

Nr. 33718 Nr. 33735 Nr. 33745
Nr. 33760 Nr. 33770 No. S3030

BRUSHLESS CONTROL

+T18, +T35, +T45, +T60, +T70, +T100

Nr. 33718 +T18 Nr. 33735 +T35 Nr. 33745 +T45
Nr. 33760 +T60 Nr. 33770 +T70 No. S3030 +T100

OPERATING INSTRUCTION

Prior to use, please read this manual thoroughly.
Keep this manual in a convenient place for quick and easy reference.



• BEFORE USE

Thank you for purchasing Graupner/SJ Brushless control Telemetry speed controller. It is the common manual for BRUSHLESS CONTROL +T 18/35/45/60/70/100. This system is extremely versatile and may be used by beginners and pros alike. In order for you to make the best use of your system and to fly safely, please read this manual carefully. If you have any difficulties while using your system, please consult the manual, our online Frequently Asked Questions (on the web pages referenced below), your hobby dealer, or the Graupner/SJ Service Center. Due to unforeseen changes in production procedures, the information contained in this manual is subject to change without notice.

• SUPPORT AND SERVICE

Customer support
Please contact your Graupner/SJ importer in your region of the world or visit www.openhobby.com to assist you with any questions, problems or service needs.
Internet sales site
Please feel free to contact www.openhobby.com to get all information on product features, specifications, running events and the newest product line up.
A/S regulation
Only when the product is faulty after normal operation within the warranty period, we will repair the product for free based on our regulations. The repair will be paid for by the consumer when the damage is due to use in improper ways or beyond the warranty period.
Warranty regulation
Refer the WARRANTY CARD in a Package.

• OPENHOBBY A/S CENTER

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• INTRODUCTION

Graupner/SJ BRUSHLESS CONTROL +T series is used to airplane, helicopter, car and boat and should be a perfect choice for anyone who needs a high quality flight. BRUSHLESS CONTROL +T series gives user real-time information on various useful data such as user model's RPM, voltage, temperature, user programmable warning and etc thanks to HoTT Telemetry technology. All instructions, warranties and other collateral documents are subject to change at the sole discretion of Graupner/SJ. For up-to-date product literature, visit <http://www.openhobby.com> and click on the support tab for this product

Read the ENTIRE instruction manual to become familiar with the features of the product before operating. Failure to operate the product correctly can result in damage to the product, personal property and cause serious injury.

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• WARNING NOTES

- Always ensure the correct polarity in all connecting cables
- Always avoid short circuits.
- Never allow water, moisture, or other foreign materials to get inside speed controller, motor, or on the PC Boards.
- Ensure adequate air circulation around the speed controller and be careful to overheating of the speed controller
- Before connecting the drive battery, check all setting of rotor blades, propellers and wheel is correct first and always keep clear of them when the drive battery is connected.
- Always keep within the values stated in the speed controller's specification.
- Always disconnect the battery pack from the speed controller when not in use to avoid short circuits and possible fire hazard.
- Always insulate exposed wiring with heat shrink tubing or electrical tape to prevent short circuits, which can damage ESC.
- Don't make any changes on the structure and design of your controller unless they are described in the manual.
- Only those components and accessory parts which have been recommended by us may be used. Use only genuine and matching Graupner/SJ connectors and accessory parts.
- Make sure whenever you start connecting and operating the controller, that your transmitter is switched on, and has the throttle set to position "STOP".
- Telemetry function in ESC is only corresponding with Graupner/SJ HoTT system

This product is only intended for use with unmanned, hobby-grade remote-controlled vehicles, aircraft, helicopter and boat. OPENHOBBY disclaims all liability outside of the intended purpose and will not provide warranty service related thereto.

Age Recommendation: Not for Children under 14 years. This is not a toy.

