



Join The Dark Side, To Keep The Lights On!

# Tesla Powerwall

- Tesla Powerwall

- 13 Kw system
- ~\$11,000.00 to install
- \$846.15 / KwHr
- 



# Do At Your Own RISK

I am not an authority or an expert on power or batteries.

Read the the DIY battery book first it will help. (link in parts slide)

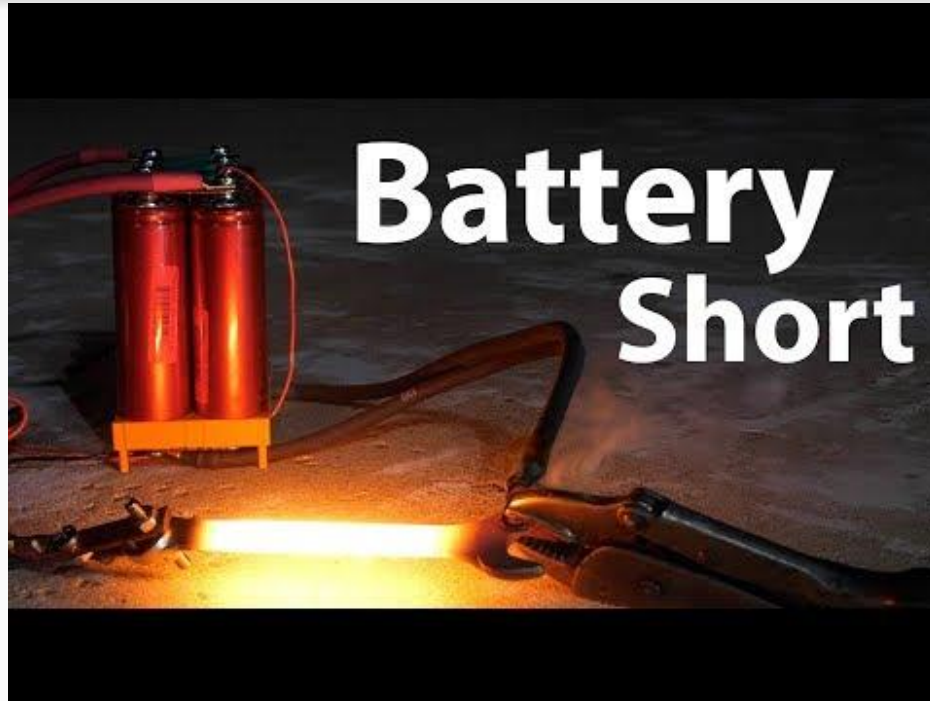




**This may be dangerous: If you Oooppss.., you may cause a fire.. Remember the Samsung Note phones ?**



Lithium Batteries have great power!



Emergency Power

Camping

Collecting Solar Power

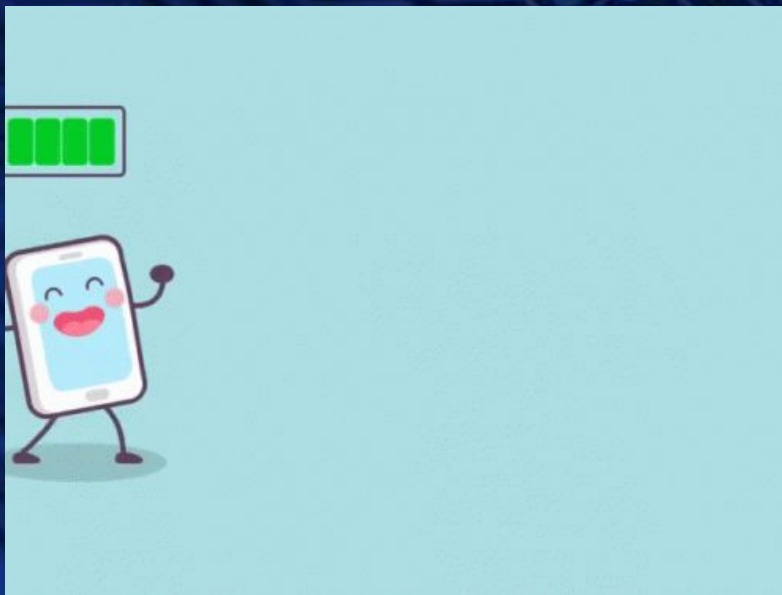
Tailgate | Mobile Power





# How To Make a Battery

- Basic Battery Knowledge
- Sourcing the 18650 cells
- Soldering the power blocks PCB
- Using the power from the battery



# Volts, Amps, and Watts

V = voltage (in volts)

I = current (in amps)

R = resistance (in ohms)

P = power (in watts)

