

Micro Master 2

Miniature Speed Controller for Small Aircraft

General

Micro Master was developed for small scale electric model aircraft. It was designed around a single high powered D-pack mosfet and the worlds smallest micro controller making it the smallest 35 Amp speed control available. Supply Voltage from 6V to 18V. In the interests of weight reduction, a brake is not included. It is not normally a necessity in this scale of aircraft.

Features

- High variable current for such a small package (35 Amps 10 seconds, 25 Amps continuous)
- Lightweight, less than 2 grams (without leads)
- BEC, 800mA continuous (with low voltage battery)
- Battery voltage monitoring with trim pot adjustable voltage level cut out from ~3.6V to above maximum allowable.
- Soft start up to reduce high torque high current stress on mountings and propellers.
- Very low on resistance (~3mΩ) for minimum loss.
- Extremely Small package (18 x 11 x 7).
- Glitch rejection technology.
- Micro controller controlled full digital operation for reliable performance.
- Innovative design.
- Uses the very latest and best available surface mount components for the highest possible power output from the smallest package.
- Will operate on all receivers.
- No Radio Signal failsafe. Goes to Off after 1/8th sec. without radio signal, and flashes LED.
- LED which shows radio signal failure, full throttle, off, and battery voltage shutdown.
- Easy installation. Just plug in, adjust battery voltage cut out if required and go.

Mounting

Micro Master can be mounted with double sided tape or with a cable tie. A position close to the motor will reduce the possibility of radio interference and some airflow is required for cooling, especially if current draw is going to be above 20 Amps continuous.

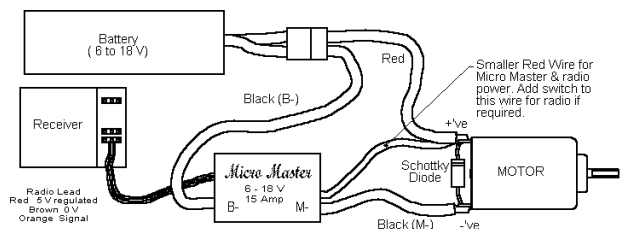
Connections

Important. Micro Master requires a Schottky Diode soldered to the motor. Running Micro Master without a diode will damage the unit and void any warranty.

Keep motor and battery wires as short as possible to reduce power loss and radio interference and keep radio wires away from power leads if practical.

1. Solder the Schottky Diode (supplied) across the motor terminals. The end with the band goes to the positive side of the motor (see diagram).

2. Ensure motor has capacitors from the terminals to ground. Some motors come with capacitors built in. For those that don't, it is important that a capacitor is soldered from each terminal to the casing, and is recommended that one be soldered between the terminals. The normal cap is 10 nF ceramic, but larger sizes will not matter. This is most important to prevent radio interference.
3. Connect the red power wire (supplied) between the positive battery connector and the motor positive.
4. Connect the Micro Master B- wire to the battery negative connector, and the M- wire to the motor negative terminal.
5. Connect the smaller Micro Master red wire to either the motor positive or the positive battery connector. A switch may be added to this wire to be used as a normal receiver ON switch.
6. Plug in Micro Master servo lead to the receiver. Micro Master is now ready to be tested



Micro Master Connections

Testing & Adjustments

Micro Master has been tested, but will need trimming, and the low battery cut out requires adjustment.

Throttle

Before connecting the battery, make sure all connections have been made according to the diagram, especially check the polarity of the Schottky Diode and the battery connections.

Turn on the transmitter and move the throttle to the low position. Keep well clear of the propeller, connect battery and turn on the switch if fitted. If motor goes to full on, reverse the throttle on the transmitter.

Adjust the throttle trim and/or endpoints so that the motor goes from off to full on. The LED on Micro Master lights up at full throttle and off, so that the LED should be on at both ends of the throttle movement. You will notice that there is a small delay between when the throttle reaches full on and the LED comes on. This is because of the soft start which takes ~0.8 seconds to ramp from off to full throttle.

Low Voltage Cut Out

Low battery voltage cut out only becomes active 1 second after Micro Master reaches full throttle. This is enough time for the motor to reach full rpm, at which point the current drain will have settled, and so will the battery voltage. The voltage is then continuously monitored until either the throttle is reduced, or the battery voltage drops below the preset value. If the low battery voltage cut out is tripped, the motor goes immediately to off, the LED comes on and no further motor control is possible. The BEC is still active, so that the remaining

battery power can be used for control during gliding. Removing Micro Master from the battery resets the cut out.

Adjusting cut out

Turn the small trim pot on Micro Master full clockwise with a suitable screwdriver (supplied position).

Attach a nearly flat battery to Micro Master and run motor at full throttle with normal propeller attached.

Adjust trim pot anti clockwise till trip occurs. Continue to move control surfaces for sufficient time to ensure that the power left in the battery is sufficient to run servos during gliding.

Fine tune as necessary.

Most important. Now, have some fun!!!

Battery Eliminator Circuit

The BEC operates from a single Low Voltage Drop-out regulator, which can handle 800 mA continuous and peaks up to 1.5A. This unfortunately is not normally the limiting factor for most voltage regulators, power dissipation is. The BEC on Micro Master can dissipate around 1.3W continuously. This means that at battery voltages above 6.6 V you can no longer draw 800 mA continuously. The amount you can draw is given by the following formula :-

$$\text{Cont. Current Draw (A)} = \frac{1.3}{\text{Battery voltage} - 5}$$

This means that with a battery of 18 V, only 100 mA can be drawn continuously. Peak currents can still be 1.5A. Over currents will cause the BEC to reach its thermal limit, which will reduce the current available.

This may not be a problem, as 800 mA will run 2 standard size JR servos stalled (maximum current). Usually servos have little load on them during flight of a properly setup and trimmed aircraft.

If required, the red wire can be removed from the Micro Master servo lead, and a separate battery can be used to run the radio.

Warranty – Micro Master is warranted for life against faulty parts or workmanship. Abuse, reverse connections & exceeding maximum ratings are not covered.

Specs

Dimensions	18 x 11 x 7 mm
Rating	6 – 18Vdc, 35Amp
Max. current	161 Amp continuous, 620 A peak (mosfet spec. sheet)
Tested continuous current	25 Amp
BEC radio connection	5Vdc, 800 mAmp cont., 1.5Amp peak
PWM frequency	2kHz
Battery Cut Out	Fully variable ~3.6V to Infinity
Schottky Replacement	11DQ04 or SB340, equivalent or better.

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Disclaimer

Although great care was taken in designing, programming and assembly of this speed controller, the end user will take all responsibility for any damage or injury caused by any device containing this controller. Due to the nature of radio control, no guarantees can be given as to the safe use of this product.