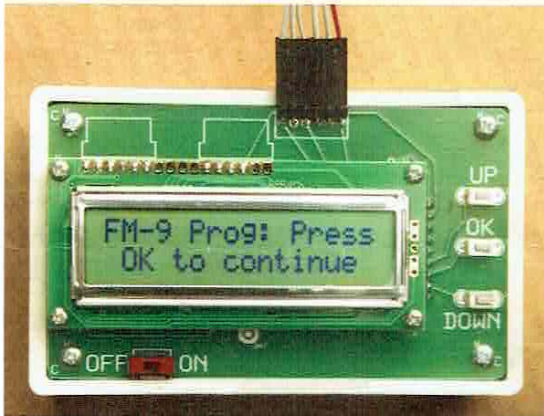


Overview of the FM-9, a “universal” electric C/L flight manager

The FM-9 flight manager system consists of a small, light circuit board on the airplane and a remote, powered programmer to set flight parameters for almost every ESC and every ESC mode.

This is the most common timer: a small board with a 6-pin connection to the programmer and a remote start button so that the timer can be inside the fuselage and the start button on the outside, to easily start (and stop) the motor.

The FM-9 programmer is housed in a plastic box, about 2½ x 4 x 1¼”, and is powered by a 9-volt battery. You should connect it to one of the timers (both face up), hold down the start button on the timer, turn on the programmer, then release the start button on the timer. You’ll receive this message on the display:



If you remembered to hold down the start button when first turning on the programmer, then when you press the “OK” key you get a display of the current flight time:



and you can use the “UP” and “DOWN” key to adjust your flight time (from 1 minute to 9’59”, in second increments). When you press “OK” you get a display of the delay time (how long after you press the start button and get a blip of the motor and the motor starts and flight time begins):



and you can again use the “UP” and “DOWN” keys to adjust as desired (from 2 seconds to 59 seconds).

Another press on the “OK” key brings up a choice of

ESCs and ESC modes. One of these is the popular Castle Creations High RPM governed mode.



The other available modes are (1) throttle mode (choice of throttle settings from 15% to 100%), (2) compensated throttle (from 59% to 91% with a choice of 14 levels of throttle advance during the flight), (3) the Phoenix Set RPM mode, giving you a choice of any one of the three RPMs, (4) the Schulze Low RPM F2B mode with the Plettenberg motor, (5) the Jeti Spin mode, (6) the Hacker A30 mode, and (7) the “Phoenix ICE/EDGE” mode (**firmware 3.23ff, the current version**). You can cycle through these choices with the “UP” and “DOWN” keys. Here’s another mode:



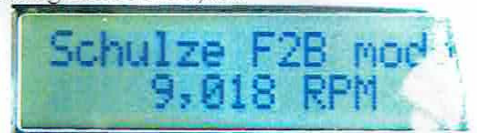
and another:



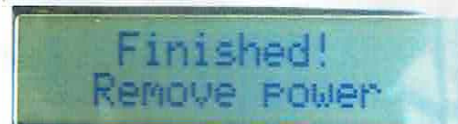
If you choose one of the throttle modes, the next display allows you adjust the percent of throttle to be used in the flight.

If you choose one of the constant/governed RPM modes [either Phoenix ICE/EDGE, Schulze F2B, Jeti Spin, Hacker A30], **you then get to choose the RPM directly!** (You’re actually choosing a throttle setting but the programmer has a built-in calibration for each of these ESCs, so you can program for the flight in terms of an RPM that should be **fairly close** to what you’ll get. More importantly, it is **easily and precisely reproducible!** Adjustments to the RPM are through throttle increments of $\pm 0.5\%$ of full throttle, probably a finer adjustment than most ESCs can utilize.

Here’s an example of choosing the Schulze F2B mode and choosing an RPM of 9,018.



When you are satisfied with your choice of throttle setting(s) or RPM, and press the “OK” key, you get the closing message:



and the new flight parameters are stored in your on-board timer chip. The next time you use the programmer, you need change only what you want to change.