• FEATURES

- Thermal cutoff
- Brake programmable
- Model finding function
- 32 kHz switching frequency
- One way or two way (Boat and car)
- Smooth throttle control and response
- The direction of motor rotation selectable.
- LiPo, NiCd and NiMH battery compatible
- LiPo, NiCd and NiMH battery compatible
- Selectable model type (Air, Heli, Boat, Car)
- Fully proportional forward with on/off brake and reverse
- Telemetry function with Graupner/SJ HoTT transmitter
- Governor mode ON / OFF with Governor Speed (only Heli)
- The automatic setup of low-voltage cutoff based on input voltage
- Perfect compatible with both inrunner and outrunner motors without setting.

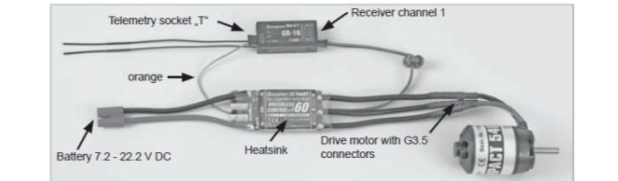
• TELEMETRY

Telemetry function of BRUSHLESS CONTROL +T series speed controller can be used with Graupner/SJ HoTT transmitter only

- Available telemetry data
 - Used capacity
 - RPM, average RPM
 - Current, maximum current
 - Battery voltage, minimum voltage
 - BEC voltage, minimum BEC voltage
 - ESC temperature, minimum ESC temperature
- Alarm : You can program telemetry warning to alert yourself of unsafe conditions such as battery voltage, BEC voltage, current consumption, capacity and ESC temperature during operation.
- Software update : You may stay up to date with the latest Graupner/SJ Firmware of development and expanded functions in future at www.openhobby.com, www.graupner-sj.com

• CONNECTIONS

Connect to the motor and receiver according to the detailed configuration in the below Attach suitable connectors for connection to the drive battery and be cautious about polarity of battery cable
• Red + Positive, Black - Negative



• MOUNTING ESC

Mount ESC with power wires away from other electronics & moving parts and select a location that allows good airflow through and around the heat sink - Good air flow allows ESC to run cooler and more efficient!
• Make sure all the cable leads are properly connected.

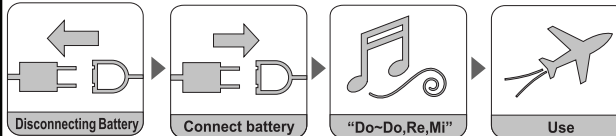
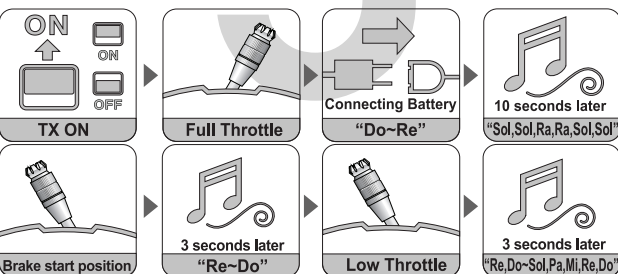
- Turn on transmitter's power and check the servo travel for throttle channel is within ±100% range
- NOTICE : Futaba radio system need to reverse (REVERSE) the throttle arm travel

BEV voltage of this speed controller is adjustable from 5 to 8V and it is set to 5.6V by default. If the voltage above 5.6V is required, you need to program the required voltage. When a high voltage servo is used, be cautious about fire !!

• TRANSMITTER THROTTLE ADJUSTMENT

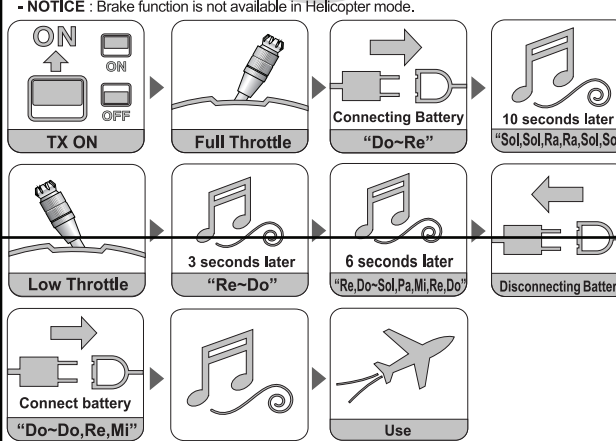
1. Air (Full throttle, Brake Start, Stop)

