A

Micro-Project

On

RECHARGEABLE POWER BANK

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CERTIFICATE

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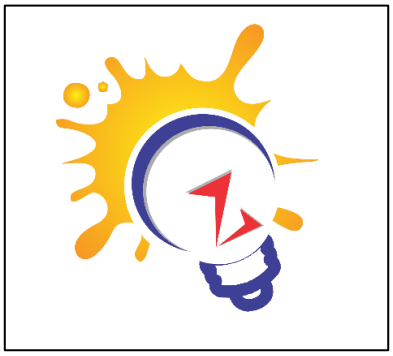
ABSTRACT:



The objective of this research is to design a Solar Powered Portable Power Bank for mobile phone using sunlight as its ultimate power, which can be used effectively during disaster events. It has in-built solar panel which converts the solar energy to electrical energy. The charge is then transferred to a battery for storage of charge for further use, with the battery having a microcontroller indicating the percent of charge present in the battery. The battery is connected to a charging circuit having an USB port as output to the respective Mobile phones. Power banks are used to charge portable electronic devices, including smartphones and tablets. However, customers' expectations are often not realized in terms of the actual delivered capacity of the power bank; it is often far less than the value specified on the product. This paper discusses the specifications of power banks and assesses two power banks in terms of advertised and actual capacity. Recommendations on how to correctly specify (advertise) capacities are then provided.

INTRODUCTION:

A power bank is a portable battery system which is used to provide energy to portable appliances including smartphones and tablets. The need for power banks arose primarily with the trend to make smartphones compact and light, which limited the space for batteries, resulting into limited battery runtime. As a result, many customers opted for power banks to enable them to portably charge their devices. In addition, most smartphone manufacturers don't allow for easy and inexpensive replacement of batteries, and since batteries eventually suffer from capacity fade, having a portable charger becomes a needed accessory for older devices. Today, power banks come in various shapes and sizes, and are a common source of battery backup. The power bank typically consists of a battery cell or pack in a case with circuitry to control power flow and voltage levels. The power bank can store electrical energy (deposit it in the bank) and use this energy to charge up another (e.g. mobile) device (withdraw it from the bank). The charging protocol (how much voltage or current for how long, and what to do when charging is complete, for instance) depends on the size and type of the battery being charged. Some battery types have high tolerance for overcharging (i.e., continued charging after the battery has been fully charged) and can be recharged by connection to a constant voltage source or a constant current source, depending on battery type. Simple chargers of this type must be manually disconnected at the end of the charge cycle, and some battery types absolutely require, or may use, a timer to cut off charging current at some fixed time, approximately when charging is complete. Other battery types cannot withstand over-charging, becoming damaged (reduced capacity, reduced lifetime), over heating or even exploding. The charger may have temperature or voltage sensing circuits and a microprocessor controller to safely adjust the charging current and voltage, determine the state of charge, and cut off at the end of charge. A trickle charger provides a relatively small amount of current, only enough to counteract self-discharge of a battery that is idle for a long time. Some battery types cannot tolerate trickle charging of any kind; attempts to do so may result in damage. Lithium ion battery cells use a chemistry system which does not permit indefinite trickle charging.

POWER BANK TYPE:

There are a few different types of power bank portable charger that can be bought. Obviously the size is one of the main criteria, but there are some other categories that can be considered.

The main types of USB power banks include the following:

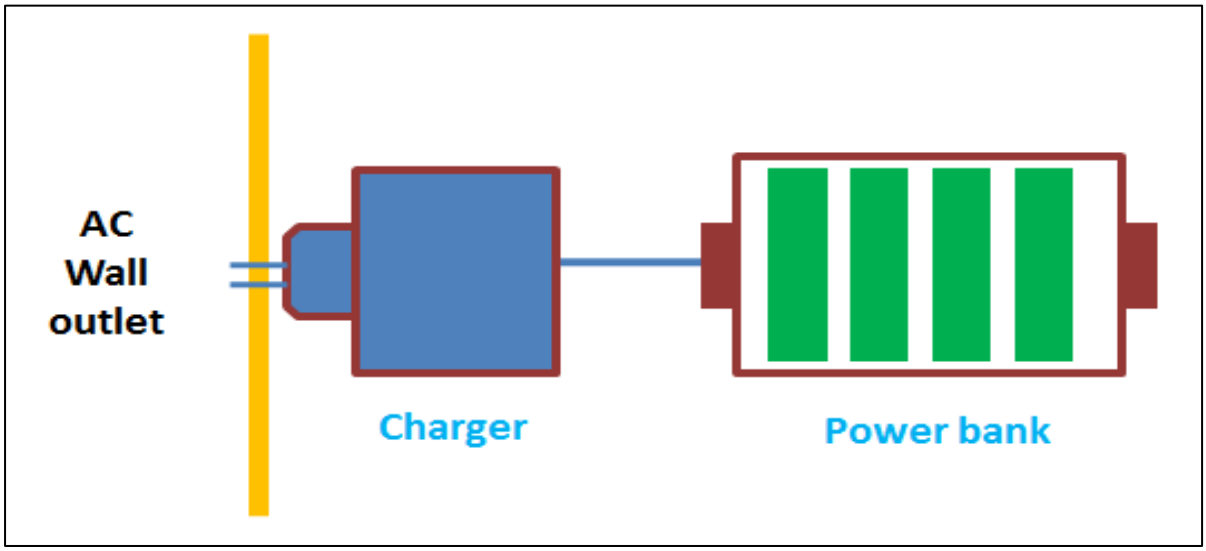
Universal or standard power bank: These are the normal power bank portable chargers which are available in the stores and online. They are charged from the normal USB sources like USB chargers. These power banks are normally charged from a standard USB charger and there is some indication on the power bank as to its state of charge. This may be a row of small LED lamps or a simple alphanumeric display that indicates the charge level as a percentage of full charge. Typically a micro USB connector is used as the power in connection. Once fully charged the power bank can be used to charge other devices. There may be one of more Type a USB sockets (dependent upon the particular power bank) that can deliver charge to the devices needing charging.

Solar power bank: As the name indicates, these solar power banks can use sunlight to charge up. To do this they have photovoltaic panels. These are really only able to trickle-charge the internal battery when placed in sunlight because the solar cells are relatively small, but nevertheless this can be a very useful function, but really only in very sunny or bright conditions. As the solar charging is slow, they can also be charged from a USB charger as well. The solar charging is a useful back-up, especially if you are travelling away from mains power. To ensure that the maximum amount of solar energy can be converted, some of the more advanced solar power banks have solar panels that fold out to present a larger area to the Sun. Even so, it can take over 24 hours to charge some, and as there obviously isn't bright sun at night, or even all day, it can take a considerable while to charge. As charge times, capacities, etc vary considerably, it is always best to take a close look at the figures, if there is a possibility of buying one.

Wireless power bank: With many gadgets like phones, ear-pods and the like now having the capability to be charged wirelessly, this concept has been adopted by the power bank industry. It is possible to obtain powerbanks that are themselves charged from a standard USB source, but they are able to charge phones and other wireless charging compatible electronic devices wirelessly. These powerbanks use the Qi standard that has been adopted by virtually all electronic devices that can be charged wirelessly. The electronic device to be changed is placed on the power bank - orientation is often important, so check with the instructions, a button typically has to be pressed to turn on the wireless charging capability, and then it all proceeds until the device is charged. It is best to turn off the wireless charging power bank once the charging is complete and then the wireless charging circuitry is disabled and the powe rbank will not be discharged unnecessarily.

