



Fortress Power

Energy Storage Systems

Jing Yu

Managing Director at Fortress Power

Bryan Whitton

Product Manager at Darfon



TOPICS

Growth Opportunity with Us

Fortress Energy Storage Sizing Tool

How to Install

Q&A



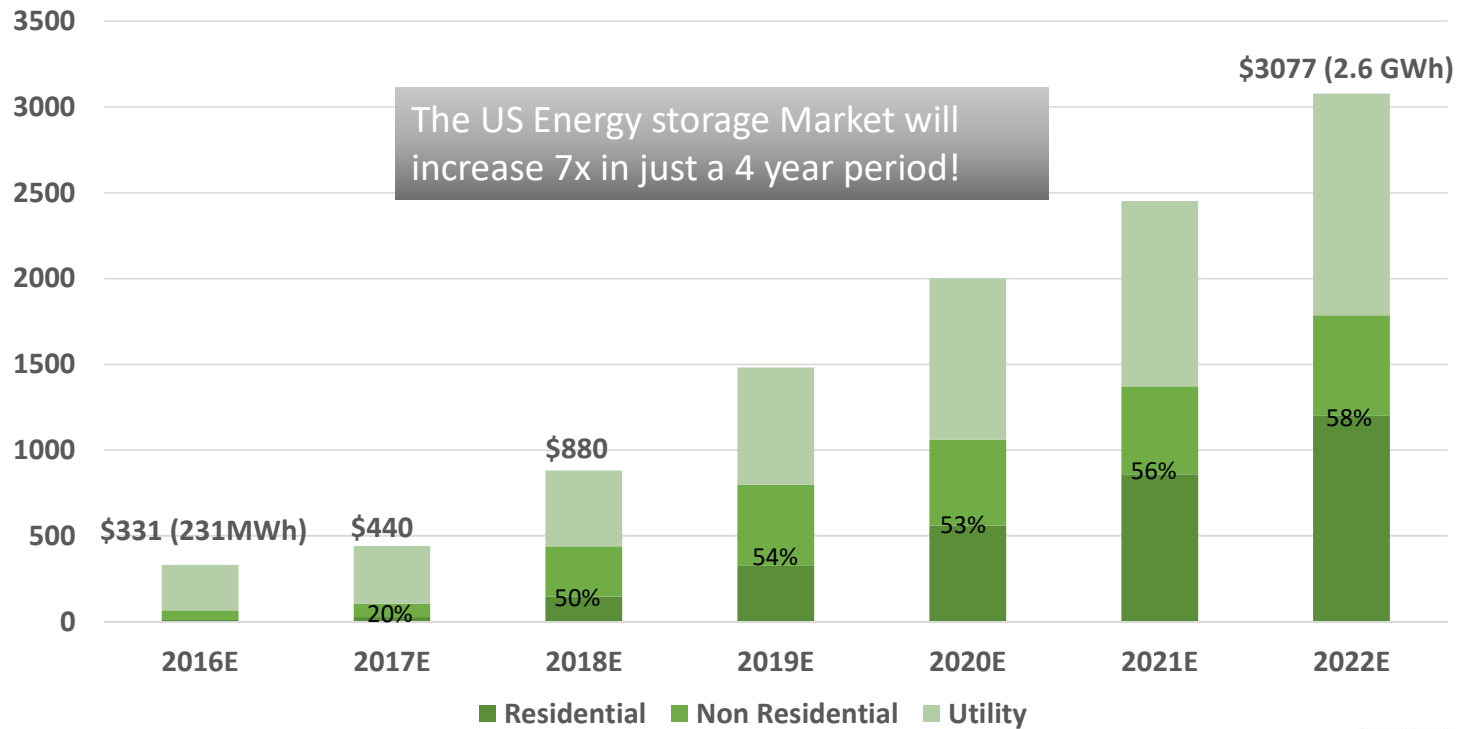
GROWTH OPPORTUNITY WITH US

Growth Opportunity with Us



MARKET OPPORTUNITIES

U.S Annual Energy Storage Market Size, 2016-2022E (Million \$)



Source: GTM Research



SELLING ENERGY STORAGE

- ❑ 74% of homeowners are interested in home energy storage
- ❑ Only 14% of homeowners received quotes for Solar+Storage;
This is due to:
 - Expensive equipment
 - Complicated installation
 - Lack of proper trainings
- ❑ 50% of those receiving quotes convert into buyers

Source: Energysage Report

COMPANY INTRODUCTION

Fortress Power – Lithium Battery

Headquarter: Southampton, PA
(30,000 sqf facility)

