Battery Connection Toggler(Series ↔ Parallel) - Boggler

by UtkarshVerma

For most of us who use **Lithium-ion batteries** for powering up our projects, a common issue arises by and large, and that is when we require **power output greater than 3.7V**. Though it may be simply evaded by wiring two or more batteries in series and regulating the output afterwards, yet it leads to another issue, and that is the **charging process**.

Since most Lithium-ion charging modules are **meant for charging only one battery**, therefore we get are stuck with this **inability to charge** our project and we better call Houston to fix it. But should we really?

To solve this, wouldn't it be better if there was some small contraption or device which would switch the battery connections mechanically between serial and parallel based on a **simple, hassle-free mechanism**?

Well, luckily, "Where there's a will, there's a way!" and so we have our solution here as well, and that is what this instructable covers.

In this instructable, we'll be looking into a **minimodular circuit**, devised by me, which allows easy toggling of battery connections based on the pushing of a handy **6 Pin DPDT Switch**. I call it **Boggler**!

> It's been a long day and this is the best I could come up with! ;)

I'd also like to add that **Boggler** isn't a module, rather it is a circuit block which may be integrated within other projects. Its implementation in other projects is as **easy** as soldering a resistor on top of the other because this circuit requires only a switch worth of space!

Things to be noted:
Pros:

- Adding this circuit to either new or older projects is a child's play since a small amount of space is required and only the battery wiring is to be modified;
- The toggling is done based on a rather simple and convenient action, that is the push of a switch;
- Based on only a single component.

Cons:

- The charging will be slower due to the distribution of current among multiple batteries;
- Adapters of higher amperage are required for faster charging of the batteries.

In terms of working, **Boggler** is very much alike to Convertendo**,** another toggler which I had made earlier.

More details on this particular wonderful switch are covered in a blog post of mine here: 6 Pin Push Switch.

Although I'm only referring to the charging issue here, this device **may be used in various other scenarios** where serial to parallel toggling is required.

Since this circuit only consists of one component alone, I don't want to waste my resources on making a PCB for it. Therefore, this instructable is going to be shorter than usual because I'll be using a breadboard to demonstrate it.
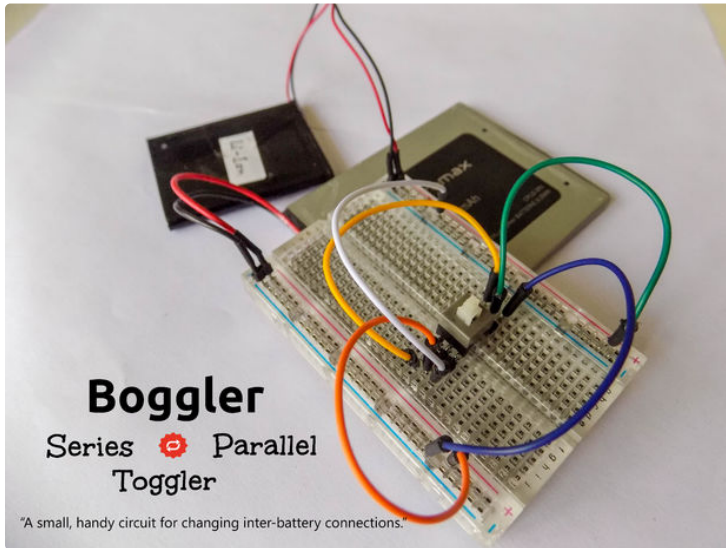
Step 1: Stuff Required

To make this circuit you require only a **6 Pin Push Switch**, two or more than two batteries, and some lying around wires. But since I'll be breadboarding this, the requirements will be stated with reference to that.

> I couldn't think of a better way to demonstrate this circuit here on Instructables rather than breadboarding.

Requirements:

- **6 Pin Push Switch** - 1pc.

> This switch is also known as **Mini DPDT Switch**. It isn't breadboardable right out of the box, but you can make it by soldering **right-angled pin headers** to it. I have posted its picture above. You can get it for cheap from here on AliExpress.