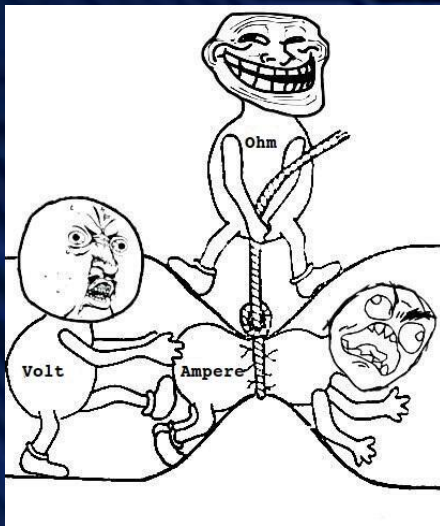
Unknown Value    Formula

Voltage     $V = I \times R$

Current     $I = V/R$

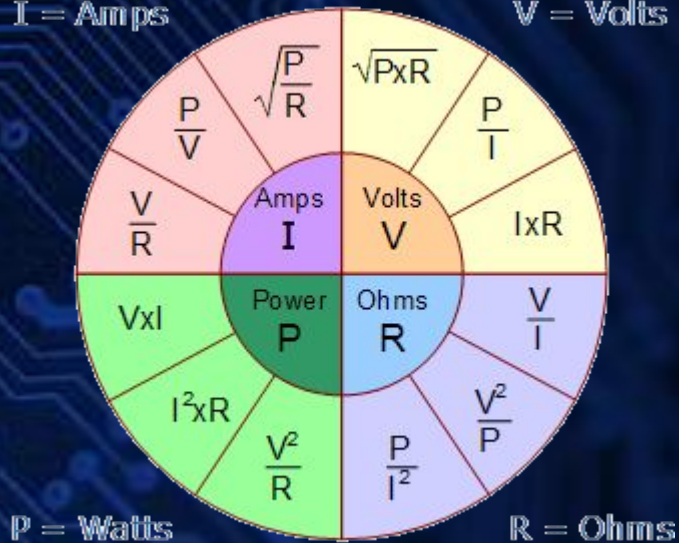
Resistance     $R = V/I$

Power     $P = V \times I$  or  $P = V^2/R$  or  $P = I^2R$     Phone charger = 15 watts =  $5v \times 3.0a$