- Connect ESC to motor but still not to drive battery
 - Turn on transmitter's power and push transmitter throttle to full on position and hold it there.
 - Connect drive battery to speed controller with correct polarity. The status LEDs (yellow and red) blink and motor sounds "Do, Re".
 - Still hold transmitter throttle at full on position for about 10 seconds then motor sounds "Sol, Sol, Ra, Ra, Sol, Sol" and the yellow status LED turns off and the red status LED turns solid red indicating that ESC is at full throttle.
 - Put transmitter throttle to brake start position and hold it there till motor sounds "Re, Do" and the red status LED turns off and the yellow status LED turns solid yellow indicating that ESC is at brake start position.
 - Put transmitter throttle at Stop position and hold it there till motor sounds "Re, Do-Sol, Pa, Mi, Re Do" and the yellow status LED turns solid red after the status LEDs (yellow and red) blink in turn indicating ESC is at Stop position. Now, ESC setup has been completed.
 - Disconnect battery from speed controller. Put & hold transmitter throttle at Stop position and connect battery to speed controller again then motor sounds " Do- Do, Re, Mi" indicating speed controller is ready to use.
- NOTICE : 3 kinds position (Full throttle, Brake start, Stop) of transmitter throttle should be set to use brake function of Auto Brake Amount, Minimum Brake Amount, Maximum Brake Amount



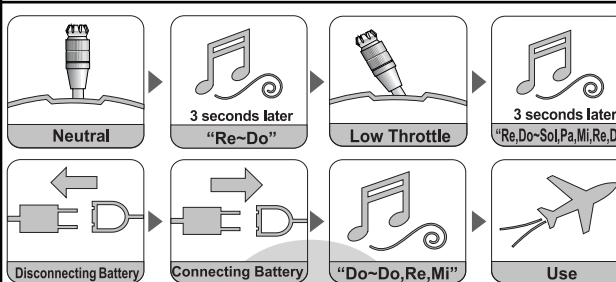
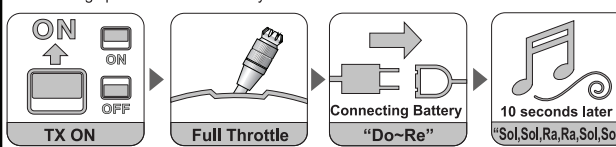
2. Heli (Full throttle, Stop)

- Connect ESC to motor but still not to drive battery
- Turn on transmitter's power and push transmitter throttle to full on position and hold it there.
- Connect drive battery to speed controller with correct polarity. The status LEDs (yellow and red) blink and motor sounds "Do, Re".
- Still hold transmitter throttle at full on position for about 10 seconds then motor sounds "Sol, Sol, Ra, Ra, Sol, Sol" and the yellow status LED turns off and the red status LED turns solid red indicating that ESC is at full throttle.
- Put transmitter throttle at Stop position and hold it there till motor sounds "Re, Do" and the red status LED turns off and the yellow status LED turns solid yellow indicating that ESC is at Stop position.
- After 6 seconds, motor sounds "Re, Do-Sol, Pa, Mi, Re Do" and the yellow status LED turns solid red after the status LEDs (yellow and red) blink in turn indicating ESC is now set for operation.
- Disconnect battery from speed controller. Put & hold transmitter throttle at Stop position and connect battery to speed controller again then motor sounds " Do- Do, Re, Mi" indicating speed controller is ready to use.



