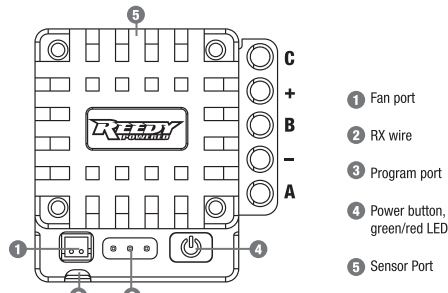


REEDY POWERED BLACKBOX 510R

#27004
#27005
#27027

OWNER'S MANUAL



ESC/RADIO CALIBRATION

1. Power ON the transmitter and adjust the throttle/brake endpoints to 100% and the throttle trim to neutral.
2. Plug the ESC into a charged battery and place your vehicle on a stand with the wheels off the ground.
3. While the transmitter is at neutral and the ESC off, press and hold the Power button until the green LED illuminates and remains solid. Release the Power button.
4. While the transmitter is in the neutral position, press the Power button. The green LED will blink until the red LED illuminates and remains solid. The neutral point has been saved.
5. Move the transmitter to the full throttle position, and press the Power button. The red LED will blink until both the red and green LEDs illuminate and remain solid. The full throttle position has been saved.
6. Move the transmitter to the full brake position, and press the Power button. The red and green LEDs will blink and then go off. The full brake position has been saved.
7. Return the transmitter to neutral. The green LED will either blink (zero-timing default setting) or remain solid (depending on activation of timing settings when using the Programmer) to signify that it is in the neutral position. If the ESC is in Forward/Reverse/Brake mode, the red LED will also illuminate and remain solid while at the neutral position.
8. The ESC calibration is complete and the ESC is ready to use.

IMPORTANT ESC/Radio calibration must be completed with new ESCs, when changing transmitters, after firmware updates and after repair service.

PARTS LISTINGS

27004	Blackbox 510R Competition ESC
27005	Blackbox 510R Competition ESC w/Programmer2
27024	Blackbox Pro Capacitor Unit
27027	Blackbox Programmer2
27028	Blackbox 30x30x7mm Fan w/screws
27029	Blackbox Pro Modified Capacitor Unit
27030	Blackbox ESC Programmer2 Connection Wire
27031	Blackbox 30x30x10mm Fan w/screws

DEFAULT SETTINGS				
		Tuning Mode	Standard	Expert
Brake	1A	Drag Brake	10%	12%
	1B	Brake Strgth	90%	55%
	1C	Init Brake	=Drag Brake	=Drag Brake
	1D	Drag Freq	=Brk Freq	=Brk Freq
	1E	Brake Freq	2KHz	1.5KHz
	1F	Brake Punch	Level 5	Level 5
Dynamic Drag Brake	2A	Dynamic Drag	NA	0%
	2B	Drag SW RPM	NA	30000
	2C	Max Ddrag RPM	NA	45000
	2D	Drag Rel Rate	NA	2000
Throttle	3A	Punch Ctrl	Level 5	Level 4
	3B	Init Throttle	0%	0%
	3C	Drive Freq	8KHz	12KHz
	3D	Dead Band	6%	6%
	3E	Current Limit	100%	90%
Motor Power	4A	Boost Timing	NA	0
	4B	Boost ST RPM	NA	15000
	4C	Boost End RPM	NA	40000
	4D	B. TH Limit	NA	Off
	4E	Turbo Timing	NA	15°
	4F	Turbo ST RPM	NA	25000
	4G	Turbo Act	NA	Full TH
	4H	Turbo Delay	NA	0.05
	4J	Slew Rate	NA	3°/0.1s
	4K	Release Rate	NA	3°/0.1s
Misc. Control	5A	Timing Level	Level 0	NA
	6A	Run Mode	For/Brake	For/Brake
	6B	Reverse Power	25%	25%
	6C	Batt Cutoff	3.4V/cell	3.4V/cell
	6D	ESC Temp Cut	194F/90C	194F/90C
	6E	Mot Rotation	Normal	Normal
6F	BEC Voltage	6.0V	6.0V	
6G	Reset Default	NA	NA	

NOTE A cooling fan is recommended when the ESC is used in modified Touring Car and 4wd Buggy classes, when utilizing ESC timing, and when used in high temperature environments.

