robbe
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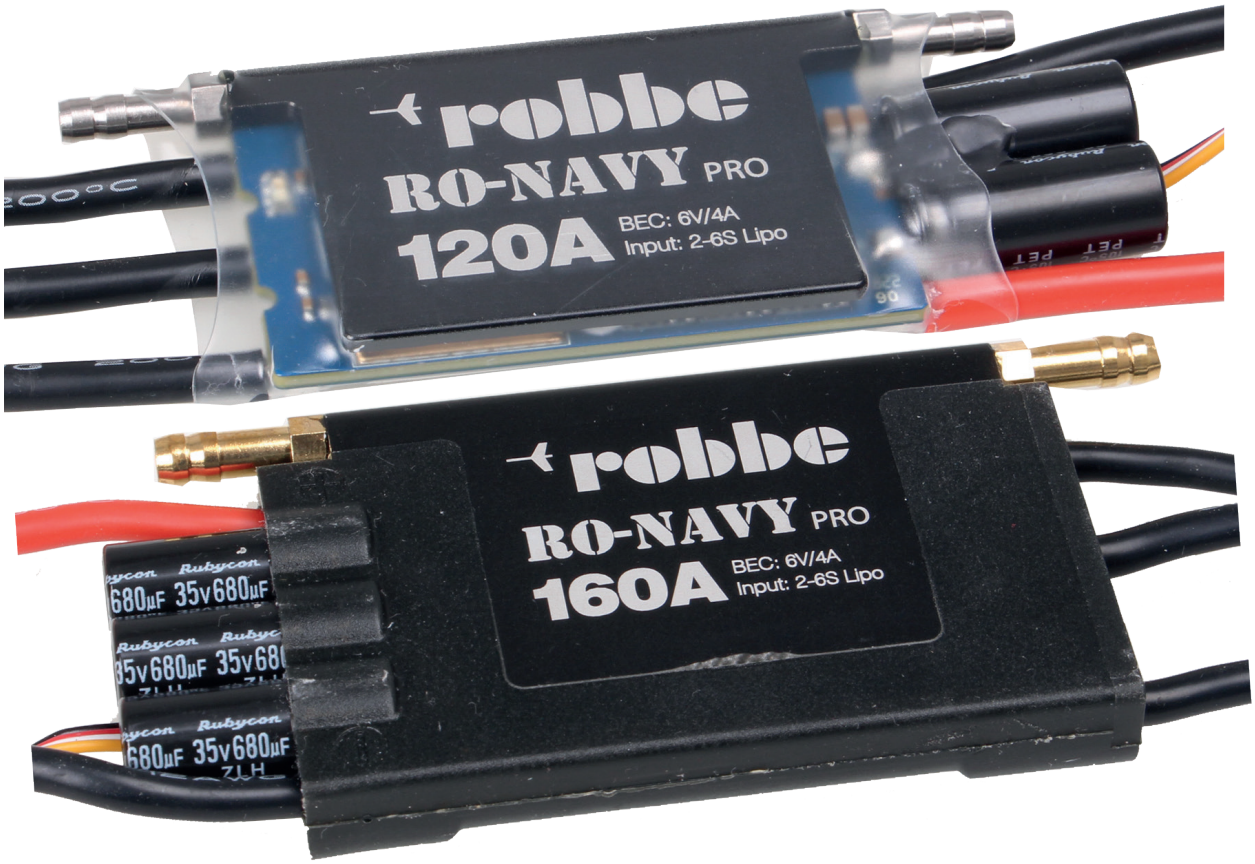
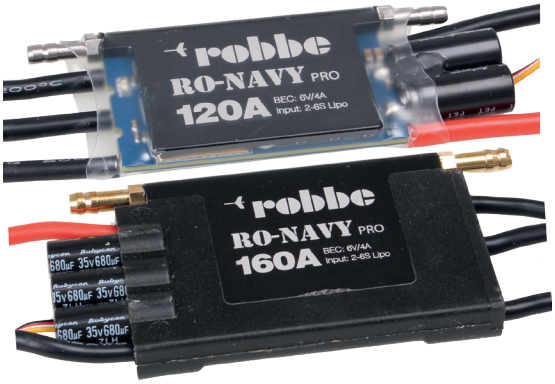


RO CONTROL
RO-NAVY PRO

Operating Manual



Operating Manual

RO-CONTROL Navy Pro 120/160A

Brushless Electronic Speed Controller

Art.-Nr.: 8725 Ro-Control Navy Pro 120

Art.-Nr.: 8726 Ro-Control Navy Pro 160

Dear customer, we are pleased that you have chosen a RO-Control Navy speed controller for brushless motors from our range. This gives you a particularly powerful controller for controlling your rc-boats engine.