Manufacturing facility: China, since 2008

Darfon Authorized Distributor

Darfon – Power Electronics

Headquarter: Taiwan

US Headquarter: Mountain View, CA

Established: 1997

Parent Company: BenQ Group (> \$ 25 bn)

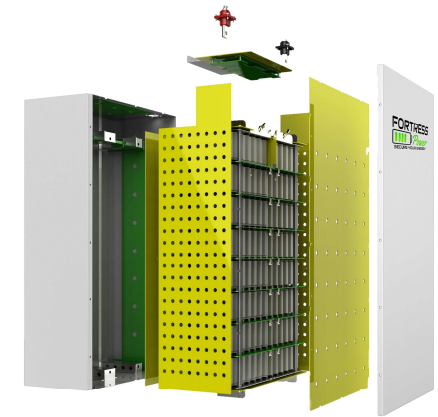


LITHIUM FERRITE PHOSPHATE TECHNOLOGY

We Use The Safest Lithium Technology – Lithium Ferrite Phosphate

	FORTRESS	Other Lithium Ion (e.g. Tesla, LG Chem)
Chemistry	Lithium Ferrite Phosphate (LFP)	Nickel- Manganese -Cobalt (NMC)
Safety	✓	X
Eco-friendly	✓	X
Operating Temperature	-4 – 140 °F	14 – 113 °F
Life Cycles	6000	< 3000
Peak Power Output	10 KW	7 KW
Rate of Capacity Loss	LFP < NMC	

Search LFP vs. NMC nail test videos on YouTube



Fortress LFP Battery

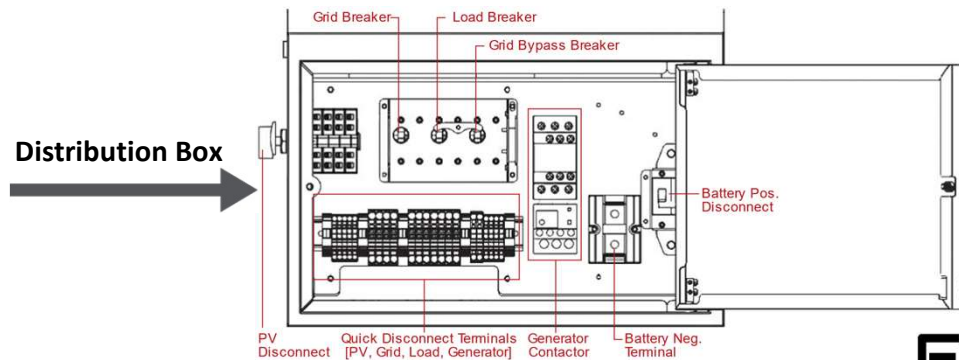


DARFON HYBRID INVERTER



Compact, Easy-to-install & Highly Efficient

It integrates PV inverter, charger inverter, control, communication, distribution box, and auto-transfer, all in one unit.



SPECIFICATIONS

	Technical Specification
Inverter AC output	5 KW*
Surge power at backup	5.5/6.5/7.5 kW (40/5/1 second)
Transfer Switch	48 amps auto-transfer relay at 20ms
AC Grid Voltage	120/240 volts
AC Output	21 amps
Battery Input Voltage	40-58.4 volts (48V)
Battery Life Cycles	6,000
Battery Capacity	10 or 15 kWh**
PV Array	Up-to 6.5 KW

**The inverters are allowed to be stacked up-to 15 kW in July*

***The batteries can be double stacked. If you wish to stack more, please talk to us first.*

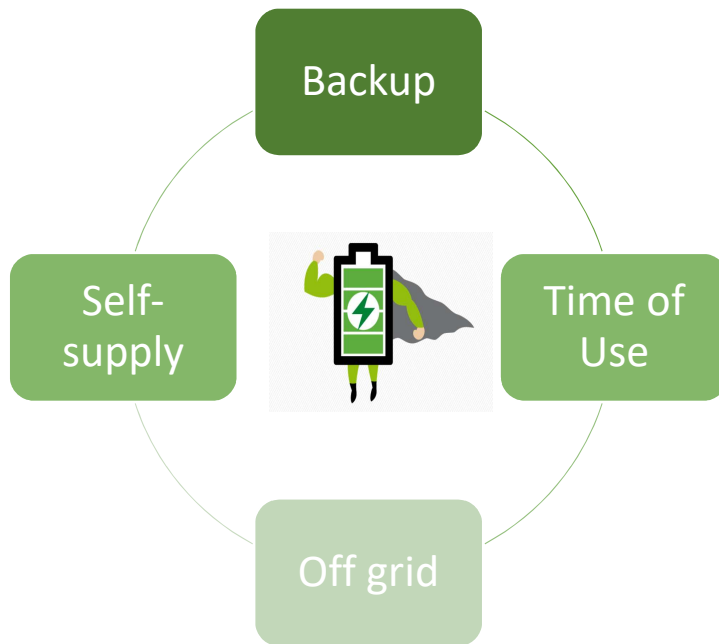


5 kW/10 kWh ESS



APPLICATIONS

ALL IN ONE SOLUTION



DC coupled solution:

- ✓ One inverter manages PV & Storage
- ✓ Higher efficiency

BENEFITS OF ENERGY STORAGE



Back Up Your Facility

Power your facility when the grid is off



Maximize Your PV Production

Keep the solar panels running during the outages; store the excess solar power for later use.



Save Money on your Electric Bill

Charge the batteries at off-peak times, and discharge them during the peak periods



Tax and Incentives

30% ITC available if it's powered by solar; enjoy state and utilities rebates

BACKUP OPTIONS

	Fortress Lithium	Lead Acid	Generator
Applications	Backup power, time of use, self-use & off grid	Backup power	Backup power
Depth of discharge	100%	50%	N/A
Potential Harm	Safest technology	Risk of harmful gases	Environmental pollution
Life Cycles	6,000	500-1,000	N/A
Warranty	10 years	2 years	2 years
Fuel Cost	\$0	\$0	\$ 50-100/day
Maintenance	No	Every 6 months	Yes
Incentives	Yes	Yes	No



COST ANALYSIS

	Fortress Power + Darfon	Lead Acid	Generator (20 KW)
Total Installed Cost	\$12,000	\$13,600	\$10,000
CA SGIP Incentive	\$3,150	\$3,150	N/A
30% ITC	\$2,655 (\$3,600 w/o SGIP)	\$3,315 (\$4,080 w/o SGIP)	N/A
Net Out-of-Pocket	\$6,195 (\$8,400 w/o SGIP)	7,135 (\$9,520 w/o SGIP)	\$10,000
Cost per Cycle	\$1 (\$1.4 w/o SGIP)	\$ 14.3 (\$19 w/o SGIP)	N/A
Fuel Cost	\$0	\$0	\$ 50-100/day

- *Fortress system: 5kW inverter + 10 kWh battery (9 kWh usage power)*
- *Lead Acid system: Outback GS 4048a + 18 kWh lead acid battery (9 kWh usage power)*
- *Total installed cost: the final sales price to home owners*
- *SGIP incentive: Up-to \$ 0.35 per usable Wh*



COMPARISON CHART

	Fortress Power+Darfon	Tesla	Solaredge + LG Chem	Pika Energy	Sonnen
Configuration	DC coupling	AC coupling	DC coupling	DC coupling	AC coupling
Battery Chemistry	LFP	NMC	NMC	NMC	LFP
Battery Cycles	6,000	2,800	2,500	2,800	10,000
Price level	Low	Low	Medium	High	High
Cost per Cycle	Lowest	Medium	High	Highest	Medium
Maintenance	Easy	Hard	Easy	Easy	Hard

•AC coupling requires an additional PV inverter and has at least 5% more power loss



COMPETITIVE ADVANTAGE

✓ SAFE

✓ COMPETITIVE PRICED

✓ LOWEST COST PER CYCLE



✓ ALL IN ONE SOLUTION

✓ MORE EFFICIENT

✓ EASY INSTALL/MAINTENANCE

FORTRESS
 *Power*
SECURE YOUR ENERGY

FORTRESS ENERGY STORAGE SIZING TOOL

FORTRESS ENERGY STORAGE SIZING TOOL



FORTRESS ENERGY STORAGE SIZING TOOL

How to size the Energy Storage System For Backup

1. Sizing PV array
2. Estimate average daily PV production
3. Selecting critical load circuits
4. Calculating daily usage of critical load panel
5. Selecting battery bank size

Available for our authorized dealer



PV ARRAY SIZING

String	Solar Module Specifications						Module String Specifications		
	Module Watts	Voc	Vmppt	Quantity	Temperature Coefficient of Voc %/°C	Record-low temperature °C	String Voc	String Vmppt	PV array size
String 1	310	40.3	32.9	10	-0.29	-20	455.6	329.0	3100
String 2	310	40.3	32.9	9	-0.29	-20	410.0	296.1	2790
Total Modules				19			Total PV System Size(Watts)		5890

Darfon H5000 Specifications		
String VOC	String VMPPT	PV System
120 - 460V	250 - 430 V	Up to 6.5 kW

2 independent MPPTs allow different module layout in each string.