3. Car & Boat (Full throttle, Neutral, Reverse)

- Connect ESC to motor, receiver but still not to drive battery
- Turn on transmitter's power and push transmitter throttle to full on position and hold it there.
- Connect drive battery to speed controller with correct polarity. The status LEDs (yellow and red) blink and motor sounds "Do, Re".
- Still hold transmitter throttle at full on position for about 10 seconds then motor sounds "Sol, Sol, Ra, Ra, Sol, Sol" and the yellow status LED turns off and the red status LED turns solid red indicating that ESC is at full throttle.
- Put transmitter throttle at neutral and hold it there till motor sounds "Re, Do" and the red status LED turns off and the yellow status LED turns solid yellow indicating that ESC is at neutral.
- Pull transmitter throttle to reverse position and hold it there till motor sounds "Re, Do-Sol, Pa, Mi, Re Do" and the yellow status LED turns solid red after the status LEDs (yellow and red) blink in turn indicating ESC is reverse position. Now, ESC setup has been completed.
- Disconnect battery from speed controller. Put & hold transmitter throttle at neutral and connect battery to speed controller again then motor sounds " Do- Do, Re, Mi" indicating speed controller is ready to use.



• The status LED condition for throttle stick operation.

Position	Yellow LED	Red LED
Neutral	On	Off
Full throttle	Off	On
Full brake	On	On
Reverse	Off	Off

• The status LED condition for error indication

NO	LED	The number of LED blinking	Error
1	Yellow	Repeat 1 time blinking	When turning on ESC, throttle is over Stop position
2	Red	Repeat 1 time blinking	No signal
3	Red	Repeat 2 times blinking	Battery voltage is too low
4	Red	Repeat 3 times blinking	ESC temperature is too high
5	Red	Repeat 4 times blinking	Current is too high

NOTICE : The LED indication keeps going till battery is disconnected, excepting No. 2
The LED indication of No. 2 is terminated as soon as ESC gets the normal signal

• THE PROGRAMMING SETUP

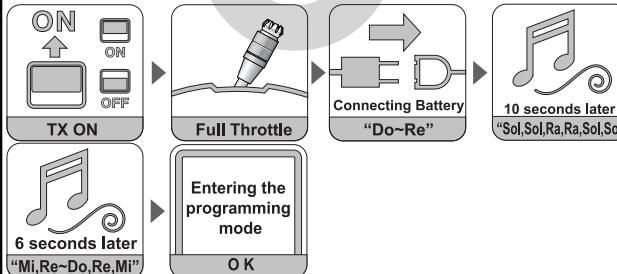
BRUSHLESS CONTROL +T series speed controllers can be programmed either directly using HoTT transmitter or Program box.

1. Setup in programming mode (without HoTT radio control system)

- Connect ESC to motor, receiver but still not to drive battery
- Turn on transmitter's power and push transmitter throttle to full on position and hold it there.
- Connect drive battery to speed controller with correct polarity. The status LEDs (yellow and red) blink and motor sounds "Do, Re".
- Still hold transmitter throttle at full on position for about 10 seconds then motor sounds "Sol, Sol, Ra, Ra, Sol, Sol" and the yellow status LED turns off and the red status LED turns solid red indicating that ESC is at full throttle.
- Still hold transmitter throttle at full on position for another 6 seconds till motor sounds "Mi, Re - Do, Re, Mi" and the status LEDs (yellow and red) blink at the same time to indicate that ESC is in programming mode.

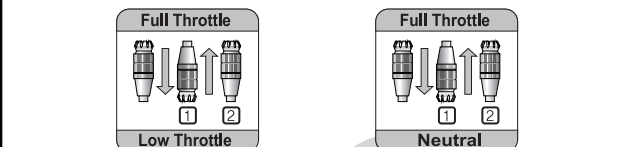
IMPORTANT : Yellow LED blinks as many times as the number of mode and red LED blinks as many times as the number of parameter. Motor sounds "Mi" as many times as the number of mode and parameter

EXAMPLE : If ESC is in mode 1 and parameter 2 is set, yellow status LED blinks 1 time and motor sounds "Mi, red status LED blinks 2 times and motor sounds "Mi ~ Mi"

