

# INSTRUCTION MANUAL



For 1/12 & 1/10 Scale Car  
Support Both Sensor or Sensor-less Brushless Motor

## INTRODUCTION

Thank you for purchasing G-FORCE TS90 90A Sensored ESC. Please read the Instruction Manual thoroughly before you use the product. These operating instructions are designed to ensure that you quickly become familiar with its features and functions and make full use of this product.

## SAFETY NOTE

- It is not a toy and suitable for users older than 14 years old.
- Never allow water, moisture, oil or other foreign materials to get inside ESC, motor, or on the PC Boards. It may damage the ESC completely.
- Never disassemble the ESC and modify the components on the PC Boards.
- Suggest using the original wires and connectors which are packed in the box.
- Never solder one part for more than 5 seconds as some components will get damaged by high temperature.
- Never run the ESC w/o load at full throttle and it may damage the bearings and other moving parts.
- Please make sure the location where to fix the ESC has good airflow ventilating so that the heat could dissipate quickly.
- To avoid short circuit, please keep the ESC connectors far away from other metal parts.
- Never connect the battery in polarity in reverse.
- Please remove the pinion gear before performing calibration and programming functions with this system. Please keep your hands, hair, cloth, clear from the gear train and wheels of an armed high performance
- Before you switch on the ESC, please make sure all the cables are well solder with the connectors (It is easy to get loose when running) . What's more, make sure the cables not touch the moving parts.
- Electronic motor timing will increase the temperatures of ESC and brushless motor. Use extreme caution when setting up and testing your application to avoid overloading and overheating.
- Incorrect timing setting may cause permanent damage to the ESC and motors. Please choose proper ratio and timing setting according to motor's instruction.
- To avoid signal interference, please always turn on the transmitter first THEN turn on the speed control. Do the opposite when powering it off.

- Never use faulty accessories, e.g. motor which may damage the ESC. Always insulate exposed wiring with heat shrink tubing or electrical tape to prevent short circuits, which can damage ESC too.
- Always disconnect the battery pack from the speed control when not in use to avoid short circuits and possible fire hazard. When the ESC is switched off, there is still small current and it may cause over discharge of the battery after some time.
- The ESC can support 4-9 cells NiMH or 2-3 cells LiPo battery.

Note: We will not be responsible for any damage caused by non-compliance with above instruction.

## PREPARATION

### 1) Plan Speed Control Placement

Choose a location for the speed control that is protected from debris. To prevent radio interference, place the speed control as far away from the radio receiver as possible and keep the power wires as short as possible. Select a location that has good airflow ventilating. If the ESC gets air flow, it will run cooler; and that means it will be more efficient.

### 2) Mount Speed Control in Vehicle

Use double-sided tape to mount the speed control in vehicle (do not use CA glue).

### 3) Soldering

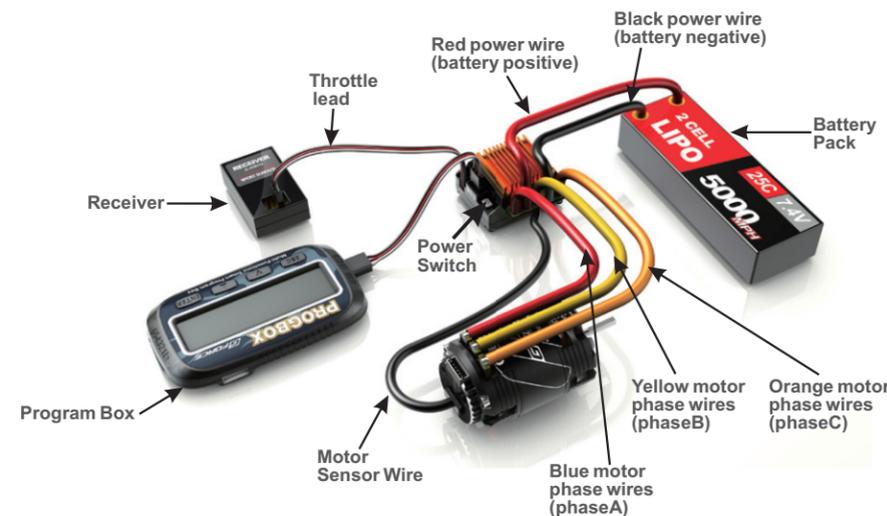
Cut the ESC's BLUE, YELLOW & ORANGE silicone motor power wires to the desired length and strip about 3.2mm-6.35mm (1/8"-1/4") of insulation from the end of each wire. "Pre-tin"the wire by heating the end and applying solder until it is thoroughly covered.

CAUTION: By very careful not to splash yourself with hot solder.

Place the ESC's BLUE Phase 'A' motor wire onto motor's 'A' solder tab and solder. Use soldering iron to apply heat to exposed wire; begin adding solder to tip of soldering iron and wire. Add just enough solder to form a clean and continuous joint from the plated area of the solder tab up onto the wire. Solder the ESC's YELLOW Phase'B' motor wire to the motor's 'B' solder tab and Solder the ESC's ORANGE Phase 'C' motor wire to motor's 'C' solder tab.