ESTIMATE AVERAGE DAILY PV PRODUCTION

PV Production of A 5.89 KW PV Array in NJ

	Solar Radiation	Monthly AC Energy (kWh)	Avg. Energy Per Day (kWh)
January	3.07	480	15.5
February	4.06	566	20.2
March	4.75	729	23.5
April	5.64	785	26.2
May	5.99	847	27.3
June	6.12	819	27.3
July	6.26	850	27.4
August	5.89	792	25.5
September	5.39	727	24.2
October	4.05	590	19.0
November	3.11	457	15.2
December	2.72	423	13.6

SELECT CRITICAL LOAD CIRCUITS

	Category	Item	Quantity	Starting Watts	Running Watts	Hours/Day	Watthours/Day
1	Essential	Refrigerator/Freezer-Energy Star	1	1200	200	8	1600
2	Essential	LED Light Bulb-60 Watt Equivalent	6	48	48	6	1728
3	Essential	Incandescent Light Bulb-60 Watt	4	240	240	6	5760
4	Essential	Sump Pump-1/3 HP	1	1300	800	0	0
5	Essential	Water Well Pump-1/3 HP	1	1400	750	3	2250
6	Kitchen	Microwave Oven-650 Watts	1	1000	1000	0	0
7	Kitchen	Coffee Maker-4 cup	1	600	600	0	0
8	Personal Electronics	Cell Phone Charger	2	50	50	1	100
9	Personal Electronics	Computer-Laptop	1	250	250	2	500
10	Personal Electronics	TV-Flat Screen-46"	1	190	190	3	570
			Totals	6278	4128		12508
Inverter Type			Surge Power		Running Watts		
Darfon H5001			222 Watts Available		872 Watts Available		
Watthours/Day							
12508 Watts							

SELECT BATTERY BANK SIZE

Critical Load Consumption Report

Item	Watthours/Day
Refrigerator/Freezer-Energy Star	1600
LED Light Bulb-60 Watt Equivalent	1728
Incandescent Light Bulb-60 Watt	5760
Sump Pump-1/3 HP	0
Water Well Pump-1/3 HP	2250
Microwave Oven-650 Watts	0
Coffee Maker-4 cup	0
Cell Phone Charger	100
Computer-Laptop	500
TV-Flat Screen-46"	570
	12,508 Wh/Day

Select Battery Bank Size

Fortress Power Battery	LFP -15
System Size:	15,360 Wh
Battery Quantity	1
Depth of Discharge:	90%
Available Power:	<u>13,824 Wh</u>

WHAT TO EXPECT

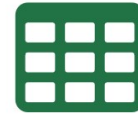
Available power in Battery at 90% DoD	13,824 Wh	1.1 Days
Lowest average daily available PV Power:	13,600 Wh	
Highest average daily available PV Power:	27,400 Wh	

TIME-OF-USE APPLICATION

Provide us one of the following stats along with a monthly electric bill and we will run the financial return for you!



Monthly Electric Bills



Spreadsheet Interval Data



Green Button Data



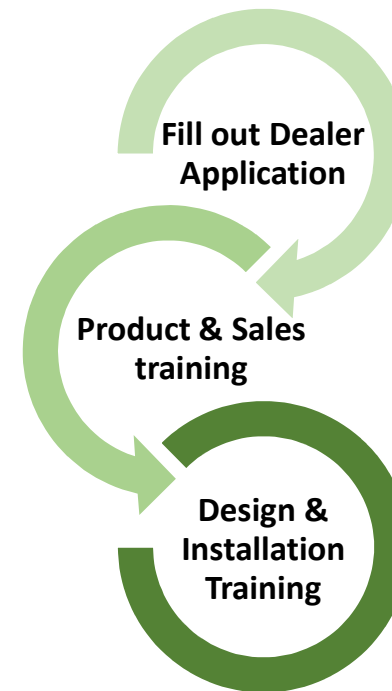
Import UtilityAPI Data

DEALER BENEFITS

Dealer Benefits



Becoming an Authorized Dealer



HOW TO INSTALL

How to Install

Bryan Whitton – Product Manager at Darfon





First Step

Your H5001 will come in a cardboard box. On the box will be a label with a description and the serial number. You should note both to make sure it is the right part and that you have the serial number for warranty purposes.



