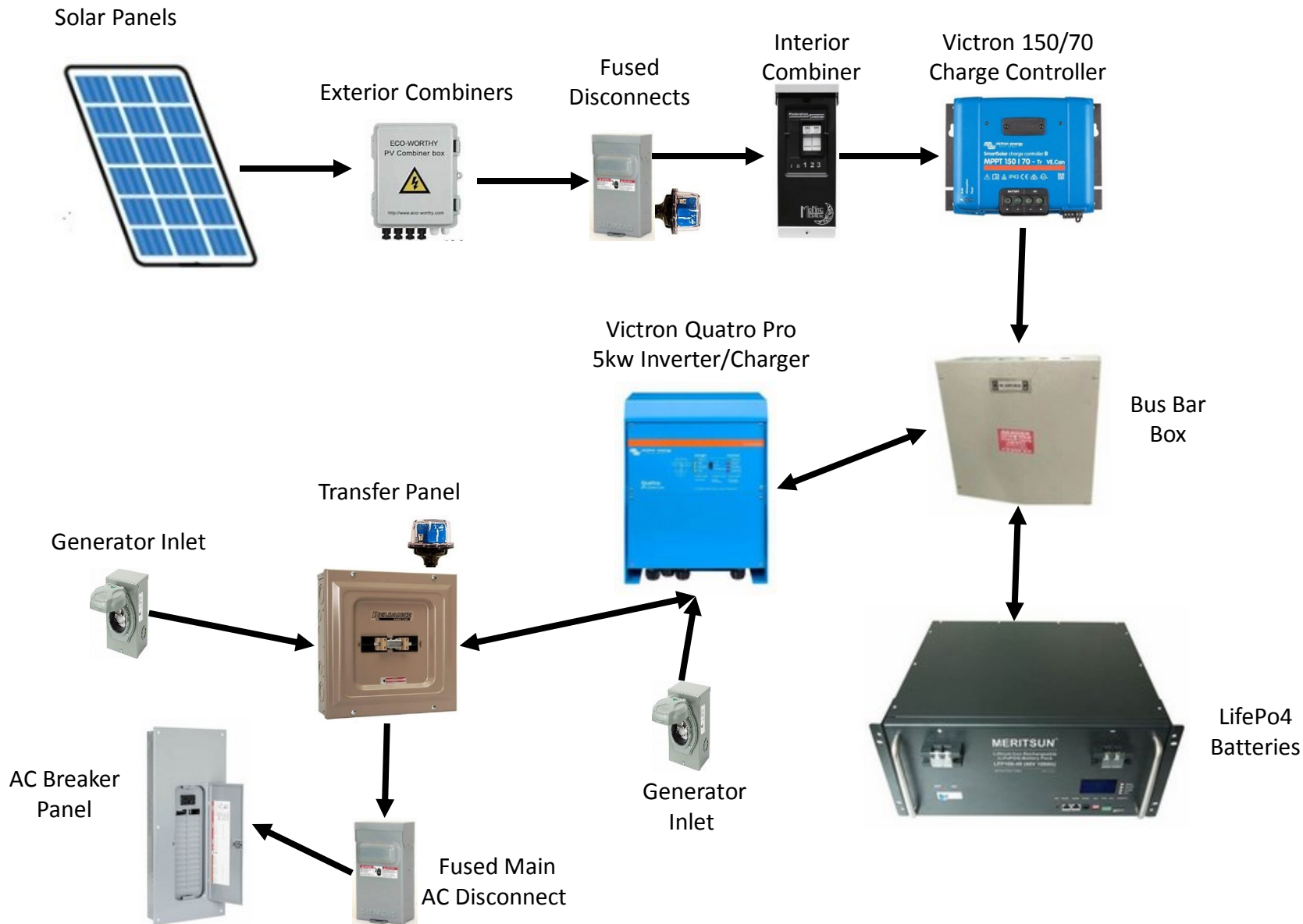


# #0 Basic Overview



# #1 PV Circuit

PV  
String #1  
1.5kw

PV  
String #2  
1.5kw

Earth Ground  
(Lightning Protection)

