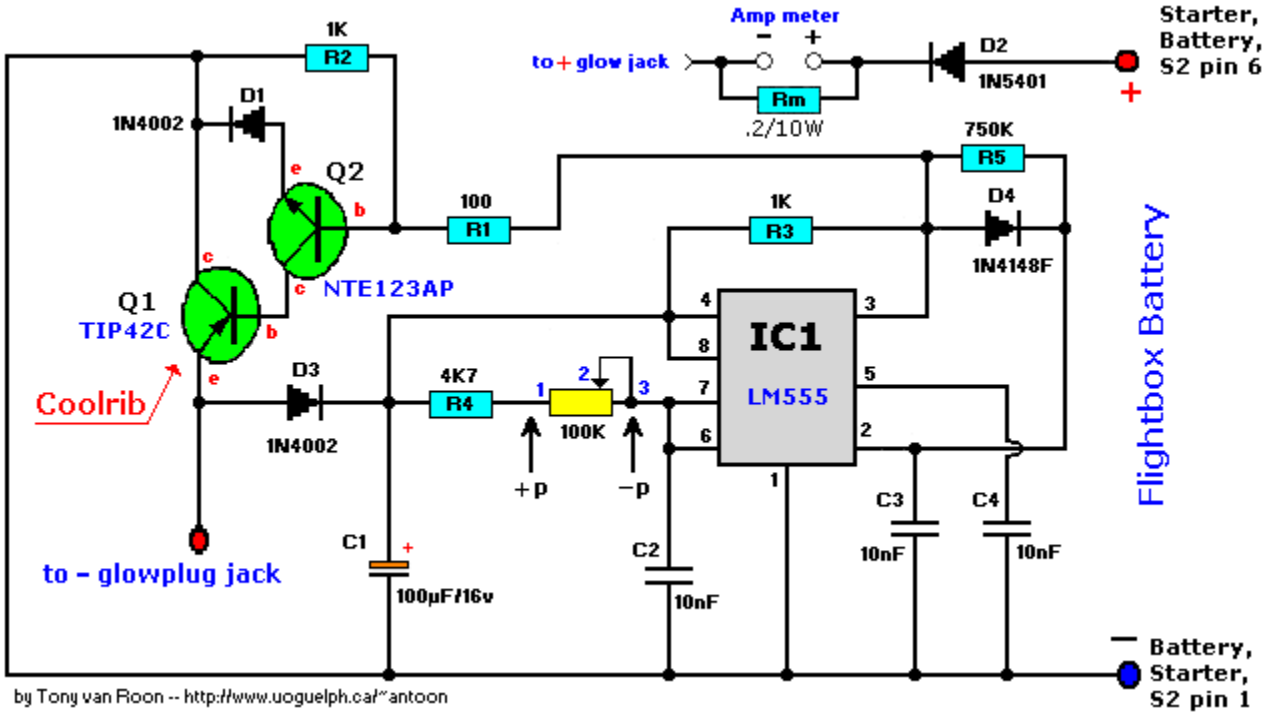
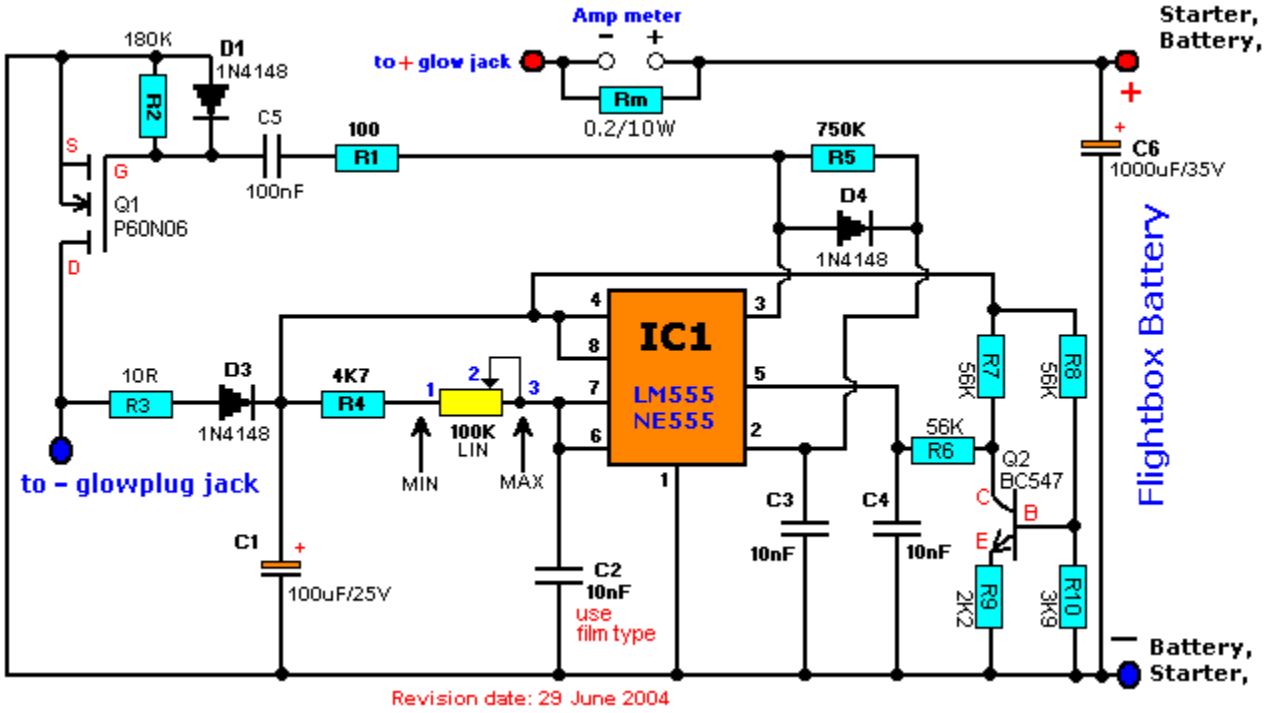
Glowplug Driver for Radio Control



