Brushless Speed Controllers

FS-HWK008	Hawk BL 8A	Nixx 6~12 / Li-Po 2~4 Cells
FS-HWK018	Hawk BL 18A	Nixx 6~12 / Li-Po 2~4 Cells
FS-HWK030	Hawk BL 30A	Nixx 6~18 / Li-Po 2~6 Cells
FS-HWK040	Hawk BL 40A	Nixx 6~18 / Li-Po 2~6 Cells
FS-HWK050	Hawk BL 50A	Nixx 6~18 / Li-Po 2~6 Cells
FS-HWK060	Hawk BL 60A	Nixx 6~18 / Li-Po 2~6 Cells
FS-HWK075	Hawk BL 75A	Nixx 14~36 / Li-Po 4~12 Cells
FS-HWK100	Hawk BL 100A	Nixx 14~36 / Li-Po 4~12 Cells
FS-HWK120	Hawk BL 120A	Nixx 14~36 / Li-Po 4~12 Cells
FS-HWKPROG	Hawk BL ESC Programmer	

Thank you for purchasing this Fusion Hawk Speed Controller or programmer. We are sure you will be pleased with its performance and features. In order to ensure that you obtain the maximum benefit from its operation, please read the instructions carefully.

OPERATING INSTRUCTIONS

Please keep for Future Reference

SPECIFICATIONS

	Hawk 008	Hawk 018	Hawk 030	Hawk 040	Hawk 050	Hawk 060	Hawk 075	Hawk 100	Hawk 120
Load Current	8A	18A	30A	40A	50A	60A	75A	100A	120A
Peak Load	12A	22A	35A	50A	60A	70A	85A	120A	150A
Dimensions (mm)	35 x 22 x 7	38 x 22 x 7	49 x 25 x 10	66 x 25 x 10	66 x 25 x 10	66 x 25 x 10	78 x 29 x 14	73 x 56 x 31	73 x 56 x 31
Weight (g)	15g	25g	29g	47g	49g	49g	79g	162g	166g
NiCD/NiMH Cells	6~12	6~12	6~18	6~18	6~18	6~18	14~36	14~36	14~36
Li-Po Cells	2~4	2~4	2~6	2~6	2~6	2~6	4~12	4~12	4~12
BEC	5.5V max 2A	5.5V max 2A	5.5V max 3A	5.5V max 3A peak 5A	5.5V max 3A peak 5A	5.5V max 3A peak 5A	None	None	None
Programmable	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Rx Filter	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Low Voltage Cut Off	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Power on Reset	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
High Motor Frequency	32 kHz	32 kHz	32 kHz	32 kHz	32 kHz	32 kHz	32 kHz	32 kHz	32 kHz
Thermal Protection	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cool Power FET	-	-	Yes	Yes	Yes	Yes	Yes	Yes (with Fan)	Yes (with Fan)

FEATURES

- Compact & lightweight.
- "Cool Power" FET technology.
- Safe Start, prevents the motor starting accidentally.
- Low Voltage Cut Off (programmed from the battery selection that you make in the set up procedure - NiCd, NiMH, Li-Po).
- Ideal for: AIRCRAFT, BOATS, CARS & HELICOPTERS.
- Designed in conjunction with the Fusion Brushless motors, but can be used with any brushless motor.
- Advanced programming possible with the optional programmer.

CONNECTIONS

Attach suitable connectors for connection to the drive battery.

Red + Positive
Black - Negative

Ensure all of the connections are suitably insulated with heat shrink sleeving.

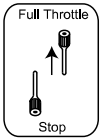
SETUP

Setting the Full Throttle, Stop & Reverse Stick Positions

1) Connect the speed controller as shown in the photograph but DO NOT connect the drive battery yet.

2) Switch the Transmitter "ON".

3) Move the throttle stick forward to the "FULL THROTTLE" position.



4) Now connect the drive battery to the speed controller. The motor will emit a short series of beeps to confirm the connection. (If the LED lights up, disconnect the drive battery and reverse the servo reverse switch on the transmitter and start again from number 1)

5) After around 10 seconds, the motor will emit a double series of beeps to confirm that it has detected the full throttle position.

6) Within 2 seconds move the throttle stick to the "STOP" position. Again the motor will emit a short series of beeps to confirm that it has detected the stop position.

7) If using the reverse function, move the throttle stick to the "REVERSE" position. The motor will emit a short series of triple beeps to confirm that it has detected the reverse position. If you don't require the reverse function, then just leave the throttle stick in the stop position for approximately ten seconds and the controller will confirm the settings with a series of triple beeps.

8) After the triple beeps, disconnect the drive battery to complete the setup.

BASIC PROGRAMMING

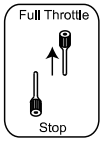
Basic parameters can be edited by moving the throttle stick on the radio, as detailed below. More advanced programming can be performed using the optional programmer unit.

ENTERING THE PROGRAMMING MODE

1) Connect the speed controller as shown in the photograph but DO NOT connect the drive battery yet.

2) Switch the Transmitter "ON".