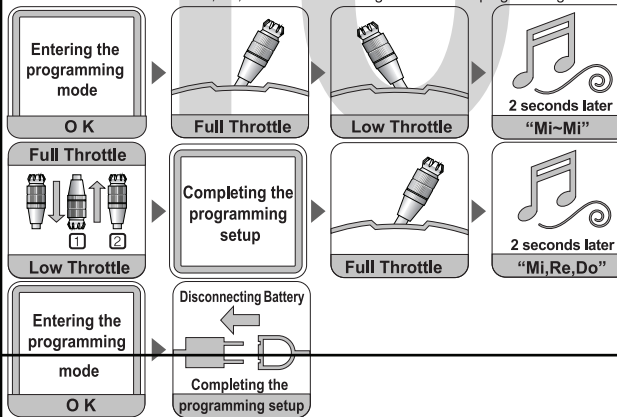


6) To enter to the other programming mode, follow below instruction

- 1 Way setup for Airplane, Helicopter, Car and Boat
Move transmitter throttle to Stop position and push it to full on position.
- 2 Way setup for Car and Boat
Move transmitter throttle to neutral and push it to full on position



- After entering the desired programming mode, move transmitter throttle to Stop/ Reverse position and hold it there for 2 seconds. You can now program the parameters. Yellow and Red LED blinks as many times as the numbers of mode and parameter
- Push transmitter throttle to full on position from Stop/ Reverse and then return Stop/ Reverse position again. When transmitter throttle forward and back, you may enter another parameter
- After the programming setup, push transmitter throttle to full on position and hold it there for 2 seconds till motor sounds "Mi, Re, Do" to indicate ESC gets back to the programming mode.



• LED indication and the programming mode/ parameter

YELLOW LED	Mode	1	2	3	4	5	6	7	8	9	10	11
1	BATTERY TYPE	LiPo	NiMH	-	-	-	-	-	-	-	-	-
2	DIRECTION	Normal	Reverse	-	-	-	-	-	-	-	-	-
3	GOVERNOR(HELI)	0	10	20	30	40	50	60	70	80	90	100
3	REVERSE-FUNCTION (BOAT/CAR)	OFF	ON	-	-	-	-	-	-	-	-	-
4	MODEL	Air	Heli	Boat	Car	-	-	-	-	-	-	-
5	FACTORY	NO	YES	-	-	-	-	-	-	-	-	-

NOTICE : Since the programming mode 3 depends on mode 4, Model type, Model type should be programmed first

2. Setup in programming mode (with HoTT radio control system)

The operating method of Brushless Control +T is very similar with the one of Graupner/SJ HoTT transmitter. For more information, please refer to the section entitled "Telemetry" in the operating instruction of HoTT transmitter or SMART BOX. The ESC programming setup is carried out in the transmitter's "SETTING & DATA VIEW" menu and the ESC programming setup page (ESC DATA VIEW) is followed by receiver setup page.

NOTICE : Telemetry menu is accessed only if transmitter and receiver are operated normally. It might take a little time for telemetry page in transmitter to be displayed after turning on transmitter and receiver. It is because all data between transmitter and receiver/ ESC are transmitted by wireless.

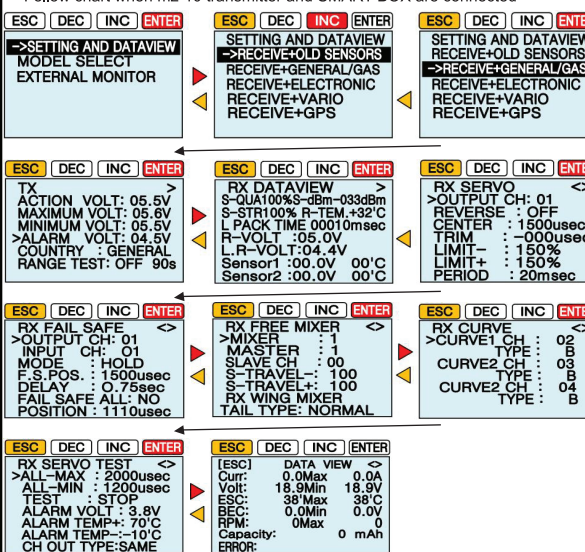
If your transmitter doesn't have LCD screen, you may program ESC with the optional SMART BOX. SMART BOX provides an easy and comfortable environment for the programming setup

