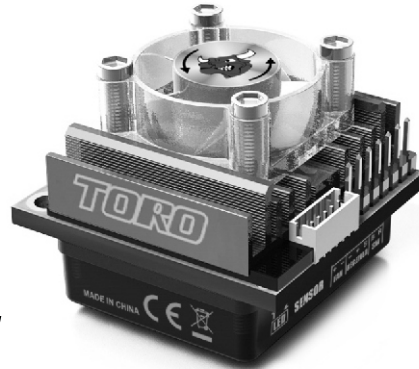


# INSTRUCTION MANUAL

# TORO 10



## 1/10 SCALE ADVENCE RACING SPEED CONTROLLER

Support Both Sensor or Sensor-less Brushless Motor

PLEASE READ ALL INSTRUCTIONS BEFORE OPERATION

### INTRODUCTION

Congratulations and thank you for purchasing TORO High performance sensor 1/10 Scale Brushless Motor Electronic Speed Control. The TORO ,1/10 scale brushless ESC represents a latest technologies, providing all the features and robust design qualities.

### SAFETY NOTE

**! WARNING:** This is an extremely powerful brushless motor system. We strongly recommend removing your pinion gear for your own safety and the safety of those around you 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 system.

#### • WATER & ELECTRONICS DON'T MIX!

Never allow water, moisture, or other foreign materials to get inside ESC, motor, or on the PC Boards. **Water damage will void the warranty!**

#### • NO REVERSE VOLTAGE!

Reverse battery polarity can damage ESC & void warranty. Disconnect battery immediately if a reverse connection occurs.

#### • DISCONNECT BATTERIES WHEN NOT IN USE

Always disconnect the battery pack from the speed control when not in use to avoid short circuits and possible fire hazard.

#### • TRANSMITTER ON FIRST

Turn on the transmitter first THEN turn on the speed control.

#### • INSULATE WIRES

Always insulate exposed wiring with heat shrink tubing or electrical tape to prevent short circuits, which can damage ESC.

#### • TIMING PRODUCES DANGEROUSLY HIGH SPEED

When Toro's electronic motor timing is enabled, the vehicle speed can be increased dramatically. Please take extra precautions.

#### • TIMING INCREASE ESC & MOTOR'S TEMPERATURE.

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.

#### • 2-3 LIPO OR 4-8 NiMH CELLS ONLY

Never use fewer than 2 or more than 3 LIPO cells (4-8 NiMH) in the vehicle's main battery pack. The Toro 10 handles up to 12.6 Volts Max.

### BEFORE YOU BEGIN

#### 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). Secure power capacitor module to chassis. You can use double-sided tape or a tie wrap to mount power capacitor to the vehicle's chassis or shock tower. Module can also be tie-wrapped along the power wires.

Use double-sided tape to mount the switch where it will be easy to access. Select a position where it will not get damaged or get switched OFF during a crash or roll-over.

#### 3) Soldering

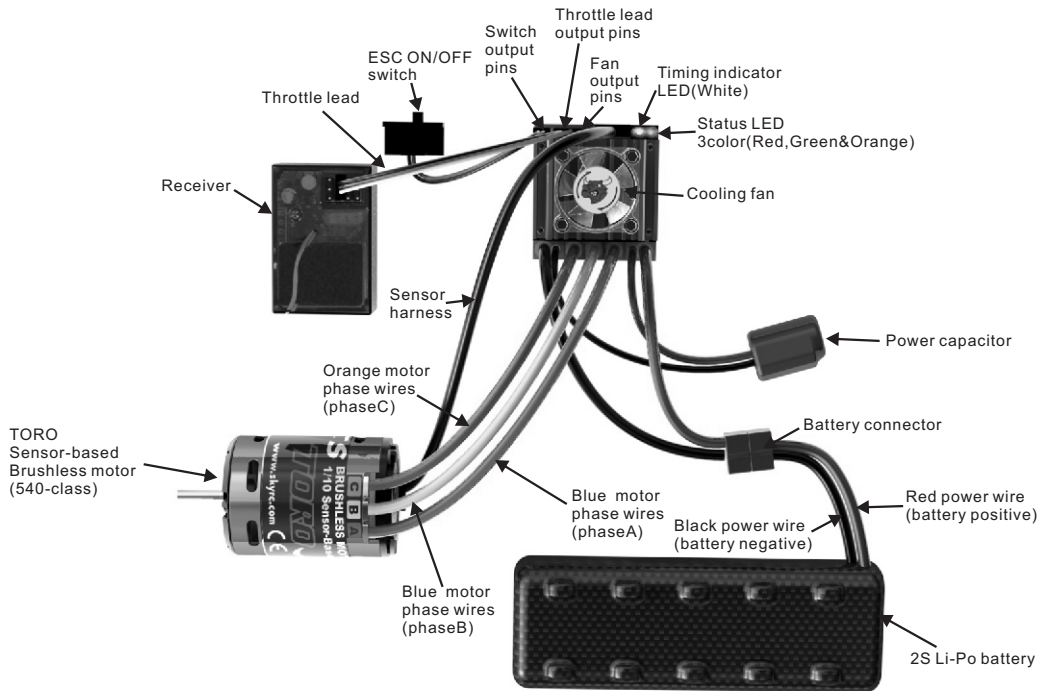
Cut the ESC's BLUE, YELLOW & ORANGE silicone motor power wires to the desired length and strip about 3.2mm-6.35mm (1/8"-1/4") of insulation from the end of each wire. "Pre-tin" the wire by heating the end and applying solder until it is thoroughly covered.