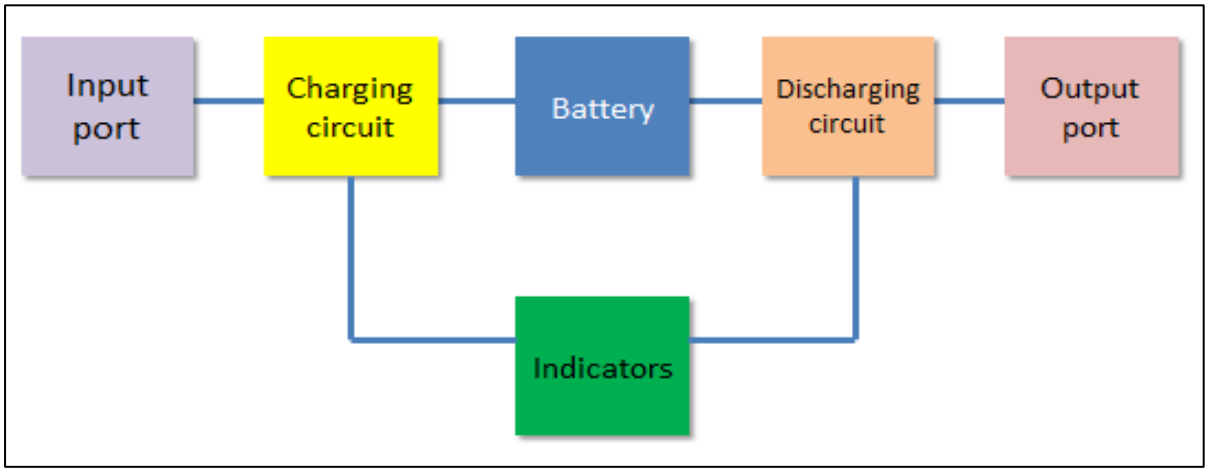
POWER BANK OPERATION BASICS:

When looking at how a power bank works, it is essentially a battery into which power is passed typically from a mains powered USB charger. This is stored and then passed out to the device under charge as required. To facilitate this operation, the power bank not only consists of a battery itself, but some sophisticated electronics which manages all of these operations. A Power bank is simply energy storage like a battery. It has input and output ports. The input port serves as the connection to the charger while the output is where the devices use the power bank connect. In the case of a portable power bank, the input and output connectors are already USB compatible. Power bank stores energy when it is charged. This energy will serve as the power source to the device that uses the power bank.



POWER BANK CONSTRUCTION AND CIRCUIT BLOCK:

It is not difficult to understand how power bank works. Further informations that may be relevant to you is the circuit block diagram of a power bank. A power bank has input port, charging circuit, battery, discharging circuit, output port and indicators. The input port is use to charge the power bank. The charging circuit is designed to recharge the power bank from a charger. This regulates the voltage and current that will supply to the battery. The battery is the energy storage element. The discharging circuit is functioning almost the same to the charging circuit. It will control the current drawn from the battery. Too large discharge current will shorten the battery life. Output port is use to connect to the devices and gadgets that will charge from the power bank. Indicators are simply added features for visual monitoring.



BASIC POWER BANK USAGE:

Power banks are generally very easy to use, and typically conform to some simple conventions, especially with respect to the connectors. Normally power bank connectors have separate functions.

- Micro USB (sometimes mini-USB): Most commonly a power bank will use a micro-USB for being charged. This enables the standard USB A to micro-USB leads to be used to charge the power bank. Often the same lead used to charge a mobile phone or other device can be used.
- USB Type A connector: The larger type A USB connector is used to enable the power bank to charge other devices. This means that standard charging cables supplied with most phones and other devices can be used. Normal USB chargers have a Type A connector from which the charge is supplied.

When using the power bank, it is normally only necessary to connect a powered USB micro connector to it for it to receive charge. Depending on the power bank capacity, its charge level, and the charger, the ambient temperature, etc., it can take quite a while to complete its charge. As an example, a 1500mAh rated power bank should take very roughly about the same time as a typical smartphone to charge. For larger power banks, this time can be considerably increased - it may take two three, four times as long. Power banks have electronic battery management and this includes a safety cut-off to prevent overcharging and overheating. However, whenever possible, it is best to remove the power bank from charger when it is full - at least avoid leaving it connected long-term after its full. However when using the power bank to charge electronic devices, the leads need to be connected, and it is normally necessary to use a button on the power bank to enable the charging. This is required because a sort circuit on the output of the power bank could generate a lot of heat and possibly cause the power bank to catch fire or explode. The prevent keys in pockets and other metallic items causing an accidental short circuit, the output normally has to be enabled before use. Often the power bank will have a simple LED indicator showing the level of charge it has when charging is enabled, or when it is being charged. These indicators often turn off after a short while to preserve the power bank charge.

