Power-supply circuit operates from USB port

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Get 1.25V to 3.75V from an adjustable regulator

Every PC has a USB (Universal Serial Bus) port that can supply 5V±5% at 500 mA for peripherals. Powered USB hubs also provide this power. You can use a USB port to power an external circuit, which is useful when you have no other dc source available.

A USB port has V_{BUS}, the power pin; a return pin, GND (ground); and two signal pins. If you need just a simple 5V supply, you can tap the power pins from a USB connector, but you should place a 10-µF filter capacitor between the ground and power-supply pins.

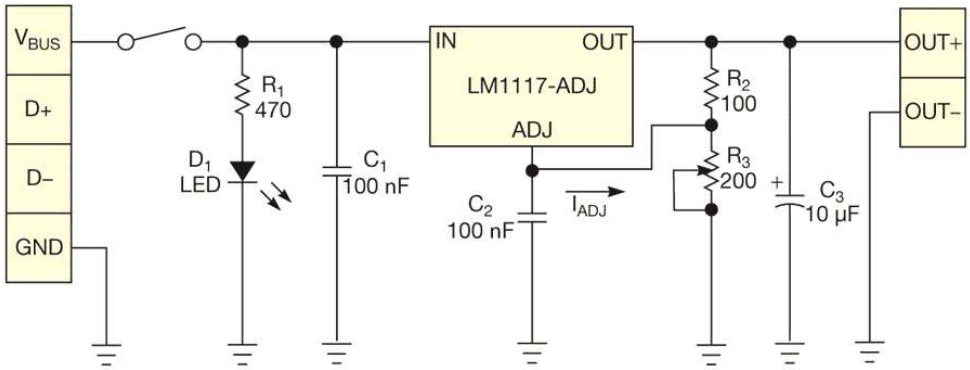

Figure 1. ***Resistors R2 and R3 set the adjustable voltage regulator's output at 1.25 to 3.75V.***

You can, however, use an adjustable voltage regulator to get voltages of 1.25 to 3.75V, a range that many circuits use. The circuit in Figure 1 covers that range. You use R_3 to change that range, as the following equation shows:

$$V_{OUT} = 1.25V \times (1 + R_3/R_2)$$

The 1.25V in the equation occurs because the LM1117-ADJ linear regulator generates 1.25V between the V_{OUT} and the ADJ (adjust) pins. Resistor R_2, therefore, has a constant current that passes through resistor R_3; the I_{ADJ} (adjusted current) is generally small enough to ignore. Selecting 100Ω for R_2 sets its current to 12.5 mA. If you use a 200Ω potentiometer for R_3, you get a voltage range of 1.25V when R_3 is 0Ω, causing a short, to 3.75V when R_3 is 200Ω.

To prevent circuit damage if the output becomes shorted or when you don't know the load, you can add a current-limiting circuit that keeps the maximum current at 500 mA. A polyswitch fuse or pair of transistors can easily implement this current-limiter site at the power-supply input line.

The filter capacitor shouldn't exceed 10 µF. That level keeps the inrush current under control in the absence of a current-limiting circuit. Generally, capacitors of 1 to 10 µF work best.