INTRODUCTION

Congratulations on your purchase of Reedy's Blackbox 510R Competition ESC. The latest electronics technology along with the design and engineering experience that is responsible for 30 World Championship titles has been incorporated into its design.

Track tested and competition proven, Reedy's Blackbox 510R is a versatile and powerful ESC specifically designed for those seeking maximum performance at all levels of competition. Excellent throttle and brake feel, a wide range of adjustability, and robust hardware make the Blackbox 510R suitable for a variety of racing applications.

Please read the following instructions before installing and operating your ESC.

FEATURES

- CNC machined black aluminum case with integrated heat sink
- Fully adjustable brake, throttle, power, and safety functions*
- Blinky mode with ROAR approved software
- Precision throttle and brake control
- Ultra-low resistance FET board
- On-board power button
- Solder tabs w/13-gauge power wires
- Pro external capacitor board
- RPM and ESC temp data logging*
- Firmware updateable*

*Requires Blackbox PROgrammer2 #27027

SPECIFICATIONS

	Blackbox 510R
Voltage input	2S LiPo
On resistance (Ω)	0.105
Continuous current (A)	150
Dimensions (mm)	38.5 x 36.9 x 19.5
Weight w/o wires (g)	44
Motor limit	3.5T
BEC	6.0-7.4V/5A
Cooling fan	optional

SAFETY PRECAUTIONS

This product is a sophisticated hobby product and not a toy. It must be operated with caution and common sense and requires some basic mechanical ability. Failure to operate this product in a safe and responsible manner could result in injury or damage to the product or property. This product is not intended to be used by children without direct adult supervision. It is essential to read and follow all instructions and warnings found in this manual prior to installation, set up, and use, for the product to operate properly and to avoid damage or injury.

WARNINGS

- **Never** expose your ESC to water
- **Never** operate your ESC/motor under no load at high RPM
- **Never** apply reverse voltage
- **Always** unplug the battery from the ESC when not in use or while in storage
- **Never** let children use this product without the strict supervision of an adult
- **Never** leave the ESC unattended while powered ON
- **Always** use caution when handling your ESC as it may become extremely hot during use
- **Always** disconnect the battery and stop using the ESC if it begins to act abnormally
- **Always** power ON your transmitter before the ESC and power OFF the ESC before the transmitter

IMPORTANT ESCs that display evidence of contact with moisture, reverse voltage, or internal/external modifications to wiring are not covered under warranty.

INSTALLATION

- Determine the most convenient location to mount your ESC, taking into consideration easy access to the battery connectors and Power button
- Determine the ideal sensor wire length and plug it into the ESC's sensor port
- Cut the battery and motor wires to the desired length
- Solder the appropriate battery connector(s) to the battery leads
- Mount your ESC/Capacitor unit securely using high quality double-sided tape.
- Plug the RX wire into the receiver (refer to radio manufacturer's manual)
- Solder the three ESC motor leads labeled A-B-C to the corresponding motor tabs labeled A-B-C.

POWERING THE ESC ON/OFF

1. To turn the ESC ON, press the Power button.
2. To turn the ESC OFF, press and hold (.1 sec) the Power button or unplug the battery.



Your Blackbox 510R ESC includes two modes that can be modified and saved independently from one another. Standard mode offers a wide variety of tuning options while Expert mode takes it one step further and opens additional options for more experienced racers and/or racing classes that can take advantage of these advanced settings. To switch between Standard and Expert modes, or to make and save changes to the settings in either mode, you must use Blackbox Programmer2 #27027.

CHANGE SETTINGS

1. Plug the Programmer2 extension wire into the programmer port on the ESC.
2. Power ON the ESC.
3. Press OK after the Blackbox Programmer, PB Firmware Version, and ESC Firmware Version splash screens.
4. Select Standard or Expert tuning mode using the up/down arrows to select the mode and OK to make the selection.
5. Use the ESC and OK buttons to scroll to the desired setting option to be changed.
6. Use the up/down arrow buttons to select the value for that setting.
7. When a custom value is available, press and hold OK until the value flashes, then use the arrow buttons to change the value. When you are satisfied with your selection, press and hold the OK button for approximately one second until the value stops flashing.
8. Changes are saved immediately. Once all changes are completed, unplug the Programmer2 extension wire from the ESC.
9. Power OFF the ESC. The new settings will take effect the next time the ESC is powered ON.

