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Dual Function Profiler

- **Function 1: - Adjusts Motor Power, Run & Decay Times**
- **Function 2: - Operates Undercarriage Retract or D/T Servo**

This Documentation:

Undercarriage Version

Designed & Manufactured in the UK for SAMS Models by:-

FORGE ELECTRONICS
Embedded Microcontrollers for Modellers
www.forge-electronics.co.uk

Electric Free Flight is clean and quiet, ideal for the 21st century environment. The huge Electric RC market ensures that components such as motors and ESC's for Free Flight are available at very attractive prices and are totally reliable. Battery technology has progressed such that the weight of an electric power train can be similar or better than conventional glow or diesel power.

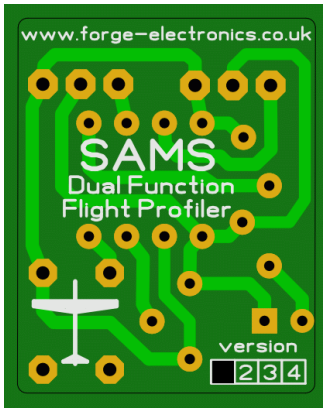
Accurate and repeatable control of motor power and run timing make for enjoyable frustration free flying. The SAMS Dual Function Profiler has been designed and developed so that sports flyers can enjoy all these advantages at a realistic price.

The primary function of this timer is to set the profile of the motor run via an ESC (power, run and decay times). The secondary function is to drive a servo to operate a retracting undercarriage mechanism. The motor power is set by a single turn potentiometer and the motor run and decay periods are set by a simple push button / LED interface.

Key Features

- Start delay:- 5 seconds
- motor soft start:- 3 seconds
- undercarriage retract:- begins at 8 seconds, transit time 2 seconds
- motor run duration:- adjustable 4 to 30 seconds, set in 2 second increments
- motor power:- adjustable from zero to full throttle (by potentiometer)
- undercarriage deployment:- occurs in last 2 seconds of motor run period
- power decay:- adjustable 2 to 30 seconds, set in 2 second increments
- option to maintain undercarriage retracted at end of flight
- optional servo reverser function to correct undercarriage operation
- push button immediately stops the motor at any point during the flight profile
- duration settings saved in memory – a single button push serves to repeat a flight.
- unique CONFIG mode for setting up ESCs without additional equipment (programming card or RX/TX otherwise required)

INSTALLATION



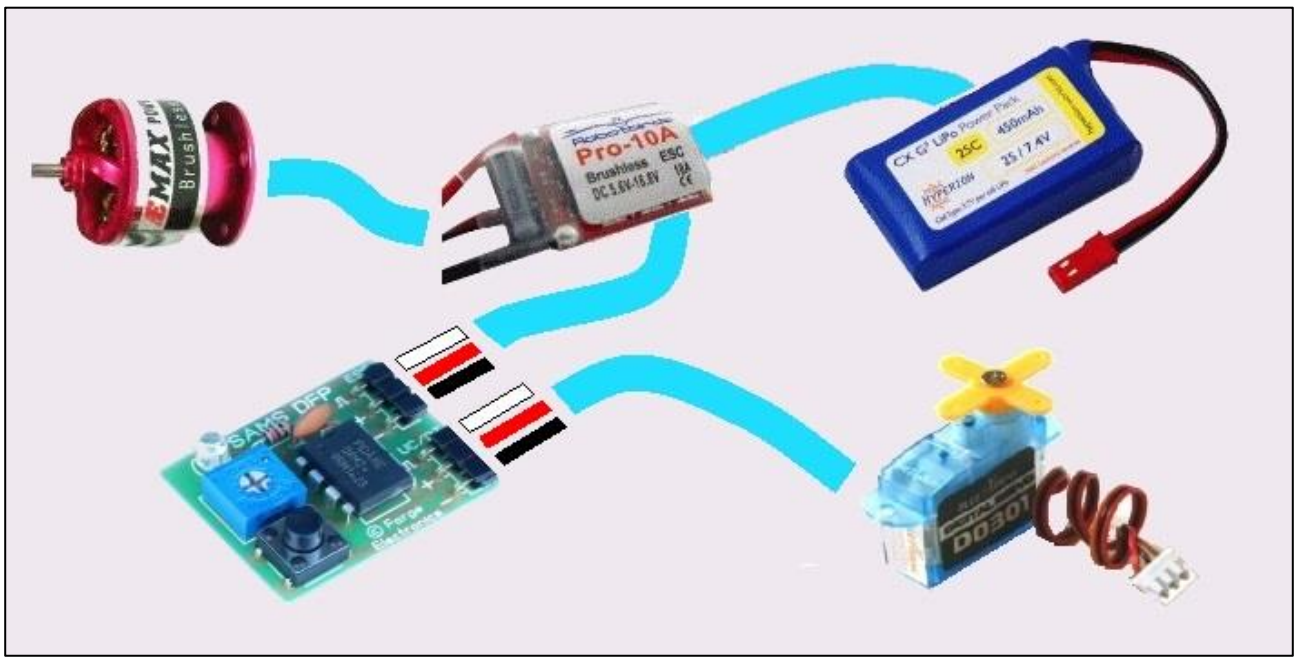
DFP Timer Identification

There are two versions of the SAMS DFP timer and they are distinguished by the version strike box

