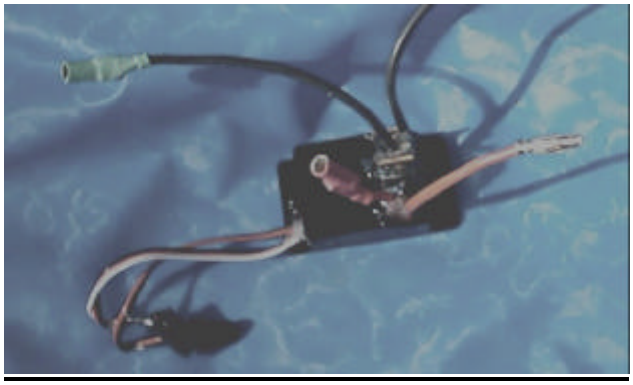
# The Model Electronics Company Simple Microprocessor Controlled Speed Controller

I had recently built my GT400 Speed 400 powered racing boat and had constructed a home brew switcher unit to control the motor. This unit worked OK, but had a few worrying features that affected the safety of the boat. For example: when you connected the battery the motor would burst into life for a short period. Also if the Tx signal was lost, the boat would either stop or continue at full throttle. I started looking around for a something a little safer and found a suitable product made by a company called The Model Electronics Company based in Twyford, England. The company produces a range of kits, but the one that caught my eye was the Simple Microprocessor Controlled Speed Controller, which is available in a 10amp or 20 amp version.

## Design

The design met all my requirements. It is a forward only device featuring safe start, motor cut out if Tx signal lost and generously rated output MOSFETs. My only reservation was that the unit needed the full end to end travel of the transmitter throttle control to operate correctly and the response is not adjustable. I figured that I could make a simple modification to the stick centering mechanism on my transmitter to get around this problem. There is no BEC circuit with this unit but this was not a problem in my case, as my receiver has a built in BEC.

This is a low frequency controller. The purists may argue that high frequency switching is superior but at least this unit will not produce the annoying high pitched motor whistle when used at part throttle settings. The system is very efficient, operating at more than 99% efficiency even at the full current rating.



## The Kit

The basic kit consists of the PCB, with just eight components to solder to the board. The case and power wires are an optional extra. I used the recommended case, which is a perfect fit and results in a very compact and professional looking unit. My only criticism is that the kit does not include the servo plug and lead, which need to be obtained from your local model shop or could be salvaged from a dead servo. The

instructions are very clear and include directions on how to identify the relevant components. I chose the 20 Amp version, which is identical to the 10 Amp model but uses higher rated MOSFETs.

## Construction

The instructions recommend that you use a 3mm diameter soldering iron bit for most of the board construction. My smallest bit was slightly larger than 3mm, but I figured that my soldering skills were good enough to compensate. I did manage to construct the circuit without any problems but had to correct a few bridged tracks as I went along. I certainly recommend that you use the suggested 3mm bit, as this will make the task easier. The other problem is due to the boards small size. You will need a method of holding the tiny PCB securely during soldering otherwise you end up chasing the tiny board around the workbench on the end of your soldering iron (guess who found this out the hard way!). Simply follow the instructions and you should not have any problems. You will probably need to remove a few strands from your power wires to get them to fit into the holes in the PCB and you may need to change to a slightly larger soldering bit to provide the higher heat output required for soldering this part of the board. You will need to cut a small slot into the case to allow air cooling for the MOSFETS. I used a junior hack saw for this task and cleaned up the edges with a small file. I did not use the power wires available from the kit producer and found the ones that I used difficult to bend to exit the end of the case as shown in the instructions. My solution was to keep the wires straight so they exit from the slot cut into the case. After completing the construction, carefully inspect your soldering to check that no tracks have been bridged and all joints are clean and shiny. You should also check that all the components are in the correct position with the proper orientation. The choice of power connector is up to you. I used 4mm gold plated banana connectors for both the battery and the motor. A receiver power lead was also soldered to the board to connect the main drive battery to the receiver (only do this, if your receiver is fitted with a battery eliminator circuit).

## Testing

The easiest way to test this unit is to rig the various components of your boat to the controller and see if it works. Take care to get your power leads the right way round, or else you could destroy the unit. There is nothing to adjust, you just need to return the transmitter throttle control to the stop position for a couple of seconds to arm the unit and move it forward to increase the motor speed. If the unit does not work carry out the following checks:

Double-check your construction.
Confirm that your batteries are adequately charged.
Try changing the transmitter servo reverse switch.
Check the servo throw and trim adjustments (*the unit will not arm if it cannot see a servo pulse of the required width)*

I would like to report that my testing went without a hitch, but my ESC would not initially arm. The problem was traced to the throttle stick on the 2 channel test transmitter. Some time ago I had played around with the stick mechanism and had inadvertently adjusted the potentiometer linkage. This meant that the ESC could not

see the correct length pulse to arm. Trying two other transmitters (which were still on their original factory settings) showed that the unit was working correctly.

## Waterproofing

This ESC is intended for model aircraft, so was not designed to operate in the humid atmosphere of a small fast electric boat. My method of making the unit water-resistant was to seal the area around the MOSFETs and Schottky diode with epoxy glue, whilst making sure that the device cooling tabs still had adequate air contact. Similar treatment was used around the connecting wire holes and the joins in the case, although in these areas I used silicone sealant. This approach entombs the circuit in its case, so make sure it is working correctly before starting the process.

## Conclusion

I think that this is a great little kit that certainly performs as expected. The price (if you include all the extras) is not much less than you would pay for a similarly rated speed controller from your local model shop. Some ESC manufacturers over-optimistic when stating the current rating of their unit, but at least with this kit you know exactly what you are getting. I would not recommend the kit to a complete novice, but you should not have any problems if you have a little electronic construction experience and can solder neatly. For those without the necessary skills, a ready-made version of the PCB is available for a small additional charge.

## Further information

The kit can be purchased direct from The Model Electronics Company web site, http://www.omegaco.demon.co.uk/mechome.htm . The site also contains a detailed description of the kit (including the construction notes) and details of the companies other radio control products.