



Tornado

Brushless Speed Controllers and optional Programmer

FS-TBL08	Tornado BL 8A	N6~12/Li 2~4
FS-TBL18	Tornado BL 18A	N6~12/Li 2~4
FS-TBL30HV	Tornado BL 30A HV	N6~18/Li 2~6
FS-TBL40HV	Tornado BL 40A HV	N6~18/Li 2~6
FS-TBL50HV	Tornado BL 50A HV	N6~18/Li 2~6
FS-TBL60HV	Tornado BL 60A HV	N6~18/Li 2~6
FS-TBLPROG	Tornado BL ESC Programmer	

Thank you for purchasing this Fusion Tornado 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

	Tornado BL8	Tornado BL18	Tornado BL30HV	Tornado BL40HV	Tornado BL50HV	Tornado BL60HV
Load Current	8A	18A	30A	40A	50A	60A
Peak Load	12A	22A	35A	50A	60A	70A
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
Weight (g)	15g	25g	29g	47g	49g	49g
NiCd/NiMH Cell No	6-12	6-12	6-18	6-18	6-18	6-18
Li-Po Cell No	2-4	2-4	2-6	2-6	2-6	2-6
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
Programmable	Yes	Yes	Yes	Yes	Yes	Yes
Rx Filter	Yes	Yes	Yes	Yes	Yes	Yes
PCO	Yes	Yes	Yes	Yes	Yes	Yes
POR	Yes	Yes	Yes	Yes	Yes	Yes
hec	32 kHz	32 kHz	32 kHz	32 kHz	32 kHz	32 kHz
TP	Yes	Yes	Yes	Yes	Yes	Yes
Cool Power FET	-	-	Yes	Yes	Yes	Yes

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

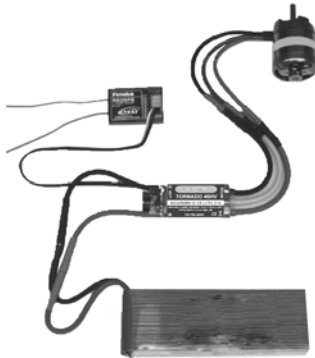
Attach suitable connectors for connection to the drive battery.

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) Move the controller 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 do not want to use the reverse function, then leave the throttle stick in the stop position (stage 6 in the above set up procedure) for approximately ten seconds and the controller will confirm the set up with a series of triple beeps.
- 8) Disconnect the drive battery.

PROGRAMMING

Without the optional “Programmer”

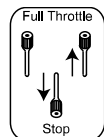
Entering the PROGRAMMING MODE:

- 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 further triple series of beeps followed by a continuous series of single beeps and LED flashes confirming that Parameter 1 has been selected

SELECTING A PARAMETER:

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

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.

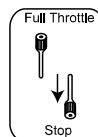


The controller will now emit continuous double beeps and the LED will flash twice to show that Parameter 2 has been selected. Repeat the stick movements again and you will hear continuous triple beeps with the LED flashing 3 times to show that Parameter 3 has been selected and so on for Parameters 4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

SETTING PARAMETERS:

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

When you have selected the Parameter you want to check/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 beep to confirm you are editing a parameter.

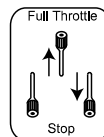


The setting for the selected parameter will be displayed and beeped as per the table above.

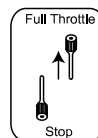
IMPORTANT NOTE:

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 be 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 beep to confirm you have stored the parameter, then return to the parameter selection menu.

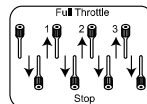


Once all parameters are stored, disconnect the drive battery. The speed controller is now programmed and ready for use.

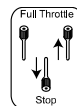
EXAMPLE: Selecting an Aircraft with the Airbrake on:

- 1) Switch the Transmitter on and move the throttle stick to "Full Throttle".
- 2) Connect the drive battery (confirmed by a brief beep).
- 3) After 10 seconds you will hear a double series of beeps, followed 3 seconds later by a triple series of beeps.
- 4) The speed controller is now in programming mode for Parameter 1 (repeating single beeps and LED flashes).

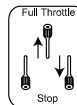
- 5) Move to Parameter 4 (Aircraft/Helicopter) by moving the throttle stick from the "Full Throttle" to "Stop" and back again 3 times until there are 4 beeps and LED flashes.



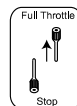
- 6) Move the throttle stick back to the "Stop" position and leave it for at least 3 seconds. The motor will emit a multi tone bleep to confirm you are editing a parameter.



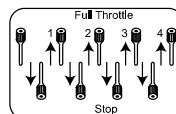
- 7) Now select "AIRCRAFT" by moving the throttle stick from the "Stop" to the "Full Throttle" and back again. This will toggle between the "AIRCRAFT" and "HELICOPTER" settings. When the LED is on and the speed controller is beeping every 2 seconds you have selected "AIRCRAFT".