Despite the relatively simple operation of these controllers, their use requires some knowledge from you. These instructions will help you to familiarize yourself quickly with the possibilities of the speed controller. To achieve this goal safely and quickly, you should read these operating instructions carefully before commissioning the controller. The safety and warning notices are of particular importance.

01. Introduction

Brushless motors can be very dangerous. Any improper use can cause personal injury and destroy the controller and the devices connected to it. We strongly recommend that you read these operating instructions completely before use.

Since we have no control over the use, installation or maintenance of the controller, we accept no liability for this product for any damage or loss resulting from the use of the product. We also accept no responsibility for damage or loss caused by unauthorized changes to our product.

02. Safety and Warnings

Remote-controlled models are not toys and may only be used by young people under 14 years of age under the constant supervision of adults who are familiar with the construction, operation, material and possible dangers. Construction, commissioning and operation of remote-controlled models are dangerous and are the full responsibility of the operator. We expressly point out these risks and accept no liability. Careful, well-considered handling during operation protects against personal injury and property damage. Perform maintenance and inspections of your models and electronic devices at short, regular intervals. Check regularly that all fastenings are securely fastened.

The controllers are only intended for use in battery- or battery-operated, remote-controlled models. Any other operation is not permitted. Please note that despite many safety features, an accidentally starting electric motor, e.g. due to a defect of the controller, has considerable risk potential and can result in considerable injuries. We cannot check the handling of the controller and reject any claim for damages due to failure, faulty operation or malfunction. We assume no liability for personal injury, property damage and their consequences arising from our delivery or work. Never operate a damaged regulator, e.g. due to exposure to water or mechanical deformation, a crash or similar.

Make sure that you do not reverse the polarity of the battery, that you avoid short circuits, that the drive motor is effectively suppressed and that the air can circulate freely. Use plug systems that are protected against polarity reversal. All cables and connections should be well insulated. The regulator must not come into contact with grease or oil. Only use the connectors, original parts and accessories recommended by us. Always set the throttle to "Stop" before switching on the transmitter.
In addition, it is imperative that you observe the following notes:

- Make sure that all cables and connections are well insulated before connecting the controller to other devices, as a short circuit can damage the controller.
- Ensure that all equipment is properly connected, poor connections may cause you to lose control of your model ship and cause other unforeseen problems, personal injury, property damage or destruction of the controller.
- Please use a soldering iron with a power of at least 60 W to solder all input and output lines.
- Stop the controller if the heat sink temperature exceeds 90 °C. Otherwise the controller and / or the motor will be damaged. We recommend activating the thermal protection (ESC Thermal Protection) which automatically stops operation at a value of 105 °C inside the controller.
- Never try to operate two brushless motors with only one controller, otherwise the controller will fail.
- Always keep the propeller away from your body and other objects, as they can be very dangerous.
- Protect the speed controller from vibrations, dust, moisture and mechanical stress!
- Always connect the drive battery to the controller just before starting the model. After you have landed/develed, disconnect immediately.
- The controller is equipped with a tarnish protection. Nevertheless, for safety reasons, be very careful and cautious when plugging the battery into the controller to prevent personal injury.
- Even if the receiving system is switched off, but the battery is still connected to the controller, there is a fundamental risk potential.
- Make absolutely sure that the controller is always operated within the values of the technical data. Overloading can lead to damage, resulting in great dangers.
- Always follow the instructions for connecting and installing the controller.
- High currents cause the cables to heat up, which can cause fire or burns to the skin. Lay the cabling accordingly and proceed very carefully.
- Be sure to follow the warnings of the manufacturer of the motor, battery and model you are using.
- The controller must never be connected to the 230V AC mains.
- When operating a rc-boat, you must comply with all safety regulations, so as not to endanger themselves and others.

