User Manual - Full Version

for Electronic Speed Controller *NITRIDE 1/10*

Dated: 25.1.2024

The latest version of manual you will find here

http://www.elceram-rc.cz/download/

Datum of Revision	Description
10.11.2023	Correction of Expo at page 7 (Setting of Throttle, Brake)
25.1.2024	Addition of a “white display issue” to chapter 13 and 14

MANUAL CONTENTS

1. Introduction

Thank you for purchasing NITRIDE 1/10 and for your trust in ELCERAM product. By this decision, you have chosen a new generation electronic speed controller (ESC) for brushless motors developed especially for 1/10 RC cars, endowed with many unique features and functions.

Using the advanced technologies, NITRIDE is a high-performance device requiring a professional approach. Improper usage and unauthorized modification to our product is extremely dangerous and may damage the product and related devices. We, ELCERAM, are not responsible for any damages occurred by unprofessional or unsuitable way of using our product.

Please, take your time and read the following instructions carefully before you start using your ESC!

We have the right to modify our product design, appearance, features and usage requirements without notification.

2. Warning and Safety

- Please read all instructions carefully before using the product!
- To avoid short circuits, ensure that all wires and connections are well insulated before connecting the ESC to related devices. Ensure all devices are well connected to prevent poor connections and avoid damage to your electronic devices.
- Read through the manuals of all power devices and chassis and ensure the power configuration is rational before using this unit.
- Please use a soldering iron with the power of at least 60W to solder all input/output wires and connectors.
- The device has to be disconnected from battery if not used!
- It is the high-power electronic device, please double check the polarity of battery interconnection! We are not responsible for a product damage caused by the incorrect connection to the battery.
- It is professional top level racing product and it is extremely important to double check the setting before use!
- This product is not a toy and it is not intended for children. Users under 18 years should use this product only with the direct supervision of a

responsible and knowledgeable adult. Keep this product away from the reach of small children.
- Do not touch the device Immediately after using, it can generate high temperatures. If the temperature of ESC is higher than 70°C, the buttons can be hot. Please, wait until it cools down to 50°C before you switch it off by button, or switch the ESC from the battery for switch off.
- Stop the usage immediately once the temperature of the ESC exceeds 130°C, as this may cause damage to both the ESC and motor. We recommend setting the "ESC Thermal Protection" to 130°C (this refers to the internal temperature of the ESC).
- Never leave the device unsupervised while it is switched on, in use or connected with a power source. If a defect occurs, it could cause a damage or fire of the product or the surroundings.
- Never wrap your product in plastic film, metal foil or similar, if it is switched on.
- Never allow this product to come in contact with water, oil, fuels or other electroconductive liquids.
- Never place this product near the source of fire or very high temperatures.
- Never switch the device off from the battery while pressing the throttle.
- We recommend to use NITRIDE together only with the compatible devices listed the chapter 4. Usage NITRIDE with other devices was not tested yet and we are not responsible for any disfunctions or damages caused by using NITRIDE together with unauthorized devices.

3. Key Features and Specifications

- Developed especially for 1/10th professional RC cars.
- TFT LCD color display with resolution 160 x 80 pixels.
- Size: 38,3 (L) x 34,3 (W) x 24,5 (H) mm.
- Weight: 50 g without wires / 90 g with wires AWG13 - 180 mm.
- 70 % of weight located in bottom side of ESC.
- Power supply: 2S LiPo.
- Current cont. / pulsed: 180 A / 1500 A.
- BEC: 7,4 V fixed, 4 A cont. / 10 A peak at 125 °C.
- Extreme low internal resistance based on silver conductive layer.
- Advanced Cooling Technology based on Aluminium Nitride Ceramic Cooler.
- Designed for high level RC racing.
- Zero Timing (Blinky Mode) supported.
- For sensored BLDC motors from 4.5T up.
- Designed and produced in Czech Republic.
- Revolutionary easy Rx calibration.
- Realtime monitoring: battery voltage, ESC and motor temperatures.
- Self-diagnostic before the race: motor temperature, sensor cable, battery.
- Post-race data evaluation.
- Easy programming: throttle, brake, boost and turbo timing, hall angle and many other functions.
- Race data logging, temperature and other curves, histograms and more.
- Adjustable maintenance reminder for easy check.
- No programming interface needed.