NOTE: Asterisks indicate the ESC's default settings.

TUNING MODE

Standard (Standard) – Disables complex Dynamic Drag Brake settings and simplifies Timing Level options by offering pre-selected options as well as zero-timing blinky mode. This selection is recommended for Spec class racers and most off-road classes.

Expert (Expert) – Allows users to access and fine tune advanced timing settings. Dynamic Drag Brake settings are also made available to fine tune braking settings for optimum feel. This selection is recommended for modified on-road, carpet off-road, and oval classes.

NOTE: Tuning Mode can only be selected when the Programmer2 is initially connected to the ESC.

BRAKE

Drag Brake (1A Drag Brake) – Drag Brake is a percentage of the Brake Strength and provides automatic braking when the throttle trigger is returned to the neutral position. The Drag Brake value requires adjustment when changes to the Brake Frequency and Brake Strength are made.

Brake Strength (1B Brake Strgth) – Changes the maximum brake strength of the ESC which in turn affects the feel of the Drag Brake and Initial Brake.

Initial Brake (1C Init Brake) – Determines the percentage of brake the ESC applies the moment the trigger is moved from the neutral range to the brake range. A setting of =Drag Brake is recommended for most applications. A setting greater than the selected drag brake setting will provide a more aggressive initial brake feel. The Initial Brake setting should never be lower than the Drag Brake setting.

Drag Brake Frequency (1D Drag Freq) – When drag brake is engaged, a lower frequency will provide a more aggressive feel while a higher frequency will provide a smoother, more precise braking feel but may result in higher ESC temperatures.

Brake Frequency (1E Brake Freq) – At brake positions other than drag brake, a lower frequency will provide a more aggressive feel while a higher frequency will provide a smoother, more precise braking feel but may result in higher ESC temperatures. A setting of =Drag Brake is recommended for most applications.

Brake Punch (1F Brake Punch) – Use to adjust the ESC's response to brake input. Higher values provide faster response while lower values slow response and produce a smoother braking effect.

DYNAMIC DRAG BRAKE

In some situations, like entering corners at high speed, the use of additional drag brake instead of push brake, is more desirable.

Dynamic Drag (2A Drag SW RPM) – Set the amount of drag brake added to the traditional Drag Brake (1A).

Drag Switchover RPM (2B Drag SW RPM) – The motor RPM at which the Dynamic Drag activates. Above the RPM, the total drag brake is the sum of Drag Brake and Dynamic Drag settings.

Maximum Dynamic Drag RPM (2C Max Ddrag RPM) – The motor RPM at which maximum Dynamic Drag is applied which should equal the RPM of the motor at the end of the longest straight (determined using RPM Memory).

Example: Drag SW RPM = 50000, Max Drag RPM = 60000, Drag Brake = 5%, Dynamic Drag = 10%
If the throttle is returned to neutral when motor rpm is 60000 or higher, total drag brake = 15% (5% + 10%). If the throttle is returned to neutral when motor rpm = 55000, total drag brake = 10% (5% + 5%).

Drag Release Rate (2D Drag Rel Rate) – The speed at which Dynamic Drag is released when the motor RPM falls below the Drag Switchover RPM. Set a lower value for a faster release rate, Hold to maintain the rate, and Fastest to release immediately.

Example: Drag SW RPM = 50000, Max Ddrag RPM = 60000, Drag Brake = 5%, Dynamic Drag = 10%, Drag Off = 2000 RPM/%.
If the throttle is returned to neutral when motor RPM = 60000, Total drag brake = 15%. The total drag brake is 15% effective between 60000 to 50000 RPM, 14% at 48000 RPM, 10% at 40000 RPM, 6% at 32000 RPM, 5% between 30000 to 0 RPM.