After use, please remove all batteries and dispose of them separately. Hand in old electrically operated equipment free of charge at the municipalities' collection points for electrical waste. The remaining parts belong in the household waste. Thank you for your help!

03. Features

- Lightweight design and therefore perfectly suited for competitive models
- No additional precautions against splash water are necessary, the regulator, however, is excellently protected by a nano coating, it can be immersed in water.
  Note: However, it is necessary to dry all plugs well after use, if they have been in contact with water, so that the plugs do not oxidize.
- Integrated pulsed BEC with switchable voltage of 6 V / 7.4 V and a load of 4.0 A (peak load 8.0 A), for use with powerful HV servos.
- Patented thermally conductive copper bars combined with water cooling and MOSFETs with extremely low internal resistance, thus high reliability and high efficiency of the controller and safe use even under short-term overloads
- Innovative firmware guarantees the user excellent control over the model in various competitive scenarios
- Innovative turbo acceleration function (turbo timing) possible, the engine suddenly delivers the absolute maximum power for acceleration and quickly leaves competitors behind during the race.
- Two different modes adjustable: forward, forward and reverse for universal applications
- Several built-in safety precautions: Undervoltage cut-off, overheating protection, protection against loss of input signal
- Eight different timing levels programmable, thus compatible with most brushless motors
- Convenient programming via optional LCD programming box possible
- Firmware update possible via the optional LCD programming box

04. Technical Specifications

	RO-Control Navy Pro 120 A	RO-Control Navy Pro 160 A
Rated current	120 A	160 A
Peak current	760 A	1050 A
BEC Type	clocked BEC, reversible 6 V / 7,4 V encumbrance 4,0 A	
LiPo Cells	2 – 6S LiPo battery	
Water cooling	inner diameter 2 mm, exterior-diameter 5,5 mm	inner diameter 3 mm, exterior-diameter 5,5 mm
Dimension	96,6 x 37,9 x 10,3 mm	108,5 x 51,5 x 14,4 mm
Weight	87,5 g	127 g
Boat Applicable	Mono 1 and other racing boats (Length to 100 cm)	Mono 2 and other racing boats (length to 120 cm)

05. Commissioning a new controller

Connections

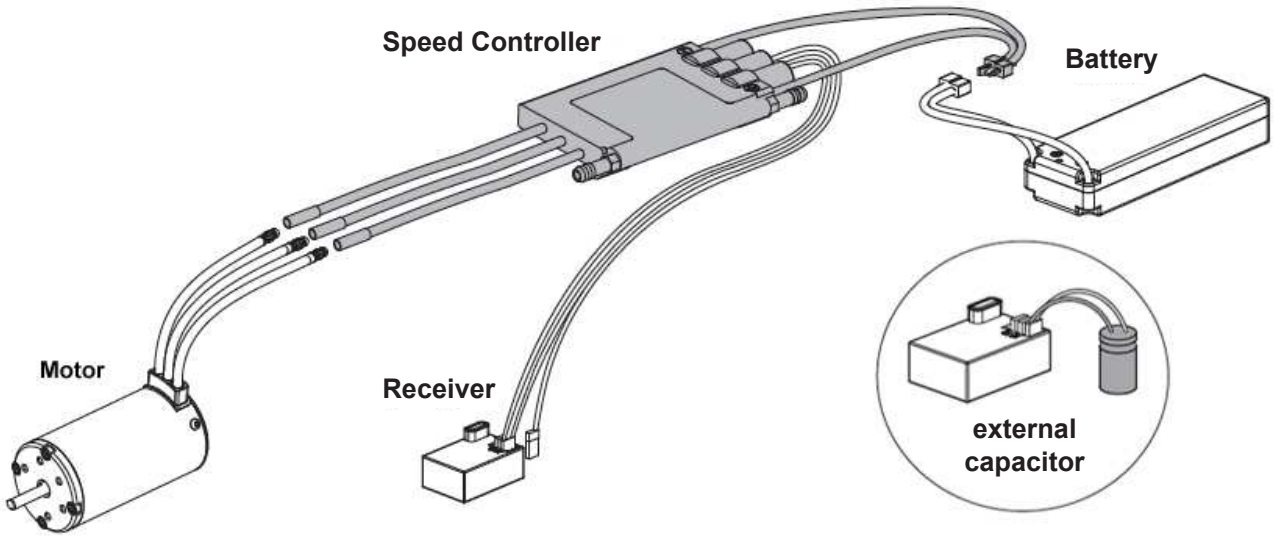
1. Water cooling: (suitable silicone hose must be procured optionally)
   The silicone hose for cooling water supply must be pushed onto the aluminium water cooling tube (outer diameter = 5.5 mm) mounted at the factory.