4. Compatible Devices

We recommend to use NITRIDE together only with the compatible devices listed below. Usage NITRIDE with other devices was not tested yet and we are not responsible for any disfunctions or damages caused by using NITRIDE together with unauthorized devices.

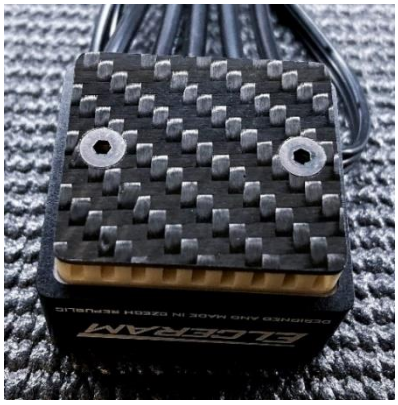
Transmitters	Receivers	Motors
Sanwa MT-17	Sanwa Rx 493-i	Hobbywing
Sanwa MT-4	Sanwa Rx 482 FH4	Trinity
Sanwa MT-44	Sanwa Rx 492 FH5	LRP
Sanwa MT-5	Futaba Rx R304SB	Muchmore
Futaba T4PM Plus	Futaba R202GF-E	Yokomo
Flysky Noble Pro	Futaba R203GF-E	Konect
	Flysky FGr4v2 micro	Dash

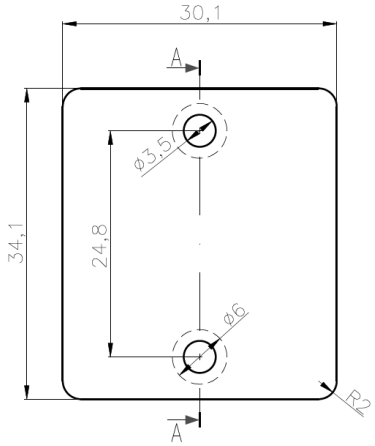
5. Installation

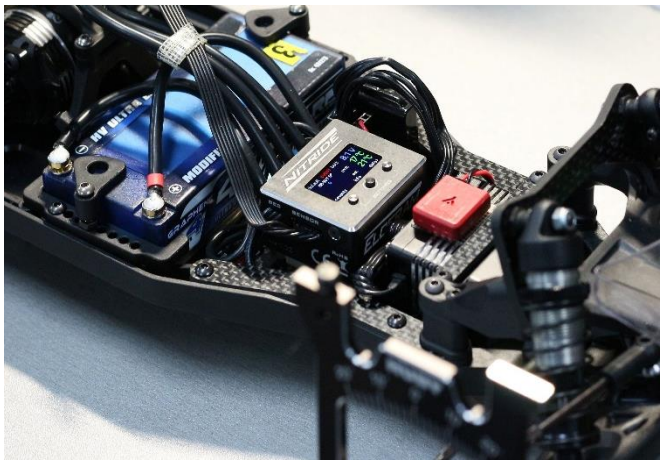
The first way how to install the ESC into your car is by using the NITRIDE Installation Kit - ELC003, included in the package - a small graphite plate and two screws M3x5mm suitable to screw to the ceramic cooler at the bottom side of ESC.

! WARNING ! Do not over tighten the screws M3x5!

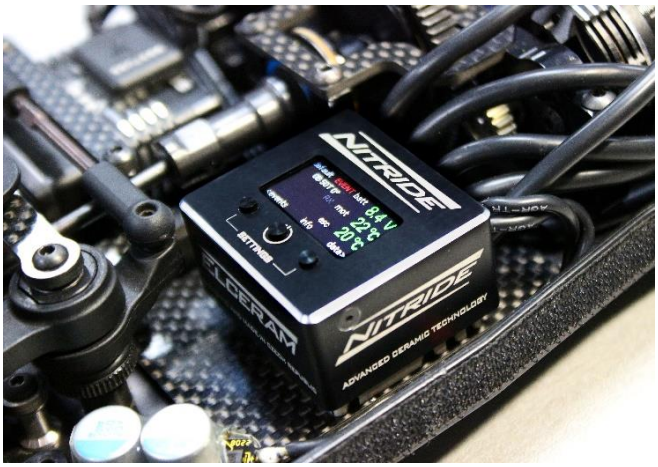
Then you can stick the installation plate directly on the chassis of your car using the double-sided tape.