1) The explanation about the operation buttons of SMART BOX is introduced

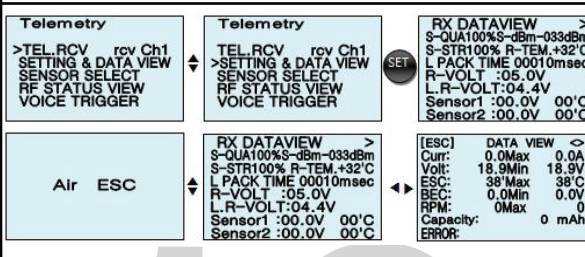
SMART-BOX	mx-12 / mx-16 / mx-20 / mx32 HoTT	mc-19 / mc-22 / mc-24 / mx24 HoTT
ENTER	ENTER	ENTER
ESC	ENTER	CLEAR
INC	scroll : ▼ value : ▲	scroll : push Rotary + ◁ value : Rotary ◁
DEC	scroll : ▲ value : ▼	scroll : push Rotary + ▷ value : Rotary ▷
INC+DEC	SET	push Rotary

2) How to access [ESC] DATA VIEW page

Follow chart when mz-10 transmitter and SMART BOX are connected



Follow chart for mz-12 transmitter
Press & hold transmitter ESC button to call Telemetry page and select Setting & DATA VIEW with ESC button to press SET button to access to RX DATA VIEW page. Select AIR ESC Setting & DATA VIEW with ESC button and SERVO TEST page appears for a while. Press button to access [ESC] DATA VIEW page



3) [ESC] DATA VIEW

ESC	DEC	INC	ENTER
[ESC]	DATA VIEW	<	>
ESC	Cur:	0.0Max	0.0A
ESC	Volt:	18.9Min	18.9V
ESC	BEC:	38Max	38°C
RPM:	0Max	0.0V	0
CAPACITY:	0Max	0.0V	0
ERROR:			

You may check the telemetry information on BRUSHLESS CONTROL +T, but can't program the data in the page

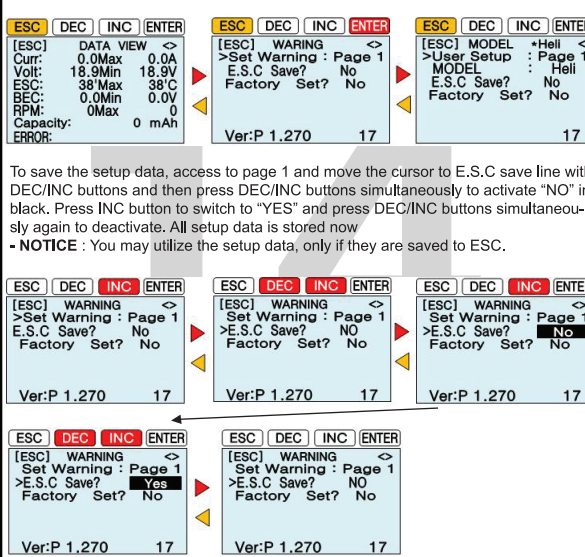
The max temperature of ESC during flight and the present temperature

Symbol	Description
Cur	The max current of ESC during flight and the present current
Volt	The min voltage of drive battery during flight and the present voltage
ESC	The max temperature of ESC during flight and the present temperature
BEC	The min BEC voltage of ESC during flight and the present BEC voltage
RPM(MAX)	Then max RPM of motor during flight and the average RPM
Capacity	The consumption amount of drive battery during flight
ERROR	The detected errors during flight <ul style="list-style-type: none">OC : Over current protectionT : Over temperature protectionV : Low voltage protectionR : No signal from receiver

3. Set Warning setup with SMART BOX

Set Warning is used to set alarm limit for telemetry function of BRUSHLESS CONTROL +T, it consists of 6 pages

To access Set Warning page 1, press "ENTER" button at [ESC] DATA VIEW page. You can access Set Warning and User Setup page with ENTER and ESC buttons. The setup data can be saved and you may get back to the factory setup at page 1