I = Amps

V = Volts



P = Watts

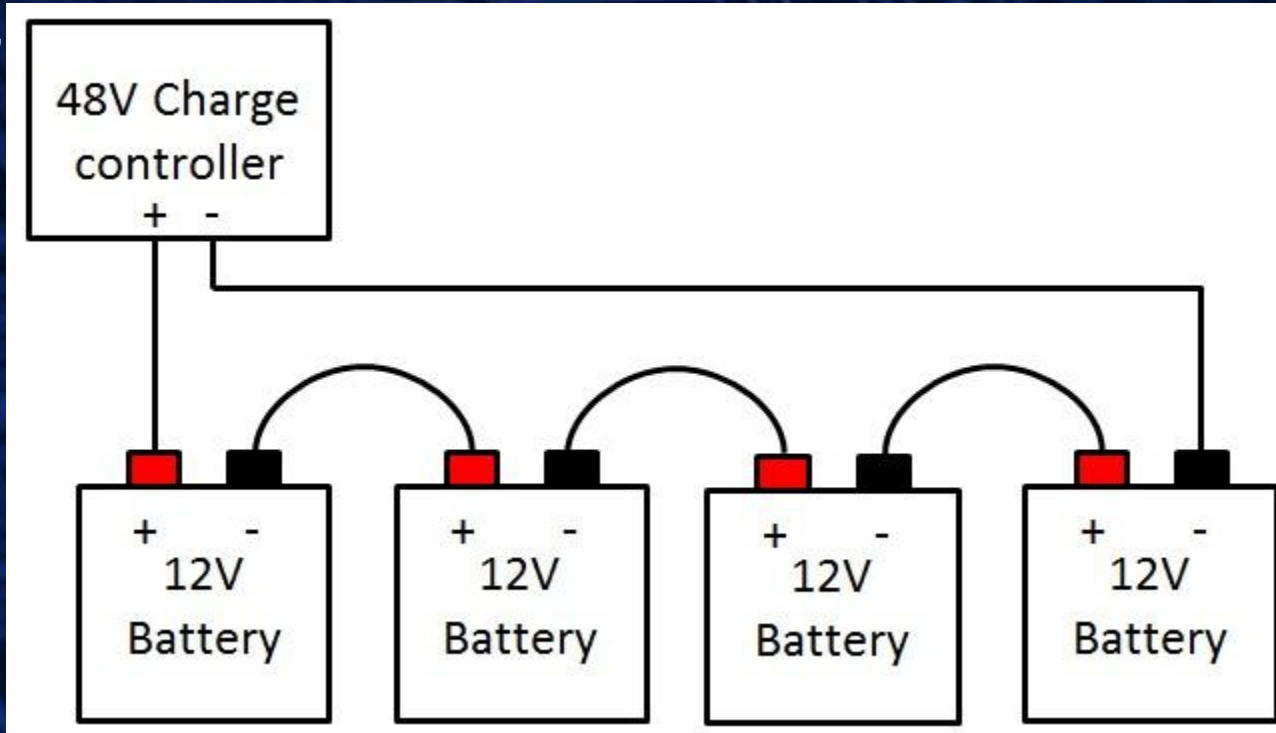
R = Ohms



# Batteries in Series | Volts

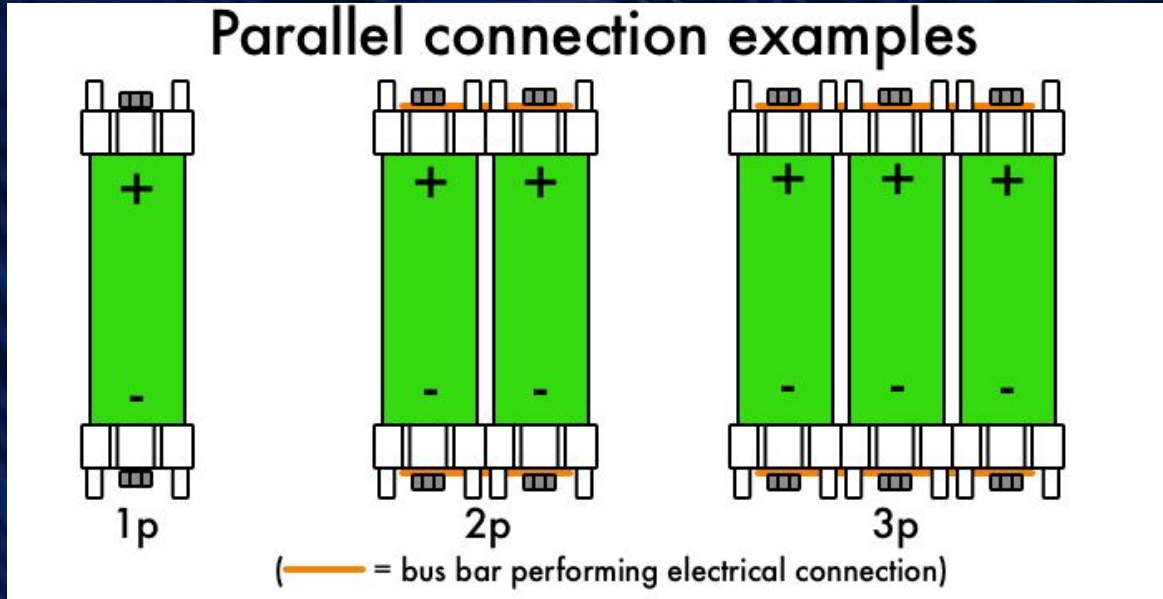
- In a series connection, batteries of like voltage and amp-hour capacity are connected to increase the voltage of the overall assembly.

le: Add Volts



# Batteries in Parallel | Amps

- Connecting batteries in parallel increases total current capacity by decreasing total resistance, and it also increases overall amp-hour capacity. All batteries in a parallel bank must have the same voltage rating.



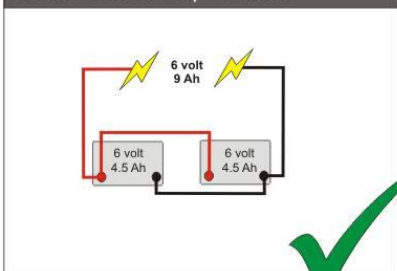
IE. Add Amps

# Series and Parallel

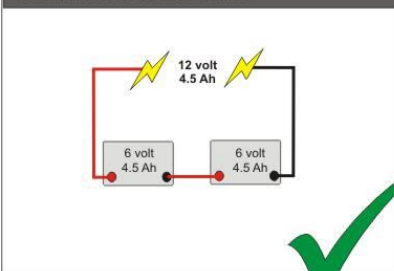
## The BatteryGuy.com Knowledge Base

Results of wiring batteries in parallel and series

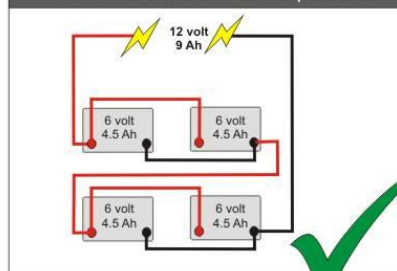
Connected in parallel



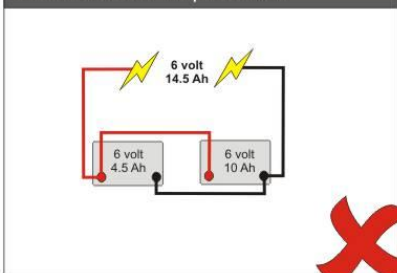
Connected in series



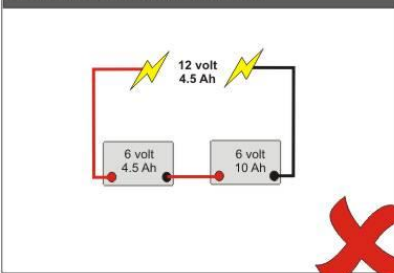
Connected in series & parallel



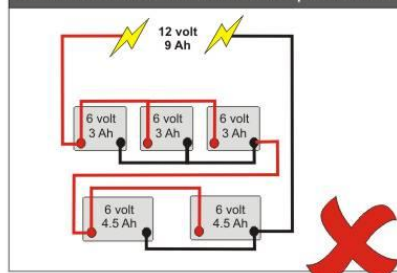
Connected in parallel



Connected in series



Connected in series & parallel







**PERFECTLY BALANCED**

**AS ALL THINGS SHOULD BE**

# 18650 Battery

18650 batteries are lithium-ion batteries. They get their name from their size: 18mm by 65mm. These batteries not only used in flashlights, but also in: power tools, electric vehicles, vaporizers, cameras, laptops, and more!

**Chemistry:** Lithium Ion

**Diameter:** 18mm

**Length:** 65mm

**Voltage nominal:** 3.6V

**Charge voltage cut-off:** 4.2V

**Discharging cut-off:** 2.5V

A standard lithium ion 18650 battery is rated to last between 300 to 500 cycles before noticing a large performance drop.

