Model Aircraft 5.0 Volt Regulator

Model aircraft electronics are designed to operate from a 4.8 volt battery pack. Generally speaking, the airborne electronics have a lower voltage limit of 3.6 Volts and an upper limit of 6.0 Volts. Voltages higher than this can result in shortened servo life and damage to electronics. A standard NiCd or NiMh 4 cell pack will be fully charged at around 6.0 Volts, operate at 4.8 Volts and be fully discharged when it reaches 4.0 Volts. There are times you might want to utilise a larger pack, with 5 or more cells, or use 2 or more LiPo cells. In this case you need to build a voltage regulator to reduce the voltage to a safe level. A BEC (Battery Eliminator Circuit) is commonly used in electric models where a large battery pack is regulated down to a safe voltage of 5.0V for the receiver and servo electronics.

To use the regulator, simply insert it between the power switch and radio gear. If you insert it between the battery and switch it will draw a continuous but small current from the battery. It should give a regulated output of around 5.0V but anything close to that is fine. The minimum battery pack voltage used with this regulator should be 6.0V. If reverting to a standard 4.8 Volt battery pack, simply remove the regulator from circuit. If you use a servo extension lead with the circuit mounted in the middle, it is then easily removed or inserted from your model.

The cost is around $5.00 if you build it from parts and around $10.00 for a basic kit.

Below is a sample circuit for a 5.0V regulator. It is simplicity itself. Don't be put off – it looks more complicated on paper than it really is. It is based on a LM317 regulator, a very simple, robust, cheap device. Capable of 1.5 Amp continuous output (with a heatsink). Both R1 (240 ohms) and R2 (680 ohms) are fixed. Being so simple, you don't even need to use a circuit board. If you require a 5 Amp output, simply substitute the LM317 device with a LM338 and increase the heatsink area.

Anyone with basic soldering skills should be able to handle this project easily.

All the parts are readily sourced from any electronics shop, such as Dick Smith Electronics - http://www.dse.com.au . They also stock two suitable off-the shelf kits - K3594 or K3592.

I hope you find this information useful.

Regards
Tony Belts
AUS 42905

Parts Required:

Servo extension lead, Futaba or JR – available from any hobby shop
LM317T Dick Smith part number **Z6541** or LM338 **Z6578**
Resistor R1 240 ohm ¼ watt Dick Smith part number **R0559**
Resistor R2 680 ohm ¼ watt Dick Smith part number **R0570**
Capacitor C1 0.1uF Greencap Dick Smith part number **R2100**
Heat shrink tubing 25mm wide x 40mm long and a hot air gun. Tubing from Dick Smith part number **W4128**. See if you can scrounge a piece from someone, you only need about 40mm!

Optional - A scrap of aluminium, brass or copper sheet for a heatsink, about 40mm * 20mm **Or**
Heatsink, TO220 Dick Smith part number **H3403**.
Optional - Capacitor C2 1.0uF Tantalum Dick Smith part number **R4720** (watch the polarity!
Optional - Silicon Insulating washer (pack of 10), TO220 Dick Smith part number **H2916**

Construction:

You probably will not need a heatsink at all if making a 1.5 amp regulator, but if you do, a copper strip about 40mm x 20mm should be ample. If you require a 5 amp output, you will need to use a larger heatsink. Solder (or screw) the tag of the regulator to small piece of copper strip to increase the heatsink area if you are going to use big servos. You can also screw it to a piece of aluminium sheet if you wish. If screwing it down, use a smear of heatsink grease or a silicon insulating mounting kit to aid thermal transfer. Be aware that the heatsink will be at Vout potential if you don't insulate it from the regulator, so don't let it touch anything in service – generally speaking this is not an issue. If the regulator stays below about 60degrees C then you have nothing to worry about. The greater the voltage differential between input and output, the warmer the device gets. The greater the current flow, the warmer the device gets. The best thing to do is when it is built, is to install the battery, switch on and work all the servos as if it was flying in the worst case configuration. Then check the temperature of the heatsink after a few minutes. If it gets too warm, increase the heatsink area. The device will safely shut down if it overheats, but you don't want that happening in the air!