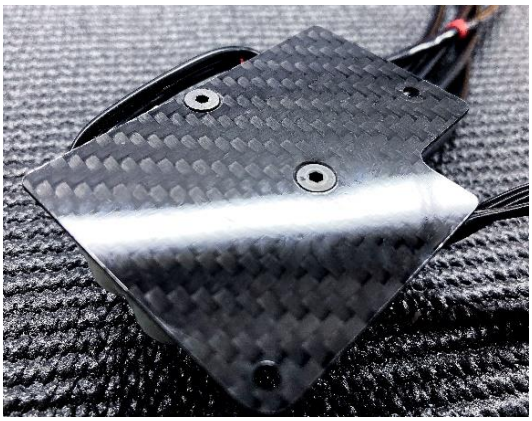
An example of NITRIDE installation into 2WD



An example of NITRIDE installation into 4WD

Another way of installation is to use graphite plates which can be screwed directly to the chassis of the car. This way of installation brings more stable position of the ESC in the car. You can use for example the option part ELC004 – Universal Graphite Plate (chapter 15).

Illustrative pictures of installation into the chassis of the cars:



6. Connections

! WARNING ! Please, double check the polarity of battery interconnection! Make sure, that positive (+) of ESC is connected to the positive (+) of battery. If polarity is reversed, the ESC will be damaged!

7. Main Screen Description and Basic Control of ESC

Basic Description of ESC Using

The using of ESC is very simple and there is no other programming interface needed.

Turning on

After short pressing of ON/OFF/ENTER button, the ESC will be switched on.

Turning off

If you press ON/OFF/ENTER for about 3 seconds the ESC will be switched off. The ESC can be switched off also by disconnecting from the battery.

! IMPORTANT ! The three buttons are multifunctional. Above buttons, there is the help text about what will happen if you press the button. You can move in the loop around using left or right buttons. The text above the ENTER button is underlined sometimes. That means you have two possibilities depended on how long you press the button. For example: reset/next. Short press = reset, Long press = next.

8. Programming and Screens schema

There are 3 Menu loops available - picture below:

1) Race data loop - LCD backlight Black

In this menu loop you can monitor race data and events before race, adjustment of ESC is not possible. You can move in the Race data loop using left or right buttons. For any action on the screen press ENTER button - see the help above the button. The most of race information will be reset after the ESC is switched off. Exceptions are maintenance and total runtime with ESC.

2) Setting 1 loop - LCD backlight Blue

For entry to this Setting hold right and left button simultaneously for about 2 s. For return, hold the buttons again for 2 s.

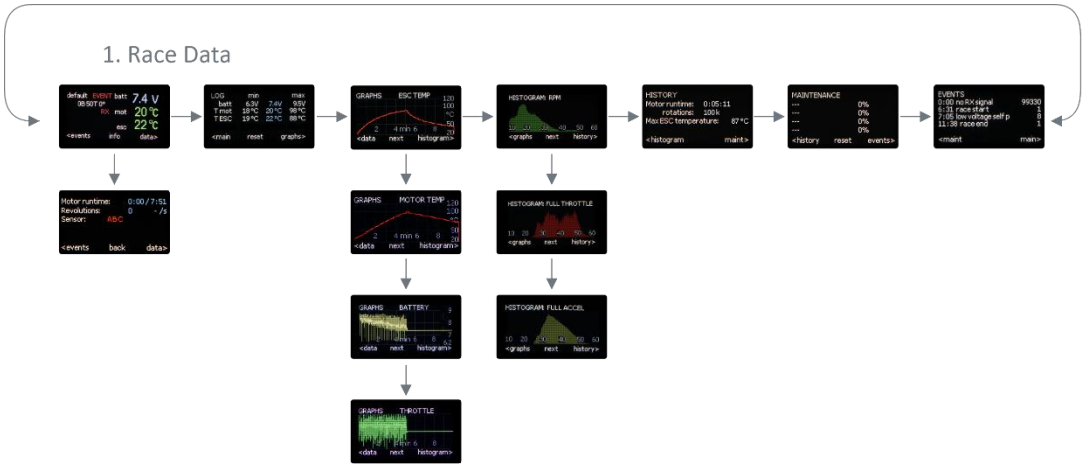
In this loop you can set all the most important parameters of your ESC for the race.