New Vs Reclaimed

New : Panasonic NCR18650B 3400mAh 4.9A Battery | Price: \$4.99

Reclaimed: LGMH1 18650 cells 3100mAh | Price \$1.47/cell buy 40 cells for \$ 57.50



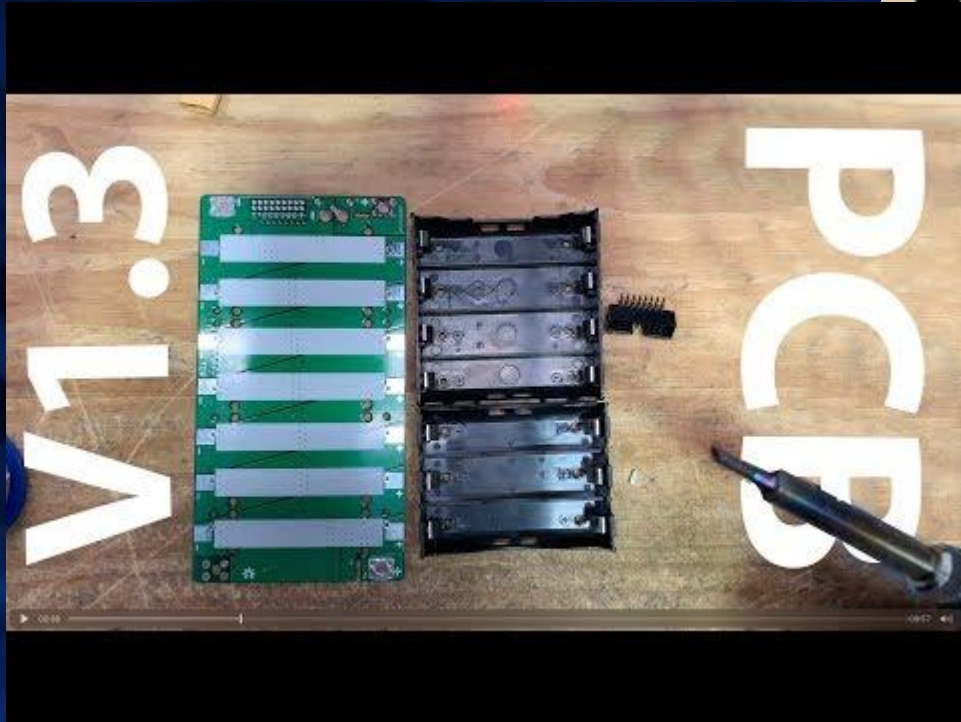
# Reclaimed 18650

- Test the cells
- [BT-C3100 Battery Charger | Discharger](#)
- Fully Charge the Battery
- Discharge the Battery cutoff 3.0 volts.
- Record the Mah battery rating on the discharge
  - This tells you how much power the battery actually has.
  - Group all cells with similar power ratings \*\* Very important\*\*