*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.

## CONNECTIONS

- Connect 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.
- Connect ON/OFF switch to power output pins.
- Connect Throttle lead to ESC and other end to the Receiver (Throttle Channel, Ch2)
- Connect ESC to battery pack



## ESC/TRANSMITTER CALIBRATION

**IMPORTANT NOTE:** Calibration is necessary for the first use of the ESC, or whenever used with a new/different transmitter.

For users with a Futaba Transmitter, you must reverse the throttle channel signal on your transmitter. Please refer to your Futaba instructions.

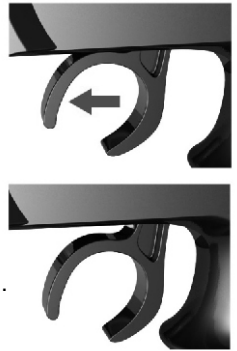
Individual transmitter's signals for full throttle, full brake and neutral vary. You must calibrate your ESC so that it will operate more effectively with your transmitter.

### How to Calibrate ESC

- ESC switch OFF.
- Turn on the Transmitter.
- Hold full throttle on your transmitter and turn the ESC's switch ON. Keep holding full throttle on the transmitter. The ESC will flash the LED and ring the initialization tones.
- Wait 2 seconds
- Green LED blinks rapidly and the motor will ring 1 second indicating full throttle measured.



- Red LED blinks while beeping, indicating it's time to push full brake. Move throttle trigger to full brake and wait few seconds, the ESC will blink red LED and ring 1 second indicating full brake measure.
- Yellow LED blinks while beeping, indicating it's time for neutral. Relax trigger to neutral (center). The ESC will now ring 1 second and flash the yellow LED rapidly to accept the neutral position.
- ESC will blink LED and ring one second indicating that it is armed.

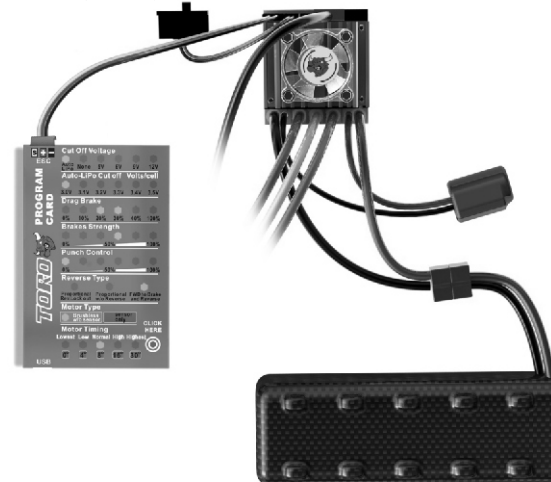


From this point on, when you connect batteries and turn on the switch, the ESC will give the initialization tone and flash, and the arming tone will ring second or two later. If the ESC is programmed for the Auto-Lipo setting, it will beep the number of cells in your Lipo pack between the initialization tones and the arming tones. After the arming tone plays, the ESC will ACTIVE and will respond to the throttle application.

## ESC PROGRAMMING

### 1) Programming Card (Optional Part)

Programming Card allows you to modify the most commonly used settings in your TORO 10 controller all at the touch of a single button. No computer needed. Simply connect the Programming Card to the throttle lead of the controller and power the programming card as described below. Click the button to scroll through and change the indicated settings. All the settings will show on the programming card at once. Can't get any easier!



#### Instruction for Program Card

- Turn off the ESC and disconnect the throttle lead from the receiver.
- Connect the throttle lead from ESC to the 3 pin connector on the Program Card.
- Turn on the ESC to apply power to both ESC and Program Card.
- All the current settings will be displayed on the correspond LEDs. Press and release button to move between settings.
- Press and hold button to change the value for that setting.
- Turn off the ESC and disconnect the throttle lead from Program Card and connect it back to the receiver.

### 2) Manual Programming

Manual Programming TORO 10 is as simple as answering a few questions. The TORO 10 asks questioning by beeping a setting number, followed by the possible setting values. There are eight settings that can be programmed in the TORO .