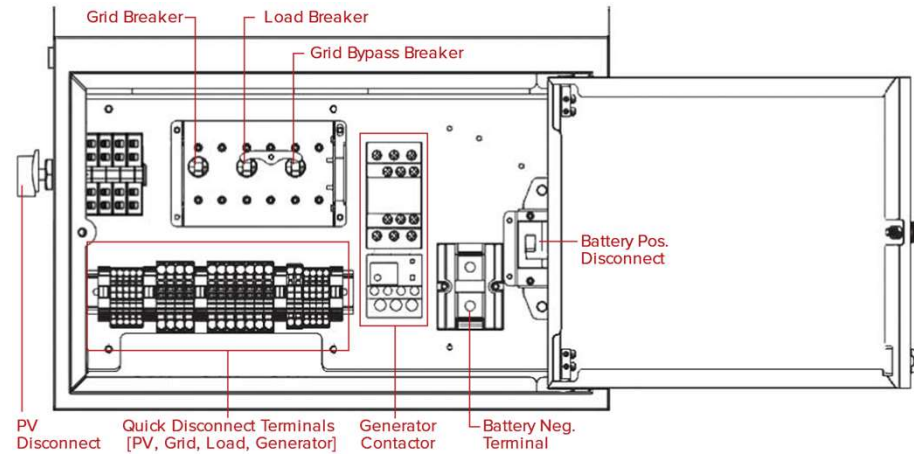
◊ Removing the H5001

- Remove the accessories.
- Remove cardboard inserts and the H5001 from the plastic bag.
- Inspect for any possible damages.





H5001 Distribution Box

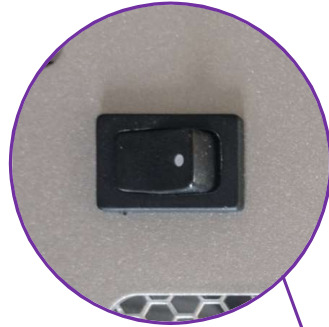


All the I/O happens here. Plenty of room to work with, easy to install and configure.

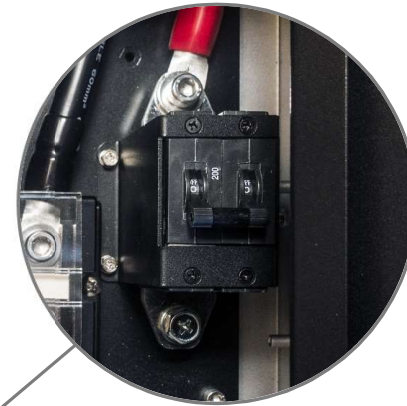


System Switches

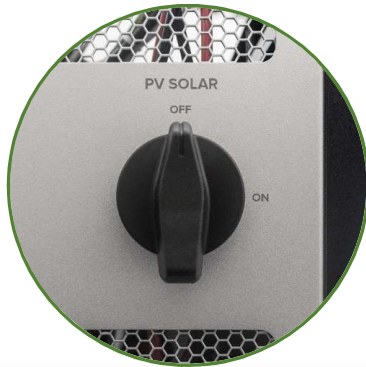
Inverter On/Off



Battery Disconnect



PV Disconnect



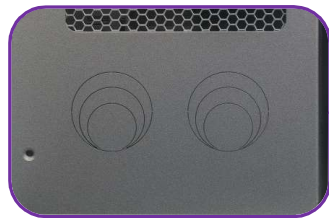


Concentric Knockouts

Located along the right, left and bottom of the distribution box

Clean install!

Typically for PV Connections



Right Side Access



Typically for
AC & Generator
Connections





Concentric Knockouts

Battery Connection

Right below the battery terminals and shutoff switch is a concentric knockout for 1", 1.25" and 1.5" connectors. You will need 2/0 conductors for the battery.





How it mounts



I use Unistrut on the top and bottom. The H5001 simply hangs on the bracket. Be sure to bolt directly into studs.