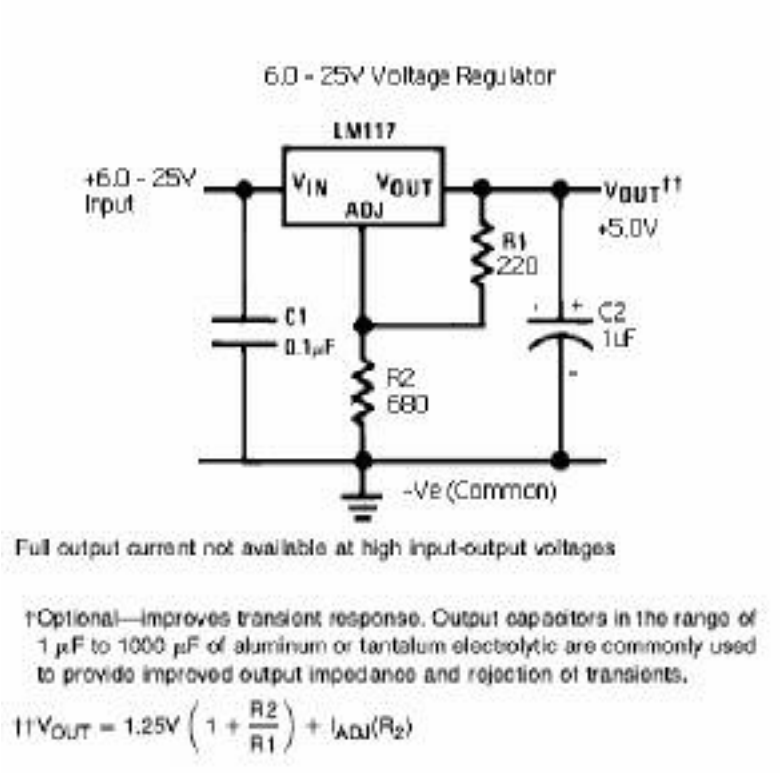
Follow the circuit below. Simply solder leads, resistors and capacitors directly to the LM317T or LM338T leads – you don't need a circuit board. Solder the red positive battery input lead to Vin, and the red positive output lead to Vout. The Black negative lead is continuous, connected to the common earth point and both ends of the lead.

If you really want to use a circuit board, you can choose from several at Dick Smith – suggestions K3594 or K3592

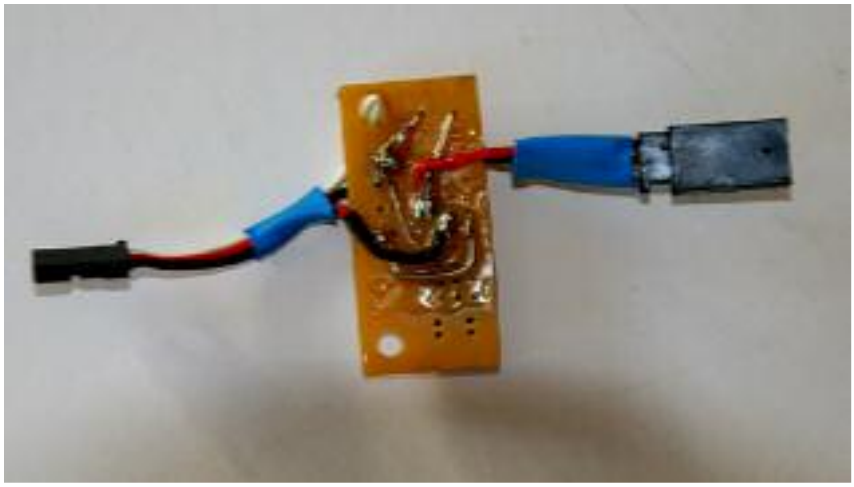
When you are happy with it, you can seal the components in a plastic heat shrink sleeve for easy future servicing. Heat shrink tubing is also readily available from DSE or any electronics shop. Do not seal the heat sink flag in silicon – it needs cooling air. You can mount the regulator solidly in your model using Velcro adhesive dots.

I hope you find this information useful.