## Programmable Features

Question (Setting)	Value	Description
1) Brake/Reverse Type	<b>1) Reverse Lockout(D)*</b> 2) Forward/Brake Only 3) Forward/Brake/Reverse	Allow the use of reverse only after the ESC senses two seconds of neutral throttle. No reverse function. Reverse or forward is accessible at any time after the ESC brakes to zero motor RPM.
2) Brake Amount	1) 25% <b>2) 50%(D)*</b> 3) 75% 4) 100%	Allow only 25% of available braking power at full brake. Allow only 50% of available braking power at full brake. Allow only 75% of available braking power at full brake. Allow all available braking power.
3) Reverse Amount	1) 25% <b>2) 50%(D)*</b> 3) 75% 4) 100%	Allow only 25% power in reverse. Allow only 50% power in reverse. Allow only 75% power in reverse. Allow all power in reverse.
4) Punch Control	1) High 2) Medium 3) Low <b>4) Lowest(D)*</b> 5) Disable	Very Limited acceleration. Good for 2WD vehicles. Medium acceleration limiting. Light acceleration limiting. Good for 4WD vehicles on soft dirt. Very light acceleration limiting. Good for most situation. Acceleration is only limited by battery ability. This setting is good for 4WD on high traction drag racing.
5) Drag Brake	<b>1) Disable(D)*</b> 2) 10% 3) 20% 4) 30% 5) 40%	Vehicle will coast with almost no resistance from the motor at neutral throttle. Low amount of braking effect from the motor at neutral throttle. More braking effect from the motor at neutral throttle. Fairly high braking effect from the motor at neutral throttle. High braking effect from the motor at neutral throttle.
6) Throttle Dead Band	1) Large <b>2) Normal(D)*</b> 3) Small(D)* 4) Very Small 5) Smallest	0.1500ms 0.1000ms 0.0750ms 0.0500ms 0.0250ms
7) Voltage Cutoff	1) None <b>2) Auto-Lipo(D)*</b> 3) 5V 4) 6V 5) 9V	Does not cut off or limit the motor due to low voltage. Use this setting ONLY with NiCad or NiMH Packs. Do not use with any LiPo Packs! Automatically detects the number of LiPo cells you have plugged in. Cuts off/limits acceleration when the pack gets down to 5 volts. Cuts off/limits acceleration when the pack gets down to 6 volts. A must use setting for 2 cells LiPo packs. Cuts off/limits acceleration when the pack gets down to 9 volts. A must use setting for 3 LiPo packs

8) Motor Timing	1) Disable <b>2) Normal(D)*</b> 3) Highest	A maximum efficiency setting giving long runtimes and cooler motor temperature. The best mix of speed, punch and efficiency for all motors. Increases ampere draw, reduces runtimes, increase motor temperatures and may increase top speed/punch slightly.
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**Note: Factory Defaults are indicated by asterisk (D)\***

You must answer "yes" or "no" to the setting values as they are presented by TORO 10. When you enter programming mode the ESC will emit a sequence of beeps and LED flashes that tell you which programming step you are in. There are two parts to the beep sequence. The first set of beeps indicates the 'Setting Number (Question), e.g. Brake/Reverse Type, and the second set of beeps indicates a Setting Value, e.g. Reverse Lockout. Answering "No" to a Setting value will cause the ESC to ask for the next value in that section. After a "Yes" answer is accepted, the ESC knows you aren't interested in any other option in that section, so it skips to the first option in the next section.

Note: If you answer "no" to all Setting Values for a particular Setting Number, the ESC will keep whatever value had been previously programmed. Only by answering "Yes" to a Setting Value will the ESC store/change that value.

### How to Enter Programming Mode

- Plug Battery into the TORO 10
- Hold full throttle on your transmitter
- Turn the ESC switch ON
- TORO 10 flashes LED and rings once
- Wait few seconds.
- TORO 10 flashes LED and rings 1 second indicating that it is ready for CALIBRATION mode
- Continue to hold full throttle
- TORO 10 flashes LED while beeping
- Wait another few seconds
- TORO 10 flashes LED and rings 1 second
- TORO 10 flashes LED while beeping indication that you are in PROGRAMMING mode
- Let trigger go neutral (Centre)

At this point the TORO 10 will be flashing/beeping the following sequence:

Beep-Pause-Beep... and then repeats

This indicates that you are at Question 1 and it is asking to accept/reject value 1.

When answering a question, you will need to move the trigger to yes (full throttle) position or the no (full brake) position and keep it there for about 3 seconds. When the ESC has accepted your answer it will confirm your reply by flashing the LED and emitting a beeping tone. Release the trigger allowing it to go to Neutral to confirm that you are ready for ESC to ask you next question. You are not required to continue through all eight programming options. For example, if you wish only to change the Brake/Reverse Type (Option 1) then after programming that setting you can disconnect power from the ESC and you're ready to run. Disconnecting the controller in the middle of programming simply retains the values for the remaining programming options that were previously set up.