V1 – Function 2 : **Undercarriage Retract**

V2 – Function 2 : D/T Servo

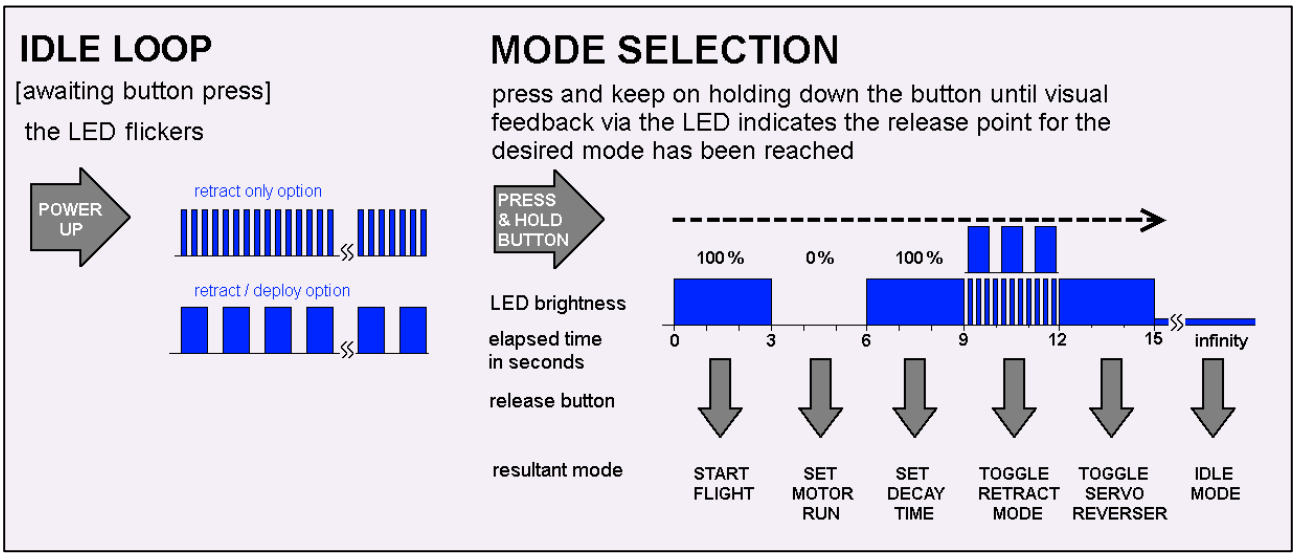
The image below shows the general interconnection of the components. Follow the instructions of the other suppliers to connect the motor and battery to the ESC.

