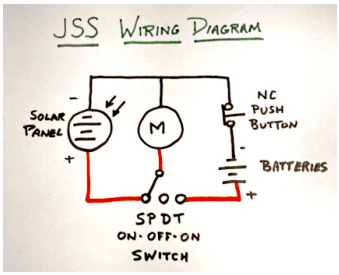
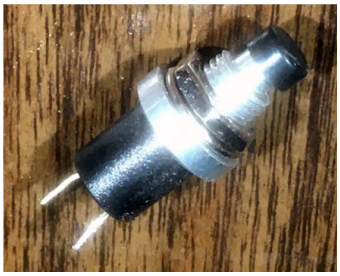
Junior Solar Sprint

Battery Circuit

This is the schematic diagram of the basic battery circuit. The circuit allows the student to switch between the vehicle to be powered by the solar panel, for normal racing, and battery power in inclement or cloudy weather.



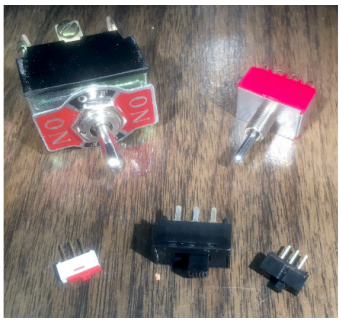


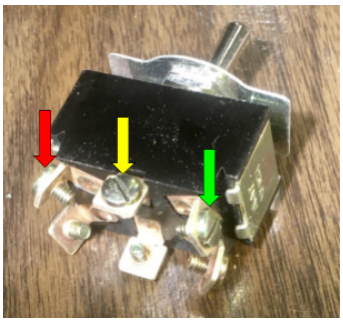
The switch changes the power source between the solar panel and the batteries. The switch is a SPDT type. The acronym SPDT stands for Single Pole Double Throw. Many types of SPDT switches can be used. There are several samples below. Pole refers to the number of circuits controlled by the switch: What do SPST, SPDT, DPST, and DPDT mean? SP switches control only one electrical circuit. DP switches control two independent circuits (and act like two identical switches that are mechanically linked).[1] In this case the two circuits are 1) solar panel - motor circuit and 2) battery - push button - motor circuit.

The photo on the right is not a switch perse but an NC type push button. NC stands for Normally Closed. This means in the normal state, current flows through the button. When the button is depressed the circuit is open and current stops flowing. On the other hand, buttons which activate circuits when they are pressed are Normally Open (NO). An example is a doorbell circuit. In that case a NO button is used. If an NC button was employed for a door bell circuit, the bell would be ringing constantly, except when the button is depressed.

In the event that batteries have to be employed to power the JSS vehicle the following procedure is followed. The push button is depressed, which opens the circuit. This does the same as covering the solar panel when racing takes place in sunlight. While the button is depressed the switch is put in the battery position. When the student(s) are given the "GO" signal the button is released, which completes the circuit allowing energy to flow to the motor.

The switch is a center off type switch. This is also referred to as On - Off - On. The center off switch allows both the solar panel and the batteries to be disconnected. This is useful when there is intermittent or weak sunlight. The solar panels can be disconnected and they don't have to be covered and the batteries won't be drained unnecessarily.





Any of the switches pictured here would work. The switches on the bottom are slide switches. They are all SPDT and are small and light. The two switches on the top are Bat Handle Toggle switches.

The switch in the upper left is a DPDT center off. The photo on the right is the bottom of that switch. The three terminals with the arrows comprise one of the two poles. The terminals with red and yellow arrows would be connected to one circuit and be engaged by one throw of the switch. The yellow and green would be for another circuit and be the other throw. The lever or bat can be positioned left, right or center. The center position is off.

A double pole switch, such as this, is not needed for our application. To use this switch for our needs, only one pole would be wired. This switch could be used and it would work. However, it is much larger than the others and obviously much heavier. Making the vehicle light as possible is of utmost importance. Therefore such a heavy switch would not be advisable. In the left hand photo above, the three slide switches in the bottom

1. www.littelfuse.com/technical-resources/technical-centers/commercial-vehicle-technical-center/poles-and-throws.aspx

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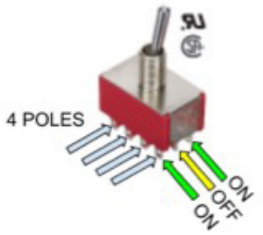
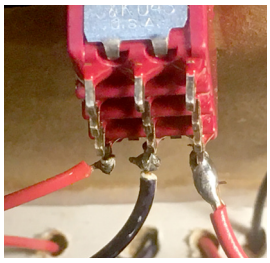
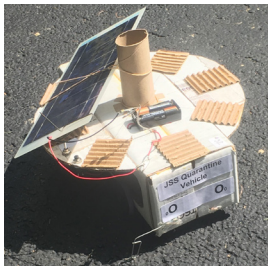
are SPST. They are not center off, in other words they are On - On. There are slide switches available which are Center Off (aka: On - Off - On).