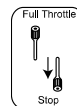
- 8) To store the setting, move the throttle stick to the "Full Throttle" position. The motor will emit a multi tone bleep to confirm you have stored the parameter, then return to the parameter selection menu.



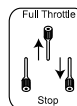
- 9) Move to Parameter 3 (Aircraft Brake) by moving the throttle stick from the "Full Throttle" to "Stop" and back again 4 times until there are 3 beeps and LED flashes.



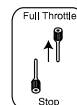
- 10) Move the throttle stick from "Full Throttle" to "Stop" and leave it for at least 3 seconds.



- 11) Now select "AIRBRAKE ON" by moving the throttle stick from "Stop" to the "Full Throttle" and back again. This will move between the "AIRBRAKE ON" and "AIRBRAKE OFF" settings. When the LED flashes and the speed controller is beeping every 0.5 seconds you have selected "AIRBRAKE ON".



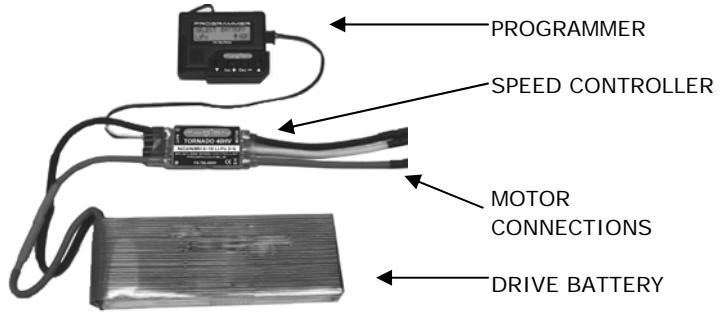
- 12) To store the setting, move the throttle stick to the "Full Throttle" position. The motor will emit a multi tone bleep to confirm you have stored the parameter.



- 13) You can now disconnect the speed controller from the drive battery.

PROGRAMMING WITH THE PROGRAMMER

Connect the programmer as shown in the photograph to the right.



The Programmer is very easy to use, with the outer arrows being used to move up and down the programming modes, which you then select by pressing both outer arrows at once.

The "INC +" and "DEC -" buttons are then used to select or change the settings within the programming modes.

With a few exceptions all of the programming points are laid out in exactly the same way and the table below shows the function lists of ease of reference.

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

Battery Type:

Use the INC or DEC buttons to set the battery type being used. If you are changing from NiCd/NiMH to Li-Po or vice versa, the new battery selection may change the "Cut-Off Voltage" and "Cut-Off Type" so be sure to check the new settings are correct.



SELECT BATTERY
LiPo ↑ AIR

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 3V per cell and for NiCd/NiMH is 5.5V (variable cut-off type). However, you can set the range manually using the INC and DEC buttons from 4.5V~33.0V.



CUT OFF VOLTAGE
AUTO ↕ HELI

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 INC and DEC buttons to switch between the two options of "SOFT OFF" or "HARD OFF".



CUT OFF TYPE
SOFT OFF ↕ HELI

Motor Direction:

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



MOTOR DIRECTION
Reverse ↕ HELI

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.



ADVANCE TIMING
8 ° ↕ HELI

Acceleration:

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



ACCELERATION
Highest ↕ HELI

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.



START POWER
Lowest ↕ HELI

Air Brake ON/OFF (AIR mode only):

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



AIR BRAKE On/OFF
On ↑ AIR

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 INC and DEC buttons allow you to select from Slow / Normal / Fast.



AIR BRAKE TYPE
Fast ↑ AIR

Reverse Function (BOAT & CAR modes only):

This menu is used for switching between "One Way" (forward only) and "Two Way" (forward and reverse). Be



REVERSE FUNCTION
Two Way # BOAT

careful that changing the direction of the motor doesn't cancel any of the other settings !

```
GOVERNOR ON/OFF
OFF          ↕ HELI
```

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.

```
RESPONSE OF GOV
Normal      ↕ HELI
```

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 INC and DEC 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 NUM
2 POLE     ↕ HELI
```

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
1.0 : 1    ↕ HELI
```

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
011801 RPM ↕ HELI
```

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.

```
DOWN LOAD
REALLY? No ↕ HELI
```

Download:

This mode is used for transferring the set values to the speed controller. Press the DEC 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 INC button.

```
RESTORE MEMORY
REALLY? No ↕ HELI
```

Restore Memory:

Restore Memory is used to access values which have been stored in the Programmer's own memory. Press the DEC 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 INC button.

```
BACKUP MEMORY
REALLY? No ↕ HELI
```

Backup Memory:

This mode allows you to store the selected values in the programmer's integral memory permanently. Press the DEC 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 INC button.

WARNING

- 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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