ADVANTAGES OF POWER BANK:

1] Affordable: We need to consider cost like a rational consumer. But seriously, even the primary perks of power bank just outweigh the cost of it. They are very inexpensive and are available according to your battery needs. It's a small price to pay for a day of a full battery. You can get the small ones at budget-friendly prices as well as the high-end ones are also quite affordable.

2] Comes handy in Emergencies: It is beneficial to have some battery backup at hand if your phone is draining, and you need to use it. You can charge your phone anytime, anywhere, and stay connected to your loved ones (or play that very urgent round of PUBG). You cannot always hope to find a charging point anywhere, whip out your charger and charge your phone. Also, in some cases, when you damage or lose your charger or even if the power goes out at your house, a power bank is handy. The battery banks will always save the day.

3] Multipurpose: The battery bank is seriously a multi-tasker. A power bank, once charged, can charge a phone multiple times. It can also charge multiple devices at once, as they have multiple sockets. The power banks can charge any device. The only thing you need is a proper charging cord suitable for your device. In addition to this, it can also charge your laptop, tabs, kindles, iPads, iPods, PSPs, and even some headphones and portable speakers. Some cool power bank models also have flashlights in them, and the USB cord is very multipurpose too—this is one of the cool advantages of power bank.

4] Comes in all Sizes: You can choose from a variety of power banks, depending upon your use. They come in all power and size variants ranging from 1000 mAh to a power-packed 21000 mAh. The smaller ones can be carried in a pocket; they weigh nothing and take up little space. The bigger ones get heavy as they have more power. The 21000 mAh ones can charge all your devices, including tabs and laptops.

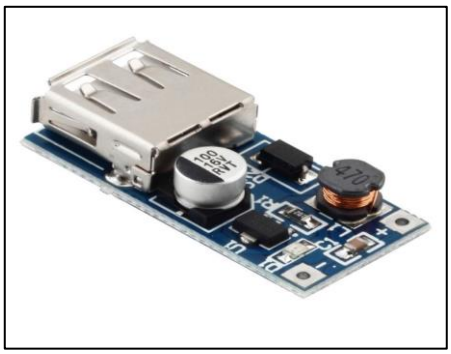
5] Charges anywhere: Because you might get an urgent Call of Duty or spot a rare Pokemon anywhere, or you might just need a quick charge on the train, Power bank is here to the rescue. You can charge your phone (and other gaming devices)on the go; you can charge it under your desk and even in the kitchen as you cook. You will not have to go through travel stress anymore. This especially high if there are no outlets nearby, and you have nowhere to plug in. Some lazy pandas (and the people who refuse to cross the wifi range) that don't want to haul themselves over to the power outlet will be glad to have a power bank right on their desks. You do not have to carry your charger everywhere with you and risk losing it. With a power bank by your side, you can keep clicking selfies all day.

6] You don't have to Fret about Charging your Phone to the Full: Now you don't have to freak out if your phone is not 100% charged before leaving for school, college or work. If you are late and don't have the time to charge a phone at your home, you can just barge out of the house and fully charge your phone as you run.This is one of the biggest advantages of power bank.

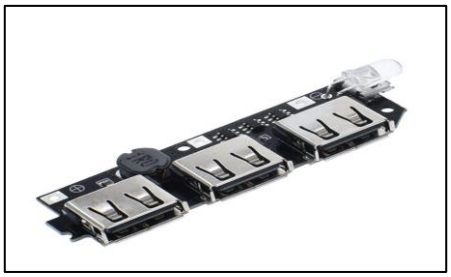
7] Easily available: You can easily purchase power banks anywhere where they sell mobile accessories. There are such stores around every corner. These mobile accessory stores are especially cluttered on bus stops, stations, and airports. You can get one on the go. You can even buy it online and get it delivered to your doorstep.