! Warning ! It is professional product for top racing and features are accessible for setting in real-time. During setting of parameters, you have to be careful and have on your mind that it can cause destruction of some components.

3) Setting 2 loop - LCD backlight Orange

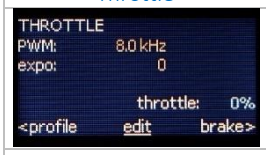
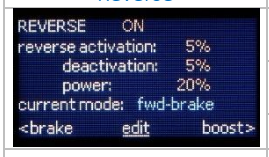
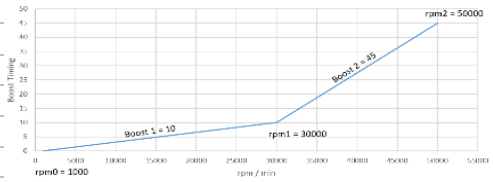
For entry to this Setting hold right and left button simultaneously about 4 s. For return, hold the buttons again for 2 s.

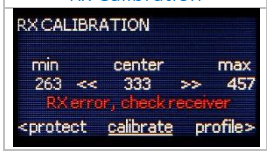
This loop you will probably use not so frequently like Setting 1. Here you can set basic parameters like temperature calibration and so one.

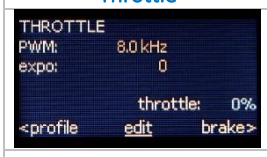
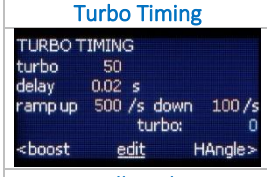


Push Settings buttons for **2** sec.

Push Settings buttons for **4** sec.

SETTING 1	Parameter Name	Default value	Typical value	Min. value	Max. value	Comments
Profile						
	Here you can set the profile. For every profile the parameters below will be saved and you can change it very easy and quickly.					
Throttle						
	PWM	8 kHz	8 kHz	0.1 kHz	45 kHz	Less PWM frequency, more current through motor and more aggressive throttle response
	expo	0	0	-64	+64	Zero = linear / line More expo = logarithmical curve = quicker beginning Less expo = exponential curve = slower beginning
Brake						
	min	0 %	5 %	0 %	50%	Initial brake force if you move with throttle from neutral position to the brake. If Drag brake is activated, min brake = drag brake
	max	100 %	95 %	1 %	200 %	Max. brake force
	expo	0	0	-125	125	Zero = linear / line More expo = logarithmical curve = quicker beginning Less expo = exponential curve = slower beginning
	dragB	off	off	on	off	If dragB is on, the car will be braking in neutral position of throttle
	PWM	2 kHz	2 kHz	0.1 kHz	45 kHz	Less PWM frequency, more current through motor during braking, and brake will be more aggressive
Reverse						
	activation	5 %	5 %	1 %	50 %	Percentual position of throttle for activation of reverse
	deactivation	5 %	5 %	0 %	50 %	Percentual position of throttle for deactivation of reverse
	power	20 %	20 %	1 %	100 %	More power more speed during reverse
Boost Timing						
	rpm 0	15000	5000	1000	48000	
	rpm 1	25000	20000	2000	49000	
	rpm 2	50000	50000	3000	50000	
	boost1	0	0	0	63	
	boost2	0	0	0	63	
Turbo Timing						
	turbo	0	40	0	63	If full throttle (100 %), turbo will be activated More value = more top speed
	delay	0.2 s	0.03 s	0.00 s	1.00 s	Delay from full throttle to activated turbo
	ramp up	100 / s	300 / s	10 / s	1000 / s	More Ramp up = More turbo increase
	ramp down	100 / s	300 / s	10 / s	1000 / s	More Ramp down = More turbo decrease
Hall Angle	Similar function like mechanical timing by motor but in specific rpm range using software. It brings more power efficiency for your power system.					
	rpm 0	10000	30000	5000	49000	Start of Hall Angle increase
	rpm 1	44000	45000	6000	50000	End of Hall Angle increase
	hall angle	0	0	0	63	This value of mechanical timing = Hall angle will be progressively reached between rpm0 and rmp1. The hall angle value will be kept above rpm1 at constant level.
Maintenance	Using this function, you can check the wear out of components of your car. You can set either time (minutes) or distance of your car. 1 distance = 100.000 turns of your motor = 100 k turns of your motor. 5 min of race have approx. 100 k of turns of your motor.					
	Maintenance A					
	Maintenance B					
	Maintenance C					
	Maintenance D					

