Program Card II - Programming Card Users' Manual
Sunrise Model

With the programming card, you can change every single function of our Program Card II compatible ESC's. A special feature is the exact cutoff voltage adjustment for the two Lithium battery types on the market with their respective number of cells. Further you can adjust the timing and different brake modes, the governor speed regulation and the accurate throttle stick positions by means of buttons. The actual settings can be read back with all our BEC ESC's and OPTO ESC's. In addition to the LED matrix overview, the confirmation of the respective programming step is done via an acoustic "beep" signal as long as the motor is connected, which is produced by the motor connected to the ESC. This programming can also be done without the motor connected, but there will be no "beep" sound , only the LED matrix will show. However it is better to have the motor acknowledge the setting. Without the sound you can never be sure.

Operating instructions for the program card.

There are two command (signal) cables on all our ICE series ESC's, both BEC and OPTO ESC'S. One is long and the other short. The long one is for the receiver throttle port, and the short one is for the program card. Their designations are also printed on the ESC's label.

 Connect everything up in the following order for ESC's with built in BEC's. (We will do OPTO ESC connecting after this)
1. Take the prop off the plane, or the blades of the Heli, to be safe.
2. Switch your radio on.
3. Connect the motor to the ESC.
4. Connect the long command cable from your ESC to your throttle port on your receiver.
5. Connect the short cable on your ESC to the "ESC" port (left hand side) on your program card.
6. Use the short cable that came with your program card and connect it to any free port on your receiver, and then connect the other side of the cable to the "RK" port (right hand side) on your program card.
7. Connect the main battery for your motor to the ESC.

If you inadvertently plug the ESC cables in the wrong way on the program card, nothing will happen, as the program card is protected against reversals.

On connecting the main battery, you will see a red led light run up and down the left side of the card, and a red led light run across the top of the card at the same time. They will both stop running and a single red led will come to rest on the top left corner of the card at the timing position. It is a steady red light. (on level 2 the led light will constantly flash) The motor

unit will signal 6 fast "beeps" (short melody). You can now push the lower left button on the card and the red led will go from top to bottom and you can also see what has been previously programmed into the ESC. You are also now on level 1 of the program card . (It has 2 levels)
 If you can't see the previous settings, the card has not been connected properly and will not program the ESC.

OPTO ESC connecting to program card.

Do steps 1, 2, 3 and 4 as per the BEC ESC.
5. Connect your main battery for your motor to the ESC.
6. Connect the short cable from your ESC to the "ESC" port (left hand side) on your program card.
7. Connect the command cable from your remote BEC (that is usually connected to your receiver throttle port) to the "RK" port on the program card. If using a separate battery pack, plug it's cable into the "RK" port.

You will hear the 6 rapid "beeps" from the motor again, and the red LED light will run up and down on the left side, and the red LED light on the top of the card will run across on the top side, it will again stop on the top left side in the timing position. The ESC is now ready to be programmed with the card. Program as per the previous instructions for the BEC ESC.

Level 1

Level 1 starts with the timing indicator. Menu selections from here will be made using the top left and bottom left buttons. These selections will be captured in a "crosshair" fashion. After choosing whatever value you want, you MUST press the right lower ENTER button. This must be done with anything you want to program. Again, remember: after each value you select you MUST push the ENTER button. The ESC will acknowledge with a positive beep. A red LED LIGHT will light up on whatever value you have chosen after you push the ENTER button, and there will be a low and high tone "beep" from the motor confirming that the vale has been entered.
 Functions that cannot be programmed in the ESC are signaled with a negative beep. (1 low tone)
All functions can be programmed like this. While the programming order is not relevant except for the Lipo type, followed by the cutoff voltage adjustment and the cell count. You can modify any single value anytime at a later stage. 2 and 3 cell batteries are recognized automatically by the controller, that is why the cell count settings start with 4 cells on the program card.
The programming of the cell count is saved in the controller. Connecting a different cell count battery would lead to incorrect under voltage detections. Resetting the Lipo type (LiPo / LiFe) will cancel the cell count and reset the ESC to automatic cell count detection!
By activating the LiFe cell type (LiFePO4), the cutoff voltage is reduced by 0.7V per cell. Cutoff voltage (upper cutoff voltage line) for LiFe is 2.2 to

2.7V per cell. Cutoff voltage (lower cutoff voltage line) for LiPo is 2.9 to 3.4V per cell. In the NiMh mode, neither the cutoff voltage nor the cell count needs to be programmed. The slowdown is done automatically based on the battery voltage during connection. (Therefore, use only fully charged batteries)

Beep short shortens the start beep.

Rev. (Boats) Forward and reverse activation (only for Boat ESC). Stick position.

Brake off (without brake) For the throttle stick range calibration, please connect the enclosed extension cable from the receiver to the rightmost connector of the program card II. Turn on the transmitter, and put the throttle on stop. Select the stop LED on the program card and push the Enter button. Do the same with the full power position and the **Full Speed** LED.
Stick position **Brake on** (with brake) The brake starts 10% below the stop position, so the throttle stick range needs to be calibrated a bit shorter. For that put the throttle stick on 10% power (about 3 notches away from stop) and proceed with the above calibration. Alternatively you can also program in the complete stick range, after having set the servo travel from 10% to 100%.After calibration you need to come back to 0% - 100% to be able to reach the brake position. For transmitters with -100 to +100% servo travels you need to program -80!a% to +100% for calibration and come back to -100, +100% after calibration.