2. Motor connections: The motor connections can be connected to the motor as required. If the motor runs upside down, any two motor connections must be replaced

3. Receiver connection:
   1. Connect the throttle channel by connecting the servo cable for the input signals to the output of the receiver that outputs the gas signal. The receiver and servos are supplied with voltage (6.0 V / 7.4 V) via the red cable.
   2. The yellow connection for triggering the additional acceleration (turbo) can be connected to any free channel of the receiver (e.g. channel 3 or channel 4).

4. External capacitor:
   Servos with a very high torque of over 20 kg are increasingly used, which can result in feedback due to relatively high voltage peaks. This can destroy both the controller and the receiver. We recommend: To be on the safe side, an external capacitor equipped with a JR connector should be used and plugged into a free receiver output. Make sure that the polarity is correct. If no slot on the receiver is available, use a "Y" cable. No warranty will be given if the ESC is damaged due to the choice of the wrong servo.

5. Battery connection:
   Make sure that the polarity is correct. The positive pole of the battery must be connected to the positive pole of the controller and the negative pole of the battery to the negative pole of the controller. If the controller is connected with the wrong polarity, it may be damaged. This is not covered by the warranty!



Throttle Range Calibration

Because the different transmitters have different sensor paths, the gas control stick must be calibrated before the first start-up. This procedure must also be performed when changing the remote control transmitter and when changing the settings for the gas channel, such as changing the trim, the dual rate function and the travel setting. Please follow these steps.

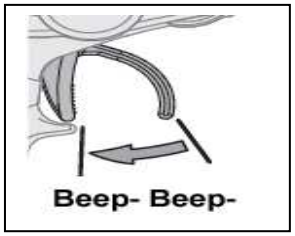
1. Switch on the transmitter and controller, set the parameters for the gas channel such as Dual rate or the travel setting to 100 %. Set the throttle trim to "0". For transmitters without LC display, set the encoder to maximum and the mechanical trim to the center. For Futaba transmitters set the direction to "Reverse", for other transmitters it must remain set to "Normal". We recommend activating a Fail Safe function to ensure that your ship stops if there is no valid input signal.

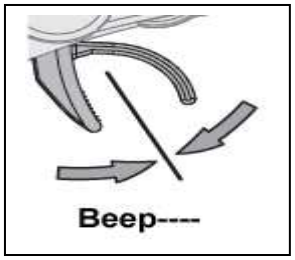
   Notice: If the transmitter is equipped with an ABS function, be sure to disable it. It hinders the procedure for the calibration of the gas control stick or makes the procedure impossible.

2. Calibrate the throttle on a pistol grip transmitter:

   Pull the throttle back to the full throttle position and hold it in this position, then connect the battery to the regulator, 2 sec. later the engine emits two short tones (beep, beep), the full throttle position has been accepted.

   Move the throttle to the neutral position, a long tone (beep----) is emitted, i.e. calibration is complete.



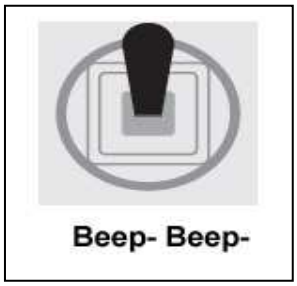


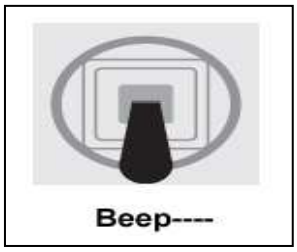
Notice:
While the acoustic signal is being emitted, the red LED lights up simultaneously.

