Flight Manager/Timer FM-FF1

Description

This device provides timed throttle signals to an Electronic Speed Control (**ESC**) that powers an electric motor for free flight.

Flight time

The flight time is adjustable from 10 seconds to 73 seconds by turning the "**TIME**" potentiometer ("**pot**") from fully counterclockwise to fully clockwise, about 270°. Based on the outer marks, an approximate calibration is as follows:

0	10 sec	6	48 sec
1	16 sec	7	55 sec
2	23 sec	8	61 sec
3	29 sec	9	67 sec
4	36 sec	10	73 sec
5	42 sec		

Flight power

The flight power is adjustable from about 68% to 100% by turning the "POWER" pot from fully counterclockwise to fully clockwise, also about 270°.

Connection

The FM-FF1 is powered through the middle (+5 volt) wire and the ground wire (one of the two outer wires) of the 3-wire connection to the ESC. The other outer wire carries the throttle information from the FM-FF1 to the ESC. (The ESC you use must include a **BEC** [Battery Eliminator Circuit] to provide this 5 volts, as most do.)

The **ground** wire from the ESC (brown or black wire) **must** be connected to the pin indicated by the letter "G". If the connection is switched so that the other outer wire is connected to this pin, no damage will occur but the motor will not start. However, if you should accidentally connect just two leads to the three-pin connector, it is possible to reverse the power connections and destroy the timer.

Operation

When the battery is connected to the ESC and the ESC is connected to the FM-FF1, the FM-FF1 sends a "throttle off" signal to the ESC and the ESC responds with (typically) a long beep and then short beeps corresponding to the number of LiPo cells detected, plus possibly additional information (melody?). After three seconds or more, the **Start** pushbutton on the FM-FF1 may be *momentarily* depressed, starting the timing sequence for flight.

To confirm for you that the timing sequence has begun after the button push, the FM-FF1 **blips** the motor one second later. After three (**3**) more seconds, the FM-FF1 smoothly increases the throttle signal to the level requested by the "**POWER**" pot. Importantly, you may adjust the power during the "flight" time, which is very useful in setting the power level initially.

If the power *decreases or even stops* during the flight time, the probable cause is that the ESC has detected a minimum voltage for the battery pack (normally set to 3.0 volts/cell or 9.0 volts for a 3S LiPo battery) and it is trying to save your battery from being depleted too much, thereby reducing its useful lifetime. This could happen, for example, if the battery wasn't fully charged at the beginning, if the propeller has too much diameter or pitch, or if the proper propeller was used but the plane wasn't allowed to fly (the propeller loads up in a static situation because the angle of attack of the blades is so high).

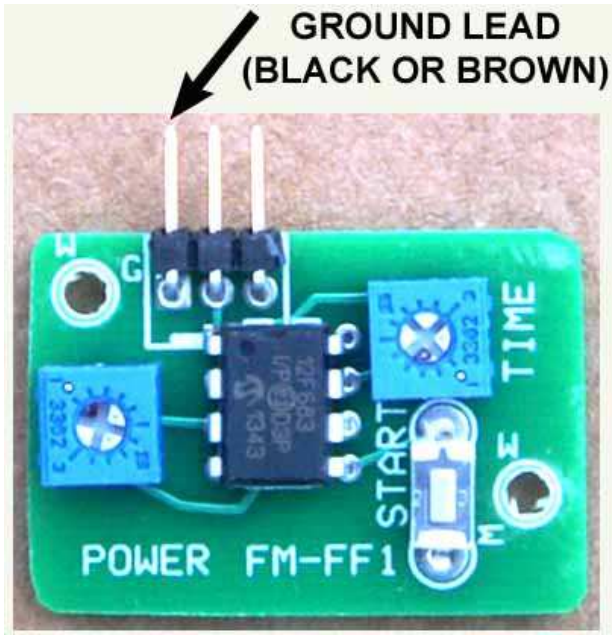
Safety features

During the programmed flight time, you may **stop** the motor at any time by momentarily depressing the Start button. This is useful when first testing the power unit in a plane. It is also important to remember to do this if the propeller should try to cultivate some grass—but only the ESC can actually detect and automatically shut down the motor under this condition, hopefully by detecting a current overload or the motor overheating. (Let the motor and ESC cool down before attempting a restart.)

If your battery is capable of providing two flights without drawing down more than **80%** of its mAh capacity (based on the charge you put back into it), you may make a second flight with the same battery but you will have to momentarily remove the connection to the battery to allow the FM-FF1's processor to reboot, leading then to a repeat of the beeps from the ESC.

Mounting

Two good ways to attach the FM-FF1 to the fuselage are to use (a) hook and loop material (e.g., Velcro®) or (b) #2 wood screws.



(Note that the **bottom** quadrants of both pots are blackened, to aid in visually detecting the fully counter-clockwise position as well as the degree of rotation.)