Protection						
	voltage warning	3.6 V	3.4 V	3.1 V	4.1 V	If battery voltage reached this value ESC starts to limit max. power
	voltage cutoff	3.4 V	3.3 V	3.0 V	4.0 V	If battery voltage reached this value ESC power will be reduced to the minimum
	motor limit	100 °C	100 °C	70 °C	150 °C	If motor temperature reached this value ESC starts to limit max. power
	ESC limit	125 °C	125 °C	125 °C	150 °C	If ESC temperature reached this value ESC starts to limit max. power
Rx Calibration	Push calibrate button and hold ca 1s. Push full throttle, full brake and leave neutral. Push Ok button.					
	**! WARNING !** Keep the sensor cable disconnected during the first power on until ESC is calibrated with your radio system, to avoid unexpected motor start! Press calibrate button and hold it for approx. 1s. Push full throttle, full brake and return to neutral. Then press the Ok button. The calibration is done.					

Setup sheet	Parameter	TC Car modified carpet	TC Car modified asphalt	TC Car Stock carpet	2WD modified carpet	2WD stock carpet	4WD modified carpet	4WD stock carpet	Default value
Motor Rotor (mm)		5T 12.3 / 12.5	4.5T 12.3 / 12.5	13.5T	6T-6.5T	13.5T	5T-5.5T	13.5T	-
Motor Timing (°)		30	30-35	-	30	-	30	-	-
Active FAN		No	Yes	No	No	No	No	No	-
Throttle	Less PWM frequency, more current through motor and more aggressive throttle response								
	PWM	8 kHz	7-8 kHz	2-4 kHz	6-8 kHz	2-6 kHz	6-8 kHz	2-6 kHz	8 kHz
	expo	0	0	0	0	0	0	0	0
Brake	Less PWM frequency, more brake torque, more aggressive brake response								
	min	10 %	15 %	10	5	5	5	5	0
	max	90 %	85 %	85 %	125 %	125 %	90 %	90 %	100 %
	expo	0	0	0	0	0	0	0	0
	dragB	on	on	on	off	off	off	off	off
	PWM	6 kHz	4-6 kHz	6 kHz	1 kHz	1 kHz	2 kHz	2 kHz	2 kHz
Boost Timing	More boost timing, more power in rpm range, less efficiency of power system								
	rpm 0	15000	15000	-	1000	-	1000	-	15000
	rpm 1	25000	30000	-	25000	-	25000	-	25000
	rpm 2	40000	45000	-	50000	-	50000	-	40000
	boost1	0	10	-	0	-	0	-	0
	boost2	0	20	-	0	-	0	-	0
Turbo Timing	More turbo value, more Top speed. More Ramp up = faster turbo increase								
	turbo	25	40	-	45	-	50	-	0
	delay	0.02 s	0 s	-	0.02 s	-	0.02 s	-	0.2 s
	ramp up	300 / s	400 / s	-	450 / s	-	500 / s	-	100 / s
	ramp down	300 / s	400 / s	-	350 / s	-	350 / s	-	100 / s
Hall Angle	Hall Angle = SW controlled Mechanical timing. More hall angle, more rpm, less torque, less efficiency of power system								
	rpm 0	-	-	-	-	-	-	-	10000
	rpm 1	-	-	-	-	-	-	-	44000
	hall angle	-	-	-	-	-	-	-	0
Protection	**! Warning** if voltage cutoff is below 3.4 V, it can cause damage of your battery								
	voltage warning	3.2 V	3.2 V	3.2 V	3.2 V	3.2 V	3.2 V	3.2 V	3.6 V
	voltage cutoff	3.1 V	3.1 V	3.1 V	3.1 V	3.1 V	3.1 V	3.1 V	3.4 V
	motor limit	100 °C	100 °C	105 °C	105 °C	105 °C	105 °C	105 °C	100 °C
	ESC limit	130 °C	130 °C	130 °C	130 °C	130 °C	130 °C	130 °C	125 °C