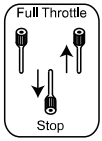
3) Move the throttle stick forward to the "FULL THROTTLE" position.



4) Connect the drive battery to the speed controller. The motor will emit a short series of beeps to confirm the connection.

5) After around 10 seconds, the motor will emit a double series of beeps. Wait a further 3 seconds and you will hear a triple series of beeps followed by single beeps together with the LED giving a single flashes confirming that Parameter 1 is now selected

SELECTING A PARAMETER

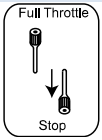


After entering programming mode, the motor should be emitting a single beep and the LED will emit a single flash to show that parameter 1 is currently selected. To move to the next parameter move the throttle stick from the "Full Throttle" position to the "Stop" position and then back again to the "Full Throttle" position again.

The controller will now emit continuous double beeps and the LED will flash twice to show that Parameter 2 has been selected. Repeat the stick movements again and you will hear continuous triple beeps with the LED flashing 3 times to show that Parameter 3 has been selected and so on for Parameters 4 and 5.

PROGRAMMABLE PARAMETERS	Parameter Type	Beep	LED Flashes
Parameter 1	Battery type	1	1
Parameter 2	Motor Rotation Direction	2	2
Parameter 3	Brake ON/OFF (Aircraft) Governor ON/OFF (Helicopter) Reverse ON/OFF (Car, Boat)	3	3
Parameter 4	AIRCRAFT / HELICOPTER	4	4
Parameter 5	BOAT / CAR	5	5

EDITTING PARAMETERS

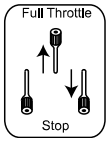


When you have selected the Parameter you want to change, move the throttle stick from the "Full Throttle" position to the "Stop" position and leave it there for at least 3 seconds. The motor will emit a multi tone bleep to confirm you are now editing a parameter, then the setting for the selected parameter will be displayed and beeped as per the table below.

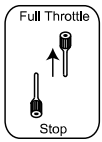
Parameter Number	Parameter type	LED ON Beep every 2 seconds	LED FLASHES Beep every 0.5 seconds
1	Battery Type	Li-Po	NiCd / NiMH
2	Direction of Rotation	Normal	Reverse
3	Brake (Aircraft) Governor (Helicopter) Reverse (Car, Boat)	OFF OFF OFF	ON ON ON
4	Model Type (Aircraft / Helicopter)	AIRCRAFT	HELICOPTER
5	Model Type (Boat / Car)	BOAT	CAR

IMPORTANT NOTE:

Editing parameters 4 or 5 (Model Types) will cause the model type to be changed and the other parameters may be reset. **THESE MUST BE SET FIRST before any other parameters are changed.**



You can then toggle the setting in the parameter by moving the throttle stick from the "Stop" position to the "Full Throttle" position and back again to the "Stop" position. The setting can been seen by the LED being on or flashing and the frequency of the beeps (see the table above).



To store the setting, move the throttle stick forward to the "Full Throttle" position and leave it there for at least 3 seconds. The motor will emit a multi tone bleep to confirm you have stored the parameter, then return to the parameter selection menu.

PROGRAMMING SUMMARY

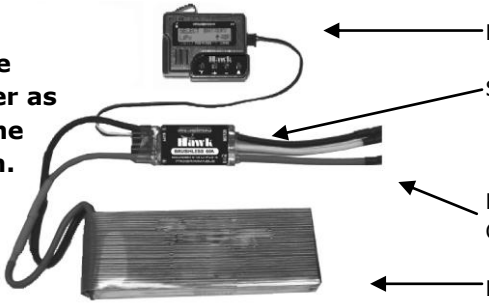
When the controller is in programming mode, it will flash and beep as detailed in the programming charts above, allowing you to select and edit the parameters.

When the throttle stick is held in the 'FULL THROTTLE' position, the parameter number is flashed and beeped as detailed in the parameter chart above. Moving the stick down then back up again allows you to move to the next parameter.

When the throttle stick is moved to and held in the 'STOP' position, the controller will enter the selected parameter and will flash/beep at a different speed, dependant on the current setting. To change this setting, move the throttle stick up and then back down again. To save and exit the parameter, move the stick back to the 'FULL THROTTLE' position.

PROGRAMMING USING THE OPTIONAL PROGRAMMER

Connect the programmer as shown in the photograph.



The Programmer is very easy to use. The outer arrows are used to move between the parameters and the '+' and '-' buttons are used to change the settings within the programming function.

Dependant on the model type, the prorgramming functions are laid out as shown in the table below.

To change the model type (shown as an icon on the right of the screen) press both outer buttons at the same time.

The programming functions that can be accessed using the programmer are detailed in the chart below.

