

INSTRUCTION MANUAL

SKYRC

TORO TS160
ADVANCED TIMING SYSTEM

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



INTRODUCTION

Thank you for purchasing TORO 1/10 ESC from SKYRC TECHNOLOGY CO.,LTD. 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 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.

- 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.

FEATURES

- Compact design for easy location.
- Aluminum case for better heat dissipation.
- Built in power switch for saving space and reliable operation.
- Built in capacitor.
- Advanced boost and turbo timing system for improving acceleration performance.
- Well-performed throttle and brake control function.
- 10 sets of profiles stored in the ESC for easy calling out.
- Adjustable BEC: 6V/7.4V.
- Keeping the trigger to full brake for 8 seconds to power off ESC.
- Variable programming method: program box, PC connected w/ SKYLINK) or smart phone via Bluetooth/Wi-Fi Module.
- Powerful Skylink software which can test motor timing and advise the ESC timing setting.
- Firmware update by PC.
- Safety features: low voltage protection, motor and ESC overheat protection and signal lost protection.

SPECIFICATION

Constant/Burst Current	150A/600A
Motor Compatible	Brushless Sensor & Sensorless ESC
Car Compatible	1/10,1/12 all competitions
	1/10 and 1/8 Crawlers
Motor Limits	2S Lipo or 4-6S NiMH ≥3.5T(1/10 on-road), ≥5.5T(1/10 off-road)
	3S Lipo or 7-9S NiMH ≥5.5T(1/10 on-road), ≥8.5T(1/10 off-road)
Resistance	0.00018ohm
Battery Cell Count	4-9S NiMH or 2-3S LiPo
BEC Output	6V/7.4V@5A, switch
Size	37.8x35.6x22.5mm (LxWxH)
Weight	45g (w/o wire)
FAN	8V@0.2A , MAX 12.6V

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

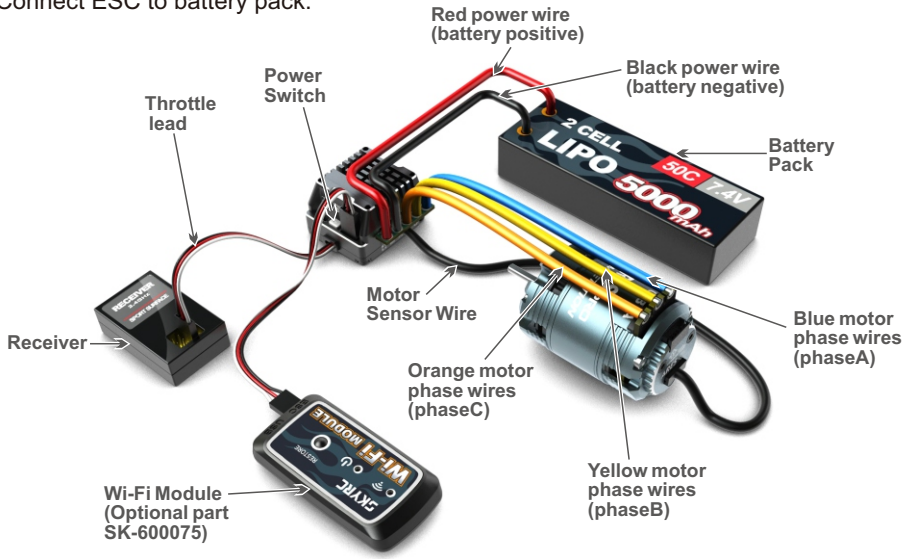
Cut the ESC's BLUE, YELLOW & ORANGE silicone motor power wires to the desired length and strip about 3.2mm-6.35mm (1/8"-1/4") of insulation from the end of each wire. "Pre-tin"the wire by heating the end and applying solder until it is thoroughly covered.

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) Solder the motor and the ESC.
- 4) Connect ESC to battery 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. (If the "Cutoff voltage" was set in Auto mode, the ESC will detect the battery cell count after that. If it is 2 cell battery, the motor will beep twice; if it is 3 cell battery, the motor will beep three times.)
- After the calibration is finished, keep the throttle in neutral position, the red LED will stay on or blink, depending on the ESC timing set, then 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, (If the "Cutoff voltage" was set in Auto mode, the ESC will detect the battery cell count after you turn it on. If it is 2 cell battery, the motor will beep twice; if it is 3 cell battery, the motor will beep three times.) and the red LED will stay on or blink which indicates the ESC is ready to work. When the ESC is on, press and hold the switch for 1 second, 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 turn off.