To get back to factory setup page, move the cursor to Factory set line with DEC/INC buttons at page 1 and press DEC/INC buttons simultaneously to activate "NO" in black Press INC button to switch to "YES" and press DEC/INC buttons simultaneously again to deactivate. You get back to factory setup now

ESC | DEC | INC | ENTER
ESC | DEC | INC | ENTER
ESC | DEC | INC | ENTER
ESC | DEC | INC | ENTER

ESC | DEC | INC | ENTER
ESC | DEC | INC | ENTER
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ESC | DEC | INC | ENTER
ESC | DEC | INC | ENTER

1) [ESC] VOLTAGE
It is used to set the voltage limit for drive battery connected to ESC. An alarm will sound when the battery voltage reaches the limit.

To perform the programming setup, you need to select the category first with DEC/INC buttons and need to activate the value of the selected category in black by pressing DEC/INC buttons simultaneously and then set the desired value with DEC/INC buttons. Now, you need to deactivate the setup value by pressing DEC/INC buttons simultaneously again

ESC | DEC | INC | ENTER
ESC | DEC | INC | ENTER
ESC | DEC | INC | ENTER
ESC | DEC | INC | ENTER

ESC | DEC | INC | ENTER
ESC | DEC | INC | ENTER
ESC | DEC | INC | ENTER
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ESC | DEC | INC | ENTER
ESC | DEC | INC | ENTER
ESC | DEC | INC | ENTER
ESC | DEC | INC | ENTER

Table with 3 columns: Category, Description, Default. Rows include Voltage, Warning Time, Repeat Time, Signal Tone, and Min-Volt.

2) [ESC] TEMPERATURE
It is used to set the temperature limit for ESC. An alarm will sound when the temperature reaches the limit.

ESC | DEC | INC | ENTER
ESC | DEC | INC | ENTER
ESC | DEC | INC | ENTER
ESC | DEC | INC | ENTER

Table with 3 columns: Category, Description, Default. Rows include Temperature, Warning Time, Repeat Time, Signal Tone, and ESC.Temp.

3) [ESC] MAX CURRENT
It is used to set the max current limit for ESC. An alarm will sound when ESC reached the max current limit.

ESC | DEC | INC | ENTER
ESC | DEC | INC | ENTER
ESC | DEC | INC | ENTER
ESC | DEC | INC | ENTER

Table with 3 columns: Category, Description, Default. Rows include Maximum CUR, Warning Time, Repeat Time, Signal Tone, and MAX.CURR.

4) [ESC] MINIMUM RPM
It is used to set the min RPM limit that ESC is detecting. An alarm will sound when the min RPM reaches the limit.

ESC | DEC | INC | ENTER
ESC | DEC | INC | ENTER
ESC | DEC | INC | ENTER
ESC | DEC | INC | ENTER

Table with 3 columns: Category, Description, Default. Rows include Maximum CUR, Warning Time, Repeat Time, Signal Tone, and MAX.CURR.

5) [ESC] CAPACITY
It is used to set the battery consumption amount limit that ESC is detecting. An alarm will sound when the battery consumption amount reaches the limit.

ESC | DEC | INC | ENTER
ESC | DEC | INC | ENTER
ESC | DEC | INC | ENTER
ESC | DEC | INC | ENTER

Table with 3 columns: Category, Description, Default. Rows include Capa warning, Warning Time, Repeat Time, Signal Tone, and Capacity.

4. User setup with SMART BOX
After setting Warning setup, you may access User setup page by pressing ENTER button The setup data can be saved and you may get back to the factory setup by page 1

ESC | DEC | INC | ENTER
ESC | DEC | INC | ENTER
ESC | DEC | INC | ENTER
ESC | DEC | INC | ENTER

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ESC | DEC | INC | ENTER
ESC | DEC | INC | ENTER

Table with 3 columns: Category, Description, Default. Rows include Model, ESC Save?, and Factory Set?.