Helicopter	Boat/Car	Aircraft
Select Battery	Select Battery	Select Battery
Cut-Off Voltage	Cut-Off Voltage	Cut-Off Voltage
Cut-Off Type	Cut-Off Type	Cut-Off Type
Motor Direction	Motor Direction	Motor Direction
Advance Timing	Advance Timing	Advance Timing
Acceleration	Acceleration	Acceleration
Start Power	Start Power	Start Power
Response to Governor	Reverse Function	Air Brake Type
Governor ON/OFF	Motor Pole Number	Air Brake ON/OFF
Motor Pole Number	Gear Ratio	Motor Pole Number
Gear Ratio	Max. RPM	Gear Ratio
Max. RPM	Average RPM	Max. RPM
Average RPM	Download	Average RPM
Download	Restore Memory	Download
Restore Memory	Back Up Memory	Restore Memory
Back Up Memory		Back Up Memory

N.B. After changing any settings using the programmer, the new settings must be downloaded to the controller.

Model Type

Press both outer buttons on the programmer (up and down) at the same time to change the model type between Aircraft, Helicopter, Car & Boat.

Battery Type:

Use the '+' or '-' buttons to select the type of battery being used.

N.B. It is very important that the correct battery type is selected, as different battery types require the controller to cut-off at different voltages. If a Lithium battery is allowed to discharge below it's minimum voltage, then permanent damage can be caused to the battery.

Cut-Off Voltage:

The Cut-Off Voltage varies according to the battery type that you have set. In "AUTO" mode the cut-off for Li-Po is 3.0V per cell and for NiCd/NiMH is 5.5V (variable cut-off type). However, you can set the range manually using the '+' and '-' buttons from 4.5V~33.0V.

Cut-Off Type:

In Cut-Off Type mode you can select the cut-off method when the battery falls below the selected cut-off voltage. Use the '+' and '-' buttons to switch between the two options of "SOFT OFF" or "HARD OFF".

Motor Direction:

The direction of the motor rotation can be selected between NORMAL and REVERSE.

Advance Timing:

Advance timing or Motor Timing alters the advance of the rotational field which has a similar effect to "advancing the ignition point". 8° is suitable for most motors, but if you want to use a special setup for your motor we would recommend the following ranges; 0°~10° for in-runner motors and 15°~25° for out-runner motors.

Acceleration:

You can set the rate of acceleration to your motor using the '+' and '-' buttons, choosing between Lowest / Low / Normal / High / Highest.

Start Power:

Similar to "Acceleration", Start Power allows you to determine the level of power fed to the motor when it starts up. Choosing between Lowest / Low / Normal / High / Highest.

Air Brake ON/OFF (AIR mode only):

This menu is used for switching the Air Brake On or Off.

Air Brake Type:

In AIR mode (model aircraft) it is possible to adjust the effect of the motor brake and select whether the motor stops slowly for a soft braking effect or quickly for a hard braking effect. The '+' and '-' buttons allow you to select from Slow / Normal / Fast.

Reverse Function (BOAT & CAR modes only):

This menu is used for switching between "One Way" (forward only) and "Two Way" (forward and reverse). Be careful that changing the direction of the motor doesn't cancel any of the other settings !

Governor ON/OFF (HELI mode only):

This mode is used for switching the speed governor on and off. The Governor mode stabilises the pre-set rotational speed and keeps it virtually constant.

Governor Response (HELI mode only):

This is used for setting the characteristics of the speed controller in speed governor mode. The available options of Slowest / Slow / Normal / Fast / Fastest can be chosen by using the '+' and '-' buttons. CAUTION: The faster the value you select, the higher the current draw from the battery. We recommend that you select a fairly low setting to avoid premature damage to the speed controller and drive battery.

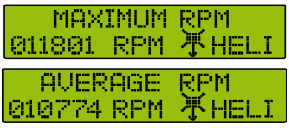
Motor Pole Number:

This menu allows you to enter the number of poles in your motor (between 2~36 poles). This value is very important for indicating the exact rotational speed.

Gear Ratio:

This menu allows you to enter the gear ratio you are using in your gearbox (from 1.0:1 to 25.0:1). The value for rotational speed indication is calculated using the number of motor poles and the gearbox reduction ratio.

Maximum RPM & Average RPM:

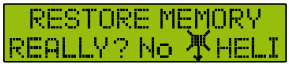


This mode shows you the maximum and the average rotational speeds recorded during the last flight, using the Motor Pole Number and Gear Ratio values from above.

Download:

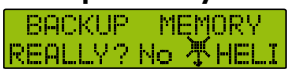
This mode is used for transferring the new settings to the speed controller. Press the '+' button to start the process and the programmer will beep once every second until the procedure is complete. If you wish to interrupt the process, press the '-' button.

Restore Memory:



Restore Memory is used to access values which have been stored in the Programmer's own memory. Press the '+' button to start the process and the programmer then beeps once every second until the procedure is complete. If you wish to interrupt the process, press the '-' button.

Backup Memory:



This mode allows you to store the selected values in the programmer's integral memory permanently. Press the '+' button to start the process and the programmer then beeps once every second until the procedure is complete. The values set on the speed controller are not affected by this action. If you wish to interrupt the process, press the '-' button.

WARNINGS

- Always ensure the correct polarity in all connecting cables.
- Always avoid short circuits.
- Keep the speed controller and the programmer dry and away from water, oil and grease.
- Ensure adequate air circulation around the speed controller.
- Always keep clear of the rotor blades, propellers and wheels when the drive battery is connected.
- Always keep within the values stated in the speed controllers specification.

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