2. Explanation of LED Indicator

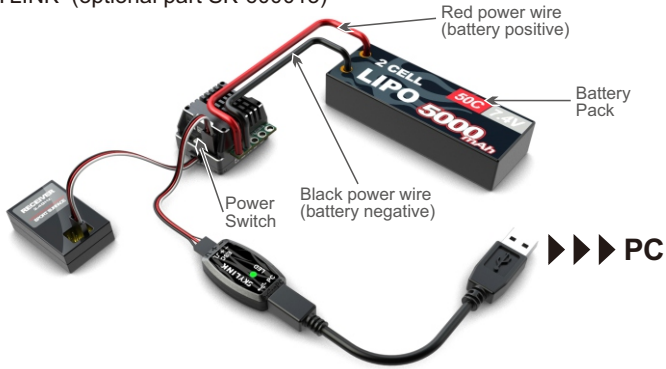
The throttle trigger is in neutral position	Red LED is blinking (zero timing)
The throttle trigger is in neutral position	Red LED stays on (Motor boost and turbo timing is on)
The motor is running while the throttle trigger doesn't reach to the highest throttle/brake position	Green LED is blinking.
The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

ESC PROGRAMMING

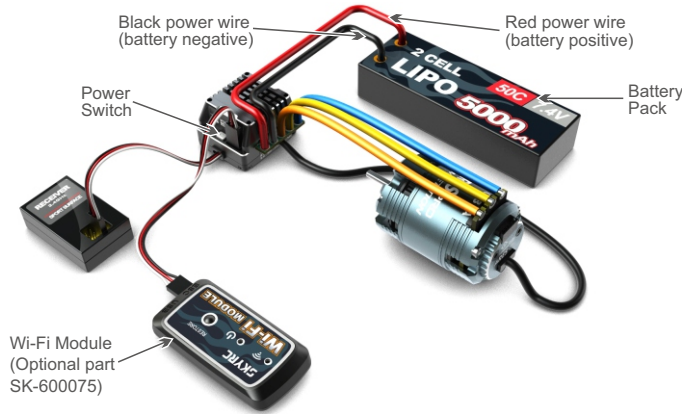
The ESC can be programmed by program box, PC (connected with SKYLINK) or smart phone via bluetooth module.

How to program the ESC?

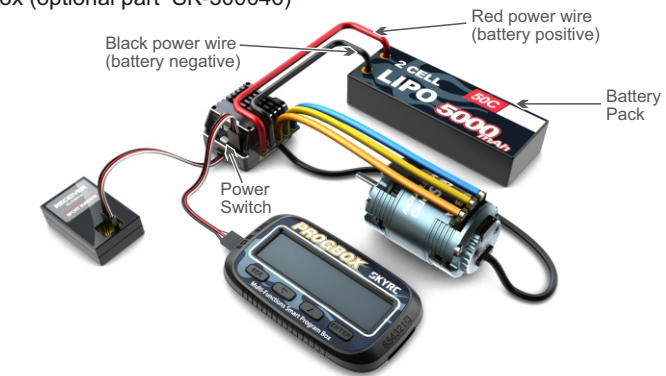
1. PC via SKYLINK (optional part SK-600013)



2. Smart Phone via Wi-Fi Module (optional part SK-600075)



3. Program Box (optional part SK-300046)



Programmable Items and Description

Section	Program Item	Description				
Setting	Pre Setting	Modify / Profile1/Profile2/Profile3.....Profile9				
	Language	English/中文/日本語/Germany				
	Running Mode	Forward/Brake	Forward/Brake/Reverse		Forward/Reverse	
	Motor Direction	Normal	Reverse			
	ESC Overheat Protection	85℃/185°F	105℃/221°F		125℃/257°F	Disable
	Motor Overheat Protection	85℃/185°F	105℃/221°F		125℃/257°F	Disable
	BEC Voltage	6.0V			7.4V	
	Reverse Speed	25-100% (in 1% increment)				
	Voltage Cutoff*	3.0-11V (in 0.1V increment)			Auto (3.2V/S)	Close
Throttle	TH Input Curve	Line	Custom			
	Throttle Rate Switch Point	1-99%(in 1% increment)				
	1st Stage Throttle Rate	Very Weak	Weak	Moderate	Strong	Very Strong
	2st Stage Throttle Rate	Very Weak	Weak	Moderate	Strong	Very Strong
	Throttle Dead Band	10-150us				
Brakes	Brake Input Curve	Line	Custom			
	Drag Brake	0-50%(in 1% increment)				
	Brake Strength	1-99%(in 1% increment)				
	Initial Brake	0-50%(in 1% increment)				
	Brake Rate Switch Point	1-99%(in 1% increment)				
	1st Stage Brake Rate	Very Weak	Weak	Moderate	Strong	Very Strong
	2nd Stage Brake Rate	Very Weak	Weak	Moderate	Strong	Very Strong
Timing	Boost Timing	0-60 deg (in 1° increment)				
	Boost Start RPM	1000-35000RPM (in 500RPM increment)				
	Boost End RPM	3000-60000RPM(in 500RPM increment)				
	Turbo Timing	0-60 deg (in 1° increment)				
	Turbo Activation Method	Full TH	RPM		Full TH+RPM	
	Turbo Delay	0-1.00S (in 0.01S increment)				
	Turbo Start RPM	9000-50000RPM/MIN(in 1000RPM increment)				
	Open Speed	1-60 deg/0.1S (in 1° increment)				
	Close Speed	0-60 deg/0.1S (in 1° increment)				
	Road Zero Timing Mode	Able/Disable				

*If you set the cut-off voltage manually, please note the adjustable votage 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 3S battery pack is 3.2V*3=9.6V in AUTO mode.