PV  
String #3  
800kw

Ecworthy  
Exterior Combiner<sup>1</sup>



40aDC Fast Blow  
Fused Disconnect



Midnite Solar  
300vDC SPD

Midnite Solar  
DC Combiner Box  
With Circuit Breakers \*\*



Ecworthy  
Exterior Combiner<sup>2</sup>



40aDC Fast Blow  
Fused Disconnect



Midnite Solar  
300vDC SPD

Ecworthy  
Exterior Combiner<sup>3</sup>



40aDC Fast Blow  
Fused Disconnect



Midnite Solar  
300vDC SPD

Victron 150/70  
Charge Controller



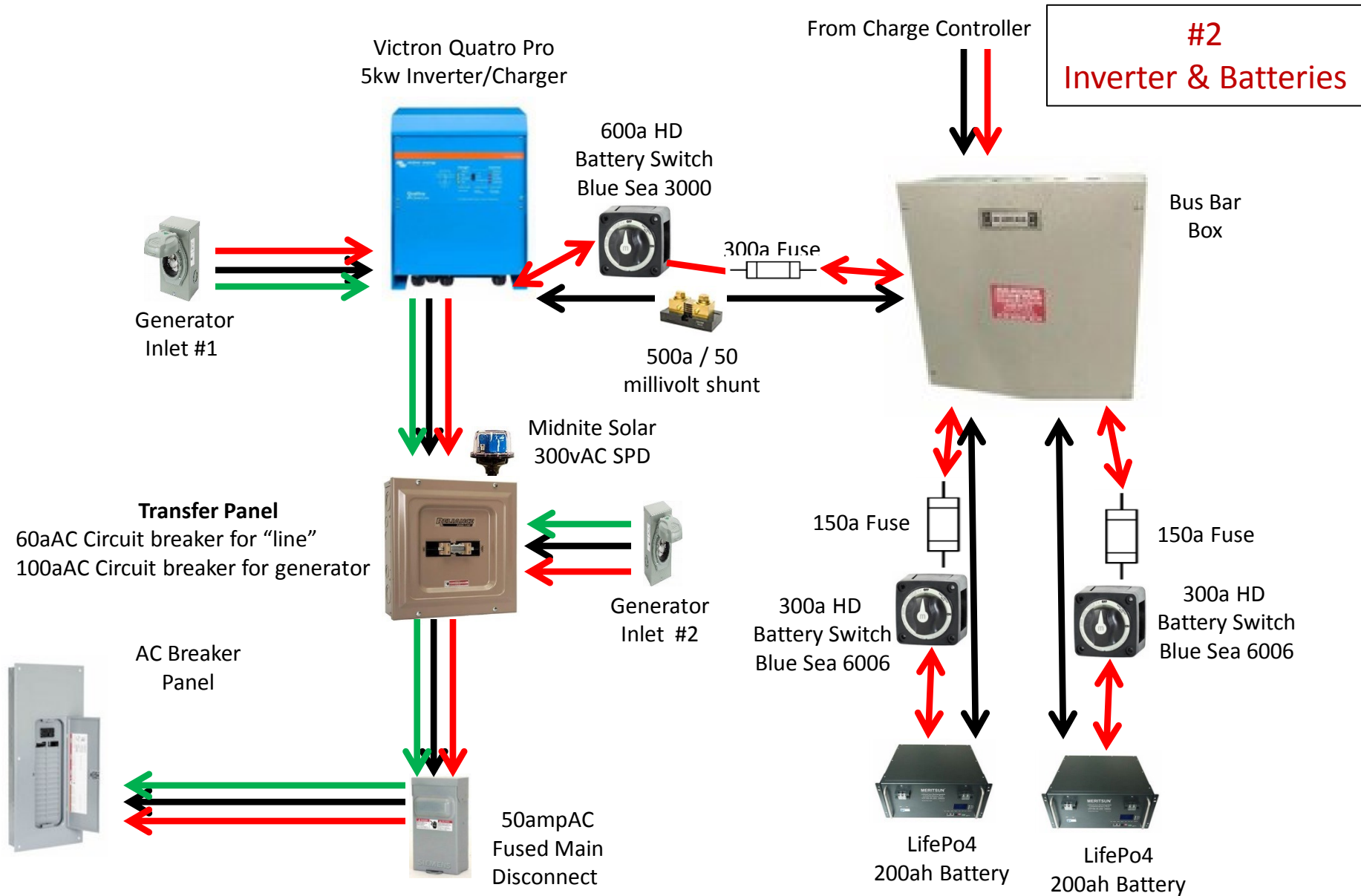
275a Battery Switch



80a Fuse

To Bus Bar Box  
See #2

1 – PV strings have 15a circuit breaker, box has 60a circuit breaker & SPD.  
2 – PV strings have 15a circuit breaker, box has 60a circuit breaker & SPD.  
3 – PV strings have 12a circuit breaker, box has 60a circuit breaker & SPD.  
\*\* PV#1 & #2 = 30a circuit breakers, PV#3 = 20a circuit breaker.