THE COMPONENTS WHICH ARE USED:

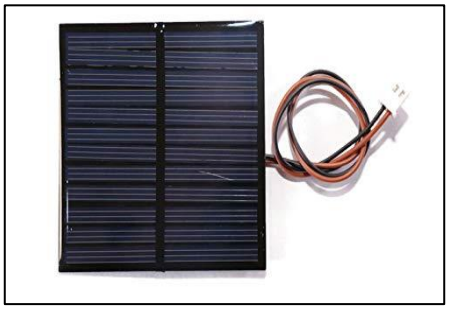
1] Lithium-ion battery: In the batteries, lithium ions move from the negative electrode through an electrolyte to the positive electrode during discharge, and back when charging. Li-ion batteries use an intercalated lithium compound as the material at the positive electrode and typically graphite at the negative electrode. The batteries have a high energy density, no memory effect (other than LFP cells) and low self-discharge. They can however be a safety hazard since they contain flammable electrolytes, and if damaged or incorrectly charged can lead to explosions and fires. Samsung was forced to recall Galaxy Note 7 handsets following lithium-ion fires, and there have been several incidents involving batteries on Boeing 787s.



2] Boost step up power module: A boost converter (step-up converter) is a DC-to-DC power converter that steps up voltage (while stepping down current) from its input (supply) to its output (load). It is a class of switched-mode power supply (SMPS) containing at least two semiconductors (a diode and a transistor) and at least one energy storage element: a capacitor, inductor, or the two in combination. To reduce voltage ripple, filters made of capacitors (sometimes in combination with inductors) are normally added to such a converter's output (load-side filter) and input (supply-side filter).



3] Power bank board: Power Bank Module is a super mini power bank mainboard compatible with 3.7V-4.2V li-ion battery. On-board micro USB port for battery charging and USB type A female output port supporting DC 5V 1A input and 5V 1A output. Just connect it with a 18650 battery then you can get a portable power bank. according to the device automatically recognize the output 5V 1A current on the phone. Flat charge, you can also take three mobile phone at the same time.

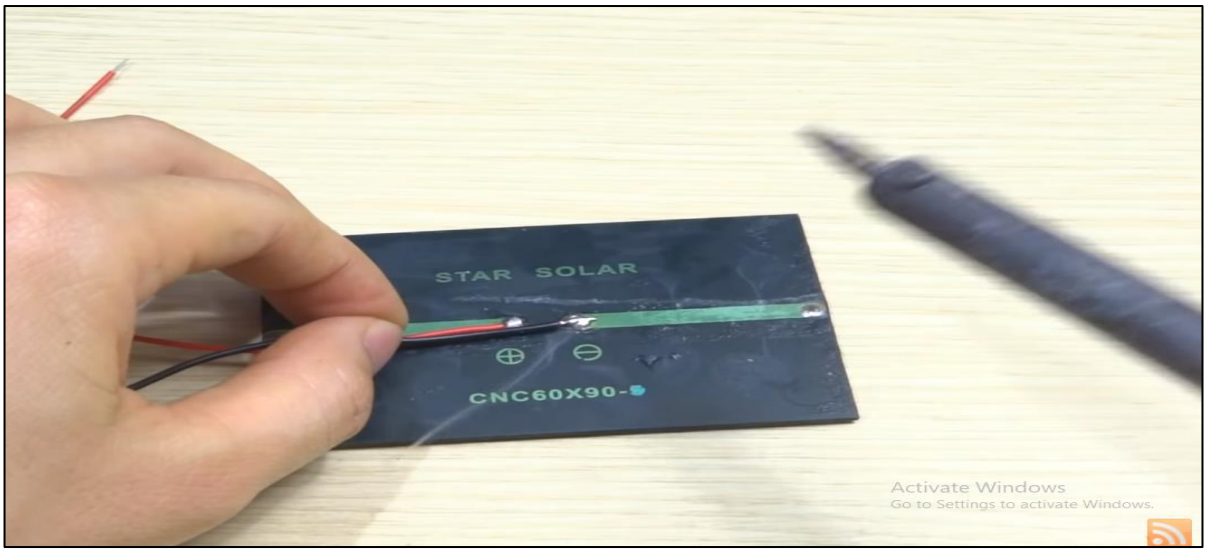


4] Solar panel: Small solar products are physically smaller and produce much less electricity than traditional solar panels. As such, they are most often used in off-grid or portable energy applications. Most manufacturers who produce traditional solar panels do not also produce panels of smaller sizes. Smaller solar panels can be used in many different ways: as a phone charger, for RVs and during camping trips, and for small off-grid solar projects. If you're looking to save money by offsetting your home energy use with a solar power system, small panels likely won't get the job done. In order to generate the electricity needed to power all of your appliances, the best option is to get quotes for a solar system installation that produces much more energy than smaller panels can.