THROTTLE

Punch Control (3A Punch Ctrl) – By reducing the Throttle Punch setting, you will experience slower throttle response which may be advantageous in low traction conditions.

Initial Throttle (3B Init Throttle) – Determines the percentage of throttle the ESC applies the moment the trigger is moved from the neutral range to the throttle range. A setting of 0% is typical and enables a smooth transition from a standing start. Higher values can be advantageous to spec racers who want instant power from neutral. For example, a setting of 15% means that the moment the throttle trigger is moved, the ESC immediately delivers 15% throttle.

Drive Frequency (3C Drive Freq) - A lower frequency will provide a more aggressive throttle feel. A higher frequency will provide a smoother, more precise throttle feel but may also result in higher ESC temperatures.

Dead Band (3D Dead Band) - Adjusts the percentage of trigger movement available before the throttle/brake initially engages.

Current Limiter (3E Current Limiter) - Adjusts the maximum amount of current allowed upon motor start up. Limiting current can reduce wheel spin, lower temperatures, and increase run time. A value of 100% means the limiter is disabled while reducing the value provides increased limiting.

Touring Car and Spec classes where ESC timing is permitted. Each setting can be used individually or together to achieve maximum speed. If you choose to leave both the Boost and Turbo timing settings at 0, the ESC will operate in blinky zero-timing mode.

Boost Timing (4A Boost Timing) - Sets the maximum advanced timing when the motor reaches the Boost End RPM.

Boost Start RPM (4B Boost ST RPM) - Sets the RPM at which Boost Timing begins.

Boost End RPM (4C Boost End RPM) - Sets the RPM at which Boost Timing ends.

Boost Throttle Limit (4D B. TH Limit) - When activated, this setting sets the maximum Boost Timing available in proportion to the throttle position. The setting value represents the maximum Boost Timing at 50% throttle.

Turbo Timing (4E Turbo Timing) - The maximum timing added during Turbo Timing activation.

Turbo Start RPM (4F Turbo ST RPM) - Sets the RPM at which Turbo Timing is activated and only if the Boost ST RPM is set to RPM or Full TH+RPM.

Turbo Activation (4G Turbo Act) - Determines how Turbo Timing is activated. The Full TH setting activates Turbo Timing when the throttle is kept at 100% and the Turbo Delay time has elapsed. When backing off the throttle to less than 100%, Turbo Timing is deactivated. The RPM setting activates Turbo Timing when the motor RPM reaches the Turbo ST RPM value. When motor RPM drops below the defined Turbo ST RPM value, Turbo Timing is deactivated. Full TH+RPM activates Turbo Timing when both the Full TH and RPM conditions are met and is deactivated when one of the conditions is no longer met.

Turbo Delay (4H Turbo Delay) - Once maximum throttle is detected, the ESC delays Turbo Timing activation using this setting and is only enabled when Turbo Activation is set to Full TH or Full TH+RPM.

Slew Rate (4J Slew Rate) - Sets the rate at which the ESC adds Turbo Timing. A higher value adds timing faster while a lower value adds timing more slowly.

Release Rate (4K Release Rate) - Sets the rate at which the ESC reduces Turbo Timing. A higher value reduces timing faster while a lower value reduces timing more slowly.

MOTOR POWER - STANDARD

For those that need additional power but who prefer not to deal with complicated timing settings, the detailed settings have already been worked out for you.

Timing Level (5A Timing Level) - When racing Spec classes and classes that require the use zero-timing blinky mode, select Level 0. Level 1-10 activates Turbo Timing to increase power output and top speed which is useful when racing off-road vehicles on larger and/or high-grip tracks and in the Modified TC classes.

MISCELLANEOUS CONTROL

Run Mode (6A Run Mode) - Select the appropriate mode depending on if the ESC is used for racing or for practice.

Reverse Power (6B Reverse Power) - Adjusts reverse power when For/Brake/Rev has been selected as the Run Mode.

Low Voltage Battery Cutoff (6C Batt Cutoff) - Select the cell voltage at which the ESC will power off to prevent over-discharge of the battery. Disabling the cutoff is an option but not recommended for most racing applications.