- **Breadboard**

> A small one will do just fine. I've used the one I got from DFRobot, called 400 TIE POINT INTERLOCKING SOLDERLESS BREADBOARD - Crystal.
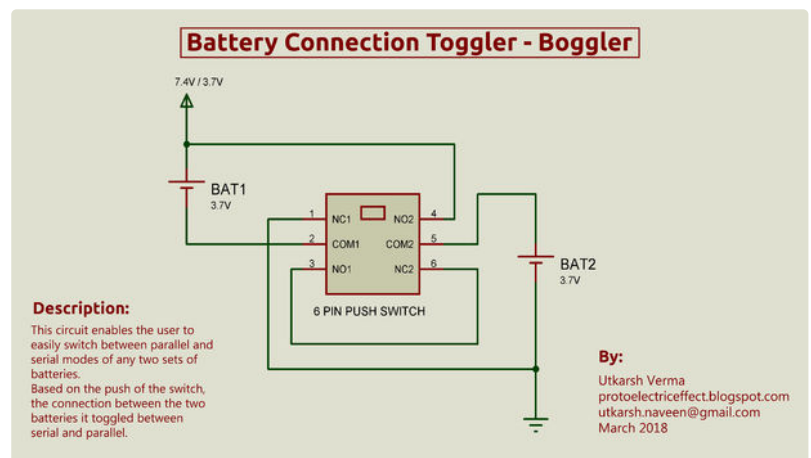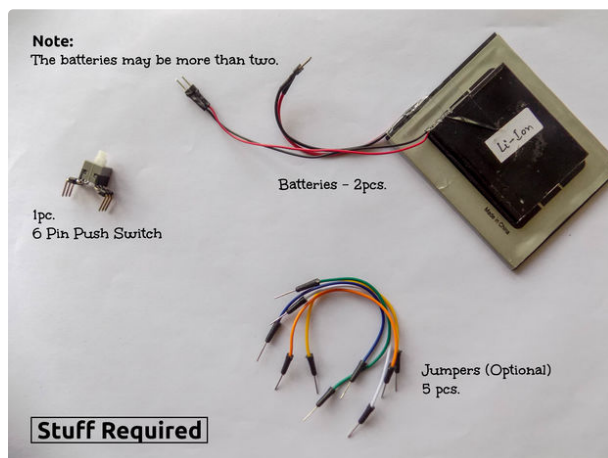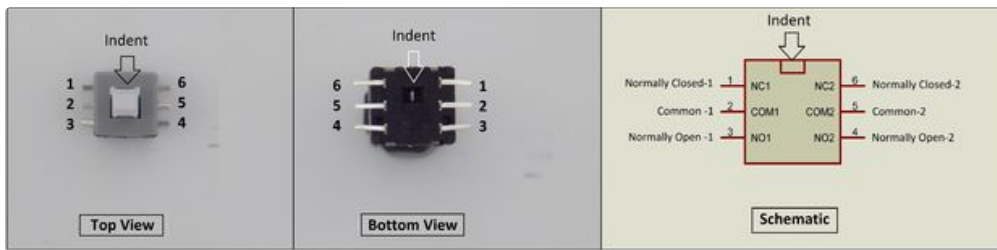
- **Jumper Wires(Male to Male)** - 6 pcs.

> I got these from DFRobot as well and they're great: Arduino Jumper Cables (M/M) (65 Pack).
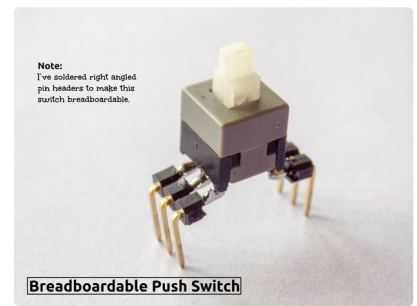
- **Batteries(Two Sets)**

> Here, I'm referring to **two sets rather than two batteries** because multiple batteries can also be used to produce higher voltages, since inter-connected batteries(representing a set) also behave like a single battery. So I can also toggle between **7.4V** and **14.8V** if I were to wire up **four batteries**, in **two sets** containing **two serial batteries each**.

Well, that's just about it for the requirements. We can now proceed with the breadboarding.

Indent | Indent | Indent

Top View | Bottom View | Schematic

Note:
I've soldered right angled pin headers to make this switch breadboardable.