# PCB board



# Crawl

DIY PCB Battery Module Starter Kit

Price: \$ 12.99

Batteries: 7 Cells \* \$1.43 = \$ 10.01

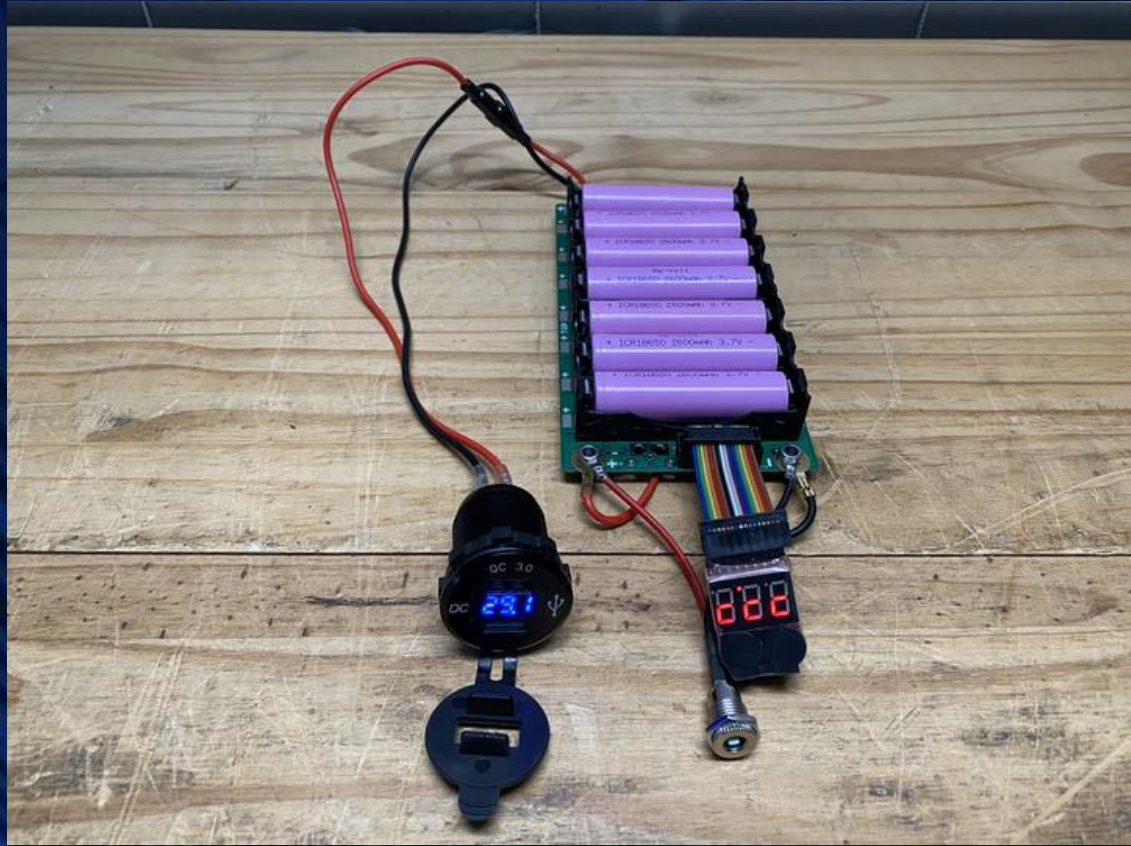
Total : \$23.01

Power: 24 volts

Amps: 3.0

Watts: 72 watts

24volts \* 3.0 Amps = 72 Watts





# Walk

## 18650 Battery Module DIY PCB Kit 10x

Price: \$ 139.98

Batteries: 70 Cells \* \$1.43 = \$ 100.00

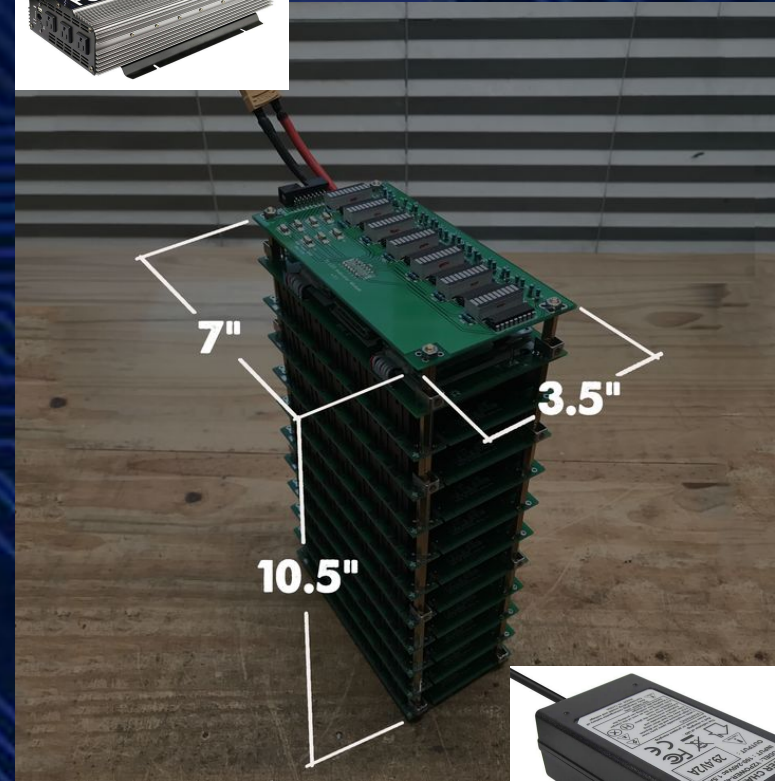
Total : \$239.98

Power: 24 volts

Amps: 30 Amps ( 3.0 A \* 10 PCBs in parallel)

Watts: 720 watts

24volts \* 30 Amps = 720 Watts





# Run

High Power 18650 Battery Module DIY PCB  
Kit 30x

Price: \$ 419.94

Batteries: 210 Cells \* \$1.43 = \$ 300.30

Total : \$720.24

Power: 24 volts

Amps: 90A ( 3.0 A \* 30 PCBs in parallel)

Watts: 2.1 Kwatts

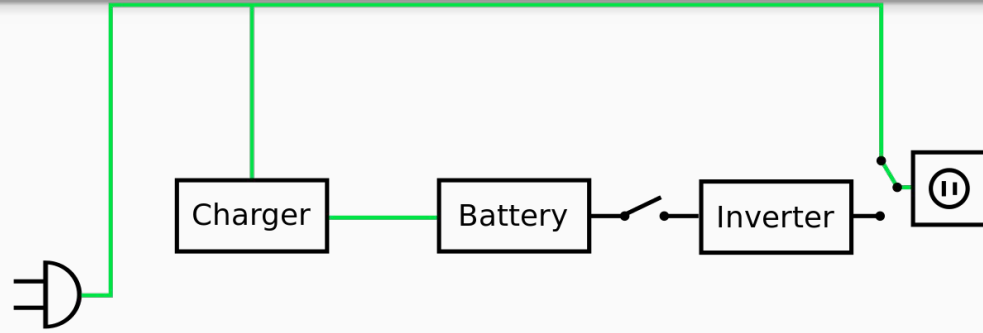
24volts \* 90 Amps = 2.1 Kwatts = \$342 /  
KwHr