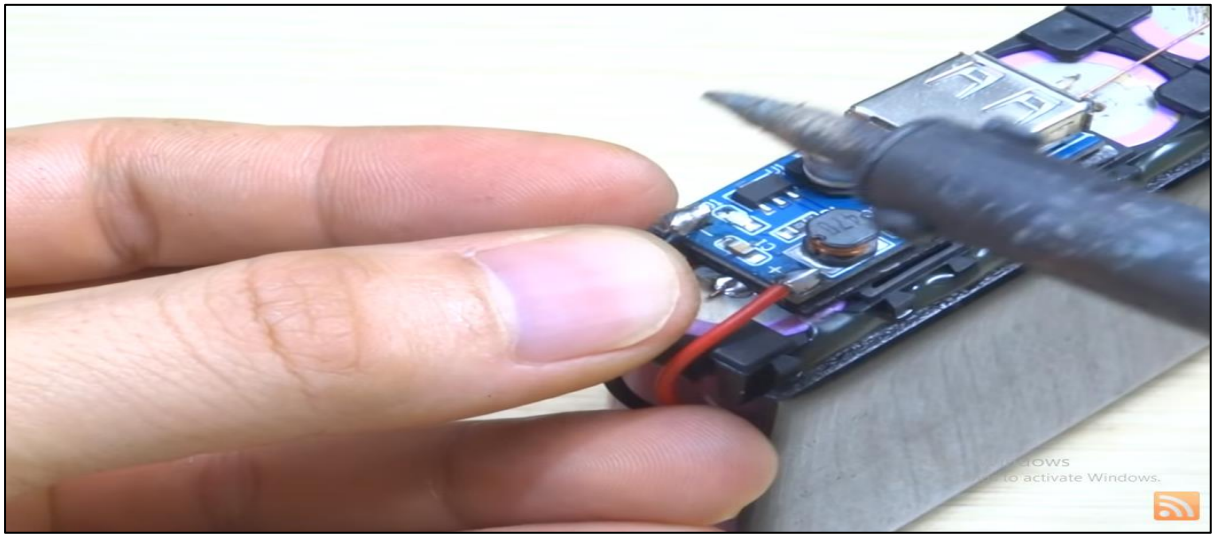
STEP TO DEVELOP A POWER BANK:

1] STEP 1:

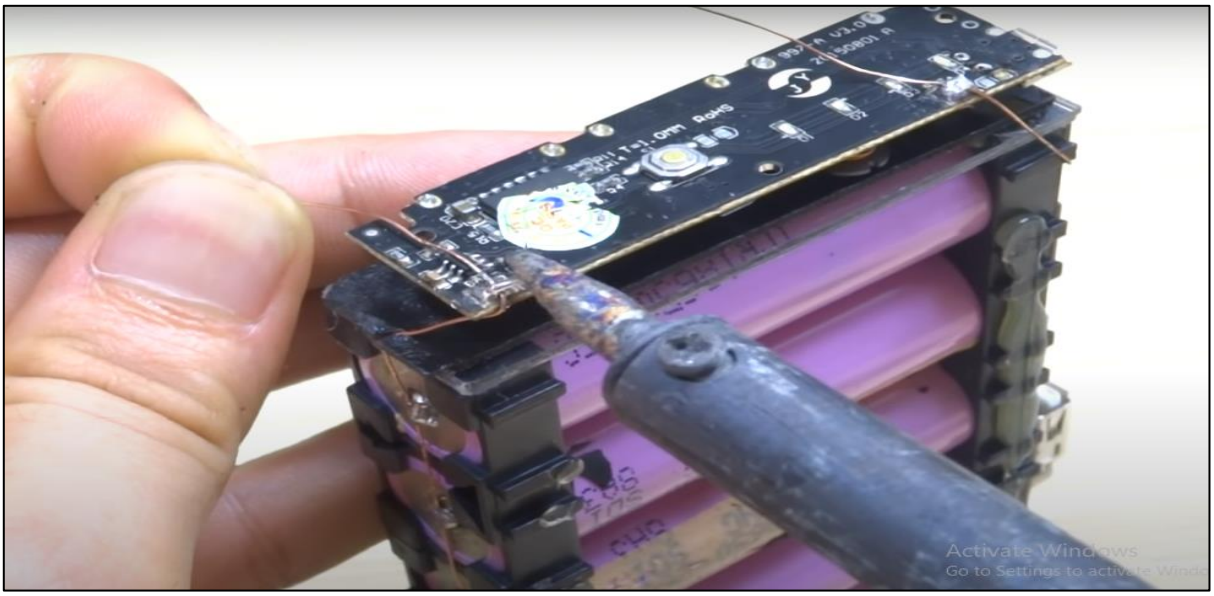
2] STEP 2:



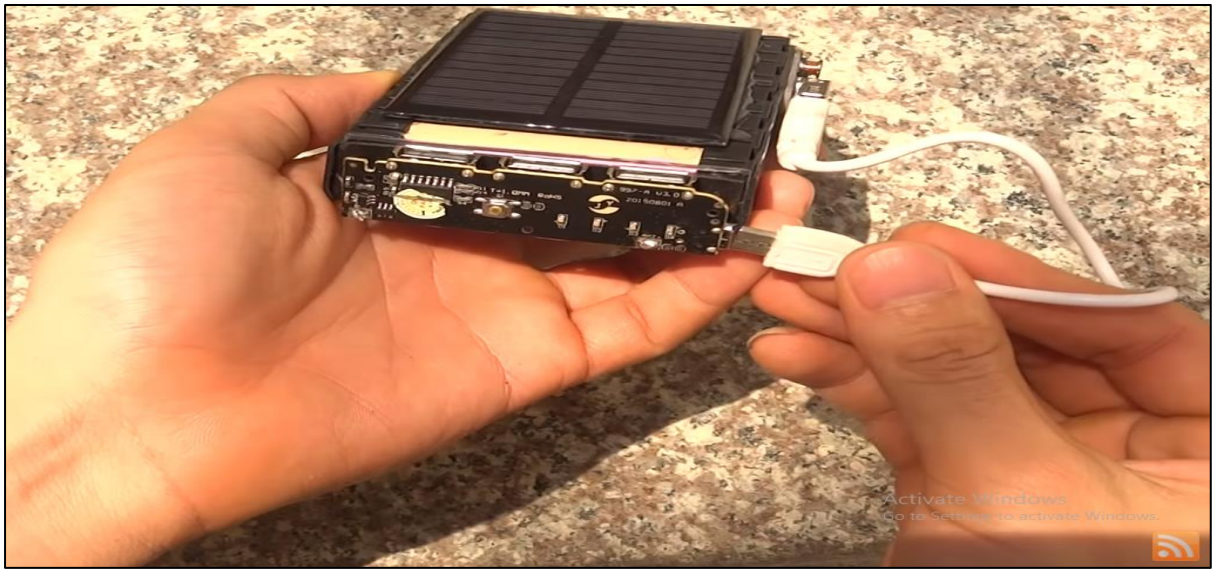
3] STEP 3:



4] STEP 4:



5] STEP 5:



6] STEP 6:

THE OUTPUT:

CONCLUSION:

Power banks are a form of portable electronic system with battery that should be properly regulated and standardized. It is inappropriate to label and advertise power banks as having a capacity equal to that of its internal battery. In fact, there is no industry or technical standard that justifies labelling a power bank that can recharge portable devices like smart phones and tablets based on the capacity of the internal cells rather than the output the power bank is capable of producing, including the standards promulgated by Underwriters Laboratories and the International Electrotechnical Commission.

REFERENCE:

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https://circuits-diy.com/how-to-make-rechargeable-power-bank-diy/

https://www.trendmut.com/make-power-bank-diy/

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We referred to some YouTube Video Playlist:

https://www.youtube.com/watch?v=KaNQ8Cj5jcI

https://www.youtube.com/watch?v=dVL3c1Cnk1g

https://www.youtube.com/watch?v=Xk100M2nw_s