1) Battery type, Cut-off type, Rotation, Motor timing (Helicopter, Airplane, Car, Boat)
It is used to set battery type, Cut-off type, Rotation, Motor timing at page 2

ESC | DEC | INC | ENTER
ESC | DEC | INC | ENTER
ESC | DEC | INC | ENTER
ESC | DEC | INC | ENTER

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ESC | DEC | INC | ENTER
ESC | DEC | INC | ENTER
ESC | DEC | INC | ENTER

Table with 3 columns: Category, Description, Default. Rows include Battery, Cut-off, Rotation, and Motor timing.

2) Speed up typ, Start torque, Gov speed, Gov Response, Governor
It is used to set Speed up type, Start torque, Governor speed, Governor Response, Governor at page 3

ESC | DEC | INC | ENTER
ESC | DEC | INC | ENTER
ESC | DEC | INC | ENTER
ESC | DEC | INC | ENTER

Table with 3 columns: Category, Description, Default. Rows include Speed up typ, Start torque, Gov speed, Gov Response, and Governor.

WARNING
If the different batteries are used to fly, it is very important to program Gov speed function with battery in lower voltage.

ESC | DEC | INC | ENTER
ESC | DEC | INC | ENTER
ESC | DEC | INC | ENTER
ESC | DEC | INC | ENTER

Table with 3 columns: Category, Description, Default. Rows include Speed up typ, Start torque, A-Brake, Min-Brake, and Max-Brake.

- NOTICE : When A-Brake is set, the brake is operated from 2nd throttle point to Low point automatically

ESC | DEC | INC | ENTER
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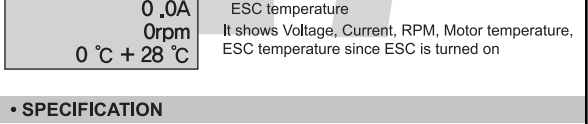
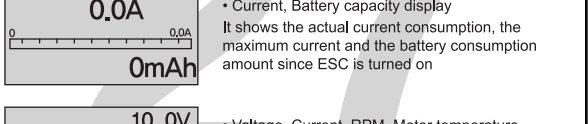
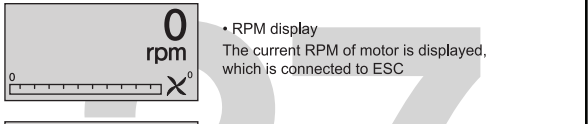
Table with 3 columns: Category, Description, Default. Rows include Number-Pole, Gear Ratio, and BEC Volt.

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Table with 3 columns: Category, Description, Default. Rows include Max-Reverse, Reverse function, Number-Pole, Gear Ratio, and BEC Volt.

5. Graphic display for telemetry data
Please refer to the section entitled "Telemetry" in the operating instruction of HOTT transmitter or SAMRT BOX.

Table with 3 columns: Category, Description. Rows include 10.0V/9.8V, 31(52)C, 0(0)C, 0mAh, 0.0A/, and 0rpm/0.



BRUSHLESS CONTROL table with columns for parameters like Cell count, Operating Voltage, Continuous current, max. current 10s, etc.

Table with multiple columns for various motor specifications such as BEC current max, BEC voltage, BEC short circuit protection, False start protection, Overtemp. Protection, Low voltage cutoff, Power wires, Motor Wires, Dimensions, and Weight.

MODEL FINDER
This function is specially designed for Airplane and Helicopter only and it may help to find the downed model location.

ENVIRONMENTAL PROTECTION NOTES
This product must not be disposed of with other waste. Instead, it is the user's responsibility to their waste equipment by handing it over to a designated collection point for the recycling of waste electrical and electronic equipment.

EG DECLARATION OF CONFORMITY
We hereby declare that the following product
Product: Graupner/SJ BRUSHLESS CONTROL ESC BRUSHLESS CONTROL +T18, +T35, +T45, +T60, +T70, +T100 ESC

KC Information
Product: Graupner/SJ BRUSHLESS CONTROL ESC BRUSHLESS CONTROL +T18, +T35, +T45, +T60, +T70, +T100 ESC