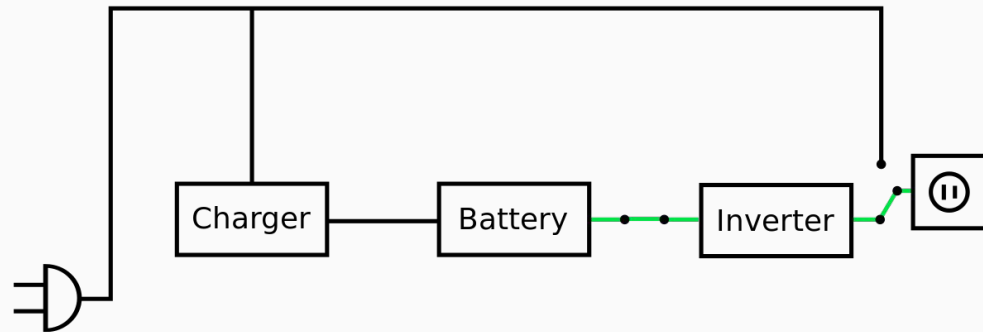
# Inverters



24v 2000 Watt



Normal AC Power



Over/Undervoltage; Loss of Power



# Using Power: Inverters

- A power inverter changes DC power from a battery into conventional AC power that you can use to operate all kinds of devices ... electric lights, kitchen appliances, microwaves, power tools, TVs, radios, computers, to name just a few.
- Inverters function by using a unidirectional DC power source to mimic an alternating current (AC) power source. Electronic inverters are essentially oscillators that rapidly switch the polarity of the DC power source, which effectively creates a square wave.
- Pure sine wave is always needed for a grid tie system. It is generally needed for newer LED TVs, CFL light bulbs, and inductive loads like brushless motors. Clocks and audio equipment will behave much better on a pure sine wave.

# Battery Chargers:

- Battery Chemistry Matters
- Learn what Chemistry Battery you have in order to charge.
- The most common batteries are lead acid, NiCd, NiMH and Li-ion
- Lead Acid Battery charger cannot charge a Lithium Ion Battery.
- Over charging can cause fire.
- Pair the charger for the battery Configuration.





# Battery Chargers

Crawl | Walk | Run

29.4V 2A Charger Power Supply Adapter for 24V 25.2V 25.9V 29.4V 7S Lithium Battery Pack, Li-ion Battery Charger, with 5.5x2.5mm Round Plug

Specifications:

Applicability: For Lithium Battery (NOT Included.)

Output Plug: 5.5 x 2.5mm (Outer Diameter x Inner Diameter)

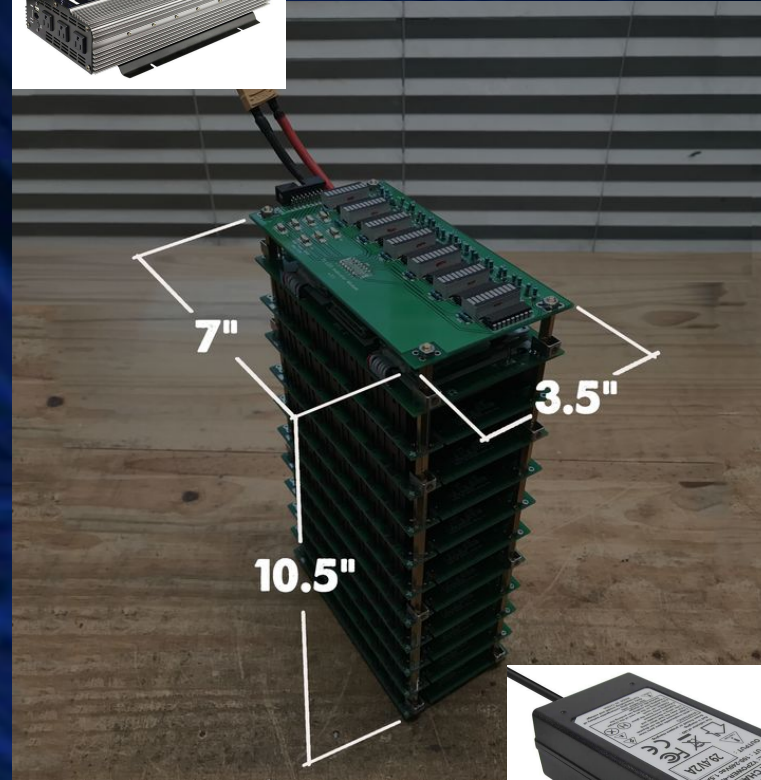
Input: AC 100 ~ 240V, 50/ 60Hz

Output: DC 29.4V 2A =  $29.4 \text{ v} * 2 \text{ a} = 58.8 \text{ watts of power}$