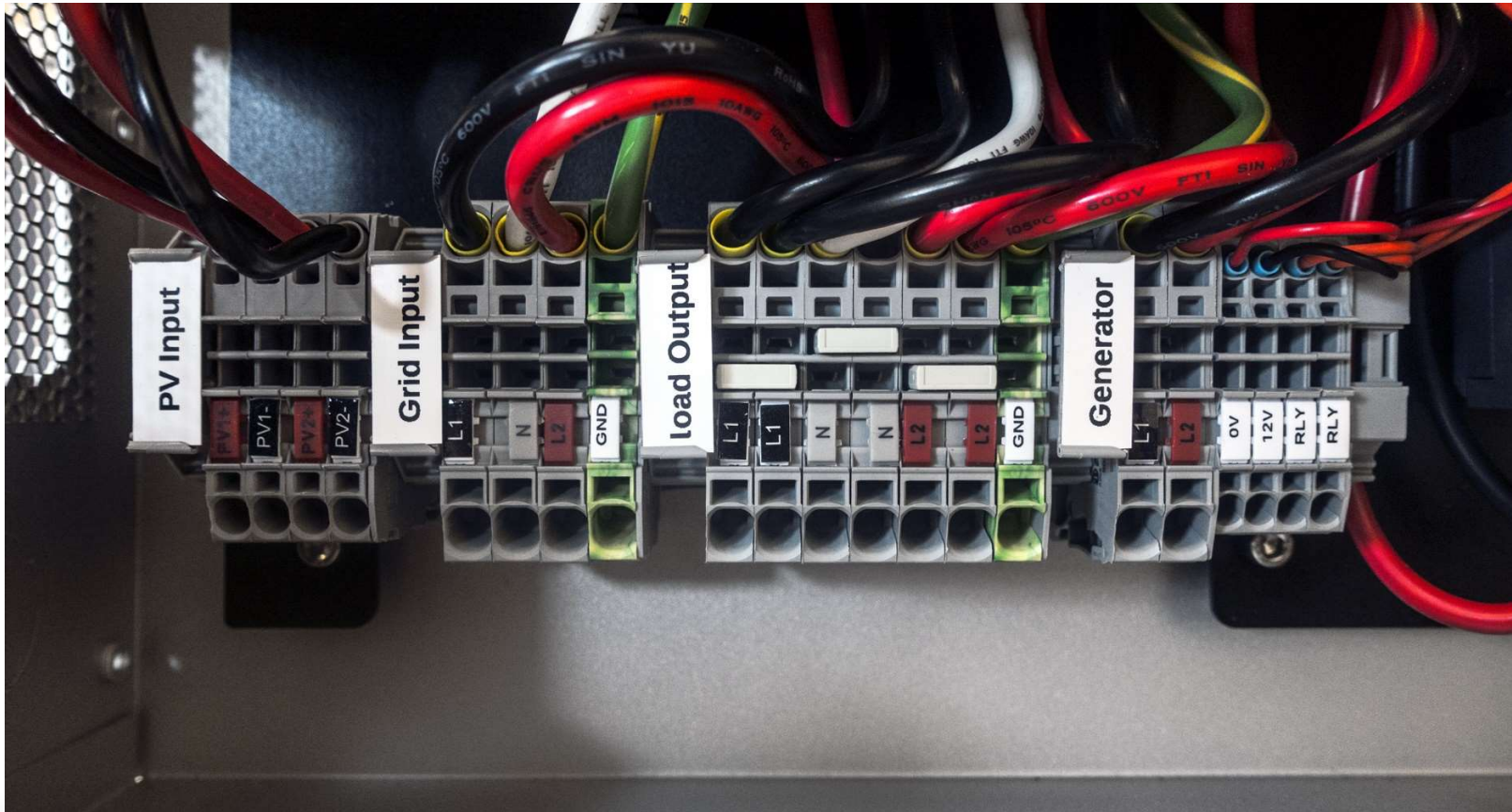


The bottom inverter bracket bolts directly to the Unistrut.



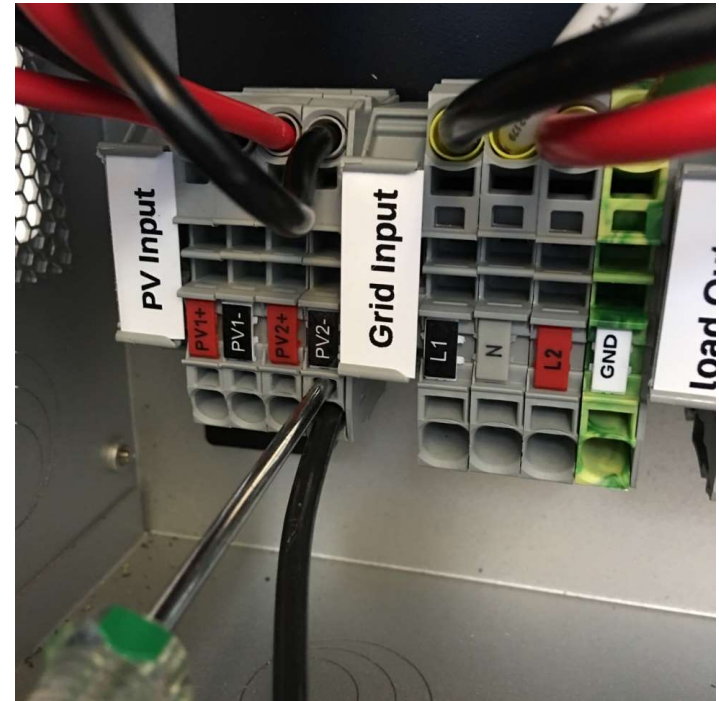
The hanger bracket it is designed to bolt to the wall and hang inverter.