All errors in circuit diagrams, documents and layout are corrected. The circuit as shown below is functional and working. Note that Q2 is sensitive and easily destroyed by wrong connection, shorts, over-voltage or too much current. What does that mean? If your circuit does not work immediately and draws excessive amounts of current when you first try it you can easily assume that Q2 and possibly T1 will be defective. I included a small list with possible replacements for the major components. I tried a couple of them and seemed to work satisfactory. An email from Mo in England indicates a logarithmic potentiometer is used to better control the current. It certainly does not harm to try that and use whatever works for you.



Above is a modified version. Much better control. Go to **Thomas Scherrer's Website** in Denmark for more information, parts list, history, and pcb.

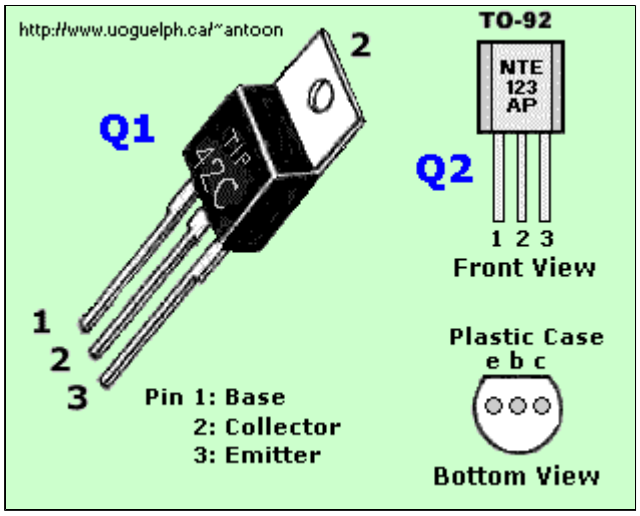
Parts List:

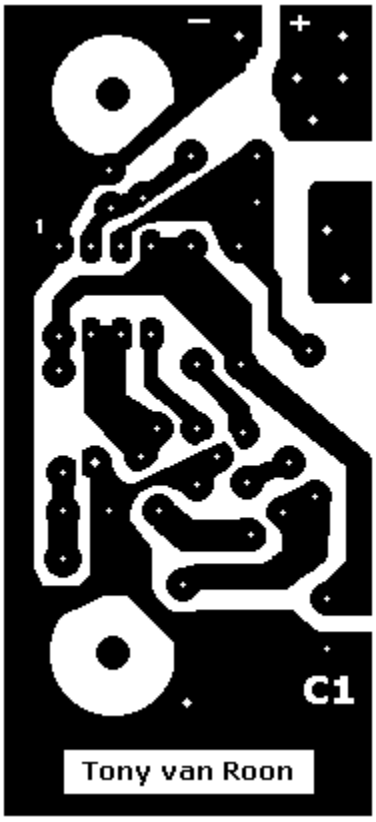
All resistors, except Rm, (metal-film recommended) 1/8 watt (1/4 watt for carbon) & no less than 5% tolerance, unless otherwise posted.

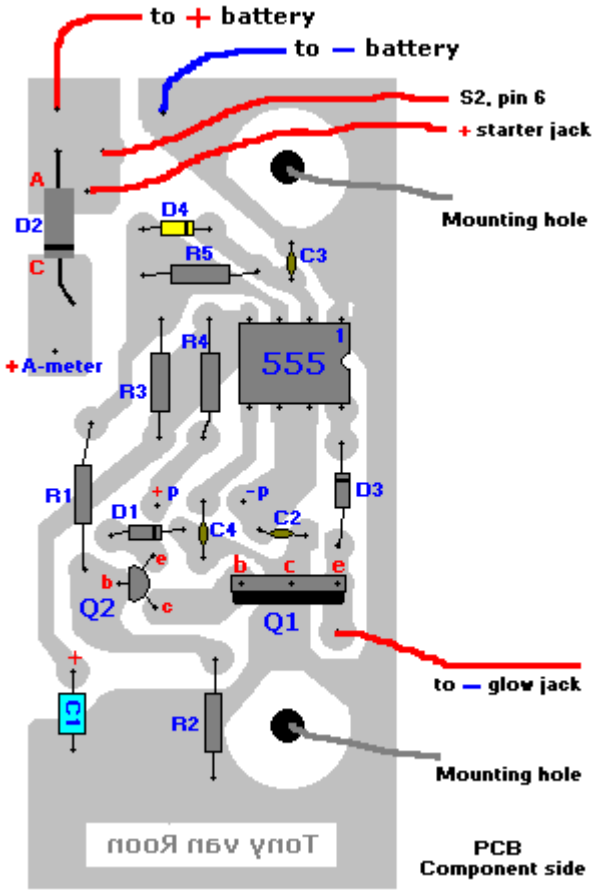
C1 = 100uF/16V Electrolytic	R1 = 100 Ohm, 1/2 watt	1 red jack
C2 = 10nF, ceramic	R2 = 1K	1 black jack
C3,C4 = 10nF, mica	R3 = 1K	1 amp meter, 1 to 6-amp (
Q1 = TIP42C	R4 = 4K7	1 knob for potentiometer
Q2 = NTE123AP	R5 = 750K	1 coolrib for Q1
D2 = 1N5401	Rm = .2 ohm/10W	
D1,D3 = 1N4002	P1 = 100K	
D4 = 1N4148F	Here is a suggestion for a complete Power Panel	
IC1 = LM555		

A couple possible substitutes, use at your disgression, no guarantees:
For Q1: TIP32C, TIP42, TIP42A (or B), NTE332, ECG332.
For Q2: 2N3904, BC547, (or A or B), BC550, European TUN.
For D1,3: NTE116, ECG116, try others.
For D2: NTE5801, try others.
For D4: NTE519, ECG519, other 1N4148x types worked also.
For IC1: NE555, TLC555, MC1455, HC555, NTE955M, ECG955, etc.
The NTE123A did not seem to work and is not quite the same as the 'AP' type.
The 2N2222(A) did not work in the prototype and shorted out the circuit.