## CONNECTION

- 1) Connect the motor sensor harness to ESC. Insert the 6 pin connector on the end of the motor's sensor wires into ESC's sensor harness socket.
- 2) Connect Throttle lead to ESC and other end to the Receiver (Throttle Channel, Ch2)
- 3) Connect the motor and the ESC.
- 4) Connect ESC to batter pack.



## ESC CALIBRATION

Calibration is necessary for the first use of the ESC, or whenever used with a new/different transmitter. Individual transmitter's signals for full throttle, full brake and neutral vary. You must calibrate your ESC so that it will operate more effectively with your transmitter.

### How to calibrate the ESC?

- ESC switch OFF.
- Connect the ESC to the battery and the motor.
- Turn on the transmitter.
- Press and hold the ESC switch for few seconds, the motor will ring long beep once. After that, the red LED will blink the motor will ring like beep-beep-beep... in a row which indicates it is time to set the neutral position, full throttle and full brake one by one. You could release the ESC switch now.
- Keep the throttle trigger in neutral position, press the ESC switch once, the green LED will blink once then extinguish and the motor will ring beep once which indicates the neutral position has been set.
- Hold full throttle and press the ESC switch once, the green LED will blink twice then extinguish and the motor will ring twice like beep-beep which indicates the full throttle has been set.
- Move the throttle trigger to full brake and hold full brake, press the ESC switch once, the green LED will blink three times then extinguish and the motor will ring three times like beep-beep-beep which indicates the full brake has been set.
- After the calibration is finished, keep the throttle in neutral position, the red LED will stay ON, the ESC and the motor is ready to work.



## ESC ON/OFF AND LED INDICATOR

1. ESC ON/OFF: When the ESC is OFF, press the switch once, the motor will ring beep once and the red LED will stay on (Motor boost and turbo timing is on), then the ESC is ready to work. When the ESC is on, press the switch once, the LED will extinguish and the ESC is OFF.

Note 1: After running at full load, the ESC will be very hot. In this case, please turn off the ESC after it cools down.

Note 2: When the motor is running, the ESC can't be powered off by pressing the switch; when the motor stops working, the ESC can be powered off. In an emergency, please disconnect the battery to power off the ESC.

Note 3: When the motor is running, keep the trigger of the transmitter to full brake for 8 seconds, the ESC will be off.

### 2. Explanation of LED Indicator

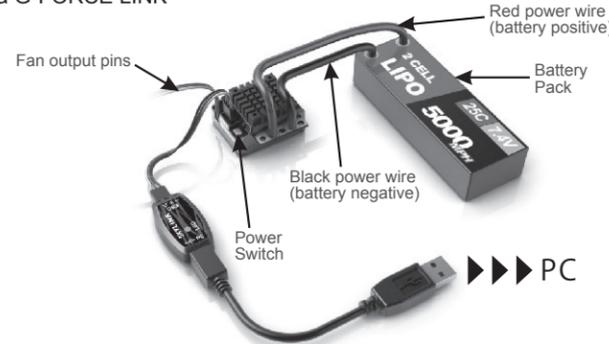
The throttle trigger is in neutral position	Red LED is blinking (zero timing)
The throttle trigger is in neutral position	Red LED stays on (Motor boost and turbo timing is on)
The motor is running while the throttle trigger doesn't reach to the highest throttle/brake position	Green LED is blinking.
The throttle trigger is at the highest throttle/brake position.	Green LED stays ON

## ESC PROGRAMMING

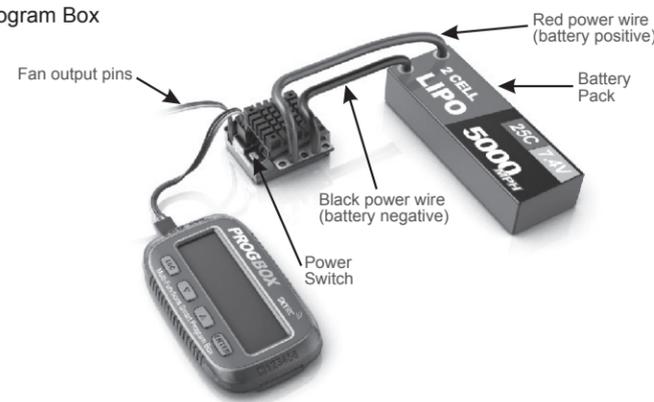
The ESC can be programmed by program box, PC (connected with G-FORCE LINK).

How to program the ESC?

