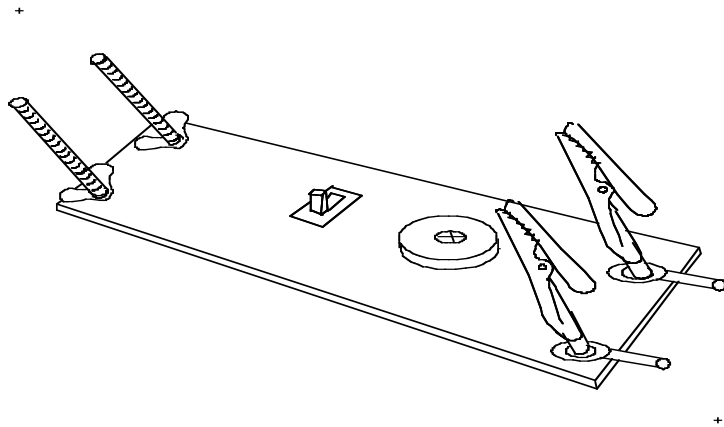


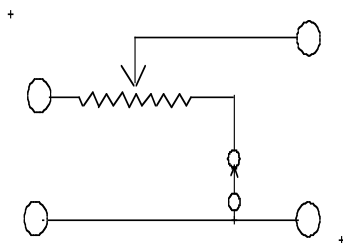
Reducing voltage output of USB power supply to less than 0.5 volts

The very useful USB power supply has a minimum voltage output of about 0.5 V and can limit studying devices that have interesting behavior at lower voltages. For example, most simple ohms law experiments treat small light bulbs as ohmic when actually they are non-ohmic at very low voltages. Diodes and other solid-state devices have interesting behavior at very low voltages. Below is a description of a simple device that can be used to place either a voltage divider or a rheostat between the output of the USB power supply and some desired device.

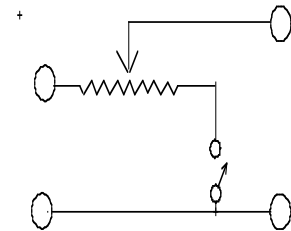


On the left is illustrated the low voltage device to reduce the output of the USB power source. The input is connected under the wing nuts on the far left. The output device to measure can be clipped in the alligator clips on the right. Under these clips are lugs to attach the probes of a voltmeter. The switch can change from a voltage divider to a rheostat configuration. The pot (potentiometer) is adjusted with a screwdriver.

The circuit diagrams for the voltage divider or rheostat switch position are shown below.



The voltage divider shown on the left is activated with the switch closed (down). The rheostat shown on the right is activated when the switch is opened (up).



It must be understood that when this device is placed between the USB power supply and the load, the output voltage between the alligator clips will not be the value indicated on the power supply. An external voltmeter must be added at the output of the device to obtain correct voltage readings. The current reading will also be incorrect in the voltage divider setting but in the rheostat setting, the current as read on the USB power supply will be correct.

If it is desired to bypass this low voltage trimmer and place the full voltage across the device connected to the alligator clips, lower the input voltage, put the switch in the rheostat position and run a shorting clip lead from the input positive (upper) terminal to the output upper terminal. Now the values indicated with the current and voltage readings of the USB power supply will be correct.

The switch has a maximum current rating of one half amp and the variable potentiometer (pot) is also about the same. While using this low voltage device it is advised to set the maximum output current of the power supply to a small value.

Using this device with an ordinary 3volt incandescent flashlight bulb will give excellent results below 0.5 volts as well as a little higher when the bulb begins to glow red. To continue to higher voltages, first lower the USB voltage output to less than 1 volt, then directly short the input to the output with an alligator clip as discussed above. Diodes are also interesting when reversed from the non-conducting state to the conducting state in the very low voltage region. Obviously when reversed, diodes will not pass any current,