ESC Temperature Cutoff (6D ESC Temp Cut) - The temperature at which the ESC will cut power to the motor to prevent permanent damage to the ESC. Disabling the cutoff is an option but not recommended and doing so will void the warranty.

Motor Rotation (6E Mot Rotation) - Reverses the motors direction of rotation if required by a vehicle's design.

BEC Voltage (6F BEC Voltage) - Either 6.0V or 7.4V can be chosen to match the input voltage requirements of the selected servo. Unless HV servos are being used, 6.0V is recommended.

Reset Default Settings (6G Reset Default) - Restores the factory default settings.

TELEMETRY

Motor RPM Memory (7A RPM Memory) - Recall the maximum motor RPM from your most recent run. The data is stored in memory until the next time the ESC is powered on and operated.

ESC Temperature Memory (7B Temp Memory) - Recall the maximum ESC temperature from your most recent run. The data is stored in memory until the next time the ESC is powered on and operated.

Setup sheets obtained from Reedy team drivers can be found at www.ReedyPower.com. These can be extremely helpful in determining good starting setups for your application. Blank editable setup sheets are also available which can be filled out and printed or saved for future reference.

SETTINGS MENU

Tuning Mode			Standard, Expert			
Brake	1A	Drag Brake	0%, 4%, 8%, 10%, 12%, 16%, 20%, Custom 0% - 100% (1% Increments)			
	1B	Brake Strgth	Custom 0% - 100% (1% Increments), 40% - 100% (5% increments)			
	1C	Init Brake	= Drag Brake, 0%, 6%, 12%, 15%, Custom 0% - 100% (1% increments)			
	1D	Drag Freq	=Brk Freq, 800Hz, 1KHz, 1.5KHz, 2KHz, 2.5KHz, 3KHz, 4KHz, 6KHz, 8KHz, 12KHz			
	1E	Brake Freq	800Hz, 1KHz, 1.5KHz, 2KHz, 2.5KHz, 3KHz, 4KHz, 6KHz, 8KHz, 12KHz			
	1F	Brake Punch	Level 1-10			
Dynamic Drag Brake	Standard		Expert			
	Unavailable		2A	Dynamic Drag	0% - 100% (1% increments)	
			2B	Drag SW RPM	500, 1000 - 69000 (1000 increments)	
			2C	Max Ddrag RPM	1000 - 70000 (1000 increments)	
			2D	Drag Rel Rate	Fastest, 100RPM/% - 5000RPM/% (100RPM/% increments), Hold	
Throttle	3A	Punch Ctrl	Level 1-10			
	3B	Init Throttle	0% - 15% (1% increments)			
	3C	Drive Freq	1KHz, 2KHz, 3KHz, 4KHz, 6KHz, 8KHz, 12KHz, 16KHz, 24KHz, 32KHz			
	3D	Dead Band	2% - 12% (1% increments)			
	3E	Current Limit	20% - 100% (1% increments)			
Motor Power	Standard		Expert			
	5A	Timing Level	Level 0 - 0° Blinky	4A	Boost Timing	0° Blinky - 60° (1° increments)
			Level 1 - 3°	4B	Boost ST RPM	0 - 55000 (1000 increments)
			Level 2 - 6°	4C	Boost End RPM	2000 - 65000 (1000 increments)
			Level 3 - 9°	4D	B. TH Limit	Off, 1° - 60° (1° increments)
			Level 4 - 12°	4E	Turbo Timing	0° - 60° (1° increments)
			Level 5 - 15°	4F	Turbo ST RPM	5000 - 60000 (1000 increments)
			Level 6 - 18°	4G	Turbo Act	Full TH, RPM, Full TH+RPM
			Level 7 - 21°	4H	Turbo Delay	Off, 0.05s - 0.4s (.05s increments)
			Level 8 - 24°	4J	Slew Rate	3°/0.1s - 22°/0.1s (1° increments), Fastest
			Level 9 - 27°	4K	Release Rate	3°/0.1s - 22°/0.1s (1° increments)
Level 10 - 30°						
Misc. Control	6A	Run Mode	For/Brake, For/Brake/Rev			
	6B	Reverse Power	25% - 100% (25% increments)			
	6C	Batt Cutoff	None, 3.2V/cell, 3.4V/cell			
	6D	ESC Temp Cut	Off, 176F/80C, 194F/90C			
	6E	Mot Rotation	Normal/Reverse			
	6F	BEC Voltage	6.0V, 7.4V			
	6G	Reset Default	No/Yes			
Telemetry	7A	RPM Memory	(no selection required)			
	7B	Temp Memory	(no selection required)			
Profiles	8A	Save Profile	Profile A, Profile B, Profile C, Profile D, Profile E, ESC			
	8B	Load Profile	Profile A, Profile B, Profile C, Profile D, Profile E			