Quick Disconnect Terminals



◆ Installing/Removing Conductors

- Installing Conductors
 - Push a small screwdriver into the release access.
 - Insert the wire and remove the screwdriver.
- Removing Conductors
 - Push the screwdriver into the release access and pull the wire out.

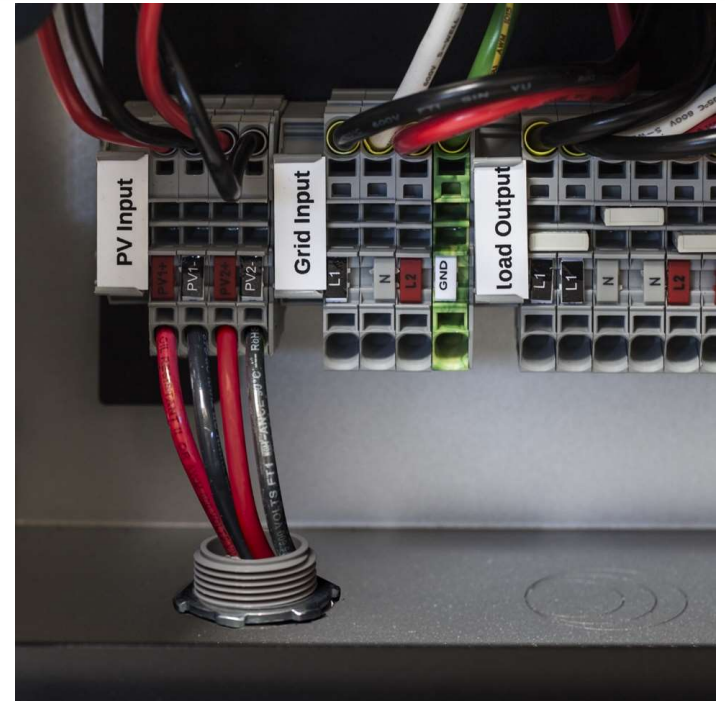


Note: Terminals use high tension springs that require a strong push to get the contact to open.



PV Conductors

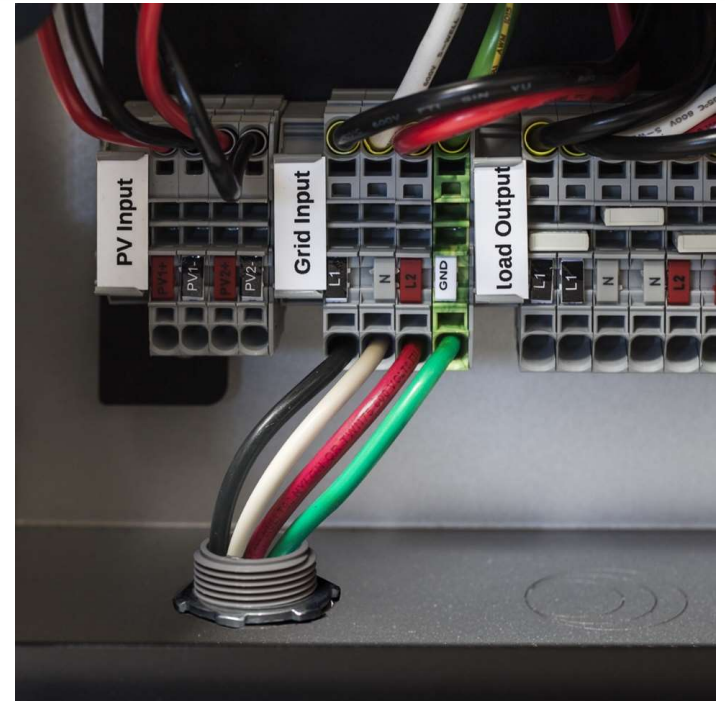
- Two MPPTs in the PV inverter (It doesn't matter which string inputs you use if you only have one string)
- Maximum wire size is #10 AWG.
- *Now is a good time to check the PV voltage and polarity*





AC Grid-Tie Conductors

- Make sure the grid is powered down when you are connecting the wires
- We can handle #8 AWG wire in these connectors
- It takes 2 minutes to do.
- There is a fair amount of room in the distribution box to work with so leave a little extra wire length to make it even easier.