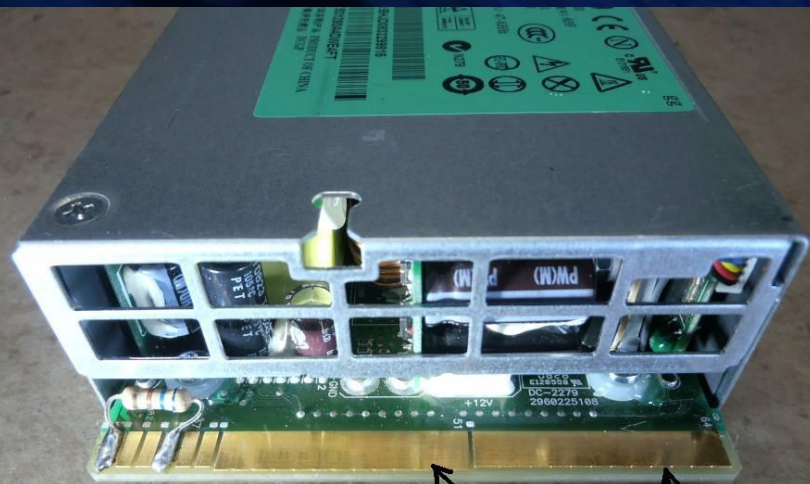




# Walk



# HP-DP 800SG



here are pins 33 and 36  
jumped with the resistor

12v negative 12v positive

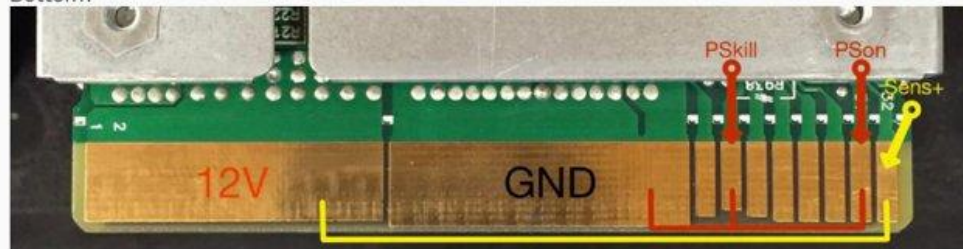
## Dps-800GB HP Power Supply



TOP:



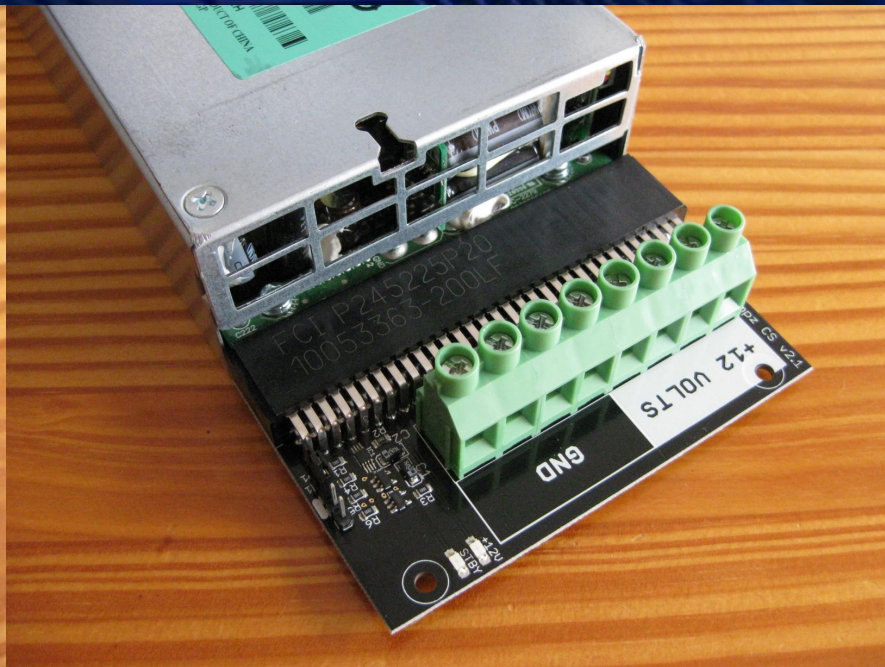
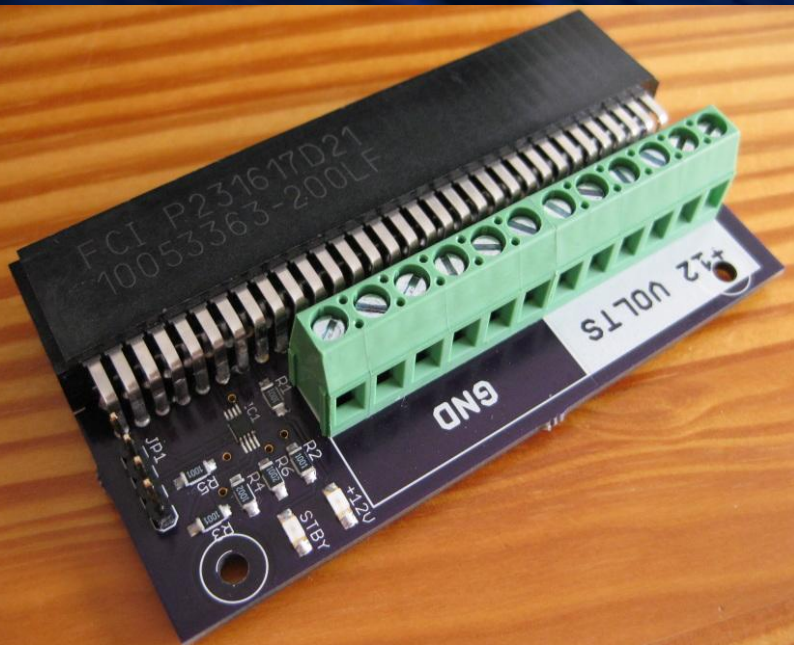
Bottom:





# Battery Chargers: Walk/Run

- Convert HP server power supply as a battery charger
- Gigampz for DPS-800GBA (Special Order)