Note1: 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.

Note2: The program items and setting selections is vary due to different programming method.

Profiles Preset

10 sets of profiles can be preset and stored in the ESC. The factory default settings are all Modify which can be used for modify class of touring car racing in 10 sets and the user could reset the profiles according his need. These data could be called out for application at any time without any special program setting.

Setting Details of Modify Mode

Modify Mode Setting Value

Section	Program Item	Description
Setting	Pre Setting	Modify
	Language	Depending on the Language of the OS
	Running Mode	Forward/Brake
	Motor Direction	Normal
	ESC Overheat Protection	105℃/221°F
	Motor Overheat Protection	105℃/221°F
	BEC Voltage	6.0V
Throttle	Reverse Speed	25%
	Voltage Cutoff*	Auto (3.2V/S)
	TH Input Curve	Linear
	Throttle Rate Switch Point	50%
	1st Stage Throttle Rate	Very Weak
	2st Stage Throttle Rate	Very Weak
Brakes	Throttle Dead Band	80us
	Brake Input Curve	Linear
	Drag Brake	10%
	Brake Strength	75%
	Initial Brake	=Drag Brake
	Brake Rate Switch Point	50%
Timing	1st Stage Brake Rate	Moderate
	2nd Stage Brake Rate	Strong
	Boost Timing	0°
	Boost Start RPM	15000RPM
	Boost End RPM	25000RPM
	Turbo Timing	0°
	Turbo Activation Method	Full TH
	Turbo Delay	0.10S
	Turbo Start RPM	20000RPM/MIN
	Open Speed	45°/0.1S
	Close Speed	28°/0.1S
	Road Zero Timing Mode	Disable

TROUBLE SHOOTING

Problem 1 Motor sounds like B-B-B-

Cause No signal from the transmitter.

Solution

Check the signal wire, connector and transmitter and confirm it works well.

Problem 2 Motor sounds like BB-BB-BB-

Cause Low voltage protection.

Solution

Change battery.

Problem 3 Motor sounds like BBB-BBB-BBB-

Cause ESC overheat protection.

Solution

- 1.Add ESC or motor cooling fan
- 2.Turn off the ESC and restart it until it cools down
- 3.Reset the temp of ESC overheat protection

Problem 4 Motor sounds like BBBB-BBBB-BBBB-

Cause Motor overheat protection.

Solution

- 1.Add ESC or motor cooling fan
- 2.Turn off the ESC and restart it until it cools down
- 3.Reset the temp of motor overheat protection

Problem 5

The ESC/Motor protection occurs even the protection temp is 125℃/257°F

Cause

The power system of the car is overloaded due to over gear ratio, over motor rpm and over timing set.

Solution

- 1.Adjust the gear ratio
- 2.Change motor
- 3.Reset the timing.

WARRANTY AND SERVICE

The TORO 10 Brushless ESC is guaranteed to be free from defects in materials or workmanship for a period of 90 DAYS from the original date of purchase (verified by dated, itemized sales receipt). Warranty does not cover incorrect installation, components worn by use, damage to case or exposed circuit boards, damage due to timing, damage from using more than 3 LiPo cells input voltage, cross-connection of battery/motor power wires, overheating solder tabs, reverse voltage application, improper use or installation of external BEC, damage resulting from thermal overload or short-circuiting motor, damage from incorrect installation of FET servo or receiver battery pack, tampering with internal electronics, allowing water, moisture, or any other foreign material to enter ESC or get onto the PC board, incorrect installation/wiring of input plug plastic, allowing exposed wiring or solder tabs to short-circuit, or any damage caused by a crash, flooding or natural disaster. Because SKYRC has no control over the connection & use of the speed control or other related electronics, no liability may be assumed nor will be accepted for any damage resulting from the use of this product. Every SKYRC speed control & motor is thoroughly tested & cycled before leaving our facility and is, therefore, considered operational. By the act of connecting/operating speed control, user accepts all resulting liability. In no case shall our liability exceed the product's original cost. We reserve the right to modify warranty provisions without notice. This product is not intended for use by children under 14 years of age without the strict supervision of an adult. Use of this product in an uncontrolled manner may result in physical damage or injuries take extra care when operating any remote control.

Note:

1. The warranty service is valid in China only.
2. If you need warranty service overseas, please contact your dealer in the first instance, who is responsible for processing guarantee claims overseas. Due to high shipping cost, complicated custom clearance procedures to send the goods back to China. SkyRC do not provide warranty service to overseas end user directly.
3. If you have any questions which are not mentioned in the manual, please feel free to send email to info@skycrc.cn



SKYRC

Manufactured by
SKYRC TECHNOLOGY CO., LTD.
www.skycrc.com

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