FM-9 Programmer

The FM-9 Programmer is designed to program the FM-9 timer unit for any mode of any ESC. With ESCs that support a

governed, constant-RPM mode (currently the Phoenix High RPM mode (both the early firmware version and the latest version), Phoenix Set RPM mode, the Jeti Spin, and the Hacker), the Programmer permits the user to directly select an RPM on the digital display.

For most motors and using these constant-RPM modes, the RPM will be close to what you measure with a tachometer, hopefully, but the most important property is that it is totally reproducible, and it gives you very fine resolution of 1/2 of 1% of full throttle, so you can experimentally determine what gives you the desired lap time and easily fine tune the RPM above and below that for optimum performance in different wind/temperature conditions.

For other, cheaper ESCs, especially those used for sport flying and for 1/2A planes, the Programmer provides a pure throttle mode and a "compensated" throttle mode, in which you specify the percent throttle desired as well as how much the throttle should be advanced to compensate for declining battery voltage during the flight (the least at low power settings and the most at high power settings, on a scale from 0 to 15).

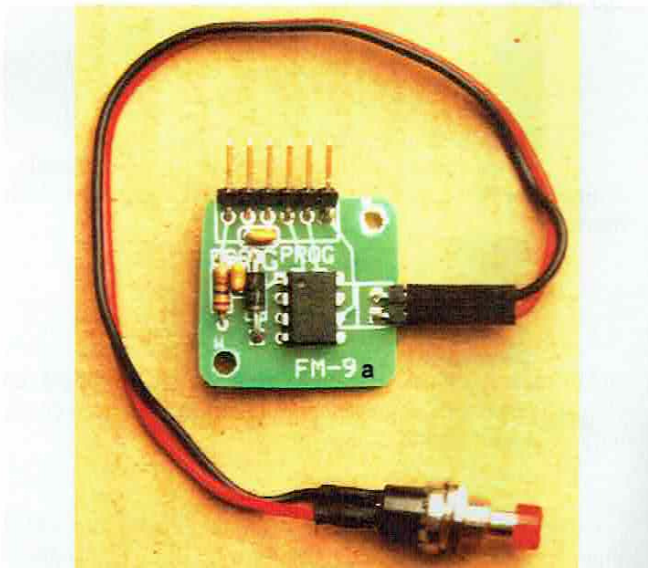
The FM-9 Programmer is \$75 and S&H for it and any FM-9 timer units in the U.S. is \$8 (Priority Shipping) and \$12 in other countries (1st Class). **Please indicate if you want a version that supports programmable retractable landing gear parameters.**

Available FM-9 Timer units

The simplest FM-9 timer unit, for profile fuselages, consists of a 6-pin connector to the Programmer, of which the left three pins are the later connection to the ESC, the micro-controller which is programmed for the flight time, delay time, and power/RPM by the Programmer, and a push-to-start button on the board, at \$8.

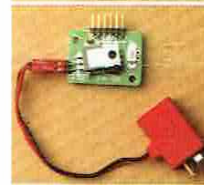
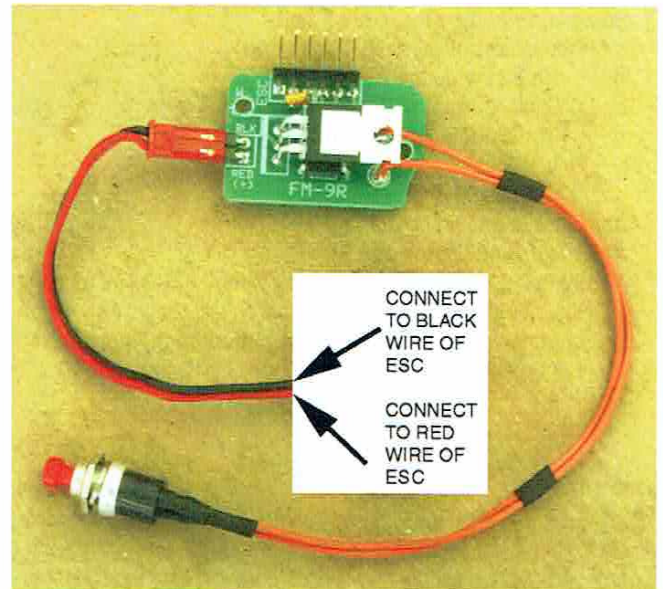