9. RX Calibration

! WARNING ! Keep the sensor cable disconnected during the first power on until ESC is calibrated with your radio system, to avoid unexpected motor start!

! WARNING ! We recommend to use one of the radio control systems compatible with NITRIDE – listed in chapter 4. The table will be extended during the time.

! WARNING ! If you have Futaba Radio system, please reverse throttle on the transmitter before first turn on!

For radio system calibration, choose the RX CALIBRATION in the Blue menu (picture above) using the buttons. Press calibrate button and hold it for approx. 1s. Push full throttle, full brake and return to neutral. Then press the Ok button. The calibration is done.

10. Temperature and Voltage Calibration

ESC Temperature Calibration

The temperature of your ESC was calibrated in factory. If needed you can re-calibrate it.

For this case use the thermometer for ensuring the ambient temperature. Then choose the CALIBRATION in the Orange menu (picture below) using the setting buttons. Set the ESC temperature according to the ambient temperature using edit button and then +/- buttons and press Ok. The temperature calibration is done.

! TIP ! The calibration should be finished short time after switching on of ESC, because ESC generates some warming itself.

Motor Temperature Calibration

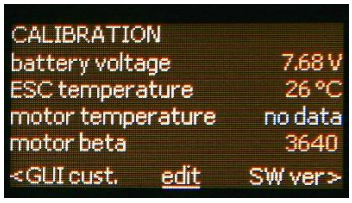
If temperature NTC sensor is included in your motor, the motor temperature has to be calibrated.

For motor temperature calibration let the car with motor to stabilize in ambient temperature for approx. 20 minutes without using. Choose the CALIBRATION in the Orange menu (picture below) using setting buttons. Set the motor temperature according to ESC temperature using +/- buttons. Then press Ok. The temperature calibration is done.

! TIP ! In some cases, you will need to change motor beta dependence according to temperature sensor used by motor producer. At the beginning start with default value 3640.

Battery Voltage Calibration

For battery voltage calibration measure battery voltage using any multimeter. Then choose the CALIBRATION in the Orange menu (picture below) and set the measured value using edit button and +/-. Then press Ok. The battery voltage calibration is done.



11. Zero Timing / Blinky / Stock Mode

NITRIDE also supports the Zero timing / Blinky / Stock mode.

Switching to Zero Timing Mode

If all of these parameters - Turbo Timing, Boost Timing and Hall Angle in Blue menu (Setting 1) - are set to 0, the ESC is switched to Zero Timing Mode. In this case, the inscription “ZERO TIMING” is blinking green on the main screen.

Alternatively, the user can change this sign for the inscription “BLINKY” or “STOCK” and choose, if the inscription will be static or blinky. The option can be made in Orange menu (Setting 2): Setting 2 → Gui Customization → blinky ID

Changing of inscription does not affect the function of Zero Timing Mode, it´s just another name, but the function is the same.

Switching the Zero Timing Mode Off

If any of these parameters - Turbo Timing, Boost Timing or Hall Angle - are set to a different value than 0, the Zero Timing mode is switched off and the inscription “ZERO TIMING” disappears from the display.

12. The Motor Choice

NITRIDE was tested with the most of sensored motors available on the market, with or without temperature sensor. If motor has no temperature sensor, “no data” will be displayed.

NITRIDE has very linear and smooth throttle characteristics especially if boost timing is set to zero. From this point of view consider carefully the choice of your Motor Turns.