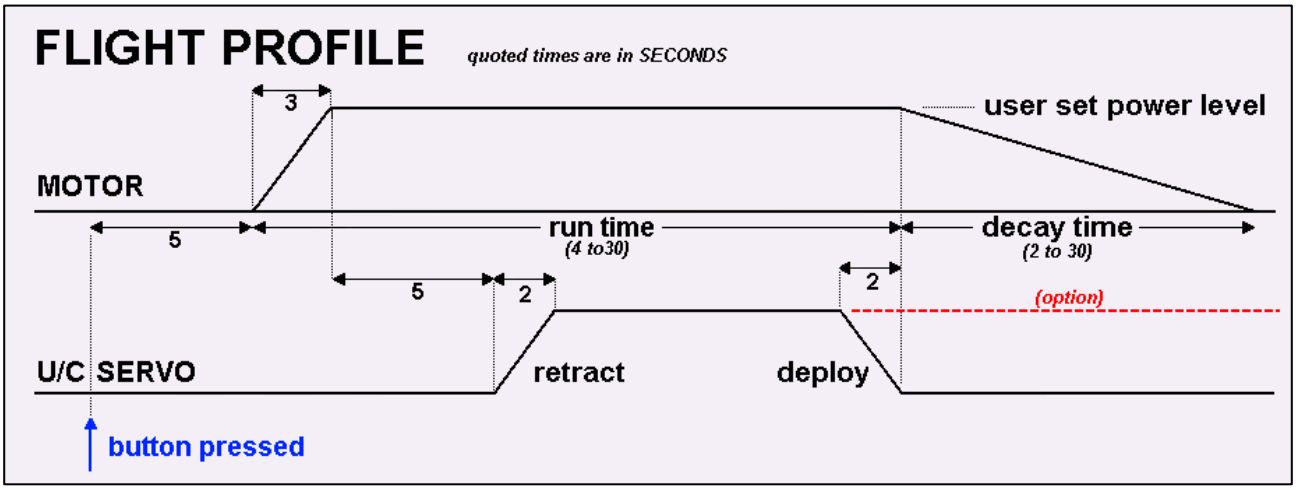


The signal lead from the ESC, usually coloured white/red/black, connects to the top three pin header on the timer as shown in the image above and the U/C servo to the lower three pin header. Note the orientation of white/red/black leads.

The chip used in the timer has a maximum rating of 5.5v, so ESCs with a 6v BEC must NOT be used.

SAMS DFP TIMER - QUICK GUIDE





SAMS DFP TIMER – IN DETAIL

Idle Loop – initially entered at power up. Subsequently it is entered following the successful conclusion of modes [1] to [5] below. Here it awaits a button press, either to commence a timed flight or to enter one of the adjustment modes. Whilst in the loop, the LED flickers to signify that the unit is powered.

Power Setting - adjustable from 0 to 100% and is set by the potentiometer. If the user wishes to judge thrust being delivered then adjustment can made during a ground handling “flight” with the motor running. However, the motor will only directly respond to the potentiometer in the window between completion of the undercarriage retract and prior to the undercarriage deployment. This window of adjustment opportunity is denoted by the LED seconds marker giving longer flashes than usual. Once the power has been set, the timed period may be aborted by a brief press of the button and the unit returns to the idle loop.

Operating Modes - there are five possible modes of operation which are entered by a single press of the push-button. The duration of the press determines the mode selected and visual feedback from the LED informs the user when to release the button as each mode becomes available.

[1] FLIGHT – entered from the idle loop by a brief press of the button (must be less than 3 seconds or the subsequent set-up routines will be entered instead). The LED is lit to acknowledge the button press. When the button is released a five second time delay begins which allows the user to position the model for take-off and retreat from its flight path. The LED briefly occludes after each second to count down the delay. The motor is then ramped up to the chosen power level over a 3 second period. Five seconds after the chosen power level is attained, the undercarriage retract servo is activated and moves smoothly across its full range in a 2 second period. The motor continues at the set power for the rest of the user selected duration. Two seconds prior to the completion of that duration, the servo operates again to deploy the undercarriage. The motor power then ramps down to zero over a further user defined period. During the whole active phase the LED counts off each second by giving a brief flash. The 'flight' may be aborted at any time by a brief press of the push-button which returns the unit back to the idle loop.

[2] SET MOTOR RUN TIME – entered from the idle loop by holding the button pressed until the LED extinguishes (in the 3 to 6 second window) and then releasing it. The duration is now set in 2 second increments by repeated brief presses of the button, counting "2", "4", "6" etc – so 10 pushes would set 20 seconds and so on. The maximum available period is 30 seconds and any presses in excess of 15 are ignored – the LED failing to respond to excess presses to indicate this situation. When the timer ascertains that no further presses are being made, the unit then returns to the idle loop. The selected duration is stored in memory and is retained indefinitely (including power cycles) until it is next altered by the user - so in this example a further flight with a 20 second motor run would only require a single button press from the idle loop to start it.
Note that the minimum motor run time for a flight incorporating a full undercarriage cycle is 12 seconds – if a lower run time is set the undercarriage feature will not operate. In the event that a 2 second run time is selected, the period will be automatically extended to 4 seconds such that the3 second motor soft start can complete.

[3] SET MOTOR POWER DECAY TIME – selected from the idle loop by holding the button pressed until the LED returns to full brightness (in the 6 to 9 second window) and then releasing it. The decay duration is now set in units of 2 seconds by repeated brief presses of the button, counting "2", "4", "6" etc – so 10 pushes would set 20 seconds and so on. The maximum available period is 30 seconds and any presses in excess of 15 are ignored – the LED failing to respond to excess presses to indicate this situation. When the timer ascertains that no further presses are being made, the unit then returns to the idle loop. The selected duration is stored in memory and is retained indefinitely (including power cycles) until it is next altered by the user - so in this example a further flight with a 20 second motor power decay duration would only require a single button press from the idle loop to start it. *Note that the time period is for the ESC drive to decay to ZERO and due to friction and prop loading the motor will almost certainly be seen to have stopped prior to the user set period.*