The ECG and NTE/ECG substitutes are made by Sylvania (Philips). I build two units and both working fine.







[Click here] to print an original size pcb (3 x 6cm).

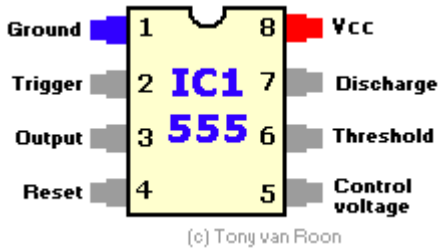
Notes:

An on/off switch is not required for the glowplug driver since it only draws current when a glowplug is attached. As a matter of fact, the circuit is only powered (via Q1) via a connected glowplug. Just in case you were wondering how the positive (+) side of the circuit is connected. The starter motor runs directly from the flight box battery, via the jacks on the power-panel, and has it's own on/off switch. Same scenario for the fuel pump, but includes a reverse switch to pump the fuel in or out the tank/cannister.

For all components, substitutes are fine. D1 and D3 are regular 1N4002 diodes. You may substitute with the 1N4001, or 1N4003. D4 (1N4148F) is an ultra-fast switching silicon diode with a 100V prv. The regular and more familiar 1N4148 seems to work also.
D2 (1N5401) is a 3A/100V prv power diode.

Q1 is a PNP power transistor/switch with a TO-220 case, 6A, 80/100V, 65 watts. Don't be afraid to experiment, and don't forget the coolrib on the TIP42, it may be needed. I strongly recommend a power supply if you're gonna experiment and turn up the voltage slowly while watching the ampmeter. My own experiments resulted in 3 burned out glowplugs, 2 TIPs, and 2 NTE123AP. Q2 is a NPN silicon, AF/RF Amp/Driver, transistor to drive Q1. If you substitute, stick with the 'driver' type, other may burn-out the very second you apply power. Again, try using whatever you have in your parts-box first, but try to match the current/voltage parameters as close as you can and make sure it is able to drive Q1. Whatever transistor you use for Q1 or Q2, watch the orientation of the the emitter, base and collector and don't assume it is the same as the original or as shown in the component layout. The tab for the metal case transistors (Q2) is *always* the emitter. Remember, Q2, as mentioned before, should be a driver-type-transistor (or close to it) in order for it to supply enough current to Q1.

All this circuit does, is providing enough controlled current (via P1) to make/keep a plug glowing under various conditions.
In regards to the 750K value of R5, it is fine to combine different resistors to get to that value. I used two 1M5 resistors in parallel myself. Works fine! So does 680K+6M8 (754K).



The CMOS timer, MC1455P, can be substituted for the ordinary LM or NE555 and are pin-for-pin compatible. The CMOS version uses much less power and its operating voltage is 2 - 18 volt versus the regular 555 type 4.5 - 18volt. On the other hand, the MC1455P is not as robust as the regular 555 type. The amp meter is not mandatory, but gives you a nice visual indicator. It can easily be constructed from a salvaged panel amp meter.

When a glowplug is hooked up (the plug act as an on/off switch to power the circuit), Q2 switches on and biases Q1, which in turn provides enough current, adjusted with potentiometer P1, to make the plug glow. C2, C3, & C4 are filtering capacitors while C1 keeps the voltage over the glowplug steady, like when the plug gets wet with fuel and draws more current. Diodes D1/D3 are feedback blocking diodes preventing signal feedback.

CAUTION! The '-' of the glow plug jack connects to the emitter of Q1 only!

If you wish to incorporate the above into a complete Power Panel check here for a possible suggestion on how to do that.

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