Breadboardable Push Switch
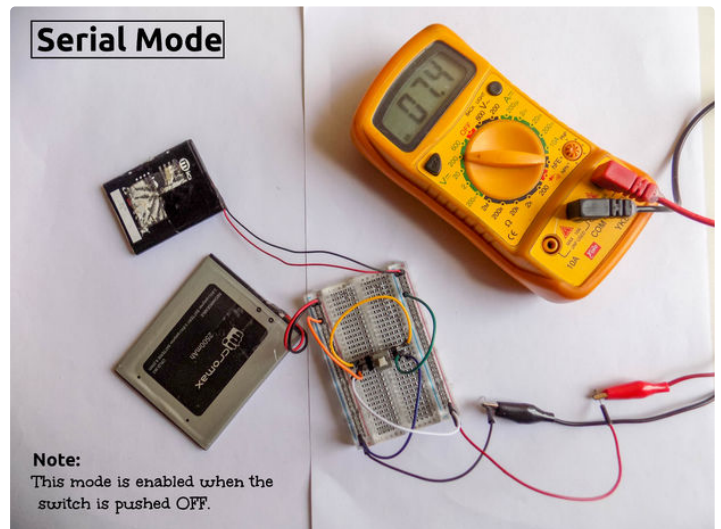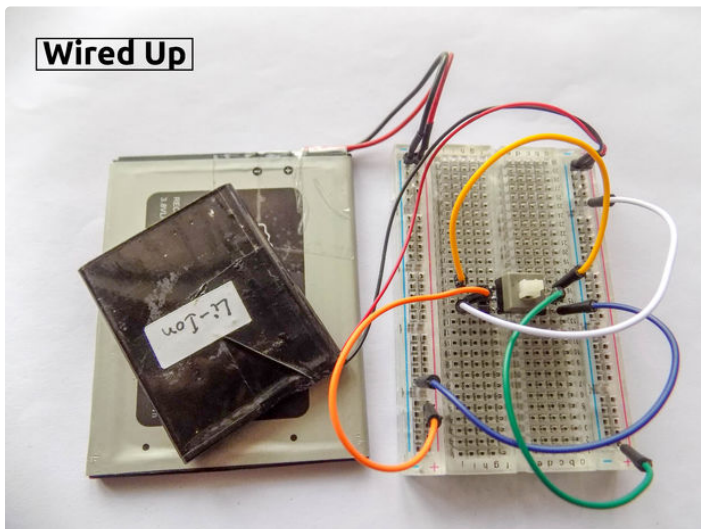
6 Pin Push Switch (Mini DPDT Push Switch) Pinout
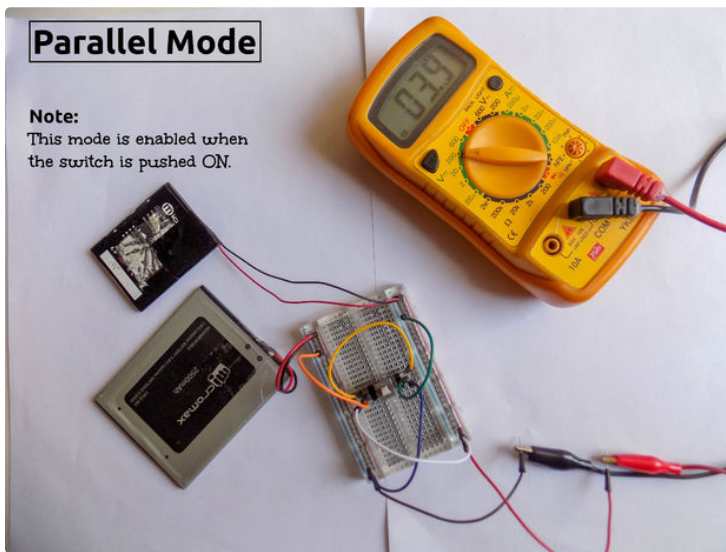
Step 2: Testing

There **isn't much to be told** here. All you have to do is to refer the schematic posted in the previous step, that is the requirements step, and wire up the switch with the batteries accordingly. However, do keep in mind to refer to the switch's pinout, posted previously, to prevent any harm to your batteries. Once you've done that, you'll have something similar to what's shown in the picture above.

Now your circuit is functional and will be toggling the output of any two sets of batteries connected to it. When the switch is left **OFF**, then the connected batteries(or sets of batteries) are made to connect to each other in **a serial manner**, as shown in the above picture by indicating a voltage of **7.4V**.

If it is switched **ON**, then the batteries are connected in **a parallel fashion**. It is shown in the above picture by indicating a voltage of **3.9V** in the above picture.

Wired Up

Serial Mode

Note:
This mode is enabled when the switch is pushed OFF.

Parallel Mode

Note:
This mode is enabled when
the switch is pushed ON.

Step 3: Congratulations!

Omedeto! You have now learnt how to easily toggle between the serial and parallel outputs of any two sets of batteries, and this indeed is a big deal since it has a lot of **real-life as well as project applications**.

Since I use Lithium-ion batteries for powering up almost everything(because I despise wasting my penny on non-rechargeable batteries) and now it has become a habit of mine to add this circuit module to my projects which require power output greater than **3.7V**. By adding this circuit, I can **easily charge multiple batteries simultaneously** as well as power up my project from them at any instant without having to pick up my soldering gear. It's clean and relieving in its own way.

The resources for this instructable are also available on GitHub here: TheProtoElectricEffect/Boggler

I have embedded the video showing this circuit in action. In the video, Boggler has been integrated into my line follower robot.

Well, that concludes this short yet mostly informative instructable. If you have ideas where this circuit may prove to be useful, fill them up in the comments section.

That's it for this instructable. If you have any doubt, feel free to comment. Don't forget to **follow me** if you liked this instructable. Please support me by reopening the shortened links twice or thrice. You can also support me on Patreon.

Keep Tinkering!

By:
Utkarsh Verma

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Thanks to **Ashish Choudhary** for lending his camera.

https://youtu.be/RZCJ0BLXUOw

I think you need to explain how the switch works when it is switched . Frankly I see direct shorts there on your circuit diagram.

The working has been explained on this post:

http://proto.utkarshverma.me/2017/07/6-pin-push-sw...

It was already linked in the introduction.

I don't think there are any shorts in my circuits, to clarify, nodes are represented by green dots in the schematic and every other wire which overlaps isn't connected.