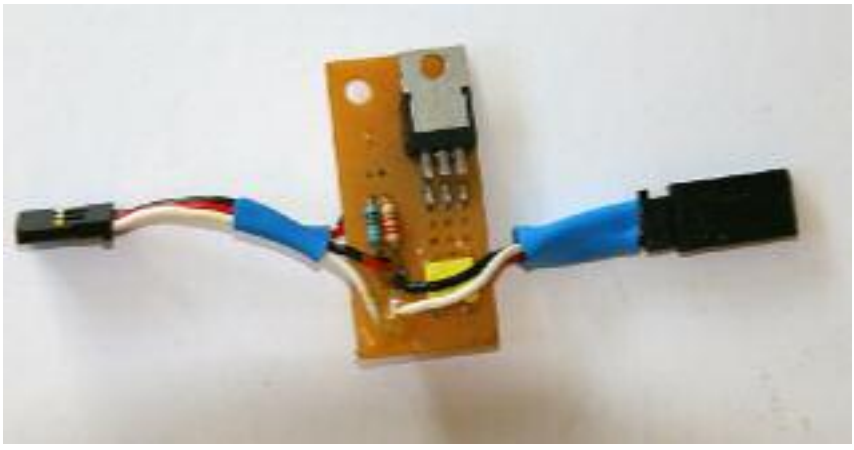
Cheers
Tony Belts
14 August 2005
Revised December 2007



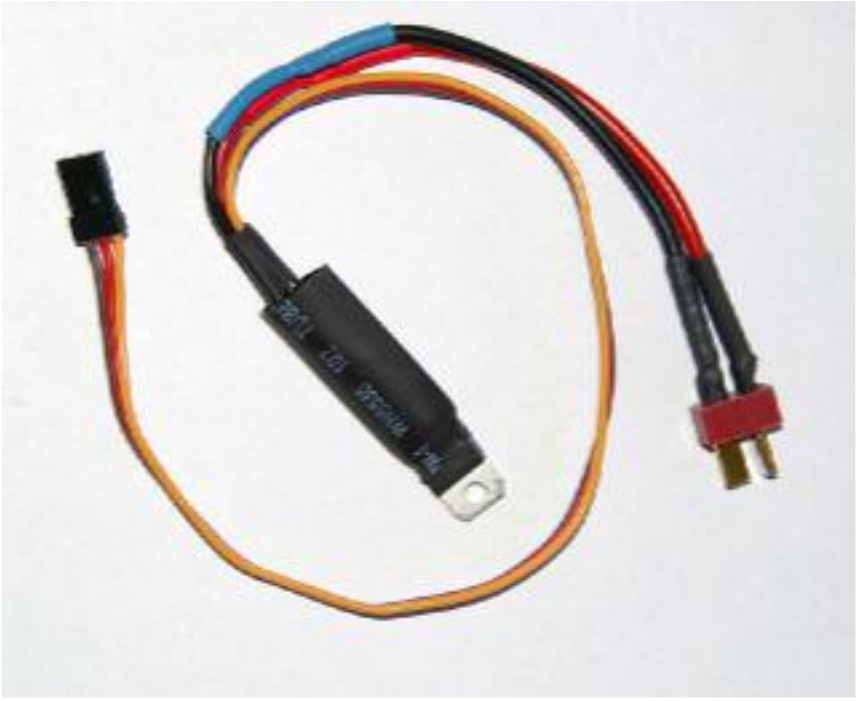
Circuit Diagram



Circuit Board side

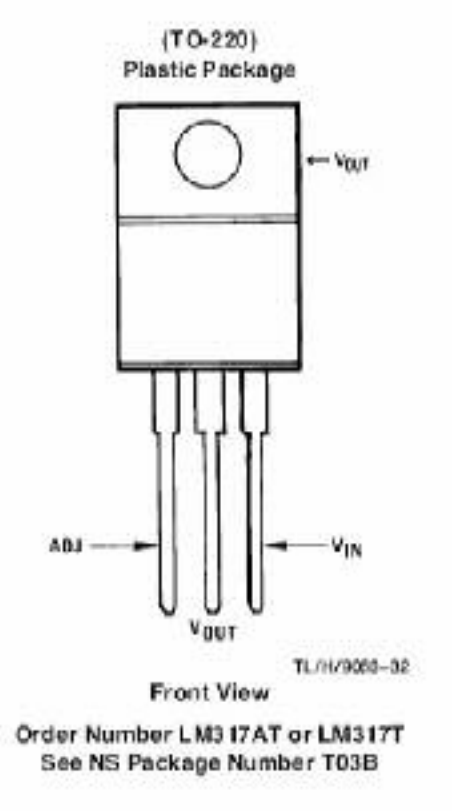


Component side



Finished item

LM317/LM338 Connections:



Front View

Order Number LM317AT or LM317T
See NS Package Number T03B