3. Calibrate one transmitter throttle lever with joysticks:

   Pull the throttle stick into the front position into full throttle position, then connect the battery to the regulator, 2 sec. later the engine emits two short tones (beep-, beep-), the full throttle position has been accepted.

   If you want to set the throttle range to the "half stick travel", move the throttle lever to the new position. If you want to use the full stick travel, move the throttle stick to the lower position. A long tone (beep----) is emitted, i.e. calibration is complete.





Notice:
While the acoustic signal is being output, the red LED lights up simultaneously.

Normal Start Process

Move the throttle or throttle control stick to the "engine off" position and switch on the transmitter.

1. Connect the battery to the controller. The motor emits a series of tones indicating the number of LiPo cells. Check that the number of tones matches the number of cells. If only one tone is output, it indicates that the undervoltage cutoff is disabled. You can and may deactivate this function during programming only for nickel cells.
2. A second later, the motor emits a long beep (beep----) indicating that the controller is ready for operation. If the control transmitter is not in the correct position, a permanent warning tone (beep, beep, beep) is emitted until the encoder is brought into the "motor off" position.
3. Move the throttle control stick forward, the engine starts.

06. Programmable parameters of the controller

	Programmable parameters							
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
1. Running Modus	forward only	forward & backwards						
2. LiPo Cells	automa-tic	2S	3S	4S	5S	6S		
3. Undervoltage protection	turned-off	2,8 V/ cell	3,0 V/ cell	3,2V / cell	3,4V / cell			
4. Over temperature	105 °C	125 °C	deact.					
5. BEC voltage	6,0 V	7,4 V						
6. Starter Mode	Level 1	Level 2	Level 3	Level 4	Level 5			
7. General Timing	0,00 °	3,75 °	7,50 °	11,25 °	15,00 °	18,25 °	22,50 °	26,25 °
8. Turbo Acceleration	activated	deactivated						
9. Turbo Timing	0,00 °	3,75 °	7,50 °	11,25 °	15,00 °	18,75 °	22,50 °	26,25 °
10. PWM rate	6 kHz	8 kHz	12 kHz	16 kHz				

The fields with a grey background correspond to the factory setting

1. **Running Mode:**
   Option 1: Forward only
   In "Forward" mode, the boat can only go forward. This mode is suitable for competitions.

Option 2: Forward / Backward
The "Forward/Reverse" mode also offers the reverse driving function. This mode is well suited for most applications. (Note: Make sure that your boat can go backwards. If the drive is equipped with a flexible shaft, it can only move in one direction, the reversal of direction can damage a flexible shaft.

2. **LiPo Cells:**
The controller automatically calculates the number of LiPo cells. If automatic detection is activated, the controller determines the number of cells on the basis of the battery voltage. A battery with a voltage below 8.8 V is detected as 2S LiPo. A battery with a voltage of 8.8 V to 13.2 V is identified as 3S LiPo. If a battery is not fully charged when connected to the controller, miscalculations may occur so that a 6S LiPo that is not fully charged is identified as 5S LiPo. As a result, the undervoltage protection function may not function properly. Therefore, you must always plug in a fully charged battery. If you only use one LiPo battery at a time, we recommend manual setting of the LiPo cell count.

3. **Undervoltage protection:**
If you are using a LiPo battery, you must set a correct cut-off voltage for your battery according to the discharge rate "C". The ESC constantly monitors the battery voltage. The undervoltage protection is activated, the output power is significantly reduced if the battery voltage drops below the programmed cut-off voltage.
A: How is the cut-off voltage calculated? cut-off voltage = cut-off voltage per cell x cell count. If the limit value is set to 3.2 V / cell, the undervoltage drop is triggered at 9.6 V (3 x 3.2 V) with a 3S LiPo. **B:** After entering the undervoltage threshold: If the protection is activated, half the power is output at the output.
This means that the output power is only 50% even at full throttle. The red LED then flashes slowly at the same time. Please return your boat to land immediately and insert another fully charged battery. **Warning! If you ignore the "Note" and continue to use the battery, the battery will be irreparably damaged.**

C: If you use NIMH batteries: Because these cell types do not necessarily require an undervoltage protection, you can deactivate the protection. If you notice a drop in power, return your rc-boat immediately to the shore and insert another fully charged battery.