### #3 Controller Unit

Victron Quatro Pro  
5kw Inverter



Victron 150/70  
Charge Controller



Victron BMV-721 Smart



CommCable

CommCable

WiFi Dongle

Victron Color Control

CommCable

500a / 50  
millivolt shunt



LifePo4  
200ah Battery



Bus Bar  
Box

## → System Notes ←

1. Right upfront I will tell you I over-engineered just about every aspect of the system. That was to doing my utmost to protect against an EMP/CME as well as a lightening strikes and to help with longevity & expandability.
2. The system components were connected with the concept of being able to isolate just about each component from others giving overall protection and additional flexibility when working on the system.
3. When calculating wire size I went one size larger than the industry standards.
4. For my earth grounds, one for lightening strikes, the other for AC system, I used three 8' rods driven in 10' apart. This was due to drier and rockier than normal ground/dirt conditions.
5. PVs are grouped into 3 arrays.
  - Arrays #1 & #2 consists of 6 x 250w Canadian Solar PVs in 2 strings of 3 PVs each.
  - Array #3 consists of 8 x 100w HQST PVs in 2 strings of 4 PVs each.
6. Each PV array:
  - Each PV is earth grounded to 3 x 8' rods in series connected with the bare copper wire buried in the ground as well.
  - Each PV array has a Econworthy Combiner that is 12a/15a fuse for each string, 60a circuit breaker, an SPD, and is earth grounded.
7. Each array Econworthy Combiner connects to a fused pull disconnect with a 40aDC fast blow fuse along with a Midnite Solar 300vDC SPD.
8. Each pull disconnect connects to the Midnite Solar 3-position combiner with circuit breakers; array 1 & 2 are 30a, #3 is 20a.
9. Between the PVs and the Victron charge controller I have 2 surge protectors, 2 circuit breakers, and 2 fuses. Both the panels and each of the electrical boxes inside the utility room are separately earth grounded.
10. The AC system is earth grounded via 3 x 8' rods in series spaced 10' apart with buried bare copper between each rod.
11. I decided on a "bus bar box" connection point based on a recommendation from an electrician friend of mine. It was a great option considering how my components lay out.
12. The 2 x 200ah LifePo4 batteries are connected in parallel to share/split the start-up load, meaning I can draw 200a at one time from the batteries, 100a each. It also allows me to isolate each battery should the need arise. I can still run the system with just one battery turned on. Each battery is individually fused between the bus box and the battery.
13. Generator Inlet #1 is connected directly to the inverter. This powers the system through the inverter, powering the house demands first and then excess current charges the batteries. I set the inverter to draw only 20aAC (2400w) from the generator even though the generator is a 4000w inverter unit. Running the generator at 60% of capacity while connected to the system greatly adds to the health and longevity of the generator.

14. Generator Inlet #2 is connected directly to the transfer panel. This allows for the house to be run off a generator allowing me to completely shutdown the solar system for maintenance or upgrades. There is no limitation on what the house can draw from the generator other than the maximum current inverter generator wattage of 4000, about 33aAC.
15. The Transfer Panel utilizes dual circuit breakers with a toggle that throws each of the breakers simultaneously, one *off*, the other *on*. It is set-up for 60aAC breaker from the inverter (7200w) or 100aAC (12,000w) breaker from the generator.
16. The reason for Array #3 is simple...leftover panels from the shop system.
17. Victron was chosen for critical components due to their Tier 1 status. And I took a class on Victron installations and equipment.
18. Midnite Solar SPDs (surge protectors) were chosen because there are none better that I know of.
19. Midnite Solar combiner box and circuit breakers were chosen because there are none better that I know of.
20. My Elite LifePo4 batteries were chosen based on the recommendation of a dealer. They are no longer available and I would not chose them again. There is no access to the BMS software/firmware so connecting them via CAT5 to the inverter is not possible. I might have access to 3 more batteries if another user upgrades their system. Yeah, that would give me 1000ah of Lithium batteries...sweet!!!
21. I have access via Internet to the charge controller and inverter, and overall system status via the Victron Color Control.
22. I have access to change inverter settings via laptop connection. This is very important if you want to fine tune a system.
23. I chose not to have a charge controller and inverter combination unit. I didn't want all the functionality in a single piece of equipment, too expensive to replace and too hard to repair.
24. Only once did my inverter shut down due to an overload condition. We were using all the electric baseboard heaters, the microwave, and the Keurig all at once...then we turned on the air fryer too. Oooppsssss! If I had to it over again I would spend the 30% more (\$900) and get the Victron Quatro Pro 8000w/230v inverter.