Those flyers with fuselage airplanes will want extended leads (typically 6" in length) for the start pushbutton so that the timer can be inside the airplane and the



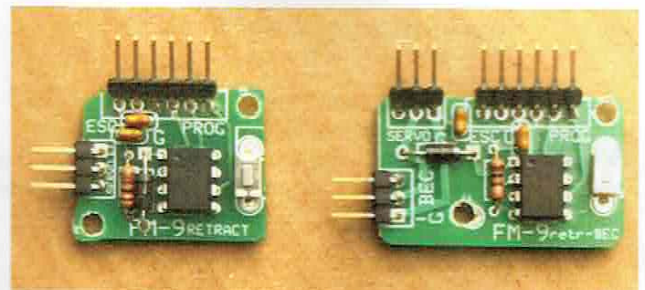
start button can be on the outside. FM-9a @ \$10.

A second version of the FM-9 timer is the FM-9R, for ESCs which don't provide a BEC (like the Schulze), which includes a 5-volt regulator to reduce the battery voltage to 5 volts to power the timer and to provide the proper voltage signal to the ESC. \$12, or \$14 with extended leads to the start button.



There is also a version (assuming the Deans connector) that doesn't require the user to solder the regulator's leads to the battery leads of the ESC: \$17 (as shown), or \$19 with extended leads to the start button.

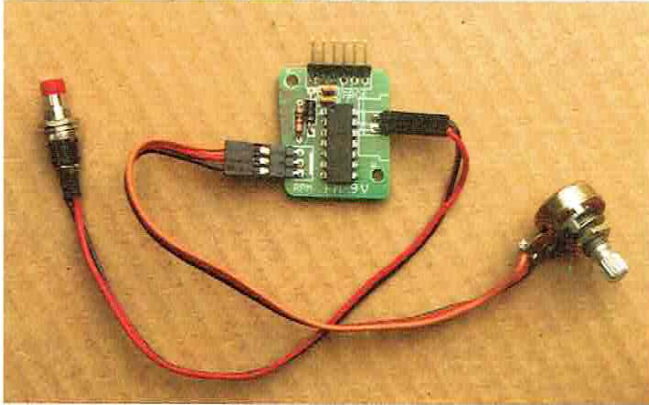
Two additional versions, FM-9retract and the FM-9retr_BEC, include provision for retracting the landing gear some time after the flight time begins and extending it some time after the warning signal is given. The version on the left is for ESCs (like the Castle Creations ICE and Lite ICE) that provide a switching power supply for the BEC with enough current capability for the retract servos. \$12 (as shown), or \$14 with extended leads to the start button.



The version on the right, FM-9retract_BEC, provides for an external BEC, for those ESCs that either don't provide any BEC (the Schulze) or those that don't have enough current capability for the retract servos (e.g., the Phoenix, but not the ICE or Edge). \$18 (as shown), or \$20 with extended leads.

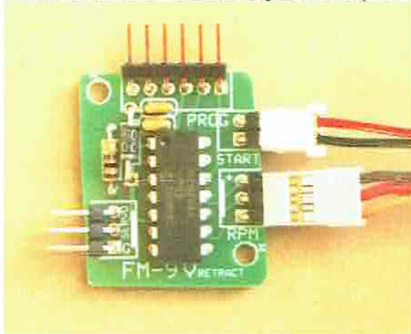
Another timer, the FM-9V, includes a pot that turns through 270 degrees and allows the user to adjust the RPM

without using the programmer, potentially very handy when first trimming a new airplane or when there is a sudden wind change as you move out to the center of the circle. The maximum amount of RPM change desired **must be chosen by the buyer**: anywhere from about +/- 250 RPM, or +/- 500 RPM, or +/- 1000 RPM (based on the Phoenix High RPM mode). The profile version, with the start button and the pot on the circuit board, is \$12; with extended