4. **Overtemperature protection:**
This protection does not stop the motor if the temperature of the controller exceeds the set value, but the output power is reduced to half (50%). The green LED flashes every time you move the throttle lever to the neutral position.
The controller operates normally again as soon as it has cooled down to a temperature below 80°C.

5. **BEC voltage**
Option 1: 6.0 V
For normal servos, not for HV servos, otherwise they cannot provide their full performance
Option 2: 7.4 V
For HV servos, do not use with normal servos, which could be destroyed by the higher voltage

6. **Start mode / punch:**
You can set the start mode in the ranges 1 (very soft) to 5 (very aggressive). Note that a powerful battery is used in "Level 4" and "Level 5",so the tension doesn't drop. If the battery can not deliver the high current the model jerks. You must then reduce the level of the start mode.

7. **Timing / General Timing:**
   This function has three aspects:
   - The controller can be configured for operation with different motors. The default setting of 15 degrees is suitable for many motors, but special motors require different values. Set the optimal timing level for your engine.
   - Fine-tune the output power of the motor. The higher the timing is set, the higher the engine speed and power of the engine, but more electrical energy is consumed.
   - Optimum adjustment of the motor to the most efficient operation

8. **Turbo acceleration:**
   When the turbo acceleration is triggered, the controller immediately goes to the set value of the turbo timing stage and thus provides greater power. This function can be used on longer straight stretches on the water, outside curves
   Note 1:
   - For the additional acceleration you need another channel (channel 3 or 4), connect the additional connection cable to the corresponding receiver output. The servo travel on this channel must be set to at least 80%, use the normal setting of 100%.
   - With a pistol grip transmitter, channel 3 or 4 is usually implemented by a key, pressing the key activates the turbo acceleration. With a normal transmitter, channel 3 or 4 is usually implemented by a switch, and turbo acceleration is activated or deactivated by pressing a switch.
   - If the general timing is set higher than the turbo timing (example: normal timing at 22.5 degrees and turbo timing at 15 degrees) the turbo acceleration has no effect. Therefore, make sure that the turbo timing value is set higher than the normal timing value.

9. **Turbo Timing:**
   The value can be set between 0 and 26.25 degrees, the value becomes effective as soon as the turbo acceleration is activated. When turbo acceleration is enabled, the ESC sets the appropriate turbo timing after receiving a signal for turbo acceleration.

10. **PWM frequency:**
    Increasing the PWM frequency can cause the motor to run smoother, smoother and the noise to decrease, but the regulator will heat up more. If the motor runs smoothly, we recommend selecting the default setting (8 KHz).

07. Programming the controller

Programming the ESC with your transmitter

Programming is carried out in four steps.

Activate programming mode → Determine parameters to be changed → Adjust selected parameters → Exit programming mode

Step 1: Activate programming mode

1) Switch on the transmitter and bring the throttle stick into full throttle position, then connect the drive battery, a signal sounds (beep, beep). It indicates that the full throttle position has been detected.
2) After 5 seconds, a sequence of tones will sound, indicating that the programming mode is active.

2. Determine parameters to be changed

After activating the programming mode, 10 different tones sound in succession, which can be assigned to the individual parameters according to the following table. To select a parameter, the throttle stick must be moved to the lower position within 3 seconds after sounding. A special tone indicates that the selected parameter is active and can be changed.

Adjustable parameters with the respective tone sequences

	Sequence of tones	Parameters	Description
1	Beep-	Running Mode	a short sound
2	Beep-, Beep-	LiPo cell count	two short sounds
3	Beep-, Beep-, Beep-	low-voltage protection	three short sounds
4	Beep-, Beep-, Beep-, Beep-	overtemperature protection	four short sounds
5	Beep----	BEC Voltage	a long sound
6	Beep----, Beep-	Start Mode	a long and a short sound
7	Beep----, Beep-, Beep-	Timing	one long and two short sounds
8	Beep----, Beep-, Beep-, Beep-	Turbo acceleration	one long and three short sounds
9	Beep----, Beep-, Beep-, Beep-, Beep-	Turbo Timing	one long and four short sounds
10	Beep----, Beep-----	PWM Turbo Frequency	two long sounds

3. Change the value of the selected parameter

After determining the parameter, different tones sound cyclically in succession, which can be assigned to the individual values of a parameter according to the following table. To activate a certain value, bring the throttle stick into full throttle position within 2 seconds. A special tone sequence will then sound confirming the selection and indicating that the value has been saved. If you want to stop programming prematurely, move the throttle lever to the lower "engine off" position within 2 seconds. This allows you to exit the programming mode immediately and quickly.