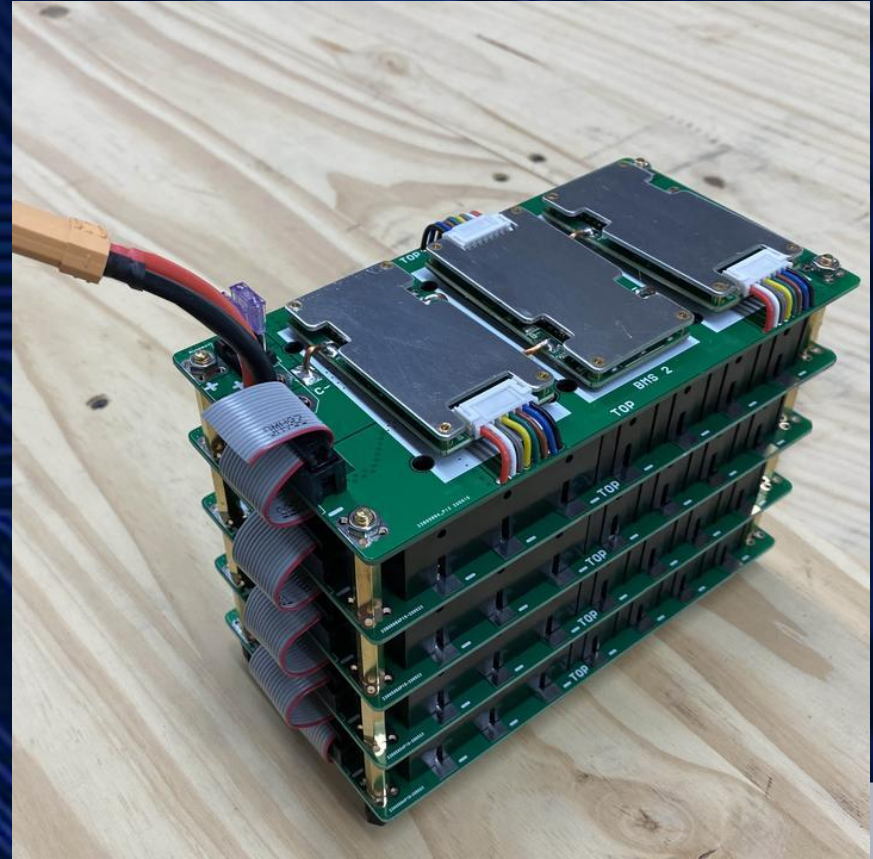


# Run



# BMS

- Battery Management System
- Controls Balance Charging
- Stops Batteries from dangerous Discharge levels
- Stops overcharging batteries
- Overall control of power flow from The battery.





# 1 Kilowatt

- A kilowatt-hour, otherwise known as a kWh, is a way to measure how much energy you're using.
- It's not the number of kilowatts you're using in an hour, even though that seems to make sense. A kWh equals the amount of energy you would use by keeping a 1,000 watt appliance running for one hour. In metric, 1,000 = kilo, so 1,000 watts equals a kilowatt.
- For instance, if you turned on a 100 watt bulb, it would take 10 hours to use one kilowatt-hour of energy. A 2,000 watt appliance, on the other hand, would only take half an hour. It all comes down to dividing the number of watts in an appliance into 1,000.



# Power Consumption

Appliance	Minimum	Maximum	Standby	1KW Battery
49 Inch LED TV	85W	85W	1W	11.7647058823529
Amazon Echo	3W	3W	2W	333.333333333333
Apple TV	3W	6W	0.3W	333.333333333333
Aquarium Pump	20W	50W	N/A	25
Ceiling Fan	60W	70W	0W	16.6666666666667
Coffee Maker	800W	1400W	N/A	1.25
Computer Monitor	25W	30W	N/A	40
Game Console	120W	200W	N/A	8.33333333333333
Home Internet Router	5W	15W	N/A	200
Laptop Computer	50W	100W	N/A	13.3333333333333
LED Light Bulb	7W	10W	0W	142.857142857143
Tower Fan	60W	60W	N/A	16.66666667

# Overall Goal

Charger -> BMS -> Battery -> inverter -> Lightbulb | Tv | Fan | etc...

Building out a DIY Li-Ion Battery will allow you to have a UPS for the house...

Scaleable - 1 Kw per year....

Build up your hardware skills and start working on more hardware related projects.



# Unexpected Projects

- [DIY Perks](#) Youtube channel
- Replace Laptop Batteries
- Replace Old Power Tool Batteries
- Turn an old Laptop Monitor to a Portable Monitor
- Summer Project - Make an INSANELY LOUD Bluetooth Amplifier!
- Repurpose Old Electronics



One more thing...



# Portable power

- 3 x 600W outlets
- 288 Wh battery capacity
- Batteries Included
- BMS Included
- Charger Included
- Sine Wave Inverter Included
- Charge Grid | solar | car
- ~ \$350.00
- <https://ecoflow.com/products>



# Parts

- [DIY Battery Book](#) - Read First
- [Lithium Cells](#)
- [PCB Starter Kit](#) - Crawl
- [PCB 10x DIY Kit](#) - Walk
- [29v 2A Battery Charger](#) - Charger
- [HP DPS-800G Power supply](#) - Charger for Large system
- [DC-DC voltage regulator](#) - Used between Large charger and BMS
- [Gigampz for DPS-800GBA \(Special Order\)](#) - Charger Bypass Connector
- [Power Meter](#) - Measure power
- <https://www.mobile-solarpower.com/> - Great Resource, Parts, and guides
- <https://bigbattery.com/products/12v-170ah-extreme-power-block/> - assembled Battery



The background is a dark blue gradient with a complex, glowing circuit board pattern. The circuit lines are light blue and white, creating a sense of depth and movement. The pattern is dense and intricate, with many small circles and lines representing components and connections.

# Questions ?