### 1. PC via G-FORCE LINK



### 3. Program Box



## Programmable Items and Description

Section	Program Item	Description			
General Setting	Running Mode	Forward/Brake	Forward/Brake/Reverse	Forward/Reverse	
	Motor Direction	Normal	Reverse		
	Reverse Speed	25-100% (in 1% increment)			
	Voltage Cutoff *	3.0-11V (in 0.1V increment)	Auto (3.2V)		
	ESC Overheat Protection	85°C/185°F	105°C/221°F	125°C/257°F	Disable
	Motor Overheat Protection	85°C/185°F	105°C/221°F	125°C/257°F	Disable
Throttle Control	Punch Rate Switch Point	1-99%(in 1% increment)			
	1st Stage Punch Rate	1-30(in 1 increment)			
	2nd Stage Punch Rate	1-30(in 1 increment)			
	TH Input Curve	Linear	Custom		
	Throttle Dead Band	0.002-0.150ms			
	Throttle Status				
Brake Control	Drag Brake	0-100%(in 1% increment)			
	Brake Strength	0-100%(in 1% increment)			
	Initial Brake	=Drag Brake			
	Brake Rate Switch Point	1-99%(in 1% increment)			
	1st Stage Brake Rate	1-20(in 1 increment)			
	2nd Stage Brake Rate	1-20(in 1 increment)			
Boost Timing	Brake Input Curve	Linear	Custom		
	Boost Timing	0-64 deg (in 1° increment)			
	Boost Start RPM	1000-35000RPM (in 500RPM increment)			
	Boost End RPM	3000-60000RPM(in 500RPM increment)			
	Boost Liner Slop	Linear	Custom		
Turbo Timing	Boost Constrain by TH	Yes	No		
	Turbo Timing	0-64 deg (in 1° increment)			
	Turbo Activation Method	Full TH	RPM	Full TH+RPM	
	Turbo Full TH Delay	Instant	0.01-1S(in 0.05S increment)		
	Turbo Start RPM	9000-50000RPM/MIN(in 1000RPM increment)			
	Turbo Engage Slop	1-64 deg/0.1S (in 1° increment)			
Turbo Timing	Turbo Deactive Slop	Instant	1-64 deg/0.1S(in 1°increment)		

\*If you set the cut-off voltage manually, please note the adjustable voltage is TOTAL cut-off voltage of the battery pack. In AUTO mode, the default cut-off voltage is 3.2V/S, for example, the cut-off voltage of a 4S battery pack is 3.2V\*4=12.8V in AUTO mode.

Note: The output power of the motor will be improved when you adjust the motor timing. Electronic motor timing will increase the temperatures of ESC and brushless motor. Use extreme caution when setting up and testing your application to avoid overloading and overheating. Incorrect Boost and Turbo timing setting may cause permanent damage to the ESC and motors. Please choose proper ratio and timing setting according to motor's instruction.

Here is some suggestions about motor timing,

Motor Turns	3.5T/4.0T	4.5T/5.5T	6.5T/7.5T	8.5T/9.5T	10.5T/11.5T	≥13.5T
Boost Timing	0	0	10	15	20	30
Turbo Timing	10	15	45	55	45	55

## Profiles Preset

The users could preset and store 10 sets of profiles in the ESC. These data could be called out for application at any time without any special program setting. The user could also reset the profile according to his request. There is one factory default setting called Modify in the ESC. This mode can be used for modify class of touring car racing.

### Setting Details of Modify Mode

#### Modify Mode Setting Value

Section	Program Item	Description
General Setting	Running Mode	Forward/Brake
	Motor Direction	Normal
	Reverse Speed	25%
	Voltage Cutoff	3.2V/1S (Auto)
	ESC Overheat Protection	105°C/221°F
	Motor Overheat Protection	105°C/221°F
Throttle Control	Punch Rate Switch Point	50%
	1st Stage Punch Rate	5
	2nd Stage Punch Rate	5
	TH Input Curve	Linear
	Throttle Dead Band	0.080ms
	Throttle Status	
Brake Control	Drag Brake	10%
	Brake Strength	75%
	Initial Brake	=Drag Brake
	Brake Rate Switch Point	50%
	1st Stage Brake Rate	10
	2nd Stage Brake Rate	16
Boost Timing	Brake Input Curve	Linear
	Boost Timing	0°
	Boost Start RPM	15000RPM/MIN
	Boost End RPM	25000RPM/MIN
	Boost Liner Slop	Linear
Turbo Timing	Boost Constrain by TH	Yes
	Turbo Timing	0°
	Turbo Activation Method	Full TH
	Turbo Full TH Delay	0.1S
	Turbo Start RPM	20000RPM/MIN
Turbo Timing	Turbo Engage Slop	48°/0.1S
	Turbo Deactive Slop	30°/0.1S

## SPECIFICATION

Constant/Burst Current	90A/450A
Motor Compatible	Brushless Sensor & Sensorless ESC
Car Compatible	1/10 and 1/12 Buggy and Touring Car
	1/10 and 1/8 Crawlers
Motor Limits	5-6S NiMH or 2S LiPo--≥5.5T(1/10 Touring Car), ≥8.5T(1/10 Buggy)
	8-9S NiMH or 3S LiPo--≥10.5T(1/10 Touring Car), ≥17.5T(1/10 Buggy)
Resistance	0.0005ohm
Battery Cell Count	4-9S NiMH or 2-3S LiPo
BEC Output	6V@3A, linear
Size	39x38x20mm (LxWxH)
Weight	38g (w/o wire)
FAN	8V@0.2A , MAX 12.6V

REMARK: All the testing results are working with 540 class motors with standard timing.



Products by  
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