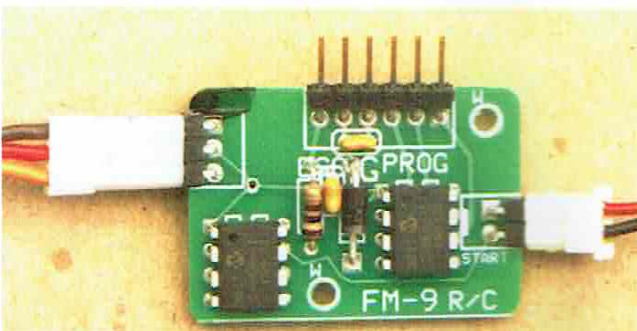
leads for both, as shown, it is \$18.

The FM-9Vretract adds the option of retractable landing gear. With remote start and remote adjustment pot, it is \$22.



A final version (not shown), the FM-9VR, includes a 5-volt regulator, to make it compatible with any ESC that doesn't provide a BEC. As above, the maximum desired RPM variation must be specified by the buyer. The profile version with the start button and the pot on the circuit board is \$16; with extended leads for both, it is \$22.

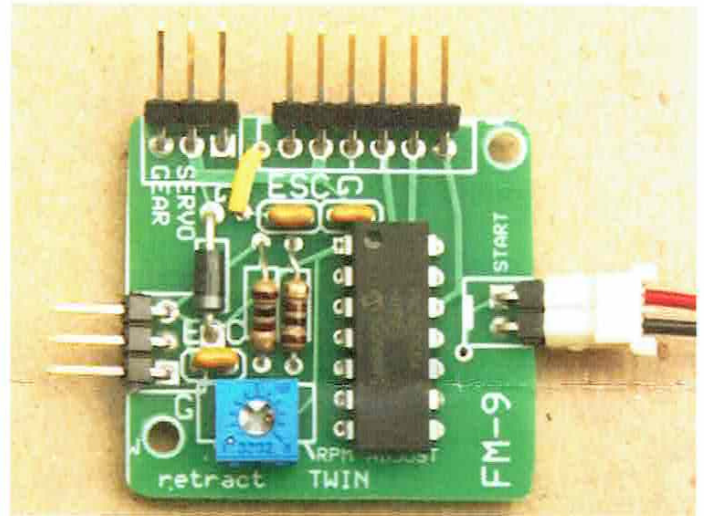
The FM-9R/C timer is a standard FM-9 with the additional option of allowing the user to shut off the motor at any time during the flight time by using any standard 2.4GHz receiver in the plane and a 2.4GHz transmitter that is "bound" to the receiver. A cable is provided to connect the timer to the receiver, which it also powers from the ESC's BEC. The motor is shut off when the remote throttle is increased to 55% or higher. \$18



Finally, there is a timer that is optimized for twin-engine aircraft, with an option for retractable gear. As usual, a separate ESC must be used for each (brushless) motor, but the BEC of only **one** of them (the one connected to the left half of the 6-pin connector) is used to power the timer and the gear. (This is better than when one timer is used with a "Y" connector from it to the ESCs and then the center wire (+5V) must be cut in one of the legs of the "Y" so that the two BECs don't fight over a slight voltage difference.)

Also, this timer allows the user to run one motor at a slightly higher RPM than the other, which can be used to adjust the line tension. \$20

If **neither** of the ESCs used has the 10A capability to power the gear servos, a **separate BEC** must be used (e.g., the one sold by Castle Creations). Then a BEC version of this timer can be used, with a separate 3-pin connector for this separate BEC. \$20



If it is desired to update the program in the FM-9 Programmer, for example to be able to program retractable gear parameters, this can be done by either switching the chip yourself @\$5 or by returning the box to me, @\$10 (including S&H).

When only FM-9 timer units are ordered, S&H is \$3 for one and \$4 for four or more (plus an additional \$4 for international shipping). When the FM-9 programmer box and any number of timers are included, S&H is \$8 (Priority Mail, U.S.) or \$15 (first class, international)

Will Hubin
719 Cuyahoga St.
Kent, OH 44240
whubin@kent.edu