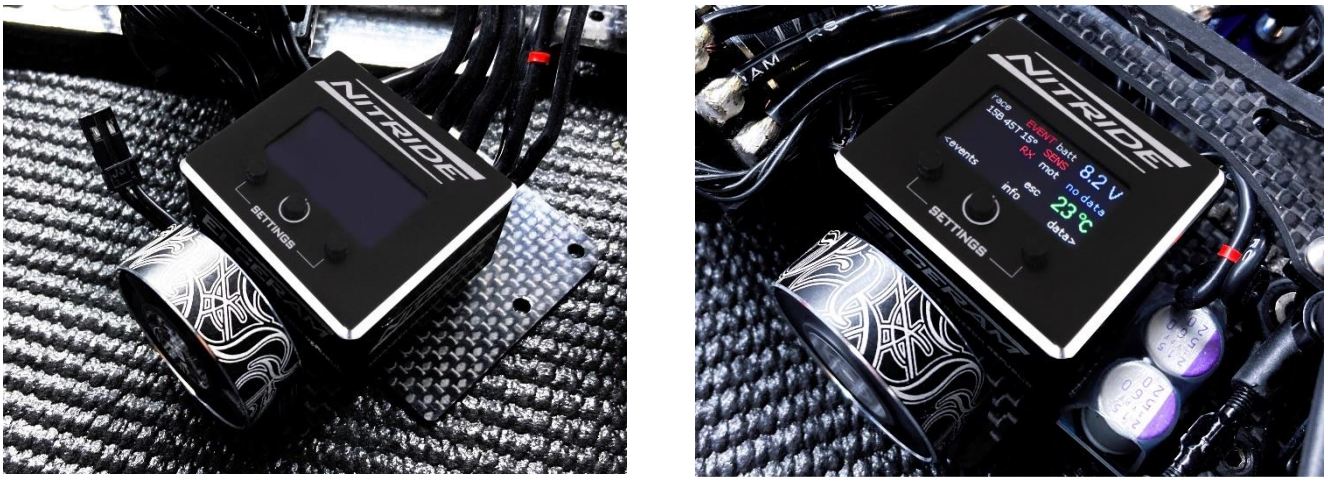
For example, you can get better feeling with Motor 5.0T and boost timing zero compared to 5.5T and activated boost timing. Some of our recommendations are summarized in the table below:

	2WD dirt	2WD carpet	2WD astro	4WD dirt	4WD carpet	4WD astro	TC carpet stock	TC carpet modified	TC asphalt stock	TC asphalt modified
Motor	7.5 T 8T	6T 6.5T	6.5T 7T	7T 7.5T	5T 5.5T	6.5T 7T	13.5T	5T-5.5T	13.5T	4.5T 5T
Active FAN	No	No	No	No	No	No	No	No	No	Recommended for 4.5T

The above recommended values strongly depend on the Drive Ratio as well.

For use in off-road cars and also for on-road with the motor with more than 4,5T, there is no active cooling needed.

For use in on-road car with the motor 4,5T on asphalt, especially in hot summer weather, we recommend to use an additive active cooler, that can be simply installed using the small plate and screwed together with NITRIDE directly to the chassis of the car. Examples of installation you can see on pictures bellow.



Example of NITRIDE installation into on-road car using the fan for use with the motor 4,5T on asphalt

13. Troubleshooting and EVENTs Description

NITRIDE has revolutionary self-diagnostics and you can see the event notifications before and after race immediately on the display.

The example of the events you can see in the picture bellow:

These events inform you that:

In the time 0:00 the ESC has no Rx signal from your Receiver.

In the time 0:12 was your battery overloaded with high current consumption 2 times.

In the time 0:20 you reached maximum temperature limit of your motor more than 99 times.