The switch below is 4PDT, Center Off (On - Off - On). Just like the double pole a four pole (4P) switch is not needed. However, it was the only double throw, center off of a miniature size which I could find locally. It is what is wired up in this example. The terminals for the four poles can be seen along the long edge. Only one pole was used for the JSS vehicle, as seen in the center photo below. The photo on the right is a switch which would be ideal. It is a miniature SPDT On - Off - On.

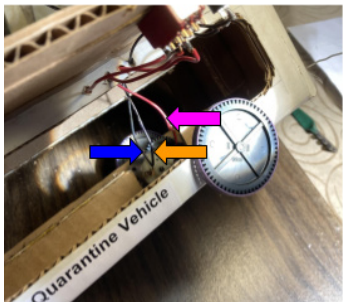


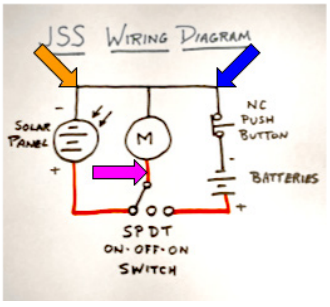




This photo is the JSS Quarantine Vehicle. Its chassis was fabricated primarily from the solar panel shipping box. Following this are close up shots of the battery system controls. These are shown alongside the schematic diagram of the battery circuit. The intent is to facilitate the student's fabrication of the battery circuit.

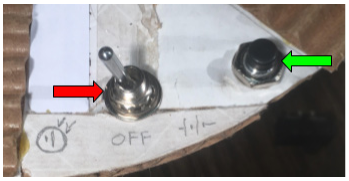
These images show the leads that connect the two motor terminals to the button, switch and the solar panel. All leads are soldered to ensure a good electrical connection.

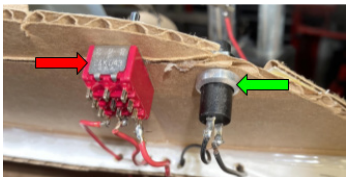


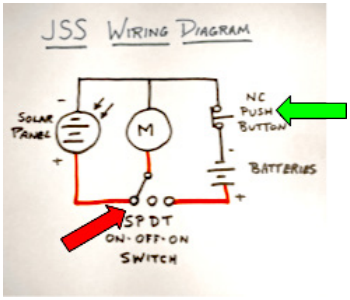


- Lead from Motor to Button
- Lead from Motor to Switch
- Lead from Motor to Solar Panel

The images below illustrate the SPDT switch and NC push button.

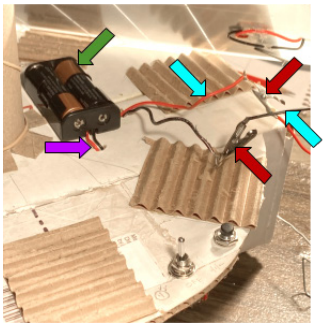


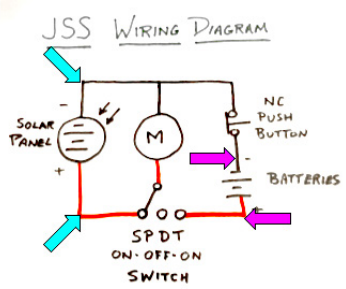




- SPDT Switch
- NC Push Button

These images show the battery leads and solar panel leads. This vehicle is using a Pitsco solar panel. The solar panel leads terminate with micro clips. The leads leading from the motor to the solar panel have loops on the ends. These facilitate a good electrical connection with the solar panel. SolarMade panels have metal strips for connection. For those panels, the micro clips would need to be soldered to the ends of the motor leads. The holder for a pair of AA batteries can also be seen in this photo.





- Battery Holder
- Micro Chips
- Battery Leads
- Solar Panel Leads