Brake smooth, middle, hard
These three steps are only for folding air-screw!

F3A Brake
This function allows you to adjust the F3A brake intensity without any step. It can reduce the motor RPM while the plane is in a dive. You need the extension cable again as described before. Select the F3A Brake LED, position the stick, e.g. for 50% brake on half throttle, and press the enter key. Likewise for 75%, put the stick on 3/4 gas, etc.
For the throttle stick range calibration, lower servo travel of the throttle channel needs to be increased by 10% because the opto-coupler has a propagation delay of 50|Is and thus the stop point is shifted.

Level 2.
All other functions like the governor mode can be accessed through level 2 of the program card by briefly pushing the two left buttons simultaneously. For confirmation the menu LED will now **blink** constantly. Again use the buttons as in level 1.
By pushing the two left buttons again simultaneously, you will be returned to the most recently changed setting on level 1.

Act. Freewheel (active Freewheel) allows best efficiency in the partial load range whereby the ESC remains clearly cooler.

Governor Mode (Gov. / Gov. Store) For the use of the governor mode in a helicopter, the throttle stick range or the throttle curve (100%) must have been calibrated as described in level 1. A throttle curve point of e.g. 70% corresponds to a completely determined head speed, which is held as long as possible for the ESC due to the battery voltage. If the battery voltage drops below a certain level, even a full power setting won't be able to reach the demanded head speed if the voltage doesn't allow it. If this appears to be the case at the end of a flight, the throttle curve should be reduced accordingly. For both governor modes: don't modify the P-gain, I-gain and PWM switching rate initially! If you do so the control loop parameters would also be modified.

Governor Mode is the classical head speed regulation for helicopters. The setting of the throttle curve should be around 60 to 80% of the full throttle range. The controller learns at **every** start the correspondence of the throttle curve and the head speed. That is why there is a short head speed increase just before reaching the demanded speed. This can disturb the tail, but a slight pitching will settle things down as the helicopter is not "glued" to the ground anymore.
Gov. store is an extended helicopter feature, where the correspondence of the throttle curve and the heads speed is done only at the first start (learning procedure). This head speed is stored so that at every later start the head speed will remain exactly the same. If the programming wasn't successful or was incorrect, you can reset the memory by selecting Gov. Store. Mode again

Operating instructions
The setting of the throttle curve should be the full throttle range (eg.80%). Start the ESC and stop for a while when it reaches the highest head speed. A faulty RPM will be noticed. Turn off the ESC and disconnect the battery. Reset the throttle curve at the same or lower throttle range when connecting battery the next time. If you are unsuccessful in programming the throttle curve, you could reset it by selecting Gov. Store. The memory can even be set with nearly or exactly 100%. Doing this will improve the correspondence of the throttle curve to the actual head speed. Please be careful as 100% programming could lead to very high head speeds. DO NOT forget to set back the throttle curve to avoid flying at full power.

Fast (Gov.) can be selected together with both governor modes. This feature increases the control loop frequency and can be used above a magnetic pole commutation frequency of 80000 per minute. (poles/2x motor rpm) Try this only if the speed control is not completely satisfactory. The advantages are that the P and I gains can be reduced without getting a weak speed control.

Important notice for the governor fine tuning.

The governor software default parameters are adapted to most setups. Nevertheless, if necessary the following parameters (P and I gain) can be adjusted.

P-Gain is the proportional gain. According to this parameter, head speed variations will be regulated
harder or softer. Practically, it is the force of the control loop. (- weaker, + stronger). With smaller helis, less then 1m rotor diameter, this parameter shouldn't exceed 1 meter. With larger diameters you can go to the max. A bad adjustment is reflected by a wagging tail.

I-Gain is the integral gain. According to this parameter, remaining head speed deviations are corrected faster or slower. It is an important complement to the P term: The P control is fast, but cannot completely recover the demanded head speed as it needs this deviation to exist. The I-term remembers this small remaining deviation and is able to remove it completely thanks to its "memory". Both parameters should be adjusted simultaneously. If you can increase the P-term, you should generally also be able to increase the I-term and vice versa. Excessively high settings can lead to a resonance between the tail gyro and governor. The result is then a very noisy or even wagging tail that could lead to an out of control situation. Therefore the adjustments on P and I should be done in small steps. By reselecting one of the governor modes, these parameters are reset to their default values.

Startup Speed is the spool up speed for helicopters and planes.

PWM Frequency is the switching rate used for partial load operation. With low frequencies the losses are reduced, but the motors run slightly rougher. With high frequencies, it is the opposite. The optimum frequency may be found in the user manual of your motor.

Startup Power. The higher the startup power, the faster and harder the start is. With small propellers it isn't a problem, but with large ones, it can lead to a fairly rough startup behavior. Before you disconnect the ProgCard from the ESC, you can verify your programmed settings by scrolling through each menu line. But this is only a history of your recent settings and doesn't reflect the other settings of the ESC. For that you have to program it in again.

After programming, please disconnect the flight battery first and then reconnect the ESC cable into the receiver throttle port.