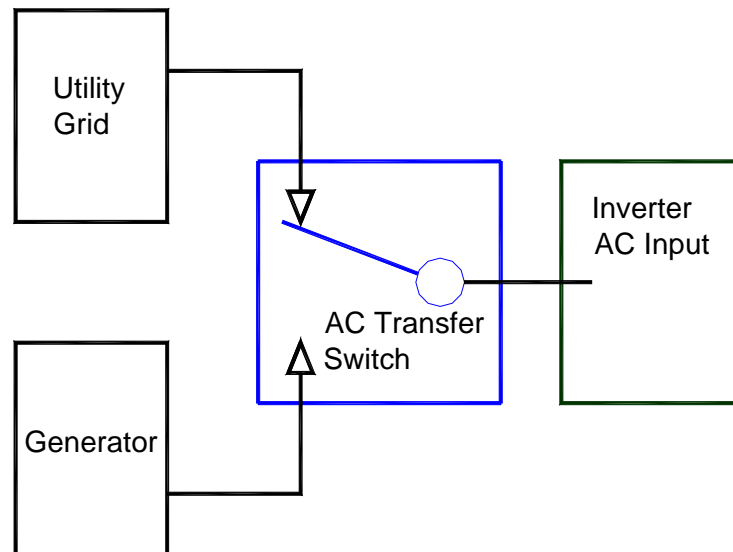


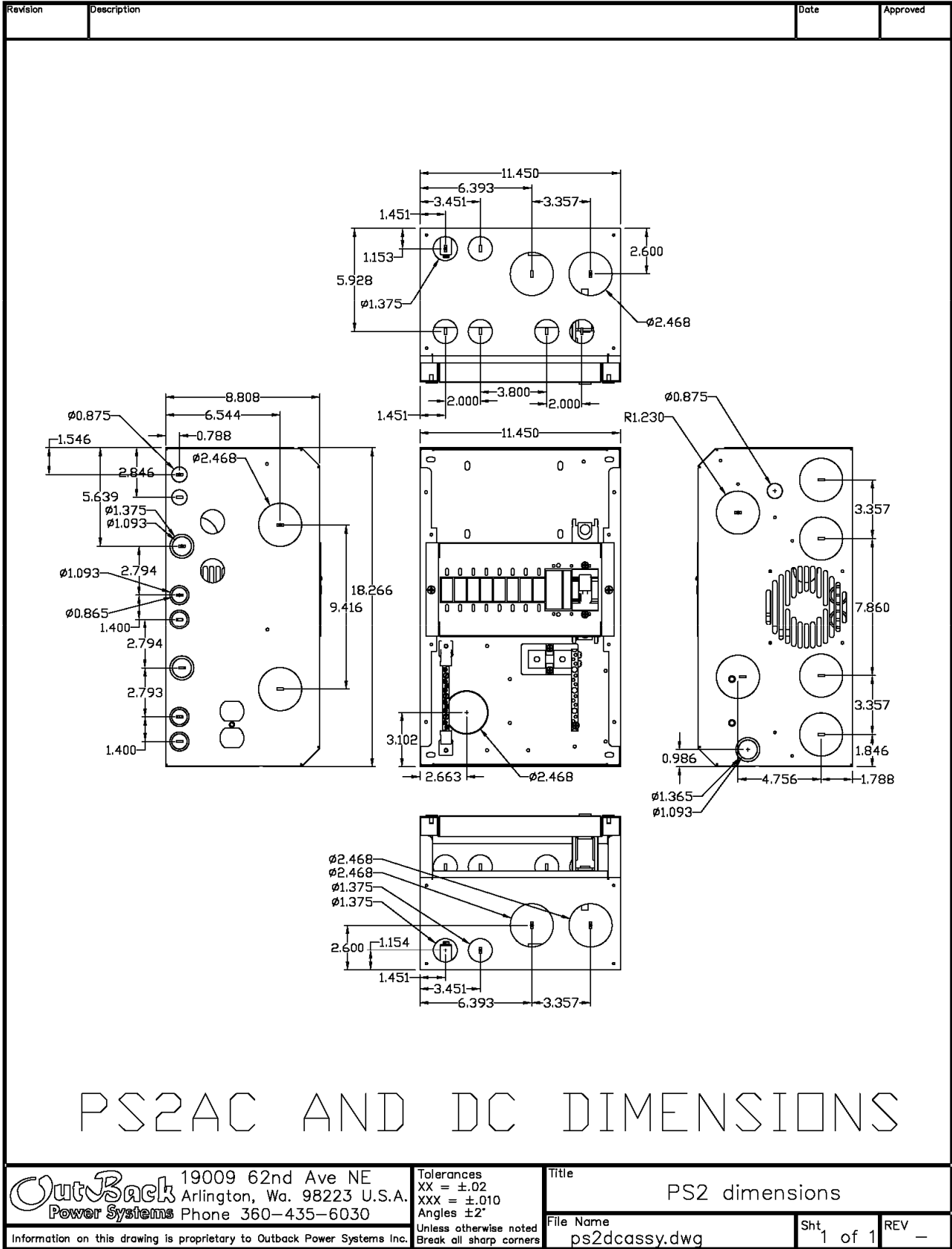
Figure 22. Simple AC Transfer Switch Diagram

## MOUNTING PS2AC & DC COVERS

Now that everything is mounted and wired up it's time to put on the covers. Use four (4) #12 x 1/2" Philips pan head screws on both the PS2AC and the PS2DC. Make sure one of the screws has a star washer to bite through the powder coating and ground the cover.



Figure 23. Thumbs Up from Dooba John  
Dooba John says "Awright Mates, you got it now."



**Figure 24. PS2AC & DC Dimensions**