If you want to continue, please wait, you will automatically return to step 2 where you can set another programmable parameter that you can change according to the same procedure.

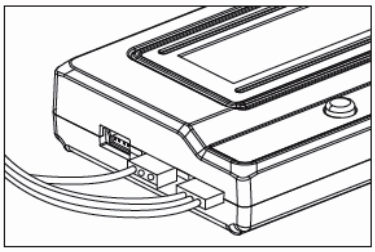
Note 2: A long note B----- corresponds to five short notes B, B, B, B, B Example: B----B stands for the sixth value of the parameter (5 + 1)

	B	B B	B B B	B B B B	B----	B---- B	B---- B B	B---- B B B
Running Mode	for-wards	back-wards						
LiPo Cells	auto-matic	2S	3S	4S	5S	6S		
Under-voltage-cutoff	deact.	2,8 V per cell	3,0 V per cell	3,2 V per cell	3,4 V per cell			
Overtemperature protection	105° C	125° C	deact.					
BEC voltage	6,0 V	7,4 V						
Starter mode	Level 1	Level 2	Level 3	Level 4	Level 5			
General Timing	0°	3,75°	7,5°	11.25°	15°	18.75°	22,5°	26.75°
Turbo acceleration	activated	deact.						
Turbo Timing	0°	3,75°	7,5°	11.25°	15°	18.75°	22,5°	26,75°
PWM frequency	6 kHz	8 kHz	12 kHz	16 kHz				

Exit programming mode

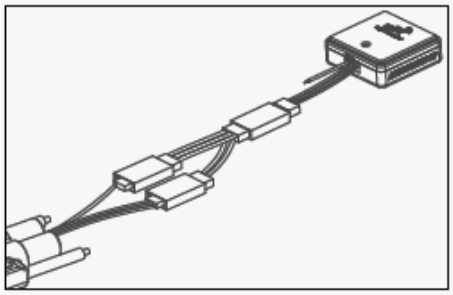
1. Within 2 seconds of selecting the parameter value, move the throttle to the lower position and you will hear a special tone sequence output from the motor. The programming mode is exited.
2. The drive battery can be disconnected in order to leave the programming mode.

Programming the ESC with optional Programming Box or WiFi Module



It is possible to combine these controllers with an optional LCD programming box or a PC for easy configuration. The RO-Control compatible software from HOBBYWING (USB LINK Software) can be installed on your PC. Before programming, the connection of the gas channel and that of the signal input must befor the turbo acceleration of the controller. can be closed. The signal line of your controller is displayed in the connections marked "- + & - + s". Short time later the boot screen will appear on the LC display of the programming box. Press any key on the box to start communication between the controller and the programming box. Then the first programming step (Running Mode) is displayed. The settings can be made using the "ITEM" and "VALUE" buttons. Press the "OK" key to accept the new value and store it in the controller.

- You can also use the WiFi module (HOBBYWING WIFI is RO-Control Navy compatible). You need a smartphone with the "HOBBYWING WiFi LINK Software" installed. Before programming, the WiFi module must be connected via a Y-cable. For more information, refer to the WiFi module manual. Please inform yourself exactly before using the module.



Restore to factory settings

- Restore factory settings using the LCD programming box

  To return the controller to the factory settings, press the "ITEM" key after connecting the controller to the LCD programming box until "RESTORE DEFAULT" is displayed. Then press the "OK" key. The controller is then reset to the factory settings.

- Restore factory settings using the WiFi module

  To return the controller to the factory settings using the WiFi module, select the "Parameters" menu in the app after connection and then activate the "Factory Reset" menu item.

8. LED Indications

During the starting process

1) The red LED flashes once every 2 seconds, the motor emits acoustic signals (beep, beep,...), which indicates that no valid signal is detected by the gas channel.

2) The green LED flashes and indicates the number of LiPo cells of the battery connected to the controller..