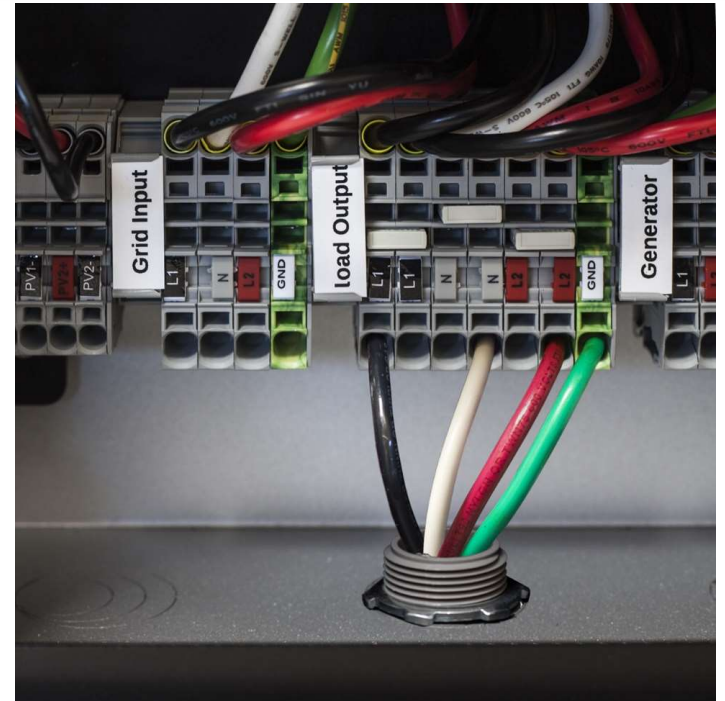


Now is a good time to check the AC voltages



Critical Load Panel

- Same as the Grid-Tie but an extra set of inputs.
- Double the inputs. Again, it gives you flexibility. Occasionally you may want to split the loads such as lights and receptacles or something along those lines. This simply gives flexibility.

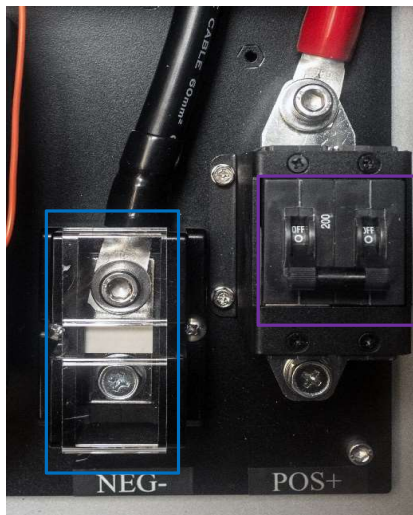




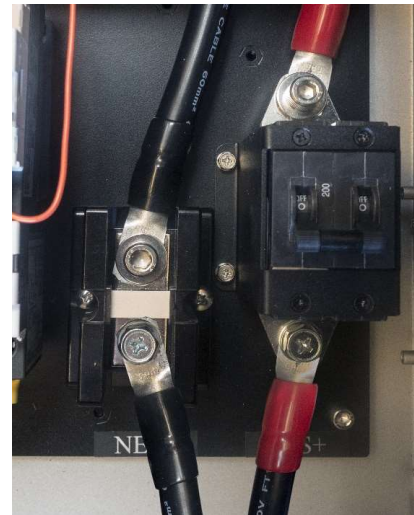
Landing the Battery Conductors

Step 1. Switch off the Battery.

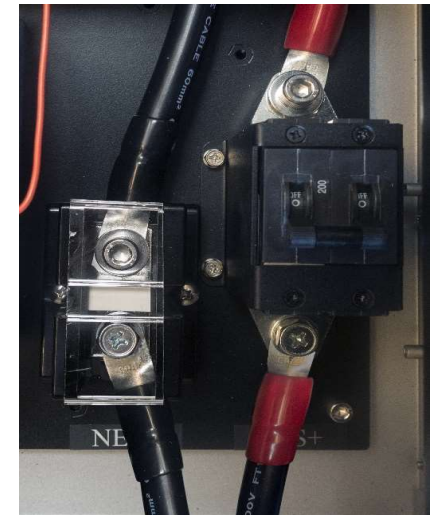
Step 2. Pull the clear finger shield off from the negative connector.



Step 3. Attach the negative cable to the negative connector and the positive cable to the positive connector. Use a 5/16" lug.



Step 4. Clip the finger guard back over the negative connector for safety.



Note: Keep the cables as short as possible.

Finished!

You have successfully installed and wired an H5001 inverter. At this point you will need to set the date, time and mode of operation but that is in the next session.

THANK YOU & CONTACT US

Jing Yu

Managing Director

jingy@fortresspower.com

(877) 497- 6937

www.fortresspower.com

Bryan Whitton

Product Manager

Bryan.whitton@darfon.com

(650) 815-7121

www.darfon.com

 **250.00**

discount on first order

Promo Code: Gogreen