TROUBLESHOOTING

Problem	Cause	Solution
ESC overheats	Motor over-gearred	Change final drive ratio (FDR)
	No ESC fan or damaged ESC fan	Install fan/new fan
	ESC Temp Cut set too low	Increase ESC Temp Cut value
	Lack of air flow	Reposition ESC
Motor overheats	Mechanical timing too high	Reduce motor timing
	Insufficient motor cooling	Add cooling fan and/or heatsink
	ESC timing settings too high	Reduce timing settings
	Weak rotor	Install new rotor
Poor speed/performance	Insufficient final drive ratio (FDR)	Change final drive ratio (FDR)
	Transmitter settings changed	Verify correct full throttle setting
	External capacitor unit damaged	Install new capacitor unit
	Incorrect ESC settings	Verify correct settings
	Motor damaged or defective	Inspect and repair necessary components
	Damaged ESC	Return ESC for repair
Motor stutters under acceleration	Damaged sensor wire	Replace sensor wire
	Damaged motor sensor board	Replace sensor board
	External capacitor unit damaged	Install new capacitor unit
	Damaged ESC	Return ESC for repair
No/reduced motor power, but servo functions	ESC plugged into RX incorrectly	Verify RX wire is plugged into Ch. 2
	ESC Temp or Batt Cutoff engaged	Wait for ESC to cool or re-charge battery
	Motor damaged or defective	Repair or install new motor
	Motor sensor wire missing or damaged	Install or replace motor sensor wire
	Damaged ESC	Return ESC for repair
No motor and servo power	ESC RX wire plugged in backwards	Plug the RX wire in correctly
	Poor battery connection/defective battery	Improve connection or replace battery
	No radio signal	Check/re-bind TX/RX
	Damaged ESC	Return ESC for repair
ESC works intermittently	Batt Cutoff voltage set too low	Reduce battery cutoff voltage
	Dead or damaged battery	Charge or replace battery
	Bad battery connection	Improve connection or replace battery
	Damaged motor	Repair or replace motor
	Damaged ESC	Return ESC for repair

OPERATION AND WARNINGS

Operation	ESC Signal		
	Red	Green	
		0° Blinky	Timing
Neutral throttle position F/B Mode		blink	solid
Neutral throttle position F/B/R Mode	solid	blink	solid
Full throttle position		solid	solid
Full brake position	solid		

All LEDs should be off at any throttle/brake position other than neutral, full brake, or full throttle.

Warning	ESC Signal			Motor Power
	Red	Green		
		0° Blinky	Timing	
LVC engaged	blink			reduced*
ESC temp cutoff	solid			reduced*
No radio signal		blink alternately		
Sensor wire removed/failure	blink	blink		

*Full operation resumes when the ESC is powered OFF and ON, and the problem that signaled the shutdown has been resolved.

FIRMWARE UPDATES

Firmware for both the Blackbox 510R ESC and Programmer2 can be updated after downloading the appropriate firmware and Blackbox Link installation program. These, along with installation and operating instructions, can be found at www.ReedyPower.com.

WARRANTY

Your Reedy Blackbox ESC is warranted to the original purchaser for 120 days from the date of purchase, verified by the sales receipt, against defects in material and workmanship. Product that has been mishandled, abused, used incorrectly, used for an application other than intended, or damaged by the user are not covered under warranty. Associated Electrics Inc. is not liable for any loss or damage, whether direct or indirect, incidental or consequential, or from any special situation, arising from the use, misuse, or abuse of this product.

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