During operation

1) The red LED and green LED go out when the throttle lever is in the neutral position.
2) The red LED lights up continuously when the boat is moving forward. The green LED also lights up when the gas stick is at full throttle (100 %).
3) The red LED lights up constantly when your boat is reversing.

While a protective measure has been activated

1) The red LED flashes repeatedly with short, single flashes, indicating that the undervoltage protection is activated.
2) The green LED flashes repeatedly with short, single flashes, indicating that the overtemperature protection is activated.

9. Integrated protection functions

Low-voltage protection

The ESC constantly monitors the battery voltage. The undervoltage protection is activated, the output power is reduced to half (50%) if the battery voltage drops below the programmed cut-off voltage for 1 second.

The red LED flashes whenever you move the throttle to the neutral position.

Overtemperature protection

- The ESC constantly monitors the internal temperature. The temperature protection is activated, the output power is reduced to half (50%) when the temperature threshold is exceeded. The green LED flashes every time you move the throttle lever to the neutral position. The controller operates normally again as soon as it has cooled down to a temperature below 80 oC.
- If no valid signal is registered by the receiver for a time of 0.1 sec., the controller switches the motor off. The motor restarts as soon as faultless input signals are detected again. We recommend activating a Fail Safe function for the gas channel on the transmitter, which should be set so that the engine is switched off if no valid signal is received from the transmitter.

10. Problem solutions

Problem	Possible cause	Solution
After switching on, no tones are emitted and the LEDs do not light up.	1. No battery voltage is detected by the controller. 2. The battery is connected with the wrong polarity.	1. Check the connection between controller and battery, replace the connectors. 2. If the polarity is incorrect, disconnect the controller from the battery immediately, otherwise it will be destroyed.
After switching on, a warning signal sounds with two short tones each (B-, B-), in an interval of 1 sec.	1. The input voltage is too high or too low. 2. The regulator is too hot (above 80 o C).	1. Check the voltage level of the drive battery. 2. Check the controller temperature and the water cooling, possibly use a larger controller.
After switching on the motor does not work, a warning tone with a short tone (B-) sounds at an interval of 2 sec.	1. No evaluable input signal is available. 2. The transmitter and receiver are not bound.	1. Check the connection to the receiver, check if the cable is connected to the correct output. 2. Re-bind the transmitter and receiver according to the manufacturer's instructions.
You pull the throttle but the boat reverses.	The motor runs upside down, it is connected incorrectly.	Replace any two connecting cables between controller and motor.
The rc-boat does not reverse.	1. 1. the correct mode (forward and backward) is not set. 2. The controller does not recognize the neutral point.	1. Check the driving mode and set it to "forward and reverse". 2. Calibrate the throttle lever / throttle control stick according to these instructions.
The motor stops during operation.	1. The undervoltage case is triggered. 2. overtemperature protection is working.	1. Insert a fully charged battery. 2. The controller temperature is too high, let the controller cool down.

Motor does not start normally, abnormal running behaviour of the motor.	1. one or more connections between controller and motor are faulty. 2. the motor is defective	1. Please check all solder connections. 2. Test the functions with an ESC or motor with very low gas setting.
The LCD progamming box continues to display "connecting ESC" even though the connection has been established.	The two connections of the ESC are connected to the wrong port of the LCD programming box.	Check the connections carefully. Make sure everything is properly connected and connected. Follow the operating instructions.

11. Disclaimer of liability

We cannot monitor the conditions and methods of installation, operation, assembly, use and maintenance of this product. Therefore, we accept no liability whatsoever for losses, damages or costs arising from or in any way connected with incorrect use and operation. To the extent permitted by law, the obligation to pay damages, for whatever legal reason, is limited to the invoice value of our goods directly involved in the event.

12. Warranty

This product comes with a 24 month warranty. Our invoice serves as proof of the beginning and expiry of this warranty. Possible repairs do not extend the warranty period. The statutory warranty conditions apply. For example, you may only have used the product properly but not opened it. In the event of a warranty repair, return the product to us freight collect with a detailed description of the fault. The addresses for a freight collect shipment are enclosed with the shipment package. For countries where an unfree shipment is not possible, we will refund the postage costs afterwards.

robbe Modellsport

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