Description of Possible Events:

Displayer	Event Description and Recommendation
no Rx signal	The ESC does not see the signal from your receiver - Rx. It can be displayed if you switched ESC on first before the Transmitter. Transmitter and Receiver not paired. Bind your radio system.
sensor cable	Data from motor sensors are invalid - check your sensor cable connection
motor temp limit	Motor reached “motor limit” temperature - ESC starts to limit max. power
motor temp over	Motor temperature exceeded “motor limit” + 5 °C - Motor power will be reduced to the minimum
ESC temp limit	ESC reached “ESC limit” temperature - ESC starts to limit max. power
ESC temp over	ESC reached “ESC limit” + 5 °C - ESC power will be reduced to the minimum
battery empty	Battery was discharged below “voltage cutoff” level
low battery	Battery was discharged below “voltage warning” level
battery overload	Current flow was too high for your battery - reduce boost timing, use motor more turns, new battery
unexpected reset	Current flow was extremely high for your battery and subsequent voltage drop caused ESC reset
maintenance interval	At least one of your maintenance counters reached 100 %
MAINTACE INTERVAL	At least one of your maintenance counters reached 200 %

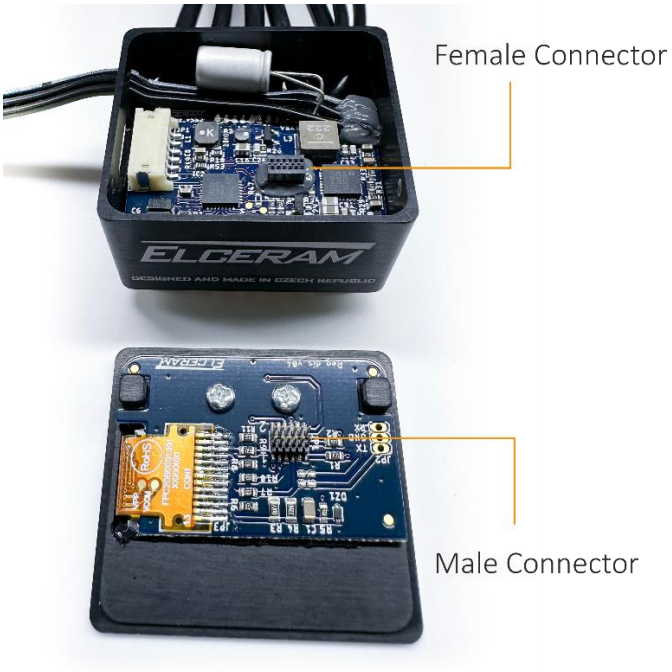
Additional Troubleshooting

Problem	Cause	Solution
Display is frozen or turns backlight to white	Dirty connector or short connector contacts loose during strong crash	- Hold settings buttons for display reset. - Check and clean the connector. - Use new cover.
Motor is tugging and ECS temperature rise up	Wrong phase connection	Check the cables.

14. Display and Maintenance

Display is very resistant and does not need any maintenance. We suggest cleaning using microfiber cloth – see picture on the right side.

! TIP ! For unscrewing use the allen key screwdriver 0,05 " / 1,27 mm



Please be informed, that the cover with display and buttons is replaceable in case of any incident – spare part number ELC002.

There is very reliable connector in your ESC. During mounting you have to avoid any dust contamination or damage of the female part on control board – see picture on the left.

There is very small probability that the image on display will be frozen or display will turn backlight to white after big car crash. This can happen because of display connector losing contact for a short time. In this case you can reset display by holding settings buttons the same way as to switch to Blue Setting.

15. Option parts

Part number	Description	Picture
ELC002	New aluminium cover with display and buttons. Allen key Tool 0,05 ‘’ (1,27 mm) and new screws included	
ELC003	Installation kit - Graphite plate with screws	
ELC004	Universal Graphite plate 50 x 60 x 1 mm	
ELC005	External low ESR capacitors soldered on the ceramic PCB with thick silver layer	
ELC006	ELCERAM RC cables 1 m	

16. Recycling

RoHS

Electronic devices marked with the crossed-out dustbin symbol must not be disposed of in normal household waste, but must instead be handed in at a specialized collection and recycling facility.

17. Conformity and Declarations

CE

The producer, company ELCERAM a.s., hereby declares that Electronic Speed Controller NITRIDE 1/10 complies with the requirements of relevant directives, regulations and harmonized European standards.

The full text of the EU Declaration of Conformity is available at following website: www.elceram-rc.com.