[4] TOGGLE UNDERCARRIAGE RETRACT OPTIONS – the two options are for a normal flight where the undercarriage retracts and then later deploys OR for test flights where after the undercarriage has retracted it remains permanently up. In the latter case the undercarriage is lowered again when the user presses the button to return to idle mode

having retrieved the model after the flight. The option to select the undercarriage retraction mode is made from the idle loop by holding the button pressed until the LED begins to flicker (in the 9 to 12 second window) and then releasing it. The timer then returns to the idle loop. The selected retract option is stored in memory and is retained indefinitely (including power cycles) until it is next altered by the user. *To warn the user that the test flight mode is selected the LED flickers more rapidly during the idle loop. These flicker rates are mirrored during the option selection process - the unit altering to the rate related to the flicker rate when the button is released.*

[5] TOGGLE SERVO REVERSER – this is to allow for situations where some servos move in the opposite direction to normal or where the mechanics of the undercarriage retraction rely upon the servo moving in the opposite direction to normal. The option to reverse the servo direction is made from the idle loop by holding the button pressed until the LED turns ON (in the 12 to 15 second window) and then releasing it. The servo then moves to the opposite end of its travel after which the timer returns to the idle loop. The selected servo direction is stored in memory and is retained indefinitely (including power cycles) until it is next altered by the user.

ESC Configuration

ESCs generally have a number of parameters which need to be configured for optimum performance and/or user preferences - such as battery type (Li-Po/NiMh), Li-Po cut off voltage, signal span, brake on/off, motor timing etc. In particular if the ESC's signal span is not set to match that of the timer (the latter being set to the industry standard of 1 mSec to 2 mSec), the motor may have already reached full speed before the timer's power setting pot is at it's extreme of rotation (thereby coarsening the user's power setting adjustment) or worse still the user may not be able to get the motor to achieve full speed.

The ESC manufacturer expects users to have access to a RC transmitter and receiver in order to set up these parameters. However, the majority of settings can be more easily configured with the manufacturer's programming card for the appropriate ESC (if available) *but with the exception of signal span which still requires to be matched to the transmitter itself (or in this case, the timer)*

CONFIG is a non-timed mode where the user can implement the ESC manufacturer's set-up instructions by using the button as though it were the throttle joystick of a transmitter (ie to assert zero or full throttle as directed).

Typically, an ESC requires to see a full throttle signal immediately at power up in order to enter its configuration routine(s) – usually for a short period to set signal span and for a longer period to access the remaining parameters. Now an ordinary timer would of course be putting out a closed throttle signal at power up whilst awaiting a button press to commence a flight. The E-ZEE timer offers this special CONFIG mode for ESC configuration in the event that the user does not possess a programming card and/or RC transmitter/receiver or does not have access to them in the field.

This mode can only be entered by powering up with the pushbutton already pressed and held. The timer then enters an endless loop where either full or zero throttle demand is asserted to the ESC depending on whether the button is held pressed (full throttle) or released (zero throttle). The LED signifies these conditions by being fully on (full throttle)

or glowing dimly at 10% of its normal brightness (zero throttle). *This endless loop can only be terminated by removing power to the unit.*

FURTHER ASSISTANCE

Forge Electronics is a design, development and manufacturing concern only, has no retail facility and neither does it provide product support – this being the responsibility of the vendor – in this case SAMS Models, to whom all enquiries should be addressed.

SAFETY

The motor must be considered 'live' whenever the propulsion battery is connected. Be careful not to inadvertently press the start button during handling the model as the prop may begin to turn as soon as the button is pressed.

When first using the timer, it is safer to remove the prop until the user is fully familiar with these operating procedures. For maximum safety, an RC servo and 5v receiver battery pack can be connected instead of an ESC and motor. The servo arm position will indicate throttle position and the timer functions can be explored without the risk of a turning prop. A standard "Y" lead is all that is needed to connect the timer, servo and receiver battery.

Be aware that electric motors behave differently to IC engines. With the latter your straying fingers might get anything from a smart whack to a nasty gash depending on the size of the engine, but nine times out of ten the engine will stop instantly. With electric motors, no matter what the size of the motor, as long as the battery remains connected, it will attempt to turn, and continue doing so - even if it becomes so overloaded that it melts itself, the ESC or the battery in the process. So, an encounter with a spinning prop can result in your fingers being continually slashed, until the power is cut. A few high-end ESCs ***do*** *feature a safety cut-out if the prop is stalled or the governed revs drop below a predetermined threshold but you should not rely on this. YOU WERE WARNED!*

Note that the blue LED used is a high brightness type to ensure good visibility outdoors in bright sunlight. If the timer is operated in the workshop under poor lighting conditions avoid looking directly at the LED to avoid potential damage to your eyes.