## TIMING INDICATOR LED

To conform to ROAR's Sportsman Class racing rules and help race organizers monitor driver compliance in non-timing race classes, Toro 10 ESC has included a feature in this speed control that indicates when the ESC has its electronic motor timing advancement feature activated.

At all times when the speed control is powered ON and the Dynamic Motor Timing is turned ON and set to a level greater than zero timing advance, the ESC's white status LED will be illuminated during normal operation.

## SPEED CONTROL SPECIFICATION

Controls, TORO 10 RTR Sensor		Fwd/Brk or Fwd/Rev	
Input Power(Cells)		2-3S LiPo/LiFe, 4-8 NiMH (12.6V Max)	
Motor Limits,	S120	120A	2S LiPo(4-6S NiMH): On Road ≥4.5T Off Road ≥6.5T 3S LiPo(7-8S NiMH): On Road ≥6.5T Off Road ≥9.5T
	S60	60A	2S LiPo(4-6S NiMH): On Road ≥6.5T Off Road ≥8.5T 3S LiPo(7-8S NiMH): On Road ≥10.5T Off Road ≥17.5T
	S45	45A	2S LiPo(4-6S NiMH): On Road ≥8.5T Off Road ≥11.5T 3S LiPo(7-8S NiMH): On Road ≥13.5T Off Road ≥17.5T
	S35	35A	2S LiPo(4-6S NiMH): On Road ≥10.5T Off Road ≥13.5T 3S LiPo(7-8S NiMH): On Road ≥13.5T Off Road ≥18.5T
Linear BEC		5.0Volts, 2Amp	
Status LED(2 LEDs)		White LED, 3 Color LED(Red, Green & Orange)	
Thermal Overload Protection		Yes	
Compatibility		Sensored Brushless Motor or Sensorless Brushless Motor	
Dimensions(Without fan)		40.5X37.5X24mm (1.6X1.47X0.95in)	
Weight (Without wires)		45g (1.59oz)	

## TROUBLE SHOOTING

**Problem:** My TORO ESC may or may not arm, but it will not calibrate to my transmitter

**Solution:** Most calibration issues can be solved by changing settings on the transmitter. Make sure you have both your throttle and brake endpoints (called EPA or ATV on your radio) on the throttle channel out to between 100 to 120%. Make sure if you have a Futaba or Futaba made transmitter to have the throttle channel set to the reversed position.

**Problem:** My ESC calibrates for the full throttle and full brake positions but won't calibrate to the neutral throttle position. (Orange LED keeps flashing)

**Solution:** Try moving the throttle trim one way, then the other (usually towards the throttle side is best). If your transmitter has a 50/50 and 70/30 setting for the throttle, set it for 50/50 and retry calibration. Also, if you have changed the dead band to a narrower band you may want to try going back to the "normal" setting.

**Problem:** Speed Control Runs Excessively Hot

**Solution:** Reduce timing level setting in ESC. Electronic motor timing set too high. Increase gear ratio/Reduce pinion.

**Problem:** My vehicle acts like it has "turbo lag" (poor acceleration/punch for the first few feet or yards)

**Solution:** Make sure you're using high quality batteries and a battery connector capable of high amp flow (40-100 amps). This behavior is very typical of a battery pack that is having difficulty providing the power your vehicle/system requires for top performance. Use copper bars to connect cells rather than welded tabs. Copper bars have a much lower resistance.

**Problem:** My battery pack is plugged into the ESC and nothing is working

**Solution:** Make sure the ESC's receiver plug is plugged into channel 2 on the receiver, and that it's plugged in with the correct orientation. Double check your solder connections on the battery plug, and make sure the battery is showing good voltage.

**Problem:** Timing Does Not Operate Properly

**Solution:** Set motor rotation to counter-clockwise - Electronic motor timing advancement only functions in counter-clockwise rotation direction. You may solve this problem by disable motor timing.

**Problem:** The ESC shut off and red LED flashing

**Solution:** The ESC has built in thermal protection circuitry to protect the ESC from being damaged during running. If the thermal protection shuts the ESC off, the redLED will flashing. Check the KV value of motor and make sure the pinion is not too large for the motor. Once the ESC cool down, it will resume working.

## PRODUCT WARRANTY

The TORO 10 Brushless ESC is guaranteed to be free from defects in materials or workmanship for a period of 120 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 Li-Po 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 injurise take extra care when operating any remote control vehicle.

SPECIFICATIONS ARE SUBJECT TO CHANGE WITHOUT NOTICE.

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